BS EN 13871:2014

BSI Standards Publication

Food processing machinery — Cubes cutting machinery — Safety and hygiene requirements

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 13871:2014. It supersedes BS EN 13871:2005+A1:2010 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee MCE/3/5, Food industry machines.

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

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

Published by BSI Standards Limited 2014

ISBN 978 0 580 78518 4
ICS 67.260

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 November 2014.

Amendments/corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13871

November 2014

ICS 67.260

Supersedes EN 13871:2005+A1:2010

English Version

Food processing machinery - Cubes cutting machinery - Safety and hygiene requirements

Machines pour les produits alimentaires - Machines à couper en cubes - Prescriptions relatives à la sécurité et à l'hygiène

Nahrungsmittelmaschinen - Würfelschneidemaschinen - Sicherheits- und Hygieneanforderungen

This European Standard was approved by CEN on 13 September 2014.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 13871:2014 E

Contents

Page

Foreword

This document (EN 13871:2014) has been prepared by Technical Committee CEN/TC 153 “Machinery intended for use with foodstuffs and feed”, 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of an identical text or by endorsement, at the latest by May 2015 and conflicting national standards shall be withdrawn at the latest by May 2015.

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

This document supersedes EN 13871:2005+A1:2010.

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 2006/42/EC.

For relationship with EU Directive 2006/42/EC, see informative Annex ZA, which is an integral part of this document.

Significant changes:

The significant changes with respect to the previous edition EN 13871:2005+A1:2010 are listed below:

— Clause 1: clarification of the Scope;

— Clause 2: normative references updated;

— Clause 3: terms partly revised; consistent use throughout the standard;

— Clause 4: new presentation in a table;

— 5.2.1: requirements to interlocking devices and the stopping time; more specific requirements to product pusher, protective rail and blade guide;

— 5.2.2.2: requirements to blade housing and blade guard;

— Clause 6: verification list updated;

— Clause 7: completion of 7.2 with all information referred to in Clause 5, now including operator training; 7.3 now contains the marking;

— Annexes: old Annex C “Common hazards” deleted and shifted into appropriate clauses;

— figures partly renewed.

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

Introduction

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

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

1.1 General

This European Standard covers cube cutting machines (see Figure 1 to Figure 6 and Figure 12 to Figure 18) and specifies requirements for the design and manufacture.

The machines covered by this European Standard are used to size reduce fresh meat, meat products and products of the same kind (e.g. fish, vegetables and cheese) by cutting in a cutting chamber.

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

This European Standard deals with the hazards which can arise during all the lifetime of the machine, including the phases of transport, assembly, operation, maintenance, dismantling, disabling and scrapping of the machine.

This European Standard is not applicable to cubes cutting machines which are manufactured before the date of publication of this document by CEN.

1.2 Types of cube cutting machines covered by this standard

This European Standard covers the following types of cubes cutting machines:

— cubes cutting machines with a forward feed plunger, a lattice and a sickle/multi-segment blade with loading by hand (see Figure 2);

— cubes cutting machines with a forward feed plunger, a lattice, a sickle/multi-segment blade, a feed intake hopper and a loading device (see Figure 1);

— cubes cutting machines with a rotating cutting tool, a sickle/multi-segment blade and a feed conveyor (see Figure 3 and Figure 5);

— cubes cutting machines with a rotating cutting tool and centrifugal force loading (see Figure 6);

— cubes cutting machines with or without integrated conveyor systems.

1.3 Machine construction

Cubes cutting machines are constructed of a machine frame, a feed intake chamber/magazine, a forward feed plunger or nip roller, a lattice or a rotating cutting tool, a sickle/multi-segment blade, an associated drive and electrical, hydraulic and pneumatic components, depending on machine type.

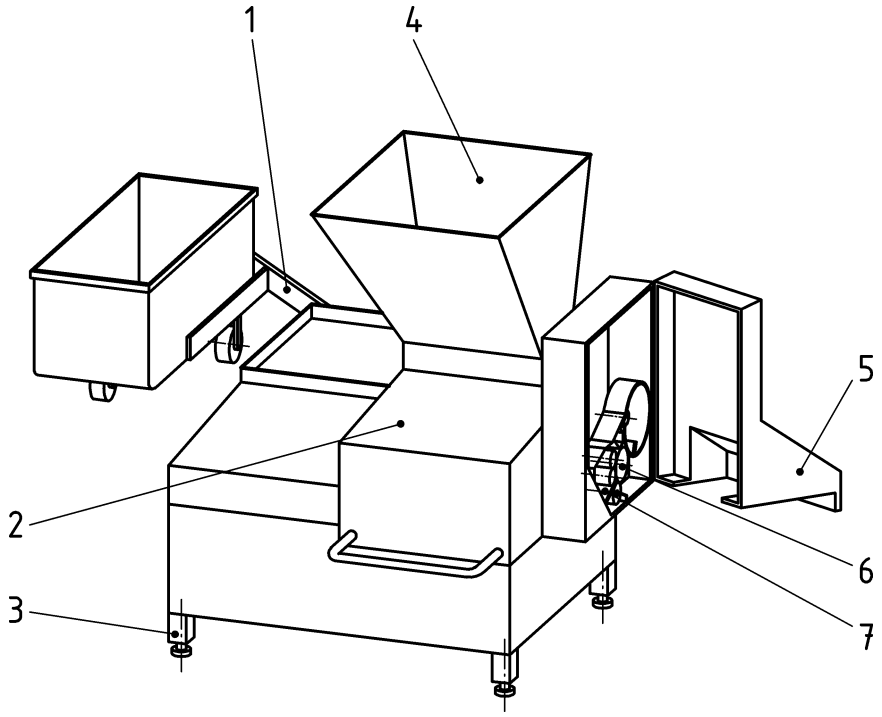
Cubes cutting machines in the scope of this European Standard may be equipped with:

— a lid over the feed intake chamber/magazine;

— a transfer car for the sickle /multi-segment blade, cutting blade and lattice;

— a loading device;

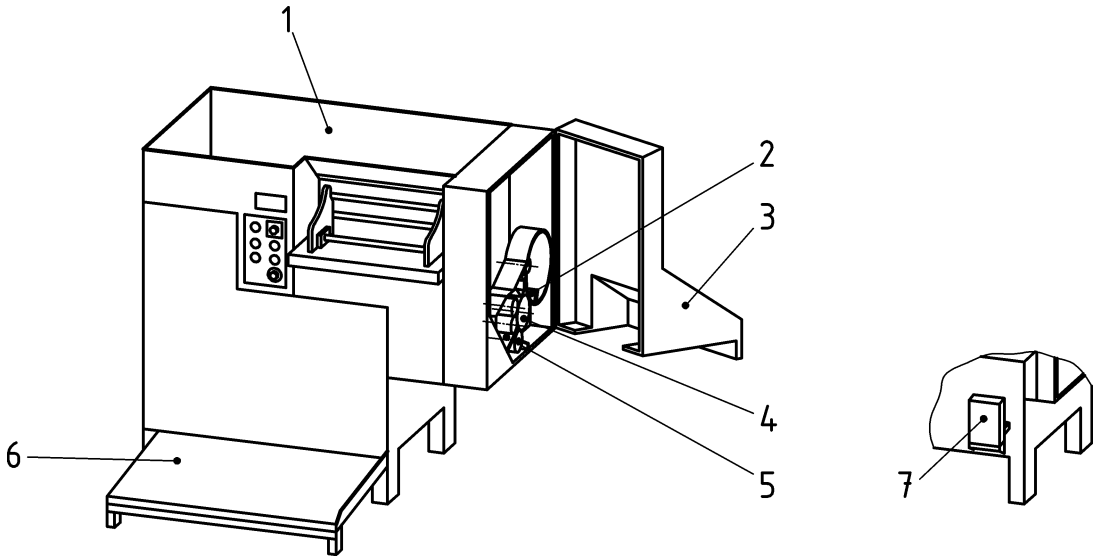
— a feed conveyor.



Key

1	loading device	5	cutting chamber door/protective hood
2	feed intake channel/magazine	6	sickle/multi-segment blade
3	frame	7	lattice
4	feed intake hopper		

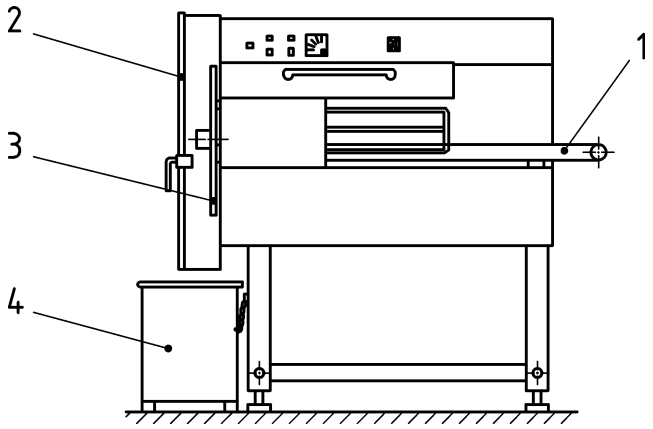
Figure 1 — Cubes cutting machine type with forward feed plunger, lattice, sickle blade, feed intake hopper and loading device



Key

1 feed intake trough
2 sickle/multi-segment blade
3 cutting chamber door/protective hood
4 lattice
5 cutting chamber
6 step
7 interlocked step

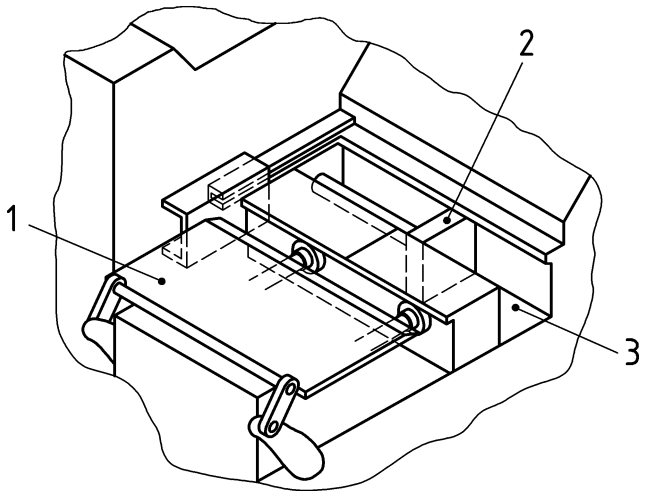
Figure 2 — Cubes cutting machine type with forward feed plunger, lattice and sickle blade and loading by hand



Key

1 feed conveyor
2 cutting chamber door
3 sickle/multi-segment blade
4 container

Figure 3 — Cubes cutting machine type with various blades, conveying unit and feed conveyor



