

ANSI B11.16 (MPIF #47) (R09)

American National Standard for Machine Tools - Safety Requirements for Powder/Metal Compacting Presses

Secretariat and Standards Developing Organization

The Association for Manufacturing Technology
7901 Westpark Drive
McLean, VA 22102
Attn: Safety Department

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AMERICAN NATIONAL STANDARDS

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Foreword (This foreword is not part of American National Standard B11.16 - 2003 (MPIF #47).

The first standard for Metal Powder Compacting Presses was developed and approved by the Metal Powder Industries Federation (MPIF) in 1973 and published in 1974 as MPIF #47. It was subsequently revised in 1977. Recognizing the need for an ANSI safety standard for powder/metal compacting presses, the ANSI Accredited Standards Committee B11 on safety requirements for machine tools established Subcommittee B11.16 in 1985 to develop for its approval a draft standard to cover safety requirements for this equipment.

Because of the substantial use of compacting presses in the powder metallurgy industry and the MPIF involvement in the original writing of MPIF #47, this standard consistently refers to "metal" powder compacting presses. However, it is recognized that these presses are used in the compaction of all types of powders, metallic and nonmetallic and that the use of compacting presses in nonmetallic and advanced particulate material industries will continue to grow. It is the intention of the Subcommittee that this standard be applicable to all industries involved in powder compaction, regardless of the specified material utilized.

The primary objective of this standard is to eliminate injuries to personnel associated with presses used in the powder metal (P/M) industry by establishing safety requirements for the construction, safeguarding, operation and maintenance of P/M presses.

To accomplish this objective the B11.16 Subcommittee approached the safe operation of P/M presses from four directions:

- Eliminating certain recognized construction hazards by design and establishing standard approaches to design so that machines available from competitive suppliers will have similar operating control characteristics.
- Minimizing the necessity of having the operator place hands, fingers, or other body parts within the point of operation through design, procedure, and process, thus minimizing the operator's exposure to point of operation hazards.
- Safeguarding the point of operation to protect personnel, should they inadvertently expose themselves to hazards at the point of operation.
- Establishing guidelines for general training and specific job-related instruction for establishing safe practices and procedures for all personnel working on P/M presses.

It is recognized that the words "safe" and "safety" are not absolutes. Safety is influenced by many factors, including attitude. This standard is not intended to replace good judgment. Operator skill, training, experience, and job organization are all safety factors that must be considered in proper compliance with written regulations or recommended practice.

In order to achieve the above goals and to assist persons in the implementation of this standard, responsibilities have been assigned to the supplier (manufacturer, reconstructor, modifier), the employer and the employee. To achieve uniform interpretation, it is imperative to read and understand the definitions (Clause 3) used in this standard.

P/M presses and associated equipment technologies are continuously evolving. This standard reflects the most commonly used and time-tested state of the art at the time of its approval. The inclusion or omission of language relative to any evolving technology, either in the requirements or explanatory area of this standard, in no way infers acceptance or rejection of such technologies.

Suggestions for improvement of this standard will be welcome. They should be sent to the Association for Manufacturing Technology, 7901 Westpark Drive, McLean, VA 22102, Attention: Safety Department. Recognizing the importance of distributing and encouraging the use of this standard as important to the proper use of the equipment described, it is recommended that all interested persons and associations make the availability of this standard known and encourage its use.

The standard was written by the B11.16 Subcommittee, processed by the Association for Manufacturing Technology, as the ANSI-accredited Standards Developing Organization, and finally, approved by the ANSI B11 Accredited Standards Committee and an MPIF review committee, for submittal to ANSI in accordance

with the requirements of the Accredited B11 Operating Procedures. The ANSI process provides for a consensus to be reached by a broad representation of associations, labor, safety organizations, federal government agencies, and industry.

ANSI B11 Accredited Standards Committee approval of this standard does not necessarily imply that all committee members voted for its approval. At the time this standard was approved as an American National Standard, the ANSI B11 Accredited Standards Committee was composed of the following member organizations:

John W. Russell, PE, CSP Chairman
 Gary D. Kopps, Vice-Chairman
 David A. Felinski, Secretary

