SLOVENSKI STANDARD
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Stroji za predelavo gume in plastike - Notranji mešalniki - Varnostne zahteve

Plastics and rubber machines - Internal mixers - Safety requirements

Kunststoff- und Gummimaschinen - Innenmischer - Sicherheitsanforderungen

Machines pour les matières plastiques et le caoutchouc - Mélangeurs internes - Prescritions de sécurité

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Plastics and rubber machines - Internal mixers - Safety requirements

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

Kunststoff- und Gummimaschinen - Innenmischer - Sicherheitsanforderungen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 145.

If this draft becomes a European Standard, 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 12013:2015) 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 12013:2000+A1:2008.

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.

The main changes with respect to the previous edition are as follows:

— modification of the structure;

— list of significant hazards are moved into an informative annex;

— clarification that internal mixers for production and for laboratory applications are dealt with;

— tandem mixers (combination of two internal mixers) are added;

— technical developments in safeguards are taken into account;

— revised type-A and type-B standards are taken into account;

— the performance levels of safety related parts of control systems are specified in accordance with EN ISO 13849-1;

— normative annex on noise measurement and declaration is added.

Introduction

This document is a type C standard as stated in EN ISO 12100:2010.

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 European Standard deals with all significant hazards, hazardous situations or hazardous events relevant to the design and construction of internal mixers for production and laboratory applications, when the machines are used as intended and under the conditions of misuse which are reasonably foreseeable by the manufacturer (see Annex A).

An internal mixer begins at the feed openings and ends at the discharge opening.

Internal mixers usually do not produce explosive atmospheres. Where materials are processed, which may cause an explosive atmosphere, the Directive 94/9/EC on the Equipment and protective systems intended for use in potentially explosive atmospheres (ATEX) should be applied. Explosion hazards are not dealt with in this document.

The safety requirements for the design of exhaust systems and of ancillary equipment are not covered. The safety requirements for the interaction between internal mixers and ancillary equipment are covered.

This European Standard is not applicable to internal mixers manufactured before the date of its publication.

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.

CLC/TR 60079-32-1, *Explosive atmospheres - Part 32-1: Electrostatic Hazards - Guidance*

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

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

EN 953:1997+A1:2009, *Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards.*

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

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

EN 60529:1991 + A1:2000 + A2:2013, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989/A1:1999/A2:2013)*

EN 61310-1, *Safety of machinery - Indication, marking and actuation - Part 1: Requirements for visual, acoustic and tactile signals (IEC 61310-1)*

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

EN 61496-2, *Safety of machinery - Electro-sensitive protective equipment - Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs) (IEC 61496-2)*

EN ISO 4413, *Hydraulic fluid power - General rules and safety requirements for systems and their components (ISO 4413)*

EN ISO 4414, *Pneumatic fluid power - General rules and safety requirements for systems and their components (ISO 4414)*

EN ISO 4871:2009, *Acoustics - Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

EN ISO 11202:2010, *Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions applying approximate environmental corrections (ISO 11202:2010)*

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

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

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

EN ISO 13850:2008, *Safety of machinery - Emergency stop - Principles for design (ISO 13850:2006)*

EN ISO 13855, *Safety of machinery - Positioning of safeguards with respect to the approach speeds of parts of the human body (ISO 13855)*

EN ISO 13856-1, *Safety of machinery - Pressure-sensitive protective devices - Part 1: General principles for design and testing of pressure-sensitive mats and pressure-sensitive floors (ISO 13856-1)*

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 14119:2013, *Safety of machinery - Interlocking devices associated with guards - Principles for design and selection (ISO 14119:2013)*

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

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

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

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

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
internal mixer
mixing machine for the discontinuous production of rubber or plastic compounds with two counter rotating horizontal rotors within a mixing chamber

Note 1 to entry: The main parts of an internal mixer are:

— a feed hopper with several openings:

  — at the feed side, a feed opening equipped with a door (hopper front door) (d);

  — at the side opposite to the feed side, an inspection/access opening (hopper rear opening) equipped with a fixed or moveable guard (hopper rear door) (e);

  — possible additional feed openings for connection to feeding ducts (f);

— a floating weight which applies pressure to the materials to be mixed (g);