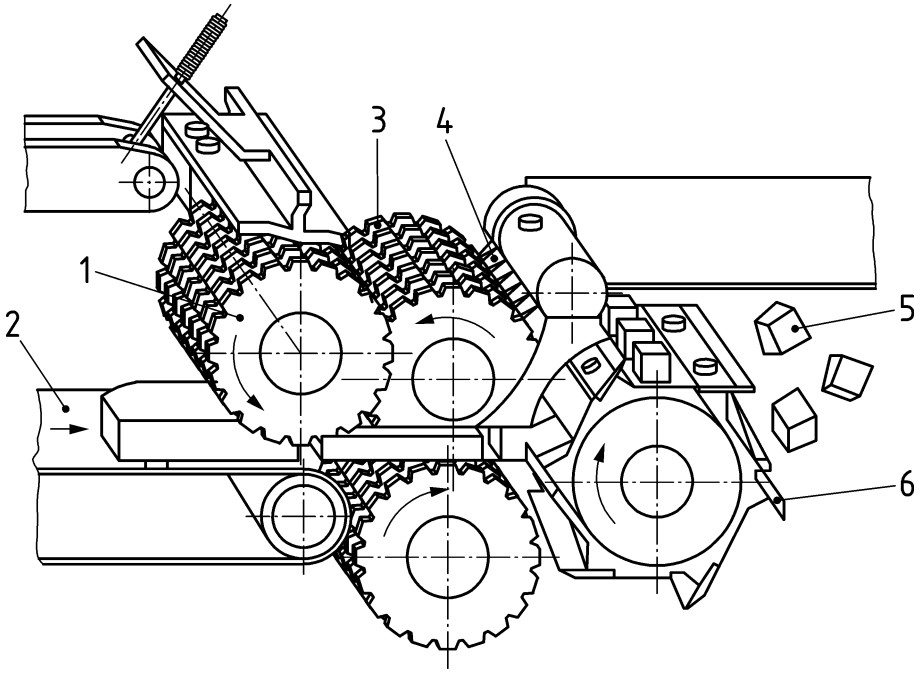
Key

1 closure gate

2 forward feed plunger

3 feed intake chamber/magazine

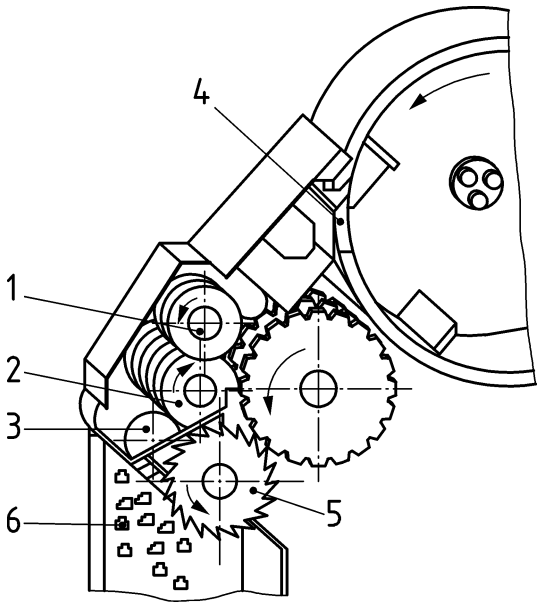
Figure 4 — Details of feed intake chamber



Key

1	nip roller	4	stripper comb
2	feed conveyor	5	cut product
3	rotating cutting tool	6	multi-segment blade

Figure 5 — Cubes cutting machine type with multi-segment blade and feed conveyor



Key

1	nip roller	4	cutting blade
2	rotating cutting tool	5	multi-segment blade
3	stripper comb	6	cut product

Figure 6 — Cubes cutting machine type with multi-segment blade and centrifugal force feeding

1.4 Intended use

The intended use (as defined in EN ISO 12100:2010, 3.23) of cubes cutting machines as dealt with in this document is described in 1.1.

The product to be cut is fed manually or by the loading device/feed conveyor into the feed intake chamber. The product is fed to the cutting unit by the forward feed plunger and/or by the nip roller or by centrifugal force and size reduced.

2 Normative references

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

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

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

EN 953:1997+A1:2009, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

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

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

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

EN 1672-2:2005+A1:2009, *Food processing machinery — Basic concepts — Part 2: Hygiene requirements*

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

EN 60529, *Degrees of protection provided by enclosures (IP Code) (IEC 60529)*

EN 61496-1:2004, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests (IEC 61496-1:2002, modified)*

EN ISO 3744:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane (ISO 3744:2010)*

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

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

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

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

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

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

EN ISO 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2008)*

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

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

3 Terms and definitions

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

3.1
stripper comb
comb-shaped rake within the rotating cutting tool for wiping off the product

3.2
nip roller
shaft with teeth and passes for transporting of product

3.3
step/working platform
standing area for operating the machine

3.4
container
unit for holding processed product

3.5
loading device
lifting and/or tilting device for raising and tilting transport trolleys or containers

3.6
construction height
height of hopper edge, measured from the floor

3.7
lid
movable unit with safety function on the feed intake chamber

3.8
feed intake channel
chamber for holding the meat or product of the same kind to be processed

3.9
feed intake chamber/magazine
chamber between feed forward feed plunger and lattice

3.10
feed intake trough / feed intake hopper
device for receiving product to be processed

3.11
locking device
device for fixing the transport trolley or container in the load bearing device

3.12
transport trolley
wheel-mounted device for holding product to be processed

3.13
lattice
cutting tool with blades arranged in parallel

3.14
design dimension
sum of dimensions measured from the floor (standing area), for steps, intermediate steps or ladders are provided, from the standing area to the feed intake hopper edge and to the first danger point in the feed intake hopper

3.15
load bearing device
device for holding transport trolleys/vats

3.16
mast-type loading device
loading device with a fixed post

3.17
frame
basic construction for carrying the machine body including legs

3.18
product to be cut
meat or products of the same kind to be processed

3.19
cutting blade
blade-shaped stationary cutting tool

3.20
cutting chamber
part of the housing for holding the lattice and sickle blade

3.21
cutting chamber door
interlocked door to the cutting chamber

3.22
protective hood / protective grid
guards for preventing access to the danger point at the lattice and sickle blade over the discharge opening

3.23
restrictor plate
fixed non-detachable or interlocked movable/detachable guard above the feed intake chamber/magazine

3.24
hinged arm
movable part of the lifting and tilting device

3.25
sickle/multi-segment blade
rotating cutting tool

3.26
transport car
wheel-mounted unit for holding the cutting unit

3.27
closure gate
automatic driven closure plate over the feed intake chamber/magazine

3.28
forward feed plunger / nip roller
plunger, conveying device to the cutting chamber for product to be processed

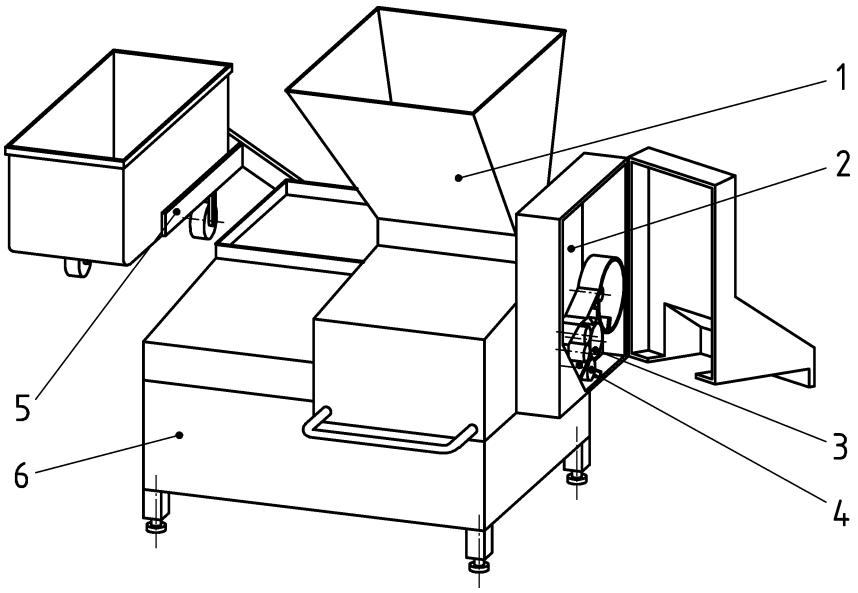
3.29
feed conveyor
conveyor belt for supplying the machine with product to be cut

4 List of significant hazards

This clause contains all the significant hazards, hazardous situations and events identified by risk assessment as significant for this type of machinery and which require measures to eliminate or reduce the risk associated with the identified hazards (see Table 1).

Table 1 — List of significant hazards

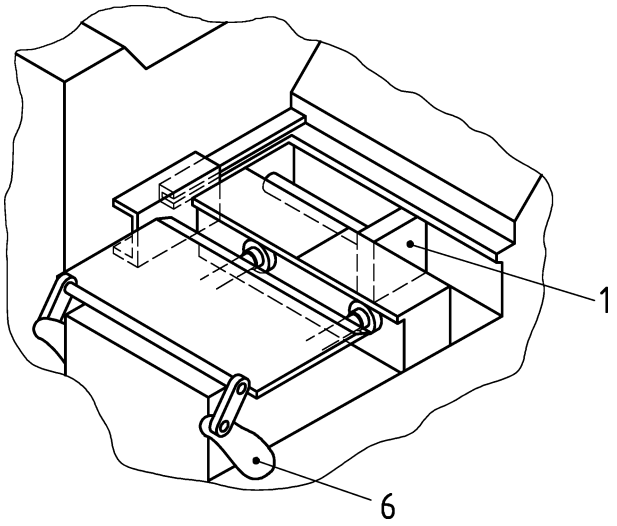
Hazards, hazardous situations and hazardous events	**Location or cause**	**Clause/subclause in this European Standard**
Hazards	**General**	5.1
Mechanical hazards	**General**	5.2.1
— crushing; — severing; — shearing; — trapping; — cutting; — drawing in	Cubes cutting machines with a forward feed plunger, a lattice and sickle blade and loading by hand;	5.2.2
	Cubes cutting machine with feed intake hopper and loading device;	5.2.3
	Cubes cutting machine with feed conveyor;	5.2.4
	Cubes cutting machine with centrifugal force feeding to the cutting unit;	5.2.5
Electrical hazards	Electric shock from direct or indirect contact with live components external influences on electrical equipment (e.g. cleaning with water)	5.3
Hazards generated by hydraulic or pneumatic	Risk of: - the operator being sprayed with hydraulic fluid; - high pressure air of hydraulic fluid entering the skin; - the product being contaminated with hydraulic fluid; - of mechanical damage and physical injury caused by malfunctions	5.4
Hazards generated by loss of stability	The complete machine	5.5
Hazards generated by noise	Machines generate noise that can lead to damage of hearing	5.6
Hazard generated by neglecting ergonomic principles	Unhealthy body posture or excessive physical effort; Inadequate consideration of human hand/arm or foot/leg anatomy by design of machines; No respect of the working area.	5.7
Hazard generated by neglecting hygienic design principles	e.g. contamination by microbial growth or foreign materials	5.8



Key

1	zone 1	4	zone 4
2	zone 2	5	zone 5
3	zone 3	6	zone 6

Figure 7 — Danger zones on cubes cutting machine with forward feed plunger, lattice, sickle blade, feed intake hopper and loading device

