BRITISH STANDARD

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Mixing machinery for coating materials — Safety requirements —

Part 1: Mixing machinery for use in vehicle refinishing

ICS 87.100

BSI
British Standards

National foreword

This British Standard is the UK implementation of EN 12757-1:2005+A1:2010. It supersedes BS EN 12757-1:2005 which is withdrawn.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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This European Standard was approved by CEN on 1st August 2005 and includes Amendment 1 approved by CEN on 6 May 2010.

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Contents

Foreword

This document (EN 12757-1:2005+A1:2010) has been prepared by Technical Committee CEN/TC 271 “Surface treatment equipment — Safety”, 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of an identical text or by endorsement, at the latest by December 2010, and conflicting national standards shall be withdrawn at the latest by December 2010.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 12757-1:2005.

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).

For relationship with EU Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document.

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 European Standard is a C type standard as stated in Parts 1 and 2 of EN ISO 12100.

This European Standard is part of a series of documents specifying the health, safety and environmental protection requirements for the devices, units and equipment for surface coating:

— EN 1953 "Atomising and spraying equipment for coating materials — Safety";

— ▌A1⟩ EN 12621 ⟨A1▌ "Machinery for the supply and circulation of coating materials under pressure — Safety";

— EN 12757-1 "Mixing machinery for coating materials — Safety".

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

NOTE Further parts of this European Standard to cover other mixing machinery applications for coating materials may follow.

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 European Standard applies to the design and construction of mixing machinery for liquid coating materials equipped with container of maximal volume ≤ 10 l used by vehicle refinishers and their coating materials distributors.

The pressure related parts of the machines covered are classified as no higher than category I under article 9 of the Pressure Equipment Directive 97/23/EC.

NOTE Pressure related parts of the machines referred to in this European Standard exceeding the limits of category I may lead to additional application of the Pressure Equipment Directive 97/23/EC.

This European Standard deals with all significant hazards, hazardous situations and events relevant to mixing machinery mentioned above, when they are used as intended and under the conditions foreseen by the manufacturer (see Clause 4).

Mixing machinery can operate by stirring or vibrating (shaking) and consists of the following equipment:

— cabinet;

— stirrer;

— vibrator;

— shaker;

— drive unit and related devices;

— container for coating material;

— safety, measuring and control devices;

— lighting;

— heating equipment and/or air conditioning inside the mixing cabinet.

The mixing machinery may be fixed or mobile.

1.2 The following is excluded from this European Standard:

— Mixing machinery intended for:

  — pressure vessels;

  — open or closed material containers larger than 10 l;

— hand-held mixing tools.

1.3 This European Standard is not applicable to mixing machinery which is manufactured before the date of publication of this European Standard by CEN.

2 Normative references

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

EN 294, *Safety of machinery — Safety distance to prevent danger zones being reached by the upper limbs*

EN 349, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body*

EN 619, *Continuous handling equipment and systems — Safety and EMC requirements for equipment for mechanical handling of unit loads*

EN 811, *Safety of machinery — Safety distances to prevent danger zones being reached by the lower limbs*

EN 842, *Safety of machinery — Visual danger signals — General requirements, design and testing*

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

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

EN 971-1:1996, *Paints and varnishes — Terms and definitions for coating materials — Part 1: General terms*

EN 982:1996, *Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics*

EN 983:1996, *Safety of machinery — Safety requirements for fluid power systems and their components — Pneumatics*

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

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

〚A1〛 EN 1127-1:2007, *Explosive atmospheres — Explosion prevention and protection — Part 1: Basic concepts and methodology* 〚A1〛

〚A1〛 EN 13237:2003, *Potentially explosive atmospheres — Terms and definitions for equipment and protective systems intended for use in potentially explosive atmospheres* 〚A1〛

EN 13445-1, *Unfired pressure vessels — Part 1: General*

EN 13463-1:2001, *Non-electrical equipment for potentially explosive atmospheres — Part 1: Basic method and requirements*

〚A1〛 EN 13463-5:2003 〚A1〛, *Non-electrical equipment intended for use in potentially explosive atmospheres — Part 5: Protection by constructional safety "c"*

EN 13478, *Safety of machinery — Fire prevention and protection*

EN 14462, *Surface treatment equipment — Noise test code for surface treatment equipment including its ancillary handling equipment — Accuracy grades 2 and 3*

〚A1〛 EN 14986*, Design of fans working in potentially explosive atmospheres* 〚A1〛

〚A1〛 EN 60079-0:2009, *Explosive atmospheres — Part 0: Equipment — General requirements (IEC 60079-0:2007)* 〚A1〛

〚A1〛 EN 60079-15:2005, *Electrical apparatus for explosive gas atmospheres — Part 15: Construction, test and marking of type of protection "n" electrical apparatus (IEC 60079-15:2005)* 〚A1〛

EN 60204-1:1997, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:1997)*

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

EN 61000-6-1, *Electromagnetic compatibility (EMC) — Part 6-1: Generic standards — Immunity for residential, commercial and light-industrial environments (IEC 61000-6-1:1997, modified)*

EN 61000-6-2, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments (IEC 61000-6-2:1999, modified)*

EN 61000-6-3, *Electromagnetic compatibility (EMC) — Part 6-3: Generic standards — Emission standard for residential, commercial and light-industrial environments (IEC 61000-6-3:1996, modified)*

EN 61000-6-4:2001, *Electromagnetic compatibility (EMC) — Part 6-4: Generic standards — Emission standard for industrial environments (IEC 61000-6-4:1997, modified)*

EN 61010-1, *Safety requirements for electrical equipment for measurement, control and laboratory use — Part 1: General requirements (IEC 61010-1:2001)*

EN ISO 11688-1:1998, *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)*

ISO 3864-1:2002, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs in workplaces and public areas*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 971-1:1996, EN ISO 12100-1:2003 and the following apply.

3.1
mixing machinery
machine for the mixing by stirring (with an inside agitating device), or by vibrating or shaking (by motion of the container) of liquid coating materials in containers (vessels without pressure)

NOTE 1 In a container, in which two or more components of which at least one is in a liquid consistence are brought together to be processed to a liquid coating material for vehicle refinishing use.

NOTE 2 In general, the mixing machinery consists of a cabinet (as framework) with several shelves on which the mixing places are arranged. The number of shelves and mixing places depend on the volume of the container. The mixing places could be occupied by container of standardized mixing coating materials with a capacity between 1 l and 10 l.

