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Atomising and spraying equipment for coating materials — Safety requirements

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National foreword

This British Standard is the UK implementation of EN 1953:2013. It supersedes BS EN 1953:1998+A1:2009 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee MCE/3/8, Thermoprocessing equipment - Safety.

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

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

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Spritz- und Sprühgeräte für Beschichtungsstoffe - Sicherheitsanforderungen

This European Standard was approved by CEN on 19 July 2013.

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Foreword

This document (EN 1953:2013) 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of an identical text or by endorsement, at the latest by March 2014, and conflicting national standards shall be withdrawn at the latest by March 2014.

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 supersedes EN 1953:1998+A1:2009.

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

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

Compared with EN 1953:1998+A1:2009, the following changes have been made:

— the Scope has been limited to applicators with maximum pneumatic pressure < 15 bar;

— ATEX requirements have been integrated into the standard;

— safety requirements against ejection of fluids have been detailed for handheld applicators;

— testing requirements for mechanical strength have been revised.

This document is part of a series of standards related to safety of design and construction of machinery and systems for surface coating with organic materials (paints, varnishes and similar products).

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

Introduction

This European Standard is a type C standard as stated in EN ISO 12100:2010.

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

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

1 Scope

This European Standard deals with all significant hazards, hazardous situations and events which are relevant for both manual and automatic atomising and spraying equipment for application of coating materials on workpieces.

In this standard, the term “machine” is used equivalently to “atomising and spraying equipment” and “applicator”.

Together with this standard, EN 50050, EN 50059, EN 50176, EN 50177 or EN 50348 give requirements for electrostatic applicators.

The specific significant risks related to the use of this machinery with foodstuffs and pharmaceutical products are not dealt with in this standard.

This standard is only applicable to machinery which is used as intended. It also covers hazards arising from conditions which are reasonably foreseeable by the manufacturer.

Applicators can consist of the following parts:

— atomising or spraying system;

— trigger;

— filter;

— swivel joint;

— safety and control systems;

— non-pressurised gravity or siphon feed cup.

This European Standard is not applicable to:

— applicators designed for operating pneumatic pressure above 15 bar;

— non-atomising equipment (e.g. extruding equipment, dispenser);

— fluidised bed powder coating machinery;

— equipment for the automated application of flock;

— spray guns covered by EN 50580;

— supply hoses and ducts;

— high-pressure cleaner equipped with high pressure water jet machines according to EN 1829-1;

— airbrushes for graphic and artistic works;

— machinery for the supply and circulation of coating materials under pressure according to EN 12621;

— water-jet cutters;

— automated devices like robots or reciprocators (EN ISO 10218-1).

This standard is not applicable to machinery manufactured before the date of its publication as a European Standard.

2 Normative references

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

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

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

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

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

EN 50050, *Electrical apparatus for potentially explosive atmospheres — Electrostatic hand-held spraying equipment*

EN 50059, *Specification for electrostatic hand-held spraying equipment for non-flammable material for painting and finishing*

EN 50176, *Stationary electrostatic application equipment for ignitable liquid coating material — Safety requirements*

EN 50177, *Stationary electrostatic application equipment for ignitable coating powders — Safety requirements*

EN 50223, *Stationary electrostatic application equipment for ignitable flock material — Safety requirements*

EN 50348, *Stationary electrostatic application equipment for non-ignitable liquid coating material — Safety requirements*

EN 60079-0, *Explosive atmospheres — Part 0: Equipment — General requirements (IEC 60079-0, modified)*

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

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

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

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

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100:2010 and the following apply.

3.1
atomising equipment
applicator for liquid coating materials

3.2
spraying equipment
applicator for powder coating materials and flock

3.3
automatic atomising and spraying equipment
applicators which are not operated manually

3.4
fluid
liquid and/or gas

3.5
coating material
product, in liquid or powder form, that, when applied to a substrate, forms a film possessing protective, decorative and/or other specific properties

[SOURCE: EN ISO 4618:2006, 2.50]

Note 1 to entry: In general, coating materials consist of binders, pigments, dyestuff, fillers and other additives. Moreover, liquid coating materials can contain organic solvents and /or water.