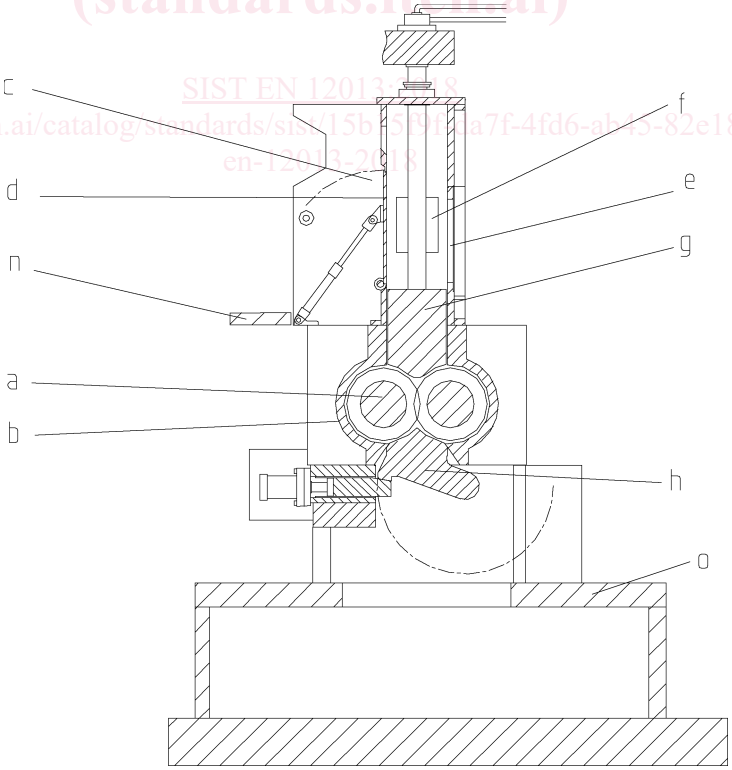
— a drop type or sliding type discharge door (h).

Note 2 to entry: The main parts of an internal mixer are shown in Figure 1.

3.2
laboratory internal mixer
internal mixer with a chamber volume up to 10 l

3.3
tandem mixer
combination of two internal mixers, whereby the lower internal mixer is equipped with a transition chute instead of a floating weight

Note 1 to entry: The main parts of a tandem mixer are shown in Figure 2.

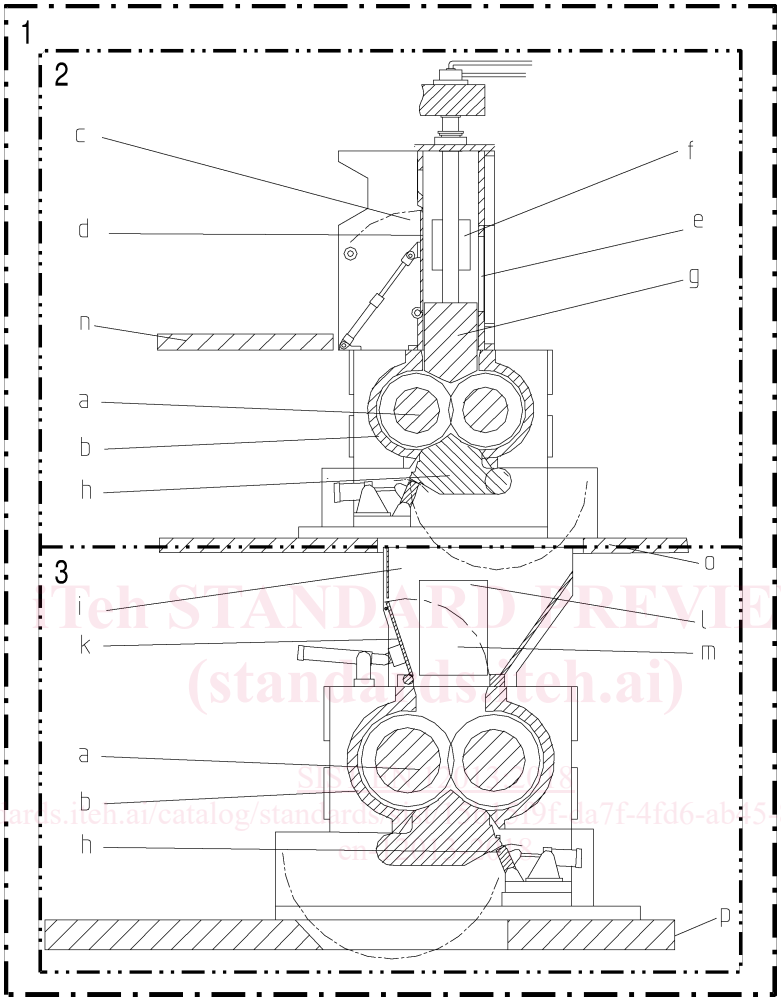


Key

a	rotors	f	feed opening for material handling system connections
b	mixing chamber	g	floating weight for applying pressure on the compound
c	feed hopper	h	discharge device

d	feeding door	n	operating platform
e	rear door opening	o	internal mixer platform, material discharge level

