



## Systems

# Calibration System Nor1525

for sound level meters, microphones and sound calibrators

The calibration system Nor1525 is capable of calibrating sound level meters, sound calibrators and microphones in accordance with applicable national and international standards.

The core of the test system consists of a test unit Nor484 and a PC system<sup>1</sup> featuring a 24-bit DAQ board and dedicated calibration software. An indoor environmental monitor is delivered with the system, providing the required environmental data in a fast and accurate manner for the calibration reports.

A calibration of a sound level meter is normally divided into two main parts: electrical calibration of the sound measuring instrument and calibration of the microphone. Eventually, an accompanying sound calibrator may be calibrated and used for an overall system check.

The measured results are automatically logged and used for an automatic generation of a calibration certificate, with appropriate uncertainty statements. If needed, the certificate may be edited by the operator. Automatic generation of reported values minimize the risk for errors generated by the operator.

- Frequency response calibration of microphones using the electrostatic actuator method.
- Sensitivity calibration of microphones using the insert voltage method ensures a high degree of accuracy.
- Fast and accurate calibration of sound calibrators, pistonphones and associated barometers in accordance with IEC 60942 (2003 and 2017).
- Sound level meter calibration in accordance with IEC 61672-3 (2006 and 2013), DIN 45657:2014, ANSI S1.4 (2014).
- Fast and accurate calibration of sound measuring instruments using three different interface modes; manual; semi-automated and fully automated.
- Test of fractional octave filters in accordance with IEC 61260-3:2016.
- Full test report generated.
- Built-in self test features (requires voltmeter).
- Easy to set up, includes all accessories needed.

The screenshot shows the NorCal software interface. On the left, there is a navigation menu with icons for home, test object, environmental conditions, and time weighting. The main area displays a table of test results for Channel 1. The table has the following columns: Frequency [Hz], Reference [dB], Measured [dB], Measured deviation [dB], Lower Tolerance [dB], Upper Tolerance [dB], Expanded uncertainty [dB], and Maximum-permitted uncertainty [dB]. The data shows a series of measurements at 1,000.0 Hz, with reference values ranging from 24.0 dB to 129.0 dB. The measured values are consistently within 0.0 dB of the reference, and the measured deviation is consistently 0.0 dB. The lower tolerance is consistently -1.1 dB, and the upper tolerance is consistently 1.1 dB. The expanded uncertainty is consistently 0.10 dB, and the maximum-permitted uncertainty is consistently 0.30 dB.

Frequency [Hz]	Reference [dB]	Measured [dB]	Measured deviation [dB]	Lower Tolerance [dB]	Upper Tolerance [dB]	Expanded uncertainty [dB]	Maximum-permitted uncertainty [dB]
1,000.0	24.0	24.0	0.0	-1.1	1.1	0.10	0.30
1,000.0	25.0	25.0	0.0	-1.1	1.1	0.10	0.30
1,000.0	26.0	26.0	0.0	-1.1	1.1	0.10	0.30
1,000.0	27.0	27.0	0.0	-1.1	1.1	0.10	0.30
1,000.0	28.0	28.0	-0.0	-1.1	1.1	0.10	0.30
1,000.0	29.0	29.0	-0.0	-1.1	1.1	0.10	0.30
1,000.0	34.0	34.0	-0.0	-1.1	1.1	0.10	0.30
1,000.0	39.0	39.0	-0.0	-1.1	1.1	0.10	0.30
1,000.0	44.0	44.0	-0.0	-1.1	1.1	0.10	0.30
1,000.0	49.0	49.0	-0.0	-1.1	1.1	0.10	0.30
1,000.0	54.0	54.0	-0.0	-1.1	1.1	0.10	0.30
1,000.0	59.0	59.0	-0.0	-1.1	1.1	0.10	0.30
1,000.0	64.0	64.0	-0.0	-1.1	1.1	0.10	0.30
1,000.0	69.0	69.0	-0.0	-1.1	1.1	0.10	0.30
1,000.0	74.0	74.0	-0.0	-1.1	1.1	0.10	0.30
1,000.0	79.0	79.0	-0.0	-1.1	1.1	0.10	0.30
1,000.0	84.0	84.0	-0.0	-1.1	1.1	0.10	0.30
1,000.0	89.0	89.0	-0.0	-1.1	1.1	0.10	0.30
1,000.0	94.0	94.0	-0.0	-1.1	1.1	0.10	0.30
1,000.0	99.0	99.0	-0.0	-1.1	1.1	0.10	0.30
1,000.0	104.0	104.0	0.0	-1.1	1.1	0.10	0.30
1,000.0	109.0	109.0	0.0	-1.1	1.1	0.10	0.30
1,000.0	114.0	114.0	0.0	-1.1	1.1	0.10	0.30
1,000.0	137.0	137.0	0.0	-1.1	1.1	0.10	0.30
1,000.0	136.0	136.0	0.0	-1.1	1.1	0.10	0.30
1,000.0	135.0	135.0	0.0	-1.1	1.1	0.10	0.30
1,000.0	134.0	134.0	0.0	-1.1	1.1	0.10	0.30
1,000.0	129.0	129.0	0.0	-1.1	1.1	0.10	0.30

