BRITISH STANDARD

BS EN
13534:2006
+A1:2010

Food processing machinery — Curing injection machines — Safety and hygiene requirements

ICS 67.260

BSI
British Standards

National foreword

This British Standard is the UK implementation of EN 13534:2006+A1:2010. It supersedes BS EN 13534:2006 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by ⟩A1⟨.

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

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

WARNING

BSI, as the UK member of CEN, is obliged to publish EN 13534 as a British Standard. However, attention is drawn to the fact that the UK consistently voted against its approval during its development as a European Standard. The reason for this disapproval is that, in the opinion of UK experts, the protection of the infeed and outfeed openings to the injection area of the machine as described in clauses 5.2.2.1.2 and 5.2.3.1.2 is inadequate. The distances specified in these clauses do not meet the requirements of BS EN 294:1992 and, consequently, allow ready access to the hazardous area. UK experts consider that the requirements of BS EN 294:1992 should be observed.

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

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

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EUROPEAN STANDARD

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EUROPÄISCHE NORM

EN 13534:2006+A1

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English Version

Food processing machinery - Curing injection machines - Safety and hygiene requirements

Machines pour les produits alimentaires - Machines à injecter de la saumure - Prescriptions relatives à la sécurité et à l'hygiène

Nahrungsmittelmaschinen - Pökelspritzmaschinen - Sicherheits- und Hygieneanforderungen

This European Standard was approved by CEN on 21 November 2005 and includes Amendment 1 approved by CEN on 6 May 2010.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Figures

Foreword

This document (EN 13534:2006+A1:2010) has been prepared by Technical Committee CEN/TC 153 “Food processing machinery - Safety and hygiene specifications”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2010, and conflicting national standards shall be withdrawn at the latest by December 2010.

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

This document includes Amendment 1, approved by CEN on 2010-05-06.

This document supersedes EN 13534:2006.

The start and finish of text introduced or altered by amendment is indicated in the text by tags ▌A1⟩ ⟨A1▌.

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

▌A1⟩ For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document. ⟨A1▌

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

Introduction

This document is a type C standard as stated in EN ISO 12100-1.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this document.

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

1 Scope

1.1 This standard applies for

— curing injection machines with infeed and outfeed devices;

— curing injection machines with infeed and outfeed devices and loading devices.

This standard does not apply to portable/hand guided curing injection devices.

〚A1〛 *deleted text* 〚A1〛

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

This document is not applicable to curing injection machines which are manufactured before the date of publication of this document by CEN.

1.2 This standard covers the following types of curing injection machines:

Curing injection machines consist mainly of a single or multilane curing needle station, holding down clamp, infeed and outfeed devices, machine frame and related drive system, and electrical, electronic, or pneumatic components, depending on machine type.

Curing injection machines in the scope of this standard can be equipped with:

— infeed chute;

— splash guard flaps;

— single or multi-lane curing needle bars (needle station);

— holding down clamp;

— infeed and outfeed conveyor belt;

— infeed and outfeed rake;

— interlocked transport car at the outfeed side;

— loading device with delivery chute.

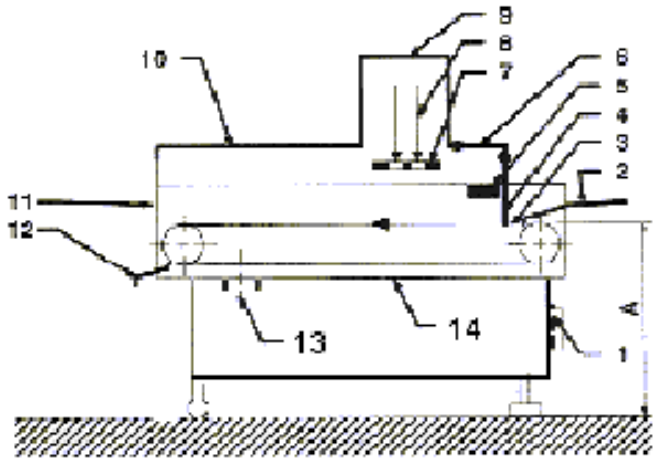
The product being processed (raw meat, game or raw fish) is fed by hand to the infeed device of the curing injection machine. The infeed device transports the product to the needle station; the product is then pressed against the infeed device by a holding down clamp. The needles of the needle station inject the curing liquid or other fluids into the product. The outfeed device then transports the product away from the needle station.

This standard also covers the loading devices, which can be necessary in the case of machines with high capacity and/or great height.

Curing injection machines in the scope of this standard can be stationary or mobile.

1.2.1 Curing injection machines with single or multi-lane curing needle bars, infeed and outfeed device at the infeed and outfeed side (see Figure 1).

The distance A between the floor/ standing position and the infeed surface of the infeed and outfeed device is > 750 mm.



KEY

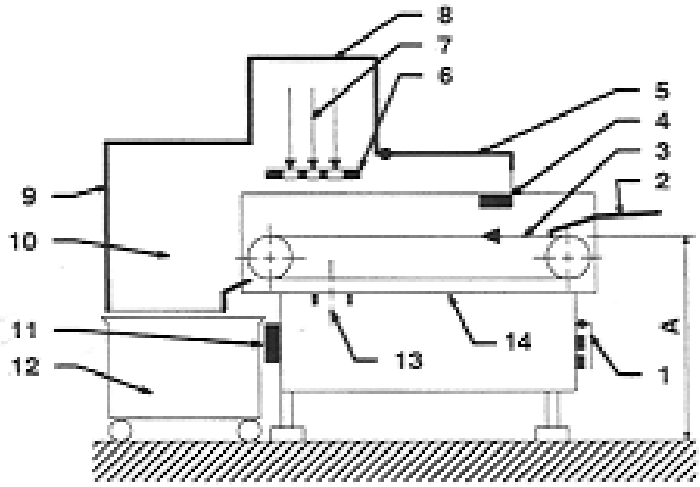
A > 750 mm

1	On/Off switch, hood	8	Needle bar
2	Infeed side	9	Housing
3	Infeed device	10	Guard cover
4	Splash guard flaps	11	Outfeed side/ outfeed device
5	Safety switch	12	Delivery chute
6	Guard cover, movable, interlocked	13	Curing liquid overflow
7	Holding down clamp	14	Bottom reservoir

Figure 1 — Construction of a curing injection machine with needle bar, holding down clamp, infeed and outfeed device

1.2.2 Curing injection machines with single or multi-lane curing needle bars, infeed and outfeed device at the infeed and outfeed side and an interlocked transport car at the outfeed side (see Figure 2).

The distance A between the floor/ standing position and the infeed surface of the infeed and outfeed device is > 750 mm.



KEY

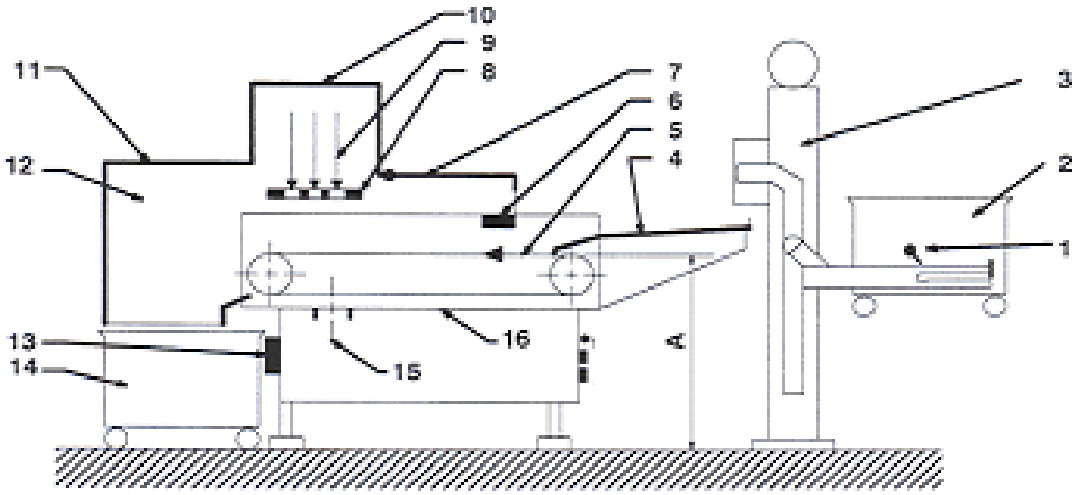
A > 750 m

1 On/Off switch, hood
2 Infeed side
3 Infeed and outfeed device
4 Safety switch
5 Guard cover, moveable, interlocked
6 Holding down clamp
7 Needle bar
8 Housing
9 Guard cover
10 Outfeed side
11 Safety switch
12 Transport car, interlocked
13 Curing liquid overflow
14 Bottom reservoir

Figure 2 — Construction of a curing injection machine with needle bar, holding down clamp, infeed and outfeed device and transport car

1.2.3 Curing injection machines with single or multi-lane curing needle bars, infeed and outfeed device at infeed and outfeed side and with a loading device (see Figure 3).

