# SLOVENSKI STANDARD
# SIST EN 12786:2013

**01-julij-2013**

**Nadomešča:**
**SIST EN 12786:2000**

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**Varnost strojev - Pravila za oblikovanje poglavij o vibracijah v varnostnih standardih**

Safety of machinery - Rules for the drafting of the vibration clauses of safety standards

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



Sécurité des machines - Guide relatif à la rédaction des clauses vibrations des normes de sécurité



**Ta slovenski standard je istoveten z:** **EN 12786:2013**

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**ICS:**

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|---|---|---|
| 01.120 | Standardizacija. Splošna pravila | Standardization. General rules |
| 13.110 | Varnost strojev | Safety of machinery |
| 17.160 | Vibracije, meritve udarcev in vibracij | Vibrations, shock and vibration measurements |

**SIST EN 12786:2013** **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN 12786

February 2013

ICS 01.120; 13.110; 17.160

Supersedes EN 12786:1999

English Version

# Safety of machinery - Requirements for the drafting of the vibration clauses of safety standards

Sécurité des machines - Exigences relatives à la rédaction des clauses vibrations des normes de sécurité

Sicherheit von Maschinen - Anforderungen an die Abfassung der Abschnitte über Schwingungen in Sicherheitsnormen

This European Standard was approved by CEN on 22 December 2012.

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

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# Contents

Page

## Foreword

This document (EN 12786:2013) has been prepared by Technical Committee CEN/TC 231 “Mechanical vibration and shock”, 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 August 2013, and conflicting national standards shall be withdrawn at the latest by August 2013.

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 12786:1999.

The main changes to the first edition EN 12786:1999 are:

– adapted to the requirements of Machinery Directive 2006/42/EC;

– Annex B with content of Directive 2006/42/EC relevant to vibration added;

– referenced documents updated.



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.

This European Standard supplements and develops examples of how to deal with vibration as a health risk to machine operators as set out in the Guide to application of the Machinery Directive 2006/42/EC.

Risks to machine operators from hand-transmitted and whole-body vibration can be assessed by reference to EN ISO 5349-1 and ISO 2631-1, respectively, and by reference to the Non-binding guide to good practice for implementing Directive 2002/44/EC (Vibrations at Work).

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.

# Introduction

For many machines, vibration is a significant hazard, i.e. a hazard which an assessment has identified as requiring a specific action on the part of the manufacturer or supplier (see EN ISO 12100:2010, 3.8).

If the manufacturer ensures that a machine complies with the relevant harmonized type-C safety standard, the machine is presumed to comply with all of the essential requirements addressed by that standard. The information contained in this European Standard will help writers of standards to address the essential requirements relevant to vibration and is based on the following principles:

a) vibration risk reduction is an integral part of machinery safety;

b) machinery shall be so designed and constructed that risks resulting from vibration produced by the machinery are reduced to the lowest level, taking account of technical progress and available means of reducing vibration, in particular at source; and

c) where vibration is assessed as a significant hazard, the vibration clauses of the type-C standard shall deal with aspects including minimizing the risk through design and protective measures, the provision of information about residual risk and instructions for safe use.

For portable hand-held and hand-guided machinery, and mobile machinery, the declaration of vibration emission is mandatory. This requirement is not dependent on the assessment of vibration as a significant hazard. The type-C standard should address the declaration of vibration emission.



Employers are required to comply with national legislation on the health and safety requirements regarding the exposure of workers to the risks arising from vibration. Employers should assess those risks and control them. The duties of machinery suppliers indicated in this standard are complementary to those of employers: by supplying safe work equipment, giving warnings of residual risk and providing information to enable safe use of the machinery they can help employers to control risks. It is therefore important that type-C safety standards deal adequately with vibration risks.



This document is a type-B standard as stated in EN ISO 12100.

The provisions of this document can be supplemented or modified by a type-C standard.

For machines which are covered by the scope of a type-C standard and which have been designed and built according to the provisions of that standard, the provisions of that type-C standard take precedence over the provisions of this type-B standard.

The provisions of this document are intended to be used by the Technical Committee drafting a type-C standard, while taking account of the specific requirements for the machinery dealt with and of the structure of the type-C standard. It is important that type-C safety standards deal adequately with vibration risks.

# 1 Scope

This European Standard gives guidance for the writers of harmonized type-C machinery safety standards on how to deal with vibration where hand-transmitted vibration and/or whole-body vibration is identified as a significant hazard.

This European Standard also gives guidance on how to deal with the requirement for declaration of the vibration emission of portable hand-held and/or hand-guided machinery and for mobile machinery.

This European Standard supplements EN ISO 12100.

# 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.

CR 1030-1, *Hand-arm vibration — Guidelines for vibration hazards reduction — Part 1: Engineering methods by design of machinery*

EN 1032, *Mechanical vibration — Testing of mobile machinery in order to determine the vibration emission value*



EN 12096, *Mechanical vibration — Declaration and verification of vibration emission values*



CEN/TR 15172-1, *Whole-body vibration — Guidelines for vibration hazards reduction — Part 1: Engineering methods by design of machinery*



EN 30326-1, *Mechanical vibration — Laboratory method for evaluating vehicle seat vibration — Part 1: Basic requirements (ISO 10326-1)*

EN ISO 5349-1, *Mechanical vibration — Measurement and evaluation of human exposure to hand-transmitted vibration — Part 1: General requirements (ISO 5349-1)*

EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

EN ISO 20643, *Mechanical vibration — Hand-held and hand-guided machinery — Principles for evaluation of vibration emission (ISO 20643)*

ISO 2631-1, *Mechanical vibration and shock — Evaluation of human exposure to whole-body vibration — Part 1: General requirements*

# 3 Requirements for drafting the vibration clauses in type-C standards

## 3.1 General drafting rules

### 3.1.1 General

The provisions of this European Standard shall be used by the Technical Committee drafting a type-C standard, while taking account of the specific requirements for the machinery dealt with and of the structure of the type-C standard.

