INSTRUCTION MANUAL

Nor103 is a small and versatile IEC Class 1 sound level meter. The combination of a big graphical display and only three function buttons makes this sound level meter easy to operate, even by a non-acoustician.

In addition to the current sound pressure level, it also measures and stores the maximum level, the equivalent continuous sound level and the sound exposure level with selected time and frequency weighting. With peak range selected, C_{peak} may also be measured simultaneously.

The instrument measures the basic acoustic figures that are widely used for general noise measurements and reporting.

nor**103**

SOUND LEVEL METER

Norsonic

Nor103 User Guide – September 2021
lm103_1Ed2R1En

If you wish to communicate with us, please feel welcome.

Our address is:

Norsonic AS, Gunnersbråtan 2, N-3409 Tranby, Norway
Find us on the web: www.norsonic.com
Tel: +47 32 85 89 00,
E-mail: info@norsonic.com

Finding the information you need

Thank you for choosing Norsonic! The sound level meter Nor103 have been designed to give you many years of safe, reliable operation.

The User Guide has been divided into 9 chapters.

Depending on your requirements and your familiarity with sound measurements as such, you may find that you use some parts of this manual often and others not at all.

The very first chapter acquaints you with the Nor103 and describes its features and possibilities.

The next section provides a closer look at the instrument with a presentation of all major parts and the keys of the keyboard.

Calibration is a vital point ensuring that your measurements are sufficiently correct for the purpose. Therefore, a separate chapter has been devoted to this.

How to measure with the sound level meter is described in the following and outlines the use of the instrument as a proper sound level meter.

Detailed specifications about the instrument is found in the chapter covering Technical specifications.

Note that the instruction manual describes a fully equipped instrument. Your Nor103 may not have the additional cables and hence information related to this is not relevant.

Our objective with this manual has been to address your goals and needs. Please let us know how well we succeeded!

Overview

Precautions

- Operate the unit only as described in this manual.
- Do not drop the unit. Protect it from shocks and vibration.
- The permissible environmental temperature range for operation of the unit is -10°C to +50°C. Relative humidity must be between 10% and 90%.
- Do not use or store the unit in locations which may be subject to water, direct sunlight, high temperatures or humidity. Also protect the unit from air with high salt or sulphur content, gases or the influence of chemicals.
- Do not forget to turn the unit off after use. Remove the batteries if the unit is not to be used for some time.
- When disconnecting cables, always hold the plug and do not pull the cable.
- To clean the unit, use only a dry cloth or a cloth lightly moistened with water. Do not use chemical cleaning cloths, solvents or alcohol-based cleaners to prevent the possibility of deformation and discoloring.
- Do not insert any objects such as pins, metal scraps, conducting plastic etc. into any opening on the unit.
- Do not disassemble the unit or attempt internal alterations.
- In case of malfunction, do not attempt any repairs. Note the condition of the unit clearly and contact the supplier.
- When disposing of the unit or the batteries, follow national and local regulations regarding waste disposal.

Safety

In this manual, important safety instructions are specially marked as shown below. To prevent the risk of death or injury to persons and severe damage to the unit or peripheral equipment, make sure that all instructions are fully understood and observed.

Important! Disregarding instructions printed here incurs the risk of damage to the product.

This product can be used in any non hazardous areas within the environmental conditions given in the technical specification.

To conform to the EU requirement of the Directive on Waste Electrical and Electronic Equipment, the symbol mark on the right is shown on the instrument.

Contents

Introducing the sound level meter Nor103

The sound level meter Nor103 is a class 1 sound level meter and complies with International standard for sound level meters IEC 61672-1. It is able to measure a number of acoustic parameters. The microphone is a 1/2-inch electret condenser microphone. The instrument has a wide 107 dB linearity range, measuring sound levels between 30 and 137 dB and peak values up to 140 dB.

The unit has an LCD panel and 4 operation keys. AC output and DC output connector is available by the use of optinal cables.

The instrument measures the following values:

- L_p The Instantaneous Sound Pressure Level (SPL)
- L_{MAX} The Maximum Sound Pressure Level
- L_{eq} The Equivalent Continuous Sound Pressure Level
- L_E The Sound Exposure Level
- L_{CPEAK} The Peak Sound Pressure Level (Peak range only)

The time-weighting can be F or S. While the measurement is running the instantaneous SPL is displayed. SPL values are not listed in the result table.

This insrument has the following two level ranges:

Wide range: This measures the sound pressure levels between 30 and 137 dB and allows simultaneous measurement of L_p, L_{eq}, L_{MAX}, and L_E.

Peak range: Along with the functions for wide range, this range in addition measures L_{Cpeak}. In the peak range, the lower limit for measurement becomes 65 dB.

The wide level range with a dynamic range of 107 dB makes the setup easy and ensures reliable measurements in all situations – especially useful for unattended measurements. With its normal microphone this means a measurement range covering levels from 30 dB A-weighted to sound with peak values up to 140 dB.

Storing and retrieving of results. The results from a measurement is automatically stored in the non-volatile memory of the instrument. The information may later be displayed on the instrument screen.

The instrument body and the microphone with preamplifier is one single unit. It is not possible to use microphone extension cable.

Battery operation. The instrument is powered from two internal batteries, size AAA, which typically last for eight hours.

Setting up is easy. After you've selected wide- or peak-range, time weighting and duration of the measurement, you are ready to press the start key. The selection last used is automatically selected when you power the instrument up again. During the measurement you have instant access to all measurement values.

With the Nor103 you are able to do all kinds of basic noise measurements – community noise, industrial hygiene, product control and more.

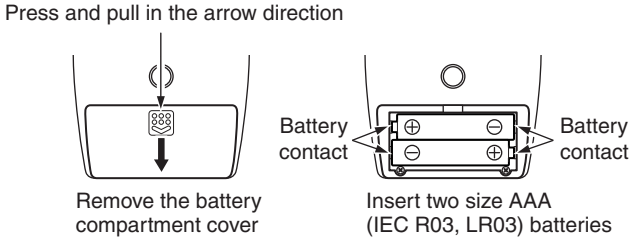
The Norsonic product range contains a wide range of equipment and accessories for use with acoustic measurements and noise monitoring. We supply enclosures for permanent monitoring installations, environmental cases for semi-permanent installations, microphones for applications in tough environments, cables, modems, weather stations and post-processing software. A detailed presentation of this is available on the Norsonic home page: www.norsonic.com.

Taking a closer look at the instrument

The Nor103 is delivered assembled and ready for use after installation of bateries. We recommend that the microphone is always mounted on the preamplifier as this will prevent dust and dirt to enter the insulator around the sensitive signal terminal on the microphone.

Always keep the instrument turned off if you are required to unscrew or screw the cartridge on the preamplifier. Screw only finger tight!

The instrument is powered from two AAA size batteries which are inserted as shown on the figure.



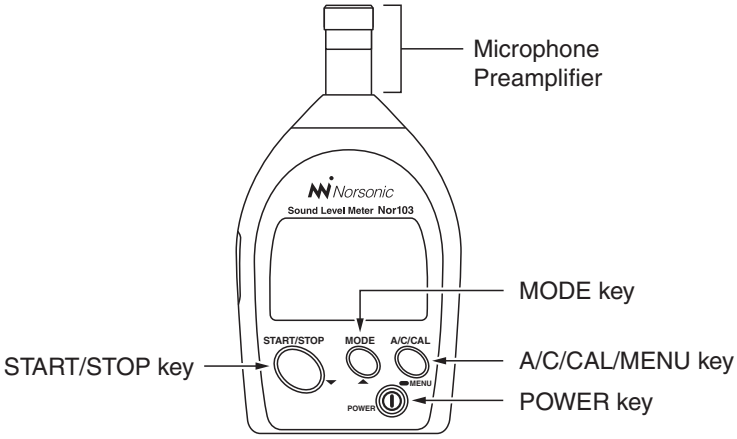
Use of batteries

The sound level meter use two AAA batteries.
Battery lifetime is typically 8 hours (depends on use and brand of batteries).
The use of alkaline or lithium batteries is strongly recommended to avoid leakage.
Rechargeable batteries may also be used, but with reduced operating time.

