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Safety of machinery — Safety requirements for extrusion presses for steel and non-ferrous metals

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National foreword

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Sicherheit von Maschinen - Sicherheitsanforderungen an Strangpressen für Stahl und NE-Metalle

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Foreword

This document (EN 14656:2006) has been prepared by Technical Committee CEN/TC 322 “Equipment for making and shaping of metals - Safety requirements”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2007, and conflicting national standards shall be withdrawn at the latest by April 2007.

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

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

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

Introduction

This European Standard is a type C standard as stated in EN ISO 12100.

The equipment concerned and the extent to which hazards and hazardous situations and events are covered are indicated in the scope of this European Standard.

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

Where for clarity an example of a preventative measure is given in the text, this should not be considered as the only possible solution. Any other solution leading to the same risk reduction is permissible if an equivalent level of safety is achieved.

This European Standard assumes that the equipment is operated and maintained by trained personnel.

1 Scope

This European Standard applies to:

— extrusion presses from the exit side of the heater through associated handling, cooling and quenching equipment including, e.g. the puller, the hot saw, the run-out table, the stretcher, the cold saw, cold saw table and/or coiler when incorporated into the equipment, to a point where the extruded product is passed to associated finishing equipment.

It specifies the health and safety requirements at all stages in the life of the equipment, its design, ordering, construction, use and disposal.

This European Standard specifies requirements to be met by the manufacturer to ensure the health and safety of persons during construction, transport, commissioning, operation, maintenance and de-commissioning, as well as in the event of foreseeable faults as malfunctions which may occur in the equipment.

This European Standard deals with all significant hazards, hazardous situations and events relevant to extrusion presses when they are used as intended and under conditions which are reasonably foreseeable by the manufacturer (see Clause 4).

This European Standard is not applicable to extrusion presses which are manufactured before the date of its publication as EN.

2 Normative references

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

EN 294, *Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs*

EN 349, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body*

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

EN 563[1)], *Safety of machinery — Temperatures of touchable surfaces — Ergonomics data to establish temperature limit values for hot surfaces*

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

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

EN 811, *Safety of machinery — Safety distances to prevent danger zones being reached by the lower limbs*

EN 842, *Safety of machinery — Visual danger signals — General requirements, design and testing*

EN 894-1, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 1: General principles for human interactions with displays and control actuators*

[1)] Will be superseded by prEN ISO 14732-2.

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

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

EN 953:1997, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

EN 954-1[2)], *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

EN 981:1996, *Safety of machinery — System of auditory and visual danger and information signals*

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

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

EN 999, *Safety of machinery — The positioning of protective equipment in respect of approach speeds of parts of the human body*

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

EN 1050, *Safety of machinery — Principles for risk assessment*

EN 1088, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection*

EN 1299, *Mechanical vibration and shock — Vibration isolation of machines — Information for the application of source isolation*

EN 1591-1, *Flanges and their joints — Design rules for gasketed circular flange connections — Part 1: Calculation method*

EN 1837; *Safety of machinery — Integral lighting of machines*

EN 10204:2004, *Metallic products — Types of inspection documents*

EN 13480-1, *Metallic industrial piping — Part 1: General*

EN 13480-2:2002, *Metallic industrial piping — Part 2: Materials*

EN 13480-3:2002, *Metallic industrial piping — Part 3: Design and calculation*

EN 13480-4:2002, *Metallic industrial piping — Part 4: Fabrication and installation*

EN 13480-5:2002, *Metallic industrial piping — Part 5: Inspection and testing*

EN 60073:2002, *Basic and safety principles for man-machine interface, marking and identification — Coding principles for indicators and actuators (IEC 60073:2002)*

EN 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2005)*

[2)] Will be superseded by prEN ISO 13849-1.

EN 60825-1, *Safety of laser products — Part 1: Equipment classification, requirements and user's guide (IEC 60528-1:1993)*

EN 61310-1, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, auditory and tactile signals (IEC 61310-1:1995)*

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

EN 61496-1, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests (IEC 61496-1:2005)*

EN ISO 3744, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane (ISO 3744:1994)*

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

EN ISO 3747, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Comparison method for use in situ (ISO 3747:2000)*

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

EN ISO 7731, *Ergonomics – Danger signals for public and work areas – Auditory danger signals (ISO 7731:2003)*

EN ISO 9614-1, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 1: Measurement at discrete points (ISO 9614-1:1993)*

EN ISO 9614-2, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 2: Measurement by scanning (ISO 9614-2:1996)*

EN ISO 11064-1, *Ergonomic design of control centres — Part 1: Principles for the design of control centres (ISO 11064-1:2000)*

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

EN ISO 11203:1995, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions from the sound power level (ISO 11203:1995)*

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

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

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

EN ISO 14122-1, *Safety of machinery — Permanent means of access to machinery — Part 1: Choice of a fixed means of access between two levels (ISO 14122-1:2001)*

EN ISO 14122-2, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways (ISO 14122-2:2001)*

EN ISO 14122-3, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails (ISO 14122-3:2001)*

EN ISO 14122-4, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders (ISO 14122-4:2004)*

ISO 7000, *Graphical symbols for use on equipment — Index and synopsis*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in EN ISO 12100:2003 and the following apply.

NOTE Definitions used in EN and ISO standards referred to in this European Standard are also valid for this European Standard.

3.1
manufacturer
body responsible for the final installation and commissioning of equipment within the scope of this European Standard and which issues the declaration of conformity

3.2
foreseeable risk
hazardous event which may occur during installation, commissioning, operation, maintenance and de-commissioning of the equipment

3.3
maintenance
maintenance, inspection, servicing, repair, lubrication, adjustment and replacement of the equipment in accordance with the manufacturer's instructions

3.4
equipment
extrusion press, ancillary machinery as well as tools and devices used during the operation, maintenance and other activities associated with the extrusion process

3.5
operators' areas
areas where the operators have to be present to control all activities associated with the extrusion process

3.6
site inspection
any inspection carried out in order to gather information relevant to the design and construction of the equipment

4 List of significant hazards

This clause contains all the significant hazards, hazardous situations and events, as far as they are dealt with in this European Standard, identified by a risk assessment as significant for this type of machinery and which require action to eliminate or reduce the risk.

This assessment then formed the basis for determining:

a) the safety features which shall be incorporated into the equipment and

b) any special instructions which shall be communicated to the user.

The significant hazards and hazardous situations are defined in 5.2, columns 1 and 2 of Table 1 and Annex A, Table A.1.

In addition it is important for the manufacturer to carry out an individual risk assessment according EN 1050 to identify any other significant hazard of the machine/equipment. Significant hazards identified in this individual risk assessment but not dealt with in this European Standard shall be reduced by applying the principles of EN ISO 12100-2.

The manufacturer shall establish at the contract stage all hazards which may arise from any foreseeable cause in which the equipment may be used, and the appropriate preventative measures.

The repeated reference to "operating/maintenance instruction" in Table 1 is an instruction to the manufacturer to give details of the information that shall be included in the information for use manual (see 7.5) which shall be supplied with the equipment and which shall be available at all times to the operator(s) and maintenance personnel of the equipment.

5 Safety requirements and/or measures

5.1 General

5.1.1 Introduction

Extrusion presses for steel and non-ferrous metals shall comply with the safety requirements and/or measures of Clause 5.

This clause specifies and explains the preventative measures given in Table 1 and it also describes additional safety features, procedures and techniques which shall be considered by the designer and the manufacturer of the equipment.

5.1.2 Site inspections

The manufacturer shall undertake sufficient site inspections to establish all safety requirements of the equipment design with regard to

a) accessibility, according to the requirements of 5.1.10 and EN ISO 14122-2,

b) maintenance and clearance gaps for cleaning, according to the requirements of EN 294, EN 349, EN 811, EN 953 and EN 1088,

c) movement of machinery and materials, according to the requirements of EN 999,

d) safe operation, according to the requirements of 5.2,

e) health and safety at the workplace, according to the requirements of EN 294, EN 811, EN 953 and

f) prevention of emissions hazardous to health at the workplace (e.g. noise, vibration, pollution).

5.1.3 Structural assembly

The manufacturer shall undertake and record design calculations to show that the structural assembly of the equipment, e.g. materials, auxiliaries, services and potential foundation block ground loadings, are adequate for safety functions under intended use.

NOTE It remains the responsibility of the user to ensure the grounding is suitable to withstand the forces generated by the equipment based on the information supplied by the manufacturer.

5.1.4 Safety layout

A safety layout showing all plant-related safety devices and their position in the plant shall be provided by the manufacturer and shall describe:

a) isolators,

b) emergency stops, according to the requirements of EN 418,

c) escape routes (if necessary, e.g., for large plants),

d) other safety marking, according to the requirements of EN ISO 7731 and EN 842,

e) guards (generic terms), according to the requirements of EN 294, EN 811, EN 953 and EN ISO 14122-2 and

f) fire precautions (if applicable).

5.1.5 Safety devices

Safety devices which require regular monitoring, e.g., fixed guards, interlocked guards, light beams, proximity devices and emergency stops, shall be accessible for inspection and maintenance and protected against damage under foreseeable conditions. In particular, they shall be selected, constructed and be sufficiently robust to operate reliably.

