ASME B5.49-1998
(Revision of ANSI/ASME B5.49M-1984)

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GLOSSARY OF POWER PRESS TERMS

AN AMERICAN NATIONAL STANDARD



The American Society of Mechanical Engineers

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GLOSSARY OF POWER PRESS TERMS

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FOREWORD

(This Foreword is not part of ASME B5.49-1998.)

Recognizing the need for a standard for mechanical power presses, The American Society of Mechanical Engineers Committee on Machine Tools and Components (B5) reestablished Technical Committee 30 in December, 1973, to develop American National Standards addressing the interchangeability of bolsters, press tooling, and mounting provisions between general purpose presses of comparable bed size, capacity, and type.

The B5-TC30 membership consists of a balance between manufacturers, users, accessory suppliers, and others associated with mechanical power presses. The technical committee's work was based on:

(a) the JIC (Joint Industry Conference) Press Room Standards, once the most widely used document, to develop a standard for mechanical power presses; and

(b) basic data submitted by U.S. manufacturers of mechanical power presses.

The first order of business for the B5-TC30 Committee was the promulgation of a glossary of terms for the industry. In July of 1977, a ''Glossary of Mechanical Press Terms'' was completed and published as ANSI/ASME B5.49-1977.

On March 12, 1984, the revised ANSI/ASME B5.49-1984 was approved. This document was reaffirmed in 1989.

In 1995, Technical Committee 30 was once again reestablished, to continue the pursuit of the original objectives set forth in 1973. Again the first order of business was the reaffirmation or revision of ANSI/ASME B5.49-1984 (R1989). A total revision became necessary when the Committee decided to broaden the scope of the document to include the following:

(a) hydraulic power presses;

(b) power press safeguarding; and

(c) transfer feed press technology.

To ensure uniformity between this document and the applicable ANSI machine tool safety standards, the terms in this Glossary have been harmonized with the terms that also appear in the ANSI B11 Definitions Manual.

This edition of the Standard was approved as an American National Standard on January 14, 1998.

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Machine Tools: Components, Elements, Performance, and Equipment

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GLOSSARY OF POWER PRESS TERMS

1 SCOPE AND PURPOSE

1.1 Scope

This Standard provides a glossary of terms commonly used in the industries that manufacture or use mechanically and hydraulically powered presses.

NOTE: Often two or more terms are used for the same definition. In this Standard, only the preferred term is defined. Synonymous terms are listed, with a reference to the preferred term instead of repetition of its definition.
(1) Example:
air pin: preferred term is *pressure pin.*

Related terms are provided where applicable, following the definition of the term provided.
(2) Example:
Reference: *horn press*.

1.2 Purpose

The purpose of this Standard is to define the terms most commonly used in the industries that manufacture or use mechanically and hydraulically powered presses, to facilitate communication and understanding.

2 DEFINITIONS

Explanatory Notes

actuating control: an operator control used to initiate slide motion.

Reference: *foot control; pedal; two-hand control; two-hand trip.*

adapter plate: a plate or fabrication installed between the die(s) and the slide, to accommodate the die configuration to the slide face for proper location and fastening.

When used with a quick die change system, the adapter plate is provided with clamping slots and/or a hole pattern.

ADC: automatic die change.

adjustable barrier guard: a guard with provisions for adjustment to accommodate various jobs or tooling setups.

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	Explanatory Notes
adjustable bed: a bed bolted to the straight, vertical, finished surface of a horn or gap press frame and supported, and adjusted up and down, by means of a screw or screws usually operated by a hand mechanism.	Can also refer to the bed (of a large straight side press) mounted and guided in the press frame and provided with a suitable mechanism, usually operated by power, for varying the press shutheight. An example is a wedge adjustment on a knuckle joint press. Reference: *horn press.*
adjustable bed press: a gap frame press with a straight front that is equipped with, or arranged for, an adjustable bed.	
adjustable stroke: the capability of varying the length of stroke of a slide.	
adjustment of a slide: preferred term is *slide adjustment.*	
air cushion: preferred term is *die cushion.*	
air jack: preferred term is *die cushion.*	
air pad: preferred term is *die cushion.*	
air pin: preferred term is *pressure pin.*	
air press: preferred term is *pneumatic power press.*	
antirepeat: the function of the control system that limits the press to a single cycle with the actuating control(s) held operated.	Antirepeat requires the release of all actuating controls before another cycle can be initiated. Antirepeat is the control equivalent of a single-cycle mechanism, with the additional requirement of the release of all actuating controls to enable a new cycle. The function of antirepeat is to prevent the successive cycles that could occur if the antirepeat control did not exist. Reference: *single cycle capability; single cycle mechanism.*
anti tie-down: with a two-hand control device, the function of the control system that requires the release of all actuators before press operation can be reinitiated.	
automatic die change: the fully programmable procedure for changing from the current die setup to a second die setup, without any manual intervention.	An automatic die change can involve a single press, or a line of presses dedicated to the production of a single end product.
automatic die clamp: a power actuated means for fastening dies into the press.	Automatic die clamps are usually electrically controlled and may be hydraulically or pneumatically actuated. Reference: *die clamp.*
automatic feeding: the process whereby means other than manual are used to place the material or workpiece(s) into the press and to remove the material or workpiece(s) from the press.	Transfer press feeds also move the workpiece(s) from die station to die station. For pick-and-place or robotic systems, feeding mechanisms move the workpiece(s) from press to press. Reference: *manual feeding.*
automatic mode: any operating mode that produces continuous cycling.	Reference: *automatic single cycle; continuous cycling; continuous mode; operator-maintained continuous mode.*

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	Explanatory Notes
automatic press: a press production system in which the work, either separate workpieces, coil stock, or sheet stock, is fed through the press in synchronism with the press and by means other than manual.	Progressive die and transfer presses are the most common automatic presses. Reference: *synchronous press line.*
automatic single cycle: continuous cycling, initiated by an operator, and maintained by actuating signals from an automatic feeding mechanism, or other auxiliary equipment, without further operator interaction.	
automatic single stroke: preferred term is *automatic single cycle.*	
barrier guard: preferred term is *guard.*	
bed: the frame member of the press to which the bolster is attached.	The lower die shoe is sometimes attached directly to the bed.
bed opening (1): space(s) in the bed of a press to accommodate a die cushion(s).	
bed opening (2): space(s) in the bed of a press provided for removal of scrap or parts from the die(s).	
bed size: the area provided to accommodate the bolster, expressed as left-to-right by front-to-back.	
bench press: any small press of a size to be mounted on a bench or table.	Bench presses are almost always gap frame and may be inclinable or stationary.
blank: a flat workpiece produced as the first operation of a stamping process.	
blankholder slide: preferred term is *outer slide.*	
blanking (1): the process of producing a flat stamping from coil, strip, or sheet stock.	
blanking (2): the means of bypassing a portion of a sensing field of a presence-sensing safeguarding device.	
blank-out: preferred term is *blanking (2).*	
bolster: the plate attached to the bed, which may have tapped holes, T-slots, or other means for attaching die components.	When the press is fitted with die cushions, the bolster will have holes for retaining and guiding pressure pins. If die cushions are slide-mounted, a bolster plate may be used as a slide adapter.
bolster carriage: preferred term is *moving bolster.*	
bolster plate: preferred term is *bolster.*	
bottom drive press: preferred term is *underdrive press.*	

