



BSI Standards Publication

Machines for mechanical processing of minerals and similar solid materials – Safety

Part 1: Common requirements for machinery and processing plants

National foreword

This British Standard is the UK implementation of EN 1009-1:2020.

The UK participation in its preparation was entrusted to Technical Committee B/513/3, Machines for the production of cement, lime and gypsum - Safety.

A list of organizations represented on this committee can be obtained on request to its secretary.

The UK committee advises users to note that the requirements of BS EN 1009 parts 1–5 are not suitable for application to mobile and semi-mobile machinery without also applying BS EN 1009-6. It is not possible for a mobile or semi-mobile machine to comply with BS EN 1009 parts 1–5 without the use of BS EN 1009-6. At the time of publication of this standard, BS EN 1009-6 is under preparation and is intended to include all necessary adaptations, additions and exemptions for mobile and semi-mobile machinery. It is anticipated to be published in 2022 and will allow for a 24-month transition period after publication by CEN. BS EN 1009 parts 1–5 can be used without qualification for fixed machines.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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English Version

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Machines pour le traitement mécanique des minéraux et des matières solides similaires - Sécurité - Partie 1 : Prescriptions communes pour les machines et installations pour le traitement des matériaux

Maschinen für die mechanische Aufbereitung von Mineralien und ähnlichen festen Stoffen - Sicherheit - Teil 1: Gemeinsame Anforderungen für unvollständige Maschinen, Aufbereitungsmaschinen und Aufbereitungsanlagen

This European Standard was approved by CEN on 13 April 2020.

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COMITÉ EUROPÉEN DE NORMALISATION
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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 1009-1:2020) has been prepared by Technical Committee CEN/TC 151 “Construction equipment and building material machines — Safety”, 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 November 2020, and conflicting national standards shall be withdrawn at the latest by May 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a standardization request 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.

This part of EN 1009 is intended to be used in conjunction with at least one specific part EN 1009-2 to prEN 1009-6.

EN 1009 “Machines for mechanical processing of minerals and similar solid materials — Safety” comprises the following parts:

- *Part 1: Common requirements for machinery and processing plants*
- *Part 2: Specific requirements for feeding machinery and continuous handling equipment*
- *Part 3: Specific requirements for crushing and milling machinery*
- *Part 4: Specific requirements for screening machinery*
- *Part 5: Specific requirements for cleaning, recycling and mud treatment machinery*
- *Part 6: Specific requirements for mobile machinery (in preparation)*

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

Introduction

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

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

- machine manufacturers (small, medium and large enterprises);
- health and safety bodies (regulators, accident prevention organizations, market surveillance etc.).

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

- machine users/employers (small, medium and large enterprises);
- machine users/employees (e.g. trade unions, organizations for people with special needs);
- service providers, e.g. for maintenance (small, medium and large enterprises);
- consumers (in case of machinery intended for use by consumers).

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

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

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.

1 Scope

This document applies to machines for mechanical processing of minerals (cement, lime and gypsum, sand and gravel, industrial minerals, metalliferous ore and hard and soft rock aggregates, coal) and - products (slag and ashes, production and demolition waste) in construction and industry.

It deals with the following types of individual machines for the mechanical processing of minerals and similar solid materials:

- feeding machinery in accordance with EN 1009-2;
- crushing machinery in accordance with EN 1009-3;
- milling machinery in accordance with EN 1009-3;
- screening machinery in accordance with EN 1009-4;
- machinery for cleaning, water recycling, sorting (other than screens) and mud treatment in accordance with EN 1009-5;
- mobile machinery in accordance with prEN 1009-6.

This document gives the common safety requirements for mechanical processing machines used for quarrying, recycling and processing mineral and by-products (cement, lime and gypsum, sand and gravel, industrial minerals, metalliferous ore, production and demolition waste, slag handling, hard and soft rock aggregates, coal) in construction and surface mining and is intended to be used in conjunction with one of the parts EN 1009-2 to prEN 1009-6. These machine specific parts (EN 1009-2 to prEN 1009-6) do not repeat the requirements from this document, but add or replace the requirements for the machine type in question.

NOTE 1 The requirements specified in this part of EN 1009 are common to two or more types of machines for the mechanical processing of minerals and similar solid materials.

Specific requirements in EN 1009-2 to prEN 1009-6 take precedence over the respective requirements of this document.

This document also covers assemblies of two or more of the mentioned machines which function as an integrated whole. The machines included in the scope of this document can be fixed, semi-mobile or mobile.

NOTE 2 prEN 1009-6 “Specific requirements for mobile and semi mobile equipment” is under preparation to cover specific requirements (e.g. mobility, braking, access, frequent transportation), including exceptions and additional requirements for mobile and semi mobile equipment. This means that mobile machines are not covered as long as EN 1009-6 is not published by CEN.

This document covers transportation, erection, commissioning, use and maintenance of single machines or combination of single machines.

This document deals with significant hazards, common to the types of machines listed in this scope when they are used as intended and under conditions for misuse which are reasonably foreseeable by the manufacturer (see Annex F) and to the hazards due to the combination of these machines and specifies the appropriate measures to eliminate or reduce the risks arising from the significant hazards.

