BS EN 289:2014

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Plastics and rubber machines — Compression moulding machines and transfer moulding machines — Safety requirements

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National foreword

This British Standard is the UK implementation of EN 289:2014. It supersedes BS EN 289:2004+A1:2008 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee MCE/3/2, Rubber and plastics machine - Safety.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Machines pour les matières plastiques et le caoutchouc - Machines de moulage par compression et machines de moulage par transfert - Prescriptions de sécurité

Kunststoff- und Gummimaschinen - Formpressen und Spritzpressen - Sicherheitsanforderungen

This European Standard was approved by CEN on 24 April 2014.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 289:2014) 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of an identical text or by endorsement, at the latest by December 2014, and conflicting national standards shall be withdrawn at the latest by December 2014.

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 supersedes EN 289:2004+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.

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

Compared with EN 289:2004+A1:2008, the following significant changes have been made:

a) modification of main element of the title;

b) replacement of safeguard groups I, II and III by more precise specifications of the safeguards in the respective clauses;

c) specification of the safety related parts of control systems with reference to EN ISO 13849-1:2008 instead of specified types I, II and III and EN 954 and deletion of corresponding normative Annexes A, B, C, D, E and H;

d) addition of safety requirements for:

    1) electromagnetic interference;

    2) machines with electrical axes;

    3) platen movements by gravity on upstroking presses;

    4) magnetic clamping systems;

    5) carousel machines;

    6) power operated mould changing equipment;

    7) hazards generated by neglecting ergonomic principles in machine design;

e) deletion of Annex G.

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, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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 specifies the essential safety requirements for compression moulding machines and transfer moulding machines for the moulding of plastics and/or rubber with a closing movement more than 6 mm.

In this document a compression moulding machine or transfer moulding machine as described above is designated by the term “press” (see 3.1).

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

The safety requirements are specified for the additional hazards arising from:

— shuttle/turn tables used for loading/unloading and/or cooling,

— magnetic clamping systems.

For other ancillary equipment, as defined in 3.7, that is not part of the press, only the requirements for the interaction between presses and ancillary equipment, especially loading and unloading devices are specified.

The following machines or units are excluded:

— pneumatic presses for plastic and rubber;

— injection moulding machines (see EN 201:2009);

— tyre curing machines (see prEN 16474);

— presses for curing inner tubes and curing bags;

— hydraulic presses for the cold working of metals as covered by EN 693:2001+A2:2011;

— mechanical presses for the cold working of metals as covered by EN 692:2005+A1:2009;

— pneumatic presses for the cold working of metals as covered by EN 13736:2003+A1:2009;

— thermoforming machines (see EN 12409:2008+A1:2011);

— reaction injection moulding (RIM) machines (see EN 1612-1:1997+A1:2008);

— the extruder of the carousel machine(see EN 1114-1:2011).

This standard does not cover:

— hazards caused by the processing of materials which may lead to a risk of explosion, see 7.2.2;

— the requirements of Directive 94/9/CE concerning equipment and protective systems intended for use in potentially explosive atmospheres;

— requirements for the design of exhaust ventilation systems, see 5.3.5 and 7.2.8.

This document is not applicable to presses manufactured before the date of its publication as EN.

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.

EN 574:1996+A1:2008, *Safety of machinery - Two-hand control devices - Functional aspects - Principles for design*

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

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 61000-6-2:2005, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments (IEC 61000-6-2:2005)*

EN 61000-6-4:2007, *Electromagnetic compatibility (EMC) — Part 6-4: Generic standards — Emission standard for industrial environments (IEC 61000-6-4:2006)*

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

EN 61496-2:2013 *Safety of machinery — Electro-sensitive protective equipment — Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs) (IEC 61496-2:2013)*

CLC/TS 61496-3:2008, *Safety of machinery — Electro-sensitive protective equipment — Part 3: Particular requirements for Active Opto-electronic Protective Devices responsive to Diffuse Reflection (AOPDDR) (IEC 61496-3:2008)*

EN 61800-5-2:2007, *Adjustable speed electrical power drive system — Part 5-2: Safety requirements — Functional (IEC 61800-5-2:2007)*

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 3747:2010, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering/survey methods for use in situ in a reverberant environment (ISO 3747:2010)*

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 9614-1:2009, *Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 1: Measurement at discrete points (ISO 9614-1:1993)*

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 13849-1:2008, *Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2006)*

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

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 13856-1:2013, *Safety of machinery - Pressure-sensitive protective devices - Part 1: General principles for design and testing of pressure-sensitive mats and pressure-sensitive floors (ISO 13856-1:2013)*

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 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 12100:2010 and the following apply.

3.1
press
machine for the discontinuous production of moulded parts from plastics or rubber compounds which essentially consists of one or more clamping units, drive and control systems and possibly ancillary equipment (see 3.7)

3.1.1
compression moulding
process in which the moulding material is placed into the open mould

Note 1 to entry: When the press is closed, the moulding process is carried out under the influence of pressure with or without heat.

Note 2 to entry: See Figures 1 and 2.

Note 3 to entry: This process may be used as well for laminating sheets or plates.

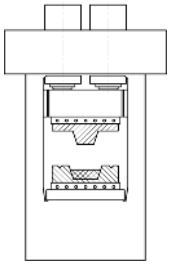


Figure 1 — Compression moulding machine shown with mould open and loaded with moulding material

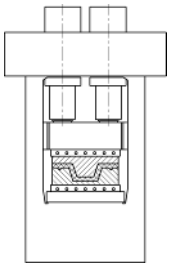


Figure 2 — Compression moulding machine shown with mould closed and moulding material formed into shape

3.1.2
transfer moulding
process in which the moulding material is fed into a separate cavity (transfer cavity) in the mould and is pressed into the moulding cavity by the pressure of the transfer plunger

Note 1 to entry: The movement of the transfer plunger is obtained either directly by the closing movement of the mould (see Figures 3 and 4) or via a separate cylinder (see Figures 5 and 6).

Note 2 to entry: If the moulding material is injected into the closed mould through a nozzle, see EN 201.

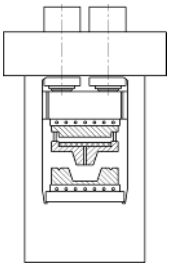


Figure 3 — Transfer moulding machine shown with moulding material in transfer cavity

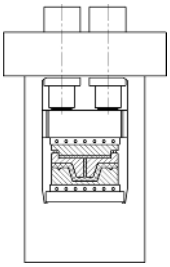


Figure 4 — Transfer moulding machine shown with moulding material fed into the moulding cavity

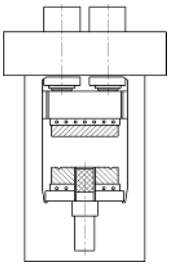


Figure 5 — Transfer moulding machine shown with separate cylinder and with moulding material in transfer cavity

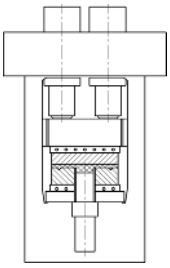


Figure 6 — Transfer moulding machine shown with separate cylinder and with moulding material fed into the moulding cavity

3.2
mould area
area between the platens

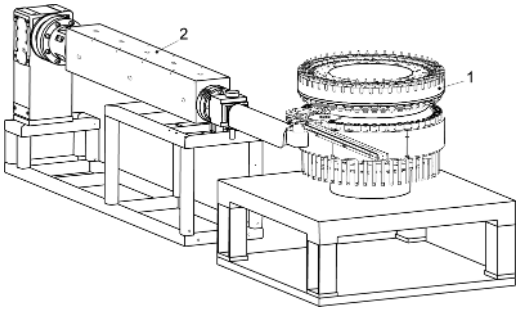
3.3
clamping unit
part of the press comprising fixed and mobile platens and associated drive mechanism

3.4
magnetic clamping system
clamping system utilising magnetic force to attach the mould to the platens

3.5
shuttle/turntable machine
press designed to contain one or more moulds attached to a table that indexes the mould(s) by a sliding or rotary motion between the loading/unloading station and the moulding position

3.6
carousel machine
machine composed by several compression units mounted on a rotating structure (carousel) fed by an extruder (see Figure 7)

Note 1 to entry: For the extruder see EN 1114–1.

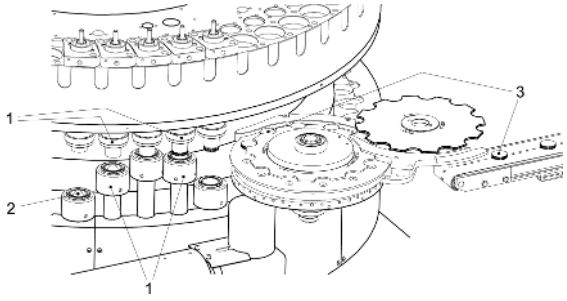


a)

Key

1 Carousel

2 Extruder



b)

Key

1 Moulds

2 Dose

3 Product

Figure 7 — Example of the main danger area on a carousel machine

3.7
ancillary equipment
equipment which interacts with the press, e.g. loading and unloading devices (including heating stations, sliding tables, robots, plasticizing units)

3.8
electrical axis
system consisting of an electrical motor, a motor control unit and any additional contactors

3.9
electrical motor
type of motor using electrical energy, e.g. servo or linear motor

3.10
motor control unit
unit to control the movement, stopping process and standstill of an electrical motor, with or without an integrated electronic device, e.g. frequency converter, contactor

3.11
gravity-loaded axis
axis which may carry out unintended hazardous movements as a result of failure effects due to gravity or stored energy

EXAMPLES Vertical axes, inclined axes, rotational axes with eccentric centre of gravity.

