NBM-550

Narda Broadband Field Meter

Operating manual

narda
Safety Test Solutions

This product is protected by the following patents:

China Design Patent	ZL 2006 3 0303322.X
China Design Patent	ZL 2006 3 0190679.1
European Design Patent	000594254-001
European Design Patent	000597836-0001
German Patent	DE19536948A1
U.S. Design Patent	No. US D570,235 S
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Contents

1 Useful information

This chapter contains basic information about measuring electromagnetic fields, about using the NBM-550, and about the structure of this operating manual.

1.1 Measuring electromagnetic fields

In today's world, practically everyone lives and works in an environment surrounded by technical equipment that generates electromagnetic fields. Our recognition of the problems associated with such fields and our depth of information in this area has increased as the effects of such fields on the human body have been examined more closely. Various authorities have long defined limit values designed to protect users from the dangers of exposure to such emissions.

1.2 About the NBM-550

The Narda Broadband Field Meter NBM-550 provides virtually everyone concerned with this subject with an instrument for measuring electromagnetic fields with utmost accuracy within the frequency range from 0 Hz (DC) to 100 GHz (depending on the probe used). The instrument has a wide range of functions, yet it is very easy to use. It also features a handy design, robust casing, long battery life, and high measurement accuracy.

Probes for various measurement applications are connected to the NBM-550 basic unit. Flat frequency response probes are available, as well as so-called shaped probes that evaluate the field according to a specific human safety standard. These probes are calibrated separately from the measuring instrument, and include a non-volatile memory containing the probe parameters and calibration data. They can therefore be used with any instrument in the NBM-500 family without any loss in calibration accuracy.

The PC software supplied with the instrument allows you to remote control the NBM-550 as well as to export saved measurement data and to analyze the results.

Applications

The NBM-550 makes precision measurements for human safety purposes, particularly in workplace environments where high electric or magnetic field strengths are likely. It can also be used to demonstrate the electromagnetic compatibility (EMC) of devices and equipment.

Examples:

- Measuring field strengths as part of general safety regulations
- Measuring the field strengths around transmitting and radar equipment to establish safety zones and for monitoring during operations
- Measuring the field strength emanating from mobile phone repeaters and satellite communications systems to ensure compliance with human safety limit values
- Measuring the field strength in the industrial workplace environment, such as plastics welding equipment, RF heating, tempering, and drying equipment
- Measurements to ensure the safety of persons using diathermy equipment and other medical equipment that generates high frequency radiation
- Field strength measurements in TEM cells and absorber chambers

1.3 About the EHP-50 Analyzer (option)

The optionally available EHP-50 Analyzer can be used to measure either electric or magnetic fields in the frequency range between 1 Hz and 400 kHz. As well as wideband measurement, it is also possible to perform spectrum analysis on the LF fields because of the FFT function built into the EHP-50. It is also possible to display the numerical value of the highest peak in the spectrum (“Highest Peak”). The IEC 6176-2 Weighted Peak method (time domain) is provided to allow standard-compliant measurement of complex signal shapes. The EHP-50 Analyzer can be operated as a stand-alone system since it has its own power supply and built-in signal processing. It forms a complete measuring system for recording, processing, storing and displaying LF field measurements when used in conjunction

with the NBM-550 as a convenient control and display unit. Even so, the EHP-50 still performs the measurement by itself and transfers the results to the NBM-550 in digital form via an optical cable.

Note: The NBM-550 only supports the functions of the EHP-50 for versions EHP-50D and EHP-50F. The EHP-50D has a frequency range restricted to 5 Hz – 100 kHz and does not yet support the Weighted Peak method.

1.4 About this operating manual

Structure of this operating manual

This operating manual is divided into two main parts:

1. Operating the NBM-550 and measuring with HF probes:
   You will find all the information you need to make the most important settings on the NBM-550 and easily carry out most of the measurement tasks using HF probes in chapters 3 to 5 and 7 to 9.
2. Measuring with the EHP-50 Analyzer:
   You will find all the information you need to operate the EHP-50 LF Analyzer in conjunction with the NBM-550 in chapter 6. Cross references are provided to information already described in other chapters.
3. Overview of menus and their functions:
   You will find an overview of all menu functions, together with a brief description of each function in chapter 10. You can use this overview to find a function quickly.

User interface language

English language terms are used in this operating manual to describe the user interface.

You can display the user interface of the NBM-550 in other languages (see **"Selecting the language"**on page 35).

⇒ Please note that if you change the language, the displayed terms will differ from those described in this manual.

Characters and symbols used

Various elements are used in this operating manual to indicate special meanings or particularly important passages in the text.

Symbols and terms used in warnings

According to the American National Standard ANSI Z535.6-2006, the following warnings, symbols, and terms are used in this document:

	The general danger symbol warns of risk of serious injury when used with the signal words **CAUTION**, **WARNING**, and **DANGER**. Follow all the instructions in order to avoid injuries or death.
NOTICE	Indicates a danger that results in damage to or destruction of the instrument.
CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

Structure of warnings

All warnings are structured as follows:

⚠ SIGNAL WORD

Type and source of danger

Consequences of failure to observe warning

⇒ Instructions for preventing danger

Symbols and marks used in this document

!	**Important instruction** Indicates an instruction that must be followed to avoid danger.
✓	**Requirement** Indicates a requirement that must be met before the next instruction can be carried out, e.g. ✓ The instrument is switched off.
⇒	**Instruction** Indicates a single instruction, e.g. ⇒ Switch the instrument on.
1. 2. 3.	**Sequence of instructions** Indicates a sequence of instructions that must be carried out in the order given.
↳	**Result** Indicates the result of carrying out an instruction, e.g. ↳ The instrument starts a self test.
Bold type	**Control element** Indicates a control element on the instrument, e.g. ⇒ Press the **ENTER** key.
CAPITALS	**Menu name** Indicates a menu name, e.g. ⇒ Open the MAIN menu.

Terminology

Item	Meaning
Battery	Rechargeable battery
Dry battery	Non-rechargeable battery

2 Safety instructions

This chapter contains important instructions on how to use the NBM-550 safely. Please therefore read this chapter carefully and follow the instructions closely.

2.1 Using this operating manual

⇒ Carefully read this entire operating manual before you start using the instrument.

⇒ Keep this operating manual so that it is available to everyone who uses the instrument, and ensure that this operating manual is with the instrument if you pass it on to a third party.

2.2 Proper use

The NBM-550 is designed to measure and evaluate electromagnetic fields.

⇒ Only use the instrument for the purpose and under the conditions for which it has been designed.

⇒ In particular, observe the technical data given in the **“Specifications”**on page 123.

⇒ Proper use also includes:

⇒ observing any national accident prevention regulations at the place of use.

⇒ ensuring that the instrument is used only by appropriately qualified and trained persons.

2.3 Improper use

The NBM-550 is not a warning device that gives active notice of the existence of dangerous fields by means of a visible or audible warning signal.

⇒ Remember that this instrument is a measuring device, not a warning device.

⇒ Carefully observe the actual measurement displayed when you are approaching an unknown field source.

⇒ If in doubt, use an additional warning device such as “RadMan” or “Nardalert”, available from Narda Safety Test Solutions.

2.4 Dangers from electromagnetic fields

Strong Fields

Very high field strengths can occur in the vicinity of some radiation sources.

⇒ Do not cross or ignore safety barriers or markings.

⇒ Persons with electronic implants (e.g. heart pacemakers) must avoid danger zones.

Measurement Errors

Metallic labels (stickers) affixed to the yellow sensor area of the probe can lead to measurement errors, usually an underestimation of the electromagnetic field strength.

⇒ Affix labels of any type only to the black probe shaft.

⇒ If the instrument malfunctions, take it out of service and contact your Narda Service Center. The addresses are listed at the end of this operating manual and on the Internet at **http://www.narda-sts.com.**

Probe is not operating properly

Possibly present high radiation values are not recognized.

⇒ Check probes for proper operation with a signal source before using this measuring instrument. This is especially important for thermocouples because the sensors can be affected by various mechanical and environmental stressors.

Narda offers portable sources to accomplish this important step (see **"Accessories"**on page 133).

⇒ Before beginning any RF radiation measurement, always inform yourself of the frequencies and field strengths that you could expect to encounter.

2.5 Dangers when handling rechargeable batteries

When handled improperly, rechargeable batteries can overheat, explode, or ignite.

⇒ Only use the NBM-550 with NiMH rechargeable batteries (AA, Mignon).
⇒ Do not use dry batteries.
⇒ Do not replace individual batteries; always replace the entire set.
⇒ Always use identical batteries.
⇒ Never touch both poles of the batteries simultaneously with a metal object.
⇒ Make sure you insert the batteries correctly as shown on the base of the battery compartment.
⇒ Always close the battery compartment immediately after replacing batteries.
⇒ Never use the NBM-550 with the battery compartment open.

2.6 Dangers from AC Adapter / Charger

You could experience electric shock from the AC adapter/charger.

⇒ Do not use the instrument when the casing is damaged because parts carrying dangerous voltages could be exposed.
⇒ Do not use an AC adapter/charger that has been moved from a cold to a warm room, thereby forming condensation.
⇒ Only use the AC adapter/charger indoors and at temperatures between 0 °C and +40 °C.

The AC adapter/charger could be destroyed if the voltage specification on the AC adapter/charger does not match the AC line voltage.

⇒ Only use the AC adapter/charger if the voltage specification on the AC adapter/charger matches the AC line voltage.

3

Preparing the NBM-550 for use

This chapter describes all you need to do before starting to use the NBM-550.

3.1 Unpacking

Packaging

The packaging is designed to be re-used as long as it has not been damaged.

⇒ Keep the original packaging and use it whenever the instrument needs to be shipped or transported.

Items included

⇒ Check that all the following items have been delivered.

NBM-550

- NBM-550
- 4 x NiMH Mignon/AA batteries (packaged separately)
- Case
- Probe (type and quantity as ordered)
- AC Adapter / Charger
- Shoulder strap
- USB cable
- Table top tripod
- NBM-TS PC software (free download at **www.narda-sts.com**)
- Safety instructions
- Operating manual
- Calibration certificate

EHP-50 Set for NBM-550

- EHP-50 Analyzer
- 12 V AC/DC charger
- Optical connector (bridged, for stand-alone operation)
- Extension rod, 0.5 m
- Optical cable, 10 m
- O/E converter USB, RP-02
- CD-ROM or USB stick with EHP-TS PC software and operating manual (PDF file)
- 2 foam inlays for the case

Transport damage

NOTICE

Instrument/accessories damaged during transportation

Using damaged instrument/accessories can lead to subsequent damage.

⇒ Check the instrument and all accessories for damage when you have unpacked them.

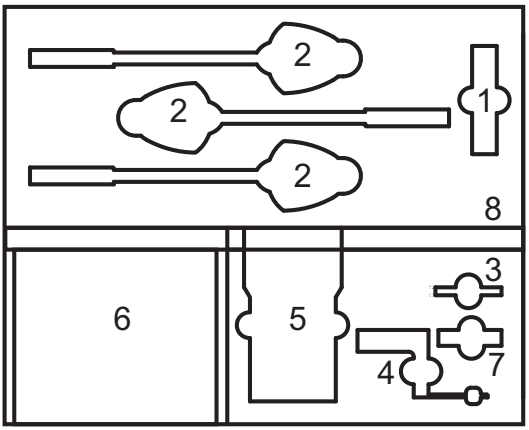
⇒ If the instrument is damaged, contact your Narda Service Center.

The addresses of your Narda Service Center are listed at the end of this operating manual and on the Internet at **http://www.narda-sts.com**.

Equipping the case

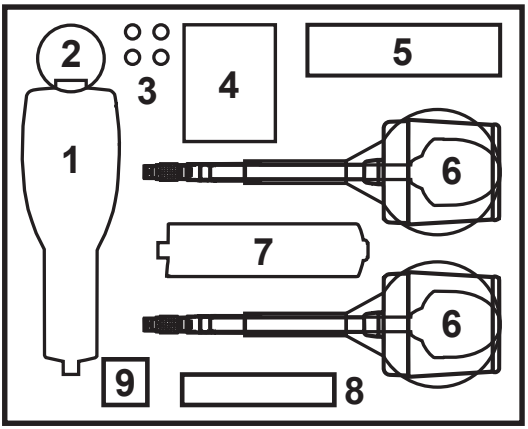
You can use the case provided to store a wide range of optional accessories in addition to the items supplied. The figures below show the compartments in the case lid and case base.

Case lid



1	Test generator
2	Probe
3	O/E converter USB
4	GPS fitting set
5	RadMan Personal Monitor
6	Compartment for cables and operating manual
7	O/E converter RS232
8	Extension rod

Case base



1	NBM-550 basic unit
2	GPS (assembled)
3	Rechargeable batteries
4	AC adapter
5	Table top tripod
6	Probe or EHP-50 with foam inlays
7	NBM-520 basic unit
8	Shoulder strap
9	Earphone

After transport and storage

NOTICE

Condensation on an instrument can lead to damage

Condensation can form on an instrument that has been stored at a low temperature when it is brought into a warm room. It may be damaged if used.

⇒ Wait until all visible condensation has evaporated from the instrument surface to avoid damaging the instrument.

Note: The instrument is not ready for use until it has reached a temperature within the operating range of -10 to +50 °C.

3.2 Instrument overview

Figure 1 Device overview NBM-550

1	**Probe connector socket**	
2	**Microphone**	
3	**Display**	
4	**Operating panel**	
		**Function keys** Used to select the menu functions shown on the display
		**ESC key** Used to exit from a menu / reset functions and measured values
		**OK key** Used to open a menu or function / confirm a setting
		**UP/DOWN arrow keys** Used to select menus and functions / change values / lock the keypad / change the contrast
		**ON/OFF key** Used to switch the instrument on or off
	Charge	**Charge state** Indicates the charge state (red = rapid charging, green = trickle charging)
	Status	**Operating status** Indicates the instrument operating status: Green = normal operation, red = remote operation, flashing red = firmware update or exceeded alarm threshold
5	**Tripod bush**	
6	**Electrical and optical connectors**	
	6a	Multi-function socket for USB / GPS (optional) / external trigger
	6b	Earphone
	6c	Optical connector
	6d	AC Adapter / Charger
7	**Tripod bush (on back of instrument)**	
8	**Battery compartment (on back of instrument)**	

Figure 2 Overview of probes

Probe (various models available)		
9	**Probe head**	
10	**Probe plug**	
	10a	Probe with threaded coupling connector
	10b	Probe with “Push-Pull” connector
EHP-50		
11	**Probe head**	
12	**Tripod bush**	
13	**Electrical and optical connections**	
	13a	Optical connector
	13b	AUX signal input for electrical signals – can only be used with EHP-TS. Please follow the instructions in the EHP-50 operating manual.
	13c	ON / OFF button
	13d	Status LED Meanings of colors and flashing rates: • No charger unit connected: – Red, rapid flashing: cannot set up communications – Green, rapid flashing: setting up communications – Green, slow flashing: data transfer in progress (flashing rate depends on measurement speed) • Charger unit connected (no data transfer possible): – Orange, rapid flashing: battery charging – Green, rapid flashing: battery fully charged
	13e	Charger unit

3.3 Power supply NBM-550

The power supply is normally taken from the batteries provided. You can use the AC Adapter / Charger supplied as an alternative power source.

Note: We do not recommend that you operate the instrument with the AC Adapter / Charger connected, as this can significantly degrade the measurement performance of the NBM-550. The measurement accuracy figures given in the specifications cannot then be guaranteed.

Operation from rechargeable batteries

The rechargeable NiMH batteries for this device are packaged separately. You must insert the batteries into the device and then charge them up fully before using the device. The charging cycle takes about 2 hours. Do not use dry batteries in this device.

NOTICE

Improper pole positions

The batteries can explode and damage the instrument if you put the batteries in the wrong way round.

⇒ Observe the positions of the positive and negative poles marked in the battery compartment.

Inserting the batteries

1. Open the battery compartment cover underneath the device by undoing the two screws with a screwdriver or the edge of a coin.
2. Take the NiMH batteries provided out of their protective foil and insert them into the battery compartment. Make sure you put them in the right way round. The positions of the positive and negative poles are marked in the battery compartment by "+" and " –" respectively. Match the markings to the markings on the batteries.
3. Close the battery compartment cover and do up the two screws again to secure it.

Charging the batteries

If the device is probably not going to be used for several weeks, it should be recharged before being stored to avoid the possibility of deep discharge of the batteries. If storage is likely to be for a period of more than two months, remove the batteries from the device after recharging them.

Note: Deep discharge can significantly reduce the battery capacity. This is indicated by unusually short charging cycles. If this happens, the nominal capacity can be restored by discharging and recharging the batteries several times. Regeneration usually takes four to five recharging cycles.

⚠ WARNING

Charging the batteries with wrong AC Adapter / Charger

Overheating, explosion, or ignition of rechargeable batteries/batteries or their surroundings

⇒ You must use only the AC Adapter / Charger supplied to charge the batteries.

Note: A complete charge cycle takes about 2 hours (with the instrument switched off).

Starting the charge cycle

✓ The AC line voltage must match the operating voltage of the AC Adapter / Charger.

1. Connect the AC Adapter / Charger to the charging socket of the NBM-550.
2. Connect the AC Adapter / Charger to the AC line
   - ↳ The charge cycle starts.
   - ↳ The **Charge** LED glows red during the entire charge cycle.

As soon as the batteries are fully charged, the AC Adapter / Charger switches to trickle charge mode and the **Charge** LED glows green.

Proper handling of rechargeable batteries

⇒ Observe the following precautions when handling rechargeable batteries:

- Always handle the batteries with care.
- Do not drop or damage the batteries or expose them to excessively high temperatures.
- Do not leave the batteries inside or outside the instrument for more than one or two days in a very warm place (e.g. in an automobile).
- Do not leave the discharged batteries in the unused instrument for a long period of time.
- Do not store the batteries for more than six months without discharging and recharging them in the meantime.
- Avoid deep discharging the batteries as this could cause the cells to reverse polarity and make them useless.

Charge state and power source indicator

The battery charge state and the power source used are indicated at the top right of the display:

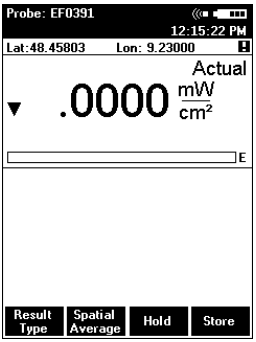


Table 1 Charge state and power source indication

	Power is supplied by the rechargeable batteries: • Continuous display: Charge level = 10% • Flashing display: Charge level ≤ 5% If the charge level drops to ≤ 5%, the instrument will switch off automatically within a few minutes.
	Power is supplied by the rechargeable batteries. The charge level is indicated in 20% steps by black bars within the battery symbol. The batteries are fully charged when all five bars are shown.
	Power is supplied by the AC Adapter / Charger. The batteries are charged at the same time.

3.4 Power supply EHP-50

The EHP-50 Analyzer is fitted with a fixed, non-exchangeable rechargeable battery which provides at least 9 hours of operation when fully charged. The battery is charged using the charger unit supplied. It takes approximately 6 hours to recharge the battery if it is almost completely discharged.

Note: You cannot operate the EHP-50 with the charger unit connected as this considerably affects the measurement characteristics of the EHP-50.

Charging the battery

⚠ WARNING

Charging the battery with an unsuitable charger unit

The battery can overheat, explode or ignite spontaneously.

⇒ You must only use the charger unit supplied with the device for charging the battery.

Starting the charging cycle:

✓ The AC line voltage must match the operating voltage of the charger unit.

⇒ Connect the charger unit to the AC line first and then connect it to the charger socket on the EHP-50 (Figure 2 13d).

↳ The charging cycle starts and the **DATA** LED flashes rapidly:
- Orange: battery charging
- Green: battery fully charged

Note: You can charge the battery with the EHP-50 switched on or off. If you connect the charger unit when a measurement is in progress, the measurement will stop and the charging cycle starts. The EHP-50 remains switched off when you unplug the charger unit.

Displaying the charge state and power source

The charge state of the battery is shown upper left in the display during the measurement. The same symbols are used as in the charge state display for the NBM-550 (see **"Charge state and power source indicator"**on page 22).

Correct handling of rechargeable batteries

⇒ Avoid completely (deep) discharging the batteries as otherwise the polarity of a cell may reverse and make the battery useless.

3.5 Connecting the probe

⚠WARNING

Probe is not operating properly

High radiation values that may be present cannot be recognized when a probe is defective.

⇒ Check probes for proper operation with a signal source before using this measuring instrument. This is especially important for thermocouples because the sensors can be affected by various mechanical and environmental stressors.
Narda offers portable sources to accomplish this important step (see **"Accessories"**on page 133).

⇒ Before beginning any RF radiation measurement, always advise yourself of the frequencies and field strengths that you could expect to encounter.

There are many different probes available for different applications for the NBM-550. You can find more information about the order numbers and specifications of the probes under **"Ordering information"**on page 131, as

well as in the data sheets of the NBM-550 and probes. These documents can also be downloaded from the Narda web site on the Internet at **http://www.narda-sts.com**.

NOTICE

Wrong handling of the probe

Damage of the probe head

⇒ Always hold the probe at the metal plug end.

Probe with “Push-Pull” connector

Connecting the probe

✓ The red mark on the probe plug **(10)** is pointing towards the front of the instrument.

⇒ Push the probe plug **(10)** straight down into the probe socket **(1)** until it clicks into place.

Disconnecting the probe

⇒ Slide the sleeve on the probe plug **(10)** upwards and pull the probe upwards to remove it.

Probe with threaded coupling connector

The latest devices use threaded connectors for the link between the probe and the basic unit. The basic unit is fitted with a longer socket which can be recognized by the approximately 1 cm long threaded section. Probes fitted with "push-pull" connectors can still be used with this connector. Probes with threaded coupling connectors can only be used with this new, longer connecting socket.

Connecting the probe

✓ Make sure the guide lug on the probe plug **(10)** is pointing towards the front of the instrument.

⇒ Push the probe plug **(10)** straight down into the probe socket **(1)** and tighten the threaded coupling using your thumb and forefinger. Never tighten the coupling using pliers or other tools.

Disconnecting the probe

⇒ Undo the threaded coupling using your thumb and forefinger and then pull the probe upwards to release it.

3.6 Connecting and setting up the EHP-50

The EHP-50 Analyzer is connected using the optical cable supplied with it. Using the optical cable for data transfer prevents the field distortions that are caused by electrically conductive cables.

To connect the probe:

1. Plug the black plug of the optical cable into the optical connector of the NBM-550 (Figure 1: **6c**). The plug will only fit in one direction and will lock in place when light pressure is applied.
2. EHP-50D: Plug the white plug of the optical cable into the optical connector of the EHP-50 (Figure 2: **13a**). The plug nose must be aligned with the indentation on the socket.

   – or –

   EHP-50F: Plug the black plug of the optical cable into the optical connector of the EHP-50 with the groove of the grip pointing towards the center of the probe. The plug can only be inserted in this one direction and will lock into place when you apply light pressure.

Observe the following when setting up the device:

⇒ Do not use a conductive tripod.

⇒ Make sure that the device is at least one meter above the ground.

⇒ Make sure that the device is at least two meters from any person and from the NBM-550.

3.7 Fitting the GPS module

The GPS receiver module is included in the option set as an accessory (see **“Ordering information”**on page 131). It allows you to determine the exact position of the instrument using GPS (Global Positioning System).

Fitting the GPS module

1. Remove the probe.
2. Place the handle against the casing from below so that the thread of the knurled screw fits into the tripod bush.
3. Do up the knurled screw and plug the GPS module cable into the multi-function socket.
4. Reconnect the probe.

3.8 Using the table top tripod

A table top tripod is included with the NBM-550. This makes the instrument easier and more convenient to use.

Attaching the tripod

1. Loosen the butterfly screw on the side.
   ↳ You can now easily move the ball joint and tripod screw.
2. Screw the knurled screw into the threaded bush on the back panel of the NBM-550.
3. Fold out the tripod legs, adjust the position of the instrument and tighten up the butterfly screw.
4. To remove the tripod at any time, loosen the butterfly screw and unscrew the knurled screw.

4 Getting started

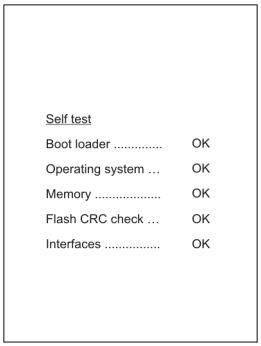
This chapter describes how to switch on the NBM-550, the operating concept, and the initial settings.

4.1 Switching on

Now that you have prepared the instrument for use, you can switch it on.

⇒ Press the **ON/OFF** key to switch the instrument on.
↳ The instrument performs a self test.

Self test



The progress of the self test is displayed on the screen. The instrument is not ready for use until all tests have been completed successfully and **OK** is displayed.

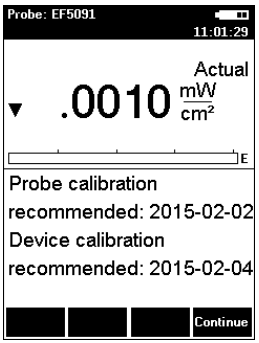
If an error message is displayed

⇒ Press the **ON/OFF** key to switch the instrument off and then switch it on again.

If an error message is displayed again:

⇒ Switch the instrument off and contact your nearest Service Center.

Calibration



The NBM-550 and probes must be calibrated at certain intervals to guarantee the quality of the measurement results. If you have missed the date for a calibration, this will be displayed by default after the self test is complete.

Note: You can deactivate the calibration date reminder under MAIN/MEASUREMENT SETTINGS/Cal. Date Check.

To display the measurement screen after viewing the calibration date reminder

⇒ Press the **Continue** key.

Tip: You can view the last and next calibration dates under MAIN/INFORMATION/DEVICE INFORMATION and .../PROBE INFORMATION.

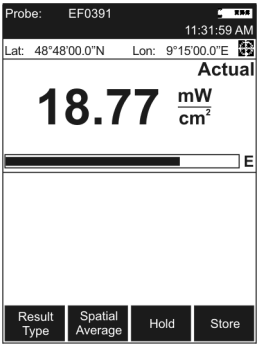
EHP-50

If the EHP-50 is already switched on and connected to the NBM-550, the NBM-550 will detect it automatically and will switch to EHP-50 measurement mode when the switch on routine has completed.

If you connect or switch on the EHP-50 after you have started the NBM-550, you will have to select EHP-50 mode manually (see **"Selecting EHP-50 mode manually"**on page 64).

GPS reception

The GPS receiver module is included as an accessory in the option set (see **"Ordering information"**on page 131) and allows you to determine the exact position of the instrument using GPS (Global Positioning System).



When the GPS module is connected, the coordinates along with other information are shown in the upper section of the display.

If GPS cannot be received despite a GPS module connection (e.g. in closed rooms), **Lat:** and **Lon:** are displayed without appropriate values.

If GPS was received but suddenly interrupted (e.g. due to poor signal quality or an unplugged GPS plug), the most recent available coordinations remain displayed and are marked with an exclamation point.

The information is explained in the table below.

Table 2 GPS symbols in the display

Symbol	Meaning
Lat	Latitude
Lon	Longitude
	Warning that the displayed GPS data is not up to date.
	GPS data is being received with enhanced accuracy (deviation < 3 m). This type of reception is only possible in regions where the corresponding satellite service is available.

Note: After connecting to the GPS module, it can take up to 5 minutes for a position display to appear. The waiting time decreases with short-term switching off and on, i.e. when the satellite positions are only marginally changed. GPS reception may be impaired by high field levels and, in particular, by field levels in the L-band (1 to 2 GHz).

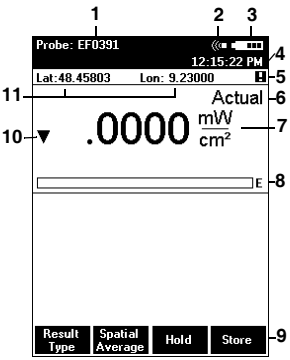
4.2 The NBM-550 operating concept

When the self test is complete, the display switches to measurement mode.

The settings will depend on the power on behavior that you have selected (see **"Saving and loading instrument settings"**on page 90).

Measurement screen overview

The description below gives you an initial overview of the display elements in the measurement screen display. Other elements are described in the chapters dealing with the individual functions and in the **"Overview of all menus and functions"**on page 101.



1	Probe used (also shows the EHP-50 battery charge state and the selected frequency range if the EHP-50 is used)
2	Alarm function (switched on)
3	Battery charge state
4	Time
5	Warning: displayed GPS data is not up to date.
6	Present display mode selection
7	Measured value and units
8	Bar graph of measured value with display of field type: E = E field, H = H field, S = S field
9	Function keys
10	Out of measurement range display. – **Down arrow**: signal too small – **Up arrow**: signal too large.
11	GPS coordinates (optional)

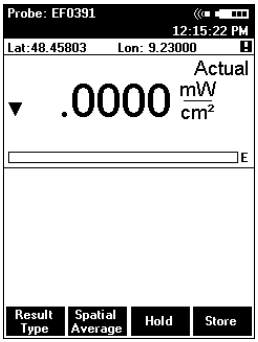
The menu levels

The NBM-550 operating concept is context sensitive. It only displays the functions that are possible based on the probe being used, the settings selected, and the menu that is open.

Settings are divided into different levels to separate functions that are used often from those that are used less often:

- 1st level: The measurement screen
- 2nd level: The main menu
- 3rd level: The sub-menus
- 4th level: The functions

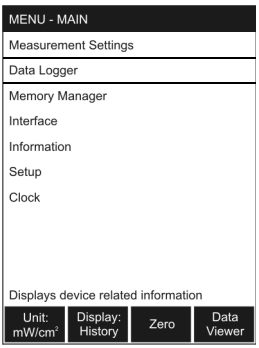
The measurement screen



You can directly activate a function or make a selection by pressing one of the four function keys in the measurement screen.

All other settings have to be made using the menus described below.

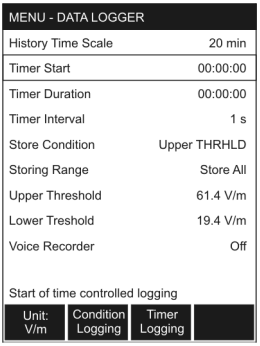
The main menu



The MAIN menu opens when you press the **OK** key. All other settings are made from this menu.

The most important settings are once again assigned to the function keys in the MAIN menu.

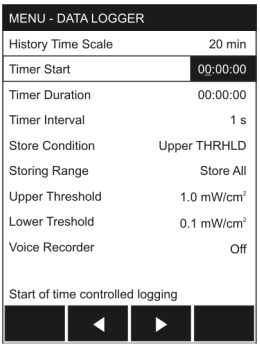
The sub-menus



Select a sub-menu from the MAIN menu and press the **OK** key to open the selected sub-menu.

The example shows: DATA LOGGER.

The function levels



Select a function from the sub-menu and press the **OK** key to open the selected function. You can then make the settings you require or read out the desired information.

The example shows: **Timer Start.**

Navigating in the menus

Use the following keys to navigate through the menus and select the functions:

	**Function keys** Select the function shown in the display, which depends on the menu selected
	**ESC key** Exits from the menu (with or without making changes)
	**OK key** Opens a menu or a function and confirms a setting
	**▲/▼ key** Select a menu or a function and change values

To simplify the description of the selection of a menu level or function, the menu and function names will be listed one after the other and separated by a slash.

Example: ⇒ To change the start time, open the **Timer Start** function (MAIN/DATA LOGGER/...).

You can find an overview of all the menus and functions under **"Overview of all menus and functions"** on page 101.

4.3 Making basic settings

When the self test is complete, the display switches to measurement mode.

The settings will depend on the power on behavior that you have selected (see **"Saving and loading instrument settings"**on page 90).

Selecting the language

You can set the user interface language to a different language.

Changing the user interface language

1. Open the **Language** function (MAIN/MEASUREMENT SETTINGS/...).
2. Use the arrow keys ▲/▼ to select the desired language and then press the **OK** key to confirm the setting.

Setting the auto zero adjustment

Zeroing compensates for the influence of temperature fluctuations on the measurement results of the basic unit. No measurement is possible during a zeroing, which takes 7s. For this period, the last measurement value is displayed and a remaining time counter is shown.

If the **Auto-Zero Interval** function is activated, an automatic zero adjustment will be performed at the specified intervals.

The following settings are possible:

- **6/15/30/60 minutes**: Auto zero every 6/15/30/60 minutes
- **off**: Auto zero function disabled

The default setting is **15 minutes**.

Changing the setting

1. Open the **Auto-Zero Interval** function (MAIN/ MEASUREMENT SETTINGS/Next/...).
2. Use the arrow keys ▲/▼ to select the desired setting and then press the **OK** key to confirm the setting.

Starting a zero adjustment manually

1. Open the MAIN menu.
2. Press the **Zero** function key.
   ↳ A zero adjustment is performed and the instrument finally changes back to the measurement display.

Setting the auto off function

You can set the instrument to switch off automatically after a specified time without any activity to protect the batteries from being discharged.

The following settings are possible:

- **6/15/30/60 minutes**: Switches off after 6/15/30/60 minutes
- **off**: Auto off function disabled

The default setting is **15 minutes**.

Note: The auto off function is disabled during long-term measurements using the **Timer Logging** function (see **"Recording measurements by timer control"**on page 80) and **Conditional Logging** function (see **"Recording conditional measurements (optional)"**on page 82).

Changing the setting

1. Open the **Auto Power-Off** function (MAIN/ MEASUREMENT SETTINGS/Next/...).
2. Use the arrow keys ▲/▼ to select the desired setting and then press the **OK** key to confirm the setting.

Setting the backlight

The display backlight is activated every time you press a key and switches off after a specified time to preserve battery power.

The following settings are possible:

- **off**: Backlight disabled
- **5/10/30/60 s**: Backlight switches off after 5/10/30/60 seconds
- **permanent**: Backlight is switched on permanently

The default setting is **10 seconds**.

Changing the switch off delay time

1. Open the **LCD Backlight** function (MAIN/ MEASUREMENT SETTINGS/Next/...).
2. Use the arrow keys ▲/▼ to select the desired setting and then press the **OK** key to confirm the setting.

Setting the contrast

✓ The display shows the measurement screen.

⇒ Press the arrow keys ▲ or ▼ to increase or decrease the contrast.

Changing the display units

Power density or field strength units can be selected when using normal (flat) probes. The units can simply be converted, while the measurement will stay the same.

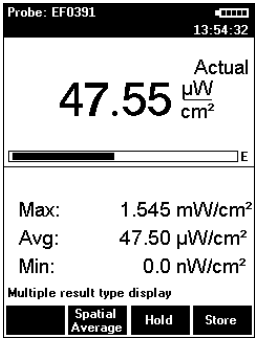
Results from shaped probes are always displayed in %. A shaped probe provides a frequency sensitivity that mirrors a particular standard, such as ICNIRP.

Values in % (of standard) are related to the equivalent power density limit, not to the field strength. A shaped probe can also display results as a field strength or power density value for a selected frequency of this particular standard (see **“Measuring with a test standard”** on page 58). This is why the display unit can be selected for shaped probes as well.

Changing the units

1. Open the MAIN menu.
2. Press the **Unit** function key repeatedly until the desired units are displayed.
   ↳ Units are set in the following order:
   W/m^2 – mW/cm^2 – A/m – µT – V/m – W/m^2 –...
3. Press the **ESC** key.
   ↳ The display reverts to the measurement screen and the selected units are displayed.

Changing the units format



The units for the measurement values can be displayed in two different formats:

- **Fixed Triad**
  Units are displayed with a fixed format (mW/cm^2, W/m^2, V/m, A/m, µT)
- **Variable Triads**
  Units are adjusted to match the size of the measured value (47.55 $\mu W/cm^2$ in the example shown on the left)

Tip: We recommend that you use the **Variable Triads** format for signals that have a high dynamic range, otherwise the display of very small or very large values will be meaningless.

