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Obdelovalni stroji – Mehanske stiskalnice – Varnost

Machine tools - Mechanical presses - Safety

Werkzeugmaschinen - Mechanische Pressen - Sicherheit

Machines-outils - Presses mécaniques - Sécurité

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English Version

Machine tools - Mechanical presses - Safety

Machines-outils - Presses mécaniques - Sécurité

Werkzeugmaschinen - Mechanische Pressen - Sicherheit

This European Standard was approved by CEN on 22 July 2004.

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Foreword

This document (EN 692:2005) 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of an identical text or by endorsement, at the latest by April 2006, and conflicting national standards shall be withdrawn at the latest by April 2006.

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).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

Annexes A, B and G to this standard are normative, whereas annexes C, D, E, F and ZA are informative.

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).

This document supersedes EN 692:1996.

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"This Standard constitutes a revision of EN 692:1996 for which it has been technically revised : the main modifications are listed below :

- Withdrawal of mechanical presses with full revolution clutches,
- Tacking into account of some additive requirements about the use of closed tools and fixed' enclosing guard(s) as protective devices (sub clauses 5.3.4, 5.3.9, 5.3.10 and 5.4.5.3),
- Addition of requirements on the implementation of protective devices for powering on the machine,
- Redrafting in order to ensure the coherence with the requirements of EN 693.

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

Introduction

This standard has been prepared to be a harmonised standard to provide one means of conforming with the essential safety requirements of the Machinery Directive and associated EFTA Regulations.

This document is a C-type standard as stated in EN ISO 12100-1.

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

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1 Scope

1.1 This European Standard specifies technical safety requirements and measures to be adopted by persons undertaking the design, manufacture and supply of mechanical presses with part revolution clutch hereinafter called presses which are intended to work cold metal or material partly of cold metal.

NOTE The design of a machine includes the study of the machine itself, taking into account all phases of its "life", i.e. construction, transport and commission (including assembly, installation and adjustment), use (including setting, teaching/programming or process changeover, operation, cleaning, fault finding and maintenance) and de-commissioning, dismantling and, as far as safety is concerned, disposal, and the drafting of the instructions related to all above-mentioned phases of the "life" of the machine (except construction), dealt with it in 6.5 of EN ISO 12100-2:2003.

1.2 This European Standard also covers presses, whose primary intended use is to work cold metal, which are to be used in the same way to work other sheet materials (such as cardboard, plastic, rubber or leather), and metal powder.

1.3 The requirements in this standard take account of intended use, as defined in 3.22 of EN ISO 12100-1:2003. This standard presumes access to the press from all directions, deals with the hazards during the various phases of the life of the machine described in clause 4, and specifies the safety measures for both the operator and other exposed persons.

1.4 This European 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 European Standard does not cover mechanical presses with full revolution clutch.

1.6 This European Standard does not cover machines whose principal designed purpose is:

a) sheet metal cutting by guillotine;

- b) attaching a fastener, e.g. riveting, stapling or stitching;
- c) bending or folding;
- d) straightening;
- e) turret punch pressing;
- f) extruding;
- g) drop forging or drop stamping;
- h) compaction of metal powder;
- i) single purpose punching machines designed exclusively for profiles, e.g. for the construction industry.

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

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 294:1992, *Safety of machinery - Safety distances 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 563:1994, *Safety of machinery - Temperatures of touchable surfaces - Ergonomics data to establish temperature limit values for hot surfaces.*

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

EN 626-1:1994, *Safety of machinery - Reduction of risks to health from hazardous substances emitted by machinery - Part 1: Principles and specifications for machinery manufacturers.*

EN 842:1996, *Safety of machinery - Visual danger signals - General requirements, design and testing.*

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.*

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.*

EN 1005-2:2003, *Safety of machinery - Human physical performance - Part 2: Manual handling of machinery and component parts of machinery.*

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

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

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 1299:1997, *Mechanical vibration and shock - Vibration isolation of machines - Information for the application or source isolation.*