If the instrument is stored for a prolonged period of time, we recommend removing the batteries to avoid damage from leaky batteries.

Data is stored in a non-volatile memory and will retain its content independent of the batteries.

Front panel overview



Microphone/preamplifier

Microphone and preamplifier are integrated with the instrument. An extension cable cannot be used.

Important! Do not unscrew the microphone from the preamlifier.

POWER key

Turns the unit on and off.

START/STOP key

Press to start or stop measurement. Also used to change settings (step down) in the calibration screen, menu screen and recall screen.

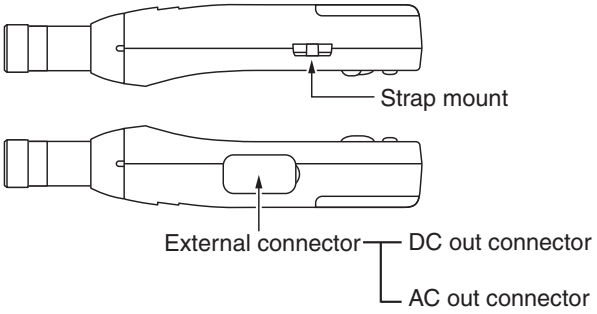
MODE key

Changes the result display in the measurement screen and processing screen. Also used to change setting (step up) in the calibration screen, menu screen, and recall screen.

A/C/CAL/MENU key

This key selects the frequency weighting characteristics, calibration screens and recall screen. Pressing and holding this key in the measurement screen activates the menu screen/settings.

Side view



External connector

This connector contains a DC out connector and an AC out connector available by the use of optional cables (must be ordered separately). The connector can only be used for one purpose at a time.

DC out connector

The output signal is a DC-signal representing the level after frequency weighting, time weighting, and logarithmic compression. 25mV/dB

AC out connector

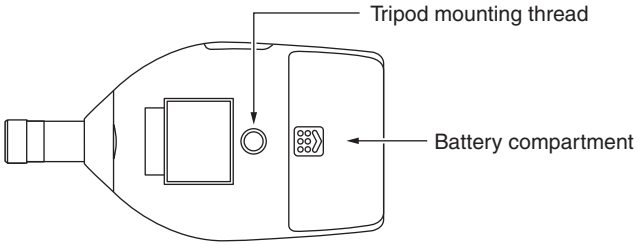
The output is a AC-signal weighted with frequency weighting characteristic Z .
When 110 dB is displayed, output RMS voltage is (1,0 +0,6/-0,4) V. (The upper limit of the output voltage is 1.8 Vrms)

Note! All cables are optional and must be ordered separately.

Strap mount

Attach the hand strap here. Pass your wrist through this strap when holding the unit when measuring.

Rear view

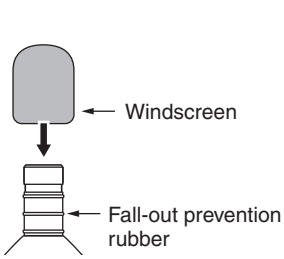


Tripod mounting thread

Mount the unit on a camera tripod with this thread.

Attachments

Windscreen



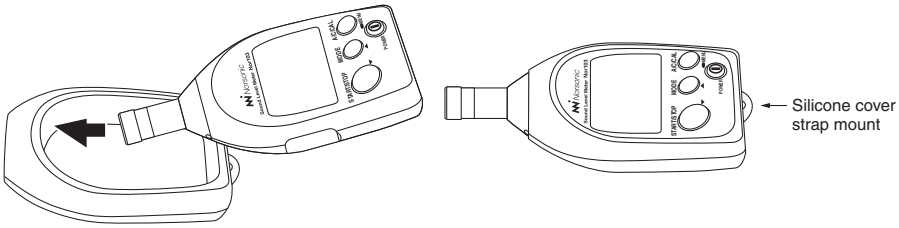
We recommend using the windscreen to reduce wind noise and to protect the microphone from dust.

Windscreen fall-out prevention rubber prevents the windscreen from dropping off the microphone.

IMPORTANT! The windscreen can easily drop off the unit, so we recommend attaching the fall-out prevention rubber. Be sure to follow the instructions in the following diagram when attaching or detaching the fall-out prevention rubber. Turning it in the opposite direction may loosen the microphone and cause it to fall off.

Silicone cover

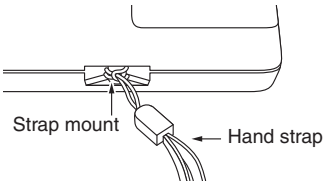
The silicone cover protects the unit from shocks and also makes it easier to grip when held. Fit the cover to the unit with the windscreen removed, as shown in the following illustrations.



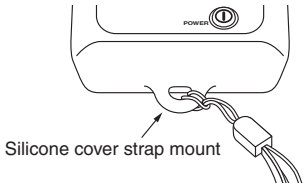
NOTE! You cannot use external connector when the silicone cover is fitted. You can attach the hand strap to the silicone cover strap mount.

Hand strap

To help prevent dropping of the unit, pass your wrist through this strap when holding the unit for measuring. Attach the hand strap as shown below.



When you have not fitted the silicone cover

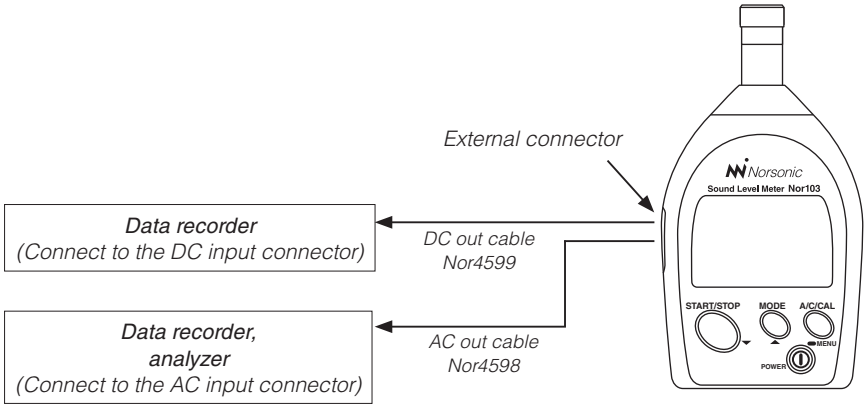


When you have fitted the silicone cover

Connecting external equipment

You can connect external equipment, such as a data recorder or level recorder, to the external connector.

Connect as shown in the following diagram.



The cables are optional and not a part of the standard configuration for the sound level meter.

NOTE! The connector has the ability to act as a DC out connector or an AC out connector, but it can perform only one of these functions at a time.

NOTE! The cables are optional and not a part of the standard configuration for the sound level meter.

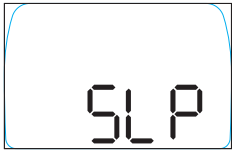
Switch the instrument on and off

Press the **POWER** key in the lower right corner of the instrument to turn the power on. A second operation, hold for 0,5 seconds or more, will switch the instrument off.

NOTE! The sound level meter shall be allowed to reach equilibrium with the prevailing ambient environment before switching on the power. Avoid large temperature changes and condensation.

Sleep mode

If powered and left unattended and unoperated with the measurement screen being shown and no key is pressed for 10 minutes, the unit enters sleep mode and the sleep mode screen appears. Power consumption is 30% of normal in sleep mode.



The unit will not enter sleep mode in the following situations, even if no key is pressed for 10 minutes;

- If the instrument is measuring.
- If the processing screen, calibration screen, recall screen, or menu screen is displayed.
- If a cable is connected to the external connector (any of the three types).

Pressing any key when instrument is in sleep mode will wake up the unit and return to the measurement screen.

Calibrating the instrument

Calibration is the normal way of ensuring that the sound level meter measures the level with sufficient accuracy. One may say that a sound calibration is just as much a verification of proper operation as a method of adjusting the sensitivity of sound measuring instruments, since the stability of a sound level meter normally is equal to the stability of a sound calibrator. However, measuring microphones are very delicate devices designed to fulfil very rigid specifications. This makes them vulnerable and subject to damage unless proper care is taken.