4 List of significant hazards

4.1 General

This clause lists all the significant hazards associated with presses, except those excluded in the scope. This document differentiates between:

— general hazards;

— hazards in specific machine areas;

— hazards associated with power operated mould clamping systems;

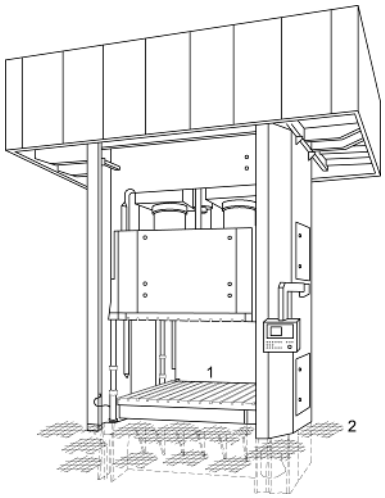
— additional hazards associated with specific design;

— additional hazards when using ancillary equipment.

NOTE The numbering system of the significant hazards in 4.3 to 4.8 corresponds with the numbering system of the safety requirements and/or measures in 5.3 to 5.8.

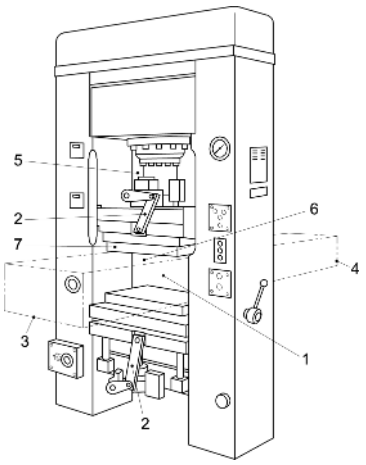
4.2 Danger areas on presses

The principal danger areas are shown in Figures 8, 9 and 10.



Key
1 Mould area
2 Floor level

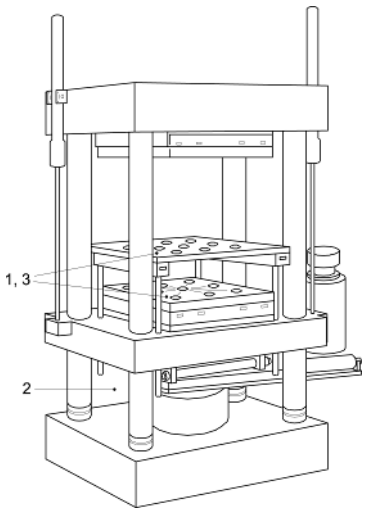
Figure 8 — Example of the mould area on a large frame construction downstroking press, shown without mould and with electro-sensitive protective equipment



Key

1 Mould area
2 Ejector mechanism
3 Loading device
4 Unloading device
5 Above mobile platen
6 Cores
7 Hot mould and platens

Figure 9 — Examples of danger areas on a frame construction downstroking press, shown with mould and without protective devices



Key

1 Mould area
2 Under mobile platen
3 Hot moulds and platens

Figure 10 — Examples of danger areas on a column construction upstroking press (also applicable to multi-daylight presses), shown without protective devices

4.3 General hazards

4.3.1 Mechanical hazards

4.3.1.1 Crushing and/or shearing and/or impact hazards caused by

— movement of power operated guards;

— whiplash of flexible hoses with pressures higher than 5 MPa;

— loss of stability/overturning of the press.

4.3.1.2 Hazards due to fluids under pressure

Hazards due to unintended release of fluids under pressure from hydraulic or pneumatic systems and in particular from flexible hoses and their connections with pressures higher than 5 MPa (50 bar) for hydraulic fluids and 1 MPa (10 bar) for pneumatic fluids.

4.3.2 Electrical hazards

Electric shock or burns due to direct or indirect contact with live conductive parts.

4.3.3 Thermal hazards

Burns due to the operating temperatures of hot machine parts and the hoses and fittings of the heat conditioning systems.

Escape of fluids from heat conditioning systems.

4.3.4 Hazards generated by noise

Hazards from high noise levels resulting for example in hearing impairment, tinnitus, tiredness, stress, loss of balance or awareness, interference with speech communications or with the perception of acoustic signals.

4.3.5 Hazards generated by dusts, gases and vapours

Hazards from contact with or inhalation of dusts, gases and vapours harmful to health:

— during placement of the material into the mould;

— during curing or vulcanising of the article in the mould;

— after the mould is opened.

4.3.6 Slip, trip and fall hazards

Injury caused by slipping, tripping or falling from designated elevated working positions on the press and associated means of access which are an integral part of the press.

4.3.7 Hazards due to malfunctioning of the hydraulic system due to contamination of the hydraulic fluid

4.3.8 Hazards due to malfunctioning of the electrical part of the control system

4.3.9 Hazards due to electromagnetic interference

Malfunction of the control circuits due to electromagnetic interference with the electrical equipment.

4.3.10 Hazards generated by neglecting ergonomic principles in machine design

Mismatch of machinery with human characteristics and abilities generating hazards, for example, by unhealthy postures or excessive efforts.

4.4 Hazards in specific machine areas

4.4.1 Mould area

4.4.1.1 Mechanical hazards

Crushing and/or shearing and/or impact hazards caused by:

— intentional or unintentional closing movement of the platen or mould support;

— movements of cores and ejectors and their drive mechanisms including unintended retraction of cores and/or ejectors in case of jamming or gripping moulds (if the design of the parts makes such movements dangerous).

4.4.1.2 Thermal hazards

Burns and/or scalds due to operating temperatures of:

— the moulds and the platens;

— heating elements of the moulds;

— material in the moulds or released from the moulds.

4.4.2 Clamping unit area outside the mould area

Mechanical hazards of crushing and/or shearing and/or impact:

— due to movement of the drive mechanism of the platen;

— due to the access above the mobile platen for a downstroking press and underneath the mobile platen for an upstroking press during the opening movement of the platen;

— due to movements of core and ejector drive mechanisms;

— due to platen movements by gravity on upstroking presses.

4.5 Hazards associated with power operated mould clamping systems

4.5.1 General

Mechanical hazards of crushing and/or shearing and/or impact caused by:

— movements of the mould clamping devices;

— falling of the mould or parts of the mould due to failure of the power supply or due to unintentional declamping or unsuccessful clamping.

4.5.2 Specific hazards associated with magnetic clamping systems

Falling of the mould or one of the mould halves due to e.g.:

— only partially magnetized platens;

— unintended demagnetization of the platens;

— impurity or foreign particles between the platen and the mould base plate;

— deformation of the platens or the mould base plate;

— required opening force of the press higher than the magnetic holding force due to extremely adhesive forces or to undercuts;

— jamming guiding pins;

— excessive operating temperature.

Crushing or shearing due to movement of the mould or other magnetic objects (e.g. tool-box tools) during magnetization.

4.6 Hazards associated with power operated mould changing equipment

Crushing and/or shearing hazards between the moving mould and/or transfer unit and fixed parts of the machine.

Impact hazards caused by the moving mould and/or transfer unit within the immediate vicinity of the mould area.

4.7 Additional hazards associated with specific design

4.7.1 Presses where whole body access is possible between the movable guard or the light curtain for the mould area and the mould area itself

Mechanical hazards of crushing and/or shearing if operators can stand in that area.

4.7.2 Presses where whole body access is possible to the mould area

Mechanical hazards of crushing and/or shearing if operators can enter the mould area.

4.7.3 Shuttle/turntable machines

Mechanical hazards of crushing and/or shearing and/or impact and/or drawing-in caused by the movements of the table.

4.7.4 Carousel machines

Mechanical hazards of crushing and/or shearing and/or impact and/or drawing-in caused by the movements of the carousel.

4.8 Additional hazards when using ancillary equipment

Additional hazards or decreased level of protection caused by interaction between the press and ancillary equipment:

— mechanical hazard of crushing in case of loss of stability/overturning of the press where ancillary equipment likely to affect the stability of the press is fitted to the press and not supported by the floor;

— access to moving parts of the machine if the safeguards are modified or ancillary equipment is removed;

— access to moving parts of the ancillary equipment;

— impairment of the visibility and accessibility of the machine by failing to take account of ergonomic principles.

5 Safety requirements and/or protective measures

5.1 General

5.1.1 Basic requirement

Machinery shall comply with the safety requirements and/or protective 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 (e.g. sharp edges).

5.1.2 Setting operations

Machines shall be designed so that it is only possible to move the platen for setting operations with guards closed and/or protective devices in operation.

For carousel machines see 5.7.4.

5.1.3 Safety related parts of the control system (SRP/CS)

The safety related parts of the control system (SRP/CS) shall be designed in accordance with EN ISO 13849-1:2008. The required performance level (PL_r) for each safety function is specified in the relevant subclauses.

5.1.4 Emergency stop

An emergency stop device shall be positioned within reach of any workplace which may be occupied by an operator. Additional emergency stop devices may be necessary in the case where whole body access to a danger area is possible (see 5.7.1 and 5.7.2).

The emergency stop shall function as stop category 0 or 1 according to EN 60204-1:2006, 9.2.2. In the case of machines with electrical axis category 0 may only be used if the machine is equipped with a brake that can stop the dangerous movement without dangerous overrun.

Emergency stop devices shall be in accordance with EN ISO 13850:2008 and EN 60204-1:2006, 10.7.

The emergency stop function shall be in accordance with PL_r = c.

Actuation of emergency stop devices shall stop any movement. It shall discharge the hydraulic accumulators if the pressure of accumulators is not needed to rescue any trapped persons.

In addition, the actuation of emergency stop devices shall stop the supply of:

— energy to the cooling/heating elements; and/or

— gas/water; and/or

— power to mould clamping systems;

if their continued supply creates further hazards such as overheating or overpressure.

See 7.2.3.