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	Explanatory Notes
brake: a mechanism for stopping, slowing, or preventing motion.	The brake may be a constant-drag type (typical on a full-revolution clutch press), or it may be a type disengaged while the clutch is engaged (most typical with a part-revolution clutch press). It may be a separate unit, or it may be a unit incorporated in combination with the clutch.
brake monitor: preferred term is *stopping-performance monitor.*	
bulldozer: a slow-acting horizontal mechanical press with a large bed used for bending and straightening.	The work, which is done between dies, may be either hot or cold. The machine is closely allied to a forging press.
cam press: a multiple action press in which the slide(s) is operated by a cam-driven mechanism to produce dwell at the end of the stroke.	On multiple action presses, toggle-driven mechanisms are more common than cam-driven mechanisms. Reference: *dwell.*
capacity of a press: preferred term is *rated capacity.*	
catwalk: a platform or system of platforms, usually elevated at least 8 feet above floor level.	Catwalks are provided for placement of press controls or access to other auxiliary equipment. With a multiple press line, catwalks on individual presses are usually connected together.
center drive: a two-point geared press with the crankshaft driven from the center.	
C-frame press: preferred term is *gap frame press.*	
clutch: a mechanism that, when engaged, transmits torque to impart motion from a driving member to a driven member.	On a mechanical power press, a clutch couples the flywheel to the main shaft or eccentric gear(s), either directly or through gear reduction(s). Reference: *full-revolution clutch; part-revolution clutch.*
coining: the process of sizing, shaping, reshaping, compacting, or controlling the dimensions of a workpiece by confining or restraining one or more surfaces.	
column: preferred term is *uprights.*	
combination clutch/brake: an integral clutch and brake, with a common actuator, arranged so that upon clutch engagement the brake is disengaged, and upon clutch disengagement the brake is engaged.	
connecting link: preferred term is *connection.*	
connecting rod: preferred term is *connection.*	
connection: connecting member between a rotating drive member, such as a crank, and a reciprocating member, such as a slide.	
contact velocity: the linear speed at the point in the stroke where the die engages the material or workpiece(s).	Contact velocity is a function of length of stroke, strokes per minute, and crank angle.

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continuous cycling: multiple cycles of the slide without intervening stops at the end of individual cycles.

continuous mode: continuous cycling, initiated by an operator, and maintained by the press control system, without further operator interaction.

continuous stroking: preferred term is *continuous cycling.*

continuous-on-demand mode: preferred term is *automatic single cycle.*

control console: a free-standing master operator station.

A control console is usually used to operate an automatic press production system, including peripheral equipment such as, but not limited to:

(a) destacker;
(b) automation; and
(c) exit conveyor.

control pedestal: preferred term is *T-stand.*

control podium: preferred term is *control console.*

control pulpit: preferred term is *control console.*

counterbalance: means provided to balance the reciprocating mass of the slide, drive members, and slide attachments.

Counterbalance is usually provided by the use of pneumatic counterbalance cylinders, which were originally provided to eliminate force reversal and shock loading of the main gear(s) at the end of the closing stroke travel. Counterbalance may also prevent a falling slide (and its attachments) in the event of:

(a) a broken connection on a single-point press; or
(b) loss of the brake with the clutch disengaged.

Springs or other means may also be used to provide counterbalance force.

Reference: *dynamic balance; push-type cylinder.*

counterbalance system: preferred term is *counterbalance.*

crank angle: the measurement of slide position at a predetermined point in the press cycle, based on the angular position of the crank throw (or eccentric) using top dead center as the reference point.

On a crankshaft, eccentric shaft, or eccentric gear press, top dead center is at zero deg. On all presses, bottom dead center is at 180 deg.

crank press: a basic type of mechanical power press wherein the reciprocating slide motion is produced by a crankshaft or an eccentric shaft.

Reference: *eccentric gear press.*

crossbar: a type of knockout.

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crossbar transfer feed: a transfer feed that is capable of two motions: lift and transfer.

A crossbar transfer feed uses tooling bars. The ends of the bars are fastened to the transfer rails. Utilization of a crossbar feed requires that the crossbars come to a rest position between the die stations after the workpieces are deposited in the dies and before the press closes.

Reference: *transfer feed; tri-axis transfer feed; two-axis transfer feed; walking beam.*

crown: the frame member of a press that houses the mechanism for driving the slide(s), except on an underdrive press.

cushion: preferred term is *die cushion.*

cushion lock: preferred term is *die cushion lock.*

cycle: a complete movement of the slide, from the initial start position back to the same start position, that may include feeding and removal of the material or workpiece(s).

cycle stop: preferred term is *top stop.*

dead inch: inching (or jogging) of a press with the flywheel rotating and power removed from the drive motor.

dead pin: the fixed main shaft of an eccentric gear press wherein the gear(s) rotates on this shaft.

deflection: the amount of deviation of a press member, measured from a reference surface, when a force is applied.

Used to specify allowable deviation of bed, slide, or frame, at rated capacity with a specified load distribution.

die(s): the tooling used in a press for blanking, shearing, punching, forming, drawing, or assembling metal or other material.

Commonly the plural *dies* is used to describe the complete die, consisting of an upper element and a lower element. Thus, the expression *dies close* has the same meaning as *die closes*.

die block: preferred term is *safety block.*

die cart plate: the interface between the die and the fixed roller plate when the press is converted to QDC. The die(s) is bolted to the die cart plate, which is rolled in and out of the press utilizing the rollers in the fixed roller plate.

die change time: the total elapsed time from the start of removal of the currently installed die to the completion of installation of the next die.

