



SLOVENSKI STANDARD
SIST EN 13736:2003+A1:2009

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Varnost obdelovalnih strojev - Pnevmatске stiskalnice

Safety of machine tools - Pneumatic presses

Sicherheit von Werkzeugmaschinen - Pneumatische Pressen

Sécurité des machines-outils - Presses pneumatiques

Ta slovenski standard je istoveten z: EN 13736:2003+A1:2009

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EUROPEAN STANDARD
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Safety of machine tools - Pneumatic presses

Sécurité des machines-outils - Presses pneumatiques

Sicherheit von Werkzeugmaschinen - Pneumatische Pressen

This European Standard was approved by CEN on 15 November 2002 and includes Corrigendum 1 issued by CEN on 21 July 2004 and Amendment 1 approved by CEN on 29 December 2008.

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Foreword

This document (EN 13736:2003+A1:2009) has been prepared by Technical Committee CEN/TC 143 "Machine tools – Safety", the secretariat of which is held by SNV.

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of an identical text or by endorsement, at the latest by August 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.

This European Standard was approved by CEN on 15 November 2002 and includes Corrigendum 1 issued by CEN on 21 July 2004 and Amendment 1 approved by CEN on 29 December 2008.

This document supersedes EN 13736:2003.

The start and finish of text introduced or altered by amendment is indicated in the text by tags $\boxed{A_1}$ $\boxed{A_1}$.

The modifications of the related CEN Corrigendum have been implemented at the appropriate places in the text and are indicated by the tags \boxed{AC} \boxed{AC} .

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

$\boxed{A_1}$ For relationship with EU Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document. $\boxed{A_1}$

Organisation contributing to the preparation of this European Standard include the European Manufacturer Association CECIMO.

NOTE The safety requirements related to the use of PES or PPS will be dealt with at its next revision.

The European Standards produced by CEN/TC 143 are particular to machine-tools and complement the relevant A and B standards on the subject of general safety (see introduction of EN 292-1:1991 for a description of A, B and C standards).

Annexes A, B and E are normative. Annexes C and D are informative.

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

EN 13736:2003+A1:2009 (E)**Introduction**

This European Standard has been prepared to be a harmonized standard to provide one means of conforming with the essential safety requirements of the "Machinery" Directive and associated EFTA Regulations. It is a C-type standard as described in EN 1070:1998.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this standard. When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this C type standard take precedence over the provisions of other standards, for machines that have been designed and built according to the provisions of this type C standard.

Complementary guidance is given in the A and B standards to which reference is made in the text (see clause 2). The figures are intended to be examples only and not to give the only interpretation of the text.

The requirements of this European Standard concern designers, manufacturers, suppliers and importers of machines described in the scope.

This standard also includes information to be provided by the manufacturer to the user.

1 Scope**iTeh STANDARD PREVIEW**

1.1 This European Standard specifies technical safety requirements and protective measures to be adopted by persons undertaking the design as defined in 3.11 of EN 292-1:1991, manufacture and supply of pneumatic presses the intended use of which is the cold working of metal or material partly of metal as defined in 3.1.13 and hereafter referred as machines.

This standard also applies to machines which are integrated into an automatic production line where the hazards and risk arising are comparable to those of machines working separately.

1.2 This standard also covers pneumatic presses:

- whose primary intended use is the cold working of metal, which are to be used in the same way to work other sheet materials (e.g. cardboard, plastic, rubber, leather) and metal powder;
- with an intermediate pneumatic/hydraulic intensifier.

1.3 The requirements in this standard take account of intended use, as defined in 3.12 of EN 292-1:1991. This standard presumes access to the press from all directions, deals with the hazards described in clause 4, and specifies the safety measures for both the operator and other exposed persons.

1.4 This standard also applies to ancillary devices which are an integral part of the press. This standard also applies to machines which are integrated into an automatic production line where the hazards and risk arising are comparable to those of machines working separately.

1.5 This standard does not cover machines whose principal designed purpose is:

- a) sheet metal cutting by guillotine;
- b) bending or folding by pneumatic press brakes or folding machines;
- c) spot welding;
- d) tube bending;

- e) straightening;
- f) drop stamping;
- g) working by pneumatic hammer;
- h) compaction of metal powder.

Special pneumatic machines for assembling or calibrating are not covered but this standard may be used as a basis for these machines.

1.6 This standard does not cover the safety requirements related to the use of PES or PPS. They will be dealt with at its next revision.

1.7 This standard is not applicable to machines which are manufactured before the date of publication of this document by CEN.

