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Meting van de geluidemissie van compressoren en vacuumpompen (praktijkmethode)

Measurement of noise emissions from compressors and vacuum pumps (engineering method)

september 1995
UDC 621.51/.52

Commentaar voor 1 januari 1996

De European Committee for Standardization (CEN), waarin de nationale normalisatie-instituten van 18 Europese landen samenwerken, heeft gepubliceerd het Europese normontwerp:

prEN 12076 Measurement of noise emissions from compressors and vacuum pumps (engineering method)

Definitief vastgestelde Europese normen zullen als Nederlandse norm gelden. Daarom wordt dit normontwerp in Nederland voor commentaar gepubliceerd. Op het ontwerp ingebracht commentaar zal aan de bevoegde normcommissie worden voorgelegd die hiermee rekening zal houden bij de bepaling van de Nederlandse stem. Indien er geen bezwaar bij het NNI wordt ingebracht, kan dat leiden tot ongewijzigd definitieve vaststelling van het ontwerp als norm.

Van Europese normen bestaan drie officiële versies: Engels, Frans, Duits. Voor Nederland zal de Engelse versie gelden, tenzij voor een geautoriseerde versie in het Nederlands wordt gekozen.

Normcommissie 341 036 "Lucht- en vacuümtechniek"

Prijsklasse 24

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DRAFT
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August 1995

ICS

Descriptors :

English version

Measurement of noise emission from compressors and vacuum pumps (engineering method)

Mesurage de l'émission sonore émise par les compresseurs et les pompes à vide (méthode d'expertise)

Messung der Geräuschemission von Kompressoren und Vakuumpumpen (Verfahren der Genauigkeitsklasse 2)

This draft European Standard is submitted to the CEN members for CEN enquiry. It has been drawn up by Technical Committee CEN/TC 232 .

If this draft becomes a European Standard, 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.

This draft European Standard was established by CEN 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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Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Ref. No. prEN 12076:1995 E

Measurement of Noise Emission from Compressors and Vacuum Pumps (Engineering method)

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Measurement of Noise Emission from Compressors and Vacuum Pumps (Engineering method)

Foreword

0. Introduction

This noise test code describes methods for determining and presenting the noise emission of compressors and vacuum pumps including, both the total noise emission expressed in sound power and the noise level, expressed in sound pressure, at the indicated position of the operator.

The measurement methods specified in this noise test code are based on ISO 3744, ISO 9614-1 and ISO/DIS 9614-2.

1. Scope

This noise test code specifies methods for measurement, determination and declaration of the noise emission from compressors and vacuum pumps:

a) measurement of the sound pressure level at the indicated position of the operator.

b) derivation of the noise emission expressed as the sound power level of the machine under specified load conditions.

This noise test code applies to stationary and portable compressors as specified in EN 1012-1, "Compressors - Safety" and vacuum pumps as specified in EN 1012-2 "Vacuum Pumps - Safety".

Note 1: The establishment of impulse noise levels is not addressed as these are not relevant to compressors and vacuum pumps.

2. Normative References

This noise test code incorporates by undated references, 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 noise test code only when incorporated in it by amendment or revision.

ISO 3744: 1994 — Acoustics - Determination of sound power levels of noise sources using sound pressure - Engineering method in an essentially free field over a reflecting plane.

ISO 9614-1 — Acoustics - Determination of sound power levels of noise sources using sound intensity measurements - Method of measurement at discrete points.

ISO/DIS 9614-2 March 1994 Acoustics - Determination of sound power levels of noise sources using sound intensity measurements by Scanning.

ISO/DIS 11201 March 1994 Acoustics - Noise emitted by machinery and equipment - Engineering method for the measurement of emission sound pressure levels at the work station.

ISO/DIS 11203 March 1994 Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at the work station and at other specified positions from the sound power level.

IEC 651 Specification for sound level meters

3. Definitions

For the purpose of this noise test code the following definitions apply.

3.1 compressor: a compressor is a machine which compresses air, gases or vapours to a pressure higher than the inlet pressure. A compressor comprises the bare compressor itself, the prime mover as well as any component which is necessary for safe operation as delivered.

3.2 vacuum pump: a vacuum pump is a device for creating, improving and/or maintaining a vacuum and comprises prime mover and components necessary for safe operation, as delivered.

