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Stationary electrostatic application equipment for ignitable flock material — Safety requirements

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National foreword

This British Standard is the UK implementation of EN 50223:2015. It supersedes BS EN 50223:2010 which is withdrawn.

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

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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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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• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2018-04-13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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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 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}.

3.36
disconnection threshold
disconnection threshold is either the overcurrent value $I_{ü}$ or the minimum voltage value U_{min}. When the value of $I_{ü}$ is exceeded or the value of U_{min} falls below, a cutting off of the high voltage supply is released

3.37
locally acting fire extinguishing system
system that protects the highly hazardous area between the flock application system and the workpiece. This fire extinguishing system meets the special conditions during electrostatic application of flock

3.38
skilled person
person who due to technical training, experience and recent occupational activities, has sufficient knowledge in the field of electrostatic coating with stationary equipment, is familiar with the relevant and generally accepted technical rules, and thus is able to test and evaluate the occupationally safe state of coating plants

3.39
repeated tests
inspection of the entire electrical equipment, systems and plants to be carried out at regular intervals

4 List of significant hazards

		Safety requirements and/or measures	
Hazardous factors	**Location or situation of the hazard**	**Specific requirements** **Corresponding clauses of this standard**	**General requirements** **Corresponding clauses of EN ISO 12100:2010**
4.1 General	This clause contains all significant hazards, hazardous situations and events, as far as they are dealt with in this standard, identified by risk assessment as significant for stationary electrostatic application equipment for ignitable flock included in the scope and which require action to eliminate or reduce the risk. NOTE ISO/TR 14121-2 describes a practical application of various procedures for each level of risk assessment.		4, 5, 6 Annex A Annex B
4.2 Mechanical hazards		5.5.1.1, 5.5.1.2, 5.5.1.3	6.2.2, 6.2.3 6.2.6, 6.2.10 6.2.11, 6.3.1 6.3.2, 6.3.3 6.3.5 Annex B
4.2.1 Hazards by shearing, crushing and drawing in	— drives, conveyors and automatic handling systems (e.g. robots) during charging or discharging flock application booths — auxiliary charging equipment and conveyors inside or adjacent to the application booths — fans (e.g. injuries due to after-running fan wheel) and air inlet openings — damper adjuster — movable parts of flock application booths (e.g. doors, gates, hoods).	5.5.1.1	6.2.2, 6.2.3, 6.2.6, 6.2.10, 6.2.11, 6.2.14, 6.3.1, 6.3.2, 6.3.3, 6.3.5 Annex B

4.2.2 Entrapment hazard	— obstacles or obstructions can impede a quick evacuation of the operator(s) from the flock application booth in case of mechanical accident or fire
	— significant accidental lowering of pressure inside a flock application booth (i.e. obstruction of air inlet),
	  — resulting in jammed doors due to mechanical deformation of the flock application booth and/or
	  — increasing the door opening effort beyond human capability.
		5.5.1.2	6.3.5
			Annex B

		Safety requirements and/or measures	
Hazardous factors	**Location or situation of the hazard**	**Specific requirements** **Corresponding clauses of this standard**	**General requirements** **Corresponding clauses of EN ISO 12100:2010**
4.2.3 Slip, trip and fall hazards for persons	— on ladders, gangways, platforms and stairs — on gratings at floor level — on slippery ground — as a result of poor lighting.	5.5.1.3	6.3.5 Annex B
4.3 Electrical hazards		5.1, 5.3, 5.4, 5.5	6.2.9, 6.3.2, 6.3.3, 6.3.5 Annex B
4.3.1 Electrical hazards resulting from dangerous electric body currents	caused by e.g.: — electrically live parts that are not insulated for operational reasons; — electrically live parts with insulation damaged by contact with solvents or by mechanical parts; — live parts which are not at a dangerous voltage during normal operation, but in the case of failure.	5.4.2 5.5.2	6.2.4, 6.2.9, 6.2.12, 6.3.2, 6.3.3, 6.3.5
4.3.2 Electrical hazards due to inappropriate grounding	caused by e.g.: — defective bonding to the protective ground system — too high resistance to ground; — interaction of the electrostatic high voltage equipment with elements of the control and safety systems can cause dangerous malfunctions (e.g. short circuits on electronic safety circuits, entrance guards, alarm unit).	5.1 5.5.2.2	6.2.9, 6.2.11, 6.2.13, 6.3.1, 6.3.2, 6.3.3, 6.3.5 Annex A Annex B
4.3.3 Electrical hazards due to electrostatic discharges	caused by e.g.: — ungrounded conductive parts or non-conductive large surfaces, especially if they are in contact with conductive material.	5.5.2.3	6.2.9, 6.3.2, 6.3.3, 6.3.5
4.4 Hazards generated by noise	Noise exposure, accidents due to interference with speech communication and the perception of acoustic signals, hearing loss and/or physiological effects caused by noise emissions of e.g.: — fans; — excessive air velocity in ducts and accessories — drives and conveyors; — resonance vibrations.	5.5.3	5.2, 5.4, 6.2.2 6.2.3, 6.2.4, 6.2.8, 6.3.1, 6.3.2, 6.3.3, 6.3.4 Annex B

		Safety requirements and/or measures	
Hazardous factors	**Location or situation of the hazard**	**Specific requirements** **Corresponding clauses of this standard**	**General requirements** **Corresponding clauses of EN ISO 12100:2010**
4.5 Hazards resulting from dangerous substances	By absorption of hazardous liquids, gases, vapours, mists, fume gases, flock and dusts, e.g. via — absorption of hazardous liquids (coating materials, solvents) getting in contact with the skin, — inhalation of dangerous gases or vapours, — inhalation of dangerous gases and vapours released by the automatic fire extinguishing system, — skin irritations caused by flock materials, — loose preparation of flock.	5.5.4	6.2.2, 6.2.3, 6.2.4 6.3.1, 6.3.2 6.3.3, 6.3.4 Annex B
4.6 Fire hazards	caused by contact with or ignition of ignitable substances due to: — hot surfaces (e.g. of the substrate); — mechanically induced sparks (e.g. by robots, fans and/or conveyors); — electrostatic and atmospheric discharges; — electrical sparks; — welding and other sources of thermal energy (e.g. during maintenance works).	5.3, 5.5.5	6.2.2, 6.2.3 6.2.4, 6.3.1 6.3.2, 6.3.3 6.3.4 Annex B
4.7 Explosion hazards		5.3, 5.5.6	
4.7.1 General explosion hazards	caused by an increase of the concentration of released ignitable substances (solvents, flock) above the lower explosion limit (*LEL*) and an effective ignition source like e.g.: — hot surfaces (e.g. of the substrate); — mechanically induced sparks (e.g. by robots, fans and/or conveyors); — electrostatic and atmospheric discharges; — electrical sparks; — welding and other sources of thermal energy (e.g. during maintenance works).	5.3, 5.5.6, 5.5.8	6.2.2, 6.2.3 6.2.4, 6.3.1 6.3.2, 6.3.3 6.3.4, Annex B