The container is closed by a stirring lid. The stirring lids generally consist of a unit with stirrer, lid and drive (e.g. clamp or rack-wheel) which are put on the open container of the coating materials. The lids are fixed by the pressing and turning of fixing clamps and ensure mixing process only in totally closed container. The stirrer can be powered e.g. via a clamp drive by a motor powered special shaft or via belt or worm drive.

In general this is an electric motor, but also air driven motors are used, especially for installations in hazardous explosive environments.

Furthermore the mixing machinery is equipped with a control unit with programmable timer controlling the mixing time (in most cases several times a day) of the closed stirring container. By fitting the side cowling moving parts of the power drive can be protected. Another standard equipment of mixing cabinets is drip trays for the coating materials.

If necessary, the mixing machinery is equipped with lighting.

3.2
container
vessel without pressure used for mixing and/or storage of coating and/or auxiliary materials

3.3
agitator
device which is used to stir or otherwise to move the coating material

NOTE Such device is generally used in conjunction with coating material containers. Such devices may be driven by a power supply and may have a shaft with a stirrer inside a container. The cover of this container may be an integrated part of the stirrer.

3.4
stirrer
part of the agitator which is immersed into the liquid coating material

NOTE Depending on the characteristics of the coating material, different types of stirrer may be used such as, but not limited to, discs, rods, twirling sticks, paddles (blades), propellers, impellers etc.

3.5
vibrator, shaker
device for mixing by mechanical movement of the liquid coating material container

3.6
hoses
flexible conduits intended for the transport of coating and/or auxiliary materials and compressed air, when connected together

3.7
pipes
rigid conduits intended for the transport of coating and/or auxiliary materials and compressed air, when connected together

3.8
safety device
device to fulfil a safety function when in use and the failure or malfunctioning of which endangers the safety or health of persons

3.9
coating material
organic product in liquid or in paste (semi-solid) form (see 1.9 of EN 971-1:1996)

NOTE 1 Such coating materials may consist of binding agents, pigments, fillers, solvents and other additives.

NOTE 2 Such coating materials can be:
— varnishes (see 1.7 of EN 971-1:1996);
— paints (see 1.36 of EN 971-1:1996);
— patching compounds;
— fillers (see 1.21 of EN 971-1:1996);
— sealers and adhesives.

3.10
auxiliary material
materials used for such purposes as:

— solvent, compressed air (for cleaning);

— water, compressed air (for maintenance)

3.11
chemical reaction
process where the coating material or any part of the coating material reacts with the materials of construction of the mixing machinery and/or process which takes place between the components of coating materials

3.12
flammable substance
substance in form of gas, vapour, liquid, solid, or mixtures of these, able to undergo an exothermic reaction with air when ignited [A1] (see 3.48 of EN 13237:2003) [A1]

NOTE 1 "Flammable substances" and "combustible material" are equivalently used terms in this document.

NOTE 2 Examples:

— Solvents, which are flammable or slow burning;

— most coating materials.

3.13
non-flammable coating material
in accordance with EN 50059:1990 a substance which, in any mixture with air, cannot be ignited by an ignition source of less than 500 mJ

3.14
explosion range
the range of the concentration of a flammable substance with air, within which an explosion can occur [A1] (see 3.33 of EN 13237:2003) [A1]

3.15
lower explosion limit (LEL)
the lower limit of the explosion range [A1] (see 3.74 and 3.33 of EN 13237:2003) [A1]

3.16
hazardous areas
areas where hazards due to explosive atmosphere may exist. The probability of occurrence of explosive atmospheres is classified in zones

NOTE Limits of hazardous zones are given in Annex B.

3.16.1
zone 0
place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is present continuously or for long periods or frequently [A1] (see 3.119-1 of EN 13237:2003) [A1]

3.16.2
zone 1
place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is likely to occur in normal operation occasionally [A1] (see 3.119-2 of EN 13237:2003) [A1]

3.16.3
zone 2
place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is not likely to occur in normal operation, but, if it does occur, will persist for a short period only [A1] (see 3.119-3 of EN 13237:2003) [A1]

3.17
equipment category
ignition protection category for intended use of equipment in areas in which explosive atmospheres may occur

3.17.1
equipment Group II category 1
equipment designed to be capable of functioning in conformity with the operational parameters established by the manufacturer and ensuring a very high level of protection.

Equipment in this category is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists or by air/dusts mixtures are present continuously, for long periods or frequently.

Equipment of this category ensures the requisite level of protection, even in the event of rare malfunctions relating to equipment, and is characterised by means of protection such that:

— either, in the event of failure of one means of protection, at least an independent second means provides the requisite level of protection,

— or the requisite level of protection is assured in the event of two faults occurring independently of each other

3.17.2
equipment Group II category 2
equipment designed to be capable of functioning in conformity with the operational parameters established by the manufacturer and ensuring a high level of protection.

Equipment in this category is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists or by air/dusts mixtures are likely to occur.

The means of protection relating to equipment in this category ensuring the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account

3.17.3
equipment Group II category 3
equipment designed to be capable of functioning in conformity with the operational parameters established by the manufacturer and ensuring a normal level of protection.

Equipment in this category is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists or by air/dusts mixtures are unlikely to occur or, if they do occur, are likely to do so only infrequently and for a short period only.

Equipment of this category ensures the requisite level of protection during normal operation

3.18
maximum allowable temperature
maximum temperature for which the equipment is designed as specified by the manufacturer

3.19
maximum allowable pressure
maximum pressure for which the equipment is designed as specified by the manufacturer

3.20
functional test
test carried out for every mixing machinery operated under normal operating conditions

3.21
type test
test conducted at the design stage of the product which proves the conformity with the required safety factors and/or measures

4 List of significant hazards

4.1 General

This clause contains the significant hazards, hazardous situations and events as far as they are dealt with in this document, identified by risk assessment as significant for this type of mixing machinery for use in vehicle refinishing and which require action to eliminate or reduce the risk.

The following hazards may occur when installing, operating, cleaning or maintaining the machine.

NOTE Information on the method of risk analysis is given in EN 1050.

4.2 Mechanical hazards

4.2.1 Crushing, shearing, entanglement, drawing-in or trapping

These hazards are related to

— physical contact with fixed or moving parts of the mixing machinery such as:

  — drive units;

  — shafts;

  — agitators and/or stirrers;

  — vibrating or shaking containers;

— insufficient safety distances;

— Instability of mobile mixing machinery causing tipping or moving.

