BS EN 50050-2:2013

BSI Standards Publication

Electrostatic hand-held spraying equipment — Safety requirements -

Part 2: Hand-held spraying equipment for ignitable coating powder

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National foreword

This British Standard is the UK implementation of EN 50050-2:2013. Together with BS EN 50050-1:2013 and BS EN 50050-3:2013 it supersedes BS EN 50050:2006 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EXL/31/-/1, Electrostatic spray guns.

A list of organizations represented on this committee can be obtained on request to its secretary.

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CENELEC

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

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Foreword

This document (EN 50050-2:2013) has been prepared by SC 31-8, "Electrostatic painting and finishing equipment", of CLC/TC 31, "Electrical apparatus for potentially explosive atmospheres".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2014-10-14
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2016-10-14

In combination with EN 50050-1:2013 and EN 50050-3:2013, this document supersedes EN 50050:2006.

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For the relationship with EU Directive(s) see informative Annex ZZ, which is an integral part of this document.

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0 Introduction

0.1 Process

During the electrostatic coating process the coating powder is transported in an air stream, or by air, from a powder hopper or other container, up to an applicator. As the powder particles are passing the applicator they are electrostatically charged by means of a high voltage in the range of some tens of kilovolts or triboelectrically and ejected in the form of a cloud which is directed towards the workpiece. The charged powder particles of the cloud are attracted by and applied to the earthed workpiece.

Powder, that is not applied to the workpiece (overspray) is removed by a exhaust ventilation system or other means and transported into the powder recovery unit.

After the coating process the workpieces are introduced into an oven where the powder is melted and cured into a coherent coating.

0.2 Explosion hazards

0.2.1 An explosion can occur, if

— the concentration of coating powder in air is above the lower explosion limit,

— an ignition source of appropriate energy for this coating powder cloud is present.

Ignition sources could be, for instance, a hot surface, a naked flame, an electric arc or a spark.

An explosion could be prevented, if at least one condition is avoided. Because it is very difficult to exclude the possibility of ignitable discharges completely, the main focus should be the prevention of ignitable concentrations of coating powder in air.

0.2.2 Deflagration of explosive atmospheres is only possible within a given range of concentration above the lower explosion limit.

NOTE 1 If an explosive cloud of coating powder and air is trapped into a closed room, an explosion can lead to a fatal increase of pressure.

NOTE 2 The particle size distribution of coating powder is usually in the range of 5 μm to 120 μm.

NOTE 3 Coating powder in air is not evenly distributed inside a given volume, therefore it is possible that a part of the mixture is within the ignitable concentration range. An upper limit is safety-related not applicable.

0.2.3 It is important that deposits of powder are not allowed to accumulate within the spraying areas for they may be whirled up 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. See 4.6 of EN 12981:2005.

0.2.4 Particular attention should be paid to the prevention of electrostatic charges on different surfaces located in the vicinity of the powder cloud. This could apply to e.g. workpieces during the coating process. Grounding is very critical to the prevention of electrostatic charge to any conductive objects in the spray area.

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 connected to dangerous voltage during normal operation, but only in case of failure,

– insulated live parts with insufficient or damaged insulation due to external impact.

0.3.2 Inadequate earthing may occur, for instance, due to

– faulty connections to the protective earthing system,

– a too high resistance to earth (e. g. contamination by coating powder).

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0.3.3 Hazards could occur, for instance, if hazardous malfunctions (e.g. shortcut of electronic safety circuits) 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-earthed conductive components or by large insulating surfaces, especially if they are backed with conductive material.

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1 Scope

1.1 This European Standard specifies the requirements for hand-held or hand-operated electrostatic spraying equipment for ignitable coating powders within a temperature range from 5 °C to 40 °C to be used in explosive atmospheres generated by their own spray cloud.

This European Standard deals with all electrical hazards significant for the electrostatic spraying of coating powders, which could also contain small quantities of added metal particles, if the work is carried out under conditions recommended by the manufacturer. In particular, this includes ignition hazards resulting from the generated explosive atmosphere. This European Standard specifies the design-related and test requirements for electrostatic spraying equipment of type A-P according to Table 1 of EN 50177:2009.

1.2 With regard to explosion protection and prevention measures, this standard also applies to ionisators with corona charging. Ionisators used together with or under similar conditions as electrostatic spraying equipment for ignitable coating powders are considered to be equipment of group II, category 2D for use in potentially explosive areas of zone 21 or 22. All other parts of ionisators are considered to be equipment of category 3D if they are installed or used in potentially explosive areas of zone 22, see Annex D.

1.3 Electrostatic applicators are considered to be equipment of group II, category 2D for use in potentially explosive areas of zone 21 or 22, which have been generated by the equipment itself. All other parts of hand-held electrostatic spraying equipment are considered to be equipment of category 3D if they are installed or used in potentially explosive areas of zone 22.