		Safety requirements and/or measures	
Hazardous factors	**Location or situation of the hazard**	**Specific requirements** **Corresponding clauses of this standard**	**General requirements** **Corresponding clauses of EN ISO 12100:2010**
4.7.2 Specific explosion hazards in enclosed spaces	caused by preventing a free dispersion of expanding gases and products of combustion by sealing an ignitable gas and/or flock-air mixture in a space and thus a possible explosion can result from an increase in pressure.	5.3, 5.5.8	6.2.2, 6.2.3 6.2.4, 6.3.1 6.3.2, 6.3.3 6.3.4, Annex B
4.8 Hazards by malfunctions of the control system	A malfunction of the control system can result in: — an increase of flock concentration in air, — an increase of the solvent-air concentration, — an incorrect operation of control functions.	5.3, 5.5.7	5.2, 5.3.2 5.4, 5.5.2 5.5.3, 6.2.2 6.2.4, 6.2.12 6.2.8, 6.2.11 6.2.13, 6.2.14 6.3.2, 6.3.3 Annex A Annex B
4.9 Hazards by failure of energy supply	Failure of energy supply can result in: — a loss of monitoring devices and thus in a reduction of the volume flow of forced ventilation, — an unexpected cut-off of control systems, — a loss of monitoring devices and thus in exceeding the maximum admissible concentrations within the flock application booth, — a failure of lighting.	5.5.9	5.3.3, 5.4 6.2.10, 6.2.11 6.3.2, 6.3.5 6.4.5, Annex B

5 Safety requirements and/or measures

5.1 General requirements for electrostatic flock application systems

All equipment and components shall comply with the required categories for group II devices to ensure avoidance of any ignition source.

All accessories shall be outside the areas with explosion hazard, if possible.

If accessories are used in areas with explosion hazard, they shall comply with the requirements of EN 60079-0 and EN 13463-1.

For requirements for the control systems of flock application systems, see 5.5.7.

5.2 Categorisation of electrostatic flock application systems

Depending on the discharge energy that can be transmitted, electrostatic flock application systems are categorised in three types according to Table 1.

Table 1 — Electrostatic flock application systems for ignitable flock – Overview

Types ("F" stands for flock)	Discharge energy	Hazard caused by	
		ignitable discharge	electrical shock
Type B-F	< 350 mJ	No	No
Type C-F	< 800 mJ	No	Yes
Type D-F	> 800 mJ	Yes	Yes

The discharge energy shall be calculated by the following formula: $W = ½ C \times U^2$. If resistors, semiconductors or liquid conductors are present the calculation of W results in too high values. Alternatively the discharge energy can be determined by measurement.

5.3 Equipment requirements for flock application systems of category 3

5.3.1 General

Flock application systems of category 3D, except for the dosing device, shall have at least IP54 degree of protection according to EN 60529.

Flock application systems of type B-F shall satisfy the requirements of EN 50050-3.

Further requirements for the different types can be taken from Table 2.

Table 2 — Requirements for electrostatic flock application systems of category 3 for ignitable flock

Clause	Requirements	Type B-F	Type C-F	Type D-F
5.3.2	Distance between workpiece and flock application system	No	No	Yes
5.3.3	Disconnection of high voltage	No	No	Yes
5.3.4	Personal protection	No	Yes	Yes
5.3.5	Ignition protection/ cleaning agents	Yes	Yes	Yes
5.3.6	Locally acting fire extinguishing equipment	No	No	Yes
5.3.7	Additional requirements for processing flock material of cotton, artificial silk and comparable material	Yes	Yes	Yes
5.4.2	Protection against contact	No	Yes	Yes

5.3.2 Distance between workpiece and flock application system

The distance between the workpieces and the parts of the flock application system under high voltage shall be such that an electrical flashover is prevented under operational conditions.

5.3.3 Safe disconnection of high voltage

5.3.3.1 General

A device/control unit shall be installed, which is to prevent hazardous discharges between parts under high voltage and grounded parts in such a way that it disconnects the high voltage, discharges the flock application system and shuts down the supply of flock materials. In this context, a difference shall be made between voltage-controlled, constant voltage and constant current operating mode.

This requirement is considered to be satisfied if the safe disconnection is actuated after the first discharge at the latest. During normal operation, spark discharges shall not occur.

5.3.3.2 Voltage-controlled and constant voltage operating mode

A device/control unit shall be installed, which is to disconnect the high voltage, in case the safety distance between the parts under high voltage and grounded parts drops below the permissible limit.

For voltage-controlled and constant voltage operating mode this is achieved by disconnection in case of overcurrent $I_{ü}$.

The disconnection threshold shall be defined with consideration of the operational and local conditions.

NOTE Typically an overcurrent $I_{ü}$, for operational currents of less than 200 µA of up to 200 % or for operational currents of more than 200 µA of up to 50 % is permissible.

5.3.3.3 Constant current operating mode

A device/control unit shall be installed, which is to disconnect the high voltage in case the safety distance between the parts under high voltage and grounded parts drops below the permissible limit.

For constant current operating mode this is achieved by a disconnection if a defined minimum output value of high voltage $U_{\min}$ is no longer reached.

The disconnection threshold shall be defined with consideration of the operational and local conditions.

NOTE Typically a value of the minimum voltage $U_{\min}$ of 20 % to 50 % below the value of the output high voltage for the failure-free normal operation is permitted.

5.3.4 Protection against too high discharge energy

After disconnection of high voltage all parts under high voltage shall be discharged to a discharge energy of less than 350 mJ before these parts can be reached. The discharge time shall be defined considering the operational and local conditions.

5.3.5 Protection against ignition of ignitable cleaning agents

If ignitable liquids are used for cleaning purposes, all parts under high voltage shall be discharged to a discharge energy of less than 0,24 mJ after the disconnection of high voltage, before these parts can be reached.

NOTE Discharges caused by charged areas of insulating plastics may also be able to ignite vapours of flammable cleaning agents if their surface area exceeds a certain value [see IEC/TS 60079-32-1].

5.3.6 Locally acting automatic fire extinguishing systems

Flock application systems shall be equipped with locally acting automatic fire extinguishing systems which are actuated immediately in case of fire and which are adapted to the specific conditions during flock application. See also 5.5.5.

Locally acting fire extinguishing systems (fire extinguishing systems which are installed fixedly and are allocated to the object) shall protect the area between the outlet of flock and the workpiece effectively.

When the fire extinguishing system has been activated, the high voltage supply, the supply of flock material and the pressurised air shall be cut-off automatically.

EN 13478 shall apply.

5.3.7 Additional requirements during processing of flock material of cotton, artificial silk and comparable material

During processing of flock material of cotton, artificial silk and comparable material at least one of the following measures shall be taken against smouldering fires within the dosage container:

— avoidance of creepage distances between the high voltage electrode and grounded parts;

— inertisation of the dosage container;

— locally acting fire extinguishing systems according to 5.3.6.

5.4 Requirements for the high voltage supply

5.4.1 Safeguarding against unauthorized switching on

The high voltage supply shall be safeguarded against unauthorised switching on. Switching off shall be possible at any time.