5.2 Basic requirements for safeguards used on presses

5.2.1 Guards

Guards shall be designed in accordance with EN 953:1997+A1:2009. They shall preferably be mounted on or close to the press.

Safety distances for guards shall be in accordance with EN ISO 13857:2008, Table 1, Table 3 and/or Table 4 unless otherwise specified.

Movable interlocking guards without guard locking (see EN ISO 12100:2010, 3.27.2 and 3.27.4) shall be positioned in accordance with EN ISO 13855:2010, Clause 9. Where this is not possible, interlocking guards with guard locking (see EN ISO 12100:2010, 3.27.5) shall be used. For hand operated movable interlocking guards the maximum opening time t_3 shall not exceed 100 ms.

When calculating or measuring the overall system stopping performance, as defined in EN ISO 13855:2010, 3.1.2, the worst case shall be taken into account related to speed, mass, temperature. See also 7.2.5.

For the guard locking device, well tried components in accordance with EN ISO 13849-1:2008, 6.2.4, shall be used. The components shall be designed to withstand a minimum force of 1 000 N, applied for example when trying to open the guard with guard locking still effective.

5.2.2 Light curtains

Light curtains as defined in EN 61496-2:2013, 3.205, shall be designed in accordance with EN 61496-1:2004 and EN 61496-2:2013. The types are specified in the relevant subclauses.

The light curtain shall become effective as soon as the press is switched on.

The positioning of the light curtain shall be in accordance with EN ISO 13855:2010.

It shall not be possible to reach the danger area around, above or beneath the light curtain.

The end of an interruption of the light curtain shall not automatically initiate any further movement. A new start command shall be required.

Before a new start is executed an acknowledgement in accordance with Annex A of this standard is required to restore the normal intended operation:

a) if a light curtain is interrupted during any dangerous movement in the cycle;

b) if a light curtain is interrupted on sides of the press from which the press is not operated;

c) in case whole body access is possible (see also 5.7.1 and 5.7.2).

The reset function shall be in accordance with EN ISO 13849-1:2008, 5.2.2.

See also 7.2.4, 7.2.5 and 7.3.

5.2.3 Two-hand control devices

Two-hand control devices (see EN ISO 12100:2010, 3.28.4) shall be designed in accordance with EN 574:1996+A1:2008. The types are specified in the relevant subclauses.

The positioning of the actuators of two-hand control devices shall be in accordance with EN ISO 13855:2010 and allow a good view on the danger area.

Additional safeguarding shall prevent access to the danger zone from the sides where no actuators of two-hand control devices are installed.

See also 7.2.5 and 7.3.

5.2.4 Hold-to run control devices

Where a hold-to-run control device (see EN ISO 12100:2010, 3.28.3) associated with a reduced speed of the dangerous movement is permitted, the maximum value of the reduced speed shall be achieved by design of the control circuit or by monitoring according to PL_r = b. However, below this maximum value, the speed may be adjustable.

5.2.5 Pressure sensitive mats, floors and edges

Pressure sensitive mats, floors and edges shall be in accordance with EN ISO 13856-1:2013 or EN ISO 13856-2:2013 and shall be active as soon as the press is switched on.

5.3 Safety requirements and/or protective measures to prevent general hazards

5.3.1 Mechanical hazards

5.3.1.1 Crushing and/or shearing and/or impact hazards

For power operated guards the following additional requirements shall apply:

— the maximum static contact force shall be ≤ 300 N;

— for static contact forces ≤ 75 N no specific protective device or measure is requested; however if a force limiting system to reach this maximum force is used, that system shall be in accordance with PL_r = c;

— for static contact forces > 75 N and ≤ 150 N, a pressure sensitive edge in accordance with EN ISO 13856-2:2013 shall be supplied. Actuation of the sensitive edge shall stop the closing movement of the guard in accordance with PL_r = c;

— for static contact forces > 150 N a pressure sensitive edge in accordance with EN ISO 13856-2:2013 shall be supplied. Actuation of the sensitive edge shall stop the closing movement of the guard in accordance with PL_r = c, and allow the reversing movement of the guard without creating any additional hazard. Closing of the guard shall be achieved by a hold-to-run control device in accordance with PL_r = c;

— the actuator to close the guard shall be positioned so as to give the operator a clear view of the danger zone;

— if there is a failure in the power supply to the guard actuator, any dangerous movement of the guard due to gravity shall be prevented.

To prevent whiplash of flexible hoses for hydraulic fluids with pressures higher than 5 MPa (50 bar) or for pneumatic fluids with pressures higher than 1 MPa (10 bar), one or more of the following shall be adopted:

— tear-proof hose assembly; this shall be proved by drawing and test report; the hoses shall have a minimum of two steel-cord layers in order to achieve the tear-proof connection mentioned; in addition, the ratio of the burst pressure of the hose and fitting to the maximum pressure in the circuit shall not be less than 3,5;

— fixed enclosing guards (see EN 953:1997+A1:2009, 3.2.1);

— attachment of the hoses by additional means e.g. by a chain (see EN ISO 4413:2010, 5.3.4.3.2 and EN ISO 4414:2010, 5.4.5.11.1).

In addition, to prevent unintentional detachment from connection points, cutting ring type connectors shall not be used. Appropriate connections are for example flanged joints, flared unions or conical nipple connections.

See also 7.2.6.

The press shall be designed to be fixed to the supporting surface.

5.3.1.2 Hazards due to fluids under pressure

Hydraulic and pneumatic circuits and their components shall be designed according to EN ISO 4413:2010 and EN ISO 4414:2010.

5.3.2 Electrical hazards

5.3.2.1 General

The electrical equipment shall be in accordance with EN 60204-1:2006, and in particular the requirements given in 5.3.2.2, 5.3.2.3 and 5.3.2.4 below.

5.3.2.2 Protection against direct contact

Protection against direct contact shall be in accordance with EN 60204-1:2006, 6.2.

5.3.2.3 Protection against indirect contact

Protection against indirect contact shall be in accordance with EN 60204-1:2006, 6.3.

5.3.2.4 Protection against the ingress of solids and liquids

Electrical equipment located on or in the vicinity of the machine shall have enclosures meeting at least IP 54 according to EN 60529:1991.

5.3.3 Thermal hazards

To prevent burns through unintentional contact with heat conditioning hoses and fittings and injury caused by escaping fluids, fixed guards or insulation shall be provided at accessible parts outside the guarded area where the maximum operating temperature can exceed the limit values determined in accordance with EN ISO 13732-1:2008.

In addition warning signs shall be fitted on fixed guards or close to the hot machine parts that cannot be protected (see 7.4). See also 7.2.13.

5.3.4 Hazards generated by noise

5.3.4.1 Noise reduction at source by design

The main sources of noise on presses are:

— the hydraulic system;

— the pneumatic system, e.g. exhaust of air.

Presses shall be designed and constructed so that risks resulting from the emission of airborne noise are reduced to the lowest level, taking account of technical progress and the availability of means of reducing noise, in particular at source (see, for example, EN ISO 11688-1:2009).

NOTE Noise generation mechanisms are described in EN ISO 11688-2:2000.

For the hydraulic system noise reduction shall be achieved by selecting low noise emission components.

5.3.4.2 Noise reduction by protective measures

For the hydraulic system additional noise reduction can be achieved by partial or complete enclosure. Noise reduction for the pneumatic system shall be achieved by the application of vent silencers.

5.3.4.3 Information connected with noise hazards

See 7.2.7 and Annex B.

5.3.5 Hazards generated by dusts, gases and vapours

The press shall be so designed that an exhaust ventilation system can be fitted or positioned as close as practicable to the emission source. This standard does not cover the requirements for the design of such an exhaust ventilation system (see Clause 1).

See also 7.2.8.

5.3.6 Slip, trip and fall hazards

Designated elevated working positions on the press shall be:

— safe against slipping and tripping;

— safe against falling from a height of ≥ 500 mm;

— provided with safe means of access.

See also EN ISO 12100:2010, 6.3.5.6.

Means of access shall be in accordance with EN ISO 14122-1:2001, EN ISO 14122-2:2001, EN ISO 14122-3:2001, EN ISO 14122-4:2004.

5.3.7 Hazards due to malfunctioning of the hydraulic system due to contamination of the hydraulic fluid

Appropriate filtering shall be provided to prevent contaminants adversely affecting the safety related functions of the hydraulic system (see EN ISO 4413:2010, 5.3.4.1.3 and 5.3.7.1).

See also 7.2.9.

5.3.8 Hazards due to malfunctioning of the electrical part of the control system

The electrical part of the control system shall be designed in accordance with EN 60204-1:2006 and in addition with the specific requirements given in this standard.

5.3.9 Hazards due to electromagnetic interference

Electronic control systems shall be designed and installed so as to be protected from electromagnetic interference and stable when exposed to operation or a failure of the electrical system in accordance with EN 61000-6-2:2005.

Electrical/electronic design shall apply technical information and physical measures to limit electromagnetic emissions in accordance with EN 61000-6-4:2007.

During installation of electrical and electronic components, the machine manufacturer shall follow the information for use provided by the manufacturer of those components.

5.3.10 Hazards generated by neglecting ergonomic principles

The press and its control actuators shall be designed to provide a good, not fatiguing work posture.

The positioning, labelling and illumination (if necessary) of control devices and handling devices (e.g. for tools or products) shall be in accordance with ergonomic principles.

Where necessary, the zones in which control devices, guards and protective devices are located shall be sufficiently lit to ensure that all work equipment and products can be properly seen, and that eye strain is avoided.

Parts of the press, which weigh more than 25 kg and require to be lifted, shall include necessary attachments to accommodate the fitting of a lifting device.

See also EN ISO 12100:2010, 6.2.8.