3.3 declared noise emission value: the value of the declared A-weighted sound power level, L_{WAd}, the declared time-averaged A-weighted emission sound pressure level, L_{pAd}, or the declared C-weighted peak emission sound pressure level, $L_{pCpeakd}$. The declared value indicates the statistical upper limit below which the measured noise emission value of the individual equipment and/or a specified large proportion of the measured noise emission values of the batch of equipment are projected to lie when the machines are new. The value of L_d is rounded to the nearest decibel.

Note 1: The symbol used in this noise test code to represent declared noise emission values is *Ld*, and where this symbol is used it represents any of L_{WAd}, L_{pAd} or $L_{pCpeakd}$.

Note 2: The declared noise emission value L_d corresponds to L_c in ISO 7574.

3.4 emission: the sound radiated by a well-defined source (e.g. the machine under test).

Note: Emission descriptors may be incorporated in a product label and/or published in a product specification. The basic noise emission descriptors are the sound power level of the product itself and the emission sound pressure levels at the work station and at other specified positions in the vicinity of the product (if any).

3.5 emission sound pressure: the sound pressure, at a specified position near a sound source, when the source is in operation under specified operating and mounting conditions on a reflecting plane surface. In the absence of background noise and reflections from room surfaces other than the plane on which the machine under test is placed.

3.6 emission sound pressure level, *Lp*, in decibels: ten times the logarithm to the base 10 of the square of the emission sound pressure to the square of the reference sound pressure, measured with a particular time weighting and a particular frequency weighting, selected from those defined in IEC 651. The reference sound pressure is 20 μ Pa.

Note: Examples include:
- Maximum A-weighted emission sound pressure level with time weighting F: L_{pAmax}
- C-weighted peak emission sound pressure level: L_{pCpeak}

3.7 sound power, W, watts: the rate per unit time at which sound energy is radiated by a source.

3.8 sound power level, Lw, in decibels: ten times the logarithm to the base 10 of the ratio of the sound power radiated by the source under test to the reference sound power. The reference power is 1pW (1pW = 10^{-12} W)

Note: The frequency weighting or the width of the frequency band used shall be indicated, for example:
- A-weighted sound power level: L_{WA}.

3.9 partial sound power, P_i : time-averaged rate of flow of sound energy through an element (segment) of a measurement surface, given by:

$$P_i = \vec{I_i} \cdot \vec{S_i} = I_{ni} \cdot S_i$$

where

I_{ni} is the signed magnitude of the normal sound intensity component measured at position i on the measurement surface;

S_i is the area of the segment of the surface associated with point i.

3.10 surface sound pressure level, L_{pf}, in decibels: the energy average of the time average sound pressure levels at all the microphone positions on the measurement surface, with the background noise correction, K_1 (see clause 3.15 of ISO 3744) and the environmental correction, K_2 (see clause 3.16 of ISO 3744) applied.

4. Description of Machinery Family

The family of compressors and vacuum pumps comprises a range of models with similar acoustical properties which are based on related mechanical parts and technology.

5. Sound power level determination

5.1 Introduction

For the determination of the sound power level one of the following international standards shall be used as base method:
ISO 3744;

ISO 9614-1 or ISO/DIS 9614-2 the intensity methods are normally used for production checking and for the measurement of the noise emission from large machines in situ;

If the noise emission level of a compressor is determined in accordance with 79/113/EEC but used for other applications than on a construction site the value measured in accordance with 79/113/EEC may be used for compliance with the Machinery Directive.

5.2 Measurement according to ISO 3744

a. Value to be determined:
The sound power level, derived from sound pressure level, shall be given as the A-weighted value.

b. Test site:
The test site shall fulfil the requirements of clause 4 of ISO 3744. The environmental correction factor, K_2 and the correction factor, K_1, for background noise shall be determined. Environmental conditions shall be as specified in clause 7.5.1 in ISO 3744. Wind speed should not exceed 8 m/s during measurement.

c. Instrumentation:
Instrumentation shall be in accordance with clause 5 of ISO 3744.

Note: If a microphone wind screen is used a correction shall be made, if appropriate.

d. Selection of reference and measurement surfaces:
The reference surface of the compressor and vacuum pump under test is the surface of the smallest possible imaginary rectangular parallelepiped (box) that will enclose it, see Figure 1 below.

When defining the reference surface, small elements such as handles, drawbars and handrails protruding from the compressor or vacuum pump and which are unlikely to be major radiators of sound, may be disregarded. Mufflers and engine exhaust pipes are regarded as major noise sources. For examples see figures C1 - C3 in Annex C.

The measurement surface shall be a parallelepiped. The perpendicular distance, d, between the reference surface and the measurement surface shall be 1 m, as indicated as the preferred value in ISO 3744, clause 7.3.

