



SLOVENSKI STANDARD

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Stroji za predelavo hrane - Mešalniki testa - Varnostne in higienske zahteve

Food processing machinery - Dough mixers - Safety and hygiene requirements

Nahrungsmittelmaschinen - Teigknetmaschinen - Sicherheits- und Hygieneanforderungen

Machines pour les produits alimentaires - Pétrins - Prescriptions relatives a la sécurité et l'hygiène

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67.260

Tovarne in oprema za
živilsko industrijo

Plants and equipment for the
food industry

SIST EN 453:2001

en

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English version

Food processing machinery - Dough mixers - Safety and hygiene requirements

Machines pour les produits alimentaires - Pétrins -
Prescriptions relatives à la sécurité et l'hygiène

Nahrungsmittelmaschinen - Teigknetmaschinen -
Sicherheits- und Hygieneanforderungen

This European Standard was approved by CEN on 2 January 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 153 "Food processing machinery - Safety and hygiene specifications", 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of an identical text or by endorsement, at the latest by September 2000, and conflicting national standards shall be withdrawn at the latest by September 2000.

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

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

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

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0 Introduction

The extent to which hazards are covered is indicated in the scope of this standard. In addition, machinery shall comply as appropriate with EN 292 for hazards which are not covered by this standard.

1 Scope

This standard specifies safety and hygiene requirements for the design and manufacture of dough mixers with rotating bowls of capacity greater than or equal to 5 l¹⁾ and less than or equal to 500 l.

These dough mixers are used to process various ingredients e.g. flour, sugar, fat, salt, water and other ingredients in food manufacturers and shops. These machines are sometimes used in other industries (e.g. pharmaceutical industry, chemical industry, printing), but hazards related to these uses are not considered in this standard.

The following machines are excluded :

- planetary mixers (EN 454) ;
- continuously fed machines ;
- mixers with stationary vertical bowls ;
- experimental and testing machines under development by the manufacturer ;
- domestic appliances ;
- automatic loading and unloading devices.

The intended use of the machine, as defined in 3.12 of EN 292-1:1991 and as given in the manufacturer's instruction handbook, is the loading of various ingredients, processing them by means of a kneading tool, unloading and cleaning. The operation is usually carried out in cycles of variable duration. Manual operations are sometimes necessary to take samples, to scrape the bowl or add ingredients.

The significant hazards covered by the standard are mechanical (crushing, shearing, trapping, impact and loss of stability), electrical, ergonomic and also those resulting from noise, inhalation of flour dust and lack of hygiene.

This standard does not deal with noise reduction.

It applies only to machines manufactured after the date of issue of this standard.

¹⁾ Below 5 l, EN 60335-1 and 60335-2 are applicable.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 292-1	1991	Safety of machinery - Basic concepts - General principles for design - Part 1 : Basic terminology, methodology.
EN 292-2 + A1	1991 1995	Safety of machinery - Basic concepts - General principles for design - Part 2 : Technical principles and specifications.
EN 294	1992	Safety of machinery - Safety distances to prevent danger zones being reached by the upper limbs.
EN 614-1	1995	Safety of machinery - Ergonomic design principles - Part 1 : Terminology and general principles.
EN 954-1	1996	Safety of machinery - Safety related parts of control systems - Part 1 : General principles for design.
EN 1050	1996	Safety of machinery - Principles for risk assessment.
EN 1088	1995	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
EN 1672-2	1997	Food processing machinery - Common requirements - Part 2 : Hygiene requirements.
EN 60204-1	1997	Safety of machinery - Electrical equipment of machines - Part 1 : General requirements
EN 60529	1991	Degrees of protection provided by enclosures.
EN 60651	1994	Sound level meters.
EN ISO 3743-1	1995	Acoustics - Determination of sound levels of noise sources - Engineering methods for small movable sources in reverberant fields - Part 1 : Comparison method.
EN ISO 3744	1995	Acoustics - Determination of sound power levels of noise sources using sound pressure - Engineering method in an essentially free field over a reflecting plane.
EN ISO 4871	1996	Acoustics - Declaration and verification of noise emission values of machinery and equipment.