5.4 Safety requirements and/or protective measures in specific machine areas

5.4.1 Mould area

5.4.1.1 Mechanical hazards

5.4.1.1.1 Hazards due to the power operated closing movement of the platen at the sides of the press where access is required for production

Hazards due to the power operated closing movement of the platen at the sides of the press where access is required for production shall be eliminated by interlocking guards or light curtains according to PL_r = e. Light curtains shall be according to type 4 of EN 61496-1:2004.

Two-hand control devices may be used only for specifically designed presses, where it is not possible to safeguard the mould area by the use of guards or light curtains, for example in cases where parts of the mould or inserts are protruding from the mould area (see 7.2.10). However see 5.7.2. On these presses:

— the two-hand control devices shall be according to Type III C of EN 574:1996+A1:2008;

— where a press is designed to be worked by more than one operator, each operator shall be provided with a two-hand control device;

— if the number of operators varies for the production of different parts, odd two-hand control devices may be deselected (e.g. by key lockable selector switches or access code) according to the current situation. Sides without any two-hand control device selected shall be protected by guards or other protective devices. The press shall only be able to operate if the combination of two-hand control devices selected corresponds exactly to the combination of two-hand control devices that are physically connected to the press (see also 7.2.10). The press shall be designed so that it can only be used if the substitute guards or protective devices are detected by the SRP/CS in accordance with PL_r = e;

— it shall not be possible to initiate closing movements of the platen until all selected two-hand control devices are actuated;

— if one of the active two-hand control devices is released or deselected during any dangerous movement of the cycle, any dangerous movement of the press shall be stopped;

— the actuators of a two-hand control device may be released without interrupting the movement of the platen if the mould is sufficiently closed (gap ≤ 6 mm). For this purpose, two position sensors shall be provided which shall be monitored at least once per production cycle. The system for detecting the mould gap at which the actuators of the two-hand control device can be released shall have at least the same level of integrity as the two-hand control device. The two-hand control device shall be automatically reactivated before the start of the next production cycle.

For machines with electrical axes, see 5.4.1.1.6.

See also 5.7.1 and 5.7.2 for machines where whole body access is possible.

See also 7.3.

5.4.1.1.2 Hazards due to the power operated closing movement of the platen at the sides of the press where access is not required for production

On the sides of the press where access is not required for production but only for repair or maintenance fixed guards may be used as an alternative to 5.4.1.1.1.

A further alternative provided that whole body access is not possible (see 5.7.1 and 5.7.2) is the use of an interlocking guard performing the safety function according to PL_r = d.

See also 5.7.1 and 5.7.2 where whole body access is possible.

For machines with electrical axes, see 5.4.1.1.6.

5.4.1.1.3 Hazards due to the unintentional closing movement of the platen

Downstroking presses shall be equipped with two restraint devices; each of these restraint devices shall be either a mechanical restraint device or a hydraulic valve. Such valves shall be fitted directly on the cylinder or, where this is not practicable, as close as possible to the cylinder; flanged (flared or welded) pipework or flared unions shall be used. Where the depth of the platen is greater than 800 mm and the stroke can exceed 500 mm either the two hydraulic restraint devices shall be leak-free popped valves or at least one of the restraint devices shall be mechanical. These restraint devices shall automatically be effective over the complete stroke of the platen when the movable guards of the mould area are opened or when the light curtain is interrupted or when an actuator of a two-hand control device is released during the movement of the platen. Where it is not possible to open the movable guards of the mould area until the platen has reached its maximum opening position, mechanical restraint devices which only become effective in that position are sufficient.

In the event of a failure of one of the restraint devices the other device shall arrest the gravity descent of the platen. The correct functioning of restraint devices shall be automatically monitored so that in the case of a failure of one of these devices:

— the failure is automatically recognized; and

— the initiation of any further downward movement of the platen is prevented.

For presses equipped with two hydraulic restraint devices, an additional mechanical restraint device shall be provided for maintenance operations which shall automatically block the platen in its maximum opening position. The engagement of this device shall be visually indicated. See also 7.2.11.

For machines with electrical axes, see 5.4.1.1.6.

5.4.1.1.4 Hazards due to the movements of cores and ejectors and their drive mechanisms

The guards and protective devices as specified in 5.4.1.1.1 or 5.4.1.1.2 shall also protect against movements of cores and ejectors and their drive mechanisms when they are triggered automatically within the production cycle. For these movements the guards and protective devices shall be in accordance with PL_r = d.

If the design of the mould (e.g. stack mould) requires alternative protective measures, the resulting protective measures shall achieve no less a degree of safety than required above. See also 7.2.12.

The press may allow manual operation of cores and ejectors when the guards for the mould area are open, or when the light curtains are interrupted or when the two-hand control devices for the movement of the platen

are released, using a hold-to-run control device according to PL_r = c, as described in 5.2.4, with a reduced speed ≤ 10 mm/s, or a two-hand control device according to Type III B of EN 574:1996+A1:2008. This operating mode shall be selected by a key lockable mode selector in accordance with EN ISO 12100:2010, 6.2.11.10 and with EN 60204-1:2006, 9.2.3 and 9.2.4.

The machine shall be designed so that no vacuum is created in the cylinder of cores and ejectors to prevent sudden and unintended retraction of them in case of jamming or gripping in the mould.

For machines with electrical axes, see 5.4.1.1.6.

5.4.1.1.5 Use of control guards

As an alternative to interlocking guards, control guards as defined in EN ISO 12100:2010, 3.27.6 may be used providing:

a) the requirements of 5.4.1.1.1 and 5.4.1.1.4 of this standard are met, and

b) the requirements of EN ISO 12100:2010, 6.3.3.2.5 except b) and c) are met; and

c) it is not possible to gain whole body access between the mould area and the guard (see 5.7.1); and

d) for vertical machines:

   1) the height of the lower platen clamping surface above the operator's standing level is ≥ 750 mm, and

   2) the maximum distance between the platens is ≤ 630 mm and the depth and width of the platen are ≤ 1 000 mm;

e) for horizontal machines:

   1) the dimension (a) in Figure 12 is ≥ 750 mm, and

   2) the distances e_1, e_2 between tie-bars (see Figure 11) or the corresponding distances e_1, e_2 for a machine without tie-bars (see Figure 12) are ≤ 630 mm.

In addition, for power operated control guards:

f) the position of the manual controls for the control guards shall allow a clear view of the mould area; and

g) the release of the manual control shall be detected before each new machine cycle or after a stop of the guard. For machines where the operator initiates the closing of the guard by single impulse, each closing shall be initiated by own impulse. A new impulse is required if the closing of the guard is interrupted (e.g. set time for guard closing is exceeded); and

h) the SRP/CS shall fulfill at least PL_r = c.

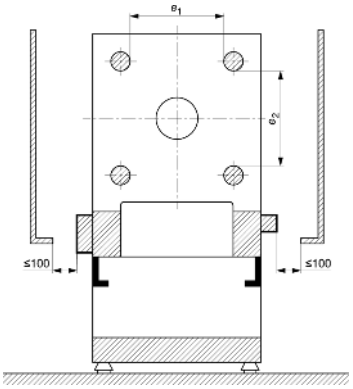


Figure 11 — Dimensions e_1 and e_2 for machines with tie-bars

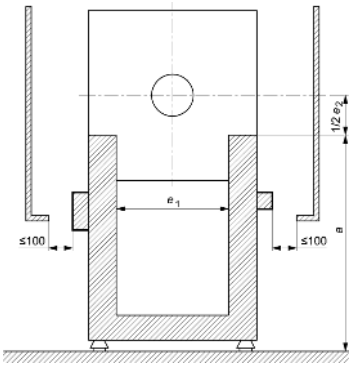


Figure 12 — Dimensions a, e_1 and e_2 for machines without tie-bars

5.4.1.1.6 Hazards due to the power operated and unintentional closing movement of the platen and movements of cores and ejectors on machines with electrical axes

5.4.1.1.6.1 Use of interlocking guards with guard locking

On presses with electrical axis for the platen or where hazards due to gravity fall of cores or ejectors exist (force > 150 N or pressure > 50 N/cm^2), only interlocking guards with guard locking shall be used.

Stop function according to category 0 or 1 of EN 60204-1:2006 shall be provided, to ensure a safe torque off function (STO, see EN 61800-5-2:2007) which shall fulfill:

— PL_r = e, category 4 for the axis of the platen at the sides of the press where access is required for production; and

— PL_r = d for the axis of the platen at the sides of the press where access is not required for production; and

— PL_r = d for the axes of cores and ejectors.

Guard locking shall remain effective until STO is active and one or more of the following conditions are fulfilled:

— a positive result of a brake test has been reached; or

— the axis is in a safe position; or

— the correct engagement of a mechanical restraint device has been detected.

The SRP/CS of the guard locking function shall fulfill PL_r = d, category 3 or 4.

The restraint device and STO shall be effective as long as the guard is not closed and locked.

A stopping time measurement is not required.

Mechanical restraint device(s) (e.g. spring operated brake(s)) shall be used to prevent dangerous gravity fall of gravity-loaded axes in case of STO. These restraint device(s) shall be mechanically and positively linked to the axis.

The control circuits for these mechanical restraint devices shall be combined with STO signals in order to prevent their damage (e.g. the engagement of the brakes shall also remove the power from the motor) and guarantee the correct timing (e.g. the brakes shall be engaged just before STO).

The holding force of the mechanical restraint device(s) preventing the descent of the load shall be over-dimensioned by a factor of at least 1,5 with respect to the total mass of the gravity-loaded axis including fitted tools for the platen (see 7.2.19).

If friction based restraint devices are applied the holding force shall be monitored. The force/torque applied during the test and the duration of the application shall be selected according to the holding force. If several friction based devices are applied in parallel (e.g. two brakes), they shall be tested separately one after the other.

