

INSTRUCTION MANUAL

Outdoor microphone
nor1218



Ni Norsonic

Outdoor microphone
nor1218

Nor1218 – User Guide

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Introduction

The outdoor microphone Nor1218 is a measurement microphone protection kit for all-weather conditions. It is mainly intended for temporary outdoor applications. The microphone contains elements for protecting the microphone cartridge from rain, snow, dust and insects, satisfying IP 55 requirements. The Protection kit is designed for use with the IEPE preamplifier Nor1207 and one of the microphones Nor1227 or Nor1228.

Further, compared to a standard measurement microphone, the Nor1218 improves the measurement accuracy by reducing the wind noise and by improving the directional response for sound from different directions.

Combined with a suitable sound level meter including a frequency response correcting function, the Nor1218 satisfy Class 1 specification requirements according to IEC61672-1 and similar national standards for a sound level meter class 1.

The microphone is intended for vertical mounting only since the act of gravitation forms a part of the rain protection system. The reference direction may, however, be selected to be vertical or horizontal based on the applied frequency response compensation in the sound level meter.

The outdoor microphone may be calibrated with a normal sound calibrator suitable for ½" working standard microphones (WS2) and without the need for extra accessories. Access to the microphone cartridge is easily gained by dismantling the upper part of the outdoor microphone.

The base of the Nor1218 is made of an electrical insulating material. The microphone body will be fully insulated from the mounting mast thereby reducing pick-up of electrical hum and noise.

Nor1218 is mainly designed to be used with the Nor131 and Nor139 Sound Level Meters. These instruments have the requested frequency compensation and deliver the required IEPE current.

Assembling

The outdoor microphone Nor1218 is normally shipped without preamplifier and microphone, since these parts is normally shipped with the Sound Level Meter Nor131 or Nor139.

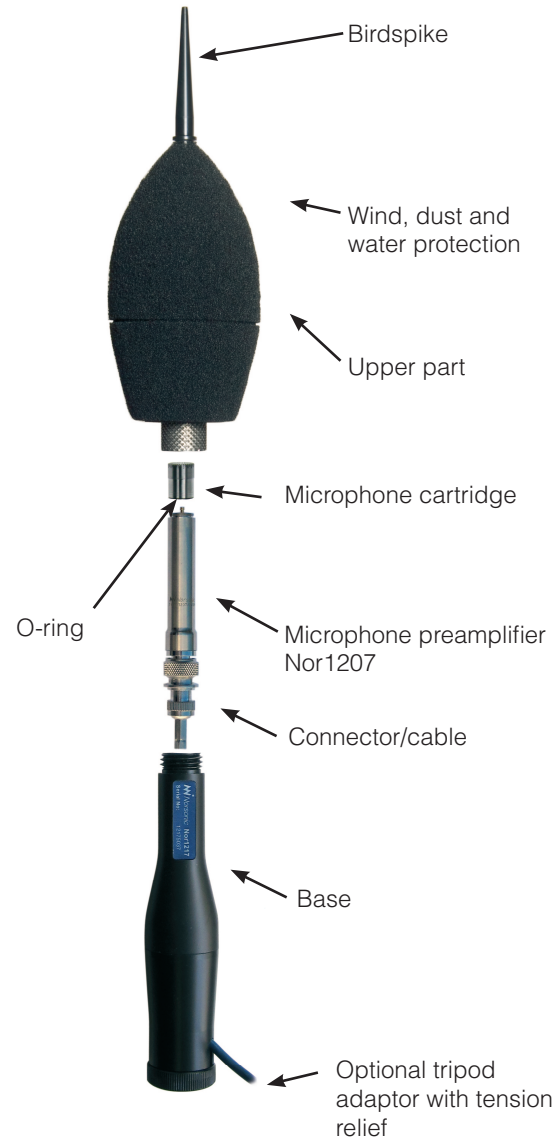
Depending on the application, you will need a mast or tripod for mounting the microphone system and possibly devices for proper grounding and lightning protection, see below.

We recommend cable type Nor4531, which comes in standard lengths of 5, 10, 15, 30 and 50 metres – other lengths are available on request.

Unscrew and remove the upper part consisting of birdspike and windscreen as one unit. Do not remove the windscreen from this upper part as this may destroy the weather protection and alter the acoustic performance.