Changing the units format

1. Open the **Results Format** function (MAIN/ MEASUREMENT SETTINGS/Next/...).
2. Use the arrow keys ▲/▼ to select the desired format and then press the **OK** key to confirm the setting.

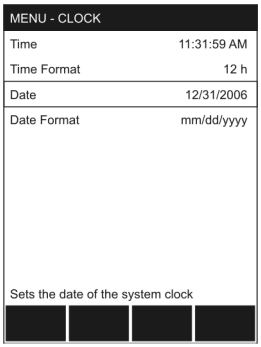
Note: Be careful not to make read-off errors due to the different formats when you use the **Variable Triads** setting.

Setting the date and time

Before you start using the instrument, set the date and time. This is particularly important if you want to save measured values, because the date and time of measurement are also saved.

Tip: Instead of making the setting manually, you can use the PC software supplied to synchronize the date and time.

Setting the date and time



1. Open the **Clock** function in the MAIN menu.
2. Set the time format:
   – Select the **Time Format** function,
   – use the arrow keys ▲/▼ to select the 12-hour or 24-hour time format and press the **OK** key to confirm the selection.
3. Set the time:
   – Select the **Time** function,
   – use the **</>** function keys to select the seconds, minutes, or hours, and use the arrow keys ▲/▼ to change the value. If you choose the 12-hour time format, you must also select AM or PM,
   – press the **OK** key to confirm the selection.
4. Set the date format:
   – Select the **Date Format** function,
   – use the arrow keys ▲/▼ to select the format (mm/dd/yyyy, dd.mm.yyyy, yyyy-mm-dd) and press the **OK** key to confirm the selection.
5. Set the date:
   – Select the **Date** function,
   – use the **</>** function keys to select the day, month or year and use the arrow keys ▲/▼ to change the value,
   – press the **OK** key to confirm the selection.

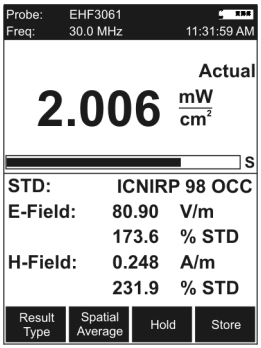
Changing the GPS display

There are three formats used for displaying GPS coordinates:

- **DMS**: (d)dd° mm' ss.s'' N
  Example: Lat: 48° 48' 10.5'' N / Lon: 9° 15' 00.0'' E
- **MinDec**: (-)(d)dd° mm.mmm'
  Example: Lat: 48° 48.175' / Lon: 9° 15.000'
- **DegDec**: (-)(d)dd.ddddd°
  Example: Lat: 48.29166° / Lon: 9.25000°

The default setting is DegDec.

Selecting the field type and units for combination probes



Combination probes can measure E-fields and H-fields at the same time. If you are using a combination probe, you can select the field that is to be measured and the units that are to be shown in the lower half of the display

The simultaneous display of E and H-Field is only possible in NORMAL display mode.

Setting the field type

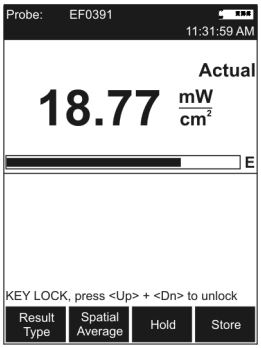
1. Select the **Combi Probe Use** function (MAIN/ MEASUREMENT SETTINGS/Next...).
2. Use the arrow keys ▲/▼ to select the desired format:
   – E-Field and H-Field
   – E-Field only
   – H-Field only
3. Press the **OK** key to confirm the selection.

Setting the units

1. Select the **E+H Field Units** function (MAIN/ MEASUREMENT SETTINGS/Next...).
2. Use the arrow keys ▲/▼ to select the desired units:
   – **Selected Unit**: The units selected using the **Unit** function key will be used
   – **V/m** for E-fields and **A/m** for H-fields
3. Press the **OK** key to confirm the selection.

Note: For simultaneous display of E and H-Field, always select the NORMAL display mode. In the other modes, display is limited to the S-Field.

Locking the keypad



To prevent inadvertent operation of any of the keys, you can lock the keypad.

Locking the keypad

⇒ Press the two arrow keys ▲/▼ simultaneously.
↳ The message KEY LOCK is displayed.

Unlocking the keypad

⇒ Press the two arrow keys ▲/▼ simultaneously again.

5

Measuring with the NBM-550 and HF probes

This chapter describes how to use the NBM-550 in combination with HF probes for measurements.
You can find information on how to use the EHP-50 LF Analyzer in the chapter **"Measurements with the NBM-550 and EHP-50"**on page 63.
You can find an overview of all the menus and functions under **"Overview of all menus and functions"** on page 101.

5.1 Avoiding measurement errors

The measurement result can be falsified by external influences when measuring electromagnetic fields. Considerable measurement deviations can occur under certain circumstances, particularly when measuring low field strengths. The following tips may be of assistance in recognizing sources of interference so as to avoid measurement errors. The following factors can affect the measurement result:

- Electrostatic charges
- Changes in temperature
- Strong low frequency fields (e.g. due to high tension lines)

Electrostatic charges

The following effect will be noted with all field strength meters: If you move the probe quickly, excessive field strength values will be displayed which do not reflect the actual field conditions. This effect is caused by electrostatic charges.

The NBM has been designed in a way that minimizes this effect. However, if you move the probe very quickly, field strengths on the order of a few V/m can be displayed.

Recommendation: Hold the device steady during the measurement. Delete the stored maximum values and average values by pressing **Clear** before using the **Max**, **Average** or **Max Average** result types. Do not touch the probe at any time during the measurement.

Changes in temperature

Ambient temperature changes as well as warming by direct sunlight will create offset voltages that may impact the measurement result. Zeroing eliminates offset voltages within the instrument only. Offset voltages caused by the probe or the probe connector can not be eliminated. Particularly probes with thermocouple sensors are affected by offset voltages until stable temperature conditions are achieved.

Recommendation: Try to avoid heating caused by direct sunlight during measurements with thermocouple probes. Consider an adequate settling time for stabilization of the probe in case of temperature changes. A settling time of about 15 minutes will ensure stabilized conditions. Extremely high steps of the environmental temperature changes may require longer settling times.

Strong low frequency fields

The result display when measuring high frequency electromagnetic fields can be falsified by low frequency fields. Wideband probes will detect signals even if the frequency is well outside the specified measurement range (out-of-band attenuation is 20 dB/decade). A probe specified to measure from 100 kHz to 3 GHz would therefore attenuate signals down to 100 Hz by at least 60 dB (= field strength / 1000). However, very high field strengths of several thousand V/m can occur in the vicinity of high tension lines. An RF wideband probe would therefore register several V/m.

Recommendation: Thoroughly inspect every measurement location before any measurement and make a note of any possible sources of interference, such as high tension lines in the vicinity. Keep a critical eye on any possible increase in the minimum display value (noise floor) which may indicate interfering factors. Increase the distance from the source of low frequency interference or use a probe that has a higher frequency cutoff point at the lower end of its range.

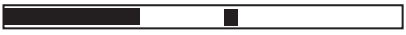
Further useful information can be found under FAQ at **www.narda-sts.com**

5.2 Measuring in Normal display mode

The latest measurement results are displayed in Normal mode. You can also display maximum and average values.

Selecting the result type

You can select the following result displays on the NBM-550:

Result type	Description
Actual	The latest measured value of field strength is shown numerically and as a bar graph.
Max Hold	The maximum field strength measured during the course of the measurement is frozen and displayed numerically and as a separate line on the bar graph. The bar graph continues to display the latest value.  ⇒ Press the **ESC (Clear)** key to reset the display value to 0.
Average  154 s	The average of the current measurement values is determined and displayed. The progress in forming the average value is shown as a bar graph until the first valid average value has been determined. The remaining measurement time in seconds is shown in the window on the right. You can set the averaging time in the MEASUREMENT SETTINGS/**Averaging Time** menu (see **"Setting the averaging time"**on page 49). The bar graph disappears once the first average value has been determined. The average result is then valid. As the measurement continues, the average is formed continuously using the results obtained during the time window (averaging time). ⇒ Press the **ESC (Clear)** key to reset the display value to 0.
Max Avg  154 s	The maximum value of the measured average values is displayed. The average values are determined as described for the Average result type. Only the highest average value determined during the course of the measurement is displayed. ⇒ Press the **ESC (Clear)** key to reset the display value to 0.

The following averages are determined for result types **Average** or **Max Average**:

- Linear average of power values (e.g. W/m^2 or mW/cm^2)
- Root mean square (RMS) of field strength values (e.g. V/m or A/m)

Both types of average give the same result. The averaging process conforms to current safety standards for high frequency fields and normally takes place over a period of 6 minutes. The units of the measured value can be switched at any time without affecting the results already averaged.

Selecting a result type

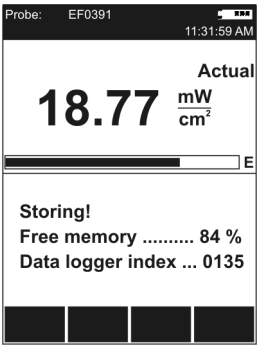
⇒ Press the **Result Type** key repeatedly until the desired result type is shown.

Freezing a measured value

⇒ Press the **Hold** key to freeze the measured value being displayed at the moment.
  ↳ **Hold** appears flashing in the display.
  ↳ The button label changes to **Release**.

⇒ Press the **Release** key to resume the measurement.

Storing a measured value



You can store the measured values in an internal memory in the NBM-550 for documentation.

Storing a measured value

⇒ Press the **Store** key.
  ↳ The measured value displayed at the moment is stored with the date and time under the index number displayed. The remaining memory space is also displayed.

You can also trigger storing of measured values using an external signal.

Storing measured values using an external trigger

1. Open the **External Trigger** function (MAIN/INTERFACE/...).
2. Use the arrow keys ▲/▼ to select the **On** setting and press the **OK** key.
3. Connect the trigger cable (optional accessory) to the multi-function socket and connect the other end (BNC) to a control contact (e.g. closing contact of an odometer).
4. A measured value will be stored every time the contact closes (just like pressing the **Store** function key).

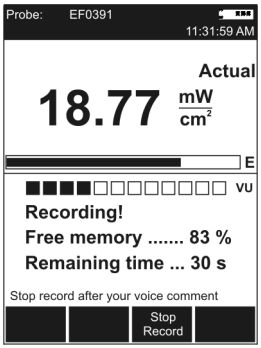
Add voice comments (optional)

You can add a spoken comment up to 30 s in length to the stored measured values. To do this, you must activate voice recording (default setting: deactivated).

Note: The user is automatically asked for voice comments. When measurements are saved manually, this is carried out by pressing the **STORE** button. Comments are only recorded before beginning the measurement at measurement series (Condition Logging or Timer Logging).

Activating voice recording

1. Open the **Voice Recorder** function (MAIN/DATA LOGGER/...).
2. Use the arrow keys ▲/▼ to select the **On** setting and press the **OK** key.
   ↳ The voice recording function is activated.



Adding a comment

✓ You have just stored a measured value.
↳ The message “Voice recorder enabled” is displayed when voice recording has been enabled.

In case you do not want any comments:

⇒ Press **Cancel Record**.

In case you want to record a comment:

1. Press the **Start Record** function key and speak the comment.
   – Speak in the direction of the microphone (above the display) from a distance of 20 to 30 cm, and
   – speak loudly enough, so that the bar reaches at least two-thirds of its maximum length.
   ↳ Recording starts. The bar graph (VU meter) shows the level of the recorded signal.
2. Press the **Stop Record** function key to stop recording.
3. Press the Store Record function key in order to save voice comments.

Note: The recording will automatically be ended after 30 seconds. Before saving, you have the option to repeat the voice comments by pressing the **Repeat Record** button, or to proceed without comments by pressing the **Cancel Record** button.

Setting the averaging time

You can set the time used to form the average for **Average and MaxAvg** display types in the range 4 s to 30 min in 2 second steps.

Setting the time and resolution

1. Open the **Averaging Time** function (MAIN/MEASUREMENT SETTINGS/...).
2. Select the digit using the **</>** function keys.
3. Change the value using the arrow keys ▲/▼.
4. Press the **OK** key to confirm the settings.

5.3 Measuring the spatial average

You can determine the spatial average of the field strength using the Spatial Average function. This function is used to determine the exposure to electromagnetic radiation of the human body, for example.

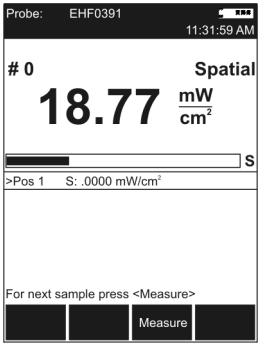
Two measurement methods are available:

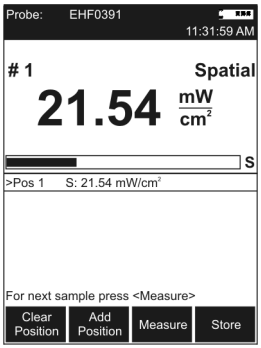
- **Discrete**
  Individual results are recorded and averaged. You can measure at specific locations using this method.
- **Continuous**
  Results are recorded and averaged continuously during the time that the probe is moved around the area of interest. You can measure the field strength affecting a particular space using this method.

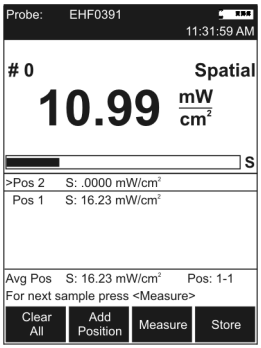
Selecting the measurement method

1. Open the **Spatial AVG Mode** function (MAIN/MEASUREMENT SETTINGS/Next/...).
2. Use the arrow keys ▲/▼ to select the method and press the **OK** key.

Measuring discrete values







✓ You selected **Discrete** as the **Spatial AVG Mode**.

1. Press the **Spatial Average** key.
   ↳ **Spatial** measurement mode is displayed
   The result counter top left shows #0, indicating that no values have been measured yet.
2. Press the **Measure** key.
   ↳ The measured value is stored,
   #1 indicates that one result has been stored,
   Pos. 1 shows the measured value.
3. Press the **Measure** key again to make another measurement.
   ↳ The measured values are stored,
   #... indicates the number of measurements.
   The average of all the measurements is shown after Pos. 1.
4. When you have recorded all the measured values,
   – you can either add positions so you can record more results (e.g. at different locations) or
   – you can store the entire measurement.

Adding a position

1. Press the **Add Position** key.
   ↳ **Pos. 2** is displayed,
   The result counter shows **#0.**
2. Record new measured values as described above.
3. You can add more positions and record more results if necessary.
   ↳ **Avg Pos** shows the average value for all the positions measured, along with the positions used to form the average (e.g. 1-4 for positions 1 through 4).

You can store the measurement results when you have recorded all the measured values.

Storing the results

⇒ Press the **Store** key.
   ↳ The average of all positions and the averages for each separate position are stored.

Measuring values continuously

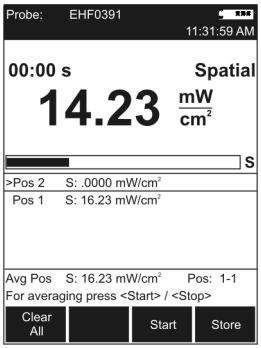
Making the measurement

✓ You have selected **Continuous** as **Spatial AVG Mode**.

1. Press the **Spatial Average** key.
   ↳ **Spatial** measurement mode is displayed.
2. Press the **Start** key.
   ↳ The measurement starts. The elapsed measurement time is shown top left in the display.
3. Move the NBM-550 evenly around the space to be measured. Press the **Stop** key to end the measurement.
   ↳ **Pos.1** displays the measured average value.
4. You can then
   – add positions to record further average values or
   – store the entire measurement.

Note: The NBM-550 emits an audible signal every second to assist you in moving it evenly.

Adding a position



1. Press the **Add Position** key.
   ↳ **Pos. 2** is displayed,
   the elapsed time counter shows **00:00 s**.
2. Record new measured values as described above.
3. You can add more positions and record more results if necessary.
   ↳ **Avg Pos** shows the average value for all the positions measured, along with the positions used to form the average (e.g. 1-4 for positions 1 through 4).

You can store the measurement results when you have recorded all the measured values.

Storing the results

⇒ Press the **Store** key.
↳ The average of all positions and the averages for each separate position are stored.

5.4 Measuring in History display mode

You can display the progress of the measurement versus time in History mode. You can use the cursor to mark individual points on the curve and display the associated values.

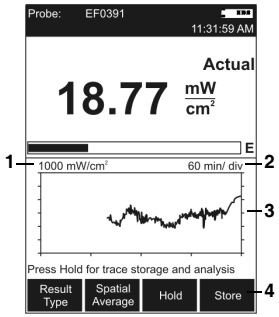
Changing to History display mode

✓ The display is in measurement mode.

1. Press the **OK** key to open the MAIN menu.
2. Press the **Display** function key until **Display: History** appears.
3. Press the **ESC** key to return to measurement mode.
   ↳ The curve is shown in the lower half of the display screen.

Note: The progress memory is always active. As a result, a valid curve already appears when changing to History mode. It will be deleted, however, as soon as you change a parameter that affects the measurement result (e.g. correction frequency or time span). The rolling measurement memory deletes all values that date back longer than the set time period.

Display overview



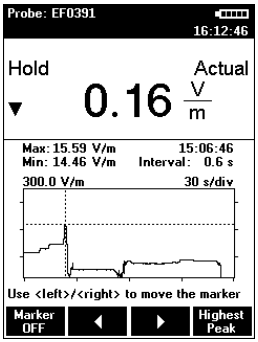
1	Defines the Y axis display range as the maximum measurable field strength
2	X axis time resolution (time period per line of graduation)
3	Graphic display of measurement progress The record begins at the right hand edge. The latest measurement is always shown at the right hand edge.
4	The functions are the same as in Normal display mode (see **"Measuring in Normal display mode"**on page 46.