NOTE Such hazards may occur by an unexpected start-up due to pre-programmed cycles within the mixing machinery.

4.2.2 High pressure fluid ejection

These hazards are related to:

— escaping pressurised liquid coating materials or compressed air;

— rupture of housing, piping or joints due to failure, breakdown, vibrations, corrosion.

4.2.3 Loss of stability (of the mixing machinery and its parts)

These hazards are related to, e.g.

— improper positioning of the mixing machinery;

— overload;

— overfilling.

4.3 Electrical hazards

4.3.1 Electrical shock (by direct or indirect contact)

Such hazards can occur, for instance by touching:

— electrically live parts that are non insulated for operational reasons;

— conductive parts which are not at a dangerous voltage under normal operation, but in the case of failure could be;

— electrically live parts when the insulation is damaged by contact with solvents or by mechanical parts.

4.3.2 External influence on electrical equipment hazard

Such hazards can occur, for instance when interaction of the electromagnetic high voltage equipment with construction elements of the control and safety systems can cause dangerous malfunctions for instance, short circuits on electronic safety circuits, entrance guards, alarm units.

4.4 Noise hazards

Hazardous noise levels can be reached for instance by noise emission of pumps, handling devices, compressed air equipment (motors, valves etc.) when the coating and/or auxiliary materials are processed in the mixing machinery. Noise can cause hearing impairment, and accidents to operators of the machine or persons working near it due to interference with verbal communication and with perception of acoustic danger signals, extra-auditory effects, shock reactions.

4.5 Hazards generated by dangerous substances

4.5.1 Hazards resulting from contact with/or absorption of dangerous substances

Such hazards can be generated by contact with/or absorption of organic liquid coating materials, solvents, cleaning agents causing skin and eye damage, dermatitis or allergies.

4.5.2 Hazards resulting from inhalation of dangerous substances

Such hazards can be generated by inhalation of aerosols and solvent vapours released by organic liquid coating materials.

4.6 Fire and explosion hazards generated by coating and/or auxiliary materials used by the mixing machinery

Such hazards are generated by flammable coating and/or auxiliary materials as a vapour, suspension of fine droplets and/or explosive mixtures together with sources of ignition.

Examples of flammable substances which increase the concentration above normal are:

— not allowable working temperature leading to the formation of flammable vapours;

— failure of hoses, pipes and/or fittings with exit of flammable substances;

— auto-ignition caused by chemical reactions between different types of liquid coating materials.

Examples of ignition sources are:

— hot surfaces e.g. of heating and/or electrical equipment;

— sparks created by mechanically induced energy e.g. fans, agitators;

— electrostatic discharges;

— electrical sparks;

— welding and other sources of thermal energy used during maintenance and cleaning.

4.7 Hazards caused by failure of energy supply

These hazards are related to:

— failure, malfunction of control system (unexpected start-up, heating system failure);

— failure of forced ventilation, if applicable;

— unexpected ejection of coating materials;

— missing guards;

— missing displays or warnings.

4.8 Hazards related to failure of control systems

These hazards may lead to:

— accumulation of vapours caused by breakdown of forced ventilation;

— unexpected overrun.

5 Safety requirements and/or measures

5.1 General

The mixing machinery shall comply with the safety requirements and/or protective measures of this document. In addition it 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).

5.2 Safety requirements and measures against mechanical hazards

5.2.1 Safety measures against crushing, shearing, entanglement, drawing-in or trapping

Moving parts such as vibrators, shakers, stirrers and components of the drive unit shall be designed and safeguarded in such a way that in normal operation and maintenance crushing, entanglement, drawing-in or trapping, impact cannot occur.

EN 294, EN 349, EN 811, EN 842, ISO 3864-1, EN 619 and EN 953 shall be taken into account.

Where this is not possible, exposed moving parts shall be protected by fixed guards, permanent enclosures or interlocking guards in accordance with EN 953 and EN 1088.

[A1] When fixed guards are applied, they shall be fixed by systems that can be opened or removed only with tools. Their fixing systems shall remain attached to the guards or to the machinery when the guards are removed. Where possible, these guards shall be designed in such a way that they can only remain in place using their fixing system. [A1]

Agitators, the stirrers of which can be moved out of the movable containers, shall be equipped with an interlocking device (see 3.26.1 of EN ISO 12100-1:2003) according category 3 of EN 954-1 and shall be designed in such a way that they can only be switched on if the stirrer is inside the container.

If, for operational reasons, any of the above requirements cannot be fulfilled, specific measures to ensure safe operation of the mixing machinery shall be provided such as, but not limited to:

— lockable actuator;

— trip device;

— slip clutch;

— shear pin;

— special design of the stirrers;

— torque limiters.

The coating material container shall be secured against rotating during the stirring operation by either a firm stand or a fixing device for the container.

Access to parts that require adjustment, setting of controls or sensors (e.g. to vibrators or shakers with power actuated fixing device for the coating material container) shall be prevented by fence-type enclosure or be safeguarded in a way resulting in the same level of safety. For fence-type enclosures, the safety distances according to EN 294 apply. Guards shall satisfy the requirements of EN 953.

5.2.2 Safety measures against hazards generated by ejection of materials

5.2.2.1 Mixing machinery and its components shall be designed and constructed in such a way that no hazardous ejection of coating materials may result from leakages or component failures in normal operation and maintenance.

The requirements shall be fulfilled by:

— adequate design of all parts under pressure;

— guards and protection according to EN 953.

Components shall be designed and constructed for the maximum pressure they could be subjected to, also taking into account faulty conditions.

Where a pressure system is composed of interconnected pressure vessels it shall be classified in the highest category according to the Pressure Equipment Directive applicable for the individual pressure vessel. Where a pressure vessel contains several fluids, classification shall be on the basis of the fluid which requires the highest category.

Mixing machines shall be equipped with an exhaust device for safe dumping of residual pressure (e.g. valve with deflection). Pressure shall not be dumped by e.g. disconnection of a pipe or hose or opening a draining valve.

If equipped with a draining valve, opening of the draining valve shall only be possible by using a tool and in depressurised condition.

Safety devices shall be designed and positioned in such a way that no hazard may result from escaping materials.

Hydraulic power systems and components shall comply with EN 982.

Pneumatic power systems and components shall comply with EN 983.

For detailed information about dumping, filling and draining procedures see 7.2.

5.2.2.2 The mixing machinery shall be fitted with a pressure limiting device to prevent exceeding of the maximum allowable pressure. Safety systems shall be in accordance with EN 13445-1. Pressure losses or drops shall not generate a hazard.

If equipped with an integrated pressurising system (e.g. compressor) the pressure relief device shall be interlocked with the power supply of the pressurising system.

5.2.2.3 Piping and hoses shall be:

— adequately protected against harmful external effects (e.g. mechanical damage by friction);

— adequately installed to prevent mechanical stresses, (e.g. sufficient radius, length);

— suitable resistant against thermal strain.

For information on inspection and maintenance of piping and hoses see 7.2.

5.2.3 Safety measures regarding mass and stability and inadequacy of mechanical strength

Mixing machinery and their parts shall be designed, constructed and installed so that their stability shall be ensured and any permanent or excessive deformation shall not occur when filled with coating material.

The design shall take into consideration the intended or foreseeable use in relation to the nature and the mass of the coating material to be used.

The machinery shall be designed and installed in such a way that, under normal operating conditions, the integrity is not influenced by vibrations or impact loading.

Mobile mixing machinery shall be designed to ensure that it does not fall or move unintentionally when positioned on a 10° sloping surface under recommended operating conditions.

All components of the mixing machinery which can come into contact with the coating and/or auxiliary materials shall be compatible with these materials.

The instruction handbook (see 7.2) shall contain a reference that, on request, a list of the materials used in the construction and assembly of the mixing machinery will be made available by the manufacturer to enable the determination of compatibility with special coating and/or auxiliary materials.

5.3 Electrical safety requirements

5.3.1 Electrical equipment for mobile or fixed (stationary) mixing machinery shall comply with EN 60204-1.

5.3.2 Protection against electric shock shall comply with the requirements of Clause 6 of EN 60204-1:1997.

The design of the mixing machinery shall ensure that static electricity can be discharged in a controlled manner by the use of any kind of one or more earth connections according to Clause 6 of EN 60204-1:1997 with a resistance similar to or less than 1 MΩ.

All mechanical conductive parts of the installation shall be earthed (see Clause 8 of EN 60204-1:1997). Measuring devices which are part of the mixing machinery shall comply with EN 61010-1:2001.

5.3.3 The insulation of electrical equipment shall be resistant against solvents and other fluids.

Electrical equipment shall have a protected installation against outside mechanical influence.

5.3.4 If electrical/electronic components are used, the manufacturer shall ensure that the equipment does not produce any electromagnetic disturbances above the levels specified in EN 61000-6-3 or EN 61000-6-4 as selected by the manufacturer to be appropriate for the intended place of use. Moreover, it shall also have sufficient immunity to electromagnetic disturbances to enable it to operate safely as intended and shall not fail to danger when exposed to the levels and types of disturbance as specified in EN 61000-6-1 or EN 61000-6-2.

NOTE It is recommended that manufacturers only use components which have been identified as conforming for immunity and emission to harmonised EMC standards and apply them in accordance with the suppliers recommendations.

5.4 Safety requirements related to noise

The mixing machinery shall be designed and constructed so that the risks resulting from emission of airborne noise are reduced to the lowest level, taking into account technical progress and availability of means for noise reduction, especially at source.

Airborne and/or structure borne noise may be generated by the moving parts of the mixing machinery such as, but not limited to:

— drive units;

— shafts;

— agitators;

— vibrating and shaking containers.

The generation and emission of airborne noise by the mixing machinery shall be reduced as far as possible by:

— insulation by using structure-borne noise damping elements;

— enclosures (where applicable);

— silencers etc.

NOTE 1 This list is not exhaustive. Other alternative technical measures with identical or greater efficiency can be used by the manufacturer.

When designing the machine, the recommendations given in EN ISO 11688-1 shall be taken into account.

NOTE 2 EN ISO 11688-2 gives useful information on noise generation mechanisms in machinery.

The determination, declaration and verification of airborne noise emission of mixing machinery shall be carried out as stated in EN 14462.

5.5 Safety requirements against dangerous substances

5.5.1 General

For the design of these machines an assessment of the foreseeable risks arising from coating and/or auxiliary materials shall be made according to their chemical and physical characteristics and the intended use of the mixing machinery. The safety data sheets of substances and compounds of the coating and/or auxiliary material shall be taken as a basis for the assessment.

5.5.2 Safety measures against contact with/or inhalation of dangerous liquid coating materials, vapours and aerosols

Contact with skin and/or inhalation of dangerous substances shall, where possible, be reduced or avoided by design.

This can be achieved by e.g.:

— totally enclosed process/mixing machinery;

— automated process;

— forced ventilated installation area.

If relevant, the manufacturer shall recommend wearing additional personal protective equipment (see 7.2).

5.6 Fire and explosion prevention and protection

5.6.1 Fire

To preclude the fast propagation of fire, all elements of construction of the mixing machinery and its components shall comply with the requirements for fire prevention and protection of machines as described in EN 13478.

Constituent elements shall be of materials which do not support combustion and shall be sufficiently resistant to fire.

The pipes and hoses for coating materials shall be of material, which does not support combustion.

The surface of the pipes and hoses shall no accumulate electrostatic charges, which could lead to an ignition.

NOTE Information on construction material's reaction to fire is given in Annex D.

5.6.2 Explosions

5.6.2.1 General

To prevent an explosion it is necessary to implement the following:

— to maintain the flammable substances concentration below LEL by forced ventilation, or keeping the temperature of the solvent-borne coating material below its flash point considering a safety margin;

— to eliminate or reduce ignition sources.

The safety margin shall be 15 K minimum.

The explosion prevention measures depend on the fundamental requirements above, as well as the hazardous area in which the mixing machinery is located.

5.6.2.2 Limitation of flammable substances concentration

The limit values of concentration depend on design of container (open or closed) and shall only be used for classification in hazardous zones (see Annex B) and determination of electrical and non-electrical equipment.

The mixing machinery shall be designed to prevent the release of flammable coating materials in order to avoid the build-up of a potentially explosive atmosphere. In selecting the materials used in the construction of the mixing machinery, special consideration shall be given to limiting, bearing in mind the current state of the art, the propagation of combustion and/or fire.

If the materials to be mixed have a flash point less than 35 °C, the containers in which they are mixed shall be tightly closed to prevent the release of flammable vapours.

