BRITISH STANDARD

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+A1:2008

Plastics and rubber machines — Reaction moulding machines

Part 1. Safety requirements for metering and mixing units

ICS 83.200

National foreword

This British Standard is the UK implementation of EN 1612-1:1997+A1:2008. It supersedes BS EN 1612-1:1997 which is withdrawn.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] 〈A1〉.

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

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Plastics and rubber machines - Reaction moulding machines - Part 1: Safety requirements for metering and mixing units

Machines pour les matières plastiques et le caoutchouc - Machines de moulage par réaction - Partie 1: Prescriptions de sécurité relatives aux unités de dosage et de mélange

Kunststoff- und Gummimaschinen - Reaktionsgießmaschinen - Teil 1: Sicherheitsanforderungen an Misch- und Dosiereinheiten

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Foreword

This document (EN 1612-1:1997+A1:2008) has been prepared by Technical Committee CEN/TC 145 “Plastics and rubber machines”, the secretariat of which is held by UNI.

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of an identical text or by endorsement, at the latest by February 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.

This document includes Amendment 1, approved by CEN on 2008-06-08. The main changes compared to the previous version are:

- Modification of the main element of the title
- Editorial modification of Annex ZA
- Addition of Annex ZB
- editorial changes of EN 292-1:1991 to EN ISO 12100-1 and of EN 292-2:1991 to EN ISO 12100-2:2003 in the following clauses: Introduction, 2, 7.

This document supersedes EN 1612-1:1997.

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 Annexes ZA and ZB, which are integral parts 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, 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 European Standard is a type C Standard as defined in [A1] EN ISO 12100 [A1].

The extent to which hazards are covered is indicated in the scope of this standard. In addition, machinery shall comply as appropriate with [A1] EN ISO 12100 [A1] for hazards which are not covered by this standard.

1 Scope

This standard specifies the health and safety requirements for the design of metering and mixing units for reaction moulding machines. The significant and specific hazards are listed in clause 4 and are dealt with in this standard.

This standard does not cover completely the hazards arising from the use of highly flammable additives, for example, pentane used as a blowing agent (see 4.7), because these hazards depend to a large extent on the additives and processes used.

This standard does not cover the hazards arising from the assembly of separate units not supplied at the same time by the same manufacturer.

This standard does not cover the hazards arising from the movement of powered mixing heads; for these, see [A1] EN 1612-2 [A1].

This standard applies to metering and mixing units manufactured after the date of publication of this standard.

2 Normative references

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

[A1] *deleted text* [A1]

EN 418:1992, *Safety of machinery - Emergency stop equipment, functional aspects - Principles for design*

EN 563, *Safety of machinery - Temperatures of touchable surfaces - Ergonomics data to establish limit values for hot surfaces*

EN 954-1, *Safety of machinery - Safety related parts of control systems - Part 1: General principles for design*

[A1] EN 1005 [A1], *Safety of machinery – Human physical performance*

EN 60204-1:1992, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements* [A1] *(IEC 60204-1:1992, modified)* [A1]

[A1] EN ISO 12100-1, *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)* 〈A1〉

3 Definitions

For the purposes of this standard, the following definitions apply (see figure 1):

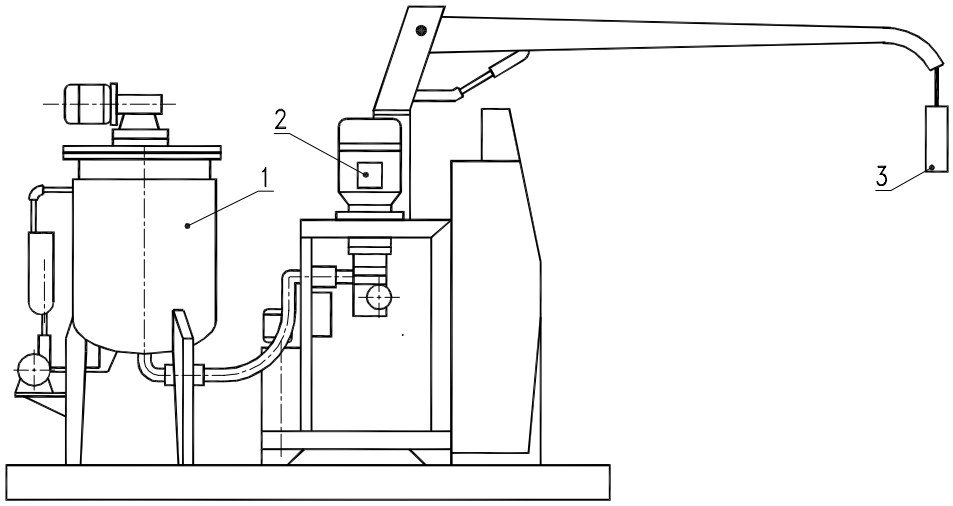
3.1
working tank
a tank which is part of the metering and mixing unit and contains one of the components

