
**Stroji za mehansko obdelavo mineralov in podobnih trdnih snovi - Varnost - 3. del:
Posebne zahteve za stroje za drobljenje in rezkanje**

Machines for mechanical processing of minerals and similar solid materials - Safety -
Part 3: Specific requirements for crushing and milling machinery

Maschinen für die mechanische Aufbereitung von Mineralien und ähnlichen festen
Stoffen - Sicherheit - Teil 3: Spezifische Anforderungen für Brecher und Mühlen

Machines pour le traitement mécanique des minéraux et des matériaux solides similaires
- Sécurité - Partie 3 : Prescriptions spécifiques pour machines de concassage et de
broyage

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Machines for mechanical processing of minerals and similar solid materials - Safety - Part 3: Specific requirements for crushing and milling machinery

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

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European foreword

This document (EN 1009-3:2020) 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of an identical text or by endorsement, at the latest by November 2020, and conflicting national standards shall be withdrawn at the latest by May 2022.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 EN 1009-1:2020.

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.

EN 1009-3:2020 (E)**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 or hazardous events are covered are indicated in the Scope of this document.

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

1 Scope

This document, to be used together with EN 1009-1:2020, specifies the safety requirements and their verification for the design and construction of crushing and milling machinery for the mechanical processing in quarrying, recycling and processing mineral and by-products. In addition, it specifies the type of information on safe working practices (including residual risks) to be provided by the manufacturer.

When requirements of this part of EN 1009 are different from those which are stated in EN 1009-1:2020, the requirements of this part of EN 1009 take precedence over the requirements of EN 1009-1:2020 for machines that have been designed and built according to the provisions of this part of EN 1009.

This document, together with EN 1009-1:2020, deals with all the significant hazards, hazardous situations and events relevant to crushing and milling machinery when they are used as intended and under the conditions foreseen by the manufacturer (see Annex C).

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 1 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.

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 is not applicable to crushing and milling 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 795:2012, *Personal fall protection equipment — Anchor devices*

EN 1009-1:2020, *Machines for mechanical processing of minerals and similar solid materials — Safety — Part 1: Common requirements for machinery and processing plants*

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

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 1009-3:2020 (E)

ISO 2631-1:1997, *Mechanical vibration and shock — Evaluation of human exposure to whole-body vibration — Part 1: General requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100:2010, EN 1009-1:2020 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/>

NOTE Annex A shows examples of crushing and milling machinery.

**3.1
crusher**

machine intended for reducing the size of mineral-based material to particles of smaller dimension starting from coarse size to millimetric size and which can be based on various crushing technology

**3.2
mill**

machine intended for reducing the size of minerals based material to particles of smaller dimensions starting from middle coarse size to micronic size, and which can be based on various grinding technologies

**3.3
jaw crusher**

compression crushing machine consisting of a fixed jaw and a movable jaw which moves so as to increase and decrease the gap between the two jaws

[SOURCE: ISO 11375:1998, 3.2.1]

**3.4
gyratory crusher
cone crusher**

compression crushing machine consisting of a moving part rotated eccentrically within the fixed part; both moving and fixed parts are in a form of truncated cones

[SOURCE: ISO 11375:1998, 3.2.2]

**3.5
roll crusher**

crushing machine which breaks

- a) by pressure being continuously maintained between the faces of two revolving cylinders (rolls);
- b) by impact, shear and pressure between one roll which has, at intervals rows of teeth and another roll or breaker plate

[SOURCE: ISO 11375:1998, 3.2.3]

3.6**hammer mill**

crushing and milling machine equipped by articulated hammers based on a rotary axis installed inside a fix frame

3.7**rod mill****ball mill****autogenous mill**

cylinder, rotating on a horizontal axis that can be partly filled with balls or rods (generally of steel), or nothing if full autogenous milling, that, by their tumbling motion, reduce a coarse material into a fine material by impact and abrasion

Note 1 to entry: These technologies can be used in wet or dry process.

3.8**horizontal shaft impactor****horizontal impact crusher**

crusher (3.1) consisting of a rotor on a horizontal shaft equipped with blow bars which is rotated at high speed, throwing material against the impact aprons

Note 1 to entry: The crusher housing is designed to open the housing hydraulically.