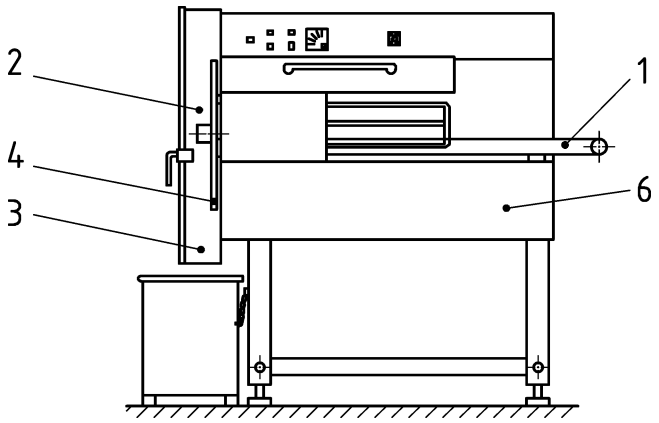


Key

1 zone 1

6 zone 6

Figure 8 — Danger zones on cubes cutting machine with feed intake chamber/magazine and loading by hand



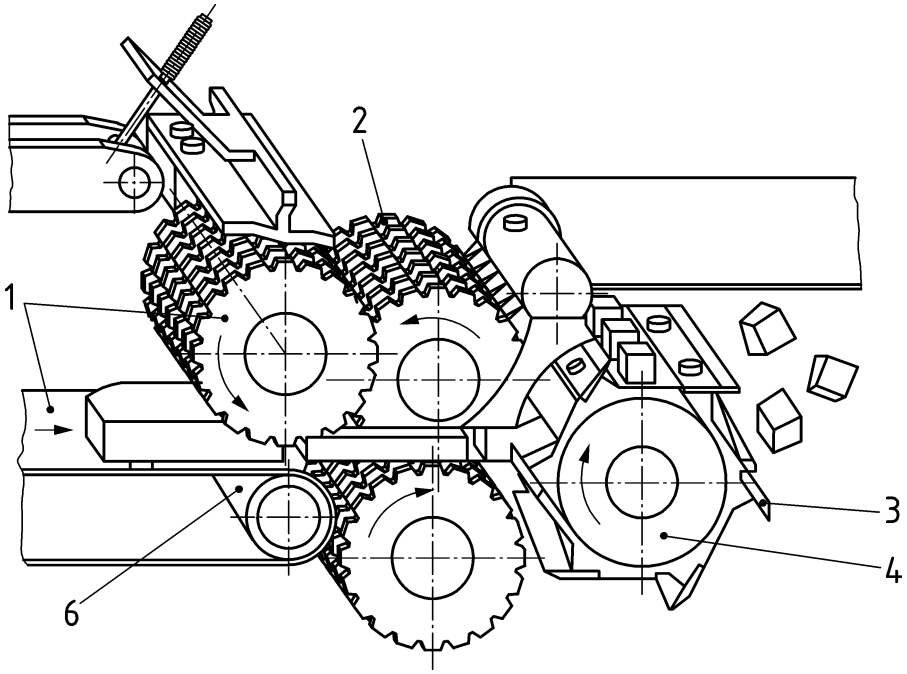
Key

1 zone 1 4 Zone 4

2 zone 2 6 zone 6

3 zone 3

Figure 9 — Danger zones on cubes cutting machine with conveying unit and feed conveyor



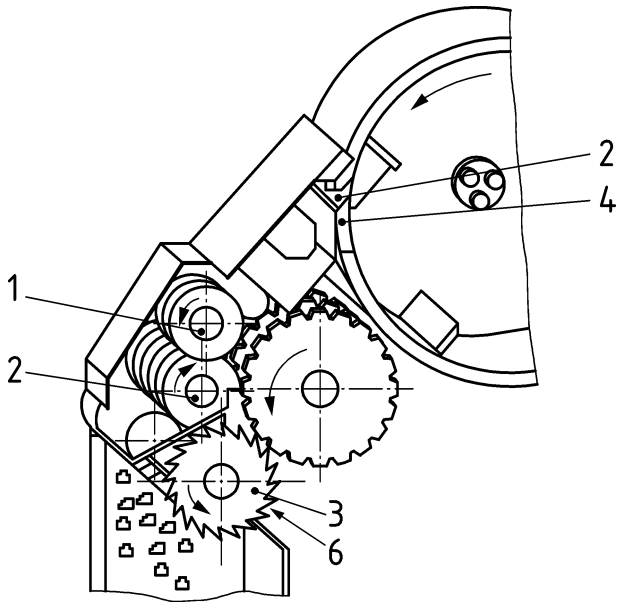
Key

1 zone 1 4 zone 2

2 zone 2 6 zone 6

3 zone 3

Figure 10 — Danger zones on cubes cutting machine with multi-segment blade and feed conveyor



Key

1	zone 1	4	zone 4
2	zone 2	6	zone 6
3	zone 2		

Figure 11 — Danger zones on cubes cutting machine with multi-segment blade and loading by means of centrifugal force

5 Safety and hygiene requirements and/or protective measures

5.1 General

Cubes cutting machines shall comply with the safety requirements and/or protective measures of this clause and Annex C of this document.

In addition, they shall be designed according to the principles of EN ISO 12100 for hazards relevant but not significant, which are not dealt with by this document (e.g. sharp edges).

The safety related parts of the control system shall present at least a performance level “c” in accordance with EN ISO 13849-1.

5.2 Mechanical hazards

5.2.1 General

The interlocking devices shall be built inside the machine housing and shall comply with EN ISO 14119:2013, 4.2 and Clause 7.

After activating an interlocking device the stopping time of the blade shall be ≤ 0,15 s.

Hazardous after-run of tools shall be prevented by braking devices or other solutions with equivalent effect.

Braking devices shall become automatically effective upon switching off the drive and in the event of a voltage failure and upon opening of the protective devices.

In the instruction handbook, the manufacturer shall indicate the daily verification of the interlocking device.

Fixing systems for fixed guards or for demountable parts of the machine casing (i.e. designed as fixed guards) shall remain attached to the guards or to the machine when the guards are removed.

5.2.2 Measures on cubes cutting machines with a forward feed plunger, a lattice and sickle blade and loading by hand

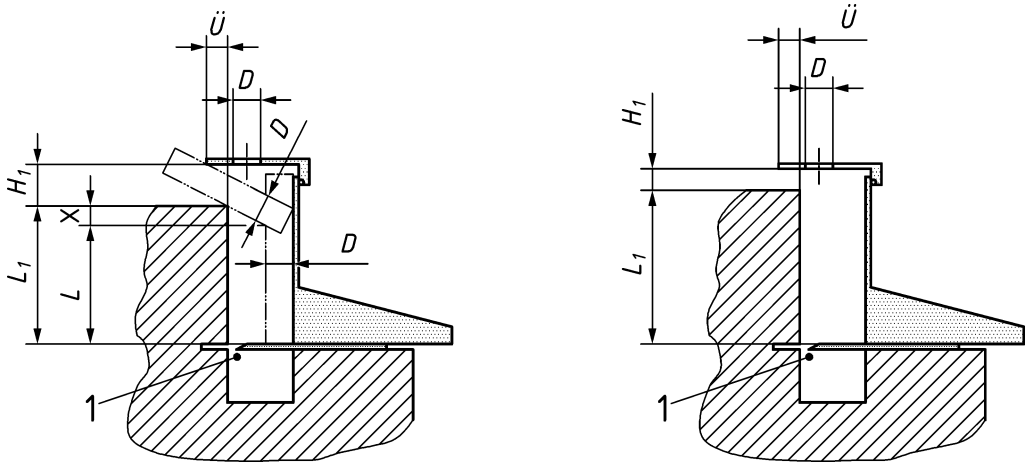
5.2.2.1 Zone 1 – Feed intake chamber (magazine) with forward feed plunger, feed intake hopper with closure gate, feed conveyor, nip roller

Access shall be prevented either by a movable guard (e.g. restrictor plate, lid), interlocked according to 5.2.1 or shall be secured by a non-detachable restrictor plate or adequate safety distances and design as described in 5.2.3.3.

Taking into account the specific technical constraints (high loading frequencies), the movable guard (lid) can be designed as a control guard according to EN ISO 12100:2010, 3.27.6.

Openings in the guard (e.g. restrictor plate, lid) may have a diameter $D \leq 52$ mm for $L \geq 120$ mm.

The dimensions and arrangements of the guard shall be according to Figure 12. Fastening of the non-detachable restrictor plate shall be according to EN 953.



Key

$\ddot{U} \geq 40$ mm

$H_1 \geq 40$ mm

$D \leq 52$ mm

$Q = 40$ mm

$L = L_1 - X$

$L \geq 230$ mm

1 danger zone

$\ddot{U} \geq 40$ mm

$H_1 \geq 40$ mm

$D < 52$ mm

$L_1 \geq 120$ mm

1 danger zone

Figure 12 — Safety dimensions on cubes cutting machine: Guard

5.2.2.2 Zone 2 – Rotating cutting tool and lattice

Access to danger points on cutting tools and lattice shall be prevented by enclosing guards in compliance with EN 953.

The enclosing guards shall be designed to prevent penetration by ejected parts as e.g. blades.

Movable enclosing guards over danger points shall be interlocked according to 5.2.1.

The blade housing and blade guard shall be designed to prevent penetration of flung parts (e.g. blades or parts of blades). Excepted are the outlet, inlet opening and in certain circumstances the opening on the floor as an outlet for remnants. A deformation of the blade housing and blade guard by parts is allowed.

The reliability of design measures is to be identified and documented by appropriate practical tests, such as collision or breaking tests.

5.2.2.3 Zone 3 – Rotating sickle blade behind cutting chamber door and multi-segment blade at discharge

Access shall be prevented at least by one of the following possibilities:

— cutting chamber door, without container (see Figure 14);

— combination of cutting chamber door and interlocked container (see Figure 13);

— combination of cutting chamber door and interlocked transport trolley (see Figure 15).

The cutting chamber door shall be interlocked according to 5.2.1.

If containers or transport trolleys or appliances are used for preventing access, these shall be interlocked so, that the function of the machine is stopped, when these elements are removed, or the danger points shall automatically be covered, when these elements are removed.

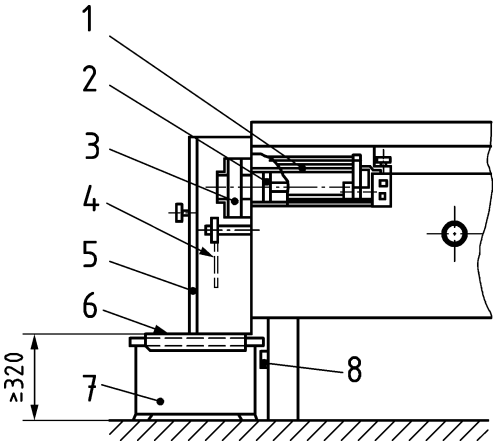
Interlocking of the container is not required on the discharge side if (see Figure 14):

— the distance from the floor to the lower edge of the sickle blade housing is not more than 320 mm, and

— the safety distance between the lower edge of the sickle blade housing and the radius of rotation of the sickle blade is at least 230 mm.

