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Machines and plants for the manufacture, treatment and processing of hollow glass - Safety requirements - Part 5: Presses

Maschinen und Anlagen für die Herstellung, Be- und Verarbeitung von Hohlglas - Sicherheitsanforderungen - Teil 5: Pressen

Machines et installations pour la production, le façonnage et la transformation du verre creux - Exigences de sécurité - Partie 5: Presses

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English version

Machines and plants for the manufacture, treatment and
processing of hollow glass - Safety requirements - Part 5:
Presses

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- Partie 5: Presses

Maschinen und Anlagen für die Herstellung, Be- und
Verarbeitung von Hohlglas - Sicherheitsanforderungen -
Teil 5: Pressen

This European Standard was approved by CEN on 7 May 2003.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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Foreword

This document EN 13042-5:2003 has been prepared by Technical Committee CEN/TC 151 "Construction equipment and building material machines – Safety", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2004, and conflicting national standards shall be withdrawn at the latest by January 2004.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of EC Directive(s).

It is one of a series concerning machinery for the treatment and processing of hollow glass.

Annex A is informative and contains "Examples of safeguarding hazards of crushing, drawing-in and entanglement at rotating tables" and annex B is informative and contains "Illustration of a mould set".

This document includes a Bibliography.

For relationship with EC Directives, see informative annex ZA, which is an integral part of this document.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

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0 Introduction

This document is a type-C standard as stated in EN 1070.

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

As with presses for forming hot metal, the result of the risk assessment is that due to the heat of the material processed and the need for the use of auxiliary aids, such as tongs, during work in the danger zone of the closing mould, there is typically no significant risk from the closing movement of the mould parts during the normal shaping process of hot glass. There are hazards at other times, e.g. movements initiated by personnel or failure of the controls during setting. Safety requirements laid down in this standard relative to the movements of mould parts therefore deal especially with the manual control of glass presses for setting operations as defined in 3.7.

When compiling this standard, it was assumed that:

- movements of mould parts (plunger and ring) in hydraulically and pneumatically operated presses result from the movements of the rod or of the cylinder;
- harmful materials such as asbestos and toxic substances are not used;
- noise generated by the glass press is itself not a significant hazard, but noise by air-cooling of hot articles and the mould and by pneumatic waste ejection with air from an outside system may cause the necessity of wearing ear protection by the operator.
- glass presses are not intended to be used in potentially explosive atmospheres.

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

1.1 This standard contains the requirements for the design and installation of glass presses including equipment for feeding of portions of molten glass to the mould, loading equipment and equipment for discharging articles (take-out) when these are integral parts of the presses.

1.2 This standard deals with all significant hazards, hazardous situations and events relevant to glass presses when they are used as intended and under the conditions foreseeable by the manufacturer (see clause 4). This standard specifies the appropriate technical measures to eliminate or reduce risks which can arise from these significant hazards.

1.3 This standard does not deal with forming machines for hollow glass where the press operation is only a part of the hot-forming process, such as the press/blow process of IS machines (see prEN 13042-3).

1.4 This standard does not deal with gob feeders (see prEN 13042-1) and handling machines for feeding (see prEN 13042-2) which are self-standing machines and dealt with in other standards of the series regarding machinery used in the production of hollow glass.

1.5 This document is not applicable to presses which are manufactured before the date of publication of this document by CEN.

1.6 This standard deals only with hazards arising from the application of components which may be used in glass presses, such as motors and continuous handling equipment. More particular safety requirements are dealt with within standards more specific to that component, including noise.

1.7 This standard does not deal with equipment for cooling and waste ejection with air or heating from an outside system.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 292-1, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology.*

EN 292-2, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles and specifications.*

EN 292-2:1991/A1:1995, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles and specifications.*

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

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

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

EN 954-1:1996, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design.*

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EN 982:1996, *Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics.*

EN 983:1996, *Safety of machinery — Safety requirements for fluid power systems and their components — Pneumatics.*

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

EN 1050:1996, *Safety of machinery — Principles for risk assessment.*

EN 1070:1998, *Safety of machinery — Terminology.*

EN 12464-1:2002, *Lighting applications — Lighting of workplaces - Part 1: Indoor work places.*

EN 60204-1:1997, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:1997 + Corrigendum 1998).*

EN 61508-5, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 5: Examples of methods for the determination of safety integrity levels (IEC 61508-5:1998 + Corrigendum 1999).*

3 Terms and definitions – Symbols and abbreviated terms

For the purposes of this European Standard, the terms and definitions given in EN 1070:1998 apply. Additional definitions specifically needed for this document are added below:

3.1

glass presses

machines, where the shaping of molten glass is performed by the action of pressure in a mould set as a result of the linear closing travel of the different parts of the mould set (lower mould, ring, plunger)