Drip trays are required, if in case of failure overfilling, mal-operation, leakages, damage to container, failure of forced ventilation and spreading of coating materials are not prevented.

The instruction handbook shall include a warning that the tightness of these containers be checked regularly.

The instruction handbook shall contain a warning regarding potential fire and/or explosion hazards.

For mixing machinery without forced ventilation, the manufacturer shall give instructions in the instruction handbook (see 7.2) on minimum requirements of air dilution in the installation area to ensure an average concentration of flammable substances in air (see Annex B).

5.6.2.3 Avoidance or reduction of ignition sources

5.6.2.3.1 General

All electrical and non-electrical equipment and components, intended for use in potentially explosive atmospheres, shall be designed and constructed according to good engineering practice and in conformity with the required categories for group II equipment to ensure avoidance of any ignition source. To classify the category of the equipment it shall be subjected to an ignition hazard assessment in accordance with 5.2 of [A1] EN 13463-1:2001 [A1].

During the design of the mixing machinery, all potential ignition sources (e.g. mechanical sparks, hot surfaces, overheating, alternating effects between different parts of the mixing machinery and/or any combination of such hazards) shall be taken into consideration.

Category 3 mixing machinery for use in zone 2, see Annexes A and B, shall not contain any effective ignition source in normal operation.

Category 2 mixing machinery for use in zone 1, see Annexes A and B, shall not contain any effective ignition source during foreseeable malfunctions or rare malfunctions.

Hot surfaces of the mixing machinery shall not be able to ignite paint aerosols and solvent vapour. The admissible temperatures of these hot surfaces are described in 6.4.2 of [A1] EN 1127-1:2007 [A1].

Undesirable electrostatic discharges shall be avoided by earthing and interconnecting all conductive components of electrical and non-electrical equipment.

NOTE 1 Further information on this topic is given in [A1] CLC/TR 50404:2003, *Electrostatics — Code of practice for the avoidance of hazards due to static electricity.* [A1]

An ignition hazard assessment report is requested for the mixing machinery, including all installed components, in accordance with 5.2.5 of [A1] EN 13463-1:2001 [A1].

NOTE 2 The report may take reference to already certified components.

5.6.2.3.2 Electrical equipment

Any electrical equipment, installed and located in zone 1 shall be at least category 2 and shall comply with the requirements of EN 60079-0. Where relevant, EN 60079-0 may be supplemented or modified by [A1] EN 60079-6 [A1], EN 60079-2, [A1] EN 60079-5 [A1], EN 60079-1, EN 60079-7 and [A1] EN 60079-11 [A1], EN 60079-18, EN 60079-25 as appropriate.

Electrical equipment installed and located in zone 2 shall be at least of category 3 complying with EN 60079-0 and EN 60079-15.

In particular the following measures shall be considered:

— all conductive components shall be interconnected and earthed according to EN 60204-1;

— for lighting devices fitted behind transparent impact resistant panels sealed to the mixing machinery's structure, so that solvent vapour inside the mixing machinery cannot ingress, IP 54 of EN 60529 is sufficient;

[A1] NOTE The requirement is related to the properties of the panel to effectively enclose the hazardous atmosphere. The enclosure of the lighting fitting itself is not located in a classified zone with potential explosive atmosphere. [A1]

— For motor outside the mixing machinery at least IP44 of EN 60529 shall be used;

5.6.2.3.3 Non-electrical equipment

Any non-electrical equipment, intended for use in a potentially explosive atmosphere, shall comply with the requirements of [A1] EN 13463-1:2001 [A1] and EN 13463-5:2003, and where relevant, the selected European Standard for the specific type of ignition protection.

In particular the following requirements shall be observed:

— electrostatic charges shall be avoided according 7.4 of [A1] EN 13463-1:2001 [A1].

— for exhaust and recirculation air ignition protected fans shall be used [A1] (EN 14986) [A1].

[A1] *deleted text* [A1]

5.7 Safety requirements against failure of energy supply

The mixing machinery shall be designed and constructed to eliminate the risk of injury caused by failure of energy supply. If residual risks remain, further information shall be given in the instruction handbook (see 7.2), with regard to any shortcomings of the protection measures adopted.

Where more than one type of energy is used (e.g. electric and pneumatic) the failure of any shall not cause a hazard to arise from sources relating to the other types of energy source.

5.8 Safety requirements and measures against failure of control systems

5.8.1 General

The mixing machinery shall be equipped with control devices for each type of energy used, according to EN 982, EN 983 EN 60204-1.

5.8.2 Safety-related control circuits

The following control circuits are considered safety-related:

— control circuit between overpressure and supply (see 5.2.2.2);

— circuits for controlling each type of energy used;

— hydraulic/pneumatic control circuits (see 5.2.2.1);

— control circuit between guards and interlocking with the agitator.

Mixing machinery shall be equipped with a device which prevents uncontrolled start-up after a failure or interruption of any energy supply. The mixing machinery shall be equipped with disconnecting devices for each type of energy used. The requirements of EN 1037 shall apply.

Control switches for starting hazardous movements shall be in accordance with EN 1037:1995. Mixing machinery shall be provided with separate main control switches for each type of energy used. The requirements of EN 1037 shall be satisfied.

5.8.3 Level of safety

Control circuits which are used in safety-related functions shall fulfil the requirements of EN 954-1 category 3 and EN 1088. For safety-related functions see EN 954-1 and CR 954-100:1999.

6 Verification of the safety requirements and/or measures

6.1 General

The safety requirements detailed in Clause 5 shall be checked by testing, calculation, inspection or other methods, according to the following subclauses.

Verification shall be checked before or during commissioning.

6.2 Mechanical

6.2.1 Verification of requirements under 5.2 and the measures adopted can be carried out by visual and/or physical inspection.

In addition piping shall be tested with a pressure of 1,3 times the maximum permissible working pressure.

Test pressure has to be applied for a minimum time of 15 min. During pressure test no leakage shall be observed.

The distance between moving or fixed parts to moving parts and between cover clamping screws and the walls of cover and/or pressure vessel shall be tested by measurement. This is a type test.

The stability of movable mixing machinery shall be checked under operation of the system as a type test.

6.2.2 The exact location of the safety devices shall be checked by inspection and functionality, and efficiency of these devices shall be checked by testing.

The integrity of any part of the mixing machinery that may be subjected to a burst pressure shall be checked by a type test in which the burst pressure shall be maintained for at least 3 min unless a part fails before that time.