NOTE Suitable safeguards against unauthorised switching on are e.g. key locks or hardware and software authorisation.

5.4.2 Protection against direct contact

On all doors and openings of the flock application booth with hazards of contact with parts under high voltage the presence of high voltage shall be indicated by optical or audible signal. Every access to the spraying area provided for operators shall be safeguarded in such a way that the high voltage is disconnected when the entrance is gained. Other openings of the spraying area through which parts under high voltage could be contacted shall be locked in such a way to be only opened by keys or tools. An interlock of the high voltage with all doors and openings shall be installed.

If exposed parts of the high voltage supply system are located outside the flock application area or outside a closed electrical operating area, complete protection against direct contact shall be provided. In addition, appropriate measures shall be taken to avoid persons or objects being charged as a result of an electrical field being present.

5.4.3 Requirements for the feedback of the operating current

Components within the flock application area which are not at high voltage potential for operational reasons shall be connected with the ground contact of the high-voltage supply system with a separate conductor of low impedance.

5.4.4 Requirements for the high voltage cable

High voltage cables shall comply with the tests of 6.1.

5.4.5 Requirements for parts under high voltage

Parts of the flock application system under high voltage located outside the flock application area, shall be installed in a way to prevent occurrence of discharges with hazards for persons.

5.4.6 Minimum distance between the parts under high voltage and grounded parts

The minimum distance in air between the parts under high voltage and the grounded parts shall not be less than 0,25 cm/kV. These minimum distances are not applicable both for the distance between the electrostatic flock application system and the workpiece, and the design-specific distances of the flock application systems.

NOTE Possible occurrence of surface discharges at the flock application system can have an influence on the minimum distances.

5.5 Requirements for the flock application booth

If flock application booths are used, they shall satisfy the requirements of this clause.

5.5.1 Protective measures against mechanical hazards

5.5.1.1 Protective measures against shearing, crushing and drawing-in

The design shall avoid injury due to shearing, crushing or drawing-in by movement of machinery and/or parts of equipment.

Exposure to hazardous moving or rotating elements shall be prevented by

— avoiding hazardous movement and/or

— fixed guards and/or

— fitting one of the following devices interlocked with the hazardous movement:

  — movable guards, see EN 953;

  — active opto-electronic protective device, see EN 61496-1 and EN 61496-2;

  — pressure sensitive protective devices (mats and floors), see EN ISO 13856.

For safety distances from dangerous moving parts see EN ISO 13857.

NOTE 1 For conveyors, see EN 619.

NOTE 2 For robots, see EN ISO 10218-1.

NOTE 3 For power operated doors for persons, see EN 12433 (all parts), EN 12453, EN 12635 and EN 12978.

NOTE 4 For lifting tables, see EN 1570-1.

NOTE 5 For safe positioning of light guards, safety mats, etc., see EN ISO 13855.

NOTE 6 For interlocks, see EN ISO 14119.

5.5.1.2 Protective measures against entrapment

Accessible flock application booths (e.g. for setting, service or maintenance) shall be equipped with devices preventing entrapment.

If flock application booths are equipped with doors, these shall

— be capable of being easily opened from inside and outside without auxiliary means,

— have a minimum width of 800 mm and a minimum height of 2 000 mm (clear opening).

Power operated doors and vertical or horizontal sliding doors are not considered to be access doors for persons.

5.5.1.3 Protective measures against slip, trip and fall of operators

Floor gratings, platforms and other possibly accessible treads shall be designed in a way to reduce slip, or fall hazards to a minimum.

Ladders, gangways and railings shall satisfy the requirements of EN ISO 14122-2, EN ISO 14122-3 and EN ISO 14122-4.

Floor gratings, platforms and similar devices shall be fixedly installed in their frame in order to prevent shifting and instability.

5.5.2 Protective measures against electrical hazards

5.5.2.1 Protection against contact

The electrical equipment shall meet the requirements of EN 60204-1.

See also 5.3.4, 5.4.2 and 5.4.5.

5.5.2.2 Grounding measures

All conductive parts of the system and all conductive components, like floor, walls, ceilings, protective screens, fences, conveyors, workpieces, containers for flock material, reciprocators within the flock application booth, except for parts under high voltage during normal operation, shall be interconnected in such a way that there is a metallic conductive connection, and shall be connected to the grounding system of the power supply via the terminal of the grounding system (see EN 60204-1).

The resistance to ground from the suspending point of each workpiece shall not exceed 1 MΩ. The voltage during measurement shall be 500 V or 1 000 V. The construction of seats shall ensure that the workpieces remain grounded during the coating process.

NOTE 1 Since workpieces are often grounded by conductive underlays, it is important to clean these underlays more often or to design them in a way to prevent the build-up of insulating layers of coating materials.

NOTE 2 For further information on this topic, see IEC/TS 60079-32-1.

If an appropriate grounding of the workpiece cannot be ensured, the dissipation of electrical charges at the workpiece by other devices, e.g. ionisators, is permitted. Such devices shall not exceed the permitted discharge energy of the flock application system according to Table 1, for which they are used. Moreover, these devices shall be submitted to the same test for admissible discharge energy as the flock application system they are used with. The dissipation device shall be interlocked with the flock application system in such a way that the high voltage is disconnected and flocking is stopped in case of failure of this device.

5.5.2.3 Propagating brush discharges

When using walls, enclosures, signs and labels made of non-conductive material the occurrence of propagating brush discharges shall be prevented. Thin sheets of plastic material less than 9 mm thick in contact with large areas of grounded metal (or other conductors) can give rise to propagating brush discharges. Where such thin sheets are used, the breakdown voltage through the sheet shall not exceed 4 kV to avoid the occurrence of propagating brush discharges.

NOTE The use of thin layers of non-conductive material on conductive surfaces may cause hazards due to the formation of propagating brush discharges.

5.5.2.4 Protective measures against external influences on the electrical equipment

The insulation of electrical equipment shall be resistant against solvents and other aggressive fluids. Electrical equipment shall be protected against external mechanical and environmental influences.

5.5.3 Protective measures against noise

Flock application booths shall be designed and constructed in such a way that hazards resulting from the emission of airborne noise are reduced to the lowest level, taking account of the technical progress and the availability of means of reducing noise, in particular at the source.

The following measures can be taken, if possible:

— equipment set on anti-vibratory supports;

— flexible connections between the ducts and especially between fans and ducts;

— choice of fan speed according to most favourable noise curves;

— sound insulation at ducts;

— limitation of air speed at ducts;

— devices to avoid vibrations that should not propagate to the flock application booth, such as resonances and any other noise generated by ancillary equipment permanently installed and connected fixedly to the flock application booth.

NOTE 1 This list is not exhaustive. EN ISO 11688-1 includes general technical information, widely recognised technical rules and information on equipment suitable for the design of low-noise machinery.

NOTE 2 EN ISO 11688-2 gives useful information on noise generation mechanisms in machinery.