The distance A between the floor/ standing position and the upper side of the infeed and outfeed device is > 750 mm.



KEY

A > 750 mm

1	Locking device	8	Holding down clamp
2	Transport car	9	Needle bars
3	Loading device	10	Housing
4	Delivery chute	11	Guard cover
5	Infeed and outfeed device	12	Outfeed side/deloading conveyor
6	Safety switch	13	Safety switch
7	Guard cover, moveable, interlocked	14	Transport car, interlocked
		15	Curing liquid overflow
		16	Bottom reservoir

Figure 3 — Construction of a curing injection machine with needle bar, holding down clamp, infeed and outfeed device, transport car and loading device

1.3 Intended use

During the production of this standard the following assumptions were made:

— Curing injection machines are installed at a sufficient lighted place.

— They are used only by designated and skilled operators.

— Although it should be advised against, this standard, taking into account practice, deals with the hazards due to cleaning with pressurised water.

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

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

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

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

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

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

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

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

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

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

EN ISO 4287, *Geometrical product specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters (ISO 4287:1997)*

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

EN ISO 11204:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Method requiring environmental corrections (ISO 11204:1995)*

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

EN ISO 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology (ISO 12100-1:2003)*

EN ISO 12100-2:2003, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles (ISO 12100-2:2003)*

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

EN ISO 14121-1:2007, *Safety of machinery — Risk assessment — Part 1: Principles (ISO 14121-1:2007)* A1

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN ISO 12100-1:2003 and the following apply.

3.1
container
device for holding products which are to be processed or are processed

3.2
loading device
lift-tilt device for the lifting and tilting of transport cars and containers

3.3
bottom reservoir
device for receiving excess curing liquid and other fluids

3.4
locking device
device for locking the transport car or container in the loading device

3.5
protecting device against tilting
device to prevent lifting or toppling over the machine

3.6
stroke height
distance between the infeed/ outfeed device and the holding down clamp in its highest position

3.7
curing liquid overflow
opening in the bottom reservoir through which the curing liquid or other fluids can flow out

3.8
light barrier
optical-electrical safety component

3.9
needle bar
assembly of needles, positioned in a row on a bar

3.10
needle station
mounting device with holding down clamp for curing needle bars, single or multi-lane

3.11
holding down clamp
spring mounted rail or frame going ahead of the curing needle bar for holding or stripping the product

3.12
curing needle
hollow needle for the injecting of the curing liquid or other fluids into the product

3.13
cleaning block
auxiliary device for rinsing the curing needles whilst mounted

3.14
trip bar
mechanically actuated trip device

3.15
guard cover
fixed or moveable guard

3.16
splash guard flaps
device to prevent the spraying of curing liquid or other fluids and deterring device for the hands

3.17
transport car
mobile device for holding the processed or to be processed product

3.18
overtravelling limiting device
device for automatic movement stopping

3.19
chute
device for receiving the product in front of the infeed device and for transferring the product to the infeed device

3.20
infeed and outfeed device
device for cyclic infeeding and outfeeding of the product to and from the needle station by a conveyor (rubber- or sectional band) or a transport rake at the infeed and outfeed side

4 List of significant hazards

4.1 General

This clause and Annex C contain all the significant hazards, hazardous situations and events, as far as they are dealt with in this standard, identified by risk assessment as significant for this type of machinery and which require action identified to eliminate or reduce risk.

Before using this standard it is important to carry out a risk assessment according to ▌A1⟩ EN ISO 14121-1 ⟨A1▌ of the curing injection machine to check that it has identified all significant hazards, hazardous situations and events in this clause.

4.2 Mechanical hazards

4.2.1 Holding down clamp and curing needle station

4.2.1.1 Zone 1

Upward and downward moving needle station (holding down clamp/needle bar) at the infeed side (see Figures 4 and 5).

Hazard of finger or hand being crushed or stabbed or punctured.

4.2.1.2 Zone 2

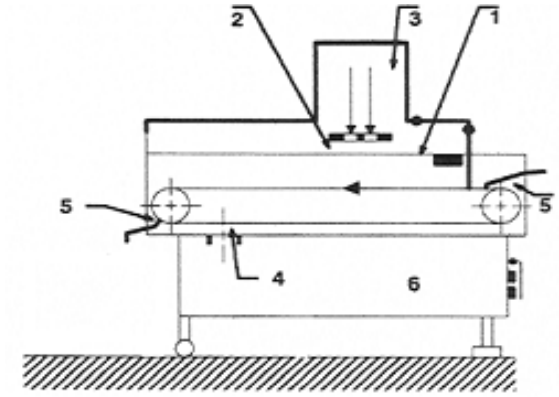
Upward and downward moving needle station (holding down clamp/needle bar at the outfeed side (see Figures 4 and 5).

Hazard of finger or hand being crushed or stabbed or punctured.

4.2.1.3 Zone 3

Moving needle station (holding down clamp/needle bar) (see Figures 4 and 5).

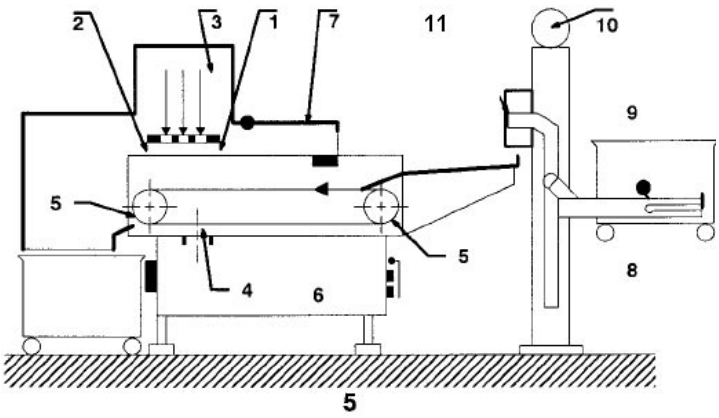
Hazard of finger or hand being crushed.



KEY

1 Zone 1
2 Zone 2
3 Zone 3
4 Zone 4
5 Zone 5
6 Zone 6

Figure 4 — Curing injection machine – danger zones



KEY

1 Zone 1
2 Zone 2
3 Zone 3
4 Zone 4
5 Zone 5
6 Zone 6
7 Zone 7
8 Zone 8
9 Zone 9
10 Zone 10
11 Zone 11

Figure 5 —Curing injection machine with loading device – danger zones

4.2.2 Infeed/outfeed device

4.2.2.1 Zone 4

Infeed/outfeed device above the curing liquid outlet port or other fluids in the bottom reservoir (see Figures 4 and 5).

Hazard of finger being crushed.

4.2.2.2 Zone 5

In-running nips or crushing points between the moving parts of the infeed/outfeed device and other elements (infeed chute, outfeed chute) (see Figures 4 and 5).

Hazard of finger drawing in or being crushed.

4.2.3 Drive system

4.2.3.1 Zone 6

Drive systems of rotating machine components (see Figures 4 and 5).

Hazard of finger or hand being drawn in.

4.2.4 Machine parts e.g. covers

4.2.4.1 Zone 7

Unintended closure and intended shutting of machine components (see Figure 5).

Hazards of finger or hand being crushed.

4.2.5 Loading device on curing injection machines

4.2.5.1 Zone 8

Space under the transport car or container (see Figure 5).

Hazard to the body by trapping or crushing on the floor during the descent.

Hazard to the body by impact from uncontrolled descent, e.g. in the case of mechanical malfunction.

4.2.5.2 Zone 9

Motion profile of the transport car or container (see Figure 5).

Hazard to the body by impact with moving parts.

Hazard to fingers or hand by crushing or shearing between moving and fixed components.

4.2.5.3 Zone 10

Drive elements and (when used) pulleys, chains or cables (see Figure 5).