3.9**vertical shaft impactor****vertical impact crusher**

crusher (3.1) consisting of a rotor or impeller disc mounted on a vertical shaft which is rotated at high speed, throwing materials against the anvils or previously crushed particles lining the crushing chamber or another part of the material which bypasses the rotor

[SOURCE: ISO 11375:1998, 3.2.4.3]

3.10**high-pressure grinding roll**

machine designed with two rollers working under high pressure for fine comminution of the material

Note 1 to entry: The particles of the feed material are in the majority smaller than the gap between the roller.

3.11**stirred mill**

machine with a vertical drum equipped with a mixer and full of grinding media dedicated to low grain size grinding

4 Safety requirements and/or protective/risk reduction measures**4.1 General****4.1.1 General requirements**

Crushing and milling machinery shall comply with the requirements of EN 1009-1:2020, as far as not modified or replaced by the requirements of this part.

EN 1009-3:2020 (E)**4.1.2 Maintenance**

A safe means of access (e.g. permanent or temporary working platform) around the crusher is required to handle and remove the wear parts.

This access platform shall meet requirements of 4.1.3 to be used for process monitoring.

The minimum operating loads of temporary working platform shall be 1,5 kN/m² under distributed load for the structure.

In case of adjustable temporary working platform fitted with a locking mechanism, it shall hold twice the minimum operating loads of temporary working platform.

If there is a risk of falling during maintenance operation, anchorage points shall be provided in accordance with tests of EN 795:2012.

For maintenance work in the crushing chamber, isolation and energy dissipation shall be provided for the crusher as well as for upstream and downstream sub-assemblies. See EN 1009-1:2020, 4.10.1.

4.1.3 Process monitoring

When a clear view to crusher feeding area is required according to the instruction handbook of the manufacturer to ensure effective process, the following safety aspects need to be considered:

- if a permanent access platform is fitted, the inspection area shall comply with EN ISO 14122-2:2016 and be guarded to protect the operator from ejection of rocks and contact with the feeding area of the machine as well as falling hazards;

The permanent access platform may be same as the maintenance platform.

- remote monitoring such as CCTV system or an automatic material control system (e.g. level sensing and control) shall be provided when the feeding area is out of vision of the operator.

Means shall be provided to control the material feeding in order to stop the upstream material flow in case of a blockage (e.g. current control, speed control, level control). Purpose of this is to reduce overfilling and falling objects occurrences and to identify blockages in order to reduce necessity for interventions for clearing out machines. Appropriate instructions shall be included in the instruction handbook, see 6.3.

NOTE The control of the material feeding function is a process function, not a safety function.

4.1.4 Wear parts handling

Mounting and dismounting of new and/or used wear parts shall be in accordance with EN 1009-1:2020, 4.17.

NOTE The specific lifting accessories can be designed-in and/or implemented to the machine as a separate element (e.g. eyelet, specific tool or any device to facilitate handling).

4.2 Jaw crusher

4.2.1 Coil spring tensioned tension rods of jaw crushers shall be guarded according to EN 1009-1:2020, 4.11, in such a way that the parts of the rods are retained in the event of break up.

4.2.2 When the crusher is in operation, means shall be provided for hands and feet to be prevented from touching the tension springs.

4.2.3 The design of the machine shall take in account the need for safe exchange of the toggle plate(s), jaw dies and cheek plates according to EN 1009-1:2020, 4.17.5 and appropriate instructions shall be included in the instruction handbook.

4.2.4 Where it is intended that the operator enter inside the crushing chamber, a means shall be designed or provided in order to:

- allow access in comfortable conditions with access openings complying with EN 1009-1:2020, 4.2.2;
- prevent operator from falling; and
- ensure that jaw crusher liners cannot accidentally fall during maintenance work.

Where special equipment or accessories are required (e.g. additional temporary working platform), they shall be provided by the manufacturer.

If part of the machinery can be used as a safe working platform, there is no need for providing special equipment or accessories.