When to calibrate

Calibration of the sound level meter should preferably take place before and after a measurement session, or whenever required by applicable standards.

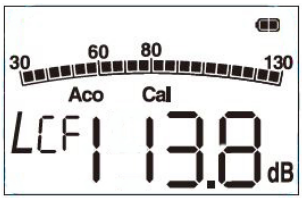
Furthermore, since the sound level meter automatically enters C-weighted mode, you won't have to bother with the calibrator frequency either if your calibrator apply a frequency of 250 Hz or 1 kHz.

Carrying out the calibration

According to IEC 61672-1, a class 1 sound calibrator like the Norsonic sound calibrator Nor1255 or Nor1256 should be used (Class 1 sound calibrator are defined by the International standard for sound calibrators: IEC 60942). This description is based on the use of a sound calibrator with a sound pressure level of 114 dB at 1 kHz. (E.g Nor1255).

Do as follows:

1. **Access calibration mode.** Press the **A/C/CAL** key until the acoustic calibration screen is shown. "Aco" and "Cal" appear on the display. The frequency weighting characteristic is fixed to C and the time weighting characteristic is fixed to F. The display will look as shown on the figure.



NOTE! Do not calibrate the instrument before three minutes after the instrument is switched on.

2. **Mount the calibrator.** Mount the sound calibrator onto the microphone. Switch on the sound calibrator and wait until the level has stabilized, according to manufacturer's product manual or at least for a minimum of 30 seconds.
3. **Adjust the dB value – if needed**. Press the **START/STOP** key (Down) or **MODE** key (Up) to adjust the display volume to 113,8 dB for a 114 dB/1 kHz, calibrator. Adjust to 93,8 dB if a 94 dB/1 1kHz calibrator is used.
4. **Access measurement mode.** Press the **A/C/CAL** key twice until the normal measurement screen is shown.

Know the output level of your sound calibrator.

Some sound calibrators have an output level of 114 dB, while others have an output level of 94 dB. Norsonics Nor1256 will be able to give both signals.

Unless you know the output level of your sound calibrator you won't be able to know what level the measuring instrument is supposed to show. The output level is stated on the sound calibrator or in its accompanying user documentation or calibration certificate.

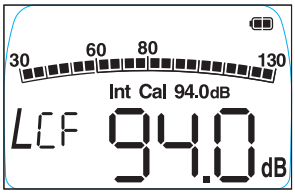
NOTE! Be aware of the fact that instruments using free-field microphones, like Nor103, shall normally be adjusted to a value slightly lower than the output level of the sound calibrator. The reason is that the sound pressure in free field conditions will increase in front of the microphone due to diffraction. The adjustmet value for this half-inch cartridge will typically be 0.2 dB lower for calibrators producing a 1000 Hz calibration signal (e.g. the sound level meter should then be set to 113.8 dB when using a 114 dB @ 1000 Hz sound calibrator).

The internal calibration

The internal calibration activates an electronic oscillator substituting the microphone signal (1 kHz, sinusoidal wave). Such calibration is not according to the requirement in the standard for sound level meters IEC 61672-1, but is to be considered as a self-test.

For adjusting the instrument with the built-in oscillator, you press the **A/C/CAL** key to switch to the internal calibration screen. “Int”, “Cal”, and “94.0dB” will appear on the display.

The frequency weighting characteristic is fixed to C and the time weighting characteristic is fixed to F. The display will look as shown on the figure.

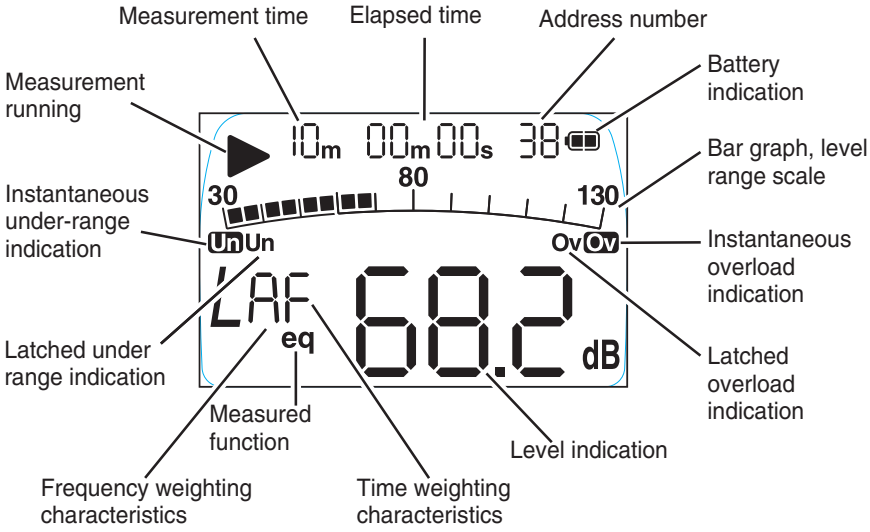


Then just press the **START/STOP** key (Down) or **MODE** key (Up) to adjust the value to 94.0 dB.

Making a measurement

The instrument measures the instantaneous sound pressure level as soon as it is powered. During and after a measurement, additional functions for describing the level during the measurement is available like the maximum level and the average level. In addition, overload and under-scale information is stored with the measured results.

Measurement screen



Measurement time

The measurement time indicate the preselected duration of a measurement. Select between 1 m (minute), 5 m, 10 m and 1 h (hour). An ongoing measurement may be stopped by pressing the **STOP** button.

Elapsed time

The amount of time elapsed since the measurement started. The time is displayed in minutes and seconds.

Address number

Each measurement is automatically given a sequence number called the address. Up to 199 measurements may be stored in the non-volatile memory. When a new measurement is started the address number is automatically increased.

Battery indication

The battery indication show the current condition of the batteries.

Bar graph, level range scale

Shows the selected level range for measurement: wide-range or peak-range.

Instantaneous overload indication

Shows that the sound level is exceeding the measurement range for the instrument.

Latched overload indication

Appears during and after a measurement if the sound level has exceeded the measurement range during the measurement. Appears also when a measurement is recalled. The indication is reset when a new measurement is started.

Level indication

Shows the instantaneous sound level (L_p) and each measurement result (L_{eq}, L_{max}, LE, and LC_{peak}) as a numerical value in decibel. The different functions are selected with the **MODE** key. LC_{peak} is measured and displayed only when peak-range is selected.

Time weighting characteristics

Shows the time weighting characteristics, F or S, selected in the menu screen.

Measured function

Shows the relevant symbol for the displayed measurement result (L_{eq}, L_{max}, L_E, or L_{Cpeak}). Change with the **MODE** key.

Frequency weighting characteristics

Shows the weighting charateristics selected, A or C. Change with the **A/C/CAL** key.

Latched under-range indication

Appears during and after a measurement if the sound level has been below (-0.6 dB) the measurement range during the measurement. Appears also when a measurement is recalled. The indication is reset when a new measurement is started.

Instantaneous under-range indication

Appears when the instantaneous sound level is below the measurement range (-0.6 dB).

Measurement running

The indicator flashes during an ongoing measurent.

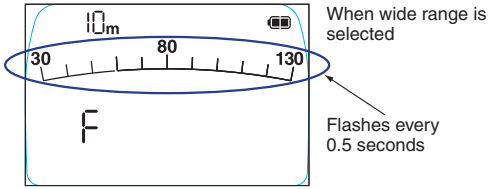
Measurement settings

In the measurement screen, press and hold for 2 seconds the **A/C/CAL** key to switch to the menu screen/settings (not available during measurement).

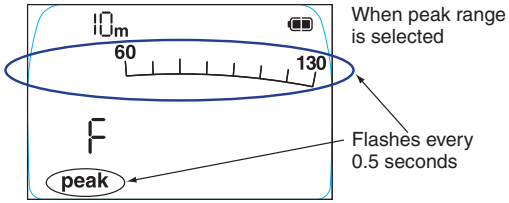
Range setting

Press the **START/STOP** key or the **MODE** key to select the following range settings:

Wide-range:
Bargraph range: 30 to 130 dB (L_{Cpeak} will NOT be measured).



