



# SLOVENSKI STANDARD

## SIST EN 50348:2010

01-september-2010

Nadomešča:  
SIST EN 50348:2002

---

**Vgrajena oprema za elektrostatični nanos nevnnetljivih tekočin za prevleke -  
Varnostne zahteve**

Stationary electrostatic application equipment for non-ignitable liquid coating material -  
Safety requirements

Stationäre Ausrüstung zum elektrostatischen Beschichten mit nichtentzündbaren  
flüssigen Beschichtungsstoffen - Sicherheitsanforderungen

Matériel fixe de projection électrostatique de produit à projeter liquide inflammable -  
Exigences de sécurité

**THIS STANDARD PREVIEW**  
(standards.iteh.ai)

<https://standards.iteh.ai/catalog/standards/sist/c0e94a42-7478-48fa-bab4-bb6c18e2c332/sist-en-50348-2010>

**Ta slovenski standard je istoveten z: EN 50348:2010**

---

**ICS:**

87.100	Oprema za nanašanje premazov	Paint coating equipment
--------	------------------------------	-------------------------

**SIST EN 50348:2010**

**en,fr,de**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN 50348:2010](#)

<https://standards.iteh.ai/catalog/standards/sist/c0e94a42-7478-48fa-bab4-bb6c18e2c332/sist-en-50348-2010>

EUROPEAN STANDARD

**EN 50348**

NORME EUROPÉENNE

EUROPÄISCHE NORM

February 2010

ICS 87.100

Supersedes EN 50348:2001

English version

**Stationary electrostatic application equipment  
for non-ignitable liquid coating material -  
Safety requirements**

Matériel fixe de projection électrostatique  
de produit à projeter liquide inflammable -  
Exigences de sécurité

Stationäre Ausrüstung  
zum elektrostatischen Beschichten  
mit nichtentzündbaren flüssigen  
Beschichtungsstoffen -  
Sicherheitsanforderungen

**iTeh STANDARD PREVIEW****(standards.iteh.ai)**

This European Standard was approved by CENELEC on 2009-12-01. CENELEC 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 Central Secretariat or to any CENELEC 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 CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

**CENELEC**

European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**Central Secretariat: Avenue Marnix 17, B - 1000 Brussels**

## Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 204, Safety of electrostatic painting and finishing equipment.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50348 on 2009-12-01.

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

This European Standard supersedes EN 50348:2001.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2010-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2012-12-01

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and covers essential requirements of EC Directive 2006/42/EC. See Annex ZZ.

The State of the Art is included in Annex ZY "Significant changes between this European Standard and EN 50348:2001".

[SIST EN 50348:2010](https://standards.iteh.ai/catalog/standards/sist/c0e94a42-7478-48fa-bab4-bb6c18e2c332/sist-en-50348-2010)

<https://standards.iteh.ai/catalog/standards/sist/c0e94a42-7478-48fa-bab4-bb6c18e2c332/sist-en-50348-2010>

## Contents

0	Introduction.....	4
	0.1 Process .....	4
	0.2 Fire hazards .....	4
	0.3 Electric hazards .....	4
1	Scope .....	5
2	Normative references .....	5
3	Definitions.....	6
4	General requirements .....	9
5	Requirements for the equipment.....	10
	5.1 Electrostatic spraying systems .....	10
	5.2 Requirements for spraying systems for non-ignitable liquid coating material .....	10
	5.3 Spraying area.....	11
	5.4 High voltage supply.....	11
	5.5 Electric requirements .....	12
	5.6 Grounding measures .....	12
	5.7 Supply for coating material .....	12
6	Testing.....	13
	6.1 Type tests of the high voltage cables .....	13
	6.2 Type tests of the insulating spraying material supply hose .....	13
	6.3 Routine tests of the stationary equipment .....	13
7	Information for use .....	15
	7.1 General .....	15
	7.2 Instruction manual.....	15
	7.3 Marking .....	16
	7.4 Warning sign .....	17
	<b>Annex A (informative) Ignitability of water-based paints .....</b>	<b>18</b>
	<b>Annex ZY (informative) Significant changes between this European Standard and EN 50348:2001 .....</b>	<b>20</b>
	<b>Annex ZZ (informative) Coverage of Essential Requirements of EC Directive 2006/42/EC .....</b>	<b>21</b>
	<b>Bibliography.....</b>	<b>22</b>
<b>Tables</b>		
	Table 1 – Electrostatic spraying systems for non-ignitable coating material – Fields of application .....	10
	Table 2 – Requirements for electrostatic spraying systems for non-ignitable liquid coating material.....	10
	Table 3 – Survey of the tests.....	14
	Table 4 – Test intervals .....	16

