
Electrical apparatus for potentially explosive atmospheres - Electrostatic hand held spraying equipment

Electrical apparatus for potentially explosive atmospheres - Electrostatic hand-held spraying equipment

Elektrische Betriebsmittel für explosionsgefährdete Bereiche - Elektrostatische Handsprüheinrichtungen

Matériel électrique pour atmosphères explosibles - Equipement manuel de projection électrostatique

ITeh STANDARD PREVIEW
(standards.iteh.ai)
<https://standards.iteh.ai/catalog/standards/sist/6136b23b-562a-47d2-b5a2-e5797459d767/sist-en-50050-1996>

Ta slovenski standard je istoveten z: EN 50050:1986

ICS:

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

SIST EN 50050:1996

en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 50050:1996](#)

<https://standards.iteh.ai/catalog/standards/sist/6136b23b-562a-47d2-b5a2-e5797459d767/sist-en-50050-1996>

UDC: 667.661.23-83:621.319.7:001.4:620.1:614.83

Key words: electrical apparatus, potentially explosive atmosphere, explosive atmosphere, explosion proofing, electrostatic hand-held spraying equipment, spray gun, constructional requirement

English version

Electrical apparatus for potentially explosive atmospheres Electrostatic hand-held spraying equipment

Matériel électrique pour atmosphères
explosibles. Equipement manuel de
projection électrostatique

Elektrische Betriebsmittel für
explosionsgefährdete Bereiche.
Elektrostatische Handsprüheinrichtungen

iTeh STANDARD PREVIEW (standards.iteh.ai)

This European Standard was ratified by CENELEC on 13 December 1984. CENELEC members are bound to comply with the requirements of the 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 CENELEC General 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 CENELEC General Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

General Secretariat: rue Bréderode 2, B-1000 Brussels

Contents

	Page		Page
1. Scope	2	5. Type tests	4
2. Definitions	3	6. Manufacturer's responsibility	5
3. Protection and surface temperature of the associated apparatus	3	7. Marking	6
4. Constructional requirements	3	8. Instruction manual	6

CENELEC Harmonization Document referred to in European Standard EN 50 050:

CENELEC HD 365 S3 Classification of degrees of protection provided by enclosures (IEC 529 (1976) and Amendments 1 and 2)

European Standards referred to in European Standard EN 50 050:

EN 50 014 (1977) (1st edition) Electrical apparatus for potentially explosive atmospheres – General requirements [including Amendment 1 (July 1979), Amendment 2 (June 1982), Amendment 3 (December 1982) and Amendment 4 (December 1982)].

EN 50 018 (1977) (1st edition) Electrical apparatus for potentially explosive atmospheres – Flameproof enclosure 'd' [including Amendment 1 (July 1979) and Amendment 2 (December 1982)].

EN 50 019 (1977) (1st edition) Electrical apparatus for potentially explosive atmospheres – Increased safety 'e' [including Amendment 1 (July 1979) and Amendment 2 (September 1983)].

EN 50 020 (1977) (1st edition) Electrical apparatus for potentially explosive atmospheres – Intrinsic safety 'i' [including Amendment 1 (July 1979)].

1 Scope

1.1 This European Standard specifies the constructional and test requirements for hand-held and hand-operated electrostatic spray guns and associated apparatus which are used to spray paints, powders or flocks which may form explosive atmospheres.

This European Standard also specifies requirements for hand-held spraying equipment used for spraying flocks on to surfaces coated with adhesives which may form potentially explosive atmospheres.

NOTE. Recommendations for the selection, installation and use of electrostatic spraying equipment for flammable materials are in course of preparation.

1.2 The General requirements of European Standard EN 50 014 which apply to hand-held electrostatic spray guns and to associated apparatus outside the hazardous area are given in the table below:

1.3 Associated apparatus inside a hazardous area shall be protected according to clause 3 of this European Standard. This apparatus and any components of the spray gun which are protected by a type of protection as listed in EN 50 014 will additionally be required to comply with the requirements of EN 50 014 for that type of protection.