5.1.6 Railings

Railings shall not be used as the sole measure for safeguarding danger zones. They are intended to prevent slips, trips and falls.

5.1.7 Discharge of fluids

The manufacturer shall give instructions for discharge of fluids in case of maintenance of the fluid systems or due to a leakage. These instructions shall include information for sealed surfaces (e.g. foundation), drains and the fluid that will be discharged.

5.1.8 Personal protective equipment (PPE)

The manufacturer shall give information in the instruction handbook (see 7.5) on the required type of personal protective equipment needed to safeguard personnel from any risks remaining after applying the safety measures.

5.1.9 Warning devices and safety signs

Warning devices and safety signs are additions to the design requirements to reduce hazards. Warning devices and safety signs according to EN 61310-1 and EN 61310-2 shall be used.

Appropriate signs shall be in accordance with ISO 7000.

Danger signals shall be in accordance with EN ISO 7731 and/or EN 842 and/or EN 981.

Warning signs shall be affixed so that they are visible from outside the danger zone.

The manufacturer shall not rely upon warning devices and safety signs alone to reduce hazards in case of significant risks.

5.1.10 Access

The manufacturer shall take account of the following:

a) access to the plant shall be controlled in such a way that unintentional entry into any danger zone shall not be possible, considering EN ISO 12100-2 and EN 953;

b) access to control desks, pulpits, underground areas, inspection and service floors shall be protected against heat radiation, jets of high pressure fluids and designed to withstand moving materials and tools (if any), according EN 294, EN 811, EN ISO 14122-1, EN ISO 14122-2, EN ISO 14122-3 and EN ISO 14122-4;

c) surfaces for walking or standing shall be so designed, that risks of slipping caused by scale, oil and/or lubricant are minimised;

d) the relevant category for controls for access to equipment during operation or maintenance shall be selected from B.2 and consider the requirements of EN 1037;

e) areas of the equipment which are entered regularly due to maintenance reasons shall be easily accessible and considering a).

5.1.11 Electrical equipment

Electrical equipment shall meet the requirements of EN 60204-1. In particular the manufacturer shall construct and install all electrical equipment so that it is capable of withstanding all hazards, including those from heat, vibration, wet conditions, identified in the risk assessment required at the design stage and taking into account the requirement set out in Annex B.

5.1.12 Safety control system

Each safety control shall be selected in accordance with the severity of the risk as described in EN 954-1. The function of each safety control shall be considered in combination with other elements of the safety control system and shall be selected so as it does not reduce the safety level of any other component of the control system.

For the hazards listed in Table 1 where an electrical control system is involved a risk assessment shall be carried out according to EN 954-1.

5.1.13 Guards

Guards shall be provided to prevent access to a danger zone. They shall be selected as appropriate for the degree and frequency of access to be permitted, e.g. an enclosing guard or distance guard, fixed or movable with interlock. This selection shall be made according to EN 953. Interlock systems shall meet the requirements of EN 1088.

The requirements of the guards shall conform to Clause 5 of EN 953:1997 and to EN 294, EN 349, EN 811.

5.1.14 Surface temperatures

Surfaces, which are intended to be touched with bare hands, shall have temperatures not exceeding the burn threshold for the contact time and material as specified in EN 563.

5.1.15 Operators' visibility

A good operators' visibility to the operating process shall be provided. Where it is not possible to prevent access to hazardous areas which are not naturally visible from the operator’s position, e.g. the die during break-through of the profile, devices shall be provided

— to prevent the operation of the equipment while a person is present in the area and/or

— to give the operator a clear view of the hazardous area, e.g. suitably placed mirrors or closed circuit televison (CCTV).

5.1.16 Hydraulic and pneumatic systems

Hydraulic and pneumatic systems shall meet the requirements of EN 982, EN 983 and Annex A.

5.1.17 Ergonomics

Operators positions and places which are regularly visited for the purposes of routine maintenance shall be designed to ergonomic principles described in EN 894-1, EN 894-2 EN 894-3, EN 614-1 and EN ISO 11064-1.

5.2 List of significant hazards, hazardous situations, safety requirements and/or measures

Table 1 is developed to allow the designer and manufacturer of the equipment to apply a logical approach to checking their design proposals against the list of significant hazards that have to be addressed for their particular extrusion equipment.

Hence the layout of Table 1 traces the route of the extrusion process

— from the billet handling and transfer station(s) (see 5.2.1) to the

— press and die handling positions (see 5.2.2) through to the

— run-out, cooling and finishing sections of the equipment (see 5.2.3).

The table then addresses miscellaneous hazards (5.2.4) difficult to categorise (e.g. noise, vibration radiation, materials/substances and ergonomic hazards).

Each of the items listed in 5.2.1, 5.2.2 and 5.2.3 addresses the mechanical, hydraulic/pneumatic, electrical and thermal hazards where they are relevant. Each clause is further subdivided into extrusion presses for steel, aluminium and copper/brass processing. This approach allows the designer to pick the process appropriate to his equipment.

Table 1 is a comprehensive presentation of identified significant hazards, the situations that give rise to the hazards, the safety requirements to reduce risks, and the means of verifying their presence:

— column 1 identifies the significant hazards;

— column 2 describes the hazardous situations;

— column 3 specifies the safety requirements and/or measures to avoid or minimize the risk. They are shown as combined measures or as options;

— column 4 makes references to clauses or standards which are relevant to the safety requirements and/or measures identified in this European Standard to avoid or minimize the risk;

NOTE 1 When implementing safety requirements and/or measures it has to be considered that different hazards may appear at the same time.

NOTE 2 5.3 contains special safety requirements or measures.

— column 5 identifies the verification method(s) to be used to demonstrate conformity. Verification may involve more than one method. The abbreviations V, D and M are defined as follows:

V: Visual inspection verifies the required features of the components.

D: Drawings and/or calculations verify that the design characteristics of the components provided meet the requirements of the relevant standards.

M: Measurement or mode test verifies that requirements are met, within the tolerances permitted by the relevant standards.

For further information on verification see Clause 6.

Table 1 — List of significant hazards, hazardous situations, safety requirements and/or measures

Column 1	Column 2	Column 3	Column 4	Column 5
Significant hazards	**Hazardous situation**	**Safety requirements and/or measures**	**References**	**Verification**
5.2.1 Billet handling and transfer equipment				
5.2.1.1 Mechanical hazards for all metals				
General	1 Uncontrolled entry into hazardous work zones	1.1 Restrict access	— See 5.1.10	D, V
		1.2 Provide devices to give clear view to areas not visible from control stand	— See 5.1.15	D, V
		1.3 Provide warning signs and visible and/or audible signals.	— See 5.1.9 — EN ISO 7731 — EN 842 — EN 61310-1	V, M
		1.4 Operating/maintenance instruction: include advice on the use of procedures for safe systems of working, e.g. use of safety locks, access only for authorised persons.	— See 7.5.5	V, M
Crushing, shearing, severing, entanglement	1 Access into danger zone when internal components, e.g. billet charger, billet cutting devices and transmission machinery are in operation.	1.1 Fixed distance guards at least 1 800 mm high which enclose the danger zone.	— See 5.1.13	D, V
		1.2 Fixed distance guards may include interlocked movable guards which, when opened, stop the movement of components before access is possible. The interlocked movable guards shall also stop the movement of components in other sections of the machine, e.g. those in the press and die handling areas, if access is possible to them from the billet handling area.	— See 5.1.13 — EN 1088 — See 5.1.12	D, V, M
		1.3 Where ducts through guards are necessary they shall be so designed that any possible access shall be prevented.	— See 5.1.13	V

Table 1 (*continued*)

Column 1	Column 2	Column 3	Column 4	Column 5
Significant hazards	**Hazardous situation**	**Safety requirements and/or measures**	**References**	**Verification**
	2 Unexpected movement or start-up of components during non-production cycles, e.g. during maintenance, inspection, repair and setting.	2.1 Provide means to stop supply of energy and where appropriate release of unnecessary residual energy to the components, e.g. by hydraulic dump valves, pneumatic exhaust valves and electrical isolators.	— See 5.1.16 — EN 982 — EN 983 — EN 60204-1	V, M
		2.2 Where interlocked movable guards are provided, the valves and isolators shall be activated by the guard interlocking devices. Valves and isolators shall remain de-activated even when guards are closed, and shall only be re-activated from safe positions outside the protected hazardous area with a clear adequate view of the danger zone.	— See 5.1.12 — See 5.1.13	D, V, M
Impact	1 Struck by falling materials or tools falling from overhead.	1.1 Provide toeboards at open edges of permanent working platforms and walkways.	— See 5.1.10 — EN ISO 14122-2	D, V
	2 Ejected parts of equipment.	2.1 Select components to withstand design forces.	— See 5.1.13 — EN 1088	D
	3 Falling machine components during their removal or replacement.	3.1 Mechanical protection against unexpected movement of component(s) during removal or replacement, e.g. temporary securing bolts, latches, supports.	— See 5.3.4	V, D
		3.2 Operating/maintenance instruction: include advice on means to support components.	— See 7.6	V
	4 Trapping between stationary and rolling billets on transfer ramp between furnace and billet transfer arms, and on billet reject conveyor.	4.1 Fixed distance guards at least 1 800 mm high which enclose the danger zone.	— See 5.1.13	D, V
		4.2 Fixed distance guards may include interlocked movable guards which, when opened, stop the movement of components before access is possible. The interlocked movable guards shall also stop the movement of dangerous components in other sections of the equipment, e.g. those in the press and die handling area, if access to them is possible from the billet handling area.	— See 5.1.12 — See 5.1.13 — EN 999 — EN 1088 — EN 60204-1	D, V, M
5.2.1.2 Thermal hazards for all metals				
Burns	1 Contact with hot surfaces, e.g. billet and billet transfer devices.	1.1 The guards provided to prevent impact injuries shall be designed to prevent accidental contact with hot billets and billet transfer devices during production cycles.	— See 5.1.13	D, V
		1.2 Appropriate signs giving warning of hot surfaces affixed to the guards.	— See 5.1.9 — EN 61310-1	D, V