Changing the time period:

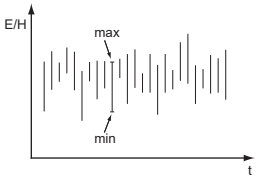
1. Open the **History Time Scale** function (MAIN/DATA LOGGER/...).
2. Use the arrow keys ▲/▼ to set the desired time and press the **OK** key to confirm the setting.

Evaluating the curve

1. Press the **Hold** key to freeze the curve.
   ↳ **Hold** is shown flashing in the display.
   Recording continues in the background.
2. Press the **Marker ON** function key to show the cursor.
   Other items will also appear in the display:
   – **Cross-hairs** for selecting the measurement point
   – **MAX** shows the maximum value at the cursor position
   – **MIN** shows the minimum value at the cursor position
   – **Time** shows the time the measurement at the cursor position was made
   – **Interval** shows the display resolution (cursor step size)
3. Press the ◀/▶ function keys to move the cursor to the left or right or press the **Highest Peak** function key to move the marker to the highest measured value.
4. Press the **Marker OFF** function key to switch off the cursor.
5. Press the **Release** function key to unfreeze the display.
   ↳ The measurement record and curve are updated to show the changes since the **Hold** key was pressed.



Significance of MAX and MIN values



Measured values are recorded continuously as the curve is recorded. However, the cursor can only select discrete time points which have to be used to produce the graphic display. The maximum and minimum values measured within the corresponding time window (interval) are displayed for these time points (see figure, left). A maximum of 200 measurement intervals are shown in the progress memory.

Storing the graphical record

The measurement values of the progress memory can be saved.

To save the measurement value recording:

1. Press the **Hold** key to freeze the curve.
2. Press the **Store History** function key.
   ↳ The measurement value recording is saved. You can add a comment if this function is activated.

5.5 Measuring in XYZ display mode

In XYZ display mode, the measurement values of the three spatial axes as well as the isotropic field strength calculated from them are displayed simultaneously.

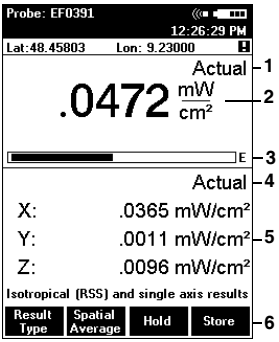
Note: **XYZ** display mode is not available for all probe types. If the probe you are using does not support **XYZ** mode, it will not be available for selection.

Changing to XYZ display mode

✓ The display is in measurement mode.

1. Press the **OK** key to open the MAIN menu.
2. Press the **Display** function key until **Display: XYZ** appears.
3. Press the **ESC** key to return to measurement mode.

Display overview



1 Result type **Actual** displays the field strength in the upper display area

2 Display of the RSS (root sum square) field strength value calculated from the X, Y, and Z values (valid for units V/m and A/m, linear addition for mW/cm^2 and W/m^2):

$$RSS = \sqrt{X^2 + Y^2 + Z^2}$$

3 Graphic display of field strength showing the selected field type (E-field in the example shown here)

4 Only the latest measured values for each axis can be shown (result type **Actual**)

5 Measured values for the three axes

6 The **Result Type** function only applies to the upper display area. The other functions are as for Normal display mode (see **"Measuring in Normal display mode"**on page 46).

Changing the result type

Note: You can only change the result type for the upper display area.

⇒ Press the **Result Type** function key to select a different result type (refer to **"Selecting the result type"**on page 46 for information about result types).

5.6 Measuring in Monitor display mode

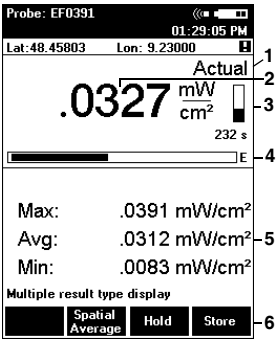
Monitor display mode simultaneously shows the maximum, average, and minimum measured values as well as the latest measured value.

Changing to Monitor display mode

✓ The display is in measurement mode.

1. Press the **OK** key to open the MAIN menu.
2. Press the **Display** function key until **Display: Monitor** appears.
3. Press the **ESC** key to return to measurement mode.
   ↳ Measurement and determination of the maximum, average, and minimum values starts immediately.

Display overview



1	Field strength result type shown in upper display area
2	Display of latest field strength value
3	Remaining averaging time
4	Graphic display of field strength showing the selected field type (E-field in the example shown here)
5	Calculated values since the beginning of measurement: – **Max**: Maximum value – **Avg**: Average value – **Min**: Minimum value
6	The **Result Type** function cannot be selected. Other functions are as for Normal display mode (see **"Measuring in Normal display mode"**on page 46).

Resetting the values shown in the lower display area:

⇒ Press the **ESC (Clear)** key.

5.7 Activating the alarm function

The alarm function allows you to enter a limit value. The instrument outputs an audible signal and the Status LED flashes red when this limit value is exceeded.

This function is useful for checking limit values or for signaling an early warning of dangerous field strengths, for example.

The possible alarm limits are:

- Normal probes

Table 3 Setting ranges of the limit values (in 1 dB steps)

Measuring range	Minimum	Maximum
V/m	100 mV/m	100 kV/m
A/m	250 µA/m	250 A/m
W/m^2	25 µW/m^2	25 MW//m^2
mW/cm^2	2.5 nW/cm^2	2.5 kW/cm^2
µT	320 pT	320 µT

- Shaped probes: 0.1% – 10,000% (in 1 dB steps)

Defining the alarm limits

1. Open the **Alarm Limit** function (MAIN/MEASUREMENT SETTINGS/...).
2. Use the arrow keys ▲/▼ to change the value and press the **OK** key to confirm the setting.

Activating the alarm function

1. Open the **Alarm Function** function (MAIN/MEASUREMENT SETTINGS/...).
2. Use the arrow keys ▲/▼ to select **On** and press the **OK** key to confirm the setting.
   ↳ The symbol  is shown in the display when the alarm function is activated (see **"Measurement screen overview"**on page 32).

5.8 Audible Indicator (hot spot search)

You can use the **Audible Indicator** function to indicate changes in field strength and determine hot spots (areas of maximum field strength). The audible signal changes according to the way the field changes:

- **Continuous tone:** Field strength is increasing
- **Interrupted tone:** Field strength is decreasing
- **No tone:** Field strength is constant

Activating the function

1. Open the **Audible Indicator** function (MAIN/MEASUREMENT SETTINGS/Next/...).
2. Use the arrow keys ▲/▼ to select **On** and press the **OK** key to confirm the setting.

5.9 Measuring with a test standard

The NBM-550 allows measurement based on test standards in the **NORMAL** display mode. Since the measurement result refers to a single, defined frequency (in contrast with the usual broadband measurements), measuring with a test standard only makes sense if the field you want to measure is dominated by a known frequency.

You can apply a test standard as follows:

- Use a shaped probe. The standard is set by the probe and cannot be changed.
- Use a flat probe and apply one of the standards stored in the instrument.
- Use the NBM-TS PC software to customize your own standard.

Three steps are needed to make a measurement using a test standard:

- **Step 1**: Select a test standard
- **Step 2**: Select the reference frequency
- **Step 3**: Apply the test standard

These steps are described below.

Step 1: Select a test standard

1. Open the **Standard** function (MAIN/MEASUREMENT SETTINGS/...).
2. Use the arrow keys ▲/▼ to select a standard and press the **OK** key.

Step 2: Select the reference frequency

⇒ Open the **Frequency** function (MAIN/MEASUREMENT SETTINGS/...).

You can now

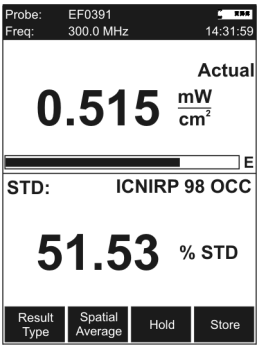
- use a calibrated frequency from the memory (the probe is calibrated at these frequencies) or
- enter a frequency value of your choice.

Using a calibrated frequency

1. Press the ▲ or ▼ arrow key
   ↳ The measuring frequency is set to the next higher or next lower calibrated frequency.
2. Press the **OK** key to confirm the setting and then use the **ESC** key to exit from the menus.

Entering a frequency manually

1. Press the **Edit** function key.
2. Select the digit using the ◀/▶ function keys.
3. Change the value using the arrow keys ▲/▼.
4. Press the **OK** key when you have completed the settings to confirm them and then press the **ESC** key to exit from the menus.



Step 3: Applying the test standard

1. Open the **Apply Standard** function (MAIN/MEASUREMENT SETTINGS/...).
2. Use the arrow keys ▲/▼ to select **On** and press the **OK** key.
   ↳ The test standard is activated, the selected frequency (**Freq**) is shown top left in the display.

Note: When you no longer wish to use a test standard, set **Apply Standard** to **Off** by following the same procedure as above.

Possible displays when using a test standard

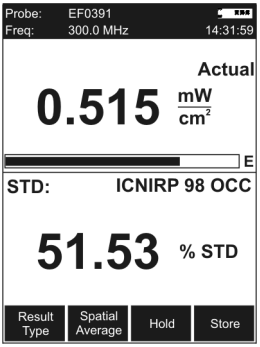
When you apply a test standard (Apply Standard = On), additional information is shown in the lower display area in Normal display mode.

Table 4 Display combinations when using a test standard

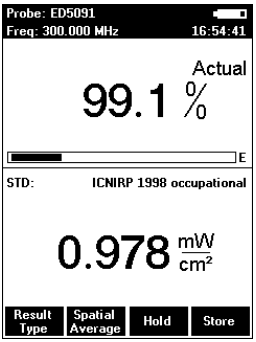
Probe type	E+H Field Units	Display (only in NORMAL mode)	
		Upper area	Lower area
E-field or H-field (flat)	–	Measured value shown with selected units	• Selected standard • Value in % calculated according to the standard and frequency
E-field or H-field (shaped)	–	Measured value in %	• Probe standard • Value and selected units calculated according to the standard and frequency
Combination probe (flat)	V/m and A/m	Measured value shown with selected S-field units (product of E-field and H-field)	• Selected standard • Measured value in V/m and A/m (E-field and H-field) • Value in % calculated according to the standard and frequency
	Selected Unit	Measured value shown with selected S-field units (product of E-field and H-field)	• Selected standard • Measured value shown with selected unit (E-field and H-field) • Value in % calculated according to the standard and frequency

Note: Values in % are always related to the power density.

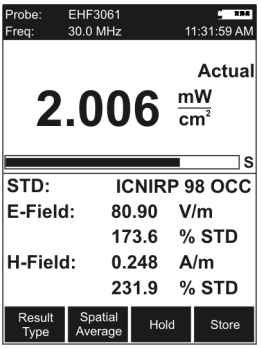
Example displays



Probe type: E-field flat probe



Probe type: E-field shaped probe



Probe type: Combination (E-field and H-field) flat probe

Combi probe uses: V/m, A/m

Note: The S-field is shown in the upper area of the display as the product of the magnitudes of the E-field and H-field.

5.10 Measuring with a correction frequency

Note: The controller function (on page 93) must be switched off to use the correction frequency. When switched on, the uncorrected measured value is displayed.

All probes are calibrated in our factory to guarantee the traceability of measurements back national standards. This calibration is performed at various frequencies over the entire measurement range of the probe concerned. An average correction factor is then used for normal measurements (broadband measurements over the entire frequency range) to give minimal measurement uncertainty.

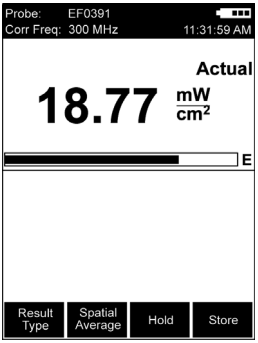
If you only want to make a measurement at a specific, known frequency, however, you can use the correction value at the calibrated frequency to enhance the accuracy of the measurement. Ideally, the calibration frequency and the measuring frequency should be identical.

However, any intermediate value (with a resolution of 1 kHz), which is calculated from the bordering calibration frequencies using interpolation, can also be set.

Selecting the correction frequency

⇒ Open the **Frequency** function (MAIN/MEASUREMENT SETTINGS/...).

1. Press the ▲ or ▼ arrow key.
   ↳ The measuring frequency is set to the next higher or next lower calibrated frequency (intermediate values can be entered after pressing the **Edit** button).
2. Press the **OK** key to confirm the setting.



Applying the correction frequency

1. Open the **Apply Correction Frequency** function (MAIN/MEASUREMENT SETTINGS/...).
2. Select **On** and press the **OK** key to confirm the setting.
   ↳ The correction frequency (**Corr Freq**) is shown top left in the display.

6

Measurements with the NBM-550 and EHP-50

This chapter describes the special functions of the NBM-550 when used with the EHP-50 LF Analyzer.
You can find information about measuring with HF probes in the chapter **"Measuring with the NBM-550 and HF probes"**on page 43.
The EHP-50 Analyzer can also be operated as a stand-alone FFT analyzer. You can find information on how to operate it along with further important information in the Operating Manual for the EHP-50, which is provided as a PDF file on the EHP-TS PC software CD.

6.1 General information

The EHP-50 Analyzer is a stand-alone measuring instrument with remote operation. This operating manual describes how measurements can be made using the NBM-550 for operation of the EHP-50. Descriptions of stand-alone operation and operation from a PC are found in the Operating Manual for the EHP-50, which is included on the EHP-TS CD-ROM as a PDF file.

EHP-50 versions supported

The NBM-550 only supports the functions of the EHP-50 for versions EHP-50D and EHP-50F. The EHP-50D has a restricted frequency range of 5 Hz to 100 kHz and does not yet support the Weighted Peak method.

Selecting EHP-50 mode manually

When starting up, the NBM-550 recognizes an EHP-50 connected to it if this has already been switched on (see **"Connecting and setting up the EHP-50"**on page 26). EHP-50 operating mode will be selected automatically after initialization has completed successfully if there is no HF probe connected to the NBM-550 (HF probes have priority).

If you connect the EHP-50 to an NBM-550 that has already been started and then switch it on, you will have to select the EHP-50 operating mode manually.

To select the EHP-50 operating mode manually:

✓ The display is in measuring mode.

1. Open the function **EHP-50 display** (MAIN MENU/INTERFACES/...).
2. Use the arrow keys ▲/▼ to select the **On** setting and confirm by pressing the **OK** key.
   ↳ The display switches to the measuring mode immediately.

6.2 Display types

The measurement settings you used last time will be applied after the EHP-50 and NBM-550 have started up. You can change the settings by opening a previously saved setup (see **"Saving and loading instrument settings"**on page 90) or change the measurement parameters manually.

WPM, Spectrum, Standard, XYZ, and Monitor display types are available in LF mode. The features common to all display types in LF mode as well as the differences are shown in the table below:

Display type	LF mode (with EHP-50)	HF mode (with HF probe)	
WPM (Weighted Peak method)	**X**	**-**	Numerical display of the percentage of the limit value reached referred to the selected safety standard (wideband from 1 Hz to 400 kHz) with graphical display of time characteristic. See **"WPM display mode (Weighted Peak method)"** on page 69.
Spectrum	**X**	**–**	Graphical display of field strength versus frequency. Numerical display of the wideband value or the highest spectral line. See **"Spectrum display mode"**on page 71.
Standard	**X**	**–**	Graphical display as Spectrum mode but with the measured values referred to the limit values of a safety standard and indicated as percentage values. See **"Standard display mode"**on page 73.
XYZ	**X**	**X**	Numerical display of measurement results for each separate axis of the EHP-50 with display of the isotropic value (RSS). Display of the wideband value or the highest spectral line. See **"XYZ display mode"**on page 74.
Monitor	**X**	**X**	Numerical display of measurement results for the wideband value or the highest spectral line (Actual, Max, Avg, Min). See **"Monitor display mode"**on page 74.
History	**–**	**X**	
Normal	**–**	**X**	

To select the display mode:

✓ The display is in measuring mode.

1. Press the **OK** key to open the main menu.
2. Press the **Display** key until the desired display mode is shown.
3. Press the **ESC** key to switch to measuring mode.

6.3 General settings

The following settings are identical for all display modes and so they are described together here. The functions specific to each separate display mode are described in the sections for each display mode.

Display wideband or peak value

You can display the numerical value referred to the wideband measurement or to the peak value.

To switch the display:

1. Open the **Frequency mode** function (MAIN MENU/MEASUREMENT SETTINGS/...).
2. Use the arrow keys ▲/▼ to select the desired setting and press the **OK** key to confirm.
3. Press the **ESC** key twice to return to measuring mode.

Changing the field type and measurement range

✓ The display is in measuring mode.

1. Press the **OK** key to open the main menu.
2. Press the left function key **(E-field/H-field)** several times until the field type and measurement range are set as you require (E-field: 1 kV/m > 100 kV/m > H-field: 10 mT > 100 µT > ...).
3. Press the **ESC** key to switch to measure mode.

The magnetic field range is displayed in Gauss if you have previously selected Gauss as the units.

To set the display to Gauss:

1. Open the **Magnetic field unit** function
   Open the **Frequency mode** function
   (MAIN MENU/MEASUREMENT SETTINGS/...).
2. Use the arrow keys ▲/▼ to select the **Gauss** setting and press the **OK** key to confirm.
3. Press the **ESC** key twice to return to measuring mode.

Changing the result type

Different result types are available depending on the display type. The table below gives an overview:

	Result type			
	ACT (Actual)	**MAX (Maximum)**	**AVG (Average)**	**MIN (Minimum)**
Monitor[1)]	**X**	**X**	**X**	**X**
XYZ	**X**	**–**	**–**	**–**
Spectrum[2)]	**X**	**X**	**X**	**–**
Standard[2)]	**X**	**X**	**X**	**–**
WPM[2)]	**X**	**X**	**–**	**–**

1) All result types are shown simultaneously.
2) Only one result type can be selected at a time.

Maximum

The maximum measured value is retained.

⇒ You can reset the maximum value and restart the measurement by pressing the **ESC** key.