The integrity of any part of the mixing machinery that may be subjected to a proof pressure shall be checked by functional test in which the proof pressure shall be maintained for at least 1 min without any signs of deformation or leakage.

Hoses in pressurized parts of the mixing machinery shall be proof tested by the user of the mixing machinery or an authorised expert at least every 3 years.

Hoses that cannot be prevented from friction contact with other parts of the mixing machinery and/or the walls and/or floor shall be checked for signs of wear by weekly visual inspection.

The marking of hoses in the mixing machinery shall be checked by visual examination.

The instruction handbook shall be checked for the notes required by visual examination.

The suitability of the materials of construction of the mixing machinery shall be checked by type tests and by the availability of a comparison list.

The stability of mobile mixing machinery shall be checked by a type test.

6.3 Electrical

Verification of requirements under 5.3 shall be carried out according to EN 60204-1 and the following tests shall be performed on all mixing machinery when the electrical equipment is fully connected to the system:

— continuity of the protective bonding circuit (see 20.2 of EN 60204-1:1997);

— insulation resistance tests (see 20.3 of EN 60204-1:1997);

— voltage tests (see 20.4 of EN 60204-1:1997);

— functional tests (see 20.7 of EN 60204-1:1997).

6.4 Noise

The measurements of the emission sound pressure levels at the workstations and of the sound power level shall be carried out according to EN 14462 during commissioning.

6.5 Dangerous substances

Verification of requirements in 5.5 and the measures adopted shall be carried out by visual inspection and measurement.

6.6 Fire and explosions

6.6.1 Fire

Check compliance with 5.6.1 according to material data in the specification by visual inspection and tests.

6.6.2 Explosions

Compliance of electrical and non-electrical equipment with required categories for ignition protection shall be checked before commissioning.

The mixing machinery, the ignition hazard assessment and the user warnings in the instruction handbook shall be checked by visual inspection.

For the verification of the temperature limitation (thermostat) and cut-off devices proceed as follows:

— for adjustable device(s) (thermostat) set the temperature 10 K below the maximum admissible design temperature. For cut-off device(s) set the controls in such a way the cut-off can operate;

— switch on the heating and all the heat sources into the machine;

— when the heating switches off (thermostat cut-off temperature) count down 15 min then immerse the probe of the verifying instrumentation into the coating material and compare the temperature value on the instrumentation to the temperature set on the limiting device (thermostat). Discrepancy shall not exceed +2 K.

Verification of alarm(s) shall be made by visual and/or audible inspection.

Verification of temperature of touchable surfaces of the mixing machinery shall be carried out in a room at ambient temperature not below the normal temperature where the mixing machinery is used or temperature compensation shall be done.

Verification of temperature of touchable surfaces shall be carried out at the maximum temperature which can be reached at the steady state when all parts in contact with coating materials are at their maximum admissible design temperature.

6.7 Failure of energy supply

Verification of the requirements detailed in 5.7 and the measures adopted shall be carried out by visual inspection.

6.8 Control systems

Verification of the requirements detailed in 5.8 shall be carried out by testing and visual inspection. The presence, function and labelling of safety devices shall be checked.

7 Information for use

7.1 General

Information for use shall be drawn up in accordance with Clause 6 and in particular with 6.5 of EN ISO12100-2:2003 for instruction handbook.

The instructions shall be drawn up in one of the languages of the EEA. On being put in service, the mixing machinery shall be accompanied by a translation of the instructions in the language of the country in which the mixing machinery is to be used and by the instructions in the original language issued by the manufacturer.

The maintenance instructions for use by specialised personnel may be drawn up in only one of the Community languages understood by that personnel.

It shall provide specifications for the commissioning, the use and the maintenance of the mixing machinery and include, as the case may be, information and safety instructions to the user for the correct and safe use of the mixing machinery, and notably the following minimum information, which depends on the type of the mixing machinery:

7.2 Instruction handbook

7.2.1 Information relating to the mixing machinery

— Performance data:

  — the maximum allowable pressure for the compressed air (where applicable);

  — the maximum and minimum allowable temperatures of the coating material and/or the compressed air supplied by the equipment (where applicable);

  — the maximum speed of rotation of parts of the mixing machinery (where applicable);

— noise emission values determined according to EN 14462 i.e.:

  — the A-weighted emission sound pressure level at workstations, where this exceeds 70 dB; where this level does not exceed 70 dB, this fact shall be indicated;

  — the A-weighted sound power level where the A-weighted emission sound pressure level at workstations exceeds ⟦A1⟩ 80 dB ⟨A1⟧;

— description of application of mixing machinery (intended use).

7.2.2 Information relating to safety

— Information about type and use of any safety devices for the mixing machinery;

— area classification with restricted areas and hazardous zones with reference to fire and explosion (if applicable);

— instructions for detection of failures and re-start after an interruption, clearance of faults (for example: diagrams for all services, trouble-shooting);

— ⟦A1⟩ the operating method to be followed in the event of accidents, breakdowns or blockages that are likely to occur; ⟨A1⟧

— warning against:

  — smoking in the hazardous zone. A display showing "No smoking" within 5 meters around the mixing machinery shall be suffixed on the machine;

  — use of naked flames, objects with hot or incandescent surfaces, equipment or items capable of generating sparks (tools, equipment etc.) in the mixing machinery or in the surrounding of it;

  — use of halogenated products for cleaning;

  — use of cleaning agents with a flash point less than 15 °C above the ambient temperature;

— safe working practices – information about:

  — required fire extinguishing equipment;

  — any special earthing measures;

  - use of the mixing machinery only in a well ventilated area, with regards to health, fire and explosion risks, where is ensured, that the concentrations of vapours and gases are below the national exposure limits and the lower explosion limits (LEL);

- compressed air shall not be directed towards persons;

- a list of the materials used in the construction of the mixing machinery available on request to validate compatibility with the coating materials to be used.

7.2.3 Information relating to transport, handling, installation

- Instructions relating to the installation such as floor plans, exhaust systems, floor mountings;

- fastening of the mixing machinery to the floor before use;

- installing of the mixing machinery in a well-lit room (300 Lux at least), otherwise choose a machine with lighting.

7.2.4 Information relating to use of the mixing machinery

- Use of personal protective equipment in respect on contact with and/or breathing of hazardous materials, gases or vapours, according to the safety data sheet of the coating materials;

- further information relating to the use/reference to:

  - all other documentation such as operation manuals for associated equipment and data sheets for coating materials;

  - all national and local regulations regarding the disposal of waste products shall be observed.