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 292-1:1991, *Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology, methodology.*

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

Ⓐ EN 292-2/A1:1995, *Safety of machinery – Basic concepts, general principles for design – Part 2: Technical principles and specifications – Amendment A1* Ⓐ

EN 294:1992, *Safety of machinery – Safety distance to prevent danger zones being reached by the upper limbs.*

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

EN 418:1992, *Safety of machinery – Emergency stop equipment, functional aspects – Principles for design.*

EN 574:1996, *Safety of machinery – Two-hand control devices – Functional aspects - Principles for design.*

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

EN 894-2:1997, *Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 2: Displays.*

EN 894-3:2000, *Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 3: Control actuators.*

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.*

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

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

EN 999:1998, *Safety of machinery – The positioning of protective equipment in respect of approach speeds of parts of the human body.*

prEN 1005-2:1998, *Safety of machinery – Human physical performance – Part 2: Manual handling of machinery and component parts of machinery.*

EN 1037, *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 1088:1995, *Safety of machinery – Interlocking devices associated with guards – Principles for design and selection.*

EN 1127-1:1997, *Explosive atmospheres – Explosion prevention and protection – Part 1: Basic concepts and methodology.*

EN 1837:1999, *Safety of machinery – Integral lighting of machines.*

EN ISO 3746:1995, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Survey method using an enveloping measurement surface over a reflecting plane (ISO 3746:1995).*

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

EN ISO 11202:1995, *Acoustics – Noise emitted by machinery and equipment – Measurement of emission sound pressure levels at a work station and at other specified positions – Survey method in situ (ISO 11202:1995).*

EN ISO 11688-1:1998, *Acoustics – Recommended practice for the design of low-noise machinery and equipment – Part 1: Planning (ISO/TR 11688-1:1995).*

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

EN 60529:1991, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989).*

EN 61310-2:1995, *Safety of machinery – Indication, marking and actuation – Part 2: Requirements for marking (IEC 61310-2:1995).*

EN 61496-1:1997, *Safety of machinery – Electro-sensitive protective equipment – Part 1: General requirements and test (IEC 61496-1:1997).*

prEN 61496-2:1997, *Safety of machinery – Electro-sensitive protective equipment – Part 2: Particular requirements for equipment using active opto-electronic devices (IEC 61496-2).*

3 Terms and definitions, abbreviations

3.1 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 1070:1998 and the following apply. Further terms and definitions are provided in relevant type A and type B standards and in annex A of EN 292-2:1991/A1:1995.

3.1.1**ancillary device**

any device intended for use with the press tools and integrated with the press (e.g. devices for lubrication, feed, ejection)

3.1.2**cycle, automatic**

operating mode where the slide/ram repeats continuously or intermittently, all functions achieved without manual intervention into the danger zone after initiation

3.1.3**cycle, operating**

movement of the slide/ram from the cycle start position (normally the top dead centre) to the bottom dead centre and back to the cycle stop position (normally the top dead centre). The operating cycle includes all operations carried out during this movement

3.1.4**cycle, single**

operating mode where each operating cycle of the slide/ram has to be positively actuated by the operator

3.1.5**dead centres**

points at which the tool, during its travel, is

- either nearest/closest to the die (generally it corresponds to the end of the closing stroke), known as the bottom dead centre (BDC),
- or furthest from the die (generally it corresponds to the end of the opening stroke), known as the top dead centre (TDC)

3.1.6**die**

fixed part of the tools used in a press

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3.1.7**early opening interlocking guard**

guard associated with an interlocking device which, if opened when any dangerous movement in the tools area has ceased, does not interrupt the operating cycle

3.1.8**monitoring**

safety function which ensures that a safety measure is initiated if the ability of a component or an element to perform its function is diminished, or if the process conditions are changed in such a way that hazards are generated

3.1.9**muting**

temporary automatic suspension of a safety function(s) by safety related parts of the control system (3.7 of EN 954-1:1996)

3.1.10**overall system stopping performance; overall response time**

time occurring from actuating the protective device to the cessation of hazardous motion, or to the machine assuming a safe condition

3.1.11**closing time**

time from the initiation of signal to start the movement TDC to BDC

EN 13736:2003+A1:2009 (E)**3.1.12****part detector**

device which detects the work-piece and/or the correct position of the work-piece and which permits or prevents the initiation of the stroke

3.1.13**pneumatic press**

stationary machine designed or intended to transmit energy by linear movement between closing tools by pneumatic means for the purpose of the working (e.g. forming or shaping of metal or material partly of metal (see Figure 1)

