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Stroji za predelavo gume in plastike - Dvovaljni gnetilniki - Varnostne zahteve

Plastics and rubber machines - Two-roll mills - Safety requirements

Kunststoff- und Gummimaschinen - Walzwerke - Sicherheitsanforderungen

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

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Plastics and rubber machines - Two-roll mills - Safety requirements

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

Kunststoff- und Gummmaschinen - Walzwerke -
Sicherheitsanforderungen

This European Standard was approved by CEN on 18 September 2023.

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COMITÉ EUROPÉEN DE NORMALISATION
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EN 1417:2023 (E)**European foreword**

This document (EN 1417:2023) has been prepared by Technical Committee CEN/TC 145 “Plastics and rubber machines”, 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of an identical text or by endorsement, at the latest by May 2024, and conflicting national standards shall be withdrawn at the latest by November 2024.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1417:2014.

In comparison with the previous edition EN 1417:2014, the following technical modifications have been made:

- a) the structure of the document has been modified;
- b) covered ancillary equipment has been clarified in the scope;
- c) the list of significant hazards has been moved to an informative annex;
- d) technical developments in safeguards have been taken into account;
- e) revised type-A and type-B standards have been taken into account;
- f) the class of intermediate two-roll mills (requirements integrated in large and/or small two-roll mills) has been removed;
- g) requirements for braking system have been adapted to the state of the art;
- h) requirements for trip bar have been modified;
- i) hazard and measures related to secondary roller have been added;
- j) requirements for small mill rolls have been modified.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annex ZA, which is an integral part of this document.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Introduction

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

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

- machine manufacturers (small, medium and large enterprises);
- health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

- machine users/employers (small, medium and large enterprises);
- machine users/employees (e.g. trade unions, organizations for people with special needs);
- service providers, e.g. for maintenance (small, medium and large enterprises);
- consumers (in the case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate in the drafting process of this document.

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

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

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EN 1417:2023 (E)**1 Scope**

This document deals with all significant hazards, hazardous situations or hazardous events relevant to two-roll mills for the processing of rubber and/or plastics (see Annex A), when used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer during all the phases of the life of the machine as described in EN ISO 12100:2010, 5.4.

This document covers two-roll mills as defined in 3.1.

This document covers two-roll mills intended to be used in normal production and two-roll mills intended to be used in laboratories (testing of mixtures by batchwise processing of small amounts, not continuously).

This document is applicable to the following ancillary equipment as integral part of the machine:

- powered stock guides;
- strip cutting device;
- stock blender;
- recovery conveyor belt;
- retractable ploughs;
- secondary roller;
- supply of heating and/or cooling fluids.

This document does not apply to the design of a local exhaust ventilation system that might be necessary in specific applications of the machine not known by the manufacturer.

This document does not apply to two-roll mills manufactured before the date of its publication as a European Standard.

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2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60204-1:2018, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 60204-1:2016, modified)*

EN IEC 61000-6-2:2019, *Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments (IEC 61000-6-2:2016)*

EN IEC 61496-1:2020, *Safety of machinery - Electro-sensitive protective equipment - Part 1: General requirements and tests (IEC 61496-1:2020)*

EN IEC 61496-2:2020, *Safety of machinery - Electro-sensitive protective equipment - Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs) (IEC 61496-2:2020)*

EN ISO 3744:2010, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane (ISO 3744:2010)*

EN ISO 3746:2010, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane (ISO 3746:2010)*

EN ISO 4413:2010, *Hydraulic fluid power - General rules and safety requirements for systems and their components (ISO 4413:2010)*

EN ISO 4414:2010, *Pneumatic fluid power - General rules and safety requirements for systems and their components (ISO 4414:2010)*

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

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 11201:2010, *Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections (ISO 11201:2010)*

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 11204:2010, *Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions applying accurate environmental corrections (ISO 11204:2010)*

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

EN ISO 13732-1:2008, *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 13849-1:2015, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2015)*