Average

The average value is determined. You can set the number of measurements to be used to form the average to 4, 8, 16 or 32.

To change the number of averages:

1. Open the **No. of averages** function (MAIN MENU/MEASUREMENT SETTINGS/...).
2. Use the arrow keys ▲/▼ to select the desired setting and press the **OK** key to confirm.
3. Press the **ESC** key twice to return to measuring mode.

Changing the frequency range (Span)

You can select the following frequency ranges: 100 Hz, 200 Hz, 500 Hz, 1 kHz, 2 kHz, 10 kHz, 100 kHz or 400 kHz. The frequency range for WPM is fixed at 1 Hz to 400 kHz

⇒ Use the arrow keys ▲/▼ to change the Span.

Freezing a measured value

This function is the same as the measurement with HF probes. See under **"Freezing a measured value"**on page 47 for more information.

Storing a measured value

This function is the same as the measurement with HF probes. See under **"Storing a measured value"**on page 47 for more information.

6.4 WPM display mode (Weighted Peak method)

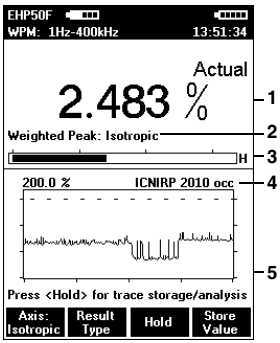
Information about WPM

Fields with complex signal characteristics, such as those caused by the current pulses used in resistance welding, are becoming more and more common. The Weighted Peak method gives the correct measurement value for this kind of pulsed signal and takes the phase of the frequency components into account at the same time. This makes measurement much easier, since you only have to select the relevant safety standard. The device then supplies the measured value as a percentage of the limit value.

The EHP-50F performs the Weighted Peak method with mathematical convolution in the time domain to conform with ICNIRP 2010 and IEC 61786-2. The measurement covers the entire frequency range from 1 Hz to 400 kHz. A graph shows the time characteristic of the measured value.

The EHP-50F supports exposure level evaluation according to:

- ICNIRP 1998, public
- ICNIRP 1998, occupational
- ICNIRP 2010, public
- ICNIRP 2010, occupational
- Directive 2013/35/EU, Limbs Action Levels
- Directive 2013/35/EU, High Action Levels
- Directive 2013/35/EU, Low Action Levels



WPM display mode displays the percentage of the limit value that has been reached referred to the selected safety standard (wideband value from 1 Hz to 400 kHz) and a graph of the field strength value versus time.

1	Result type and numerical display of the percentage of the limit value reached for the selected standard
2	Display of the currently selected sensor axis: Isotropic, X, Y, or Z
3	Graphical display of weighted field strength with indication of selected field type (H-field in the example)
4	Display of selected evaluation standard
5	Graph of measured value versus time. The measured value axis is logarithmic and is fixed, depending on the field type and measurement range selected. The time axis setting is variable

To change the time scale:

1. Open the **History Time Scale** function (MAIN MENU/DATA LOGGER/...)
2. Use the arrow keys ▲/▼ to select the desired time and press the **OK** key to confirm the setting.

Taking measurements from the graph

1. Press the **Hold** key to freeze the display.
   ↳ Hold is shown in the display, but measurements continue to be made in the background.
2. Press the **Marker ON** function key to dispplay the cursor. Further items are now shown in the display:
   – **Crosshairs:** For selecting a measurement point
   – **WPM:** Maximum value at the cursor position
   – **Time:** Time the measurement at the cursor position was made
3. Use the ◀/▶ function keys to shift the cursor to the left or right, or press the **Highest value** function key to move the marker to the highest value.
4. Press the **Marker OFF** function key to remove the cursor from the display.

5. Press the **Continue** function key to unfreeze the display.
   ↳ The recorded measured values and the graph will be updated from the time that the **Hold** key was pressed.

Meaning of the WPM values

Measurement values are captured continuously while the graph is drawn. However, the graph display can only use discrete time points that can be selected using the cursor. The maximum value measured within the corresponding time window (interval) between time points is shown for each time point. The trace memory can display a maximum of 200 measurement intervals.

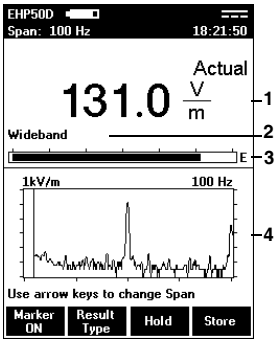
Saving the measurement values recorded

You can save the measurement values in the trace memory.

To save the measured value recording:

1. Press the **Hold** key to freeze the display.
2. Press the **Save History** function key.
   ↳ The measured value recording is saved. You can add a voice comment if you have activated this function.

6.5 Spectrum display mode



Spectrum display mode displays the field strength versus frequency values graphically and numerically.

1	Result type and numerical display of field strength or marker value
2	Wideband or frequency of maximum field strength or of the marker
3	Graphical display of field strength with indication of selected field type (E-field in the example)
4	Spectrum with information about: – **1 kV/m**: field type and measurement range – **100 Hz**: span (in addition to display top left). The logarithmic axis scale always spans 6 decades.

To use the marker function:

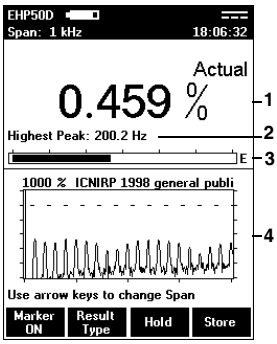
You can use the marker to read out each separate evaluation frequency in the spectrum of the FFT analysis.

1. Press the **Marker** function key (the key is labeled **OFF** when the marker function is active).
   ↳ The marker is shown as a horizontal and a vertical line. The numerical value of the marker is shown in the upper display window.
2. Use the ◀/▶ function keys to shift the marker to the left or right.
3. Press the **Highest value** function key to move the marker to the highest value on the trace.

Other functions

The other functions are the same for all display modes and are described under **"General settings"**on page 66.

6.6 Standard display mode



Standard display mode corresponds to Spectrum display mode but with the measured values normalized against a safety standard and shown as percentage values. Limit values must be defined by the safety standard for the frequency range being used.

Note: Simultaneous display of the wideband value in percent is not possible in this display mode. The "Peak value" is therefore always shown automatically.

1	Result type and numerical display of percentage of the standard or the marker value
2	Frequency of the maximum field strength or of the marker
3	Graphical display of field strength with indication of the selected field type (E-field in the example)
4	Spectrum with indication of the selected standard showing the limit value (the dotted line corresponds to 100 %). The span is shown in the display header top left. The logarithmic axis scale always spans 6 decades.

To use the marker function:

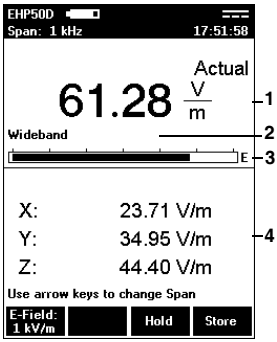
You can use the marker to read out each separate evaluation frequency in the spectrum of the FFT analysis.

1. Press the **Marker** function key (the key is labeled **OFF** when the marker function is active).
   ↳ The marker is shown as a horizontal and a vertical line. The numerical value of the marker is shown in the upper display window.
2. Use the ◀/▶ function keys to shift the marker to the left or right.
3. Press the **Highest value** function key to move the marker to the highest value on the trace.

Other functions

The other functions are the same for all display modes and are described under **"General settings"**on page 66.

6.7 XYZ display mode



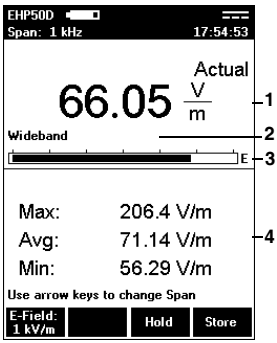
XYZ display mode allows you to display the numerical measurement results for each separate axis of the EHP-50 as well as the isotropic value (RSS). This display mode is useful for optimum alignment of the EHP-50 and allows you to see if an axis is overdriven and correct this by adjusting the alignment. The result type displayed is always the actual value (Actual).

1	Numerical display of the actual measured value
2	Wideband or frequency of the highest field strength
3	Graphical display of field strength with indication of the selected field type (E-field in the example)
4	Numerical display of the measured values for the X, Y and Z axis.

Other functions

The other functions are the same for all display modes and are described under **"General settings"**on page 66.

6.8 Monitor display mode



Monitor display mode shows the numerical actual, maximum, average, and minimum measured values simultaneously.

1	Numerical display of the actual measured value
2	Wideband or frequency of the highest field strength
3	Graphical display of field strength with indication of the selected field type (E-field in the example)
4	Numerical display of the maximum (Max), average (Avg) and minimum (Min) values.

Other functions

The other functions are the same for all display modes and are described under **"General settings"**on page 66.

6.9 Other settings

Where necessary, you can make other settings in the same way as for HF probes. There are some restrictions for certain functions; these are explained below. Detailed descriptions are found in the chapters indicated.

Unavailable functions

The following functions available in HF mode are not available in LF mode:

- Auto zero
- Correction frequency
- Spatial average value
- Conditional storing of results (but timer controlled storing is possible; see **“Storing measured values”**on page 75.)

The alarm function

The alarm function can be used without any restrictions. See **“Activating the alarm function”**on page 57.

Note: The alarm thresholds for HF and LF modes are saved separately in a setup. This also applies to the E-field and H-field thresholds in LF mode.

Storing measured values

You can only record wideband values or highest spectral values using timer controlled storage in LF mode with the EHP-50. It is not possible to use the conditional storage function.

See **“Recording measurements by timer control”**on page 80 for more information.

The selected time interval is temporarily increased automatically in LF mode if the measuring time of the EHP-50 makes a longer interval time necessary. The interval time menu parameter is not changed though. This

means that 1 s will be displayed even if an interval time of 10 s is necessary, for example. The table below shows the relationship between span and timer interval:

Span	Timer interval
100 Hz	≥ 10 s
200 Hz	≥ 5 s
500 Hz	≥ 2 s
> 500 Hz	≥ 1 s

Generally the measurement time or refresh rate for the result display in LF mode depends on the selected span.

Span	Measuring time
100 Hz	approx. 4 s
200 Hz	approx. 2 s
> 500 Hz	approx. 1 s

Note: Timer logging results obtained in LF mode can be subsequently averaged using the optionally available NBM-TS PC software. RMS/MEAN and MEDIAN post average evaluations are available.

Note: Since uninterrupted measurement is not possible in LF mode (except for WPM), the measurement results are not summarized into Min/Max/Avg values for each measurement interval. The Actual values are recorded once every interval instead.

Managing result data

Please refer to **“Managing result data”**on page 84 for information. The results saved in EHP-50 mode are indicated by the following abbreviations in the Data Viewer:

- LFS = Spectrum display mode
- LF% = Standard display mode
- LF3 = XYZ display mode
- LFM = Monitor display mode
- LFT = Timer Logging storage type
- WPV = Weighted Peak value (single measurement)
- WPH = Weighted Peak history (values versus time)

Saving and loading device settings

You can save and recall your device settings in a setup in the same way as in HF mode. All EHP-50-specific settings are saved separately. This also applies to the selected standard.

See **“Saving and loading instrument settings”**on page 90 for more information.

7

Recording and managing measured values

This chapter describes how to record measurement values automatically (Data Logger) and how to recall and manage the measurement data that you have recorded manually or automatically.

7.1 Storage types

As well as manually storing individual values (see **"Storing a measured value"**on page 47), you can also store entire sequences of measurements automatically.
There are two ways to do this:

- You can start storing results at a specified time and stop storing them again after a defined time period has elapsed (see **"Recording measurements by timer control"**on page 80).
- You can set the instrument to start storing results depending upon the measured field strength (see **"Recording conditional measurements (optional)"**on page 82).

7.2 Recording measurements by timer control

For timer controlled recordings, measured values are recorded without interruption within the specified time period and are combined in 3 values per measurement interval (minimum value, maximum value, and average of the measurement interval).

The averages can be very easily converted subsequently to other averaging times with the NBM-TS PC Software (post-average function).

You must take the following steps to record measurements by timer control:

1. Set the recording parameters:
   – enter the starting time (Timer Start),
   – enter the recording time (Timer Duration),
   – enter the recording interval (Timer Interval).
2. Select **Timer Logging** function to start the recording.

These steps are explained below.

Setting the recording parameters

1. Open the DATA LOGGER menu (MAIN/DATA LOGGER).
2. To enter the starting time:
   – open the **Timer Start** function,
   – select a digit using the ◀/▶ function keys and use the arrow keys ▲/▼ to change the value,
   – press the **OK** key when you have completed the settings to confirm them.

Note: The current time can easily be set with the **Current Time** button.

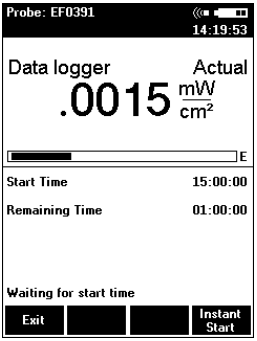
3. To enter the recording time:
   – open the **Timer Duration** function,
   – select a digit using the ◀/▶ function keys and use the arrow keys ▲/▼ to change the value,
   – press the **OK** key when you have completed the settings to confirm them.
4. To enter the recording interval:
   – open the **Timer Interval** function,
   – select a digit using the ◀/▶ function keys and use the arrow keys ▲/▼ to change the value,
   – press the **OK** key when you have completed the settings to confirm them.

Started measurement intervals are always carried out to completion. The actual duration is rounded to a multiple of the interval time.

The maximum duration is determined by the selected interval time (see table below), because the number of measurement intervals is limited to 32000.

Interval time (seconds)	Maximum duration (HH:MM:SS)
1	8:53:20
2	17:46:40
3	26:40:00
5	44:26:40
10	88:53:20
> 10	99:59:59

Starting the recording



✓ The DATA LOGGER menu (MAIN/DATA LOGGER) is open.

⇒ Press the **Timer Logging** function key.

↳ The display switches to measurement mode. The latest measured value is shown in the upper half of the display. The values you entered for the starting time and recording time are shown in the lower half of the display.

Note: If voice recording is activated, a comment can be recorded (optional).

↳ The recording starts at a preset time. The remaining recording time (Remaining Time) is displayed.

↳ The recording is stopped after the preset recording duration (Timer Duration) has elapsed.

Note: The recording starts immediately when **Instant Start** is selected.
The recording can be prematurely stopped at any time with the **Stop** and **Exit** button.

7.3 Recording conditional measurements (optional)

For conditional recording, the measurement is triggered when the predetermined field strength values are exceeded or fallen short of. Up to 32000 events can be recorded.

You must take the following steps to record measurements conditionally:

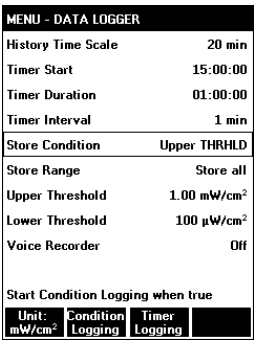
1. Set the recording parameters:
   – enter the starting condition (Store Condition),
   – enter the store range (Store Range),
   – enter the upper threshold,
   – enter the lower threshold.
2. Start the recording:
   – select the **Condition Logging** function,
   – press **Start**.

These steps are explained below.

Setting the recording parameters

The following parameters are available:

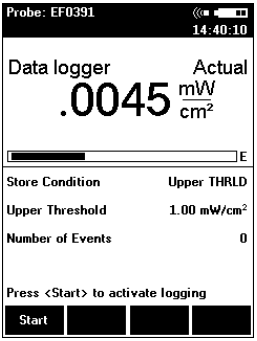
Parameter	Meaning
Store Condition	Specifies the condition for starting recording. • **Upper THRHLD** (upper threshold) The recording starts if the Upper Threshold value is exceeded. • **Out of GAP** The recording starts if the value is outside the range defined by the Upper Threshold and Lower Threshold.
Store Range	Specifies the range of values to be stored (max. 32000 events). • **First and Last** The first and last values occurring within the time period when the Store Condition is fulfilled are recorded. • **Store All** All the values occurring within the time period when the Store Condition is fulfilled are recorded.
Upper Threshold	Specifies the **upper threshold value**
Lower Threshold	Specifies the **lower threshold value**



Setting the recording parameters

1. Open the DATA LOGGER menu (MAIN/DATA LOGGER).
2. To enter the starting condition:
   – open the **Store Condition** function,
   – sse the arrow keys ▲/▼ to select the condition you want to use and press the **OK** key to confirm the setting.
3. To enter the store range:
   – open the **Store Range** function,
   – use the arrow keys ▲/▼ to select the range you want to use and press the **OK** key to confirm the setting.
4. To enter the upper threshold:
   – open the **Upper Threshold** function,
   – select the threshold value with the arrow keys ▲/▼ and press the **OK** button to apply the settings.
5. To enter the lower threshold (only effective at OUT of Gap):
   – open the **Lower Threshold** function,
   – select the threshold value with the arrow keys ▲/▼ (only effective at OUT of Gap) and press the **OK** button to apply the settings.

Starting / stopping the recording



✓ The DATA LOGGER menu (MAIN/DATA LOGGER) is open.

1. Press the **Condition Logging** function key.
   ↳ The display switches to measurement mode.

Note: If voice recording is activated, a comment can be recorded (optional).

   ↳ The latest measured value is shown in the upper half of the display.
   ↳ The starting condition and the values you entered for the thresholds (depending on the starting condition) are shown in the lower half of the display.
2. Press the **Start** function key.
   ↳ Recording starts as soon as the condition is fulfilled.
   ↳ The number of values measured that fulfill the condition is displayed (**Number of Events**).
3. Press the **Exit** function key to end the recording.