Peak-range:
Bargraph range: 65 to 130 dB, L_{Cpeak} will be measured.



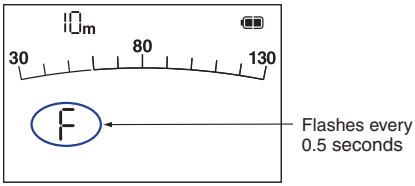
NOTE! Even if the frequency weighting characteristic is A, LCpeak is processed as C.

At all time you can press the **A/C/CAL** key to proceed in the settings menu, or press and hold the **A/C/CAL** key to exit and return to the measurement screen.

Setting time weighting characteristics

Press the **A/C/CAL** key to proceed in the settings menu

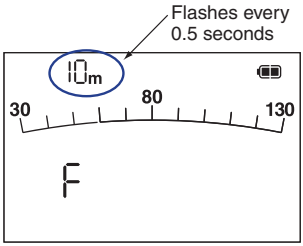
Press the **START/STOP** key or the **MODE** key to select the following settings.



F (fast), S (slow)

Setting measurement time

Press the **A/C/CAL** key to proceed in the settings menu



Press the **START/STOP** key or the **MODE** key to select the following settings.
1 m (1 minute), 5 m (5 minutes), 10 m (10 minutes), 1 h (1 hour).

Starting the Measurement

Set the requested measurement settings before you start a measurement: measurement range, time weighting and measurement time.

Press the **START/STOP** key to start the measurement.

The measurement running indicator flashes during an ongoing measurement.

By pressing the **MODE** key, the display will show the different results available (L_p, L_{eq}, L_{max}, L_E, or L_{Cpeak}). The ongoing measurement stops when the measurement time elapses or you press the **START/STOP** key.

Storing measurement results

When the measurement stops, the measured results(L_{eq}, L_{max}, L_E, or L_{Cpeak}) are automatically stored, in the next available address number.

Resume after power off

When the instrument is turned on, the following parameters maintain the same settings they had before you turned the unit off:

- Measurement time
- Time weighting characteristics
- Level range
- Address indication

The following items have predefined settings upon startup.

- Frequency weighting characteristic: A
- Display value type: L_p

Vibrations during measurement

A sound level meter is sensitive to vibrations. The meter is most sensitive to vibrations along the symetry axis of the microphone. Avoid monting the sound level meter on a vibrating structure, especially when measuring low sound levels. If vibrations can not be avoided, consider resilent mounting.

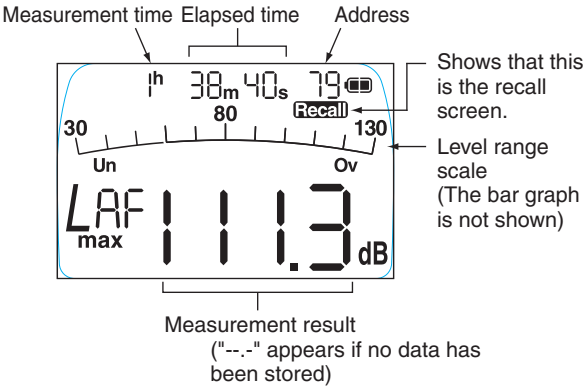
A mechanical vibration with an acceleration of 1 m/s^2 with a direction perpendicular to the microphone membrane, will increase the lower boundary of the measurement range to 55 dB(A).

Memory handling

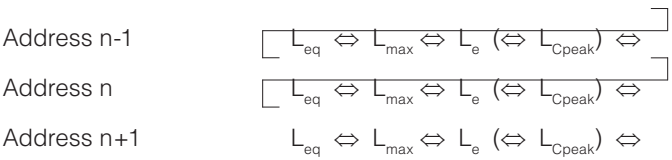
Recalling stored data

Press the **A/C/CAL** key until the **Recall** screen appears. The most recent result is automatically selected.

The display will look similar as shown on the figure, with Recall written in the upper right corner.



Press the **START/STOP** key (step down) or the **MODE** key (step up) to change the displayed data as follows (LCpeak appears only when peak range is selected).

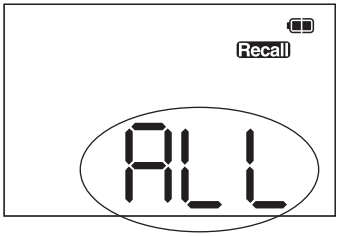


Press and hold the **START/STOP** or the **MODE** key to move through the addresses faster.

Press the **A/C/CAL** key to return to the measurement screen

Clearing stored data

Press the **A/C/CAL** key for 3 or more seconds while the recall screen is shown and a screen asking you to confirm clearing of the data appears.



ALL and CLr flash alternately on the screen every 0.5 seconds.

Press the **START/STOP** key and all stored data is cleared, then the recall screen appears again.

Press the **A/C/CAL** key to cancel the operation and return to the recall screen.

NOTE! It is not possible to undo the cancellation of the memory. When pressing **START/STOP** you will not be asked to confirm the cancellation, all data will be permanently lost.

Initializing

The instrument is reset to the initial settings if the instrument is switched ON while pressing the **START/STOP** key: address counter is set to 1 and settings are reset to factory default settings. Memory is not formatted /cleared, but new measurements will now overwrite stored data.

Initial setting values

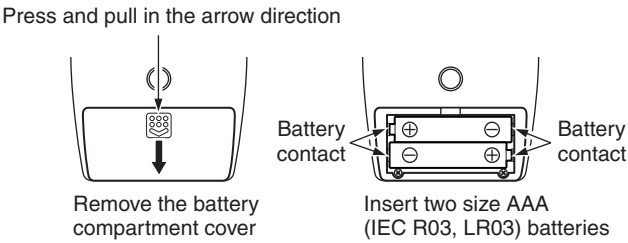
Measurement time	10 m (10 minutes)
Time weighting characteristics	F (Fast)
Level range	Wide
Address	1

Batteries

Inserting or changing batteries

Important! Make sure the unit is turned off before removing old batteries.

1. Remove the battery compartment cover on the rear of the unit. Press and pull in the direction indicated by the arrow.
2. Take out eventual old batteries an insert two new, size AAA (IEC R03, LR03) batteries into the battery compartment. Insert correctly as indicated in the compartment and the figure below.



3. Re-mount the battery compartment cover.

Important!
Take care not to reverse the (+) and (-) polarity when inserting the batteries. If batteries are inserted with wrong polarity, the unit will not operate.
Always use two identical batteries, and replace batteries only as a set. Mixing battery types or old and new batteries can lead to damage.
Remove the batteries from the unit when it is not in use for more than a week.
Do not apply strong force or stress to the battery connectors. Damaged springs can lead to loss of proper battery contact.

Battery life (at 23°C, using wide range)

Manganese batteries: approx. 3 hours
Alkaline batteries: approx. 7 hours

Battery life will be reduced by 20% when a DC output cable is connected.

Full charge

Indicator flashing
(replace the batteries)

Battery indication

The battery indication shows the current condition of the batteries: Fully charged, half discharged and discharged.

When the indicator starts to flash, starting a new measurement is no longer possible. Replace the batteries with new ones.

Note that a discharged battery is more likely to leak. Therefore do not leave the instrument with discharged batteries.

Important! If the indicator starts flashing during measurement, the processing will end at that point.

Measuring sound

What is sound

Sound is the mechanical vibration of a gaseous, liquid or solid elastic medium through which energy is transferred away from the source by sound waves. This is the strict physical definition of sound. More generally we restrict the term sound to be pressure variations which can be detected by the human ear.

Sound pressure is the difference between the instantaneous pressure and the atmospheric pressure. Note that the sound pressure, typically in the range: 0,0001 – 100 pascal, is a small perturbation of the atmospheric pressure being about 100 000 pascal.

In a sound level meter, the sound pressure is detected by a pressure sensitive microphone measuring the difference between the instantaneous pressure and the atmospheric (average) pressure directly.