Design relating to road traffic regulations is not covered by this document.

This document does not cover:

- design relating to road traffic regulations;
- hazards arising from the use of the machines in potentially explosive atmospheres as well as from processing of explosive materials and risks related to electromagnetic compatibility;
- specific hazards related to mobile machinery.

NOTE 3 EN ISO 13766-1 and EN ISO 13766-2 specify test methods and acceptance criteria for evaluating the electromagnetic compatibility of all kinds of mobile construction machinery.

This document is not applicable to machinery which are manufactured before the date of publication of this document by CEN.

2 Normative references

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

EN 547-1:1996+A1:2008, *Safety of machinery — Human body measurements — Part 1: Principles for determining the dimensions required for openings for whole body access into machinery*

EN 547-2:1996+A1:2008, *Safety of machinery — Human body measurements — Part 2: Principles for determining the dimensions required for access openings*

EN 547-3:1996+A1:2008, *Safety of machinery — Human body measurements — Part 3: Anthropometric data*

EN 617:2001+A1:2010, *Continuous handling equipment and systems — Safety and EMC requirements for the equipment for the storage of bulk materials in silos, bunkers, bins and hoppers*

EN 620:2002+A1:2011, *Continuous handling equipment and systems — Safety and EMC requirements for the equipment for the storage of bulk materials in silos, bunkers, bins and hoppers*¹⁾

EN 795:2012, *Personal fall protection equipment — Anchor devices*

EN 842:1996+A1:2008, *Safety of machinery — Visual danger signals — General requirements, design and testing*

EN 894-1:1997+A1:2008, *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*

EN 894-3:2000+A1:2008, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 3: Control actuators*

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

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

1) Under revision. Amendment to EN 1009-1:2020 is planned to update the reference to the new edition of EN 620.

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

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

EN 1005-5:2007, *Safety of machinery — Human physical performance — Part 5: Risk assessment for repetitive handling at high frequency*

EN 12464-1:2011, *Light and lighting — Lighting of work places — Part 1: Indoor work places*

EN 12464-2:2014, *Light and lighting — Lighting of work places — Part 2: Outdoor work places*

EN 12600:2002, *Glass in building — Pendulum test — Impact test method and classification for flat glass*

EN 14253:2003+A1:2007, *Mechanical vibration — Measurement and calculation of occupational exposure to whole-body vibration with reference to health — Practical guidance*

EN 14359:2017, *Gas-loaded accumulators for fluid power applications*

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

EN 60529:1991,²⁾ *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN 61310-1:2008, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals (IEC 61310-1:2007)*

EN 61310-2:2008, *Safety of machinery — Indication, marking and actuation — Part 2: Requirements for marking (IEC 61310-2:2007)*

EN ISO 4871:2009, *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

EN ISO 4413:2010, *Hydraulic fluid power — General rules and safety requirements for systems and their components (ISO 4413:2010)*

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

EN ISO 7010:2020, *Graphical symbols — Safety colours and safety signs — Registered safety signs (ISO 7010:2019)*

EN ISO 7731:2008, *Ergonomics — Danger signals for public and work areas — Auditory danger signals (ISO 7731:2003)*

EN ISO 11201:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections (ISO 11201:2010)*

EN ISO 11202:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions applying approximate environmental corrections (ISO 11202:2010)*

EN ISO 11688-1:2009, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning (ISO/TR 11688-1:1995)*

2) This document is impacted by the amendments EN 60529:1991/A1:2000 and EN 60529:1991/A2:2013.

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

EN ISO 13849-1:2015, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2015)*

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

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

EN ISO 13855:2010, *Safety of machinery — Positioning of safeguards with respect to the approach speeds of parts of the human body (ISO 13855:2010)*

EN ISO 14118:2018, *Safety of machinery — Prevention of unexpected start-up (ISO 14118:2017)*

EN ISO 14119:2013, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection (ISO 14119:2013)*

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

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

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

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

EN ISO 14122-4:2016, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders (ISO 14122-4:2016)*

EN ISO 14123-1:2015, *Safety of machinery — Reduction of risks to health resulting from hazardous substances emitted by machinery — Part 1: Principles and specifications for machinery manufacturers (ISO 14123-1:2015)*

ISO 3864-1:2011, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings*

ISO 3864-2:2016, *Graphical symbols — Safety colours and safety signs — Part 2: Design principles for product safety labels*

ISO 3864-3:2012, *Graphical symbols — Safety colours and safety signs — Part 3: Design principles for graphical symbols for use in safety signs*

ISO 3864-4:2011, *Graphical symbols — Safety colours and safety signs — Part 4: Colorimetric and photometric properties of safety sign materials*

ISO 7000:2019, *Graphical symbols for use on equipment — Registered symbols*

3 Terms and definitions

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

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

- ISO Online browsing platform: available at <https://www.iso.org/obp/ui>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

plant

assembly of machines and/or components for the mechanical processing of minerals, arranged and controlled so that they function as an integral whole

Note 1 to entry: A plant may be an assembly of machines in the sense of the Machinery Directive 2006/42/EC, or not.

3.2

mobile machine

crawler or wheel, self-propelled, trailed or towed machine movable from a worksite to another or from a place to another on the same worksite

3.3

modular machinery

module or combination of modules having no tracks, wheels or ground anchorage and designed to be partly dismantled to be transportable

EXAMPLE Skid chassis. See Annex D.

3.4

sub-assembly

part of a *plant* (3.1) which is able to operate independently, comprising *mobile machinery* (3.2) and/or *modular machinery* (3.3) or a combination of partly completed machinery with a common control system

3.5

passage opening

opening which allows the movement or the entry of a person's entire body (e.g. door, manhole)

3.6

access opening

opening through which a person can lean forward, reach forward, or extend the upper body, head, arm, hand, a finger or several fingers, leg or foot

3.7

visual inspection opening

opening where, due to design or size, only visual inspections are possible

3.8

workspace

volume allocated to one or more persons in the work system to complete the work task

3.9**operator's station**

area from which an operator controls the travel and/or work functions of the machine

3.10**manual sorting station**

workspace (3.8) from which an operator extracts materials (e.g. contaminants such as plastics, wood, metals, etc.) from the conveying system

3.11**automatic start/stop**

predetermined sequence of starting or stopping parts of the machine/plant by the activation of one or more buttons by the operator

3.12**prestart warning**

audio and visual warning generated by sirens/beacons or other notification devices on the plant

3.13**manual start/stop**

mode where for each individual machine part the operator has to take individual actions (push individual buttons) to achieve starting/stopping of this part

Note 1 to entry: The start sequence of machine parts is often pre-determined.

3.14**maintenance start**

mode in which an item or items of plant are started by the operator, outside of normal sequence (no pre-determined starting order may exist) and is designed solely to be used for carrying out inspection, cleaning or testing of an individual machine part

3.15**high pressure**

pressure greater than 1 MPa in pipes and hoses which contain fluids

3.16**exceptional maintenance**

preventive maintenance which is infrequent and has a significant impact in terms of total life cycle costs

[SOURCE: EN 13306:2017, 8.13]

3.17**silo**

that part of a continuous handling system used to contain intended kind(s) of bulk material(s) during a certain period of time. The silo is usually charged from the top and discharged from one or more outlets at the bottom or side

[SOURCE: EN 617:2001+A1:2010, 3.1]

4 Safety requirements and/or protective/risk reduction measures

4.1 General

Machinery shall comply with the safety requirements and/or protective/risk reduction measures of this clause.

In addition, the machine shall be designed according to the principles of EN ISO 12100:2010 for relevant, but not significant hazards, which are not dealt with by EN 1009-1 to prEN 1009-6.

4.2 Openings

4.2.1 Passage openings

Annex C gives details of the calculation of the following dimensions.

- a) Opening for horizontal forward movement in upright posture (doors) shall meet the following minimum dimensions:

$$A = 2\,031\text{ mm}$$

$$B = 695\text{ mm.}$$

See Figure 1.

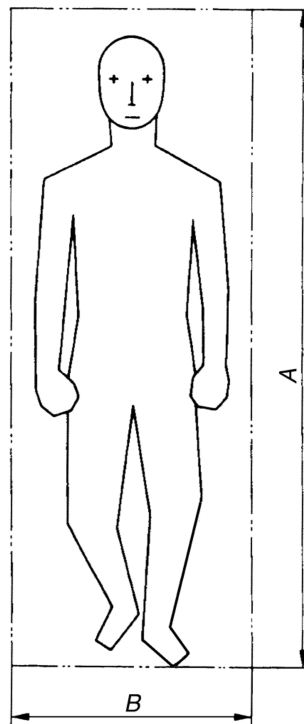


Figure 1 — Opening for horizontal forward movement in upright posture (doors)

- b) For manhole for vertical entry through which rapid active movement needs to be possible, the following dimensions shall comply with a diameter $A \geq 695\text{ mm}$. $B < 500\text{ mm}$.

See Figure 2.

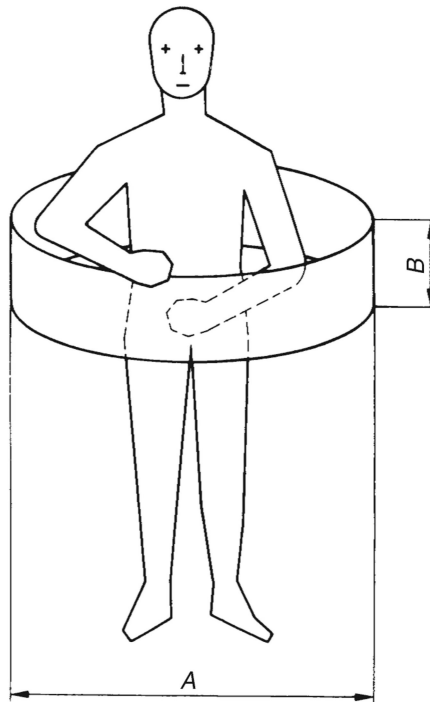


Figure 2 — Manhole for vertical entry through which rapid active movement needs to be possible

- c) For opening for entry in kneeling posture, the following minimum dimensions shall comply with:
 $A = 970 \text{ mm}$ and $B = 695 \text{ mm}$.

See Figure 3.

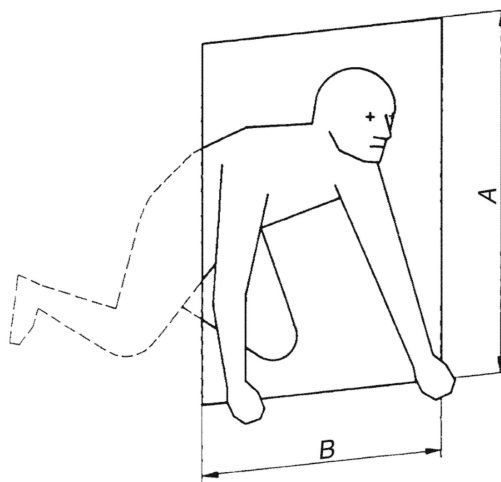


Figure 3 — Opening for entry in kneeling posture

- d) For all other passage openings, according to dimensions given in Annex B, provided there is no obstacle after the hole.

If this passage opening dimension cannot be fulfilled for technical reasons (e.g. small dimension of the machine, or obstacles inside the machine due to functional devices), then all or part of the machine shall be folded, or if not possible dismantled, to allow for the access and the corresponding procedure shall be described in the instructions for use.

NOTE The followings are examples of devices that could be removed in order to fulfil requirements related to minimum dimensions:

- nozzles in screens in case of front or rear access,
- screening media in case of top access,
- rear sealing devices for rear access,
- crusher feeding chutes or
- side holes.

If the passage opening gives access to an area where there is a falling hazard from a height, an anchor point which complies with EN 795:2012 shall be positioned in such a way that

- it is reachable by upper limbs of the operator in his expected posture in accordance with EN 547;
- at the distance specified by the manufacturer to avoid fall through the opening when connecting to the anchor point (see Clause 6).

4.2.2 Access openings

For access openings, EN 547-2:1996+A1:2008 and EN 547-3:1996+A1:2008 can be used as guidelines.

The design of the access opening shall take into consideration the specific tools intended to be used inside this access opening. If all or part of the machine has to be dismantled or folded to allow the access then the corresponding procedure shall be described in the instructions for use.

4.2.3 Visual inspection openings

Where needed, visual inspection openings shall be equipped with guards according to 4.11.

In case of risks of projection (e.g. dust, water, steam), a warning sign shall be fitted near the visual inspection opening in order to inform users about the need to wear personal protective equipment.

4.3 Prevention of enclosing of persons

The machinery and plants shall be designed such that a person cannot be trapped (as defined in EN ISO 12100:2010) into one component of the plant.

Where doors are fitted, they shall be designed for allowing opening from inside or a provision shall prevent a person to be trapped inside.

Additional requirements are given in 4.10 if there is an additional hazard inside the enclosure.

4.4 Permanent means of access

Permanent means of access shall comply with EN ISO 14122-1:2016, EN ISO 14122-2:2016, EN ISO 14122-3:2016, EN ISO 14122-4:2016.

Access to loading as well as materials discharge areas shall be avoided (see Clause 6).

4.5 Operator's station

If the permanent presence of an operator is required at the operator's station, a cabin shall be provided.

Cabins shall be designed to fulfil the following requirements:

- protection of the operator against foreseeable adverse climatic conditions. A ventilation system and an adjustable heating system shall be provided;

- observation windows designed to be easily and safely replaced. Where there is foreseeable ejection of products, the windows shall be in safety glass according to EN 12600:2002 (glass class 2B2);
- at least one door (as per 4.2.1 a)) opening outward;
- provide systems for isolation against dust (see also 4.8), noise (see also 4.20) and vibrations (4.21).

4.6 Manual sorting station

The design of the manual sorting station shall meet the following:

- the height between the belt and the platform shall be adjustable between 0,80 m and 1,10 m for a standing operator;
- the width of the conveyor shall allow the operator to catch objects and be no more than 600 mm for access from one side by one operator or be no more than 1200 mm for access from both sides (two operators), according to the EN 1005 series;
- the working speed of the conveyor shall be maximum 0,8 m/s;
- the conveyor shall be fitted with nip guards (according to EN 620:2002+A1:2011);
- at least one emergency stop according to 4.10.4 shall be installed.

If noise, vibrations, dust, or adverse climatic conditions are foreseen, a cabin, designed according to 4.5, shall be provided.

4.7 Storage equipment

4.7.1 General

Silos shall comply with EN 617:2001+A1:2010 with the following additions and exemptions.

A warning sign (pictogram) shall be provided near to the discharge gate to warn about hazard of being crushed by products.

In addition, for access into the storage equipment, for the specific conditions of plants:

An anchor point for personal protective equipment (PPE) shall be provided above each silo which can be reached from the walkways described above. Anchor points complying with the tests of EN 795 shall be provided. Distance to avoid fall through the opening when connecting to the anchor point shall be specified.

Lifting attachment points and tying down points intended to be used as anchor points for PPE shall comply with the tests of EN 795:2012.

4.7.2 Top of the storage equipment

On the top of the equipment for storages with openings:

- a fall protection grid or parallel bars with openings not greater than 250 mm × 250 mm shall be fitted and, if walking is intended a foldable or removable platform according to EN ISO 14122-2:2016 shall be fitted;

Determination of the minimum load of the protection grid and platform shall comply with EN ISO 14122-2:2016, 4.2.5. Additional load that could be stored on the fall protection device shall be taken into account (e.g. blockages or frozen aggregates). Verification shall be done by testing or calculation.

By the design of fall protection device, the working conditions should be taken into consideration.

- a guardrail or the upper part of the storage equipment shall comply with EN ISO 14122-3:2016, Clause 6.

4.7.3 Access to the silo

Access to the silo shall be prevented by a fixed guard.

- In complement to EN 617:2001+A1:2010, 4.1.10, the slope of the roof of the powder silos shall be considered as a platform.

With the following exemptions to EN 617:2001+A1:2010:

- EN 617:2001+A1:2010, 4.1.6.2: ladders shall not be fitted permanently inside the silo, excepted if designed to be prevented from contact with materials.
- EN 617:2001+A1:2010, 4.1.10: permanent means of access shall be fitted at the top of the silo where access is foreseen, e.g. manhole, safety valve, filter or any other equipment requiring maintenance.

4.8 Dust removal devices

The complete plant shall be designed to reduce dust emission in accordance with the principles of EN ISO 14123-1:2015.

The main sources causing dusts are:

- feeding point;
- crusher;
- screen;
- discharge/chute;
- continuous handling equipment;
- air movement (e.g. ventilation).

The following devices are possible solutions to reduce dust emission:

- water spraying, mist blowing, fogging;
- emulsion spraying;
- encapsulating, sealing, including decompression;
- vacuum, filter de-dusting;
- electrostatic de-dusting.

NOTE National regulation might apply regarding exposure to dangerous substances, e.g. for Respirable Crystalline Silica Dust.

4.9 Visibility

4.9.1 Process survey

For plant and modular machinery, means (e.g. access means or Programmable Logical Control) shall be provided, allowing surveying the process in some critical visual points and in points where sampling is necessary, by direct control or indirect control. See specific parts for critical survey points.

4.9.2 Lighting

The plant shall be provided with lighting for means of access, platforms and operator's station.

The cabins shall be fitted with an inner lighting system.

For maintenance and sampling, means shall be provided to plug corded hand lamps and/ or rechargeable cordless hand lamps. When access is necessary more than once a month, fixed lighting shall be provided.

Illumination levels shall comply with Table 1, whatever is the working time (day and/or night) or the working place (indoor or outdoor).

Table 1 — Average illumination level

Location	Average illumination level to comply with (See EN 12464-1:2011) for indoor areas	Average illumination level to comply with (See EN 12464-2:2014) for outdoor areas
Tunnels, pits, visual inspection	50 lx	50 lx
Corridors, circulation area for pedestrians and passages, vehicle turning, loading and unloading points	50 lx	50 lx
Walkways exclusively for pedestrians	N/A	5 lx
Stairs and ladders	150 lx	50 lx
Maintenance, sampling station	300 lx	200 lx
Operator's station, cabin	500 lx	N/A

4.10 Control devices

4.10.1 General

The design of controls shall be in accordance with EN 894-1:1997+A1:2008, EN 894-3:2000+A1:2008, EN ISO 14118:2018, and EN 60204-1:2006.

Hold-to-run controls shall comply with EN 60204-1:2006, 9.2 or with EN ISO 4413:2010 if they are hydraulically controlled.

Two-hand controls shall comply with EN ISO 13851:2019.

When electro-sensitive protective devices are fitted, approach speed shall be considered according to EN ISO 13855:2010.

Each plant sub-assembly shall be designed to be independently controlled, providing the sequence of control is consistent with the feeding/emptying operation of each plant sub-assembly.

Each plant or sub-assembly shall have a lockable supply disconnection device in accordance with EN 60204-1:2006, 4.3 or EN ISO 4413:2010, EN ISO 4414:2010. Where the intended use of the machine includes interventions on a sub-assembly of a plant by lock out/tag out of the sub-assembly (see 6.3.5), unintended material feeding shall be avoided automatically (e.g. by switching off upstream sub-assemblies simultaneously or earlier to the sub-assembly where intervention occurs or by diverting the material), including the fixing of appropriate warnings about the presence of a person, or need for a second person. Disconnection of downstream sub-assembly shall be dependent on hazards that can exist during the intervention.

NOTE Parts EN 1009-2 to prEN 1009-6 give specific requirements, where appropriate.

4.10.2 Main control station

Each plant sub-assembly shall be designed to be independently controlled from the main control station, e.g. by an on/off control, providing the sequence of control is consistent with the feeding/emptying operation of each plant sub-assembly.

Control elements shall have logical influence on the items controlled, and they shall be clearly marked so that the user knows the influence of each actuator without special consideration. Where practicable, permanent wear, weather and light-resistant symbols shall be used instead of written identifications.

4.10.3 Control devices

Controls shall be located so that the operator is able to ensure that no-one is in the danger zone, or measures (e.g. trapped key) shall be provided to ensure that starting is prevented while someone is in the danger zone.