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

EN 61310-2:1995, *Safety of machinery - Indication, marking and actuation - Part 2: Requirements for marking (IEC 1310-2:1995).*

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

CLC/TS 61496-2:2003, *Safety of machinery - Electrosensitive protective equipment - Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs) (IEC 61496-2:1997).*

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

EN ISO 12100-1:2003, *Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology (ISO 12100-1:2003)*

EN ISO 12100-2:2003, *Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles (ISO 12100-2:2003)*

ISO 8540:1993, *Open front mechanical power presses - Vocabulary.*

3 Terms, definitions and abbreviations

For the purposes of this European Standard, the terms and definitions given in EN ISO 12100-1:2003 and EN ISO 12100-2:2003 and in relevant type A and type B standards, and the following apply.

3.1 Terms and definitions

3.1.1

band brake

brake (see 3.1.2) where a flexible band lined with friction material is arranged around the circumference of a drum

3.1.2

brake

mechanism (usually friction) intended to stop and hold the slide when the clutch, if provided, is disengaged

3.1.3

clutch

mechanism used to impart the movement of the flywheel to the slide

3.1.4

clutch - full revolution

type of clutch that, when tripped or actuated, cannot be disengaged until the slide has completed a complete stroke, e.g. most positive key clutches. It also includes clutches which can only be disengaged at certain positions in the operating cycle

3.1.5

clutch - part revolution

type of clutch that can be engaged or disengaged at any point in the stroke of the slide, e.g. most friction clutches

3.1.6

cycle - automatic

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

3.1.7

cycle - operating

movement of the slide 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

3.1.8

cycle - single

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

3.1.9

dead centres

points at which the tool, during its travel, is

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- 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)

3.1.10

die

fixed part of the tools used in a press

3.1.11

die cushion

accessory for a die which accumulates and releases, or absorbs, force as required in some press operations

3.1.12

direct drive

type of driving arrangement wherein no clutch is used: movement of the slide is accomplished by energising and de-energising the motor, possibly in conjunction with a brake

3.1.13

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

3.1.14

guard locking device

mechanical device to maintain an interlocking guard gate in the closed and locked position until the risk of injury from the hazardous machine functions has passed

3.1.15**limited movement control device; inching device**

control device, a single actuation of which, together with the control system of the machine, permits only a limited amount of travel of a machine element

[3.26.9 of EN ISO 12100-1:2003]

3.1.16**mechanical press**

machine designed or intended to transmit energy from a prime mover to a tool by mechanical means for the purpose of the working (e.g. forming or shaping) of cold metal or material partly of cold metal between the tools. Such energy is transmitted by a flywheel and part revolution clutch or by means of a direct drive mechanism (see Figure 1)

3.1.17**monitoring (M)**

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

3.1.18**muting**

temporary automatic suspension of a safety function(s) by safety related parts of the control system during otherwise safe conditions in the operation of a machine

[3.7 of EN 954-1:1996]

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3.1.19**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

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3.1.20**overrun**

movement of the crankshaft past a defined stopping point, e.g. TDC

3.1.21**overrun monitoring device**

device which provides a signal to inhibit further machine initiation when the overrun exceeds the pre-set limit(s)

3.1.22**position switch**

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

3.1.23**redundancy (R)**

application of more than one device or system, or part of a device or a system, with the objective of ensuring that, in the event of one failing to perform its function, another is available to perform that function

[3.47 of EN 60204-1:1997]

3.1.24**shut height**

distance from the bed-plate surface to the slide surface measured with the maximum variable stroke, stroke down and slide adjustment up

[3.12 of ISO 8540:1993]

3.1.25

single stroke function

feature used to limit the motion of the tool to one operating cycle at each engagement of the clutch even if the stroke initiating means (e.g. a pedal) is held in the operating position

3.1.26

slide

main reciprocating press member which holds the tool

3.1.27

tool

moving part of the tools

3.1.28

tools

term for the combination of tool and die

3.1.29

tools - closed

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

3.2 Abbreviations

M Monitoring (see 3.1.17)

R Redundancy (see 3.1.23)