Note 2 to entry: Coating materials are, for instance, paints, lacquers, varnishes, impregnating varnishes, paste fillers, filling materials, impregnating agents, anti-noise agents, fire resisting agents, stains, burnishes, adhesives, sealing compounds, as well as coating powders.

3.6
cleaning liquid
all liquids which can be used for cleaning and/or rinsing of applicators

Note 1 to entry: A distinction is made between aqueous and organic cleaning liquids.

Note 2 to entry: Cleaning liquids may consist of or contain organic solvents.

3.7
maximum working pressure
maximum admissible static or dynamic fluid pressure as defined by the manufacturer

3.8
hydraulic pressure

3.8.1
static hydraulic pressure
pressure of the liquid material without flow

Note 1 to entry: This includes flow through the nozzle and/or recirculation through the applicator.

3.8.2
dynamic hydraulic pressure
pressure of the liquid material under flow conditions

Note 1 to entry: This includes flow through the nozzle and/or recirculation through the applicator.

Note 2 to entry: The dynamic hydraulic pressure is reached shortly after having opened the valve.

Note 3 to entry: The dynamic hydraulic pressure depends on the installation and can vary temporarily.

3.9
pneumatic applicator
applicator for liquid coating materials which atomises the coating material after leaving the nozzle by charging it with air at high-speed

3.10
hydraulic applicator
applicator for liquid coating materials which atomises the material discharges from a nozzle at high liquid velocity and at high liquid pressure

Note 1 to entry: The corresponding process is generally referred to as “airless”.

3.11
hydraulic applicator combined with air
applicator in which atomisation and/or spray pattern shape is modified by the addition of air

3.12
components of applicators

3.12.1
nozzle
component through which liquid, powder or flock coating material is discharged

Note 1 to entry: The geometry of the nozzle influences the shape of the spray pattern.

3.12.2
air cap
component arranged around the nozzle in pneumatic applicator and hydraulic applicator combined with air

Note 1 to entry: The geometry of the air cap influences the degree of atomisation and the shape of the spray pattern.

3.12.3
horns
parts of the air cap projecting in the direction of the spray equipped with holes through which the air discharges and forms the spray pattern

3.13
routine test
test to which each individual device is subjected during or after manufacture to ascertain whether it complies with certain criteria

4 Hazards

Significant hazards are given in Table 1.

Table 1 — List of significant hazards

Hazard factors	Location or situation of the hazard	Specific requirements Applicable clauses of this standard	General requirements Applicable clauses of EN ISO 12100:2010
4.1 General	This clause contains all hazards, hazardous situations and events as far as they are dealt with in this document, identified by risk assessment significant for this type of machinery and which require action to eliminate or reduce the risk. NOTE EN ISO 12100:2010 contains information for the procedure of risk assessment.	5.1	4, 5, 6
4.2 Mechanical hazards			
4.2.1 Hazards by shearing, crushing, drawing-in	During actuation of the applicators.	5.2.1	6.2.2.2
4.2.2 Hazards related to inadequate mechanical strength	Caused by insufficient design and construction of fixing and joints between applicators and pressurised liquid supply hoses.	5.2.2	6.2.3, 6.2.10
4.2.3 Hazards by ejection of liquids	Caused by leakages at or bursting of the applicator. Caused by uncontrolled discharge (unintended actuation of the applicator) and injection into the body tissues. NOTE The injection hazard increases with rising hydraulic pressure, smaller distance to skin, greater nozzle diameter and smaller spraying angles also resulting from wear of the nozzle.	5.2.3	6.2.10
4.2.4 Hazards by ejection of material or other objects	Caused by inappropriate design and construction of the applicator and of the joint to the liquid supply hoses.	5.2.4	6.2.3, 6.2.10