The success of the applied noise reduction measures is assessed on the basis of the actual noise emission values in relation to other machines of the same family.

The determination, declaration and verification of airborne noise emission of flock application booths shall be carried out as stated in EN 14462.

5.5.4 Protective measures against hazards by dangerous substances

5.5.4.1 Protective measures against contact with/inhalation of flock

Flock application booths shall be equipped with a forced ventilation system preventing escape of flock material from the booth through the inlet and outlet openings for the workpieces, openings for flock application systems, for the reciprocating devices and openings for the conveyor, if applicable (e.g. by lower pressure within the flock application booth than outside). Reference shall be given if breathing protective equipment shall be used, see 7.2.2.

The exhaust gases extracted from the flock recovery system shall only be recirculated to the working area if the flock concentration in air is below the relevant exposure limit values.

5.5.4.2 Protective measures against inhalation of solvent vapours

Flock application booths shall be equipped with a forced ventilation system preventing escape of solvent vapours from the booth through the inlet and outlet openings for the workpieces, openings for flock application systems, for the reciprocating devices and openings for the conveyor (if applicable) (e.g. by lower pressure within the flock application booth than outside).

The exhaust gases extracted from the flock recovery system shall only be recirculated to the working area if the concentration of solvent vapours in air is below the relevant exposure limit values.

5.5.4.3 Performance of the forced ventilation

See 5.5.6.2.

5.5.4.4 Protective measures against inhalation of dangerous vapours and gases released by the fire extinguishing system

When an automatic fire extinguishing system is installed, a warning device shall be provided, which gives audible alarm before release of dangerous fire extinguishing materials.

5.5.5 Fire protection requirements

5.5.5.1 General

The required fire protection measures depend on the dimensions of the flock application booth, the presence of persons and the fire hazards (ignition sources present, type and quantity of the released ignitable substances). EN 13478 shall be considered.

NOTE For the selection of the fire prevention measures already existing fire prevention concepts can be taken into consideration.

5.5.5.2 Materials of construction

The following elements of construction shall be made of non ignitable material according to class A1 of EN 13501-1:

— fixed elements of construction (e.g. floors, walls, ceilings, fittings, air ducts);

— movable elements (e.g. loading and operator doors).

The following elements of construction shall not support or propagate the fire or increase the fire hazard:

— the dosing device and devices for flock transport;

— heat insulation;

— small elements of construction.

NOTE Glass windows are permitted.

The surface of the ducts shall not accumulate electrostatic charges. They shall be rigid enough, as short as possible, smooth inside and shall have no bends of small radius causing local reductions in air flow velocity and allow hazardous amounts of flock material deposits.

Flock deposits in hazardous quantities shall be avoided within the flock application booths. An exception are the flock container and the flock collection container.

5.5.5.3 Fire detection and extinguishing systems

Independent of the type of flock recovery system used, flock application booths shall be equipped with a fire detection system.

The fire detection system shall:

— have a response time of less than 0,5 s;

— cut-off the following processes in the sequence given:

  — the high voltage supply;

  — the flock supply;

  — the cleaning of the filters, and

  — the ventilation system;

— actuate optical and audible alarm according to EN 981.

Flock application booths shall be equipped with an automatic fire extinguishing system.

It shall be checked for each case, if the function of an automatic fire extinguishing system has already been provided by a locally acting fire extinguishing system according to 5.3.6.

5.5.6 Explosion prevention requirements

5.5.6.1 General

The requirements shall ensure that

— the concentration of ignitable substances remains below LEL by forced ventilation,

— ignition sources are eliminated and

— ignition hazards shall be reduced.

5.5.6.2 Limitation of the concentration of ignitable substances

5.5.6.2.1 Limitation of the concentration of flock-air-mixtures

In a flock application booth, a forced ventilation system shall be provided, so that the average concentration of flock in air does not exceed 50 % of *LEL*. If the *LEL* of the flock is unknown, a value of 100 g/m³ shall be taken for calculation.

NOTE See PTB Report PTB-ThEx-9, Braunschweig, 1999, ISBN 3-89701-441-6.

The calculation of the mean concentration of flock or of the minimum exhaust volume flow shall be done according to Annex A.

5.5.6.2.2 Limitation of concentration of organic solvent vapours

The mean concentration of solvent-vapour in air mixture shall be limited to a maximum of 20 % of the *LEL* of the solvent, if organic solvents are released, e.g. due to an adhesive layer on workpieces; this is also applicable for recirculation air systems. If the *LEL* of the solvent is unknown, a value of 40 g/m³ shall be used for calculations.

The calculation of the mean concentration of the solvent-vapour in air shall be done according to Annex B.

5.5.6.3 Prevention or reduction of ignition sources

In order to prevent hazards by explosive atmospheres, the design and selection of electrical and non electrical equipment shall ensure that ignition sources are avoided in any part of the system.

Ignition sources in flock booths shall be prevented by installation of explosion protected devices, control systems, monitoring systems and control units, and by protection systems of the categories classified in Table 3.

NOTE 1 Areas with potential explosion hazard are classified into zones depending on the frequency and length of the occurrence of explosive atmosphere, see also Annex C.

Table 3 — Required minimum ignition protection categories inside and within the vicinity of flock systems

Location	Category	Additional requirements
Inner volume of the flock booth	3D	
Raw gas side of open flock recovery systems	3D	Cleaning cycle of the filtering separator shall not exceed 50 % of the operating hours. The minimum exhaust volume flow has to be ensured during the cleaning process (see 5.5.6.2.1).
Raw gas side of closed flock recovery systems	1D	
	2D	Cleaning cycle of the filtering separator shall not exceed 50 % of the operating hours. The minimum exhaust volume flow has to be ensured during the cleaning process (see 5.5.6.2.1)
Inner volume of the pre-separator (e.g. cyclones)	2D	
Intake air side of the main separator	2D	Without monitoring the filter and in case of unknown dust concentration or with a calculated dust concentration of > 1 % of the LEL
	3D	In case of interlocking monitoring of the filter (e.g. particle sensor) with the exhaust gas fan and dosing device, or with a calculated dust concentration of < 1 % of the LEL and with regular cleaning.
	None	With monitored filters or indestructible filter media
	None	With interlocking of monitored safety filters (e.g. differential pressure gauge) with exhaust gas fan and dosing device, or with a calculated dust concentration of < 1 % of the LEL and with regular cleaning.
Inner volume of the exhaust gas duct between flock application booth and filter system	3D	If flock deposits cannot be excluded inside the ducts
	None	If flock deposits can be excluded inside the ducts
External volume at permanent openings of the flock application booth at a distance/radius of 1 m	3D	
	None	If flock deposits are prevented safely in this area (e.g. by negative pressure inside the flock application booth, see 5.5.4.1 and 5.5.4.2)

NOTE 2 Category 1D equipment is designed for operation in zones 20, 21, and 22.

NOTE 3 Category 2D equipment is designed for operation in zones 21, and 22.

NOTE 4 Category 3D equipment is designed for operation in zone 22.