3.1.14**position switch**

switch which is operated by a moving part of the machine when this part reaches or leaves a predetermined position

3.1.15**redundancy**

application of more than one device or system, or part of a device or system, with the objective of ensuring that, in the event of one failing to perform its function, another is available to perform that function (3.44 of EN 60204-1:1997)

3.1.16**slide/ram**

main reciprocating press member which holds the tool

3.1.17**tool (punch)**

moving part of the tools

3.1.18**tool protective device**

device which protects the tool against damage by stopping the stroke or by preventing its start

3.1.19**tools**

term for the combination of tool and die

3.1.20**tools, closed**

tools designed and constructed to be inherently safe (see Figure B.1)

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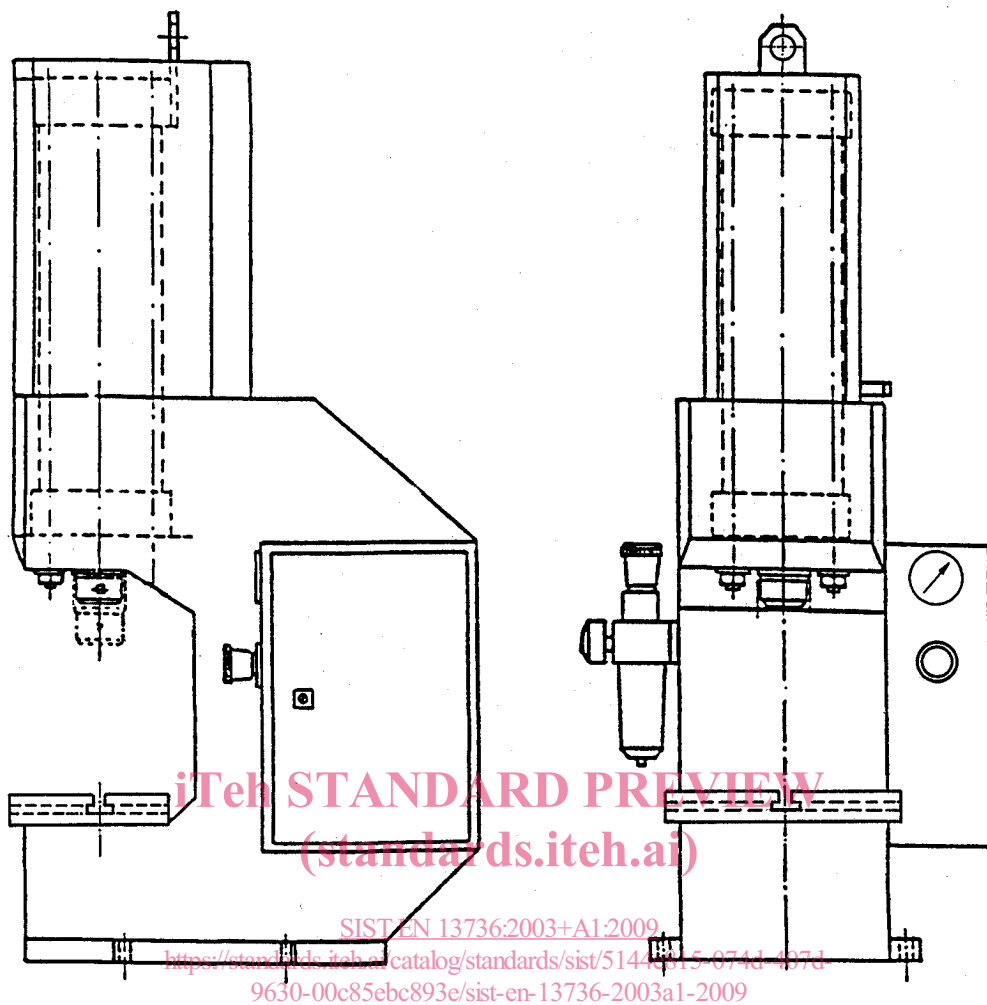


Figure 1 — Example of a down-stroking pneumatic press

3.2 Abbreviations

- 3.2.1 M Monitoring (see 3.1.8)
- 3.2.2 R Redundancy (see 3.1.15)
- 3.2.3 S Single system
- 3.2.4 BDC Bottom dead centre (see 3.1.5)
- 3.2.5 TDC Top dead centre (see 3.1.5)
- 3.2.6 PES Programmable electronic systems
- 3.2.7 PPS Programmable pneumatic systems
- 3.2.8 AOPD Active opto-electronic protective devices
- 3.2.9 ESPE Electro-sensitive protective equipment
- 3.2.10 THCD Two-hand control device

EN 13736:2003+A1:2009 (E)**4 List of significant hazards**

4.1 The list of hazards contained in Table 1 is the result of a hazard identification, their associated danger zones and reference to protective measures for pneumatic presses covered by the scope of this standard. The safety requirements and/or protective measures and information for use contained in clauses 5 and 7 are based on a risk assessment and deal with the identified hazards by either eliminating them or reducing the effects of the risks they generate.