Clause of EN 50 014	Spray guns	Associated apparatus outside the hazardous area
2 Definitions	except 2.3	except 2.3
4 Temperatures	except 4.2	no
5 General	only 5.1.2	only 5.1.2
6 Non-metallic enclosures and non-metallic parts of enclosures	only 6.4	no
7 Light alloy enclosures	only 7.1	no
8 Fasteners	only 8.1	only 8.1
12 Connections	yes	yes
13 Connection facilities for earthing or bonding conductors	yes	yes
14 Connection facilities and terminal compartments	yes	no
15 Cable and conduit entries	only 15.3	no
22 Type verifications and tests	only 22.1; 22.2; 22.3; 22.4.1; 22.4.2; 22.4.3.1; 22.4.6.1; 22.4.8	only 22.1; 22.2; 22.3; 22.4.1; 22.4.2
23 Routine verifications and tests	yes	yes
25 Verifications and tests on modified or repaired electrical apparatus	yes	yes
Annex A	yes	no
Annex B	yes	no

2 Definitions

The following definitions, specific to electrostatic paint, powder and flock spray guns and associated apparatus, are applicable to this European Standard; they supplement the definitions which are given in EN 50 014.

2.1 hand-held electrostatic paint, powder or flock spraying equipment. Equipment for producing, charging and depositing suspended particles with the assistance of electric fields. It consists in general of the following parts: spray gun, high voltage generator and connecting cable.

2.1.1 spray gun. The part of the electrostatic spraying equipment from which the charged spraying material emerges and which is held and operated by the hand.

2.1.2 high voltage electrode. A conducting part of the spray gun which is at high potential and which charges the spraying material.

2.1.3 high voltage generator. The part of the equipment for producing the high voltage and the current required.

NOTE. The high voltage generator can be, in certain cases, incorporated in the spray gun.

2.1.4 connecting cable. All cables to the spray gun, including any necessary high voltage cable.

2.1.5 earth terminal. A terminal intended to provide means for reliable earthing of parts of an equipment.

2.1.6 associated apparatus. All the electrical apparatus required to generate and control the electrostatic voltage of the spray gun.

2.2 workpiece. The article on which the spraying material is to be deposited.

2.3 spraying material. The material which is applied by means of the electrostatic hand-held spraying equipment.

2.3.1 flammable powder or flock. Powder or flock in a form which may readily catch fire after brief contact with a source of ignition and which continues to burn after removal of the source of ignition. (For the purpose of this European Standard powders and flocks are considered to be flammable.).

2.3.2 explosive atmosphere. A 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 exploded by excessive temperature, arcs or sparks (the danger is a real one).

2.4 hazardous area. An area in which explosive atmospheres are, or may be expected to be, present in quantities such as to require special precautions for the construction, installation and use of electrical apparatus.

2.5 U_{max} . The maximum rated voltage of the high voltage generator.

3 Protection and surface temperature of the associated apparatus

If the associated apparatus is used in the hazardous area, the following requirements shall be met.

3.1 The associated apparatus for use with paint containing flammable solvents shall comply with the requirements of one or more of the types of protection listed in EN 50 014 and the degree of protection provided by enclosures shall comply with the requirements of IP 54 in HD 365 S3.

3.2 For use with powder and flock spraying it is only necessary for the enclosures of the associated apparatus to comply with the impact test of 22.4.3.1 in EN 50 014, the degree of protection IP 54 in HD 365 S3, and the maximum temperature of the surface of the enclosure shall not exceed 200 °C.

NOTE. This requirement is to ensure that the powder in the form of a layer will not be heated to the point of ignition.

3.3 For flock spraying on to a surface which is coated with a flammable adhesive which may form an explosive atmosphere, the associated apparatus shall comply with the requirements of 3.1 together with the requirement that the maximum surface temperature shall not exceed 200 °C.

4 Constructional requirements

The spray guns shall normally be designed for use in the ambient temperature range between 0 °C and + 40 °C, in this case no additional marking is necessary.

4.1 Mechanical

4.1.1 The spray gun shall withstand the impact and drop tests in 5.4 and 5.5 of this European Standard.

4.1.2 The gun handle shall have a total surface area of at least 20 cm², of metal or a material the maximum resistivity of which is 10 Ω.m. This surface shall be connected to the earth terminal (see 4.2.2).