NOTE 5 In general, an explosive atmosphere cannot be prevented inside closed flock recovery systems. The likelihood of occurrence, and thus the zone, mainly depends, besides the quantity of extracted flock, on the kind of separation (one or two phases), on the type of separator used (cyclone, filtering separator), and on the frequency of cleaning cycles.

5.5.6.4 Electrical equipment

Flock application systems shall satisfy the equipment requirements of 5.3 of this standard.

— all conductive components, except for live components, shall be interconnected and grounded according to EN 60204-1;

— lighting devices fitted behind transparent impact resistant panels sealed to the flock application booth shall fulfil IP54 protection according to EN 60529;

— for motors outside the flock application booth, IP44 of EN 60529 is sufficient. Motors shall not be positioned within an exhaust air duct;

— undesirable static discharges shall be avoided by adopting the grounding and interconnecting measures as specified in 5.5.2.2.

5.5.6.5 Non electrical equipment

All non-electrical equipment and components installed and located in a potentially explosive atmosphere shall be designed and constructed according to good engineering practice and shall be subjected to an ignition hazard assessment in accordance with 5.2 of EN 13463-1:2009.

In particular the following requirements shall be satisfied:

— electrostatic charges shall be avoided according to EN 13463-1;

— according to EN 13463-1, mechanically moved parts shall not generate sparks;

— fans for exhaust and recirculation air shall be designed according to EN 14986.

5.5.6.6 Antistatic floor

Inside flock application booths and in a radius of 2,5 m around the openings of the booths an antistatic floor shall be installed. The resistance shall not exceed $10^8\ \Omega$. The resistance of the floor shall comply with the test conditions of EN 61340-4-1. When using elastic floor the requirements of EN 1081 shall be applied.

5.5.6.7 Prevention of external ignition sources brought into explosive atmospheres

Appropriate measures shall prevent external ignition sources (e.g. hot surfaces, open flames) from being brought from the outside into the flock application system and the flock recovery system. Appropriate measures are e.g.

— monitoring of the material supply together with cooling systems or fire extinguishing systems,

— spark detection and spark extinguishing inside the exhaust air channel.

5.5.7 Safety devices and control systems

5.5.7.1 General

The entire control system consisting of e.g. electrical control, monitoring and measurement systems, which are used in safety related functions, shall comply with the requirements of the safety integrity level 2 according to EN 62061 or fulfil the requirements of performance level (PL) d of EN ISO 13849-1.

If the safety functions of the control system according to Clause 5 and Table 2 depend on software, particular attention shall be paid to risks due to programme errors, see EN 61508-3 and EN 62061:2005, 6.10, 6.11 and Annex C.

5.5.7.2 Monitoring of ventilation performance loss

Flock application booths shall be provided with devices, e.g. a differential pressure switch.

The device with audible and visual alarm shall indicate any performance loss (such as that caused by clogging of filters) below the forced ventilation velocity specified in 5.5.6.2.

5.5.7.3 Interlocking of forced ventilation and flock application system

The flock application booth shall be purged before the first start-up and after every interruption of the forced ventilation.

The flock application booth shall be equipped with an interlocking device of the forced ventilation and the spraying device.

This interlocking device shall ensure that

— the flock application systems can only operate with effective forced ventilation,

— the high voltage supply can only be switched on with effective forced ventilation,

— in case of a failure or a performance loss of more than 10% of the forced ventilation, the flock application system is stopped and the high voltage supply is cut-off immediately and can only be reset, if the forced ventilation is restored,

— the forced ventilation continues to run, even if the high voltage supply and the supply of flock are cut-off, until the air volume within the flock application booth has been purged appropriately; unless in case of fire.

NOTE Under working conditions, five air exchange have proven to be safe.

5.5.7.4 Protective measures against external influences on the safety devices and control systems

All safety relevant systems and apparatus shall be designed in such a way, that they cannot be influenced by interactions with electromagnetic fields.

According to EN 60204-1, physical aspects of environmental and operating conditions have to be taken into account.

5.5.8 Explosion protection design measures

If, depending on the likelihood of a dangerous explosive atmosphere (zone classification), external ignition sources (see 5.5.6.7) cannot be avoided, the following explosion protection measures for the flock recovery system are required:

— specification of the closed flock recovery system on the basis of the maximum explosion pressure as well as explosion-resistant design according to EN 14460;

— specification on the basis of a reduced explosion pressure combined with

  a) explosion suppression according to EN 14373, or

  b) explosion relief according to EN 14797 and EN 14491,

each option being combined with devices for explosion decoupling according to EN 15089.

5.5.9 Protection measures in case of failure of energy supply

In case of failure of energy supply, it shall be ensured that an explosion will be prevented safely.

In case of failure of the whole control system, the supply of releasable ignitable substances has to be stopped.

After an interruption of the energy supply (e.g. electricity, compressed air), an uncontrolled start-up (re-start) according to EN 1037 shall be prevented.

Safety-related control systems shall fulfil the requirements of 5.5.7.

6 Testing

6.1 Type test of the high voltage cables

6.1.1 A sample of the high voltage cable of at least 2,5 m is raised to a voltage of 1,2 U_{max} for a period of 24 h, the electrically conductive screen of the cable being grounded, except for 75 cm at each end. There shall be no breakdown.

6.1.2 If the cable does not have an electrically conductive screen, a sample cable of at least 2,5 m in length is placed on an grounded metal plate. A test voltage of 1,2 U_{max} is applied for 24 h. There shall be no breakdown.

6.2 Routine tests of the stationary equipment

The tests shall be carried out for each single flock application system. The tests shall include the tests according to Table 4. For test intervals of repeated tests, see Table 5.

Table 4 — Survey of tests

	Type of test	Requirements
6.2.1	The stationary equipment for electrostatic coating with ignitable flock material shall be tested for occupationally safe state.	In this context, especially the disconnection threshold, the overcurrent $I_{ü}$ and the minimum voltage U_{min} shall be defined and documented with respect to operational and local conditions (see also 5.3.3).
6.2.2	Effectivity of forced ventilation (exhaust air systems)	See 5.5.6.2.
6.2.3	Safe disconnection of high voltage shall be tested for voltage-controlled and constant voltage operation.	See 5.3.3 und 5.3.3.1. The disconnection threshold $I_{ü}$ shall be defined and documented with respect to operational and local conditions. It shall be tested, if the high voltage is disconnected in case of inadmissible increase of the operational current I_b and if the disconnection threshold $I_{ü}$ is reached. In this context, the disconnection threshold $I_{ü}$ defined during the initial test shall be tested. A disconnection threshold $I_{ü}$, giving rise to expect an occurrence of hazardous discharges or flashover between parts under high voltage and grounded parts of the plant in case the safety distance drops below the permissible limit, is not permitted.
6.2.4	Safe disconnection of high voltage supply shall be tested for constant current operation.	See 5.3.3 and 5.3.3.2. The disconnection threshold U_{min} shall be defined and documented with respect to operational and local conditions. It shall be tested, if the high voltage is disconnected in case of inadmissible decrease of the high voltage below the disconnection threshold U_{min}. In this context, the disconnection threshold U_{min} defined during the initial test shall be tested. A disconnection threshold U_{min}, giving rise to expect an occurrence of hazardous discharges or flashover between parts under high voltage and grounded parts of the plant in case the safety distance drops below the permissible limit, is not permitted.
6.2.5	Protection against too high discharge energy	See 5.3.4.
6.2.6	Protection against ignition of cleaning agents	See 5.3.5.
6.2.7	Effectivity of measures for protection against direct contact	See 5.5.2.1.
6.2.8	Effectivity of grounding measures	See 5.5.2.2.
6.2.9	Interlocks / protection against entrance	See 5.5.2.1.

	Type of test	Requirements
6.2.10	Effectivity of locally acting fire extinguishing systems	See 5.3.6. In addition to a room-protection system, locally acting fire extinguishing systems (installed fixedly and allocated to the object) shall give effective protection for the hazard zone between the flock application system and the workpiece. It shall be proved for each individual case, if the aspects of locally acting fire extinguishing systems and the room-protection system can be satisfied by one fire extinguishing system.
6.2.11	Effectivity of the fire extinguishing system or of the explosion suppression system for the flock recovery system	See 5.5.8.

6.3 Testing of the requirements for the flock application booth

6.3.1 General

Compliance with the safety requirements detailed in 5.5 shall be checked by tests, calculation, inspection or other methods according the following clauses.

Before the first commissioning, it shall be tested, if the safety requirements are met and/or the measures taken are effective.

6.3.2 Testing the measures taken to prevent mechanical hazards (5.5.1)

Compliance with the requirements mentioned in 5.5.1.1, 5.5.1.2 and 5.5.1.3 shall be tested by functional tests and visual inspection.

6.3.3 Testing the measures taken to prevent electrical hazards (5.5.2)

6.3.3.1 Safety measures against contact

The compliance with the requirements of EN 60204-1 shall be tested.

Make sure that guards are fitted to prevent access to hazardous areas and that the interlocking devices are functioning, see 5.5.2.1.

6.3.3.2 Protective measures regarding grounding

Compliance shall be tested by means of an ohmmeter, see 5.5.2.2.

6.3.3.3 Propagating brush discharges

Compliance with the defined limit values shall be tested by means of measuring instruments, see 5.5.2.3.

6.3.4 Testing the protective measures against noise

Measurements of the emission sound pressure levels at workstations and the emission sound power level shall be done in compliance with EN 14462.

6.3.5 Testing the protective measures against dangerous substances

6.3.5.1 Testing the protective measures against hazards due to flock and solvent vapours

Requirements for forced ventilation to prevent inhalation of flock and solvent vapours shall be verified as follows.

Place a smoke generator in the flock application area and test that all the smoke is extracted by the equipment provided for this purpose.

On all inlet and outlet openings for the workpieces, openings of the flock application systems, of the reciprocators and of the conveyor (if applicable) test by means of a smoke generator, whether the air flow direction is from the outside to the inside of the flock application booth.

6.3.5.2 Testing the protective measures against inhalation of dangerous gases and vapours emitted by the fire extinguishing equipment

Test correct functioning of the warning system to ensure that sufficient time is available to allow the operator to exit from the flock application booth before activation of the automatic fire extinguishing system.

6.3.6 Testing the fire prevention measures

6.3.6.1 Testing the materials of construction

The following points shall be tested by visual tests and inspection:

— materials used for the construction of the flock application booth comply with the requirements defined in 5.5.5.1;

— the wall elements shall be easy to clean.

6.3.6.2 Testing the fire warning and fire extinguishing system

Test whether the automatic fire detection system works and inspect the equipment.

Test whether all interlocks and controls work.

6.3.7 Testing the explosion protection measures

6.3.7.1 Testing the concentration limits for ignitable flock

In flock application booths, the concentration of ignitable flock in % of *LEL* (C_{LEL}) shall be calculated according to Annex A.

It shall be verified, that the value taken as a calculation basis for the exhaust volume flow (see 5.5.6.2) will not be exceeded by the total output of flock.

6.3.7.2 Verification of the prevention or reduction of ignition sources

Compliance of electrical and non-electrical equipment with required categories shall be checked by inspection.

NOTE Annex B shows examples for classification of zones with potential explosion hazard.

All other measures shall be tested by visual inspection.

The good functioning of safety devices described in 5.5.7 shall be tested.

Grounding protection measures: see 6.3.3.2 and 5.5.2.2.

6.3.8 Verification of the additional explosion protection measures

Test adequate size and appropriate setting up of explosion relief or explosion suppression and explosion decoupling inside the enclosed flock recovery system. See 5.5.8.

Test whether the explosion relief is venting into areas that are not accessible for persons or without danger of injury.

6.3.9 Testing the protective measures in case of failure of energy supply

Safety devices and fire detection shall be tested via a separate power supply allowing the simulation of an interruption of the main power supply.

7 Information for use

7.1 General

The equipment shall be accompanied by instructions in the official Community language or languages of the Member State in which it is placed on the market and/or put into service.

The instructions accompanying the equipment shall be either ‘Original instructions’ or a ‘Translation of the original instructions’.

The translation shall be accompanied by the original instructions in a language of the EU to be chosen by the manufacturer or his authorized representative.

The original language version(s) of the instructions shall be marked with the words “Original instructions”.

7.2 Instruction manual

7.2.1 General information

Stationary electrostatic application equipment for ignitable flock material shall be accompanied by an instruction manual according to EN ISO 12100. It shall also contain the content of Tables 4 and 5.

The instruction manual shall contain information on installation, commissioning and use, together with references related to general maintenance of stationary electrostatic application equipment for ignitable flock material, and shall contain the intended use foreseen by the manufacturer.

The instruction manual shall contain the warning that stationary electrostatic application equipment for ignitable flock material shall only be operated by qualified operators. The instruction manual shall contain the warning that protective gloves, if used, shall comply with the requirements of 7.2.6.

The instruction manual shall contain the warning that flock application systems outside of flock application booths shall only be operated, if ventilation measures complying with the requirements of 5.5 have been taken within the installation area. The instruction manual shall contain the admissible combinations of devices, including the indication of the admissible accessories.

The type plate shall include the reference "admissible combinations of devices, see information for use".

The instruction manual shall contain a reference that ignition sources (hot surfaces, open flames) shall not be brought into a stationary electrostatic application equipment for ignitable flock material.

The instruction manual shall contain the following information:

— description of the flock application booth, the flock recovery system and safety devices;

— design-related performance data and characteristics;

— schematic diagrams of the safety functions;

— maximum admissible pressure loss caused by the air filter system;

— maximum dimensions of the workpiece to be coated;

— noise emission values determined according to EN 14462, that is

  — the A-weighted emission sound pressure level L_{pA} emitted by the machinery where it exceeds 70 dB(A). Where the level does not exceed 70 dB(A) $L_{pa} \leq 70\ dB(A)$ shall be indicated;

  — the peak C-weighted instantaneous sound pressure value at machinery, where this exceeds 63 Pa (L_{pCpeak} = 130 dB);

  — the A-weighted sound power level emitted by machinery, if the A-weighted emission sound pressure level exceeds 80 dB(A);

  — the uncertainties surrounding the determined noise emission values.

— warnings regarding

  — use of open flames, incandescent objects, equipment or workpieces capable of generating sparks (tools, equipment, etc.) in the flock application booth,

  — smoking within hazardous areas. A display showing "No smoking" shall be affixed to all entrances to the flock application booth,

  — use of organic solvents within the flock application booth,

  — prohibition of storage of flock material in the flock application booth or in front of any doors.

Furthermore, the instruction manual shall refer to

— the use of qualified, trained and authorised operators for adjusting the operating conditions of the flock application booth according to the manufacturer's specifications,

— wearing of appropriate personal protection when an operator shall work in an insufficiently purified atmosphere (e.g. breathing mask for cleaning),

— wearing of adequate hearing protection if necessary.

7.2.2 Operating instructions

The instruction manual shall, as a minimum, contain the following information:

— information and instruction on how to fix the flock application booth and any constituting equipment to the floor, including information on the required space of the booth in such a way that no additional crushing and shearing hazards are created between the moving parts of the machine or workpieces and other fixed adjacent machines, part of the building or stocks of material, etc.;

— instructions on how to keep up the safety of surrounding areas where ventilation ducts, pipes and chimneys pass through a wall. The fire resistance of this wall shall not be modified;

— information on safe conditions of transport or handling;

— commissioning report (e.g. on compliance of grounding measures, air velocity, safety interlocks);

— information on how to determine the maximum amount of flock admissible for the operation of the flock application booth, depending on the exhaust volume flow with regard to the lower explosion limit [g/h];

— information on how to determine the maximum amount of organic solvents to be introduced into the flock application booth, depending on the exhaust volume flow with regard to the lower explosion limit [g/h];

— information on the built-in safety devices and their operating modes;

— description of the control system and their operating modes;

— instructions on start-up (operation);

— information on the grounding of the workpieces before starting the flocking process;

— instructions on all settings;

— information on cleaning;

— information on the recommendations of the flock manufacturer;

— instructions on the provision of antistatic footwear for operators;

— use of antistatic floor within the work area of the operator outside the flock application booth;

— instructions on appropriate precautions (e.g. provision of adequate protective clothing), if contact with the flock materials or with the cleaning agents can cause dermatitis or skin irritations;

— instructions on the use of personal protective equipment or breathing equipment with fresh air supply, if an operator has to enter the flock application booth for adjustment, inspection or maintenance.

7.2.3 Information for maintenance

7.2.3.1 Preventive maintenance

The manufacturer shall inform the user on

— regular tests to prevent clogging of the filters and exhaust systems,

— regular tests to prevent deposits on walls and floor of the flock application booth,

— regular tests of the grounding of the flock application booth,

— regular cleaning of the workpiece suspension hooks to avoid the build-up of insulating layers of dry adhesive,

— observation of the intervals for filter replacement.

Information shall be given on

— measures to be taken in case of emergency,

— decommissioning, dismantling and, as far as safety is concerned, disposal.

7.2.3.2 Repair

The manufacturer shall inform the user that repair measures shall only be carried out by a competent, qualified person according to the instructions of the manufacturer. The information shall include the following:

— troubleshooting and repair of failures and defects;

— methods for identification of all parts or materials that are replaceable;

— examples for malfunctions and breakdowns and the respective causes.

7.2.4 Cleaning and maintenance

7.2.4.1 The manufacturer shall provide comprehensive information on cleaning and maintenance. The stationary electrostatic application equipment shall be maintained regularly according to the instructions of the manufacturer. The instruction manual shall contain the following warning notices:

7.2.4.2 Before cleaning works or other works within the flock application area, the high voltage supply system shall be disconnected and secured against restart.

7.2.4.3 Use only electrically conductive containers for cleaning liquids; the containers shall be grounded.

7.2.4.4 Non-ignitable cleaning agents shall be preferred.

7.2.4.5 Ignitable cleaning liquids shall only be used if, after disconnection of high voltage supply, all parts under high voltage are discharged to a discharge energy of less than 0,24 mJ before these parts are possible to be reached, see 5.3.5.

NOTE Most of the organic solvents have an ignition energy of about 0,24 mJ, corresponding to 60 nC (see also EN 13463-1).

7.2.4.6 Appropriate measures shall ensure that the resistance to ground of the suspending point of the workpiece shall not exceed 1 MΩ measured at 500 V or 1 000 V.

7.2.5 Test intervals

For a safe operation of the stationary electrostatic application equipment for ignitable flock material the intervals for repeated tests shall be determined by the manufacturer. The intervals depend on the operational and local conditions. The following maximum intervals are recommended (see Table 5):

Table 5 — Test intervals

Clause	Reference		Test interval Category 3
6.2.1	Occupationally safe state of the whole equipment		12 months
6.2.2	Effectivity of forced ventilation		continuously
6.2.3	Overcurrent disconnection		weekly
6.2.4	Low voltage disconnection		weekly
6.2.5	Discharge energy		weekly
6.2.6	Ignition protection for ignitable cleaning agents		weekly
6.2.7	Protection against contact		weekly
6.2.8	Grounding measures		weekly
6.2.9	Protection against entrance		weekly
6.2.10	Fire extinguishing system		6 months
6.2.11	Effectivity of the fire extinguishing system or the explosion suppression system of the flock recovery system		6 months

NOTE An automatic monitoring of the stationary electrostatic application equipment for ignitable flock material is considered to be equivalent.

7.2.6 Additional information

The instruction manual shall contain the following additional information:

— description of the operational limitations of equipment marked with "X";

— all warnings necessary for proper operation of the equipment;

— function of the safety devices;

— measures in case of failures or repair;

— capacitance of the high voltage generator;

— warning: "This equipment could present hazards if it is not operated according to the information given in the instruction manual";

— footwear to be used by the operator shall comply with EN ISO 20344. The measured insulation resistance shall not exceed 100 MΩ;

— protective clothing, including gloves, shall comply with EN 1149-5. The measured insulation resistance shall not exceed 100 MΩ.

7.3 Marking of the flock application system

7.3.1 General

The following marking and any additional information required for the safe operation of stationary electrostatic application equipment for ignitable flock material shall be placed clearly and visible on the equipment. This marking shall be legible and durable taking into account possible chemical decomposition or corrosion.

7.3.2 High voltage supply

The high voltage supply shall be marked as follows:

— name and address of the manufacturer or his registered trade mark;

— the manufacturer's type identification which shall be unique in order to ensure the safe use of combinations of the apparatus;

— range of input voltages and whether AC or DC;

— frequency range of input;

— input power;

— the number of this European Standard EN 50223;

— rated output voltage;

— rated output current;

— any marking generally required by the design standards for electrical equipment.

7.3.3 Flock application systems

— The marking of flock application systems of type B-F according to Table 1 shall comply with EN 50050-3.