Upon opening the cutting chamber door by 20 mm or after removal of a container or discharge conveyor underneath the discharge opening the blade shall come to a standstill according to 5.2.

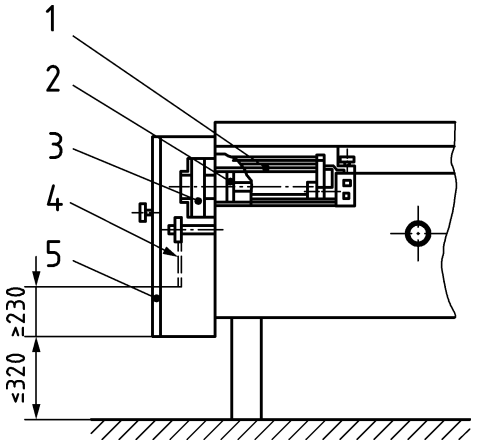
Dimensions in millimetres



Key

1	lid	5	cutting chamber door
2	forward feed plunger	6	protective hood
3	lattice	7	container
4	sickle blade	8	interlocking device / position switch

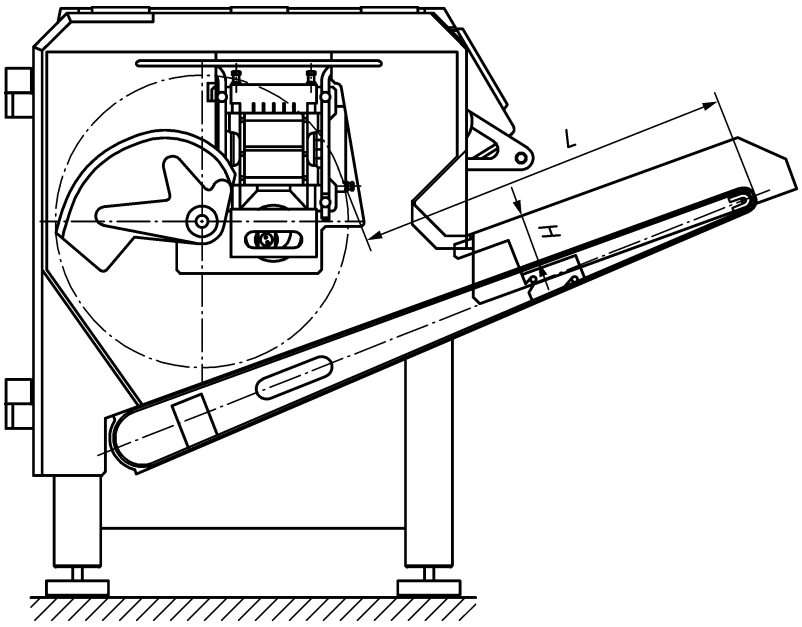
Figure 13 — Safety measures on cutting chamber door in conjunction with container



Key

1	lid
2	forward feed plunge
3	lattice
4	sickle blade
5	cutting chamber door

Figure 14 — Safety measures on cutting chamber door without container



Key

If $H < 40$ mm then $L > 250$ mm

If $40 \text{ mm} < H < 100$ mm then $L > 600$ mm

If $H > 100$ mm then $L > 850$ mm

Figure 15 — Safety dimensions on cutting chamber door in conjunction with an integrated conveyor belt

5.2.2.4 Zone 4 – Stationary blades

The mounting between the sickle blade and the drive shall be positive. If the enclosing guard (e.g. cutting chamber door, protective hood) is open, the sickle blade shall be prevented from any unintentional movement.

It shall be stated clearly in the instruction for use that “Cut-resistant gloves shall be worn” when changing the cutting tools and when carrying out any work in the vicinity of the cutting tools.

5.2.2.5 Zone 6 – Drive mechanism

Access to danger points at the drive mechanism shall be safeguarded by the provision of fixed or interlocked movable guards as defined in EN 953:1997+A1:2009, 3.2 and 3.5. If guards need to be opened for changing the operating process or for cleaning purposes, they shall be interlocked.

The interlocking system shall be according to 5.2.1.

5.2.3 Cubes cutting machine with feed intake hopper and loading device

5.2.3.1 Zone 1 – Feed intake hopper with automatic driven closure gate

Access to the danger points at the closure gate shall be prevented. This shall be achieved e.g. by the following measures:

Access is prevented by:

— the design (e.g. closed feed intake hopper) including a closed loading device for products (e.g. screw conveyor, pipeline with pump) (see 5.2.3.2.1) or

— the use of guards (e.g. a cover), according to EN 953 (see 5.2.3.2.2) or

— the use of electro-sensitive protective devices (e.g. light barrier), see EN ISO 12100 (see 5.2.3.2.3.2) or

— the use of fixed guards (e.g. fence), see EN 953 (see 5.2.3.2.3).

Access is made safe by:

— the use of adequate safety distances, design and additional measures (see 5.2.3.2.3.2).

5.2.3.2 Zone 1 – Interlocking devices and safety distances

5.2.3.2.1 Design with a closed feed intake hopper

The feed intake hopper and the loading device shall be completely enclosed or the openings shall comply with EN ISO 13857:2008, Table 4.

The manufacturer shall specify in the instruction handbook that the lid shall not be walked on.

5.2.3.2.2 Design with a cover at the feed intake hopper

A cover shall be provided at the feed intake hopper. The cover shall be interlocked. The feeding device shall come to a standstill within 2 s after the front edge of the guard has been raised 40 mm (opening distance).

The interlocking system of the movable cover shall comply with 5.2.

Openings in the cover shall comply with EN ISO 13857:2008, Table 4.

5.2.3.2.3 Design with safety distances and additional measures

5.2.3.2.3.1 General

On cubes cutting machines which cannot use an interlocked cover or a light curtain because they would be interrupted by continuous working, the following measures are necessary:

5.2.3.2.3.2 Safety distances

The design dimension (see 3.15), measured from the floor shall be $S \geq 2\,250$ mm. This is only possible in connection with additional measures 5.2.3.2.3.3. There by the distance from floor to upper edge of mechanical bar or light barrier shall be $H_1 \geq 1\,600$ mm. The distance from the standing area of steps and platforms up to the upper edge of the mechanical trip bar/light barrier shall be $L \geq 1\,100$ mm. Without additional measures the design dimension shall be ≥ 2 450 mm in combination with a divided hopper.

5.2.3.2.3.3 Additional measures

With a height $H_1 \geq 1\,600$ mm, means shall be provided (e.g. a mirror or a fill level indicator) for allowing a verification of the product level in the hopper.

The outside walls shall be designed (e.g. vertical and smooth) to prevent the operator climbing on the machine. This also applies to interlocked steps in their folded position.

a) Interlocked step:

If danger points in the feed intake hopper can be reached from steps or platforms (design dimension below 2 250 mm). The steps or treads of platforms shall be foldable and interlocked for preventing the functioning of the machine when they are in their usable position. The feeding device shall come to a standstill within 2 s after the interlocking system has been actuated by moving the step into its usable position.

The interlocking system of the movable step shall comply with 5.2.1.

The standing area of steps shall have a width ≥ 500 mm and a length ≥ 400 mm and a toe rail of a height of 15 mm. If the standing area is < 500 mm above ground, an area of a width ≥ 400 mm and a length ≥ 350 mm is sufficient. The standing area shall be of the non-slip type.

Platforms shall have an accessible area of a width B ≥ 500 mm. The length of the platform shall correspond to the length of the hopper.

Standing areas of steps which are located > 500 mm above ground shall be fitted with intermediate steps or ladders and grab handles. The standing areas and steps shall be sufficiently large and of the non-slip type and arranged at identical distances from one another.

Standing areas of steps which are located > 1 200 mm above ground shall also be limited with handrail that shall fulfil the requirements of EN ISO 14122-3.

The standing area of the intermediate step shall have a width of ≥ 300 mm and a length of ≥ 200 mm. Treads of ladders shall have a length of ≥ 500 mm and a width of ≥ 80 mm. A ladder shall be arranged at an angle of < 70° to the horizontal.

b) Mechanical trip bar/light barrier or movable protective grid on mixing container edge, running round all sides:

At the hopper edge there shall be at all sides alternatively a mechanical trip bar, a light barrier or a protective grid with trip function. There by the design dimension from the standing area (floor or fixed step or fixed platform) across the upper edge of the protection equipment at the hopper edge up to the next hazard point in the hopper shall be ≥ 2 250 mm.

The interlocking of the mechanical trip bar or the movable protective grid shall comply with 5.2.1.

The design of the light barrier shall be in accordance with ESPE type 2 of EN 61496-1:2004.

5.2.3.3 Zone 1 – Movably mounted feed intake hoppers

Movably mounted feed intake hoppers shall be interlocked according to 5.2.1.

On powered movable guards (feed intake hopper, lid), closing is effected in two phases:

— rapid descent to a minimum distance of 200 mm from the closing edge (measured at the point of largest distance from the protective device to the closing edge);

— from that point the closing speed shall ≤ 50 mm/s.

In the event of a drive failure (e.g. pipe or hose breakage), the guard shall be automatically locked in its position or the movement of the guard shall be reduced to a non-hazardous speed.

Non-powered movable guards shall be prevented from slamming shut (e.g. counterweight, springs) if their open position is not sufficiently beyond their dead centre. The guard shall be fitted with a grab handle (ergonomically mounted).

5.2.3.4 Zone 1 – Requirements on steps, tread surfaces and ladders

If danger points in the feed intake hopper can be accessed from steps, tread surfaces or ladders, the steps, tread surfaces or ladders shall be interlocked according to Performance Level “c” according to EN ISO 13849-1 (see Figure 2).

The forward feed plunger or closure gate shall come to a standstill at the latest 2 s after the step or the tread surface ladder has been brought into protective position.

5.2.3.5 Zone 1 – Requirements on hoppers with an edge height ≥ 1 600 mm

With hopper edge heights ≥ 1 600 mm, means to look into the feed intake hopper (e.g. mirror, fill level indicator, ladder or step) shall be provided.

5.2.3.6 Zone 2 – Rotating cutting tool and lattice

See 5.2.2.2.

5.2.3.7 Zone 3 – Rotating sickle blade behind the cutting chamber door and the multi-segment blade at the discharge: Access prevention

See 5.2.2.3.

5.2.3.8 Zone 3 – Rotating sickle blade behind the cutting chamber door and the multi-segment blade at the discharge: Requirements on containers, transport trolleys, etc.

See 5.2.2.3.

5.2.3.9 Zone 4 – Stationary blades

See 5.2.2.4.

5.2.3.10 Zone 5 – Cubes cutting machines with a loading device

Loading devices of various designs refer to:

— fixed lifting arms for holding the transport trolley;

— lifting arms which allow the transport trolley to swivel in a gondola and remain horizontal in a raised position;

— a vertical mast-type lift-tilt device with a fork for holding transport trolleys or containers.

Lift-tilt devices can be electrically or mechanically connected to the cubes cutting machine. Lift-tilt devices shall be designed to be stable. Specifically measures shall be provided to prevent the lift-tilt device or machine falling over. This can e.g. be achieved by:

— a control designed as a hold-to-run switch for lowering the load bearing device;

— use of gravity for lowering the load bearing device;

— a special device on the machine or lift-tilt device so that powered descent of the load-bearing device onto an obstruction cannot cause instability. This can be e.g. a level switch to automatically stop the descent.