Table 1 (*continued*)

Column 1	Column 2	Column 3	Column 4	Column 5
Significant hazards	**Hazardous situation**	**Safety requirements and/or measures**	**References**	**Verification**
		1.3 Operating/maintenance instruction: include advice on appropriate personal protective equipment, e.g. fire resistant gloves and overalls for maintenance and similar activities.	— See 5.1.8 — See 7.6	V
	2 Contact with billets on transfer ramp between heater and billet transfer arms, on the billet reject conveyor and on the hot billet storage rack.	2.1 The guards provided to prevent impact injuries shall be designed to prevent contact with hot billets.	— See 5.1.13	D, V
Fire	1 Bursting of, or leaks from hydraulic hoses, pipes and fittings	1.1 Protect hoses, pipes and fittings with metal shields or covers.	— See Annex A	V
	2 Ignition of oil on billet transfer conveyor or ramp.	2.1 Operating/maintenance instruction: include advice on regular cleaning.	— See 7.5.5	V
5.2.1.3 Additional requirements for aluminium presses				
Scalds	1 Contact with hot billet quenching water.	1.1 Provide local shielding to contain spraying hot water.	— See 5.1.13	D, V
5.2.2 Press, die and disc handling equipment				
5.2.2.1 Mechanical hazards for all metals				
Crushing, shearing, severing, entanglement	1 Access into danger zone when internal components are in motion, e.g. — press ram, — movable crosshead, — container holder, — side rams, — transmission machinery, — die carrier, — butt shear or saw or other cutting devices, — butt-end discard pusher and — discard conveyer.	1.1 Fixed guards at all possible access points to prevent access to the dangerous moving components by any part of a person's body.	— See 5.1.10 — See 5.1.13	D, V
		1.2 If the above is not possible, provide fixed distance guards at least 1 800 mm high which enclose the danger zone.	— See 5.1.13	D, V
		1.3 Fixed distance guards may include interlocked movable guards which, when opened, stop the movement of components before access is possible. The interlocked movable guards shall also stop the movement of dangerous components in other sections of the equipment, e.g. those in the billet handling and transfer area, if access is possible to them from the press and die handling area.	— See 5.1.12 — See 5.1.13 — EN 1088	D, V, M
		1.4 Where ducts through guards are necessary they shall be so designed that any possible access shall be prevented.	— See 5.1.13	D, V, M
	2 Unexpected movement or start-up of components during non-production cycles, e.g. during maintenance, inspection, repair and	2.1 Provide means to stop supply of energy and where appropriate release of unnecessary residual energy to the components, e.g. by hydraulic dump valves, pneumatic exhaust valves and electrical isolators.	— See 5.1.16 — EN 982 — EN 983 — EN 60204-1	D, V, M

Table 1 (*continued*)

Column 1	Column 2	Column 3	Column 4	Column 5
Significant hazards	**Hazardous situation**	**Safety requirements and/or measures**	**References**	**Verifi-cation**
	setting.	2.2 Where interlocked movable guards are provided, the valves and isolators shall be activated by the guard interlocking devices. Valves and isolators shall remain de-activated even when guards are closed, and shall only be re-activated from safe positions outside the protected hazardous area with a clear adequate view of the danger zone.	— See 5.1.12 — See 5.1.13	D, V, M
	3 Access into danger zone when the dummy block loading device and the dummy block and butt end catcher are in operation.	3.1 The components shall be enclosed by the guards required to prevent this hazard under 5.2.1.1 “Mechanical hazards for all metals” above.	— See 5.1.13	D, V
Impact	1 Ejection of parts of the die.	1.1 Operating/maintenance instruction: include advice on the maintenance of the die carrier to ensure it is correctly aligned before extrusion commences.	— See 7.6	V
	2 Ejection of scale and flush from die/container sealing area.	2.1 Provide shielding to contain ejected particles within the press area.	— See 5.1.13	D; V
		2.2 Appropriate signs giving warning of ejected particles.	— See 5.1.9 — EN 61310-1	D, V
		2.3 Operating/maintenance instruction: include advice on the use of appropriate PPE, e.g. eye protection.	— See 5.1.8 — See 7.5.5	V
	3 Ejection of fragments of mandrels, broken dies or extruded metal during break through.	3.1 Provide remote means of inspection to establish quality of break through at the die, e.g. closed circuit television or mirrors and	— See 5.1.15	D, V, M
		3.2 a light beam in the area of the break through of the die. If interrupted, it shall stop the extrusion process and	— EN 954-1 — EN 61496-1	D, V, M
		3.3 a solid fence at the end of the run-out table which is of sufficient strength to withstand the impact of an ejected mandrel and die fragment.	— See 5.1.13	V, D, M
	4 Struck by falling materials or tools falling from overhead.	4.1 Provide toeboards at open edges of permanent working platforms and walkways	— See 5.1.6 — EN ISO 14122-2	D, V
	5 Falling machine components during their removal or replacement.	5.1 Mechanical protection against unexpected movement of component during removal or replacement, e. g. temporary securing bolts, latches, supports.	— See 5.3.4	D, V
		5.2 Operating/maintenance instruction: include advice on means to support components.	— See 7.6	V

Table 1 (*continued*)

Column 1	Column 2	Column 3	Column 4	Column 5
Significant hazards	**Hazardous situation**	**Safety requirements and/or measures**	**References**	**Verification**
	6 Slip, trip, falls.	6.1 Ladders, walkways, floors and stairs shall be designed and constructed without any tripping hazards, be easy to maintain and keep clean, treated with slip resistant material and positioned to not be contaminated with oils and greases.	— See 5.1.10	V, D
		6.2 Provide adequate lighting on the equipment if appropriate.	— EN 1837	D
	7 Falls from heights.	7.1 Design to obtain access to various parts of machine and eliminate potential risks by guard rails around open edges of platforms, walkways and stairs.	— See 5.1.10	D
		7.2 Locate calibration and regular lubrication points at places which are easily accessible for maintenance.	— See 5.1.10 — See 5.1.16	D
5.2.2.1.1 Additional requirements for copper and brass presses				
Crushing, shearing, severing, entanglement	1 Access between the moving die and the clamping devices at die changing area.	1.1 Provide a fixed guards or a combination of fixed guards to prevent access to the moving components and	— See 5.1.13	V
		1.2 interlocked movable guards, or	— See 5.1.13 — EN 1088	V
		1.3 light beams which will stop the movement of the components before access is possible.	— EN 954-1 — EN 999 — EN 61496-1	V, M
5.2.2.2 Thermal hazards for all metals				
Burns	1 Contact with hot surfaces, e.g., during die changing and entry for maintenance.	1.1 Appropriate signs giving warning of hot surfaces affixed to the guards provided to prevent crushing and/or shearing and/or severing and/or entanglement.	— See 5.1.9 — See 5.1.10 — EN 61310-1	D, V
		1.2 Operating/maintenance instruction: include advice on the use of appropriate PPE, e.g. fire resistant gloves and overalls.	— See 5.1.8 — See 7.5.5	V
Fire	1 Bursting of, or leaks from, hydraulic hoses, pipes and fittings.	1.1 Protect hoses, pipes and fittings with means of metal shields or covers.	— See Annex A	D, V
	2 Ignition of oil and other combustible materials by hot material, e.g., billet, butt-ends and scale falling into oil sump.	2.1 Provide scale collecting devices.	— See 5.1.7	D, V, M
		2.2 Provide gratings to cover oil sump.	— See 5.1.7	D, V, M
		2.3 Operating/maintenance instruction: include advice on regular cleaning of oil sump. The scale collecting area shall be designed to allow safe access for regular cleaning and shall be free of obstacles.	— See 5.1.7 — See 5.1.10 — See 7.5.5	D, V

Table 1 (*continued*)