Organizations Represented

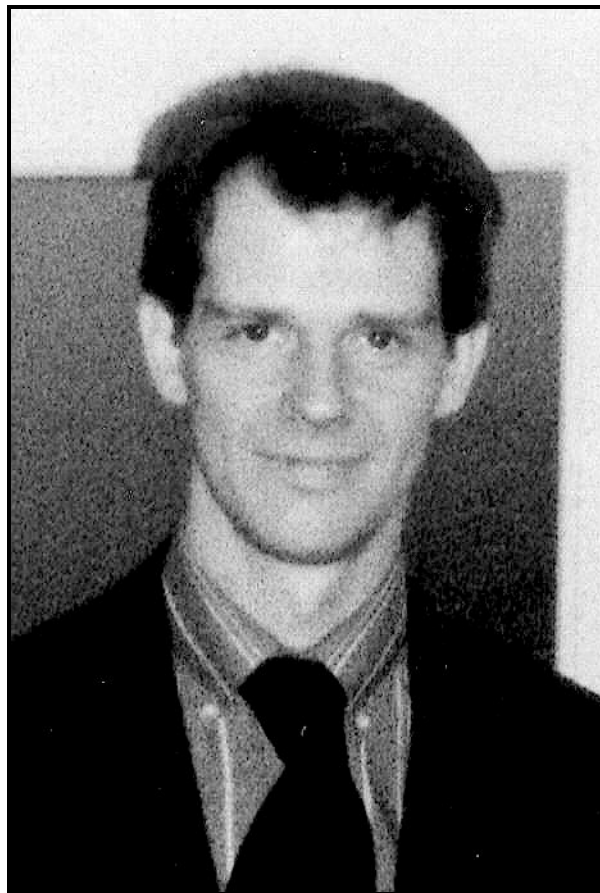
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Alliance of American Insurers	John Russell, PE, CSP (D)	Keith Lessner
American Society of Safety Engineers	Bruce Main, PE, CSP	George Karosas, PE, CSP
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Sheet Metal & Air Conditioning Contractors' Natl. Assn.	Mike McCullion, CSP, ARM	
Tooling and Manufacturing Association	Daniel Kiraly	Allan Te Ronde
Toyota Motor Manufacturing North America	Barry Boggs	Tom Huff

At the time the standard was written, the following companies of powder metal press builders, end-user parts manufacturers, and trade association personnel supported and comprised membership on the B11.16 Subcommittee:

Dennis Cloutier, CSP	Chairman	Cincinnati Incorporated
Teresa Stillman	Secretary	Metal Powder Industries Federation
	Gary Barrett	Gasbarre Products Press Division
	Laird Brislen	Tamagawa Machinery
	Ronald Cejer	CIECO
	David Charley	General Motors Corporation
	Keith Chevalier	GKN Sinter Metals - Salem
	James Cretti, Jr.	Gasbarre Products Press Division
	Thomas Gasbarre	Gasbarre Products Press Division
	Tom Gaul	Keystone Powdered Metal Company
	James Gilbert	PTX-Pentronix
	Mel Henry	Gasbarre Products Press Division
	Jim Jones	GKN Sinter Metals - Emporium
	Roger Ketterer	GKN Sinter Metals - Salem
	Jack Krajcirik	Dorst America, Inc.
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	Robert Pittan	Burgess-Norton Mfg. Co.
	Larry Shindledecker	Gasbarre Products Press Division
	Joseph Skurka	Borg-Warner Automotive
	Tim Stauffer	Keystone Powdered Metal Company
	Michael Swiderski	Burgess-Norton Mfg. Co.
	Gary Todd	Cincinnati Incorporated
	Steve West	National Sintered Alloys, Inc.
	Fred Wheeler	PTX-Pentronix
	Matt Yow	Burgess-Norton Mfg. Co.

The B11.16 Subcommittee and the
ANSI B11 Accredited Standards Committee
would like to dedicate this work to Mr. Mel Henry
who died in an airplane crash while returning from a
B11.16 Subcommittee meeting on September 8, 1994.



**In Sympathy and Fond Memory of Mel Henry
1958-1994**

Explanation of the format, and ANSI B11 conventions

This ANSI B11.16 – 2003 standard is divided into parts formerly referred to as sections or chapters and now referred to as clauses in line with the current ANSI style manual. Major divisions of clauses are referred to as subclauses and, when referenced by other text in the standard, are denoted by the subclause number (e.g., see 5.1).

The standard uses a two-column format to provide supporting information for requirements. The material in the left column is confined to “Standard Requirements” only, and is so captioned. The right column, captioned “Explanatory Information” contains information that the writing Subcommittee believed would help to clarify the requirements contained in the standard. This column should not be construed as being a part of the requirements of this American National Standard.

As in all American National Standards, the term “SHALL” denotes a requirement that is to be strictly followed in order to conform to this standard; no deviation is permitted. The term “SHOULD” denotes a recommendation, a practice or condition among several alternatives, or a preferred method or course of action.

Similarly, the term “CAN” denotes a possibility, ability or capability, whether physical or causal, and the term “MAY” denotes a permissible course of action within the limits of the standard.