4.2 The risk assessment assumes foreseeable access from all directions, as well as unexpected and unintended strokes or gravity falls. Risks to both the operators and other persons who can have access to the danger zones are identified, taking into account hazards which can occur under various conditions of intended use (e.g. commissioning, tool setting, production, maintenance, repair, decommissioning, dismantling - see also 3.11 of EN 292-1:1991) during the life of the machine. The assessment includes an analysis of the effect of failure in the control system.

4.3 The user of this standard (i.e. the designer, manufacturer, supplier) shall check that the list of significant hazards in Table 1 is complete for the machine under consideration. If the user determines that there are additional hazards then he shall analyse and evaluate the risks associated with these hazards in accordance with EN 1050 with particular attention to the intended use of the machine (e.g. commissioning, tool setting, production, maintenance, repair, decommissioning, dismantling - see also 3.11 of EN 292-1:1991), and its reasonably foreseeable misuse.

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Table 1 — Significant hazards, danger zones, preventive measures

No.	Hazards	Danger zone	Relevant clauses in EN 292-2/A1:1995	Relevant clauses in EN 292-1:1991	Preventive measures: relevant clauses in this standard
1.0	Mechanical hazards generated by: machine parts or work-pieces	Tools and associated area: – between tools, – moving slide/ram – between the moving and the fixed parts of the pneumatic press – moving die cushions – moving work-piece ejectors – moving guards	1.3 (except 1.3.6)	4.2	5.1, 5.3 to 5.5
	accumulation of energy inside machinery caused, for example, by: – elastic elements (springs) – liquids and gases under pressure		1.5.3, 1.6.1, 1.6.3	4.2	5.8.2
1.1	Crushing hazard	Outside tools area: – from hazardous situation of falling objects	1.3 (except 1.3.6)	4.2.1	5.2.1, 5.2.2, 5.3 to 5.6
1.2	Shearing hazard		1.4 (except 1.4.2.3)		
1.3	Cutting or severing hazard		1.5.14		
1.4	Entanglement hazard				
1.5	Drawing-in or trapping hazard				
1.6	Impact hazard	Moving parts of electrical, hydraulic and pneumatic equipment Mechanical handling device	1.3	4.2.1	5.6
1.9	High pressure fluid injection or ejection hazard	Pneumatic system, Hydraulic system	1.3.2	4.2.1	5.2.3.4, 5.6.5, 5.8.2
2.0	Electrical hazards due to:				
2.1	Contact of persons with live parts (direct contact)	Electrical equipment	1.5.1, 1.6.3	4.3	5.8.1
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	Electrical equipment	1.5.1		5.8.1
4.0	Noise hazards				
4.1	Hazards generated by noise resulting in hearing losses (deafness)	Any area at the pneumatic press where there is a risk to hearing	1.5.8	4.5	5.8.3
8.0	Hazards generated by neglecting ergonomic principles in machinery design, as e.g. from:				
8.1	Unhealthy postures or excessive effort	The working position and any area for controls, setting, maintenance and handling	1.1.2 d), 1.1.5, 1.6.2, 1.6.4	4.9	5.8.5
8.2	Inadequate consideration of hand-arm foot-leg anatomy		1.1.2 d), 2.2		
8.4	Inadequate local lighting		1.1.4		5.8.5.3, 7.2.2 e)
8.6	Human error, human behaviour		1.1.2 d), 1.2.2, 1.2.5, 1.2.8, 1.5.4, 1.7	4.9	5.4.4, 5.4.6.1, 5.4.6.5, 5.4.7
8.7	Inadequate design, location or identification of manual controls		1.2.2		5.4.6, 5.8.5.2
8.8	Inadequate design or location of visual display units		1.7.1		5.8.5.2

(continued)

Table 1 (concluded)

