

# Airborne Sound Insulation

## with XL2-TA Sound Level Meter



**This application note describes the verification of the airborne sound insulation in buildings with the XL2-TA Sound Level Meter. All measurements are in accordance with the standard ISO16283-1, which replaces the corresponding parts of the older ISO140-4.**

The airborne sound insulation describes sound insulation between rooms. The sound insulation is calculated by combining multiple sound pressure level and reverb time measurements. The investigated frequency range is typically from 50 Hz to 5 kHz. The test results can be used to quantify, assess and compare the airborne sound insulation in unfurnished or furnished rooms. The measured airborne sound insulation is frequency-dependent and can be converted into a single number sound reduction index to characterize the acoustic performance.

This application note applies for rooms with a volume larger or equal than 25 m3. Special methods apply for smaller rooms as specified in ISO 16283-1.

Related standards:

ISO 16283-1	Describes the procedures for field measurements of sound insulation in buildings. (replaces the corresponding parts of ISO140-4)
ISO 717	Describes the rating of sound insulation in buildings
IEC 61672-1	Specifies the requirements for a class 1 sound level meter
IEC 61260	Specifies the requirements for octave-band and third-octave band filters
ISO 3382-2	Specifies the measurement of the RT60 reverberation time

### Instrument Configuration

The sound level meter shall meet the requirements of a class 1 instrument in accordance with the standard IEC 61672-1. The configuration of the dedicated NTi Audio sound pressure level measurement system consists of

- XL2-TA Sound Level Meter
- Optional Extended Acoustic Pack installed  
(required for the RT60 measurement in 1/3 octave resolution)
- Sound Insulation Option or an enabled Sound Insulation Reporter 365 annual subscription
- M2230 Measurement Microphone
- ASD Cable
- NTi Audio Precision Calibrator
- Tripod
- Omnidirectional Loudspeaker  
(uniform omnidirectional radiation is required)
- Sound Insulation Reporter Software



The sound pressure level measuring system shall be calibrated at intervals not exceeding two years.

### Required measurements

- Sound level in source room
- Sound level in receiving room
- Background noise level in receiving room
- Reverberation time RT60 in receiving room

At the beginning and at the end of each measurement day, the entire sound pressure level measuring system shall be checked with the precision calibrator. This shall meet the class 1 requirements in accordance with IEC 60942.



Wear hearing protection for all measurements!

