



SLOVENSKI STANDARD

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Postroji za premaze in prevleke – Kabine za nanašanje tekočih organskih snovi – Varnostne zahteve

Coating plants - Spray booths for application of organic liquid coating materials - Safety requirements

Beschichtungsanlagen - Spritzkabinen für flüssige organische Beschichtungsstoffe - Sicherheitsanforderungen

Installations d'application - Cabines d'application par pulvérisation de produits de revêtement organiques liquides - Prescriptions de sécurité

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EUROPEAN STANDARD

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Coating plants - Spray booths for application of organic liquid coating materials - Safety requirements

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Beschichtungsanlagen - Spritzkabinen für flüssige organische Beschichtungsstoffe - Sicherheitsanforderungen

This European Standard was approved by CEN on 10 September 2004.

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Foreword

This document (EN 12215:2004) 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of an identical text or by endorsement, at the latest by May 2005, and conflicting national standards shall be withdrawn at the latest by May 2005.

This document is one of a set of standards devoted to the health and safety requirements of coating plants for the application and drying of organic liquid coating material and varnishes.

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-directives.

NOTE Although a spray booth, as an integral whole, formally does not fall under the scope of the ATEX Directive 94/9/EC, the standard is based upon a fundamental risk analysis according to this directive.

For relationship with EU Directives, see informative annex ZA, which is an integral part 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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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Introduction

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

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

When provisions of this type C standard are different from those which are stated in type 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.

The specific requirements which manufacturers are included in the information for use are given in clause 7.

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1 Scope

This document is applicable to spray booths as well as multizone spray booths for the application of organic liquid coating materials (paints, varnishes...), and deals with all significant hazards relevant to spray booths or multizone spray booths, when they are used as intended and under the conditions foreseen by the manufacturer (see clause 4).

A spray booth is an assembly of the following linked components: forced ventilation by one or more fans; dry air filtering and/or wet air washing systems, measuring and control devices, ventilation air heating system, automatic fire extinguishing equipment, warning devices, electrical apparatus, joined together within or at a partially or totally enclosed structure (limited by walls, called space) for the controlled processing of spray application of organic liquid coating material.

NOTE 1 Spray booths are classified in annex G.

This standard describes methods of verification of safety measures, information labels to be affixed to the spray booth and minimum usage requirements contained within the operators handbook.

This standard does not cover:

- spraying areas (spaces for application of organic liquid coating materials which are limited only by one side wall used for extraction of exhaust ventilation).
- combined spray booths according to definition given in 3.2;

NOTE 2 See prEN 13355.

- the limiting walls of spray booths if they are constituent parts of a building are not to be considered part of the machinery assembly;
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- the workroom or building used for the spraying of large size items (example: air-liner);
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- spraying equipment used in spray booths which is covered by EN 1953, EN 50050, and EN 50176.
- Spray booths which are part of complex installations.

NOTE 3 complex installations may include additional hazards.

This standard is not applicable to spray boots which are manufactured before the date of publication of this standard by CEN.

EN 12215:2004 (E)

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 525, *Non-domestic direct gas-fired forced convection air heaters for space heating not exceeding a net heat input of 300 kW.*

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

EN 746-1, *Industrial thermoprocessing equipment — Part 1: Common safety requirements for industrial thermoprocessing equipment.*

EN 746-2, *Industrial thermoprocessing equipment — Part 2: Safety requirements for combustion and fuel handling systems.*

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, *Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics.*

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

EN 1070:1998, *Safety of machinery — Terminology.*

EN 1088, *Safety of machinery — Interlocking devices associated with guards — 4-Principles for design and selection.*

EN 1127-1:1997, *Explosive atmospheres — Explosion prevention and protection — Part 1: Basic concepts and methodology.*

EN 1838, *Lighting applications — Emergency lighting.*

EN 1953, *Atomising and spraying equipment for coating materials — Safety requirements.*

EN 13463-1:2001, *Non-electrical equipment for 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 13478, *Safety of machinery — Fire prevention and protection.*

prEN 14986, *Design of fans working in potentially explosive atmospheres.*

EN 50015, *Electrical apparatus for potentially explosive atmospheres — Oil immersion "o",*