When fixing the machine or the lift-tilt device to the floor, when setting down the load bearing device onto an obstruction, no excess load shall be applied to the load bearing components or the lift-tilt device to the floor. This can e.g. be achieved by slip clutches or a motor overload cut-out to automatically stop the descent.

5.2.3.11 Zone 5 – Load-bearing devices

Load bearing devices shall be designed to prevent trolleys or containers from falling off (e.g. by means of a locking device). The distance between the load bearing device and the machine base shall be > 120 mm and the distance between the trolley or load-bearing device and the container edge > 60 mm. If the hopper wall

with a height H_1 ≥ 1 600 mm is opened by the dimension of load bearing device including container from the side, the load bearing device is acting, there should not be any crushing or shearing points (dimensions relating to EN 349 shall be kept).

When using a hold-to-run control to operate the lift tilt device it is permitted to use a smaller distance than mentioned in EN 349. The height of the hopper wall in this place shall ensure a design dimension up to the danger zones inside the hopper ≥ 2 250 mm.

Dimensions in millimetres

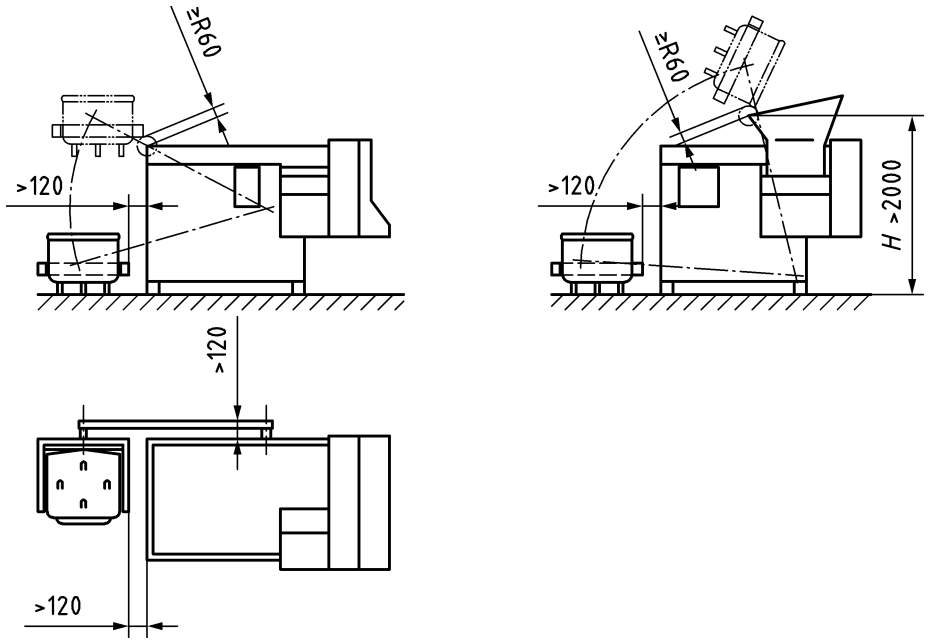
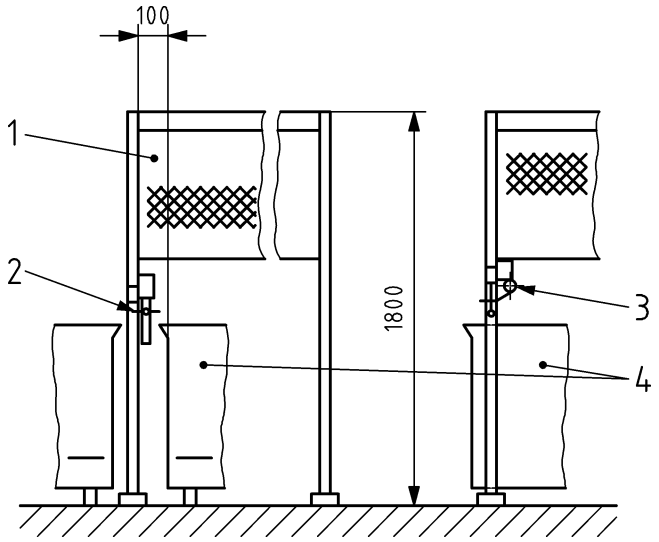


Figure 16 — Safety dimensions on cubes cutting machine with a loading device

Dimensions in millimetres



Key

1	cover designed as grate	3	pendulous mechanical bar
2	pendulous mechanical bar	4	container

Figure 17 — Safety dimensions on feed, discharge opening on cubes cutting machine with a mast-type loading device for feed heights over 2 500 mm

5.2.3.12 Zone 5 – Mast-type lift-tilt device

The danger points at the mast-type lift-tilt device between the load bearing device and the mast on the side opposite the load bearing device shall be safeguarded by guards. There are no danger zones in the tilt range if the distance between the load bearing device and the mast is > 120 mm. If the tilt range of the load bearing device is > 2 000 mm or more above the floor, there are no danger zones if this distance is > 60 mm.

5.2.3.13 Zone 5 – Lift-tilt device for feed heights > 2 500 mm

The path of movement of the load bearing device, with the exception of the run-in and run-out opening, shall be protected by means of a distance guard (e.g. a protective fence). An electro-sensitive protective device (e.g. a light barrier, mechanical bar or flap) shall be fitted on the upper edge of the run-in and run-out opening to prevent lifting of incorrectly positioned trolleys or containers.

For requirements relating to the interlocking system of the mechanical bar or mechanical flap as well as the light barrier, see 5.2.3.2.

5.2.3.14 Zone 5 – Lowering velocity of load bearing device

The lowering velocity shall be ≤ 0,4 m/s when it is controlled by a hold-to-run switch.

The lowering velocity shall be ≤ 0,1 m/s if the descent is controlled automatically or by a switch with a locking contact. In this case the last 0,5 m until the transport trolley or container has touched down shall be controlled by a hold-to-run switch.

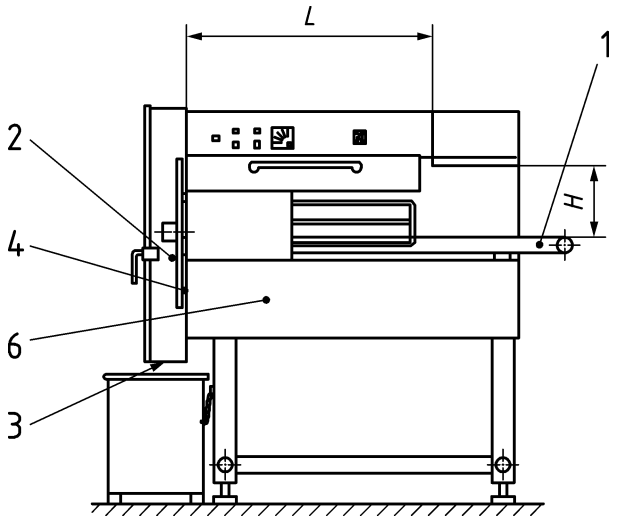
5.2.3.15 Zone 6 – Drive mechanism

See 5.2.2.5.

5.2.4 Cubes cutting machine with feed conveyor

5.2.4.1 Zone 1 – Access to nip roller via feed conveyor

On cubes cutting machines with a feed conveyor, the danger point shall be safeguarded by a protective hood on the in-feed side.



Key

1 feed conveyor
2 cutting chamber
3 discharge opening
4 sickle/multi-segment blade
6 drive mechanism
L length of protective hood
H height of the in-feed opening

Figure 18 — Cubes cutting machine with feed conveyor

If a fixed protective hood is provided, *H* shall be ≤ 200 mm and *L* ≥ 850 mm.

If *L* < 850 mm;

— a movable protective hood with a switch interlock shall be provided, *H* shall be ≤ 100 mm and L ≥ 550 mm, or

— a fixed protective hood with a trip device shall be provided, *H* shall be ≤ 100 mm and L ≥ 550 mm.

Interlocks shall be designed to meet the following requirements:

Hazardous movements shall not be possible, if the guards are not closed and the hazardous movements shall be stopped when the protective devices are opened.

When activating the guard or protective device, all hazardous movements shall come to a standstill within 0,15 s.

The interlocking system for the protective hood and the trip device shall comply with 5.2.

If a light barrier is used, it shall be in accordance with ESPE type 2 of EN 61496-1:2004.

The movable guard (lid) can be designed as a control guard according to EN ISO 12100:2010, 3.27.6.

In case of special design of cubes cutting machines with feed conveyor speeds ≥ 100 m/min all safety related parts of the control system shall present at least a Performance Level “d” defined in accordance with EN ISO 13849-1.

5.2.4.2 Zone 2 – Rotating cutting tool

See 5.2.2.2.

5.2.4.3 Zone 3/4 – Rotating multi-segment blade: Access prevention

See 5.2.2.3.

5.2.4.4 Zone 3/4 – Rotating multi-segment blade: Requirements on containers, transport trolleys, etc.

See 5.2.2.3.

5.2.4.5 Zone 6 – Drive mechanism

See 5.2.2.5.

5.2.5 Cubes cutting machine with centrifugal force feeding to the cutting unit

5.2.5.1 Zone 1 – Access to nip roller

On cubes cutting machines, the danger point at the nip roller shall be safeguarded by a protective hood in accordance with EN 953.

Movable protective hoods shall be interlocked with the drive. Interlocks shall be designed to meet the following requirements:

Hazardous movements shall not be possible if the guards are not closed, and the hazardous movements shall be stopped when the protective devices are opened.

When activating the guard or protective device, all hazardous movements shall come to a standstill within 0,15 s.

The interlocking system for the protective hood and the trip device shall comply with 5.2.

If a light barrier is used, it shall be in accordance with ESPE type 2 of EN 61496-1:2004.

The movable guard (lid) can be designed as a control guard according to EN ISO 12100:2010, 3.27.6.

In case of special design of cubes cutting machines with feed conveyor speeds ≥ 100 m/min the related part of the control system shall present at least a performance level “d” defined in accordance with EN ISO 13849-1.

5.2.5.2 Zone 2 – Rotating cutting tool and cutting blade

See 5.2.2.2.

5.2.5.3 Zone 3/4 – Rotating multi-segment blade and cutting blade: Access prevention

See 5.2.2.3.

5.2.5.4 Zone 3/4 – Rotating multi-segment blade and cutting blade: Requirements on containers, transport trolleys etc.

See 5.2.2.4.

5.2.5.5 Zone 6 – Drive mechanism

See 5.2.2.5.

5.3 Electrical hazards

5.3.1 General

The electrical equipment shall comply with EN 60204-1. Additional requirements for the electrical equipment shall meet the following requirements.

5.3.2 Emergency stop device

In general a cubes cutting machine does not need an emergency stop device. In this case the usual OFF-switch shall be easily reachable from the operator position.

5.3.3 Protection against water ingress

5.3.3.1 IP degrees of protection

Electrical operating components shall comply with the following degrees of protection in accordance with EN 60529:

a) IP X5 External electrical operating components:

   1) on the machine;

   2) on the control box enclosure on the machine;

   3) on the control box enclosure located in the process room.

b) IP X3 Internal electrical operating components:

   1) in the machine with enclosed housing with the degree of protection IP X5 and open lower surface;

   2) protection against direct and indirect impact of a water jet shall be ensured.

c) IP X2 Internal electrical operating components:

   1) in a machine with completely enclosed housing with the degree of protection IP X5:

   2) Protection against condensate water shall be provided:

   3) in the control box enclosure.

d) IP X0 Internal electrical operating components:

1) in a machine with completely enclosed housing with the degree of protection IP X5:

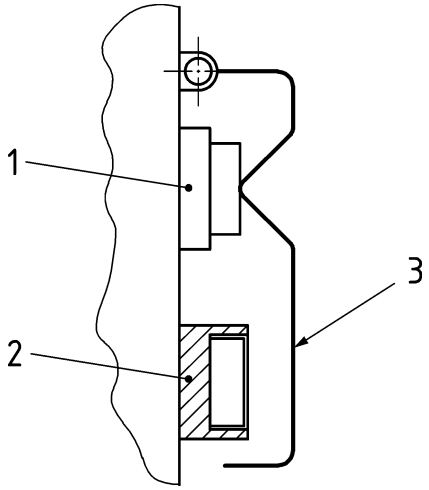
2) protection against condensate water shall be provided, and the safety of fingers and the back of the hand shall be ensured, by the design of the electrical elements.

5.3.3.2 Hoods

By cleaning with water (e.g. tap water), ingress of water into the external electrical operating components shall be prevented. This can be achieved e.g. by adopting the following measure:

The electrical operating components shall be covered by hoods. A statement to this effect shall be included in the instruction handbook.

Hoods covering the external operating components may be lifted for actuating ON- and OFF-switches. Hoods shall not, when closed, restrict the use of the OFF-switch (see Figure 19). When using membrane switches or similar systems, no hoods are needed if the membrane switch or similar are suitable for cleaning with water.



Key

1 OFF

2 ON

3 protection hood (OFF)

Figure 19 — ON-/OFF-switch with hood

5.4 Hydraulic and pneumatic hazards

The hydraulic and pneumatic devices shall comply with the standards:

— EN ISO 12100:2010, 6.2.10;

— EN ISO 4413;

— EN ISO 4414.

The bursting pressure of the hydraulic hoses shall be four times the maximum pressure under operating conditions.

The instruction handbook shall give details of the maximum operating pressure.

5.5 Hazard from loss of stability

Cubes cutting machines (fixed and mobile) shall be designed to be stable under normal operating conditions.

For cubes cutting machines which are not fixed on the floor there shall be a sufficient safety of tilting.

Mobile cubes cutting machines shall be designed not to roll, slip, or tip over under normal operating conditions. This can be achieved e.g. by the design of the machine, the position of the point of gravity (wheels and position of feet).

Mobile cubes cutting machines shall be stable. There shall exist e.g. minimum 2 support rollers (or legs) and 2 pivot castors with locking devices to prevent them rolling and/or turning.

The manufacturer shall give detailed information on the foundation load and the fixation in the instruction handbook. The use of the locking device and the quality of the floor shall be described.

Machines tested in accordance with Table 2 shall not roll, slip, or start tilting at their location.

5.6 Noise reduction

Noise reduction shall be an integral part of the design process thus specifically taking into account measures at source as given in EN ISO 11688-1. The success of the applied noise reduction measures is assessed on the basis of the actual noise emission values (see Annex A) in relation to other machines of the same family.

5.7 Ergonomic requirements

5.7.1 General

The protective devices described in EN ISO 12100:2010, 6.2.8, as well as in EN 614-1 and EN 1005-1, EN 1005-2 and EN 1005-3, shall be taken into account. All information required for achieving the ergonomic objectives to be followed by the user shall be described in the instruction handbook.

5.7.2 Cubes cutting machines with lids or movable feed intake hoppers

On cubes cutting machines with lids and/or movable feed intake hoppers which need to be moved by hand, a grab handle shall be designed and positioned such that a force ≤ 250 N is required for operation.

5.7.3 Cubes cutting machines with heavy cutting tool components

Cubes cutting machines with cutting tool components weighing more than 25 kg shall be provided with lifting devices or level transfer cars, enabling installation and removal as well as transport of these components without manual lifting.

5.7.4 Cubes cutting machines with feed intake hopper and a construction height ≥ 1 400 mm

Cubes cutting machines with feed intake hopper and a construction height ≥ 1 400 mm shall be provided with steps or working platforms for operational and cleaning processes which cannot be done from the floor.

5.7.5 Cubes cutting machines with large distance between standing area and hopper edge

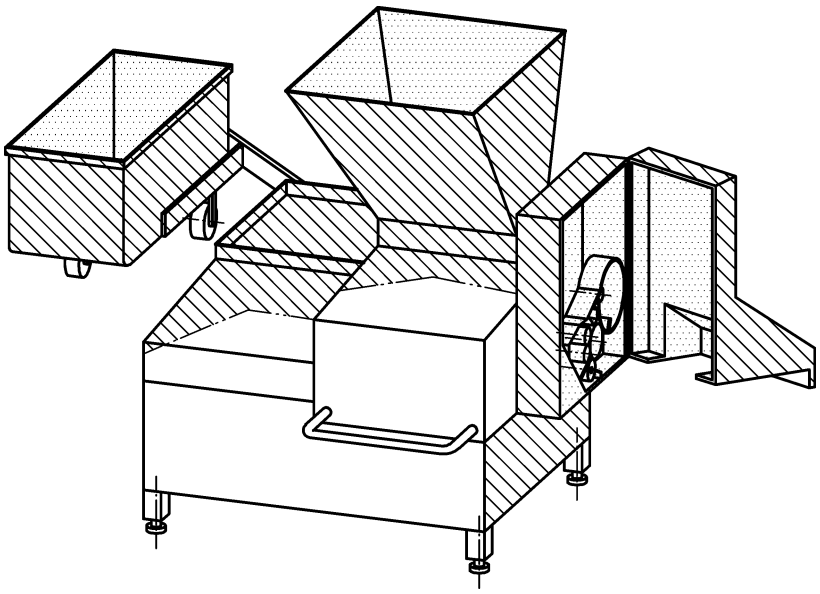
Cubes cutting machines shall be provided with loading devices (see 5.2.3) if the distance from the standing area to the hopper edge is ≥ 1 400 mm.

5.8 Hygiene and cleaning

5.8.1 General

The design of the machines shall be in accordance with EN 1672-2 and with the requirements laid down below as well as in accordance with Annex B.

Hygiene areas see Figure 20, Figure 21 and Figure 22.



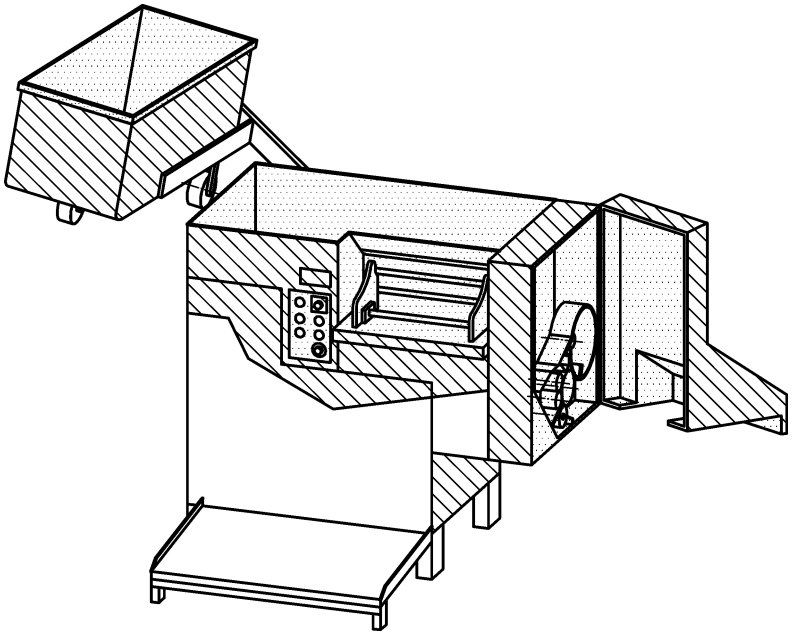
Key

food area

splash area

non-food area

Figure 20 — Hygiene areas on cubes cutting machine



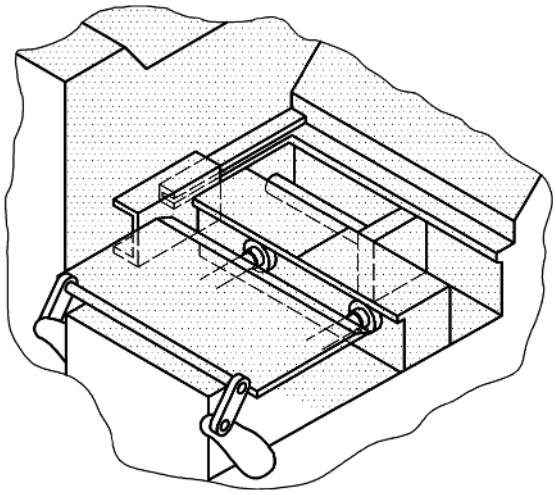
Key

food area

splash area

non-food area

Figure 21 — Hygiene areas on cubes cutting machine



Key

food area

splash area

non-food area

Figure 22 — Hygiene areas on cubes cutting machine

5.8.2 Food area

The following components are defined according to EN 1672-2 and regarded as the food area:

— inside of feed intake channel, trough, hopper;

— feed intake magazine with side wall, separating knife and forward feed plunger, plate and feed conveyor – outside;

— inside of blade housing, protective hood, cutting blade with lattice cutting system;

— transport roller;

— nip roller;

— multi-segment blade;

— blade holder;

— stripper comb;

— supply and discharge table, top face;

— supply and discharge unit, top face of belt;

— protective hoods, inside and outside.

Nevertheless, some components of the food area are not easy to clean. Special instructions shall be given for cleaning (see 5.8.6).

5.8.3 Splash area

The following components are defined according to EN 1672-2 and regarded as splash area:

— machine housing – front face;

— machine housing (in the supply and discharge area);

— supply table – inside and/or bottom face;

— supply and discharge unit – inside of belt;

— outside of feed intake channel, trough and hopper and feed conveyor;

— blade housing – outside;

— transport trolley.

5.8.4 Non-food area

The non-food area comprises all other surfaces:

— loading device;

— steps;

— working platform;

— all other surfaces.

5.8.5 Surface conditions

The surface design shall comply with the requirements of EN 1672-2.

The maximum surface roughness values shall comply with those listed in Annex B.

5.8.6 Cleaning

All surfaces in the food area shall be easy to clean and disinfect. They shall be designed such that cleaning liquids can run off freely.

Information shall be included in the instructions for use on the methods recommended for cleaning surfaces in the food areas, particularly for the sickle blade. Information shall also be given on general cleaning methods and the adequate removal of cleaning and disinfecting agents and of any cleaning materials that are unsuitable.

