SLOVENSKI STANDARD
SIST EN 50223:2015

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Vgrajena oprema za elektrostatični nanos gorljivih kosmičastih materialov - Varnostne zahteve

Stationary electrostatic application equipment for ignitable flock material - Safety requirements

Stationäre elektrostatische Flockanlagen für entzündbaren Flock - Sicherheitsanforderungen

Matériel fixe de projection électrostatique de flock inflammable - Exigences de sécurité

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29.260.20	Električni aparati za eksplozivna ozračja	Electrical apparatus for explosive atmospheres
87.100	Oprema za nanašanje premazov	Paint coating equipment

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Stationary electrostatic application equipment for ignitable flock material - Safety requirements

Matériel fixe de projection électrostatique de flock inflammable - Exigences de sécurité

Stationäre elektrostatische Flockanlagen für entzündbaren Flock - Sicherheitsanforderungen

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Foreword

This document (EN 50223:2015) has been prepared by CLC/SC 31-8 "Electrostatic painting and finishing equipment" from CLC/TC 31 "Electrical apparatus for potentially explosive atmospheres".

This document supersedes EN 50223:2010.

The following dates are proposed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2016-04-13
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2018-04-13

The State of the Art is included in Annex ZY "Significant changes between this European Standard and EN 50223:2010".

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For the relationship with EU Directives 94/9/EC and 2006/42/EC, see informative Annexes ZZA and ZZB, which are an integral part of this document.

Introduction

In the process of electrostatic flock application, the flock is transported from a reservoir through an electrical field either by gravitational forces or an air stream or electrostatic forces. As the flock particles disperse due to the flock application device and/or the electric field, they are electrostatically charged by means of high voltage of some tens of kilovolts aligned and, in the form of a cloud, encased by and deposited on the grounded workpiece. They stick to those workpieces, which are covered with an adhesive layer. The adhesive is set at room temperature or by heating.

Flock particles not deposited on the workpiece (overspray) are upcast or removed by the exhaust ventilation system, by brushes or other devices into the flock recovery system.

1 Scope

1.1 This European Standard specifies requirements for stationary electrostatic flock application equipment which is designed for applying ignitable flock which may form explosive atmospheres in the flock application area. For stationary electrostatic application devices for ignitable flock of type B-F, EN 50050-3 is applicable in addition to this standard.

This European Standard also specifies the constructional requirements for a safe operation of the stationary equipment of flock application booths, including the electrical installations and the accessories.

This European Standard deals with all significant hazards, hazardous situations and events relevant to flock application booths, when they are used as intended and under conditions which are foreseeable as malfunction by the manufacturer (see Clause 4).

1.2 This European Standard considers three types of electrostatic flock systems. For more details, see Table 1.

1.3 This European Standard deals with those hazards occurring during stationary automatic electrostatic flocking. Among these hazards are, above all, ignition hazards of the generated explosive atmosphere and hazard to persons.

1.4 The stationary equipment dealt with in this European Standard is considered to be equipment of group II, category 3D for the use in areas with potential explosion hazards of zone 22.

1.5 This European Standard is not applicable for

— flock systems in which mixtures of solvent vapours in air occur with a concentration of > 20 % of the LEL,

— flock systems operated with AC high voltage,

— hand-held spraying equipment for ignitable flock (see EN 50050-3),

— the application system for liquid or pasty substances (e.g. adhesives, primer),

— the cleaning of flock application booths,

— the storage and handling of ignitable substances outside the coating plant.

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 953, *Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards*

EN 981, *Safety of machinery - System of auditory and visual danger and information signals*

EN 1037, *Safety of machinery - Prevention of unexpected start-up*

EN 1081, *Resilient floor coverings - Determination of the electrical resistance*

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

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

EN 13478, *Safety of machinery - Fire prevention and protection*

EN 13501-1, *Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests*

EN 14373, *Explosion suppression systems*

EN 14460, *Explosion resistant equipment*

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

EN 14491, *Dust explosion venting protective systems*

EN 14797, *Explosion venting devices*

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

EN 15089, *Explosion isolation systems*

EN 50050-3, *Electrostatic hand-held spraying equipment - Safety requirements - Part 3: Hand-held spraying equipment for ignitable flock*