7.4 Managing result data

There are two menus provided for you to display and delete measurement data that you have recorded either manually or automatically:

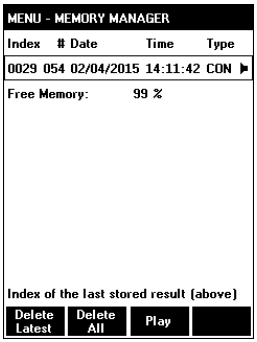
- **Memory Manager** (MAIN/MEMORY MANAGER)
- **Data Viewer** (MAIN/**Data Viewer** function key)

The differences between these menus are described in the table below:

Menu	Displays	Deletes	Comment playback
Memory Manager	• Overview of the last data set • Display of free storage space in %	• Last data set • All data sets	Yes
Data Viewer	Overview of all stored data sets and display of the measurement results	Last data set only	Yes

Note: Before final deletion of data sets, a warning notice always appears giving you the option to cancel the deletion process.

Using the Memory Manager



⇒ Open the MEMORY MANAGER menu (MAIN/...).
↳ The last data set stored is displayed (refer to **Table 5** for the meanings of the columns).
⇒ Press the **Play** key to play back the comment (if available).
⇒ Press the **Delete Latest** key to delete the displayed (= last) entry.
⇒ Press the **Delete All** key to delete all the data sets.

Using the Data Viewer

Displaying the stored measurement data

⇒ Press the **Data Viewer** function key in the MAIN menu.
↳ The list of all stored data opens.

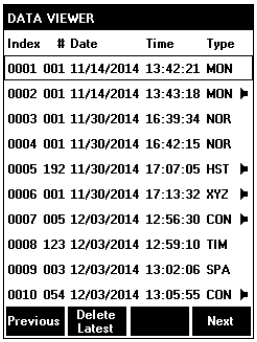


Table 5 Column meanings

Column	Function
Index	Consecutive number identifying the data se.
#	Number of stored sub data sets within a measurement series (max. 32000); always 1 for manually stored results, since only one data set is stored each time). A maximum of 999 sub data sets can be displayed on the device (intervals or events). The NBM-TS PC software enables complete evaluation of all data.
Date	Date when the data set was stored.
Time	Time when the data set was stored
Type	Storage type: • CON: Condition Logging • HST: History mode • MON: Monitor mode • NOR: Normal mode • SPA: Spatial Averaging • TIM: Timer controlled (Timer Logging) • XYZ: XYZ mode
▶	A comment has been added.

Paging through the overview list

⇒ Press the **Previous** or **Next** function key to page back or forward in the list.

To display saved measurement data:

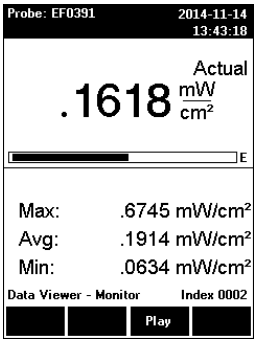
⇒ Use the arrow keys ▲/▼ to select an entry from the list and press the **OK** key to open the entry.

↳ The stored data are displayed.

Note: With the ▲/▼ arrow keys, you can scroll to the next or previous entries.

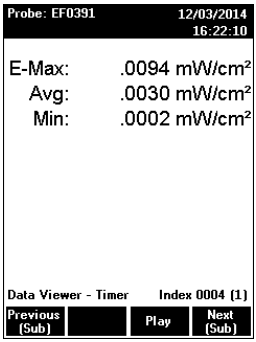
Data Viewer display examples

Some examples of the possible contents of the measurement data memory are shown below. Results are shown in the same format as for the measurement itself.



Example 1: Manual storing

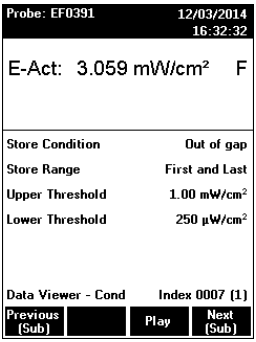
Display	Meaning
Values	Monitor display mode, E-field.
Data Viewer	Display is in Data Viewer mode.
Monitor	Measurement values were saved in the Monitor display mode.
Index 0002	The values were stored at memory position 2.



Example 2: Timer Logging

Display	Meaning
Values	Timer display mode
Data Viewer	Display is in Data Viewer mode
Timer	Values were stored by timer control
Index 0004	The series of values was stored at memory position 4.
(1)	First value in the series

Example 3: Condition Logging



Display	Meaning
Values	Conditional display mode Meaning of the status indicators on the **First and Last** Storage Range: • F (First): first measurement value in which the condition is fulfilled • L (Last): last measurement value in which the condition is still fulfilled • -: no change, neither to F nor L (only with combination probes) Meaning of the status indicators **Store all** on the Storing Range: • Y (Yes): measurement value fulfills the condition • N (No): measurement value does not fulfill the condition (only with combination probes)
Settings	Selected settings for starting condition, store range, and upper and lower threshold
Data Viewer	Display is in Data Viewer mode.
Conditional	Measured values were stored conditionally.
Index 0007	The values were stored at memory position 7.
(1)	First value in the series

Paging within a series of measurements

⇒ Use the **Previous (Sub)** or **Next (Sub)** key to page back or forward in the series of measurements.

↳ The value in brackets after the index indicates the sub data set within the measurement series.

Playing back a comment

Note: Measurement data with comments are indicated by a loudspeaker symbol in the overview list.

✓ The earphone must be connected for playback.

⇒ Press the **Play** function key. This function is available from the overview list view and the selected measurement view.

↳ The comment is played back.

Deleting a data set

Note: You can only ever delete the last entry in the memory.

✓ The overview list is open.

⇒ Press the **Delete Latest** function key.

↳ The last (latest) entry is deleted.

8

Setup and configure

This chapter describes additional functions and settings for the interface, for instrument information and settings, as well as for use of the NBM-550 as a controller and for the activation of new instrument options.

8.1 Configuring the interface

You can use the serial interface via USB or an optical connection.

Configuring the interface

Open the **Serial Interface** function (MAIN/INTERFACE/...).

⇒ Use the arrow keys ▲/▼ to select **USB** or **Optical** and press the **OK** key.

Note: Logging parameters (e.g. the baud rate) are permanently set and cannot be changed (see **"Interfaces"**on page 125).

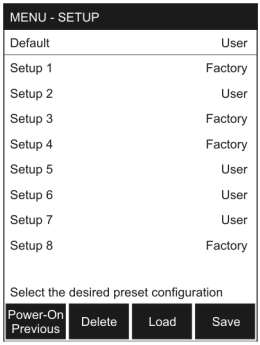
8.2 Saving and loading instrument settings

You can save your current instrument settings (setups) and recall them when you need them again. Nine memory positions are provided for such settings, so you can save setups for different measurement tasks or for different users, for example.

Note: You can use the NBM-TS PC software to store the setups completely in the database and upload them to the instrument again when they are needed.

Menu overview

⇒ Open the MAIN/SETUP menu.



Default	These settings will be used when the instrument is switched on as long as Power On = Default.
Setup 1-8	Memory positions
User	Indicates that a user setup is stored at this memory position
Factory	Indicates that the factory default settings apply because a user setup has not been stored

To delete a memory position:

Any saved instrument settings are deleted and the factory default settings are substituted. The memory position is retained.

Note: This function is not available unless **User** is displayed.

⇒ Use the arrow keys ▲/▼ to select the desired memory position and press the **Delete** function key.
↳ The user setup is deleted and **Factory** is displayed.

Restoring a setup

You can restore your own settings (User) or the factory default settings (Factory).

⇒ Use the arrow keys ▲/▼ to select the desired memory position and press the **Load** function key.
↳ The instrument settings are restored (loaded).

Saving a setup

You can only store your own setups in memory positions that are occupied with the factory default settings (Factory). If you want to store your own settings in a memory position that is occupied with a User setup, you will have to delete this setup first (see **“To delete a memory position:”**on page 91).

⇒ Use the arrow keys ▲/▼ to select the desired memory position and press the **Save** function key.
↳ The instrument settings are saved.

Changing a setup name

You can change the names of setups using the NBM-TS PC software supplied with the device.

To change setup names:

1. Upload the setups to your PC using the NBM-TS PC software.
2. Edit the names on your PC and then transfer the setups back to the instrument.

Setting the power on behavior

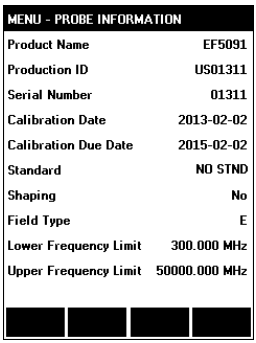
You can use the **Power On** function to specify the instrument setup that is loaded when you switch on the NBM-550. The following settings are possible:

- **Previous**: The settings in use when the instrument was last switched off are restored.
- **Default**: The settings saved under Default are restored.

⇒ Press the **Power-On** function key to toggle between the two settings.

Note: The selection displayed is active.

8.3 Displaying instrument and probe information



The following information is displayed in the INFORMATION menu:

- **Device Information**: Information about the instrument, including:
  - The last and the next calibration,
  - Option 1, 2,... (options installed)
- **Probe Information**: Information about the probe used
- **Device Diagnostic**: Service information
- **Probe Test**: Checking all 3 channels (Ch1...Ch3) with a test source for proper operation

Displaying the information

⇒ Open the required function in the MAIN/INFORMATION/ ... menu.

8.4 Using the NBM-550 as a controller

You can use the NBM-550 to control other instruments from Narda Safety Test Solutions such as the NBM-520 or another ▲/▼.

This allows you to measure in places that are difficult to reach with convenient operation and reading of results.

Using the NBM-550 as a controller

1. Open the **Controller Function** function (MAIN/INTERFACE/...).
2. Use the arrow keys ▲/▼ to select **On** and press the **OK** key.
   ↳ The PC interface is set to **USB** regardless of the setting made in **Serial Interface** because the optical interface is reserved for communication between meters.
3. Connect the NBM-550 to the NBM-520 using an optical cable.
   ↳ You can then use the NBM-520 as an extended probe handle.
   ↳ All the measurement functions of the NBM-550 are available (except for the correction frequency).

Note: The probe must be connected to the NBM-520. Probes connected to the NBM-550 will be ignored.
The display of the used probe type on the controller (NBM-550) changes from **Probe:** to **Remote:** in order to indicate an external probe (for example **Remote: EF0391**).

Note: Measuring with a correction frequency (page 58) is not possible when the controller function is switched on. When switched on, the uncorrected measured value is displayed.

8.5 Activating instrument options

Instrument options such as the GPS/Voice Recorder/ Conditional Logging option expand the capabilities of the NBM-550.

Options can be subsequently ordered and must then be activated via a provided activation code (Option Key). After activation, the option appears under **Information** (see **"Information"**on page 112).

Activation is conducted using the NBM-TS PC software (see **"PC software"**on page 95).

To activate an option:

1. Establish a connection between the instrument and PC (see **"Working with the PC software"**on page 97).
2. Start the NBM-TS software.
3. 
   Activate the connection in the **Extras** menu via the **Connect** icon.
4. 
   Click on the icon for **activation.**
   - A window in which all the options are listed opens. Active options are identified with marked check boxes.
5. Click on the desired option.
   - The **Option Code** field appears.
6. Enter the activation code from the Options Passport Document in the corresponding fields and click on **Activate.**
   - The option is activated and can be used.

You can find other tips in the PC software's online help.

Note: The activation code of an option is linked to the serial number of the instrument. For this reason, be sure to specify the serial number of the NBM-550 being used when placing subsequent orders.

9 PC software

This chapter gives you some basic information about the NBM-TS PC software. It explains the possible applications of the software, how to connect the NBM-550 to the PC and the settings you need to make on the NBM-550. It also describes how to update the firmware of the NBM-550 via the PC software.

You can find detailed information about the PC software itself in the on-line help for the PC software.

9.1 Using the PC software

The NBM-TS PC software can be downloaded for free at **www.narda-sts.com**.

The PC software provides a large number of functions:

- Visualization of stored measurement results
- Off-line analysis of stored results
- Remote control of the NBM-550, including live signals on the PC (not available for LF mode with the EHP-50)
- Straightforward export of measurement data to Microsoft Excel
- Measurement data management in databases
- Direct printout of measurement results
- Screenshots of the displayed windows (copy and paste function)
- Bitmap downloads of NBM-550 displays

The PC software is essential for performing a firmware update and in order to activate subsequent options

Minimum system requirements

The following minimum system requirements must be met:

- Windows 2000 SP4 or later
- Microsoft .NET Framework 2.0 (installed automatically if needed)
- USB driver (installed with the software)

9.2 Connecting the NBM-550

You can connect the NBM-550 to the PC using the USB interface or the optical interface:

- Use USB to make use of the higher transmission speed
- Use the optical interface for remote control, since the metallic USB cable can affect the measurements

Connecting the NBM-550 to a PC

1. Configure the interface
   (see **"Configuring the interface"**on page 90).

⇒ Connect the NBM-550 to the PC using a USB cable or an optical cable.

↳ The NBM-550 will be detected as a new device automatically by the PC.

9.3 Working with the PC software

The following conditions must be fulfilled before you can work with the PC software:

✓ The PC is ready to use and the PC software has been installed successfully,
✓ the NBM-550 is ready to use,
✓ NBM-550 and PC are connected together by a USB cable.

Start the PC software and use it to operate the NBM-550. Information on using the PC software is found in the on-line help for the PC software.

9.4 Updating the firmware

You can update the firmware of the NBM-550 in order to make use of new or improved functions.

You can only update the firmware using a PC on which the NBM-TS PC software has been installed.

Note: The NBM-550 must be supplied with power via the mains adapter while updating. This prevents the update from being interrupted due to discharged batteries. The PC software checks whether an adapter is connected, and, if not, displays a warning.

Updating the firmware

1. Save the latest firmware for the NBM-550 on the PC. The latest firmware is available from the Narda website at **http://www.narda-sts.com**.
   The NBM-TS software automatically directs you with a simple mouse click to the corresponding website in order to search for a newer version of both the NBM-550 firmware as well as the NBM-TS software. Always use the most recent NBM-TS version to perform a firmware update.
2. Establish a connection between the instrument and PC (see **"Working with the PC software"**on page 97).
3. Start the NBM-TS software.

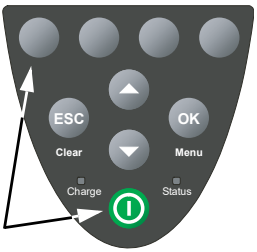
4. Change to the **Extras** menu and activate the connection via the **Connect** icon.

5. Click on the **Firmware Update** icon and follow the instructions displayed on the screen
   - The NBM is initially switched off via remote control and you will be prompted to switch it on.
   - The firmware transfer is indicated by the flashing status LED.
   - After a successful transfer, a PC software notice appears.
6. Switch the NBM-550 on again.
   - The self test with the new firmware starts.

Note: A firmware update takes about 5 minutes. The NBM-550 display remains blank during update.

9.5 Performing a reset

If the instrument no longer responds, you can perform a reset to initialize it.



Performing a reset

⇒ Press the **1** function key and the **On/Off** key at the same time.

↳ The instrument restarts.

Note: A reset does not change any instrument parameters, it only restarts the instrument.
Use the Setup menu to reset the instrument to the factory default settings (see **"Saving and loading instrument settings"** on page 90).

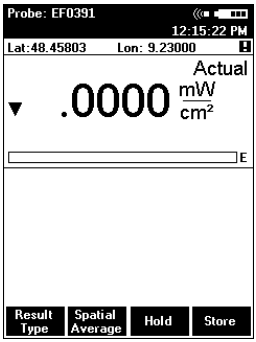
10 Overview of all menus and functions

This chapter describes all the menus and functions of the NBM-550.

10.1 Measurement menus

The four function keys in the measurement menus allow you to select various functions.

Note: The function keys have the same functions in all display modes (Normal, XYZ, Monitor, History), with the exception of function key 1 (**Result Type**) which is inactive in **Monitor** display mode.

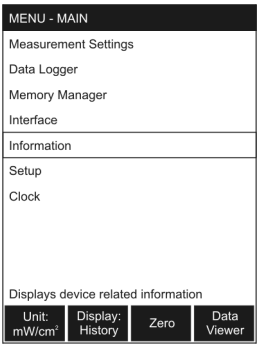


Function	Meaning
Result Type	Selects the result type: Actual, Max Hold, Average, Max Avg
Spatial Average	Switches to spatial averaging
Hold	Freezes the current (actual) measured value. The function key label changes to **Release** after you press **Hold**, and **Hold** flashes in the display. Press it to unfreeze the measurement value.
Store	Stores the current (actual) measurement value

10.2 Main menu

⇒ To open the MAIN menu, press the **OK** from any of the measurement menus.

Note: The underlined settings are the factory default settings.



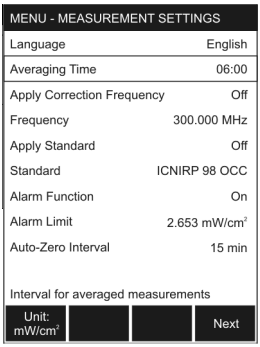
Function	Meaning
Sub-menu	
Measurement Settings	• Set general measurement parameters • Select the language
Data Logger	Set the parameters for recording measurement data
Memory Manager	• Display the free memory space • Delete the last stored measured value or delete all measured values.
Interface	Set the interface parameters
Information	Display information about the instrument and the probe.
Setup	Save and recall instrument settings.
Clock	Set the time and date.
Function keys	
Unit:...[1)]	Select the measured value units: W/m^2, mW/cm^2, V/m, A/m
Display:...[1)]	Select the display mode: • Normal: Measured value (depending on selected result type) • XYZ: X, Y, and Z axis results shown separately • Monitor: actual, maximum, average, and minimum values • History: actual value and graph of value vs. time
Zero[2)]	Start a zero adjustment
Data Viewer	• Display a list of all saved measured values. • Display saved measured values. • Delete the last measured value saved.

1) See Chapter 6 for LF measurements with EHP-50
2) Only displayed when EHP-50 display is OFF

10.3 Measurement Settings (HF mode)

You can change the general measurement parameters in the MEASUREMENT SETTINGS menu.