EN ISO 13850:2015, *Safety of machinery - Emergency stop function - Principles for design (ISO 13850:2015)*

EN ISO 13851:2019, *Safety of machinery - Two-hand control devices - Principles for design and selection (ISO 13851:2019)*

EN ISO 13854:2019, *Safety of machinery - Minimum gaps to avoid crushing of parts of the human body (ISO 13854:2017)*

EN ISO 13855:2010, *Safety of machinery - Positioning of safeguards with respect to the approach speeds of parts of the human body (ISO 13855:2010)*

EN ISO 13857:2019, *Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2019)*

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

EN ISO 14120:2015, *Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards (ISO 14120:2015)*

EN 1417:2023 (E)**3 Terms and definitions**

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1**two-roll mill**

machine with two counter-rotating cylinders (known as mill rolls) which are not enclosed, which may be smooth or grooved, and whose axes are on substantially the same horizontal plane for the mixing of plastics or rubber

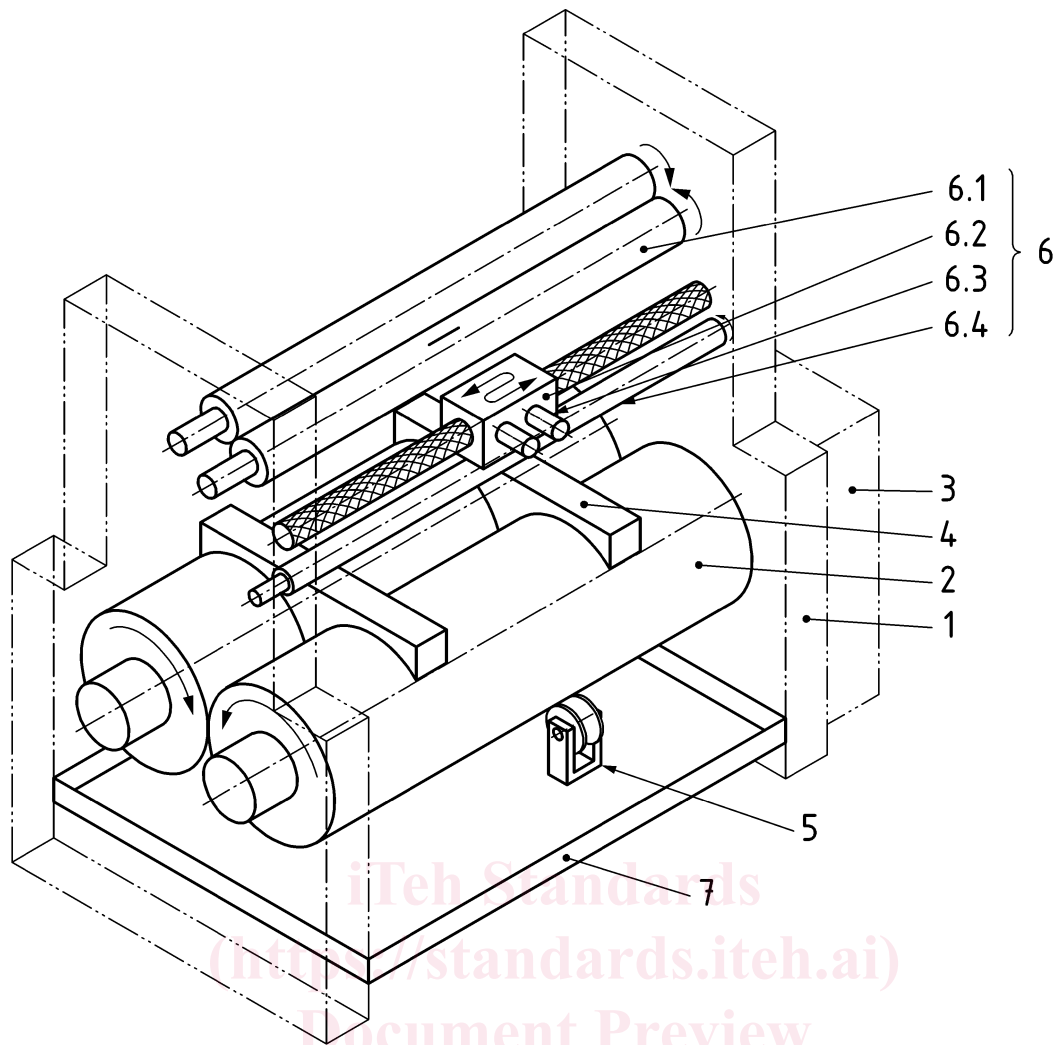
Note 1 to entry: The two-roll mill can be equipped with several devices, e.g. strip cutting device, stock blender, mill tray