<sup>1</sup> PC not included

### Periodic Verification of Sound Calibrators

- Sound pressure level corrected for pressure, temperature and humidity.
- Short term stability expressed in dB (option).
- Output frequency in Hz.
- Total distortion in % (option).

### Calibration of Microphones

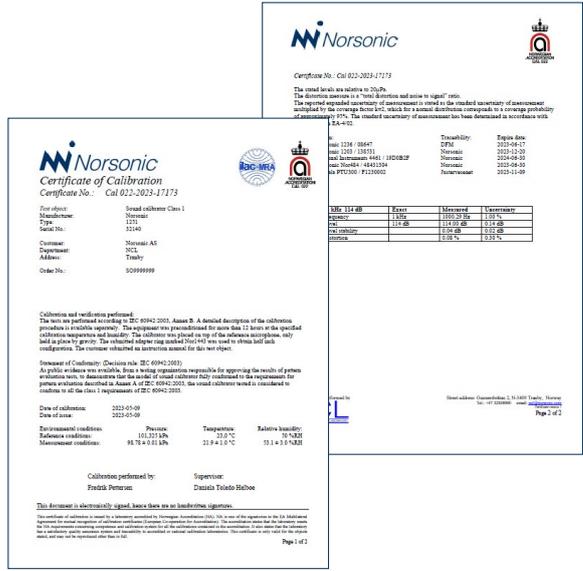
- Sensitivity of the microphone as mV/Pa and dB rel.1V/Pa.
- Frequency response using an electrostatic actuator in the frequency range 20 Hz - 80 kHz.
- Short test time using sine-sweep techniques for electrostatic actuator measurements. A typical calibration consisting of 3 repeated measurements takes less than 1 minute.

### Periodic Verification of Sound Level Meters

The Periodic Verification of Sound Level Meters can be performed in accordance with several national and international standards. This includes measurements of:

- Accuracy of input range selector
- Level linearity
- Spectral weighting networks A, B, C, Z, Lin and Flat
- F, S, and I time constants. Pulse measurement capability
- RMS detector capability
- Overload detector
- Inherent noise using microphone equivalent or acoustically insulated test vessel
- Integrating averaging functions Leq and SEL
- Noise dose
- 1/1 and 1/3 octave band filters (option)

The results from the microphone and instrument calibration may be combined to validate conformance with standards for a complete sound level meter.



### Uncertainties

The expanded uncertainties for calibrator and microphone measurements, are calculated as a combination of the uncertainty of the test system and the repeatability of the measurements. This includes the calculation of the standard deviations, degrees of freedom and coverage factor which are needed to estimate the 95% expanded uncertainty. A digital and personalized course on uncertainties and how to set up an uncertainty budget can be purchased as option.

### Traceability

Each system is delivered with a certificate of calibration with traceability to SI units. Recalibration can be performed by the user with the built-in self test features (requires voltmeter), or by the manufacturer.

The calibration system Nor1525 may be configured to suit specified applications and consists typically of:

- 24-bit DAQ board<sup>1</sup>
- Actuator chamber with reference microphone and insert voltage preamplifier
- Indoor environmental monitor
- Test unit Nor484 with microphone power supplies, amplifiers and filters
- Support while setting up the system

<sup>1</sup> PC required



 +47 32 85 89 00

 [info@norsonic.com](mailto:info@norsonic.com)

 Gunnersbråtan 2, N-3409 Tranby, Norway

 [norsonic.com](http://norsonic.com)