Page 1

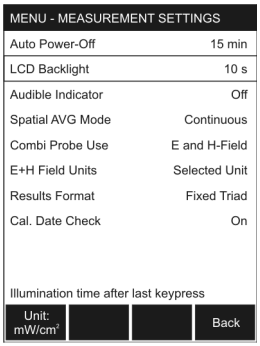


Function	Meaning
Menu functions	
Language	Select the language: English, Spanish, Italian, Chinese, French, Turkish, Russian, German
Averaging Time	Set the averaging time: 4 sec. – 30 min.; Default: 6 min.
Apply Correction Frequency	Activate the frequency set under **Frequency** as a correction frequency: On, Off
Frequency	Set the frequency (applies to **Apply Correction Frequency** and **Apply Standard**)
Apply Standard	Activates the test standard set under **Standard**: On, Off The frequency set under **Frequency** is used as the reference frequency.
Standard	Select a test standard.
Alarm Function	Activate the alarm function: On, Off
Alarm Limit	Set the alarm limit (you can change the displayed units by pressing the **Unit** function key).
Auto-Zero Interval	Set the interval for the auto zero function: • Off: Auto zero function disabled • 6 min, 15 min, 30 min, 60 min
Function keys	
Unit:...	Select the measured value units: W/m^2, mW/cm^2, V/m, A/m
Next	Open page 2 of the menu

Note: The language selection is deliberately at the top of the menu. This makes it easy for you to revert to the original setting if you change the language by mistake.

Page 2

⇒ Press the **Next** function key to open page 2 of the menu.

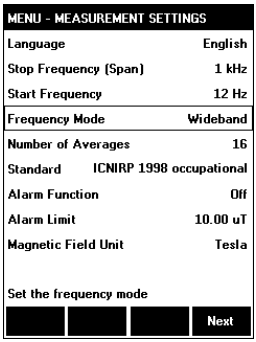


Function	Meaning
Menu functions	
Auto Power-Off	Set time until automatic power off: • Off: Auto power off disabled • 6 min, 15 min, 30 min, 60 min
LCD Backlight	Set time until backlight switches off: • Permanent: Always on • Off: Always off • 5 s, 10 s, 30 s, 60 s
Audible Indicator	Switch the signal tone for locating field maxima (hot spots) on or off: On, Off
Spatial AVG Mode	Select the method for spatial averaging: • Discrete: Individual measured values • Continuous: Continuous measurement
Combi Probe Use	Select the field type when using a combination probe: • E-field only • H-field only • E- and H-field: Both field types active
E+H Field Units	select units for simultaneous display of E-field and H-field (only applies in **Normal** mode): • Selected: Use the units selected using the **Unit** function key • V/m and A/m: Always use V/m and A/m regardless of the selection made with the **Unit** function key
Results Format	Select the display format for the unit dimensions: • Variable Triads: Unit dimensions are matched to the measurement result • Fixed Triads: Unit dimensions are independent of the measurement result
Cal. Date Check	Check the calibration date when the instrument is switched on: On, Off
Function keys	
Unit:...	Select the measured value units: W/m^2, mW/cm^2, V/m, A/m
Back	Open page 1 of the menu

10.4 Measurement Settings (LF mode)

You can change the general measurement parameters in the MEASUREMENT SETTINGS menu.

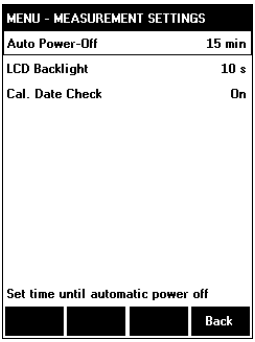
Page 1



Function	Meaning
Menu functions	
Language	Select the language: English, Spanish, Italian, Chinese, French, Turkish, Russian, German
Stop frequency (Span)	Upper frequency limit: 100 Hz, 200 Hz, 500 Hz, 1 kHz, 2 kHz, 10 kHz, 100 kHz, 400 kHz
Start frequency (Info)	Lower frequency limit (1.2 % of the stop frequency, 1 Hz for Span = 100 Hz): 1 Hz, 2.4 Hz, 6 Hz, 12 Hz, 24 Hz, 120 Hz, 1200 Hz, 4800 Hz
Frequency mode	Type of frequency measurement: Wideband, Highest value
Number of Averages	Number of measurements used to take the average: 2, 4, 8, 16, 32
Magnetic Field Unit	Magnetic field units: Tesla, Gauss
Standard	Select a measurement standard to be used for the standardized display in Standard display mode. Default: ICNIRP 1998 occupational
Standard (WPM)	Select a standard to be used in Weighted Peak display mode. The standards for WPM must be implemented in the EHP-50F. You cannot retrospectively download standards via the NBM. Default: 2013/35/EU Low ALs
Alarm Function	Activate alarm function: On, Off
Alarm Limit	Set the alarm limit
Function keys	
Next	Open page 2 of the menu

Page 2

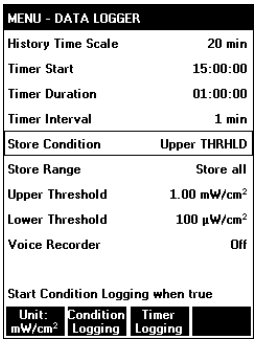
⇒ Press the **Next** function key.



Function	Meaning
Menu functions	
Auto Power-Off	Set time until automatic power off: • Off: Auto power off disabled • 6 min, 15 min, 30 min, 60 min
LCD Backlight	Set time until backlight switches off: • Permanent: Always on • Off: Always off • 5 s, 10 s, 30 s, 60 s
Cal. Date Check	Check the calibration date when the instrument is switched on: On, Off
Function keys	
Back	Open page 1 of the menu

10.5 Data Logger

In the DATA LOGGER menu, you can set the measurement value recording parameters and start a timer controlled or conditional recording.



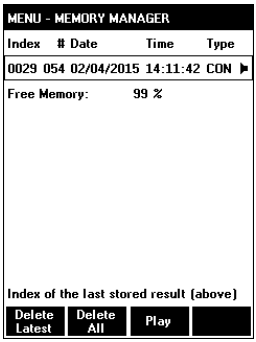
Function	Meaning
Menu functions	
History Time Scale	History window time scale: 2 min., 8 min., <u>20 min.</u>, 1 h, 2 h, 4 h, 8 h History window time scale for Weighted Peak with EHP-50F: 100/200/400/1000/2000 s 100/200/400/1000/2000 min
Timer Start	Starting time for timer controlled measured value recording.
Timer Duration	Measurement time for timer controlled measured value recording: 1 sec. – 99 h 59 min. 59 sec., Default: <u>10 min</u>[1) 4)]
Timer Interval	Time between storing consecutive measured values for timer controlled measured value recording: 1 s, 2 s, 3 s, 5 s, 10 s, 20 s, 30 s, <u>1 min.</u>, 2 min., 3 min., 6 min.
Store Condition[2)] (optional)	Start condition for conditional measured value recording: • <u>Upper THRHLD</u>: Recording starts when the threshold defined by **Upper Threshold** is exceeded. • Out of gap: Recording starts if the value is outside the range defined by **Upper Threshold** and **Lower Threshold**.
Store Range[2)] (optional)	Range of stored measured values for conditional measured value recording: • First and Last: Only the first and last values occurring during the period when the Store Condition was fulfilled are recorded. • <u>Store all</u>: All measured values that fulfill the Store Condition are recorded.[3) 4)]
Upper Threshold [2)] (optional)	Upper threshold for Condition Logging

Function	Meaning
Lower Threshold[2] (optional)	Lower threshold for Condition Logging (only applies to **Out of gap**)
Voice Recorder (optional)	Enable voice recording after storing measured values: On, Off
Function keys	
Unit:...[2]	Select the measured value units: W/m^2, mW/cm^2, V/m, A/m
Condition Logging[2]	Open the menu for starting conditional recording of measured values.
Timer Logging	Open the menu for starting timer controlled recording of measured values

1) The actual duration is limited by the maximum number of 32000 intervals per data set. For dependency of the timer duration on the selected timer interval, see table in **"Setting the recording parameters"**on page 81.
2) Only displayed if EHP-50 display = off
3) Up to 32000 events can be recorded.
4) After a successful recording, the measured values can be viewed with the Data Viewer (see **"Using the Data Viewer"**on page 85).
It should be noted that only the first 999 sub data sets (intervals or events) can be displayed on the NBM-550. The NBM-TS PC software enables complete evaluation of all data.

10.6 Memory Manager

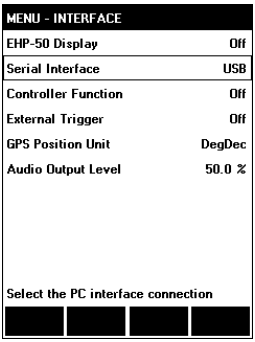
You can display information about the last stored set of measured values and delete stored measured values in the MEMORY MANAGER menu.



Function	Meaning
Information displayed	
Index	Memory position of saved measurement data set.
#	Number of measurements saved in this measurement data set.
Date	Date measured value was saved.
Time	Time measured value was saved.
Type	Storage type: • CON: Condition Logging • HST: History mode • MON: Monitor mode • NOR: Normal mode • SPA: Spatial Averaging • TIM: Timer Logging • XYZ: XYZ mode • ▶: With voice recording (comment) With EHP-50: • LFS: Spectrum • LF%: Standard • LF3: XYZ • LFM: Monitor • LFT: Timer Logging • WPV: Weighted Peak value • WPH: Weighted Peak history
Free Memory	Free memory space.
Function keys	
Delete Latest	Delete the last saved set of measured values (i.e. the displayed set).
Delete All	Delete all saved sets of measured values.
Play	Replay the voice recording (if one exists).

10.7 Interface

You can configure the interface, change the display of GPS coordinates, and adjust the volume of the audio output signal to the earphone using the INTERFACE menu.

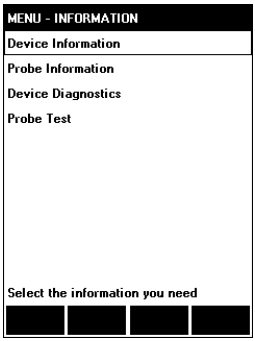


Function	Meaning
EHP-50 Display	LF measurement with EHP-50: On, Off
HP-01 Display	Measurements 0 Hz to 1 kHz with HP01: On, Off
Serial Interface[1)]	Configures the serial interface for connection with a PC: • USB: Connection via USB cable to the multi-function socket • Optical: Connection via optical duplex cable, type RP-02
Controller Function[1)]	Use the NBM-550 to control another NBM-5xx instrument: On, Off
External Trigger	Trigger storage externally: On, Off
GPS Position Unit	Changes the display of GPS coordinates: • **DMS**: (d)dd° mm' ss.s'' N e.g. Lat: 48° 48' 10.5'' N / Lon: 9° 15' 00.0'' E • **MinDec**: (-)(d)dd° mm.mmm' e.g. Lat: 48° 48.175' / Lon: 9° 15.000' • **DegDec**: (-)(d)dd.ddddd° e.g. Lat: 48.29166° / Lon: 9.25000°
Audio Output Level	Sets the volume of the audio output to the earphone (only functions with the Voice Recording option)

1) Only displayed if EHP-50 display = off

10.8 Information

You can display information about the instrument and the probe in the INFORMATION menu.



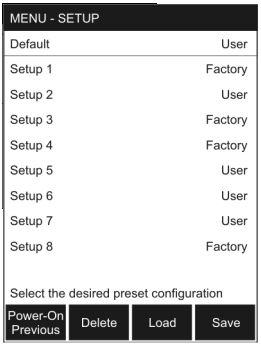
Function	Meaning
Device Information	Displays information about the instrument: • Product Name: Instrument name • Production ID: Production number • Serial Number • Firmware Version • Calibration Date: Date of last calibration • Calibration Due Date: Date of next calibration due • Option 1, 2, 3: Installed options
Probe Information	Displays information about the probe that is connected: • Product Name: Probe name • Production ID: Production number • Serial Number • Calibration Date: Date of last calibration • Calibration Due Date: Date of next calibration due • Shaping: Yes or No (flat) • Standard: Test standard for shaped probes • Field Type: E or H • Lower Frequency Limit: Smallest frequency that can be measured • Upper Frequency Limit: Greatest frequency that can be measured
Device Diagnostic	Service information • Temperature • Battery voltage • Battery capacity
Probe Test	Checking instrument functions (see **"Checking instrument functions"**on page 120)

10.9 Setup

You can save and recall your instrument setups and specify the power on behavior of the instrument in the SETUP menu.

The following parameters are not changed by the setups:

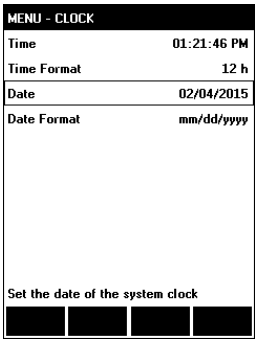
- Language
- Serial Interface
- Controller Function
- Power On
- Contrast



Function	Meaning
Default	The instrument setup saved here is used when you switch on the instrument if you have selected the **Default** setting with the **Power-On** function key.
Setup 1 – 8	Memory positions for storing instrument setups
User	Indicates that you have stored your own settings at this memory position.
Factory	Indicates that the factory default settings are stored at this memory position, not a user setup.
Function keys	
Power-On	Sets the power on behavior: • Previous: The settings in use when the instrument was last switched off are reloaded. • Default: The settings in the Default memory position are loaded when the instrument is switched on.
Delete	Deletes the user setup stored in a memory position.
Load	Loads the user setup stored in a memory position.
Save	Saves the current setup to a memory position.

10.10 Clock

You can set the time and date in the CLOCK menu.



Function	Meaning
Time	Sets the time.
Time Format	Sets the time format: • 12 h clock • 24 h clock
Date	Sets the date.
Date Format	Sets the date format: • mm/dd/yyyy • dd.mm.yyyy • yyyy-mm-dd

11 Instrument maintenance

This chapter describes how to clean the instrument and how to replace the batteries.

11.1 Cleaning the instrument

NOTICE

Damage to the instrument from liquids

The instrument may be damaged or destroyed if liquids are allowed to get inside the casing.

⇒ Make sure that no liquid gets inside the instrument.

NOTICE

Solvents

Solvents can corrode the surfaces of basic unit, probe and AC Adapter / Charger.

⇒ You must not use solvents to clean the basic unit, probe, and AC Adapter / Charger.

Cleaning the instrument

1. Use a soft cloth to clean the instrument. You can use lukewarm water to which a little detergent solution has been added as a cleansing agent.
2. To prevent streaks and spots, wipe off the instrument with a dry cloth while it is still damp.

11.2 Replacing / removing the batteries

⚠ WARNING

Improper replacement of batteries

Overheating, explosion, or ignition of rechargeable batteries/batteries or their surroundings

⇒ Only use the NBM-550 with NiMH rechargeable batteries (AA, Mignon).
⇒ Do not use dry batteries.
⇒ Do not replace individual batteries; always replace the entire set.
⇒ Always use identical batteries.

⚠ WARNING

Short circuiting the batteries

Overheating, explosion, or ignition of rechargeable batteries or their surroundings

⇒ Never touch both poles of the batteries simultaneously with a metal object.
⇒ Always close the battery compartment immediately after replacing batteries.
⇒ Never use the NBM-550 with the battery compartment open.

⚠ WARNING

Reverse charging of rechargeable batteries

NiMH batteries can explode if you charge them with reversed poles

⇒ Make sure you insert the batteries correctly as shown on the base of the battery compartment.

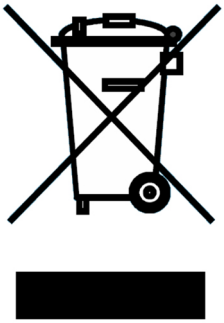
The rechargeable batteries have a useful life of about 1000 charge cycles or 3 years (whichever occurs soonest).

Replace the batteries if the operating time is significantly reduced although the batteries are fully charged.

Replacing the batteries

1. Switch off the instrument and disconnect it from all other devices (AC Adapter / Charger, USB).
2. Open the battery compartment on the back of the instrument.
3. Remove the old batteries and dispose of them according to the waste disposal ordinances applicable in your country.
4. Insert the new batteries.
   Make sure you insert them the right way round according to the diagram on the base of the battery compartment.
5. Close the battery compartment.
6. Connect the AC Adapter / Charger and charge the batteries (a complete charge cycle takes about 2 hours).

11.3 Disposal



Disposal of used equipment

The crossed-out wheeled garbage can symbol indicates that this product is subject to the European WEEE Directive 2012/19/EU on the disposal of waste electrical and electronic equipment and must be disposed of separately from household waste in accordance with your national regulations.

In the European Union, all electronic measuring systems purchased from Narda after August 13, 2005 can be returned at the end of their useful life.

⇒ For more information, please contact your Narda distributor.

Disposal of removable batteries

Batteries must not be disposed of in household waste, but must be disposed of separately from the product in accordance with the applicable regulations. They can be returned free of charge to the appropriate collection points, your dealer or directly via Narda.

⇒ Please discharge the batteries before disposal.

Disposal of permanently installed batteries

Your instrument has permanently installed Li-metal, non-rechargeable batteries, which cannot be removed non-destructively by the user.

Non-destructive removal is only possible by Narda itself or by qualified personnel.

⇒ Instructions for non-destructive removal of the batteries can be found on the Narda website www.narda-sts.com under the corresponding product page.

Deleting private data

Make sure that you delete any stored private data before passing on or disposing of the device.

11.4 Checking instrument functions

Note: The function test does not apply to the EHP-50 and HP-01. The EHP-50 and HP-01 have their own built in self test.

⚠WARNING

Probe is not operating properly

Possibly present high radiation values are not recognized.

⇒ Check probes for proper operation with a signal source before using this measuring instrument. This is especially important for thermocouples because the sensors can be affected by various mechanical and environmental stressors. Narda offers portable sources to accomplish this important step (see **"Accessories"**on page 133).

⇒ Before beginning any RF radiation measurement, always advise yourself of the frequencies and field strengths that you could expect to encounter.

