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BSI Standards Publication

Food processing machinery — Basic concepts

Part 1: Safety requirements

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National foreword

This British Standard is the UK implementation of EN 1672-1:2014.

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

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Foreword

This document (EN 1672-1:2014) 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of an identical text or by endorsement, at the latest by April 2015 and conflicting national standards shall be withdrawn at the latest by April 2015.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.

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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.

At the time of publication of this European Standard there exist about 50 European C-standards for all kinds of food processing machinery. Yet, some food processing machines are so specific and their variety is so large that it is not possible to sufficiently cover all types by machine-specific standards. EN 1672-1 therefore addresses those food processing machines that are not covered by one of the machine-specific standards that are listed in Annex C.

The extent to which hazards are covered by this document is indicated in the Scope and Clause 4.

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 European Standard 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 in 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.

Exclusions:

This European 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 European 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 1672-2:2005+A1:2009.

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

EN 614-1, *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 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2005, modified)*

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

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

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

EN 61496-1:2013, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests (IEC 61496-1:2012)*

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 7010:2012, *Graphical symbols — Safety colours and safety signs — Registered safety signs (ISO 7010:2011)*

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

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

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

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

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: Stairs, stepladders and guard-rails (ISO 14122-3:2001)*

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

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
food processing machine
machine used for the production of 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 1 to entry: 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

Note 1 to entry: 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 during mounting and dismounting

Note 1 to entry: The cutting device holder may be an integrated part of the cutting device or detachable.

3.8
cutting device edge
device designed to guard the sharp edge of the cutting device during the mounting and dismounting of the cutting device or during other machine intervention

Note 1 to entry: 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 European Standard.

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 12100:2010.

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 brine 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 cleaning 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, by-product outlet 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.

4.2.1.3 Risks which may arise from hygienic design features

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.

4.2.1.4 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.

4.2.1.5 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.

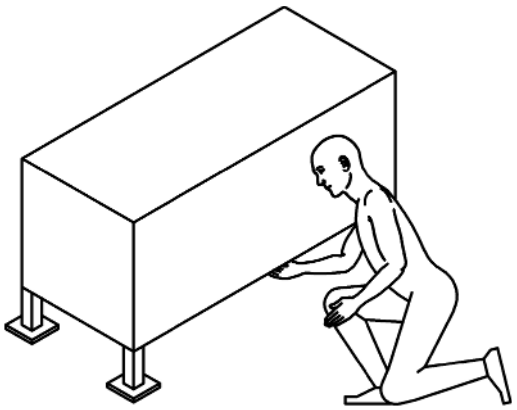


Figure 1 — Cleaning under food processing machinery

4.2.1.6 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.

4.2.2 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.

4.2.3 Stored energy

Many food processing machines including retorts and cookers contain stored energy. This energy may be mechanical, gravitational, 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.

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

4.2.4.1 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 spilt 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. Runoff water and detergents used for cleaning can also make surfaces slippery.

4.2.4.2 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.

4.2.4.3 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 surface used for standing or walking at a height is covered with food products, oil, fats, water or detergents.

4.2.5 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:

   1) if someone rests a container full of product on the edge of the feed hopper;

   2) if the machine is loaded with product unevenly;

   3) if someone stands on the machine.

b) While the machine is being moved, for example:

   1) if the manufacturer’s lifting and moving instructions are not followed;

   2) 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.

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 very cold surfaces, refrigerants and very 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, 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 food, which can cause burning and other health damaging effects;

b) infrared, visible light and ultraviolet 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, sensitizing 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 downing can occur.

c) Impact:

   1) 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:

   1) from hot food, steam generated during cooking or frozen foods.

e) Microbiological contamination:

   1) 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;

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 and 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:

c) electrical sparks, e.g. from electrical switchgear or electric motors;

d) electrostatic discharges, e.g. plastic machine parts or components linked with plastic bushes;

e) mechanically generated sparks, e.g. milling rollers contaminated with tramp metal or stones or ferrous and aluminium components colliding;

f) hot surfaces, e.g. parts of ovens or mechanical components like bearings, which have become overheated whilst failing.

4.9 Hazards generated by neglecting ergonomic principles in machine design

4.9.1 General

Hazards to safety and health can occur when people are carrying out manual tasks on the food processing machine. The risks from these hazards will be increased if the variability of the operator's physical anthropometric characteristics, strength and stamina of operator are not taken into account and if insufficient space is provided for movements of the parts of the operator's body.

a) Operation, e.g. repetitive strain, assuming a bad posture;

b) loading product into the machine, e.g. repetitive strain, assuming a bad posture, using excessive effort, fatigue;

c) cleaning the machine, e.g. assuming a bad posture, using excessive effort;

d) maintenance, e.g. assuming a bad posture, using excessive effort;

e) moving the machine, e.g. using excessive effort, fatigue.

4.9.2 Human error

Hazards can arise on food processing machines due to human error as in the following cases:

a) failing to assemble the machine correctly;

b) failing to operate the machine correctly;

c) failing to maintain the machine correctly;

d) psychological stress, e.g. caused by the need for monitoring that requires lengthy concentration or a poorly designed man/machinery interface;

e) mental underload, e.g. caused by a machine-determined work rate.

4.10 Hazards due to position, identification and operation of controls

4.10.1 General

Hazards can arise if the controls of the machine are not easy to access from the operating position or cannot be easily identified. Hazards can also occur on large machines where whole body access is possible if it is not possible to see inside hazardous areas of the machine from the control position.

4.10.2 Inability to stop movement

Hazards can arise particularly on semi-automatic machines if operators cannot stop movement once a machine cycle has been initiated.

4.10.3 Failure to isolate

Hazards can arise if operators are unable to identify how to isolate all energy sources to a food processing machine, particularly energy sources other than electricity, e.g. compressed air or steam. Hazards include crushing, shearing, impact, drawing-in, electric shock and scalding.

4.11 Hazards caused by failures on the machine

Hazards can arise on food processing machines if failures occur. For example:

a) failure of mechanical components, e.g. rotating parts, drive belts;

b) failure of energy supplies, e.g. electricity, steam, gas, compressed air. Hazards can also arise when the energy supply is reconnected unexpectedly following a failure;

c) failure of control circuits, e.g. through wear ingress, or electromagnetic interference;

d) failure of electronic drives systems, e.g. on systems where the power supply to a drive motor is not physically disconnected while the guards are open, there is a risk of unexpected start-up with consequential mechanical hazards if the control system fails or responds to an external disturbance such as electromagnetic interference;

e) unexpected ejection of fluids, e.g. if pipes containing liquid products or compressed air rupture;

f) errors of fitting, e.g. if components fail because they have been fitted incorrectly;

g) over-run, e.g. if braking systems wear or fail;

h) failure of safety related components, e.g. if guard interlocking devices or protective devices fail to danger;

i) failure of energy supply disconnection devices, e.g. if isolating switches or valves fail to danger;

j) failure of starting or stopping devices, e.g. stop button fails to bring machine to a halt;

k) failure of information or warning devices, e.g. if a light used to warn of a hazardous situation fails;

l) failure of emergency devices, e.g. if the contacts on an emergency stop device become separated from the actuator;

m) failure of guards and guard fixings, e.g. if guards or their fixings break.

4.12 Hazards due to missing or wrongly adjusted guards and protective devices

Hazards can arise if safety critical parts of a food processing machine are missing or wrongly adjusted. For example:

a) guards – e.g. if they are left off after cleaning or maintenance;

b) protective devices – e.g. if they are deliberately by-passed or wrongly adjusted;

c) safety signs – e.g. if they come off during cleaning;

d) feeding and discharge equipment – e.g. if a machine is run without feed chutes or discharge conveyors which form part of the guarding of the machine;

e) essential equipment for safe adjustment or maintenance – e.g. if special tools are missing.

4.13 Hazards due to the linking of machines and processes

Many food processing machines operate in continuous production and some cannot be stopped immediately without creating additional hazards either on the machine that has been stopped or at some other point in the food processing line. For instance, if a continuously fed biscuit oven is stopped when full of product, the contents of the oven will catch fire and there is a risk of the oven band snapping and injuring people and damaging equipment outside the confines of the oven.

4.14 Hazards created by common mechanisms on food processing machines

4.14.1 Feed hoppers

4.14.1.1 General

Feed hoppers on food processing machines give rise to several hazards, but the risks from these hazards vary significantly depending on the following factors:

a) the location of the hopper;

b) the size of the hopper;

c) whether the hopper is loaded manually or automatically;

d) the need for operator intervention in the hopper.

4.14.1.2 Mechanical hazards

There are mechanical hazards (e.g. crushing, shearing, drawing-in, or entanglement) at feed hoppers caused by the mechanical assemblies that are typically located at the base of feed hoppers and in some hoppers which are equipped with stirring devices. Typically these mechanisms will cause permanent injuries.

Operators are exposed to these hazards in the following situations:

a) loading product manually into the hopper;

b) assisting product flow in the hopper while the machine is running or at the end of a production run;

c) taking samples of or testing the product in the hopper:

d) cleaning the hopper while the machine is in motion.

4.14.1.3 Slip and fall hazards

Slip and fall hazards can occur at feed hoppers in the following situations:

a) if it is necessary to stand on access steps, work platforms or a part of the machine to carry out any of the tasks listed in 4.14.1.2;

b) if the size and location of the hopper relative to access positions makes it possible to fall into the hopper while carrying out the tasks listed in 4.14.1.2.

4.14.1.4 Stability hazards

On small machines, if an operator rests a container full of product on the edge of the feed hopper there may be a risk of the machine falling over.

