SLOVENSKI STANDARD
oSIST prEN 16474:2024

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Stroji za predelavo gume in plastike - Stiskalnice za vulkaniziranje - Varnostne zahteve

Plastics and rubber machines - Tyre curing machines - Safety requirements

Kunststoff- und Gummimaschinen - Reifenvulkanisiermaschinen - Sicherheitsanforderungen

Machines pour les matières plastiques et le caoutchouc - Machines à vulcaniser les pneumatiques - Prescriptions de sécurité

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Will supersede EN 16474:2015

English Version

Plastics and rubber machines - Tyre curing machines - Safety requirements

Machines pour les matières plastiques et le caoutchouc - Machines à vulcaniser les pneumatiques - Prescriptions de sécurité

Kunststoff- und Gummimaschinen - Reifenvulkanisiermaschinen - 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.

This draft European Standard was established by CEN 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-CENELEC Management Centre has the same status as the official versions.

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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 16474:2023) 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 16474:2015.

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

— modification of the scope including machines for cycle and motorcycle tyres and Post Curing Inflator (PCI);

— consideration of revised type-A and type-B standards;

— added safety requirements for Post Curing Inflator;

— added requirements related to rescue movement for the movable upper part and the loading device;

— introduced fire hazard and related safety requirements;

— considered the possibility to leave pressurized the bladder above the semi-closed position for a limited time and also when safeguards are activated and to increase the pressure above the threshold for a very short time;

— considered the possibility to install a shield in order to leave pressurized the bladder below the semi-closed position for a limited time when safeguards are activated.

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.

Introduction

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

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

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 in accordance with the provisions of this type C standard.

1 Scope

This document applies to tyre curing machines having the following configuration:

— crossing flow tyre curing machines, with one cavity with manual or automatic feeding and discharge;

— crossing flow tyre curing machines, with two cavities, with manual or automatic feeding and discharge and with:

  — common curing cycle and common safeguarding; or

  — independent curing cycles and common safeguarding; or

  — independent curing cycles and independent safeguarding;

— tyre curing machines with automatic rear feeding and discharge.

The safety requirements and/or protective measures specified in this document apply to tyre curing machines for cycle, motorcycle, passenger vehicle and truck tyres.

This document deals with the following ancillaries equipment that are an integral part in a tyre curing machine:

— loading/unloading device;

— take-away conveyor;

— Post Cure Inflator (PCI) integrated in the rear side of a crossing flow machines for passenger vehicle tyres.

This document does not deal with:

— feeding system and discharge system;

— tyre curing machines with manual loading of the green tyre into the mould and manual unloading of the cured tyre from the mould;

— ancillary equipment which is not an integral part of the tyre curing machine, e.g. conveying equipment;

— exhaust systems.

This document deals with all significant hazards, hazardous situations and events relevant to tyre curing machines, when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer (see Annex A).

It does not deal with hazards associated with falling of parts of the container or mould because they are not part of the machinery.

This document is not applicable to tyre curing machines which are manufactured before the date of its publication as an EN.

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 619:2022, *Continuous handling equipment and systems - Safety requirements for equipment for mechanical handling of unit loads*

EN 1005-3:2002+A1:2008, *Safety of machinery - Human physical performance - Part 3: Recommended force limits for machinery operation*

EN 1005-4:2005+A1:2008, *Safety of machinery - Human physical performance - Part 4: Evaluation of working postures and movements in relation to machinery*

EN 60204-1:2018, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements*

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 IEC 61496-3:2019, *Safety of machinery - Electro-sensitive protective equipment - Part 3: Particular requirements for active opto-electronic protective devices responsive to diffuse reflection (AOPDDR) (IEC 61496-3:2018)*

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 7010:2020,[1] *Graphical symbols - Safety colours and safety signs - Registered safety signs (ISO 7010:2019, Corrected version 2020-06)*

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,[2] *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)*

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[1] As impacted by EN ISO 7010:2020/A1:2020, EN ISO 7010:2020/A2:2022, EN ISO 7010:2020/A3:2022, EN ISO 7010:2020/A4:2023, EN ISO 7010:2020/A5:2023 and EN ISO 7010:2020/A6:2023.

[2] As impacted by EN ISO 11202:2010/A1:2021.

