

STN	Striekacie kabíny na organický povlakový materiál Bezpečnostné požiadavky	STN EN 16985 82 4004
------------	--	--

Spray booths for organic coating material - Safety requirements

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 05/19

Obsahuje: EN 16985:2018

Oznámením tejto normy sa ruší
STN EN 12215+A1 (82 4004) z februára 2010

STN EN 12981+A1 (82 4003) z októbra 2009

STN EN 13355+A1 (82 4005) z októbra 2009

128241

EUROPEAN STANDARD

EN 16985

NORME EUROPÉENNE

EUROPÄISCHE NORM

December 2018

ICS 87.100

Supersedes EN 12215:2004+A1:2009, EN
12981:2005+A1:2009, EN 13355:2004+A1:2009

English Version

Spray booths for organic coating material - Safety requirements

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

Lackierkabinen für organische Beschichtungsstoffe - Sicherheitsanforderungen

This European Standard was approved by CEN on 15 March 2018.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

EN 16985:2018 (E)

Contents	Page
European foreword	6
1 Scope.....	8
2 Normative references.....	9
3 Terms, definitions, variables and abbreviations	11
3.1 Terms and definitions.....	11
3.2 Variables	15
3.3 Abbreviations.....	17
4 Safety requirements and/or -measures	18
4.1 General.....	18
4.2 Mechanical.....	18
4.2.1 Moving or rotating elements	18
4.2.2 Falling objects	18
4.2.3 Height from the ground	19
4.2.4 Slippery surface.....	19
4.3 Electrical	19
4.4 Thermal.....	19
4.5 Noise	19
4.6 Radiation.....	20
4.7 Contact with and inhalation of hazardous material.....	21
4.7.1 General.....	21
4.7.2 Automatic application.....	22
4.7.3 Manual application.....	22
4.8 Fire	26
4.8.1 General.....	26
4.8.2 Spray booth construction.....	27
4.8.3 Filter media.....	27
4.8.4 Fire detection	27
4.8.5 Fire extinguishing equipment.....	28
4.9 Explosion.....	28
4.9.1 General.....	28
4.9.2 Spray booth for liquid coating material.....	29
4.9.3 Spray booth for powder coating material.....	31
4.10 Safety devices and control systems.....	34
4.11 Trapping.....	36
4.11.1 General.....	36
4.11.2 Manual spray booth	36
4.11.3 Automatic spray booth.....	37
4.12 Ergonomics.....	37
4.12.1 General.....	37
4.12.2 Access	37
4.12.3 Working area.....	37
4.12.4 Climatic environment.....	37
4.12.5 Luminous environment	38
4.12.6 Maintenance	38
4.13 Environment in which the machinery is used	38

5	Verification of the safety requirements	38
6	Information for use	44
6.1	General	44
6.2	Instruction handbook	44
6.2.1	General	44
6.2.2	Information related to installation	45
6.2.3	Information related to operation	46
6.2.4	Information related to maintenance	46
6.3	Marking	47
	Annex A (informative) Hazards	49
	Annex B (informative) Examples of classification of hazardous zones.....	53
B.1	Example 1	53
B.2	Example 2	54
B.3	Example 3	56
B.4	Example 4	58
B.5	Example 5	60
B.6	Example 6	62
	Annex C (normative) Calculated average concentration of flammable substances	65
C.1	General	65
C.2	Spray booths for liquid coating material containing organic solvents	65
C.2.1	General	65
C.2.2	Example for the calculation of concentration of flammable substances on the basis of a given air flow velocity (manual spray booth)	65
C.2.3	Example for the calculation of required minimum fresh air flow (automatic spray booth).....	66
C.3	Spray booths for organic powder coating material.....	67
C.3.1	General	67
C.3.2	Example for the calculation of coating powder concentration	67
C.3.3	Example for the calculation of maximum coating powder input	68
C.4	Filters for powder coating booths	69
C.4.1	General	69
C.4.2	Example for the calculation of coating powder concentration in the clean air part of the filter.....	69
	Annex D (normative) Air flow velocity measurement.....	71
D.1	Measurement equipment	71
D.2	Measurement procedure	71
D.2.1	Measurement conditions	71
D.2.2	Air flow velocity components.....	71
D.3	Measurement points.....	72