The mechanical parts of the power transmission system shall be designed to withstand the static and dynamic stresses of at least twice the load.

5.4.1.1.6.2 Use of safeguards as specified in 5.2

On presses with electrical axes only for cores or ejectors and where there is no hazard due to gravity fall of those elements (force ≤ 150 N and pressure ≤ 50 N/cm^2), safeguards as specified in 5.2 shall be used.

Where there is no interlocking guard with guard locking, the following shall apply:

— a stop function according to category 1 of EN 60204-1:2006 shall be provided implementing a safe stopping function according to SS1 (see EN 61800-5-2:2007, 4.2.2.3 a) or b));

— the safe stopping function SS1 (including the safe torque off function STO, see EN 61800-5-2:2007) shall fulfill PL_r = d, category 3 or 4;

— the stopping time for calculating the safety distance shall be determined in accordance with EN ISO 13855:2010. The calculated or measured stopping time (including the reaction time of the SRP/CS, but without the reaction time of the protective device) may be used as t_2 in 5.1 of EN ISO 13855:2010; the reaction time t_1 of the protective device (e.g. light curtain) shall be calculated. The SS1 function shall include monitoring of the deceleration rate.

5.4.1.2 Thermal hazards

Thermal hazards shall be reduced as far as reasonably practicable. Additionally, warning signs shall be displayed drawing attention to the residual thermal hazards caused by moulds, platens, heating elements and/or material. See 7.4.

In addition, manufacturers shall advise on the need for personal protective equipment. See 7.2.13.

5.4.2 Clamping unit area outside the mould area

5.4.2.1 Drive mechanism of the platen

Where access to the area of dangerous movements of the drive mechanism of the platen is possible e.g. within reach of an operator (see EN ISO 13857:2008, Table 1) or not prevented by the guards or protective devices specified in 5.4.1.1.1 then interlocking guards according to PL_r = d shall be provided.

Opening an interlocking guard shall:

— interrupt the production cycle;

— interrupt all movements of the platen.

Where access is only required for repair or maintenance, fixed guards are permitted.

5.4.2.2 Opening movement of the platen

The opening movement of the platen shall be safe by design or by fixed guards in respect of crushing and/or shearing and/or impact points. Alternatively, the safeguard for the mould area shall stop the opening movement of the platen according to PL_r = d.

5.4.2.3 Drive mechanisms of cores and ejectors

When access to the area of dangerous movements of the core and ejector drive mechanisms is possible, it shall be prevented as follows:

a) on downstroking presses:

   1) above the mobile platen, by means of the interlocking guard for the drive mechanism of the platen (see 5.4.2.1); however, for the movements of cores and ejectors the interlocking shall fulfill at least PL_r = c;

   2) underneath the fixed platen, by means of an interlocking guard according to PL_r = c or a fixed guard;

b) on upstroking presses:

   1) underneath the mobile platen, by means of the interlocking guard for the drive mechanism of the platen (see 5.4.2.1); however, for the movements of cores and ejectors, the interlocking shall fulfill at least PLr = c;

   2) above the fixed platen, by means of an interlocking guard according to PL_r = c or a fixed guard.

5.4.2.4 Platen movements by gravity on upstroking presses

On upstroking machines, shearing or crushing hazards below the mobile platen due to unintentional gravity descent of that platen during setting the strokes for the cores and ejectors, shall be prevented by a restraint device that shall be effective over the complete dangerous stroke of the platen when the guards for the clamping mechanism area have been opened or the light curtains have been interrupted or the manual actuators of any two-hand control devices have been released.

When it is possible to gain access under the movable platen during production the same restraint device shall be effective over the complete dangerous stroke of the platen when the guards for the mould area have been opened or the light curtains have been interrupted or the manual actuators of any two-hand control device have been released.

For repair or maintenance operations on machines where a mechanical restraint device is not installed, the machine shall be designed so that the mobile platen can be blocked by a mechanical device or that it shall be possible to move the platen to a position where further unintentional movement by gravity is impossible.

See also 7.2.21.

5.5 Safety requirements and/or protective measures for power operated mould clamping systems

5.5.1 General

Any movable guard, light curtain or two-hand control device as specified in 5.4.1.1.1 or 5.4.1.1.2 or 5.4.1.1.6 shall also provide protection against the movements of the power operated mould clamping devices according to PL_r = c.

Falling of the mould or its parts shall be prevented even in case of failure of the energy supply e.g. by additional mechanical restraint devices or by self-retaining clamping elements or by clamping elements such that unclamping can be effected only by applying energy or by a clamping system according to PL_r = e.

Clamping and unclamping shall be possible only in a specific mode, accessible only via a key lockable selector switch or an access code.

See also 7.2.17.

5.5.2 Magnetic clamping systems

The following requirements apply:

a) only permanent magnets shall be used;

b) the magnetic clamping force for the upper part of the mould shall be at least the highest of the following values:

   1) maximum force of the ejectors, if existing in the upper part, plus 6 times the maximum weight of the upper mould halves;

   2) 3,5 times the maximum weight of the complete mould;

   3) opening force of the press;

c) the magnetic clamping force for the lower part of the mould shall be at least the higher of the following values:

   1) opening force of the press;

   2) force of the ejectors, if existing.

d) sensor(s) shall be provided in the lower magnetic platen and, if there are ejectors acting top to down, also in the upper magnetic platen in order to detect the get-off of the mould base plate from the magnetic platen. If a get-off is detected when the machine is operating in modes different from “Mould change (assembly/disassembly) mode” the SRP/CS shall stop press movements within 6 mm in accordance with PL_r = b;

e) sensors shall be automatically monitored whenever the “Mould change (assembly/disassembly) mode” is selected and the demagnetizing command is given and the mould is removed; if a fault is detected the selection of any other mode shall be prevented;

f) if the mould area is not safeguarded by interlocking guards with guard locking, then the dynamic force generated by deceleration/acceleration shall not exceed 2 times the weight of the upper part of the mould;

g) the demagnetizing/magnetizing current shall be switched off in accordance with PL_r = e;

h) the mould displacement shall be monitored; if a mould displacement is detected the press movements shall be stopped in accordance with PL_r = b when the machine is operating in modes different from "Mould change (assembly/disassembly) mode";

i) magnetizing/demagnetizing shall be an additional function to the "Mould change (assembly/disassembly) mode" and shall fulfil the following requirements:

   1) this function shall be selected by a key switch;

   2) it shall be designed so that the magnetizing/demagnetizing command is effected only if the light curtains are not interrupted or the guards for the mould area are closed or the two-hand control device is activated and:

      i) for magnetizing, the press is closed and the pressing force is applied, and

      ii) for demagnetizing, the maximum gap between the mould halves is less than 6 mm;

   3) the control of the magnetic clamping system shall provide monitoring of the correct saturation of the magnets in accordance with PL_r = d, category 3 or 4;

   4) the correct magnetization/demagnetization shall be indicated by visual signals;

   5) the proper declamping and clamping shall be ensured by limiting the length of the opening stroke to 6 mm to enable the operator a verification e.g. by visual inspection (see 7.2.18). The opening stroke shall only be continued after an acknowledgement button has been actuated;

   6) leaving the operation mode "Mould change mode (assembly/disassembly)" is permitted only if both platens are magnetized or demagnetized properly as confirmed by the indent above;

   7) an optical signal (yellow blinking light) shall indicate to the operator that the magnetization or the demagnetization is going on and that the safeguarded area shall not be entered;

j) the control circuit of the magnetic clamping system shall be provided with a temperature sensor. When a dedicated temperature limit value is reached, it shall initiate an alarm, interrupt the current production cycle and prevent the next cycle in accordance with PL_r = b;

k) for each platen a separate control device is required for magnetization/demagnetization; the control devices shall be clearly marked to identify which platen they affect.

For machines where whole body access is possible between the movable guard or the light curtain for the mould area and the mould area itself (see 5.7.1) and/or whole body access is possible to the mould area (see 5.7.2) the existing protective devices that detect the presence of persons shall prevent magnetizing/demagnetizing in accordance with PL_r = c.

See also 7.2.18.

5.6 Safety requirements and/or protective measures for power operated mould changing equipment

Access to the mould change area shall be prevented by safeguards in accordance with PL_r = c for the movements of the mould changing equipment, in conjunction with fixed guards where necessary.

Where it is possible to gain whole body access into the mould change area, one of the following protective measures shall be used:

— additional protective devices, e.g. electro-sensitive protective equipment in accordance with EN 61496-1:2004, type 2, or pressure sensing mats or floors, PL_r = c. These additional devices when actuated shall interrupt the control circuit for movements of the mould changing equipment; or

— acknowledgement systems in accordance with Annex A.

Movements of the mould and/or mould transfer device may be initiated manually in the absence of guards or with guards open or with additional protective devices being ineffective using a selector switch lockable in all positions and by actuation of:

— a hold to run control device, provided that the maximum speed cannot exceed 75 mm/s; or

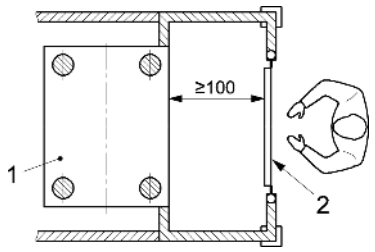
— a limited movement control device.

The manual control device shall be positioned to give a clear view of the danger area.

5.7 Additional safety requirements and/or protective measures associated with specific design

5.7.1 Presses where whole body access is possible between the movable guard or the light curtain for the mould area and the mould area itself

Where a guard is used, such access is considered possible if the smallest horizontal gap between the guard in the closed position and the machine frame is ≥ 100 mm (see Figure 13).