Column 1	Column 2	Column 3	Column 4	Column 5
Significant hazards	**Hazardous situation**	**Safety requirements and/or measures**	**References**	**Verification**
5.2.2.2.1 Additional requirements for aluminium presses				
Burns	1 Contact with hot butt-end.	1.1 Appropriate signs giving warning of hot surfaces affixed to the guards provided to prevent crushing and/or shearing and/ or severing and/or entanglement.	— See 5.1.9 — EN 61310-1	D, V
		1.2 Operating/maintenance instruction: include advice on the use of appropriate PPE, e.g. fire resistant gloves and overalls.	— See 5.1.8 — See 7.5.5	V
5.2.2.2.2 Additional requirements for steel presses				
Burns	1 Contact with flying hot cuttings.	1.1 Provide shielding.	— See 5.1.13	D, V
5.2.2.2.3 Additional requirements for copper and brass presses				
Burns	1 Contact with hot butt-ends on butt-end reject conveyor.	1.1 Provide fixed screens to prevent contact with butt ends.	— See 5.1.13	D, V
5.2.3 Run-out, cooling and finishing equipment				
5.2.3.1 Mechanical hazards for all metals				
Crushing, shearing, severing, entanglement	1 Access to transmission machinery, e.g. chains and sprockets, belts and pulleys and rotating drive shafts.	1.1 Totally enclose in the machine frame or provide local fixed guards which prevent access to the injury-causing components, e. g. shafts and in-running nips of rotating/moving driven elements.	— See 5.1.10 — See 5.1.12 — See 5.3.2	D, V, M
5.2.3.1.1 Additional requirements for aluminium presses				
Crushing, shearing, severing, entanglement	1 Access to moving components, e.g., puller jaws, hot saw or other extrusion cutting device.	1.1 Provide fixed guards at least 1 800 mm high at rear of the run-out table, which extend for the full length of the run-out table.	— See 5.1.13	D, V
		1.2 The hot saw blade shall be retained in a covered enclosure when not cutting extrusions.	— See 5.1.13	D, V
		1.3 Provide a light beam across the open area between the die to the cooling table which, if interrupted, will stop the operation of the puller jaws and will either a) return the hot saw blade to its enclosure or b) stop the movement of any other ancillary devices of this area.	— See 5.1.5 — EN 954-1 — EN 61496-1	D, V, M
	2 Access between closing stretcher jaws.	2.1 Provide light guards or other devices which shall, if interrupted, return the jaws to their open position.	— See 5.1.13 — EN 954-1 — EN 61496-1	D, V, M

Table 1 (*continued*)

Column 1	Column 2	Column 3	Column 4	Column 5
Significant hazards	**Hazardous situation**	**Safety requirements and/or measures**	**References**	**Verification**
Impact	1 Struck by returning puller.	1.1 Provide fixed guards at least 1 800 mm high at the rear of the run-out table, which extend for the full length of the run-out table.	— See 5.1.13	V
		1.2 The fixed guards may include interlocked movable guards which, when opened, stop the movement of the puller before access is possible.	— See 5.1.13 — EN 1088	V, M
		1.3 Provide light beams or proximity detectors, etc. extending the complete length of the run-out table and positioned between the run-out table and cooling beds which, if interrupted, shall arrest any movement of the puller, or provide other safety arrangements that prevent access to the moving puller.	— See 5.1.12 — EN 61496-1	V, M
	2 Whipping extrusions entrapped in the returning puller jaws.	2.1 Provide a trip device situated at the hot saw end of the run-out table and which is interlocked into the puller return cycle so that it shall arrest the returning puller if it is operated by material trapped in the returning puller jaws, e.g. plates which rise across the run-out table after the extrusion has cleared the place in which they are situated and are interlocked into the puller power supply on the return cycle.	— EN 954-1 — EN 60204-1	V, M
	3 Struck by falling water box or air cooling device.	3.1 Design water box or air cooling device to avoid free suspension.		V, D
5.2.3.1.2 Additional requirements for steel presses				
Crushing, shearing, severing, entanglement	1 Access to outlet trough and/or roller table.	1.1 Fixed guards shall be provided where access is possible from the front, rear and ends of the run-out table or quench tank.	— See 5.1.13	D, V
		1.2 Fixed guards shall include interlocked movable guards which, when opened, stop the movement of dangerous components before access is possible.	— See 5.1.12 — See 5.1.13 — EN 999 — EN 1088	V, M
5.2.3.1.3 Additional requirements for copper and brass presses				
Crushing, shearing, severing, entanglement	1 Access to moving puller jaws and shear.	1.1 Fixed guards shall be provided where access is possible from the front, rear and ends of the run-out table or quench tank.	— See 5.1.13	D, V, M

Table 1 (*continued*)

Column 1	Column 2	Column 3	Column 4	Column 5
Significant hazards	**Hazardous situation**	**Safety requirements and/or measures**	**References**	**Verification**
		1.2 Fixed guards shall include interlocked movable guards which, when opened, stop the movement of dangerous components before access is possible.	— See 5.1.12 — See 5.1.13 — EN 999 — EN 1088	D, V, M
	2 Access to shears or other extrusion cutting devices.	2.1 Shears shall be designed to operate inside fixed guards which enclose the shears to greatest extent possible.	— See 5.1.13	D, V, M
		2.2 Saw blades shall be retained in enclosures when not cutting extrusions.	— See 5.1.12 — See 5.1.13	D, V, M
5.2.3.2 Thermal hazards for all metals				
Scalds	1 Sprayed by escaping water from water box.	1.1 Provide shielding to contain sprayed water.	— See 5.1.13	D, V
Burns	1 Contact with hot material.	1.1 Provide shielding to prevent burns from flying swarf from hot saw.	— See 5.1.13	V
		1.2 Operating/maintenance instruction: include advice on the use of appropriate PPE, e.g. fire resistant gloves and overalls.	— See 5.1.8 — See 7.5.5	V
5.2.4 Miscellaneous hazards for all machines and all metals				
5.2.4.1 Mechanical hazards				
Slips, trips, falls	1 On or from stairs, ladders, platforms or walkways.	1.1 Open sides of platforms and walkways shall be fitted with secure guard-rails and toeboards.	— See 5.1.10 — EN ISO 14122-2	D, V
		1.2 Stairways shall be provided with a handrail to a height of 1 100 mm and, if there is an open side, the handrail will be on that side.	— See 5.1.10 — EN ISO 14122-3	D, V
		1.3 All treading surfaces of stairs, walkways and platforms shall be constructed to prevent slipping and capable of being easily cleaned of oil, grease etc.	— See 5.1.10	D, V
5.2.4.2 Hydraulics (see Annex A)				
5.2.4.3 Electrical hazards (see Annex B)				
5.2.4.4 Radiation hazards				
Laser beam	1 Laser light can cause eye damage.	1.1 Use of low energy lasers (class 1 or 2) and, wherever possible, a controlled beam path.	— See 5.1.5 — EN 60825-1	D, V
		1.2 Safety marking.	— EN 60825-1; Clause 5, Clause 6, Table D.2	D, V

Table 1 (*continued*)

Column 1	Column 2	Column 3	Column 4	Column 5
Significant hazards	**Hazardous situation**	**Safety requirements and/or measures**	**References**	**Verification**
		1.3 Operating/maintenance instruction: include advice on the use of appropriate PPE.	— See 5.1.8 — See 7.5.5	V
5.2.4.5 Materials and substances hazards				
Substances hazardous to health	1 Combustion of hydraulic fluids can cause release of substances hazardous to health.	1.1 See Annex A.	— See Annex A	D, M
Gases	1 Accidental discharge of gases from fixed fire extinguishing systems, e.g. in basements, control rooms	1.1 Provide manual override to isolate automatic extinguishing systems when area is occupied.	— See 5.1.12 — EN 954-1	D, V, M
		1.2 Audible warning devices.	— See 5.1.9 — EN ISO 7731 — EN 981:1996; Table 3	D, V, M
		1.3 Operating/maintenance instruction: include advice for proper procedures during maintenance and servicing.	— See 7.6	V
5.2.4.6 Ergonomic hazards				
	1 Poor design of equipment may cause fatigue, backache and lack of concentration.	1.1 Provide equipment to meet ergonomic standards on reach, height and standing conditions.	— See 5.1.13 — See 5.1.16 — EN 60073:2002, 4.2.1	D, M
	2 Manual handling when changing fixed or loose dummy blocks or tool changing and handling of extruded material.	2.1 Provide mechanical handling aids, accessories and lifting aids.	— EN 614-1	V, D, M
	3 Restricted working areas particularly during changing dies and tools or fixed dummy blocks and during maintenance.	3.1 Design equipment to provide safe reach, limit the need for lifting or provide lifting equipment as necessary.	— See 5.1.10 e)	D, M
		3.2 Calibration and lubrication points shall be positioned at easily accessible areas.	— See 5.1.10 e)	V, D
5.2.4.7 Noise (see 5.4, Clause 6 and Annex C)				M

5.3 Special safety requirements and/or measures

5.3.1 General

The application of the following safety requirements are given in 5.2, Table 1.

5.3.2 Accessible rotating/moving parts

Accessible drive shafts, couplings, belts and chains, pulleys and sprockets (i.e. where the safety distances in EN 294 cannot be achieved) shall be guarded in accordance with EN 953 (see also 5.1.13).

Drive shafts and couplings shall be designed with a smooth surface without protruding parts except where they are operationally essential.

Rotating shafts should be marked so that it is visually evident when the shafts are in motion.

5.3.3 Hold-to-run control device

If necessary, a hold-to-run control device shall be provided to ensure that the operator cannot reach danger zones during the hazardous movement of components. The operator shall have a clear view of the danger zone, e.g. by mirrors or CCTV. Release of a hold-to-run control device shall immediately bring the movement to a standstill.