die changeover time: preferred term is *die change time.*

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die clamp: a mechanism attached to a press member, such as a slide or bed, for fastening the die(s) into the press.	On a slide, die clamps fasten to the upper die shoe or the clamping plate. On a bed, die clamps fasten to the lower die shoe, bottom clamping plate, or moving bolster.
die cushion: a press accessory that provides the counterforce required in some operations to aid in the forming or release of the workpiece.	The pressure system used to produce counterforce is usually compressed air, but hydraulic systems, hydropneumatic systems, rubber, and springs are also used. Although usually mounted within the press bed and under the bolster, die cushions may sometimes be mounted within the slide, within an attachment to the slide, or within the die. A die cushion may also act as stripper or liftout. Reference: *nitrogen cylinder.*
die cushion lock: a means of holding the die cushion in its stroke down position, and relieving all force from the stamping, until the press slide has reached a predetermined position in its return stroke.	The locking device is usually a hydraulic cylinder attached to the die cushion.
die enclosure guard: a guard attached to the die shoe or stripper in a fixed position.	
die safety block: preferred term is *safety block.*	
die set: a tool holder consisting of a lower die shoe and an upper die shoe or punchholder, held in alignment by guide posts and bushings.	Means of maintaining parallelism and alignment of the upper and lower die shoes include the following: *(a)* guideposts and bushings that are usually an integral part of the die set; *(b)* guideposts and bushings, supplemented by heel blocks to contain lateral forces; and *(c)* the press gibbing, or other means of guiding the press slide.
die setting: the process of installing or removing dies and the process of adjusting and safeguarding the dies, other tooling, or equipment.	
die shoe: a plate or block upon which the die members are mounted.	A die shoe functions primarily as a base for the complete die assembly and, if used, is bolted or clamped to the bolster or to the face of the slide. The individual die shoes are often referred to as the lower shoe and the upper shoe or punch holder.
die shutheight: the actual or design dimension between the mounting surfaces of a die.	Maximum die shutheight to which a die can be designed is the press shutheight less the bolster thickness. Reference: *press shutheight.*
die space: the volume encompassed by the slide area projected to the bed or bolster surface, wherein the dies are mounted.	
die spotter: preferred term is *spotting press.*	

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die transition time: the total changeover time from the last good part until the operation is producing the next good part.	
die tryout: the process of functionally testing and performing adjustments or alterations to the die assembly.	Die tryout differs from die setting in that tryout will usually involve more significant alterations to the die than the routine adjustments associated with die setting. Die tryout may occur as the final construction phase of the die, in a number of different situations, some of which are: *(a)* in the die builder's (vendor's) plant and press; *(b)* in the user's plant in a press other than that intended for production; or *(c)* in the user's plant in the press designated to be used for production.
direct drive: the type of driving arrangement that does not use a clutch.	
double action press: a multiple action press with two slides.	Reference: *multiple action press.*
double crank press: a crank press with force applied through two connections.	A double crank press may be either a gap frame press or a straight side press.
drift (1): on a mechanical power press, the overtravel of the slide past top dead center when stopping.	
drift (2): on a hydraulic power press, the downward movement of the slide due to leakage within the hydraulic system.	
drive: the source of mechanical force and energy to impart press motion.	
dry cycle: a complete movement of the slide from the initial start position back to the same start position, without the feeding and removal of parts.	
dwell: a portion of the press cycle where movement of the slide is zero, or at least insignificant.	Usually refers to the interval in a drawing operation when the blankholder is holding the blank while the punch is making the draw.
dynamic balance: means to balance the reciprocating weight and inertial forces of the slide, drive members, and slide attachments.	A dynamically balanced mechanical press includes counterweights to balance rotary crank forces along with an auxiliary balancing means to balance reciprocating slide inertia forces.
eccentric: the offset portion of the main shaft or main gear that imparts reciprocating slide motion.	The stroke length of the press is twice the offset dimension.
eccentric gear press: a basic type of mechanical power press wherein the reciprocating slide motion is produced by an eccentric gear(s).	Reference: *crank press.*

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eccentric motion: the slide motion produced when the slide connection(s) is directly driven by a crankshaft, eccentric shaft, or eccentric gear(s).	The slide motion diagram is symmetrical before and after bottom dead center.
eccentric shaft: a crankshaft with crankpin of such a size that it contains or surrounds the shaft.	
eccentric strap: preferred term is *connection.*	
eccentricity: in a crank or eccentric gear press, the distance from the centerline of the crankpin or main shaft to the centerline of the crankpin(s) or eccentric(s).	The eccentricity is equal to one half of the stroke length.
effective draw: the maximum limits of forming depth that can be accomplished with a multiple action press.	Effective draw as shown on a motion diagram for a multiple action press is the distance of the inner slide from the end of its stroke, at the point where the outer slide begins its dwell. For a triple action press as well, the effective draw of the lower slide will be shown as the distance from the end of its stroke, at the point where the inner slide begins its dwell. Reference: *dwell.*
emergency stop: the immediate or controlled stopping of all hazardous press motion, accompanied by the removal of sources of electrical energy to the press.	For most mechanical power presses, the red mushroom head STOP palm button does not stop the flywheel and should not be considered an emergency stop. An emergency stop may not remove stored pneumatic or hydraulic energy. Reference: *stop control; top stop.*
emergency stop control: an operator control, usually a push button (palm button) with a large, red, protruding mushroom head, that when actuated, initiates an emergency stop.	Reference: *stop control.*
energy curve: preferred term is *usable energy curve.*	
ergonomics: the evaluation, design, or redesign of facilities, environments, jobs, job tasks, training methods, and equipment to match the capabilities of people.	
eyelet machine: an automatic multiple station transfer feed machine for making drawn stampings by use of cam-driven adjustable plungers, acting from above and below the workpiece, and to which individual tool elements are attached.	An eyelet machine does not utilize a slide or slides, or die sets. Unlike press slides, eyelet machine plungers are individually adjustable for timing within a machine cycle.
face of slide: preferred term is *slide face.*	
feeding: the process of placing the material or workpiece(s) into the press or removing the material or workpiece(s) from the press.	

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fine blanking: the process of blanking that provides full penetration of the metal before the blank is released from the strip or sheet.	In conventional blanking, the blank is released after about 35% penetration, which produces a rough edge with what are called: *(a)* rollover; *(b)* land; *(c)* breakout; and *(d)* burr. Fine blanking eliminates the breakout, which is about 60% of the edge, and produces a workpiece that is precision finished except for deburring.
first action: preferred term is *outer slide.*	
fixed barrier guard: a guard affixed to the frame, bolster, or other surface in such a manner as to enclose all or part of the point of operation or other hazard area.	
fixed roller plate: a bolster-like plate that becomes a fixed plate of the press bed when converted to QDC. The plate incorporates die clamps and hydraulically operated rollers. The rollers lift to facilitate movement of the die cart plate, and lower to position the die cart plate in the press.	
flywheel: a wheel that rotates constantly when the motor is energized and whose purpose is to store kinetic energy during the nonworking portion of the press cycle, and to release energy during the working portion of the press cycle.	Most press operations are performed in less than 25% of the cycle. Thus with a flywheel the peak horsepower requirement of the motor is greatly reduced.
flywheel energy: preferred term is *usable flywheel energy.*	
flywheel press: a nongeared mechanical power press that has the flywheel mounted directly to the crankshaft or eccentric shaft.	
foot control: a foot operated electrical actuating control.	Reference: *actuating control; pedal.*
foot pedal: preferred term is *pedal.*	
four-piece tie rod frame: preferred term is *tie rod frame.*	
four-point press: a press with force applied to the slide through four connections.	
friction clutch: a mechanical clutch wherein torque and energy are transmitted by the coupling of rotating and stationary members by the application of clamping force on frictional surfaces between the members.	Reference: *part-revolution clutch; positive clutch.*
front of press: for a freestanding power press, the face of the master operator station usually identifies the front.	The right and left sides of the press are to the right and left of an individual facing the front of the press.

