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Food processing machinery - Basic concepts - Part 1: Safety requirements

Nahrungsmittelmaschinen - Allgemeine Gestaltungsleitsätze - Teil 1:
Sicherheitsanforderungen

Machines pour les produits alimentaires - Notions fondamentales - Partie 1: Prescriptions
relatives à la sécurité

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Food processing machinery - Basic concepts - Part 1: Safety requirements

Machines pour les produits alimentaires - Notions fondamentales - Partie 1: Prescriptions relatives à la sécurité

Nahrungsmittelmaschinen - Allgemeine Gestaltungsleitsätze - Teil 1: Sicherheitsanforderungen

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (prEN 1672-1:2012) 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 document is currently submitted to the CEN Enquiry.

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.

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

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Introduction

Food processing machines are used extensively in Europe, in domestic, catering and industrial applications. They present many health and safety hazards and have the potential to cause serious injury.

This document is a Type C standard as defined in EN ISO 12100.

The extent to which hazards are covered by this Standard is indicated in the scope and Clause 4 of this Standard. In addition, machines should comply as appropriate with EN ISO 12100 and other appropriate European and International standards for hazards that are not covered by this document.

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

1 Scope

This European Standard deals with the significant hazards, hazardous situations and events relevant to commercial and industrial food processing machines as defined in Clause 3 when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer (see Clause 4).

This document deals with the significant hazards, hazardous situations and events that occur during transport, assembly and installation, commissioning, setting, teaching, programming, process changeover, operation, cleaning, fault finding and maintenance.

This European Standard deals with those risks which occur commonly at food processing machines and for which common technical requirements can be set which can be applied at all (or most) machines which have that particular hazard.

This standard is not applicable to the following machines:

- food processing machines intended for domestic use;
- food processing machines covered by the machine specific standards listed in Annex C;
- packaging machines;
- machines used in the agricultural and animal rearing sectors.

This standard does not deal with the hygiene risks to the consumer of the food product handled in the food processing machine. These risks are dealt with in EN 1672-2.

This document is not applicable to food processing machines that were manufactured before the date of its publication as a European Standard.

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 349:1993+A1:2008, *Safety of Machinery — Minimum gaps to avoid crushing of parts of the human body*

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EN 574:1996+A1:2008, *Safety of machinery — Two-hand control devices — Functional aspects — Principles for design*

EN 614-1:2006+A1:2009, *Safety of machinery — Ergonomic design principles — Part 1: Terminology and general principles*

EN 619:2002+A1:2010, *Continuous handling equipment and systems — Safety and EMC requirements for equipment for mechanical handling of unit loads*

EN 620:2002+A1:2010, *Continuous handling equipment and systems — Safety and EMC requirements for fixed belt conveyors for bulk materials*

EN 626-1:1994+A1:2008, *Safety of machinery — Reduction of risks to health from hazardous substances emitted by machinery — Part 1: Principles and specifications for machinery manufacturers*

EN 894-1:1997+A1:2008, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 1: General principles for human interactions with displays and control actuators*

EN 894-2:1997+A1:2008, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 2: Displays*

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

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

EN 1037:1995+A1:2008, *Safety of machinery — Prevention of unexpected start-up*

EN 1088:1995+A2:2008, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection*

EN 1127-1:2007, *Explosive atmospheres — Explosion prevention and protection — Part 1: Basic concepts and methodology*

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

EN 1760-2:2001+A1:2009, *Safety of machinery — Pressure sensitive protective devices — Part 2: General principles for the design and testing of pressure sensitive edges and pressure sensitive bars*

EN 13463-1:2009, *Non-electrical equipment for potentially explosive atmospheres — Part 1: Basic method and requirements*

EN 14373:2005, *Explosion suppression systems*

EN 14491:2006, *Dust explosion venting protective systems*

CEN/TR 14715:2004, *Safety of machinery — Ionizing radiation emitted by machinery — Guidance for the application of technical standards in the design of machinery in order to comply with legislative requirements*

EN 60079-0:2004, *Electrical apparatus for explosive gas atmospheres — Part 0: General requirements* (IEC 60079-0:2004)

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

EN 60529:1991+A1:2000, *Degrees of protection provided by enclosures (IP code)* (IEC 60529:1989+A1:1999)

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

EN 61310-3:2008, *Safety of machinery — Indication, marking and actuation — Part 3: Requirements for the location and operation of actuators* (IEC 61310-3:2007)

EN 61496-1:2004+A1:2008, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests* (IEC 61496-1:2004, mod.+A1:2007)

CLC/TS 61496-2:2006, *Safety of machinery — Electro-sensitive protective equipment — Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs)* (IEC 61496-2:2006)

