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Machine tools — Safety — Press brakes

Machines-outils — Sécurité — Presses plieuses

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 39, *Machine tools*, Subcommittee SC 10, *Safety,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 143, *Machine tools - Safety,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document is a type C standard as stated in ISO 12100:2010.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

— machine manufacturers (small, medium and large enterprises);

— health and safety bodies (regulators, accident prevention organizations, market surveillance etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

— machine users/employers (small, medium and large enterprises);

— machine users/employees (e.g. trade unions, organizations for people with special needs);

— service providers, for example, for maintenance (small, medium and large enterprises);

— consumers (in the case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

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

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

Machine tools — Safety — Press brakes

1 Scope

This document specifies technical safety requirements and measures to be adopted by persons undertaking the design, manufacture and supply of press brakes which are intended to work cold metal or material partly of cold metal but which can be used in the same way to work other sheet materials (e.g. cardboard, plastic, rubber, leather) and also referred to as machines.

NOTE 1 The design of a machine includes the study of the machine itself, taking into account all phases of the "life" of the machine mentioned in ISO 12100:2010, 5.4, and the drafting of the instructions related to all the above phases.

This document covers the following types of machines (see Annex J):

— hydraulic press brakes;

— hydraulic servo-drive press brakes;

— screw servo-drive press brakes;

— belt-spring servo-drive press brakes.

The requirements in this document take account of intended use, as defined in ISO 12100:2010, 3.23, as well as reasonably foreseeable misuse, as defined in ISO 12100:2010, 3.24. This document presumes access to the press brake from all directions, deals with all significant 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.

NOTE 2 All significant hazards means those identified or associated with press brakes at the time of the publication of this document.

This document can also be used as a guide for the design of press brakes which are intended to be integrated in a manufacturing system.

This document deals with all significant hazards, hazardous situations or hazardous events relevant to press brakes and ancillary devices (see Clause 4) when it is used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer. This document specifies the safety requirements for press brakes defined in Clause 3.

This document does not cover press brakes which transmit energy to impart beam motion by using pneumatic means or mechanical clutch or press brakes that use combination of technologies (e.g. combined hydraulic and screw servo-drive press brake or combined hydraulic servo-drive and screw servo-drive press brake).

This document does not cover machines whose principal designed purpose is:

a) sheet folding by rotary action;

b) tube and pipe bending by rotary action;

c) roll bending.

This document does not cover hazards related to the use of press brakes in explosive atmospheres.

This document is not applicable to press brakes which are manufactured before the date of its publication.

This document does not cover the safety aspect of equipment for automatic workpiece loading and unloading where provided. Guidance on how to take into account additional automatic loading and unloading equipment can be found in ISO 11161:2007.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3744:2025, *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 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 4413:2010, *Hydraulic fluid power — General rules and safety requirements for systems and their components*

ISO 4414:2010, *Pneumatic fluid power — General rules and safety requirements for systems and their components*

ISO 4871:1996, *Acoustics — Declaration and verification of noise emission values of machinery and equipment*

ISO 5774:2023, *Plastics hoses — Textile-reinforced types for compressed-air applications — Specification*

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 11237:2025, *Rubber hoses and hose assemblies — Compact wire-braid-reinforced hydraulic types for oil-based or water-based fluids — Specification*

ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 13732-1:2006, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces*

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

ISO 13849-2:2012, *Safety of machinery — Safety-related parts of control systems — Part 2: Validation*

ISO 13850:2015, *Safety of machinery — Emergency stop function — Principles for design*

ISO 13851:2019, *Safety of machinery — Two-hand control devices — Principles for design and selection*

ISO 13855:2024, *Safety of machinery — Positioning of safeguards with respect to the approach of the human body*

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

ISO 14118:2017, *Safety of machinery — Prevention of unexpected start-up*

ISO 14119:2024, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection*

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

ISO 14122-1:2016, *Safety of machinery — Permanent means of access to machinery — Part 1: Choice of fixed means and general requirements of access*

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

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

ISO 14738:2002, *Safety of machinery — Anthropometric requirements for the design of workstations at machinery*

ISO 14738:2002/Cor 2:2005, *Safety of machinery — Anthropometric requirements for the design of workstations at machinery — Technical Corrigendum 2*

IEC 60204-1:2016+AMD1:2021, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

IEC 60529:1989+AMD1:1999+AMD2:2013, *Degrees of protection provided by enclosures (IP code)*

IEC 60825-1:2014, *Safety of laser products — Part 1: Equipment classification and requirements*

IEC 60947-5-1:2025, *Low-voltage switchgear and control gear — Part 5-1: Control circuit devices and switching elements — Electromechanical control circuit devices*

