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**Stroji za predelavo gume in plastike - Ekstruderji in oprema za iztiskavanje - 1. del:  
Varnostne zahteve za ekstruderje**

Plastics and rubber machines - Extruders and extrusion lines - Part 1: Safety requirements for extruders

Kunststoff- und Gummimaschinen - Extruder und Extrusionsanlagen - Teil 1: Sicherheitsanforderungen für Extruder

Machines pour les matières plastiques et le caoutchouc - Extrudeuses et lignes d'extrusion - Partie 1: Exigences de sécurité pour les extrudeuses

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## Plastics and rubber machines - Extruders and extrusion lines - Part 1: Safety requirements for extruders

Machines pour les matières plastiques et le caoutchouc -  
Extrudeuses et lignes d'extrusion - Partie 1: Exigences de  
sécurité pour les extrudeuses

Kunststoff- und Gummimaschinen - Extruder und  
Extrusionsanlagen - Teil 1: Sicherheitsanforderungen für  
Extruder

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## Foreword

This document (prEN 1114-1:2007) has been prepared by Technical Committee CEN/TC 145 “Plastics and rubber machines”, the secretariat of which is held by UNI.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 1114-1:1996.

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 ZB, which is an integral part of this document.

This is the first in a series of standards on the safety of extruders and extrusion lines.

Part 2 deals with die face pelletisers.

Part 3 deals with caterpillar, roller and belt take-offs.

## 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.

## 1 Scope

This document deals with all significant hazards, hazardous situations and events relevant to all types of screw extruders for plastics and rubber, when they are used as intended and under conditions of misuse which are foreseeable by the manufacturer (see Clause 4).

This standard additionally covers the following feeding systems:

- hoppers;
- single roller feeding systems;
- double roller feeding systems;
- crammer feeding systems;

and the following ancillary equipment which form part of or are attached to the extruder:

- screen changers;
- melt/gear pumps;
- melt pipes and adaptors;
- static mixers;
- extruder head.

NOTE Metering devices are not covered by this standard.

This European Standard does not deal with hazards caused by processing materials and which may lead to a risk of fire or release of health hazardous materials.

This standard only applies to extruder heads that give initial shape to the plasticised material.

An extruder conforming to this standard is not regarded as a pressure vessel as defined in the Pressure Equipment Directive 97/23/EC.

Extruders usually do not produce explosive atmospheres. Where materials are processed, which may cause an explosive atmosphere, the Directive 94/9/EC on the Equipment intended for use in Potentially Explosive Atmospheres (ATEX) shall be applied. Explosion hazards are not dealt with in this standard.

This document is not applicable to extruders which are manufactured before the date of its publication

## 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 294:1992, *Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs*

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

EN 418:1992, *Safety of machinery — Emergency stop equipment, functional aspects — Principles for design*

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: Principles and specifications for machinery manufacturers*

EN 811:1996, *Safety of Machinery — Safety distances to prevent danger zones being reached by the lower limbs*

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

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

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)*

EN ISO 3744:1995, *Acoustics — Determination of sound power levels of noise sources — Engineering methods for free-field conditions over a reflecting plane (ISO 3744:1994)*

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

EN ISO 9614-1:1995, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 1: Measurement at discrete points (ISO 9614-1:1996)*

EN ISO 9614-2:1996, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 2: Measurement by scanning (ISO 9614-2:1996)*

EN ISO 11201:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at the workstation 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 the workstation and 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 11688:1998)*

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 and specifications (ISO 12100-2:2003)*

EN ISO 13732-1:2006, *Ergonomic 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 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)*

CENELEC Report R044-001:1999, *Safety of machinery — Guidance and recommendations for the avoidance of hazards due to static electricity*

### 3 Terms and definitions

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

#### 3.1

##### **extruder**

a machine which conveys materials by means of one or more screws rotating within a barrel and discharges it continuously through the extrusion head

**Note** In doing so the material can be heated, cooled, consolidated, mixed, plasticised, can undergo chemical reactions, and may be degassed or gas injected. Viewed in the direction of flow of the material the extruder itself ends with the tip of the screw or screws.

#### 3.2

##### **hopper**

a container for gravity feeding of material into the extruder

#### 3.3

##### **single roller feeding device**

a roller, which has an axis parallel to that of the screw

**NOTE** The screw and the roller counter-rotate and form an in-running nip and thereby improve the regularity of feeding. The device may be driven by the screw or by an independent device.

#### 3.4

##### **double roller feeding**

a device used for constant feeding of the extruder

**NOTE** The feeding device consists of two rollers arranged in parallel positioned at the feed opening of the extruder

#### 3.5

##### **crammer feeding system**

a system which has a dedicated drive which assists or densifies the flow of materials into the extruder by means of screws or other devices

#### 3.6

##### **main feed opening**

an opening in the barrel through which for example the granule, sheets, strips, powder or plasticised material passes

#### 3.7

##### **secondary opening**

a subsidiary opening in the barrel through which for example granulate, powder, liquid, gases or paste (e. g. colour, stabilisers, plasticisers) enters, or gases or vapours are removed

#### 3.8

##### **barrel**

a housing which surrounds one or more screws

#### 3.9

##### **accessories attached to openings in the extruder barrel**

parts or devices for example pins, temperature or pressure gauges, vent or degassing chimneys

### 3.10

#### **melt/gear pump**

a device which has a dedicated drive used to convey molten material at a defined pressure

### 3.11

#### **melt pipes and adaptors**

parts for connecting accessories for example screen changers, melt pumps and static mixers

### 3.12

#### **static mixer**

a device positioned at the outlet of the screw of an extruder which contains fixed obstacles used to homogenize, cool and heat the material

### 3.13

#### **screen changer**

a device containing one or more screens through which molten material flows to remove foreign particles

NOTE The screen or screens are fixed on a carrier and can be moved from an on-line operating position and vice versa.

### 3.14

#### **extruder head**

a device that gives shape to the molten material

## 4 List of significant hazards

### 4.1 General

This clause contains all the significant hazards, hazardous situations and events, as far as they are dealt with in this document, identified by risk assessment as significant for this type of machinery and which require action to eliminate or reduce the risk

### 4.2 Mechanical hazards

NOTE Table 1 below shows the danger areas and the types of mechanical hazards which may occur.

**Table 1 — Mechanical hazards and danger areas**

	Crushing hazards	Shearing hazards	Cutting and severing	Drawing-in or trapping	Ejection of parts of machinery
Rotating parts of the drive and power transmission machinery	X	X	X	X	X
Rotation of screw(s)	X	X	X	X	
Moving parts of the feeding system	X	X	X	X	