5.3.4 Mechanical restraint devices

Mechanical restraint devices shall be selected depending on the design, e.g. safety bolts, latches, scotches and brakes. Where safety bolts are selected which operate automatically, their correct locking shall be monitored. Where safety bolts or latches are to be set by hand they shall be clearly identifiable and permanently attached on the equipment to be protected, e.g. with a chain.

In case that the moving parts be controlled by electrical (voltage) switches, it shall be ensured, that the component is held in a process-related and safe position and all mechanically movement force is released.

5.4 Noise reduction as a safety requirement

5.4.1 Noise reduction at source by design

When designing a machine, technical measures for reducing noise at source at the design stage shall be considered according to EN ISO 11688-1. Examples for general measures which should be considered are:

— selection of low noise components such as low noise hydraulic pumps, motors or control elements;

— reduce impact energy, e.g. by height of fall of butt-ends and scrap;

— reduce oscillation amplitude or vibration frequency, e.g. by reducing unbalance, increasing mass;

— reduce noise of gas flow, e.g. low-noise nozzles and sound absorbers;

— dampening of structure-borne noise, e.g. by design and material selection;

— insulation of structure-borne noise, e.g. by vibration isolated mounting of pumps.

The above list of technical measures is not exhaustive; alternative technical measures for noise reduction with identical or greater efficacy can be used.

Where the above technical measures do not reduce noise to safe levels, noise reduction by protective measures will be necessary.

NOTE EN ISO 11688-2 gives useful information on noise generation mechanisms.

5.4.2 Noise reduction by protective measures

The secondary noise control can be achieved, e.g. by the increase of noise dampening and insulation, physical separation for noise source and receiver. Examples are reductions by using:

— enclosures, e.g. encasing pumps, motors and saws with sound insulating materials;

— screens fitted to the machine,

— silencers in pneumatic exhaust, outlets and radial fan inlets and/or

— increased distance between source and operator (e.g. pulpit, local control desk).

NOTE The efficacy of such protective measures can be estimated, e.g. by using EN ISO 11546-1 (for enclosures), EN ISO 11691 and EN ISO 11820 (for silencers) and EN ISO 11821 (for screens).

5.4.3 Noise reduction by PPE

Recommendation to wear a hearing protection shall be given in the Information for use manual, see 7.5.5, indent l), 3).

6 Verification of the safety requirements and/or measures

It is necessary to verify that the requirements of this European Standard have been considered in the design and manufacture of an extrusion press. The verification required is defined in 5.2, Table 1, and Annex A, Table A.1. Verification of electrical safety shall be made according to EN 60204-1 and for the noise according to the noise test code given in Annex C.

7 Information for use

7.1 General

The essential requirements for the information for use are listed in Clause 6 of EN ISO 12100-2:2003.

Essential maintenance operations carried out in hazardous areas shall be authorised and performed in accordance with a written safe system of work.

In addition to these requirements special consideration shall be given to the following points:

7.2 Location and nature of information for use

The manufacturer shall decide in agreement with the user the location for such information for use and shall provide in the information for use a safety layout according 5.1.4 showing the type and location of the relevant signals and warning devices.

7.3 Safety devices, warning signs and labels

7.3.1 Safety devices

The manufacturer shall instruct the user that if a faulty or ineffective safety device is discovered (see also 5.1.5), either it shall be replaced immediately or if a replacement is not available, this equipment shall be completely shut-down.

7.3.2 Warning signs and labels

Any warning sign or label attached to or adjacent to any machine dealt with in this European Standard shall meet the requirements as defined in 5.1.9.

7.4 Marking

The following information shall be attached clearly, readably and durably to the equipment:

— name and address of manufacturer,

— designation of series or type,

— mandatory marking[3)],

— serial number/machine number, if any and

— year of manufacture.

Auxiliary electric equipment shall be fitted with durable plates containing data, in accordance with EN 60204-1 including casing protection grade.

The hydraulic and/or pneumatic equipment shall be fitted with legible and durable plates containing data in accordance with 7.3 of EN 982:1996 and/or 7.3 of EN 983:1996.

7.5 Instruction handbook

7.5.1 General

The manufacturer shall provide an instruction handbook for each machine/equipment (see also Clause 6 of EN ISO 12100-2:2003), covering all auxiliary systems.

The following items describe the structure and content of an instruction handbook and shall be completed or extended in consideration of the specific machine.

7.5.2 Machine declaration

The machine declaration shall include the following:

a) manufacturer, type of machine, year of manufacturing, serial number (if any),

b) technical documents (circuit diagrams, data sheets, information/reference for spare parts),

c) particulars of interfaces with additional machine outside the scope of this European Standard and

d) description of auxiliary equipment and the installation of the control system of these, e.g., emergency stop and the effect of this upon the safety devices.

7.5.3 Instructions about transport and installation

Instructions on the above matters shall include the following:

a) instructions for safe lifting, e.g. position of points and techniques,

---

3) For machines and their related products intended to be put on the market in EEA, CE marking as defined in the European applicable directive(s), e.g. Machinery, Low Voltage, Explosive Atmosphere, Gas Appliances.

b) transportation weight,

c) transport safety devices and removal of these before commissioning,

d) dimensional plan(s) of machine layout and ancillary equipment within the scope of this European Standard and

e) how to install and assemble the machine or single parts of it.

7.5.4 Information about commissioning and de-commissioning

Information shall be given highlighting the associated significant risks and instructions on remedial measures needed to be taken. In particular, they should include details about:

a) location and type of energy systems (electric, hydraulic, pneumatic),

b) fluid contents in the systems,

c) specification of fluids,

d) use and fitting of special devices, e.g. for lifting, emptying hydraulic systems etc.,

e) safe starting, operation and shut-down,

f) inspection and proofing of safety devices before commissioning,

g) prohibition of unauthorised reconstruction and modification and

h) reference for de-commissioning, e.g. disposal of high pressure fluids, emptying instructions (see Annex D).

7.5.5 Instructions about operation, including significant hazards and their remedies

Instructions on the above matters shall include the following:

a) use of safety devices,

b) regular inspection of safety devices,

c) instructions for the use of personal protective equipment (PPE),

d) characteristic hazards, e.g. current, hydraulic, especially references to setting up and re-commissioning after setting up,

e) processing materials which generate fume or dust hazardous to health including cleaning requirements,

f) description of safety related control systems,

g) references about the qualification level of operators,

h) instruction to be given to the operator how to operate the machine,

i) action in the event of faults or irregularities and abnormal operation,

j) information on hazards due to:

   1) non-relieved pressures,

   2) malfunction of programmable electronic systems,

   3) temperature and

4) fire;

k) escape routes;

l) information about noise emission according to Annex C, where necessary recommendation to, e.g.

1) implement enclosures, screens by the user,

2) use of cabins for the personnel,

3) wear personal protective equipment, i.e. hearing protection and

4) visual sign posting of noisy areas,

m) information on residual hazards, for example, due to

1) radiation,

2) hot surfaces in the working area,

3) ejection of material or product parts and

4) information on particular hazards in case of access on special occasions, e. g., maintenance, trouble-shooting shall be pointed out in the information for use manual and on the machine by markings / symbols referring to the nature of hazard (see EN 61310-1). If the protective devices are not operational during this action, the necessary actions shall be indicated,

n) non-intended use, e.g. forbidden use of specific auxiliary equipment, prohibition of specific materials and

o) intended use.

7.6 Maintenance manual

The maintenance manual shall contain instructions for, or information on:

a) maintenance activities that require special knowledge or qualification, e.g., press alignment,

b) spare parts with reference to drawings or circuit diagrams,

c) an inspection schedule of the safety devices (the frequency of these thorough inspections shall be defined at the design stage according to the reliability, nature and importance of the device),

d) checking the effectivity of isolation of dangerous components before maintenance work commences,

e) precautions needed during re-commissioning,

f) preventative measures, e.g., inspection and replacement of safety related wear parts within the scope of this European Standard,

g) the action to take at prime fault information from the control panel,

h) fault lists with specifications of causes and action to be taken,

i) which parts of the system(s) shall be electrically isolated during repair work,

j) remaining residual energy (hydraulic reservoir etc.) and

k) where necessary, warnings and instructions about hot surfaces.

Annex A
(normative)

Safety requirements for hydraulic, pressure water and lubrication systems

A.1 Significant hazards

Risks identified as significant as a result of using the equipment were considered when this annex was prepared.

The significant hazards and hazardous situations are tabulated in Table A.1 together with the appropriate safety requirements and/or measures. This table contains all hazards identified as significant for extrusion presses and which require measures to eliminate or reduce risks. For easy reference Table A.1 also indicates the corresponding additional preventative measures in conjunction with A.2 if necessary.

Manufacturers shall identify through their own risk assessment (EN 1050) which of the hazards listed below are significant for custom made equipment. Additional significant risks identified in the individual risk assessment shall be dealt with according to EN ISO 12100.

A.2 Safety requirements and/or measures

A.2.1 General

Equipment shall comply with the safety requirements and/or measures of A.1 and A.2. In addition, the equipment shall be designed according to the principles of EN ISO 12100-2 for hazards relevant but not significant which are not dealt with by this European Standard.

When more than one measure is necessary to safeguard a hazard then all the necessary measures shall be used. When selecting the safety requirements and/or measures it has to be considered that different hazards may appear at the same time.