EN 50016, *Electrical apparatus for potentially explosive atmospheres — Pressurised apparatus "p".*

EN 50017, *Electrical apparatus for potentially explosive atmospheres — Powder filling "q".*

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

EN 50176, *Automatic electrostatic spraying installations for flammable liquid spraying material.*

- EN 60079-0, *Electrical apparatus for explosive gas atmospheres - Part 0: General requirements* (IEC 60079-0:2004).
- EN 60079-1, *Electrical apparatus for potentially explosive atmospheres - Part 1: Flameproof enclosure "d"* (IEC 60079-1:2003).
- EN 60079-7, *Electrical apparatus for explosive gas atmospheres - Part 7: Increased safety "e"* (IEC 60079-7:2001).
- EN 50020, *Electrical apparatus for potentially explosive atmospheres — Intrinsic safety "i"*.
- EN 60079-15, *Electrical apparatus for explosive gas atmospheres - Part 15: Type of protection "n"* (IEC 60079-15:2001, modified).
- 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).
- EN 60079-25, *Electrical apparatus for explosive gas atmospheres - Part 25: Intrinsically safe systems* (IEC 60079-25:2003).
- 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 ISO 3746, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane* (ISO 3764:1995).
- EN ISO 4871, *Acoustics — Declaration and verification of noise emission values of machinery and equipment* (ISO 4871:1996).
- EN ISO 11202, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at the work station and at other specified positions — Survey method in situ* (ISO 11202:1995).
- EN ISO 12100-1:2003, *Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology* (ISO 12100-1:2003).
- EN ISO 12100-2:2003, *Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles* (ISO 12100-2:2003).
- EN ISO 14122-2, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways* (ISO 14122-2:2001).
- EN ISO 14122-3, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails* (ISO 14122-3:2001).
- EN ISO 14122-4, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders* (ISO 14122-4:2004).

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3 Terms and definitions

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

3.1

spray booth

assembly of linked components such as forced ventilation by one or more fans; dry air filtering and/or wet air washing systems, measuring and control devices (e.g. interlocking of forced ventilation and spraying device), ventilation air heating system (e.g. burner), automatic fire extinguishing equipment, warning devices, electrical apparatus, joined together within or at a partially or totally enclosed structure (limited by walls, called space) for the controlled processing of spray application of organic liquid coating material

3.1.1

enclosed spray booth (see annex G – Figures G.1 and G.3)

spray booth enclosed on all sides during spray process except the openings for ingress and egress of workpieces and ducts for ventilation

3.1.2

open top spray booth (see annex G - Figure G.2)

spray booth enclosed on all sides during spray process except the top entrance side for ventilation air, the openings for ingress and egress of workpieces and ducts for exhaust ventilation

3.1.3

open fronted spray booth (see annex G – Figure G.4)

spray booth enclosed on all sides during spray process except openings provided in the side walls for ingress and egress of workpieces and ducts for exhaust ventilation. The open front side is used as entrance of ventilation air and access for operator

3.2

combined spraying and drying booth

assembly of linked components such as fan(s), ventilation air heating system (e.g. heat exchanger or burner), power driven dampers, forced ventilation ducting, dry air filtering and/or wet air washing systems, automatic fire extinguishing equipment and additional specific electrical equipment, control and power circuits joined together for the spraying and drying process of liquid coating material in a space totally enclosed provided with a forced ventilation

NOTE The combined booth can be provided with a working pit.

3.3

organic liquid coating material

organic product, in liquid form, that when applied to a substrate forms a film possessing protective, decorative and/or other specific technical properties, e.g. paints, varnishes, including their solvents and thinners (see EN 971-1)

3.4

binder

non-volatile part of the medium which forms the film (see 1.6 of EN 971-1:1996)

3.5

solvent

single liquid, or blends of liquid, volatile under specified drying conditions, and in which the binder is completely soluble (see 1.4.5 of EN 971-1:1996)

NOTE Solvents are also contained in liquids used as cleaning or washing agents.