EN 16985:2018 (E)

D.3.1	Vertically ventilated spray booth (liquid and powder, internal working area)	72
D.3.2	Vertically ventilated spray booth with designated workpiece (liquid and powder, internal working area).....	73
D.3.3	Vertically ventilated segmented spray booth.....	73
D.3.4	Horizontally ventilated spray booth (liquid and powder)	75
D.3.5	Openings of a spray booth	76
D.3.6	Summary of air flow velocity parameters.....	76
	Annex E (informative) Ignitability of water-based paint	79
	Annex F (normative) Energy-efficiency and reduction of environmental impact.....	80
F.1	General.....	80
F.2	Spray booths for liquid coating material.....	80
F.2.1	Acquisition	80
F.2.2	Production.....	80
F.2.3	Use	80
F.2.3.1	Input	80
F.2.3.1.1	Material.....	80
F.2.3.1.2	Water	80
F.2.3.1.3	Energy.....	81
F.2.3.2	Output	81
F.2.3.2.1	Emissions to air.....	81
F.2.3.2.2	Waste	81
F.2.3.2.3	Noise.....	81
F.2.4	End of life	82
F.3	Spray booths for powder coating.....	82
F.3.1	Acquisition	82
F.3.2	Production.....	82
F.3.3	Use	82
F.3.3.1	Input	82
F.3.3.2	Output	82
F.3.3.2.1	Emissions to air.....	82
F.3.3.2.2	Waste	82
F.3.3.2.3	Noise.....	82
F.3.4	End of Life	83
	Annex G (informative) Examples for safety related controls.....	84
G.1	General.....	84
G.2	Interlocking of forced ventilation system with interface to spray application.....	84

Annex H (informative) Determination of the spray booth clearance time using smoke.....	86
H.1 General	86
H.2 Procedure.....	86
Annex I (informative) Estimation of the spray booth purge time.....	87
I.1 General	87
I.2 Example.....	87
Annex J (informative) Examples for ventilation of spray booths with working pits.....	89
J.1 Ventilation of working pits	89
J.2 Measurement of air flow velocity in working pits	93
Annex ZA (informative) Relationship between this European Standard and the essential requirements of Directive 2006/42/EC aimed to be covered.....	95
Bibliography	98

EN 16985:2018 (E)**European foreword**

This document (EN 16985:2018) 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 June 2019, and conflicting national standards shall be withdrawn at the latest by June 2019.

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

This document supersedes EN 12215:2004+A1:2009, EN 12981:2005+A1:2009 and EN 13355:2004+A1:2009.

In comparison with the previous edition the following technical modifications have been made:

- a) The 3 European Standards EN 12215:2004+A1:2009, EN 12981:2005+A1:2009 and EN 13355:2004+A1:2009 have been merged into this European standard;
- b) The scope has not been changed, but the limits of a spray booth have been defined by specifying the interfaces to ancillary machinery, to clarify the scope;
- c) 4.2.2 Falling objects, has been introduced;
- d) 4.2.3 Height from the ground, has been introduced;
- e) 4.7 Contact with and inhalation of hazardous material, has been revised;
- f) 4.7.3.3.4 Segmented spray booths, has been introduced;
- g) 4.8 Fire, has been revised;
- h) 4.9 Explosion, has been revised;
- i) 4.10 Safety devices and control systems, has been revised;
- j) 4.11 Trapping, has been introduced;
- k) 4.12 Ergonomics, has been introduced;
- l) 4.13 Environment in which the machinery is used, has been introduced;
- m) The list of hazards has been moved to new Annex A (informative);
- n) Examples of classification of hazardous zones have been moved to new Annex B (informative);
- o) Calculations for explosive atmosphere have been moved to new Annex C (normative);
- p) Calculation for powder filters has been introduced (Annex C.4);
- q) Requirements for air flow velocity measurement have been clarified and moved to new Annex D (normative);

- r) Information on ignitability of water-based paint has been introduced in new Annex E (informative);
- s) Annex F (normative) on Energy-efficiency and reduction of environmental impact has been introduced;
- t) Annex G (informative) with examples for safety related controls has been introduced;
- u) Annex H (informative) on a procedure for the determination of the spray booth clearance time using smoke has been introduced;
- v) Annex I (informative) with an example for the estimation of the spray booth purge time has been introduced;
- w) Annex J (informative) with examples for ventilation of spray booths with working pits has been introduced.