A.2.2 General design requirements

As applicable, the manufacturer of the equipment shall design the systems to provide practical solutions for the following:

— accessibility,

— visibility of operation,

— maintenance and cleaning clearances,

— movement of machine and material,

— safety in operation,

— health and safety at workplace and

— prevention of pollution.

Fluid systems carrying or containing fluids which are likely to solidify and/or have high or low viscosity shall be protected against the effects of temperature extremes which can influence the functionality of the fluid and can subsequently lead to potential damage of parts of the equipment.

The chemical composition of lubricants, as far as possible, shall not be harmful.

The manufacturer shall give information that drains, which form part of the equipment, shall discharge into a suitable isolated sump.

A.2.3 Requirements of piping

High pressure pipes used in hydraulic driven presses are subjected to fatigue loading and rated to a temperature up to 120 °C. For the design of high pressure pipes EN 13480 parts 1 to 5 shall be considered.

NOTE Caution should be taken when using EN 13480-3 to calculate wall thicknesses of pipes because the formula in this version produces pipes of unrealistic dimensions. Until EN 13480-3 is revised manufacturers should use appropriate proven standards, whether current or withdrawn.

High pressure pipes ($\geq 6{,}4\ N/mm^2$) used as pre-material for the fabrication of the piping shall have an inspection certificate according 3.1B of EN 10204:2004.

The hazard class for the calculation of the pipes according to EN 13480-1 shall be designed in accordance with the operating medium (for water = 1, for all other media = 11). It should be noted that the fatigue strength of pipes with a heavily corroded inner surface will be considerably lower than that of uncorroded pipes. On mineral oil based hydraulic fluids the influence corrosion factor is normally negligible. The design wall thickness shall take into account any ovality caused by bending operations. The fatigue strength of oval bends will decrease in direct proportion to their degree of ovality. With standard bending procedures the ovality should be below 4 %. Accounting for such ovality under fatigue loading, the characteristic strength value shall be multiplied by the factor 0,9. If the type of bending procedure cannot guarantee an ovality smaller than 4 %, then the strength value shall be reduced in accordance with the requirements of EN 13480-3:2002, Table 10.3.2-5.

For fatigue loading the analysis is based on a fatigue strength at over 2×10^6 cycles (life time service).

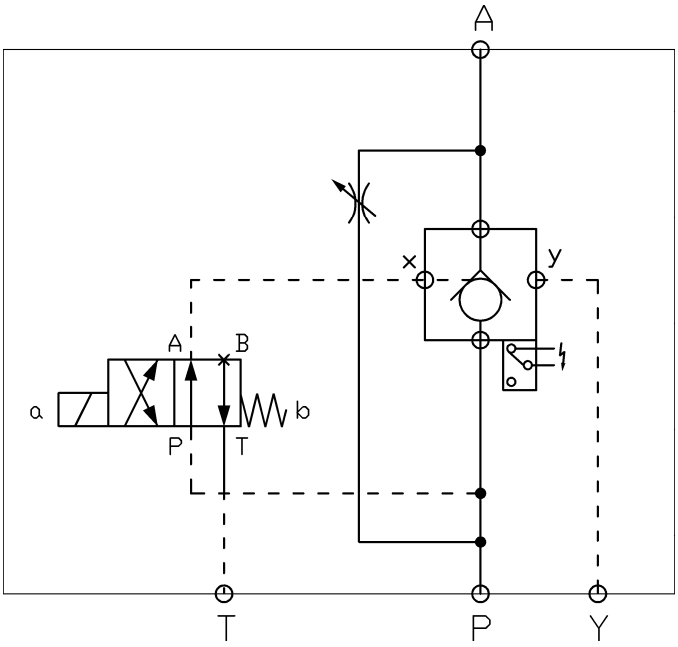
For predominantly static loading the maximum pressure is defined as the maximum operating pressure including a possible maximum pressure peak, e.g. travelling against mechanical stops.

Fabrication and installation shall be in accordance with EN 13480-4.

The pipework shall be tested in accordance with EN 13480-5 and documented in accordance with EN 13480-5:2002, Table 9.6-1.

Examples for the design of pipework systems are given in EN 13480-3.

A.2.4 Detail of the hydraulic diagram for limitation of set-up speed



Hazards	V_{max}*
Squeezing, shearing	2 m/min
Impact	15 m/min

* with entirely open flow valve

Key

A	connection	a	solenoid
B	connection	b	spring
P	pressure line	x	control line to the unlockable check valve
T	tank line	y	connection of the leakage line
Y	leakage line		

Figure A.1 — Detail of the hydraulic diagram for limitation of set-up speed

A.2.5 List of significant hazards, hazardous situations, safety requirements and/or measures

Table A.1 is a comprehensive presentation of identified significant hazards for hydraulic, pressure water and lubrication systems (column 1 of Table A.1), the situations that give rise to the hazards (column 2 of Table A.1), the safety requirements to reduce risks (column 3 of Table A.1), reference to appropriate standards (column 4 of Table A.1) and means of verifying the implemented safety requirements and/or measures (column 5 of Table A.1). See 5.2 for further information with regard to the columns and verification.

Table A.1 — List of significant hazards, hazardous situations, safety requirements and/or measures

Column 1	Column 2	Column 3	Column 4	Column 5
Significant Hazards	**Hazardous Situation**	**Safety Requirements and/or Measures**	**References**	**Verification**
A.2.5.1 Hydraulic, pressure water and lubrication systems				
High pressure fluid ejection which may cause injury to persons	1 Hose or pipe break due to inadequate dimensions of hoses, pipes and fittings.	1.1 Use of adequately dimensioned hoses, pipes and fittings.	— EN 13480-3 — EN 1591-1	D
		1.2 Selection of component material.	— See A.2.3 — EN 13480-2	D

Table A.1 (*continued*)

Column 1	Column 2	Column 3	Column 4	Column 5
Significant Hazards	**Hazardous Situation**	**Safety Requirements and/or Measures**	**References**	**Verifi-cation**
	2 Hose or pipe break due to vibration.	2.1 Vibration reduction at source.	— EN 1299	D, M
		2.2 Provision of isolation/damping measures.	— EN 1299	D
		2.3 Dimensioning taking into account the vibration load.	— EN 13480-3	D
		2.4 Adequate connections.	— EN 982:1996, 5.3.4.2	V, D
	3 Hose or pipe break due to reversed bending stress.	3.1 Selection of material, dimensioning and bending radii, taking into account the fatigue strength.	— See A.2.3 — EN 13480-2 — EN 13480-3	D
	4 Hose or pipe break due to mechanical stress, kinking.	4.1 Dimensioning taking into account mechanical stress and kinking.	— See A.2.3	D
		4.2 Protected location.	— See A.2	V, D
		4.3 Protection against mechanical damage by covering.	— See 5.1.13	V, D
	5 Hose or pipe break due to thermal overload	5.1 Position at adequate distance from heat source.	— See A.2	V, D
		5.2 Covering against thermal radiation.	— See 5.1.13	V, D
	6 Hose or pipe break due to chemical reaction	6.1 Selection of compatible materials and fluids.	— See A.2.3	D
		6.2 Taking corrosion into account when dimensioning wall thickness.	— See A.2.3 — EN 13480-3:2002, 4.3	D
		6.3 Use of inhibitors in fluids.	— See A.2	D
	7 Hose or pipe break due to incorrect installation	7.1 Provide instruction for correct installation.	— EN 13480-4:2002, Clause 8	V, D
	8 Hose or pipe break due to incorrect welding	8.1 Provide instructions for correct welding and	— EN 13480-4:2002, Clause 9	V
		8.2 Operating/maintenance instruction: welding shall be done only by trained welders or certificated welders.	— See 7.6	V
	9 Unexpected start-up during dismantling and repair.	9.1 Automatic pressure reduction in the pressure system (vessels) when switching-off the extrusion press.	— See 5.1.12 — EN 982:1996, 5.3.4.5 — EN 954-1	D, M
		9.2 Measures to prevent start-up by third parties, e. g., key-operated switch	— See 5.1.12 — EN 1037	D, M
		9.3 Audible and visual warning device for restart.	— See 5.1.9 — EN 981 — EN 842	V, D, M
		9.4 Attachment of measuring points with pressure relief facility.		V, D

Table A.1 (*continued*)