Hazard to fingers or hands by shearing, crushing, trapping or entanglement.

4.2.5.4 Zone 11

Outfeed area (see Figure 5).

Hazard to the body by impact or crushing by the loading device.

4.3 Electrical hazards

4.3.1 Direct or indirect electrical contact with live parts.

Hazard from electric shock to the body.

4.3.2 Electrical components with insufficient safety level.

Hazard of mechanical injury to the body due to malfunction.

4.4 Hazards generated by loss of stability

Mobile curing injection machine or curing injection machine with a loading device (see Figures 4 and 5).

Hazard to the body of impact or crushing if machine or loading device topples over.

4.5 Hazard generated by noise

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

4.6 Hazards from non compliance with ergonomic principles

— Unhealthy body postures or excessive efforts;

— Insufficient consideration of human hand/arm or foot/leg anatomy during machine design.

— Hazard of harm to the body.

4.7 Hazards during maintenance

Hazard of insufficient safety measurements by stopping the machine.

4.8 Hazards from non-compliance with hygienic principles

4.8.1 Microbiological causes

Hazard (spoilage) of the foodstuffs.

Hazard of damage to health of the user through food poisoning.

Infection of the operator.

4.8.2 Chemical causes

Contamination of foodstuffs through traces of cleaning- and disinfecting materials.

Hazard of damage to health of the user through harm.

4.8.3 Physical causes

Foreign objects originating from raw materials, machines or other sources.

Hazard of damage to the health of the user through harm.

5 Safety and hygiene requirements and/or protective measures

5.1 General

Machinery shall comply with the safety and hygiene requirements and/or protective measures of this clause and of Annex C. In addition, the machine shall be designed according to the principles of EN ISO 12100 for hazards relevant but not significant, which are not dealt with by this document (e.g. sharp edges).

〈A1〉 For hazards which are to be reduced by the application of the type B-standards such as EN 614-1, EN 953, EN 1005-3, EN 1088, EN 60204-1, EN 60529, EN ISO 4287, EN ISO 12100, EN ISO 13849-1 and EN ISO 13857, the manufacturer shall carry out a risk assessment to establish the requirements of the type B-standard. This specific risk assessment shall be part of the general risk assessment of the machine. 〈A1〉

Where reduction of the risk is by a physical arrangement or positioning of the installed machine, the manufacturer shall include in the Information for use a reference to the reduction means to be provided, and to any limiting value of the requirement, and, if appropriate, to the means of verification.

Where the reduction of the risk is by a safe system of working the machinery, the manufacturer shall include in the Information for use, details of the system and of the elements of training required by the operating personnel.

5.2 Mechanical hazards

Curing injection machines shall be designed and constructed in accordance with Annex C and with the requirements mentioned below.

5.2.1 [A1] The interlocking systems of guards shall comply with 4.2.1 of EN 1088:1995 (interlocking devices without guard locking) and the safety related parts of the control system shall present at least a performance level “c” in accordance with EN ISO 13849-1:2008. [A1]

5.2.1.1 The interlocking devices shall be incorporated in the machine housing and correspond to 5.7 of EN 1088:1995.

NOTE This is required for the following reasons:

- fulfillment of the hygiene requirements;

- protection against mechanical damages;

- protection against influence of cleaning and disinfection detergents;

- protection against influence of cleaning liquids (water);

- protection against bypassing in a simple way.

5.2.1.2 In the "Information for use" the manufacturer shall describe the procedure of the daily verification of the interlocking device before using the machine.

[A1] **5.2.1.3** Fixing systems for fixed guards or for demountable parts of the machine casing (i.e. designed as fixed guards) shall remain attached to the guards or to the machine when the guards are removed. [A1]

5.2.2 Infeed side

5.2.2.1 Infeed side – zone 1

Holding down clamp and needle bar at the infeed side (see Figures 1 and 2).

The access to the danger points on the holding down clamp and needle bar shall be restricted. This shall be achieved by observance of the following conditions:

5.2.2.1.1 At the infeed side:

— product shall be carried to the needle station by a cyclic infeed device;

— tunnel shaped guard shall be installed moveable and interlocked with the functioning of the machine;

— tunnel shaped guard shall pass into a housing over the needle station (see Figures 6 and 7).

5.2.2.1.2 The tunnel shaped guard in combination with the housing at the curing station has to comply with the following dimensions (see Figures 6 and 7):

— Distance $L_1 \geq 230$ mm between the outside edge of the guard and the needle station
Opening height $H_1 \leq 180$ mm inclusive the opening distance before activation of the interlocking device
Opening height ≤ stroke height of the needle station
Splash guard flaps shall be a hand rejector at the infeed side of the guard (see Figure 8)
Width $B \leq 350$ mm at the infeed device

or

— Distance $L \geq 550$ mm between outside edge of the guard and the needle station
Opening height $H \leq 350$ mm inclusive the opening distance before activation of the interlocking device

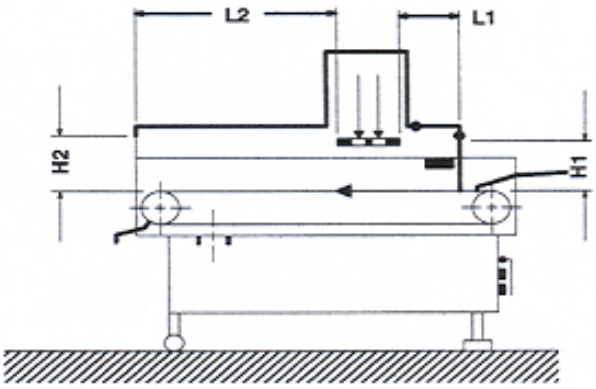
Opening height ≤ stroke height of the needle station
Width $B \leq 350$ mm at the infeed device

or

— Distance $L \geq 850$ mm between outside edge of the guard and the needle station
Opening height $H \geq 350$ mm inclusive the opening distance before activation of the interlocking device
Opening height ≤ stroke height of the needle station
With a safety distance $L \geq 850$ mm and an opening height ≤ 350 mm the guard differing from 5.2.2.1.1. can be fixed.

5.2.2.1.3 The lowering motion of the needle bar shall be finished within 2 s, after activating the interlocking device of the tunnel shaped guard.

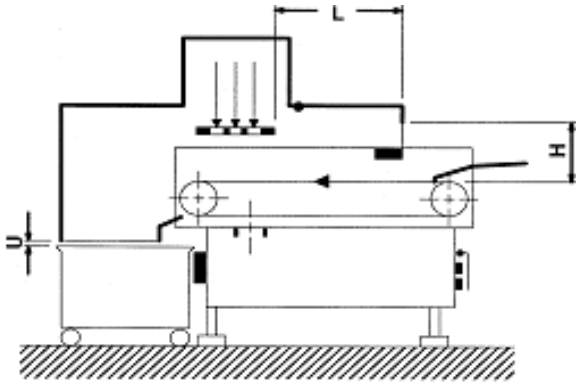
Requirements of the interlocking of the tunnel shaped guard see 5.2.1.



KEY
$L_1 \geq 230$ mm
$H_1 \leq 180$ mm
$H_1 \leq$ Stroke height of the needle station

$L_2 \geq 550$ mm
$H_2 \leq$ Stroke of holding down ≤ 350 mm
H_2 = Stroke of holding down needle station

Figure 6 — Curing injection machine infeed and outfeed side – safety distances



KEY
$L \geq 550$ mm
$H \leq 350$ mm
$H \leq$ Stroke height of the needle station

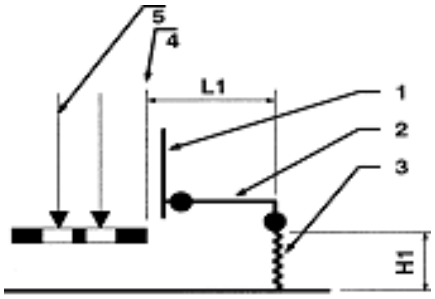
$L \geq 850$ mm
$H \geq 350$ mm
$H \geq$ Stroke of holding down needle station

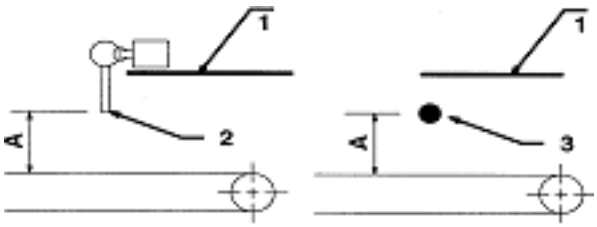
$U \leq 50$ mm

Figure 7 — Curing injection machine infeed and outfeed side – safety distances outfeed side for a transport car

5.2.2.2 When using a tunnel shaped fixed guard with a distance $L_1 \geq 230$ mm or $L \geq 550$ mm, up to $L \leq 850$ mm, the upper edge of the infeed opening shall be provided with a protective device (e.g. trip bar or light barrier) with proximity reaction (see Figure 9).