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

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

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

EN ISO 11161:2007+A1:2010, *Safety of machinery — Integrated manufacturing systems — Basic requirements* (ISO 11161:2007+Amd 1:2010)

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

EN ISO 11204:2010, *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 11204:2010)

EN ISO 11553, (all parts) *Safety of machinery — Laser processing machines* (ISO 11553)

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

EN ISO 12001:2009, *Acoustics — Noise emitted by machinery and equipment — Rules for the drafting and presentation of a noise test code* (ISO 12001:1996)

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

EN ISO 13732-1:2008, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces* (ISO 13732-1:2006)

EN ISO 13732-3:2008, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 3: Cold surfaces* (ISO 13732-3:2005)

EN ISO 13849-1:2008 *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design* (ISO 13849-1:2006)

EN ISO 13850:2008, *Safety of machinery — Emergency stop — Principles for design* (ISO 13850:2006)

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

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

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

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

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

EN ISO 14122-4:2004+A1:2010, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders* (ISO 14122-4:2004+Amd 1:2010)

3 Terms and Definitions

In addition to those terms defined in EN ISO 12100 the following definitions apply, for the purposes of this European Standard.

3.1

food processing machine – machine used for the production of food or animal food

3.2

commercial or industrial food processing machine – food processing machine intended by the manufacturer to be used in a place of work

Note: Some machines of this type may also have a domestic use.

3.3

household appliance – food processing machine intended by the manufacturer for domestic use

3.4

food – substance intended to be orally consumed by either humans or animals.

3.5

product – ingredient, component or material processed in a food processing machine to produce a food

3.6

cutting device – cutting tool with a sharp blunt or corrugated cutting edge, intended for cutting food . The cutting device may be stationary, reciprocating, rotating or an endless blade.

3.7

cutting device holder – component designed to allow the cutting device to be held safely during mounting and dismounting. The cutting device holder may be an integrated part of the cutting device or detachable.

3.8

cutting device edge guard – device designed to guard the edge of the cutting device during the mounting and dismounting of the cutting device or during other machine interventions

Note: A cutting device edge guard may be detachable or an integrated part of the machine.

3.9

cutting device carrier – component designed to protect the operator and the cutting device during transport and storage

4 List of significant hazards

4.1 General

This clause lists the wide range of hazards, hazardous situations and events that can be found on food processing machines and their associated equipment.

The manufacturer of a food processing machine can use this list of hazards to help identify the hazards on his machine and then find appropriate safety requirements for each of these hazards in the corresponding subsections of Clause 5 of this document.

If the manufacturer identifies hazards on his machine that are not listed in this clause, he shall assess these hazards by using the principles detailed in EN ISO 12100.

The hazards on a particular food processing machine can vary depending on the product being processed and any ancillary equipment that may be supplied with or connected to the machine.

4.2 Mechanical hazards

4.2.1 Moving parts

4.2.1.1 General

Most food processing machines, whether intended for commercial or industrial use, incorporate mechanical mechanisms, which can cause moderate or disabling injuries. Typical mechanical hazards caused by moving parts on food processing machines include:

- a. crushing hazards – e.g. caused by tools or drive mechanisms, gears and chains and sprockets;
- b. shearing hazards – e.g. caused by tools or transfer mechanisms, rotary valves, dividing mechanisms;
- c. cutting hazards – e.g. caused by cutting devices during operation, machine intervention, cleaning and handling, sheet metal edges that have not been deburred;
- d. entanglement hazards – e.g. caused by mixing tools, rotating shafts;
- e. drawing-in and trapping hazards – e.g. caused by milling or gauging rollers, drive rollers on belt conveyors;
- f. impact hazards – e.g. caused by unsupported lids or covers, small machines falling off work surfaces;
- g. stabbing and puncture hazards – e.g. caused by meat injectors;
- h. friction and abrasion – e.g. caused by conveyor belts, drive belts;
- i. ejection of parts hazards – e.g. caused by products in rotating bowls, break-up of high speed rotating components.

4.2.1.2 Risks arising from frequent operator intervention

4.2.1.2.1 General

On food processing machines, the risks from moving parts are increased in comparison to similar machinery used in other industries because of the need for frequent operator intervention. There is a need for frequent intervention into danger zones to remove blockages, to assist product flow (especially the last piece of a product run), to clean between different product runs and to gain access to the machine parts for a thorough clean to meet food hygiene requirements.

4.2.1.2.2 Openings in machines

There is a risk from danger zones on food processing machines, when operators reach into infeed, outfeed and inspection openings to load product, unload product, and assist product flow and to clean the machine.

4.2.1.2.3 Reaching over guards

There is a risk from danger zones on food processing machines, when operators stand on parts of machines or mobile steps and reach over guards to assist product flow or to clean the machine while the machine is running.