B11 conventions: Operating rules (safe practices) are not included in either column of this standard unless they are of such nature as to be vital safety requirements, equal in weight to other requirements, or guides to assist in compliance with the standard. The B11 standards do not use the term “and/or” but instead, the term “OR” is used as an inclusive disjunction, meaning *one or the other or both*. A distinction between the terms “*individual*” and “*personnel*” is drawn. Individual includes personnel (employees, subcontractors, consultants, or other contract workers under the indirect control of the supplier or user) but also encompasses persons who are not under the direct or indirect control of the supplier or user (e.g., visitors, vendors, etc.). Gauge refers to a measuring or testing instrument; gage refers to a limiting device (e.g., backgage).

Suggestions for improvement of this standard will be welcome. They should be sent to AMT-The Association For Manufacturing Technology, 7901 Westpark Drive, McLean, VA 22102 - Attention: B11 Secretariat.

American National Standard for Machine Tools – Safety Requirements for Powder/Metal Compacting Presses

STANDARD REQUIREMENTS

1 Scope and exclusions

1.1 Scope

The requirements of this standard apply to those mechanically or hydraulically powered machines that are designed, modified, or converted for the purpose of compressing metallic or nonmetallic powders.

These machines are commonly referred to as metal powder presses, powder metal presses, compacting presses, P/M briquetting presses, metal powder sizing presses or metal powder coining presses. For the purpose of this standard, they shall be referred to as "P/M presses."

P/M presses are composed of a frame, tooling platens, upper or lower rams or sliding anvil and may utilize any combination of mechanical, hydraulic, or pneumatic power.

1.2 Types of machines excluded

Excluded from this standard are:

- mechanical and hydraulic power press brakes;
- mechanical and hydraulic power presses;
- bulldozers;
- conventional hot bending and hot metal presses;
- conventional forging presses;
- hammers;
- riveting machines and similar types of fastener applications;
- isostatic and hydrostatic presses;
- high energy rate presses.

EXPLANATORY INFORMATION

(Not part of American National Standard for Machine Tools –Safety Requirements for Powder/Metal Compacting Presses, ANSI B11.16 (MPIF #47) - 2003.

E1.1

P/M presses are composed of a frame, tooling platens and upper or lower rams. Mechanical P/M presses have fixed or moving die platens and utilize a single motion, multi-motion, rotary motion or sliding anvil motion. The tooling components are located in, or attached to the rams and are mechanically driven. Hydraulic P/M presses contain all the components and motions of mechanical machines but are hydraulically driven. "Hybrid" P/M presses may utilize any combination of mechanical, pneumatic or hydraulic power for driving the rams and have the same basic description as mechanical P/M presses.

P/M presses include compacting and certain automatic isostatic and hydrostatic P/M presses for the initial consolidation of powder into a desired shape, as well as coining and sizing presses for repressing of previously compacted parts.

P/M presses include compacting presses for the initial consolidation of powder into a desired shape, as well as coining and sizing presses for repressing of previously compacted parts. The unique characteristics that differentiate the P/M press from other presses are how it is used to achieve the conversion from metallic and nonmetallic powder to the green part or to size, coin, or densify the previously compacted P/M part. Typical nonmetallic powders are ceramics, various oxides, plastics, food products, chemicals and pharmaceutical powders. See Figures 2-11, Annex A.

E1.2

Typical of those machines excluded are metal stamping presses, sheet- and plate-working press brakes. See E1.1 regarding non-automatic isostatic and hydrostatic presses.

The unique characteristics described in E1.1 are those which differentiate between a conventional hot metal press, a P/M hot press, a forging press, and a P/M (coining) press. See 3.28 (hot forging) and 3.29 (hot pressing).

Standard Requirements

2 Normative References

The following normative documents contain provisions which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid.

ANSI B11.19–2003, Performance criteria for safeguarding

ANSI / ASSE Z244.1–2003, *Control of hazardous energy – Lockout/tagout and alternative methods*

ANSI / ASME Boiler & Pressure Vessel Code, 2001, Division 1, Section VIII.

ANSI / NFPA 70 – 2002, National Electric Code

ANSI / NFPA 70E, Electrical Safety Requirements for Employee Workplaces

ANSI / NFPA-79-2002, Electrical Standard for Industrial Machinery

3 Definitions

3.1 antirepeat: The part of the control system designed to limit the P/M press to a single stroke if the actuating control is maintained in an operating position. Antirepeat requires release of all actuating controls before another stroke can be initiated. Antirepeat may also be called single stroke reset or reset circuit.

3.2 brake: The mechanism used on a mechanical P/M press to stop the crankshaft, or hold the crankshaft stationary, either directly or through a gear train, when the clutch is disengaged.

3.3 brake monitor: See *stopping performance monitor*.

3.4 clutch: An assembly used to connect and disconnect a driving and driven part of a mechanism and, when connected, transmits rotary motion from the driving to the driven member.

