INSTRUCTION MANUAL



Norsonic

nor278

REFERENCE SOUND SOURCE

Nor278 User Guide – September 2012 Edition
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nor278

REFERENCE SOUND SOURCE

Introduction
– what is a Reference Sound Source?

The Nor278 reference sound source are a device for generating a known amount of sound power. The principle of operation is very simple: a rotating centrifugal fan creates a turbulent airflow which leads to noise with a very broad frequency range.

The simplicity leads to a very stable and robust source of sound power. The noise is determined by the mechanical design and the rotational speed of the fan. The rotational speed is mainly determined by the frequency of the mains power which in most places are known with high accuracy.

The reference sound source Nor278 satisfies all requirements in the product standard ISO 6926 for the extended frequency range 50 Hz to 20 kHz. The standard describes requirements for the flatness of the sound spectrum, temporal stability and directivity of the source. Ideally, the sound should be close to pink noise giving equal level in each 1/3-octave frequency band and emit equal amount of acoustic power in all directions above the floor.

The sound source is calibrated in an hemi-anechoic room with the source placed on a acoustically reflecting floor. For the calibration data to be valid, the source should be placed in a similar way during operation, i.e be placed on a flat hard surface of a certain minimum area.

One of the main application for the reference sound source is for measurement of the sound power from other equipment. By comparing the sound pressure level when the equipment to be measured is operating with the sound pressure level when the reference sound is operating the sound power may be found. The difference in sound power level is equal to the difference in sound pressure level. Different standards give details for such testing. In situations where the unknown source can not be switched off, the method may be modified to cover the sound power from both sources operating simultaneously.

The reference sound source may also be used for measuring sound absorption and sound insulation in building acoustics.

Operation

The Reference Sound Source (RSS) was carefully checked and inspected at the factory before shipment and is shipped ready for use.

Unpack the unit and ensure that the unit have no visual damages from transport.

Verify that the RSS has the specifications for mains power in accordance with the local conditions (200 V – 240 V, 50 Hz).

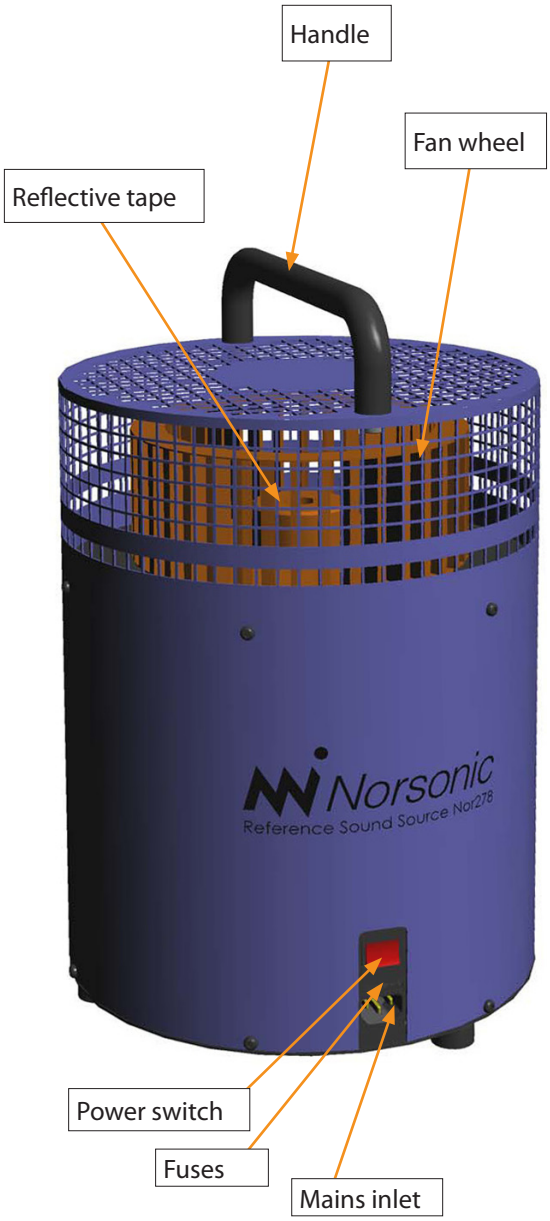
Connect the mains cord to a suitable mains outlet with at least 10 A fuse.

Place the source as required by the application. Normally the RSS should rest on a flat surface of at least 1 m^2 for the calibrated sound power values to be applicable. For emphasis on lower frequencies even a larger are may be needed

Remember that the RSS creates some wind. Clean the area close to the source for dust, papers and other materials that can be moved by the airflow.

Start the motor by switching on the mains power switch located adjacent to the mains inlet. The RSS is ready for use after a few seconds and will produce sound power close to the values stated in the calibration certificate for the RSS.

The rotational speed may be verified by an optical tachometer to be close to the value stated in the certificate. An reflective tape is placed on the fan-wheel close to the axle.



Clear about 1,5 m diameter area of dust and loose papers around the RSS. During normal operation air flows out from the fan wheel, across the floor and back into the fan wheel centre.

Tecnical description

The reference sound source is based on the International product standard ISO 6926 for reference sound sources. The main requirements in this standard is as follows for a unit satisfying the requirement in the extended frequency range:

- Temporal steadiness in power level so the standard deviation for the power level is less than:
  – 0,8 dB in the range 50 Hz to 80 Hz,
  – 0,4 dB in the range 100 Hz to 160 Hz,
  – 0,2 dB in the range 200 Hz to 20 kHz;
- The power level in each 1/3-octave band in the range 100 Hz to 10 kHz is within 12 dB;
- The power level in each 1/3-octave band in the range 50 Hz to 20 kHz is within 16 dB;
- The difference in the power level between adjacent 1/3-octave bands in the range 100 Hz to 10 kHz is less than 3 dB;
- The difference in the power level between adjacent 1/3-octave bands in the range 50 Hz to 20 kHz is less than 4 dB;
- The directivity index in the range 100 Hz to 10 kHz is not larger than +6 dB.

