DATA SHEET

# V3500A Handheld RF Power Meter


## Why Keysight's Power Meters and Sensors?

### Reliable, high-performing solutions

Every power meter and sensor from Keysight Technologies, Inc. consistently delivers great results.

### A sure investment for many years to come

Code-compatibility between power meters reduces the need for re-coding. Not only that, all Keysight power meters are backward-compatible with most legacy power sensors.

### One specific application: One right solution

Keysight offers a wide selection of power meters and sensors for practically all application needs—wireless communications, radar pulse measurements, component test and more.

### Global network support

No matter where you are, Keysight is committed to giving you the 24-hour support you need regarding our products, applications or services.

Keysight's power meters have long been recognized as the industry standard for RF and microwave power measurements.

The first palm-sized power meter from Keysight Technologies that delivers high lab quality RF power measurements for installation and maintenance or R&D lab environments.

KEYSIGHT TECHNOLOGIES

# Compact, Portable Solutions for Today's RF Power Measurements

## For production testing

- Compact build saves rack space
- Simple set-up and usage
- Wide dynamic and frequency range

## For R&D and design verification

- Compact build saves bench space
- Simple set-up and usage
- Wide dynamic and frequency range
- High accuracy
- Advanced troubleshooting of designs with built-in backlight display for easy readings and data recording

## For installation and maintenance

- Integrated power sensor eliminates the need to carry separate sensor
- Lightweight and rugged
- Truly portable (with AA batteries)
- Wide dynamic and frequency range
- Quick and easy testing with built-in backlight display

Associated with mobile phones and infrastructure, wireless sensors and transceivers, and WiMAX™, WLAN, RFID, mobile radio, Zigbee, and Bluetooth® devices

# Introducing the New Member of the Power Meter Family—the Keysight V3500A

## Key features

- Broad 10 MHz to 6 GHz frequency range enables use in variety of applications, including test of mobile phones and infrastructures, WLAN devices, RFID readers, and WiMAX devices
- Large dynamic range of –60 dBm to +20 dBm measures various types of signals, either directly from the device-under-test or through layers of cabling and fixtures
- Integrated power sensor eliminates the need to carry a separate sensor and makes it the most compact and portable RF power measurement instrument
- Internal power reference enables self-calibration and excludes the need to perform independent calibration before using the instrument
- Compensate for cable losses with the Relative Offset function that can add an offset to the display ranging between –99.99 dB and +99.99 dB
- Absolute accuracy up to ±0.21 dB enables more precise characterization of devices, tighter test limits, and more accurate fixture calibration

The Keysight V3500A handheld RF power meter is a compact, portable instrument that makes lab quality RF power measurements in both field and R&D laboratory environments. With an absolute accuracy up to ±0.21 dB, a wide frequency range of 10 MHz to 6 GHz, and measurement range of –60 dBm to +20 dBm, the V3500A is suitable for a wide variety of RF measurement applications. Its built-in power sensor eliminates the need for users to carry both an instrument and a separate sensor module, and the same sensor is used when duplicating tests or measurements for better repeatability. Truly portable, the V3500A fits easily into your hand or a toolkit and optional loop holster carrying case with shoulder strap is also available to fit your need. To optimize flexibility, it's capable of drawing operating power from batteries, an AC-DC converter module, or a computer via the USB interface. With its features and very attractive price, the V3500A truly redefines superior value.

## High accuracy in both the lab and field


Whether it's used in the field or on the factory floor, the Keysight V3500A makes lab quality RF measurements quickly and easily. Its absolute accuracy up to ±0.21 dB,enables more precise characterization of devices, tighter test limits, and more accurate fixture calibration. In the laboratory, it can be used as an RF power data-logger. Using normal or high speed mode, it easily captures and transfers data to your personal computer through its built-in USB interface (cable supplied), allowing for trend or drift analysis. Despite its small package, the V3500A provides outstanding accuracy on the bench, replacing much larger and more expensive instrumentation.