The unit is delivered with an adaptor for mounting on a tripod. The cable is led through a slot in the side of the adaptor. The base screw has a threaded hole like those commonly used for cameras (3/8" UNC). The base screw also forms a tension relief for the cable.

Remove the base screw and slide the cable through the base unit. Assemble the microphone cartridge to the preamplifier and connect the preamplifier to the cable. We recommend mounting the supplied O-ring between the microphone cartridge and the preamplifier.



Screw the lock nut on the preamplifier onto the female connector on the cable. Push the preamplifier carefully into the base unit. The preamplifier and microphone is aligned in the correct position by a spring force. After mounting the upper protection part, the outdoor microphone unit will be ready for use. However, we recommend that you test the unit together with the measuring instrument by applying a calibrator before the upper part is mounted.

Grounding and lightning protection

If the outdoor microphone assembly is the highest object in the vicinity when mounted, it may be exposed to lightning strokes. We recommend to use a conductive mast and to ground it properly. A rod in proper contact with the conductive mast should be made at the side and 50 cm above the tip of the microphone. The rod should be placed at least 25 cm to the side of the microphone assembly and have a diameter not more than 10 mm in order not to interfere with the directional properties of the microphone.

Safety considerations may require the screen of the microphone cable to be properly grounded and that the internal conductors are clamped for high voltage protection.

We recommend making the combined grounding for the cable and instrument at one point only in order to reduce the risk of pick-up of hum and electromagnetic noise.

Verify the noise floor of the complete system after installation is completed to ensure it is below the lower end of the required measurement range. If a quiet location is not available, the noise floor may be measured by substituting the microphone with a dummy microphone like Nor1448. As an alternative the Nor1447 adaptor terminated with a short-circuit or a 50 ohm BNC termination is also a suitable device for making this test. A sound calibrator in OFF-mode may also be used to attenuate the external noise.

Microphone calibration

The Nor1218 can be calibrated with a sound calibrator for ½" microphones without the need for special couplers. We recommend using Nor1251 (1000 Hz) or Nor1253 (250 Hz).

Unscrew the upper part of the Nor1218 to gain access to the microphone cartridge. Mount the calibrator slowly and carefully while turning the calibrator and switch it on. See figure.

If the calibrator frequency is 250 Hz, adjust the reading to be the level stated for the calibrator, e.g. 124,0 dB for Nor1253 with 124 dB specified level.

If the calibrator frequency is 1000 Hz, adjust the reading to be 0,1 dB below the stated calibrator level, e.g. 113,9 dB for Nor1251 calibrator with a stated level of 114 dB.

This is only valid if the frequency response correction is turned off. For the Nor131 and Nor139 the frequency correction is turned off, when entering into the calibration menu. Perform calibration and calibrate the microphone as a normal free field microphone. I.E. -0.1 dB if using a 1000 Hz calibrator. When leaving the calibration menu, you will observe that the level measured with the calibrator on, is different from what obtained in the calibration mode. This is correct, and is due to the frequency correction added. If horizontal reference axis is selected, the signal will be about 0.1 dB higher than the calibrated signal, if vertical reference axis is selected the signal will be 0.3 dB lower than the calibrated level. This does not apply if you calibrate with a 250 Hz calibrator since there is no correction added at this frequency.



Technical description

The outdoor microphone Nor1218 is based on a ½" working standard microphone type WS2F according to IEC 61094-4.

Two types of microphones are tested and are recommended; Nor1227 and Nor1228.

Both microphones have a nominal sensitivity of 50 mV/Pa and are self-polarised. However, each microphone is individual calibrated and may differ slightly from this value.

The upper part of the Nor1218 consists of windscreen, rain hood, dust mesh and birdspike and protects the microphone from rain, snow, dust and insects. Both the rain hood and the dust mesh are made of a water-repellent fabric open for the sound. The sound is reaching the microphone through nine slots placed equidistantly around the circumference of the circular body of the upper part. The mechanical part with the birdspike is also important for the directional response of the complete microphone system.

The upper part may be removed as one unit and will thus give easy access to the microphone cartridge for testing and calibration. The lower part consists of the base, the microphone cartridge and the preamplifier Nor1207. A normal IEPE microphone cable supplied with Norsonic sound level meters, like Nor4531, should



be used for connection to the sound level meter instrument. An adaptor for mounting the outdoor microphone on a tripod is included.

The base is made of black polyacetal (POM). The material is durable and insulating, thus preventing electric noise from ground loops through the mast.

Drops of water from rain are kept away from the microphone diaphragm by the combined act of the tubular windscreen, the rain hood and the dust mesh. The upper part of the microphone cartridge is air- and water tight, and the backside is vented to the air through the preamplifier.

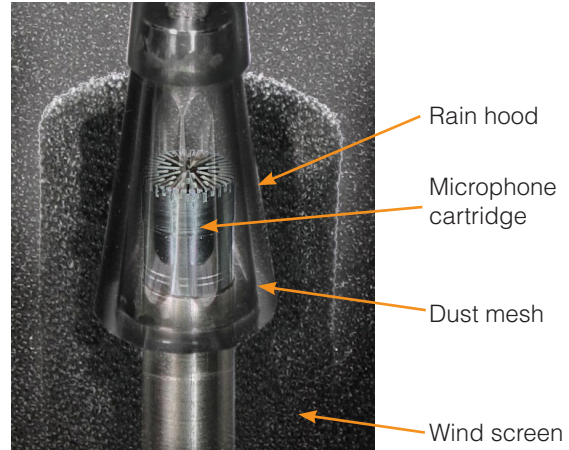
The Ingress Protection Category for the assembled microphone is IP55 according to IEC 60529.

Consider the assembly of microphone cartridge and preamplifier as a single unit when operated in the field. If disassembled in the field, the performance may be reduced due to contamination from dust and humidity.

When Nor1218 substitutes a normal measurement microphone on a sound level meter, a correction of the frequency response is needed to retain the class of accuracy for the sound level meter, see Specifications. Based on the correction, the reference direction may be selected to be either horizontal or vertical. Horizontal reference direction is usually selected for sound approaching the microphone mainly along a horizontal axis like noise from industry or vehicles. A vertical reference axis is usually used for measuring the noise from aircraft.

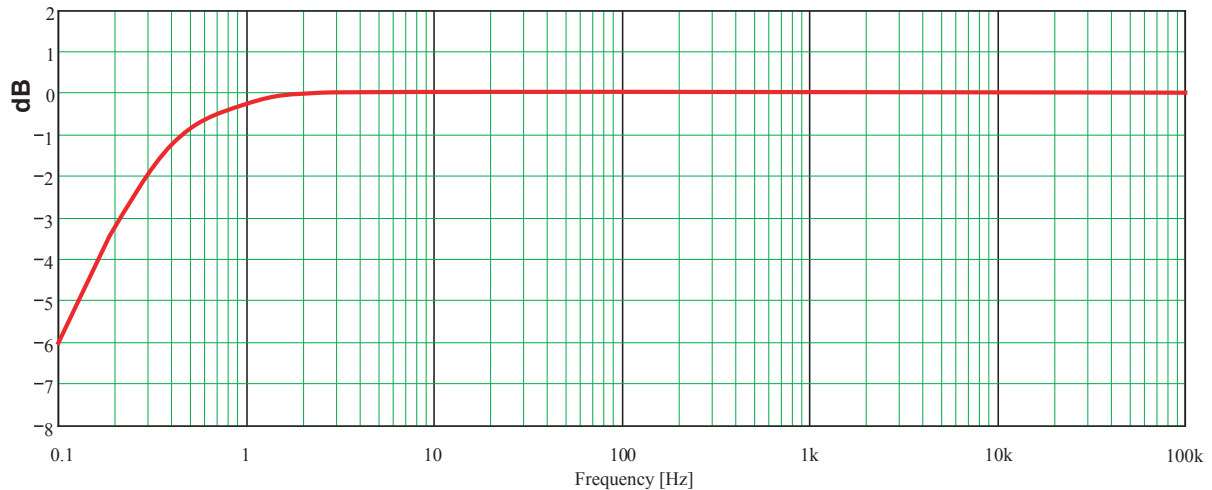
The sound level meters Nor131 and Nor139 have a correction network where the reference axis for the outdoor microphone Nor1218 may be selected to be horizontal or vertical.

See separate description in this manual on how to configure the Nor131 or Nor139, Chapter 5.