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

Explanatory Information

E2 Informative References

All normative documents are subject to revision and users of this standard are encouraged to investigate applying the most recent revisions of the normative documents listed in clause 2.

The documents (in this column below) are listed for information only, and are not essential for the completion of the requirements of this standard:

29 CFR 1910.147 - Control of Hazardous Energy (Lock Out/Tag Out) (for more info, see www.osha.gov)

29 CFR 1910.333 b(2) Selection and Use of Electrical Work Practices (for more info, see www.osha.gov)

29 CFR 1910.178 Powered Industrial Trucks

29 CFR 1910.179 Overhead and Gantry Cranes

29 CFR 1910.184 Slings

ANSI B11.TR3-2000 Risk Assessment and Risk Reduction – A guide to estimate, evaluate and reduce risks associated with machine tools

E3.1 Antirepeat requires the release of all actuating controls before another cycle (stroke) can be initiated.

Antirepeat is the control equivalent of a single-cycle (stroke) mechanism, with the additional requirement of the release of all actuating controls to enable a new cycle (stroke). The function of antirepeat is to prevent the successive cycles (strokes) that could occur if the antirepeat control did not exist.

E3.2 The brake may be a constant drag type (typical on a full-revolution clutch machine) or may be of a type that is disengaged while the clutch is engaged (most typical with part-revolution clutch machines).

E3.4.1 Positive type clutches are almost always full-revolution types. Usually, a tripping device releases spring pressure to move engaging members which by nature require a full revolution before they can be disengaged, generally by a throwout cam arrangement which is part of the clutch mechanism.

Standard Requirements

3.4.2 clutch, part-revolution: A type of clutch that may be engaged or disengaged during any part of the cycle.

3.5 coining: The pressing of a sintered compact to obtain a definite surface configuration.

3.6 cold forming: See *coining*.

3.7 compaction: The compression or consolidation of metallic or nonmetallic powder into a desired shape.

3.8 concurrent: Acting in conjunction; used to describe a situation wherein two or more controls exist in an operated condition at the same time, but not necessarily simultaneously.

3.9 continuous: Automatic multiple strokes of the P/M press that can include automatic momentary intervening stops during each stroke.

3.10 control reliability: The capability of the P/M press control system, the safeguarding, other control components and related interfacing to achieve a safe state in the event of a failure within their safety-related functions.

3.11 control valve: The valve that initiates or stops P/M press motion by controlling the fluid power source.

3.12 conversion: The taking of other than a P/M press and making it into a P/M press. See *modifier*.

3.13 counterbalance: The mechanism that is used to balance or support the weight of the ram and its attachments.

3.14 cycle: A complete movement from the initial start position back to the same start position of the P/M press.

3.15 device: A means that detects or prevents inadvertent access to a point of operation hazard.

3.15.1 device, gate or movable barrier: A mechanism that is designed to allow compacted parts to pass through it but restricts the entry of the operator into the point of operation before the ram can start its downward motion.

3.15.2 device, hold out or restraint: An adjustable attachment that restricts entry of the hands and fingers into the point of operation.

3.15.3 device, presence sensing: A device designed, constructed and arranged to create a sensing field, area or plane to detect the presence of an individual or object.

Explanatory Information

E3.4.2 Part-revolution clutches are usually air engaged and usually are friction-type mechanisms, although some types of positive engagement clutches are capable of being disengaged at any time during the cycle of the ram. Other types of clutches such as eddy current, or hydraulically engaged, are sometimes used for part-revolution operations.

E3.5 Repressing is the application of pressure to a previously pressed and sintered compact, usually for the purpose of improving a physical property.

Sizing is a final pressing of a sintered compact to secure a desired size (see also, 3.60).

E3.6 Coining and cold forming may be used interchangeably.

E3.8 Specifically as applied to the operation of RUN buttons or INCH controls, the use of the word "concurrent" means that the clutch or control valve will be activated after each hand of the operator is holding a control in the operated position.

E3.10 See *safety-related function*.

E3.15 In this standard, the use of the word "device" is reserved exclusively for describing mechanisms or controls designed for safeguarding at the point of operation.

E3.15.1 See ANSI B11.19 for information on the design, construction, operation and application of movable barriers.

E3.15.2 See ANSI B11.19 for information on the design, construction, operation and application of restraint devices.

E3.15.3 See ANSI B11.19 for information on the design, construction, operation and application of presence sensing devices.

Standard Requirements

3.15.4 device, pull-back: A mechanism with attachment for the operator's hands and wrists and connected to the moving portion of the ram/punch of the P/M press used to withdraw the operator's hands if they are inadvertently within the point of operation as the ram/punch closes.

3.15.5 device, two-hand control: A device designed, constructed and arranged to retain and maintain the operator(s) at a safe distance from the point of operation during the hazardous portion of the P/M press cycle.