## Convenient utilities

The V3500A incorporates several handy and practical utilities that make it easier than ever to attain high quality RF measurements with this handheld instrument. Compensate the display reading for any losses or gains between the location where the level of power is desired and the actual point where the power can be measured. Typically the compensation will be required for cable loss. The relative offset factor can be as large as 99.99 dB, and the offset can be programmed with a resolution of 0.01 dB. A number of averaging values can be used when the signal you want to measure varies significantly with time. A hold command saves a measurement that is made in a hard to reach area until the instrument can be retrieved. A backlight can be illuminated when making measurements in poorly lit areas. To maximize battery life, the V3500A can be set up to turn off the backlight or the instrument entirely after a specific period of time. Once the instrument utilities are setup in the manner you prefer, the instrument state can be saved for the next use.

# Take a Closer Look

## RF connector

In the RF world, cables are often equipped with N-connectors and SMA connectors. N-con-nectors are commonly used on test instru-mentation, because they are rugged, can handle high powers, and perform well up to about 18 GHz.

This section contains information about how to make RF signal connections to the Type N male RF connector (50 Ω characteristic impedance—refer to Figure 1) of the V3500A for power measurement.

## Connection for a power measurement

**NOTE:** When connecting the Type N connector of the V3500A to a Type N female connector for a power measurement, observe the following proper practice for tightening the connection.

While holding the body of the power meter in one hand, turn the Type N male connector nut to tighten the connection (do not turn the body of the V3500A). Continue to do so until the connection is hand-tight. It is important to turn the nut of the connector rather than the body of the power meter when tightening the connection.

## USB port

**NOTE:** The term USB (Universal Serial Bus) is used in this data sheet. USB is simply another term for the Universal Serial Bus.

The power meter has a USB 2.0 interface with a USB type Mini-B port (refer to Figure 2). The V3500A can be remotely programmed over this USB interface. In addition to programming, the V3500A can be powered by the USB. With the USB connected and providing power, and the optional external power disconnected, the V3500A will be powered from USB regardless of whether batteries are present.

**NOTE:** The interface is USB 2.0 compatible, but with an interface speed of 12 Mbps.

## External power connector

The power connector provides a connection for the optional external power supply (refer to Figure 2). If the external power supply is connected, the V3500A will be powered by the external supply, regardless of whether USB power or batteries are present.

**CAUTION:** Only connect the optional external power supply (V3500A-PWR) to this connector. Instrument damage may result if improper power is applied.

## Battery power

The V3500A can also be powered by two AA batteries. If installed, the batteries will power the V3500A only if the external power supply and USB are not connected.

