

**Masinate ohutus. Inimeste füüsiline töö. Osa 4:
Tööasendite ja liigutuste hindamine
KONSOLIDEERITD TEKST**

Safety of machinery - Human physical performance -
Part 4: Evaluation of working postures and movements
in relation to machinery CONSOLIDATED TEXT

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN 1005-4:2005+A1:2008 sisaldab Euroopa standardi EN 1005-4:2005+A1:2008 ingliskeelset teksti.</p> <p>Standard on kinnitatud Eesti Standardikeskuse 10.11.2008 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.</p> <p>Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 01.10.2008.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN 1005-4:2005+A1:2008 consists of the English text of the European standard EN 1005-4:2005+A1:2008.</p> <p>This standard is ratified with the order of Estonian Centre for Standardisation dated 10.11.2008 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.</p> <p>Date of Availability of the European standard text 01.10.2008.</p> <p>The standard is available from Estonian standardisation organisation.</p>
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English Version

**Safety of machinery - Human physical performance - Part 4:
Evaluation of working postures and movements in relation to
machinery**

Sécurité des machines - Performance physique humaine -
Partie 4: Evaluation des postures et mouvements lors du
travail en relation avec les machines

Sicherheit von Maschinen - Menschliche körperliche
Leistung - Teil 4: Bewertung von Körperhaltungen und
Bewegungen bei der Arbeit an Maschinen

This European Standard was approved by CEN on 17 February 2005 and includes Amendment 1 approved by CEN on 18 August 2008.

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 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 Management Centre has the same status as the official versions.



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Foreword

This document (EN 1005-4:2005+A1:2008) 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 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.

This document includes Amendment 1, approved by CEN on 2008-08-18.

This document supersedes EN 1005-4:2005.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

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).

A1 For relationship with EU Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document. A1

EN 1005 consists of the following Parts, under the general title *Safety of machinery - Human physical performance*:

- *Part 1: Terms and definitions;*
- *Part 2: Manual handling of machinery and component parts of machinery;*
- *Part 3: Recommended force limits for machinery operation;*
- *Part 4: Evaluation of working postures and movements in relation to machinery;*
- *Part 5¹ : Risk assessment for repetitive handling at high frequency.*

This European Standard includes a Bibliography.

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, 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 United Kingdom.

¹ This European Standard is under preparation by CEN/TC 122/WG 4 "Biomechanics".

Introduction

About one third of all workers in the European Union are involved in painful or tiring postures for more than half of their working day, and close to 50 % of all workers are exposed to short repetitive tasks, which are mostly accompanied by painful and tiring movements [2]. Pain and fatigue may lead to musculoskeletal disorder, reduced productivity, and deteriorated posture and movement control. The latter can increase the risk of errors and may result in reduced quality and hazardous situations. Within the life cycle of a machine, from construction to dismantling, all machine-related actions require certain postures and movements. The role of the machinery designer should be to avoid painful and tiring postures and movements.

The requirements in this European Standard aim to reduce the health risks associated with machine-related actions and could also have a positive effect on the quality, efficiency and profitability of those actions.

The requirements in this European Standard are based on current ergonomic knowledge and expert opinions, and will be subject to changes in accordance with future research [1].

This document is a type B standard as stated in EN ISO 12100-1.

The provisions of this European Standard 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.

1 Scope

This European Standard presents guidance when designing machinery or its component parts in assessing and affecting health risks due only to machine-related postures and movements, i.e. during assembly, installation, operation, adjustment, maintenance, cleaning, repair, transport, and dismantlement. This European Standard specifies requirements for postures and movements without any or with only minimal external force exertion. The requirements are intended to reduce the health risks for nearly all healthy adults.

This European Standard is not applicable to the machinery, which is manufactured before the date of publication of this European Standard by CEN.

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 any amendments) applies.

EN 547-1, *Safety of machinery - Human body measurements - Part 1: Principles for determining the dimensions required for openings for whole body access into machinery.*

EN 547-2, *Safety of machinery - Human body measurements - Part 2: Principles for determining the dimensions required for access openings.*

EN 547-3, *Safety of machinery - Human body measurements - Part 3: Anthropometric data.*

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

EN 894-1, *Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 1: General principles for human interactions with displays and control actuators.*

EN 894-2, *Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 2: Displays.*

EN 894-3, *Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 3: Control actuators.*

EN 1005-1:2001, *Safety of machinery - Human physical performance - Part 1: Terms and definitions.*

EN 1005-2, *Safety of machinery - Human physical performance - Part 2: Manual handling of machinery and component parts of machinery.*

EN 1005-3, *Safety of machinery - Human physical performance - Part 3: Recommended force limits for machinery operation.*

prEN 1005-5², *Safety of machinery - Human physical performance - Part 5: Risk assessment for repetitive handling at high frequency.*

EN 1050, *Safety of machinery – Principles for risk assessment.*

EN ISO 12100-1:2003, *Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology (ISO 12100-1:2003).*

EN ISO 12100-2, *Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles (ISO 12100-2:2003).*

² This European Standard is under preparation by CEN/TC 122/WG 4 "Biomechanics".

EN ISO 14738, *Safety of machinery - Anthropometric requirements for the design of workstations at machinery*. (ISO 14738:2002).

ISO 11226:2000, *Ergonomics - Evaluation of static working postures*.

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 1005-1:2001 and EN ISO 12100-1:2003 apply.

4 Requirements

4.1 General

It is recommended that those using this European Standard should first refer to EN 1050, EN ISO 12100-1, EN ISO 12100-2, and EN 614-1.

The requirements conveyed by this European Standard formally apply to all machine-related actions. Assessing each individual action may be impracticable, therefore those actions which are frequently undertaken or are infrequent but may give rise to risk of pain, fatigue or disorder shall be part of the risk assessment.

NOTE It is emphasised that the requirements in this European Standard should not be used to regulate work organisation.

Above all, machinery design shall allow for **variation** between and while sitting, standing, and walking. Awkward body postures and movements shall be avoided (e.g. kneeling, crouching). Good design shall encourage low frequency movements and avoid painful and tiring postures and high frequency movements (see 4.3).

This European Standard adopts a stepwise risk assessment approach for assessing postures and movements as part of the machinery design process (see Figure 1). The approach detailed in this European Standard makes a distinction between:

- Evaluation **without** operators: When there is no full-size model/prototype of the machinery or its parts currently available (see 4.2.5);
- Evaluation **with** operators: When a full-size model/prototype of the machinery or its parts is available (see 4.2.6).

Clause 4.2 provides guidance during the various design stages. Clause 4.3 provides the risk assessment procedure for determining the acceptability of postures and movements.

It is emphasised that there may be information available or obtainable on the use and consequences of particular designs and tasks performed. Provision shall be made for the collection and use of this data. This data shall be analysed to determine whether current designs and practices are adequate or whether a redesign of the machine is needed. The use of inexperienced subjects to perform established tasks may sometimes identify problems that experienced operators have learned to avoid.

4.2 Guidance towards risk assessment

4.2.1 General

Five main stages of the design process based on ergonomic tasks, as outlined in EN 614-1, are discussed in more detail (see 4.2.2 to 4.2.6 and Figure 1 (texts printed in bold)).