The human hearing mechanism requires that the pressure variations occur at least 20 times a second, but not more frequent than 20 000 times a second. This is referred to the audible frequency range.

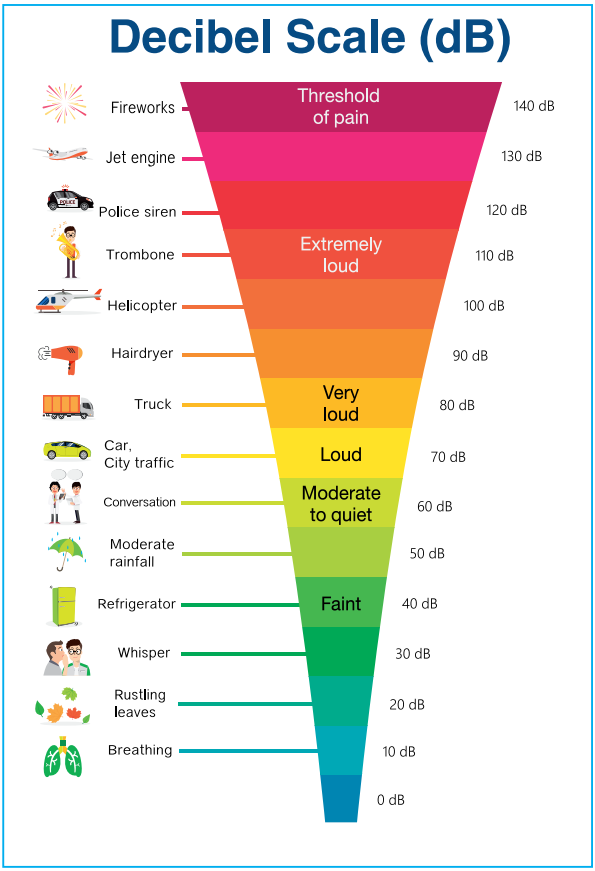
The number of variations per second is called the frequency of the sound and is expressed in hertz (Hz). Hence, the human hearing is able to hear sound with frequencies ranging from 20 Hz to 20 000 Hz, the latter often written as 20 kHz.

The propagation speed of sound is about 340 m/s, corresponding to 1224 kilometres per hour.

Unit for strength of sound

The unit for the measured quantity, sound pressure, is pascal, written Pa. One pascal corresponds to a force of 1 newton acting on an area of 1 m^2. However, the commonly unit used for sound pressure is decibel (dB). There are two good reasons for using the dB scale, which is based on a logarithmic function:

- The sound pressure varies over a large number of decades;
- The human impression of sound strength corresponds closely to the logarithmic function.



Decibel means the tenth of a bel, the unit named after Alexander Graham Bell, inventor of the telephone.

Mathematically, the sound level in dB is defined by:

$$L = 10 \cdot \lg\left(\frac{\langle p^2 \rangle}{p_0^{\,2}}\right) \mathrm{dB}$$

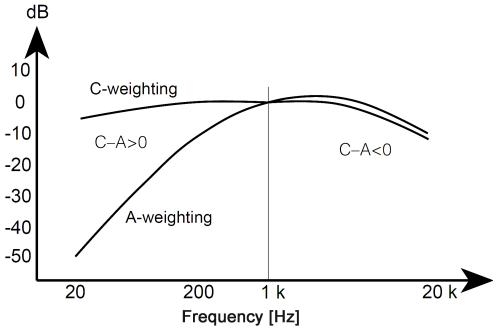
where $\langle p^2 \rangle$ is the time average of the squared sound pressure. p_0 is a reference value equal to 20 µPa. An average sound pressure equal to the reference value is thus 0 dB. 0 dB, so defined, corresponds to the lowest sound level a human being can hear.

By converting sound pressure in pascals to levels in decibels, a scale spanning no less than 1 : 10 000 000 is conveniently reduced to a level between 0 dB to 140 dB. See the graph above indicating typical sound pressure levels for “everyday” incidents.

Note that the dB-values can not be added together like masses given in kg. If sound from two equal levels are added the sum will be 3 dB higher than each.

Frequency weighting

The effect of the selected frequency weighting is to give more or less emphasis to the sound based on the frequency of the sound. Two frequency weightings are in common use for sound level measurements: ***A-weighting*** and ***C-weighting***. A-weighting is the most used weighting and is required in all sound level meters. For peak level measurements, C-weighting is normally used. The figure below shows both weighting in dB as a function of frequency. As can be deduced from the figure, if the A-weighted level is considerably lower than the C-weighted level, the sound is dominated by lower frequencies.



Time weighting

As was shown in the equation defining the decibel level scale, the value is based on the time averaged squared sound pressure.

Time weighting F and S

The time weightings F and S gives more empasis on the current time and less on the past. When a sound is suddenly changed, the indicated level will change gradually. The time weighting F (time-constant 0,125 second) is 8 times faster than time-weighting S (time-constant 1 second).

Maximum levels

The levels with time weighting F or S vary during the measurement period. The maximum of the observed values is displayed by placing “max” below the level sign.

Equivalent continuous sound level

Equivalent continuous sound level is also called *time-averaged sound level*. The weigting gives equal emphasis to the sound from the start to the end of the measurement period. It is simply the average of the elapsed time for an ongoing measurement, and the average of the measurement duration for an ended measurement. The time-averaged sound levels are indicated by L_{Aeq} for A-weighted averaged levels and L_{Ceq} for C-weighted averaged levels.

Sound exposure level

Sound exposure level is used to describe the energy in the sound and give emphasis to the duration as well as the strength. The sound exposure level is indicated by an “E” placed below the level symbol in the measurement and recall screen of the instrument.

If a stable sound signal is measured with two measurement durations, one with the double length of the other, the sound exposure level for the longest period will be 3 dB higher than the other. Ten times longer measurement duration gives 10 dB difference.

If the measurement duration is 1 second, the exposure level will be equal to the time-averaged sound level. The sound exposure level can be computed from the time-averaged sound level if the duration of the measurement period is known.

Peak sound level

When peak sound level is calculated, the maximum value of the squared, instantaneous sound pressure (no-time weighting) is used as a replacement for the averaged squared value in the formula defining the level in dB. The peak sound level is often used to characterize short impulses of sound like noise from an impact or a gunshot.

Measurement of C-weighted peak sound level are often required for estimating the risk for hearing damage due to impulsive noise.

Technical specifications

Applicable legislation

IEC 61672-1 Ed.2.0 (2013) class 1, group X
JIS C 1509-1 class 1
JIS C 1516 class 1
CE marking WEEE Directive

Normal configuration

Sound level meter Nor103 with microphone UC-59;
With or without windscreen Nor4617 with fall-out preventer;
With or without silicone cover;
Powered from internal batteries;
No cables attached.

Measurement functions

Measured functions

Sound level L_p with time weighting F or S, frequency weighting A or C;
Equivalent continuous sound level $L_{eq,}$ frequency weighting A or C;
Sound exposure level L_E, frequency weighting A or C;
Maximum Sound level L_{max} with time constant F or S, frequency weighting A or C;
C-weighted peak sound level L_{Cpeak} (when peak range is selected). May be combined with measurement of A-weighted levels.

Measurement times

1 minute, 5 minutes, 10 minutes, or 1 hour.
An ongoing measuremnt may be stopped by the operator.

Microphone

1/2-inch electret condenser microphone Model: UC-59;
Microphone type: Freefield;
Sensitivity: -27 dB±3 dB (re.1 V/Pa);
Highest sound level without causing damage: 150 dB;
Device for electrical test: Dummy-microphone with capacitance (19±3)pF;
Highest voltage without causing damage: ±14 V.