Column 1	Column 2	Column 3	Column 4	Column 5
Significant Hazards	**Hazardous Situation**	**Safety Requirements and/or Measures**	**References**	**Verification**
		9.5 Operating/maintenance instruction: indicate the need to disconnect the hoses only in depressurised state.	— See 7.6 — EN 982:1996, 5.3.4.3 — EN 983:1996, 5.3.4.3	V
Burns, fire, explosion	1 Combustion of fluids may cause release of substances hazardous to health and poisoning caused by fumes.	1.1 Use of low-toxicity fluids in the hydraulic equipment.	— See A.2.2 — EN 626-1 — EN 982:1996, 5.3.4	V, D
		1.2 Position at adequate distance from heat source.	— See A.2.2	V, D
	2 Combustion of fluids may cause asphyxiation by fire extinguishing agents.	2.1 Manual override to isolate automatic extinguishing systems when area is occupied.	— EN 954-1	D, M
		2.2 Audible warning devices.	— See 5.1.9 — EN 981:1996, Table 3	V, D, M
	3 High pressure leaking through a defective pre-fill valve into the low pressure system.	3.1 Provide a pressure relief valve and explosion relief panel on the low pressure vessel.	— EN 982:1996, 5.3	V, D
		3.2 Relief panel to be situated to eject to a save area and vessel mountings designed to withstand recoil forces. NOTE Any ejected fluid should be contained in a sealed area or tank.	— See A.2.2 — EN 982 — See 5.1.7	V, D
	4 High pressure may flow backwards from the accumulators over a defective check valve and pump into the tank.	4.1 Provide means to de-energise a jet of fluid going into tank.	— EN 982	V, D
	5 Overfilling of the high pressure accumulators may cause too high pressure.	5.1 Provide safety valves and a "fail-safe" level control system. Ensure that the outlet of the safety valve(s) is(are) directed in a safe direction.	— EN 982	V, D, M
Impact	1 Maintenance work on pressurised air vessels.	1.1 Provide means to depressurise compressed air vessels and fit pressure gauge.	— EN 983	V, D
		1.2 Operating/maintenance instruction: include instruction to exhaust vessels before work begins.	— See 7.6	V
	2 Maintenance work on pressurised pipes to the air vessels.	2.1 Provide means to isolate and exhaust pipework.	— EN 982:1996, 5.3.4.5	V, D
		2.2 Operating/maintenance instruction: advice the user not to weld pressurised pipes and vessels.	— See 7.6	V

Table A.1 (*continued*)

Column 1	Column 2	Column 3	Column 4	Column 5
Significant Hazards	**Hazardous Situation**	**Safety Requirements and/or Measures**	**References**	**Verifi-cation**
Crushing, shearing, cutting	1 Safety equipment for the hydraulic control system in set-up mode.	1.1 When using accumulators or pressure-controlled pumps a second element with mechanically limited flow capacity shall be applied in order to ensure correct setting of set-up mode. In addition, the main shut-off valve shall be equipped with switch position control.	— EN ISO 12100-2:2003, 4.11.9 — EN 954-1 — See A.2.4 — EN 60204-1	D, M
		1.2 Hydraulic systems shall be designed and constructed that danger from any unexpected movement of components is prevented.	— EN 954-1 — EN 1037	V,
		1.3 Measures shall be taken to avoid unintentional hazardous movement of components, i.e., those in water hydraulic presses. The hydraulic system to the main components shall be fitted with two valves installed in series and acting independently of one another.	— EN 954-1	V, D, M

Annex B
(normative)

Safety requirements and/or measures for electrical equipment for extrusion presses

B.1 General

Manufacturers shall identify through their own risk assessment (EN 1050) which electrical hazards (EN 60204-1) are significant for equipment and the quoted effects of Table B.1.

All necessary measures shall be taken in order to preclude any electrical hazards at the machines. The relevant clauses of EN 60204-1 shall be complied with.

B.2 Special requirements for controls

The IP-class of the electrical equipment shall be determined according to its use and the environmental conditions during risk assessment (EN 60204-1:2006, 10.1.3 and 11.3).

NOTE The IP-code classification only takes into account the ingress of water and not of other fluids. In case of other fluids their influence should be considered.

Where access to a danger zone is required for any reason during normal operation the safety related control system of the equipment shall be in accordance with the appropriate category given in EN 954-1. If the access is required for the operations described as examples in Annex A of EN 1037:1995, the measures defined in EN 1037 shall be employed (EN 60204-1:2006, 5.4, 5.5 and 5.6).

All isolating devices, either main or local, designed to be locked shall include facilities to apply one or more padlock according to 5.2 of EN 1037:1995.

Controls frequently include safety functions; in which case they are classified under the general term "safety-related parts of controls" of EN 954-1. The following are applicable to the design of such controls:

— safety-related controls shall at least be designed corresponding to category 1;

— if access to the danger zone is required during operation the protective devices and signal processing equipment shall correspond at least to category 3.

B.3 Special requirements for shut-down equipment

B.3.1 Stop and emergency-off functions

In conformity with the requirements of 4.11.3 of EN ISO 12100-2:2003, EN 418 and EN 60204-1 as well as EN 1037, the stop and emergency-off functions in B.3.3 shall be applied.

Furthermore, the following shall be applicable to normal stop and emergency-stop functions:

— In inter-linked plants, it shall be ensured that the upstream or downstream equipment is shut down. Where stored energies are a source of danger they shall be eliminated, isolated or reduced to a level

which does not cause a risk. It may be necessary that power remains available and controlled for certain purposes:

— to preserve the effectiveness of safety devices or equipment with a safety-related function according 4.1.9 of EN 418:1992,

— to preserve the integrity of facilities provided for rescuing stranded personnel from the danger zone according 4.1.10 of EN 418:1992 and

— to carry out mechanical movements of machine for releasing trapped personnel or rescuing injured persons.

Design of the control actuator for the shutdown functions shall be such as to ensure that:

— there is no confusion, e.g. by colour and marking according 10.2.1 of EN 60204-1:2006,

— inadvertent actuation is eliminated/avoided and

— the control actuators are at all times readily and safely accessible according 4.4.2 of EN 418:1992.

B.3.2 Emergency stops

Emergency stops shall be:

— easily identifiable in accordance with the requirements of EN 418,

— located at control desk(s), in the pump room, one at each opposing corner and other locations identified in the risk assessment,

— marked to indicate the area of the plant affected by their operation(s) according to 4.4.4 of EN 418:1992,

— readily accessible as defined in EN 418 and

— provided with means of locking in their off-position.

When an emergency stop device has been operated a re-start shall only be possible from safe positions outside the protected hazardous area with a clear view of the danger zone.

B.3.3 Stop functions

Table B.1 shows a compilation of different kinds of applicable stop functions. On the basis of the assessment of electrical risk the manufacturer shall select the categories according to 9.2.5.3 and 9.2.5.4 of EN 60204-1:2006 regarding the given examples and the quoted effects in Table B.1.

Table B.1 — Emergency functions for extrusion presses

Function	**Category** according EN 60204-1	**Setting**	**Location (examples)**	**Effect**
Emergency stop	Category 1	Red mushroom push-button before yellow background and with re-closing lockout (lock) and possibly with pilot lamp Main switch Mechanical device against unintended use on control panels necessary	— Main control desk — Auxiliary control panel — Separated devices of category 1 emergency-stops for different parts of the equipment might be necessary (e.g. for the hydraulic system)	— Shut-down of main drives with electric and/or mechanical braking — Shut-down of auxiliary drives while maintaining operation with self-resetting control. Energy supply is maintained up to the standstill, then power-off — Mechanical damage possible — Potentially, rescue of persons by moving units into an open position might not be possible — Cobbling material possible
Normal stop	Category 1	Push-button (colour according EN 60204-1:2006, 10.2.1)	— Main control desk — Auxiliary control panel	— Stopping of the complete installation: — 1st step: Production stop — 2nd step: Interruption of energy supply
Emergency off	Category 0	Red mushroom push-button before yellow background and with re-closing lockout (lock) and possibly with pilot lamp Main switch Mechanical device against unintended use might be necessary	— Transformer room — Computer room — Rectifier room — Switch cabinet feeder panel — Not adjacent to operational control desks with category 1 Emergency Stop (EN 418)	— Immediate Power-off — Uncontrolled shut-down — All accumulators which might cause self-starting are relieved — Shut-down of all drives — Application of mechanical brakes — Potentially, rescue of persons by moving units into an open position might not be possible — Cobbling material possible
Quick stop	Category 2 This does not meet the requirements of an emergency stop or normal stop	Push-button (colour according EN 60204-1:2006, 10.2.1)	— where required	— Maximum possible negative acceleration during shut-down — All operating conditions are maintained — Energy supply remains on during standstill — Possibly automatic standstill monitoring
Production stop	Category 2 This does not meet the requirements of an emergency stop or normal stop	Push-button (colour according EN60204-1:2006, 10.2.1)	— Main control desk and every auxiliary control panel — Usually combined with category 1 emergency stop (see above)	— Stop function for normal operating conditions — All operating conditions are maintained — Energy supply remains on during standstill — Possibly automatic standstill monitoring

Annex C
(normative)

Noise test code

C.1 Introduction

This noise test code specifies all the information necessary to carry out efficiently and under standardised conditions the determination, declaration and verification of noise emission for the equipment within the scope.

In order that the noise test can be repeated, representative operating conditions of the equipment have to be defined. This is why this noise test code requires these operating conditions to be recorded, reported and declared in detail.

Extrusion presses never operate at the manufacturer's place. Noise emission measurement can only be carried out after commissioning is completed.

The noise emission of a machine in general is described by two quantities:

— the A-weighted emission sound pressure level at work stations and

— the A-weighted sound power level.

The determination of these quantities is necessary for:

— manufacturers to declare the noise emitted and

— purposes of noise control at the source at the design stage.

This noise test code gives information on the selection of suitable standards for noise measurement. The use of this European Standard ensures the reproducibility of the determination of the noise emission characteristics within specified limits determined by the grade of accuracy of the basic noise measurement method used. Methods of grade 2 of accuracy (engineering method) shall be preferably used. Methods of grade 3 of accuracy (survey method) can be used, but the reasons for not using a grade 2 method shall be reported.