The number and positions of microphones shall be in accordance with 5.2 e, Table 1.

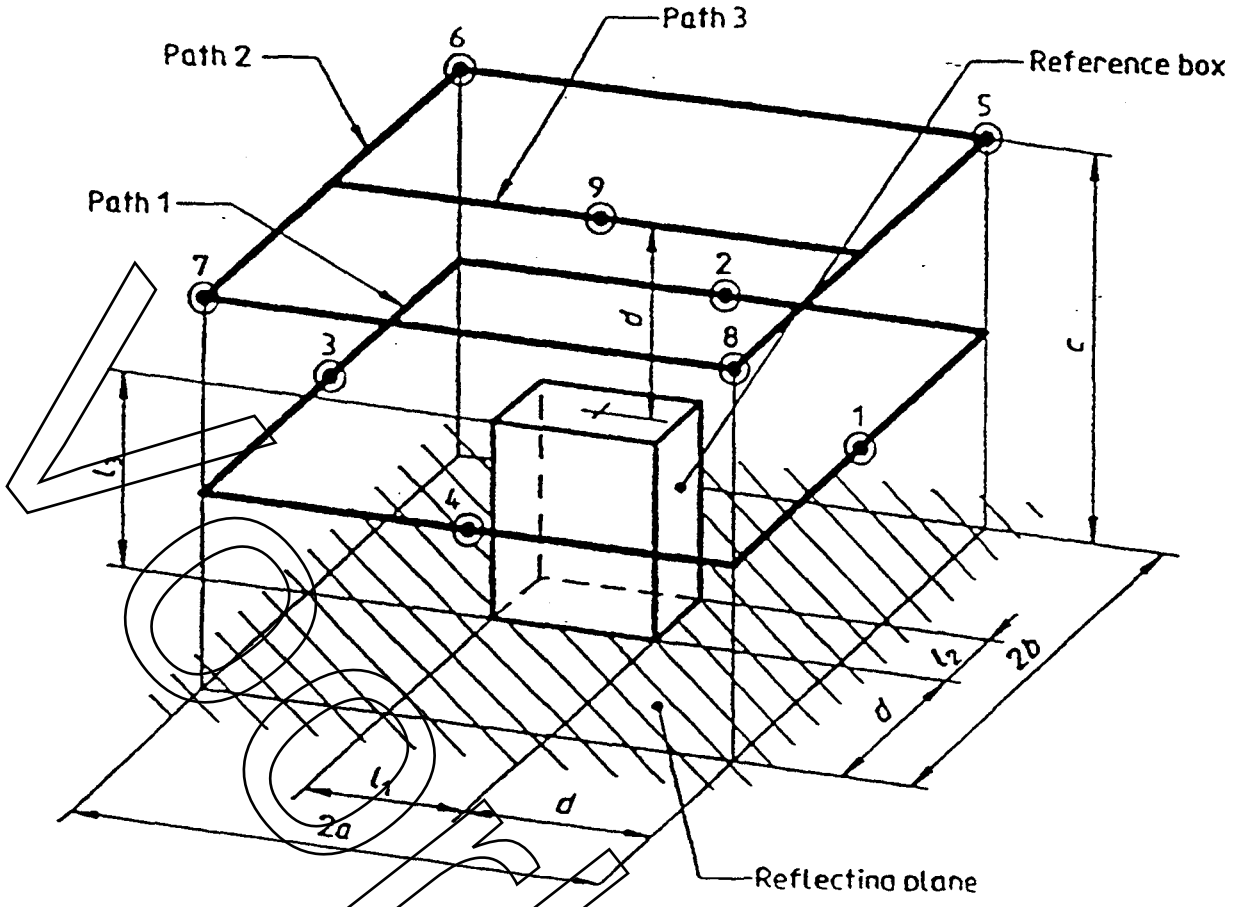

Figure 1. Reference and measurement surface and microphone array

e. Microphone positions:

Major reference surface dimension metres	Number of microphones	Microphone positions
≥ 1.5	5	1 to 5 See Figure 1
> 1.5 ≤ 4	9	1 to 9 See Figure 1
> 4	≥ 9 See ISO 3744 Clause 7.3.2	See ISO3744 Clause 7.3.2

Table 1.

f. Measurements:

Measurements shall be carried out in accordance with ISO 3744, clause 7.5.

g. Calculation of surface sound pressure level and sound power level:

The calculation of the surface sound pressure level and sound power level shall be made in accordance with ISO 3744, clause 8.

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