IEC 61310-2:2007, *Safety of machinery — Indication, marking and actuation — Part 2: Requirements for marking*

IEC 61310-3:2007, *Safety of machinery — Indication, marking and actuation — Part 3: Requirements for the location and operation of actuators*

IEC 61496-1:2020, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and test*

IEC 61496-2:2020, *Safety of machinery — Electro-sensitive protective equipment — Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs)*

IEC 61496-3:2018, *Safety of machinery — Electro-sensitive protective equipment — Part 3: Particular requirements for Active Opto-electronic Protective Devices responsive to Diffuse Reflection (AOPDDR)*

IEC 61508-1:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 1: General requirements*

IEC 61508-2:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems*

IEC 61508-3:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 3: Software requirements*

IEC 61800-5-2:2016, *Adjustable speed electrical power drive systems — Part 5-2: Safety requirements — Functional*

IEC 62061:2021+AMD1:2024, *Safety of machinery — Functional safety of safety-related control systems*

EN 1005-1:2001+A1:2008, *Safety of machinery — Human physical performance — Part 1: Terms and definitions*

EN 1005-2:2003+A1:2008, *Safety of machinery — Human physical performance — Part 2: Manual handling of machinery and component parts of machinery*

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

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

EN 1837:2020, *Safety of machinery — Integral lighting of machines*

EN 50370-1:2005, *Electromagnetic compatibility (EMC) — Product family standard for machine tools — Part 1: Emission*

EN 50370-2:2003, *Electromagnetic compatibility (EMC) — Product family standard for machine tools — Part 2: Immunity*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in in ISO 12100:2010 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

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

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

3.1
press brake
machine designed or intended to transmit energy to the moving part of the *tool* (3.13) principally for the purpose of bending between narrow forming tools along straight lines

3.2
up-stroking hydraulic press brake
hydraulic press brake (3.4) in which the moving part of the *tool* (3.13) moves upwards during the closing stroke

Note 1 to entry: The movement is reciprocal to a *down-stroking press brake* (3.3); see Figure 1.

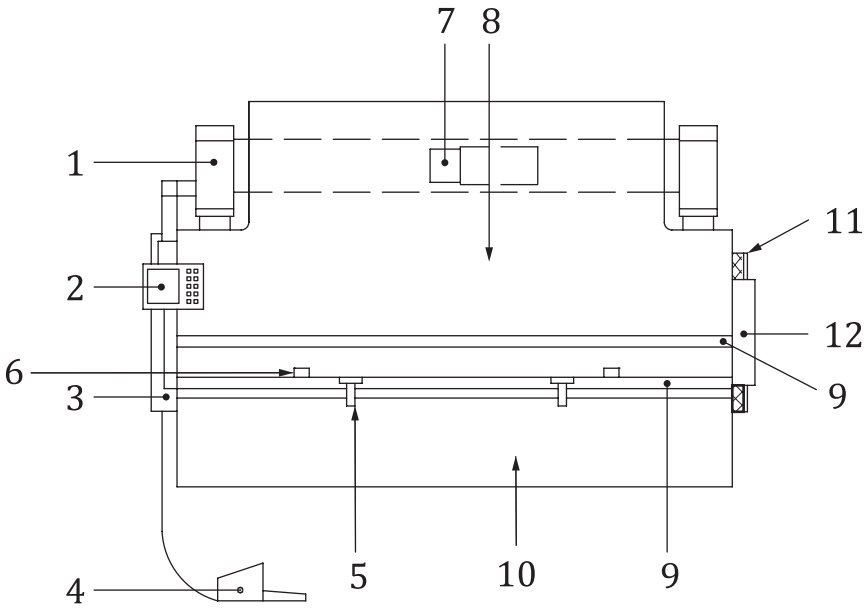
3.3
down-stroking press brake
press brake (3.1) in which the moving part of the *tool* (3.13) moves downwards during the closing stroke

3.4
hydraulic press brake
press brake (3.1) utilising hydraulic power to impart the movement of the *beam* (3.14) whose characteristics are dependent on hydraulic valve(s)

Note 1 to entry: The hydraulic valve(s) includes servovalve(s) and proportional control valve(s).

Note 2 to entry: Examples of characteristics are speed, pressure and direction.

Note 3 to entry: For an example of a down-stroking hydraulic press brake, see Figure 1.