S Single channel

BDC Bottom dead centre (see 3.1.9)

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TDC Top dead centre (see 3.1.9)

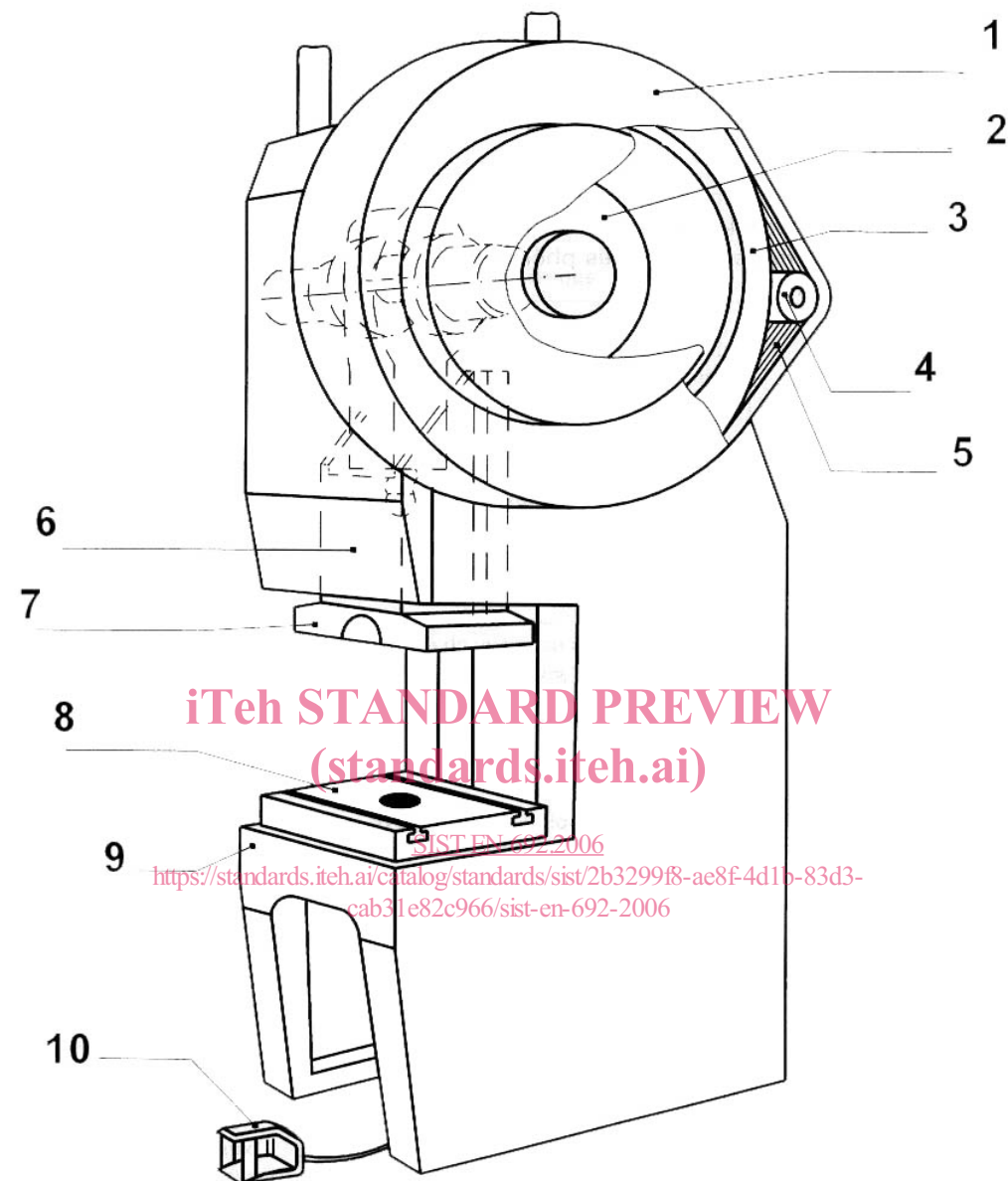
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PES Programmable electronic system PPS Programmable pneumatic system