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front-to-back shaft press: a mechanical power press in which the main shaft and other drive shafts are positioned in a front-to-back orientation.

full-revolution clutch: a type of clutch that, when engaged, cannot be disengaged until the press has completed a cycle.

These clutches require a full revolution before they can be disengaged, generally by a throw-out cam arrangement that is part of the clutch mechanism.

Reference: *part-revolution clutch; positive clutch.*

gage of material: the thickness of the material being processed.

gap: preferred term is *throat depth.*

gap frame press: a general classification of presses in which the frames are made in the approximate form of a letter "C".

gauge of material: preferred term is *gage of material.*

geared press: a press whose main crank or eccentric is connected to the driving source by one or more sets of gears.

gibs: the press components that guide the reciprocating motion of the slide to ensure required squareness and parallelism.

Gibs are usually provided with replaceable liners, and are usually adjustable to enable setting of proper clearance and to compensate for wear.

guard: a barrier that prevents entry into the point of operation or other hazard area.

Reference: *adjustable barrier guard; die enclosure guard; fixed barrier guard; interlocked barrier guard.*

guide post: the pin and bushing assembly used to maintain the alignment of the dies.

Guideposts are usually an integral part of the die set.

guide rods: the press components that guide the reciprocating motion of the slide to ensure required squareness and parallelism.

hand control: a hand operated mechanism used as an actuating control.

Reference: *actuating control; two-hand control; two-hand trip.*

high energy rate press: a forging machine that imparts impact to the workpiece, by means of high slide velocities resulting from the sudden release of a compressed gas against a free piston.

hit-to-hit time: preferred term is *die transition time.*

holdout device: preferred term is *restraint device.*

horizontal press: a press in which the slide reciprocates horizontally.

horn: a horizontal cantilever block or post that acts as the die, or to which the die is fastened.

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	Explanatory Notes
horn press: a gap frame press with a straight front that is equipped with, or arranged for, a horn.	Used for framing, punching, or riveting operations on basically cylindrical parts. Reference: *adjustable bed press.*
human factors: one of several terms used to describe *ergonomics.*	
hydraulic cushion: preferred term is *hydraulic die cushion.*	
hydraulic die cushion: a die cushion that uses a hydraulic pressure system to produce the counterforce.	Reference: *die cushion; NC die cushion.*
hydraulic overload: preferred term is *overload relief device.*	
hydraulic power press: a machine tool that transmits force hydraulically to cut, form, or assemble metal or other material by means of tools or dies attached to and operated by slides.	
hydraulic tie rod nut: a tie rod nut arranged to prestress the tie rod hydraulically.	Not to be confused with a hydraulic overload.
hydropneumatic cushion: preferred term is *hydropneumatic die cushion.*	
hydropneumatic die cushion: a die cushion that uses a hydropneumatic pressure system to produce the counterforce.	
inch: to impart incremental motion to the slide.	INCH, as used in press terminology, has no relationship to the common measure of length. The term *jog* is synonymous with the term *inch* except in mechanical power press terminology. INCH is accomplished by the following means: *(a)* normal clutch actuation in the INCH mode; *(b)* clutch actuation using an INCH control circuit to provide a time interval to each INCH actuation (“timed INCH”); and *(c)* actuation of a separate drive to produce a slow speed (“slow INCH”). Reference: *inch mode; jog mode.*

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Explanatory Notes

inch mode: an operating mode wherein incremental slide motion is imparted by manual means, by a single individual.

INCH mode is intended solely for use by die setters or other service personnel. Use of INCH mode for production operations is prohibited by safety regulations and standards.

For a mechanical power press, equipped with part-revolution clutch, actuation of the INCH control by the die setter (or other service person) engages the clutch to produce an increment of slide travel. The length of the increment of slide travel obtained at each actuation is dependent upon:

(a) time of engagement of the INCH control;
(b) length of the stroke;
(c) speed of the press; and
(d) position of the slide within the stroke.

Reference: *dead inch; jog mode; micro-inch drive.*

inclinable press: preferred term is *open back inclinable press.*

inclined press: any press having the frame built in a fixed inclined position.

inner slide: the slide of a multiple action press to which the punch of a draw die is fastened.

On a double action press, the inner slide operates within and is guided by the outer slide. It is usually operated directly by a crankshaft or eccentric gear and normally duplicates the action of a single action press.

On a triple action press, the inner slide is operated by a toggle or cam mechanism to provide dwell at the bottom of its stroke.

Reference: *dwell.*

integral carriage: a type of moving bolster wherein the top plate serves as a bolster and is not removable.

In a moving bolster press requiring die cushions, the integral carriage serves the multiple role of a bolster for mounting the die(s) and guiding the pressure pins, as well as a carrying device for supporting the pins during transit and die changing.

interlocked barrier guard: a barrier, or section of a barrier, interlocked with the press control to prevent inadvertent access to a hazard area during normal operation.

iron hand: a press-mounted unloading mechanism for automatically removing a workpiece(s) from the point of operation.

An iron hand can be either press-driven or press-initiated.

jog mode: an operating mode of a full-revolution clutch press wherein an intermittent motion is imparted to the slide by momentary operation of the drive motor, after the clutch is engaged with the flywheel at rest.

JOG places much more severe conditions on the drive motor and drive components than normal operating conditions.

Reference: *dead inch; inch.*

knee press: preferred term is *adjustable bed press.*

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knockout: a mechanism for releasing the material or workpiece(s) from the upper die.	Types of knockouts include the following: *(a)* crossbars through slots in the slide, with actuation by adjustable knockout posts fixed to the press frame; *(b)* cam knockouts with actuation by bell cranks on the slide; and *(c)* spring or cylinder actuated knockouts.
knockout mechanism: preferred term is *knockout.*	
knuckle joint press: a single action press in which force is transmitted to the slide by a single toggle (or knuckle joint) mechanism that is closed and opened by means of a crankshaft and connection.	Used for embossing, coining, sizing, heading, swaging, extruding, and trimming.
left-to-right shaft press: a mechanical power press in which the main shaft and other drive shafts are positioned in a left-to-right orientation.	
liftout: a mechanism for releasing the material or workpiece(s) from the lower die.	Types of liftouts include the following: *(a)* crossbars below the top of the bed, with actuation by rods connected to the slide; *(b)* cam knockouts with actuation by bell cranks on the slide; and *(c)* spring or cylinder actuated knockouts.
link drive: a type of press drive that uses a link motion.	
link motion: the slide motion produced when the slide connection(s) is driven by a crankshaft, eccentric shaft, or eccentric gear(s) driven linkage.	The slide motion produces: *(a)* fast approach of the slide to the working portion of the stroke; *(b)* slowdown immediately above the working portion of the stroke; *(c)* near constant velocity through the working portion of the stroke; and *(d)* rapid slide return to the top of the stroke.
live pin: the rotating main shaft on an eccentric gear press wherein the shaft is fastened to and rotates with the gear.	
load monitor: instrumentation to measure and display forces being applied.	
loading: preferred term is *feeding.*	
locking device: preferred term is *die cushion lock.*	
lockout/tagout: the placement of a lock and/or tag on an energy isolating device, such as a disconnect switch or shut-off valve, in accordance with an established safe work procedure.	A lockout/tagout procedure is used to prevent unexpected start-up or other hazardous press motion.
lower slide: the third slide on a triple action press.	