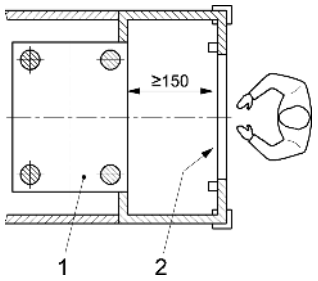
Key

1 Mould area

2 Movable guard

Figure 13 — Dimension allowing whole body access between a movable guard and the mould area

When a light curtain is used, such access is considered possible if the smallest horizontal gap between the light curtains and the machine frame is ≥ 150 mm (see Figure 14).



Key

1 Mould area

2 Light curtain

Figure 14 — Dimension allowing whole body access between a light curtain and the mould area

The above gaps should be measured without considering components that are liable to be removed or repositioned for production reasons, e.g. heating platens, moulds, cores.

For these machines, one of the following protective devices shall be provided in addition to those specified in 5.4.1.1 and, where relevant, in 5.7.2:

a) a single or double acknowledgement system in accordance with Annex A for interlocking guards or light curtains; or

b) a mechanical latch for the guard; this device shall become effective with each opening movement of the guard. It shall be necessary to separately reset this safety device before another machine cycle can be initiated. The position from which the latch is reset shall afford a clear view of the mould area, if necessary with the use of aids to vision. The correct functioning of the latch shall be monitored at least once during each movement cycle of the guard, so that a fault in the latch will be automatically recognized and commencement of all further platen closing movement shall be prevented. For all power operated guards fitted with a mechanical latch, the closing movement of the guard shall be operated by a hold-to-run control device according to PL_r = b which is positioned to give a clear view of the mould area and cannot be operated from inside the danger area; or

c) for power operated guards with horizontal closing movement, a hold-to-run control device meeting the following requirements:

   1) the hold-to-run control device and the circuit shall be in accordance with PL_r = c; and

   2) the hold-to-run control device actuator shall be positioned to provide a clear view of the mould area and cannot be operated from inside the danger area; and

   3) the hold to run control device shall not be easily defeated (this may be achieved e.g. by automatically monitoring that the manual actuator is released after each closing movement of the guard); or

d) a component of the guard which prevents the closing of the guard when an operator is standing in the safeguarded area; such a component shall be so designed that the operator cannot easily get around it when the guard is open; or

e) sensitive protective equipment to detect the presence of persons between the movable guard or light curtain for the mould area and the mould area itself, e.g.:

   1) light curtain in accordance with EN 61496-1:2004, type 2*;* or

   2) pressure sensitive mat or floor in accordance with PL_r = c; or

   3) scanner in accordance with CLC/TS 61496-3:2008 and PL_r = d.

   Such sensitive protective equipment shall become effective when the machine is switched on and, when persons are standing in this area, shall:

   — prevent the closing and opening movement of the platen according to PL_r = c; and

   — in the case of a power operated guard, prevent the closing movement of the guard in accordance with PL_r = c; and

   — prevent any dangerous movement of the cores and ejectors in accordance with PL_r = c; however see 5.4.1.1.4; and

   — for presses with magnetic clamping, prevent magnetizing/demagnetizing in accordance with PL_r = c.

5.7.2 Presses where whole body access is possible to the mould area

Whole body access to the mould area is considered possible for:

a) presses with tie-bars (see Figure 15) where:

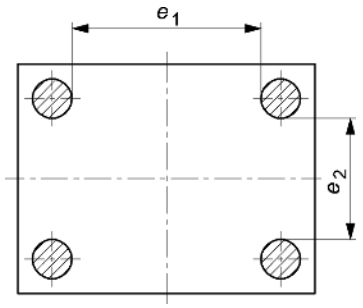
   1) e_1 or e_2 > 1 200 mm; and

   2) maximum opening between the platens > 1 200 mm;

b) presses without tie-bars where:

   1) one of the platen dimensions > 1 200 mm; and

   2) maximum opening between the platens > 1 200 mm.



Key

e_1 larger distance between tie-bars

e_2 smaller distance between tie-bars

Figure 15 — Mould area section of a press with tie-bars

For these machines, protective devices additional to those specified in 5.4.1.1 and, where relevant, in 5.7.1 shall be provided:

c) for machines where the mould area is safeguarded by interlocking guards, devices which prevent the unintentional closing of interlocking guards such as:

   1) a mechanical latch as specified in 5.7.1; or

   2) for power operated guards with horizontal closing movement, a hold-to-run control device as specified in 5.7.1;

d) for machines where the mould area is safeguarded by light curtains, at any side where there is a light curtain a single acknowledgement switch as described in Annex A; after interruption of one or more light curtain(s), an acknowledgement shall be carried out at all sides of the press where a light curtain was interrupted.

Additionally, in both cases, either a light curtain or a scanner as specified in 5.7.1 shall be provided in the mould area to detect the presence of persons (see 7.2.14).

Where detection is not possible because of the process (e.g. due to dust, steam), a single acknowledgement system in accordance with Annex A may be used instead of the additional light curtain or scanner. However, if the lowest position of the clamping surface of the lower platen is less than 750 mm above the operator's standing surface, the single acknowledgement system shall be replaced by a double acknowledgement system in accordance with Annex A.

Two-hand control devices shall not be the only protective device provided on presses where whole body access is possible to the mould area. However, the press may be equipped with a key lockable switch which permits deactivation of the guard interlocking or light curtain where required by the process e.g. for parts protruding beyond the guarded area. At such presses, two-hand control devices in accordance with 5.4.1.1.1 shall be used for initiating the platen closing movement.

See also 7.2.10 and 7.2.15.

5.7.3 Shuttle/turntable machines

Access to dangerous movements of the table shall be prevented by one or more of the following:

— fixed guards;

— interlocking guards or protective devices according to PL_r = d.

Where these interlocking guards or protective devices also prevent access to the mould area then they shall act in accordance with PL_r = e for the closing movement of the platen as specified in 5.4.1.1. Alternatively they may perform to PL_r = d for the closing movement of the platen provided that the correct functioning of the shuttle/turntable is monitored at least once during each production cycle, so that a fault is automatically recognized and commencement of any further platen closing movement is prevented.

5.7.4 Carousel machines

Access to dangerous movements of the carousel shall be prevented by a combination of fixed guards and:

— interlocking guards without guard locking positioned according to EN ISO 13855:2010, Clause 9, or

— interlocking guards with guard locking.

Interlocking guards with guard locking shall be used when the stopping time of the dangerous elements of the machine exceeds what is stated in EN ISO 13855:2010, Clause 9 or if there are other hazards such as moving elements that are hydraulically actuated by stored energy (e.g. hydraulic accumulators). In such cases it shall be possible to unlock the guard only when the termination of the dangerous situation has been detected, e.g. by verifying the effective stopping of moving elements or the lack of pressure in the circuits that are able to initiate a dangerous movement when the guard is open.

The interlocking function of the guards and the locking function shall be according to PL_r = d.

Carousel machines shall be designed to enable setting when the machine is at rest or from outside the safeguards while the machine is running. Where this is not practicable, the requirements a) to f) below shall apply:

a) a mode selector switch in accordance with EN ISO 12100:2010, 6.2.11.10 and with EN 60204-1:2006, 9.2.3 and 9.2.4, shall be provided which can be locked in all positions by a removable or coded key, see 7.2.20. Changing the mode of operation shall not be possible when the key is removed from the selector or the coded key is deactivated;

b) dangerous movements required for setting shall only be possible by means of a hold-to-run control device (see EN ISO 12100:2010, 3.28.3 and 6.2.11.9) meeting the following requirements:

   1) the required performance level of the safety-related parts of the control circuit associated with the hold-to-run control device shall be PL_r = c;

   2) where the hold-to-run control device is fitted on a portable unit which may be taken into the danger areas it shall be a three-position hold-to-run control device with the following positions: 1 for stop, 2 for run, 3 for stop again. After the actuator has passed the pressure point to position 3, a restart shall only be possible after returning the actuator to position 1 (see also EN 60497-5-8). Additionally, an

emergency stop actuator shall be fitted on the portable unit. The emergency stop shall act on all dangerous movements associated with setting;

3) where the hold-to-run control device is not on a portable unit it shall be permanently fixed in such a position that the operator has a clear view of the danger areas;

4) the hold-to-run control device shall only be operable if the mode selector switch is in the setting position;

c) for indexing the machine the maximum speed shall not exceed 10 % of the nominal production speed; in any case the peripheral speed shall be:

1) ≤ 250 mm/s in case of hazards other than shearing hazards;

2) ≤ 33 mm/s in case of shearing hazards;

d) pneumatic drive for the setting movement of elements that may create hazards for the operator during setting is not permitted;

e) valves through which dangerous movements can be initiated during setting and which can be activated by hand shall be made inaccessible to unauthorised persons, e.g. by fixed guards;

f) for machine parts which can have dangerous movements under the influence of gravity a mechanical restraint device shall be provided, see 7.2.20.

5.8 Additional safety requirements and/or protective measures when using ancillary equipment

The installation/connection of ancillary equipment shall not reduce the level of safety specified in this standard for presses.

When the machine manufacturer also provides the ancillary equipment or if the press is intended to be used only together with specified ancillary equipment, the machine shall be so designed that it can only be operated if this ancillary equipment is installed and connected in accordance with the following requirements:

— the connection of ancillary equipment and the resulting modifications of the safeguarding of the press shall not allow unprotected access to danger areas of the machine;

— ancillary equipment, the presence of which prevents access to a danger area of the press and which can be removed without the use of a tool, shall be interlocked with the machine control circuit in the same way as a movable guard for the danger area concerned.

