



SLOVENSKI STANDARD

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Avtomatska oprema za elektrostatično brizganje gorljivega prahu za prevleke

Automatic electrostatic spraying equipment for flammable coating powder

Ortsfeste elektrostatische Sprühanlagen für brennbare Beschichtungspulver

Installations automatiques de projection électrostatique de poudre de revêtement inflammable
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87.100	Oprema za nanašanje premazov	Paint coating equipment

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 50177

October 2006

ICS 87.100

Supersedes EN 50177:1996

English version

**Automatic electrostatic spraying equipment
for flammable coating powder**

Installations automatiques
de projection électrostatique
de poudre de revêtement inflammable

Ortsfeste elektrostatische Sprühanlagen
für brennbare Beschichtungspulver

This European Standard was approved by CENELEC on 2006-05-01. 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, 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

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Foreword

This European Standard was prepared by SC 31-8, Electrostatic painting and finishing equipment, of Technical Committee CENELEC TC 31, Electrical apparatus for explosive atmospheres. The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50177 on 2006-05-01.

This European Standard supersedes EN 50177:1996.

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) 2007-05-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2009-05-01

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 94/9/EC. See Annex ZZ.

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0 Introduction

0.1 Process

In the process of electrostatic powder coating the powder is transported in an air stream from a powder hopper up to an electrostatic spraying device. As the powder particles flow through the spraying device they are electrostatically charged by means of a high voltage of the order of some tens of kilovolts and ejected in the form of a cloud which is directed towards the workpiece. The powder particles of the cloud are attracted to and deposited on the earthed workpiece. The powder will continue to be deposited on the earthed workpiece until, at a certain thickness, it acts as an insulator and so further deposition of powder is prevented.

Powder that is not deposited on the workpiece (overspray) is extracted by the exhaust ventilation system or other means into the powder collection unit.

The workpieces coated with powder are then passed into an oven where the powder is melted and cured into a coherent coating.

0.2 Special hazard

A flammable coating powder ¹⁾ explosion may occur where both

- the concentration of coating powder in air is in the explosion range and
- a source of ignition of sufficient energy for that coating powder cloud is present. This ignition source can be for example a hot surface, a naked flame or an electrical arc or spark.

It follows that an explosion can be prevented if one or preferably both of these conditions are avoided. Due to the difficulty in totally eliminating sources of ignition, most reliance should be placed on avoiding explosive concentrations of coating powder in air.

0.2.1 Although an intimate mixture of flammable coating powder and air may burn with explosive violence, not all mixtures will do so. There is a range of concentrations of coating powder in air in which the mixture can explode, but mixtures above or below this range cannot.

NOTE If a burning powder cloud is confined within a space which restricts free escape of expanding gases and combustion products the explosion may lead to a pressure increase.

0.2.2 The particle size distribution of coating powders is usually in the range of 5 µm to 80 µm. Where there is a doubt about or no knowledge of the lower explosion limit, an average concentration of the coating powder suspended in the air of 10 g/m³ shall not be exceeded.

0.2.3 It is important that deposits of powder are not allowed to accumulate within the spraying areas for they may become disturbed and give rise to an explosive atmosphere. This does not apply to deposits on filter devices and accumulations of coating powder in hoppers where filters and hoppers are integrated in the spraying area and are designed to collect the coating powder.

0.2.4 Careful attention should be given to prevent the build-up of an electrostatic charge on various surfaces close to the powder application zone. These can be the workpieces being coated or moving automatic devices and fixtures of the powder spraying system etc. Care should be taken that these are adequately earthed. Of special importance is the attention needed to maintain proper earthing through the fixtures supporting the workpieces. These should be carefully designed to minimize deposition of powder on them.

¹⁾ In the sense of this European Standard flammable coating powders are treated as combustible dusts.

1 Scope

1.1 This European Standard specifies requirements for automatic electrostatic spraying equipment which are used for spraying flammable powders which create explosive atmospheres in the spraying area. In this connection distinction is made between spraying devices which due to their type of construction comply with requirements as laid down in EN 50050:2006 as applicable, and those for which other discharge energies and/or current limits are stipulated.

It also gives information on the safe operational conditions of the electrical equipment including ventilation requirements. Additional requirements as to the construction of the spraying areas such as cabins, booths, etc. are dealt with in EN 12981.