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	Explanatory Notes
main control station: preferred term is *master operator station.*	
manual feeding: the process whereby the operator(s) places the material or workpiece(s) into the press or removes the material or workpiece(s) from the press.	Reference: *automatic feeding.*
manual mode: any operating mode of the press that requires the operator to initiate and maintain motion of the press during the stroke, or portion of the stroke, by use of the actuating control.	Reference: *automatic mode.*
master operator control: preferred term is *master operator station.*	
master operator station: the control station that includes the full complement of controls required for the setup and operation of the press.	Operator controls located at the master operator station may include, but not be limited to, the following: *(a)* motor controls; *(b)* mode selector(s); *(c)* slide adjustment controls; *(d)* inch mode actuator(s); *(e)* stop controls; *(f)* variable speed control; and *(g)* displays, meters, readouts.
maximum draw: preferred term is *effective draw.*	
maximum separation: on a multiple action press, the point or position during the press cycle at which the faces of the inner and outer slides are the farthest apart.	
maximum upper die weight: the total mass of the tooling and tooling attachments that can be pneumatically counterbalanced with the maximum air pressure available to the pneumatic control system.	Presses equipped with pneumatic counterbalance cylinders are required by safety standards to have a die weight chart for guidance in setting counterbalance pressure.
mechanical power press: a machine tool that transmits power mechanically to cut, form, or assemble metal or other material by means of tools or dies attached to or operated by slides.	A mechanical power press consists of a stationary bed and a slide or slides having a controlled reciprocating motion toward and away from the bed surface. The slide is guided in a definite path by the frame of the press.
micro-inch drive: a drive means to provide a slow press speed for controlled inching of the slide.	A micro-inch drive can utilize a separate motor and gear reduction that drives the brake assembly and typically runs at 1 SPM. It can also utilize an oversized main motor and flywheel, typically running at about 5 SPM. Either arrangement can be rated at full press capacity or some reduced capacity rating.
minimum safe distance: preferred term is *safe distance*.	
minimum separation: on a multiple action press, the point or position during the press cycle at which the faces of the inner and outer slides are the closest together.	

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	Explanatory Notes
mode: the specific manner of operation of a press or press production system determined by the state or condition of the control system.	Reference: *mode selector.*
mode selector: a control device used to establish the press operating mode.	One or more mode selectors may be used. The mode selector(s) generally includes positions for all operating modes available on a press such as OFF, (clutch control), INCH, SINGLE STROKE, or CONTINUOUS.
MOS: master operator station.	
motion diagram: a graphical representation of slide motion characteristics relative to the motion of the driving member, such as the rotation of the crank.	The graphical representation may show slide position, velocity, or acceleration. For a multiple action, the motion diagram shows the relative motion and position between the slides.
movable barrier device: a safeguarding device arranged to enclose the point of operation before press motion can be initiated.	There are two types of movable barrier devices: *(a)* The type A device encloses the point of operation until the press ceases motion and is at its initial starting position. *(b)* The Type B device encloses the point of operation during the closing portion of the press cycle. A movable barrier device may be powered open and closed by mechanical, electrical, hydraulic, or pneumatic means, or opened and closed physically by the operator.
movable barrier safeguarding device: preferred term is *movable barrier device.*	
moving bolster: a bolster arranged to move the die in and out of position on the press bed for the purpose of facilitating die changes.	May be operated manually or by power. May be integral with or mounted to a carriage. Reference: *sliding bolster.*
multiple action press: a press designed for deep drawing of sheet metal by means of parallel movement of an inner slide and an outer slide, with the inner slide encompassed by the outer slide.	A multiple action press may be either a double action press or a triple action press. With either, the blankholder die component is fastened to the outer slide and the punch component is fastened to the inner slide. The outer slide is usually driven by means of a toggle or cam mechanism to produce a dwell at the end of the slide stroke. A triple action press also has a third slide that operates from below the bolster. This arrangement necessitates a dwell at the end of the inner slide stroke, the use of pressure pins, and a pin plate arranged to support the pressure pins. Reference: *dwell.*
multiple slide press: a press with two or more single action slides, individually guided but synchronized in their actions.	An example is a three column press with one slide for first operation blanking from a coil and a second slide for the secondary operations. Reference: *double action press; triple action press.*
multiple point press: preferred term is *two-point press; four-point press.*	

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muting: a means of bypassing the field of a presence-sensing safeguarding device during the nonhazardous portion of the press cycle.

NC die cushion: a hydropneumatic die cushion wherein cushion pressure can be instantaneously adjusted to the counterforce required at any specific point during the working stroke of the cushion.

nitrogen cylinder: a nearly constant force gas spring that utilizes regulated nitrogen as the pressure medium.

Nitrogen cylinders are small enough to be placed within a die set. Multiple nitrogen cylinders are normally required to provide the counterforce that would otherwise be provided by press-mounted pneumatic die cushion(s).

Reference: *die cushion.*

nongeared press: preferred term is *flywheel press.*

normal operation: the operating condition during which the press production system functions as intended, to produce parts.

normal separation: on a multiple action press, the slide separation measured with stroke down and adjustment up, for both the inner and outer slides.

Slide separation is measured between the slide faces.

OBI press: open back inclinable press.

OBS press: open back stationary press.

one-piece frame: a straight side press frame combining bed, crown, and uprights into a single structure.

one-point press: preferred term is *single point press.*

open-back inclinable press: a gap frame press with an opening at the back between the two side members of the frame. The frame is arranged to be inclined to facilitate parts removal by gravity.

The open-back inclinable press is the type of press that is in most common use. Open-back inclinable presses are usually single-point presses.

open-back stationary press: a gap frame press with an opening at the back between the two side members of the frame. The frame is arranged to be permanently upright or inclined.

operator: an individual who performs production work and who controls the press.

Reference: *setup operator.*

operator console: preferred term is *control console.*

operating control: preferred term is *operator station.*

operator control: an operator actuated push button, switch, lever, pedal, or other device that initiates, controls, or stops motion of the press.

operator control station: preferred terms are *master operator station; operator station.*

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operator-maintained continuous mode: Continuous cycling, initiated and maintained by the operator, by means of the actuating control(s).

operator station: the complement of controls used by an operator to operate the press in production modes.

outer slide: the slide of a multiple action press to which the blankholder of a draw die is fastened.