3.16 die closing: Die closing is that portion of the P/M press cycle from top dead center to where the punch enters the die.

3.17 die set: That part of the P/M press (sometimes removable) that holds and aligns the tool set in proper relation to the P/M press.

3.18 direct drive - with a brake: The type of driving arrangement wherein no clutch is used; coupling and decoupling of the driving torque is accomplished by energizing and de-energizing a motor. The pressing motion of the P/M press is stopped by the application of a brake at the time the motor is de-energized.

3.19 employer: See *user*.

3.20 feed shoe: The container or components for transferring the powder from the supply hopper to the die cavity. In addition, it may be used for removing the part from the point of operation.

3.21 feeding or removal: The process of replacing or removing material into or from the point of operation.

3.21.1 feeding or removal - manual: Feeding wherein the material or part being processed is placed into or removed from the point of operation by the operator's hand, with or without a hand tool.

3.22 foot control: A foot-operated control mechanism designed to activate a P/M press.

3.23 foot pedal or treadle: A foot-operated lever designed to operate the mechanical linkage that trips the clutch.

3.24 green part: A compacted part that retains its shape by mechanical bond of the individual particles as opposed to the metallurgical bond that is typical of cast, wrought, or sintered materials.

3.25 guard: A barrier that prevents entry of any part of the operator's body into the point of operation or other hazard area.

3.25.1 guard, adjustable barrier: A guard with provisions for adjustment to accommodate various jobs or tooling set-ups.

3.25.2 guard, die enclosure: A guard attached to the die shoe or stripper in a fixed position.

Explanatory Information

E3.15.4 See ANSI B11.19 for information on the design, construction, operation and application of pull-back devices.

E3.15.5 See ANSI B11.19 for information on the design, construction, operation and application of two hand control devices.

E3.18 For the purposes of this standard, this is considered in the same category as a part-revolution clutch.

E3.20 This component is also referred to as a "feeder," "filler shoe" or "shuttle."

E3.22 This control usually takes the form of a foot-operated electrical switch to operate a solenoid or solenoid-operated valve, or it may take the form of a foot-operated valve.

E3.24 Mechanical bonds can be easily broken and can result in a compacted part that is highly fragile and may require special handling to retain its shape or details of its shape.

Standard Requirements

3.25.3 guard, fixed barrier: A guard affixed to the frame, bolster or other surface in such a manner so as to enclose all or part of the point of operation or other hazard area.

3.25.4 guard, interlocked press barrier: A fixed or movable barrier or section of a barrier provided with an interlock arranged to prevent entry into the point of operation or hazard area when the barrier or the section of the barrier is in the closed position.

3.26 guidepost: The pin and bushing assembly used to maintain the alignment of the dies.

3.27 hand tool: Any hand-held object designed for placing or removing material or parts to be processed into or from the point of operation.

3.28 hot forging: Hot densification by forging of an unsintered, pre-sintered or sintered pre-form made from powder.

3.29 hot pressing: The compression or consolidation of preheated metallic or nonmetallic powder into a desired shape.

3.30 inch: To impart momentary motion to the P/M press.

3.31 interleaving: The condition wherein the spacing between the wire coils of a spring is greater than the diameter of the coil wire, thereby allowing one coil spring, or portion thereof, to thread into another coil spring, or portion thereof.

3.32 immediate stop command: A command that initiates an action(s) to stop a hazardous motion (or situation) at any point in the P/M press cycle.

3.33 jog: An intermittent motion of the P/M press by momentarily energizing the drive motor.

3.34 maintenance personnel: Individuals who service, inspect, and maintain P/M presses.

3.35 manufacturer: Any person or legal entity who manufactures, reconstructs, or modifies P/M presses or presses for P/M use.

3.36 microprocessor logic system (MLS): A microprocessor logic system consists of processing elements, associated memory, and other peripheral devices necessary to receive input information, process that information, and provide controlling outputs, or information outputs, or both.

Explanatory Information

E3.28 Hot forging is more commonly referred to in the P/M industry as “powder forging” or “P/M forging.”

E3.29 Also known as “hot powder pressing” or “warm powder pressing. Commonly includes the heating of powder, the powder delivery system, the feed shoe and tooling to temperatures in excess of 93°C (200°F).

E3.30 Use of the INCH operating mode activates the P/M press so that a small portion of one stroke or indefinite stroking can occur, depending upon the length of time the INCH operating mode is held operative. INCH is a function used by maintenance personnel and by the die setter for set-up of dies and tooling, but is not intended for use during production operations by the operator.

E3.35 See also, **supplier**.

Standard Requirements

3.37 mode selector: The part of the P/M press control that determines the mode of operation when the P/M press cycle is actuated.