Frequency response

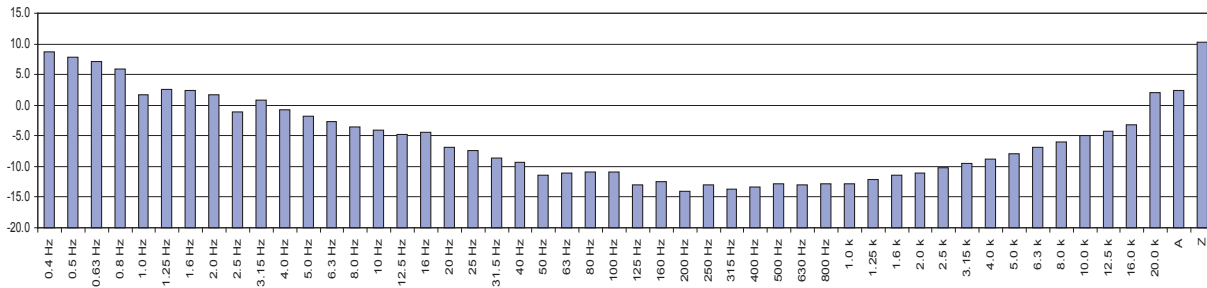
The typical frequency response for the preamplifier Nor1207 is shown below. The frequency response for the outdoor microphone system is therefore mainly determined by the microphone cartridge and the acoustic performance of the enclosure.



Typical frequency response for the preamplifier Nor1207. The combination of microphone and preamplifier has an additional typical attenuation of 6 dB relative to the open circuit sensitivity of the microphone.

Self-noise

The electrical noise when the microphone is substituted by a 20 pF capacitor is shown on the graph below. 0 dB corresponds to 1 μ V. For a microphone with a sensitivity of 50 mV/Pa (Nominal value of Nor1227/ Nor1228), 0 dB voltage also corresponds to the normal reference pressure for sound: 20 μ Pa and the noise level may be compared with sound pressure level directly.