If a temporary working platform is provided, it shall be designed to:

- take into account presumable crushing chamber geometry changes (e.g. available liner options, crusher setting adjustment and the amount of wear);
- in case of adjustable platform, ensure that the locking mechanism will hold required forces of 4.1.2;
- enable safe use of ladders (when required);

NOTE If jaw liners are constructed from two pieces it can be necessary to provide two separate platforms.

If the crushing chamber and the feed hopper by design protect the worker from falling, then guardrails are not required.

The manufacturer of the platform shall provide operating instructions. See 6.3. Special attention shall be given to:

- residual risks;
- inspection and repair instructions;
- limitations related to crusher types (e.g. crusher models or sizes).

4.2.5 The feed opening of the crusher shall be provided with a guard to minimize hazards caused by ejected material.

When raised for maintenance, the guard shall be provided with means to prevent it falling down from its position when opened.

4.2.6 Means shall be foreseen to solve blockages (e.g. hydraulic rock breaker, reverse rotating) and instructions shall be provided, see 6.3.

4.2.7 If means of access is permanently installed adjacent to crusher inlet and if manufacturer permits access during operation, then platform shall comply with whole body vibration standard according to ISO 2631-1:1997. In all other cases, restricted areas shall be defined in the instruction handbook.

NOTE Clearing of blockages is not normal operation. In case of using the means of access only during clearing blockages while the crusher is running this vibration standard is not applicable. For using the means of access for maintenance work while the crusher is not running, this vibration standard is also not applicable.

EN 1009-3:2020 (E)**4.3 Gyratory and cone crusher**

4.3.1 There shall be a system that prevents the crusher to be over filled with feed material. A typical solution for this is a level sensor system that will control the feeder.

4.3.2 The design of the sub-assembly shall take in account the need for maintenance work inside the crushing chamber.

4.3.3 In cone and gyratory crushers, dismantling of upper frame is required in order to change wear parts. If according to EN ISO 14122-2:2016, the working height is over to 1 700 mm, it is required that there is a separate working platform that is installed into the crushing chamber during the maintenance work.

The platform shall prevent the operator from falling into the cavity. In addition, if there is a risk of falling outside the crusher then it is required that the platform has guardrail as specified in EN ISO 14122-3:2016, 7.1. The guardrail is not required if the falling height is less than 500 mm.

4.3.4 The design of the sub-assembly shall take in account the need of safe installation and exchange of the main parts of the machine.

4.3.5 When a cone crusher is fitted with coil springs as a tramp release mechanism and threads for setting adjustment, means shall be provided for hands and feet to be prevented from touching these devices.

4.3.6 If supplying a sub-assembly, protection against rocks ejection shall be designed and supplied as part of the modular machinery.

4.3.7 If the crusher is stalled during crushing there is a risk of serious injury if a compressed rock or uncrushable material ejects from the cavity during the inspection. The crusher shall be designed to allow release of the compression forces. Detailed instructions how to clear stalled crusher with warnings shall be provided in the instruction handbook (see 6.3).

4.4 Horizontal shaft impactor, impact mills, hammer crushers and hammer mills**4.4.1 Machine under rotation**

Means shall be fitted, e.g. chain and rubber curtains in the inlet and outlet of the crusher or the crusher shall be closed and incorporated in order to minimize the risk of ejection of material.

Opening of the crusher or reaching the rotor via intended means of access (housing and or inspection door), including in the event of a blockage, shall only be possible if the rotor is locked. Appropriate instructions shall be included in the instruction handbook, see 6.3.

When an impact crusher is fitted with coil springs as a tramp release mechanism, means shall be provided for hands and feet to be prevented from touching these devices. In case the impact crusher is equipped with an overload protection system, it shall be ensured that injury of people by moving parts is minimized by proper design and the sub-assembly shall include a maintenance area for the operators.

A visual inspection opening shall be provided for inspection inside the crusher. The crusher housing as well as any visual inspection opening or guards giving access to the rotor shall be fitted with interlocking guard with guard locking (see EN 1009-1:2020, 4.11.4).

Backside and/or top of housing inspection doors shall be considered as fixed guards, provided that the rotor shall still be covered by impact aprons.