3.38 modifier: One who converts, changes, or otherwise alters the original design of P/M presses that fall within the scope of this standard.

3.39 monitoring: The checking of system components to detect a failure of a component, subassembly or module that affects the performance of the safety-related functions.

3.40 normal stop command: A command that initiates an action(s) to stop motion(s) or situation(s) at the end of a P/M press cycle or at other points required by the P/M press functions.

3.41 operator: An individual performing production work with the P/M press.

3.42 operator control: An operator activated push button, switch, lever, hand wheel or other mechanism that initiates, cycles, controls or stops motion of the P/M press.

3.43 operator station: The controls used by or available to an operator to operate the P/M press.

3.44 P/M part: A part which is compacted, formed, or compressed into a specific shape starting from metallic or nonmetallic powder.

3.45 pinch point: Any point other than the point of operation where it is possible for a part of the body to be caught between the moving parts of a P/M press or auxiliary equipment, or between moving and stationary parts of a P/M press or auxiliary equipment, or between the material and moving part or parts of the P/M press or auxiliary equipment.

3.46 platen: A member of the P/M press or die set used for mounting or attaching the individual tool elements contained in the tool set.

3.47 point of operation: The area of the P/M press where compaction, coining, or sizing takes place and includes the space between that area and the face of the upper punch.

3.48 programmable logic controller (PLC): A programmable logic controller is a solid-state control system which has a user-programmable memory for storage of instructions to implement specific functions such as input/output control, logic, timing, counting, report generation, data highway communications, arithmetic, and data/file manipulation. A programmable controller consists of a central processor, input/output interface, and memory. A programmable controller is designed as an industrial control system.

Explanatory Information

E3.37 This is sometimes referred to as a "stroking" selector. The mode selector generally includes positions for OFF, INCH, SINGLE STROKE and CONTINUOUS when furnished.

E3.38 See also, *supplier*.

E3.44 After being compacted into a specific shape, a P/M part in the as-pressed or "green" state goes through a sintering process to metallurgically bond the particles. Subsequent processing steps may be performed such as sizing, coining, machining, or other secondary operations.

E3.45 The expression "pinch point," as used in this standard, refers only to hazards which may exist as a result of moving parts of the P/M press or its associated parts. The expression is not used to describe hazards caused by the tooling at the point of operation, since these hazards are a different problem and require different treatment.

E3.47 See Figure 13.

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Explanatory Information

3.49 quasi-isolation: Quasi-isolation restricts current flow between electrical circuits powered by separate supplies to values that do not affect the voltage characteristics of either power supply. The use of large resistors between separately powered circuit elements is necessary to accomplish quasi-isolation.

3.50 ram: The main load-transmitting P/M press member.

3.51 rebuilder: Anyone who is responsible for, and engaged in, restoring or rebuilding a P/M press to its original condition and capability.

3.52 repeat: An unintended or unexpected successive stroke of the P/M press resulting from a malfunction.

3.53 redundancy: The use of multiple means to perform the same function.

3.54 run: SINGLE STROKE or CONTINUOUS stroking of a P/M press.

3.55 safety-related function: That portion of the control system or safeguarding device that eliminates exposure to a hazardous situation or reduces exposure to a tolerable level.

3.56 set-up: The process of removing or installing workholding devices, tooling, safeguarding, and selecting P/M press settings to ensure proper and safe operation.

3.57 shield: A barrier used to reduce the potential of tooling parts or work pieces from being expelled from the P/M press.

3.58 single cycle or single stroke: One complete cycle of the P/M press, from the initial (open) position through the closing or work-performing position and a return to the initial position.

3.59 single cycle mechanism: A control arrangement used to limit the P/M press to one complete cycle.

3.60 sizing: The re-pressing of the P/M compacted part in the P/M press for the purpose of dimensional control.

3.61 stop, top (cycle) (stroke): An operator control used to stop continuous cycling (stroking) at the end of the cycle (a stroke) or at another predetermined point.

3.62 stop control: An operator control designed to initiate the stopping action of the P/M press.

3.63 stopping performance monitor: A system or device used to monitor the stopping performance of the P/M press.

3.64 stroking selector: See *mode selector*.

E3.50 A ram may also be called a “slide” or “crosshead.”

E3.51 Also known as “reconstructor.” See also, *supplier*.

E3.55 Also known as “control reliability.”

Standard Requirements

3.65 supplier: An individual, corporation, partnership or other legal entity or form of business.

NOTE - For the purpose of this standard, a supplier provides, or makes available for use, all or part of the P/M press.

3.66 tool set: One or more of the following elements: upper punches, lower punches, die and core rods, each necessary to form the part.

3.67 trip or tripping: The momentary actuation of the P/M press control or mechanism to initiate the P/M press cycle.