## 0 Introduction

### 0.1 Process

During the electrostatic coating process the liquid coating material is transported to an electrostatic spraying device where it is converted to droplets by mechanical forces and by the influence of an electric field. During this atomising process the droplets are charged by high voltage of some 10 kV and a spray cloud is generated. The charged droplets are attracted by and applied to the grounded workpiece.

Droplets which are not applied to the workpiece (overspray) are removed by an extraction device or by another device.

The coated workpieces are transported to dryer, where the solvent is evaporated and a dry film of coating material is generated.

### 0.2 Fire hazards

**0.2.1** Fire hazards can be caused by paint and varnish deposits inside the spray booth, exhaust air ducts and filters. During operation, malfunctions or electrical faults may cause ignition of these residues. This is especially true for spray booths where electrostatic coating takes place. The fast propagation of the fire leads to hazards also in adjacent areas.

**0.2.2** Particular attention shall be paid to the prevention of electrostatic charges on different surfaces, which are in the vicinity of the spray cloud. This could apply to workpieces during the coating process or the reciprocating devices and the mounting parts of the spraying system, etc.

**0.2.3** When spraying non-ignitable coating material, the formation of an explosive atmosphere is not likely to occur. Electrostatic application equipment for ignitable liquid coating materials and hard to ignite coating materials are covered by EN 50176.

### 0.3 Electric hazards

**0.3.1** Electric shock (by direct or indirect contact) can be generated, for instance, by contact with

- live parts, which are not insulated for operational reasons,
- conductive parts, which are not under dangerous voltage during normal operation, but only in case of failure,
- insulated live parts whose insulation is insufficient or has been damaged due to mechanical influences.

**0.3.2** Inadequate grounding may occur, for instance, due to

- faulty connections to the protective grounding system,
- a too high resistance to ground (requirement as in 5.6).

**0.3.3** Hazards could occur, for instance, if hazardous malfunctions (e.g. shortcut of electronic safety circuits, of access guards to dangerous areas or of warning devices) occur due to interferences of the high voltage equipment and the components of the control and safety systems.

**0.3.4** Hazardous electrostatic discharges could be generated, for instance, by non-grounded conductive components or by large insulating surfaces, especially if they are backed with conductive material.

## 1 Scope

**1.1** This European Standard specifies the requirements for stationary electrostatic application equipment for non-ignitable liquid coating materials which do not generate an explosive atmosphere inside the spraying area. A distinction is made between spraying systems corresponding to EN 50050 and spraying systems designed for higher discharge energies and/or currents.

This European Standard also specifies the design-related requirements for a safe operation of the stationary equipment, including its electrical installations.

**1.2** This European Standard considers two types of electrostatic spraying systems, see 5.1 for more details.

**1.3** Noise has not been dealt with in this standard as it is not considered to be a significant hazard of stationary electrostatic application equipment for non-ignitable liquid coating material. For any other health protection, see EN 12215:2004, 5.5. For fire prevention and protection (e. g. fire hazards due to other sources), see also EN 12215:2004, 5.7.1.

This European Standard deals with all significant hazards, hazardous situations and events, which are relevant for stationary electrostatic application equipment for non-ignitable liquid coating and cleaning materials which do not generate an explosive atmosphere inside the spraying area, provided they are used as intended by the manufacturer.

## 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 1081:1998, *Resilient floor coverings - Determination of the electrical resistance*

EN 1149-5, *Protective clothing - Electrostatic properties - Part 5: Material performance and design requirements*

EN 12215:2004, *Coating plants - Spray booths for application of organic liquid coating materials - Safety requirements*

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

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

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

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

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

EN 61340-4-1:2004, *Electrostatics - Part 4-1: Standard test methods for specific applications - Electrical resistance of floor coverings and installed floors* (IEC 61340-4-1:2003)

EN 61508-3; *Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 3: Software requirements* (IEC 61508-3)

EN 62061:2005, *Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems* (IEC 62061:2005)

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)

EN ISO 13849-1:2008, *Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design* (ISO 13849-1:2006)

EN ISO 20344:2004, *Personal protective equipment - Test methods for footwear* (ISO 20344:2004)

### 3 Definitions

For the purposes of this document, the following terms and definitions apply.

#### 3.1

##### **stationary electrostatic application equipment for non-ignitable liquid coating material**

equipment in which the electrostatic spraying system is either fixed stationary (e. g. on supports) and is operated automatically or is guided by reciprocators (e. g. robots).

In general, the equipment comprises the following:

- spray booth;
- spraying area;
- spraying system;
- fixtures for workpieces;
- conveyors;
- grounding system;
- forced ventilation

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)

[SIST EN 50348:2010](https://standards.iteh.ai/catalog/standards/sist/c0e94a42-7478-48fa-bab4-bb6c18e2c332/sist-en-50348-2010)

<https://standards.iteh.ai/catalog/standards/sist/c0e94a42-7478-48fa-bab4-bb6c18e2c332/sist-en-50348-2010>

#### 3.2

##### **spraying system**

devices for application of liquid coating material by means of electrostatic charge.

In general, the spraying system consists of the following components:

- device for the supply of coating material;
- high voltage electrode;
- high voltage supply system;
- spraying device

#### 3.3

##### **high voltage supply system**

system consisting generally of the following components:

- low voltage section with devices for switching on and off the unit and for adjustment, control, regulation, limitation and monitoring of current and voltage, as well as the required connecting cables;
- high voltage generator;
- high voltage switching device;
- high voltage cable;
- high voltage plug-and-socket connector



**3.4****spraying area**

area, closed or not, in which the coating material is applied to the workpiece by the electrostatic spraying system

**3.5****dangerous discharge**

discharge which generates a fire hazard and/or a hazard of electric shock

**3.6****workpiece**

article to which the coating material is applied

**3.7****ignitable liquid coating materials**

sprayed materials, especially varnishes, which could be ignited by an effective ignition source and which continue to burn after the ignition source has been removed or may react in the form of an explosion

NOTE A formula for the estimation of the ignitability on the basis of the composition of the coating material is given in Annex A.

**3.8****hard to ignite liquid coating materials**

sprayed materials, especially varnishes, which could be ignited by an effective ignition source with an energy of 2 J or above and which continue to burn after the ignition source has been removed, or may react in the form of an explosion

NOTE A formula for the estimation of the ignitability on the basis of the composition of the coating material is given in Annex A.

**3.9****non-ignitable liquid coating materials**

sprayed materials, especially varnishes, which could not be ignited by an effective ignition source with an energy of 2 J or above

NOTE A formula for the estimation of the ignitability on the basis of the composition of the coating material is given in Annex A. Liquids whose composition is outside the range of the formula, e.g. chlorinated liquids, have to be tested experimentally.

**3.10****discharge energy**

energy discharged from a conductive part of the installation in the form of a spark which could cause an electric shock to a person

**3.11****antistatic footwear**

footwear that has a resistance to earth via the sole which is low enough to prevent the build-up of electrostatic charges capable to produce a hazardous discharge

See EN ISO 20344:2004.

NOTE A necessary electric insulating resistance to prevent electric shocks is not contradictory to this definition.

**3.12****antistatic clothes**

clothes that have a resistance which is low enough to prevent the build-up of electrostatic charges capable to produce a hazardous discharge

See EN 1149-5.

NOTE A necessary electric insulating resistance to prevent electric shocks is not contradictory to this definition.

**3.13****antistatic floor**

floor that has a resistance to earth which is low enough to prevent the build-up of electrostatic charges capable to produce a hazardous discharge

**3.14****accessories**

assemblies and other equipment, except of the spraying system and the high voltage supply system

**3.15****constant-voltage operation**

closed control circuit system with direct feedback of the actual value of the output high voltage. During the constant-voltage operation, the adjusted output high voltage is maintained constant up to the capacity of the high voltage part via a control device, independent of the variable operational current

NOTE In this standard, the symbol for this mode of operation is  $U_k$ .