Note 2 to entry: See Figure 1.

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**Key**

1	frame	6	stock blender
2	mill roll	6.1	stock blender rolls
3	drive and transmission unit	6.2	stock blender carriage
4	stock guide	6.3	guiding rolls of stock blender carriage
5	strip cutting device	6.4	guiding roll below stock blender carriage
		7	mill tray

Figure 1 — Example of a two-roll mill shown without safety devices and without retractable ploughs secondary-rollers and recovery conveyor belt

3.1.1**large two-roll mill**

two-roll mill with a mill roll diameter $D > 200$ mm

3.1.2**small two-roll mill**

two-roll mill with a mill roll diameter $D \leq 200$ mm

Note 1 to entry: Small two-roll mills are usually not equipped with stock blenders and strip cutting devices.

Note 2 to entry: Small two-roll mills are mostly used in laboratory applications (testing of new mixtures by batchwise processing of small amounts, not continuously).

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3.2

principal crushing zone

zone extending over the full length of the mill rolls indicated by V in Figure 2 and Figure 3

Dimensions in millimetres

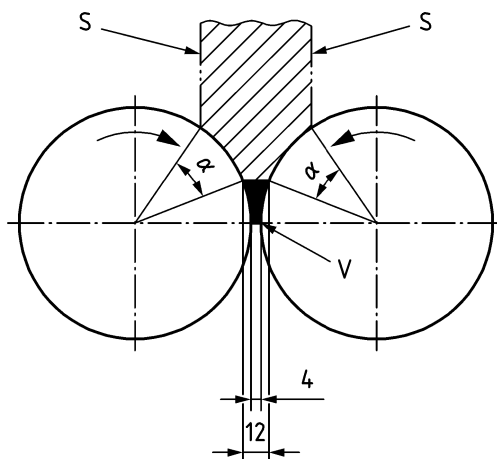


Figure 2 — Principal crushing zone V, safety limits S and stopping angle α on a large two-roll mill

Dimensions in millimetres

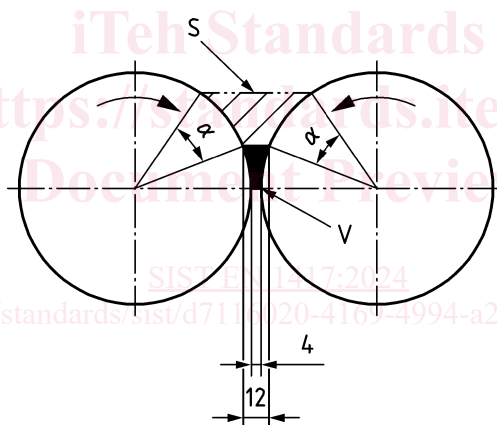


Figure 3 — Principal crushing zone V, safety limit S and stopping angle α on a small two-roll mill

3.3

stopping angle

α

angle through which the mill rolls rotate from the stop signal triggered by a protective device until the mill rolls have come to rest with the machine unloaded, and running at maximum rated speed

3.4

safety limit

vertical plane indicated by Line S in Figure 2 (for large two-roll mills) or horizontal plane indicated by Line S in Figure 3 (for small two-roll mills) demarcating the zone which is unsafe for operators who can reach into it without actuating the trip bar

3.5

stock guide

part which prevents material being processed from going beyond the mill roll end

Note 1 to entry: See Figure 1, Location 4.