3.6

application

action of putting organic liquid coating material on a substrate so that it adheres to the surface to be coated

3.7**spray processes**

atomisation of liquid organic coating materials by different means

3.7.1**pneumatic process**

sprayed organic coating material by a flow of compressed air

3.7.2**airless or under hydrostatic pressure processed**

sprayed organic coating material through a suitable nozzle under high pressure

3.7.3**combined process**

combination of several processes such as hydrostatic pressure associated with compressed air

3.7.4**electrostatic process**

sprayed organic coating material electrostatically charged and attracted by the surface of the earthed workpiece

3.8**flammable (combustible) substance**

substance in the form of gas, vapour, liquid, solid or mixtures of these, able to undergo an exothermic reaction with air when ignited (see 3.1 of EN 1127-1:1997)

NOTE "Combustible materials" and "flammable substances" are equivalently used terms in this standard. Examples are paint aerosols and solvents.

3.9**drying**

evaporation of liquids from the materials being processed (see 3.5 of EN 1539:2000)

3.10**forced ventilation**

air circulation achieved by one or several fans

3.11**fresh air**

air drawn from a clean source inside or outside the building into the spray booth

3.12**circulated air**

air extracted from the volume and reintroduced into it

NOTE In this standard, the volume is the spray booth.

3.13**explosive atmosphere**

mixture with air, under atmospheric conditions, of flammable substance(s) in the form of gas, vapour, mist or dust, in which after ignition has occurred, combustion spreads to the entire unburned mixture (see 3.17 of EN 1127-1:1997)

3.14**lower explosion limit (LEL)**

lower limit of explosion range (see 3.8 and 3.13 of EN 1127-1:1997)

NOTE "Explosion limit" and "Ignition limit" are equivalent. In accordance with international usage, only the term "Explosion limit" is used in this standard.

3.15**exposure limits**

concentration limits of hazardous substances in air required by worker health legislation

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NOTE Limits are different according to the countries (see annex F).

3.16**hazardous areas**

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

Limit of hazardous zones are given in annex A

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 (see 6.3.2 of EN 1127-1:1997)

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 (see 6.3.2 of EN 1127-1:1997)

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 (see 6.3.2 of EN 1127-1:1997)

3.17**Equipment category**

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3.17.1**Equipment Group II Category 1**

equipment in this category is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists are present continuously for long periods or frequently (see 3.2.3 of EN 13463-1:2001)

NOTE Equipment of category 1 is suitable for use in zone 0.

3.17.2**equipment Group II Category 2**

Equipment in this category is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists are likely to occur (see 3.2.4 of EN 13463-1:2001)

NOTE Equipment of category 2 is suitable for use in zone 1.

3.17.3**Equipment Group II Category 3**

equipment in this category is intended for use in areas in which explosive atmospheres cause by mixtures of air and gases, vapours or mists are unlikely to occur, or, if they do occur, are likely to do so only in frequently and for a short period only (see 3.2.5 of EN 13463-1:2001)

NOTE Equipment of category 3 is suitable for use in zone 2.

3.18**pit**

ground excavation covered or open. For example a suction pit

3.19**working pit**

ground excavation, illuminated and ventilated in which the operator works while painting the underside of an item

3.20**multizone spray booth**

spray booth including a number of sections for manual and/or automatic spraying and forced ventilated flash off space

NOTE In flash off spaces no spraying takes place.

4 List of significant hazards

4.1 General

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

NOTE 1 Examples for classifications are given in annex G.

NOTE 2 Hazards can occur from combinations of ancillary equipment (e.g. atomising and spraying equipment, paint heaters, pumps, pipes for coating materials, robots, reciprocators, conveyors, platforms) and other parts of the spray booth.

4.2 Mechanical hazards

4.2.1 Shearing, crushing and drawing-in hazards

These hazards may occur especially in spray booths for automatic spraying equipment/systems, e.g. by means of:

- unexpected actuation of conveyor (during maintenance);
- fans and automated damper adjusters (e.g. injuries caused by over-running of fan blades during maintenance);
- moving parts of the spray booth (e.g.: doors, gates);
- installed automatic spraying equipment or system (e.g.: spraying reciprocator, atomising and spraying system and revolving tables for workpieces).