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

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

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

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

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

EN ISO 13856 (all parts), *Safety of machinery - Pressure-sensitive protective devices (ISO 13856)*

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

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

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

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

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

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

3 Terms and definitions

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

3.1
stationary electrostatic application device for ignitable flock
flock application booths or flock application areas, in which the electrostatic application equipment 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 units:

— flock application booth;

— flock application area;

— flock application system;

— flock recovery system;

— fixtures for workpieces;

— conveyors;

— grounding devices;

— forced ventilation;

— fire prevention and protection equipment;

— explosion protection equipment

3.2
flock application system
devices for application of flock by means of electrostatic charge. In general, the flock application system comprises the following units:

— device for the transport of flock;

— high voltage electrode;

— high voltage supply system;

— dosing device

3.3
high voltage supply system
system comprising the following:

— 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
flock application area
area, closed or not, in which the flock is applied to the workpieces by the electrostatic flock application system

3.5
flock application booth
assembly of linked parts and devices like e.g.:

— forced ventilation by one or several fan(s);

— ducts of the forced ventilation;

— transport device for the flock;

— air filter and flock recovery system;

— measuring and control devices (e.g. interlocking of forced ventilation and flock application system);

— fire detection system and interlocking devices;

— explosion protection system;

— automatic cleaning system;

— air conditioning system;

— warning devices;

— electrical apparatus,

joined together for application of flock within or at a partially or totally enclosed structure (limited by walls) for the controlled flock application

3.6
multizone booth
flock application booth including a number of sections for manual and/or automatic application of flock and forced ventilation flash off space

3.7
hazardous discharge
discharge which generates the hazard of ignition of explosive mixtures or by electric shock

3.8
dosing device
in general, the dosing device comprises the following parts:

— devices for dosing the flock;

— supply lines for the flock;

— devices for drive, control and monitoring the flock transport

3.9
flock recovery system
system collecting the overspray from the flock application process which has not been deposited on the workpiece, and, if necessary, recycles it

Note 1 to entry: In general, the flock recovery system is either connected directly to the flock application booth or via the ducts of the forced ventilation

3.10
workpiece
part, which is coated with an adhesive film and applied with flock

3.11
ignitable flock
dispersed flock which could be ignited by an effective ignition source, and which continues to burn after removal of the ignition source or may react in the form of an explosion

3.12
solvent
liquid consisting of one or several components, volatile under specified drying/setting conditions, and in which the binder of the adhesive is soluble

Note 1 to entry: Solvents are also contained in liquids used as cleaning or washing agents.

3.13
explosive atmosphere
mixture with air, under atmospheric conditions, of ignitable substances in the form of gases, vapours, mists, powder or flock in which combustion spreads to the entire unburned mixture after ignition has occurred

3.14
lower explosion limit
LEL
concentration of ignitable gas, vapour, mist, powder or flock in air, below which an explosive atmosphere will not be generated

3.15
average concentration of ignitable flock in air
mass of ignitable flock introduced into the flock application area, divided by the volume of air extracted by the forced ventilation system from the flock application area within the same period of time

3.16
hazardous areas
areas where hazards due to explosive atmosphere may exist. The probability of occurrence of explosive atmosphere is classified in zones

Note 1 to entry: Hazardous areas are given in Annex C.

3.16.1
zone 20
area, in which an explosive atmosphere in the form of a cloud of ignitable flock in air is present continuously, or for long periods or frequently

Note 1 to entry: In general, these conditions, when they occur, arise inside containers, ducts and apparatus, etc.

3.16.2
zone 21
area, in which an explosive atmosphere in the form of a cloud of ignitable flock in air is likely to occur occasionally during normal operation

Note 1 to entry: This zone can include, among others, areas in the immediate vicinity of e.g. flock filling and delivery positions and places where flock layers occur and, during normal operation, may give rise to an explosive concentration of ignitable flock in mixture with air.

3.16.3
zone 22
area in which an explosive atmosphere in the form of a cloud of ignitable flock in air is not likely to occur during normal operation. If it does occur, it will persist for a short period

Note 1 to entry: This zone can include, among others, areas in the vicinity of equipment containing ignitable flock, from which flock can escape from leaks and form flock deposits.

