

8500 SERIES INDUSTRIAL COMPLIANCE METERS

- **Complete Measurement System: Meter and Dual Electric and Magnetic Field Probe**
- **Covers Most Industrial Equipment**
- **Extremely Easy to Use**
- **Low Cost, Compact, and Lightweight**
- **High Overload Tolerance**
- **RMS Detection**

APPLICATIONS

- **RF or High Frequency Heat Sealers, Vinyl Welders**
- **Semiconductor Process Equipment: Etchers, Sputterers, Ashers, and Glass Deposition**
- **RF Induction Heating**
- **Dielectric Dryers and Heaters**
- **Plasma Generation Systems**



DESCRIPTION

The Narda Models 8511 and 8513 combine an unprecedented ease of operation with powerful measurement capabilities. It provides the industrial plant manager and safety professional with an accurate and inexpensive solution for proving compliance with regulations that

cover exposure to RF radiation. Both models provide a complete measurement system comprised of an extremely easy to operate meter and a probe that contains sensors to measure both the electric (E) and magnetic (H) field components of an electromagnetic wave.

OPERATION

The 8511 and the 8513 were designed to make measurements a simple process that does not allow the most common mistakes to happen.

NO CHANGING PROBES TO MEASURE THE ELECTRIC AND MAGNETIC FIELDS - the probe contains two sets of sensors that separately measure each field. Simply press the **E/H Field** key to change the field that you are measuring.

NO RANGE CHANGES - the meter automatically displays a numeric value over the probe's entire measurement range.

NO CONFUSING SCALES - simply read the digital display, including the unit of measure.

NO DIFFICULT ZEROING - just touch the **Auto Zero** key.

NO FORGETTING THAT YOU ARE IN THE MAXIMUM HOLD MODE - the meter clearly displays the word "Max" when you are in the maximum hold mode. The digital display shows the maximum value while the bar graph continues to indicate the instantaneous value.

Electric and Magnetic Field Measurement



APPLICATION

Major safety standards worldwide require that both the electric and the magnetic field components (E and H fields) be measured for equipment operating below 300 MHz. Most high power industrial equipment operates at one of the frequencies allocated for Industrial, Scientific, and Medical (ISM) applications. Two ISM frequencies - 27.12 MHz and 13.56 MHz - are used extensively. The majority of heat sealers and induction heaters operate at 27.12 MHz while most semiconductor processing equipment operates at 13.56 MHz. The 8513 operates from 10 MHz to 42 MHz and is calibrated at the three ISM frequencies within this range: 13.56 MHz, 27.12 MHz and 40.68 MHz. The 8511 has a much broader sensor that operates from 300 kHz to 100 MHz.

RF energy can cause the body to be heated beyond its ability to thermally regulate itself. Since 1987 OSHA has had the authority to cite employers for exceeding the limits specified by "state-of-the-art, scientific standards." OSHA

has chosen the IEEE C95.1-1991 Standard for enforcement of non-ionizing radiation safety. This IEEE standard includes many changes from earlier standards and is considerably more complex. The Maximum Permissible Exposure (MPE) limits for Controlled Environments are:

Frequency	E Field (mW/cm ²)	H Field (mW/cm ²)
13.56 MHz	4.89	54.4
27.12 MHz	1.22	13.6
40.68 MHz	1.00	6.04

TECHNICAL DESCRIPTION

The Models 8511 and 8513 are unique in several ways that are important to the user. The most important is that both the electric and magnetic fields can be measured separately with a single probe. Changing field detection is as simple as pressing the **E/H Field** key on the meter. Measured field levels are displayed on the large-character, liquid crystal display (LCD). A bar graph makes it easy to determine trends during the measurement process. The **Max Hold** key makes it easy to lock in the maximum value on the digital display while still using the bar graph to indicate instantaneous values and trends. Small frequency deviations that are inherent in all electromagnetic field probes are automatically compensated for by selecting the correct frequency range before beginning to make measurements.