NOTE For further information see series EN ISO 11200, EN ISO 9614-1, EN ISO 9614-2 and EN ISO 3740.

C.2 Determination of sound power level

C.2.1 General method

The A-weighted sound power level shall be determined in accordance with EN ISO 3744 (grade 2) or EN ISO 3747 (grade 2) or EN ISO 9614-1 (grade 2) or EN ISO 9614-2 (grade 2).

Where these standards are not applicable, the A-weighted sound power level shall be determined in accordance with EN ISO 3746 (grade 3) or EN ISO 3747 (grade 3) or EN ISO 9614-2 (grade 3). The report shall give a justification why a grade 2 method was not applicable.

When using EN ISO 3744 or EN ISO 3746, the measurement surface shall be a parallelepiped and the measurement distance to the surface shall be preferably 1 m.

NOTE 1 EN ISO 3740 gives guidance on the choice of measurement methods given in the EN ISO 3740 and EN ISO 9614 series.

NOTE 2 Sound power levels in frequency bands may also be determined.

C.2.2 Method for large machines/plants

Large machines/plants are those where the greatest linear dimension exceeds 15 m. In case of extrusion equipment greater than 15 m in length (which is relevant for the predominant part of extrusion equipment), it is permissible to determine and report the emission sound pressure level at specified measuring points, instead of the sound power level.

Specified measuring points shall be along a path around the machine at a height of 1,6 m above the floor or access level and at a distance of 1 m from the machine surface. They shall be spaced so that the difference in emission sound pressure levels between adjacent measuring points does not exceed 5 dB(A). The number of measuring points will depend on the characteristic of the noise emission. For even distribution of sound pressure levels (e.g. run out system), a low number of measuring points may be required. There should, however, be at least one measuring point at each side of the machine.

For determining the emission sound pressure level, the method described under C.3 shall be used.

C.3 Determination of emission sound pressure level at workstations

The A-weighted emission sound pressure level at workstations shall be determined in accordance with EN ISO 11202 (grade 3).

The regular operators' areas, i.e. permanent or temporary workstations, shall be determined by the manufacturer with consultation of the user of the equipment, but in all cases shall include the main control desk and local control desks (e.g. see workstations 9 (permanent) and 10 (temporary) in Figure C.1).

Where measuring is made difficult due to strong environmental influences such as reverberation and high levels of noise from other sources, EN ISO 11203 may be applied using the sound power level determined according to EN ISO 9614-1 or EN ISO 9614-2.

NOTE EN ISO 11200 gives guidance on the choice of measurement methods given in the EN ISO 11200 series.

C.4 Measurement uncertainty

Total measurement uncertainty of sound emission values is that given in the basic standard used.

C.5 Operating conditions

Measurements shall be made under defined representative operating conditions for the main part of the production and shall at least cover:

— type of metal extruded;

— cutting system (e.g. saw);

— operating pressures of hydraulic or pneumatic systems;

— type of cooling system (e.g. by air, water, air/water spraying).

The installation and mounting conditions shall be those recommended by the manufacturer.

Operating conditions shall be the same for the determination of both sound power level and emission sound pressure level.

C.6 Information to be recorded and reported

The information recorded when carrying out the test and the test report shall at least contain the following information:

a) manufacturer, kind of machine/plant, boundary and technical data and sizes;

b) operating conditions under which noise is measured (see C.5);

c) reference of the basic standards used for the determination of noise emission according to this noise test code (see C.2 and C.3); and

d) measurement results

- A-weighted emission sound pressure level at the permanent or temporary workstation(s),
- if required, A-weighted sound power level,
- for large machines/plants, individual values of the A-weighted emission sound pressure levels along the measurement path and
- possible deviations to this noise test code or to the basic standards used, with the justification for them,

e) position of workstation and measurement points and

f) place, date and responsible person for measurement.

C.7 Declaration and verification of noise emission values

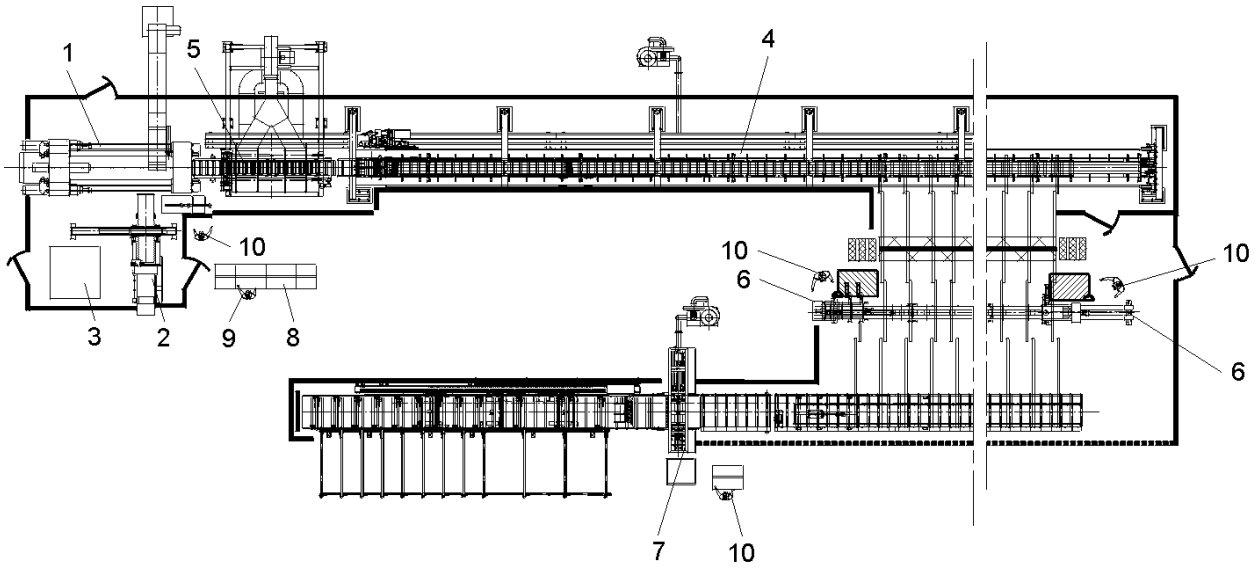
The declaration of the noise emission values at workstations shall be included in the operating manual. It shall be made in accordance with this annex. The declaration shall be made as dual-number noise emission values and is the sole responsibility of the manufacturer. The noise declaration shall be made in such a way that the values can be verified according to 6.2 of EN ISO 4871:1996.

For equipment subject to this European Standard only typical values can be given as noise emission values before commissioning. The noise emission shall then be measured under defined representative operating conditions (see C.5) and declared after the plant has been put into operation.

The noise declaration shall explicitly mention the fact that the noise emission values have been obtained according to the specifications of this noise test code and indicate which basic standards have been used. If this statement is not true, the noise declaration shall indicate clearly what the deviations are from these specifications and / or from the basic standards.

Additional noise emission quantities such as sound power levels in octave bands may also be given in the noise declaration. In this case, care shall be taken to avoid confusion between these additional noise emission data and the declared dual-number noise emission values.

Table C.1 shows an example of a dual-number noise declaration.



Key

1	extrusion press	6	stretcher
2	billet loader	7	saw
3	pump station	8	main control desk
4	run-out equipment	9	operator, permanently present at the main control desk
5	cooling equipment	10	local control desks, operator not permanently present

Figure C.1 — Example of locations of workstations (9 and 10) for noise measurement

Table C.1 — Example of declared dual-number noise emission values

— identifying information, e.g.

Machine type	
Metal extruded	
Operating pressures (hydraulic or pneumatic system)	
Type of cooling system	
Type of cutting system	

— declaration of measured values, e.g. at workstations

DECLARED DUAL-NUMBER NOISE EMISSION VALUES				
Declared A-weighted emission sound pressure level at workstations				
Measurement at workstations (see Figure C.1)		**Measured value** L_{pA} [dB] (re 20 µPa)	**Uncer-tainty** K_{pA} [dB]	**Location** x,y [m]
5	Cooling equipment			
6 (1)	Stretcher (right hand side)			
6 (2)	Stretcher (left hand side)			
7	Saw (during cutting)			
8	Main control desk			
Values determined according to noise test code Annex C of EN 14656 and measurement standard EN ISO 11202				

— if applicable:

Declared A-weighted sound power level:
Measured value: L_{WA} = ____ dB (re 1 pW) Uncertainty: K_{WA} = __ dB
Values determined according to noise test code Annex C of EN 14656 and measurement standard EN ISO 3747

NOTE The sum of a measured noise emission value and its associated uncertainty factor represents an upper bound of the range of values which can occur in the measurements.

Annex D
(informative)

De-commissioning

As no present European Directive exists to cover the requirements for de-commissioning, manufacturers are advised to consult the present national laws on de-commissioning of the Member States to which they are selling the equipment to ensure themselves that they meet those requirements.

Note should also be made of the need to address the disposal of toxic waste material and any soil that might be contaminated.

Companies are advised to seek expert advice from suitable qualified consultants.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 98/37/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide one means of conforming to Essential Requirements of the New Approach Directive Machinery 98/37/EC, amended by 98/79/EC.

Once this document is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this European Standard confers, within the limits of the scope of this European Standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

WARNING: Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this document.

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