4.14.1.5 Ergonomic hazards

Hazards resulting from excessive effort or assuming a bad posture can arise if feed hoppers are loaded with product manually. The risk of these hazards will increase if the height of the top of the feed hopper relative to the access position is greater than 600 mm.

4.14.2 Cutting devices

Mechanical cutting devices present a cutting or shearing hazard and if they rotate a drawing-in or entanglement hazard:

a) when the machine is in normal operation;

b) if when the machine’s power supplies are isolated the mechanism moves unexpectedly due to stored energy;

c) if when cleaning the machine the operator touches the exposed cutting surface;

d) when the device is handled during setting-up, cleaning or maintenance.

4.14.3 Conveyors

Food processing machines will frequently be supplied with or mounted over belt conveyors or slat band conveyors. Drawing-in or trapping hazards can be generated where belts or slat bands pass over rollers

or fixed parts of the conveyor frame and where the conveyor passes under fixed parts of the machine. These hazards are increased if flights are attached to the belt or slat band.

5 Safety requirements and protective measures

5.1 General

This clause indicates measures that can be applied to food processing machines to eliminate or mitigate the hazards described in Clause 4 of this document. It also indicates type-B- and type-C-standards (as defined by EN ISO 12100:2010) which contain relevant safety requirements.

Where a food processing machine has significant hazards that are not described in Clause 4, the manufacturer shall identify appropriate methods of eliminating or minimizing the risks from these hazards by referring to European Standards that are relevant to that hazard.

5.2 Requirements to eliminate mechanical hazards

5.2.1 Safeguarding of moving parts

5.2.1.1 General

When selecting the most appropriate safeguarding method for each part of a food processing machine, preference shall be given to eliminating mechanical hazards by design, e.g. by limiting the force, power or movement of moving parts. See 5.2.1.2.

Where hazards cannot be eliminated by design, mechanical hazards shall wherever possible be safeguarded using guards that comply with EN 953:1997+A1:2009. Fixed guards, i.e. guards that are securely held in place with fixings that can only be undone using tools shall be used for parts of machines where access is infrequent. See 5.2.1.3.

The use of protective devices on food processing machines shall be limited to situations where fixed and moveable guards cannot be used for technical reasons.

5.2.1.2 Safety by design

Moving parts can be considered to be safe by design provided the force exerted by the moving parts does not exceed 75 N, the pressure they exert against an object is less than 25 N/cm^2 and their energy is less than 4 J. If the hazardous movement is automatically reversed within 1 s when resistance is detected, the movement can be considered as safe provided the force does not exceed 150 N, the pressure does not exceed 50 N/cm^2 and the energy is less than 10 J.

Crushing hazards caused by moving parts can also be made safe by design by ensuring sufficient distance between moving and fixed parts and between one moving part and another using the dimensions indicated in EN 349:1993+A1:2008.

5.2.1.3 Fixed and interlocked guards

Moving parts which cannot be made safe by design shall be safeguarded by fixed or interlocked enclosing guards complying with EN 953:1997+A1:2009 and dimensioned and positioned using EN ISO 13857:2008. Where distance guards are used they shall be dimensioned and positioned in accordance with EN ISO 13857:2008, Table 2, but shall be at least 1 600 mm high. Where it is foreseeable that someone will try to put their feet into a machine, e.g. because it is next to an access platform, guards shall be dimensioned and positioned in accordance with Table 7 and all relevant tables in EN ISO 13857:2008.

As a general rule the fixings for fixed guards shall remain attached to either the guard or the machine when the guard is removed, however it is acceptable to use a conventional fixing method where the guard is only removed very infrequently or hygiene considerations make the use of captive fixings unacceptable.

5.2.1.4 Openings in guards

Openings in guards shall be positioned or dimensioned to prevent access to danger zones within the machine when standing on the floor or access level and reaching into the opening.

The minimum safety distance to the nearest danger zone through the opening shall comply with EN ISO 13857:2008, Table 3, Table 5, Table 6 and Table 7.

Where the width of the opening is greater than 400 mm or the height is greater than 120 mm the safeguarding methods indicated in Annex B shall be used.

5.2.1.5 Interlocking devices associated with guards

Moveable guards shall be interlocked with devices that comply with EN ISO 14119:2013, 4.2 and 4.3. The requirements of EN ISO 14119:2013, Clauses 5, 7 and 8 shall be satisfied.

EN ISO 13855:2010 shall be used to determine if guard-locking devices complying with EN ISO 14119:2013, 4.3 and 5.7, need to be fitted to guard doors to prevent access to moving parts while they are slowing down.

5.2.2 Safety requirements for hygienic design features

5.2.2.1 Quick release fixings

Where quick release fixings, which can be undone without the use of tools, are used to secure parts of machines or guards that prevent access to danger zones, an interlocking device complying with 5.2.1.5 shall be fitted which ensures that no hazardous movement can occur when the fixings are removed.

5.2.2.2 Guarding under machines

Where the distance between the bottom of the machine frame or guards and the floor is greater than 50 mm and less than 120 mm it shall be assumed that someone can get the full length of their arm under the machine and so the distance from the edge of the frame or guard to the nearest danger zones shall be at least 850 mm. See Figure 2.

Where the distance between the bottom of the machine frame or guards and the floor is greater than 120 mm and less than 200 mm it shall be assumed that someone can get the full length of their arm under the machine and part of their shoulder and so the distance from the edge of the frame or guard to the nearest danger zones shall be at least 1 000 mm.

Where the distance between the bottom of the machine frame or guards and the floor is greater than 200 mm, it shall be assumed that someone can crawl under the machine and so the machine shall be fitted with guards to prevent access from danger zones from underneath the machine.

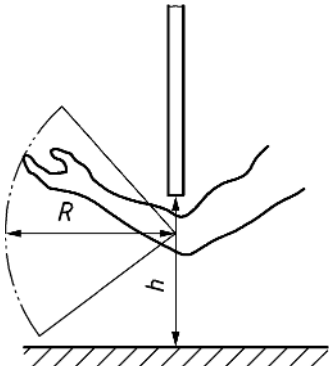


Figure 2 — Area free of danger zones

Where 50 mm < *h* < 120 mm, R shall be > 850 mm.

Where 120 mm < *h* < 200 mm, R shall be > 1 000 mm.

Where *h* > 200 mm, the machine shall be fitted with guards to prevent access under the machine.

5.2.2.3 Spillage trays

Where the removal of spillage trays gives access to danger zones and the trays only need to be removed while the machine is stopped the tray shall either:

a) be secured with fixings, e.g. locks, that can only be undone with tools and remain attached to the machine or the tray, or

b) be fitted with an interlocking device complying with 5.2.1.5 which ensures that he machine cannot operate unless the tray is in place.

If it is necessary to remove the tray while the machine is in operation access to the danger zone shall be prevented by either:

c) fitting a fixed wire mesh guard above the tray positioned and dimensioned according to EN ISO 13857:2008, Table 4, or

d) fitting a fixed wire mesh guard below the tray as illustrated in Figure 3. Ensuring that the dimensions and position of the mesh and the slot revealed when the tray is removed shall comply with EN ISO 13857:2008, Table 4, or

e) fitted with mechanical interlocking devices which prevent the tray from being removed until a guard is inserted above the tray and prevent the guard from being removed until the tray is put back in place, or

f) an alternative method which risk assessment suggests gives an equivalent level of safety.

Figure 3 — Fixed mesh guard positioned below spillage tray

5.2.3 Safety requirements for high pressure fluids

All pneumatic components and piping shall conform to the requirements of EN ISO 4414:2010. All hydraulic components, systems and piping shall conform to the requirements of EN ISO 4413:2010.

Where safety functions are controlled through hydraulic or pneumatic systems, these circuits shall comply with the requirements of 5.3.1.4 and 5.3.1.7.

Unexpected start-up shall be prevented using the measures described in EN 1037:1995+A1:2008, and a separate means of isolation shall be provided for each type of energy.

The design shall ensure that hydraulic oil or pneumatic lubricating oil cannot come into contact with the product.

Where high pressure water is used as a cutting medium interlocked guards complying with 5.2.1.3 shall be provided that prevent access to the high pressure water and are interlocked in such a way that the hazardous flow of water is stopped immediately the guards are opened.

5.2.4 Stored energy

Where a food processing machine contains stored energy, e.g. compressed air or pressurized steam, the machine shall be designed in such a way that this energy cannot be released accidentally, e.g. using a guard locking device linked to a pressure sensor and a means shall be provided to release this stored energy safely.

5.2.5 Requirements to prevent slip, trip and falling hazards

5.2.5.1 Design to avoid slipping

The design of the machine shall ensure that liquids, steam or solids that could spill onto the floor or working platforms around the machine are contained, e.g. in spillage trays. The design of work platforms and steps that are likely to become covered with water or other liquids during operation or cleaning shall be provided with an enhanced slip resistant surface as required by EN ISO 14122-2:2001, 4.1.2 b), e.g. machine-serrated open bar grating floors, or top surface resin bonded abrasive grit floors, should be used in preference to plate floors with a coefficient of friction of less than 0,6.

5.2.5.2 Design to avoid tripping

The design of the machine should avoid assemblies at low level that are likely to cause a trip accident and the instructions for use shall stress the importance of routing cables and pipe work so that it does not cause a tripping hazard.

5.2.5.3 High level access

5.2.5.3.1 Design of means of access

Where access is required to operate, adjust, clean, disinfect, inspect, or maintain a machine in a position which cannot be reached from the floor, the manufacturer shall design or specify a safe means of access to these areas. The manufacturer shall follow the hierarchy in EN ISO 14122-1:2001 when selecting or designing this means of access.