### 3.1.2 Vibration as a significant hazard

Hazardous vibration from human contact with machinery (see EN ISO 12100:2010, Table B.1 row 5) is generally categorized as:

— hand-transmitted vibration (hand-arm vibration), usually from hand-held, hand-guided or hand-fed machines, or from the controls of some mobile machines; or

— whole-body vibration from the supporting surface (e.g. seat or floor), usually (but not exclusively) in mobile machines.

The requirements for managing risks from hand-transmitted vibration and whole-body vibration are different and, where appropriate, they are treated separately in the clauses below.

Machine manufacturers are required to reduce the vibrations transmitted to the operator to the lowest level, taking account of technical progress and the availability of means of reducing vibration, in particular at source (see Annex B, rows 2 and 3). The requirements of the type-C standard shall meet this objective. This should be achieved by applying the following three step method so far as possible in the order presented (see Annex B, row 1):

— by inherent safe design (see EN ISO 12100:2010, 6.2);

— by safeguarding (see EN ISO 12100:2010, 6.3); and

— by information for use (see EN ISO 12100:2010, 6.4);



If, for the machinery identified in the scope of the type-C standard, the vibration hazard is considered to be significant the type-C standard shall



— include vibration in the list of significant hazards, see 3.2;

— formulate measures for reducing risk so far as possible, see 3.3;

— provide information on how compliance with these requirements can be verified, see 3.4; and

— include in the clause “Information for use” requirements on information regarding management of residual risk from vibration, see 3.5.

Vibration emission values shall be declared and these have an important role in the verification that risks from vibration have been reduced to the lowest level, along with other factors such as ergonomics and the efficiency of a machine, see 3.4.

Where a machine exposes the operator to vibration or shock that is not adequately dealt with by EN ISO 5349-1 or ISO 2631-1 (e.g. single shocks, recoils from cartridge-operated hand held tools, extremes of vibration frequency), where there is evidence of a risk to the operator (e.g. evidence of ill health), this shall be addressed in the type-C standard.

If, for the machinery in the scope of the type-C standard, vibration is considered to be a relevant but not significant hazard (see EN ISO 12100:2010, 3.7 and 3.8) the type-C standard shall not formulate specific design requirements concerning vibration. In the normal structure of a type-C standard, these hazards are dealt with by the second sentence of the standard introduction of the clause dealing with safety requirements and/or protective measures: “In addition, the machine shall be designed according to the principles of EN ISO 12100 for relevant but not significant hazards, which are not dealt with by this document."

The Technical Committee should also consider the suitability of the following additional statement (e.g. as a Note, see 3.3):

"*As a general rule, vibration is not considered to be a significant hazard for the machinery in the scope but this does not absolve the manufacturer from the obligation to minimize vibration risk*."

#### 3.1.3 Declaration of vibration emission

For portable hand-held and hand-guided machinery and mobile machinery, the declaration of vibration emission of the machine is mandatory. This requirement is not dependent on the identification of vibration as a significant hazard (but may indicate that vibration needs to be included as a significant hazard). The type-C standard shall address the measurement and declaration of vibration emission and its uncertainty, by including, or referring to, a vibration test code that meets the requirements of the relevant type-B standard (EN ISO 20643 for hand-held and hand-guided machines or EN 1032 for mobile machines, see 3.6). The operating conditions in which the vibration is to be measured shall be specified.

### 3.2 Clause "List of significant hazards"

If vibration is considered to be a significant hazard (see EN ISO 12100:2010, 3.8) for the machinery in the scope of the type-C standard it shall be included in the list of significant hazards, with information on the hazardous situations and hazardous events (i.e. the circumstances in which people are at risk from vibration).

Hand-transmitted vibration and whole-body vibration are considered to be significant hazards if they have the potential to cause a risk to health (or safety) in intended use or foreseeable misuse of the machine. Vibration will usually be considered a significant hazard if it is likely that the vibration emission will exceed the threshold value for declaration of 2,5 $m/s^2$ for hand-transmitted vibration and 0,5 $m/s^2$ for whole-body vibration (see Annex B, row 6), although there may be exceptions for machines that are used only for very short periods of time.



### 3.3 Clause "Safety requirements and/or protective measures"

#### 3.3.1 General



Where vibration has been included in the list of significant hazards, this clause shall include appropriate design requirements and technical measures for minimizing the vibration risk. The complementary requirements for the provision of information shall be dealt with in the clause on information for use (see 3.5).

#### 3.3.2 Minimizing vibration risk by design and by protective measures

##### 3.3.2.1 General

This clause of a type-C standard shall address the requirement to minimize vibration risk by design (see Annex B, row 2). Vibration risk is dependent on the vibration emission and duration of exposure and also on parameters such as coupling forces and operator posture which can modify the transmission to the human body and the effects of that vibration.

A description shall be given of typical sources of vibration emission for the specific family or group of machines.

If appropriate, a list of examples of technical measures suitable for vibration reduction at source for the family of machines shall be given. Such a list may be given in an informative annex.

It is important that the technical information given in the examples does not discourage innovation with respect to machinery safety. When a list of examples is given, the type-C standard should state that: "This list is not exhaustive; alternative technical measures that would be equally effective or that would further reduce vibration risks may, where suitable, be adopted by the manufacturer."

Measures to minimize vibration-related risk shall be selected taking into account: