



SLOVENSKI STANDARD
oSIST prEN 50059:2020
01-julij-2020

Oprema za ročno elektrostatično brizganje - Varnostne zahteve - Ročna oprema za brizganje nevnetljivih premazov

Electrostatic hand-held spraying equipment - Safety requirements - Hand-held spraying equipment for non-ignitable coating materials

Elektrostatische Handsprüheinrichtungen - Sicherheitsanforderungen - Handsprüheinrichtungen für nichtentzündbare Beschichtungsstoffe

Équipement manuel de projection électrostatique - Exigences de sécurité - Équipement manuel de projection de revêtement inflammable

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Ta slovenski standard je istoveten z: prEN 50059

ICS:

87.100	Oprema za nanašanje premazov	Paint coating equipment
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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 50059

May 2020

ICS 87.100

Will supersede EN 50059:2018 and all of its
amendments and corrigenda (if any)

English Version

Electrostatic hand-held spraying equipment - Safety requirements - Hand-held spraying equipment for non-ignitable coating materials

Équipement manuel de projection électrostatique -
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de revêtement inflammable

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nichtentzündbare Beschichtungsstoffe

This draft European Standard is submitted to CENELEC members for enquiry.
Deadline for CENELEC: 2020-07-31.

It has been drawn up by CLC/TC 204.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CENELEC in three official versions (English, French, German).
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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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Contents	Page
European foreword	4
0 Introduction	5
0.1 Process	5
0.2 Fire hazards	5
0.3 Electric hazards	5
1 Scope	6
2 Normative references	6
3 Terms, definitions and symbols	7
3.1 Terms and definitions	7
3.2 Symbols	9
4 Requirements for hand-held spraying equipment for non-ignitable liquid coating materials	10
4.1 General requirements	10
4.2 Requirements for the accessories	12
5 Tests	13
5.1 General	13
5.2 General tests	13
5.2.1 Test of earth connections	13
5.2.2 Resistance test	13
5.2.3 Test of contact surface area	13
5.2.4 Test of OFF-position	13
5.3 Conditioning test	13
5.3.1 Cable pull test and hose pull test	13
5.3.2 Impact test	13
5.3.3 Drop test	14
5.4 Tests for electrical safety	14
5.4.1 Measurement of the parameters high voltage and short-circuit current	14
5.4.2 Voltage test	14
5.4.3 Test of the degree of protection of applicators	14
5.5 Test of the peak current values of discharges $I_C(p)$ with their associated pulse durations t_j	14
5.6 Tests of the accessories	14
5.6.1 Test of the degree of protection	14
5.6.2 Test of the coating material supply system	15
6 Information for use	15
6.1 General	15
6.2 Instruction manual	15
6.2.1 General	15
6.2.2 Cleaning, maintenance and repair	15
6.2.3 Test intervals of repeated tests	16
Table 1 — Test intervals	16
6.2.4 Additional information	16
6.3 Marking of electrostatic hand-held spraying equipment and associated control devices	17
6.3.1 Marking of applicators	17
6.3.2 Marking of the associated control devices	17
6.3.3 Reduced marking	18

Annex A (normative) Measurement of a discharge with the peak current value $I_C(p)$ and the pulse duration t_i (type test)	19
Figure A.1.1 - Equivalent circuit diagram with shunt and oscilloscope	20
Figure A.1.2 - Equivalent circuit diagram with current transformer and oscilloscope	21
Figure A.2 — Schematic discharge curve.....	22
Annex B (informative) Example for discharge measurement.....	24
Figure B.1 — Discharge plot	24
Annex C (informative) Ignitability of coating materials.....	26
C.1 General	26
C.2 Non-ignitable coating materials.....	26
C.3 Ignitable coating materials	26
Annex D (informative) Quality assurance systems for electrostatic spraying equipment.....	27
D.1 General	27
D.2 Electrical assembly	27
D.3 Mechanical assembly.....	28
D.4 Tests	28
Annex ZZ (informative) Relationship between this European standard and the essential requirements of Directive 2006/42/EC aimed to be covered.....	29
Table ZZ.1 — Correspondence between this European standard and Annex I of Directive 2006/42/EC.....	29
Bibliography.....	30

oSIST prEN 50059:2020
<https://standards.iteh.ai/catalog/standards/sist/cab5a70d-23d0-4945-8eb4-c6096be0e3bd/osist-pren-50059-2020>

prEN 50059:2020 (E)**European foreword**

This document (prEN 50059:2020) has been prepared by Technical Committee CEN-CENELEC/TC 204 “Safety of electrostatic painting and finishing equipment”, the secretariat of which is held by DIN.

This document is currently submitted to the Enquiry.

The following dates are proposed:

- latest date by which the existence of this document has to be announced at national level (doa) dor + 6 months
- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) dor + 12 months
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) dor + 36 months (to be confirmed or modified when voting)

This document will supersede EN 50059:2018 and all of its amendments and corrigenda (if any).

prEN 50059:2020 includes the following significant technical changes with respect to EN 50059:2018:

- modification of 3.2 Symbols,
- update of 1.5,
- update of 2 Normative references,
- update of 6.2.1 General,
- correction and modification of Annex A (normative),
- modification of Annex B (informative),
- modification of Annex C (informative),
- update of Bibliography.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

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 non-ignitable liquid coating material is transported from a reservoir to an applicator where it is atomised by mechanical forces and by the influence of an electric field. The coating material is charged by high voltage of some 10 kV and a spray cloud is generated. The charged droplets of the coating materials are attracted by and applied to the earthed workpiece.

Droplets of the coating material, which are not applied to the workpiece (overspray) are removed by a suction device or by other means.

After the coating process, the coated workpieces are introduced into a dryer or oven where a dry film of coating material is generated.

0.2 Fire hazards

0.2.1 Fire hazards can be caused by deposits of coating materials inside the spray booth, exhaust air ducts, the recovery system for coating materials, and filters. During operation, malfunctions or electrical faults could cause ignition of these residues. The propagation of the fire also leads to hazards in adjacent areas.

0.2.2 Particular attention should be paid to the prevention of electrostatic charges on different surfaces, which are in the vicinity of the spray cloud. This could apply both 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 coating materials are covered by EN 50050-1, EN 50050-2 and EN 50050-3.

0.3 Electric hazards

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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,
- charged passive parts with inadequate earthing.

0.3.2 Inadequate earthing could occur, for instance, due to:

- faulty connections to the protective earthing system,
- a too high resistance to earth (e.g. contamination by coating materials).

0.3.3 Hazards could occur, for instance, if hazardous malfunctions (e.g. shortcut of electronic safety circuits) occur due to interferences of the electrostatic 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.

0.3.5 Ventricular fibrillation is the primary risk of electric shock. The undercut of the current/time limit and the fibrillation limit are proven by current and time measurement. In this document, $I(t)$ is used as a measure for falling below the current/time limit and the fibrillation limit. It is comparable to the amount of current $I t$ or the specific fibrillation energy $I^2 t$ in accordance with IEC 60479-1 and IEC 60479-2. A power limit as given in the standards EN 50176, EN 50177, EN 50223 and EN 50348 is not applicable in this document due to the characteristics of the equipment and the resulting hazard of electric current.

prEN 50059:2020 (E)**1 Scope**

1.1 This document specifies the requirements for hand-held or hand-operated electrostatic spraying equipment for non-ignitable liquid coating materials which

- do not generate an explosive atmosphere inside the spraying area,
- are used to process materials with a conductivity of less than 2 000 $\mu\text{S}/\text{cm}$, and
- operate with direct current having a sinusoidal ripple of not more than 10 % of the rms value.

This document deals with all electrical hazards significant for the electrostatic spraying of non-ignitable liquid coating materials, which could also contain small quantities of added metal particles, if the work is carried out under conditions recommended by the manufacturer.

This document specifies the design-related and test requirements for electrostatic spraying equipment of type A-NL according to of EN 50348:2010, Table 1.

1.2 With regard to all other significant hazards relevant for applicators (e.g. ejection of fluids, mechanical strength, electrical (with the exception of electrostatic) hazards, noise, contact with or inhalation of dangerous substances, ergonomics), the requirements of EN 1953 apply.

1.3 This document also gives details regarding quality assurance systems for electrostatic spraying equipment; see Annex D.

1.4 For electrostatic spraying equipment used in food and pharmaceutical industry, additional requirements could apply.

1.5 This document is not applicable to:

- electrostatic hand-held spraying equipment for non-ignitable coating materials which are manufactured before the date of its publication,
- cleaning of spraying areas, see instruction manual of the spraying booth,
- fire prevention and protection (for instance fire hazards due to other sources; see EN 16985),
- requirements for machinery for the supply and recirculation of coating material under pressure (see EN 12621).