7.2.5 Information relating to maintenance of the mixing machinery

- Before starting any maintenance operation, the mixing machinery shall be disconnected from the power supply;

- work shall only be carried out by qualified and trained personnel using only recommended tools and spares;

- nature and frequency about regular inspection of ventilation, cleaning and earthing etc. shall be specified;

- effectiveness of the container seal shall be checked at intervals not exceeding 6 months;

- ▌A1⟩ the specifications of the spare parts to be used, when these affect the health and safety of operators. ⟨A1▐

7.3 Marking

The mixing machinery shall be marked, clearly and indelibly, as laid out in 6.4 of EN ISO 12100-2:2003.

The following additional marking shall also be included, where applicable:

- Information, if coating materials can be mixed with a flash point below 35 °C, see 5.6.2.3 and Annexes A and B;

- The specific „EX“-sign (in the hexagon) and the category, see 5.6.2.3 and Annexes A and B, on mixing machinery designed for use in potentially explosive atmospheres;

- the maximum allowable pressure for the compressed air;

- the maximum speed/frequency of rotation/reciprocation of any part of the mixing machinery;

— the maximum temperature of coating material and/or compressed air intended for use with the mixing machinery if higher than 43 °C;

— A1 the business name and full address of the manufacturer and, where applicable, his authorised representative;

— designation of the machinery;

— the year of construction, that is the year in which the manufacturing process is completed. A1

Annex A
(informative)

Relationship between categories and zones

[A1] EN 1127-1:2007 [A1] specifies methods for the identification of hazardous situations that may lead to an explosion. It details the design and construction measures to achieve the required safety. It includes the relationship between categories and zones and the applicable equipment in the different zones.

Information on the control and classification of hazardous places for gases and vapours by the use of ventilation is given in [A1] EN 60079-10:2003 [A1].

The zones classification for areas with potentially explosive atmosphere is corresponding to categories of ignition protection according to [A1] EN 13463-1:2001 [A1].

Table A.1 – Relationship between categories and zones

Category	Designed for type of explosive atmosphere	Designed for zone	Also applicable in zone
1	gas/air mixture resp. vapour/air mixture resp. mist/air mixture	0	1 and 2
2	gas/air mixture resp. vapour/air mixture resp. mist/air mixture	1	2
3	gas/air mixture resp. vapour/air mixture resp. mist/air mixture	2	—

Annex B
(informative)

Explosion-prevention requirements for mixing machinery for vehicle refinishing

Table B.1 – Explosion-prevention requirements

No.	Characteristics of mixing machinery		Prevention of potentially explosive atmospheres with forced ventilation		Prevention of ignition by declaration of areas with risk of explosion	
	Design of mixing machinery	Design of container	Forced ventilated enclosure	Forced ventilated area of installation	Zone generated inside the enclosure during mixing	Zone generated by the mixing machinery at the areas of installation
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	open	closed	no	yes	none	Zone 1
2	open	closed	no	none	none	none
3	closed	open	yes	no	Zone 1: 25 % LEL < c < 50 % LEL Zone 2: C < 25 % LEL	none
4	closed	closed	no	no	none	none

NOTE 1 Maximum container volume ≤ 10 l of liquid coating material (see scope).

NOTE 2 Flash point of the liquid coating material is not sufficiently (not 15 K) above the processing temperature (see 5.6.2.1).

NOTE 3 Mixing process only takes place in closed container (see 5.6.2.2) with self-closing dosing option.

Annex C
(informative)

References to national exposure limit values

Country	National references to exposure limit values for hazardous substances	Technical terms for limits
A	Amtliche Mitteilungen des Bundesministeriums für soziale Verwaltung (2/93)	MAK, TRK
B	Koninklijk Besluit tot wijziging van Bijlage II van Titel II, Hoofdstruk II bis van het ARAB wat de vaststelling van de grenswaarden voor blootstelling aan chemische agentina betreft.	VLE
	Arreté Royal modifiant l'Annexe II du titre II, chapitre II bis du R.G.P.T. qui etablit les limites d'exposition des agents chimiques	VLE
CzR	Directive of Ministry of Health No. 58/1981 Coll., about principal hygienic requirements for maximum permitted concentration of the most important injurants in air und assessment of Level of pollution	NPK NPK-P
DK	Instruction No 3.1.0.2., December 1996, Exposure Limit Values for Substances and Materials	GV
SF	at present unknown	
F	[A1] *deleted text* [A1] [A1] ED 839 – *Guide pratique de ventilation N°9.1 – Cabines d'application par pulvérisation de produit liquide*. ED 6049 – *Guide pratique de ventilation N°20 – Postes d'utilisation manuelle de solvant*. [A1]	VMEI VLE
D	Technische Regeln für Gefahrstoffe TRGS 900 "Luftgrenzwerte"	MAK, TRK BAT
GR	at present unknown	
ISL	at present unknown	
IRL	at present unknown	
I	Threshold Limit Values and Biological Exposure Indices published by American Conference of Governmental Industrial Hygienists, Technical Affairs Office, Kemper Woods Center, 1330 Kemper Meadow Drive, Cincinnati, OH 45240-1634 – USA	ACGIH
L	at present unknown	
NL	Min. v. sociale Zaken en Werkgelegenheid P145: de nationale MAC-lijst 1996	MAC
N	Administrative normer for forurensing i arbeidsatmosfaere 1996	AT 361
P	at present unknown	
ES	at present unknown	
S	(Threshold Limit values) AFS 1996:2 Hygieniska Gränsverden	NGV, TGV KTV
CH	Suva Publikation: Grenzwerte am Arbeitsplatz 1997 Maximale Arbeitsplatzkonzentrationswerte gesundheitsgefährdender Stoffe. Biologische Arbeitsplatztoleranzwerte – Arbeitshygienische Grenzwerte für physikalische Einwirkungen	MAK, BAT
GB	Health and Safety Executive H&SE EH 40/97, Part 2: "List of occupational exposure limits and other tables"	MEL, OES

Annex D
(informative)

Classification of construction material's reaction to fire - National standards

According to 5.6.1 of this document, the specific properties for the materials of construction are necessary for fire prevention and protection.

Presently there are no harmonised EN-standards for the fire behaviour of materials for construction for the fire prevention and protection of machines.