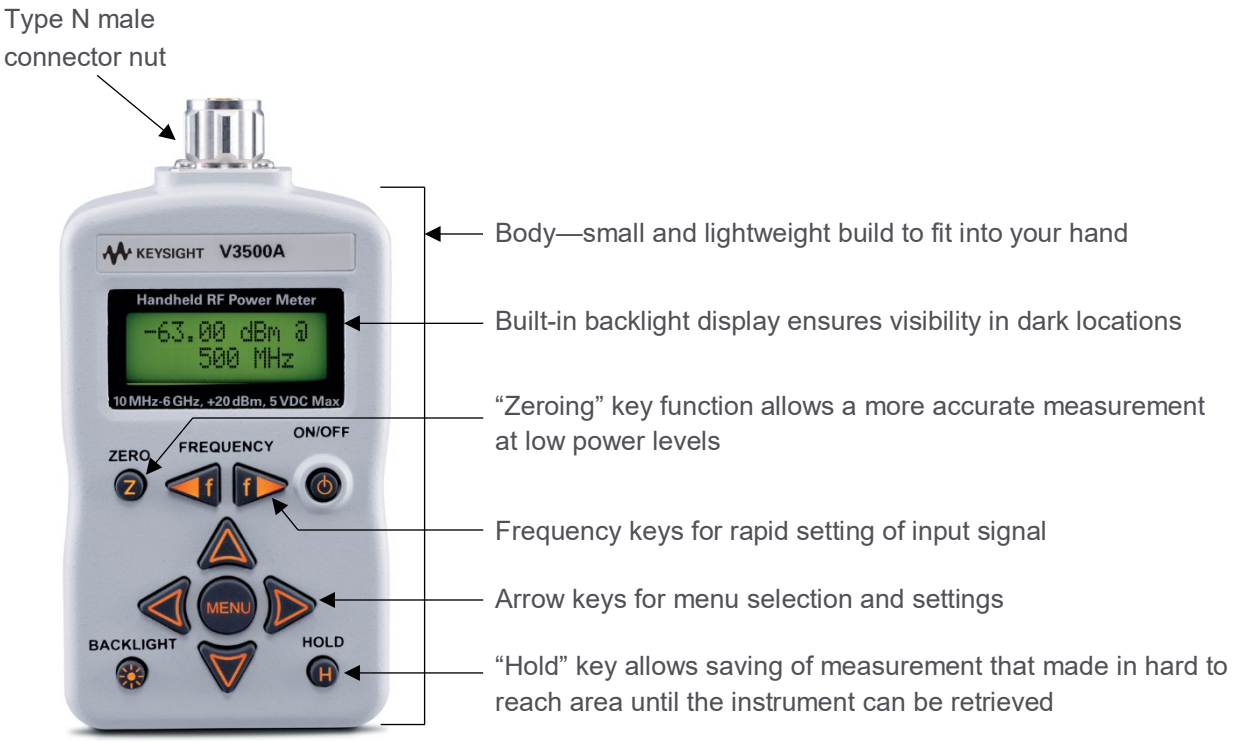



Figure 1. Signal connection

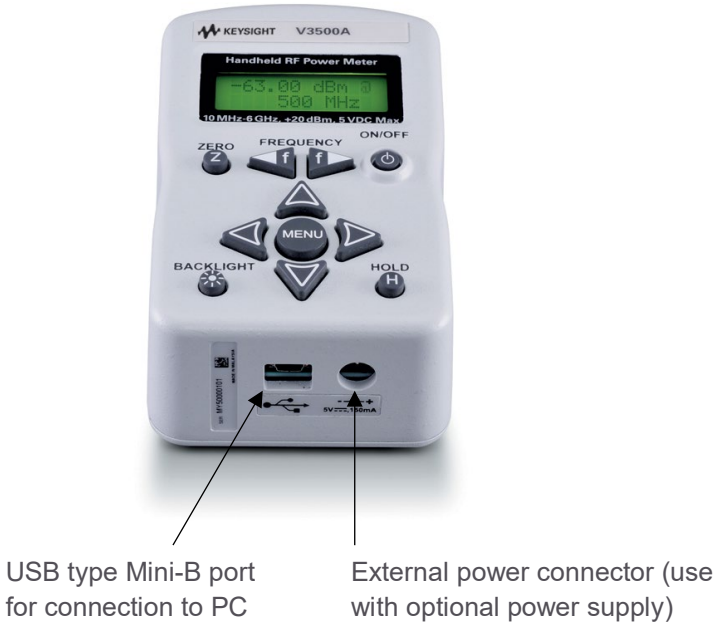



Figure 2. USB and power connector

# Specifications

The following specifications are based on performance at a temperature of 23 °C ± 5 °C unless stated otherwise.