1.4 All other significant hazards relevant for applicators (e.g. ejection of powder, mechanical strength, electrical hazards (apart from the electrostatic hazards)), noise, explosion, contract with or inhalation of dangerous substances, ergonomics) are covered by EN 1953.

1.5 This European Standard also gives details regarding quality assurance systems for electrostatic spraying equipment, see Annex C.

1.6 Additional requirements may be applicable to equipment designed for use in food and pharmaceutical industry.

1.7 This European Standard does not apply to

— zone classification of the areas in and around spray booths [see EN 12981],

— zone classification of other areas with potentially explosive atmosphere [see EN 60079-10-2],

— selection, erection and application of other electrical and non-electrical equipment in areas with explosion hazard [see EN 60079-14 and EN 12981],

— cleaning of spraying areas, see instruction manual of the spray booth,

— fire prevention and protection, for instance fire hazards due to other sources [see EN 12981],

— dust hazards [see EN 12981].

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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 1149-5	*Protective clothing – Electrostatic properties – Part 5: Performance requirements*
EN 1953	*Atomising and spraying equipment for coating materials – Safety requirements*
EN 12981:2005	*Coating plants – Spray booths for application of organic powder coating material – Safety requirements*
EN 50177:2009	*Stationary electrostatic application equipment for ignitable coating powders – Safety requirements*
EN 60079-0	*Explosive atmospheres - Electrical apparatus for explosive gas atmospheres – Part 0: General requirements (IEC 60079-0)*
EN 60079-7:2007	*Explosive atmospheres – Part 7: Equipment protection by increased safety "e" (IEC 60079-7:2006)*
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 62061	*Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems (IEC 62061)*
EN ISO 12100	*Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100)*
EN ISO 13849-1	*Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1)*
EN ISO 20344	*Personal protective equipment – Test methods for footwear (ISO 20344)*

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3 Terms and definitions

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

3.1
hand-held spraying equipment
hand-held or hand-operated equipment for electrostatic coating using ignitable coating powders, generally comprising the following parts:

— applicator (with corona charging or triboelectric charging);

— coating powder supply system;

— control device;

— high voltage supply system for corona charging (can be integral to the applicator);

— connecting cable

3.2
connecting cable
electric cable to the applicator

3.3
earthing device
device for earthing the hand-held spraying equipment permanently

Note 1 to entry Triboelectric applicators (see 3.8) are generally earthed by the recirculation of the tribo-current.

3.4
spraying device
outlet opening for the coating powder

3.5
high voltage electrode
conductive part of the applicator which is at high voltage and serves to charge the coating material directly or indirectly

3.6
control device
device generally having the following functions:

— control of, for instance, the coating powder supply system, the control air, the purge air;

— measurement of recirculated tribo-current at triboelectrical equipment

Note 1 to entry A combination of the control device and the high voltage supply according to 3.9 is possible.

3.7
applicator with corona charging
equipment for application of coating powder with corona charging

Note 1 to entry In general, the applicator comprises the following parts:

- high voltage electrode;
- high voltage supply (as far as integrated into the applicator);
- housing;
- spraying device;
- exchangeable attachment parts (e.g. nozzles, extensions, angular pieces, etc.);
- if applicable, battery unit (integrated fixedly, or attached).

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3.8
triboelectric applicator
equipment for application of coating powder with triboelectric charging (tribo-charge)

Note 1 to entry In general, the applicator comprises the following parts:

- charging system;
- housing;
- powder feed line;
- spraying device;
- device for recirculation of tribo-current (earthing);
- exchangeable attachment parts (e.g. nozzles, extensions, angular pieces, etc.).

3.9
high voltage supply for applicators with corona charging
in general, high voltage supply comprising the following parts:

— low voltage section with devices for switching on and off the hand-held spraying equipment and for adjustment, control, regulation, limitation and monitoring of current and voltage, as well as the required connecting cables;

— high voltage generator

3.10
spraying area
area, closed or not, in which the coating powder is applied to the workpiece by the hand-held spraying equipment

3.11
dangerous discharge
discharge which generates the hazard of ignition of explosive mixtures or of electric shock

3.12
coating powder supply system
in general, coating powder supply system comprising the following:

— powder hopper, or supply container;

— dosing devices for coating powder;

— supply lines for coating powder;

— devices for drive, control and monitoring powder delivery

3.13
workpiece
article to which the coating powder is applied

3.14
ignitable coating powder
coating powder which, in a whirled-up state, could be ignited by an effective ignition source and which continues to burn after the ignition source has been removed or may react in the form of an explosion

3.15
explosive atmosphere
mixture of air, under atmospheric conditions, and of ignitable substances in the form of gas, vapour, mist, powder or flock, in such proportions that it can be ignited by effective ignition sources, such as excessive temperature, arcs or sparks

Note 1 to entry See EN 1127-1.

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