4.2.2 Risks which may arise from hygienic design features

4.2.2.1 General

Design features that make a food processing machine easy to clean can expose operators to hazards on the machine if they are not correctly designed.

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4.2.2.2 Quick release fixings

Quick release fixings that can be undone without the use of tools are frequently fitted to food processing machines so that machines can be dismantled quickly for cleaning. A risk may arise if the removal of quick release fittings allows access to danger zones.

4.2.2.3 Cleaning space under machines

There is a risk from danger zones on food processing machines, if operators kneel on the floor and reach under guards to clean the machine or the floor under the machine when the machine is in motion as shown in Figure 1. This risk is increased if an open design structure has been used to allow food to fall freely through the machine's mechanisms onto the floor.

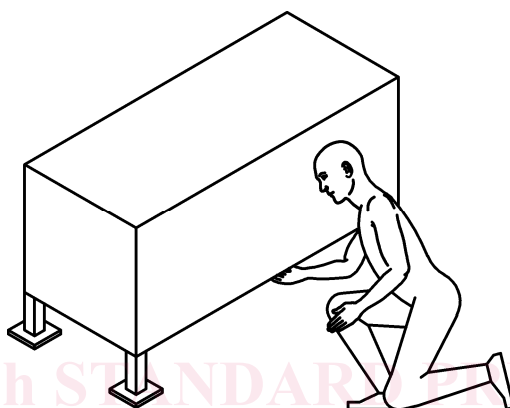


Figure 1 — Cleaning under food processing machinery

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4.2.2.4 Spillage trays

Food processing machines may be fitted with trays to collect spillages of food from the machine. It is good hygienic design practice for spillage trays to be easily removable so that product can be emptied frequently; however, when the trays are removed, the operator may be exposed to danger zones on the machine.

4.2.3 Hazards caused by high pressure fluids

Some food processing machines incorporate pneumatic or hydraulic systems. Pneumatic and hydraulic equipment presents crushing, shearing, ejection of parts, explosion and injection of fluids hazards. Stored energy in pneumatic or hydraulic systems may cause mechanisms to move unexpectedly even when power supplies are disconnected. In addition hydraulic oil and pneumatic lubricating oil present a potential fire hazard and can contaminate the food.

Some food processing machines use high-pressure water to cut or dislodge food products. These high-pressure jets can cause cutting injuries.

4.2.4 Stored energy

Many food processing machines including retorts and cookers contain stored energy. This energy may be mechanical, hydraulic, pneumatic, steam, over-pressure or vacuum. Hazards occur if components containing the energy fail or if the energy is released in an uncontrolled way during loading, unloading, cleaning or maintenance.

4.2.5 Slip, trip and fall hazards resulting from the design of the machine

4.2.5.1 Slip hazards

The nature and the form of many foods, the oils and fats used in food processing and the wet nature of some processes makes slipping on spilled substances a particular hazard in premises where food is prepared. Slipping hazards will occur if the design of the machine permits materials to spill out, overflow or otherwise escape from the machine. Run-off water and detergents used for cleaning can also make surfaces slippery.

4.2.5.2 Trip hazards

Trip hazards may arise on food processing machines where there are pipes or cables trailing on the floor or assemblies positioned at low level.

4.2.5.3 Hazard of falling from a height

There is a risk of people falling from a height if it is necessary to operate, clean or maintain a machine above floor level. The risk of falling is increased if the surfaces used for standing or walking at a height are covered with food products, oil, fats, water or detergents.

4.2.6 Loss of stability

If food processing machines become unstable and move unexpectedly or fall over they can cause crushing and impact injuries. Circumstances in which loss of stability can occur include the following:

- a) While the machine is in operation or being cleaned, for example:
 - a. if someone rests a container full of product on the edge of the feed hopper;
 - b. if the machine is loaded with product unevenly;
 - c. if someone stands on the machine.
- b) While the machine is being moved, for example:
 - a. if the manufacturer's lifting and moving instructions are not followed;
 - b. on machines fitted with wheels if the machine is moved on a slope or uneven surface.

4.3 Electrical Hazards

4.3.1 Electrical equipment

Electrical equipment on the machine generates a potential electric shock and burn hazard.

In the presence of combustible materials there is a potential fire hazard. Electrical systems may act as an ignition source. In the presence of flammable substances or products that may create explosive atmospheres, this could give rise to an explosion hazard.

If liquids, e. g. product spillage or cleaning substances like water, come into contact with the electrical conductors, there is a risk of electric shock.

4.3.2 Electrostatic phenomena

Electrostatic discharges can be a source of ignition for flammable substances or explosive atmospheres, e. g. flour dust.