4.1.3 All cables shall be attached securely to the spray gun (see 5.6).

4.2 Electrical

4.2.1 Any cable to the gun, other than those carrying only earthed intrinsically safe circuits, shall include an earthed metallic screen protected by an insulated sheath. If this is not possible in the case of the high voltage cable due to design reasons, any other construction shall be tested in accordance with 5.1.6 to ensure that no incendive sparks can be produced to an earthed object close to the cable.

4.2.2 All the non-current carrying metal parts of the spray gun other than those designed to acquire a high potential shall be assembled so that they remain in electrical contact with each other. These metal parts shall be connected to the earth terminal in the power supply of the high voltage generator by means of terminals of the type described in clauses 3.1 or 3.2 of EN 50 019 or other connections which are equally reliable.

NOTE. A method of connection between the metal parts of the spray gun and the earth terminal in the power supply of the high voltage generator is via the metallic screen referred to in 4.2.1 above.

4.2.3 Any electrical apparatus or part of electrical apparatus of a paint spray gun, if necessary including the outer enclosure of the gun, with the exception of the components in the high voltage circuit, shall comply with the requirements of one or more of the types of protection listed in EN 50 014.

All the electrical components of a powder or flock spray gun, with the exception of the high voltage electrode, shall comply with the degree of protection of IP 54 as defined in HD 365 S3.

In addition, a flock spray gun used in association with adhesives which may form an explosive gas atmosphere, shall comply with the same requirements as for a paint spray gun.

All components of a powder or flock spray gun shall comply with the requirements of temperature class T 6 (see EN 50 014).

4.2.4 If it is considered possible that a breakdown could occur within cavities where there could be an explosive atmosphere, the gun shall pass a voltage test of $1,5 U_{max}$ (see 5.2.1). This test is not necessary if the high voltage electrical components, including their enclosures, comply with the requirements of an appropriate type of protection in EN 50 014 for Group IIA (e.g. flameproof enclosure 'd' according to EN 50 018).

4.2.5 The high voltage cable shall be capable of withstanding a voltage test of $1,5 U_{max}$ (see 5.2.2).

4.2.6 The operating trigger of the spray gun shall be biased towards the OFF position. The trigger, when released, shall switch off the high voltage supply and the spraying material supply to the spray gun within 2 s.

Multi-outlet high voltage supplies shall not be used unless isolation for each high voltage outlet can be achieved by release of the operating trigger of the spray gun connected to the outlet concerned.

4.2.7 Any current limiting resistor used in the spray gun or the associated apparatus shall be so mounted, insulated and protected that it is immune from short circuit and shall be so rated that it is undamaged when a short circuit occurs between the high voltage electrode of the spray gun and earth for 5 min.

4.2.8 Components on which safety in respect of ignition depends and which are built into the high voltage supply shall be connected, assembled, etc., so that the safety of the device cannot be prejudiced.

4.2.9 If zener diodes are used to limit the high voltage, they shall be duplicated.

Zener diodes shall not be operated at more than 2/3 of their manufacturer's rating under a one fault condition (see particularly 4.2, 6.1 and 7.6 of EN 50 020).

4.2.10 Potentiometers whose adjustment could increase the maximum tested high voltage output shall not be capable of re-adjustment. The locking of the adjustment shall be durable and permanent.

5 Type tests

Type tests to this European Standard are made at an ambient temperature of $(20 \pm 5) ^\circ\text{C}$.

5.1 Ignition tests for the spray gun

WARNING NOTE. Attention is drawn to the fact that tests contained in this standard require precautions to ensure the safety of personnel carrying out such tests.

5.1.1 The ignition energy of the explosive mixture used for testing paint spray guns shall be 0,24 mJ.

A mixture of propane of 99 % purity and air with a concentration by volume of $(5,25 \pm 0,25) \%$ propane shall be used.