3.68 turnover bar: A bar used in tool setting to manually turn the crankshaft of the P/M press.

3.69 two-hand trip: An actuating means that requires the concurrent use of both hands of the operator to trip the P/M press.

3.70 unitized die set: See *die set*.

3.71 user: Any entity that utilizes P/M press production systems or related equipment.

Explanatory Information

E3.65 A supplier can be the manufacturer, manufacturer's agent, representative or distributor, reseller, installer, modifier, rebuilder or integrator who provides equipment or services for the P/M press

NOTE - When the user provides any of the above services, the user is considered the supplier.

E3.66 See figure 13

E3.71 Under certain circumstances (i.e., acting as a builder, modifier, integrator), the user may assume the responsibility of a supplier.

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Explanatory Information

4 Responsibility

4.1 Supplier

For purposes of this standard, the supplier can be the manufacturer, integrator, modifier, rebuilder or installer of the P/M press and associated equipment.

Within the scope of the work activity, the supplier shall be responsible to ensure that the design, construction, modification, installation and safeguarding are in accordance with clauses 5, 6, 7 & 8.

4.1.1 Task and hazard identification

The supplier shall be responsible for identifying sources of hazards within the scope of their work activity in accordance with 5.1.

4.1.2 Risk assessment / risk reduction

The supplier shall be responsible for assessing and reducing the risks identified in 4.1.1, in accordance with 5.2.

4.1.3 Documentation (information for use)

The supplier shall be responsible for providing documentation to the user that establishes guidelines for the installation, operation and maintenance of the P/M press and its associated equipment.

E4.1

The supplier should refer to Clause 2 for applicable standards and information relative to the product or service provided.

When the user provides any of the services normally assigned to the supplier, the user is considered to be the supplier within the scope of that work activity.

E4.1.1

All tasks associated with the P/M press and its associated equipment should be identified. Examples of categories of tasks include but are not limited to:

- packing and transportation;
- unloading/unpacking;
- systems installation;
- start-up/commissioning;
- operation (all modes);
- tool change;
- planned maintenance;
- unplanned maintenance;
- major repair;
- recovery from control failure or jams;
- trouble shooting;
- housekeeping;
- decommissioning;
- disposal.

All hazards associated with the tasks should be identified. Annex B gives examples to assist in this process. All tasks associated with the intended use and reasonably foreseeable misuse of the machine should be identified. This should include all phases in the lifecycle of the machine. Intended use includes consideration of the supplier's information for use. The intended use may be determined by the user.

E4.1.2

The risk assessment process yields a level of risk (probability of occurrence of harm and the severity of that harm). If the risk is determined to not be tolerable, (see 5.2), it is necessary to reduce that risk by implementing protective measures. Reduction of risk is the result of the application of one or more protective measures. See also, ANSI B11.TR3 and ANSI B11.19.

The type of protective measure is determined by the nature of the task and associated hazard(s) for the P/M press and its associated equipment under consideration. Protective measures should be selected to provide the desired degree of risk reduction.

E4.1.3

Supplier documentation of the risk assessment and the risk reduction process should demonstrate the procedure that has been followed, and the results that have been achieved. The supplier should provide documentation of protective measures taken and recommendations for additional protective measures to be implemented by the

Standard Requirements

Explanatory Information

4.2 User

The user shall be responsible for the requirements contained in 4.2.1 through 4.2.9.

4.2.1 Task and hazard identification

Identify sources of hazards, including point of operation hazards, associated with the installation, operation and maintenance of the P/M press and its associated equipment in accordance with 5.1.

4.2.2 Risk assessment / risk reduction

Reduce the risks identified in 4.2.1, in accordance with 5.2.

user, system integrator or other entity involved with the P/M press and its associated equipment.

The documentation should include but not be limited to the following, where applicable:

- performance specifications;
- electrical or pneumatic schematics and diagrams;
- physical environment for which the P/M press and its associated equipment is designed;
- function and location of the operator controls, indicators, and displays;
- schedules for periodic maintenance, lubrication, and inspection;
- application of safeguarding and other protective measures;
- auxiliary equipment.

E4.2.1

All tasks associated with the P/M press and its associated equipment should be identified. Examples of categories of tasks include but are not limited to:

- unloading/unpacking;
- systems installation;
- start-up/commissioning;
- set-up and try out;
- operation (all modes);
- tool change;
- planned maintenance;
- unplanned maintenance;
- major repair;
- recovery from control failure or jams;
- trouble shooting;
- housekeeping;
- decommissioning;
- disposal.

All hazards associated with the tasks should be identified. Annex B gives examples to assist in this process.

All tasks associated with the intended use and reasonably foreseeable misuse of the machine should be identified. This should include all phases in the lifecycle of the machine. Intended use includes consideration of the supplier's information for use. The intended use may be determined by the user.