- 3.2 ring**
part of the mould set to close the gap between plunger and lower mould in press position
- 3.3 mould set**
configuration consisting of plunger, ring and lower mould, see annex B (informative)
- 3.4 mould change**
replacement of a mould set or parts of it by identical ones in order to maintain production
- 3.5 job change**
replacement of a mould set in order to produce another product
- 3.6 adjustment**
regulation of machine functions, e.g. pressing load, cooling, lubrication during normal operation
- 3.7 setting operations**
all work which is necessary for mould change or job change
- 3.8 start-up delay**
time between the first given start signal for the start of the machine in the automatic mode and the first movement of the automatic cycle of the machine
- 3.9 loading equipment**
device to feed already pre-formed glass parts into the press
- 3.10 working cycle**
all movements completed by parts of the mould from fully open to fully closed and back to fully open
- 3.11 cycle-single (control) mode**
operating method where each working cycle has to be operated positively by the operator and is stopped automatically when the cycle is completed
- 3.12 automatic (control) mode**
operating method where working cycles are repeated automatically after a given manual start till the movements are stopped by a manually given stop signal
- 3.13 press station**
area of machines with sliding or rotation table where the mould set is brought into position and closes to form the article
- 3.14 manual control (mode)**
operating method permitting (individual) movements only by controls (control devices) requiring sustained action, e.g. for setting

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4 List of significant hazards

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

Before using this standard, it is important to carry out a general risk assessment of the machine in question.

NOTE Application of B-level standards see clause 5.

Clause () Ref. No. of Table A.1 of annex A of EN 1050:1996	Hazards	Danger zone/ dangerous item	Preventive measures see clause
4.1 (1)	Mechanical		
4.1.1 (1.1)	crushing of hand and arm	the closing travel of the plunger and the ring against the lower mould during setting operations	5.6.1, 5.13 - 5.13.2, 5.18
4.1.2 (1.1)	crushing of hand and arm	the opening travel of the plunger and the ring and of the piston rod or cylinder with adapters against fixed parts of the press during setting operations	5.1, 5.6.1, 5.13 - 5.13.2, 5.18
4.1.3 (1.1)	crushing of hand and arm	between ring and plunger during setting operations	5.6.1, 5.13 - 5.13.2, 5.19
4.1.4 (1.1)	crushing of hand and arm	between moving piston rod or cylinder with adapter and plunger, ring or cage on their travel for the mounting of the plunger, ring or cage during setting operations	5.13 - 5.13.2
4.1.5 (1.1)	crushing of hand and arm	closing movement of a divided lower mould during setting operations	5.13
4.1.6 (1.1)	crushing of the hand	between cam (or piston) and divided (lower) mould, e.g. basket mould, during setting operations	5.13
4.1.7 (1.1, 1.4)	crushing/drawing-in	rotating table or back and forth-moving sliding table with or without equipment, e.g. mould parts against fixed parts of the machine itself or adjacent fixed parts	5.1.3, 5.1.4
4.1.8 (1.1, 1.6)	crushing of hand and arm and impact	take-out; loading equipment	5.1.1, 5.13
4.1.9 (1.3)	cutting	cullets	7.1.6, 7.1.12
4.1.10 (1.4)	entanglement	protruding parts of rotating or sliding tables with mounted equipment	5.1.2
4.2 (2.1, 2.2)	Electrical	direct or indirect contact	5.4.2
4.3 (3.1)	Thermal hazards resulting in burns	hot glass, hot mould parts and machine parts, heated cooling water, naked flames	5.2, 7.1.5-7.1.7
4.4 (7.2) (17)	Fire	ignition of inflammable hydraulic fluid	5.3
4.5 (8)	Neglecting ergonomic principles		
4.5.1 (8.1)	excessive effort	mould parts, mould set	5.19
4.5.1 (8.6)	human behaviour	untrained personnel	7.1.9
4.5.2 (8.7)	inadequate design of manual controls	areas with hazards resulting in burns	5.8.1
4.5.3 (8.8)	inadequate design of display units	switching mode	5.8.2, 5.8.3, 7.1.10

Clause () Ref. No. of Table A.1 of annex A of EN 1050:1996	Hazards	Danger zone/ dangerous item	Preventive measures see clause
4.6 (10)	Unexpected start-up, malfunction		
4.6.1 (10.1) (10.2) (13) (14)	failure/disorder of the control system; energy supply	all dangerous movements	5.7, 5.9-5.12; 5.14-5.16, 7.1.2, 7.1.3
4.6.2 (10.3) (10.4)	External influences, e.g. heat, gravity	electrical equipment, lifted machine parts	5.4, 5.17, 5.18.1, 5.18.2
4.7 (11)	Impossibility of stopping the machine in the best possible conditions	all dangerous movements	5.5, 5.6, 5.18, 7.1.4
4.7 (19)	Slip	spilled oil (lubrication)	7.1.8

5 Safety requirements and/or protective measures

Machinery shall comply with the safety requirements and/or protective measures of this clause and in addition with EN 292 for pertinent hazards not covered by this document (e.g. sharp edges).

NOTE For applications of a B-level standard such as EN 418, EN 953, EN 954-1, EN 982, EN 983, EN 1037 and EN 60204-1, the manufacturer should carry out an adequate risk assessment for the requirements thereof where choice is necessary. This specific risk assessment is part of the general risk assessment relating to the hazards not covered by this standard.

