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**Acoustics — Laboratory tests on noise  
emission from appliances and equipment  
used in water supply installations —**

**Part 1:  
Method of measurement**

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*Acoustique — Mesurage en laboratoire du bruit émis par les robinetteries  
et les équipements hydrauliques utilisés dans les installations de  
distribution d'eau —*

*Partie 1: Méthode de mesure*

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## Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 3822 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 3822-1 was prepared by the European Committee for Standardization (CEN) in collaboration with ISO Technical Committee TC 43, *Acoustics*, Subcommittee SC 2, *Building acoustics*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this standard, read "...this European Standard..." to mean "...this International Standard...".

This third edition cancels and replaces the second edition (ISO 3822-1:1983), which has been technically revised.

ISO 3822 consists of the following parts, under the general title *Acoustics — Laboratory tests on noise emission from appliances and equipment used in water supply installations*.

- Part 1: Method of measurement
- Part 2: Mounting and operating conditions for draw-off taps and mixing valves
- Part 3: Mounting and operating conditions for in-line valves and appliances
- Part 4: Mounting and operating conditions for special appliances

Annex C forms a normative part of this part of ISO 3822. Annexes A and B are for information only.

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## Foreword

The text of EN ISO 3822-1:1999 has been prepared by Technical Committee CEN/TC 126 "Acoustic properties of building products and of buildings", the secretariat of which is held by AFNOR, in collaboration with Technical Committee ISO/TC 43 "Acoustics".

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 1999, and conflicting national standards shall be withdrawn at the latest by November 1999.

The content of this part of EN 3822 is not identical with the International Standard ISO 3822-1:1983 "Acoustics - Laboratory tests on noise emission from appliances and equipment used in water supply installations - Part 1 : Method of measurement".

Working group CEN/TC 126/WG 3 was instructed, in May 88, to examine and take into account the comments on ISO 3822-1, following the primary questionnaire.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this document : Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

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## Introduction

Noise caused by water supply installations may lead to annoyance in adjacent rooms, for example in dwellings, hospitals and hotels, especially at night. This noise has its origin mainly in appliances. Standardised measurements of such noise are needed to permit comparison of the noise of commercial products made in different countries.

This part of EN ISO 3822 describes a method of measurement allowing comparable results to be obtained in laboratory measurements.

It is not possible to describe in detail how a given tap would give the same result in different laboratories. Therefore, the principle of comparing results to an installation noise standard is utilised. This procedure can be regarded as a kind of calibration of the test arrangement. The installation noise standard is described in detail and the basic arrangements for a laboratory water supply installation are given in this part of EN ISO 3822.

The test conditions described herein constitute the standard reference conditions essential for comparisons between laboratories.

Descriptions of the mounting and operating conditions for testing different types of appliances are given in other parts of this European Standard : see EN ISO 3822-2 for draw-off taps and mixing valves, EN ISO 3822-3 for in-line valves and EN ISO 3822-4 for special appliances.

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## 1 Scope

This part of EN ISO 3822 specifies a method of measurement, in the laboratory, of the noise emission resulting from the flow of water through appliances and equipment used in water supply installations.

The items covered include draw-off taps, in-line valves and special appliances, for example pressure reducers and water-heating appliances, all of which are hereafter referred to as "appliances".

The method specified makes it possible to obtain comparable results of measurements in different laboratories.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

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.*

EN 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 3822-2: 1995).*

EN 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 3822-3:1997).*

EN 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.*

EN 60651, *Sound level meters.*

EN 61260, *Electroacoustics - Octave band and fractional-octave-band filters.*

## 3 Definitions

For the purposes of this standard the following definitions apply :

### 3.1

#### **octave band sound pressure level, in decibels**

the unweighted sound pressure level in the frequency band of one octave. In this part of EN ISO 3822 octave band sound pressure levels and sound pressure level differences are denoted by the subscript n.

### 3.2

#### **a-weighted sound pressure level, in decibels**

the sound pressure level weighted with the A-weighting specified in EN 60651

**3.3 appliance sound pressure level,  $L_{apn}$  for octave bands**

a quantity defined by :

$$L_{apn} = L_n - (L_{sn} - L_{srn}) \tag{1}$$

where

- $L_n$  is 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 ;
- $L_{sn}$  is 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 <sup>1)</sup> (see clause 7) ;
- $L_{srn}$  is the reference value of the octave band sound pressure level in the octave  $n$  for the INS at flow pressure of 0,3 MPa (see clause 7).

**3.4 appliance sound pressure level,  $L_{ap}$  in decibels**

the A-weighted sound pressure level, which is a characteristic value for the noise emission by an appliance. It is defined, in decibels, by :

$$L_{ap} = 10 \lg \sum_{n=1}^6 10^{\frac{[L_n - (L_{sn} - L_{srn}) + k(A)_n]}{10}} \text{ dB} \tag{2}$$

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where

- $n = 1, 2, 3, \dots, 6$  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.

When the sound pressure level difference ( $L_{sn} - L_{srn}$ ) at the octave band mid-frequencies from 125 Hz to 4 000 Hz is constant to within  $\pm 2$  dB (see clause 8), the appliance sound pressure level  $L_{ap}$  may be obtained directly from the A-weighted sound pressure levels as follows :

$$L_{ap} = L - (L_s - L_{sr}) \tag{3}$$

where

- $L$  is the average A-weighted sound pressure level in the test room due to the noise produced by the appliance under the specified test conditions ;
- $L_s$  is 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 ;
- $L_{sr}$  is the reference A-weighted sound pressure level of the INS at a flow pressure of 0,3 MPa (see clause 7).

The appliance sound pressure level  $L_{ap}$  shall always be given rounded to the nearest whole decibel.

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<sup>1)</sup> 1 MPa = 10 bar



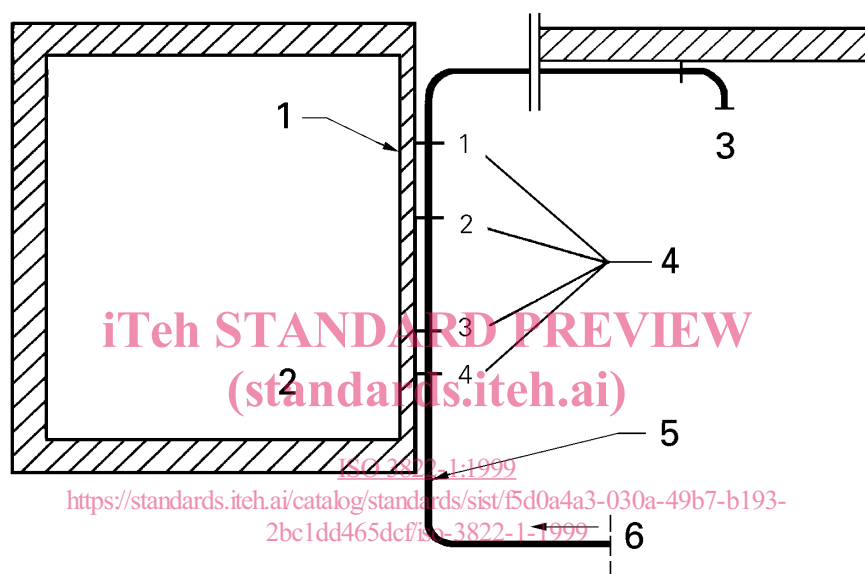
## 4 Principle

The appliance to be tested is mounted at the end of a water pipe, the test pipe, which is fixed to the wall of a room. The wall is called the test wall, the room the test room (see figure 1).

The sound generated by the appliance is transmitted from the test pipe to the test wall. The airborne sound which is radiated from the test wall into the test room is measured.

In order to obtain comparable measurements in different laboratories, the noise produced by the appliance is compared with the noise produced by an installation noise standard.

## 5 Test arrangement (see figure 1)



### 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

Figure 1 - Example of test arrangement

### 5.1 Test room

The test room shall have a volume of at least 30 m<sup>3</sup>. For new laboratories a volume of approximately 50 m<sup>3</sup> is recommended.

Two opposite surfaces of the test room shall not be less than 2,3 m apart.

In the test room, the reverberation time should be between 1 s and 5 s for the octave bands with mid-frequencies from 125 Hz to 2 000 Hz.

The sound field in the test room should be as diffuse as possible.

## 5.2 Correction for background noise

Measurements of background noise levels shall be made to ensure that the measurements in the test room are not affected by extraneous sound such as noise from outside the test room, electrical noise in the receiving system, or structure born sound not originating from the appliance under test. The background level shall be at least 6 dB (and preferably more than 15 dB) below the level of signal and background noise combined.

If the difference in levels is smaller than 15 dB but greater than 6 dB, calculate corrections to the signal level according to the equation :

$$L = 10 \lg \left( 10^{L_{sb}/10} - 10^{L_b/10} \right) \text{dB} \quad (4)$$

where

$L$  is the adjusted signal level, in decibels ;

$L_{sb}$  is the level of signal and background noise combined, in decibels ;

$L_b$  is the background noise level, in decibels.

If the difference in levels is less than or equal to 6 dB in any of the frequency bands, use the correction 1,3 dB corresponding to a difference of 6 dB. In that case,  $L_{ap}$  shall be given in the test report so that it clearly appears that the reported  $L_{ap}$  values are the limit of measurement.

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## 5.3 Test wall

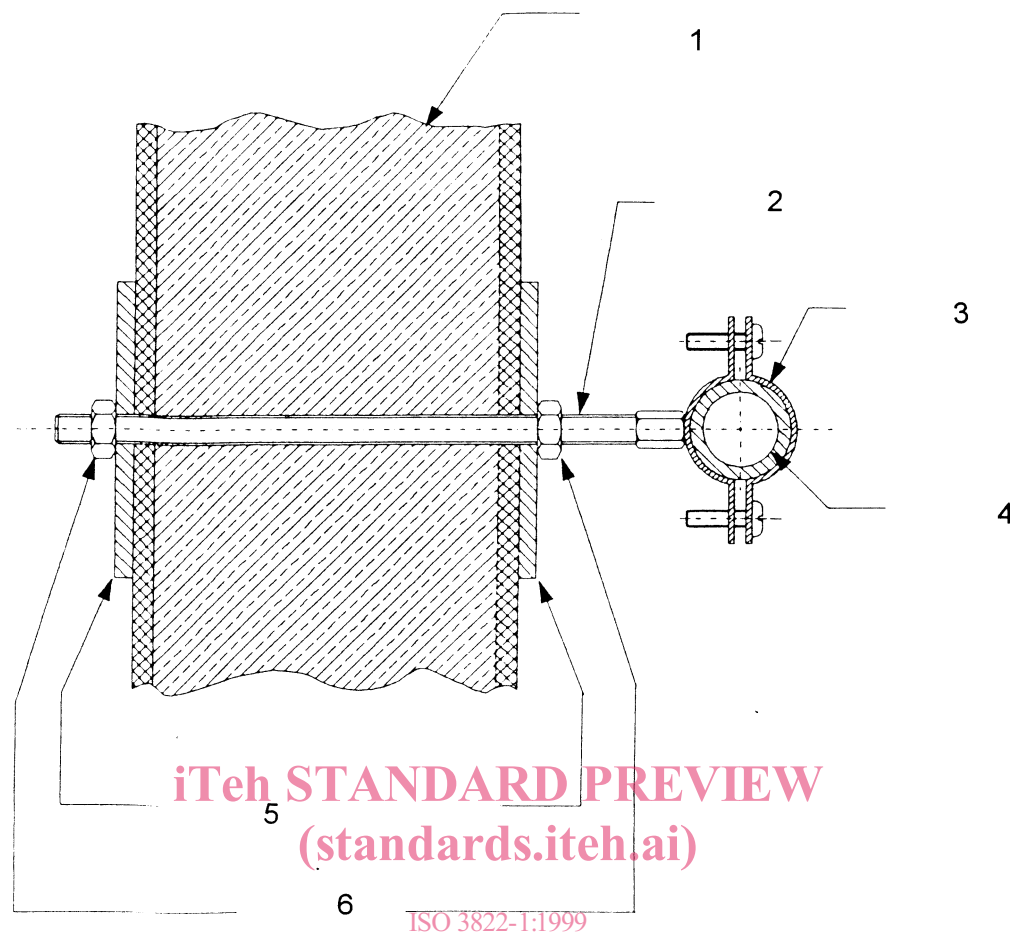
The test wall shall have an area of 8 m<sup>2</sup> to 12 m<sup>2</sup>.

It shall be a single wall of masonry or poured concrete and shall have a mass per unit area between 100 kg/m<sup>2</sup> and 250 kg/m<sup>2</sup>.

## 5.4 Test pipe

The test pipe shall be a galvanised steel tube of medium series complying with the requirements of ISO 65 with a nominal bore of 25 mm (1 inch).

The test pipe shall be fixed to the test wall outside the test room. It shall be mounted rigidly and durably, approximately in the middle of the wall, in a straight line, by means of four brackets, spaced unequally over approximately the whole length of the wall. The pipe shall be clamped rigidly in the brackets (without insulation). The brackets shall be in accordance with figure 2. There shall be no other connections between the test pipe and the test wall. The test pipe shall be accessible for periodic inspection of the mounting.



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### Legend

- 1 Test wall
- 2 Metal stud M10
- 3 Metal clamp with welding nut, galvanized, without insulation
- 4 Test pipe
- 5 Steel plate ( $6 \pm 1$ ) mm thick; area  $(100 \pm 20)$  cm<sup>2</sup>
- 6 Nut M10

**Figure 2 - Bracket for mounting test pipe on the test wall**

It shall be possible to vent the test pipe at all high points, for example by using drain valves. It is recommended that the test pipe be mounted sloping slightly upwards in the direction of flow.

The test pipe shall include a twin outlet so that appliances with two inlets can be mounted. A galvanized (hot zinc dip coated) union, taper seat, ISO 49-U11-1, shall be provided at the downstream end of each branch of the twin outlet. Immediately adjacent to each of these unions there shall be a full-bore, quarter-turn spherical plug valve, size DN25, so that the test pipe can be kept under pressure at all times, even when the appliance is exchanged or to connect the installation noise standard. The ISO 49-U11-1 unions are regarded as the end of the test pipe. The length of test pipe between these unions and the first fixing on the test wall (see figure 1) shall be between 2 m and 10 m.

The twin outlet shall be in accordance with figure 3. Only galvanized fittings complying with ISO 49 shall be used. The straight portions of the two main branches shall be of galvanized steel tube of medium series complying with ISO 65 with a nominal bore of 25 mm (1 inch). They shall be arranged for either vertically upward or vertically downward flow. Upstream of the division into the two branches of the twin outlet there shall be a branch for connecting a pressure gauge (see figure 3). The sensing unit for measuring the pressure shall be attached directly,