3.6

strip cutting device

device equipped with rotating discs or stationary blades to cut off strips of processed material from a mill roll

Note 1 to entry: See Figure 1, Location 5.

3.7

stock blender

equipment used to continuously recirculate the material being processed to obtain a uniform mixing, distributing it with a reciprocating motion along the length of the mill rolls

Note 1 to entry: See Figure 1, Location 6.

Note 2 to entry: The horizontal movement of the processed material is achieved by guiding rolls fixed on the stock blender carriage (see item 6.3 in Figure 1). An additional horizontal guiding roll below the stock blender (see item 6.4 in Figure 1) can be used for better guidance of the material.

3.8

mill tray

equipment for catching material which falls under the mill rolls

Note 1 to entry: See Figure 1, Location 7.

3.9

recovery conveyor belt

equipment for recirculating material which falls under the mill rolls

Note 1 to entry: See Figure A.3.

3.10

retractable plough

equipment which can be moved towards the mill roll in order to cut and turn over the material, and which can be retracted

Note 1 to entry: See Figure A.2.

3.11

secondary roller

additional roller, which is used to support the mixing process

Note 1 to entry: See Figure 7.

Note 2 to entry: Examples are take-off rollers or pressure rollers applying pressure on the material processed by the two-roll mill. The pressure can be applied by the weight of the roller or by a power-driven actuator.

3.12

knee plate

pressure sensitive protective device installed at a height so that it can be activated by the knee of the operator

EN 1417:2023 (E)**4 Safety requirements and/or protective/risk reduction measures****4.1 General**

Two-roll mills 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 Control systems**4.2.1 General**

The electrical part of the control system shall be designed in accordance with EN 60204-1:2018, Clause 9 and in addition with the specific requirements given in this standard.

The safety related parts of the control system (SRP/CS) shall be designed in accordance with EN ISO 13849-1:2015. The required performance level (PL_r) for each safety function is specified in the relevant subclauses.

4.2.2 Starting

The start of an operation shall be possible only when all safeguards are in place and functional (see EN 60204-1:2018, 9.2.3.2). The machine shall only be started by actuation of the start device provided for that purpose.

4.2.3 Normal stopping

A normal stop device (e.g. a push button) shall be provided to stop the machine.

The normal stop command shall function as a stop category 0 or 1 in accordance with EN 60204-1:2018, 9.2.2, depending on the actuators and braking systems used.

4.2.4 Emergency stop

Emergency stop devices shall be positioned on each control panel and on each working side of the two-roll mill and shall conform to EN ISO 13850:2015 and to category 0 or 1 according to EN 60204-1:2018, 9.2.2, whichever provides the best stopping performance.

The actuation of any emergency stop device shall

- cause stopping of the mill rolls in accordance with 4.3.1.1.2. If the installed protective device requires to respect a maximum braking angle, this shall also be met (see 4.3.2.1.5, 4.3.3.4.2, B.2); and
 - on machines equipped with protective device requiring roll automatic separation (see 4.3.2.1.5, 4.3.3.4.2, 4.3.3.5), cause automatic roll separation achieving
 - a gap of at least 50 mm within 5 s in accordance with $PL_r = d$; or
 - a gap of at least 30 mm within 3 s in accordance with $PL_r = d$ and automatic reversal of the mill rolls commencing in a time not greater than 2 s and achieving a rotation of $60 \pm 5^\circ$. See also 4.3.2.2.2;
- and
- on machines not equipped with automatic separation allow the roll separation for emergency release of persons (see 4.3.2.3); and
 - on large two-roll mills, allow the rescue reverse movement in accordance with 4.3.2.3; and