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 13849-1:2023, *Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2023)*

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

prEN ISO 13855:2022, *Safety of machinery - Positioning of safeguards with respect to the approach of the human body (ISO/DIS 13855:2022)*

EN ISO 13856-2:2013, *Safety of machinery - Pressure-sensitive protective devices - Part 2: General principles for design and testing of pressure-sensitive edges and pressure-sensitive bars (ISO 13856-2:2013)*

EN ISO 13856-3:2013, *Safety of machinery - Pressure-sensitive protective devices - Part 3: General principles for design and testing of pressure-sensitive bumpers, plates, wires and similar devices (ISO 13856-3:2013)*

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

prEN ISO 14119:2022, *Safety of machinery - Interlocking devices associated with guards - Principles for design and selection (ISO/DIS 14119:2022)*

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

EN ISO 14122-2:2016, *Safety of machinery - Permanent means of access to machinery - Part 2: Working platforms and walkways (ISO 14122-2:2016)*

EN ISO 14122-3:2016, *Safety of machinery - Permanent means of access to machinery - Part 3: Stairs, stepladders and guard-rails (ISO 14122-3:2016)*

EN ISO 14122-4:2016, *Safety of machinery - Permanent means of access to machinery - Part 4: Fixed ladders (ISO 14122-4:2016)*

ISO 1402:2021, *Rubber and plastics hoses and hose assemblies - Hydrostatic testing*

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 terminology databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp/

3.1
tyre curing machine
machine used for vulcanisation of tyres usually comprising fixed and movable parts that can be locked together, inside which the green tyre assumes its final shape and characteristics by the use of pressure and heating

Note 1 to entry: See Figure 1 and Figure 2.

3.2
crossing flow
machine type in which green tyres are fed and loaded from the front and cured tyres are unloaded and discharged from the rear

3.3
cavity
part of the machine in which the container and/or the mould and the bladder are installed

3.4
green tyre
assembly of rubber parts intended to be cured

3.5
cured tyre
tyre in its final form after vulcanisation

3.6
bladder
inflatable rubber component used to push the green tyre into contact with the mould while being inflated by the curing media

Note 1 to entry: The bladder could be connected to the machine by means of the top ring and bottom ring or automatic clamped on the lower foot.

3.7
bottom ring
assembly of the bottom bladder clamping plate

3.8
top ring
assembly of the top bladder clamping plate

3.9
green tyre stand
supporting element for the green tyre before loading

3.10
chuck
device for holding or gripping the green or cured tyre

3.11
movable upper part
part of the machine that is opened for loading the green tyre and unloading the cured tyre and is closed and locked during curing

3.12
heating platen
equipment used to heat sidewalls of the mould by contact

3.13
steam dome
equipment used to heat the complete mould by direct contact with the steam

3.14
container
exchangeable equipment used to heat the curing mould or part of it

Note 1 to entry: The container is fixed to the tyre curing machine by use of screws or automatic fixation device.

3.15
mould
exchangeable equipment used to give the external shape to the cured tyre

Note 1 to entry: The mould could be a two halves' moulds or a segmented mould.

3.16
dummy mould
subassembly representative of the mould

3.17
mould segment
movable part of the mould

3.18
loading pressure
pressure inflated into the bladder in order to make it able to hold the green tyre in place while the loading device deposits it into the cavity

3.19
pre-shaping pressure
pressure inflated into the bladder in order to make it able to pre-shape the green tire while the curing machine is closing the mould

3.20
opening pressure
pressure inflated into the bladder in order to make it able to hold the cured tire in place while the curing machine is opening the mould

3.21
semi-closed position
position of the movable top beam above which the loading pressure is applied and below which the pre-shaping pressure or the opening pressure is applied

Note 1 to entry: The position depends on the height of the mould and the size of the green tire.

Note 2 to entry: In case of segments mould, position where the still open segments of the mould in the container are 100 mm above the position generating the first contact with the bottom part of the mould.

Note 3 to entry: In case of two halves mould, position where the movable upper part of the mould gets in contact with the Top Ring, when the top ring is in the loading position.

3.22
feeding
manual or automatic operation to feed green tyres to the loading device

3.23
loading device
device that is an integrated ancillary equipment of the machine and it is used to pick up the green tyre and insert it into the tyre curing machine

3.24
curing cycle
period of time in which the curing process is completed, i.e. from full closing, squeezing and locking until the pressure is dropped down

3.25
unloading device
device that is an integrated ancillary equipment of the machine and it is used to remove the cured tyre from the tyre curing machine

3.26
discharge
manual or automatic operation to remove cured tyres from the unloading device

3.27
take-away conveyor
conveyor that is an integral part of the machine and on which the unloading device deposits the cured tyres for discharge to the rear of the tyre curing machine

3.28
spraying device
static or dynamic nozzle(s) used to treat the mould and/or the bladder with treatment fluid

3.29
distance guard
guard which does not completely enclose a danger zone, but which prevents or reduces access by virtue of its dimensions and its distance from the danger zone, e.g. perimeter fence or tunnel guard

[SOURCE: EN ISO 14120:2015, 3.2.2]

3.30
enclosing guard
guard which prevents access to the danger zone from all sides

[SOURCE: EN ISO 14120:2015, 3.2.1]

3.31
integrated ancillary equipment
ancillary equipment which cannot in itself perform a specific application but need to be integrated with a curing machine in order to carry out the intended use

Note 1 to entry: A stand-alone PCI is not an integrated ancillary equipment.