Hazard factors	Location or situation of the hazard	Specific requirements Applicable clauses of this standard	General requirements Applicable clauses of EN ISO 12100:2010
4.3 Electrical hazards	Caused by direct or indirect contact of the operator with electrically live parts. Caused by electric shock caused by electrostatic discharges of energies > 350 mJ, for instance by flow friction of the coating material.	5.3	6.2.9
4.4 Thermal hazards	Caused by burns and/or scalds during handling the applicator, for instance: — during application of the heated coating material; — during use of heated pressurised air or steam; — due to leakage or bursting of the applicator.	5.4	6.2.8 c)
4.5 Noise hazards	Due to noise emissions (for instance resulting from flow or vibration) which can cause hearing loss and/or physiological effects.	5.5	6.2.2.3 6.2.3 c) 6.2.8 c) 6.3.2.1 b) 6.3.2.5.1 6.3.3.2.1 6.3.4.2
4.6 Explosion hazards	Caused by the generation of an explosive atmosphere due to concentrations equal or higher than the LEL during atomising or spraying of ignitable coating materials Caused by presence of an effective ignition source e.g. by electrostatic discharge, electrical sparks, hot surfaces.	5.6	6.2.4 6.3.3.2.1 6.4.4
4.7 Hazards by dangerous substances	Caused by contact with or inhalation of atomised coating and/or auxiliary materials occurring as aerosol, vapour or gas. Caused by absorption of coating materials and/or cleaning liquids.	5.7.1 5.7.2 5.2.3	6.2.2.3 6.2.3 b) 6.2.3 c) 6.3.3.2.1 6.3.4.4 6.4.5.1 g)
4.8 Hazards by lack of ergonomics	Caused by, for instance, too heavy equipment, inappropriate balance point, design of handle and trigger equipment not appropriate to shape of the hands, too high trigger force of manual applicator.	5.8	6.2.8 6.2.11.8 6.3.2.1 6.3.3.2.1

Hazard factors	Location or situation of the hazard	Specific requirements Applicable clauses of this standard	General requirements Applicable clauses of EN ISO 12100:2010
4.9 Hazards caused by malfunctions	Caused by unexpected discharge of coating materials after a short interruption in the supply, e.g. by nozzle blockage. Caused by uncontrolled discharge of coating materials due to e.g. malfunction of the trigger mechanism.	5.9 5.9.2 5.9.3	6.2.12.2 6.3.2.1
4.10 Hazards by failure of the control system		5.10	6.2.12.2 6.3.2.1
Hygiene	Not dealt with		

5 Safety requirements and/or measures

5.1 General

Applicators shall comply with the safety requirements and/or protective measures of this clause. In addition, applicators shall be designed according to the principles of EN ISO 12100:2010 for relevant but not significant hazards (for instance sharp edges), which are not dealt with by this standard.

5.2 Safety requirements against mechanical hazards

5.2.1 Crushing, shearing and pinching

The distances between movable and fixed parts of applicators shall be wide enough to prevent injuries of parts of the human body due to crushing or pinching.

5.2.2 Mechanical strength

Applicators, their fixing elements and the joints for pressurised liquid supply hoses shall be designed and constructed in such a way to withstand the arising forces.

External forces (e.g. by dropping atomising or spraying equipment, forces of the supply hoses), shall be taken into account for all applicators.

Additionally, the following forces shall be taken into account for applicators for liquid coating material:

— static hydraulic pressure,

— dynamic hydraulic pressure (e.g. oscillating supply system pressure),

— recoil forces during operation,

— vibrations.