The requirements of EN 12621 apply in terms of specific requirements regarding machinery for the supply and recirculation of coating materials under pressure.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1149-5, *Protective clothing — Electrostatic properties — Part 5: Material performance and design requirements*

EN 1953, *Atomising and spraying equipment for coating materials — Safety requirements*

EN 16985, *Spray booths for organic coating material — Safety requirements*

EN 60079-7:2015, *Explosive atmospheres — Part 7: Equipment protection by increased safety “e” (IEC 60079-7:2015)*

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

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

3 Terms, definitions and symbols

3.1 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1.1

hand-held spraying equipment

hand-held or hand-operated equipment for electrostatic coating using non-ignitable liquid coating materials, generally comprising the following parts:

- applicator,
- coating material supply system,
- control device,
- high voltage supply system, and
- connecting cable

3.1.2

connecting cable

electric cable connected to the applicator or charging device for liquid coating material

3.1.3

earthing system

system for earthing the electrostatic hand-held spraying equipment permanently

3.1.4

spraying device

outlet opening for the coating material of the applicator

Note 1 to entry: Spraying devices may be constructed as nozzle or bell types.

3.1.5

high voltage electrode

conductive part, which is at a high voltage and serves to directly or indirectly charge the coating material

prEN 50059:2020 (E)**3.1.6****control device**

device generally having the following functions of controlling, for instance, the coating material supply system and the control air

Note 1 to entry: A combination of the control device and the high voltage supply according to 3.1.8 is possible.

3.1.7**applicator**

equipment for application of coating material that comprises the following parts in general:

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

3.1.8**high voltage supply for applicators**

high voltage supply comprising the following parts in general:

- 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,
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- high voltage generator

3.1.9**spraying area**

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

3.1.10**dangerous discharge**

discharge which generates the hazard of electric shock

3.1.11**coating material supply system**

coating material supply system that comprises the following in general:

- reservoir for coating materials,
- dosing and mixing devices for coating materials,
- supply lines for coating materials,
- devices for drive, control and monitoring supply of coating materials, and
- charging device for liquid coating material

3.1.12**workpiece**

article to which the coating material is applied

3.1.13**non-ignitable liquid coating material**

liquids and varnishes which cannot be ignited by an effective ignition source during spraying

Note 1 to entry: A formula for the estimation of ignitability on the basis of the composition of the liquid coating material is given in Annex C.

3.1.14**antistatic footwear**

footwear that has a resistance to earth via its sole, which is low enough to prevent the build-up of electrostatic charges capable of producing a dangerous discharge

Note 1 to entry: See EN ISO 20344.

Note 2 to entry: A required electric insulating resistance to prevent electric shocks is not contradictory to this definition.

3.1.15**antistatic clothes**

clothes that have a resistance to earth, which is low enough to prevent the build-up of electrostatic charges capable of producing a dangerous discharge

Note 1 to entry: See EN 1149-5.

Note 2 to entry: A required electric insulating resistance to prevent electric shocks is not contradictory to this definition.

3.1.16**antistatic floor**

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

3.1.17**accessory**

device, component or other equipment, except for 3.1.7 of this document

3.1.18**repeated test**

test of the hand-held spraying equipment, including all accessories, to be carried out at regular intervals

3.2 Symbols

U_{max}	maximum outlet voltage of the high-voltage generator
I_{max}	maximum outlet current of the high-voltage generator
$I_{B\ rms}$	body current (RMS) flowing from the hand to both feet
$I_C(\rho)$	peak current value of a discharge caused by the hand-held spraying equipment
$U_C(\rho)$	peak voltage value of a discharge measured from the oscilloscope
t_i	time period, in which the peak current value $I_C(\rho)$ is dropped to 5 % of its value
R_{Shunt}	resistance of the shunt (0,100 Ω to 0,500 Ω)
F_{CT}	factor of the current transformer in V/A

prEN 50059:2020 (E)

F_{AT} factor of the attenuator $\geq 10:1$

4 Requirements for hand-held spraying equipment for non-ignitable liquid coating materials

4.1 General requirements

4.1.1 Hand-held spraying equipment shall be designed and constructed that both

- in case of long-time contact (>1 s) of live parts and charged passive parts, the short-circuit current flowing through the user does not exceed the maximum of 30 mA DC (see 5.4.1.2), and
- in case of discharge times of less than 10 ms from live parts and charged passive parts the body current with the value $I_{B\ rms}$ of a discharge does not exceed the boundary line C_1 of Figure 1 (see 5.5, 5.6.2 and Annex A and Annex B).