The outer slide is usually operated by a toggle or cam mechanism to provide dwell at the closed position of its stroke, in order to grip the blank while the punch draws the metal.

Reference: *dwell.*

overhead drive press: preferred term is *top drive press.*

overload relief device: a mechanism designed to relieve overloads to structural press members, the tooling, or both.

The mechanism can be mechanical (such as shear plates), hydropneumatic, or hydraulic. The device can be located in the slide, bed, bolster, connections, or tie rods.

part revolution clutch: a type of clutch that may be engaged or disengaged during the press stroke.

Most part-revolution clutches are air-engaged mechanisms. Some types of positive-engagement clutches are capable of being disengaged within the stroke of the slide.

pass line height: the distance between a reference surface and the travel path, of the material or workpiece(s), through the tooling.

Typical reference surfaces are the floor level, the press bed, and the bottom of the die.

pedal: a foot-operated mechanical actuating control.

Reference: *actuating control; foot control; trip; trip control.*

pendant: preferred term is *pendant operator control.*

pendant operator control: an operator control station that is suspended from the press to facilitate movement for operator convenience.

perimeter guard: a barrier at the perimeter, or segment of the perimeter, of a press production system.

A typical use is to prevent unintended entry between individual machine components of the coil processing system, such as a blanking or progressive die line.

pin plate (1): a replaceable wear-resistant plate that fastens to the working surface of the die cushion to transfer the force of the pressure pins to the die cushions.

pin plate (2): the plate used to support the pressure pins at the lower limit of their travel.

A pin plate is used to prevent the pressure pins from coming out of the bolster. When so arranged, the pin plate can be lifted for removal of the pressure pins. A pin plate is used with moving bolsters and with the lower slide of a triple action press.

pitman: preferred term is *connection.*

plain press: preferred term is *flywheel press.*

platen: preferred term is *slide.*

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	Explanatory Notes
plunger: preferred term is *inner slide.*	
pneumatic cushion: preferred term is *die cushion.*	
pneumatic die cushion: a die cushion that uses a pneumatic pressure system to produce the counterforce.	
pneumatic power press: an air-powered or gas-powered press that blanks, shears, punches, forms, draws, or assembles metal by means of dies actuated by a slide.	
POC: pendant operator control.	
podium: preferred term is *control console.*	
point: the location at which force from a connection is transmitted to the slide.	Reference: *single-point press; two-point press; four-point press.*
point of operation: the location in the tooling where material is positioned and work is performed.	For purposes of safeguarding, a guide pin that separates from the bushing, as the die opens, is considered part of the die's point of operation.
positive clutch: a mechanical clutch wherein torque and energy are transmitted by the coupling of rotating and stationary members through mechanical interlocking engagement between the members.	Positive-type clutches are almost always full-revolution types. They employ a tripping device that releases spring pressure to move engaging members. Reference: *friction clutch; full-revolution clutch.*
powdered metal press: a machine tool that transmits force for compressing metallic or nonmetallic powders.	Force may be transmitted hydraulically or mechanically.
power takeoff: an extension of the crankshaft, or the live pin of an eccentric gear press, provided for the purpose of driving a press-mounted feed or other auxiliary equipment.	
presence-sensing device: a device that creates a sensing field, area, or plane to detect the presence of an individual or object.	Reference: *presence-sensing safeguarding device.*
presence-sensing device control: a presence-sensing device used as an actuating control.	
presence-sensing device initiation: an automatic mode wherein the presence sensing device initiates a single cycle upon sensing, by the removal of all the body parts of operator(s) from the sensing field, that the work motions of the operator(s) have been completed.	
presence-sensing safeguarding device: a presence-sensing device used as a safeguarding device.	Reference: *presence-sensing device.*
press: for the purpose of this glossary, the general term for any power press.	Reference: *hydraulic power press, mechanical power press, pneumatic power press.*
press capability curve: preferred term is *press capacity curve.*	

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	Explanatory Notes
press capability graph: preferred term is *press capacity curve.*	
press capacity: preferred term is *rated capacity.*	
press capacity curve: a graphical representation that combines the energy and tonnage curves of a press.	
press capacity graph: preferred term is *press capacity curve.*	
press production system: the press(es), tooling, methods of feeding, auxiliary equipment, and safeguarding set up for production.	Parts or scrap removal methods (or equipment) are usually classified as a part of feeding.
press rating: preferred term is *rated capacity.*	
press shutheight: the distance from the bed surface to the slide face, with the slide in its closed position and the slide adjustment up (SDAU).	On moving bolster presses, the press shutheight is measured from the die mounting surface of the bolster, when it is integral with the carriage, or from the carriage, when the bolster is separate. Reference: *die shutheight.*
press stop control: preferred term is *stop control.*	
pressure curve: preferred term is *torque curve.*	
pressure pad: preferred term is *die cushion.*	
pressure pin: a steel rod used to transfer die cushion force through the die to the stamping.	Also used in triple action presses to transfer the force of the lower slide through the die to the stamping.
programmable limit switch: an electronic device, used in conjunction with a linear or angular transducer, to provide independent output circuits that can be closed and opened at selected positions during the press cycle.	
progressive die: a die with two or more stations arranged in line for performing two or more operations on a part, one operation usually being performed at each station.	Material in the form of coil strip is usually fed to progressive dies automatically, utilizing the strip as the carrier of the parts.
progressive die press: a specialized press designed for use with progressive dies and an automatic feed.	The press is designed with added frame and slide rigidity and with variable speed capability.
PSDI: presence sensing device initiation.	
pullback device: a safeguarding device with attachments for the operator's hands and wrists and connected to the press slide that, when properly adjusted, prevents the operator from reaching into the point of operation, or withdraws the operator's hands from the point of operation during the hazardous portion of the press cycle.	
pullback safeguarding device: preferred term is *pullback device.*	