Performing a function test:

1. Connect the probe to the instrument (see **"Connecting the probe"**on page 24).
2. Switch the instrument on (see **"Switching on"**on page 30) and wait until the self test is complete.
3. Open the **Probe Test** function (MAIN/INFORMATION/ PROBE TEST).
   ↳ The measured field strength will be displayed separately for all 3 input channels (Probe channel 1...3).
4. Bring an appropriate signal source (see **"Appropriate test sources"**on page 122) near the probe head.

5. Switch the signal source on
   - ↳ The Probe channel 1...3 display increases: **Function test OK**.
     Press the **ESC** button three times to change to the measurement mode.
   - ↳ The Probe channel 1...3 display does not increase: **Function test not OK.**
     Do not use the probe any more. Contact the responsible service center.

Measures to be taken when function test is erroneous:

⇒ Repeat the test:
- move the signal source around the probe head to generate a signal for each of the 3 spatial axes,
- monitor the display while moving the signal source.

Note: Do not use this function test for measurements. This test is suitable only for checking probes.
All 3 channels must respond to the field source. It is no fault if some channels display identical values.
The meaning of the channels varies depending on the type of probe and is irrelevant for this test.

For more details about the probe, refer to the data sheet.

Appropriate test sources

The following table shows appropriate test sources for a function test.

Probe	Test Source: 27 MHz (2244/90.38)	Test Source: 446 MHz PMR Pocket Radio[1)]
EF0391	✓	✓
EF0392	✓	✓
EF0691	✓	✓
EF1891	✓	✓
EF6091	✓	✓
EF6092	✓	✓
HF3061	✓	✓
HF0191	✓	✓
EA5091	–	✓
EB5091	–	✓
EC5091	–	✓
ED5091	–	✓
EF5091	–	✓
EF5092	–	✓

1) PMR Pocket Radios are commonly available in electronics stores.

12 Specifications

This chapter lists the specifications of the NBM-550. For the EHP-50 a separate data sheet is provided.

The technical specifications may change due to product developments. The latest technical specifications can be found in the datasheet of the product. The datasheet can be downloaded from the Narda website **www.narda-sts.com** under the corresponding product page.

12.1 Display

Display type	Transreflective monochrome LCD
Display size	10 cm (4"), 240 x 320 pixels
Backlight	White LEDs, selectable lighting time (OFF, 5 s, 10 s, 30 s, 60 s, PERMANENT)
Display refresh rate	200 ms for bar graph and graphics, 400 ms for numerical result values

12.2 Measurement functions (with HF probes)

Result units	mW/cm^2, W/m^2, V/m, A/m, µT, % of standard (% of standard is related to power density)
Display range	0001 to 9999, switchable between variable and permanent triads
Display range, variable triads	0.01 V/m to 100.0 kV/m 0.01 mA/m to 265.3 A/m 0.001 mW/m^2 to 26.53 MW/m^2 0.1 nW/cm^2 to 2.653 kW/cm^2 0.0001% to 9999%
Display range, fixed triads	0.01 to 9999 V/m 0.0001 to 265.3 A/m 0.0001 to 9999 W/m^2 0.0001 to 9999 mW/cm^2 0.0001% to 9999%
Result types (RMS, isotropic)	Actual, Maximum, Minimum, Average, Maximum Average
Result types (RMS, XYZ mode)	Actual X, Actual Y, Actual Z (for probes with separate axis connections)
Time averaging	Averaging time selectable from 4 s to 30 min (2 s steps)
Spatial averaging	Individual or continuous sampling
Multi-position spatial averaging	Averaging over up to 24 spatially averaged results, storage of individual position results and of the total value
Progress memory (History mode)	Graphical display of the latest values versus time (time span 2 min to 8 h)
Correction frequency	1 kHz to 100 GHz or OFF (direct frequency selection, interpolation between calibration points)
Hot Spot search	Acoustic indication of increasing or decreasing field strength (Actual or Maximum)
Alarm function	2 kHz warning tone (4 Hz repetition rate), variable threshold
Timer controlled recording (Timer Logging)	Starting time setting: Up to 24 h in advance or record immediately Recording time: up to 100 h Store interval: Every 1 s to 6 min (in 11 steps) Number of store intervals: up to 32000

12.3 Result memory

Physical memory	12 MB non-volatile Flash memory for measurement results and voice comments
Memory capacity	Up to 5000 results (indices with instrument setting, timestamp, and GPS data if included)

12.4 Interfaces

Remote operation	Optional via USB or optical RS-232 interface
• USB	Serial, full duplex, 460800 baud (virtual COM port), multi-function plug connector
• Optical interface	Serial, full duplex, 115200 baud, no parity, 1 start bit, 1 stop bit
Earphone	3.5 mm TRS, ≥ 16 ohms (mono), see accessories
External triggering (for storing results)	Via multi-function plug connector. Connecting cable with BNC plug available as optional accessory. Triggering by closing a contact.
External GPS receiver	Uses the multi-pin connector; GPS receiver with interface cable available as accessory.
Probe connection	Plug-and-play with automatic detection, compatible with all NBM-series probes, integration time for measuring input approx. 270 ms, measurement sampling rate 5 Hz (5/50/60 Hz for remote operation)

12.5 Other functions

Conditional Logging	
Conditions	Selectable: – Upper threshold: Value stored when set threshold exceeded – Out of gap: Value stored if outside the range limits (upper / lower threshold)
Store range	Selectable: – Store all (as long as the condition is fulfilled), store rate 5 Hz – First and last result (for which the condition is fulfilled)
Voice comments (Voice Recorder)	
Microphone	Built-in microphone on top of instrument close to the Narda logo
Record level	Fixed level, VU meter display for checking the level during recording
Length of recording	Maximum 30 s per voice comment, 1 comment can be saved for each measurement result
Recording format	8 bit PCM mono, saved as WAV file (approx. 240 kB for a 30 s comment)
Replay	External earphone (with output volume control) or via the NBM-TS PC software
GPS position logging	
Receiver type	12 channel satellite tracking, supports DGPS, WAAS / EGNOS compatible
Displayed position data	Latitude (Lat) and longitude (Lon), selectable units: DMS (degrees, minutes, seconds)/ MinDec (decimal minutes)/ DegDec (decimal degrees)
Geodetic system	WGS84 / NAD83
Position accuracy	< 3 m (DGPS, WAAS), <15 m (SPS), display indication of enhanced accuracy. Variations are valid with a probability of 95%.
Refresh rate	1 s
Detection time	2 s (restoration of reception) up to 5 minutes (if position completely unknown)
Receiver size / weight	Diameter 61 mm, height 19.5 mm, weight 62 g (approx. 100 g with fixing bracket)
Receiver mounting	Uses the tripod bush on the underside of the instrument, fixing set is included

12.6 General specifications

Recommended calibration interval		24 months [1]
MTBF		>10 years (basic unit with probe)
Batteries		Standard NiMH rechargeable batteries, 4 x type AA (Mignon), 2700 mAh
Operating time		20 hours (without backlight or GPS) 12 hours (permanent backlight, without GPS) 10 hours (without backlight, with GPS)
Charging time		2 h
Battery status display		100%, 80%, 60%, 40%, 20%, 10%, low battery (<5%)
Temperature range		Operational: -10 °C to +50 °C Non-operational (transport): -30 °C to +70 °C
Humidity		5 to 95% relative humidity, no condensation; ≤29 g/m³ absolute humidity (IEC 60721-3-2 class 7K2)
Immunity to radiated electromagnetic fields		200 V/m (100 kHz to 60 GHz) Note: The immunity may be less than the specified measurement range of a probe
Operation in static magnetic fields		≤ 30 mT (to avoid high force on the device)
Dimensions (H x W x D) basic unit	Series A, B Series C...	46 x 98 x 276 mm (without probe and GPS receiver) 46 x 98 x 282 mm (without probe and GPS receiver)
Dimensions (H x W x D) transport case		470 x 545 x 230 mm (outside dimensions)
Weight basic unit		approx. 550 g (without probe and GPS receiver)
Weight transport case		4.2 kg (empty)
Accessories (included)		Hard shell case, AC Adapter / Charger, batteries, shoulder strap, table top tripod, NBM-TS software (free download), operating manual, calibration certificate, USB interface cable

1) only for basic instrument; probes are specified separately

12.7 Standards compliance

Climatic	Storage	1K3 (IEC 60721-3) extended to -10 °C to +50 °C
	Transport	2K4 (IEC 60721-3) restricted to -30 °C to +70 °C
	Operating	7K2 (IEC 60721-3) for the basic unit extended to -10 °C to +50 °C
Mechanical	Storage	1M3 (IEC 60721-3)
	Transport	2M3 (IEC 60721-3)
	Operating	7M3 (IEC 60721-3)
Ingress Protection		IP 42 (IEC 60529)

12.8 AC Adapter / Charger

Nominal AC line voltage range	100 V to 240 V AC
Nominal AC line frequency range	50 Hz to 60 Hz
Output voltage	9 V DC
Maximum output current	1.5 A
Temperature range • Storage • Operation	 -40 °C to +70 °C 0 °C to +40 °C

12.9 EHP-50

The specifications for the EHP-50 are contained in the EHP-50 operating manual, which is provided as a PDF file on the CD of the EHP-TS PC software.

12.10 Declaration of Conformity

Hereby, Narda STS declares that this device is in compliance with the directives 2014/30/EU, EN 61326-1:2013, 2014/35/EU, EN 61010-1:2010, and 2011/65/EU.

The full text of the EU declaration of conformity is available at **www.narda-sts.com**.

12.11 Declarations of origin

NBM-550	**Germany**
EHP-50	**Italy**

13 Ordering information

This chapter contains the information needed for ordering the NBM-550, together with its probes and accessories.

13.1 NBM-550

NBM-500 Set 1, Narda Broadband Field Meter	**2400/101B**

Set includes:

- NBM-550 Basic Unit (2401/01B)
- Hardcase for NBM-500 Series, Holds Meter and up to 5 Probes (2400/90.06)
- Power Supply 9 VDC, 100 V – 240 VAC (2259/92.06)
- Battery, Rechargeable AA-Size, NiMH (4 pcs. 1001-0000-471)
- Shoulder Strap, 1 m (2244/90.49)
- Tripod, Benchtop, 0.16 m (2244/90.32)
- Cable, USB Interface for NBM-550, 2 m (2400/90.05)
- Software, NBM-TS, PC Transfer (free download)
- Operating Manual NBM-550
- Calibration Certificate

Probes are not included

13.2 Probes

High frequency probes

Probe HF 3061, H-Field, for NBM, 300 kHz – 30 MHz	**2402/05B**
Probe HF 0191, H-Field, for NBM, 27 MHz – 1 GHz	**2402/06B**
Probe EF 0391, E-Field, for NBM, 100 kHz – 3 GHz	**2402/01B**
Probe EF 0392, E-Field, HiPow, for NBM, 100 kHz – 3 GHz	**2402/12B**
Probe EF 0691, E-Field, for NBM, 100 kHz – 6 GHz	**2402/14B**
Probe EF 0692, E-Field, for NBM, 600 MHz – 6 GHz	**2402/20B**
Probe EF 1891, E-Field, for NBM, 3 MHz – 18 GHz	**2402/02B**
Probe EF 4091, E-Field, for NBM, 40 MHz – 40 GHz	**2402/19B**
Probe EF 5091, E-Field, for NBM, 300 MHz – 50 GHz, Thermo	**2402/03D**
Probe EF 6092, E-Field, for NBM, 100 MHz – 60 GHz	**2402/17B**
Probe EF 9091, E-Field, for NBM, 100 MHz – 90 GHz	**2402/18B**
Probe EF 5092, E-Field, for NBM, 300 MHz – 100 GHz, Thermo	**2402/11E**
Probe EA 5091, FCC 1997 Controlled Shaped for NBM, 300 kHz – 50 GHz, E-Field	**2402/07D**
Probe EB 5091, IEEE 2019 Restricted Shaped for NBM, 3 MHz – 50 GHz, E-Field	**2402/21B**
Probe EC 5091, SC 6 2015 Controlled Shaped for NBM, 300 kHz – 50 GHz, E-Field	**2402/16D**
Probe ED 5091, ICNIRP 1998 Occ Shaped for NBM, 300 kHz – 50 GHz, E-Field (compliant with ICNIRP 2020 above 30 MHz)	**2402/10D**

Low frequency probes

EHP-50F E&H Field Analyzer Set, 1 Hz – 400 kHz, for NBM-550		**2404/103**
Set includes:		
• EHP-50F Basic Unit	(2404/03)	
• AC/DC Battery Charger, for EHP-50	(2259/92.08)	
• FO Duplex RP-02 Cable, 10 m	(2260/91.07)	
• Optical Bridge Connector RP-02	(2260/91.08)	
• EHP50-TS PC-Software	(2404/93.01)	
• O/E Converter USB, RP-02/USB	(2260/90.07)	
• Tripod Extension, 0.50 m, Non-Conductive	(2244/90.45)	
• Foam Inserts for EHP-50, For Hardcase 2400/90.06	(2404/90.01)	
HP-01 Magnetometer Set DC – 1kHz		**2405/101**

13.3 Accessories

GPS Kit for NBM-550, Receiver and Mounting Set	**2400/90.10**
Earphone, 3.5 mm Plug	**2400/90.03**
Test-Generator 27 MHz	**2244/90.38**
Tripod, Non-Conductive, 1.65 m, with Carrying Bag	**2244/90.31**
Tripod Extension, 0.50 m, Non-Conductive (for 2244/90.31)	**2244/90.45**
Handle, Non-Conductive, 0.42 m	**2250/92.02**
Cable, Coaxial Multi-pin/BNC, for NBM-550, Ext. Trigger, 2 m	**2400/90.04**
Cable, FO Duplex (1000 µm) RP-02, 2 m	**2260/91.02**
Cable, FO Duplex (1000 mm) RP-02, 5 m	**2260/91.09**
Cable, FO Duplex (1000 mm) RP-02, 10 m	**2260/91.07**
Cable, FO Duplex (1000 µm) RP-02, 20 m	**2260/91.03**
Cable, FO Duplex (1000 mm) RP-02, 50 m	**2260/91.04**
Cable, FO Duplex, F-SMA to RP-02, 0.3 m	**2260/91.01**
O/E Converter RS232, RP-02/DB9	**2260/90.06**
O/E Converter USB, RP-02/USB	**2260/90.07**
Cable, Adapter USB 2.0 - RS232, 0.8 m	**2260/90.53**

14 Glossary

This chapter explains some important terms that are used in this operating manual.

Average The average (mean) value formed from a range of numerical values or measurements. For high frequency electromagnetic fields, RMS (root mean square) averaging is used for determining field strength values (V/m, A/m) and linear averaging for power density values (W/m^2, mW/cm^2).

DGPS **Differential GPS**

Method of improving the accuracy of ③GPS navigation by transmitting correction data (orbit and time system).

E-field **Electric field**

Electric fields emanate from electrical charges or are caused by induction in changing magnetic fields. Electric field strength is expressed in volts per meter: E = [V/m].

EGNOS **European Geostationary Navigation Overlay Service**

European system comparable with ③DGPS for improving the position accuracy of ③GPS from 10 to 20 meters to 1 to 3 meters. It also warns users when the positioning systems are transmitting incorrect data or if the integrity of the GPS data is restricted for some other reason. EGNOS is fully compatible with the American ③WAAS system.

EMC **Electromagnetic compatibility**

Electromagnetic compatibility (EMC) describes the technical and legal aspects of electrical engineering covering the interactions between electrical equipment due to the electromagnetic fields that they generate.

GPS **Global Positioning System**

The Global Positioning System is a satellite supported navigation system belonging to the US Defense Ministry that is used for determining the position of any location in the world.

H-field **Magnetic field**

Magnetic fields are generated by moving electrical charges. Magnetic field strength H is expressed in Amperes per meter: H = [A/m].

Isotropy From the Greek: isos = same; tropos = turning, direction. Signifies the degree to which a characteristic is independent of its direction. An antenna that measures isotropically is therefore an ideal antenna that would yield the same result in all spatial directions regardless of its orientation.

NAD83 **North American Datum of 1983**

NAD83 is an earthbound reference point based on the Geodetic Reference System of 1980. This has determined the size and shape of the earth to an accuracy of 2 meters using satellites and electronic measuring systems.

RMS Root mean square: This term describes an average (mean) obtained by taking the square root of the average of the squares of the measured values; this method is used when measuring high-frequency electromagnetic field strengths. The averaging corresponds to a linear average of power density values.

RSS **Root Sum Square**

Formula used to calculate the total field strength from the three spatial components X, Y, and Z:

$$RSS = \sqrt{X^2 + Y^2 + Z^2}$$

SPS The standard positioning service works with the C/A Code (Coarse/Acquisition Code) and is available for general, civilian use.

S-field Product of E-field and H-field, expressed as power density or electromagnetic power flux density. The power density S is expressed in Watts per unit area: S = [W/m^2] (or [mW/cm^2] or [μW/cm^2])

TEM cell **Transverse Electromagnetic Cell**

TEM cells are used to perform RF supported noise immunity investigations or emission measurements. They are much smaller than an EMC cabin (maybe just large enough to hold a PC), and are basically a coaxial conductor expanded into rectangular form for generating transverse electric fields. If the frequency range is extended upwards into the gigahertz range, the cells are called GTEM cells (Gigahertz Transverse Electromagnetic Cell).

USB **Universal Serial Bus**

USB is a bus system used to connect a computer to peripheral devices. Equipment fitted with USB can be connected and disconnected while running (hot plugging). The connected devices and their properties are detected automatically.

WAAS **Wide Area Augmentation System**

WAAS is part of the SBAS (Satellite-Based Augmentation System) for improving the existing US ③GPS. WAAS signals are transmitted by separate satellites on the same frequencies as GPS and serve to improve the relatively inaccurate GPS position information.

WAV The WAV file format is a container format for digitally storing audio data, which can contain compressed audio data in addition to the usual uncompressed PCM raw data. It has become the de-facto standard for storing digital audio data on MS Windows-based PC systems.

WGS84 **World Geodetic System 1984**

WGS84 is a system used for surveying the earth, which was introduced by the Americans in 1984 along with the triumph of satellite navigation. WGS84 includes both the reference point as well as the ellipsoid and is the geodetic basis for ③GPS.

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