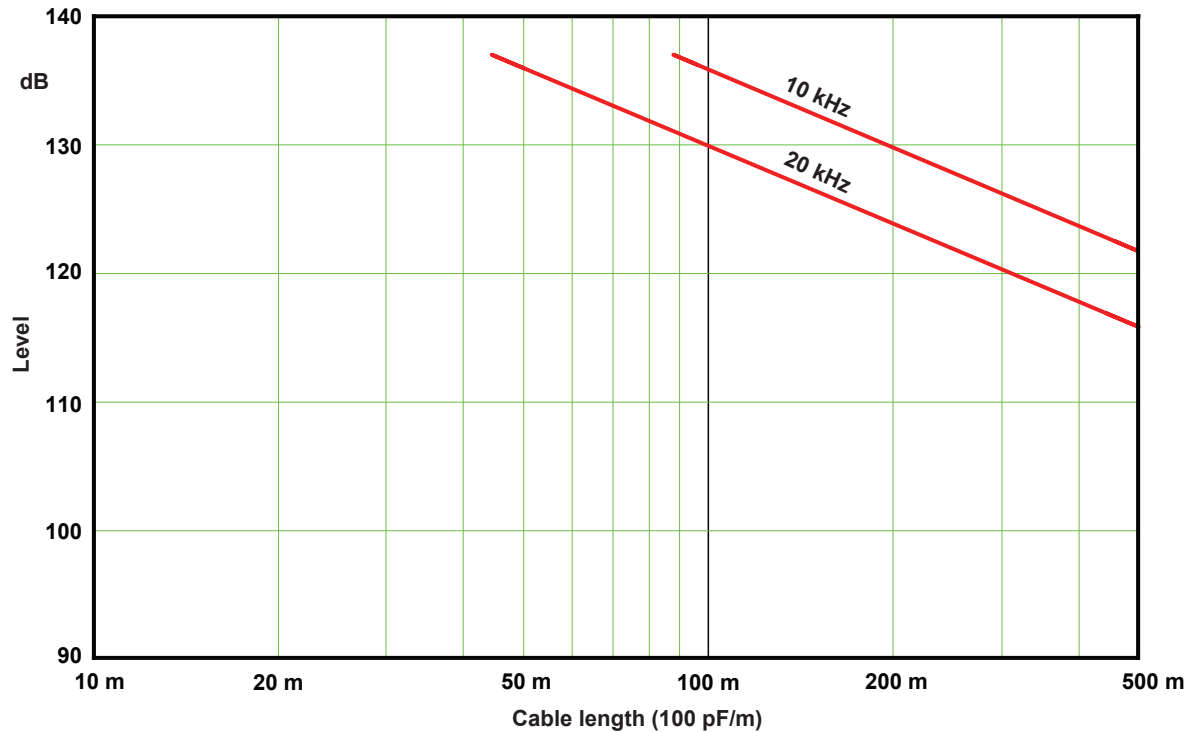


Typical self-noise of the microphone system when the microphone is substituted by a capacitor with similar capacitance as the microphone. Note that the acoustical self-noise for a real microphone will be higher due to thermal noise in the microphone cartridge.

Cables and cable length

The Nor1218 with its preamplifier Nor1207 has excellent driving capability for long cables. The signal output from the microphone preamplifier will be loaded by the capacitance of the cable between the microphone system and the instrument. The capacitance will increase proportionally with the length of the cable. A typical value for the Nor4531 microphone cable from Norsonic is 100 pF per metre. Hence, a cable with length 100 m, will load the output with a capacitance of 10 nF. For lower frequencies there are seldom

problems with long cables. However, when the signal contains the combination of high amplitude and high frequency, the capacitive loading will lead to high output current. A limited current capacity will set limits for the maximum slew-rate for the signal. The figure below shows the maximum level as function of cable length and frequency. 20 kHz corresponds to the bandwidth of the microphone system with the normal microphone Nor1227 or Nor1228.



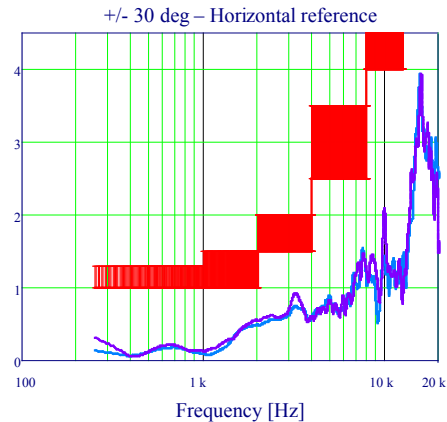
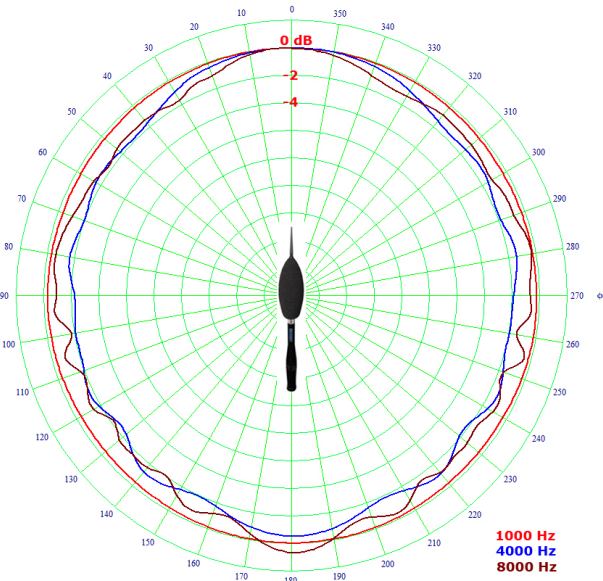
Directional response

An outdoor microphone system like Nor1218 may form a part of a sound level meter when applied for environmental noise monitoring. The combination of microphone and instrument shall therefore satisfy all requirements in the international standards for sound level meters, specified in IEC 61672-1. Ideally, the microphone shall have the same sensitivity for sound from any direction. The IEC 61672-1 specifies tolerance limits for the directional response.

The directional response of a microphone is the ratio of the free field response at a particular frequency as a function of angle of sound incidence to the response in the reference direction.

The upper adjacent figure shows the directional response for Nor1218, when the reference axis is vertical, for the frequencies 1000 Hz, 4000 Hz and 8000 Hz.