If visibility on the danger zone is not practicable, before the machinery starts, an acoustic and/or visual warning signal shall be given (see 6.2). The exposed persons shall have time to leave the danger zone (see 4.10.6) or prevent the machinery starting up, and the instructions for use shall describe a safe procedure as to how to operate these functions (see 6.3.4).

Control elements and display units shall be positioned so that they can be actuated safely. This means that when actuating the controls, the operator is not in the danger zone of:

- crushing process;
- crushing cavity;
- conveyors;
- feed material falling out of the feed hopper or from trucks, shovels or similar when feeding;
- processed material discharged from the machine or magnetic separator;
- power unit;
- power transmission.

To minimize hazards, machines equipped with programmable control system shall be programmed to stop under normal conditions in accordance with such a sequence which empties the screen, crusher and belt conveyors, etc. of the material before the full stop of the machine.

Exception should be given to machines with circulating load or when the operator decides a faster stop is suitable. In these cases, the control system shall inform the operator prior to stopping the machine that the machine may not be empty of material.

Two-hand and hold-to-run functions shall be local controls allowing visibility of the controlled elements and/or portable control unit (remote control). This applies, for example, to the following moving parts:

- outriggers;
- feeder/feed hopper tilting, feed plate tilting, feed hopper grid tilting;
- feed hopper wall folding;
- conveyor folding and tilting;
- screen angle adjustment;
- cylinder drives for transforming the machine from transport position to working position;
- cylinder drives for additional mounting devices;
- drives for movable chutes.

4.10.4 Emergency-stop

An emergency stop function shall be installed on all machines. It shall be selected (i.e. emergency stop category 0 or 1) and designed according to EN ISO 13850:2015.

At least one emergency stop of category 0 according to EN ISO 13850:2015 shall be provided on the control unit.

NOTE 1 For machines with a long deceleration time due to inertia, immediate stopping of the machine (e.g. hammer crusher, impact crusher, roll crusher, jaw crusher, gyratory crusher, lowering belt conveyor) can lead to dangerous situations.

NOTE 2 In complex plants, the automation designer can separate emergency stop function for stopping the different modular machinery, instead of one general emergency stopping provision, considering the need for stopping also upstream and/or downstream modular machinery.

4.10.5 Remote controls

Remote controls shall fulfil the requirements of Annex A.

When a remote control is fitted, the possibility that correct control signals are not received including loss of communication shall be taken into consideration for emergency stop. Delay time of the emergency stop shall not be allowed, except for the response time of the system which should not exceed 1 s, response time of the system shall be taken into account during risk assessment (see Table 3).

4.10.6 Modes of starting

4.10.6.1 General

Where machinery has been designed and constructed to allow its use in several control or operating modes requiring different protective measures and having a different impact on safety, it shall be fitted with a mode selector which can be locked in each position (for example key operated switch). Each position of the selector shall be clearly identifiable and shall correspond to a single operating or control mode.

The selector may be replaced by another selection method which restricts the use of certain functions of the machinery to certain categories of operator (for example access code).

Where automatic mode is implemented, a maintenance mode shall also be implemented.

Mode selection by itself shall not initiate machine operation. A separate actuation of the start control shall be required.

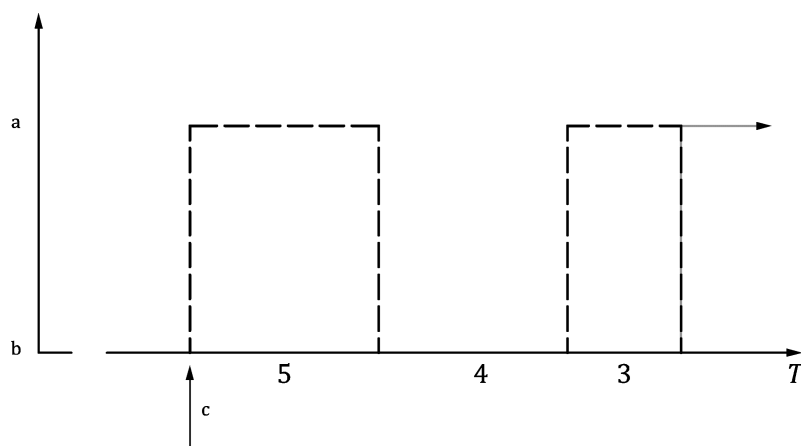
4.10.6.2 Automatic start/stop

Where an automatic start has been initiated, there shall be a prestart warning prior to starting any item of plant for duration of 5 s followed by a delay of 4 s (with no prestart warning) and then a further prestart warning of 3 s after which the first item of plant shall start with no delay (see Figure 4).

Within automatic starting where there is a time delay between the start of a plant item and the start of a subsequent plant item in the sequence of greater than 60 s then a 3 s prestart warning shall be activated again prior to starting of the item of plant.

Where an automatic stop has been initiated, the plant shall stop according to the predetermined sequence meeting the time delay between the stop of a plant item and the stop of a subsequent plant item in the sequence.

For large and complex plants, for automatic mode, the sequence durations presented may be extended by the manufacturer based on the risk assessment.



