SLOVENSKI STANDARD
SIST EN 13861:2011

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Nadomešča:
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Varnost strojev - Navodila za uporabo ergonomskih standardov pri načrtovanju strojev

Safety of machinery - Guidance for the application of ergonomics standards in the design of machinery

Sicherheit von Maschinen - Leitfaden für die Anwendung von Ergonomie-Normen bei der Gestaltung von Maschinen

Sécurité des machines - Guide pour l'application des normes relatives à l'ergonomie dans la conception des machines

Ta slovenski standard je istoveten z: **EN 13861:2011**

ICS:

13.110	Varnost strojev	Safety of machinery
13.180	Ergonomija	Ergonomics

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Safety of machinery - Guidance for the application of ergonomics standards in the design of machinery

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This European Standard was approved by CEN on 11 September 2011.

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Foreword

This document (EN 13861:2011) has been prepared by Technical Committee CEN/TC 122 “Ergonomics”, 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of an identical text or by endorsement, at the latest by April 2012, and conflicting national standards shall be withdrawn at the latest by April 2012.

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 13861:2002.

This document is intended to provide guidance for standardisers and manufacturers seeking to deal with the ergonomic requirements defined in EN ISO 12100:2010, 6.2.8, 6.3.2 and 5.3.2.

During the development of this document the Technical Committee has referred to the recommendations made within CEN/CENELEC Guide 6 to address the specific needs of older persons and persons with disabilities.

Annex A is normative; Annexes B, C and D 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, Bulgaria, Croatia, 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 the United Kingdom.

Introduction

The designer of machinery is under an obligation to assess the risks during all phases of the life cycle of the machinery (see EN ISO 12100:2010, Clause 4). This includes knowledge and experience of the design, use, incidents, accidents and harm.

This European Standard elaborates EN ISO 12100:2010, Annex B as far as ergonomics are concerned. This standard refers to European and International ergonomics Standards in the various relevant fields.

The standards for ergonomic design of machinery, as referred to in this document, can help to avoid or reduce numerous hazards and risks, as assessed at the design stage, whilst considering the intended use, the expected use and the foreseeable misuse of the machinery.

1 Scope

This European Standard provides a methodology to achieve a coherent application of various ergonomics standards for the design of machinery. This standard presents a step model calling upon specific standards. To this end, Annex A shows a reference table with relation between hazards as described in EN ISO 12100:2010 and applicable B-standards related to ergonomics.

This European Standard can only be used in combination with other relevant ergonomics standards.

This European Standard provides guidance where no relevant or suitable ergonomics clauses in C-type standards are available.

This European Standard may also be used for incorporating ergonomics in the drafting of C-type standards (see Annex C for further information).

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 amendments) applies.

EN 614-1, *Safety of machinery — Ergonomic design principles — Part 1: Terminology and general principles*

EN 614-2, *Safety of machinery — Ergonomic design principles — Part 2: Interactions between the design of machinery and work tasks*

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

CEN Guide 414:2004, *Safety of machinery — Rules for the drafting and presentation of safety standards*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100:2010 and the following apply:

3.1
ergonomics
human factors
scientific discipline concerned with the understanding of the interactions among human and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance (IEA[1)], 2000)

NOTE Adapted from prEN ISO 26800:2011.

3.2
machinery
machine
assembly, fitted with or intended to be fitted with a drive system consisting of linked parts or components, at least one of which moves, and which are joined together for a specific application

1) International Ergonomics Association.

NOTE 1 The term "machinery" also covers an assembly of machines which, in order to achieve the same end, are arranged and controlled so that they function as an integral whole.

NOTE 2 EN ISO 12100:2010, Annex A provides a general schematic representation of a machine.