3.17
equipment category
equipment for potentially explosive atmospheres is divided into groups and categories. Group II: Equipment for areas with a potentially explosive atmosphere, other than mines susceptible to firedamp; this group comprises three categories depending to the level of safety provided

3.17.1
equipment group II category 1D
equipment intended for use in areas in which explosive atmospheres caused by flock/air mixtures are present continuously or for long periods or frequently

Note 1 to entry: Equipment of category 1D is suitable for use in zone 20, zone 21 and zone 22.

3.17.2
equipment group II category 2D
equipment intended for use in areas in which explosive atmospheres caused by flock/air mixtures are likely to occur

Note 1 to entry: Equipment of category 2D is suitable for use in zone 21 and 22.

3.17.3
equipment group II category 3D
equipment intended for use in areas in which explosive atmospheres caused by flock/air mixtures are unlikely to occur, or, if they do occur, are likely to do so only infrequently and only for a short period

Note 1 to entry: Equipment of category 3D is suitable for use in zone 22.

3.18
explosion relief
protective measure by which an area of the wall panel of the enclosure (for example of the flock recovery system) is designed and constructed to release the excess pressure in the event of an explosion to prevent injury to persons and further damage to equipment

3.19
explosion suppression
system which can detect and suppress an incipient explosion

3.20
explosion decoupling
system preventing the propagation of flames and explosions from one unit to other parts of the installation by special devices, e.g. mechanical high-speed shut-off, rotary valves or flame suppression barriers

3.21
discharge energy
energy discharged from a conductive part of the installation in the form of a spark which could cause both electric shock to a person and an ignition of an explosive atmosphere

3.22
antistatic footwear
footwear that has a resistance to ground, via the sole, which is low enough to prevent the build-up of electrostatic charges capable of an incentive discharge. See EN ISO 20344

Note 1 to entry: A required electric insulating resistance to prevent electric shocks is not contradictory to this definition.

3.23
antistatic clothes
clothes that have a resistance to ground, which is low enough to prevent the build-up of electrostatic charges capable of an incentive discharge. See EN 1149-5

Note 1 to entry: A required electric insulating resistance to prevent electric shocks is not contradictory to this definition.

3.24
antistatic floor
floor that has a resistance to ground, which is low enough to prevent the build-up of electrostatic charges capable of an incentive discharge

3.25
forced ventilation system
system ensuring the air exchange by one or several fans or by other powered equipment

Note 1 to entry: Forced ventilation systems are using exhaust air units with devices for material separation and – optional – automatic cleaning, and in addition a supply air unit with devices for filtering, air conditioning and an automatic flock recovery system if applicable.

3.26
minimum air volume flow
air volume flow of the forced ventilation which shall ensure to undercut the LEL under most unfavourable operating conditions and to prevent the emission of flock out of the flock application booth

3.27
recirculation air
air, which is extracted from a volume and will be reintroduced into it

3.28
exposure limit values
concentration limits of dangerous substances in the breathing air required by worker health legislation

Note 1 to entry: Limits may differ from country to country.

3.29
accessories
accessories are all devices, assemblies and other equipment, except of the flock application system and the high voltage supply system according to this standard

3.30
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 1 to entry: In this standard the symbol for this type of operation is U_k.

3.31
voltage-controlled operation
open control circuit system, control without feedback of the output high voltage. During the voltage-controlled operation the output high voltage is adjusted generally to 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 behaviour of the high voltage device

Note 1 to entry: In this standard the symbol for this type of operation is U_v.

3.32
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 1 to entry: In this standard the symbol for this type of operation is I_k.

3.33
operational current
current which flows within the high voltage circuit during failure-free operation

Note 1 to entry: In this standard the symbol for the operational current is I_b.

3.34
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 flashovers between high voltage parts and grounded parts of the installation can occur in case the safety distance drops below the permissible limit

Note 1 to entry: In this standard the symbol for overcurrent in the high voltage circuit is $I_{ü}$.

3.35
minimum voltage
voltage of the high voltage circuit giving rise to expect that in constant current operation hazardous discharges or flashovers can occur between high voltage parts and grounded parts of the installation in case the safety distance drops below the permissible limit

Note 1 to entry: In this standard the symbol for minimum voltage in the high voltage circuit is U_{min}.