IEC 61672-1 specifies tolerance limits for any frequency. The limits are depending on the angle from the reference axis and the standard specify tolerance limits for angles up to $\pm 30^\circ$, up to $\pm 90^\circ$ and up to $\pm 150^\circ$ from the reference axis. The lower adjacent figure shows the typical max. deviation for the sector up to $\pm 30^\circ$ from a horizontal reference axis together with the applicable tolerance limits ■ for a Class 1 sound level meter.

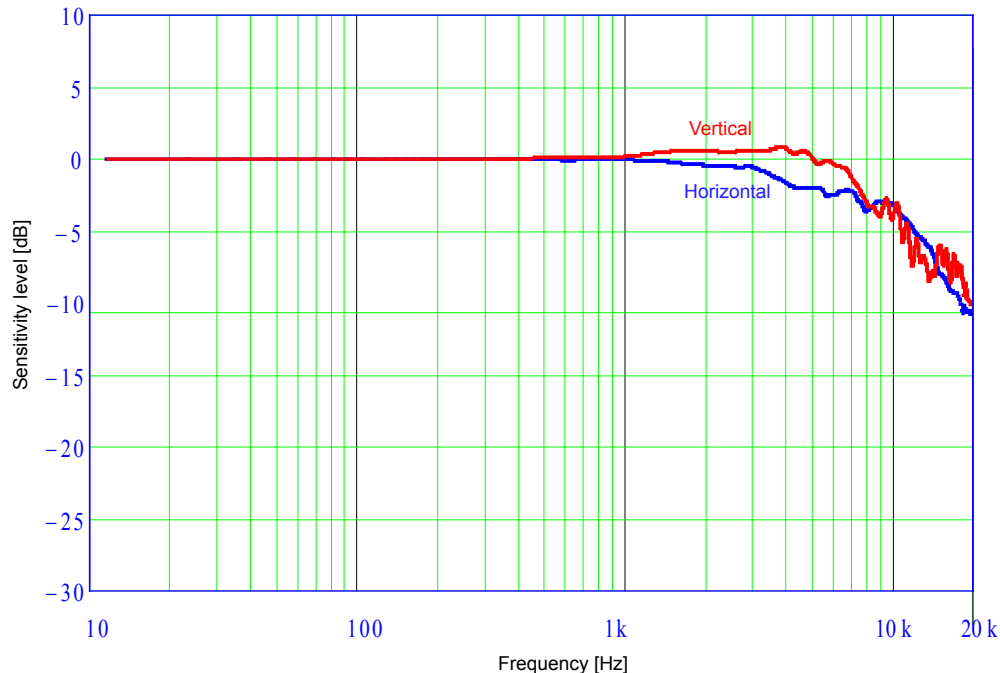


Frequency response

The figure below shows the typical frequency response for sound approaching the microphone in two directions. The response marked “Vertical” is the response for sound approaching the microphone from above along the bird spikes, when the microphone is in the recommended vertical direction. The response marked “Horizontal” is the response for sound approaching the microphone in a horizontal direction when the microphone is mounted in the same recommended vertical direction.

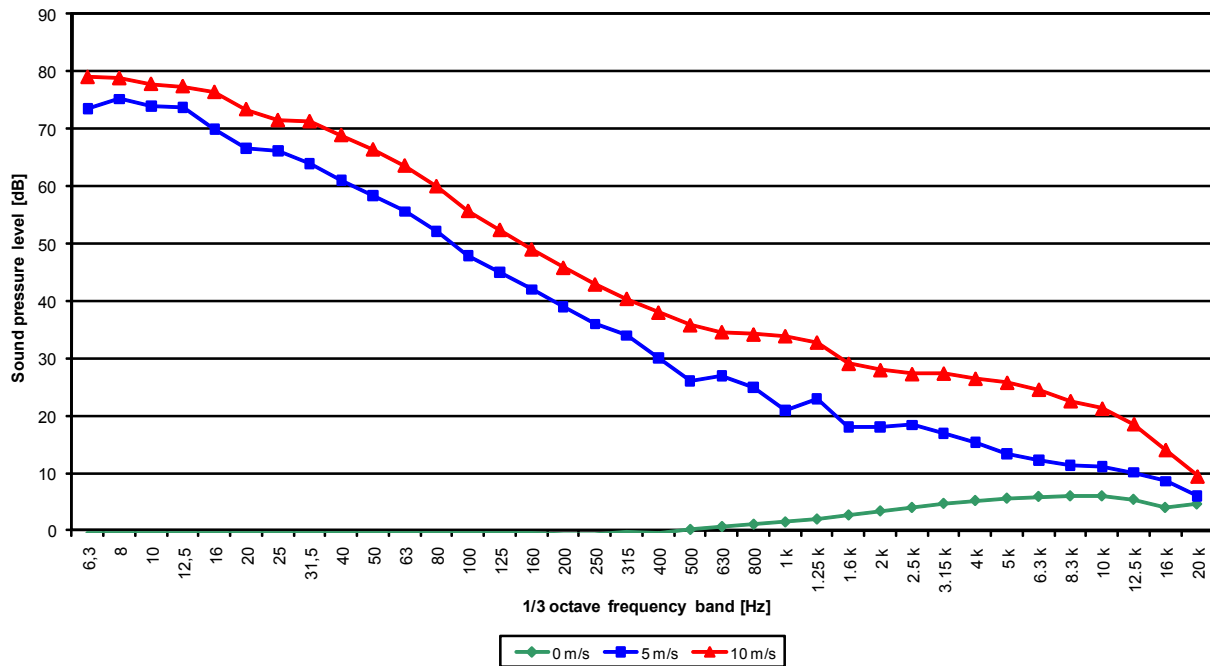
Due to the lower sensitivity for higher frequencies, as shown on the figure, it is recommended to correct the frequency response to ensure that the response is within the requirement for Class 1 sound level meters specified in the international standard IEC 61672-1.

When the microphone system is used in connection with the precision sound level meter Nor131 or Nor139 (for program version 3.0 and above), select 1218 Vertical or Horizontal in the input setup menu to enable the right settings. If the large windscreen Nor4576 is fitted above the standard windscreen supplied with the Nor1218 an extra frequency compensation is needed. This is only possible if the horizontal mode is selected. Select 2: corrections in the input menu and then 1: large windscreen in the next submenu to turn this correction on. Please note that this correction is always set to OFF each time the instrument is turned off. There is not possible to use large windscreen if vertical mode is selected. Adding the extra windscreen is required in some applications when measuring on wind turbines.



Self-noise and wind

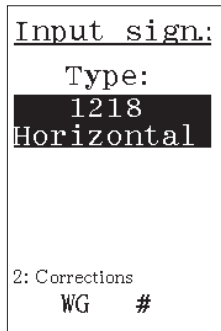
The figure below shows typical self-noise for the microphone system as levels for the various 1/3-octave frequency bands re. 20 μ Pa when the microphone is placed in a horizontal, laminar flow of air with speed 0, 5 and 10 m/s, respectively. The levels are measured without frequency compensation. The corresponding A-weighted levels are 16 dB, 40 dB and 48 dB. Depending on the wind speed, the noise levels are typically 20 dB to 30 dB lower than for an unprotected microphone.



Connecting the Nor1218 to Sound Level Meter Nor131 or Environmental Noise Meter Nor139

The Nor1218 is designed to be used with the Sound Level Meter Nor131 or Nor139. These instruments support all the needed corrections for the two types of microphones. This chapter discuss how you set up and use the Sound Level Meter.

In the SETUP – 1 (Instrument menu) – 4 (Input menu), you select which type transducer you have connected. Select either “1218 Vertical” for Nor1218 for vertical frequency correction to be applied and “1218 Horizontal” for horizontal frequency correction.



If the large windscreen Nor4576 is fitted above the standard windscreen supplied with the Nor1218 an extra frequency compensation is needed. This is only possible in the horizontal mode. Select 2: corrections in the input menu and then 1: large windscreen in the next submenu to turn this correction on. Please note that this correction is always set to OFF each time the instrument is turned off.

It is not possible to use large windscreen if vertical mode is selected. Adding the extra windscreen is required in some applications when measuring on wind turbines.

Maintenance

The need for maintenance depends largely on the environmental conditions where the microphone system is used. Contamination of dust, ice or snow on the windscreen may alter the acoustic performance. For most applications, it will be sufficient to check the microphone periodically by using the system check facility, e.g. every night. For permanent operation we recommend to inspect the microphone and check the microphone sensitivity with a calibrator at least two times a year. The frequency for checking may be increased in places with difficult weather conditions or excess of dust.

