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Varnost strojev - Smernica za oblikovanje poglavij o hrupu v varnostnih standardih

Safety of machinery - Guidance for the drafting of the noise clauses of safety standards

Sicherheit von Maschinen - Anleitung für die Abfassung der Abschnitte über Geräusche in Sicherheitsnormen

Sécurité des machines - Guide (relatif à la rédaction des articles "bruit" des normes de sécurité)

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Safety of machinery - Guidance for the drafting of the noise clauses of safety standards

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This European Standard was approved by CEN on 21 December 1997.

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.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



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

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

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РЕПУБЛИКА БЪЛГАРИЯ
МИНИСТЕРСТВО НА ОБРАЗОВАНИЕТО И НАУКАТА
Училище "Св. Кирил и Методий" - Бургас
1800 Бургас
.....7018
СТАНДАРТИ И ТЕХНОЛОГИИ



SAFETY OF MACHINERY - GUIDANCE FOR THE DRAFTING OF THE NOISE CLAUSES OF SAFETY STANDARDS

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 211 "Acoustics", the secretariat of which is held by DS.

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of an identical text or by endorsement, at the latest by March 1999 and conflicting national standards shall be withdrawn at the latest by March 1999.

This European Standard has been prepared by Technical Committee CEN/TC 211 "Acoustics", the Secretariat of which is held by Denmark, as a guidance document to be used by CEN machinery Technical Committees as the basis for the preparation of the clauses concerning noise in their type C-Standards. "Guidance" is used, because the document is a general one and therefore may not be applicable in all details for a specific type of machinery.

This European Standard 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).

Several documents concerning noise referred to in this European Standard are at the moment at the stages of draft. The latest reference document numbers are given which makes it possible to obtain these documents from a national member body.

This European Standard also contains two annexes which are informative.

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

Introduction

For many machines, noise is a significant hazard, i.e. a hazard which an assessment carried out in accordance with EN 1050 has led to identify as being connected with one or more essential requirements decreed in annex I of the Machinery Directive and which requires a specific action on the part of the manufacturer or supplier (see 6.4.2 of EN 414:1992). The information contained in this European Standard is based on the following principles:

- a) noise reduction is an integral part of machinery safety, and
- b) machinery must be so designed and constructed that risks resulting from the emission of airborne noise are reduced to the lowest level taking account of technical progress and available means of reducing noise, in particular at source, and
- c) specific quantitative information on airborne noise emitted by machinery under specified operating and mounting conditions shall be given in accordance with the relevant noise test code, or, if no test code exists, under specified individual conditions.
- d) the noise clauses of type C-Standards shall deal with noise emission aspects including residual risk; but information on how the noise immission at the work station can be further reduced, including advice on personal protection equipment, may be helpful.

1 Scope

This European Standard gives guidance on how to deal with noise in type C-Standards where noise is identified as a significant hazard (see 4.5 of EN 292-1:1991). As such, this European Standard supplements the rules given in EN 414:1992.

The exact way that noise is dealt with for a particular type of machinery will depend on the structure of the type C-Standards and is the responsibility of the type C-Standard Technical Committees.

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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.

EN 292-1:1991	Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology.
EN 292-2:1991/ A1:1995	Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles and specifications.
EN 414:1992	Safety of machinery - Rules for the drafting and presentation of safety standards.
prEN ISO 3740	Acoustics - Determination of sound power levels of noise sources – Guidelines for the use of basic standards (ISO/DIS 3740:1998)
prEN ISO 3741	Acoustics – Determination of sound power levels of noise sources using sound pressure – precision methods for reverberation chambers (ISO/DIS 3741.2:1998)
EN ISO 3743-1	Determination of sound power levels of noise sources - Engineering methods for small, movable sources in reverberant fields. Part 1: Comparison method in hard-walled test rooms (ISO 3743-1:1994)