E4.2.2

The risk assessment process yields a level of risk (probability of occurrence of harm and the severity of that harm). If the risk is determined to not be tolerable, (see 5.2), it is necessary to reduce that risk by implementing protective measures. Reduction of risk is the result of the application of one or more protective measures. See also, ANSI B11.TR3 and ANSI B11.19.

The type of protective measure is determined by the nature of the task and associated hazard(s) for P/M press and its associated equipment under consideration. Protective measures should be selected to provide the desired degree of risk reduction.

Standard Requirements**4.2.3 Safeguarding**

Ensure that safeguarding is provided, installed, maintained, and used in accordance with clause 8, for all personnel involved in the production process.

4.2.4 Operation and maintenance

Ensure that the P/M press and its associated equipment is used and maintained in accordance with clause 9.

4.2.5 Tool sets and die sets

Ensure that the design of tool sets and die sets eliminates the need for the operator to place his hands or fingers within the point of operation. See 6.4.

4.2.6 Feeding and part removal

Ensure that point of operation safeguarding as specified in clause 7 is provided for feeding or removing of a part.

4.2.7 Training

Ensure that supervisors, operators, and maintenance individuals are trained in the proper installation, adjustment, operation and maintenance of the P/M press and its associated equipment. See clause 9.

Emphasis shall be placed on instructing personnel concerning hazards involved in the following areas of P/M press operation:

- hazardous conditions associated with projectiles;
- conditions associated with exposure of body parts in hazardous areas;
- pinch points involved with the fixturing, clamping, tool changing and work changing mechanisms, and shields or guards;
- the restrictions on entering enclosures for electrical and power transmission equipment.

4.2.8 Documentation

Ensure that documentation is provided to personnel that establishes the training and safety procedures necessary for operation and maintenance of the P/M press and associated equipment.

4.3 Personnel

Personnel shall be responsible for following the training and safety procedures provided by the user in the operation and maintenance of the P/M press and its associated equipment, in accordance with clause 9.

Explanatory Information**E4.2.3**

Safeguarding is one element of protective measures. See ANSI B11.19 for additional information

E4.2.7

Training and instruction should include reading, or familiarization with, the pertinent contents of the operations manual and the use of all controls on the P/M press.

Examples of projectiles are shattered tooling, part ejection, etc.

E4.2.8

User documentation of the risk assessment and risk reduction process should demonstrate the procedure that has been followed, and the results that have been achieved. The user documentation should include the protective measures taken, the resulting residual risk and the requirements for additional protective measures to be implemented by personnel involved with the P/M press and its associated equipment. See also, ANSI B11.TR3.

E4.3

The Occupational Safety and Health Act of 1970 – Public Law 91-596, states in section 5(b), “Each employee shall comply with occupational safety and health standards and all rules, regulations and orders issued pursuant to this Act which are applicable to his own actions and conduct.”

Standard Requirements

Explanatory Information

5 Hazard Control**5.1 Task and hazard identification**

Reasonably foreseeable tasks and associated hazards shall be identified throughout the lifecycle (design, installation, set-up, operation and maintenance) of the P/M press.

In addition, reasonably foreseeable hazards not directly related to tasks shall be identified.

Tasks and associated hazards shall be identified and reassessed when necessary or whenever the machine is modified or its typical use is changed (see 5.2).

E5.1

Task identification should take into account, but not be limited to the following task categories:

- packing and transportation;
- unloading/unpacking;
- systems installation;
- startup/commissioning;
- set-up and tryout (debug);
- operation (all modes);
- tool change;
- planned maintenance;
- unplanned maintenance;
- major repair;
- recovery from control failure or jam;
- troubleshooting;
- housekeeping;
- decommissioning;
- disposal.

For each of the task categories there may be many tasks. Tasks are specific activities that relate to the task category. Each task category may have numerous tasks associated with it, such as:

- changing a worn upper punch;
- replacing a drive belt on the main motor;
- replacing an oil filter on an HPU;
- troubleshooting a green part cracking problem on machine #7;
- clearing jammed part in sizing P/M press feeder.

For each of the above tasks, there may be numerous hazards. Examples of hazards and hazardous situations addressed within this standard (design/construction, installation, set-up, operation and maintenance) are contained in Annex B.

Following are some examples of reasonably foreseeable hazards not related to tasks:

- failure of a high-pressure hydraulic line;
- bearing failure or bearing seizure;
- failure of the structural components of the machine.

Each time a P/M press is modified or its use is changed, the tasks/hazards associated with the modification or change shall be identified and re-assessed (see 5.2).

For a more detailed discussion on task/hazard combination identification, refer to ANSI B11.TR3.