5.2.5.3.2 Provision of means of access

When high level access is required or expected for operation or cleaning, a permanent or moveable means of access shall be provided by the manufacturer with the machine.

When high level access is required for maintenance the manufacturer is not required to provide the means of access but shall describe the temporary means of access to be used to carry out these tasks in the instruction handbook.

5.2.5.3.3 Construction of means of access

Permanent working platforms shall comply with EN ISO 14122-2:2001.

Permanent stairs which are used once a week or more often shall comply with EN ISO 14122-3:2001.

Step ladders and fixed ladders shall only be used where the criteria for their use set out in EN ISO 14122-1:2001 is met. Step ladders shall comply with EN ISO 14122-3:2001 and fixed ladders shall comply with EN ISO 14122-4:2004.

Moveable platforms with stairs are an acceptable alternative to a permanent means of access for access once a week or more often provided they meet the requirements for EN ISO 14122-2:2001 and EN ISO 14122-3:2001.

5.2.5.3.4 Distance to danger zones

It shall not be possible for the operator to reach any danger zone on the machine when standing on the permanent means of access. The safety distances from the means of access to the nearest danger zone shall comply with EN ISO 13857:2008, Table 2.

Where a moveable means of access is provided for frequent access, the design of the machine's guards shall ensure that if is not possible to reach a danger zone from this moveable means of access wherever it is positioned around the machine.

5.2.6 Stability of machines

5.2.6.1 Stability during operation

The machine shall be designed and constructed so that it is stable during normal use and foreseeable abnormal situations.

The manufacturer shall state in the instruction manual if the machine shall be anchored to the floor or to another machine before use and give detailed information about the methods and means of anchorage.

On machines fitted with wheels, at least two wheels shall be fitted with locking devices to ensure that the machine does not move unexpectedly when it is in use.

If it is foreseeable that someone will stand on the machine, the manufacturer shall design the machine or its fixings to ensure stability in this situation.

5.2.6.2 Stability while being moved

The manufacturer shall provide information in the instruction manual on how to move the machine safely. See 7.3.

Machines fitted with wheels shall be designed so that they are stable when they are placed on a 10° slope in any orientation.

5.3 Requirements to prevent electrical hazards

5.3.1 Electrical equipment

5.3.1.1 General

Electrical equipment shall comply with EN 60204-1:2006. In the places where EN 60204-1:2006 provides various options, the options stated below shall be used.

5.3.1.2 Supply disconnecting device

The machine shall be equipped with a readily identifiable and accessible supply disconnection device. This device shall be selected from those listed in EN 60204-1:2006, 5.3.2, and comply with 5.3.3 and 5.3.4 of that standard. At least one such device shall be attached to the machine. The actuator of the supply disconnection device shall conform to EN 61310-3:2008.

5.3.1.3 Excepted circuits

Some circuits, e.g. machine lighting circuits, do not need to be disconnected by the supply disconnection device. Circuits that do not have to be disconnected are listed in EN 60204-1:2006, 5.3.5. Those circuits that are not disconnected by the main supply disconnecting device shall each have their own supply disconnecting device, and the notice and warning requirements of EN 60204-1:2006, 5.3.5, shall be implemented.

5.3.1.4 Prevention of unexpected start up

Devices to prevent unexpected start up shall be selected from EN 60204-1:2006, 5.4, and shall be designed so that they can be locked. The design of the controls shall comply with EN 1037:1995+A1:2008.

The control system shall be designed so that the machine does not start unexpectedly, e.g. under the following conditions:

a) as a result of a signal generated by a sensor (except when in automatic mode);

b) by closing an interlocked guard (unless it is a control guard);

c) by restoring the power supply after an interruption.

5.3.1.5 Protection against electric shock

Electric shock by direct contact shall be prevented by choosing from the methods described in EN 60204-1:2006, 6.2, and electric shock by indirect contact shall be prevented by choosing from the methods describe in EN 60204-1:2006, 6.3.

5.3.1.6 Degree of protection

The protection level for electrical enclosures, as defined by EN 60529:1991, shall be selected for the machine and its environment, in accordance with EN 60204-1:2006, 11.3, and Table 1 and Table 2 of this standard.

The manufacturer shall state in the instructions for use any restrictions on cleaning techniques, e.g. “the electrical enclosures are protected to IP65 and so the machine should only be cleaned using low pressure water”.

Table 1 — Degree of protection for dusty environments

Dusty Environment	**Required degree of protection (**EN 60529:1991**)**
Non conducting dusts	IP 5X
Conducting dusts	IP 6X

Table 2 — Degree of protection for different cleaning methods using water

Method of cleaning	**Required degree of protection (**EN 60529:1991**)**
Cleaning without water	IP X3
Cleaning with damp cloth	IP X4
Cleaning with low pressure water (12,5 l/min maximum)	IP X5
Cleaning with medium pressure water (100 l/min maximum)	IP X6
Cleaning with high pressure water	IP X9

NOTE 1 The tests for electrical enclosures stipulated by EN 60529:1991 use water. Therefore, if fluids other than water are used for cleaning or the water contains a detergent, it may be necessary to use a higher IP-rating than indicated by EN 60529:1991 and Table 2.

NOTE 2 It is possible to use either fixed or moveable hoods to prevent the ingress of water into electrical enclosures during cleaning.

5.3.1.7 Emergency stop

Where food processing machines are provided with an emergency stop device it shall comply with EN ISO 13850:2008 and the emergency stop function shall comply with EN 60204-1:2006, 9.2.5.4.2.

5.3.1.8 Cables in wire trays

Where open wire trays are used to support cables, sufficient mechanical protection shall be provided for the cables to ensure that they cannot be damaged or pulled from glands during normal operation, cleaning and maintenance activities.

5.3.2 Electrostatic phenomena

Where there is a risk of a build-up of static electricity on a food processing machine, the manufacturer shall provide the necessary earth bonding or static elimination equipment to ensure that no hazardous build-ups occur.

5.4 Thermal hazards

As a general rule the temperature of touchable surfaces on food processing machines shall not exceed the burn thresholds defined in EN ISO 13732-1:2008 for hot surfaces and EN ISO 13732-3:2008 for cold surfaces.

If this is technically impossible the manufacturer shall eliminate the burning risk by insulation, or shall prevent access, for example by fitting a distance guard (see Figure 4). If these measures are not sufficient a hot or cold surface warning pictogram as illustrated in Figure 12 — Warning pictogram “Warning, hot surface” and Figure 13 — Warning pictogram “Warning, cold surface” shall be fitted either on or immediately adjacent to the hot or cold surface.

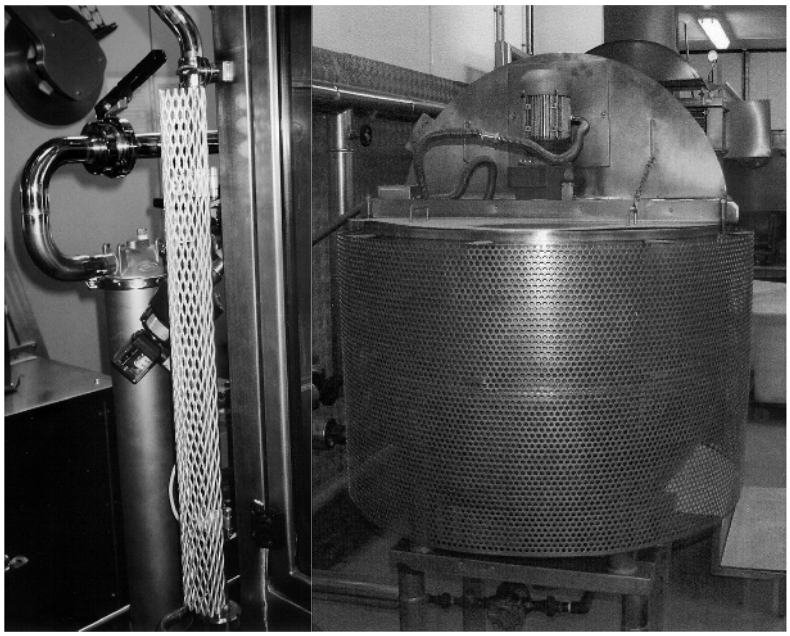


Figure 4 — Use of expanded mesh and punched metal to prevent accidental contact with hot surfaces on food machinery

Where the operation of the food processing machine is likely to generate a hot or cold environment in the area where the machine is being operated, the manufacturer shall provide information in the instructions for use on the steps that the user shall take to prevent health damaging effects to operators and maintenance personnel, e.g. the provision of ventilation, air conditioning or personal protection equipment.

5.5 Noise reduction

Noise reduction of food depositors shall be an integral part of the design process and shall be achieved particularly by applying measures to control noise at source.

Noise can be reduced or eliminated at source using measures that include the following:

a) drive mechanisms can be fitted with acoustic attenuation materials;

b) mechanisms should be designed so that they do not hit against each other;

c) air exhausts should be fitted with silencers.

Additional design measures can be found in EN ISO 11688-1:2009.

This list is not exhaustive, alternative technical measures for noise reduction with identical or greater efficiency can be used.

5.6 Vibration

Where food processing machines contain mechanisms that vibrate, the manufacturer shall ensure that hazardous vibration is not transmitted to people operating the machine, e.g. by using anti-vibration mountings. See EN 1299:1997+A1:2008 for more information on reducing vibration.

