Industrial Field Meter

for measuring electric and magnetic fields simultaneously

The Narda Models NIM-511 and NIM-513 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.

- Complete measurement system with dual electric and magnetic field probe for frequencies up to 100 MHz
- True RMS measurements of high field strength
- Extremely high overload limit of 50 W/cm^2
- Fast and reliable measurements
- Extremely easy to use
- Low cost, compact and lightweight

Applications

- RF heat sealers and vinyl welders
- Semiconductor process equipment
- Glass coating systems
- RF induction heating
- Plasma generation systems
- Dielectric dryers and heaters

Standard Compliance

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 NIM-513 operates from 10 MHz to 42 MHz and is adjusted to the reference calibration frequency at 27.12 MHz. The NIM-511 has a broader sensor that operates from 100 kHz to 100 MHz and is adjusted to the reference calibration frequency at 13.56 MHz.

RF energy can cause the body to be heated beyond its ability to thermally regulate itself. Since 1987 the Occupational Safety and Health Administration OSHA has had the authority in the USA to cite employers for exceeding the limits specified by “state-of-the-art, scientific standards.” OSHA has chosen the IEEE C95.1 Standard for enforcement of non-ionizing radiation safety for ISM frequencies (Industrial, Scientific and Medical). The Exposure Reference Levels (ERLs) for whole-body exposure of persons in restricted environments are:

Frequency	E-Field in mW/cm²	H-Field in mW/cm²
13.56 MHz	4.89	54.4
27.12 MHz	1.22	13.6
40.68 MHz	1.00	6.04

Table: Exposure reference levels according IEEE C95.1 2019 (restricted)

For countries following the ICNIRP 1998 recommendations, the exposure limits are 1 mW/cm² for the frequencies mentioned above.

Operation

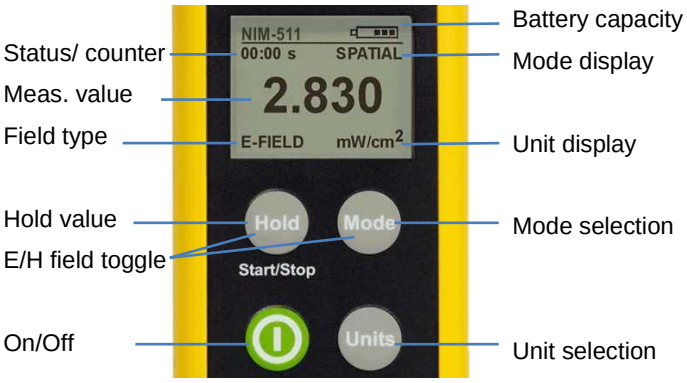
The NIM-511 and the NIM-513 were designed to make measurements a simple process that does not allow the most common mistakes to happen.

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 combination 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 - Auto Zero is executed repetitively every 15 minutes.



Definitions and Conditions

Conditions

Unless otherwise noted, specifications apply after 30 minutes warm-up time within the specified environmental conditions. The product is within the recommended calibration cycle.

Specifications with limits

These describe product performance for the given parameter covered by warranty. Specifications with limits (shown as <, ≤, >, ≥, ±, max., min.) apply under the given conditions for the product and are tested during production, considering measurement uncertainty.

Specifications without limits

These describe product performance for the given parameter covered by warranty. Specifications without limits represent values with negligible deviations, which are ensured by design (e.g. dimensions or resolution of a setting parameter).

Typical values (typ.)

These characterize product performance for the given parameter that is not covered by warranty. When stated as a range or as a limit (shown as <, ≤, >, ≥, ±, max., min.), they represent the performance met by approximately 80% of the instruments. Otherwise, they represent the mean value. The measurement uncertainty is not taken into account.

Nominal values (nom.)

These characterize expected product performance for the given parameter that is not covered by warranty. Nominal values are verified during product development but are not tested during production.

Uncertainties

These characterize the dispersion of the values attributed to the measurands with an estimated confidence level of approximately 95%. Uncertainty is stated as the standard uncertainty multiplied by the coverage factor k=2 based on the normal distribution. The evaluation has been carried out in accordance with the rules of the “Guide to the Expression of Uncertainty in Measurement” (GUM).