AOPD Active opto-electronic protective device

ESPE Electro-sensitive protective equipment

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Key

- | | | | |
|---|----------------|----|---------------------------|
| 1 | Flywheel guard | 6 | Slide |
| 2 | Clutch/brake | 7 | Slide flange, tool holder |
| 3 | Flywheel | 8 | Bed-plate/bolster |
| 4 | Motor pulley | 9 | Bed |
| 5 | Belt | 10 | Pedal |

Figure 1 — Example of mechanical power press (tools area safeguards not shown)

4 List of significant hazards

4.1 The list of hazards contained in Table 1 is the result of a risk assessment, carried out as required by EN 1050, for all mechanical presses covered by the scope of this standard. The technical measures and information for use contained in Clauses 5 and 7 and Annexes A, B, C, E and F are based on the risk assessment, and deal with the identified hazards by either eliminating them or reducing the effects of the risks they generate.

4.2 Risk assessment assumes foreseeable access from all directions, as well as overruns, 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 all hazards which can occur during the life of the press. The assessment includes an analysis of the effect of failure in the control system.

4.3 In addition, the user of this standard, i.e. the designer, manufacturer or supplier, shall conduct a risk assessment in accordance with EN 1050 with particular attention to:

- the intended use of the press including maintenance, tool-setting and cleaning, and its reasonably foreseeable misuse;
- the identification of the significant hazards associated with the press (see 4.4).

4.4 Table 1 of this standard is a list of significant hazards and their related danger zones normally associated with a mechanical power press. As part of the risk assessment, the designer shall verify whether the list of hazards in Table 1 is exhaustive and applicable to the press under consideration.

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Table 1 — Significant hazards, danger zones, preventive measures

Hazards	Danger zone	Preventive measures: relevant clauses of this standard	Relevant clauses of EN ISO 12100-1:2003
Mechanical hazards			
Crushing hazard Shearing hazard Cutting or severing hazard Entanglement hazard Drawing-in or trapping hazard	Tools area: - between moving tools - moving slide - moving die cushions - work-piece ejectors - guards	5.3 to 5.5 Annexes A, B, C, D and E	4.2.1
Impact hazard	Moving parts of electrical, hydraulic and pneumatic equipment Motor and drive machinery Mechanical handling device During installation, setting operation, maintenance.	5.6.1 to 5.6.3 5.6.1 to 5.6.4	4.2.1
Ejection hazard	Machine components Work-pieces and tools	5.6.5 7.2.2 i)	
High pressure fluid ejection hazard	Hydraulic systems	5.8.3	4.2.1
Slip, trip and fall hazards	All work at heights Floor area around the press	5.7	4.10
Electrical hazards			
Direct contact hazard	Electrical equipment	5.8.1	4.3
Indirect contact hazard	Electrical equipment Parts made live by electrical equipment under fault conditions	5.8.1	4.3
Thermal radiation hazard (burns)			
Thermal hazards resulting in burns and scalds, by a possible contact of persons	Brakes, clutches, parts of the hydraulic system	5.8.2	4.4
Hazards generated by noise resulting in hearing losses (deafness)	Any area at the press where there is a risk to hearing	5.8.4	4.5
Hazards generated by vibration	Parts of the press where the risk occurs, e.g. the workstation(s)	5.8.5	4.6
Hazards generated by materials and substances processed, used or exhausted by machinery , for example: Hazards resulting from contact with or inhalation of harmful fluids, gases, mists, fumes and dusts	Hydraulic systems; pneumatic systems and their controls; toxic work materials	5.8.6.1 to 5.8.6.4	4.8
Fire or explosion hazards	Exhaust ventilation and dust collection equipment	5.8.6.5	4.8
Hazards generated by neglecting ergonomic principles in machine design (mismatch of machinery with human characteristics and abilities) caused, for example, by unhealthy postures or excessive efforts	The working position and controls for operators and maintenance staff handling tools	5.8.7	4.9