5.7 Radiation

Where machines contain radiation sources or equipment that generates radiation, the manufacturer shall ensure that undesirable radiation emissions from the machinery are eliminated or be reduced to levels that do not have adverse effects on persons. The following risk reduction methods shall be used:

a) low frequency, radio frequency and micro-waves, e.g. contained using Faraday cages;

b) infrared, visible light and ultraviolet light, e.g. contained using light baffles;

c) X- and Gamma rays, e.g. contained using the methods described in EN 12198-3:2002+A1:2008;

d) alpha- and beta-particles, electron or ion beams, neutrons, e.g. contained using the methods described in EN 12198-3:2002+A1:2008;

e) lasers, e.g. contained using the methods described in EN ISO 11553-1, EN ISO 11553-2 and EN ISO 11553-3.

5.8 Food products, materials and substances

5.8.1 Food products

Where the manufacturer knows that the food products that will be processed in the food processing machine, the manufacturer shall design and equip the machine in such a manner that operators and maintenance personnel are protected from any hazards presented by these food products.

Where the manufacturer does not know the food products that will be processed in the food processing machine, the manufacturer shall state in the instructions for use any assumptions that have been made about the intended use of the machine, e.g. “This machine has been designed on the assumption that it will only be used to process non-hazardous food products”.

a) Inhalation of harmful substances – When choosing methods of reducing hazards from hazardous food products and gases like ammonia, reference shall be made to EN 626-1:1994+A1:2008.

b) Suffocation and asphyxiation – On food processing machines where there is a risk of suffocation if people enter the machine, e.g. to clean or carry out maintenance, the manufacturer shall design a safe system for carrying out these tasks which is described in the information for use and supply any means of isolation, air quality measurement or ventilation necessary to control the atmosphere within the machine.

Where a food processing machine emits gases, e.g. nitrogen or carbon dioxide, that are likely to reduce oxygen levels around the machine, the manufacturer shall provide information on how safe levels of oxygen can be maintained to prevent suffocation of operators working near the machine, e.g. adequate ventilation and monitoring of oxygen levels.

Where it is necessary for someone to enter a confined space within a food processing machine, the manufacturer shall provide readily identifiable and accessible isolating valves which can be locked in the closed position for each feed point to the enclosed space.

c) Impact – The manufacturer shall ensure that exposed persons cannot be hit by food products entering, discharging, or being ejected from the machine.

d) Burns and scalds – The manufacturer shall ensure that the design of the food processing machine protects exposed persons from burns and scalds from food products. See 5.4.

e) Microbiological contamination – When choosing methods of reducing hazards from hazardous food products reference shall be made to EN 626-1:1994+A1:2008.

5.8.2 Cleaning media

When selecting the method for cleaning the machine, the manufacturer shall give preference to cleaning methods that minimize the hazards to the operator and minimize the risk of contaminating the product, i.e. methods that do not use hazardous chemicals.

If the cleaning method adopted recommends the use of hazardous chemicals for cleaning, the manufacturer shall design the machine and the operating procedures to minimize the risk to operators by providing:

— an automated handling, dilution, use and recovery system for the chemical (in-place cleaning system);

— by providing detailed instructions on the correct method of handling the chemical and cleaning the machine and the appropriate personal protection equipment in the instructions for use.

Where the manufacturer recommends the use of steam or pressurized water for cleaning, the manufacturer shall ensure that electrical equipment on the machine has the appropriate degree of protection. See 5.3.1.6.

Where an automated clean in place (CIP) or sterilize in place (SIP) is provided which uses a hazardous cleaning medium, the manufacturer shall equip the machine with:

— guard-locking devices complying with EN ISO 14119:2013 which prevent accidental opening of lids or guards and exposure to the cleaning media during the cleaning or sterilizing cycle;

— a visual warning device which operates during the cleaning or sterilizing cycle.

5.8.3 Requirements for machines used in potentially explosive atmospheres

Where food processing machine are to be used in a potentially explosive atmosphere the manufacturer shall comply with the requirements of the ATEX-Directive 94/9/EC.

5.9 Ergonomic design principles

5.9.1 General

The manufacturer shall ensure that the food processing machine is designed to avoid ergonomic hazards in the following ways.

5.9.2 Operating the machine

Controls and control panels shall be positioned according to the requirements of EN 614-1. The indicators and actuators shall comply with EN 894-1:1997+A1:2008, EN 894-2:1997+A1:2008, EN 894-3:2000+A1:2008, EN 61310-1:2008 and EN 61310-3:2008. Indication lights fitted to the machine shall comply with the requirements of EN 60204-1:2006, 10.3.2 and 10.3.3.

5.9.3 Loading product into the feed hopper

On machines where the hopper cannot be loaded conveniently from floor level, e.g. if the height of the hopper is 1 400 mm or greater, the manufacturer shall either provide a mechanism to load product into the hopper or a permanent means of access, e.g. stairs and a platform, complying with the requirements of EN ISO 14122-1:2001, EN ISO 14122-2:2001 and EN ISO 14122-3:2001.

5.9.4 Cleaning the machine

The parts of the machine, which have to be reached for cleaning shall be easily accessible. This may involve providing additional interlocked guards, access platforms designed for cleaning work or designing the machine so it can be cycled to a position where cleaning can be carried out without the risk of injury.

5.9.5 Maintenance

The design of the machine shall minimize the risk of physical strain when carrying out maintenance. This may require the provision of lifting beams over heavy drives or gearboxes or the provision of mechanical handling equipment to minimize risks from ergonomic hazards.

5.9.6 Moving the machine

The manufacturer shall provide instructions on how to move the machine safely in the instruction handbook. Where machines are equipped with wheels the manufacturer shall ensure that the machine can be moved without the need for excessive effort.

5.10 Controls

5.10.1 General

The controls on a food processing machine shall be designed so that they are robust, easily accessible and their function is easily identifiable.

Where technically feasible, the controls shall be positioned so that the operator has a clear view of the interior of the machine from the control position.

5.10.2 Stop Function

Each workstation of a food processing machine shall be equipped with a stop button. On semi-automatic machines this stop button shall be within easy reach of the operator when the operator is in the operating position.

5.10.3 Emergency stop devices on large machines

Where the perimeter of a standalone machine is greater than 10 m the machine shall be equipped with two or more emergency stop devices and the devices shall be positioned so that they are no further than 10 m apart.

Where the machine is typically included in a line of machines, emergency sop devices shall be positioned on both sides of the machine or in a position where it can be accessed from both sides of the machine.

5.10.4 Means of isolation of energy supplies

Food processing machines shall be equipped with a readily identifiable and accessible means of isolation for each type of energy supplied to the machine which can be locked in the off position.

Compressed air isolation valves shall be clearly labelled to indicate their purpose and the method of operation of the valve and shall have the facility to release stored energy.

Electricity isolation devices shall comply with 5.3.1.2.

If the electrical isolation device does not isolate all energy sources, this fact shall be marked on the isolation device and described in the instruction handbook.

5.11 Requirements to prevent failures

The manufacturer shall design the food processing machine so that hazards do not arise following component or system failures in the following ways:

a) Failure of mechanical components – components shall be robust and suitable for their intended use.

b) Failure of energy supplies – no hazard shall arise following a failure of the power supply.

c) Failure of control circuits – no hazard shall arise following a control circuit failure and the design of the food processing machine shall ensure that it is possible to stop the machine safely following a control system failure.

d) Failure of electronic drive systems – Where hazardous movement of machinery is controlled by servo, rectifier, inverter or similar electronic drive systems, the design of the safety related parts of the control system shall prevent unexpected start up during short term interventions, e.g. the removal of misshaped products during normal operation.

   Where the safety related pulse blocking, monitoring or control functions are achieved with electrical or electronic control systems, they shall comply with performance level “d” of EN ISO 13849-1:2008.

   The manufacturer shall ensure that the instruction handbook emphasizes that these methods of preventing the unexpected start-up of drives are only suitable for short duration machine interventions and that safe isolation procedures should be used for long term interventions like cleaning or maintenance. The instructions shall state how these drives shall be isolated and stored energy safely dissipated.

e) Unexpected ejection of fluids – the food processing machine shall be designed to ensure that liquids and gases, including, compressed air, steam, the product and hydraulic fluid cannot escape unexpectedly.

f) Errors of fitting – the food processing machine shall be designed so that hazards cannot arise if parts that have to be removed and replaced for cleaning or product changing are fitted incorrectly.

g) Over-run – food processing machines shall be designed so that the over-run following a stop command is less than the time it takes for an operator to reach danger zones. Where this requirement is achieved by the use of a brake, the manufacturer shall provide information in the instruction handbook on the frequency and method of adjusting this brake to maintain a safe operation.

h) Failure of safety-related components – unless stated otherwise in this European Standard or indicated by risk assessment, the following requirements shall apply:

   1) safety functions incorporating electrical and electronic components shall comply with at least performance level “d” of EN ISO 13849-1:2008;

   2) safety functions incorporating hydraulic and pneumatic components shall comply with at least performance level “c” of EN ISO 13849-1:2008.

i) Hydraulic and pneumatic two-hand controls shall comply with type III A, and electric/electronic two-hand controls shall comply with type III B of EN 574:1996+A1:2008 and type III of EN 60204-1:2006.

j) Failure of energy supply disconnection devices – the manufacturer shall use isolating switches, plugs and valves that are specifically designed for the purpose of isolating energy supplies.

k) Failure of starting or stopping devices – the normal stops and emergency stops shall be stops of category 0 or 1 as defined in EN 60204-1:2006, 9.2.5.3, or their equivalent where the controls are pneumatic or hydraulic.