[EN ISO 12100:2010, 3.1]

3.3
operator
person or persons installing, operating, adjusting, maintaining, cleaning, repairing or moving machinery

[Machinery Directive 2006/42/EC, Annex I, 1.1.1]

4 Application of ergonomics standards in the design of machinery

4.1 Introduction

This standard provides a step-by-step approach for the application of ergonomics standards in the design of machinery. Users of this standard should select and use a C-type standard for that particular machine. For issues related to ergonomics the described step model may be used as guidance through the process of selecting the appropriate B-type ergonomics standards, whilst carrying out a risk assessment according to EN ISO 12100.

4.2 Process for guidance to the appropriate ergonomics standards

4.2.1 General

The guidance process is based on the general procedures for dealing with safety clauses. EN ISO 12100 provides a description of basic hazards, describes intrinsic design measures, and gives a list of examples for hazards, hazardous situations, and hazardous events that occur when using machinery. In order to meet the essential health and safety requirements, the machinery shall be designed in accordance with EN 614-1 and EN 614-2.

The following step model gives a methodology to achieve a coherent application of various ergonomics standards (see Figure 1).

4.2.2 Step 1: Hazard analysis and risk estimation

— Specify the limits of the machine with respect to ergonomics.

— Identify the hazards present at the machine during all modes of operation and at each stage in life of the machine by following the guidance in EN ISO 12100:2010, 5.4.

Ergonomic aspects of machinery can only be assessed, evaluated and verified when all intended interchangeable equipment of the machinery are known. Ergonomics requirements are necessary when considering 'the operator' and 'the exposed persons'.

Specifying the limits of the machinery during the life cycle phases as described in EN ISO 12100:2010, 5.3, involves the following ergonomics aspects:

Table 1 — Ergonomic aspects for specifying the limits of the machinery

External preconditions (characteristics and restrictions)	Work tasks (man/machine interface)
— Use limits (user groups)	— Intended and expected types of jobs
— Space limits	— Expected use of personal protective equipment
— Time limits — duration — frequency	— Foreseeable misuse
— Environmental conditions — climate — noise, lighting — vibration — dust, fume or other nuisances	

Annex B provides a checklist for listing the limits of the machinery.

4.2.3 Step 2: Investigation of applicability of standards

— Specify if a specific C-type standard exists.

— Check in the relevant C-type standard if the hazards generated by neglecting ergonomics principles and related risks are dealt with.

— Check which B-type standards may be used instead of or in addition to the relevant C-type standard.

If a relevant C-type standard is found, this should be followed first. Where appropriate, these C-type standards refer to A- and B-type standards for reduction of risks, which are likely to occur with the machinery involved. If no suitable C-type standard is available, or if the C-type standard concerned does not cover ergonomics related risks sufficiently, see Annex A for relevant B-type standards.

4.2.4 Step 3: Evaluation of the risks using relevant ergonomics standards

— Assess the remaining risks related to ergonomics.

— Check whether these risks are relevant.

— Consider the ergonomics standards mentioned in relation to the relevant risks (see Annex A).

— Check if these standards have been used to optimize the design of machinery.

In order to carry out the risk evaluation, the respective horizontal B-type standards on general and specific ergonomics related risks shall be considered. These standards are classified in Annex A (a short description of these standards can be found in Annex D).

Ergonomics related risks are significant if a human being and the machinery are part of a common work system (man machine interface). This interaction involves a mutual role as an interface as a tool, a fixture, an energy source or a link in a safety chain. See EN 614-1 and EN 614-2.

4.2.5 Step 4: Risk reduction using the various standards

Use one of the following alternatives:

— a solution as described in a C-type standard which refers to B-type standards for ergonomics where relevant;

— relevant B-type standards for ergonomics where no C-type standard is available;

— other (additional) references, related to ergonomics.

All the relevant and significant risks shall be reduced. However, there may be one or more reasons why some risks cannot be dealt with, e.g. there is no information available or the standard is restricted to some specific items.

If the use of personal protective equipment (PPE) has to be taken into account when designing the machine, an additional risk assessment shall be carried out in order to check that all essential health and safety requirements, including ergonomics, have been satisfied.

4.2.6 Step 5: Verification

— Check if all relevant and significant ergonomic related risks have been removed or reduced with the help of applicable standards.