The table below shows typical values for Nor278. Each unit is delivered with an calibration certificate indicating the values for the individual device. Always use the values from a valid calibration certificate for measurements of calibrated values.

The speed of the motor may be measured with an optical tachometer. Point the excitation light through one of the opening on the top in the direction of the small reflective tape located on the hub of the fan-wheel by the shaft.

The speed of the motor is mainly determined by the mains frequency for an asynchronous motor like the one used in Nor278. For a two-pole motor the mains frequency 50 Hz corresponds to 3000 rotations per minutes (RPM). Due to the load, the rotational speed will be about 2% lower. A typical value for Nor278 is 2940 RPM.

The generated sound level increases with higher rotational speed. Typical values are 0,2 dB per percent change or 0,07 dB for an increase of 10 RPM. The values may however vary for the various frequency bands.

The sound power level is little affected by the mains voltage. Typical value for Nor278 is 0,004 dB/volt.



In case of malfunction and the unit will not rotate after the unit is powered, switch off the power immediately. Check for broken fuses.

Typical Sound power levels

Freq. [Hz]	Third Octave bands	Octave bands	Dir. [dB]
50	71 dB	77 dB	2,3 dB
63	71 dB		2,1 dB
80	73 dB		2,1 dB
100	76 dB	81 dB	2,2 dB
125	77 dB		2.5 dB
160	76 dB		2,4 dB
200	76 dB	82 dB	2,5 dB
250	78 dB		2,3 dB
315	79 dB		2,5 dB
400	79 dB	84 dB	2,4 dB
500	79 dB		2,6 dB
630	79 dB		3,2 dB
800	80 dB	85 dB	3,5 dB
1 k	80 dB		2,9 dB
1,25 k	81 dB		2,9 dB
1,6 k	82 dB	87 dB	3,1 dB
2 k	83 dB		2,2 dB
2,5 k	83 dB		2,3 dB
3,15 k	84 dB	88 dB	2,9 dB
4 k	83 dB		3,1 dB
5 k	81 dB		1,4 dB
6,3 k	81 dB	84 dB	2,6 dB
8 k	79 dB		1,5 dB
10 k	78 dB		1,3 dB
12,5 k	76 dB	79 dB	1,3 dB
16 k	74 dB		2,0 dB
20 k	71 dB		1,0 dB
A-weigh.	93 dB		–
Lin	94 dB		–

Dir. = Directivity index, i.e. the difference between the maximum SPL in one particular direction and the SPL averaged in all direction of a hemisphere.

Periodic calibration

The need for re-calibration depends largely of the how the reference sound source is used. A drift in the sound power level is not likely since the method of operation is very simple and related to the rotational speed of the motor and mechanical parts not changing during normal use. However, dust contamination on the fan-wheel may lead to changes in the airflow and can thus change the generated sound power. Mechanical damage on the fan-wheel or the enclosure may also change the sound power. In general we recommend re-calibration every second year and after any repair that may affect the sound power.

Maintenance

The Reference Sound Source is maid for long term operation without maintenance except for cleaning of the fan-wheel. Contamination of dust may modify the operation of the fan and alter the generated sound power.

Normally the fan-wheel can be sufficiently cleaned by blowing compressed air through the opening in the enclosure. If more thorough cleaning is needed, the enclose may be removed by the following operation:

- Remove the power cord;
- Remove the 12 screws (two rows of six, type TX20) which secure the enclosure to the frame;
- Lift up the enclosure;
- Clean the fan;
- Remount the enclose.

Fuses

The fuses are placed just below the power switch. The RSS uses two fuses of size 5 mm × 20 mm. For replacement of fuses, remove the power cord and pull out the drawer with the fuse compartment. Replace broken fuses and mount the compartment.

Nor278 for 230 V/50 Hz operation uses fuses with rating T10A (10A – slow blow). For safety – use only fuses rated for 250 V.

Specifications

Device type: Reference sound source according to IEC 6926 for extended frequency range 50 Hz – 20 kHz.

Power Supply: 200 – 240 volt, 50 Hz

Power consumption: <750 W (typical 650 watt)

Fuses: 10A – slow blow

Sound power output: >75 dB re 1 pW in each 1/3-octave bands in the range 100 Hz to 10 kHz.

A-weighted sound power output: 93 dB (typically)

Weight: 18 kg

Height exclusive handle: 396 mm

Height inclusive handle: 464 mm

Diameter: 283 mm

Temperature : -25° to 50°C. Above 35°C intermittent use only.

Humidity: Up to 90 %, non-condensing.

Complience:

IEC 6926 (1999) Extended frequency range 50 Hz – 20 kHz.

CE-mark indicates compliance with: Machinery Directive, EMC Directive and Low Voltage Directive. See Declaration of conformity.

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Declaration of Conformity

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

Reference Sound Source Nor278

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

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

EMC: EN 6100-6-3; 2007
EN 6100-6-2; 2005

following the provisions of the EU Machine Directive 2006/42/EC.

Configuration for test: Connected to public power supply, machine running.

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, September 2012

Dagfinn Jahr
Quality Manager

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

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