Measurement level range (1 kHz)

Wide range: A weighting: 30 dB to 137 dB
C weighting: 36 dB to 137 dB
Peak range: A weighting: 65 dB to 137 dB
C weighting: 65 dB to 137 dB
C-weighted peak level: 65 dB to 140 dB

Inherent noise level with microphone

Wide range: A weighting: 21 dB or less
C weighting: 29 dB or less
Peak range: A weighting: 54 dB or less
C weighting: 54 dB or less

Inherent noise level – electrical input

Dummy microphone 19 pF:
Wide range: A weighting: 19 dB or less
C weighting: 24 dB or less

Measurement frequency range

10 Hz to 20 kHz

Reference frequency

1 kHz

Reference sound pressure level

114 dB

Frequency weighting characteristics

A or C
C-weigthed peak may be measured with A-weighted levels.

Time weighting characteristics

F or S.

RMS detecting circuit

Digital processing.

Processing

Digital
Sampling interval: 25 µs
Functions: L_p, L_{eq}, L_{max}, L_E, L_{Cpeak}

Display update rate

1 second

Calibration:

Acoustic calibration using Nor1255 or similar
Calibration frequency: 1 kHz
Calibration sound pressure level: 114 dB (Adjust to 113,8 dB).

Electronic verification using an internal electronic signal (94 dB).

Windscreen

Conforms to IEC 61672-1 Class 1 with and without the windscreen attached.

Display

TN positive display, reflective type
Numeric display 0.1 dB resolution

Bar graph (wide range)

Scale range 100 dB
Resolution 5 dB
Display update cycle 0.1 s

Warning indications

Over (overload): appears before the level is above the upper limit of the linearity range.
Under (under range): is shown if the level is below lower limit of the linearity range.

Battery indication

Remaining battery capasity is indicated in 3 stages.

Storing measurement results

Measured results are stored in the internal memory when measurement period ends.
Storing capacity: 199 measurements.
Stored data can be viewed in the recall mode.

DC out connector (optional – not a part of normal configuration)

DC output: 3 V (full scale), 25 mV/dB
Output impedance: 50 Ω
Load impedance: 10 kΩ or more

AC out connector (optional – not a part of normal configuration)

AC output:

1 Vrms	+600 mVrms -400 mVrms	(at 110 dB)

(Upper limit: 1.8 Vrms)
Overload: +2 dB
Output impedance: 600 Ω
Load impedance: 10 kΩ or more
Frequency weighting characteristics: Z weighting

Power requirements

2 size AAA (IEC R03, LR03) batteries;
Maximum power supply voltage: 3,6 V;
Minimum power supply voltage: 2,1 V;
Power consumption: Approx. 80 mA (when operating at 3 V) (Approx. 30% in sleep mode)
Battery life (at normal temperature):
- Wide range: Approx. 7 hours (using alkaline batteries)
- Peak range: Approx. 5 hours (using alkaline batteries)
- Battery life is reduced by 20% when a DC or AC output cable is connected.

Power consumption increases by approximately 20% during calibration.

Environmental conditions for operation

-10°C to 50°C, 10% to 90% RH (No condensation)
Time interval for stabelizing after environmental changes:
- Temperature: Less than 1 hour;
- Humidity: Less than 1 hour;
- Atmospheric pressure: Less than 5 minutes.

Dimensions

Approx. 130 mm(H)×63 mm(W)×23.5 mm(D)

Weight

Approx. 105 g (incl. batteries)

Supplied accessories

Windscreen:	1 off Nor4617
Hand strap:	1 off
Windscreen fall-out prevention rubber:	1 off Nor4618
Silicone cover:	1 off Nor4619
Size AAA alkaline batteries:	2 off
Instruction Manual:	1 off
Inspection certificate:	1 off

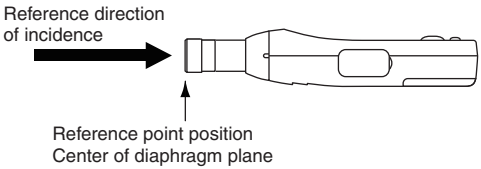
Optional equipment

Sound calibrator:	Nor1255
AC out cable:	Nor4598
DC out cable:	Nor4599
Dummy-microphone	Nor1447

Reference incidence direction and reference point position

Sound level meter Nor103 is designed for measuring the sound pressure level in free-field sound conditions.

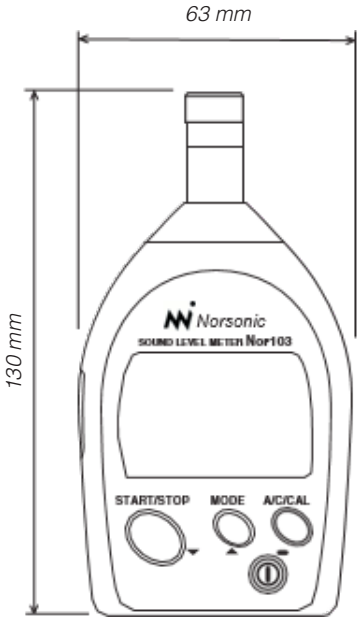
Reference point is the center of diaphragm of the microphone. The reference axis is along the symmetry axis of the microphone.



Reference incidence direction and reference point position

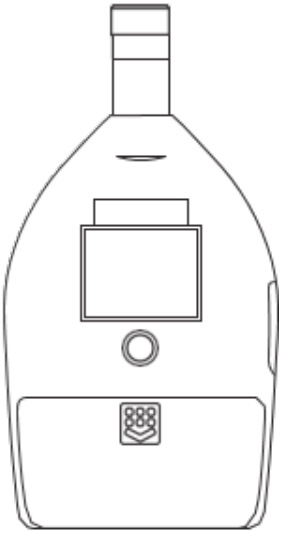
Dimensional drawings

Left side view



Front view

Right side View



Rear view

Table for level corrections

Nominal frequency	Exact frequency	Microphone UC-59			Case reflections		Windscreen	
Hz	Hz	Typical Response (dB)	Free-field/ actuator	Exp. uncert. (dB)[1)]	Deviations (dB)	Exp. uncert. (dB)[1)]	Deviation (dB)	Exp. uncert. (dB)[1)]
63	**63**	**0,00**	**0,00**	**0,05**	**0,00**	**0,05**	**0,00**	**0,05**
80	79	0,00	0,00	0,05	0,00	0,05	0,00	0,05
100	100	0,00	0,00	0,05	0,00	0,05	0,00	0,05
125	**126**	**0,00**	**0,00**	**0,05**	**0,00**	**0,05**	**0,00**	**0,05**
160	158	0,00	0,00	0,05	0,00	0,05	0,00	0,05
200	200	0,00	0,00	0,05	-0,04	0,05	0,01	0,05
250	**251**	**0,00**	**0,00**	**0,05**	**-0,07**	**0,05**	**0,01**	**0,05**
315	316	0,00	0,01	0,05	-0,04	0,10	0,02	0,05
400	398	0,00	0,01	0,05	-0,10	0,10	0,03	0,05
500	**501**	**0,00**	**0,02**	**0,05**	**0,02**	**0,10**	**0,03**	**0,05**
630	631	0,00	0,02	0,05	0,04	0,10	0,04	0,05
800	794	-0,03	0,03	0,05	0,08	0,10	0,04	0,05
1 k	**1000**	**-0,04**	**0,03**	**0,05**	**0,07**	**0,10**	**0,05**	**0,05**
	1059	-0,04	0,04	0,05	0,09	0,10	0,06	0,05
	1122	-0,03	0,08	0,05	0,12	0,10	0,06	0,05
	1189	-0,03	0,09	0,05	0,17	0,10	0,07	0,05
1,25 k	1259	-0,04	0,09	0,05	0,26	0,10	0,07	0,05
	1334	-0,05	0,10	0,05	0,33	0,10	0,07	0,10
	1413	-0,04	0,12	0,05	0,28	0,10	0,08	0,10
	1496	-0,03	0,13	0,05	0,22	0,10	0,08	0,10
1,6 k	1585	-0,01	0,15	0,05	0,14	0,10	0,09	0,10
	1679	-0,01	0,17	0,05	-0,09	0,10	0,10	0,10
	1778	-0,01	0,19	0,05	-0,21	0,10	0,11	0,10
	1884	-0,01	0,23	0,05	-0,31	0,10	0,11	0,10
2 k	**1995**	**-0,01**	**0,27**	**0,05**	**-0,22**	**0,10**	**0,12**	**0,10**
	2113	-0,01	0,28	0,05	-0,22	0,10	0,13	0,20
	2239	0,00	0,30	0,05	-0,28	0,10	0,14	0,20
	2371	0,01	0,37	0,05	-0,28	0,10	0,15	0,20
2,5 k	2512	0,02	0,44	0,05	-0,29	0,10	0,16	0,20
	2661	0,02	0,48	0,05	-0,42	0,10	0,17	0,20
	2818	0,02	0,53	0,06	-0,67	0,10	0,19	0,20
	2985	0,03	0,57	0,08	-0,68	0,10	0,20	0,20
3,15 k	3162	0,03	0,61	0,11	-0,37	0,10	0,22	0,20
	3350	0,04	0,70	0,09	0,00	0,10	0,24	0,20
	3548	0,03	0,78	0,08	0,18	0,10	0,25	0,20
	3758	0,03	0,86	0,09	0,12	0,10	0,27	0,20
4 k	**3981**	**0,04**	**0,96**	**0,09**	**0,06**	**0,10**	**0,29**	**0,20**
	4217	0,06	1,08	0,10	-0,09	0,10	0,31	0,20