3.2
metering unit
a unit for metering the components

3.3
mixing head
the part of the metering and mixing unit for mixing and delivery which can be manually operated or powered (if powered, see 〈A1〉 EN 1612-2 〈A1〉)

3.4
highly flammable additive
an additive with a flash point ≤ 21°C

NOTE For the moment there is no European Directive or Standard in existence



Key

1 working tank

2 metering unit

3 mixing head

Figure 1 — Example of a metering and mixing unit

4 List of hazards

4.1 Hazards due to moving couplings

4.2 Hazards due to instability

4.3 Hazards due to whiplash of hoses following rupture or disconnection

4.4 Hazards due to fluid ejection

4.5 Hazards due to overpressure

4.6 Hazards due to elevated temperatures of manually operated mixing heads which can cause either burns or unexpected reactions on the part of the operator

4.7 Hazards due to contact with the components, additives or a mixture of them or due to the inhalation of gases dangerous to health

— During manual filling of the working tanks;

— Due to leakage;

— During delivery of product through the mixing head.

4.8 Hazards due to incorrect connection of hoses

4.9 Hazards due to explosion where highly flammable additives are used

4.10 Hazards due to neglect of ergonomic principles

4.11 Electrical hazards

4.12 Hazards due to failure of the control circuit

5 Safety requirements and/or measures

5.1 Hazards due to moving couplings

The exposed couplings between pumps and motors shall be protected by fixed guards.

5.2 Hazards due to instability

Where independent fixings are used to support the mixing head they shall be bolted to the floor. See also clause 7.

5.3 Hazards due to whiplash of hoses

Whiplash of hoses shall be prevented, for example by:

— Binding the hoses together;

— Attaching the hoses to a fixed part.

This shall be done at least every 75 cm.

In addition, flexible hoses and their connections shall be designed to prevent tearing from their fittings and unintentional detachment from connection points.

Flexible hoses shall not be used to support the mixing head.

5.4 Hazards due to fluid ejection

Hose assemblies shall be marked at their connection points with the nominal pressure, month and year of manufacture and the name of the manufacturer.

Because of the need to replace hoses (see clause 7) a shot counter shall be provided for metering and mixing units which work at a pressure of more than 30 bar.

Adjustment devices on the mixing head, for example screws or pins shall be designed in such a way that they are retained in the head so that unintentional complete removal of these devices and the resulting outflow of fluids is prevented.

It shall not be possible for fluids to be released from the mixing head due to

— Failure of the energy supply and/or

— Unexpected restoration of the energy supply.

This may be achieved for example

— By means of a valve which shall automatically close in case of any failure of the energy supply;

— By a requirement to restart the machine at the control panel after any failure of the energy supply.

The safety related parts of the control system for the mixing head shall be of at least category 1 of EN 954-1.

5.5 Hazards due to overpressure

The metering and mixing unit shall be designed so that the pressure cannot exceed the maximum pressure specified by the manufacturer. This shall be achieved either:

— By limitation of the drive system for pumps or

— By one or more mechanical devices for example a pressure relief valve or bursting disc. Opening of the device(s) shall not give rise to emissions to the environment. This may be achieved for example by the relief valve being vented into a vessel to contain any liquid released.

5.6 Hazards due to elevated temperatures of manually operated mixing heads

Manually operated mixing heads where the temperature of the surface can exceed 50°C shall be provided with handles.

The temperature of the handles shall not exceed the limits set by EN 563. These handles shall be so designed that it is impossible for the operator to touch the mixing head whilst holding them.

5.7 Hazards due to contact or inhalation

For manual filling of working tanks, see clause 7.