Figure 1 — Main parts of an internal mixer



Key

1	tandem mixer	2	upper internal mixer
		3	lower internal mixer
a	rotors	i	transition chute
b	mixing chamber	k	pusher flap
c	feed hopper	l	opening
d	feeding door	m	inspection door
e	rear door opening	n	operating platform
f	feed opening for material handling system connections	o	internal mixer platform, material discharge level
g	floating weight for applying pressure on the compound	p	internal mixer platform, material discharge level of the tandem mixer
h	discharge device		

Figure 2 — Main parts of a tandem mixer

3.4
mixing chamber
part of the machine comprising two mixing chamber halves, rotors, side walls and discharge door, where the mixing process runs

3.5
chamber volume
volume within the halves of the mixing chamber and the floating weight or the pusher flap

3.6
ancillary equipment
equipment which interacts with the internal mixer

Note 1 to entry: Examples for ancillary equipment: belt conveyors, bin tippers, powder or liquid feeding systems, two-roll mills and extruders.

3.7
major cleaning and/or maintenance operations
cleaning and/or maintenance operation at the shutdown and secured internal mixer, which requires suspension of production, the mixer to be emptied and access to the mixing chamber or to the floating weight

4 Safety requirements and/or protective/risk reduction measures

4.1 General

Machinery shall comply with the safety requirements and/or protective/risk reduction measures of this clause. In addition, the machine shall be designed according to the principles of EN ISO 12100:2010 for relevant but not significant hazards, which are not dealt with by this document.

4.2 Safety related parts of the control system

The safety related parts of the control system shall be in accordance with EN ISO 13849-1. The required performance levels (PL_r) for the relevant safety functions is given in the corresponding subclauses.

4.3 Emergency stop

Emergency stop equipment shall be in accordance with category 0 of EN ISO 13850:2008. The emergency stop shall interrupt all energy supply for the internal mixer and shall bring the upstream and downstream equipment to rest if its continued operation can be hazardous.

The control circuit of the internal mixer shall be designed in such a way that it is capable of exchanging signals with emergency stop circuits of downstream or upstream equipment. The method how to process the signals depends on the mixing process and shall be agreed between the manufacturer and the user and documented.

The emergency stop safety function shall be in accordance with PL_r = c with two input channels.

When a fire emergency procedure has started, it shall be possible to activate manually the completion of the fire emergency procedure even if an emergency stop has been activated.

4.4 Emergency stop devices

One or more emergency stop actuators shall be provided. The number of the actuators depends on the dimensions of the machine and its configuration. The actuators shall be so positioned, that from all of the operating positions at least one is easily accessible. Emergency stop devices shall be positioned at

least at the operating position (control panel), at the hopper, at the hydraulic unit and at the control cabinet.

For laboratory internal mixers, a single actuator mounted at the control panel is sufficient, if the control panel is positioned in the vicinity of the feed openings and a clear view to these openings is ensured.

4.5 Mechanical hazards

4.5.1 General

Depending on the design of the machine, single safety solutions or a combination of safety solutions are possible for the individual local danger point or individual local danger area.

4.5.2 Safeguarding and complementary protective/risk reduction measures

For safeguarding and complementary protective/risk reduction measures referred to in Table 1, the following apply:

— guards shall be in accordance with EN 953 taking into consideration the safety distance of EN ISO 13857. For reaching over protective structures the choice of Table 1 or Table 2 is given in the relevant subclauses;

— interlocking guards shall be in accordance with EN ISO 14119:2013, 3.2;

— interlocking guards with guard locking shall be in accordance with EN ISO 14119:2013, 3.3;

— the safety related parts of the control system shall be in accordance with PL_r = c, subject to other provisions in relevant subclauses;

— the positioning of safeguards with respect to the approach speeds of parts of the human body shall be in accordance with EN ISO 13855;

— two-hand control devices shall be in accordance with EN 574; the required types are specified in the relevant subclauses;

— hold-to-run control devices shall be in accordance with EN ISO 12100:2010, 3.28.3;

— electro-sensitive protective equipment (e.g. light curtains) shall be in accordance with EN 61496-1;

— active opto-electronic protective devices (AOPDs) shall be in accordance with EN 61496-2;

— sensitive mats and pressure sensitive floors shall be in accordance with EN ISO 13856-1;

— to prevent whole body access between light curtains and danger areas the maximum distance shall be 120 mm.