   Workstations of food processing machines shall be equipped with a normal stop device in accordance with the requirements above, which can be accessed easily from the operating position and can stop all of the moving parts of the machine.

l) Failure of information or warning devices – Where information or warning devices have a safety critical function, the manufacturer shall provide a method of monitoring these devices that will alert the user if a failure has occurred.

m) Failure of emergency devices – Food processing machines shall be provided with an emergency stop button located on each control station. The emergency stop function shall comply with EN 60204-1:2006, 9.2.5.3. The emergency stop device shall comply with EN ISO 13850:2008.

n) Failure of guards and guard fixings – the manufacturer shall design guards and guard fixings so that when used as intended they will last the lifetime of the machine. The manufacturer shall include details on how to maintain guards and guard fixings in the instruction handbook.

5.12 Requirements to prevent hazards due to missing or wrongly adjusted guards and protective devices

The manufacturer shall comply with the following requirements to prevent hazards from missing or wrongly adjusted guards or protective devices:

a) Guards – where there is a risk of guards being removed an left off following routine cleaning and product changing, these guards shall be fitted with interlocks complying with 5.2.1.5 that prevent the machine from operating if the guard is missing.

b) Protective devices – electro-sensitive protective equipment (ESPE) shall conform to EN 61496-1:2013, type 4, and shall be positioned in accordance with EN ISO 13855:2010, to ensure that any hazardous movement has been stopped before the operator reaches the danger zone.

c) Safety signs – warning symbols complying with EN ISO 7010:2012 shall be used in preference to warning notices. The manufacturer shall select materials of construction and fixing methods for safety signs that will be compatible with the cleaning methods of the food processing machine. The position and purpose of all safety signs fitted on the machine shall be noted in the instruction handbook.

d) Feeding and discharge equipment – where the removal without tools of feeding or discharging equipment e.g. conveyors, exposes danger zones on the food processing machine, the feeding or discharging equipment shall be interlocked with the food processing machine in such a way that when the feeding or discharging equipment is removed, the food processing machine cannot operate. The interlocking devices used shall comply with 5.2.1.5.

e) Essential equipment for safe adjustment and maintenance – where special tools are required for the safe adjustment of a food processing machine, these shall be supplied with the machine by the manufacturer.

5.13 Requirements for machines and processes that are linked together

Where food processing machines operate in continuous production and cannot be stopped immediately without creating additional hazards either on the machine that has been stopped or at some other point in the food processing line, the manufacturer shall design the machine or system in such a way that the machine or system can be brought safely into a mode where the significant hazards of the machine are eliminated in as short a time as is reasonably practicable.

5.14 Requirements for common mechanisms on food processing machines

5.14.1 Safety requirements for feed hoppers

5.14.1.1 General

The hazards at feed hoppers can be safeguarded in a variety of ways, six of which are described in this document, however some methods of safeguarding are only suitable in specific situations, e.g. when the hopper is fed automatically and some methods of safeguarding give a better level of protection than others.

Moreover safeguarding solutions which reduce the risk from the mechanical hazard, e.g. increasing the height of the hopper, may increase the ergonomic risks when loading product into the hopper and measures introduced to reduce the ergonomic risk, e.g. providing stairs or a platform may increase the risk of slipping and falling and from mechanical hazards.

The method chosen to eliminate the mechanical hazards shall take into account the anticipated activities associated with the hopper and the other risks that may result from these activities, e.g. ergonomic, slip and fall hazards.

Table 3 can be used to compare the relative merits of different safeguarding methods.

5.14.1.2 Safeguarding moving parts in feed hoppers

5.14.1.2.1 Solid interlocked guard

Where the top of the hopper is safeguarded with a solid interlocked guard complying with 5.2.1.3 the hopper can be of any height, regardless of the height of the danger zone in the hopper. However, if there are any openings in the lid the distance of these openings from the nearest danger zone shall comply with EN ISO 13857:2008, Table 4. See Figure 5.

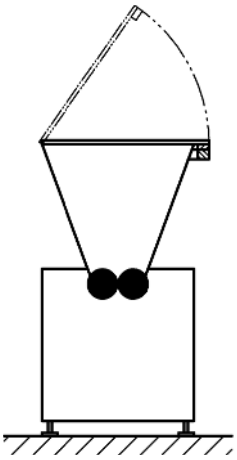
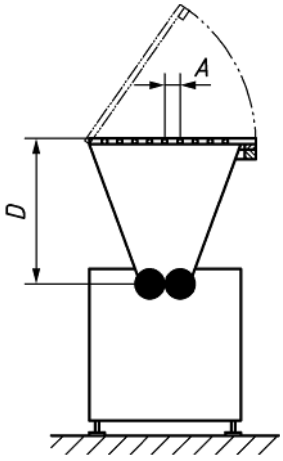


Figure 5 — Solid interlocked guard

The guard shall be interlocked with a device complying with EN ISO 14119:2013.

5.14.1.2.2 Interlocked guard with openings

Where the top of the hopper is safeguarded with an interlocked guard complying with 5.2.1.3 which contains openings up to 120 mm wide, the distance from the opening to the nearest danger zone shall comply with of EN ISO 13857:2008, Table 4. Where the height of the hopper from the nearest access position is less than 600 mm there is a risk that someone may try to put their legs through the openings and so the reach distance from the opening to the nearest danger zone shall be determined using EN ISO 13857:2008, Table 4 and Table 7. See Figure 6.



Key

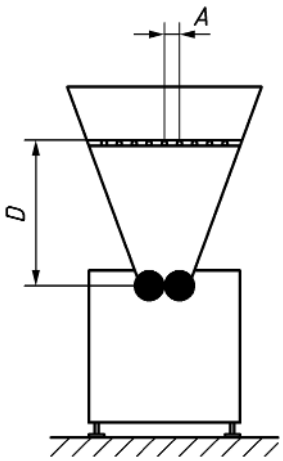
D reach distance to the nearest danger zone

Figure 6 — Interlocked guard with openings

The guard shall be interlocked with a device complying with EN ISO 14119:2013.

5.14.1.2.3 Fixed guard

Where the top of the hopper is safeguarded with a fixed guard complying with 5.2.1.3 which comprises bars set up to 120 mm wide, the distance from the opening to the nearest danger zone shall comply with EN ISO 13857:2008, Table 4. Where the height of the hopper from the nearest access position is less than 600 mm there is a risk that someone may try to put their legs through the bars and so the reach distance from the opening to the nearest danger zone shall be determined using EN ISO 13857:2008, Table 4, and – if there is a risk of someone standing in the hopper – EN ISO 13857:2008, Table 7. See Figure 7.



Key

D reach distance to the nearest danger zone

Figure 7 — Fixed guard

5.14.1.2.4 Interlocked stairs and platform

Guarding by distance in conjunction with an interlocked set of steps and platform is suitable for use in a situation where the hopper has to be fed manually, but because of the risk of slipping and falling on the stairs is less desirable than 1 or 2. *b* shall be > 1 600 mm, and *b* and *c* shall be determined on the basis of the height of the danger zone *a,* using EN ISO 13857:2008, Table 2. The design of the stairs shall comply with EN ISO 14122-3:2001 and the platform and handrails to EN ISO 14122-2:2001. The stairs and platform shall be interlocked with suitable devices, e.g. complying with EN ISO 14119:2013. See Figure 8.

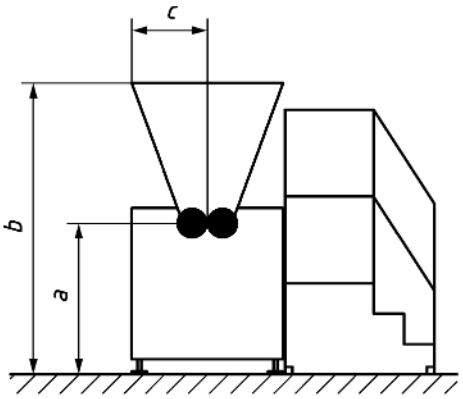


Figure 8 — Interlocked stairs and platform

5.14.1.2.5 Swan neck hopper

The swan-neck hopper is a variation on guarding by distance where the horizontal distance from the danger zone is increased by a horizontal chute and access into the hopper is restricted by limiting the height of the chute. *b* shall be > 1 600 mm, and *b* and *c* shall be determined on the basis of the height of the danger zone *a,* using EN ISO 13857:2008, Table 1. *d* shall be < 400 mm. See Figure 9.

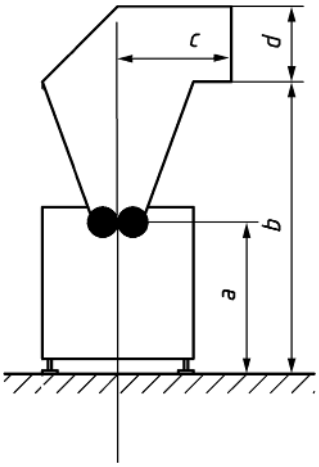


Figure 9 — Swan neck hopper

5.14.1.2.6 Hopper fitted with ESPE

Electro-sensitive protection equipment (ESPE) can be used as a protective device for a feed hopper provided it is positioned sufficiently far from the danger zone so that the moving parts have time to stop before the danger zone is reached. In general this will mean that the drives of the moving parts will need to be braked.

The electro-sensitive protection equipment shall comply with EN 61496-1:2013. D^4 shall be determined on the basis of the stopping time of the machine using EN ISO 13855:2010. See Figure 10.