For requirements for the interlocking of the trip bar see 5.2.1. The construction of the light barrier shall be ESPE type 2, see EN 61496-1.





KEY

$L_1 \leq 230$ mm

$H_1 \leq 180$ mm

1 Housing
2 Guard cover, moveable, interlocked
3 Splash guard flaps
4 Holding down clamp
5 Needle bars

Figure 8 — Moveable guard with splash guard flap

$A \leq 180$ mm

1 Guard cover, fixed
2 Switch bar
3 Light barrier

Figure 9 — Fixed guard with trip bar, light barrier

The lowering motion of the needle station shall come to a standstill within 2 s after activating the interlocking device of the tunnel shaped guard, the trip bar or the light barrier.

5.2.2.3 The tunnel shaped movable guard shall be such designed and pivoted, that an operating effort of < 50 N is required.

5.2.3 Outfeed side

5.2.3.1 Zone 2

Holding down clamp and needle bar at the outfeed side (see Figures 6 and 7).

Access to the danger points at the holding down clamp and at the needle bar shall be prevented. This can be achieved by observing all the following measures:

5.2.3.1.1 At the outfeed side:

— product of the needle station shall be unloaded by a cyclic out-feed device;

— there shall be a fixed tunnel shaped guard, or if movable interlocked with the functioning of the machine, or a guard in combination with an interlocked transport car/container;

— tunnel shaped guard shall pass into a housing at the needle station (see Figures 6 and 7).

5.2.3.1.2 The tunnel shaped guard shall fulfil in combination with the housing at the needle station the following conditions (see Figures 6 and 7):

— Distance $L_2 \geq 550$ mm between the edge of the guard and the needle station
Opening height $H_2 \leq 350$ mm inclusive the opening distance before activation of the interlocking device
Opening height ≤ stroke height of the needle station

or

— Distance $L_2 \geq 850$ mm between the edge of the guard and the needle station
Opening height $H_2 \geq 350$ mm inclusive the opening distance before activation of the interlocking device
Opening height ≤ stroke height of the needle station

— Dimensions of the guard are not required, if the access to the needle station is prevented by the design of the guard in combination with a transport car/container (see Figure 7). At the disconnection point between guard and transport car/container there shall be a device with interlocking.

— Distance U ≤ 50 mm between transport car/container and the guard (see Figure 7).

5.2.3.1.3 The lowering motion of the needle station shall come to a standstill within 2 s, after activating the interlocking device of the tunnel shaped guard or the transport car/container.

For requirements for the interlocking of the guard or the transport car/container see 5.2.1.

5.2.4 Zone 3

Needle station above the infeed/out-feed device (see Figures 6 and 7).

The access to the danger points at the movable parts of the holding down clamp and needle bar above the infeed/outfeed device shall be prevented. This can be achieved e.g. by observance of all of the following measures:

5.2.4.1 At the zone of the needle station which is moving up and down, above the infeed/out-feed device, an enclosed housing shall be available. The guard shall be either fixed or movable. A movable housing and doors or hatches shall be interlocked with the functioning of the machine.

5.2.4.2 The lowering motion of the needle station shall come to a standstill within 2 s, after activating the interlocking device of the movable housing or of the doors/hatches.

For requirements for the interlocking of the movable housing or the doors/hatches see 5.2.1.

5.2.5 Zone 4

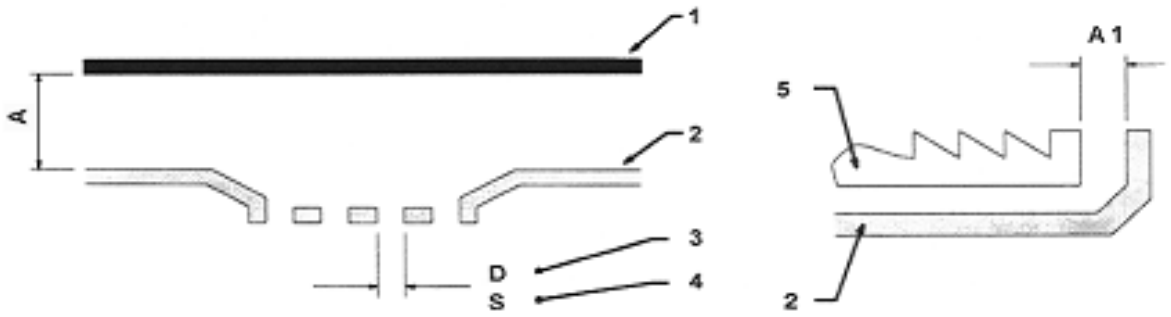
Infeed/ outfeed device (see Figure 10).

The access to the danger points between the infeed/outfeed device and the bottom reservoir and also the outlet ports in the bottom reservoir shall be prevented. This shall be achieved by fulfilling all of the following conditions:

5.2.5.1 The distance *A* between the infeed and outfeed device and the bottom reservoir shall be $\underline{\geq}$ 25 mm (see Figure 10).

5.2.5.2 The curing liquid out-feed openings *D* in the bottom reservoir shall have a diameter of $D \underline{\leq} 25$ mm or a slot width $S \underline{\leq} 15$ mm (see Figure 10).

5.2.5.3 The distance A_1 between the bottom reservoir and the transport rake shall be $\underline{\geq}$ 25 mm (see Figure 10).



KEY

A ≥ 25 mm
A_1 ≥ 25 mm
D ≤ 25 mm
S ≤ 15 mm
1 Infeed and outfeed device (lower part)
2 Bottom reservoir
3 Diameter
4 Slot width
5 Transport rake

Figure 10 — Bottom reservoir, infeed and outfeed device, transport rake – safety distances

5.2.6 Zone 5

Infeed/out-feed chutes (see Figures 4 and 5).

Access to the danger points at the nip points of the infeed/outfeed chutes shall be prevented. This can be achieved by fulfilling the following condition:

The transition chute (fixed) shall directly pass over in the infeed/outfeed device (movable) and shall have an angle of pitch > 90°.

5.2.7 Zone 6

Drive system (see Figures 4 and 5).

The access to the danger points on the drive system shall be prevented. This shall be achieved by fulfilling all of the following conditions:

5.2.7.1 At the drive system safety guards (e.g. doors) shall be provided according to 3.2 and 3.3 of EN 953:1997. The guards (e.g. doors) can be fixed guards or interlocking movable guards.

5.2.7.2 If guards have to be opened for changing the machine operation or cleaning these guards shall be interlocked.

Requirements for interlocking of the guards shall be in accordance with 5.2.1.

5.2.8 Zone 7

Machine parts, e.g. guard covers (see Figure 5).

Movable machine components (e.g. guards) shall be prevented from falling into a closed position. This can be achieved by observance of one of the following measures:

5.2.8.1 A non-driven guard shall be provided with e.g. a counter balance weight, or a spring, when the guard in its open position is not far enough behind its centre of gravity to prevent it falling. The guard shall be provided with a handle.

5.2.8.2 For power-operated guards the closing time of the last 250 mm (measured at the outer closing edge) of the closing distance shall be $\geq$ 4 s. The measuring point is located at the greatest opening width of the guard. If a drive system malfunctions (e.g. piping or hose rupture) the motion of the cover shall be interrupted.

5.2.9 Zone 8 to 11

5.2.9.1 Loading devices on curing injection machines (see Figure 5)

Loading devices shall comply with the requirements of EN 13288 as far as applicable. For additional requirements for lift-tilt devices see 5.2.9.2.

NOTE Lift-tilt devices of various designs exist, e.g. with

- Fixed lifting arms for holding transport cars;

- Lifting arms which allow the transport car to swivel in a gondola and thus remain horizontal;

- Vertical pillar mast and forks for holding the transport car or container.

- Lift-tilt devices can be free standing or connected to the curing injection machine.

5.2.9.2 Additional requirements for lift-tilt devices on curing injection machines

5.2.9.2.1 Installation

5.2.9.2.1.1 Lift-tilt devices shall be designed in such a way, that they are stable.

5.2.9.2.1.2 A special device shall be provided to prevent the lift-tilt device or the curing injection machine from falling over if the loading device is lowering and meets an obstacle. This can be achieved by fulfilling one of the following conditions:

— use of a hold to-run control for the lowering of the loading parts;

— use of gravity only for lowering of the loading device;

— special device on the machine or lift-tilt device so that powered descent of the loading device onto an obstacle cannot cause instability. This can be a level switch, to automatically stop the descent, if the lift-tilt device is in a slope position.

5.2.9.2.1.3 Where the curing injection machine or the lift-tilt device is fixed to the floor, overload conditions to the loading components of the lift-tilt device shall be prevented in the event of the power operated loading device meeting an obstacle. This can be achieved by fulfilling of one of the following conditions:

— slipping clutch;

— overload cut out (e.g. control limit switches with snap action and slow action contacts, and positive contact opening) to stop automatically the lowering motion.

5.2.9.2.2 Lifting device

5.2.9.2.2.1 Lifting devices shall be designed to prevent transport cars or containers from falling off. This can be achieved by a fixing device at the loading device for transport cars or containers.

5.2.9.2.2.2 Lifting devices shall be so designed that transport cars or containers create no danger points during up and down movements. This can be achieved by the fulfilling of all following conditions:

— distance between the loading device, transport car and the machine base shall be > 120 mm;

— distance between the transport car or loading device and the delivery chute > 25 mm.

By using a hold-to-run control these distances are not required.

5.2.9.2.3 Mast type lift-tilt device

The danger points between the loading device and the mast shall be safeguarded. This can be achieved by observance of one of the following measures:

5.2.9.2.3.1 The distance between the loading device and the mast is > 120 mm.

5.2.9.2.3.2 If the tilt range of the loading device is located higher than 2 000 mm above the floor (standing position) no guarding for a distance > 60 mm is required.

5.2.9.2.4 Lowering velocity of the loading device

5.2.9.2.4.1 The lowering velocity shall be $\leq$ 0,4 m/s, when the lowering motion is controlled by a hold-to-run control.

5.2.9.2.4.2 The lowering velocity shall be $\leq$ 0,1 m/s, when the lowering motion is controlled automatically or without a hold-to-run control. In this case the last 0,5 m until the transport car or the container meets the floor shall be controlled by a hold-to-run control.

5.3 Electrical hazards

The electrical equipment shall be in accordance with EN 60204-1. For additional requirements for the electrical equipment see 5.3.1 to 5.3.5.

5.3.1 Stopping function of switching devices

The stopping function of switching devices shall be in accordance with category 0 or 1, 9.2.2 of ▌A1⟩ EN 60204-1:2006 ⟨A1▐.

5.3.2 Emergency stop device

Machines shall be fitted with an emergency stop device, as far as the risk assessment carried out by the manufacturer does not allow concluding that such a device would not decrease the risk, because it would not reduce the stopping time.

In general a curing injection machine does not need an emergency stop device. In this case the usual OFF switch shall be easily reachable from the operator position (see 5.3.4).

5.3.3 Protection against water ingress

5.3.3.1 IP degrees of protection

The electrical components shall be in accordance with the following protection levels according to EN 60529:

— IPX5 External electrical operating components:

  — on the machine;

  — on control box enclosure on the machine;

  — on control box enclosure located in the process room.

— IPX3 Internal electrical operating components:

  — in a machine with a closed housing with protection of IPX5 and open underside;

  — protection against direct and indirect contact of a water jets shall be ensured.

— IPX2 Internal electrical operating components:

  — in a machine with completely enclosed housing in the degree of protection IPX5. Protection against condensation shall be provided e. g. by a hood;

  — in the control box.

— IPX0 Internal electrical operating components:

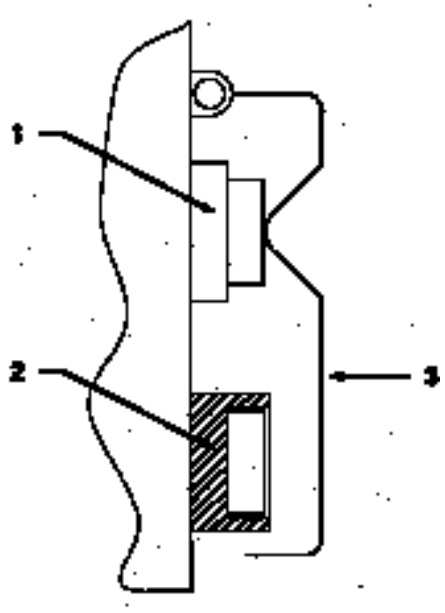
  — in a machine with completely enclosed housing in the degree of protection IPX5. Protection against condensed water shall be provided. Contact of fingers or back of the hands with live parts shall be prevented by the design of electrical elements according to EN 60529.

5.3.3.2 Hoods

If the curing injection machines are intended to be cleaned by means of pressurized water (tap water), the external electrical operating components shall be prevented from ingress of water. This can be achieved by observance of all of the following measures:

5.3.3.2.1 The electrical operating components shall be covered with hoods. The use shall be indicated in the instruction handbook (see Figure 11).

5.3.3.2.2 Hoods over external operating components may be opened for the operation of ON- and OFF-switches. Hoods over the STOP-switches shall not - when closed - hinder the function of the STOP-switches (see Figure 11).



KEY

1 OFF

2 ON

3 Protection hood (OFF)

Figure 11 — ON-/OFF-switch with cover

5.3.3.2.3 When using membrane switches or similar systems, no hoods are needed if the membrane switches or similar systems are capable of being cleaned with water under pressure.

5.3.4 ON- and OFF-switch

Curing injection machines shall be provided with ON- and OFF-switches. The switches should be located the operator side of the machine (see Figures 1 and 2). The ON-switch shall be protected against accidental switching (e.g. by a protective collar).

5.3.5 Safety requirements related to electromagnetic phenomena

The machines shall have sufficient immunity to electromagnetic disturbances to enable them to operate safely as intended and not fail to danger when exposed to the levels and types of disturbances intended by the manufacturer.

The manufacturer of the machines shall design, install and wire the equipment and sub-assemblies taking into account the recommendations of the suppliers of these sub assemblies.

5.4 Hazards generated by loss of stability

5.4.1 Curing injection machines (fixed and mobile) shall be designed to be stable under normal operating conditions.

5.4.1.1 For curing injection machines, which are not fixed on the floor, there shall be a sufficient safety of tilting.

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

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

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

5.4.3 Machines tested in accordance with Table 1 shall not roll, slip, or start tilting at their location.

5.5 Noise reduction

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

5.6 Ergonomic requirements

5.6.1 Regard shall be given to the ergonomic principles and requirements set out in ▌A1⟩ EN ISO 12100-2:2003, 4.8 ⟨A1▐, in EN 614-1 and in part 1 to 3 of EN 1005.

5.6.2 Any information necessary to achieve the ergonomic objectives which the user must follow (level of the infeed) shall be described in the instruction handbook.

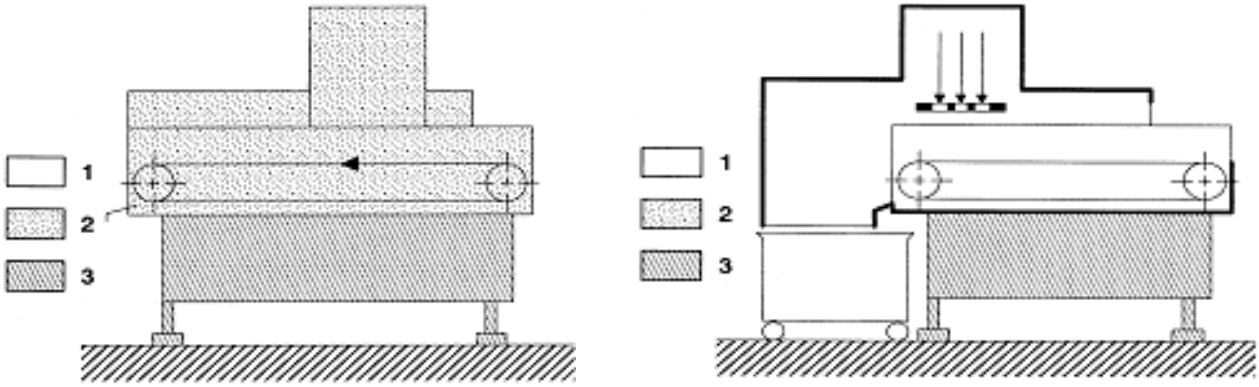
5.6.3 Removable conveyors and components of the bottom reservoir shall be provided with handles or manipulation openings. The manipulation effort for the removal shall be < 250 N.