Depending on the maximum working pressure, applicators for liquid coating material shall withstand the following test pressures given in Table 2:

Table 2 – Test pressures for applicators for liquid coating material

Maximum working pressure P	Working pressure test	Burst pressure test
P < 375 bar	1,2 times of the maximum working pressure	4 times of the maximum working pressure
375 bar ≤ P ≤ 750 bar		1 500 bar
750 bar < P		2 times of the maximum working pressure

5.2.3 Ejection of fluids (not for powder and flock applicators)

Hand-held applicators shall be designed in such a way that, in case of releasing the trigger a further hazardous release from the applicators of fluids is prevented.

The trigger return mechanism of applicators shall be designed to close at 1,2 times of the maximum working pressure.

For adjustable applicators designed for operating hydraulic pressure above 10 bar, the trigger return mechanism shall close at maximum working pressure in all adjustment positions.

Hand-held applicators with hazards of penetrating of coating materials going under the skin shall be equipped with - depending on the maximum working pressure - the protective devices given in Table 3:

Table 3 – Protective devices for hand-held applicators

<table>
<tr><th>Protective measure</th><th colspan="3">Maximum hydraulic working pressure P</th></tr>
<tr><th></th><th>$P \leq 10$ bar</th><th>10 bar < $P \leq 50$ bar</th><th>$P > 50$ bar</th></tr>
<tr><td>Trigger lock for locking the trigger and/or the fluid needle preventing an unintended actuation</td><td>No</td><td>Yes
in case of Hydraulic applicator and Hydraulic applicator combined with air
No
in case of Pneumatic applicator</td><td>Yes</td></tr>
<tr><td>Trigger guard for protection against unintended actuation of the trigger. The trigger guard shall be
— an integral part of the equipment necessary for operation;
A part of the fluid supply line may be used as a trigger guard.
or
— only be dismountable with tools.</td><td>No</td><td colspan="2">Yes</td></tr>
<tr><td>Nozzle guard, preventing hazardous proximity to body tissue as far as possible.
The nozzle guard shall
— ensure a axial distance between body tissue and discharge point of the nozzle of more than
— be an integral part of the equipment necessary for operation,
— have a minimum radial distance and not cause excessive contamination.</td><td>No</td><td colspan="2">Yes
in case of flat jet nozzles
in case of round jet nozzles
No
in case of round jet nozzles if risk assessment indicates no injection hazard
8 mm
NOTE This requirement can be satisfied by the design and construction of the horns.</td></tr>
<tr><td></td><td></td><td></td><td>25 mm</td></tr>
</table>

5.2.4 Safety requirements against hazards of ejection of material or objects

Applicators shall be designed and constructed in such a way that hazards of ejection of fluids or objects are reduced to a minimum.

Pneumatic and hydraulic joints shall not be interchangeable.

Joints to pressurised hydraulic supply hoses of applicators:

— shall only be detachable with tools; or

— shall be self-closing.

Filter which can be released manually shall not be detachable under working pressure.

Pneumatic connectors shall comply with EN ISO 4414.

References for safe releasing of hoses and filters shall be given in compliance with Clause 7.

5.3 Safety requirements against electrical hazards

Applicators shall be equipped with a connection to dissipate static electricity via grounding terminal. The connection between applicators and ground terminal shall have a resistance of ≤ 1MΩ.

NOTE The connection can be made via the pneumatic or hydraulic hose connection.

Hand-held electrostatic applicators shall satisfy the requirements of EN 50050 or EN 50059.

Automatic electrostatic applicators shall satisfy the requirements of EN 50176, EN 50177, EN 50223 or EN 50348.

Electrical elements (e.g. digital displays, heating systems, initiators) shall satisfy the requirements of EN 60204-1.

5.4 Safety requirements against thermal effects

Protection against burns on hot surfaces shall be ensured by appropriate insulation of touchable parts of applicators which can be reached during normal operation.

Hand-held applicators shall be designed to prevent the surface temperature of handle and trigger exceeding 43 °C as indicated in EN ISO 13732-1. Technical means to fulfil this requirement are for example

— sufficient distance between material supply and handle,

— use of insulating materials.