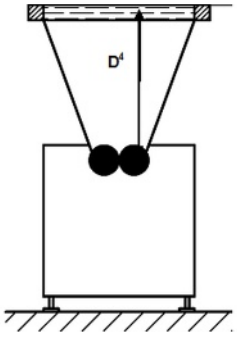


Figure 10 — Hopper with ESPE

Table 3 — Comparison of different feed hopper safeguarding methods

Safeguarding method	Automatic feeding	Manual feeding	Assisting product flow	Taking samples	Cleaning while running
1 - Solid interlocked guard	✓	✓	✓s	✓s	✓s
2 - Interlocked guard with openings	✓	✓	✓	✓	✓
3 - Fixed guard	✓	✓	!m	✓	!m
4 - Interlocked stairs and platform	✓	✓s	✓s	✓s	✓s
5 - Swan neck hopper	✗	!e	✗	✗	✓
6 - Hopper fitted with photocell	✓	✓s	✓s	✓s	✓s

✓ suitable

✓s suitable but machine stops while this activity takes place

✗ unsuitable

o not preferred

!e ergonomic residual risks

!m mechanical residual risks; only acceptable if the risk of injury is medium or low.

5.14.2 Cutting devices

5.14.2.1 General

Knives and cutting devices on food processing machines shall not only be safeguarded while they are in motion, according to 5.2.1.3, but shall also be designed in such a way that it is possible to install, remove and clean the device safely.

Methods of achieving this objective include the following:

— positioning the cutting device so that unintentional contact with the knife-edge is avoided during installation and removal, or;

— equipping the cutting device with a detachable knife-edge guard.

Cutting-edge guards shall, if detachable, be easy to attach and remove and sufficiently robust to withstand being hit by an operator's hand or arm.

Note: The force of a hand or arm can be assumed to be 200 N when the person only is able to reach into the cutting device and 800 N when the knife is positioned so that the operator can lean over the knife.

5.14.2.2 Requirements to avoid injury when installing or removing the cutting device

The cutting device shall be designed so that it can be held and moved without the risk of contact with the knife-edge. This can be achieved by:

— shaping the cutting device so that it can be gripped firmly on the side opposite to the cutting-edge, or

— providing a loose holding device which can hold the cutting device, or

— providing a cutting device holder that can be fastened to the device with bolts, a magnet or a clamping mechanism.

Handles and grips designed for holding the cutting device shall be suitable for supporting the weight and shape of the knife and be designed so the knife can be held with the knife-edge directed away from the person holding the knife.

5.14.2.3 Requirements to avoid injury when carrying or storing the cutting device

Every machine shall be provided with a cutting device carrier for storing and transporting the cutting device. The cutting device carrier shall protect persons against contact with the cutting-edge and prevent damage to the knife-edge during transport and storing.

Long band cutting devices can be carried in a clip with the cutting edge turned away from the person carrying the device. The manufacturer shall provide the clip or clips for carrying the blade with the machine.

Short band cutting devices shall be equipped with a cutting device carrier.

5.14.3 Conveyors

Conveyors shall comply with the relevant safety requirements of EN 619:2002+A1:2010 or EN 620:2002+A1:2010. Where fixed or interlocked guards are used to safeguard danger zones on conveyors they shall comply with 5.2.1.3.

6 Verification

6.1 Introduction

Compliance with the requirements of Clause 5 (and Clause 7) shall be verified using the methods described in this clause. Where the criteria for acceptance are not self-evident, they can be found in Clause 5 (and Clause 7) or are indicated in this clause. See Table 4 for the appropriate method of verification for each requirement in Clause 5.

Table 4 — Verification procedures for safety requirements identified in

Safety requirement	Visual inspection	Functional test	Measurement	Design verification
Requirements for all food depositors				
5.2.1.2	✓	✓	✓	✓
5.2.1.3	✓	✓	✓	✓
5.2.1.4	✓	✓	✓	✓
5.2.1.5	✓	✓		✓
5.2.2.1	✓	✓	✓	✓
5.2.2.2	✓		✓	✓
5.2.2.3	✓	✓	✓	
5.2.3	✓	✓	✓	✓
5.2.4		✓	✓	✓
5.2.5.1	✓			✓
5.2.5.2	✓			✓
5.2.5.3	✓		✓	✓
5.2.6	✓	✓		✓
5.3	✓	✓	✓	
5.4		✓	✓	✓
5.5		✓		✓
5.6		✓	✓	✓
5.7		✓	✓	✓
5.8	✓	✓	✓	✓
5.9	✓	✓	✓	✓
5.10	✓	✓	✓	✓
5.11	✓	✓	✓	✓
5.12	✓	✓	✓	✓
5.13	✓	✓	✓	✓
5.14.1	✓	✓	✓	✓
5.14.2	✓	✓	✓	✓
5.14.3	✓	✓	✓	✓

6.2 Visual inspections

6.2.1 Mechanical parts

Check that all mechanical components are securely fixed and all unnecessary sharp edges have been removed.

6.2.2 Guards

Check that all guards are in place and securely fixed.

6.3 Functional tests

6.3.1 Interlocking and protective devices

Check the operation of all interlocking and protective devices. Check that, following the operation of a device, all hazardous movements cease and that the machine does not restart without resetting the device and without an intentional start command.

6.3.2 Stopping functions

Check the operation of all stop and emergency stop devices. Check that following the operation of an emergency stop that all hazardous movements cease and that the machine does not restart without resetting the emergency stop device and without an intentional start command.

6.4 Measurements

6.4.1 Measurements with machine stopped

6.4.1.1 Guards

Check the relationship between the size of any openings in the guards and their distance from the nearest danger zones conform to 5.2.1.4, 5.14.1.2.1 and 5.14.1.2.2.

6.4.1.2 Electrical testing

Electrical testing shall be carried out in accordance with EN 60204-1:2006, Clause 18.

The following tests shall always be performed for each individual machine when assembled and finished:

— continuity of the protective bonding circuit;

— insulation resistance test;

— voltage test;

— function test.

In addition, for the type of machine, protection against residual voltages shall, where applicable, be tested and it shall be verified that the electrical equipment is in compliance with the technical documentation.

6.4.2 Measurements with machine running

6.4.2.1 Noise emission

The measurement and declaration of noise emissions shall be carried out according to Annex A.

6.4.2.2 Temperature

With the machine fully warmed up, measure the temperature of touchable surfaces and follow the requirements of 5.2.4.

6.5 Design verification

6.5.1 Guards

Check with the machine running that the guards conform to the safety requirements in Clause 5.

6.5.2 Pneumatic systems

Check all pneumatic components and pipe-work conform to safety requirements of EN ISO 4414:2010 and are correctly installed.

6.5.3 Hydraulic systems

Check all hydraulic components and pipe-work conform to the safety requirements of EN ISO 4413:2010 and are correctly installed.

6.5.4 Electrical equipment

Check that the electrical equipment and installation is in compliance with 5.3.

6.6 Hazardous-product- and cleaning-media-related requirements

Visual inspections before delivery: Check that the safety requirements for handling the products or cleaning materials in question have been followed, e.g. dust extraction equipment has been supplied.

7 Information for use

7.1 General

In addition to the requirements of Clause 6 of EN ISO 12100:2010 the following information for use shall be provided by the manufacturer:

7.2 Signal and warning devices

Safety signs used on the machine shall comply with the principles of Clause 7 of EN 61310-1:2008.

The prohibition pictogram “do not reach in” complying with EN ISO 7010:2012, P015, and illustrated in Figure 11 shall be used in the circumstances described in 5.2.1.4.

Figure 11 — Prohibition pictogram “Do not reach in”

The warning pictogram “Caution hot surface” complying with EN ISO 7010:2012, W017, and illustrated in Figure 12 shall be used in the circumstances described in 5.4.

Figure 12 — Warning pictogram “Warning, hot surface”

The warning pictogram “Caution cold surface” complying with EN ISO 7010:2012, W010, and illustrated in Figure 13, shall be used in the circumstances described in 5.4.

Figure 13 — Warning pictogram “Warning, cold surface”

7.3 Accompanying documents

In addition to the requirements of EN ISO 12100:2010, 6.5, the instruction handbook shall contain the following information.

a) an explanation of how the machine can be moved safely;

b) an indication of any special installation requirements to ensure that the machine is stable during operation, e.g. locking wheels or bolting feet to the floor;

c) explicit instructions on the adjustment of guards or fitting of change part guards so that the machine is safe to use following a product change;

d) a statement of all parts of the machine which are likely to be hot enough (as defined by EN ISO 13732-1:2008) to cause burn injuries;

e) instructions for safe size changing and dismantling for cleaning including details of the mass of machine parts which are regularly removed for size changing or cleaning;

f) where the machine is designed for low risk food products, but could be used in error for high risk food products, a statement of this limitation of use, e.g. “This machine has been designed to process low-risk food products and may not be suitable for use with high risk food products”;

g) where there is a residual risk of products or liquids spilling onto the floor around the machine, a statement of the importance of clearing these spills to avoid slip hazards;

h) an indication of how the machine should be cleaned and disinfected and the cleaning media to be used;

i) where the recommended cleaning substance is hazardous, the precautions to be taken by operators when handling this substance and the personal protection equipment that needs to be worn;

j) a statement of any restrictions on cleaning techniques, e.g. “the electrical enclosures are protected to IP65 and so the machine should only be cleaned using low pressure water”;

k) where infrequent access is required to parts of the machine an explanation of how this can be done safely without the risk of slipping, tripping and falling;

l) a record of the noise emissions from the machine as required by Annex A;

m) instructions for making the machine safe for interventions including disconnection of all power supplies, methods of preventing reconnection to power supplies, neutralizing stored energy and testing methods to verify that the machine is in a safe state;

n) the operating method to be followed to enable the equipment to be safely unblocked after a product blockage;

o) the specifications of the spare parts to be used, when these affect the health and safety of operators;

p) on machines where there are hazards due to the emission of substances, information on the required extraction or monitoring devices or the provisions for such devices; in cases where this equipment is not provided by the manufacturer, a specification for the equipment that is required and details of how it should be used.