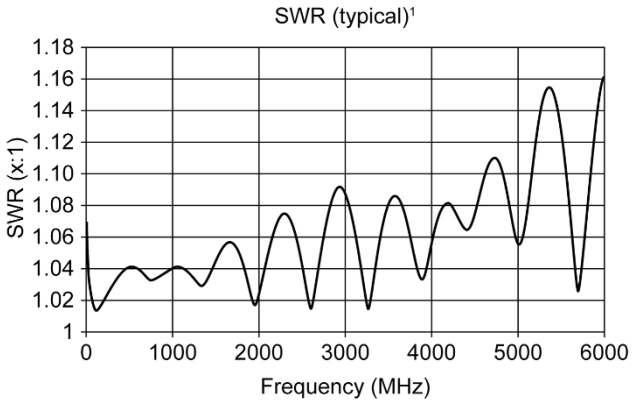
| Product specifications | | |
|---|---|---|
| **Category** | **Specifications** | |
| Frequency range | 10 MHz to 6 GHz | |
| Power range | –60 dBm to +20 dBm | |
| Maximum power | +23 dBm, 5 VDC | |
| Power accuracy | At 23 °C ±5 °C[1] | At 0 °C to 50 °C |
| **Frequency range**<br>10 MHz to 3.75 GHz<br>3.75 GHz to 6 GHz | **+20 dBm to +6 dBm**<br>*±0.23 dB*<br>*±0.20 dB* | **+20 dBm to +6 dBm**<br>*±0.33 dB*<br>*±0.44 dB* |
| **Frequency range**<br>10 MHz to 3.75 GHz<br>3.75 GHz to 6 GHz | **+6 dBm to –9 dBm**<br>±0.26 dB<br>±0.40 dB | **+6 dBm to –9 dBm**<br>*±0.33 dB*<br>*±0.55 dB* |
| **Frequency range**<br>10 MHz to 3.75 GHz<br>3.75 GHz to 6 GHz | **–9 dBm to –29 dBm**<br>±0.18 dB<br>±0.19 dB | **–10 dBm to –29 dBm**<br>*±0.29 dB*<br>*±0.34 dB* |
| **Frequency range**<br>10 MHz to 3.75 GHz<br>3.75 GHz to 6 GHz | **–29 dBm to –39 dBm**<br>±0.22 dB<br>±0.25 dB | **–30 dBm to –40 dBm**<br>*±0.32 dB*<br>*±0.44 dB* |
| **Frequency range**<br>10 MHz to 3.75 GHz<br>3.75 GHz to 6 GHz | **–39 dBm to –50 dBm**<br>±0.36 dB<br>±0.39 dB | **–39 dBm to –50 dBm**<br>*±0.48 dB*<br>*±0.65 dB* |
| **Frequency range**<br>10 MHz to 3.75 GHz<br>3.75 GHz to 6 GHz | **–50 dBm to –55 dBm**<br>±1.37 dB<br>±1.81 dB | **–50 dBm to –55 dBm**<br>±1.47 dB<br>±1.97 dB |
| Linearity<br>–40 dBm to +6 dBm<br>–50 dBm to –40 dBm<br>–50 dBm to –55 dBm | At 23 °C ±5 °C<br>±0.1 dB<br>±0.4 dB<br>±1.0 dB | At 0 °C to 50 °C<br>±0.2 dB<br>±0.5 dB<br>±1.1 dB |
| Noise floor | At 0 °C to 50 °C<br>–61 dBm | |
| Speed | Normal<br><br>High-speed<br> | ~2 readings per second (> –30 dBm approximately)<br>~1 readings per second (≤ –30 dBm approximately)<br>~23 readings per second (> –30 dBm approximately)<br>~10 readings per second (≤ –30 dBm approximately) |

1. Customer spec after warm up time of 30 minutes
   $X = (x,f) + K(=2) \cdot \delta(x,f) + \Delta_E(x,f[18\ ^\circ – 28\ ^\circ C]) + \mu$
   where
   X is mean of the data taken in the frequency range stated (x,f).
   δ is standard deviation of the data taken in the frequency range stated (x,f).
   x is measured value at test frequencies.
   f is frequency range over which data was taken for specification.
   μ is measurement uncertainty.
   $\Delta_E$ is change associated temperature variation.
   18 ° – 28 °C is the statistics generated separately at these temperatures and larger statistical value used in setting spec.

# Specifications (continued)

SWR performance for different frequency band

| SWR | |
|---|---|
| **Frequency band** | **SWR (0 °C to 50 °C)** |
| 10 MHz to 3.75 GHz | 1.13 |
| 3.75 GHz to 6 GHz | 1.22 |




Typical SWR performance

| Product characteristics | |
|---|---|
| Power (equipped with auto-shutoff) | – Two 1.5 V alkaline AA batteries (typical battery life: 17.5 hours[1] with low battery indicator<br>– USB interface cable (Standard-A to Type-B)[2]<br>– Optional external DC power supply[3] (V3500A-PWR) |
| Display | – 4 digits with backlight and auto-shutoff feature<br>– Hold feature—most recent reading is shown on the display and is no longer updated |
| Connector | – USB 2.0 interface with a mini-B USB connector[4]<br>– Type N male RF connector (50 Ω characteristic impedance) |
| Operating environment | – At 0 ° to 50 °C<br>– Up to 80% RH for temperature up to 35 °C, non-condensing<br>– Altitude up to 2,000 meters |
| Storage compliance | – –10 °C to 70 °C<br>– Non-operating maximum humidity: 90% at 65 °C, non-condensing |
| EMC compliance | Certified with<br>– IEC 61326-2-1:2005/EN 61326-2-1:2006<br>– Canada: ICES-001:2004<br>– Australia/New Zealand: AS/NZS CISPR11:2004 |
| Pollution degree | Pollution Degree 2 |
| Dimensions (W × H × D) | 79 mm × 134 mm × 49 mm (without N-connector) |
| Weight | 0.5 kg |