

**Kummi- ja plastitöötlusmasinad.  
Kuumvormimisseadmed. Ohutusnõuded**

Plastics and rubber machines - Thermoforming machines - Safety requirements

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 12409:2008 sisaldab Euroopa standardi EN 12409:2008 ingliskeelset teksti.

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English Version

## Plastics and rubber machines - Thermoforming machines - Safety requirements

Machines pour les matières plastiques et le caoutchouc -  
Machines de thermoformage - Prescriptions de sécurité

Kunststoff- und Gummimaschinen - Warmformmaschinen -  
Sicherheitsanforderungen

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## Foreword

This document (EN 12409:2008) has been prepared by Technical Committee CEN/TC 145 "Plastics and rubber machines", the secretariat of which is held by UNI.

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of an identical text or by endorsement, at the latest by April 2009, and conflicting national standards shall be withdrawn at the latest by April 2009.

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 has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EC Directive(s).

For relationship with EC Directive(s), see informative Annex ZA and B, which are an integral part of this document.

This document supersedes EN 12409:1999.

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 the United Kingdom.

## Introduction

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

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this document.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

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## 1 Scope

This European Standard deals with all significant hazards, hazardous situations and events relevant to thermoforming machines for continuous sheet and single sheets of thermoplastics materials, when they are used as intended and under conditions of misuse which are foreseeable by the manufacturer (see Clause 4).

A thermoforming machine may consist of a forming unit or a forming unit linked to one or more additional units. This standard covers the following units:

- continuous sheet unwind unit;
- single sheet feed unit;
- material intake;
- conveying equipment;
- heating unit;
- preheating unit;
- edge heating unit;
- component feeding/inserting unit;
- forming station;
- finishing station;
- stacking station;
- discharge station;
- residual sheet winding unit;
- sheet cutting unit.

This European standard does not apply to units mounted upstream or downstream of the thermoforming machine:

- which have a separate control system; and/or
- are located separately.

NOTE 1 This European Standard specifies requirements for machines supplied as a single forming unit or a number of units designed to operate as a single machine. Additional units that may be introduced at a later stage should be considered separately applying relevant standards and taking into account any hazards arising through their interaction with the thermoforming machine.

This European Standard does not apply to units which are integrated into form, fill and seal machines. These are covered in EN 415-3:1999.

This European standard does not apply to units which incorporate heating systems which are fuelled by gas.

NOTE 2 Thermoforming machines generally do not create explosive atmospheres. In principle they therefore correspond with line F of Table 2 of the ATEX Guideline and consequently do not fall within the scope of Directive 94/9/EC.

This European Standard is not applicable to thermoforming machines which are manufactured before the date of its publication as EN.

## 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 349:1993, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body*

EN 574:1996, *Safety of machinery — Two-hand control devices — Functional aspects — Principles for design*

EN 614-1:2006, *Safety of machinery — Ergonomic design principles — Part 1: Terminology and general principles*

EN 626-1:1994, *Safety of machinery — Reduction of risks to health from hazardous substances emitted by machinery — Part 1: Principals and specifications for machinery manufacturers*

EN 953:1997, *Safety of Machinery — Guards — General requirements for the design and construction of fixed and movable guards*

EN 982:1996, *Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics*

EN 983:1996, *Safety of machinery — Safety requirements for fluid power systems and their components — Pneumatics*

EN 999:1998, *Safety of machinery — The positioning of protective equipment in respect of approach speeds of parts of the human body*

EN 1037:1995, *Safety of machinery — Prevention of unexpected start-up*

EN 1088:1995, *Safety of machinery — Interlocking devices associated with guards — Principals for design and selection*

EN 1760-1:1997, *Safety of machinery — Pressure sensitive protective devices — Part 1: General principles for the design and testing of pressure sensitive mats and pressure sensitive floors*

EN 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2005, modified)*

EN 60529:1991, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN 61496-1:2004, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests (IEC 61496-1:2004, modified)*

EN ISO 3744:1995, *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 4871:1996, *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

EN ISO 11201:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Engineering method in an essentially free field over a reflecting plane (ISO 11201:1995)*

EN ISO 11204:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Method requiring environmental corrections (ISO 11204:1995)*

EN ISO 11688-1:1998, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning (ISO/TR 11688-1:1995)*

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

EN ISO 13732-1:2006, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces (ISO 13732-1:2006)*

EN ISO 13849-1:2006, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2006)*

EN ISO 13850:2006, *Safety of machinery — Emergency stop — Principles for design (ISO 13850:2006)*

EN ISO 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2008)*

EN ISO 14122-1:2001, *Safety of machinery — Permanent means of access to machinery — Part 1: Choice of fixed means of access between two levels (ISO 14122-1:2001)*

EN ISO 14122-2:2001, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways (ISO 14122-2:2001)*

EN ISO 14122-3:2001, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails (ISO 14122-3:2001)*

EN ISO 14122-4:2004, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders (ISO 14122-4:2004)*

### **3 Terms and definitions**

For the purposes of this document, the terms and definitions given in EN ISO 12100-1:2003 and the following apply.

#### **3.1 thermoforming machine**

machine which renders thermoplastic sheet material formable, by heating, and deforms it either by using vacuum or compressed air with or without the use of a stretching aid, for example, a stretching punch

#### **3.2 continuous sheet unwind unit**

unit where a continuous sheet roll is clamped and unwound as required by the manufacturing process

#### **3.3 sheet roll**

continuous sheet wound on a core with or without an integral shaft