For areas which shall be touched for adjustment or maintenance, a contact time of 4 s shall be used to determine the relevant maximum surface temperatures for the different materials according to EN ISO 13732-1.

If a contact with surfaces heated to temperatures which are higher than those indicated in EN ISO 13732-1 cannot be prevented, reference to the use of protective clothing shall be given. The requirements for the protective clothing shall be indicated in the information for use (see Clause 7).

5.5 Safety requirements against noise

Applicators shall be designed and constructed to minimise hazards due to noise emissions, considering the technical progress and available means for noise reduction, especially at the source.

Noise emission values shall be given in the information for use in compliance with EN 14462; see Clause 7.

NOTE 1 Noise reduction measures are relevant for the following equipment, especially: Pneumatic applicator, hydraulic atomising equipment combined with air and rotary atomisers.

NOTE 2 EN ISO 11688-1 includes general technical information, generally accepted technical rules and means for design and construction of low-noise machinery.

NOTE 3 EN ISO 11688-2 contains information related to generation of noise in machinery, plants and systems.

5.6 Safety requirements against explosion hazards

5.6.1 General

Applicators intended for use in potentially explosive atmosphere shall be assessed according to EN 13463-1. The applicators shall comply with the requirements of EN 13463-1 and EN 13463-5.

The ignition hazard assessment according to EN 13463-1 may also lead to the result that no potential ignition source is present. Applicators without potential ignition source need not comply with the requirements dealing with explosion protection.

NOTE 1 Plastic feed cups with volumes less than 1,5 l are not electrostatically charged to a hazardous level during operation as foreseen by the manufacturer.

Category 3 applicators shall be designed and manufactured to prevent foreseeable ignition sources which can occur during normal operation.

Category 2 applicators shall be designed and manufactured to prevent ignition sources during frequently occurring failures of equipment or during faulty operating conditions which can generally be expected.

NOTE 2 Complete definitions of Category 2 and Category 3 equipment are indicated in EN 13463–1.

5.6.2 Thermal ignition sources

Applicators shall be constructed to prevent ignitions of explosive atmospheres by hot surfaces (see EN 13463-1).

Heating systems of applicators shall:

— be designed to safely prevent a heating of the applicators above the maximum surface temperature; or

— be equipped with temperature limiting devices which safely prevent a heating of the applicators above the maximum surface temperature.

5.6.3 Electrostatic ignition sources

Applicators shall be equipped with a connection to dissipate static electricity via grounding terminal. The connection between applicators and ground terminal shall have a resistance of ≤ 1MΩ.

NOTE The connection can be made via the pneumatic or hydraulic hose connection.

Hand-held electrostatic applicators shall comply with the requirements for ignition protection of EN 50050.

Automatic electrostatic applicators shall comply with the requirements for ignition protection of EN 50176, EN 50177 or EN 50223.

5.6.4 Electrical ignition sources

Electrical parts and components (digital displays, heating devices, initiators etc.) shall comply with the requirements of EN 60079-0.

5.6.5 Material ignition sources

Construction materials shall be selected to not cause potential reactions or explosion hazards in specific cases (e.g. the combination of aluminium with coating materials or cleaning liquids containing halogenated hydrocarbons under pressure).

Further requirements for materials are given in EN 13463-1.

5.7 Safety requirements against hazards due to dangerous substances

5.7.1 Measures against contact with or absorption of coating materials or cleaning liquids

Applicators shall be designed and constructed to minimise hazards due to contact with or absorption of coating materials or cleaning liquids by the following measures:

— design of seals to prevent leakages,

— construction of joints to pressurised liquid supply hoses according to 5.2.4.

For hand-held applicators, contamination of operators due to the spray jet and aerosols in the breathing zone shall be reduced to a minimum.

NOTE Suitable measures are, for instance:

— sufficient distance between nozzle and trigger,

— function to optimise spray parameters to reduce contamination.