Key

1	press cylinder
2	control panel
3	electrical switch gear cabinet
4	foot pedal
5	workpiece support
6	*backgauge* (3.53)
7	hydraulic system
8	*beam* (3.14)
9	*tool* (3.13)
10	bed
11	side safeguard
12	*light curtain* (3.17)

Figure 1 — Example of a down-stroking hydraulic press brake

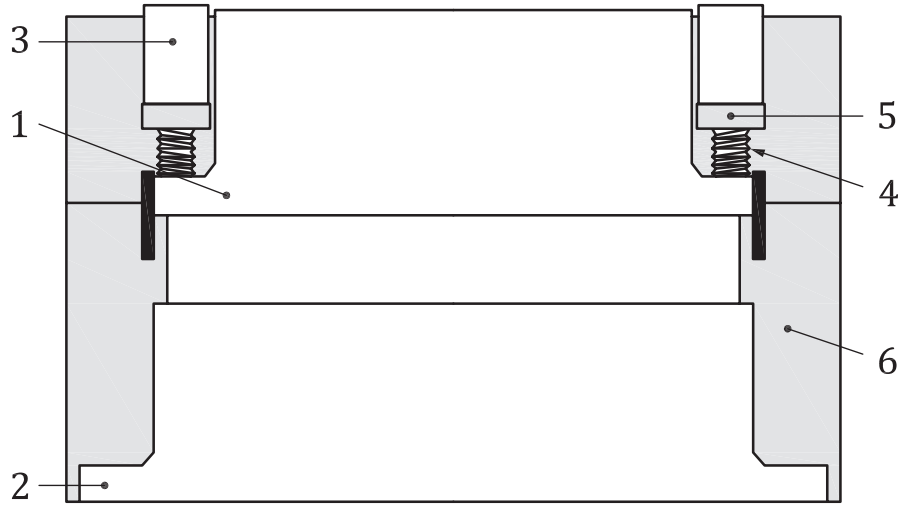
3.5
hydraulic servo-drive press brake
press brake (3.1) utilising hydraulic power to impart the movement of the *beam* (3.14) whose characteristics are directly dependent on *servopump(s)* (3.31)

Note 1 to entry: Examples of characteristics are speed, pressure and direction.

3.6
screw servo-drive press brake
press brake (3.1) utilising servomotor(s) and screw(s) to impart the movement of the *beam* (3.14)

Note 1 to entry: The characteristics of movements (e.g. speed, force, direction) are directly dependent on servomotor(s).

Note 2 to entry: For an example of a down-stroking screw servo-drive press brake, see Figure 2.



Key

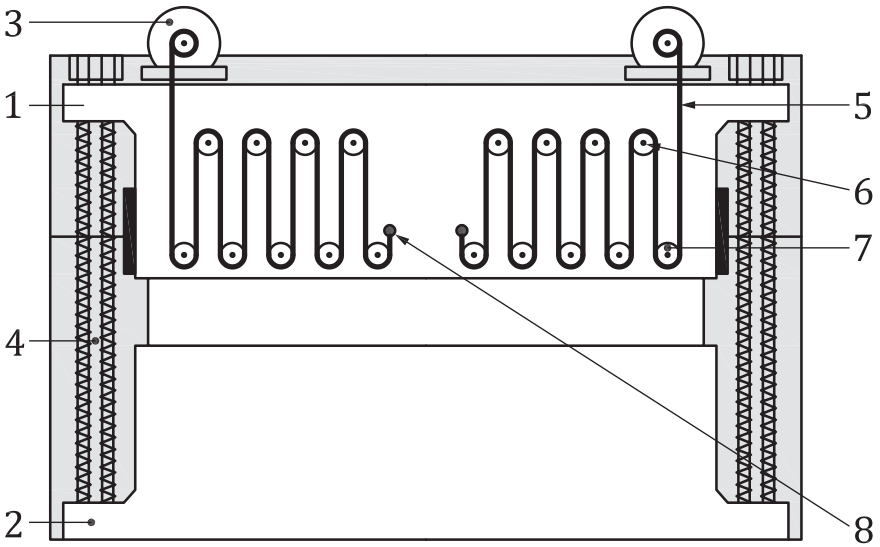
1	down-stroking beam
2	bed
3	left side servomotor
4	right side screw
5	right side brake
6	frame

Figure 2 — Example of a down-stroking screw servo-drive press brake

3.7
belt-spring servo-drive press brake
press brake (3.1) utilising servomotor(s), belt(s), pulley(s) and spring(s) to impart the movement of the *beam* (3.14)

Note 1 to entry: The characteristics of movements (e.g. speed, force, direction) are directly dependent on servomotor(s).

Note 2 to entry: For an example of a down-stroking belt-spring servo-drive press brake, see Figure 3.



Key

1	down-stroking beam
2	bed
3	left side servomotor
4	left side twin spring arrangement
5	right side belt
6	idle pulley mounted on the beam
7	idle pulley mounted on a fixed part
8	attachment of the belt

Figure 3 — Example of a down-stroking belt-spring servo-drive press brake

3.8
tool area
area between moving and stationary *tools* (3.13)

EXAMPLE Space between the punch and the die of a *press brake* (3.1).