5.1.2 The ignition energy of the explosive mixture used for testing powder spray guns shall be 5 mJ. The test gas shall be either:

5.1.2.1 A mixture of methane of 99 % purity and air with a concentration by volume of $(12,0 \pm 0,1) \%$ methane or

5.1.2.2 A mixture of methane, oxygen and nitrogen, each of 99 % purity. The concentration by volume of the gases shall be

methane	$(6,6 \pm 0,15) \%$,
oxygen	$(14,9 \pm 0,2) \%$,
nitrogen	$(78,5 \pm 0,2) \%$.

5.1.3 Flock spray guns which are to be used in association with adhesives which may form an explosive atmosphere shall be tested with the explosive mixture for paint spray guns.

5.1.4 Spray guns which are used to spray flock which has an ignition energy of less than 500 mJ and are used with adhesives which do not form an explosive atmosphere shall be tested with the explosive mixture for powder spray guns.

5.1.5 The ignition tests shall be carried out after performing the manufacturer's cleaning procedure 10 times. If the high voltage is adjustable, it shall be set to the maximum value. The test shall be carried out at the rated mains supply voltage plus or minus 10 %, whichever gives the maximum output voltage. In order to assess the maximum possible voltage available from the power supply, the effect of fault: due to small clearance or creepage paths between parts of the circuit or of faults in a component will have to be taken into consideration (e.g. as for apparatus of Intrinsic Safety Category 'ib' in EN 50 020).

Earthed metal spheres, 10 mm and 25 mm diameter, are repeatedly moved towards those parts of the spray gun and its connecting cable from which it is possible to obtain the most incendive discharges. The discharges are produced inside a chamber of non-conducting material containing the explosive mixture. This test is carried out for a period of 5 min and is performed four times using a fresh explosive mixture each time. Alternatively, if the explosive mixture is passed continuously through the chamber, the test is carried out for one period of 20 min. If the explosive mixture is not ignited, the spray gun shall be considered to have passed the test.

During the test the spray gun is operated without atomizing air flowing through the nozzle. This ensures that the most incendive discharges that the spray gun is capable of producing take place in an explosive mixture which is not diluted and made less sensitive by atomizing air. The nozzle of the spray gun shall be wetted with a liquid having the highest value of conductivity specified by the manufacturer. A spray gun which does not need a column of paint to conduct or produce the charging current is operated without liquid inside it. A spray gun which does, is operated whilst emitting a small quantity of a non-flammable liquid of conductivity within the range recommended by the manufacturer of the spray gun being tested.

5.1.6 If the high voltage cable to the spray gun is not provided with a metallic screen (see 4.2.1), a length of cable at least 0,5 m long is put into the test chamber, e.g. in the form of a loop. This is tested for incendive discharges in the same manner as for the spray gun described above. During each period of 5 min the high voltage shall be switched on and off at least 10 times (or 40 times in the case of the 20 min test).

5.2 Voltage test

5.2.1 With the normally earthed parts of the spray gun and its connecting cable connected to earth, the high voltage parts of the spray gun and of its connecting cable are raised to a voltage of $1,5 U_{max}$. This will require the suppression of corona current from the high voltage electrode. In order to avoid the effects of impulses at the switching on of the equipment, the test voltage should be increased uniformly from the minimum value up to the final value in 10 s and subsequently kept constant for 1 min. There shall be no breakdown.

When the high voltage generator is part of the spray gun, it is permissible to use for test purposes a dummy which contains all conductive parts of the high voltage generator that operate at a voltage exceeding $0,5 U_{max}$ and is supplied with the test voltage from a separate generator.

5.2.2 The high voltage part of the high voltage cable shall be raised to a voltage of $1,5 U_{max}$ for a period of 20 min. The screen of the cable shall be earthed. There shall be no breakdown.

If the cable does not have a metallic screen, the whole of a sample cable at least 2,5 m long shall be placed in a water bath containing ordinary tap water at ambient temperature,

except for 75 cm at each end. Both ends are joined together and a test voltage of $1,5 U_{max}$ applied between core and water bath for 20 min. There shall be no breakdown.