— Check if there are significant risks that are not covered by any standard or other technical specification. In that case, (re)design the man machine interface in accordance with EN 614-1 and EN 614-2.

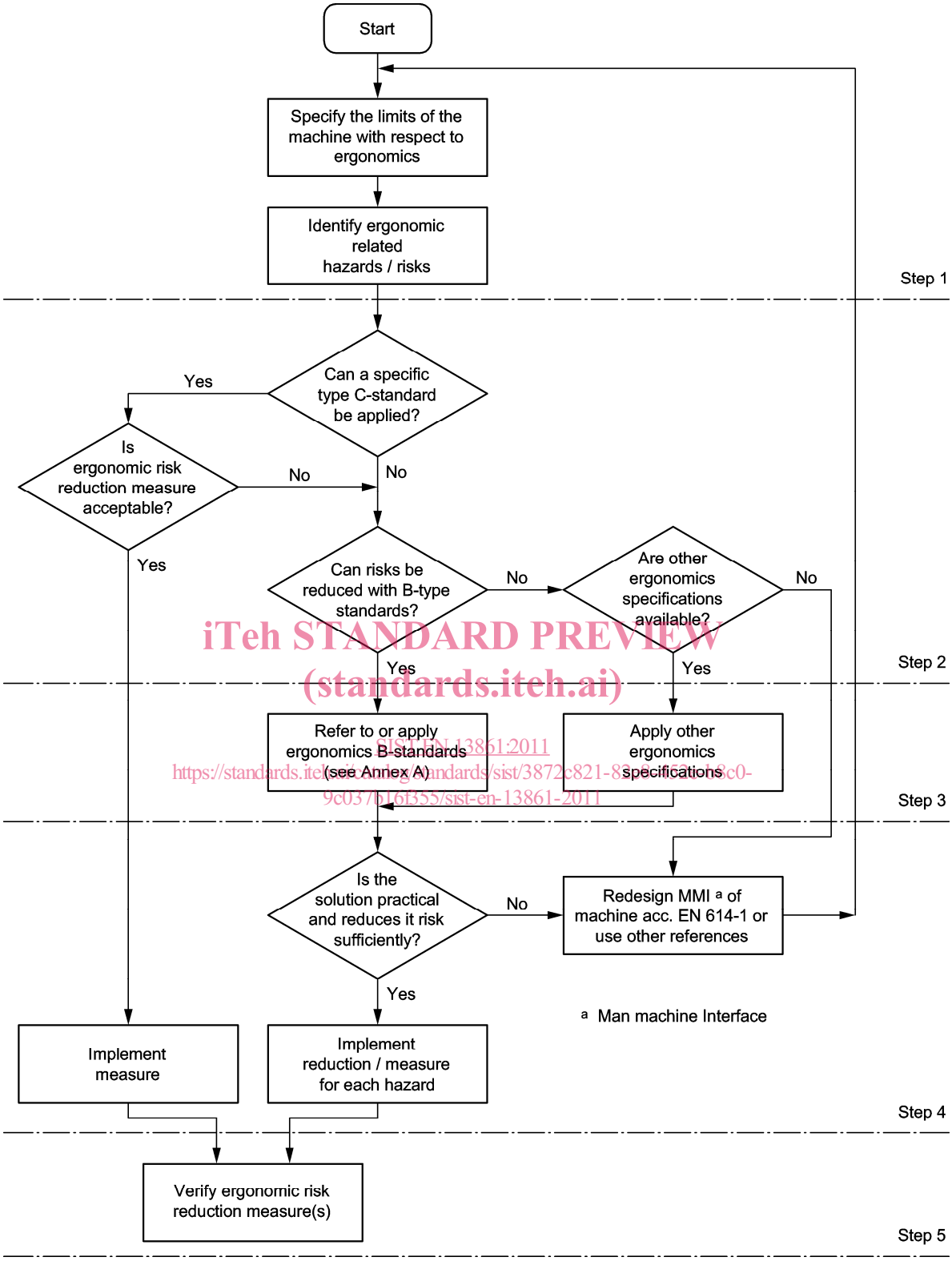

Figure 1 — Flowchart of the step model

5 Information for use

All residual ergonomics risks, which cannot be reduced sufficiently with help of specific C-type standards, horizontal B-type standards or other technical specifications, shall be dealt with in the user instructions for the machinery or in the chapter dealing with user instructions of the relevant C-type standard as stated in CEN Guide 414:2004, 6.10.

Any limitation in the use of the machinery shall be mentioned in these specifications. In addition, safety signs or pictograms may be prescribed.

Annex A
(normative)

Relation between hazards as described in EN ISO 12100 and applicable B-standards related to ergonomics

Table A.1

Number of EN ISO 12100: 2010, Annex B	Type or group[a]	Example of hazards[b]	Type-B standards in the fields of ergonomics			
		Origin EN ISO 12100:2010, Annex B	**Definition**	**Requirements/ design process**	**Measures**	**Verification or testing methods**
3	Thermal hazards	Flames or explosions and also by the radiation of heat sources	EN ISO 13732-1	EN ISO 13732-1	EN ISO 13732-1	EN ISO 13732-1
		Hot or cold surfaces and work environment	EN ISO 13731[c]	EN 27243[c] EN ISO 7730[c] EN ISO 11079[c]		EN ISO 7933[c] EN ISO 7726[c] EN ISO 8996[c] EN ISO 11064-6[c] EN ISO 13732-1 EN ISO 13732-3

Table A.1 *(continued)*

Number of EN ISO 12100: 2010, Annex B	Type or group[a]	Example of hazards[b]	Type-B standards in the fields of ergonomics			
		Origin EN ISO 12100:2010, Annex B	**Definition**	**Requirements/ design process**	**Measures**	**Verification or testing methods**
4	**Noise hazards**	Hearing loss (deafness), other physiological disorders	EN 1746[c]	EN ISO 11688-1 EN ISO 11688-2[c] EN ISO 11690-1[c] ISO 1999[a, c]	EN ISO 11688-1 EN ISO 11688-2[c] EN ISO 11690-2[c]	EN ISO 11200 EN ISO 11201 EN ISO 11204 EN ISO 3744 EN ISO 4871
		Interference with speech communication, acoustic signals, etc.	EN 1746[c]	EN ISO 7731[a] EN 894-2 EN ISO 11690-1[c] EN ISO 9921[c]	EN ISO 11688-1 EN ISO 11688-2[c] EN ISO 11690-2[c]	EN ISO 3744 EN ISO 4871 EN ISO 11200 EN ISO 11201 EN ISO 11204

Table A.1 *(continued)*

Number of EN ISO 12100:2010, Annex B	**Type or group**[a]	Example of hazards[b]	**Type-B standards in the fields of ergonomics**			
		Origin EN ISO 12100:2010, Annex B	**Definition**	**Requirements/ design process**	**Measures**	**Verification or testing methods**
		Noise at the work position	EN 1746[c]	EN 547-1 EN 547-2 EN 547-3 EN 1005-4 EN ISO 11201 EN ISO 11688-1 EN ISO 11688-2[c] EN ISO 11690-1[c] EN ISO 14738 ISO 1999[a, c]	EN ISO 11688-1 EN ISO 11688-2[c] EN ISO 11690-2[c]	EN ISO 11200 EN ISO 11201 EN ISO 11202 EN ISO 11203 EN ISO 11204 EN ISO 11064-6[c]
5	**Vibration hazards**	Use of hand-held machines	CR 12349[c] EN ISO 5349-1[c] ISO 2041[c] ISO 5805[c]	EN ISO 20643 EN ISO 5349-1[c] EN 28662-1[c]	CR 1030-1[c]	EN ISO 20643 EN ISO 5349-1[c] EN ISO 8041[c] EN ISO 5349-2[c] ISO 2631-1[c]