3.9
ancillary device
device intended for use with the *press brake* (3.1) and/or integrated with it

EXAMPLE *Backgauges* (3.53), adjustable front sheet supports, tool loading devices.

3.10
dead centre
point at which the *tools* (3.13), during its travel, is either

— nearest to the die (generally it corresponds to the end of the closing stroke), or

— furthest from the die (generally it corresponds to the end of the opening stroke)

Note 1 to entry: The point at which the *tool* (3.13) is either nearest to the die is known as the bottom dead centre (BDC). The point at which the tool is furthest from the die is known as the top dead centre (TDC).

Note 2 to entry: On an *up-stroking hydraulic press brake* (3.2), the centres are reversed.

3.11
guard locking
means to maintain an interlocking guard in the closed position until the risk of injury from the hazardous machine *functions* (3.46) has ceased

[SOURCE: ISO 16092-1:2017, 3.2.8, modified —"measures" has been replaced by "means".]

3.12
position switch
switch which is operated by a moving part of the machine when this part reaches or leaves a predetermined position

3.13
tool
combination of a moving part (e.g. punch) and a stationary part (e.g. die)

3.14
beam
main reciprocating *press brake* (3.1) member which normally holds the punch on a *down-stroking press brake* (3.3) and which normally holds the die on an *up-stroking press brake* (3.2)

3.15
electro-sensitive protective equipment
ESPE
assembly of devices and/or components working together for protective tripping or presence-sensing purposes comprising

— a sensing device;

— controlling/*monitoring* (3.20) devices;

— *output signal switching devices* (3.49);

— a safety-related data interface

Note 1 to entry: For the purposes of this document, electro-sensitive protective equipment covers *active opto-electronic protective devices* (3.16), *active opto-electronic protective devices responsive to diffuse reflection* (3.19) and laser actuated active opto-electronic protective devices.

[SOURCE: ISO 13855:2024, 3.1.5, modified — “as a minimum” has been deleted after "comprising" in the definition, the last list item has been replaced by two list items and Note 1 to entry has been replaced.]

3.16
active opto-electronic protective device
AOPD
device whose sensing *function* (3.46) is performed by opto-electronic emitting and receiving elements detecting the interruption of optical radiation, generated within the device, by an opaque object present in the specified detection zone

[SOURCE: IEC 61496-2:2020, 3.201]

3.17
light curtain
active opto-electronic protective device (3.16) comprising an integrated assembly of one or more emitting element(s) and one or more receiving element(s) forming a detection zone with a detection capability specified by the supplier

[SOURCE: IEC 61496-2:2020, 3.205]

3.18
blanking
optional *function* (3.46) that permits an object of a size greater than the detection capability of the *active opto-electronic protective device* (3.16) to be located within the detection zone without causing an OFF-state of the *output signal switching device(s)* (3.49)

Note 1 to entry: Fixed blanking is a technique wherein the locations of the blanked areas of the detection zone do not change during operation. The detection capability of the other parts of the detection zone remains unchanged.

Note 2 to entry: Floating blanking is a technique wherein the blanked area of the detection zone follows the location of a moving object(s) during operation. The detection capability of the other areas remains unchanged.

Note 3 to entry: Progressive blanking also known as successive blanking or sequential blanking is a particular blanking technique related to laser actuated active opto-electronic protective device, where the blanking is done progressively at a high speed, at less than a 10 mm gap to the workpiece.

[SOURCE: ISO 16092-1:2017, 3.2.19]

3.19
active opto-electronic protective device responsive to diffuse reflection
AOPDDR
device, whose sensing *function* (3.46) is performed by opto-electronic emitting and receiving elements, that detects the diffuse reflection of optical radiations generated within the device by an object present in a detection zone specified in two dimensions

[SOURCE: IEC 61496-3:2018, 3.301]

3.20
monitoring
safety *function* (3.46) 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

[SOURCE: ISO 16092-1:2017, 3.3.1]

3.21
muting
temporary automatic suspension of a safety *function(s)* (3.46) by safety-related parts of the control system during otherwise safe conditions in the operation of a machine

[SOURCE: ISO 16092-1:2017, 3.3.2]

3.22
overall system response time
time occurring from actuating the protective device to the cessation of hazardous motion, or to the machine assuming a safe condition

3.23
reset
function (3.46) within the *safety-related part of a control system* (3.50) used to restore manually one or more safety functions before re-starting a machine

[SOURCE: ISO 16092-1:2017, 3.3.4]

3.24
restraint valve
hydraulic device which protects against a gravity fall of the *beam* (3.14)

3.25
brake
mechanism for slowing, stopping and holding the *beam* (3.14)