NOTE It may be required to provide loading devices for curing injection machines with multiple needle stations, due to the treatment of larger quantities of products (see 1.3).

5.7 Hygiene and cleaning

The machines shall be designed according to EN 1672-2, the conditions mentioned below, and according to Annex B.

Hygiene areas see Figure 12.



KEY

1 Food area
2 Splash area
3 Non-food area

Figure 12 — Curing injection machines – Hygiene zones

5.7.1 Food area

The following components have been defined according to [A1] EN 1672-2 [A1] and will be regarded as food area:

— holding down clamp;

— curing needles;

— curing needle clamp;

— curing liquid system,
pump with the inside of the infeed and outfeed piping;

— filter,
inside and outside;

— bottom reservoir,
inside;

— guard cover and needle station housing,
inside;

— loading and deloading device.

5.7.2 Splash area

The following components have been defined according to EN 1672-2 and will be regarded as splash area:

— machine housing,
outside, upper part;

— guard covers and needle station housing,
outside.

5.7.3 Non-food area

The following components have been defined according to EN 1672-2 and will be regarded as non-food area:

— curing liquid system,
pump with the outside of the infeed and outfeed piping;

— machine housing,
outside, lower part;

— all other surfaces;

— loading device.

5.7.4 Surface conditions

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

The maximum surface roughness shall comply with the requirements of Annex B.

5.7.5 Cleaning

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

5.7.5.2 Some components in the food area, e.g. curing needles, curing liquid system, are not easy to clean. In the instruction handbook special indications shall be provided in order to achieve appropriate cleaning and injection of cleaning and disinfecting materials (see 7.1).

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

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

— fully commissioned;

or

— partially dismantled.

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

Table 1

Section	Testing Method
5.2.2.1.2	Measuring of the dimensions (type) Verification of the electrical diagram (type) Visual inspection, especially the interlocking devices of the guards (individual)
5.2.2.2	Measuring of the dimensions (type) Verification of the electrical diagram (type) Visual inspection and functional test of the interlocking of the trip bar and the light barrier (individual) Measurement of the stopping time (individual)
5.2.2.3	Verification of the force (type)
5.2.3.1.2	Measurement of dimensions (type) Verification of the electrical diagram (type) Visual inspection and functional test of the guards and the transport car (individual)
5.2.4.1	Verification of the electrical diagram (type) Visual inspection and functional test of the interlocking device of the housing (individual) Visual inspection of fixed screw connections (individual)
5.2.4.2	Measurement of stopping time (individual)
5.2.5	Measurement of dimensions (type)
5.2.7	Visual inspection of guards (individual) Verification of the electrical diagram (type) Visual inspection and functional test of the interlocking device of the doors (individual)
5.2.8	Visual inspection and functional test of the devices against unintended closing of machine parts (individual) Measurement of closing time (individual)
5.2.9.2.1.1	Visual inspection and functional test (individual) Verification of calculations (individual)
5.3	The tests according to ▌A1⟩ EN 60204-1:2006, Clause 18 ⟨A1▐ shall be carried out on each machine (individual) EMC performance: examination of documentation concerning use and application of components and sub-assemblies (type). Verification of IP-codes (type)
5.3.3.2	Visual inspection of the ON – OFF switch and of the membrane switches (type) Verification of IP-codes (type) Verification of the function of the guard
5.4	Calculation or position test on a surface with an inclination of 10°. For mobile machines the wheels shall be locked in an unfavourable position. In this position there shall be a functional test by loading product of the maximum size intended (type) Position test with machine partial dismantled (type) Functional test (type) Visual inspection (type)
5.4.1	Visual inspection of the lifting device (type) Verification of the size of the transport car/lifting device acc. to calculations (type)
5.5	Measurements of noise emission according to Annex A (type)
5.6	Measurement of the forces, e.g. by spring balance (type) Functional test (type) Visual inspection (type)
5.7	Measurement of surface roughness according to EN ISO 4287, see Annex B (type) Measurement of radii and grooves (type) Visual inspection, especially welding seams (type)
7.1	Verification that the required information is provided (type)

7 Information for use

7.1 Instruction handbook

Information for use shall be provided in accordance with Clause 6 of EN ISO 12100-2:2003. This information for use shall include among others an instruction handbook in accordance with 6.5 of EN ISO 12100-2:2003 with the specific element listed in 7.1

a) Information relating to transportation, installation and storage:

— of the machine;

— of the needle station, loading and de-loading device.

b) Information relating to commissioning:

— Connection and installation requirements.

c) Information relating to the machines:

— Information relating to the machine, guard covers and other safety devices;

— Information relating to the hazards e.g. on the needle station which cannot be fully eliminated by safety devices, e.g. at the infeed side;

— Noise emission declaration according to Annex A;

— Information relating to the electrical installation (see Clause 18 of EN 60204-1:1997) and electrical diagram or reference to storage location (e.g. pocket) inside the machine.

d) Information relating to normal operating conditions:

— Information relating to the use of locking devices on wheels;

— Information relating to the use of components, which will stop the machine;

— Information relating to the use of the electrical supply cable and that before moving the machine it shall be switched off and the electrical plug shall be disconnected and that while moving the electrical supply cable shall not be damaged;

— Information relating to the use of interlocked guards, trip bar, splash guard flaps;

— Description on the non-manipulating of guards;

— Information required for achieving the ergonomic objectives;

— Information relating to the fact that products shall not be further pushed in by hand;

— Information relating to the safe securing of malfunctioning machines;

— Information relating to the daily verification of guard- and interlocking devices before using the machine.

e) Information relating to cleaning:

— Description of Cleaning operation, Cleaning agent with reference to the safety information sheet of the manufacturer, Disinfecting operation, Disinfecting agent with reference to the safety information

sheet of the manufacturer, Rinsing agent and recommending application time in order to avoid toxic hazards;

— Information relating to the operating procedures with cleaning and disinfecting operations and wearing personal protection devices;

— Information relating to the use of hoods over external electrical components when machines are cleaned with pressurized water and how the areas that are covered by the hoods during the general cleaning shall be cleaned;

— Information relating to the installation and removal of the curing needles, parts of the curing liquid pump, curing liquid strainer;

— Information relating to the use of the cleaning block;

— Information relating to the removal and installation of protective guards for cleaning purposes.

f) Information relating to maintenance:

— Information relating to the execution and frequency of inspections and maintenance operations with regard to operating procedures (disconnection, locking, neutralisation of residual energy and testing of safe state of the machine);

— Information relating to the use of lubricating materials;

— Information on non-suitable lubricating materials;

— Drawings which are required to carry out these tasks;

— [A1] the specifications of the spare parts to be used, when these affect the health and safety of operators; [A1]

— Electrical schematics.

g) Operator training see 7.2.

7.2 Operator training

Operators should be trained in the dangers associated with the use, cleaning, transportation and installation of curing injection machines and with all precautions to be observed. Information shall be given which specifies the elements of training required for normal operating, cleaning, transportation and installation of the machines.

NOTE It is recommended that operating personnel should be instructed during installation by a representative of the manufacturer or the supplier of the machine.

Also, that the training should be repeated as required at regular intervals, however, at a minimum of 6 months.

7.3 Marking

[A1] Curing injection machines conforming to this document shall be marked permanently and legibly with the following information on its rating plate: [A1]

[A1]

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

— designation of the machinery;

— designation of series or type;

— serial number;

— mandatory marking[1)];

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

— rating information, including supply voltage and frequency, power rating. [A1]

[A1] 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. [A1]

Annex A
(normative)

Noise test code for curing injection machines (grade 2)

A.1 Emission sound pressure level determination

The A-weighted emission sound pressure level at the workstation shall be determined according to EN ISO 11204 following the requirements for grade 2.

The measurement shall be taken at the normal operator position:

— height of 1,6 m above the floor;

— 1 m in front of the needle station of the curing injection machine

with the microphone oriented towards the machine.

NOTE In case that the A-weighted emission sound pressure level exceeds 〚A1〛 80 dB(A) 〚A1〛 or in any other reason which would require to determine the sound power level of a curing injection machine, EN ISO 3744 should be applied. The parallel piped measurement surface should then be chosen.

A.2 Installation and mounting conditions

The machine to be tested shall be installed on a reflecting floor in a test field according to 6.2 of EN ISO 11204:1995 and meet the requirements for grade 2 measurements.

A.3 Operating conditions

The measurement of the noise emission of the machine is taken at maximum speed under no load.

A.4 Measurement

The machine shall be run-in for a period of 5 min (warm-up time) before starting the measurement.

The measurement instruments shall be in compliance with section 5 of 10.2.1 of EN ISO 11204:1995.

The measuring time shall be at least 15 s.

A.5 Information to be recorded

The information to be recorded shall comply with Clause 12 of EN ISO 11204:1995.

All deviations from this noise test code and from EN ISO 11204 shall be documented together with the technical justification for these deviations.

A.6 Information to be reported

The information to be reported shall comply with Clause 13 of EN ISO 11204:1995.

As a minimum, the following information shall be included:

— reference to EN ISO 11204;

— description of the operation and installation conditions during the measurement;

— location of the point of the microphone position;

— determined A-weighted emission sound pressure level at the workstation;

— 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.

A.7 Declaration and verification of the noise emission values

The noise emission values shall be declared according to the dual number declaration of EN ISO 4871. Thus in cases where the emission sound pressure level L_{pA} exceeds 70 dB(A) at the workstation, its value and the uncertainty K_{pA} has to be declared. K_{pA} is assumed to be 2,5 dB.

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

The noise emission declaration shall explicitly state that the emission value has been measured according to the specification of this noise test code as well as to EN ISO 11204:1995 grade 2.

If this is not the case, it shall be explicitly mentioned which deviation, with regard to EN ISO 11204, exists.

The verification shall be carried out according to EN ISO 4871 and under the same mounting, installation and operating conditions as those which were applied to the original determination of the noise emission values.

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

Annex B
(normative)

Design principles to ensure the cleanability of curing injection machines

B.1 Definitions

For the purpose of this annex, the following definitions apply:

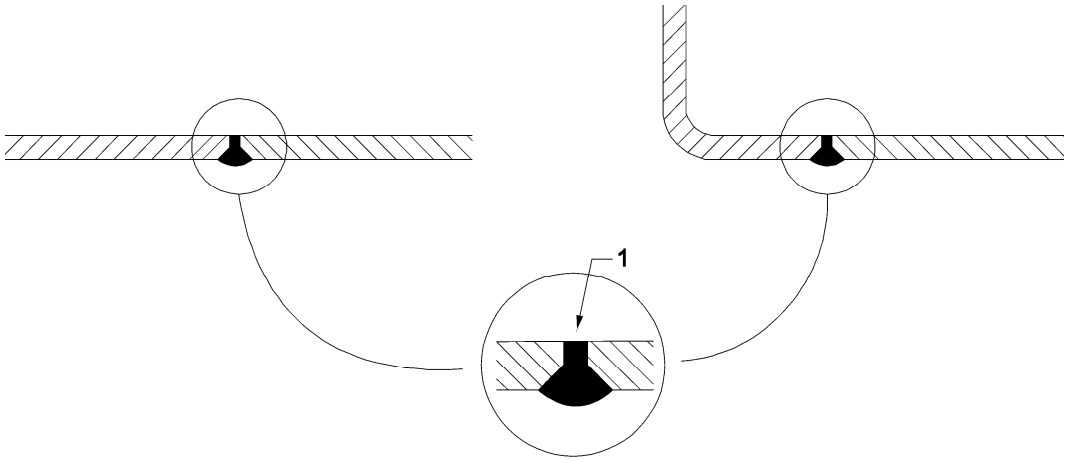
B.1.1
food Area
area composed of those surfaces in contact with food; the food area also includes the surfaces with which the product may come in contact with under normal condition of use, after which it returns into the product (see Figure 12)

B.1.2
splash Area
area composed of surfaces on which a part of the food may splash or flow along under condition of use and does not return into the product (see Figure 12)

B.1.3
non food Area
any area other than those specified above (see Figure 12)

B.1.4
joined surfaces
surfaces are joined so that no particle or product becomes trapped in small crevices, thus becoming difficult to dislodge and so introducing a contamination hazard (see Figure B.1)

B.1.5
easily cleanable
machines shall be designed and constructed such that the elimination of contaminants can be achieved through a simple cleaning method, e.g. cleaning agents and water under pressure



KEY
1 Smooth surfaces

Figure B.1 — Smooth surfaces - Food area

B.2 Materials of construction

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

B.2.1 Type of materials

B.2.1.1 Materials for food area

[A1] All legal requirements in force for materials and articles in contact with food shall be met, as well the general requirements as those related to specific materials, e.g. plastics. [A1]

B.2.1.2 Materials for splash area

See [A1] EN 1672-2:2005, 5.3.2 [A1].

B.2.1.3 Non food area

See [A1] EN 1672-2:2005, 5.3.3 [A1].

B.3 Design

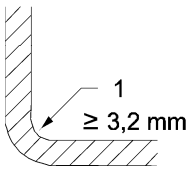
Surfaces and components in the various areas shall meet the following requirements:

B.3.1 Food area

B.3.1.1 **The surfaces** in the food area shall be smooth and free of grooves and depressions (see Figure B.1).

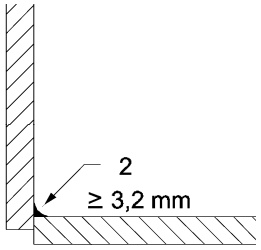
B.3.1.2 **Inside corners:** The angle formed by the intersection of two surfaces shall be ≥ 90° and have a radius of ≥ 3,2 mm (see Figure B.2).

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



KEY

1 Radius
Machining operation, bent blade



KEY

2 Radius
Welding seam

Figure B.2 — Angles and radii in Food area

Parts of machines, e.g. tooth, transport or cleaning rolls can have recesses, grooves and corners with smaller radii due to product manufacturing necessities. The rolls shall be easy to clean.

A corner with an angle ≥ 135° without a radius is permissible. The distance between two edges shall then be ≥ 8,0 mm (see Figure B.3).

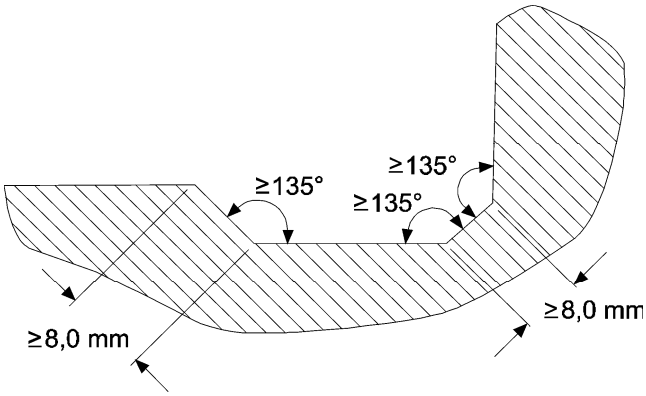
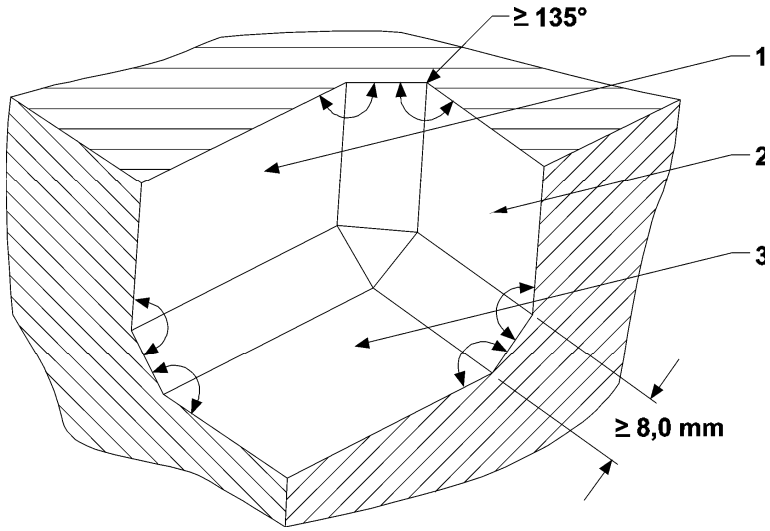


Figure B.3 — Angles in food area

Should a corner be formed by the intersection of three surfaces, then the corners formed shall have angles of ≥ 90° and radii of ≥ 6,4 mm. Also, corners with an angle of ≥ 135° are permitted without a radius (see Figure B.4).



KEY

1 Surface 1

2 Surface 2

3 Surface 3

Figure B.4 — Intersecting surfaces in food area

B.3.1.3 **Grooves** may be used if the inner radius is ≥ 3,2 mm and the depth < 0,7 times the radius.

B.3.1.4 **Joints and seams** shall be welded or sealed and as smooth as the connected surfaces (see Figure B.1).

B.3.1.5 **Surface roughness** shall be ≤ R_z 25 μm. In those areas where it is technically possible < R_z 16 μm should be selected.

B.3.2 Splash area

B.3.2.1 **Surfaces** shall be smooth (see Figure B.1).

B.3.2.2 **Inside corners:** The angle formed by the intersection of two surfaces shall be ≥ 80° and have a radius ≥ 3,2 mm.

If a corner is formed by the intersection of three surfaces, the corner formed by the intersection of two surfaces shall have a radius ≥ 6,4 mm. No requirements apply to the radius for the joining points of the third surface.

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

B.3.2.3 **Grooves** may be used if the inner radius is ≥ 3,2 mm and the depth < 1,0 times the radius.

B.3.2.4 **Openings** are permissible if they go right through and have a diameter ≥ 16 mm. Gaps are permissible provided the gap is at least 16 mm in width, the depth is not more than 16 mm and the gap is open.

B.3.2.5 **Joints and seams** shall be welded or continuously sealed. This requirement does not apply if these joints are formed by overlapping sheet metal surfaces from the top to the bottom in a vertical plane such that there are no horizontal corners in which dirt may be trapped. The overlap shall be ≥ 12 mm. Joints which do not overlap shall be easily separated for cleaning purposes. For information see EN 1672-2:2005, Annex B.

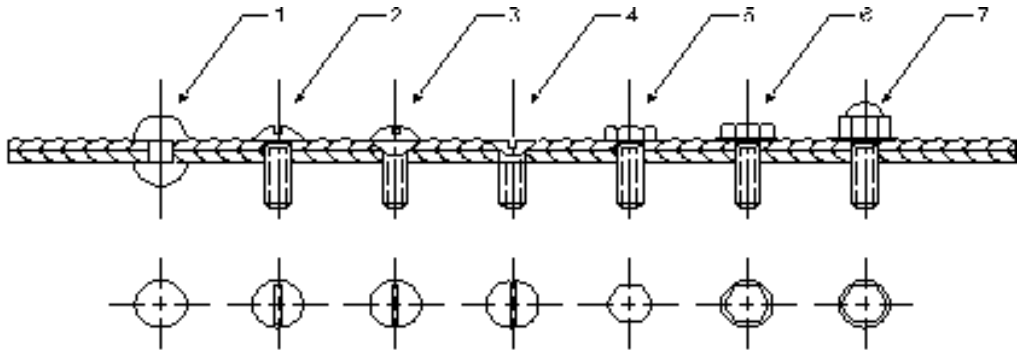
B.3.2.6 **Fastenings methods:** Screws and rivets with low profile heads and of the types shown in Figure B.5 may be used only when other fastening methods are impracticable and they are easy to clean (see Figure B.5).

The following types of screws shall not be used:

— Cross head recessed screws;

— Hexagon socket head cap screws;

— Screws with a diameter < 3 mm.



KEY

1 Round head
2 Oval head
3 Slotted raised countersunk head
4 Slotted countersunk head
5 Hexagon head
6 Hexagon head with flange
7 Hex domed head

Figure B.5 — Permissive fastening methods – head profiles

B.3.2.7 **Surface roughness conditions** shall comply with the requirements of B.3.1.5.

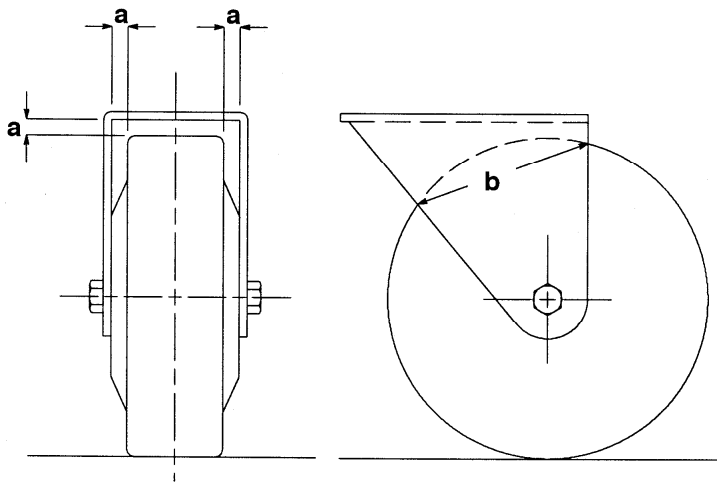
B.3.3 Non-food area

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

B.3.4 Machines standing on a floor

B.3.4.1 Mobile machines

The wheels should be cleanable (see Figure B.6).



KEY

b < 25 mm a $\geq$ 3,5 mm

b > 25 mm a $\geq$ 6 mm

b is the largest area of coverage at the circumference of the wheel

Figure B.6 — Examples of dimensions

Annex C
(normative)

Common hazards for food processing machines and reduction requirements applicable to curing injection machines

C.1 Cutting and stabbing hazards

Needle station handling: Needle stations have to be removed periodically. Needles are sharp and special measures shall be taken. For such needles, designers shall provide means of attaching a tool to the needles to avoid hand contact and a box, or surround guard, to protect against the sharp edges of the needles during handling and transportation. Explanations on the use of these protective means shall be included in the Instructions for use.

Verification: Visual inspection of the machine and its documentation.

C.2 Risks from cleaning

In the food industry the risk from cleaning is increased due to the need for operators to clean the danger zones at the needle station so frequently including removal of blockages, assisting product flow and cleaning between different products during a working day and gaining access to the machine parts for a thorough clean to meet the hygiene needs as required throughout or at the end of a working day.

Hazards commonly arise from the cleaning processes or substances used to obtain the hygiene condition needed. Where hazardous chemicals are used, e.g. concentrated caustic solutions, the curing injection machines shall be designed so that the substance is handled, diluted, used and recovered in an enclosed system (e.g. cleaning in place) which removes the operator from contact. Where contact is unavoidable, the instructions to the user shall include appropriate information on the need to select and use suitable personal protective equipment and any other protective recommendations.

Verification: By visual inspection and examination of documentation

C.3 External influences on electrical equipment

Many curing injection machines are exposed to humid environments and wet cleaning methods which increase the risk from electrical shock.

The designer shall employ safeguarding strategies such as:

ensuring the possibility of impact on electrical equipment from direct (or indirect) water jets is minimised.

Verification: By functional test and examination of documentation.

C.4 Hazards from neglecting use of PPE

Certain personal protective equipment is required at curing injection machines to deal with residual risks e.g.:

— wearing gloves to clean and remove needles;

— aprons for cleaning;

— gloves to handle cold products.

The instructions to the user shall include appropriate information on the need to select and use suitable personal protective equipment.

Verification: Examination of the documentation.

C.5 Hazard from noise

The designer shall design and construct the machinery so that risks arising from the emission of airborne noise are reduced to the lowest level, taking account of the technical progress and available means of reducing noise in the following order: at source, by preventive measures (e.g. enclosure), by instructions to the user.

Verification: Measurement or examination of the documentation.

Annex ZA
(informative)

[A1] Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide one means of conforming to Essential Requirements of the New Approach Directive 2006/42/EC on machinery.

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

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard. [A1]

Bibliography

[A1] *deleted text* [A1]

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

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

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

[4] EN 1037:1995, *Safety of machinery — Prevention of unexpected start-up*

[5] [A1] EN 61310-1:2008 [A1], *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, auditory and tactile signals* [A1] *(IEC 61310-1:2007)* [A1]

[6] EN 61310-2:1995, *Safety of machinery — Indication, marking and actuation — Part 2: Requirements for marking (IEC 61310-2:1995)*

[7] EN ISO 3744, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane (ISO 3744:1994)*

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