Therefore, national standards apply until harmonised CEN standards are available.

They are:

Austria	ÖNorm B 3800-1	Behaviour of building materials and components in fire; building materials: requirements and tests
	ÖNorm B 3800-2	Behaviour of building materials and components in fire — Components: Definitions, requirements, tests
	ÖNorm B 3800-3	Behaviour of building materials and components in fire — Special components: Definitions, requirements, tests
	ÖNorm B 3800-4	Behaviour of building materials and components in fire; components: assignation to the classes of fire resistance
United Kingdom	H.F.L '72	"Highly flammable liquids and liquefied petroleum gases regulations"
and relevant parts of	BS 476	"Fire tests on building materials and structures".
France	NF P 92-501	"Safety against fire. Building materials. Reaction to fire tests, radiation test used for rigid materials, or for materials on rigid substrates (flooring and finishes) of all thickness, and for flexible materials thicker than 5 mm"
	NF P 92-507	"Safety against fire — Materials for construction — Reaction to fire tests — Classification according to the reaction against fire"
Germany	DIN 4102-1	"Fire behaviour of materials and components for construction — Materials for construction — Definitions, requirements and tests"
Italy	UNI 9177	"Classification of materials — Reaction to fire of combustible materials"

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 a means of conforming to Essential Requirements of the Recast Machinery Directive 2006/42/EC.

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 ((except Essential Requirements 1.2.1. 1st paragraph 1st indent, 1.2.1. 1st paragraph 4th indent, 1.2.3, 1.2.4, 1.1.2.c), 1.7.4.2.o), 3)) 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)

Relationship between this European Standard and the Essential Requirements of EU Directive 94/9/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 ATEX 94/9/EC.

Once this standard is cited in the Official Journal of the A1 European Union A1 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 given in Table ZB.1 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.

Table ZB.1 - Correspondence between this European Standard and Directive 94/9/EC

Clause(s) of this European Standard	Essential Requirements of Directive 94/9/EC
5.6.2.1, 5.6.2.2,	1.0 General requirements
5.6.2.2, 5.6.2.3,	1.1 Selection of materials
5.6.2.2, 5.6.2.3,	1.2 Design and Construction
5.6.2.3,	1.3 Potential ignition sources
5.6.2.1,	1.4 Hazards arising from external effects
5.8	1.5 Requirements in respect of safety related devices
5.7, 5.8	1.6 Integration of safety requirements relating to the system
5.6.2.3,	2.2 Requirements applicable to equipment in category 2 of equipment-group II
5.6.2.3,	2.3 Requirements applicable to equipment in category 3 of equipment-group II

Bibliography

[1] EN 418, *Safety of machinery — Emergency stop equipment, functional aspects — Principles for design*

[2] EN 563:1994*, Safety of machinery — Temperature of touchable surfaces — Ergonomics data to establish temperature limit values for hot surfaces*

[3] EN 574, Safety of machinery — *Two-hand control devices — Functional aspects — Principles for design*

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

[5] EN 809, *Pumps and pump units for liquids — Common safety requirements*

[6] CR 954-100:1999, *Safety of machinery — Safety-related parts of control systems — Part 100: Guide on the use and application of EN 954-1:1996*

[7] EN 981:1996, *Safety of machinery — System of auditory and visual danger and information signals*

[8] EN 1050, *Safety of machinery — Principles for risk assessment*

〚A1〛 *deleted text* 〈A1〉

[9] EN 1953:1998, *Atomising and spraying equipment for coating materials — Safety requirements*

[10] prEN 12621:1996, *Machinery for the supply and/or circulation of coating materials under pressure — Safety requirements*

[11] EN 50015, *Electrical apparatus for potentially explosive atmospheres — Oil immersion “o”*

[12] EN 50017, *Electrical apparatus for potentially explosive atmospheres — Powder filling “q”*

[13] EN 50020, *Electrical apparatus for potentially explosive atmospheres — Intrinsic safety “i”*

[14] prEN 50039:2001, *Electrical apparatus for potentially explosive atmospheres — Intrinsically safe electrical systems "i" - Group II systems for gas atmospheres*

[15] EN 50059:1990, *Specification for electrostatic hand-held spraying equipment for non-flammable material for painting and finishing*

[16] EN 60079-1, *Electrical apparatus for potentially explosive atmospheres — Part 1: Flameproof enclosure "d" (IEC 60079-1:2003)*

[17] EN 60079-2:, *Electrical apparatus for explosive gas atmospheres — Part 2: Pressurized enclosures "p" (IEC 60079-2:2001)*

[18] EN 60079-7, *Electrical apparatus for explosive gas atmospheres — Part 7: Increased safety "e" (IEC 60079-7:2001)*

[19] EN 60079-10:2003, *Electrical apparatus for explosive gas atmospheres — Part 10: Classification of hazardous area (IEC 60079-10:2002)*

[20] EN 60079-18, *Electrical apparatus for explosive gas atmospheres — Part 18: Construction, test and marking of type of protection encapsulation "m" electrical apparatus (IEC 60079-18:2004)*

[21] EN 60079-25, *Electrical apparatus for explosive gas atmospheres — Part 25: Intrinsically safe systems (IEC 60079-25:2003)*

[22] EN 60335-1, *Household and similar electrical appliances — Safety — Part 1: General requirements (IEC 60335-1:2001, modified)*

[23] EN 61508-1:2001, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 1: General requirements (IEC 61508-1:1998 + Corrigendum 1999)*

[24] EN 60519-1:2003, *Safety in electroheat installations — Part 1: General requirements (IEC 60519-1:2003)*

[25] EN ISO 3994, *Plastics hoses — Helical-thermoplastic-reinforced thermoplastics hoses for suction and discharge of aqueous materials — Specification (ISO 3994:1998)*

[26] EN ISO 4671, *Rubber and plastics hoses and hose assemblies — Methods of measurement of dimensions (ISO 4671:1999)*

[27] EN ISO 6385, *Ergonomic principles in the design of work systems (ISO 6385:2004)*

[28] EN ISO 7250, *Basic human body measurements for technological design (ISO 7250:1996)*

[29] EN ISO 8031, *Rubber and plastics hoses and hose assemblies — Determination of electrical resistance (ISO 8031:1993)*

[30] EN ISO 11688-2:2000, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 2: Introduction to the physics of low-noise design (ISO/TR 11688-2:1998)*

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

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