Where the means of reducing the risk is by the arrangement of the installed machine or by a safe system of work, the manufacturer shall include in the Information for use a reference to the reduction means to be provided, including training, and to any limiting value of the requirement and, if appropriate, to the means of verification.

5.1 Crushing hazards of hand and arm by pistons or cylinders and their adapters (with or without mould parts) against other moving or fixed parts during the opening travel of plunger and ring shall be prevented as far as is practicable by design, such as providing a minimum gap of 120 mm (see Table 1 of EN 349:1993).

5.1.1 Crushing and impact hazards from the movement of loading equipment and the take-out during the "automatic" operation mode shall be safeguarded by fixed or interlocking distance guards conforming to the requirements of 3.2.2 and 3.5 of EN 953:1997.

5.1.2 Entanglement hazards of the body caused by the movement of rotating or sliding tables together with mounted equipment such as mould parts, shall be avoided or safeguarded by:

5.1.2.1 having a smooth outside edge and surface of the table and the mounted equipment without any protruding parts (see Figure A.1 of annex A [informative]), or,

5.1.2.2 where parts protrude from the table; by the provision of a fixed cover, e.g. rod, barrier rail, around the rotating table or along the sliding table at the height of the table surface. The fixed cover shall not create hazards of crushing of hand and arm between the cover and the moving parts, such as by maintaining a gap of not less than 120 mm in accordance with Table 1 of EN 349:1993 (see Figure A.2 of annex A [informative]), or,

5.1.2.3 fitting a fixed horizontal table at the same height as the rotating table surface and forming a parallel gap with its outer edge not exceeding 8 mm (see Figures A.3 and A.4 of annex A [informative]); the distance between the outer edges of the rotating table and the fixed table shall be minimum 120 mm.

5.1.3 Risks of crushing and drawing-in of hand and arm between moving tables with mounted equipment and all fixed parts shall be avoided, where practicable, by a minimum gap of 120 mm.

5.1.4 Any residual risks of crushing or drawing-in remaining after the application of requirements set out in 5.1.2 and 5.1.3 shall be safeguarded, e.g. by a trip device e.g. interlocking swinging gate, placed at the danger zone between rotating or sliding parts and fixed parts of the press or adjacent fixed parts (see Figure A.4 of annex A [informative]).

5.2 The dangerous emission (overflow) of steam or heated water from water-cooling systems shall be avoided, e.g. by:

5.2.1 an open system that can be watched by personnel or by a flow control with pressure relief, and

5.2.2 protective covers of flanges of pipes and hoses preventing any discharge over workplaces, and

5.2.3 equipment allowing the blowing-out of water into an outlet pipe (see 7.1.5), e.g. for plunger changes.

5.3 Separable joints of pipes and hoses for hydraulic liquid shall be covered preventing hydraulic liquid from spreading to workplaces and to areas where ignition is possible.

NOTE Consideration should be given to the use of fire-resistant fluids in accordance with 5.3.4.1.1 of EN 982:1996.

5.4 Electrical leads (cables) and hydraulic/pneumatic hoses shall be covered to prevent the adverse influences of hot glass, cullet and heat radiation.

5.4.1 Electrical cabinets shall be cooled or ventilated taking into account the heat exposure in factories forming molten glass, or shall be located in a specific air-conditioned room.

NOTE Air temperature should be kept below 40 °C (see 4.4.3 of EN 60204-1:1997).

5.4.2 All electrical equipment shall conform to the requirements of EN 60204-1 with regard to the protection against electrical shock (see clause 6 of EN 60204-1:1997).

5.5 Each glass press shall be equipped with its own lockable energy supply disconnecting device for each kind of energy such as separate main master switches (see 5.1 and 5.2 of EN 1037:1995).

5.6 Emergency-stop equipment

Glass presses shall be fitted with emergency-stop equipment conforming to EN 418 which functions as stop category 0 or 1 of 9.2.2 of EN 60204-1:1997 in order to stop or reverse dangerous movements. Actuators of emergency-stop equipment shall be installed at the following places:

- at all places with manual controls (actuators) for automatic operation and setting;
- at the press station;
- in the areas for mould change;
- at the main control panel.

Provisions shall be made to ensure that emergency stopping can also affect other machines linked to the glass press.

NOTE Unexpected movement by gravity see 5.17 and 5.18.

5.6.1 During the operation mode manual control for setting (see 5.13), there shall be no reverse movements of piston rod or cylinder of plunger and ring by the actuation of the emergency device.

5.7 Stop-control device

Latching-in stop-control devices in accordance with 6.3.2 of EN 1037:1995 having positive opening operation shall be installed close to the glass press, and also inside a protected danger zone which is accessible to persons, in order to be able to prevent an unexpected start-up of dangerous movements in any mode of operation, e.g. manual or automatic. This device shall also be effective if the drive, e.g. hydraulic pumps or motor with clutch, is still running. A new start shall only be possible, after the actuated device is reset manually.

5.8 Design of actuators – identification of switching mode

5.8.1 Manual controls (actuators) which are located in areas where there is a risk of burns shall be designed in such a way that they can be used when the operator is wearing heat-resistant gloves.