The metering and mixing unit shall be designed so that leakage can be detected visually. Devices shall be provided to contain fluids which may escape from dynamic seals.

A local exhaust ventilation system may be needed for the delivery area dependent on composition of the product (see clause 7).

For contact due to splashing, see clause 7.

5.8 Hazards due to incorrect connection of hoses

Hoses and their connection points shall be unambiguously and permanently marked. See also clause 7.

5.9 Hazards due to explosion where highly flammable additives are used

Measures are required to prevent the build up of concentrations of highly flammable additives which could lead to an explosion. The methods to be adopted to achieve this depend on the additive and the process used.

The measures shall take into account a failure of the safety related parts of the control system, the dynamic seals or the energy supply.

See also clause 7.

5.10 Hazards due to neglect of ergonomic principles

The force needed per operator to manipulate the mixing head shall not exceed the limit values given in ⟨A1⟩ EN 1005 ⟨A1⟩. See also clause 7.

5.11 Electrical hazards

Electrical equipment shall be in accordance with EN 60204-1.

Stop functions shall be at least category 0 of 9.2.2 of EN 60204-1:1992.

Emergency stops shall conform to either category 0 or 1 in accordance with 9.2.5.4 of EN 60204-1:1992.

Emergency stop actuators shall be positioned in accordance with 4.4.2 of EN 418:1992.

5.12 Hazards due to failure of the control circuit

The control system shall be designed in accordance with category 1 of EN 954-1.

The control panel shall be equipped with a start control and a stop control. The start control shall require resetting after a power failure. See also 5.4.

6 Verification of the safety requirements and/or measures

Verification of the safety requirements and/or measures shall be undertaken as shown in table 1 below.

Table 1 — Methods of verification

subclause	methods of verification				references
	visual inspection	functional test[1)]	measurement	calculation	
5.1	X				
5.2	X				
5.3	X		X		
5.4	X	X			EN 954-1
5.5	X	X	X	X	
5.6	X		X		EN 563
5.7	X	X			see also clause 7
5.8	X				see also clause 7
5.9[2)]	X	X	X	X	see also clause 7
5.10			X		see also clause 7
5.11	X	X			EN 60204-1; EN 418
5.12	X	X			[A1] EN 954-1 [A1]

1) Functional testing includes verification of the function and efficiency of guards and safety devices on the basis of

— descriptions given in the information for use

— safety related plans and circuit diagrams

— the requirements given in clause 5 of this standard and in the other quoted standards

2) The methods of verification will depend on the safety measures selected

7 Information for use

Each metering and mixing unit shall be accompanied by information from the manufacturer giving general instructions for use. (See [A1] 6.5 of EN ISO 12100-2:2003 [A1])

The manufacturer shall indicate:

— The number of operators needed for manual operation of the mixing head;

— Positions and sizes of bolts needed to secure the independent fixings supporting the mixing head;

— The specification for replacement hose assemblies;

— The maximum time in use after which the hose assemblies shall be replaced and, for mixing units operating at pressures above 30 bar, the maximum number of cycles after which this shall be done;

— That hose assemblies shall be inspected at least once every month and if there is significant wear they shall be replaced immediately;

— That hose assemblies shall be replaced after any heavy external impact (for example caused by a fork-lift truck)

— That hose assemblies shall be marked at connection points with the nominal pressure, month and year of manufacture and the name of the manufacturer;

— That during manual filling of the working tanks, operation, cleaning, inspection and maintenance, personal protective equipment shall be worn in accordance with the information given by the manufacturers of the components and additives;

— That the use of certain components and additives may cause the release of gases dangerous to health and may require preventive measures such as for example local exhaust ventilation;

— The measures which have been taken to prevent the risk of explosion when highly flammable additives are used, and the methods of verification for them;

— That if the risk of contact due to splashing is not prevented by the mould design, additional protective devices (for example splash screens) shall be fitted as part of the user's responsibility;

— A safe procedure for ▌A1⟩ filling ⟨A1▐, cleaning and maintenance.

Annex ZA
(informative)

A1 Relationship between this European Standard and the Essential Requirements of EU Directive 98/37/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 a means of conforming to Essential Requirements of the New Approach Directive 98/37/EC amended by 98/79/EC on machinery.

Once this standard is cited in the Official Journal of the European Communities 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

Annex ZB
(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 Communities 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

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