NOTE Cleaning by pressurized water is discouraged; it can contaminate the surroundings.

6 Verification of safety and hygiene requirements and/or protective measures

This clause contains the methods for verification of the compliance with the safety requirements of the document. As far as the criteria for acceptance and the conditions during verification are not self-evident, they can also be found in Table 2. These testing methods shall be applied with machines

— fully commissioned; or

— partially dismantled.

A dismantling can be necessary for some tests. A partially dismantled machine shall not invalidate the result of the verification.

Table 2 — Verification list

Subclause	Test method
5.1	Calculation of the Performance level
5.2.1	Measurement of stopping time
5.2.2	Measurement of dimensions Measurement of after-run time or rotation Verification of electrical circuit diagram Check of interlocking device especially on feed intake hopper and on cutting chamber door Visual inspection of blade mounting and of condition of cutting chamber door
5.2.3	Measurement of dimensions Measurement of lowering velocity Verification of electrical circuit diagram Check of interlocking device Visual inspection of blade mounting and of condition of cutting chamber door
5.2.4	Measurement of dimensions Measurement of after-run time Measurement of belt speed Verification of electrical circuit diagram Check of interlocking device
5.2.5	Measurement of dimensions Measurement of after-run time or rotations Verification of electrical circuit diagram Check of interlocking device Visual inspection of condition of cutting chamber door
5.3	The tests according to EN 60204–1:2006, Clause 18, shall be carried out on each machine Functional test with protective hood Verification of degrees of protection
5.4	Verification of hydraulic/pneumatic circuit diagram Study of instruction handbook
5.5	Calculation or standing test on a plane with an inclination of 10° and an unfavourable wheel position. The wheels shall be locked. Functional test Visual inspection
5.6	Measuring of noise emission
5.7	Measurement of forces Functional test Visual inspection

Subclause	Test method
5.8	Measurement of surface roughness, radii and grooves Visual inspection especially of welds
7.2	Verification that a noise emission declaration is given in the instructions
A.7	Verification of noise emission values

7 Information for use

7.1 General

The information for use shall meet the requirements laid down in EN ISO 12100:2010, 6.4. An instruction handbook shall be supplied with the machine.

7.2 Instruction handbook

a) Information about the machine:

1) detailed description of the machine and its components;

2) information on the material to be processed;

3) information on the range of applications for which the machine is intended;

4) documents attesting that the machine complies with the essential requirements;

5) the instruction handbook (and any sales literature describing the performances of the machine) shall contain the following information on airborne noise emissions, determined and declared in accordance with Annex A of this European Standard:

i) the A-weighted emission sound pressure level at workstations, where this exceeds 70 dB(A); where this level does not exceed 70 dB(A), this fact shall be indicated;

ii) the peak C-weighted instantaneous sound pressure value at workstations, where this exceeds 63 Pa (130 dB in relation to 20 µPa);

iii) the A-weighted sound power level emitted by the machinery, where the A-weighted emission sound pressure level at workstations exceeds 80 dB(A).

Whenever noise emission values are indicated the uncertainties "*K*" surrounding these values shall be specified. The operating conditions of the machinery during measurement and the measuring methods used shall be described.

6) for the loading device:

i) where relevant, at test report detailing the static or dynamic tests carried out or,

ii) for devices assembled at the user's premises, the instructions for performing the static and dynamic tests necessary for the verification of the fitness for use.

b) Information relating to the installation of the machine:

1) information of the location of the rating plate;

2) information about the maximum operating pressure;

3) information on foundation load, fixation, locking devices, quality of the floor an suitable flooring materials;

4) information on the space required for the operation of the machine;

5) information on permissible environmental influences;

6) information on how to connect the machine to the electric, hydraulic, pneumatic or gas supply including necessary safety devices;

7) information on the arresting of the wheels.

c) Information relating to transportation and storage of the machine:

1) information on dimensions, weight, position of centre of gravity.

d) Information relating to the use of the machine:

1) instructions for commissioning;

2) instructions for setting and adjustment;

3) information on items which require setting;

4) information on devices which stop the machine;

5) information on residual risks, and recommended personal protective equipment including an instruction that cut-resistant gloves shall be worn when changing the cutting tools and when carrying out any work in the vicinity of the cutting tools;

6) information on particular risks which may arise in certain applications;

7) information on prohibited uses;

8) information to achieving the ergonomic objectives;

9) information on balancing the blades;

10) information on storage, transportation, maintenance and cleaning of the sickle-blade;

11) information that the lid shall not be walked on;

12) information on the daily verification of the interlocking devices before using the machine.

e) Information relating to maintenance:

1) information on the nature and frequency of inspections and maintenance activities;

2) information on the risks of breakdowns and their repair;

3) information to the use of protective means and personal protective equipment;

4) information on installation and removal of the sickle-blade;

5) information on the types of oils and/or greases to be used for lubrication;

6) the specifications of the spare parts to be used when these affect the health and safety of operators.

f) Information to the cleaning of the machine:

1) advice on the cleaning of tools and the need for the user to determine the frequency of examinations necessary to prevent the accumulation of residues or product in the machine;

2) information that cleaning with pressurized water is discouraged; it may pollute the surrounding area.

The manufacturer shall provide information on:

3) method of cleaning;

4) type of cleaning agents;

5) method of disinfecting;

6) type of disinfecting agents;

7) type of rinsing agents.

g) The instruction handbook shall contain the information that the operator shall be trained and specifies the elements of training and the standard of training required.

7.3 Marking

Cubes cutting machines conforming to this document shall be marked permanently and legibly with the following information on its rating plate:

— the business name and full address of the manufacturer and, where applicable, his authorized representative;

— designation of the machinery;

— designation of series or type;

— serial number;

— mandatory marking[1)];

— the year of construction, that is the year in which the manufacturing process is completed;

— rating information, including supply voltage and frequency, power rating.

From hygiene and/or technical reasons (face-to-face is not allowed for hygienic reasons and for problems with cleaning and disinfection due to different materials of machine and rating plate) a fixing place is possible inside of the machine housing at an easily reachable and visible place. In this case, however, there shall be an identification (name of manufacturer or type) outside of the machine housing, and the fixing location of the rating plate shall be described in the instruction handbook.

1) For machines and their related products intended to be put on the market in the EEA, CE-marking as defined in the applicable European Directive(s), e.g. Machinery.

Annex A
(normative)

Noise test code for cubes cutting machines (grade 2)

A.1 Determination of the emission sound pressure level

EN ISO 11201 shall be applied in order to determine the emission sound pressure level.

The measurements shall be taken at the normal operator position at a distance of:

— 1 m from the discharge outlet of the cubes cutting machine

— at a height of 1,55 m above the floor

with the microphone directed towards the machine.

If it is required to determine the sound power level of a cubes cutting machine EN ISO 3744 should be applied.

A.2 Installation and mounting conditions

The test field shall be in accordance with EN ISO 11201:2010, Clause 6. It shall be laid out according to EN ISO 3744:2010, Annex A.

NOTE In free-field tests, the environmental correction factor K_2 is assumed to be equal or smaller than 0,5 dB and is therefore negligible.

A.3 Operating conditions

The test shall be carried out with the machine running without product at its maximum speed.

A.4 Measurement

The A-weighted time-averaged emission sound pressure level shall be measured.

The measuring instruments shall be in accordance with EN ISO 11201:2010, Clause 5 and 10.2.1.

The measurement shall be carried out over a complete work cycle of more than 15 s whereby stopping shall be excluded.

A.5 Information to be recorded

The information shall be in accordance with EN ISO 11201:2010, Clause 12.

All deviations from this noise test code and from EN ISO 11201 shall be documented together with the technical justification for these deviations.

A.6 Information to be reported

The information to be included in the report is at least that which the manufacturer requires to prepare a noise declaration or which the user requires to verify the declared values.

As a minimum, the following information shall be included:

— reference to the basic noise emission standard EN ISO 11201;

— description of the mounting and operating conditions used;

— location for the determination of the emission sound pressure level at the workstation;

— the noise emission value obtained.

It shall be confirmed that all requirements of this noise test code have been fulfilled, or, if this is not the case, any unfulfilled requirements shall be identified. Deviations from the requirements shall be stated and technical justification for the deviations shall be given.

A.7 Declaration and verification of the noise emission values

The declaration of the noise emission value shall be made as a dual number noise emission declaration according to EN ISO 4871.

It shall declare the emission sound pressure level L_{pA} at the workstation and the respective uncertainty K_{pA}. The uncertainty K_{pA} is assumed to be 2,5 dB.

The noise emission value shall be rounded to the next higher Decibel.

The noise declaration shall state that the noise emission value has been obtained according to this noise test code and to the basic standard EN ISO 11201. If this statement is not true, the noise declaration shall indicate clearly what the deviations are.

If undertaken, verification shall be done according to EN ISO 4871 by using the same mounting, installation and operating conditions as those used for the initial determination of the noise emission value.

Annex B
(normative)

Design principles to ensure the cleanability of cubes cutting machines

B.1 Terms and definitions

For the purpose of this annex, the following terms and definitions apply.

B.1.1

food area

area comprising surfaces which will come into contact with foodstuff; the food area also comprises those surfaces with which the foodstuff may come into contact under normal operating conditions and returns into the product (see Figure 20, Figure 21 and Figure 22)

B.1.2

splash area

area comprising surfaces on which part of the foodstuff may splash or flow along under operating conditions and does not return into the product (see Figure 20, Figure 21 and Figure 22)

B.1.3

non-food area

all other areas not specified above (see Figure 20, Figure 21 and Figure 22)

B.1.4

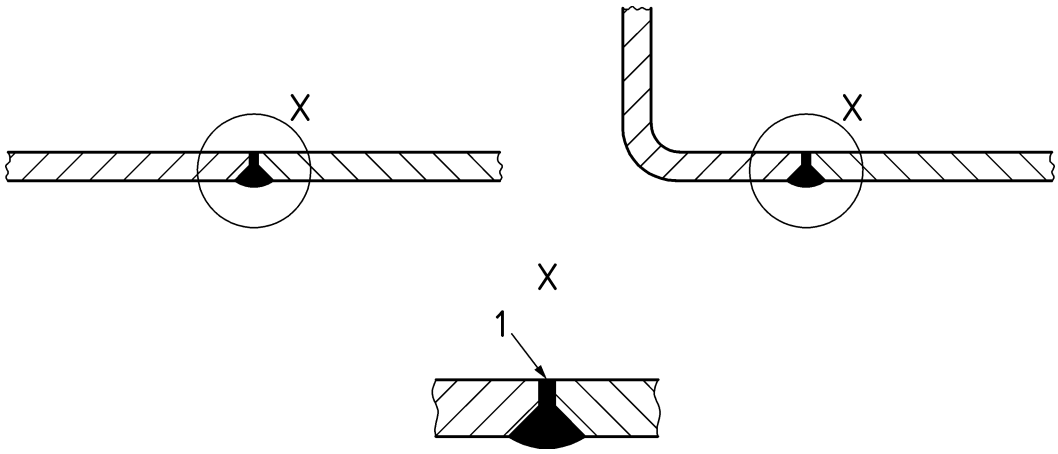
closely joined surfaces

surfaces are joined closely if product particles cannot be trapped in small crevices which would make them difficult to be removed and which would cause a contamination hazard (see Figure B.1)

B.1.5

easy to clean

machines are designed and constructed such that it is possible to remove dirt with a simple cleaning method, e.g. cleaning agent and water (see Figure B.1)



Key

1 closely joined surfaces

Figure B.1 — Closely joined surfaces – food area

B.2 Materials of construction

Materials of construction shall comply with EN 1672-2:2005+A1:2009, 5.2.