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	Explanatory Notes
pullout device: preferred term is *pullback device.*	
pullout safeguarding device: preferred term is *pullback device.*	
punch: the male part of the die.	
punch press: preferred term is *mechanical power press.*	
punchholder slide: preferred term is *inner slide.*	
push-type cylinder: a counterbalance cylinder installed below the slide.	Use of a push-type cylinder increases the effective piston area and eliminates the need for piston rod packing.
QDC: quick die change.	
quick die change: utilization of means to reduce die transition time.	Means to achieve quick die change usually include the following: *(a)* moving bolsters or die carts; *(b)* automatic die clamps; and *(c)* preprogrammed controls.
quick disconnect: a coupling device that can be connected or disconnected without the use of tools.	Commonly associated with, but not limited to, pneumatic and hydraulic systems.
ram: preferred term is *slide.*	
rated capacity: the maximum force that a slide is designed to apply at the rating point.	
rating point: the predetermined distance, from the stroke closed position of the slide, at which the maximum force of the press is designed to be applied.	The maximum force that can be applied is reduced as the distance from the stroke closed position is increased. Capacity at any point in the working stroke can be determined by use of the tonnage curve of the press.
repeat: an unintended or unexpected successive stroke of the press.	
restraint device: a safeguarding device, with attachments for the operator's hands and wrists, that prevents the operator from reaching into the point of operation at all times.	A restraint device may be likened to a nonmoving pullback device.
riser (1): a plate or fabrication inserted under the die set to accommodate die height to the press shutheight.	
riser (2): a plate or fabrication inserted under the die set to obtain the desired pass line height.	
riser (3): a plate or fabrication inserted under the die set to allow for placement of a conveyor(s) for removal of parts or scrap.	
rolling bolster: preferred term is *moving bolster.*	
rolling carriage: preferred term is *moving bolster.*	

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	Explanatory Notes
rolling subplate: preferred term is *die cart plate.*	
rotary cam limit switch: preferred term is *rotary limit switch.*	
rotary limit switch: a press-driven rotating control device that initiates, maintains, or interrupts control functions based on crank angle (slide position).	
run: the operating modes that produce single cycle or continuous cycling of a press.	
run-button stand: preferred term is *T-stand.*	
safety block: a prop that is inserted between opposing tool or press members.	Safety blocks are not intended or designed to stop a powered stroke of the slide.
safety block device: preferred term is *safety block.*	
scrap: residual waste or discarded material produced by a stamping process.	
SDAU: stroke down, adjustment up.	
setup: the process of adjusting the press, and the installation and adjustment of tooling, auxiliary equipment, and appropriate safeguarding, to ensure proper and safe operation of the press production system.	
setup operator: an individual who is responsible to prepare the press prior to production and who controls the press during production operations.	
shutheight: use the applicable preferred term, *die shutheight* or *press shutheight.*	
single action press: any press with a single slide.	
single cycle: a complete movement of the slide from the initial start position, to the return and stop at the same start position.	Reference: *cycle.*
single cycle capability: a mechanism or control arrangement used to automatically initiate stopping action of the press at the completion of a cycle.	Single cycle capability can be accomplished by the use of a single stroke mechanism on full-revolution clutch presses or by an antirepeat control on full- or part-revolution clutch presses. Reference: *antirepeat; single stroke mechanism.*
single cycle mechanism: preferred term is *single stroke mechanism.*	
single cycle mode: preferred term is *single stroke mode.*	
single end drive: a press with a crankshaft (or eccentric shaft) driven from one end.	
single-piece frame: preferred term is *one-piece frame.*	

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	Explanatory Notes
single-point press: a press with force transmitted to the slide through one connection.	
single stroke: preferred term is *single cycle.*	
single stroke capability: preferred term is *single cycle capability.*	
single stroke mechanism: a mechanical device on a full revolution clutch that limits the travel of the slide to one complete cycle at each engagement of the clutch.	A single stroke mechanism is a mechanical means of providing an antirepeat function. Reference: *single cycle capability.*
single stroke mode: an operating mode of a press wherein a single cycle of the press is produced by each operation of the actuating control.	
single stroke rate: preferred term is *single trip rate.*	
single stroke reset: preferred term is *antirepeat.*	
single trip rate: allowable single cycles per minute.	
slide: the press member(s) that reciprocates linearly and to which the tooling is attached.	
slide adjustment (1): on a mechanical power press, the distance the press shutheight can be reduced.	
slide adjustment (2): on a mechanical power press, the mechanism for adjusting the press shutheight.	Slide adjustment mechanisms may be manually or power operated.
slide adjustment lock: the mechanism provided to prevent unintended change in the press shutheight.	
slide counterbalance: preferred term is *counterbalance.*	
slide face: the surface of the slide to which the punch or upper die is generally attached.	
slide lock: an integral mechanical device to prevent unintended slide movement.	Slide locks are not intended or designed to stop a powered stroke of the slide. Reference: *safety block.*
slide separation: the distance between the faces or die mounting surfaces of the inner slide and the outer slide of multiple action presses.	Slide separation is shown on a motion diagram and is usually defined in three conditions: minimum, normal, and maximum. Reference: *maximum separation; minimum separation; normal separation.*
sliding bolster: a bolster arranged for moving the lower die into and out of the point of operation for the purpose of parts feeding.	In some industries, *sliding bolster* is synonymous with *moving bolster.* Reference: *moving bolster.*
slow inch: preferred term is *micro-inch.*	
solid frame: preferred term is *one-piece frame.*	

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	Explanatory Notes
spacer: a plate or fabrication installed between the die(s) and the slide to accommodate the press shutheight.	Reference: *riser.*
SPM: strokes per minute.	SPM states the speed of the press expressed as continuous cycles per minute.
spotting press: a power press used in the final finishing of dies to indicate (spot) inaccuracies, and also to test mating and functioning of the die parts.	A spotting press is usually of low capacity in relation to die area or die rating.
spring cushion: a die cushion that uses springs to produce the counterforce.	
stamping (1): the end product of a press operation, or series of operations, wherein a workpiece is generated by processing flat (or preformed) strip or sheet stock between opposing members of a die.	During the operation(s), the material is subjected to force sufficient to cut the part, form the part, or both, into the required configuration.
stamping (2): a general term used to describe the process, or the press operations, or both.	
stay rod: a tie rod used on a gap frame press.	Reference: *tie rod.*
stop (1): a cessation of movement, action, or operation.	
stop (2): for a press, the cessation of slide motion.	For a mechanical power press, stop is usually accomplished by disengaging the clutch or other drive means, and engaging the brake. Normal stopping of the mechanical power press slide is initiated as follows: *(a)* in SINGLE STROKE mode, by the control system, usually through a cam on the rotary limit switch; *(b)* in INCH mode, by removal of the hands from the INCH push buttons; and *(c)* in CONTINUOUS mode, by use of the TOP STOP push button. Reference: *emergency stop; top stop.*
stop control: an operator control, usually a push button that, when actuated, initiates a stop of the slide.	For a mechanical power press, actuation of the stop control usually is arranged to disengage the clutch and engage the brake without stopping the flywheel. Reference: *emergency stop control; top stop.*
stop-return control: on a hydraulic power press, a control that stops and returns the slide to its initial position.	
stopping-performance monitor: a system or device to monitor brake performance of the press.	
straight side press: a general classification of presses with uprights or housings that have plain, flat sides (usually vertical) that bound or enclose the left and right hand sides of the die space.	

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stretch forming: the process of shaping sheet metal by stretching it over a form.

stripper: a mechanism or die part for releasing the material or workpiece(s) from the die.

stripping: the motion that releases the material or workpiece(s) from the die.

Stripping is shown on a motion diagram of a multiple action press as the measured distance the inner slide raises before the outer slide begins to rise.

stroke: the movement of the slide from the open to the closed position.