Nominal frequency	Exact frequency	Microphone UC-59			Case reflections		Windscreen	
Hz	Hz	Typical Response (dB)	Free-field/ actuator	Exp. uncert. (dB)[1)]	Deviations (dB)	Exp. uncert. (dB)[1)]	Deviation (dB)	Exp. uncert. (dB)[1)]
	4467	0,08	1,19	0,10	0,49	0,10	0,34	0,20
	4732	0,09	1,35	0,14	0,60	0,10	0,36	0,20
5 k	5012	0,10	1,50	0,18	0,24	0,10	0,38	0,20
	5309	0,12	1,64	0,06	-0,30	0,15	0,39	0,30
	5623	0,13	1,78	0,18	-0,18	0,15	0,40	0,30
	5957	0,15	2,02	0,15	-0,02	0,15	0,41	0,30
6,3 k	6310	0,16	2,25	0,10	0,00	0,15	0,41	0,30
	6683	0,20	2,56	0,11	-0,62	0,15	0,43	0,30
	7079	0,22	2,84	0,10	-0,10	0,15	0,42	0,30
	7499	0,20	3,13	0,06	-0,32	0,15	0,39	0,30
8 k	**7943**	**0,26**	**3,49**	**0,08**	**-0,36**	**0,15**	**0,43**	**0,30**
	8414	0,30	3,98	0,08	0,34	0,15	0,46	0,40
	8913	0,31	4,43	0,09	0,11	0,15	0,47	0,40
	9441	0,35	4,97	0,13	0,29	0,15	0,52	0,40
10 k	10000	0,40	5,53	0,18	-0,10	0,20	0,57	0,40
	10593	0,40	6,12	0,15	-0,28	0,30	0,57	0,40
	11220	0,40	6,71	0,20	-0,15	0,30	0,53	0,50
	11885	0,34	7,24	0,16	-0,31	0,30	0,47	0,50
12,5 k	12589	0,26	7,74	0,26	-0,08	0,30	0,38	0,50
	13335	0,26	8,27	0,23	0,06	0,40	0,27	0,50
	14125	0,14	8,67	0,18	0,17	0,40	0,17	0,50
	14962	-0,03	9,07	0,15	-0,19	0,40	-0,02	0,50
16 k	**15849**	**-0,32**	**9,35**	**0,44**	**-0,12**	**0,40**	**-0,17**	**0,50**
	16788	-0,47	10,02	0,34	-0,10	0,40	-0,32	0,50
	17783	-0,74	10,57	0,40	0,16	0,40	-0,40	0,50
	18836	-1,07	11,19	0,39	-0,01	0,40	-0,54	0,50
20 k	19953	-1,36	11,86	0,51	-0,02	0,40	-0,64	0,50

1) The expanded unercertainty listed is the value to be used when calculating uncertanties in the measured result when the corrections are applied. This uncertainty is mainly caused by typical differences between units of similar model/type. The uncertainties during the measurement of the corrections are as required in IEC 62585:

Case corrections: < 0,25 dB for f ≤ 4 kHz and < 0,35 dB for f > 4 kHz.

Wind screen corrections: < 0,20 dB for f ≤ 4 kHz and < 0,30 dB for f > 4 kHz.

Typical microphone response

Typical open circuit free-field response of the microphone UC-59 without windscreen and without case reflections.

Microphone free-field to actuator correction:

Correction to be added to the microphone response measured with an electrostatic actuator (IEC 61094-6) in order to obtain the free-field response for the microphone system. The corresponding expanded uncertainty (95%) includes the typical variations between different microphones of the same model.

Case correction

Correction to be added to the freefield response of the microphone to obtain the free-field response of the sound level meter. The corrections are caused by diffraction and reflections from the instrument housing.

When the response of the sound level meter is determined from electrostatic actuator excitement of the microphone (IEC 61094-6), both the actuator to free-field correction and case correction shall be applied. The corresponding expanded uncertainty (95%) includes the typical variations between different instruments of the same model measured at reference conditions.

Windscreen correction

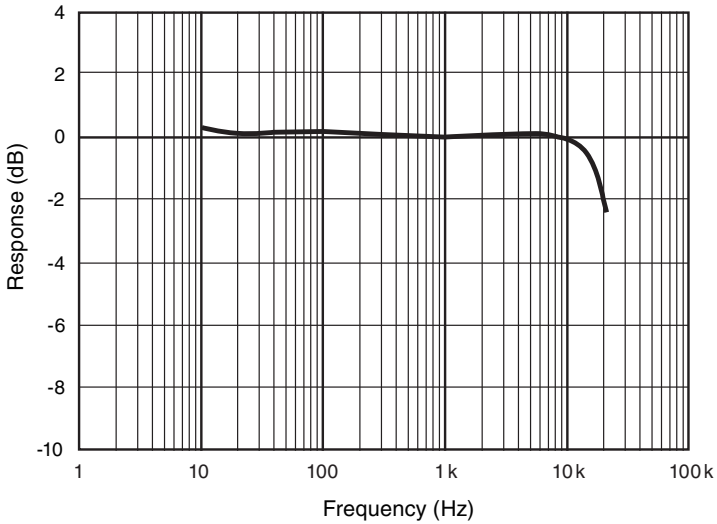
Correction to be added to the free-field response of the sound level meter without windscreen to obtain the free-field response of the sound level meter with windscreen. The corresponding expanded uncertainty (95%) includes the typical variations between different windscreens of the same model measured at reference conditions.

Electrical verification of acoustic performance

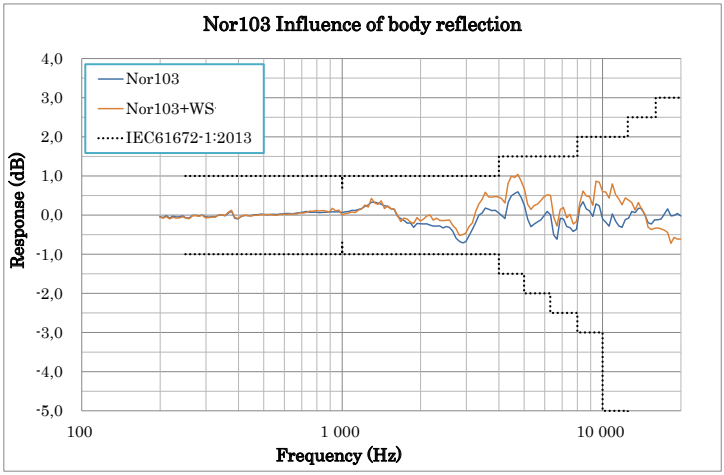
Electrical signals resembling the microphone signal is used to assess conformance to the specifications and the sound level meter standard. The input adapter Nor1447 with an internal capacity of 18 pF (± 20%) is then used for feeding the signal into the instrument.

Frequency Response

The frequency response of a free-field field microphone is expressed as the frequency response in the reference direction (0° incidence).
The diagram below shows a typical example for the frequency response of the microphone UC-59.