Information for operation shall be given in accordance with Clause 7.

5.7.2 Measures against inhalation of aerosols and solvent vapours

Information on appropriate working environment and on recommended personal protective equipment shall be given in accordance with Clause 7.

NOTE The formation of aerosols and solvent vapours cannot be avoided by design and construction of applicators within the framework of the intended use.

5.8 Ergonomic requirements

During construction of hand-held applicators the following shall be taken into account:

— weight and centre of gravity of the applicators;

— ergonomic construction of handle and trigger;

— usability with gloves;

— triggering force (see EN 614-1).

5.9 Safety requirements against malfunction

5.9.1 General

Applicators shall be designed and constructed to avoid hazards due to malfunction as far as possible.

Information on proceedings in case of malfunction shall be given in accordance with Clause 7.

5.9.2 Measures against blocking of the trigger

The trigger resets of applicators shall be constructed in accordance with the forces and pressures occurring during operation. The following aspects shall for example be considered:

— failure of the return spring;

— wearing of seals;

— contamination at moving parts.

5.9.3 Blockage of the nozzle

The nozzle sizes shall be designed to comply with the intended coating materials and the material throughput.

To remove blockage of the nozzle, reversible nozzles are recommended for airless devices.

Information on permissible nozzles shall be given in accordance with Clause 7.

5.10 Control systems

If applicators interchange safety-related signals or settings with upstream or downstream system parts, interfaces for safe exchange of signals shall be present.

For safety related functions dealing with hazards related to electrostatically supported atomising and/or spraying equipment, see EN 50176, EN 50177, EN 50223 or EN 50348.

The performance level of safety functions dealing with other hazards shall be determined according to EN ISO 13849-1.

6 Verification of the safety requirements

6.1 General

Verification of the safety requirements listed in Clause 5 is done by testing, calculation, inspection or other procedures which are listed in the following subclauses.

Verification of the safety requirements and or measures shall be carried out prior to placing on the market.

All tests are type tests unless specified differently.

6.2 Verification of mechanical safety requirements

6.2.1 Verification of the safety requirements relating to crushing, shearing or trapping

Verification of the safety requirements relating to crushing, shearing or trapping shall be checked by visual examination and functional test.

6.2.2 Verification of mechanical strength requirements

6.2.2.1 General

Verification of the mechanical strength requirements shall be checked by visual examination and functional test. Independent circuits can be tested individually with the relevant test pressure for each circuit.

6.2.2.2 Working pressure test

The working pressure test is a routine test.

The resistance to maximum working pressure of all parts of the applicators shall be verified by a working pressure test with subsequent functional test.

The test pressure shall not lead to deformation, leakage or other failures of the equipment. The applicators shall function as intended after the working pressure test.

6.2.2.3 Burst pressure test

The resistance to burst pressure of all parts of the applicators, except for the seals, shall be verified by a type test.

For the burst pressure test:

— equipment for the prevention of overpressure during operation (e.g. safety valves, shear bolts) shall be replaced by components which at least resist the maximum test pressure,

— the material valve may be blocked.

The burst pressure shall be maintained for 3 min.

The burst pressure test is passed, if there is no leakage.

6.3 Verification of electrical safety requirements

The resistance to earth shall be determined by measurement.

Electrostatic applicators shall be tested in accordance with the specific requirements in EN 50050, EN 50059, EN 50176, EN 50177, EN 50223 or EN 50348.

6.4 Verification of thermal safety requirements

The surface temperature shall be determined by measurement.

6.5 Verification of safety requirements relating to noise hazards

Determination, indication and inspection of the airborne noise emission values of applicators shall be carried out in accordance with EN 14462.

6.6 Verification of safety requirements relating to explosion hazards

6.6.1 General

Verification of the electrical and non-electrical equipment with the corresponding categories for the ignition protection type shall be checked prior to placing on the market.

6.6.2 Verification of protective measures for the prevention of thermal ignition sources

Measures for prevention of hot surfaces shall be checked by a functional test of the temperature limiting device and by measuring the temperature.

6.6.3 Verification of protective measures for the prevention of electrostatic ignition sources

The resistance to earth is determined by measurement.

Electrostatic applicators shall be tested in accordance with the specific requirements in EN 50050, EN 50176, EN 50177 or EN 50223.

6.6.4 Verification of protective measures for the prevention of electrical ignition sources

Applicators equipped with electrical elements shall be tested in accordance with EN 60079-0.

6.7 Verification of safety requirements relating to hazards caused by dangerous substances

The efficiency of the measures against contact with or the absorption of coating material or cleaning liquids shall be verified by visual examination and functional test.

6.8 Verification of ergonomic requirements

Compliance with the ergonomic requirements shall be checked by visual examination and functional test.

6.9 Verification of safety requirements relating to malfunction

The trigger return mechanism of the applicators shall be checked for function.

6.10 Verification of safety requirements relating to malfunction of the control system

Compliance with the requirements for the control system shall be checked in accordance with EN ISO 13849-1.

7 Information for use

7.1 General

The manufacturer shall provide information for use for all applicators.

The information for use shall comply with the requirements in Clause 6, especially 6.5 “Operating instructions” and 6.4 “Marking” of EN ISO 12100:2010.

The accompanying documents of all applicators shall include instructions in the official language(s) of the member state in which the machine is placed on the market and/or commissioned.

The instructions included in the accompanying documents of the applicators shall either be “original instructions” or “translations of the original instructions”; translations shall also include the original instructions.

The information for use shall contain data on installation, commissioning and use, together with advice on the general maintenance of the applicator and the intended use specified by the manufacturer.

7.2 Instructions for use

7.2.1 General

The instructions for use shall at least contain the following data:

a) detailed description of the applicators and its safety devices;

b) description of the intended use and suitable liquids;

c) noise emission values in accordance with EN 14462;

d) if applicable data on vibrations likely to be caused by the applicators. The test method used including measurement setup shall be stated;

e) for applicators intended for use in potentially explosive atmosphere, the information according to EN 13463-1:2009, 9.2;

f) advice on decommissioning, disassembly and safe disposal.

7.2.2 Information on installation

The following advice shall at least be given:

a) connection to the material and energy supply;

b) requirements for the appropriate working environment (e.g. forced ventilation);

c) required grounding measures (e.g. dissipative air or material supply hoses, dissipative floor, grounding of automatic applicators via holding device);

d) if applicable, requirements for the installation of explosion protected applicators in explosive areas.

7.2.3 Information on operation

The following advice shall be given:

a) instructions for safe operation (e.g. nozzle exchange, cleaning, filter exchange, setting of the spraying parameters);

b) requirements for the operators (e.g. training, instruction);

c) instructions for protective measures to be taken by the user, including personal protective equipment to be provided (e.g. respiratory protective equipment, protective clothing, dissipative gloves or shoes);

d) advice for proceedings in case of presumable blockage and failures (e.g. blockage of the nozzle);

e) warning notices concerning:

   1) hazards due to injection of coating material or cleaning liquid (e.g. during nozzle exchange or cleaning activities). Expected effects of an injection shall be stated (e.g. necroses, loss of extremities); advice to seek special medical care shall be given;

   2) hazards caused by the formation of an explosive atmosphere in combination with ignition sources during operation, maintenance and cleaning;

   3) hazards due to puncture injuries (e.g. high voltage electrodes of electrostatic applicators);

   4) hazards due to hot surfaces; advice on the recommended longest contact time (see EN ISO 13732-1) shall be given;

   5) hazards by inhalation, contact or absorption of coating material or cleaning liquids, e.g. caused by:

      i) insufficient forced or natural ventilation,

      ii) inappropriate atomising pressure,

iii) poor optimisation of spray parameters to reduce contamination,

iv) missing personal protective equipment,

v) inappropriate distance between applicators and workpiece, including advice on the dependency of the distance from the coating material,

vi) inhalation of solvent vapours or other hazardous substances,

vii) foreseeable misuse (e.g. connection to wrong pump, use with unsuitable or hazardous liquids).

7.2.4 Information on maintenance and inspection

The following advice shall be given if applicable:

a) putting the applicators into a safe state for servicing and maintenance (e.g. disconnect pressure, trigger protection);

b) information on safe release of hoses and filters;

c) advice for control and exchange of nozzles, filters and seals;

d) information on necessary cleaning activities, disposal of the residual coating material in appropriate time intervals;

e) advice for maintenance of heating systems;

f) information on regular testing of grounding;

g) information on the spare parts to be used, if they may have negative effects on health and safety of the operator;

h) requirements for the training of the servicing and maintenance staff.

7.3 Marking

The following information shall be provided for applicators:

— name and address of the manufacturer and, where applicable, the authorised representative,

— designation of the applicators,

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

— maximum hydraulic working pressure,

— maximum pneumatic working pressure,

— designation of the series of applicators,

— serial number (if any), and

if applicable,

— highest temperature of the coating material used and / or the compressed air,

— the maximum surface temperature of the spraying or applicators (see EN ISO 13732-1),

— maximum bell speed of rotary atomisers.

In addition, for electrostatically supported applicators, marking in accordance with EN 50050, EN 50059, EN 50176, EN 50177, EN 50348 shall be provided.

In addition, for non-electrostatical supported applicators with own potential ignition source, designed for use in explosive atmospheres, the following shall be provided:

— the symbol  to inform that the applicator has an own potential ignition source and is designed, tested and confirmed for use in Zones with potentially explosive atmospheres;

— if applicable, the name or mark of the responsible notified body and reference to the test certificate;

— explosion group (“II”) followed by;

— the equipment category of the work equipment (2 or 3) followed by;

— the sign for the “type of explosion protection” (“G” or “D”) followed by;

— the maximum surface temperature T as temperature value in °C;

— if special conditions for safe use apply, the symbol “X” shall be used. A warning marking giving appropriate instructions can be used as an alternative to the requirement for the “X” marking.

On very small equipment where there is limited space, a reduction in the marking is permitted and all other marking may be given on the packaging and the accompanying documents, but at least the following information is required on the equipment itself:

a) name or registered trade mark of the manufacturer,

b) Ex marking if appropriate:

   1) symbol of the type of protection,

   2) symbol “X” if appropriate.

Annex ZA
(informative)

Relationship of this European Standard and the Essential Requirements of the EU Directive 2006/42/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission to provide one means of conforming to Essential Requirements of the 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 corresponding Essential Requirements (except Essential Requirements 2.1) 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.

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 Machinery 94/9/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 of that Directive and associated EFTA regulations.

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	1.0 General requirements 1.2.1 Design and construction 1.2.2 Design and construction
5.6.1	1.3.1 Hazards arising from different ignition sources
5.6.2	1.3.2 hazards arising from static electricity
5.6.3	1.3.3 Hazards arising from stray electricity and leakage currents
5.6.4	1.1 Selection of materials
7.2.2	1.0.6 Instructions
7.3	1.0.5 Marking

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

Bibliography

[1] EN 1829-1, *High pressure water jet machines — Safety requirements — Part 1: Machines*

[2] EN 12621, *Machinery for the supply and circulation of coating materials under pressure — Safety requirements*

[3] EN 50580, *Safety of hand-held electric motor operated tools — Particular requirements for spray guns*

[4] EN ISO 4618:2006, *Paints and varnishes — Terms and definitions (ISO 4618:2006)*

[5] EN ISO 10218-1, *Robots and robotic devices — Safety requirements for industrial robots — Part 1: Robots (ISO 10218-1)*

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

[7] EN ISO 11688-2, *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)*

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