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 the EU Directive 2006/42/EC.

For relationship with the EU Directive, see informative Annex ZA, which is an integral part of this document.

NOTE Although a spray booth, as an integral whole, formally does not fall under the scope of the ATEX Directive 2014/34/EU, the standard is based upon a fundamental risk analysis according to this directive.

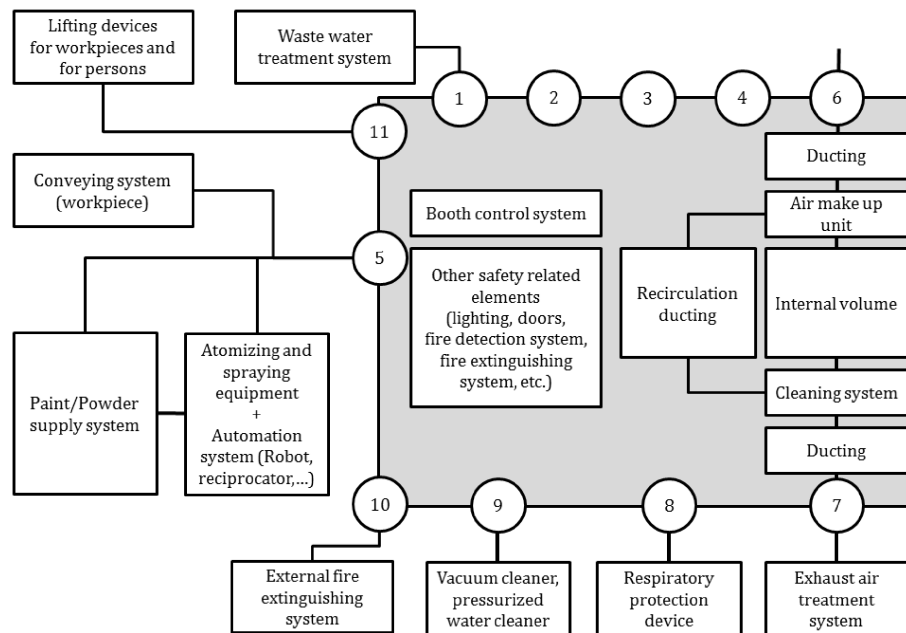
According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany,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

EN 16985:2018 (E)**1 Scope**

This European Standard deals with all significant hazards, hazardous situations and hazardous events relevant to spray booths for the application of organic liquid and powder coating materials, when they are used as intended and under the conditions foreseen by the manufacturer, including reasonably foreseeable misuse.

See Annex A for significant hazards.

Interfaces between spray booths and other machinery used in coating application are given in Figure 1.

**Key**

spray booth

- | | |
|----|--|
| 1 | water output connector |
| 2 | connector to electric power supply |
| 3 | water input connector |
| 4 | connector to pressurized air supply |
| 5 | interface of control system |
| 6 | fresh air supply |
| 7 | connector to exhaust air treatment system |
| 8 | connector to RPD air supply |
| 9 | booth cleaning system connector |
| 10 | connection to external fire extinguishing system |
| 11 | connection to lifting device |

Figure 1 — Interfaces of a spray booth to ancillary machinery

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

The specific significant risks related to drying operation of combined spraying and drying booths are not dealt with in this standard, but in EN 1539:2015.

This European Standard is not applicable to:

- spaces for application of organic coating material consisting only of an extraction wall;
- platforms attached to spray booths (e.g. for touch-up jobs);
- flock booths (see EN 50223:2015);
- spray booths with airflow from vertical inlet to horizontal extraction or from horizontal inlet to vertical extraction.