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4.4 Thermal hazards

Many food processing machines incorporate heat sources, e.g. electrical heating elements, gas flames or steam. On machines containing heat sources there is a risk of burning from the heat source, steam, hot surfaces or hot air. Machines containing heat sources can create a hot working environment that may have a health damaging effect, e.g. heat exhaustion.

Some food processing machines incorporate refrigerating systems. On machines containing refrigerating systems there is a risk of burning from cold surfaces, refrigerants and cold products. Machines containing refrigerating systems may create a cold environment that can have health damaging effects, e.g. hypothermia.

Thermal hazards from hot or cold surfaces may be increased on food processing machines because standard heat insulating materials may not be compatible with the hygienic design requirements for the machine.

4.5 Noise

Food processing machines may generate noise which can result in hearing damage, in accidents due to interference with speech communication and interference with the perception of acoustic signals.

4.6 Hazards generated by vibration

Food processing machines that incorporate vibratory feeders or other vibrating mechanisms may cause vibration hazards if operators are required to hold, sit on or stand on vibrating parts of the machine for long periods.

4.7 Hazards generated by radiation

Some food processing machines incorporate sources of radiation that may give rise to hazards, for example:

- a) low frequency, radio frequency and micro-waves, e.g. for microwave cooking of foods, which can cause burning and other health damaging effects;
- b) infra-red, visible light and ultra-violet light, e.g. for infrared drying or heating of foods which can cause burning or blindness;
- c) X- and gamma rays, e.g. for inspection or irradiation of foods, which can cause burning, cancer and genetic mutation;
- d) alpha- and beta-particles, electron or ion beams, neutrons, e.g. for inspection of food which can cause burning, cancer and genetic mutation;
- e) lasers, e.g. for measuring or cutting food products, which can cause burning or blindness.

4.8 Hazards generated by materials and substances**4.8.1 Food products**

The products being processed in a food processing machine may injure operators in the following ways:

- a) Inhalation of harmful substances
 - 1) dusts and aerosols from processing food products – Many foodstuffs including wheat flour, grain, spices, seasonings, enzymes and seafood can be hazardous to operators when they are being processed. This is because they can cause an irritant, sensitising or allergic reaction such as occupational asthma. Reactions of this sort can occur even if machines emit only a low concentration of dusts or fumes from these substances;
 - 2) gases – Harmful gases, e.g. ammonia, can be emitted from freezing equipment on food processing machines.
- b) Suffocation, asphyxiation, drowning

- 1) processes – where food products are fermented, e.g. to make beer, malt, yeast, or yoghurt, carbon dioxide and other gases are given off reducing oxygen levels and causing suffocation;
- 2) modified atmospheres – where gases such as carbon dioxide or nitrogen are used to modify the atmosphere for a process or prior to packaging, oxygen levels can be reduced causing suffocation;
- 3) cryogenic freezing – where carbon dioxide or nitrogen are used as a direct refrigeration medium, oxygen levels can be reduced causing suffocation;
- 4) silos and other confined spaces – if operators enter a confined space in a food processing machine and are engulfed by products, suffocation or drowning can occur.

c) Impact

when food is ejected from the machine or when people enter silos and are hit by bulk flows of food products;

d) Burns and scalds

from hot food, steam generated during cooking, or frozen foods;

e) Microbiological contamination

When some products such as meat or poultry by-products are being processed there may be a risk to operators, maintenance personnel and consumers from microbiological contamination.

4.8.2 Hazards from cleaning media

The chemicals used to clean and disinfect food processing machines can be hazardous, particularly in their concentrated form. Hazards can arise if the chemicals

- a) come into contact with the skin or eyes; [SIST EN 1672-1:2014](https://standards.iteh.ai/catalog/standards/sist/9a070b7a-0ad4-4567-88a6-ec8224edde28/sist-en-1672-1-2014)
- b) are swallowed;
- c) are inhaled in the form of an aerosol, e.g. if used in conjunction with a high-pressure hose or compressed air.

Where high pressure water is used to clean machines there is a risk of

- cutting hazards if the water contacts the skin;
- electric shock if the water enters electrical enclosures.

4.8.3 Hazards from operating machines in potentially explosive atmospheres

Hazards can arise if food processing machines are operated in potentially explosive atmospheres or if potentially explosive atmospheres are allowed to form in parts of food processing machines, e.g. in mills, sieves, conveyors, silos and spray dryers.

Explosive atmospheres can be:

- a) gases, mists of vapours, e.g. natural gas from gas fired equipment, alcohol from beverages or flavourings, ammonia used in refrigeration systems;
- b) dusts, e.g. corn flour, wheat flour or icing sugar.

Potentially explosive atmospheres can be ignited by the following sources which can occur on food processing machines:

1. electrical sparks, e.g. from electrical contactors or electric motors;
2. electrostatic discharges, e.g. plastic machine parts or components linked with plastic bushes;