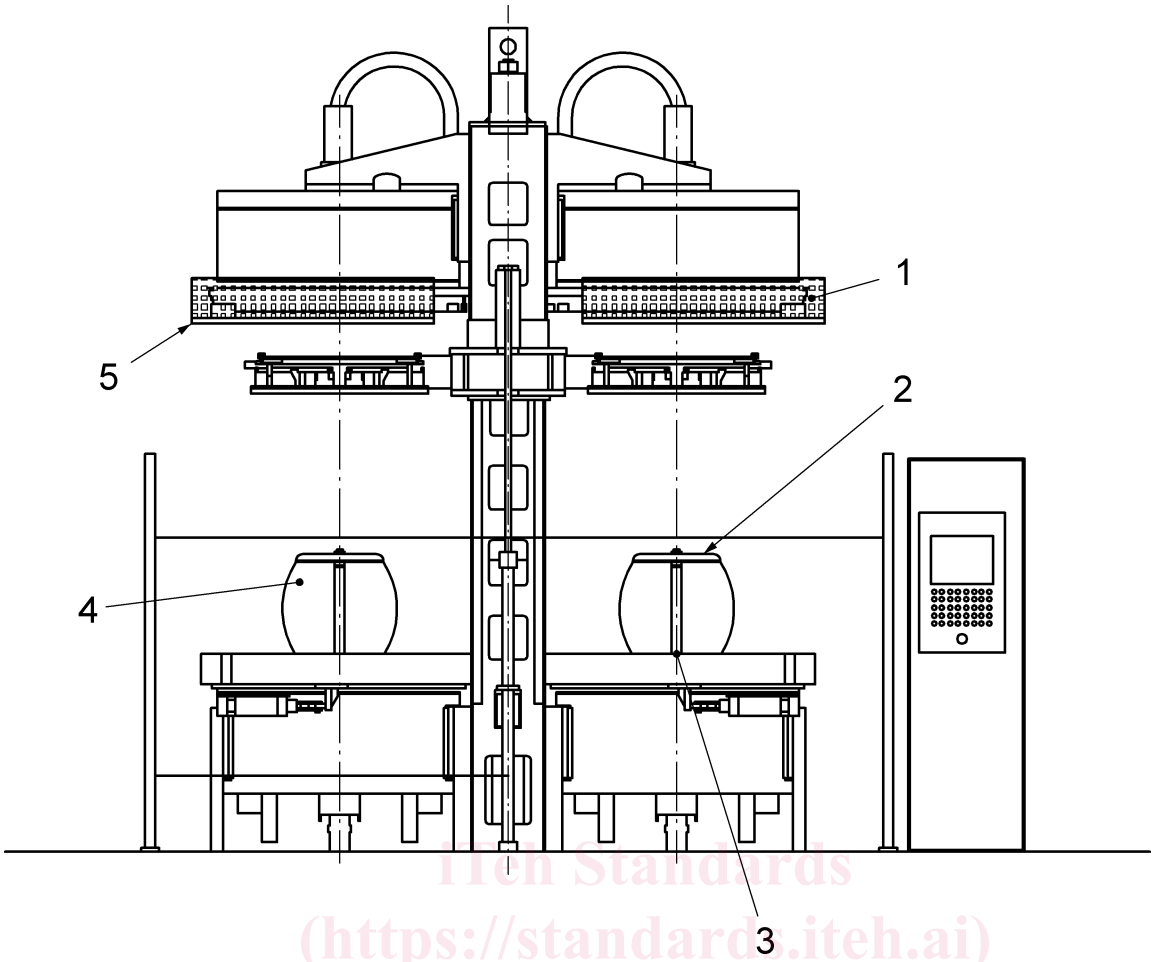
3.32
Post Cure Inflator
PCI
integrated ancillary equipment used for the inflation of the still hot cured tyre during its cooling

3.33
PCI half rim
exchangeable mechanical tool to keep the tyre in shape while inflating it

3.34
rim locking device
device that locks the rim on the PCI

3.35
machine designed for automatic feeding only
machinery designed to operate only with automatic feeding equipment to feed green tyres to the loading device and when it is not possible to operate the machinery without those devices

3.36
machine designed for automatic discharging only
machinery designed to operate only with automatic discharging equipment to remove cured tyres from the unloading device and when it is not possible to operate the machinery without those devices



Key

1 container
2 top ring
3 bottom ring or bottom clamping
4 bladder
5 heating platen

Figure 1 — Main parts of tyre curing machines (front view)