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

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 525:2009, *Non-domestic direct gas-fired forced convection air heaters for space heating not exceeding a net heat input of 300 kW*

EN 547-1:1996+A1:2008, *Safety of machinery — Human body measurements — Part 1: Principles for determining the dimensions required for openings for whole body access into machinery*

EN 746-1:1997+A1:2009, *Industrial thermoprocessing equipment — Part 1: Common safety requirements for industrial thermoprocessing equipment*

EN 746-2:2010, *Industrial thermoprocessing equipment — Part 2: Safety requirements for combustion and fuel handling systems*

EN 1127-1:2011, *Explosive atmospheres — Explosion prevention and protection — Part 1: Basic concepts and methodology*

EN 1539:2015, *Dryers and ovens, in which flammable substances are released — Safety requirements*

EN 12198-1:2000+A1:2008, *Safety of machinery — Assessment and reduction of risks arising from radiation emitted by machinery — Part 1: General principles*

EN 12198-2:2002+A1:2008, *Safety of machinery — Assessment and reduction of risks arising from radiation emitted by machinery — Part 2: Radiation emission measurement procedure*

EN 12464-1:2011, *Light and lighting — Lighting of work places — Part 1: Indoor work places*

EN 14373:2005, *Explosion suppression systems*

EN 14462:2015, *Surface treatment equipment — Noise test code for surface treatment equipment including its ancillary handling equipment — Accuracy grades 2 and 3*

EN 16985:2018 (E)

EN 14491:2012, *Dust explosion venting protective systems*

EN 14986:2017, *Design of fans working in potentially explosive atmospheres*

EN 15089:2009, *Explosion isolation systems*

EN 16447:2014, *Explosion isolation flap valves*

EN 50050-1:2013, *Electrostatic hand-held spraying equipment — Safety requirements — Part 1: Hand-held spraying equipment for ignitable liquid coating materials*

EN 50050-2:2013, *Electrostatic hand-held spraying equipment — Safety requirements — Part 2: Hand-held spraying equipment for ignitable coating powder*

EN 50176:2009, *Stationary electrostatic application equipment for ignitable liquid coating material — Safety requirements*

EN 50177:2009, *Stationary electrostatic application equipment for ignitable coating powders — Safety requirements*

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

EN 60519-1:2015, *Safety in installations for electroheating and electromagnetic processing — Part 1: General requirements (IEC 60519-1:2015)*

EN 60529:1991, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN 61496-1:2013, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests (IEC 61496-1:2012)*

EN 61496-2:2013, *Safety of machinery — Electro-sensitive protective equipment — Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs) (IEC 61496-2:2013)*

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

EN ISO 13732-1:2008, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces (ISO 13732-1:2006)*

EN ISO 13856-1:2013, *Safety of machinery — Pressure-sensitive protective devices — Part 1: General principles for design and testing of pressure-sensitive mats and pressure-sensitive floors (ISO 13856-1:2013)*

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

EN ISO 13849-1:2015, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2015)*

EN ISO 14119:2013, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection (ISO 14119:2013)*

EN ISO 14120:2015, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards (ISO 14120:2015)*

EN ISO 14122-1:2016, *Safety of machinery — Permanent means of access to machinery — Part 1: Choice of fixed means and general requirements of access (ISO 14122-1:2016)*

EN ISO 14122-2:2016, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways (ISO 14122-2:2016)*

EN ISO 14122-3:2016, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails (ISO 14122-3:2016)*

EN ISO 14122-4:2016, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders (ISO 14122-4:2016)*

EN ISO 19353:2016, *Safety of machinery — Fire prevention and fire protection (ISO 19353:2015)*

EN ISO 80079-36:2016, *Explosive atmospheres — Part 36: Non-electrical equipment for explosive atmospheres — Basic method and requirements (ISO 80079-36:2016)*

koniec náhľadu – text ďalej pokračuje v platenej verzii STN