EN ISO 11201	1995	Acoustics - Noise emitted by machinery and equipment - Measurement of emission sound pressure levels at the work station and at other specified positions - Engineering method in an essentially free field over a reflecting plane.
EN ISO 11688-1	1998	Acoustics - Recommended practice for the design of low-noise machinery and equipment - Part 1 : Planning.
EN ISO 12001	1996	Acoustics - Noise emitted by machinery and equipment - Rules for the drafting and presentation of a noise test code.
ISO 468	1982	Surface roughness - Parameters values and general rules for specifying requirements.

3 Description

A dough mixer usually consists of (see figure 1) :

- a frame, supporting or containing the drive mechanism and control devices ;
- a bowl to contain the ingredients to be mixed. This bowl is rotated either mechanically or through the action of the kneading tool on the dough, may be removable, and may tilt ;
- one or more kneading tools on a vertical or inclined fixed axis or two special arms mixing the dough. In some cases these devices can be raised to allow bowl or food removal.

4 List of hazards

This clause contains those hazards identified by risk assessment (see EN 1050) as specific and significant for dough mixers and which require action to reduce risk.

4.1 Mechanical hazards

The significant mechanical hazards are :

- crushing hazard ;
- shearing hazard ;
- trapping hazard ;
- impact hazard ;
- loss of stability.

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The examples shown in figure 1 illustrate six danger zones associated with these hazards :

- zone 1 : Volume covered by the movement of the kneading tools ; hazards of crushing, shearing, trapping, impact
- zone 2 : Space between bowl and frame ; hazard of trapping
- zone 3 : Bowl driving mechanism ; hazard of trapping hazard of shearing in the case of a tilting bowl
- zone 4 : Kneading tool-holder driving, positioning and adjusting mechanism ; hazards of shearing, trapping, impact, crushing
- Zone 5 : Guide rollers and bowl ; hazards of drawing in or trapping
- Zone 6 : Powered guard and bowl ; hazards of crushing between power operated guard and bowl

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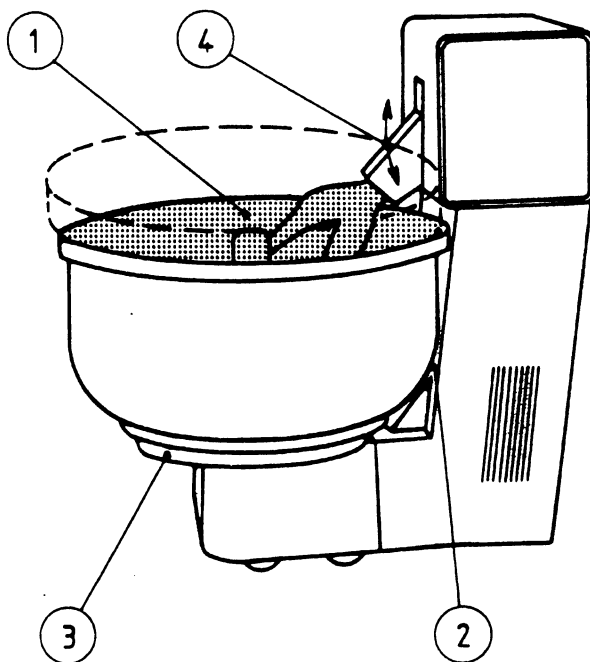
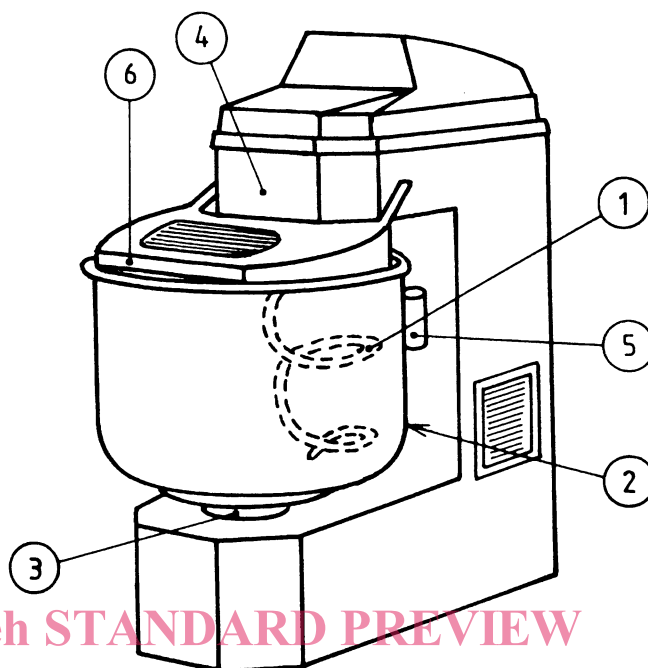


