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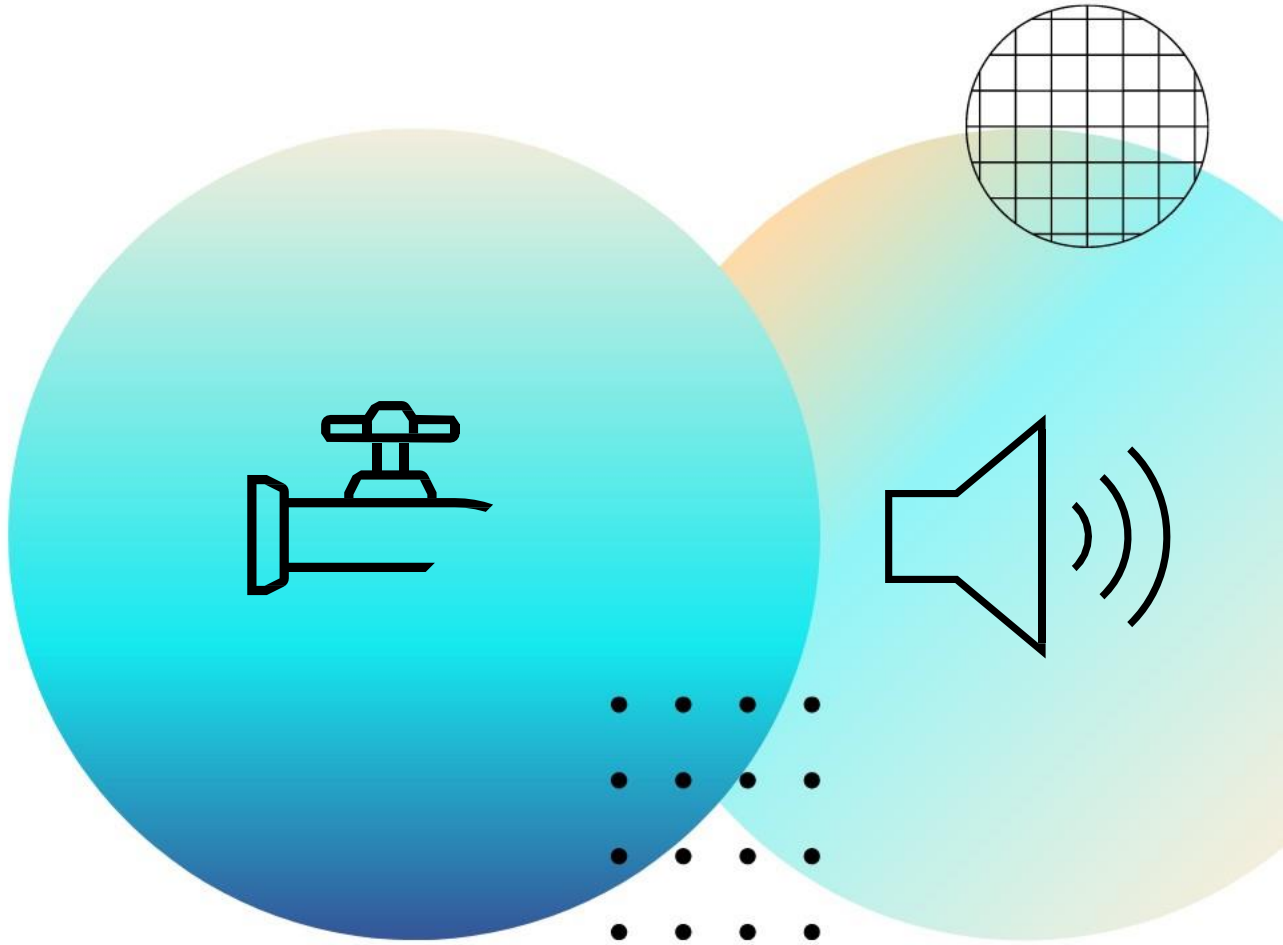
Acoustic Laboratory
Thailand

Laboratory Measurement for Appliances Noise

ISO3822



INTRODUCTION

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“Noise caused by water supply installations may lead to annoyance in adjacent rooms. This noise has its origin mainly in appliances.” ISO3822-1

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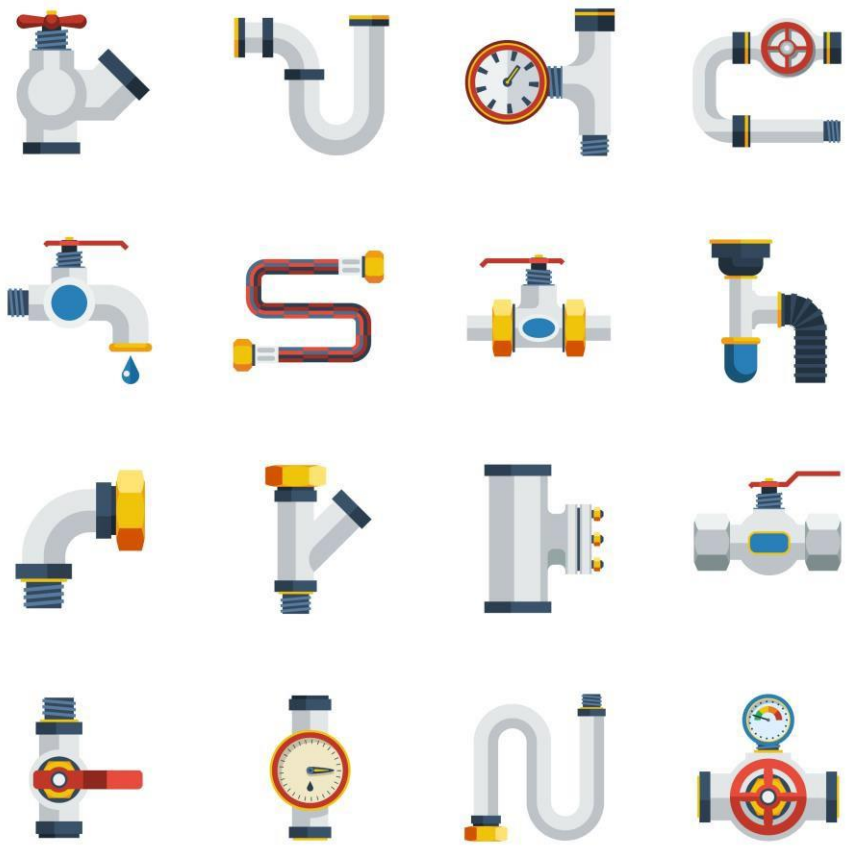


= "APPLIANCES"

TERMS AND DEFINITIONS

- L_{apn} : appliance sound pressure level, for octave bands

$$L_{\mathrm{apn}} = L_{\mathrm{n}} - \left(L_{\mathrm{sn}} - L_{\mathrm{srn}}\right)$$

L_n : the average octave band sound pressure level in octave n, in the test room, due to the noise produced by the appliance under the specified test conditions

L_{sn}: the corresponding octave band sound pressure level in the test room due to the noise produced by the installation noise standard (abbreviation INS) at a flow pressure of 0.3 Mpa

L_{srn} : the reference value of the octave band sound pressure level in the octave n for the INS at flow pressure of 0.3 Mpa

TERMS AND DEFINITIONS

- L_{ap} : appliance sound pressure level (applied with A-weighted)

$$L_{\mathrm{ap}} = 10 \lg \sum_{\mathrm{n}=1}^{6} 10 \frac{\left[L_{\mathrm{n}} - \left(L_{\mathrm{sn}} - L_{\mathrm{srn}}\right) + k(\mathrm{A})_{\mathrm{n}}\right]}{10}$$

$$L_{\mathrm{ap}} = L - \left(L_{\mathrm{s}} - L_{\mathrm{sr}}\right)$$

n = 1, 2, 3, ..., 6 are the octaves with mid-frequencies from 125 Hz to 4 000 Hz ;

k(A)n are the A-weighting values, in decibels, given in EN 60651 for the six octave mid-frequencies from 125 Hz to 4 000 Hz.

- If $L_{sn} - L_{srn} \leq \pm 2\ dB$ for all octave from 125 Hz to 4000 Hz, Lap can be determined from:

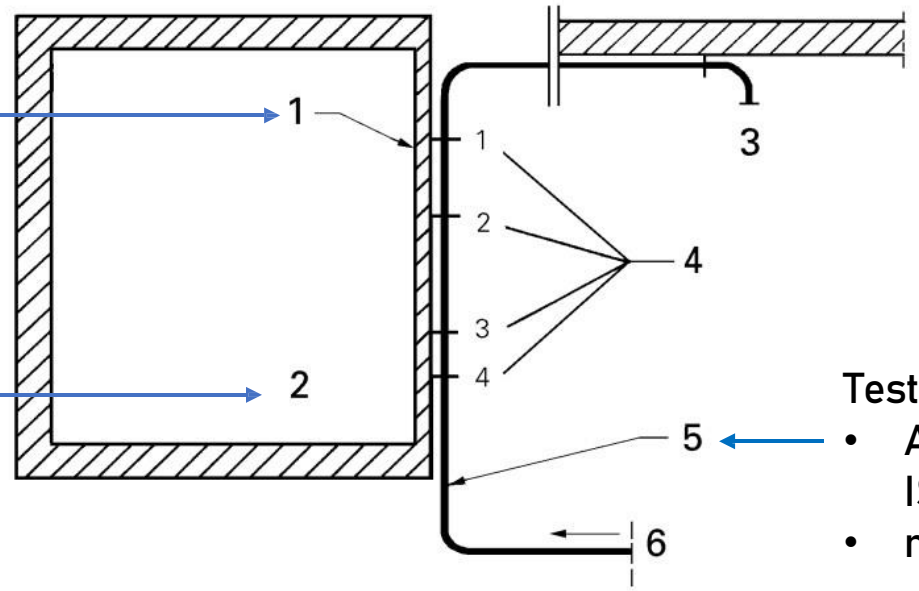
$$L_{\mathrm{ap}} = L - \left(L_{\mathrm{s}} - L_{\mathrm{sr}}\right)$$

L: the average A-weighted sound pressure level in the test room due to the noise produced by the appliance under the specified test conditions
L_s: the average A-weighted sound pressure level in the test room due to the noise produced by the INS at a flow pressure of 0.3 Mpa
L_{sr} : the reference A-weighted sound pressure level of the INS at a flow pressure of 0.3 MPa

TEST ARRANGEMENT

Test wall:
- 8 m² - 12 m²
- single wall of masonry or poured concrete with 100 kg/m² to 250 kg/m² weight

Test room:
- volume of at least 30 m³
- 50 m³ is the recommended volume
- RT between 1-5 s for 125Hz - 2000Hz



Legend

1 Test wall
2 Test room
3 Appliance connection
4 Fixing point 1 to 4
5 Test pipe
6 From the water supply system

Test pipe
- A galvanized steel tube with ISO 65
- nominal bore of 25 mm

MEASUREMENT OF APPLIANCE NOISE

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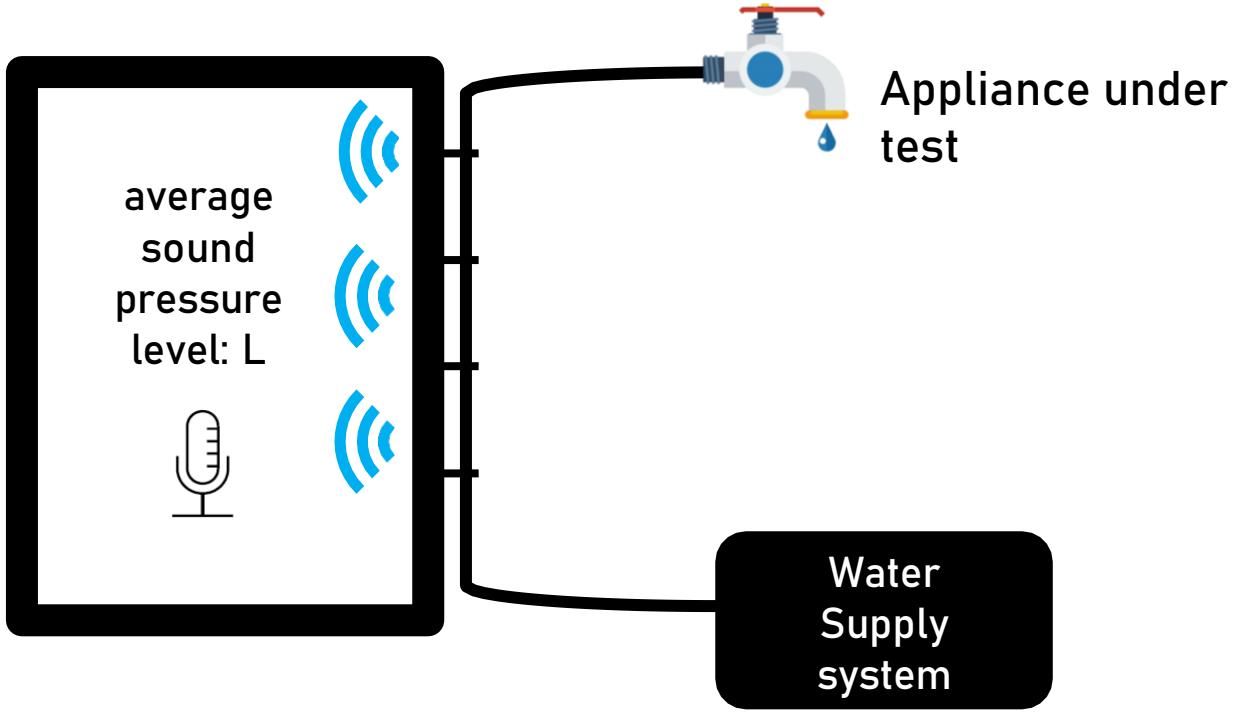

The sound generated by the appliance is transmitted from through the test wall.
The airborne sound radiated from the test wall into the test room is measured!

MEASUREMENT OF APPLIANCE NOISE

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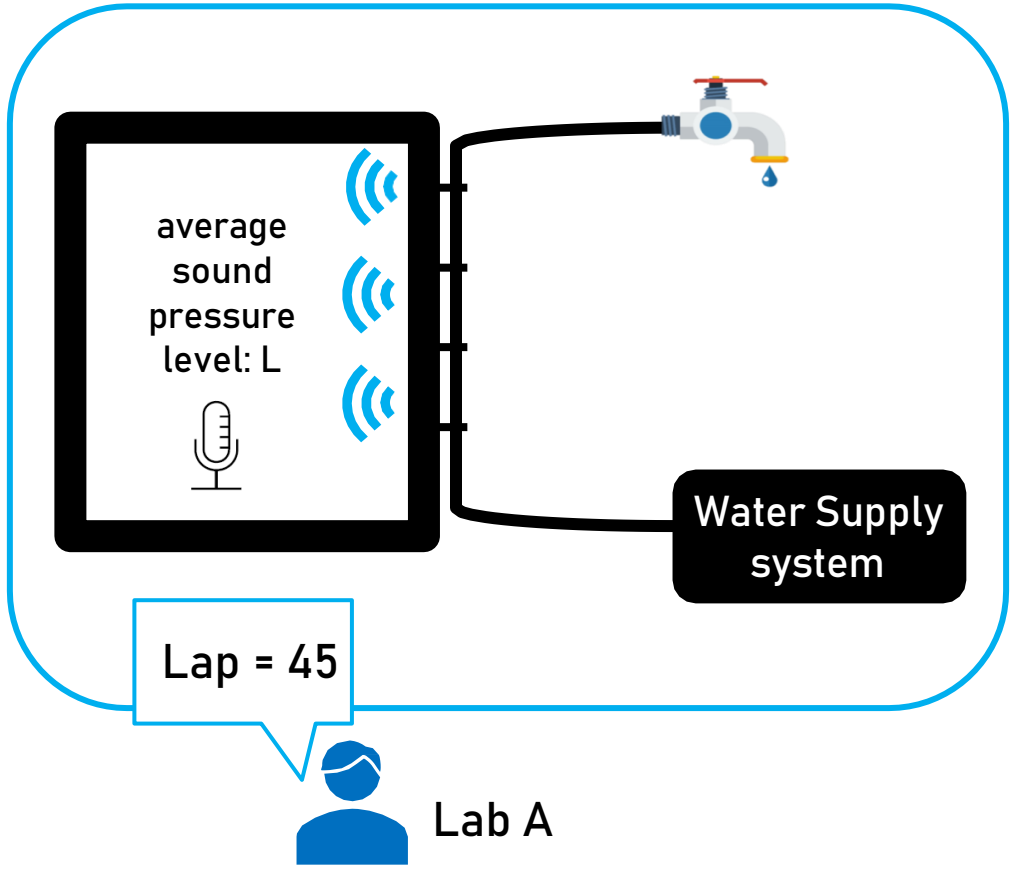
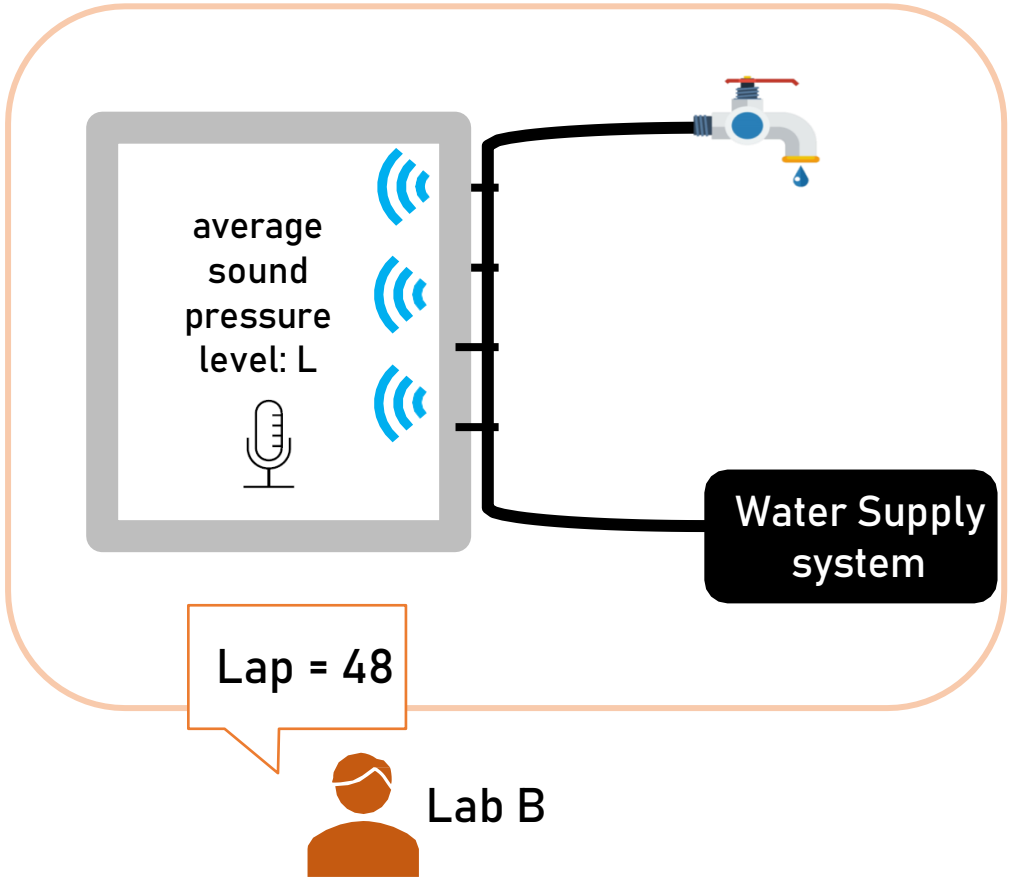




How do we know if Lap from different laboratory is all equal or how to compare them?
We need some reference measurement!

INSTALLATION NOISE STANDARD

- Measure the noise produced by the installation noise standard (INS) in each laboratory.
- The INS is mounted at the end of the test pipe in place of the appliance under test.

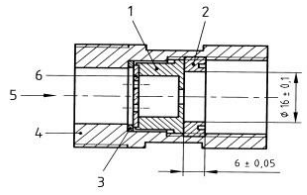


Figure 4a) - Assembly

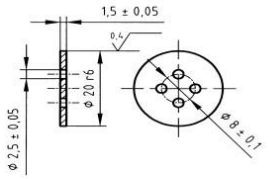


Figure 4b) – Diaphragm of insert

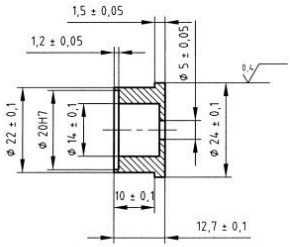
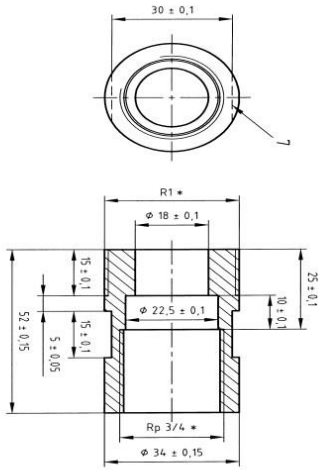
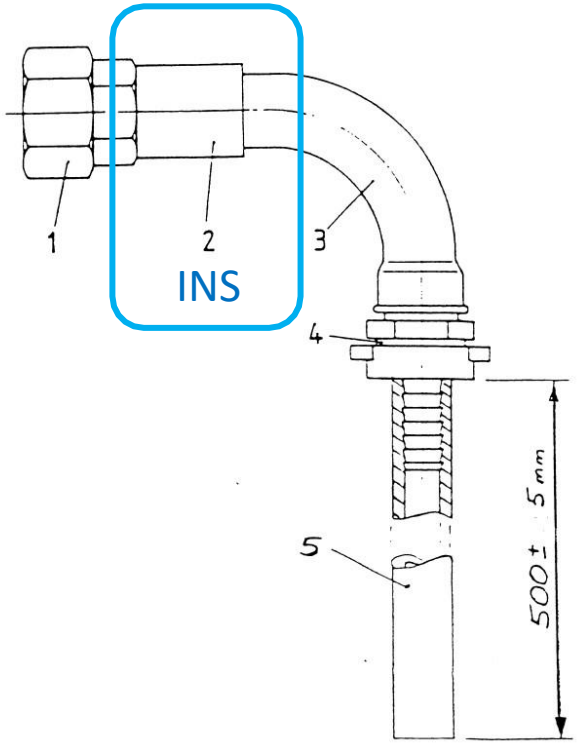


Figure 4c) – Body of insert



* See ISO 7-1

Figure 4d) - Receptacles



INSTALLATION NOISE STANDARD

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Compare the **measured INS level** in the lab to the **reference INS value**.

- For octave bands, L_{apn} :

$$L_{\mathrm{apn}} = L_{\mathrm{n}} - \left(L_{\mathrm{sn}} - L_{\mathrm{srn}}\right)$$

Table 1 - Reference values for the octave band sound pressure levels, L_{srn}, for the INS at a flow pressure of 0,3 MPa

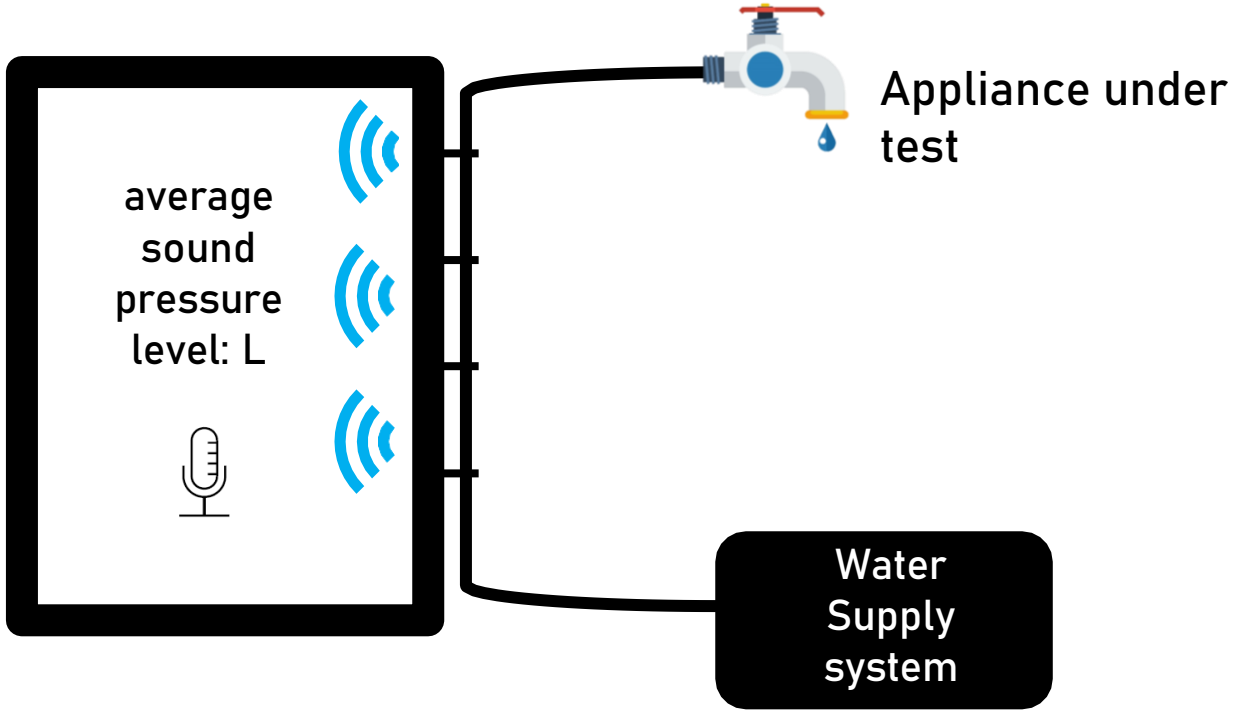
Mid-frequency of the octave band Hz	Reference octave band sound pressure level, L_{srn} dB
125	35
250	39
500	42
1 000	42
2 000	37
4 000	25

- For A-weighted, L_{ap} :

$$L_{\mathrm{ap}} = L - \left(L_{\mathrm{s}} - L_{\mathrm{sr}}\right)$$

L_{sr} at a flow pressure of 0.3 MPa is 45 dB

GETTING READY



1. Use “Fast” response for the sound level meter
2. Frequency range : 125 Hz – 4000 Hz with octave band
3. Prepare a Hydraulic measuring instrument, to make sure the water supply system is stable

MEASUREMENT WITH THE INS

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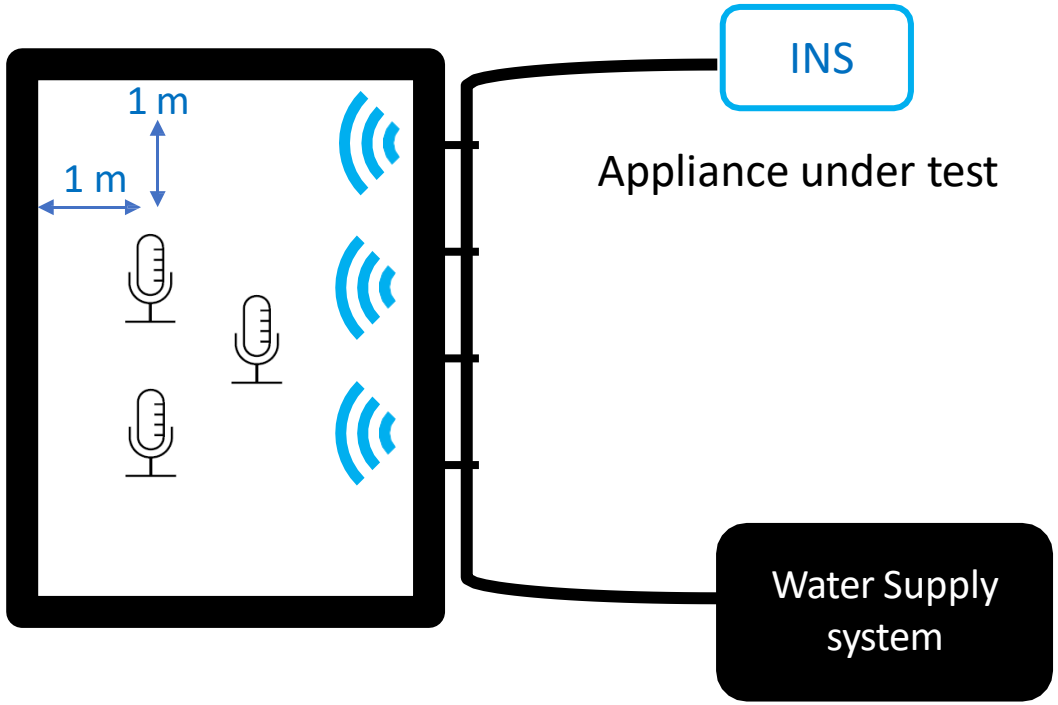
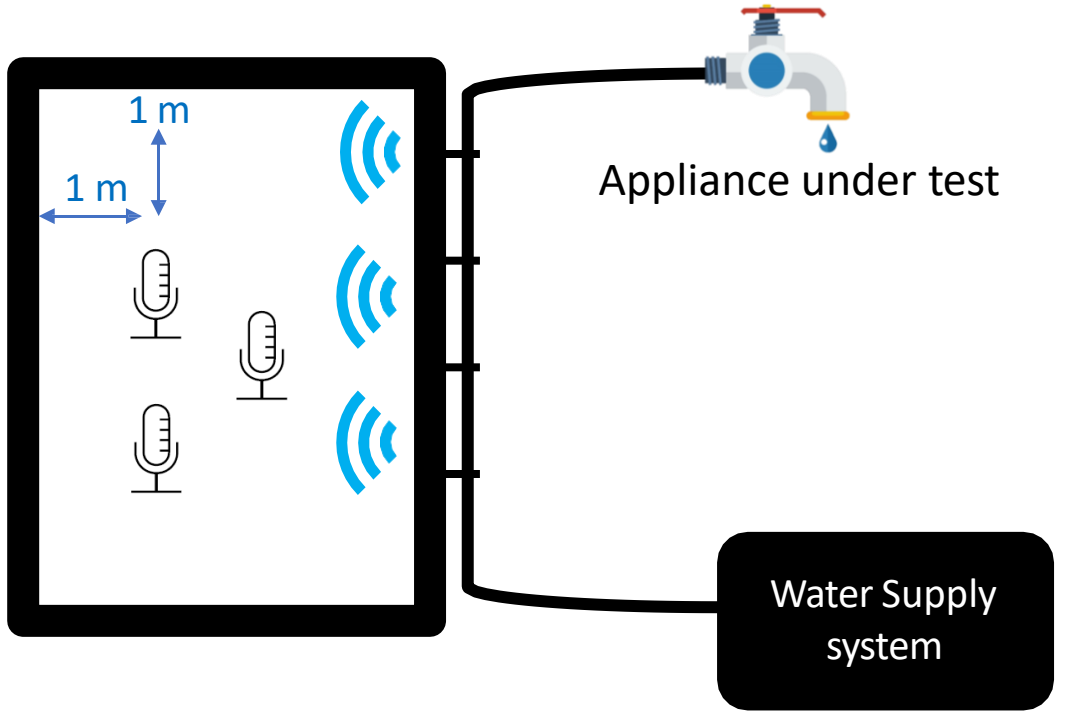
1. Screw the arrangement of the INS to the male union thread of the U11 union at the end of the right-hand branch of the twin outlet
2. Adjust the water pressure up to 0.3 Mpa
3. Measure INS of the right-hand twin outlet
4. Move INS to the left-hand branch of the twin outlet
5. Adjust the water pressure up to 0.3 Mpa
6. Measure INS of the right-hand twin outlet
7. Average mean-value for the Ls / Lsn



MEASUREMENTS WITH THE APPLIANCE TO BE TESTED

- At least three samples of appliances with the similar design should be measured
- More than one microphone position (no minimum number of mic position is stated).
- Measure the sound level several times until the L value stable (at least from 2 kHz – 4kHz)
- The microphone of the sound level meter shall be kept at least 1m from the boundary surfaces of the room



CORRECTION FOR BACKGROUND NOISE LEVEL

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- To ensure that the observations in the test room are not affected by the background noise.
- The background noise level shall be at least 6 dB (and preferably more than 15 dB) below the level of signal and background noise combined at each frequency band.
- If the difference in levels is smaller than 15 dB but greater than 6 dB, calculate corrections to the signal level:

$$L = 10 \log\left(\frac{10^{\frac{LSB}{10}}}{10^{\frac{LBG}{10}}} - 10 \right)$$

RATING VALUE

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1 Averaged maximum Lap values of the three samples

2 If the three maximum Lap deviates from the average value within ± 3 dB: Rating value = Average maximum Lap of the three sample

3 If the three maximum Lap deviates from the average value more than ± 3 dB: Rating value = The maximum Lap value of the loudest sample

REFERENCE

[1] ISO 3822-1, *Acoustics — Laboratory tests on noise emission from appliances and equipment used in water supply installations — Part 1: Method of measurement*

Other sub-parts of ISO 3822

ISO 3822-2, Acoustics - Laboratory tests on noise emission from appliances and equipment used in water supply installations - Part 2 : Mounting and operating conditions for draw-off taps and mixing valves

ISO 3822-3, Acoustics - Laboratory tests on noise emission from appliances and equipment used in water supply installations - Part 3 : Mounting and operating conditions for in-line valves and appliances

ISO 3822-4, Acoustics - Laboratory tests on noise emission from appliances and equipment used in water supply installations - Part 4 : Mounting and operating conditions for special appliances.

Related standards

ISO 7-1, Pipe threads where pressure-tight joints are made on the threads - Part 1 : Dimensions, tolerances and designation.

ISO 49, Malleable cast iron fittings threaded to ISO 7-1.

ISO 65, Carbon steel tubes suitable for screwing in accordance with ISO 7-1

Credit for illustration

Illustration of water supply system in building *"http://www.freepik.com" Designed by macrovector / Freepik*