**3.16****voltage-controlled operation**

open control circuit system without feedback of the output high voltage. During the voltage-controlled operation the output high voltage is adjusted generally at a defined operational current. The output high voltage, however, is not maintained constant by a control device, it varies depending on the operational current and the on-load behavior of the high voltage device

NOTE In this standard, the symbol for this mode of operation is  $U_v$ .

**3.17****constant-current operation**

closed control circuit system with direct feedback of the actual value of the high voltage current to a control device. In doing so, the operational current is maintained constant and the output high voltage varies load-dependently between a minimum and a maximum value defined by the process

NOTE In this standard, the symbol for this mode of operation is  $I_k$ .

**3.18****operational current**

current that flows within the high voltage circuit during failure-free operation

NOTE In this standard, the symbol for the operational current is  $I_b$ .

**3.19****overcurrent**

current occurring during a malfunction, exceeding the operational current of the high voltage circuit and giving rise to expect that in voltage-controlled and constant-voltage operation hazardous discharges or arcs between high voltage parts and grounded parts of the plant can occur in case the safety distance drops below the permissible limit

NOTE In this standard, the symbol for overcurrent in the high voltage circuit is  $I_U$ .

**3.20****minimum voltage**

value of the voltage of the high voltage circuit giving rise to expect that in constant-current operation hazardous discharges or flashover by arcs can occur between high voltage parts and grounded parts of the plant in case the safety distance drops below the permissible limit

NOTE In this standard, the symbol for minimum voltage in the high voltage circuit is  $U_{\min}$ .

**3.21****disconnection threshold**

disconnection threshold is either the overcurrent value  $I_U$  or the minimum voltage value  $U_{\min}$ . When the value of  $I_U$  is exceeded or the value of  $U_{\min}$  falls below, a cutting off of the high voltage supply is released

**3.22****skilled person**

person who due to technical training, experience and recent occupational activities has sufficient knowledge in the field of electrostatic coating with stationary equipment, is familiar with the relevant and generally accepted technical rules, and thus is able to test and evaluate the safe state of coating plants

**3.23****repeated inspection**

inspection of the entire electrical equipment, systems and plants to be carried out at regular intervals

**4 General requirements**

**4.1** If spray booths are used, they shall comply with the requirements of EN 12215:2004, except for requirements related to explosion protection.

**4.2** Special requirements for the spraying area are specified in 5.3.

**4.3** An appropriate grounding of the different surfaces shall be provided. Special care shall be taken that sufficient grounding is maintained by the hangers. The hangers shall be designed in such a way that deposits of coating material are minimised.

**4.4** Stationary equipment shall be designed and constructed to satisfy the intended function as given by the limitations of the manufacturer safely even in case of varying environmental conditions, influence of external voltages, exposure to humidity, vibrations, contaminations as well as other environmental influences. Stationary equipment shall be suitable for the intended mechanical and thermal demands and shall withstand the effects of present or predictable aggressive materials.

**4.5** The spraying system, with exception of the spraying device, shall have at least IP-protection IP54 protection according to IEC 60529.

**4.6** Safety devices shall function independently of the measuring, control and regulation devices required for operation. The failure of a safety device shall be detected, if possible, by appropriate technical measures within an adequate period, so that hazardous conditions are not likely to occur.

Fundamentally, the fail-safe principle shall be applied.

In case of failure of safety devices, the stationary equipment shall be led to a safe condition as far as possible.

**4.7** The entire control system consisting of e.g. electrical control, monitoring and measurement systems, which are used in safety related functions, shall comply with the safety integrity level 2 according to EN 62061:2005 or fulfil the requirements of performance level (PL) d of EN ISO 13849-1:2008.

If safety functions of the control system according to Clause 5 and Table 2 depend on software, particular attention shall be paid to risks due to programme errors, see EN 61508-3 and EN 62061:2005, 6.10, 6.11 and Annex C.

**4.8** The equipment shall comply with the safety requirements and/or protective measures of this clause. In addition, the equipment shall be designed according to the principles of EN ISO 12100 for relevant, but not significant hazards, which are not dealt with by this standard.