Key

- a On
- b Off
- c start button
- T time in s
- — — prestart warning
- > item of plant

Figure 4 — Prestart warning

4.10.6.3 Manual start/stop

Manual start/stop, shall consist in a voluntary actuation by the operator for each action of the machine with the following sequence:

- prestart warning prior to any item of plant starting which will last for a duration of 5 s,
- followed by a delay of 4 s (with no prestart warning),
- and then a further prestart warning of 3 s (see Figure 4).

4.10.6.4 Maintenance start/stop

Maintenance start shall not allow for running of the entire plant.

Maintenance mode operation may be carried out through the use of the existing manual mode start stop buttons, once machine has been placed in this mode, or through component selection and issuing a start stop command on the human machine interface (HMI) in a maintenance mode, or by some other method or buttons dedicated for maintenance mode function.

Prestart warning shall be same as requested in 4.10.6.3.

Where, for maintenance, a guard has to be displaced or removed and/or a protective device has to be disabled, and where it is necessary, for the purpose of these operations, for the machinery or part of the machinery to be put into operation, the safety of the operator shall be achieved by simultaneously:

- disabling all other control modes by providing a lockable mode selector;
- permitting operation of the hazardous elements only by continuous actuation of an enabling device, a two-hand control device or a hold-to-run control device;
- permitting operation of the hazardous elements only in reduced risk conditions (for example, reduced speed, reduced power/force, step-by-step, with a limited movement control device) as specified in specific parts EN 1009-2:2020 and EN 1009-3:2020, and
- preventing any hazardous automatic functions (e.g. functions started by sensors).

NOTE An example is the safety function for motorized rotation of an impact crusher, while the housing is open according to 4.13, Table 3.

4.11 Safeguarding

4.11.1 General

The selection of types of guards shall be determined in accordance with the principles of EN ISO 14120:2015, Clause 6.

Movable parts of power transmission parts shall be safeguarded with either fixed or movable guards in accordance with EN ISO 14120:2015. This applies especially to:

- a) engine belts, fan, timing, generator, etc.
- b) fans for engine, hydraulic oil cooler, etc.
- c) Mechanical drives like shafts, eccentrics, flywheels, pulleys, belts, chains and mechanical couplings, etc.

4.11.2 Fixed guards

Fixed guards shall comply with EN ISO 14120:2015.

The moving parts directly involved in the process shall be safeguarded with fixed guard.

4.11.3 Movable guards

Movable guards shall comply with EN ISO 14120:2015.

Hinged doors, hatches or hoods shall be lockable in open position, e.g. by a latch or cylinder, if there is a risk of injury related to unexpected closure.

If the force needed to handle the door is greater than 250 N considering the normal human performance, means for relief of load shall be provided.

Verification: by measure or test with scale Borg.

4.11.4 Interlocking guards with or without guard locking

Interlocking guards shall be in accordance with EN ISO 14120:2015. They shall be securely fixed in position and shall use interlocking devices in accordance with EN ISO 14119:2013.

Interlocking devices and interlocking devices with guard locking shall:

- shut down all energies related to the danger zone (e.g. mechanical, electrical, pneumatics, hydraulics, fuels);
- not be easily overridden (EN ISO 14119:2013).

In case of hazard for the operator to being trapped in the danger zone, see 4.3.

NOTE The key transfer systems (according to EN ISO 14119:2013, B.2) allow compliance with all of these requirements.

4.12 Access to the fixed enclosures by doors where parts are running (e.g. scrubber, ball mill)

Where a machine is guarded all around (e.g. by a fence), if access is intended while parts are running, then access shall be prevented by doors designed in accordance with EN ISO 14120:2015 and EN ISO 14119:2013.

NOTE Specific requirements are given in EN 1009-2 to prEN 1009-6, e.g. for scrubber, ball mills and ore sizer.

4.13 Safety related parts of control systems

The safety related parts of the control systems shall comply with EN ISO 13849-1:2015.

The minimum required performance levels shall comply with the following Table 2.

Table 2 — Required performance level of safety function — Safety-Related Parts for Control Systems

Safety function	Explanation	Required performance levels according to EN ISO 13849-1:2015	See also subclause/Part
Emergency stop: Ability to stop	An EMERGENCY STOP circuit with associated EMERGENCY STOP control devices shall be provided at the Plant/Mobile Machine.	c	4.10.4
Hold to run function for supporting feet: Safe stop of movement	Releasing the control function for extension or retraction of supporting feet which are lowered to make contact with the ground below the machine shall result in safe stop of the movement. ^a	b	prEN 1009-6 g
Hold to run function for travelling: Safe stop of movement	Releasing the remote control function for travelling of the mobile machine shall result in safe standstill. ^a	c This level can be reduced to PL _r = b with the use of a rated PL _r = c stop button or EStop button on the remote, only when loss of communication is also considered as PL _r = c.	prEN 1009-6 g
Prevention of unexpected Travel movement	An unexpected travelling movement of the mobile machine shall not be possible.	c	prEN 1009-6 g
Hold to run function for swivelling or folding belt conveyors, hopper walls, screen boxes: Safe stop of movement	Releasing the control function for swivelling or folding belt conveyors, hopper walls, screen boxes shall result in safe stop of the movement. ^{a,b}	b	4.10
Hold to run function for opening/closing of crusher housing: Safe stop of movement	Releasing the control function for opening/closing of crusher housing	c	4.10

