

© Copyright SEK. Reproduction in any form without permission is prohibited.

Handhållen elektrostatisk sprututrustning – Säkerhetsfordringar – Handhållen sprututrustning för ytbeläggning med icke antändbar vätska

Electrostatic hand-held spraying equipment –

Safety requirements –

Hand-held spraying equipment for non-ignitable coating materials

Som svensk standard gäller europastandarden EN 50059:2018. Den svenska standarden innehåller den officiella engelska språkversionen av EN 50059:2018.

Nationellt förord

Tidigare fastställd svensk standard SS-EN 50059, utgåva 1, 1990, gäller ej fr o m 2021-07-27.

ICS 87.100.00

Denna standard är fastställd av SEK Svensk Elstandard, som också kan lämna upplysningar om **sakinnehållet** i standarden.
Postadress: Box 1284, 164 29 KISTA
Telefon: 08 - 444 14 00.
E-post: sek@elstandard.se. Internet: www.elstandard.se

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a mätning, säkerhet och provning och för utförande, skötsel och dokumentation av elprodukter och elanläggningar.

Genom att utforma sådana standarder blir säkerhetsfordringar tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK Svensk Elstandard

Box 1284
164 29 Kista
Tel 08-444 14 00
www.elstandard.se

EUROPEAN STANDARD

EN 50059

NORME EUROPÉENNE

EUROPÄISCHE NORM

July 2018

ICS 87.100

Supersedes EN 50059:1990

English Version

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

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

Elektrostatische Handsprüheinrichtungen -
Sicherheitsanforderungen - Handsprüheinrichtungen für
nichtentzündbare Beschichtungsstoffe

This European Standard was approved by CENELEC on 2018-01-02. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

© 2018 CENELEC All rights of exploitation in any form and by any means reserved worldwide for CENELEC Members.

Ref. No. EN 50059:2018 E

SEK Svensk Elstandard

SS-EN 50059, utg 2:2018

Contents	Page
European foreword.....	4
0 Introduction.....	6
1 Scope.....	8
2 Normative references.....	8
3 Terms, definitions and symbols	9
3.1 Terms and definitions	9
3.2 Symbols.....	11
4 Requirements for hand-held spraying equipment for non-ignitable liquid coating materials.....	12
4.1 General requirements	12
4.2 Requirements for the accessories.....	14
5 Tests	15
5.1 General	15
5.2 General tests	15
5.2.1 Test of earth connections	15
5.2.2 Resistance test.....	15
5.2.3 Test of contact surface area	15
5.2.4 Test of OFF-position.....	15
5.3 Conditioning test.....	15
5.3.1 Cable pull test and hose pull test.....	15
5.3.2 Impact test	15
5.3.3 Drop test	16
5.4 Tests for electrical safety	16
5.4.1 Measurement of the parameters high voltage and short-circuit current.....	16
5.4.2 Voltage test.....	16
5.4.3 Test of the degree of protection of applicators	16
5.5 Test of the peak current values of discharges $I_C(p)$ with their associated pulse durations t_j.....	16
5.6 Tests of the accessories	17
5.6.1 Test of the degree of protection	17
5.6.2 Test of the coating material supply system	17
6 Information for use.....	17
6.1 General	17
6.2 Instruction manual.....	17
6.2.1 General.....	17
6.2.2 Cleaning, maintenance and repair	18
6.2.3 Test intervals of repeated tests	18
6.2.4 Additional information	18
6.3 Marking of electrostatic hand-held spraying equipment and associated control devices.....	19

6.3.1	Marking of applicators	19
6.3.2	Marking of the associated control devices	19
6.3.3	Reduced marking.....	20
Annex A	(normative) Test of a discharge with the peak current value $I_C(p)$ and the pulse duration t_j (type test).....	21
Annex B	(informative) Example for discharge test.....	24
Annex C	(informative) Ignitability of water-based paints.....	26
Annex D	(informative) Quality assurance systems for electrostatic spraying equipment.....	28
Annex ZZ	(informative) Relationship between this European standard and the essential requirements of Directive 2006/42/EC aimed to be covered.....	30
Bibliography	31

Tables

Table 1	— Test intervals.....	18
Table ZZ.1	— Correspondence between this European Standard and Annex I of Directive 2006/42/EC.....	30

Figures

Figure 1	— Pulse duration - body current, ventricular fibrillation risk.....	12
Figure A.1	— Equivalent circuit diagram	22
Figure A.2	— Schematic discharge curve	23
Figure B.1	— Discharge plot	24

European foreword

This document (EN 50059:2018) has been prepared by Technical Committee CEN-CENELEC/TC 204 "Safety of electrostatic painting and finishing equipment".

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) 2019-01-27
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2021-07-27

This document supersedes EN 50059:1990.

EN 50059:2018 includes the following significant technical changes with respect to EN 50059:1990:

- modification of the title of the standard;
- extension of introduction;
- extension of normative references;
- extension of terms and definitions;
- new arrangement, amendment and complement of the requirements for hand-held spraying equipment for non-ignitable liquid coating materials;
- definition of requirements for safety functions;
- new arrangement, amendment and complement of tests for hand-held spraying equipment for non-ignitable liquid coating materials;
- new arrangement and extension of the information for use;
- definition of requirements for repeated tests;
- introduction of the normative Annex A "Test of a discharge with the peak current value $I_{C(p)}$ and the pulse duration t_i (type test)";
- introduction of the informative Annex B "Example for discharge test";
- introduction of the informative Annex C "Ignitability of water-based paints";
- introduction of the informative Annex D "Quality assurance systems for electrostatic spraying equipment";
- introduction of the informative Annex ZZ "Relationship between this European standard and the essential requirements of Directive 2006/42/EC aimed to be covered".

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

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.

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 may cause ignition of these residues. The propagation of the fire leads to hazards also 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

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 may 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 standard, $I(t)$ 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/TS 60479-1 and IEC TS 60479-2. A power limit as given in the standards EN 50176, EN 50177, EN 50223 and EN 50348 is not applicable in this standard due to the characteristics of the equipment and the resulting hazard of electric current.

1 Scope

1.1 This European Standard 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 $\mu\text{S}/\text{cm}$;
- operate with direct current having a sinusoidal ripple of not more than 10 % of the rms value.

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

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

1.3 This European Standard 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 may 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 as EN,
- 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 12215, EN 12981],
- requirements for machinery for the supply and recirculation of coating material under pressure [see EN 12621].

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

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: Material performance and design requirements*

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

EN 12215, *Coating plants - Spray booths for application of organic liquid coating materials - Safety requirements*

EN 12621, *Machinery for the supply and circulation of coating materials under pressure - Safety requirements*

EN 50348:2010, *Stationary electrostatic application equipment for non-ignitable liquid coating material - Safety requirements*

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 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)*