B.2.1 Type of materials

B.2.1.1 Materials of food area

European Directives contain a list of materials which come into contact with foodstuff and with foodstuff for human consumption. Some materials (e.g. plastic) shall be tested by means of migration tests. Materials not mentioned in the European Directives are admissible if compatibility with foodstuff is documented. The blade edge and the centring pivot need not be corrosion-resistant.

B.2.1.2 Materials of splash area

See EN 1672-2:2005+A1:2009, 5.3.2.

B.2.1.3 Non-food area

See EN 1672-2:2005+A1:2009, 5.3.3.

B.3 Design

Surfaces and components in the various areas shall meet the following requirements:

B.3.1 Food area

B.3.1.1 Surfaces

The surfaces in the food area shall be smooth and free of depressions and scratches (see Figure B.1).

B.3.1.2 Inside corners

The angle formed by the intersection of two surfaces shall be ≥ 90° and have a radius *R* of **≥** 3 mm (see Figure B.2).

Smaller radii are admissible if no other solutions can be found for reasons of process engineering, manufacturing technology (e.g. weld seam) or economic feasibility (see Figure B.2).

Key

a Radius
machining operation
bent blade

b Radius
welding seam

Figure B.2 — Angles and radii in food area

For reasons of process engineering, machine components, e.g. material holders, may have depressions, grooves and corners of smaller dimensions. The material holder shall be easy to clean.

An angle ≥ 135° without radii is admissible. The distance shall be easy to clean. An angle ≥ 135° without radii is admissible. The distance between two edges shall then be ≥ 8,0 mm (see Figure B.3).

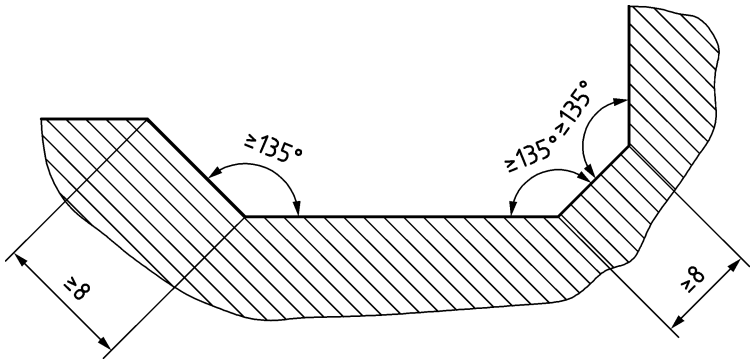
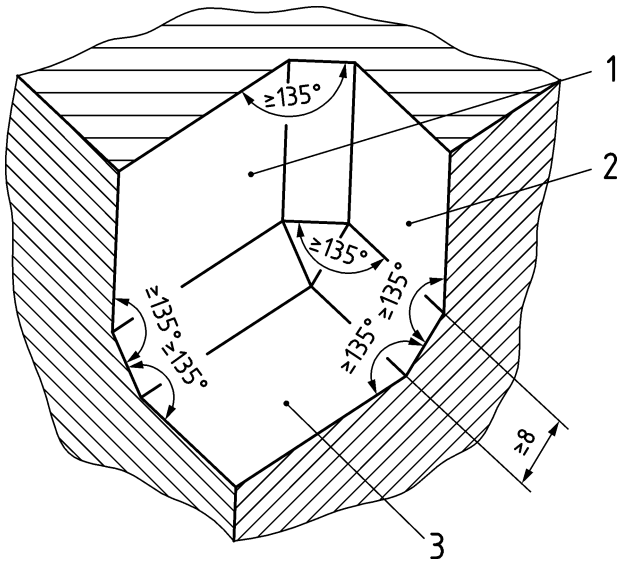


Figure B.3 — Angle in food area

If a corner is formed by the intersection of three surfaces, the angles shall be ≥ 90°, the radii ≥ 6 mm. Angles ≥ 135° without radii are admissible. In this case, there shall be a distance between two edges of ≥ 8,0 mm (see Figure B.4).



Key

1 surface A

2 surface B

3 surface C

Figure B.4 — Adjoining surfaces in food area

B.3.1.3 Grooves

Grooves may be used if the inner radius is ≥ 3 mm and the depth < 0,7 times the radius.

B.3.1.4 Joints and seams

Joints and seams shall be welded or sealed and as smooth as the connected surfaces (see Figure B.1).

B.3.1.5 Surface roughness

The surface roughness R_z shall be ≤ 25 µm. Whenever technically feasible, R_z ≤ 16 µm shall be selected.

B.3.2 Splash area

B.3.2.1 Surfaces

Surfaces shall be smooth (see Figure B.1).

B.3.2.2 Inside corners

The angle formed by the intersection of two surfaces shall be ≥ 80° and have a radius ≥ 3 mm.

If a corner is formed by the intersection of three surfaces, the corner formed by the intersection of two surfaces shall have a radius ≥ 6 mm. No requirements apply to the radius for the joining points of the third surface.

Angles ≥ 110° without radii are admissible (see Figure B.4).

B.3.2.3 Grooves

Grooves may be used if the inner radius is ≥ 3 mm and the depth < 1,0 times the radius.

B.3.2.4 Openings

Openings are permissible if they go right through and have a diameter ≥ 16 mm. Gaps are admissible provided that the gap has a minimum width of 16 mm, the depth is no more than 16 mm and the gap is open.

B.3.2.5 Joints and seams

Joints and seams shall be welded or continuously sealed. This requirement does not apply if these joints are formed by overlapping sheet metal surfaces from the top to the bottom in a vertical plane such that there are no horizontal corners in which dirt may be trapped. The overlap shall be ≥ 12 mm. Joints which do not overlap shall be easily separated for cleaning purposes. Information see EN 1672-2:2005+A1:2009, Annex B.

B.3.2.6 Modes of fastening

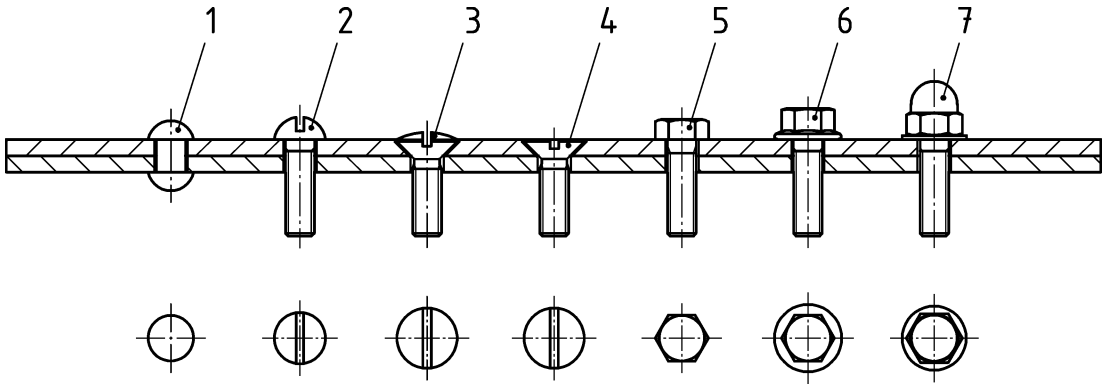
Screws, bolts and rivets with a low head profile and the design shown in Figure B.5 may be used only if other modes of fastening are not feasible and if they are easy to clean.

The following types of screws shall not be used:

— Phillips screws,

— Allen screws,

— screws of a diameter < 3 mm.



Key

1 saucer-head screw
2 cup-head screw
3 tallow-drop screw with slot
4 countersunk-head screw with slot
5 hexagon-head flat screw
6 hexagon-head flange screw
7 cap screw

Figure B.5 — Admissible joining elements – head profiles

B.3.2.7 Surface roughness

The surface roughness shall comply with the requirements of B.3.1.5.

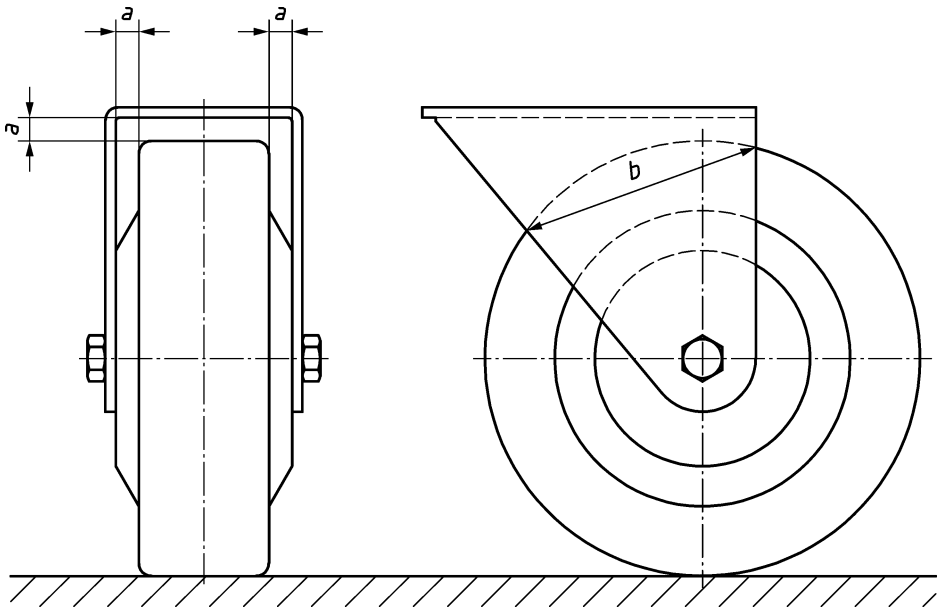
B.3.3 Non-food area

Surfaces shall be smooth as far as possible. Grooves, corners, holes, gaps and joints shall be avoided as far as possible. Closed hollow spaces shall be sufficiently wide to allow thorough cleaning and, where required, disinfection.

B.3.4 Floor-type machines

B.3.4.1 Wheel-mounted machines

Castors should be cleanable (see Figure B.6).



b < 25 mm *a* ≥ 3,5 mm

b > 25 mm *a* ≥ 6 mm

b is the largest dimension of coverage on the circumference of the castor

Figure B.6 — Castors - Dimensional examples

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/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 2006/42/EC on machinery.

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard confers, within the limits of the scope of this 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 standard.

Bibliography

[1] 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*

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

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

[4] EN 1037, *Safety of machinery — Prevention of unexpected start-up*

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

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

[7] EN ISO 4287, *Geometrical product specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters (ISO 4287)*

[8] EN ISO 11204, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions applying accurate environmental corrections (ISO 11204)*

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

This page deliberately left blank

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™