EN ISO 3743-2	Acoustics - Determination of sound power levels of noise sources - Engineering methods for small, movable sources in reverberant fields. Part 2: Methods for special reverberation test rooms (ISO 3743-2:1994)
EN ISO 3744	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 3746	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)
prEN ISO 3747	Acoustics - Determination of sound power levels of noise sources using sound pressure - Comparison method for use in situ (ISO/DIS 3747:1998)
EN ISO 4871	Acoustics - Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)
EN ISO 9614-1	Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 1: Measurement at discrete points (ISO 9614-1:1993)
EN ISO 9614-2	Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 2: Scanning method (ISO 9614-2:1996)
EN ISO 11200	Acoustics - Noise emitted by machinery and equipment - Guidelines for the use of basic standards for the determination of emission sound pressure levels at the work station and at other specified positions (ISO 11200:1995)
EN ISO 11201	Acoustics - Noise emitted by machinery and equipment - Measurement of emission sound pressure levels at the work station and at other specified positions - Engineering method in an essentially free field over a reflecting plane (ISO 11201:1995)
EN ISO 11202	Acoustics - Noise emitted by machinery and equipment - Measurement of emission sound pressure levels at the work station and at other specified positions - Survey method in situ (ISO 11202:1995)
EN ISO 11203	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 (ISO 11203:1995)
EN ISO 11204	Acoustics - Noise emitted by machinery and equipment - Measurement of emission sound pressure levels at the work station and at other specified positions - Method requiring environmental corrections (ISO 11204:1995)
EN ISO/TR 11688-1	Acoustics - Recommended practice for the design of low-noise machinery and equipment. Part 1: Planning (ISO/TR 11688-1:1995)
EN ISO 11689	Acoustics - Procedure for the comparison of noise emission data for machinery and equipment (ISO 11689:1996)
EN ISO 12001	Acoustics - Noise emitted by machinery and equipment - Rules for the drafting and presentation of a noise test code (ISO 12001:1996)
ISO 3745	Acoustics - Determination of sound power levels of noise sources - Precision methods for anechoic and semi-anechoic rooms
ISO/TR 11688-2 ¹	Acoustics - Recommended practice for the design of low-noise machinery and equipment. Part 2: Introduction to the physics of low-noise design.

¹ At the stage of draft

3 Requirements for drafting the noise clauses of type C-Standards

3.1 General drafting rules

The type C-Standard shall reflect, in accordance with 6.8 of EN 414:1992, the application of the strategy defined in clause 5 "Strategy for selecting safety measures" of EN 292-1:1991 with a view to reducing the noise emission to the lowest level taking account of technical progress and the available technical measures for noise control at the source.

In addition, in every type C-Standard dealing with noise, there is a need to provide information on how the technical measures can be verified (see 6.9 of EN 414:1992). This verification shall be based on noise emission values, see 3.4.1.

The information for use of the machinery (see 6.10 of EN 414:1992) shall include not only information on noise emission but also sufficient information on additional noise reduction, if necessary.

NOTE: If, for a particular type of machinery, noise is considered by the relevant type C-Standard Technical Committee not to be a significant hazard the following statement should be included in the safety standard:

"Noise is not considered to be a significant hazard for these machines. This does not mean that the manufacturer of the machine is absolved from reducing noise and making noise declaration".

The following rules for the drafting of the noise clauses of a type C-Standard are given in accordance with the structure as laid down in EN 414:1992:

- list of hazards, see 3.2
- safety requirements and/or measures, see 3.3
- verification of the effect of the safety measures, see 3.4
- information for use, see 3.5

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3.2 Clause on "noise as a hazard"

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If noise is accepted as a significant hazard (see 4.5 of EN 292-1:1991) this shall be stated in the list of hazards and, if appropriate, the hazardous situation.

3.3 Clause on "noise reduction as a safety requirement"

3.3.1 Noise reduction at source by design

In this clause of the type C-Standard, a description shall be given of the internal sound sources of the specific family or group of machinery covered.