Specifications

Display and Functions	
Display type	Transflective LCD, monochrome, LED backlight
Display size	4 cm (1.5”), 128 x 64 dots
Refresh rate	400 ms
Result display	E-field or H-field value (selectable, 4 digits)
Units key	mW/cm², W/m², V/m or A/m
Mode key	ACT – displays the actual value MAX – holds the maximum of the measured values AVG – displays the 6 min time averaged result SPATIAL – displays a spatially averaged result
Hold key	Freeze the value that is currently displayed Start/Stop Spatial Averaging Hold + Mode: Toggle between E-field and H-field display
Zeroing	Automatic zeroing after power-on and repetitively every 15 min

Measurement Characteristics		NIM-511	NIM-513
Field type		Electric (E-) field and magnetic (H-) field, switchable	
Frequency range		100 kHz to 100 MHz	10 MHz to 42 MHz
Measurement range (True RMS)	E-field	0.1 to 100 mW/cm² (20 to 614 V/m)	
	H-field	0.2 to 200 mW/cm² (0.073 to 2.3 A/m)	
CW damage level		50 W/cm²	
Sensor type		Two diode based systems for E-field and H-field	
Directivity		Isotropic (Tri-axial)	
Readout mode / spatial assessment		Combined 3-axes (RSS)	

Uncertainty [1]		NIM-511	NIM-513
Flatness of frequency response Calibration uncertainty not included	E-field	±0,25 dB @ 13.56 MHz ±4.0 dB (100 kHz to 10 MHz) typ. ±1.0 dB (10 MHz to 42 MHz) ±1.5 dB (42 MHz to 100 MHz)	±0,25 dB @ 27.12 MHz ±1.0 dB (10 MHz to 42 MHz)
	H-field	±0,25 dB @ 13.56 MHz -8 dB @ 100 kHz typ. ±1.5 dB (1 MHz to 10 MHz) typ. +0.6/-1 dB (10 MHz to 30 MHz) +0.6/-1,5 dB (42 MHz to 100 MHz)	±0,25 dB @ 27.12 MHz +0.6/-1 dB (10 MHz to 30 MHz) +0.6/-1 dB @ 40.68 MHz
Linearity Referred to 10 mW/cm²		±1 dB (0.5 to 2 mW/cm²) ±0.8 dB (2 to 100 mW/cm²)	
Isotropic response		±1 dB (10 MHz to 100 MHz)	
Temperature response		+0.8 dB (10 °C to 40 °C)	

Calibration	NIM-511	NIM-513
Calibration frequencies	0,2/ 0,3/ 0,4 /10 / 13.56/ 27.12/ 40.68/ 90 MHz	10/ 13.56/ 27.12/ 40.68/ 42 MHz
Recommended calibration interval	24 months, for the first time 24 months after initial startup	

[1] Specifications are valid for NIM-511 probe 2402/15F and NIM-513 probe 2402/13D. Unless otherwise noted specifications apply at reference condition: device in far-field of source, ambient temperature (23 ± 3) °C, relative air humidity 40% to 60%, sinusoidal signal, probe handle oriented perpendicular to both, the direction of propagation and the direction of the E-field vector.

General Specifications		
Battery		NiMH rechargeable batteries, 2 x AA size (Mignon), 2700 mAh, included
Operation time		22 hours (nom.)
Charging time		2 hours (nom.)
Battery level display		100%, 80%, 60%, 40%, 20%, 10%, low level (< 5%)
Temperature range	Operating	-10 °C to +50 °C (14 °F to 122 °F)
	Transport	-30 °C to +70 °C (-22 °F to 158 °F)
Humidity		5 to 95% RH @ ≤28 °C, non-condensing ≤26 g/m³ absolute humidity (IEC 60721-3-2 class 7K2)
Immunity to radiated electromagnetic fields		200 V/m for the basic unit
Dimensions	Basic unit	38 x 52 x 205 mm (1.5” x 2.0” x 8.1”)
	Probe length	410 mm (16 inches)
	Cable length	1.1 m (44 inches)
Weight	Basic unit	300 g (0.66 lbs)
	Probe	310 g (0.68 lbs)
Accessories (included)		Hard case, power supply, shoulder strap, operating manual, certificate of calibration
Country of origin		Germany
Patents pending		United States Patent US6084551

Ordering Information

Model	Part number
NIM-511 Industrial Field Meter (100 kHz to 100 MHz)	**2400/511B**
NIM-513 Industrial Field Meter (10 MHz to 42 MHz)	**2400/513**
NIM-511 and NIM-513 include: › NIM-510 Basic unit › NIM-511 or NIM-513 E/H Field Probe › Hard case › Power supply, 9VDC, 100V-240VAC › Shoulder strap, 1 m › Operating manual › Certificate of calibration	

Narda Safety Test Solutions GmbH
Sandwiesenstrasse 7
72793 Pfullingen, Germany
Phone +49 7121 97 32 0
info@narda-sts.com

Narda-MITEQ
North American Sales Office
435 Moreland Road
Hauppauge, NY11788, USA
Phone +1 631 231 1700
info@narda-sts.com

Narda Safety Test Solutions S.r.l.
Via Benessea 29/B
17035 Cisano sul Neva, Italy
Phone +39 0182 58641
nardait.support@narda-sts.it

Narda Safety Test Solutions GmbH
Beijing Representative Office
Xiyuan Hotel, No. 1 Sanlihe Road, Haidian
100044 Beijing, China
Phone +86 10 6830 5870
support@narda-sts.cn

www.narda-sts.com