7.4 Marking

Machines shall be marked visibly, legibly and indelibly with the following information.

a) the business name and full address of the manufacturer and where applicable his authorized representative;

b) designation of the machinery;

c) the mandatory marking;[1)]

d) designation of series or type;

e) serial number (if any);

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

g) rating information;

h) electrical markings as indicated in of EN 60204-1:2006, Clause 16.

The machine parts that are intended to be moved by lifting equipment shall be legibly, indelibly and unambiguously marked with their mass.

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 measurement

A.1 Scope

These rules for the noise determination and declaration of noise emission values are applicable to food processing machines in the scope of this European Standard.

A.2 Terms and definitions

See Clause 3 of EN ISO 12001:2009 for terms and definitions.

A.2.1
work cycle
a single cycle of the measuring chamber of the dispensing valve

A.3 Determination of emission sound pressure level

The A-weighted emission sound pressure level at the workstation shall preferably be determined according to EN ISO 11201:2010, grade 2 or EN ISO 11202:2010, grade 2. Only in cases where it is not possible to comply with the requirements of a grade 2 measurement method EN ISO 11202:2010 grade 3 may be applied, explicitly explaining the reasons why it was not possible to apply a grade 2 method.

The measuring time for determination of the emission sound pressure level shall be 30 s and during a minimum of 5 cycles.

For food processing machines with fixed operator positions, the measurement shall be carried out at the usual position of the operator without the operator being present. The microphone shall be positioned at a height of 1,55 m ± 0,075 m above the reflecting floor if the machine is operated standing up and at a height of 0,80 m ± 0,05 m above the middle of the seat plane if the machine is operated sitting down.

The manufacturer shall define the work station of the machine with a drawing showing a plan view of the machine, the position of the microphone during the noise emission measurement and normal position for the machine operator.

A.4 Sound power level determination

The A-weighted sound power level shall be determined according to EN ISO 3744:2010 by using the parallelepiped measurement surface with a distance of 1 m from the reference box.

In cases where it is not possible to comply with the requirements of a grade 2 measurement method EN ISO 3746:2010 may be applied, explicitly explaining the reasons why it was not possible to apply a grade 2-method.

The measurement time for measuring at each measurement position shall be the same as for the determination of the emission sound pressure level.

A.5 Installation and mounting conditions

The installation and mounting conditions shall be identical for the determination of both sound power level and emission sound pressure level at specified positions and for declaration purposes.

Care shall be taken to ensure that any electrical conduits, piping or air ducts which are connected to the machine do not radiate significant amounts of sound energy.

For the purpose of measurements, the machine shall be installed on a sound reflecting plane either outside (e.g. a parking space) or in a room providing for the necessary free field above the reflecting plane.

The test environment has to meet the requirements specified in the measurement methods indicated in either A.3 or A.4 whichever is applicable.

A.6 Operating conditions

The operating conditions have to be the same for the determination of the sound power level and of the emission sound pressure level at specified positions.

Measurements shall be taken during running empty and with the product for which the machine has been specified. In situations where this is not possible, e.g. because the product is frozen, the machine shall be tested with a representative product that is likely to produce similar noise emission to the specified product.

The specification of product used in the noise test shall to be described.

The machine shall run with maximum speed or number of revolutions.

A.7 Measurement uncertainties

The total measurement uncertainty of the emission sound pressure level determined according to this European Standard is depending on the standard deviation σ_{R0} given by the applied noise emission measurement method and the uncertainty associated with the instability of the operating and mounting conditions σ_{omc}. The resulting total uncertainty is then calculated from:

$$\sigma_{tot} = \sqrt{\sigma_{R0}^2 + \sigma_{omc}^2}$$

The upper bound value of σ_{R0} is about 1,5 dB for grade 2 measurement methods respectively 3 dB for grade 3 ones.

NOTE 1 For food processing machines with a rather stable noise emission a value of 0,5 dB is expected for σ_{omc} for the proposed operating condition for measurement. In case of an unstable operation 2 dB or even 4 dB can be expected.

NOTE 2 σ_{tot} is referred to as σ_R in EN ISO 4871:2009.

The expanded measurement uncertainty U, in decibels, shall be calculated from:

$$U = k \cdot \sigma_{tot}$$

with k the coverage factor.

NOTE 3 It depends on the degree of confidence that is desired. For the purpose of comparing the result with a limit value, it is appropriate to apply the coverage factor for a one-sided normal distribution. In that case, the coverage factor k = 1,6 corresponds to a 95 % confidence level. Further information is given in EN ISO 4871:2009. Please note that the expanded measurement uncertainty U is referred to as K in EN ISO 4871:2009.

A.8 Information to be recorded

The information to be recorded includes all the technical requirements laid down in this noise test code and shall comply with the requirements either the standards mentioned in A.3 or A.4. whichever is applicable The information to be included in the test report is at least that which the manufacturer requires to prepare a noise declaration or the user requires to verify the declared values.

A.9 Information to be reported

The information given in the noise declaration shall refer to the requirements of the manufacturer for noise declaration or of the user for verifying the declared values.

The following minimum of information shall be given:

a) identification of the manufacturer, machine type, machine model, serial number and year of manufacture;

b) reference to the basic noise emission standards applied;

c) description of installation and operating conditions;

d) the type of product used during noise measurement;

e) description of microphone positions;

f) determined emission values;

g) location of work stations and other specified positions;

h) confirmation that all requirements of this noise test code have been fulfilled, or, if this is not the case, any unfulfilled requirements shall be identified. All unfulfilled requirements shall be specified; deviations from requirements shall be stated and technical reasons shall be given.

A.10 Declaration and verification of noise emission values

The declaration of the noise emission values shall be made as a dual number noise emission declaration according to EN ISO 4871:2009. It shall declare the emissions sound pressure level L_{pA} and if additionally required the sound power level L_{WA} and the respective uncertainties K_{pA} and K_{WA}.

The noise emission value shall be rounded to the nearest decibel.

The noise emission declaration shall explicitly state that the emission values have been measured according to the specification of this noise test code as well as to the applied basic standards mentioned in A.3 respectively A.4. If this statement is not true, the noise declaration shall indicate clearly what the deviations are from this noise test code and/or from the basic standards.

If undertaken, verification shall be done according to EN ISO 4871:2009 by using the same mounting, installation and operating conditions as those used for the initial determination of noise emission values.

The above information has to be given in the instructions of use as well as in the sales documentation.

The noise emission declaration according to EN ISO 4871:2009, B.2, can be given as a table like follows:

Table A.1 — Noise emission declaration (The values in this table are examples)

Food processing machine Type: ..., model: ... etc.		
Declared dual-number noise emission values in accordance with EN ISO 4871:2009		
	load	idling
Measured A-weighted emission sound pressure level L_{pA} (ref. 20 µPa) at the operator's position in dB	92	89
Uncertainty K_{pA} in dB	3	3
Measured A-weighted sound power level L_{WA} (ref. 1 pW) in dB	97	95
Uncertainty K_{WA} in dB	3	3
Values determined according to EN ISO 11204:2010, EN ISO 3744:2010.		
NOTE The sum of a measured noise emission value and its associated uncertainty represents an upper boundary of the range of values which is likely to occur in measurements.		

NOTE Additional noise emission values can be given in the declaration.

Annex B
(normative)

Alternative methods of safeguarding medium-sized openings in guards

a) Where the width and height of the opening are greater than 120 mm, but less than or equal to 250 mm and the guard around the opening is tunnel-shaped and access is restricted by a conveyor of the same width as the opening and with the conveying direction perpendicular to the opening, the minimum reach distance to the nearest danger zone shall be 850 mm, and a prohibition symbol complying with Figure 11 shall be fitted to the guards near the opening.

b) Where the width or height of the opening are greater than 250 mm, but both are less than or equal to 400 mm and the guard around the aperture is tunnel-shaped and access is restricted by a conveyor of the same width as the opening and with the conveying direction perpendicular to the opening, the minimum reach distance to the nearest danger zone shall be at least 1 000 mm, and a prohibition symbol complying with Figure 11 shall be fitted to the guards near the opening

c) Where the width or height of the opening are greater than 400 mm, but the width is less than or equal to 600 mm and the height is less than or equal to 500 mm and the guard around the opening is tunnel-shaped and access is restricted by a conveyor of the same width as the opening and with the conveying direction perpendicular to the opening, the reach distance to the nearest danger zone shall be at least 1 000 mm, and all of the following requirements shall apply:

    1) a prohibition symbol complying with Figure 11 shall be fitted to the guards near the opening; and

    2) one or more interlocked guards shall be provided giving access to all the parts of the machine where access is required near the opening, so that it is unnecessary to reach through the opening to access these zones; and

    3) the instructions for use shall explain the means of gaining safe access through the interlocked guards to the points where access is foreseeable.

d) Where the size of the opening is as described in a) to c) and access to the opening is not restricted by a conveyor or where the guard around the opening is not tunnel shaped or the dimensions of the opening are greater than those indicated in (c), the reach distance to the nearest danger zone shall comply with EN ISO 13857:2008, Table 2, or the opening shall be safeguarded using electro-sensitive protection equipment complying with EN 61496-1:2013 and positioned using EN ISO 13855:2010.

Annex C
(normative)

Relationship to machine-specific food processing machine standards

This European Standard does not apply to the food processing machines covered by the following draft and published European Standards:

C.1 Bakery equipment	
Automatic dividers	EN 12042
Bowl lifting and tilting machines	EN 13288
Bread slicers	EN 13954
Dough and pastry brakes	EN 1674
Dough mixers	EN 453
Fixed deck oven loaders	EN 13591
Intermediate provers	EN 12043
Mixers with horizontal shafts	EN 13389
Moulders	EN 12041
Pie and tart Machines	EN 13390
Planetary mixers	EN 454
Rotary rack ovens	EN 1673
C.2 Meat machinery	
Automatic industrial slicing machines	prEN 16743
Back splitting machines	EN 15166
Band saws machines	EN 12268
Chop cutting machines	EN 13870
Circular saw machines	EN 12267
Clipping machines	EN 13885
Cubes cutting machinery	EN 13871
Curing injection machines	EN 13534
Derinding machines	EN 12355
Filling machines	EN 12463
Forming machines	prEN 15165
Meat pressing machines	
Mincing machines	EN 12331
Mixing machines	EN 13570
Portable/hand-operated tools	EN 12984
Rotating bowl cutters	EN 12855
Smokehouses	EN 15861
Steakers/strip cutters and meat tenderizers	

C.3 Catering equipment	
Baguette slicers	EN 14655
Beam mixers	EN 12854
Catering attachments	EN 12851
Cooking kettles with stirrers	EN 13886
Dishwashing machines with conveyor	EN 14957
Food processors and blenders	EN 12852
Hand-held blenders and whisks	EN 12853
Salad dryers	EN 13621
Vegetable cutting machines	EN 1678
Vegetable peelers	EN 13208
C.4 Pasta processing equipment	
Dryers and coolers	EN 13289
Machinery for grinding and processing flour and semolina	EN 14958
Machines for processing fresh and filled pasta	EN 15774
Pasta presses	EN 13378
Spreader, stripping and cutting machine, stick return conveyor, stick magazine	EN 13379
C.5 Other food processing machines	
Artisan ice cream machinery and associated equipment	
Bulk milk coolers on farms	EN 13732
Centrifuges for edible oils and fats	EN 12505
Fish heading and filleting machines	prEN 15467
Food depositors	prEN 15180
Slicing Machines	EN 1974

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[2] EN 618:2002+A1:2010, *Continuous handling equipment and systems — Safety and EMC requirements for equipment for mechanical handling of bulk materials except fixed belt conveyors*

[3] EN 626-2:1996+A1:2008, *Safety of machinery — Reduction of risk to health from hazardous substances emitted by machinery — Part 2: Methodology leading to verification procedures*

[4] EN 894-4:2010, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 4: Location and arrangement of displays and control actuators*

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

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

[7] EN 1127-1:2011, *Explosive atmospheres — Explosion prevention and protection — Part 1: Basic concepts and methodology*

[8] EN 1299:1997+A1:2008, *Mechanical vibration and shock — Vibration isolation of machines — Information for the application of source isolation*

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

[10] EN 12198-1:2000+A1:2008, *Safety of machinery — Assessment and reduction of risks arising from radiation emitted by machinery — Part 1: General principles*

[11] EN 12198-2:2002+A1:2008, *Safety of machinery — Assessment and reduction of risks arising from radiation emitted by machinery — Part 2: Radiation emission measurement procedure*

[12] EN 12198-3:2002+A1:2008, *Safety of machinery — Assessment and reduction of risks arising from radiation emitted by machinery — Part 3: Reduction of radiation by attenuation or screening*

[13] EN 13478:2001+A1:2008, *Safety of machinery — Fire prevention and protection*

[14] EN 61000-6-2:2005, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments*

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

[16] EN ISO 3746:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane (ISO 3746:2010)*

[17] EN ISO 11553-1:2008, *Safety of machinery — Laser processing machines — Part 1: General safety requirements (ISO 11553-1:2005)*

[18] EN ISO 11553-2:2008, *Safety of machinery — Laser processing machines — Part 2: Safety requirements for hand-held laser processing devices (ISO 11553-2:2007)*

[19] EN ISO 11553-3:2013, *Safety of machinery — Laser processing machines — Part 3: Noise reduction and noise measurement methods for laser processing machines and hand-held processing devices and associated auxiliary equipment (accuracy grade 2) (ISO 11553-3:2013)*

[20] 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)*

[21] EN ISO 13856-1:2013, *Safety of machinery — Pressure-sensitive protective devices — Part 1: General principles for design and testing of pressure-sensitive mats and pressure-sensitive floors (ISO 13856-1:2013)*

Food processing machinery standards listed in Annex C

[22] EN 453, *Food processing machinery — Dough mixers — Safety and hygiene requirements*

[23] EN 454, *Food processing machinery — Planetary mixers — Safety and hygiene requirements*

[24] EN 1673, *Food processing machinery — Rotary rack ovens — Safety and hygiene requirements*

[25] EN 1674, *Food processing machinery — Dough and pastry brakes — Safety and hygiene requirements*

[26] EN 1678, *Food processing machinery — Vegetable cutting machines — Safety and hygiene requirements*

[27] EN 1974, *Food processing machinery — Slicing machines — Safety and hygiene requirements*

[28] EN 12041, *Food processing machinery — Moulders — Safety and hygiene requirements*

[29] EN 12042, *Food processing machinery — Automatic dough dividers — Safety and hygiene requirements*

[30] EN 12043, *Food processing machinery — Intermediate provers — Safety and hygiene requirements*

[31] EN 12267, *Food processing machinery — Circular saw machines — Safety and hygiene requirements*

[32] EN 12268, *Food processing machinery — Band saw machines — Safety and hygiene requirements*

[33] EN 12331, *Food processing machinery — Mincing machines — Safety and hygiene requirements*

[34] EN 12355, *Food processing machinery — Derinding-, skinning- and membrane removal machines — Safety and hygiene requirements*

[35] EN 12463, *Food processing machinery — Filling machines and auxiliary machines — Safety and hygiene requirements*

[36] EN 12505, *Food processing machinery — Centrifugal machines for processing edible oils and fats — Safety and hygiene requirements*

[37] EN 12851, *Food processing machinery — Catering attachments for machines having an auxiliary drive hub — Safety and hygiene requirements*

[38] EN 12852, *Food processing machinery — Food processors and blenders — Safety and hygiene requirements*

[39] EN 12853, *Food processing machinery — Hand-held blenders and whisks — Safety and hygiene requirements*

[40] EN 12854, *Food processing machinery — Beam mixers — Safety and hygiene requirements*

[41] EN 12855, *Food processing machinery — Rotating bowl cutters — Safety and hygiene requirements*

[42] EN 12984, *Food processing machinery — Portable and/or hand-guided machines and appliances with mechanically driven cutting tools — Safety and hygiene requirements*

[43] EN 13208, *Food processing machinery — Vegetable peelers — Safety and hygiene requirements*

[44] EN 13288, *Food processing machinery — Bowl lifting and tilting machines — Safety and hygiene requirements*

[45] EN 13289, *Pasta processing plants — Dryers and coolers — Safety and hygiene requirements*

[46] EN 13378, *Pasta processing plants — Pasta presses — Safety and hygiene requirements*

[47] EN 13379, *Pasta processing plants — Spreader, stripping and cutting machine, stick return conveyor, stick magazine — Safety and hygiene requirements*

[48] EN 13389, *Food processing machinery — Mixers with horizontal shafts — Safety and hygiene requirements*

[49] EN 13390, *Food processing machinery — Pie and tart machines — Safety and hygiene requirements*

[50] EN 13534, *Food processing machinery — Curing injection machines — Safety and hygiene requirements*

[51] EN 13570, *Food processing machinery — Mixing machines — Safety and hygiene requirements*

[52] EN 13591, *Food processing machinery — Fixed deck oven loaders — Safety and hygiene requirements*

[53] EN 13621, *Food processing machinery — Salad dryers — Safety and hygiene requirements*

[54] EN 13732, *Food processing machinery — Bulk milk coolers on farms — Requirements for performance, safety and hygiene*

[55] EN 13870, *Food processing machinery — Chop cutting machines — Safety and hygiene requirements*

[56] EN 13871, *Food processing machinery — Cubes cutting machinery — Safety and hygiene requirements*

[57] EN 13885, *Food processing machinery — Clipping machines — Safety and hygiene requirements*

[58] EN 13886, *Food processing machinery — Cooking kettles equipped with powered stirrer and/or mixer — Safety and hygiene requirements*

[59] EN 13954, *Food processing machinery — Bread slicers — Safety and hygiene requirements*

[60] EN 14655, *Food processing machinery — Baguette slicers — Safety and hygiene requirements*

[61] EN 14957, *Food processing machinery — Dishwashing machines with conveyor — Safety and hygiene requirements*

[62] EN 14958, *Food processing machinery — Machinery for grinding and processing flour and semolina — Safety and hygiene requirements*

[63] prEN 15165, *Food processing machinery — Forming machines — Safety and hygiene requirements*

[64] EN 15166, *Food processing machinery — Automatic back splitting machines of butchery carcasses — Safety and hygiene requirements*

[65] prEN 15180, *Food processing machinery — Food depositors — Safety and hygiene requirements*

[66] prEN 15467, *Food processing machinery — Fish heading and filleting machines — Safety and hygiene requirements*

[67] EN 15774, *Food processing machinery — Machines for processing fresh and filled pasta (tagliatelle, cannelloni, ravioli, tortellini, orecchiette and gnocchi) — Safety and hygiene requirements*

[68] EN 15861, *Food processing machinery — Smokehouses — Safety and hygiene requirements*

[69] prEN 16743, *Food processing machinery — Automatic industrial slicing machines — Safety and hygiene requirements*

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