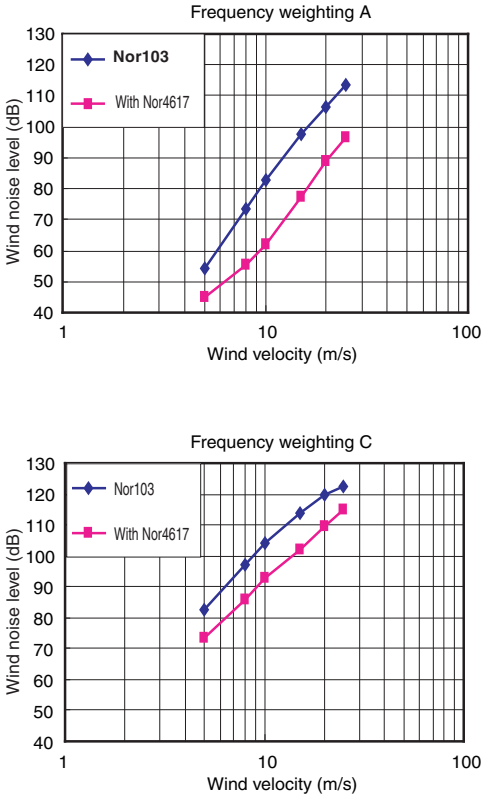
Frequency response for mic UC-59



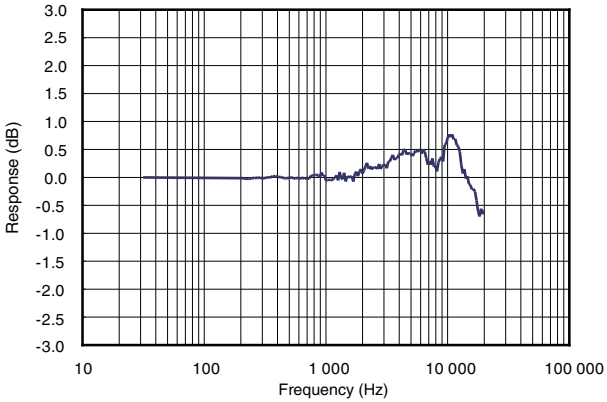
Diffraction and reflections from the instrument housing

Effect of Windscreen Nor4617

The windscreen Nor4617 reduces measurement errors due to wind noise. The Nor4617 characteristics are shown below.



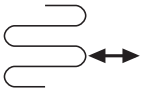
Wind noise reduction effect



Influence of windscreen Nor4617 on acoustic performance of Nor103 (Referenced to Nor103 characteristics)

The greatest susceptibility configuration for radio frequency fields

Nor103



Polarization direction is parallel to drawing plane

Antenna

Operation mode: normal operation

The greatest susceptibility configuration for radio frequency fields

Statement of conforming to the basic statement

Tab. 1 Statement of conforming to the basic statement	
Immunity to AC power frequency fields	The specification of IEC 61672-1 Class 1 is satisfied
Immunity to RF fields	The specification of IEC 61672-1 Class 1 is satisfied
Emissions	The specification of IEC 61672-1 Class 1 is satisfied

The performance or function of a sound level meter may be temporarily degraded during electrostatic discharges.

The lower and upper limits of the linear operating range

Tab. 2 The lower and upper limits of the linear operating range

A-weighting

	Sound level (dB)				
Frequency (Hz)	31.5	1 k	4 k	8 k	12.5 K
Upper	97.0	137.0	136.0	133.0	130.0
Reference	74,6	114.0	115,0	112,9	109,7
Lower	30.0	30.0	30.0	30.0	30.0

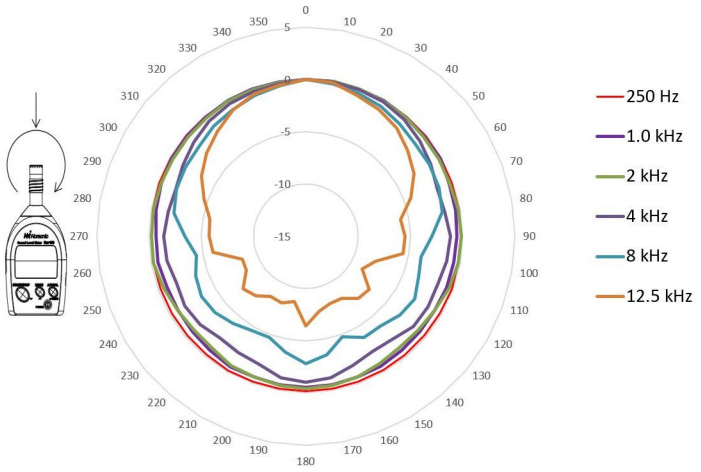
C-weighting

	Sound level (dB)				
Frequency (Hz)	31.5	1 k	4 k	8 k	12.5 K
Upper	134.0	137.0	136.0	133.0	130.0
Reference	111,0	114.0	113,2	111,0	107,8
Lower	36.0	36.0	36.0	36.0	36.0

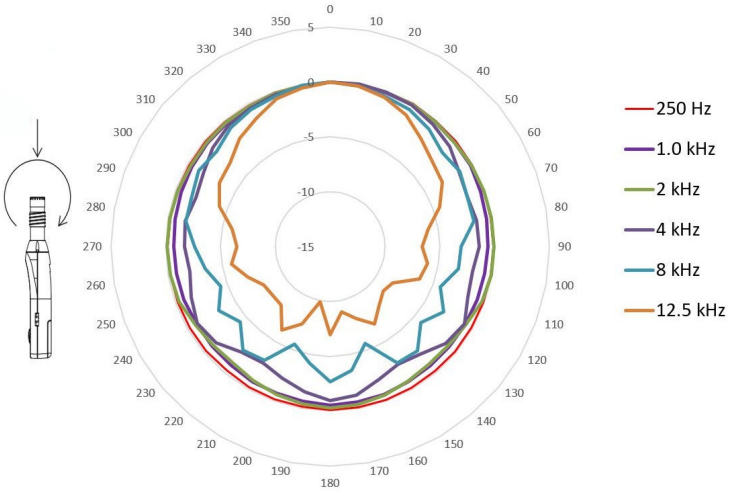
Directional Characteristics

The directional characteristics of Nor103 is a measure of its sensitivity for sound waves arriving from different angles. Ideally, the microphone is equally sensitive in all directions. However, at higher frequencies diffraction and case reflections cause the sensitivity to vary with the direction of the incident sound.

Horizontal Directional Characteristics



Vertical Directional Characteristics



Random incidence response

Norsonic AS
Gunnersbråtan 2
N-3409 Tranby
Norway
Tel: +47 3285 8900
info@norsonic.com
www.norsonic.com

Declaration of Conformity

We, Norsonic AS, Gunnersbråtan 2, N-3409 Tranby, Norway, declare under our sole responsibility that the product:

Sound Level Meter Nor103

to which this declaration relates, is in conformity with the following standards or other normative documents

Standards	:	EN/IEC 61672-:2013 Class 1
Safety	:	EN 61010-1:2010/A1:2019 Portable equipment and pollution category 2
RoHS	:	Directive 2011/65/EU, 2015/863/EU
WEEE	:	Directive 2012/19/EU

This product has been manufactured in compliance with the provisions of the relevant internal Norsonic production standards. All our products are tested individually before they leave the factory. Calibrated equipment – traceable to national and international standards – has been used to carry out these tests.

This Declaration of Conformity does not affect our warranty obligations.

Tranby, September 2021

Jens Petter Ringvold
Cheif Enginee

Norsonic

Gunnersbråtan 2
N-3409 Lierskogen
Norway
Tel: +47 3285 8900
info@norsonic.com
www.norsonic.com

Norsonic AS supplies a complete range of instrumentation for acoustics – from sound calibrators, microphones and preamplifiers; via small handheld sound level meters to advanced, yet portable, real time analysers, but also spectrum shapers, building acoustics analysers and complete community, industry and airport noise monitoring systems. Contact your local representative or the factory for information on our complete range of instrumentation.