No.	Hazards	Danger zone	Relevant clauses in EN 292-2 /A1:1995	Relevant clauses in EN 292-1:1991	Preventive measures: relevant clauses in this standard
10	Unexpected start-up, unexpected overrun/ over-speed				
10.1	Failure/disorder of the control system	Tools and associated area: – between tools, – moving slide/ram – between the moving and the fixed parts of the pneumatic press, – moving die cushions – moving work-piece ejectors – moving guards Outside tools area – from hazardous situation of falling objects	1.2.7, 1.6.3		5.2 to 5.5
10.2	Restoration of the energy supply after an interruption		1.2.6		5.4.1.1
10.3	External influences on electrical equipment		1.2.1, 1.5.11		5.4.1
10.5	Errors in the software		1.2.1		5.4.3
10.6	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities, see 8.6 of Table 1)		1.1.2 d), 1.2.2, 1.2.5, 1.2.8, 1.5.4, 1.7	4.9	5.3, 7.2.2
13	Failure of the power supply		1.2.6		5.4.1.1
14	Failure of the control circuit	1.2.1, 1.2.3, 1.2.4, 1.2.5, 1.2.7, 1.6.3		5.2 to 5.5	
15	Errors of fitting	tools	1.5.4	4.9	5.3.17
16	Break-up during operation	Mechanical, electrical, hydraulic and pneumatic equipment	1.3.2	4.2.2	5.2.3.4, 5.2.3.7, 5.2.3.8, 5.2.3.9, 5.4.5
17	Falling or ejected objects or fluids	Machine components Work-pieces and tools	1.3.3		5.3.17, 5.3.17.1
19	Slip, trip and fall of persons (related to machinery)	All access and/or work at heights Floor area around the pneumatic press	1.5.15	4.2.3	5.7

5 Safety requirements and/or protective measures

5.1 Introduction

Pneumatic presses shall comply with the safety requirements and/or protective measures of this clause. In addition, the pneumatic press shall be designed according to the principles of EN 292 for hazards relevant but not significant which are not dealt with by this standard.

The methods or measures to be implemented to eliminate the significant hazards or reduce their associated risks are detailed in this clause in the following manner:

- basic design considerations for major press components or systems (see 5.2);

- safeguarding against mechanical hazards in the tools area under different modes of production (see 5.3 and Tables 2, 3 and 4);
- protection against hazards due to control system or control component failures (see 5.4);
- safeguarding against hazards which can occur during tool setting, trial strokes, maintenance and lubrication (see 5.5);
- safeguarding against other hazards (see 5.6 to 5.8).

5.2 Basic design considerations

5.2.1 Prevention of unintended gravity fall during production (down-stroking press)

5.2.1.1 Where there is a risk of injury (mass of the mobile component exceeding 15 kg) measures shall be provided to prevent injury from unintended gravity fall of the slide/ram in the production mode with manual or automatic feed or removal (see Tables 2 and 3). Such a fall may be due to a failure of the pneumatic system, mechanical failure or a failure of the electrical control system. The risk shall be prevented by a mechanical and/or a pneumatic restraint device or a combination of the two. The restraint device(s) shall operate automatically and shall be effective whenever the tool is stopped and operator access to the tools is possible.

5.2.1.2 The restraint device may consist of any of the following measures, provided that they are capable of holding up the slide/ram:

- a) return spring;
- b) clamping device;
- c) one, or if necessary, for flow consideration, two restraint valves fitted to the cylinder outlet.

NOTE 1 See also 5.4.1.2 and 5.4.1.3 for the control system requirements to prevent unintended strokes.

NOTE 2 Automatic monitoring of the check valve(s) is not required.

5.2.2 Prevention of gravity fall during maintenance or repair

Where there is a risk of injury (mass of the mobile component exceeding 15 kg), measures shall be provided to prevent injury from a gravity fall of the slide/ram during maintenance or repair, either:

- a) the mechanical restraint device as referred to 5.2.1 shall be designed to conform to 5.2.1.2 a or b; or
- b) a scotch shall be provided for manual insertion into the press.

Where the mechanical restraint device or the scotch is not capable of absorbing the entire press force, it shall be interlocked to the press control so that the closing stroke cannot be performed while the device is in position and the press slide/ram is retained in the up position according to EN 1037.

5.2.3 Pneumatic systems

5.2.3.1 Pneumatic system shall be designed in accordance with the requirements of EN 983 and in addition.

5.2.3.2 Filters, pressure regulators and water separators shall be provided.

5.2.3.3 Devices shall be provided to ensure that the permitted range of working pressure is maintained (see 7.2.2).

5.2.3.4 Pressurized transparent bowls (e.g. glass, plastic) shall be protected to prevent injury from flying particles without affecting visibility.