Reference: *cycle; single cycle; stroke length.*

stroke length: the distance that the slide travels from the open to the closed position.

stroke position indicator: means to indicate press crank angle.

stroking selector: preferred term is *mode selector.*

surge tank: a reservoir provided in a pneumatic system to reduce pressure fluctuations in the operation of the system.

synchronous press line: a press production system with two or more presses and with automatic synchronized parts loaders, parts conveyance between presses, and parts unloaders.

T-stand: an operator station mounted on a free-standing pedestal, not attached to the press, but connected to the press control by a flexible cord.

A T-stand may be connected by means of a terminal box or by a plug and receptacle. Typically, T-stand will include:

(a) two (2) two-hand RUN controls;
(b) one (1) STOP control; and
(c) one (1) TOP STOP control, when required.

When required to ensure minimum safe distance from the nearest point of operation, safety standards require the T-stand to be secured in position.

table: preferred term is *adjustable bed.*

tail-out: the act of passing the end of strip material through, between, or across the press or its tooling and components.

third action: preferred term is *lower slide.*

threading: the act of passing the leading end of strip material through, between, or across the press or its tooling and components.

throat: an opening or recess in the press frame to permit positioning of the material or workpiece(s).

throat depth: on a gap frame press, the distance from the slide centerline to the frame.

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	Explanatory Notes
throw: in crank or eccentric presses, the distance from the centerline of the crankshaft (or main shaft) to the centerline of the crankpin (or eccentric).	The throw is equal to one half of the stroke length.
tie rod frame: a straight side press frame made up of bed, crown, and uprights held together by prestressed tie rods.	
tie rods: steel rods, threaded at both ends for nuts, used to prestress tie rod frames.	Infrequently used to reduce deflection in gap frame presses.
toggle press: a multiple action press that uses a toggle mechanism to provide the dwell motion of the inner slide.	Toggle mechanisms are also used in special purpose single action presses such as knuckle joint and link drive presses. Reference: *double action press; dwell; triple action press.*
tonnage curve: a graphical representation, based on drive torque, to show allowable press force as a function of slide positions during the working portion of the stroke.	
tooling: a punch, die, shear, etc., used in a press for the manufacture of parts.	Reference: *die(s).*
top clamping plate: the interface between the upper die(s) and the press slide when using die clamps.	The top clamping plate is fastened to the top of the die. It is then fastened to the slide by actuation of the die clamps. The top clamping plate is normally the size of the press slide.
top drive press: any press with the drive mechanism above the slide.	
top stop: an operator control used to stop continuous cycling at the end of a complete cycle, or at another predetermined point in the cycle.	A TOP STOP control action is delayed, after actuation of the actuating control, so as to cause stopping at the predetermined point.
torque: the moment of force that is the product of the force and the length of the lever arm.	Clutch torque produces, or tends to produce, rotation in a body at rest. Brake torque retards, or tends to retard, rotation in a rotating body.
torque arm: the perpendicular distance from the center of rotation to the line of action of a force.	
torque curve: preferred term is *tonnage curve.*	

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transfer feed: an automatic mechanism that moves workpiece(s) from one die station to the next by means of reciprocating motions.	Workpiece handling devices include: *(a)* grippers; *(b)* suction cups; and *(c)* mechanical fingers. These devices are mounted to transfer rails. The rails are located on opposite sides of the die. The transfer mechanism(s) move in as many as three axes, which are: *(a)* clamp motion; *(b)* lift motion; and *(c)* transfer motion. References: *crossbar transfer feed; tri-axis transfer feed; two-axis transfer feed; walking beam.*
transfer press: an automatic press equipped with a transfer feed.	
transmission: the mechanical drive components, usually including speed changing means, by which power is transmitted from the source (driving) members to the output (driven) members.	
traveling die clamp: a die clamp that can move and clamp at any location when conventional T-slots are provided.	The clamp unit is controlled within the T-slot, which also includes and protects the movement device, whether a chain, spindle, or hydraulic cylinder.
tri-axis transfer feed: a transfer feed that is capable of clamp motion, lift motion, and transfer motion.	Reference: *crossbar transfer feed; transfer feed; two-axis transfer feed; walking beam.*
trip: the momentary actuation of the press control to initiate a press cycle.	
trip control: a mechanism for actuating a power press.	Also used as a general term to describe any press actuating device.
triple action press: a multiple action press with three slides.	Reference: *multiple action press.*
tripping: the actuation of press motion, using a trip control.	
turnover bar: a bar used to manually turn the flywheel or crankshaft.	
twin end drive: a geared press with the crankshaft (or eccentric shaft) driven from both ends.	
two-axis transfer feed: a transfer feed that is capable of clamp motion and transfer motion.	Reference: *crossbar transfer feed; transfer feed; tri-axis transfer feed; walking beam.*
two-hand control: an actuating control that requires concurrent use of both hands of the operator to initiate and continue the press stroke.	Reference: *actuating control; two-hand control device.*

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two-hand control device: a two-hand control used as a safeguarding device.

A two-hand control device requires holding the push buttons depressed during a substantial portion of the closing stroke of the slide. Removal of hands during the closing travel of the slide results in a stopping action.

Reference: *actuating control; two-hand control.*

two-hand trip: a mechanical actuating control that requires the concurrent use of both hands of the operator to actuate the press.

Reference: *actuating control; two-hand control.*

two-hand trip device: a two-hand trip used as a safeguarding device.

A two-hand trip device requires only a momentary concurrent activation of the push buttons (or other operating mechanisms) to set the slide immediately into motion. Instantaneous removal of the hands cannot recall the action or stop the motion.

A two-hand trip device is usually applicable to full-revolution clutch equipment, and a two-hand control device is possible only with part-revolution clutch equipment.

Reference: *operator control; trip control; tripping; two-hand trip.*

two-point press: a press with the force transmitted to the slide through two connections.

underdrive press: any press with the drive located within or under the bed, and with the connections within or alongside the uprights.

unintended actuation: an inadvertent stroke of the press, not initiated by an intentional or unintentional act of an individual.

uprights: the side members on a straight side press.

usable energy curve: a graphical representation to show usable flywheel energy as related to the point in the stroke where the work begins.

usable flywheel energy: the energy made available to do press work during the permissible slowdown of the flywheel.

The permissible slowdown for which the flywheel is designed is dependent on the characteristics of the drive motor.

walking beam: a transfer feed that is capable of lift motion and transfer motion.

Reference: *crossbar transfer feed; transfer feed; tri-axis transfer feed.*

wedge (1): a type of slide adjustment installed at each die station on transfer presses to enable individual adjustment of die height at each station.

wedge (2): a means of press shutheight adjustment provided on knuckle joint presses.

wedges: tapered hardwood blocks used with a safety block.

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workpiece: any material or part to be placed into the dies for the purpose of having work performed on it.

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