The probe's unique, patented design incorporates three orthogonal loops for the magnetic (H) field having a center

that corresponds to the approximate vertex of the three orthogonal dipoles for the electric (E) field. The electric field dipoles respond only to the electric fields and the magnetic field loops respond only to the magnetic field. The diode detectors are operated in their square law region in order to provide RMS average detection. RMS average detection is important when similar industrial equipment is nearby. Cross coupling caused by re-radiated fields is virtually eliminated. Performance testing of this design was conducted by establishing various impedance fields in a TEM (Transverse Electromagnetic) cell. The cast aluminum meter housing provides a high level of shielding for the electronic circuitry. Feed-through capacitors are used for exit and entry leads. Static charges are eliminated by using special carbon-loaded filler between the shield and insulated conductors. Operating time is approximately 50 hours from a standard 9 volt alkaline battery.

MAINTENANCE

Both 8500 series meters are very easy and inexpensive to maintain. The entire unit is calibrated together at a cost much lower than a meter and two separate probes. Users that have the ability to establish precise field levels will be able to calibrate the instrument using the meter's built-in calibration program.

Electric and Magnetic Field Measurement

SPECIFICATIONS

Model	8513	8511
Frequency Range Bands ^a	10 to 42 MHz Three: 10-20 MHz, 20-35 MHz, & 35-42 MHz	300 kHz to 100 MHzb Four: 0.3 - 1.0 MHz, 1.0 - 20 MHz, 20 - 80 MHz, 80 - 100 MHz
Measurement Range	Single Range, 0.05 to 50.0 mW/cm ² Bar Graph Auto Ranges or Select One of Three 10 dB (10:1) Ranges	Single Range, 0.1 to 100 mW/cm ² E field 0.2 to 200 mW/cm ² H field Bar Graph Auto Ranges or Select one of Three 10 dB (10:1) Ranges)
Display Type Digital Output Bar Graph Units	Custom Liquid Crystal Display 3½ Digits, .44 inch (11 mm) Character Height 18 Segments Custom Legends	
Controls	8 Key Membrane Keypad	
Zeroing	One Touch Auto Zero	
Units	mW/cm ² , W/m ² , V/m, A/m	
Audible Alarm	Probe Overload Warning	
Accuracy (frequency response and meter)	Calibrated precisely at three ISM frequencies. Accuracy at other frequencies within each of the three user-selectable frequency bands is ±0.75 dB for the E field and ±1.0 dB for the H field, plus one digit. ^c	Calibrated precisely at four frequencies. Accuracy at other frequencies within each of four user-selectable bands is ±1.5 dB for both the E field and the H field, plus one digit. ^c
Isotropic Error (max)	± 1.00 dB	
Ellipse Ratio (max)	± 0.75 dB	
Calibration Frequencies	13.56 MHz, 27.12 MHz, 40.68 MHz	500 kHz, 13.56 MHz, 27.12 MHz, 90 MHz
Calibration Accuracy	±0.5 dB	
Probe Overload	>50 W/cm ²	
Battery Type Life (approx)	9V alkaline 50 Hrs.	
Weight Meter Probe	1.35 lbs. (0.61 kg) 0.60 lbs. (0.46 kg)	
Size (LxWxD) Meter Probe Cable (approx)	7.8" x 2.5" x 1.8" (19.8 cm x 6.4 cm x 4.6 cm) 16 inches (41 cm) long 44 inches (112 cm) long	
Temperature Operating Non-operating	-20°C to +50° -20°C to +70°C	
Humidity	0% to 90%, Non-Condensing	
Accessories Supplied	Battery, Manual, Shielded Storage Case ^d	Battery, Manual, Shielded Storage Cased, Insulated Handle

NOTES

- ^a. The probe always detects energy over its entire measurement range. The “bands” are used to provide greater accuracy by automatically compensating for frequency response deviation.
- ^b. To use the 8511 to make measurements from 100 kHz to 300 kHz, set the meter to the **0.3 - 1.0 MHz** range. The indicated measurement for the electric field will be high (ranging from a small error up to a maximum of 2:1). The indicated measurement for the magnetic field will be low. To obtain a more accurate value, multiply the number displayed by a correction factor using the formula 300/f (f = frequency in kHz).
- ^c. There is an additional uncertainty due to traceability, i.e. the fields generated to calibrate the models 8511 and 8513 are accurate within +/- 0.5 dB.
- ^d. The heavy duty storage case is foam-lined and shielded to protect the meter and the probe in storage and in transit. It is approximately 17.6 in X 12.6 in x 5.0 in (44.7 cm x 32.0 cm x 12.7 cm).