SLOVENSKI STANDARD
SIST EN 12102:2014

01-januar-2014

Nadomešča:
SIST EN 12102:2008

Klimatske naprave, enote za tekočinsko hlajenje, toplotne črpalke in razvlaževalniki z električnimi kompresorji za ogrevanje ali hlajenje prostora - Merjenje hrupa v zraku - Določanje ravni zvočne moči

Air conditioners, liquid chilling packages, heat pumps and dehumidifiers with electrically driven compressors for space heating and cooling - Measurement of airborne noise - Determination of the sound power level

Klimageräte, Flüssigkeitskühlsätze, Wärmepumpen und Entfeuchter mit elektrisch angetriebenen Verdichtern zur Raumbeheizung und -kühlung - Messung der Luftschallemissionen - Bestimmung des Schallleistungspegels

Climatiseurs, groupes refroidisseurs de liquide, pompes à chaleur et déshumidificateurs avec compresseur entraîné par moteur électrique pour le chauffage et la réfrigération - Mesure de bruit aérien émis - Détermination du niveau de puissance acoustique

Ta slovenski standard je istoveten z: **EN 12102:2013**

ICS:

17.140.20	Emisija hrupa naprav in opreme	Noise emitted by machines and equipment
23.120	Zračniki. Vetrniki. Klimatske naprave	Ventilators. Fans. Air-conditioners
27.080	Toplotne črpalke	Heat pumps
91.140.30	Prezračevalni in klimatski sistemi	Ventilation and air-conditioning

SIST EN 12102:2014 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12102

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ICS 17.140.20; 27.080; 91.140.30

Supersedes EN 12102:2008

English Version

Air conditioners, liquid chilling packages, heat pumps and dehumidifiers with electrically driven compressors for space heating and cooling - Measurement of airborne noise - Determination of the sound power level

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This European Standard was approved by CEN on 30 May 2013.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (EN 12102:2013) has been prepared by Technical Committee CEN/TC 113 “Heat pumps and air conditioning units”, the secretariat of which is held by AENOR.

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 January 2014 and conflicting national standards shall be withdrawn at the latest by January 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12102:2008.

The main changes with respect to the previous edition are listed below:

a) the addition of a table containing the sound power levels to be recorded in the test report;

b) the addition of an Annex ZA relating to the Commission Regulation (EC) n°206/2012.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

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

1 Scope

This European Standard establishes requirements for determining, in accordance with a standardized procedure, the sound power level emitted into the surrounding air by air conditioners, heat pumps, liquid chilling packages with electrically driven compressors when used for space heating and/or cooling, including water cooled multisplit systems, as described in EN 14511 and dehumidifiers as described in EN 810.

This European Standard also covers the measurement of the sound power level of evaporatively-cooled condenser air conditioners, as defined in EN 15218. However, the measurement should be done without external water feeding and these units will thus be considered as the other air conditioners covered by EN 14511.

It is emphasised that this measurement standard only refers to airborne noise.

This European Standard offers ways to determine the sound power level of units. Some of them are specifically adapted to provide results with low uncertainties, by using laboratory class acoustic methods and highly controlled working conditions. Those measurements are suitable for certification, labelling and marking purposes.

In some cases, the target and/or the environment of the measurements do not allow such precision-class methods. This European Standard also offers ways to assess sound power levels with acceptable accuracy even though acoustic methods and/or working conditions are not laboratory-type, e.g. *in situ* or quality control measurements.

This European Standard gives two classes of measurements and results, according to the test environment:

— Class A measurements correspond to controlled working conditions (standard or application rating conditions). It is defined by the respect to the tolerances of Table 2 and should be used for the conformity to requirements of the Commission Regulation (EC) No 206/2012 of 6 March 2012 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for air conditioners;

— Class B measurements correspond to the case where the range defined by the tolerances of Table 2 cannot be fulfilled.

In both classes, precision or engineering class acoustic methods should be applied. The choice of the acoustic measurement method is done in accordance with EN ISO 3740 and EN ISO 9614 depending on the type of surrounding acoustic fields (diffuse or free field, enclosed or open space), and the available instrumentation. Whatever the current working conditions, the reference of acoustic standard should be reported, with explicit mention of its accuracy class.

The use of EN ISO 3746 and EN ISO 3747 as survey grade methods are not recommended due to the high level of uncertainties. Their use is only allowed for non controlled environments.

Three methods for determining the sound power levels are specified in order to avoid unduly restricting existing facilities and experience:

— the first methodology is based on reverberation room measurement (see EN ISO 3741, EN ISO 3743 and EN ISO 3747 in some favourable cases when the engineering grade can be fulfilled);

— the second method is based on measurements in an essentially free field over a reflecting plane (see EN ISO 3744 and EN ISO 3745);

— the third method is based on sound intensity measurement (see EN ISO 9614) in preferably free field environment.

The references in this European Standard to EN ISO 3743 should be understood as EN ISO 3743-1 or EN ISO 3743-2 as well.

The necessity to regulate the test conditions obviously leads to recommend test methods implemented in acoustically designed (enclosed) spaces, such as EN ISO 3741, EN ISO 3743, EN ISO 3745 and also EN ISO 9614 when implemented in an enclosed space.

The open spaces should be covered only in specific cases, e.g. when the size or the power of the unit under test cannot be managed by standard test rooms. Suitable test methods are EN ISO 3744 and EN ISO 9614.

NOTE Intensity measurement methods are quite robust and are well suited for tests to be done in environments without or with a light acoustic treatment (the better the acoustic treatment, the easier the implementation).