If applicable, a list of examples of possible technical measures for noise reduction at source may be given. Such a list of measures should be given in an informative annex.

Care must be taken that the technical information given in the list does not discourage innovation with respect to machinery safety. When a list is given, the type C-Standards should state that "This list is not exhaustive, alternative technical measures for noise reduction with identical or greater efficacy can be used by a manufacturer". EN ISO/TF 11688 gives general technical information on widely recognised technical rules and means to design low-noise machinery. The above mentioned list of technical measures for noise reduction at source should be derived from the recommendations given in EN ISO/TR 11688 and the current practice of manufacturers.

The criterion for assessing the efficiency of these measures is the actual noise emission values from the machine in relation to other machines of the same family (see 3.4) and not the nature of the reduction measures themselves (see 6.8.2 and 6.8.5 of EN 414:1992).

3.3.2 Noise reduction by protective devices

If it is not possible to achieve the noise reduction at the source by design methods then this clause shall indicate that, whenever practical, it will be necessary to equip the machine with devices such as noise enclosures, screens fitted to the machinery, silencers etc. (see EN ISO 11546, EN ISO 11691, EN ISO 11820, EN ISO 11821).

3.3.3 Noise control by information

For some machinery, consideration of noise control at the design stage may show that noise emission levels after taking all possible technical measures for noise control at source will be so high that further protection of the operator will be necessary. In this case the instruction handbook shall contain such additional information as given in 3.5.

3.4 Clause on "verification of compliance with the safety requirements and measures"

3.4.1 Verification based on noise emission values

Noise declaration requires the measurement of noise emission quantities. A noise test code (see EN ISO 12001) is essential for noise declaration since it specifies how noise emission is to be determined and declared for a specified family of machinery. The preparation of noise test codes is the responsibility of the Technical Committees preparing type C-Standards. Depending on the structure of the type C-Standards, a noise test code may be a separate type C-Standard or a discrete part or an annex of a type C-Standard. The rules for the preparation of noise test codes by type C-Standard Technical Committees are given in EN ISO 12001.

This clause shall state that measurement of noise emission values shall be made in accordance with the relevant noise test code, including declaration of dual-number noise emission values and verification in accordance with EN ISO 4871.

The term "noise emission value" is a general one that can represent an emission sound pressure level (at a workstation or some other specified position) and/or the sound power level.

If the noise test code for the family or group of machinery concerned is not yet available, it shall be stated in this clause that, in the absence of a noise test code, the noise declaration shall indicate precisely:

- the mounting and operating conditions of the machinery during noise emission measurement,
- the work station position(s) where noise emission sound pressure levels have been determined,
- the noise emission measurement methods used, (i.e. chosen from the EN ISO 3740 series (guidance for the selection given in EN ISO 3740), the EN ISO 9614 series, and the EN ISO 11200 series (guidance for the selection given in EN ISO 11200),
- the criteria on which the noise declaration is made (i.e. EN ISO 4871).

3.4.2 Verification of noise reduction

This clause shall provide means by which the designer or any other user of the type C-Standard can verify that the technical noise reduction measures have been successfully implemented. An assessment of the noise reduction achieved can be performed by comparing the actual noise emission values to the range of noise emission values from other machines of the family concerned, measured as indicated in 3.4.1. Where available, these emission values from the family of machines should be published for comparison with the actual noise emission value for the machine.

This can be done by describing the population of noise emission values declared for the specific family of machinery, and by analysing the population according to EN ISO 11689. Such an analysis might be undertaken by the type C-Standard Technical Committee, manufacturers or suppliers, purchasers, enforcement authorities, etc.

The description of the population of noise emission values and the analysis may be published by the above mentioned bodies using criteria that they consider best suited to the family or group of machinery they are dealing with. The population of noise emission values should be reviewed regularly to consider if it needs to be adjusted to take account of technical progress.