NOTE 1 A discharge in the timeframe between 10 ms and 1 s does not occur in this type of equipment.

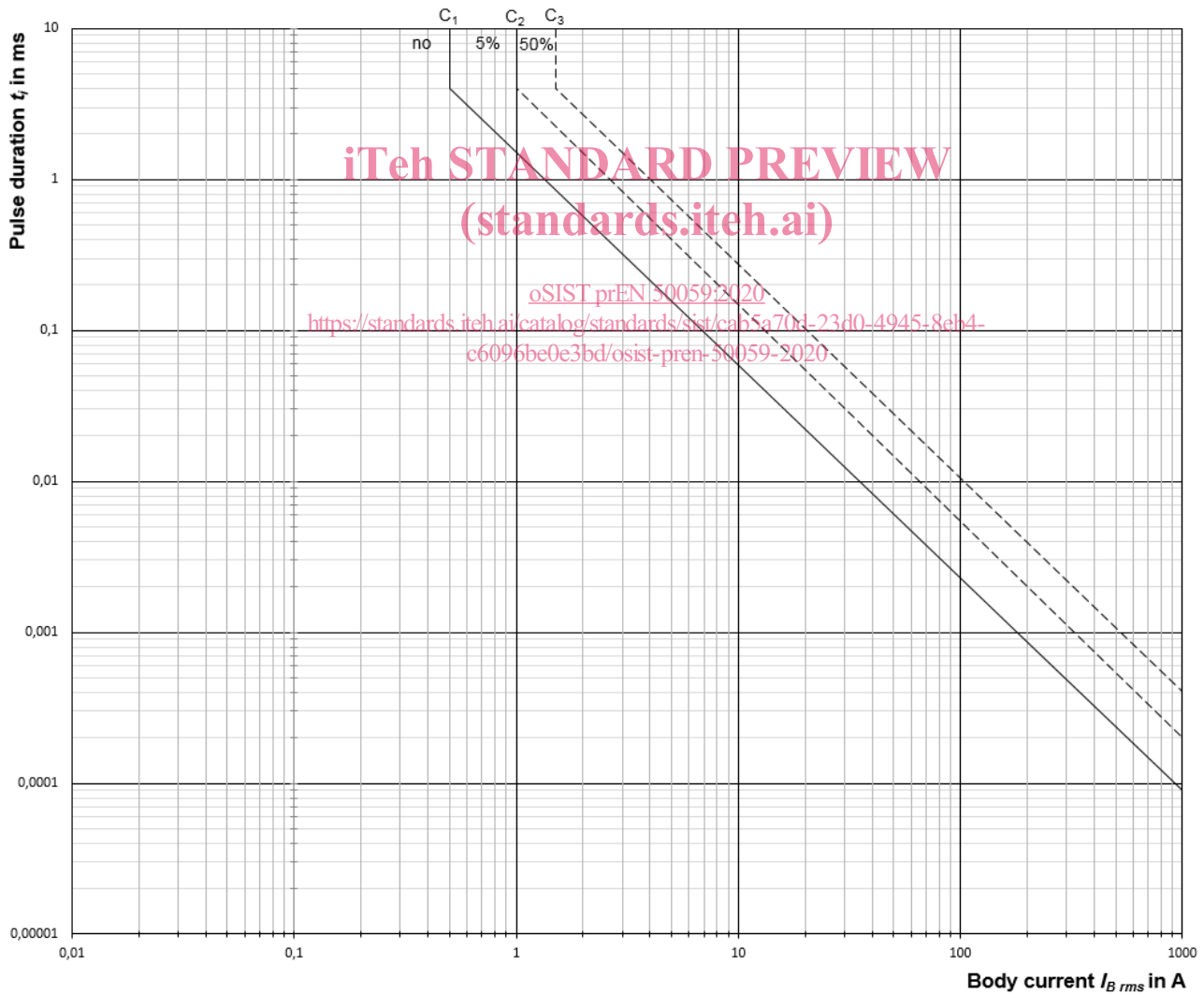


Figure 1 — Pulse duration — body current, ventricular fibrillation risk