2 Normative references

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

EN 15218:2013, *Air conditioners and liquid chilling packages with evaporatively cooled condenser and with electrically driven compressors for space cooling - Terms, definitions, test conditions, test methods and requirements*

EN 810:1997, *Dehumidifiers with electrically driven compressors — Rating tests, marking, operational requirements and technical data sheet*

EN 14511-1:2013, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling — Part 1: Terms, definitions and classification*

EN 14511-2:2013, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling — Part 2: Test conditions*

EN 14511-3:2013, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling — Part 3: Test methods*

EN 14511-4:2013, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling — Part 4: Operating requirements, marking and instructions*

EN ISO 3740, *Acoustics — Determination of sound power levels of noise sources — Guidelines for the use of basic standards (ISO 3740)*

EN ISO 3741, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Precision methods for reverberation test rooms (ISO 3741)*

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

EN ISO 3743-2, *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)*

EN ISO 3744, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane (ISO 3744)*

EN ISO 3747, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering/survey methods for use in situ in a reverberant environment (ISO 3747)*

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

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

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

3 Terms, definitions and symbols

3.1 General

Terms, definitions and symbols of EN 14511:2013, EN 15218:2013 and EN 810:1997 apply.

The terms, definitions and symbols of the acoustic standards referred in Clause 2 apply.

The required value, sound power level, expressed in dB, is denoted by L_W, defined by:

$$Lw = 10 \cdot \log_{10}\left(W / W_o\right) \quad (1)$$

where W is the sound power and W_0 is the reference sound power = 1 pW (10^{-12} W)

3.2 Symbols

3.2.1 Non ducted units

The suffix "*i*" denotes the indoor side of units and "*o*" the outdoor ones.

L_{Wi} : sound power level radiated by the indoor side.

L_{Wo} : sound power level radiated by the outdoor side.

3.2.2 Ducted units

For ducted unit, the attended value is the sound power level travelling into the duct. It is assessed from the sound power level radiated by the air outlet opening of the duct, corrected by the "duct end correction" factor *E* (vori 6.2.2). The suffix "d" denotes the "in duct" sound power level.

L_{Wd} = sound power level travelling into the (discharge or suction) duct.

For the case of a ducted indoor side of a split unit:

L_{Wdi} = sound power level travelling into the (discharge or suction) duct of indoor unit.

For the case of a ducted unit on the outdoor side:

L_{Wdo} = sound power travelling into the (discharge or suction) duct of outdoor unit.

The sound radiated by the casing does not require any specific suffix. Use the same symbols as in 3.2.1 to specify which unit is concerned, indoor or outdoor side.

3.3 Standard operating conditions

The "standard operating conditions" shall be defined as the conditions for the operating points of the unit in accordance with the relevant parts of EN 14511 and EN 810. The definitions given in these European Standards also apply.

4 Measuring instruments

The instruments used for measuring and evaluation shall comply with the requirements of the standards appropriate to the test method used, from acoustic and capacity points of view.

To respect Class A measurements, the instruments necessary to control the working conditions shall fulfil the requirements of Table 1.

Table 1 — Uncertainties of measurement for indicated values

Measured quantity	Unit	Uncertainty of measurement
Liquid		
- temperature inlet/outlet	°C	± 0,3 K
- volume flow	m3/s	± 3 %
Air		
- dry bulb temperature	°C	± 0,5 K
- wet bulb temperature	°C	± 0,8 K
- static pressure difference	Pa	± 8 Pa ($\Delta p \leq 100$ Pa) ± 8 % ($\Delta p > 100$ Pa)
- volume flow	m³/s	± 10 %
Refrigerant		
- pressure at compressor outlet	kPa	± 3 %
- temperature	°C	± 1 K
Concentration		
- heat transfer medium	%	± 6 %
Electrical quantities		
- voltage	V	± 1 %
Rotation speed	min-1	± 1 %

Wet bulb temperature measurement involves the generation of air flow around a wet thermometer which may generate unwanted noise in the sound power measurement. It is then recommended to preferably determine relative humidity or dew point instead.

Suitable windshields are recommended to be fitted on microphones if they have to be affected by air velocity (above about 2 m/s) which may be produced by the appliance to be tested or by the laboratory facilities. Adjustment should be made to the measured sound pressure levels to compensate for any alteration in the sensitivity of shielded microphones. Above 10 m/s, windshields are usually not efficient enough and care shall

be taken to reduce the air velocity (by changing the location of microphones) or to change the type of windshields.

It is recommended to fit the intensity probes with windshields if they have to be affected by air velocity because they are much more sensitive to that parameter. For instance, the maximum air velocity admitted by EN ISO 9614-1 is 2 m/s.

5 Operation of the unit

NOTE The case of inverter devices is treated in Annex A.

As a general rule, the sound power level is dependent on the operating conditions of the unit. Sound measurements shall be carried out at the standard operating rating conditions.

The unit shall be installed and connected for the test as recommended by the manufacturer in its installation and operation manual according to EN 14511. The accessories provided by option (for example heating element) shall not be included in the test.

Steady state conditions of operation of the appliance are considered obtained and maintained when all the measured quantities remain constant, with respect of the tolerances given in Table 2.

The noise measurement shall be started no sooner than 30 min of operation under steady state conditions of the appliance.

These steady state conditions shall be maintained during the sound pressure (or intensity) measurements that may require from 30 s (multichannel analyzer) to sometimes several hours (free fieldmethods). This requires the continuous recording of the meaningful data.

The uncertainties of each measurement shall not exceed the values specified in Table 1.