1.2 This European Standard considers the following three types of electrostatic spraying systems.

Type A Systems complying with EN 50050:2006 with a discharge energy limit of 2 mJ (see 5.1.1)

In these systems there is no danger of either electric shock or discharges of incensive energy.

Type B Systems with a discharge energy in excess of 2 mJ but less than 350 mJ and a current limit of less than 0,7 mA (see 5.1.2)

In these systems there is no danger of electric shock but there are dangers from discharges of incensive energy.

Type C Systems with a discharge energy in excess of 350 mJ and/or a current in excess of 0,7 mA (see 5.1.3)

In these systems there are dangers of electric shock and from discharges of incensive energy.

1.3 This European Standard considers the hazards specific to explosive atmospheres created by the electrostatic spraying process.

1.4 The automatic electrostatic spraying equipment for flammable coating powders shall be constructed suitable for group II category 3 as defined in EN 60079-0.

1.5 This European Standard does not deal with matters of noise created by the equipment. For this item, the requirements are laid down in EN ISO 11688-1.

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.

CLC/TR 50404	2003	Electrostatics – Code of practice for the avoidance of hazards due to static electricity
EN 1127-1	1997	Explosive atmospheres – Explosion prevention and protection – Part 1: Basic concepts and methodology
EN 1149	series	Protective clothing – Electrostatic properties
EN 12981	2005	Coating plants – Spray booths for application of organic powder coating material – Safety requirements

EN 13478	2001	Safety of machinery – Fire prevention and protection
EN 50050	2006	Electrical apparatus for potentially explosive atmospheres – Electrostatic hand-held spraying equipment
EN 60079	series	Electrical apparatus for explosive gas atmospheres (IEC 60079 series, mod.)
EN 60079-0	2006	Electrical apparatus for explosive gas atmospheres – Part 0: General requirements (IEC 60079-0:2004, mod.)
EN 60529	1991	Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)
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 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 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

electrostatic spraying device for powder spraying material

device for producing, charging and depositing suspended powder particles with the assistance of electric fields

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3.2

electrostatic spraying system

system in general comprising electrostatic spraying devices, high voltage supply system and connecting cables

3.3

automatic electrostatic spraying equipment

equipment in which the spraying device is either permanently fixed or led by means of moving automatic devices (e.g. robots)

NOTE An installation with automatic electrostatic spraying equipment comprises in general the following items:

- spraying area;
- high voltage supply system;
- electrostatic spraying device;
- supply of spraying material;
- fixtures of the spraying devices;
- jigs/resp. fixtures of the workpieces;
- conveyors;
- earthing system;
- exhaust ventilation system;
- fire protection equipment;
- explosion protection device.

3.4**high voltage supply system**

voltage conversion unit comprising in general

- low voltage section with devices for switching on and off the unit and for adjustment, control, regulation, limitation and monitoring of voltage and current,
- high voltage section for voltage conversion,
- high voltage switching device,
- high voltage cables

3.5**spraying area**

area, closed or not, in which the spraying material is deposited onto the workpieces by the electrostatic spraying system

3.5.1**enclosed spray cabin**

area closed on all sides while spraying except openings for ingress and egress of the workpieces and ducts for ventilation

3.5.2**partly enclosed spray cabin**

area closed on all sides while spraying except openings for ingress and egress of the workpieces, the automatic electrostatic spraying devices and ducts for ventilation

3.5.3**spray booth**

area closed on all sides while spraying except on the side of the automatic electrostatic spraying devices and excluding openings for ingress and egress of the workpieces and ducts for ventilation

3.6**powder collection unit**

unit which collects excessive powder of the spraying process which has not been deposited on the workpiece.

In general, the powder collection unit is connected with the spraying area either directly or through the ducts of the exhaust ventilation

3.7**workpiece**

article on which the spraying material is to be deposited

3.8**flammable coating powder**

powder which may be ignited by an effective source of ignition and which continues to burn after removal of the source of ignition or may react in the form of an explosion

3.9**explosive atmosphere**

mixture with air, under atmospheric conditions, of flammable substances in the form of gas, vapour, mist, powder or flock, in such proportions that it can be ignited by effective sources of ignition, such as excessive temperature, arcs or sparks (see EN 1127-1)