Safety function	Explanation	Required performance levels according to EN ISO 13849-1:2015	See also subclause/Part
	shall result in safe stop of the movement. a,b		
Interlocking guard with guard locking for impact crushers, impact mill, hammer mill, hammer crusher, roll crusher, rotary scrubber and dynamic air classifier: Prevention of unexpected start.	For impact crushers, impact mill, hammer mill, hammer crusher, roll crusher an unexpected start shall not be possible, as long as moving parts of the crusher are accessible. c For maintenance work in the rotary scrubber if an access door to this area is necessary for inspection, the access shall be controlled with an interlocking guard with guard locking, e.g. trapped key system according to EN ISO 14119:2013, B.2. For maintenance work in the dynamic air classifier, if an access door to this area is necessary for inspection, an interlocking guard with guard locking according to EN 1009-1:2019, 4.11.4 shall be provided to ensure that No access to the rotor is not possible shall be possible until the rotor has stopped rotating.	c	4.10, 4.11.4, EN 1009-3:2020, 4.4 EN 1009-5:2020, 4.9 and 4.15
Prevention of unexpected start of jaw crusher/cone crusher during maintenance work in the crushing chamber: Isolation of drive energy	For Jaw crusher/cone crusher an unexpected start shall not be possible during maintenance work in the crushing chamber if the main power supply is required to be active, (for example: diesel engine running to	c	4.10, EN 1009-3:2020, 4.2.4

Safety function	Explanation	Required performance levels according to EN ISO 13849-1:2015	See also subclause/Part
	provide electric or other power during maintenance). ^d		
Interlocking guard with guard locking on the crusher housing and inspection flap(s) of an impact crusher, impact mill, hammer mill, hammer crusher, roll crusher and vertical shaft impactor: Ability to keep the guard closed and locked until the crusher is at standstill and the rotor is secured against rotation	A guard locking of the crusher housing and inspection flap(s) of an impact crusher, impact mill, hammer mill, hammer crusher, roll crusher shall be activated until the rotor of the crusher is at standstill and locked against rotation. ^e	c	4.10, 4.11.4, EN 1009-3:2020, 4.4.2, 4.5.2 and 4.7.1
Hold to run function for motorised rotation of the rotor of the impact crusher, impact mill, hammer mill, hammer crusher, roll crusher while crusher housing and/or inspection flap(s) are open: Safe stop of movement	For maintenance, when it is necessary to move the rotor of the impact crusher, impact mill, hammer mill, hammer crusher, roll crusher in a motorized way while the door(s) is/are open, then this control(s) shall have a hold-to-run function. The danger zone shall be visible from the control position. During maintenance, upon releasing the control function, the rolls of the machine shall be designed to stop in a maximum of 3 s. ^f	c	EN 1009-3:2020, 4.4.2 and 4.5.2
Horizontal shaft impactor, impact mills, hammer crushers, hammer mills and roll crushers maintenance: rotor peripheral speed kept under the maximum value	During maintenance, the maximum rotor peripheral speed shall be 100 mm/s.	c	EN 1009-3:2020, 4.4.2 and 4.5.2

Safety function	Explanation	Required performance levels according to EN ISO 13849-1:2015	See also subclause/Part
Hold to run function for motorized movement of the bucket elevator while the door(s) are open: Safe stop of movement	For maintenance, when it is necessary to move the bucket elevator in a motorized way while the door(s) is/are open, then this control(s) shall have a hold-to-run function. The danger zone shall be visible from the control position.	c	EN 1009-2:2020, 4.9.1
Safely limited speed of motorized movement of the bucket elevator while the door(s) are open	For maintenance, when it is necessary to move the bucket elevator in a motorized way while the door(s) is/are open, then the activated maximum speed of the bucket elevator shall not exceed 30 mm/s [safely-limited speed (SLS) according to EN 61800-5-2].	b	EN 1009-2:2020, 4.9.1
Hold to run function for manual or maintenance operation of the tipping grid: Safe stop of movement	Releasing the control function for manual raising/lowering the tipping grid, (including foldable slotted grate, vibrating slotted grate, vibrating tipping grid) shall result in safe stop of the movement. ^a	c	prEN 1009-6 g
a Provisions for the case of loss of signal are given in 4.10.5. b Opening of the crusher housing refer to impact crusher, impact mill, hammer mill, hammer crusher, roll crusher. c The unexpected start refers to the situation where the crusher housing and/or the inspection flap are opened. d Where switching off and locking of the main switch during maintenance does not achieve safe isolation of all drive energy, then this safety function does apply. Switching off and locking of the main switch during maintenance is not a safety function. e Opening of the crusher housing is only be possible if the rotor is secured against rotation. See specific requirement EN 1009-3:2020, 4.4. f For the stopping time of the rotor upon releasing the control function, see EN 1009-3:2020, 4.4. g Under preparation.			