Figure 1 a)



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Figure 1 b)

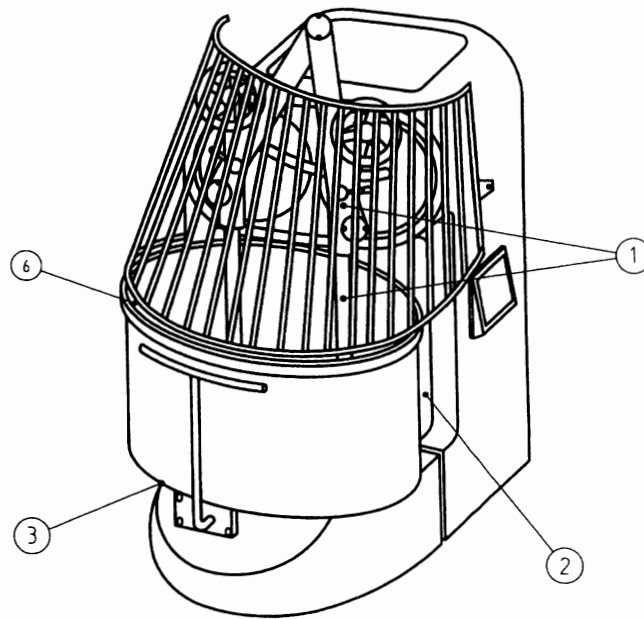


Figure 1 c)
Figure 1 : Danger zones of a dough mixer

4.2 Electrical hazards

Hazard of electric shock from direct or indirect contact with live components.

Hazard of external influences on electrical equipment (e.g. cleaning with water).

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4.3 Hazards generated by noise

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Especially large dough mixers generate airborne noise which can result in hearing damage, in accidents due to interference with speech communication and interference with the perception of acoustic signals.

4.4 Hazards resulting from inhalation of dust

Use of dough mixers exposes operators to dust including flour and ingredients which may be harmful to their health, causing rhinitis (running noses), watering eyes and possibly occupational asthma.

4.5 Hygiene

Lack of hygiene can create a risk to human health and unacceptable modification of foodstuff e.g. contamination by microbial growth or foreign materials.

4.6 Hazards generated by neglecting ergonomic principles

During operation, cleaning and maintenance, there is a risk of injury or chronic damage to the body resulting from awkward body postures.

Movement of the bowl between different working stations, or filling or emptying of the bowl can create a risk of injury or chronic damage to the body from lifting, pushing and pulling of heavy loads.

5 Safety and hygiene requirements and/or measures

This clause states the requirements and/or measures to be met to reduce the effect of the hazards detailed in clause 4.

5.1 Mechanical hazards

Where reference is made to interlocking devices throughout clause 5, they shall comply with 4.2.1, 5 and 6 of EN 1088:1995.

Safety related parts of control systems shall be category 1 as defined in 6 of EN 954-1:1996.

5.1.1 Zone 1 - Volume covered by the movement of the kneading tools

Usual conditions of use involve taking samples, adding some ingredients, scraping or taking away dough from the inside of the bowl in order to be able to test its consistency or to measure its temperature. Accordingly, an opening is necessary on the outer side of the bowl. This means that for these machines it is not possible to comply with the safety distances given by EN 294:1992. The strategy for selecting safety measures from EN 292-1:1991 gives the following requirements and or measures.

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5.1.1.1 Access from above shall be prevented. This may be achieved by a movable interlocking guard covering the top of the moving bowl using control interlocking. The bowl itself when in position prevents access from other directions.

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Guards may be, for example, hinged or move up and down vertically and be linked to mechanically actuated position detectors functioning in the positive mode in compliance with 5.1 of EN 1088:1995. Position detectors themselves shall comply with 5.2 of EN 1088:1995 and any rotary or linear cams with 5.3 of EN 1088:1995.

To minimize the possibility of defeat the interlocking mechanism shall be designed taking into account 5.7 of EN 1088:1995 for example by being located within the machine housing.

When there is an opening to enable the operator to see and take dough samples during the kneading process it shall be entirely within the hatched area shown in figure 2.

This hatched area shall be located on the bowl side opposite the kneading tool zone, and it shall have the dimensional characteristics shown in table 1. If the guard has holes, meshing shall comply with EN 294:1992 table 4.

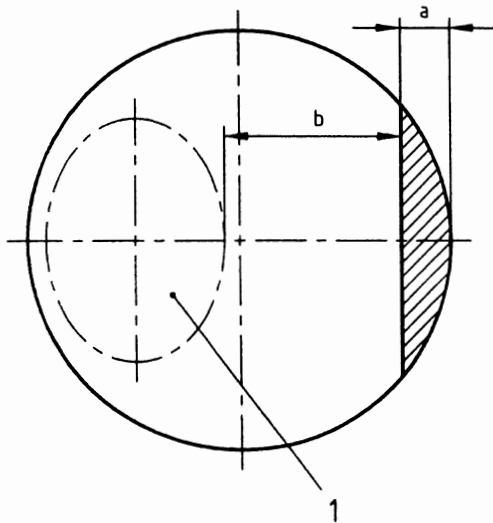


Figure 2 a)

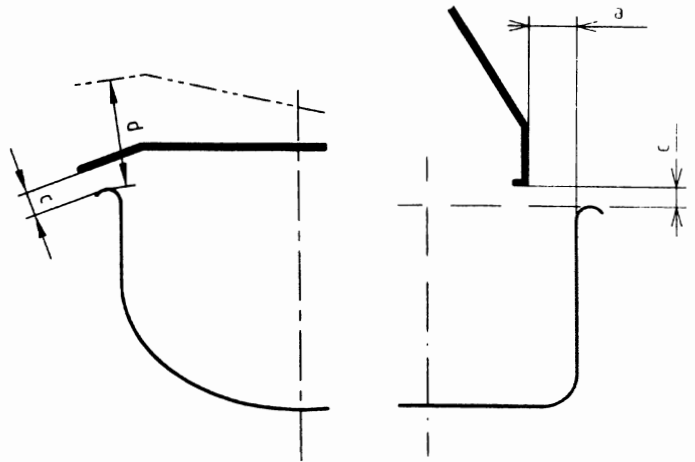


Figure 2 b)

Key :

- (1) volume covered by the kneading tool
- a distance between the internal rim of the bowl and the external part of the guard
- b horizontal distance between the external part of the guard and the nearest point of the danger zone i.e. the volume covered by the movement of the kneading tool (s)
- c distance between the bowl guard and the rotating bowl rim
- d distance between the upper rim of the bowl and the position of the outer edge of the guard when the interlocking device is actuated

Figure 2 : Dimensions of the guard

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Table 1 : Dimensions of the guard

Dimensions in millimetres

b	a	c	d
$b \leq 120$	$a = 0$	$c \leq 25$	$d < 25$
$120 < b \leq 230$	$a \leq 100$	$c \leq 25$	$d < 50$
$b > 230$	$a \leq 140$	$c \leq 25$	$d < 75$

5.1.1.2 In order to facilitate dough discharge from dough mixers with non-removable bowls, movement of the kneading tool and bowl motions at low speed is permitted with the guard opened, by operation of a hold-to-run control. This allows the operator to turn the bowl for unloading the bowl in different positions.

5.1.1.3 Stopping time

Guard actuated stopping devices shall stop the dough mixer with the bowl empty within 4 s of opening the guard.

If this is not possible, opening of the guard shall be prevented until movement has ceased, for example by guard locking (5.5 of EN 1088:1995) or by a time delay device.

Release of any guard lock may, for example, be by a timer or operation of a stop detection device.

An example of a time delay device that could be used is an hand operated threaded pin to operate a limit switch and also release the guard from its locked position. The time taken between opening the limit switch and guard release shall be longer than the time required to stop the motor.

When opened, the guard position shall prevent the pin from being screwed in again (figure N.1 in EN 1088:1995 illustrates this principle).

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5.1.2 Zone 2 - Space between bowl and frame

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If the design allows access between the rotating bowl and fixed machine parts (i.e. clearance more than 4 mm) the clearance between the two shall be at least 30 mm and the outside of the bowl shall be smooth. For the trapping hazard between the guide rollers and the bowl, see 5.1.6.

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5.1.3 Zone 3 - Bowl driving mechanism

5.1.3.1 The bowl drive mechanism shall be protected by a fixed or interlocking guard. For example many manufacturers simply enclose it in the machine casing which is bolted shut. If the bowl is removable the bowl and kneading tool drive mechanisms must not be capable of operation when the bowl is removed.