The windscreen consists of two parts. The outer part is hollow and sealed by a lower ring-shaped part. Remove the upper part of the windscreen with care (see figure). When the upper part is lifted upward, ensure that the lower part stay fixed – otherwise the rain hood above may be harmed.

The outer part of the windscreen may be cleaned by washing by hand using standard household washing up detergents. Ensure that it has been thoroughly rinsed in clean water and is completely dry before it is remounted. Do not use excessive heat for the drying: 85°C maximum. However, we recommend to replace the whole upper part every second year. In some locations, near to chemical complexes or in coastal installations it may be necessary to replace the windscreen earlier (spare part Nor4529).



The lower part of the windscreen, the dust mesh and rain hood are not parts that can be serviced by the user. In case of wear or strong contamination we recommend to order a replacement unit (Spare part Nor4560) or send the part to the factory for refurbishment.

Do not disassemble the assembly of microphone and preamplifier outdoors. Contamination from humidity or dust – or from your finger sweat – may lower the performance.

Specifications

Mounting direction

The microphone shall be mounted with the tip pointing upwards and the axis of symmetry shall be vertical. The acoustic reference axis for the microphone may either be horizontal or vertical.

Acoustic performance

General

Sensitivity: typically 25 mV/Pa (-32 dB re 1V/Pa) – individually calibrated. (Based on typical open circuit sensitivity of 50 mV/PA for microphone and typical 6 dB attenuation in the preamplifier.)

Measurement range: From noise floor up to at least 140 dB re. 20 μ Pa (peak).

Self-noise:

A-weighted: < 18 dB re. 20 μ Pa

Z-weighted: < 22 dB re 20 μ Pa (22.5 Hz - 22.5 kHz)

Frequency response

See Technical description.

Frequency correction is recommended for conformance with the requirements in IEC 61672 for class 1 sound level meters.

Directional response

The directional response satisfies the requirements for a Class 1 sound level meter according to IEC61672-1. See section 4.4 Directional response for further information.

General

Mounting on a tripod: 3/8" UNC (photo-tripod)

Temperature range: -10°C to +50°C

Satisfies requirements in IEC 61672-1 when operated with a suitable instrument.

Air pressure: 85 kPa to 108 kPa

Humidity/rain: Up to 100%, IP55

Height: 375 mm (without tripod adapter)

Diameter: Approx 78 mm with windshield

Weight: 280 g (without tripod adapter)

Conformity

The microphone satisfies the requirements for a Class 1 sound level meter according to IEC 61672-1 when combined with Nor131 or Nor139 with software version 3.0 and upwards.

The device is in conformity with the following standards:

EN-50081-1
EN-50082-1

Protection provided by the enclosure

The microphone satisfies the requirements for Ingress Protection Category IP55 according to IEC 60529.

(DnV report No 2009-3124)

Accessories and spare parts

Windshield upper part: Norsonic part no. Nor4529

Assembled upper part with windscreen:
Norsonic part no. Nor4560

Microphone: Nor1227 or Nor1228

Microphone preamplifier: Nor1207

Sound calibrator: Nor1251 or Nor1253

Microphone cable: Nor4531

Standard lengths 5, 10, 15, 30 and 50 metres – other lengths on request.

Dummy microphone: Nor1448 (18 pF) or Nor1447 with a short-circuit (BNC).

O-ring: Article no. 3000012 (Between microphone cartridge and preamplifier).

Nor4576 mm windscreen for extra wind reduction in horizontal direction.

Declaration of Conformity

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

Outdoor microphone Nor1218

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

Safety: EN61010-1: February 2001 for portable equipment and pollution degree 2.

Enclosure	IEC60529 - IP55
EMC:	EN 6100-6-3; 2007 EN 6100-6-2; 2005
Sound:	Applicable parts of IEC61672-1


Configuration for test: Connected to Nor131, Nor139 and Nor140 sound level meters.

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.

This Declaration of Conformity does not affect our warranty obligations.

Tranby, January 2015


Dagfinn Jahr
Quality Manager

The declaration of conformity is given according to EN 45014 and ISO/IEC Guide 22.

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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 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.