4.5.3 Guidance for interpreting Tables in subclauses

The different protective measures for each hazard are separated in table rows. Each measure in a row shall be deemed to be a self-contained alternative.

The first column "Admissible protective measures" contains one or more alternative safety solutions.

The second column "Mandatory requirements for the protective measures" contains requirements which need to be applied in addition to the corresponding protective measure in the first column of the same row.

The third column contains, if any, the required performance level.

4.5.4 Safety requirements and/or protective/risk reduction measures preventing mechanical hazards in the feeding area

4.5.4.1 Movement of the feeding door

Admissible protective measure	Mandatory requirement for the protective measures	Required performance level PL_r
Fixed guards	The maximum distance between fixed or movable parts of the machine shall be 120 mm in order to avoid whole body access.	not relevant
Interlocking guards	— The maximum distance between the guard and fixed parts of the machine shall be 120 mm in order to avoid whole body access (see EN ISO 13857); and — the opening of the guard shall stop the movement of the feeding door.	$PL_r = d$ Where the movement of the feeding door can only be operated manually: $PL_r = c$
Conveyor acting as an interlocking guard	— The maximum distance between fixed or movable parts of the machine shall be 120 mm in order to avoid whole body access; and — the position of the conveyor shall be monitored. The removal or shifting of the conveyor shall stop the machine.	$PL_r = d$ Where the movement of the feeding door can only be operated manually: $PL_r = c$
Two-hand control devices, Type III B for triggering the movement of the feeding door	The danger area shall be clearly visible.	$PL_r = c$
Hold-to-run control device for triggering the movement of the feeding door.	— The danger area shall be clearly visible; and — the minimum distance to the closest crushing and shearing points shall be at least 2 m.	$PL_r = c$
Operator monitoring by means of presence detective devices	The triggering of the devices (e.g. scanners, pressure sensitive mats/floors or light curtains) shall stop the movements of the feeding door.	$PL_r = d$

4.5.4.2 Movement of externally located rotating parts on the feeding door (cams)

Admissible protective measure	Mandatory requirement for the protective measures	Required performance level PL_r
Fixed guards	-	not relevant
Safety distances	Access not possible due to the mounting situation.	not relevant

4.5.4.3 Reaching through lateral or rear openings

Admissible protective measure	Mandatory requirement for the protective measures	Required performance level PL_r
Ducts, feeding channels or covers on lateral or rear openings	The ducts, feeding channels and covers shall be so designed that they act as fixed guards	not relevant

4.5.4.4 Reaching through exhaust openings

Admissible protective measure	Mandatory requirement for the protective measures	Required performance level PL_r
Connection flange in combination with an exhaust system	— The combination of connection flange in combination with an exhaust system shall act as a fixed guard.; and — information shall be given in the instruction handbook about the installation of an exhaust system and that the internal mixer may not be operated without the installation of an exhaust channel.	not relevant

4.5.4.5 Movement of the floating weight

Admissible protective measure	Mandatory requirement for the protective measures	Required performance level PL_r
Fixed guards		not relevant
Conveyor acting as an interlocking guard	— The maximum distance between fixed or movable parts of the machine shall be 120 mm in order to avoid whole body access; and — the position of the conveyor has to be monitored. The removal or shifting of the conveyor shall stop the machine.	PL_r = d Where the movement of the floating weight can only be operated manually: PL_r = c
Automatic controlled mode: Use of a feeding door acting as an interlocking guard	Opening of the feeding door shall stop the movement of the floating weight.	PL_r = d
Manual mode: Two-hand control, Type III B for triggering the movement of the floating weight movement	— The manual mode shall be activated by a mode selector; and the danger area shall be clearly visible.	PL_r = c
Manual mode: Hold-to-run control device	— The manual mode shall be activated by a mode selector; and — and the danger area shall be clearly visible. And — the minimum distance to the closest crushing and shearing points shall be at least 2 m.	PL_r = c
Interlocking guard with guard locking	The movement of the floating weight shall only be possible if — the interlocking guard is closed; or — the feeding door is closed; or — the machine is in ”Manual mode”; the movement of the floating weight shall be released by either a two-hand control device, Type III B or a hold-to-run control device Unlocking of the interlocking guard shall only be possible if the feeding door is closed or the machine is in manual mode.	PL_r = d