4.2.2 Entrapment hazard

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This hazard can occur, for instance: [c0c3fab494fb/sist-en-12215-2005](https://standards.iteh.ai/catalog/standards/sist/8e69ba56-99dd-4677-b78d-c0c3fab494fb/sist-en-12215-2005)

- when obstacles or obstructions can impede a quick evacuation by the operator(s) from the spray booth in case of mechanical accident or fire;
- when there is an accidental significant lowering of pressure inside an enclosed spray booth (i.e.: obstruction of air inlet) capable:
 - of clamping the doors by mechanical deformation of the structure of the spray booth;
 - to increase the door opening effort beyond human capability.

4.2.3 High pressure fluid ejection hazards

Such hazard can occur, for instance, in case of the failure of high pressure equipment.

4.2.4 Personnel's slip, trip and fall hazards

Such hazards can occur, for instance:

- on gangways, platforms, ladders and stairs within the spray booth;
- on gratings at floor level;
- on ground rendered slippery from paint deposits or other substances;
- falling down into the working pit of the spray booth.

These hazards may be increased as a result of poor lighting.

EN 12215:2004 (E)**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 electrostatic 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 Thermal hazards

Such hazards can for instance be generated by:

- contact with hot surfaces;
- fire or explosions (see 4.7.1. and 4.7.2. specific to these hazards);
- hot spraying systems.

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4.5 Hazards generated by noise (standards.iteh.ai)

These hazards may occur inside and outside the spray booth.

They can be generated by noises emitted for instance by:

- fans;
- excessive air velocity in ducts and accessories;
- wet air washing systems;
- air operated equipment (nozzles of atomising and spraying equipment, pumps, valves, etc.).

Noise hazards are only partly dealt with. They will be fully covered in a future revision of the standard.

4.6 Hazards resulting from dangerous substances**4.6.1 Hazards resulting from contact with/or absorption of organic liquid coating materials**

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.

4.6.2 Hazards resulting from inhalation of organic liquid coating materials

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

4.6.3 Hazards resulting from inhalation of gases

Such hazards can be generated by inhalation of toxic gases released by the heating device (heating gases, gases from combustion).

4.6.4 Hazards resulting from inhalation of gases and vapours

Such hazards can be generated by inhalation of dangerous gases and vapours emitted by automatic fire extinguishing equipment.

4.7 Fire and explosion hazards

4.7.1 Fire hazards

Such hazards can be generated by, e.g.:

- ignition of flammable paint and varnish deposits inside the spray booth, in exhaust ducts and filtration units;
 - when the spray booth is in operation a misuse or mechanical or electrical defects can cause ignition of these deposits. This is especially valid in electrostatic spray booths;
 - in maintenance operations requiring use of cutting or welding tools, energy released can also initiate a combustion;
- The fast propagation of fire induces a risk for the neighbouring areas.
- failure of liquid coating material or solvent or combustible liquid pipes or fittings with exit of flammable liquids inside the spray booth;
- ignition of cleaning rags containing solvents;
- auto-ignition created from chemical reactions between different types of liquid coating materials;
- electrostatic equipment, badly driven items or control system malfunction causing electric arcs between items to be painted and machinery parts at high voltage. Hence electric arcs can provoke the ignition of the paint aerosol. This can especially occur in plant using robots or automated machines;
- heating devices capable of igniting solvents.

- NOTE Examples of ignition sources are: [SIST EN 12215:2005](https://standards.iteh.ai/catalog/standards/sist/8e69ba56-99dd-4677-b78d-c0c3fab494fb/sist-en-12215-2005)
- hot surfaces e.g. of heating systems and electrical equipment;
 - sparks created by mechanically induced energy e.g. fans, conveyors, etc.;
 - electrostatic discharges;
 - electrical sparks;
 - welding and other sources of thermal energy used during maintenance and cleaning.

4.7.2 Explosion hazards

Such hazards can occur when the concentration of the flammable substances in air exceeds the lower explosion limit (*LEL*) and if an effective ignition source is present.

- NOTE 1 Examples of flammable substances which increase concentration above the normal:
- solvent vapours from the flash off process;
 - gases from fuels and/or product by the combustion of the heating system;
 - gases released from deposits;
 - combustible heating gases;
 - solvent vapours from any leakage from broken pipes or fittings;
 - cleaning fluids;
 - solvent vapours from recirculating process in automatic spraying booth.

NOTE 2 Examples of sources of ignition see NOTE of 4.7.1.