5.3 Tests for temperature classification and surface temperature of spray guns and associated apparatus

A test or an assessment based on previous experience of similar apparatus shall be carried out to establish the temperature classification, in accordance with clause 4 of EN 50 014 for Group II apparatus, of the spray gun and of the surface of the enclosure of the associated apparatus for use with powder and flock spraying, if it is intended to be located in the hazardous area.

5.4 Impact test

The spray gun and associated apparatus for powder or flock intended to be located in the hazardous area shall be submitted to tests corresponding to the high risk of mechanical danger for apparatus of Group II according to EN 50 014 clause 22.4.3.1 table 4. The lower values quoted in this table for light transmitting parts do not apply.

The tests shall be performed on two samples of the spray gun.

Both samples of the spray gun shall comply after the test with the requirements of the ignition test (5.1). It is not a requirement that the spray guns remain undamaged.

The impact test on the associated apparatus shall not affect the degree of protection IP 54.

5.5 Drop test

The spray gun shall be dropped four times from a height of 1,25 m on to a concrete floor.

The test shall be performed on two samples (not the same as those used in 5.4), fully assembled and ready for use. The positions of the sample for the drop test shall be selected by the testing station.

Both samples shall comply after the test with the requirements of the ignition test (5.1). It is not a requirement that the spray guns remain undamaged.

5.6 Cable pull test

Any cable to the spray gun, other than a cable containing only intrinsically safe circuits, shall be subjected to a pull test of 150 N for 50 s.

This test shall be performed on two samples fully assembled. Neither sample shall exhibit visible movement of the cable in its retaining device during the test.

6 Manufacturer's responsibility

By marking the electrical apparatus in accordance with clause 7 of this European Standard, the manufacturer attests on his own responsibility that the routine verifications and tests in clause 23 of EN 50 014 have been successfully completed and that the product complies with the specification submitted to the testing station.

7 Marking

NOTE. In the interest of safety, it is essential that the system of marking indicated below is not applied to apparatus which does not comply with this European Standard.

The following marking, and any additional marking required for the safe operation of the system, shall be clearly marked on the apparatus in a visible place. This marking shall be legible and durable taking into account possible chemical corrosion.

7.1 Associated apparatus

7.1.1 The name of the manufacturer or his registered trade mark.

7.1.2 The manufacturer's type identification, which shall be unique in order to ensure safe use of combinations of apparatus.

7.1.3 Range of input voltages and whether a.c. or d.c.

7.1.4 Rated frequency range of input.

7.1.5 Rated input power.

7.1.6 The number of this European Standard EN 50 050.

7.1.7 The indication of the testing station and the certificate reference in the following form: the year of certification followed by the serial number of the certificate in that year.

7.1.8 The rated output voltage.

7.1.9 The rated output current. <https://standards.iteh.ai/catalog/standards/sis/01500230-962a-47412-03a2-e5797459d707/sist-en-50050-1996>

7.1.10 Where appropriate, the marking required by the type of protection listed in EN 50 014.

7.1.11 Where appropriate, the degree of protection required by clause 3.

7.1.12 Any marking normally required by the standards of construction of the electrical apparatus.

7.2 Spray gun

7.2.1 The name of the manufacturer or his registered trade mark.

7.2.2 The manufacturer's type identification, which shall be unique in order to ensure safe use of combinations of apparatus.

7.2.3 The symbol EEx followed by the marking 0,24 mJ or 5 mJ as appropriate (see 5.1.1 to 5.1.4).

7.2.4 The indication of the testing station and the certificate reference in the following form: the year of certification followed by the serial number of the certificate in that year.

7.2.5 If the testing station considers that it is necessary to draw attention to special conditions for safe use, the sign X shall be placed after the certificate reference.

8 Instruction manual

Each spray gun shall be supplied with an instruction manual in the appropriate language. In addition to the marking information above, the instruction manual shall contain the following:

8.1 The rated output voltage of the high voltage generator.

8.2 The rated output current of the high voltage generator.

8.3 The upper and lower limit of the conductivity of the paint to be used, if the spray gun needs a column of paint to conduct or produce the charging current.

8.4 Any other information for the correct use of the apparatus.

8.5 The sentence: This equipment can be dangerous unless it is used in accordance with the rules laid down in this manual.