— if the safeguarding system of the ancillary equipment prevents access to a danger area of the press, this safeguarding system shall meet the safety requirements applicable to that particular danger area of the machine. In the case of whole body access to the machine (see 5.7.1 and 5.7.2), additional protective devices as specified in 5.7.1 and/or 5.7.2 shall be provided;

— if the safeguarding system of the press prevents access to a danger area of ancillary equipment, this safeguarding system shall meet the safety requirements applicable to that ancillary equipment.

For information for use and ergonomic principles see 7.2.16.

6 Verification of the safety requirements and/or protective measures

Tests shall be used to verify the safety requirements and/or protective measures in accordance with Table 1.

Table 1 — Verification methods

Subclause	Visual inspection	Functional testing	Measurement	Calculation	Documentation
5.1 General					
Basic requirement Setting operations SRP/CS Emergency stop	X	X	X	X	X
5.2 Basic requirements for safeguards used on presses					
5.2.1 Guards	X	X	X	X	X
5.2.2 Light curtains	X	X	X	X	X
5.2.3 Two-hand control devices	X	X	X	X	X
5.2.4 Hold-to-run control devices	X	X	X	X	X
5.2.5 Pressure sensitive mats, floors and edges	X	X			X
5.3 Safety requirements and/or protective measures to prevent general hazards					
5.3.1.1 Crushing, shearing, impact hazards	X	X	X	X	X
5.3.1.2 Fluids under pressure					X
5.3.2 Electrical hazards	X	X			X
5.3.3 Thermal hazards	X		X		X
5.3.4 Noise	X		X		X
5.3.5 Dusts, gases and vapours	X				
5.3.6 Slip, trip and fall	X		X		X
5.3.7 Malfunction of hydraulic system due to contamination of the hydraulic fluid	X				X

5.3.8 Malfunction of the electrical part of the control system	X				X
5.3.9 Electromagnetic interference			X		X
5.3.10 Neglecting Ergonomic principles	X		X		X
5.4 Safety requirements and/or protective measures in specific machine areas					
5.4.1 Mould area					
5.4.1.1.1 Power operated closing movement of the platen at the sides where access is required for production	X	X	X	X	X
5.4.1.1.2 Power operated closing movement of the platen at the sides where access is not required for production	X	X		X	
5.4.1.1.3 Unintentional closing movement of the platen	X	X	X		
5.4.1.1.4 Movement of cores and ejectors and their drive mechanisms	X	X	X	X	X
5.4.1.1.5 Control guards	X	X	X	X	X
5.4.1.1.6 Machines with electrical axes	X	X	X	X	X
5.4.1.2 Thermal hazards	X				
5.4.2 Clamping unit area outside the mould area					
5.4.2.1 Drive mechanism of the platen	X	X	X	X	X
5.4.2.2 Opening movement of the platen	X	X		X	X
5.4.2.3 Drive mechanisms of cores and ejectors	X	X		X	
5.4.2.4 Platen movement by gravity on upstroking presses	X	X			

5.5 Safety requirements and/or protective measures for power operated mould clamping systems					
5.5.1 General	X	X		X	X
5.5.2 Magnetic clamping	X	X	X	X	X
5.6 Safety requirements and/or protective measures for power operated mould changing equipment					
Power operated mould changing equipment	X	X	X	X	X
5.7 Additional safety requirements and/or protective measures associated with specific design					
5.7.1 Whole body access between safeguard and mould area	X	X	X	X	X
5.7.2 Whole body access to mould area	X	X	X	X	X
5.7.3 Shuttle/turntable machines	X	X		X	X
5.7.4 Carousel machines	X	X	X	X	X
5.8 Additional safety requirements and/or protective measures when using ancillary equipment					
Ancillary equipment	X	X		X	X
Annexes					
Annex A Acknowledgement systems	X	X	X		
Annex B Noise test code	X	X	X	X	X

Functional testing includes the verification of the function and efficiency of the guards and protective devices on the basis of:

— descriptions given in the information for use;

— safety related design documents;

— the requirements given in Clause 5 of this standard.

Functional testing of guards and protective devices according to PL_r = c, d or e shall also include the simulation of faults which are likely to occur.

7 Information for use

7.1 General

Information for use shall be provided in accordance with EN ISO 12100:2010, 6.4.

7.2 Instruction handbook

7.2.1 General

Each press shall be accompanied by a handbook giving general instructions for use (see EN ISO 12100:2010, 6.4.5). In addition the instruction handbook shall contain the following.

7.2.2 General instructions

The manufacturer shall indicate the following:

— that the press is designed to process plastics and/or rubber only, because other materials might generate additional hazards;

— the press is not designed to safely process materials that can generate explosion hazards;

— the frequency of inspection and functional testing of the protective devices and indicators;

— the necessary maintenance work on the protective devices;

— the procedures to be followed for maintenance and/or repair particularly when the protective devices are inhibited;

— the list of the safety related components which shall not be modified or replaced by the user;

— the intervals for the replacement of the safety related components;

— the frequency of checking external leakages;

— the frequency and the procedure of functional testing of the hydraulic system to detect internal leakages;

— the maximum mass and dimensions of the mould parts which may be used on the press.

7.2.3 Emergency stop and rescue procedure

The manufacturer shall indicate the effects of the emergency stop.

The manufacturer shall describe how to free a person trapped inside the mould area particularly due to defeating or misusing the protective devices or after an actuation of an emergency stop.

7.2.4 Light curtains

The manufacturer shall give adequate instructions on the monitoring of the stopping time and that on a press equipped with light curtains, moulds protruding from the platens shall not be used.

7.2.5 Stopping distance and stopping time

The manufacturer shall state that the user shall ensure that the stopping distance and stopping time relating to the light curtains and two-hand control devices and interlocking guards without guard locking are verified at least once a year.

7.2.6 Flexible hose assemblies

The manufacturer shall give information on the regular inspection of flexible hose assemblies and also their replacement.

7.2.7 Noise emission

The instruction handbook and the technical documentation describing the press shall:

— give the declared noise emission values of the press in accordance with B.7 of this standard and EN ISO 4871:2009, A.2.2, as dual-number noise emission values;

— refer to the noise test code specified in Annex B to this standard upon which the determination of the noise emission values of the press is based and state which basic noise measurement standards have been used;

— contain information on possible methods of installation to minimize noise emission;

— if necessary, recommend the wearing of personal hearing protection.

7.2.8 Exhaust ventilation system

The manufacturer shall:

— indicate that some materials during processing can emit dusts, gases or vapours which are hazardous to health;

— indicate that when these conditions exist, an exhaust ventilation system shall be fitted or positioned by the user;

— give information concerning the fitting, positioning and electrical connection of the exhaust ventilation system.

7.2.9 Maintenance of the hydraulic system

The manufacturer shall specify procedures and time intervals of the cleaning and changing of filters and refilling the hydraulic system.

The manufacturer shall advise the user that while working on the hydraulic system, appropriate measures should be taken to avoid contamination of the hydraulic fluid.

7.2.10 Presses equipped with two-hand control devices

The manufacturer shall provide information that the press is specifically designed for applications such that it is not possible to safeguard the mould area by the use of guards or light curtains, for example that the machine is designed exclusively for the use of moulds and/or inserts protruding from the mould area.

When two-hand control devices can be deselected, the manufacturer shall inform the user to remove the deselected control devices from the press in order to avoid confusion between active and inactive control devices.

7.2.11 Additional mechanical restraint device for downstroking presses with two hydraulic restraint devices

The manufacturer shall indicate that repair and maintenance work shall be carried out in the mould area only if the visual indicator according to 5.4.1.1.3 is active.

7.2.12 Movements of cores and ejectors and their drive mechanisms

If hazardous movements of cores or ejectors inside the mould are controlled by the press control system, the press manufacturer shall state:

— the category and the PL of the corresponding safety functions,

— that the user is not allowed to install a mould requiring a higher level of safety.

7.2.13 Personal protective equipment against thermal hazards

The manufacturer shall describe which personal protective equipment (e.g. gloves) should be provided by the user for work in the vicinity of hot elements of the press or hot materials.

7.2.14 Presence detecting devices in the mould area

The manufacturer shall state that presence detecting devices according to 5.7.2 may require readjustment after a mould change.

7.2.15 Key lockable switch

The manufacturer shall state that the key lockable switch according to 5.7.2 may only be used if:

— the deactivation of the interlocking of the movable guard or light curtain is required for process reasons; and

— third persons are protected by organisational measures of the user.

The manufacturer shall state that the key of the lockable switch shall be used only by authorized persons and shall not remain in the lock during operation.

7.2.16 Ancillary equipment

The machine manufacturer shall give adequate information so that the safety level is not reduced when ancillary equipment which has not been supplied by them is installed by the user. The machine manufacturer shall specify the interfaces available on the machine to connect the ancillary devices (e.g. see EUROMAP 67).

The manufacturer shall state that they are only responsible for the interaction of the machine with ancillary equipment where they have designed the interface system.

The machine manufacturer shall state that a reassessment of the risk of overturning is necessary if ancillary equipment not supported by the floor is fitted to the machine and that their agreement is required before fitting ancillary equipment to the machine.

The machine manufacturer shall state that if ancillary equipment is removed, the original guards or safety devices should be replaced.

The manufacturer shall state that the installation of ancillary equipment should not reduce the necessary visibility of dangerous machine areas, nor prevent access to the working positions specified in the instruction handbook.

7.2.17 Mould clamping

The manufacturer shall describe the safe procedure for mould clamping and changing.