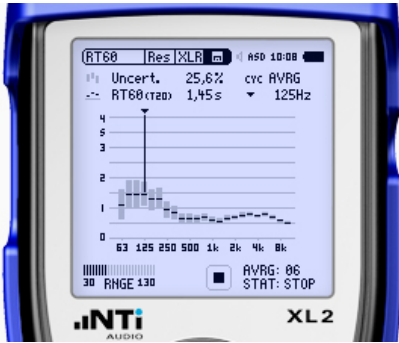








### 6. Measure Reverberation Time T in Receiving Room



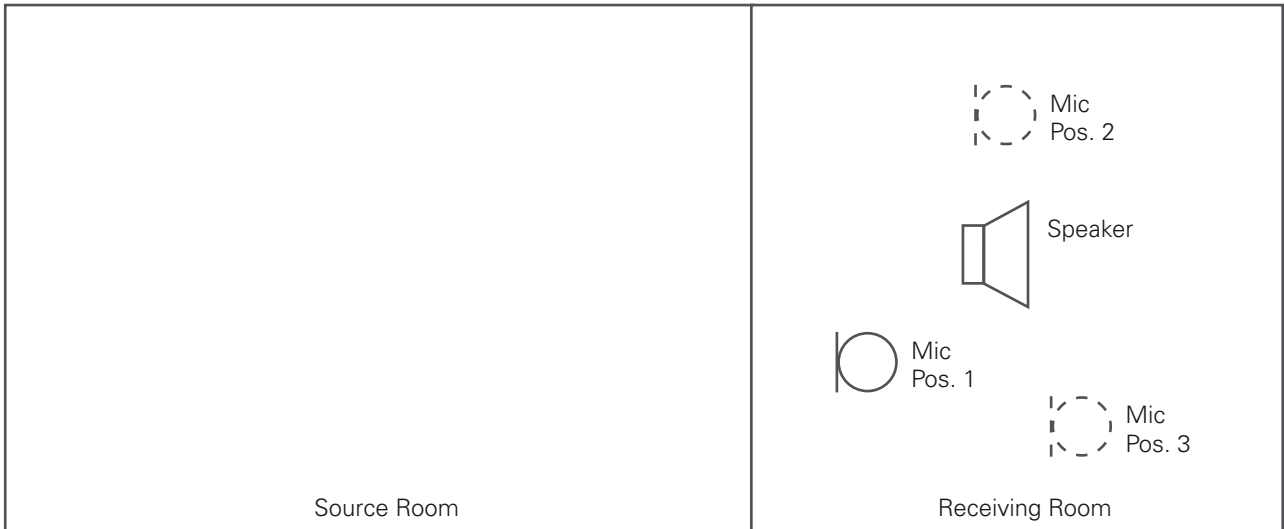
RT60 Reverb Time T in Receiving Room

#### Preparation

- Move the loudspeaker to center of the receiving room.
- Select three microphone positions from the positions used at the level measurements in the receiving room.
- Select the RT60 measurement function on XL2 Sound Level Meter.
- Select the 1/3 octave resolution.
- Use the Minirator MR-PRO and select the test signal gated pink noise. Guideline: The on/off-cycle time shall be longer than the expected reverberation time.

#### Measure T in Receiving Room

- Perform the RT60 measurement twice at each microphone position. In total you will get 6 readings.
- Store the individual readings on the XL2 for post calculation of the sound insulation.



Measure the reverberation time T in receiving room

## 7. Sound Insulation Reporter

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Verify and document all readings by using the Sound Insulation Reporter software. This is a PC-Software dedicated for building acoustics professionals.

You may load all measurement records into the software and generate the Airborne Sound Insulation report. The form calculates the level difference  $D_{w'}$ , the standardized level difference  $D_{nT,w'}$ , the normalized level difference  $D_{n,w}$  and the apparent sound reduction index  $R'_w$  based on the reference curve shifting method in accordance with the standard ISO 717-1.

The following calculations are used:

- $D = L1 - L2$
- $D_{nT} = D + 10 \lg (T/0.5)$
- $R' = D + 10 \lg (S/A)$
- $A = 0.16 * V / T$

with

- A Equivalent absorption area of the receiving room in m<sup>2</sup>
- D Level difference between source and receiving room
- $D_{nT}$  Standardized level difference (the level difference D is standardized to the 0.5 seconds reference value of the reverberation time in the receiving room)
- $D_{nT,w}$  Weighted standardized level difference (is the value of the reference curve at 500 Hz after shifting the reference curve)
- L1 Sound pressure level in the source room in dB
- L2 Sound pressure level in the receiving room in dB
- R' Apparent sound reduction index of field measurement
- $R'_w$  Weighted apparent sound reduction index (is the value of the reference curve at 500 Hz after shifting the reference curve)
- S Partition area in m<sup>2</sup> of the wall between source and receiving room
- T Reverberations time RT60 in receiving room
- V Volume of receiving room in m<sup>3</sup>

The following page shows a sample report.



**Standardized level difference measured in accordance with ISO 16283-1**  
**Field measurements of airborne sound insulation between rooms**

Client: Demo Date of test: 3/15/2016  
 Object: Partition from Sample Room 1 to Sample Room 2

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XL2 Sound Level Meter SNo. A2A-05850-E0, Microphone M4260 SNo. 3285  
 XL2 Sound Level Meter SNo. A2A-05850-E0, Microphone M2210 SNo. 1465  
 Area of common partition: 15 m<sup>2</sup>  
 Source room volume: 50 m<sup>3</sup>  
 Receiving room volume: 50 m<sup>3</sup>

Frequency f Hz	DnT 1/3 octave dB
50	31.2
63	38.5
80	32.3
100	30.3
125	38.3
160	41.2
200	39.4
250	39.9
315	40.0
400	41.3
500	42.1
630	45.6
800	49.2
1000	50.6
1250	51.5
1600	51.9
2000	47.7
2500	49.5
3150	51.6
4000	52.3 *
5000	50.9 *

\* 1.3 dB correction applied,  
value at the limit of measurement

Rating in accordance with ISO 717-1:  
 DnT,w(C;Ctr) = 48 (-1; -4) dB C<sub>50-3150</sub> = -1 dB; C<sub>50-5000</sub> = -1 dB; C<sub>100-5000</sub> = -1 dB  
 Evaluation based on field measurement using C<sub>tr,50-3150</sub> = -5 dB; C<sub>tr,50-5000</sub> = -5 dB; C<sub>tr,100-5000</sub> = -4 dB  
 results obtained by an engineering method:

No. of test report: 1234 Name of test institute:  
 Date: 12/1/2016 Signature: