



# SLOVENSKI STANDARD

## SIST EN 15036-1:2007

01-februar-2007

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### Kotli za gretje – Postopek preskušanja emisije hrupa po zraku iz generatorjev toplote – 1. del: Emisija hrupa po zraku iz generatorja toplote

Heating boilers - Test regulations for airborne noise emissions from heat generators - Part 1: Airborne noise emissions from heat generators

Heizkessel - Prüfverfahren für Luftschallemissionen von Wärmeerzeugern - Teil 1: Luftschallemissionen von Wärmeerzeugern

Chaudières de chauffage - Règles d'essais des émissions de bruit aérien des générateurs de chaleur - Partie 1 : Emissions du bruit aérien des générateurs de chaleur

**Ta slovenski standard je istoveten z: EN 15036-1:2006**

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17.140.20	Emisija hrupa naprav in opreme	Noise emitted by machines and equipment
91.140.10	Sistemi centralnega ogrevanja	Central heating systems

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NORME EUROPÉENNE  
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English Version

## Heating boilers - Test regulations for airborne noise emissions from heat generators - Part 1: Airborne noise emissions from heat generators

Chaudières de chauffage - Règles d'essais des émissions de bruit aérien des générateurs de chaleur - Partie 1 : Émissions du bruit aérien des générateurs de chaleur

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This European Standard was approved by CEN on 14 August 2006.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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**EN 15036-1:2006 (E)****Foreword**

This document (EN 15036-1:2006) has been prepared by Technical Committee CEN/TC 57 “Central heating boilers”, the secretariat of which is held by DIN.

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 March 2007, and conflicting national standards shall be withdrawn at the latest by March 2007.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard : Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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## Introduction

Generally speaking, determining the airborne noise emissions is only part of a comprehensive testing programme which takes into account many different viewpoints relating to the characteristics and behaviour in using a heat generator. It is therefore important that the requirements for noise tests, such as the measuring equipment and the environment in which it is used should always be considered within the prescribed context.

It is also important whatever the ultimate purpose may be, to lay down procedures within a defined degree of accuracy, so that the measuring results obtained from various different laboratories can be compared with one another. These conditions have been taken into account as far as possible in preparing these test methods. All test procedures defined in EN ISO 3741, EN ISO 3743, EN ISO 3744, EN ISO 3746 and EN ISO 9614 are permissible methods.

It should be emphasised that these test methods only apply to airborne noise. In many cases, however, structure-borne noise, such as can be transmitted into a neighbouring room, can also be of significance. It is envisaged that airborne noise emissions through the flue gas path will be dealt with in a separate part of this standard.

All the basic and noise measurement standards of accuracy categories 1 to 3 are permissible under this testing standard.

Sound values declared by the manufacturer can be measured according to these three categories, but in any case, the used category has to be stated.

This European Standard sets out various methods for testing to approximate the airborne noise emitted by heat generators into the room of installation.

**EN 15036-1:2006 (E)****1 Scope**

This European Standard specifies test methods for airborne noise emissions from heat generators in a test laboratory or at the place of installation.

The test methods described in this European Standard, however, may be used for measuring the airborne noise emissions of the appliances and functions listed below.

This European Standard applies to following appliances regardless of their heat output and the fuel used:

- wall-mounted and floor-standing heating appliances;
- forced-draught burners;
- boilers/forced-draught burner units;
- boilers with freely allocated forced-draught burners;
- pellet burners.

According to this European Standard the manufacturer is allowed to choose an appropriate category of testing for the measured appliance.

This European Standard does not apply to **(standards.iteh.ai)**

- appliances used exclusively for heating drinking-water;
- function of heating drinking-water in so-called combined water-heaters;
- heat generators which work with air as the heat transfer medium;
- electrical heating appliances;
- structure-borne noise;
- sound transmission along the flue gas path.

**2 Normative references**

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 267, *Forced draught oil burners — Definitions, requirements, testing, marking*

EN 437, *Test gases — Test pressures — Appliance categories*

EN 676, *Automatic forced draught burners for gaseous fuels*

EN ISO 3741, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Precision methods for reverberation rooms (ISO 3741:1999).*



EN ISO 3743-1:1995, *Acoustics — Determination of sound power levels of noise sources – Engineering methods for small, movable sources in reverberant fields — Part 1: Comparison method for hard-walled test rooms (ISO 3743-1:1994)*

EN ISO 3743-2:1996, *Acoustics - Determination of sound power levels of noise sources using sound pressure - Engineering methods for small, movable sources in reverberant fields - Part 2: Methods for special reverberation test rooms (ISO 3743-2:1994)*

EN ISO 3744:1995, *Acoustics - Determination of sound power levels of noise sources using sound pressure - Engineering method in an essentially free field over a reflecting plane (ISO 3744:1994)*

EN ISO 3745, *Acoustics - Determination of sound power levels of noise sources using sound pressure - Precision methods for anechoic and semi-anechoic rooms (ISO 3745:2003)*

EN ISO 3746:1995, *Acoustics - Determination of sound power levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane (ISO 3746:1995)*

EN ISO 9614-1:1995, *Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 1: Measurements at discrete points (ISO 9614-1:1993)*

EN ISO 9614-2:1996, *Acoustics — Determination of the sound power levels of noise sources using sound intensity — Part 2: Measurements by scanning (ISO 9614-2:1996)*

EN ISO 9614-3:2002, *Acoustics — Determination of the sound power levels of noise sources using sound intensity — Part 3: Precision method for measurement by scanning (ISO 9614-3:2002)*

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### 3 Terms and definitions (standards.iteh.ai)

For the purposes of this standard, the terms and definitions given in EN ISO 3743-1:1995, EN ISO 3743-2:1996, EN ISO 3744:1995, EN ISO 3746:1995, EN ISO 9614-1:1995, EN ISO 9614-2:1996 and EN ISO 9614-3:2002 and the following apply:

#### 3.1

##### heat generator

device suitable for the combustion of liquid, gaseous and solid fuels

## 4 Determining sound power levels

### 4.1 General data

The sound power  $W$ , of a noise source is the total sound energy radiated by that source per second, expressed in Watts (W). The sound power  $W$ , is customarily related to a reference sound power  $W_0$  and expressed as a sound power level  $L_W$  in decibels (dB) according to equation (1):

$$L_W = 10 \cdot \log \frac{W}{W_0} \quad (1)$$

where

$W_0$  is the reference sound power level of 1 pW (=  $10^{-12}$  W).

**EN 15036-1:2006 (E)**

The main criteria for determining the choice of sound power level for the purpose of labelling the noise emission are:

- a) sound power level shall provide an adequate description of the noise emission and is independent of environmental factors;
- b) it shall be possible to determine the sound power level to a defined degree of accuracy from relatively simple acoustic tests which can be carried out under a large number of defined acoustic conditions.

These test methods describe the objective procedure for determining the sound power level of airborne noise,  $L_W$ .

The following sound power levels can be determined:

- A-weighted sound power level  $L_{WA}$ ;
- sound power level in octave bands,  $L_{WOct}$ . Tests shall be carried out on a frequency band covering at least an octave band from 125 Hz to 4000 Hz;
- sound power level in third bands,  $L_{WThird}$ . Tests shall be carried out on a frequency band covering at least third-octave bands from 100 Hz to 5000 Hz.

For practical use,  $L_{WA}$  test-stand measurements are sufficient for calculating the A-weighted sound power level.

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**4.2 Test method****4.2.1 Measurement approach**

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To determine sound power level, there are three basic procedures. These are:

- Conversion of sound pressure level measured into a reverberant field to sound power level. This approach is described in EN ISO 3741 and EN ISO 3743-1 and EN ISO 3743-2.
- Conversion of sound pressure level measured into a free-field (or assimilated to a free-field) according to EN ISO 3744, EN ISO 3745 and EN ISO 3746.
- Conversion of intensity field emitted around the appliance to sound power level. This approach is described in EN ISO 9614-1, EN ISO 9614-2 and EN ISO 9614-3.

**4.2.2 Uncertainty of test**

Within each measurement approach in 4.2.1, different methods are described by specific standards in order to reach different levels of accuracy on the final results. These accuracy levels are the following (from the best to the worst accuracy):

- Category 1 describes the precision class;
- Category 2 describes the engineering class;
- Category 3 describes the survey class.

NOTE 1 For instance, using a free-field approach, the three relevant standards are EN ISO 3745 (Category 1), EN ISO 3744 (Category 2) and EN ISO 3746 (Category 3). If the experimental approach is similar (measure of average sound pressure level on a fictitious area including the appliance), test requirements are different depending on the targeted level of accuracy (number of points, difference between background and appliance noise, test environment correction, etc.).

NOTE 2 Depending on the accuracy category, the available information is different. Survey methods do not provide spectral data.

According to accuracy categories, standard deviations on A-weighted are provided in Table 1.

**Table 1 - Standard deviations on A-weighted overall sound power level according to accuracy categories of standards**

	Precision class	Engineering class	Survey class
Standard deviation $\sigma_R$ dB	1	1,5	4

These standard deviations relate to a relatively flat spectrum.

In case of tonal noise, standard deviation of the survey method is increased by 1 dB.

In the hypothesis of a normal distribution of sound power level values, the probability that the correct value of the sound power level of the appliance falls within a  $\pm 1,645 \sigma_R$  range, is 90 %. In addition, the probability that the correct value of sound power level of the appliance falls within a  $\pm 1,96 \sigma_R$  range, is 95 %.

NOTE 3 Precision and engineering standards provide a spectral standard deviation, thus, it is possible to determine relevant standard deviation on A-weighted overall level.

The manufacturer shall declare the category to be used.

It is recommended to use category 2, but if this is not possible, e.g. due to the back ground noise, environmental conditions, size of the appliance etc., then category 3 applies.

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#### 4.2.3 Selection of test methods

Table 2 summarises the main requirements for categories available to determine sound power level.

Table 2 –Summary of test procedures and measurement environment for determining sound power levels

	Sound pressure procedure				sound intensity procedure <sup>b</sup>	
	EN ISO 3743-1	EN ISO 3743-2	EN ISO 3744	EN ISO 3746	EN ISO 9614-1	EN ISO 9614-2
	Comparative procedure	Direct procedure				
<b>Accuracy category<sup>a</sup></b>	2	2	2	3	1, 2 or 3	2 or 3
<b>Test environment</b>	Room with reverberant walls	Special reverberation room	In a mainly free sound field over a reflecting plane	No special test environment	No special test environment	No special test environment
<b>Measuring equipment</b> a) Microphone b) Integrated sound level meter c) Band pass filter d) Calibrator e) Sound intensity probe f) Reference sound source	EN ISO 3743-1:1995 clause 5 a), b), c), d), f)	EN ISO 3743-2:1996 clause 5 a), b), c), d)	EN ISO 3744:1995 clause 5 a), b), c), d)	EN ISO 3746:1995 clause 5 a), b), c), d)	EN ISO 9614-1:1995 clause 6 d), e)	EN ISO 9614-2:1996 clause 6 d), e)
<b>Sound power level measurement which can be obtained</b>	A-weighted, in octaves	A-weighted, in octaves	A-weighted, in octaves, in third octaves	A-weighted	A-valued, in octaves, in thirds, band-limited	A-weighted, in octaves, in third octaves, band-limited
<b>Tests</b>	according to Annex B	according to Annex B	according to Annex A	according to Annex A	according to Annex C	according to Annex C
<sup>a</sup> See Table 1. <sup>b</sup> Not handled within this standard; only for information.						

#### 4.2.4 Operation

According to the test facility and operator knowledge, tests will be carried out according to one of the following annexes.

The use of each method according to category 2 is shortly described in:

- Annex A, free field method;
- Annex B, reverberant room method;
- Annex C, sound intensity method.

## 5 Set up and operation of the appliances

### 5.1 General

For measuring in a laboratory, the boiler shall be fixed to a wall/floor made of concrete or heavy masonry.

### 5.2 Equipment and preliminary treatment

Heat generators have to be equipped in the form in which they are delivered for the intended purpose or function.

Front-mounted forced-draught burners can be measured at the test flame tube as well, in accordance with EN 267 for forced-draught oil-fired burners or in accordance with EN 676 for forced-draught gas-fired burners or on a boiler. Noise coming from the front of the test flame tube where the burner is installed is taken into account.

It should be ensured that auxiliary equipment necessary for the operation of the heat generator or front-mounted forced-draught burners does not emit any sound energy in the measuring environment which could affect the results (see also Table A.1, "Limitation of background noise").

### 5.3 Climatic conditions

The heat generators or front-mounted forced-draught burners shall be tested in a test laboratory under the following climatic conditions (unless it has been designed specially for some other specific conditions):

- Temperature  $T$ :  $(20 \pm 5)$  °C;
- Relative atmospheric humidity  $RH$  between 15 % and 70 %;
- Atmospheric pressure  $p_s$  between 860 mbar and 1 060 mbar.

NOTE If measurements are to be taken on site, the ambient conditions should be stated in the report.

### 5.4 Operation of the appliance

The load and operating conditions of the equipment in static operation, in accordance with the manufacturer's installation and operating instructions, are decisive for determining its noise emissions.

The tests are taken at nominal output according to the relevant appliance standards and at the operating load at which the greatest noise is emitted, as declared by the manufacturer. The start-up and shut-down behaviour of the equipment and its operation for domestic hot-water, are ignored for these purposes.