7.2.18 Magnetic mould clamping

The machine manufacturer shall declare the following:

— the intended use;

— only trained and qualified personal should be allowed to operate the magnetic clamping system;

— mould and/or base plate material requirements;

— minimum base plate thickness;

— required minimum contact area of mould as a function of the weight of the upper part of the mould, taking into account e.g. holes;

— required conditions of contact surfaces;

— maximum permissible temperature for the magnetic clamping system;

— allowable ejector force and importance of properly adjusting the ejector stroke and alignment;

— allowable mould opening force taking into account conditions that can increase the force that is necessary to open the mould (e.g. jamming guiding pins, adhesive forces, undercuts, etc.);

— mould change procedure(s) including the verification of proper declamping and clamping;

— warn users that the magnetic field exerts a high force on ferrous objects placed close to the magnetic clamping system surface and could create pinch points;

— warn users not to magnetise the magnetic clamping system without the mould being in contact with the magnetic clamping system surface;

— optimum magnetic clamping force for each mould is achieved when the magnetic field is built with the surfaces already in contact;

— pacemakers, hearing aids or other medical devices can be damaged or affected by the use of the magnetic clamping system;

— the user is not allowed to install a magnetic clamping system on a press that is not designed for this system as specified by the machinery manufacturer;

— recommended maintenance schedule;

— the magnetic clamping system shall be switched off when the press is switched off;

— the function of the emergency stop, especially if this may interrupt the magnetization and demagnetization and, as a result, the mould is in an undefined status; in this case, clear instructions shall be written about the operations to reach a safe status;

— in case the mould is provided with its own internal heating circuit (e.g. steam, diathermic oil or other heat source), the magnetization shall be done after the stabilization of the target moulding temperature.

7.2.19 Maximum additional mass

On machines with electrical axes, the manufacturer shall specify the maximum additional mass that can be added to the parts liable to move by gravity.

7.2.20 Setting of carousel machines

The manufacturer shall indicate that the key of the mode selector switch referred to in 5.7.4 should only be issued to persons trained in setting operations.

The manufacturer shall give instruction to use the provided mechanical restraint device for setting operations to prevent the movement of parts due to gravity.

7.2.21 Machines with upstroking platen

On such presses the manufacturer shall give information on how to set the drive mechanism of the cores and ejectors to avoid any residual risk due to movement of the platen because of gravity.

The manufacturer shall describe the safe blocking of the lower platen for maintenance operations.

7.3 Marking

The minimum markings for all machines shall include:

— business name and full address of the manufacturer and where applicable his authorized representative ;

— designation of the machinery;

— mandatory marking;

— designation of series or type;

— serial number if any, or machine number;

— year of construction, that is the year in which the manufacturing process is completed;

In addition, where a light curtain or two-hand control device is used, the overall system stopping performance and corresponding safety distance(s) shall be included.

7.4 Warning signs and alarm signals

The press shall be equipped with warning signs about hot parts: heat conditioning hoses and fittings, moulds, platens and heating elements.

Where a magnetic clamping system is integrated by the press manufacturer, warning signs shall be displayed to indicate that:

— ferromagnetic objects close to the platen may be subjected to a magnetic force; and

— pacemakers, hearing aids or other medical devices can be damaged or affected by the use of the magnetic clamping system; and

— the contact surfaces have to be cleaned carefully.

The press shall be equipped with alarm signals:

— on presses equipped with magnetic clamping systems, an alarm shall be initiated when a dedicated temperature limit value is reached (see 5.5.2 j));

— on presses equipped with a double acknowledgement system, an alarm shall be activated if improper operation or sequencing of the push buttons is detected (see A.2).

Annex A
(normative)

Acknowledgement systems

A.1 Single acknowledgement system

A single acknowledgement system shall consist of an acknowledgement switch located outside of the danger area which cannot be actuated from inside the danger area when the movable guards are closed or without interrupting the light curtain.

The acknowledgement switch shall be positioned to afford a clear view of the danger area.

Restart of the dangerous movements shall only be possible after:

— actuation of the acknowledgement switch following interruption of the light curtain, or

— closing the relevant movable guard, followed by actuating the acknowledgement switch.

Actuating the acknowledgement switch shall not initiate a dangerous movement.

The correct functioning of the acknowledgement switch shall be automatically monitored, at least once after each cycle of the movable guard or every time the associated light curtain has been interrupted, so that a fault in the acknowledgement switch is automatically recognized and prevents the initiation of any further dangerous movement.

Automatic monitoring of the acknowledgement system may be carried out by the programmable controller.

A.2 Double acknowledgement system

A double acknowledgement system shall consist of one or more push button(s) (A) located inside of the protected area in full view of the mould area and an additional push button (B) located outside of the protected area and with a clear view of this area, which cannot be actuated from inside the protected area.

The start of a cycle shall be possible only after the following sequence has been completed within a time interval:

— push button(s) (A);

— close operator's gate or exit the protected area interrupting the light curtain;

— push button (B).

A monitoring circuit shall be provided to check the operation of each push button. If improper operation or sequencing is detected, the cycle of the machine shall be inhibited and an alarm shall be activated.

Automatic monitoring of the acknowledgement system may be carried out by the programmable controller.

Annex B
(normative)

Noise test code

B.1 Introduction

This noise test code specifies all the information necessary to carry out efficiently and under standardised conditions the determination, declaration and verification of the airborne noise emission values of presses.

It specifies the noise measurement methods and operating and mounting conditions for the test.

The use of this noise test code ensures the reproducibility of the measurements and the comparability of the airborne noise emission values within specified limits determined by the grade of accuracy of the basic measurement method used. Noise measurement methods allowed by this noise test code are engineering (grade 2) and survey (grade 3) methods.

B.2 Measurement of the A-weighted emission sound pressure level at the operator's or other specified positions

For all presses, the microphones shall be positioned 1 m from the external surface of the press at a height of 1,6 m above the operator's standing surface and at a distance from one another not exceeding 2 m using one of the standards EN ISO 11201:2010, EN ISO 11202:2010 or EN ISO 11204:2010, and recording the highest value measured.

For presses which are manually loaded and unloaded by an operator, the measurement of the A-weighted emission sound pressure level shall be carried out at all specified working positions.

If practicable, an engineering method shall be used.

Measurements at each microphone position shall be carried out over at least one full test cycle of the press as defined in B.5.

B.3 Determination of the A-weighted sound power level

If the A-weighted emission sound pressure level at the operator's position exceeds 80 dB, the determination of the A-weighted sound power level shall be carried out using one of the standards EN ISO 3744:2010, EN ISO 3746:2010, EN ISO 3747:2010, EN ISO 9614-1:2009 or EN ISO 9614-2:1996.

If practicable, an engineering method shall be used.

Measurements shall be carried out once at each microphone position. The duration of each measurement is given in B.5.

When EN ISO 3744:2010 or EN ISO 3746:2010 is used the measurement surface shall be a parallelepiped and the measurement distance shall be 1 m.

B.4 Installation and mounting conditions for noise measurement

The press shall be mounted and connected as indicated by the manufacturer in the instruction handbook.

The press shall be placed on a plane reflecting surface made of concrete. If elastic mounts are placed between the machine and the supporting surface their technical characteristics shall be recorded.

The installation and mounting conditions shall be identical for all measurements.

B.5 Operating conditions

The press shall be at normal operating temperature and run:

— with mould or metallic spacers;

— with an opening stroke ≥ 75 % of the maximum;

— without ejectors, ancillary devices or exhaust ventilation system operating;

— without interruption of the hydraulic pump for a minimum of three consecutive full test cycles lasting for at least 90 s.

The test cycle shall include charging of accumulators and one movement of the mechanical latch if any.

The test cycle is specified in Table B.1.

Table B.1 — Test cycle

Part of the cycle	Time
Total cycle time	80 P_t
Time for application of pressing force	1 P_t
Holding time	30 P_t
Remaining time (includes the opening and closing of the press with 80 % of the maximum speed)	49 P_t
P_t = minimum time to increase the force from 10 % to 80 % of the maximum force	

The operating conditions shall be identical for all measurements.

B.6 Information to be recorded and reported

B.6.1 General

The information to be recorded shall include all the data required by the basic standards used i.e. precise identification of the press under test, acoustic environment, instrumentation, presence and position(s) of the operator(s) if any and as a minimum the data in accordance with B.6.2 to B.6.6.

The information to be reported is as follows:

B.6.2 General data

— Type, serial number if any, year of manufacture of the press;

— date of test, location, person in charge;

— ambient temperature.

B.6.3 Technical data of the press

— Maximum stroke;

— pressing force;

— maximum hydraulic pressure.

B.6.4 Standards

Measurement standards.

B.6.5 Mounting and operating conditions

— Oil temperature;

— value of P_t;

— actual stroke;

— operation with/without accumulators;

— size of mould or spacers.

B.6.6 Acoustic data

— Location of measurement positions;

— noise emission values obtained, especially the highest value of the emission sound pressure level and the position where it is obtained.

Any deviation from the test code shall be recorded and reported.

B.7 Declaration and verification of noise emission values

The noise declaration shall be a dual-number declaration as defined in EN ISO 4871:2009 i.e. the measured value and the measurement uncertainty shall be indicated separately. It shall include the following:

— the value of the measured A-weighted emission sound pressure level at the operator's position where this exceeds 70 dB; the highest value of the A-weighted emission sound pressure level and the position where it is obtained shall be declared; for manually loaded and unloaded presses, both the highest value measured and the values at the operator’s positions specified in B.2 shall be declared. Where the A-weighted emission sound pressure level does not exceed 70 dB, this fact shall be indicated;

— the value of the A-weighted sound power level, only where the measured value of the A-weighted emission sound pressure level at the operator's position exceeds 80 dB.

The noise declaration shall mention explicitly that noise emission values have been obtained according to this noise test code and indicate which basic measurement standards have been used. The noise declaration shall clearly indicate any deviation from this noise test code and/or from the basic standards used.

If undertaken, the verification of declared values shall be conducted according to EN ISO 4871:2009, 6.2 by using the same mounting and operating conditions as those used for the initial determination of noise emission values.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 2006/42/EC on machinery.

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

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