— The marking of flock application systems of type C-F and D-F according to Table 1 shall be the following:

  — name of the manufacturer or his registered trade mark;

  — type of system;

  — discharge energy;

  — all information generally required by the design standards for electrical equipment.

NOTE EN 60204-1 includes information on the marking of electrical equipment.

In addition, the manufacturer shall provide the following information:

— information on the design of the flock application area and the flock recovery system, e.g. description of specific characteristics regarding an enhanced safety against effects of explosions;

— specific conditions of the installation.

7.3.4 Additional marking of equipment - Category 3

— The symbol  is used to indicate that the electrical equipment is designed and tested for use in potentially explosive areas or is specifically allocated to such an equipment;

— a reference number referring to the technical documentation used by the manufacturer;

— the markings

  — II for the device group, followed by

  — 3 for the category of the equipment, followed by

  — D for "dust explosion protection", followed by

  — the maximum surface temperature T as temperature value in °C,

  — X to denote special conditions for use.

NOTE An example of marking is given in Annex D.

7.3.5 Warning sign

Needed warning signs shall be in a language understood by the operator, shall be delivered by the manufacturer and shall be placed at a noticeable place in the vicinity of the flock application area. This warning sign shall contain e.g. protective measures to be observed by the operators and maintenance personnel. Hazards generated by inappropriate cleaning shall be pointed out in a clear way (see 7.2.4).

7.4 Marking of the flock application booth

Flock application booths shall be marked clearly and indelibly on a type plate as laid out in EN ISO 12100:

— the business name and full address of the manufacturer and, where applicable, his authorized representative;

— designation of the machinery;

— designation of series or type;

— serial number, if any;

— the year of construction, that is the year in which the manufacturing process is completed;

— minimum exhaust volume flow ..... m³/h;

— power installed:

  — electrically ..... (kVA);

  — other .....

— appropriate marking of machinery designed and constructed for use in a potentially explosive atmosphere.

Annex A
(normative)

Determination of the concentration of ignitable flock material in terms of *LEL*

A.1 Calculation

In order to simplify the comparison with the lower explosion limit (*LEL*), the concentration is expressed as C_{LEL} (percentage of *LEL*).

$$C_{LEL} = \frac{100 \times \overline{C}}{LEL} \tag{A.1}$$

The average concentration (mass) inside the flock application booth depends on the input of flock material and the air flow:

$$\overline{C} = \frac{M_{\max}}{Q_{\min}} \tag{A.2}$$

The minimum exhaust volume flow $Q_{\min}$ can be calculated from the air velocity v and the total cross section of openings:

$$Q_{\min} = v \cdot A \cdot 3600 \tag{A.3}$$

where

$\overline{C}$	Average concentration of ignitable flock material in air inside the flock application booth	in g/m³
LEL	Lower explosion limit of a ignitable flock and air mixture. If data is not available, the value of 100 g/m³ shall be used.	in g/m³
C_{LEL}	Concentration of ignitable flock material in terms of *LEL*	in % of *LEL*
$M_{\max}$	Maximum quantity of flock material sprayed per hour (Maximum outlet of all flock application systems used at the same time)	in g/h
$Q_{\min}$	minimum exhaust volume flow drawn into the flock application booth which dilutes the ignitable flock material to the required concentration level	in m³/h
V	Average air velocity	in m/s
A	Total cross section of openings (The total cross section includes all the permanent openings - e.g. for ingress and egress for workpieces, including the conveyors, openings for the operators and flock application systems)	in m²

If the flock application booth is a multizone booth, each section shall be considered as a separate unit for the calculation of C_{LEL}. The concentration of the most unfavourable section shall be used (see 5.5.6.2 and 5.5.6.3).

A.2 Examples of calculation – Determination of concentration of ignitable flock material

a) Assumption:

Parameters for the air volume flow within the flock application booth (or within the sections):

— Total cross section of openings	A	= 0,5 m²
— average design-specific air velocity	v	= 0,3 m/s
	M_{max}	= 30 000 g/h
	LEL	= 100 g/m³

according to Formula (A.3)

$$Q_{\min} = 0{,}5\ m^2 \cdot 0{,}3\ m/s \cdot 3600\ s/h = 540\ m^3/h$$

according to Formula (A.2)

$$\overline{C} = \frac{30\,000\ g/h}{540\ m^3/h} = 55{,}55\ g/m^3$$

according to Formula (A.1)

$$C_{\mathrm{LEL}} = \frac{100 \cdot 55{,}55\ g/m^3}{100\ g/m^3} = 55{,}6\ \%$$

b) Result:

If the forced ventilation of a flock application booth is designed for an average air velocity of v = 0,3 m/s, (and further assumptions described above are valid), a nominal concentration of C_{LEL} = 55,6 % is achieved. In accordance to 5.5.6.2.1 only a maximum concentration of 50 % of *LEL* is allowed. In that case either the input of flock material $M_{\max}$ has to be reduced or the total cross section of openings A or the air volume flow $Q_{\min}$ has to be increased.

Starting from a maximum allowed concentration of 50 % of *LEL*, according to Formula (A.1)

$$\overline{C} = \frac{100\ g/m^3 \cdot 50}{100} = 50\ g/m^3$$

According to Formula (A.2) and to Formula (A.3) either the maximum output of sprayed flock material is determined and the minimum exhaust volume flow $Q_{\min}$ and the average air velocity v can be calculated or the minimum exhaust volume flow is determined and the maximum output of flock material M_{max} can be calculated:

$$M_{\max} = Q_{\min} \cdot \overline{C} = 540\ m^3/h \cdot 50\ g/m^3 = 27\,000\ g/h$$

$$Q_{\min} = \frac{M_{\max}}{\overline{C}} = \frac{30\,000\ g/h}{50\ g/m^3} = 600\ m^3/h$$

$$v = \frac{Q_{\min}}{A \cdot 3\,600} = \frac{6\,00\,m^3/h}{0{,}5\,m^2 \cdot 3\,600} = 0{,}33\,m/s$$

Independent of the calculation above, the design of the flock application booth shall consider that the chosen air flow velocity allows an effective electrostatic flocking process.

Annex B
(normative)

Determination of concentration of organic solvents

B.1 Calculation

In order to simplify the comparison with the lower explosion limit (*LEL*), the concentration is expressed as C_{LEL} (percentage of *LEL*):

$$C_{LEL} = \frac{100 \times \overline{C}}{LEL} \quad \text{(B.1)}$$

The average concentration (mass) inside the flock application booth depends on solvents input and air flow:

$$\overline{C} = \frac{M_{\max} \times k_1 \times k_2 \times k_3}{Q_{\min}} \quad \text{(B.2)}$$

where

C_{LEL}	Calculated value of the maximum concentration of organic solvents as a function of *LEL* in %	in %
$\overline{C}$	Average concentration of organic solvents (in air) in the flock application booth	in g/m³
LEL	Lower Explosion Limit of solvents or solvents mixtures at 293 K. If the component parts of the solvents mixtures are known, but the *LEL* of the mixture is unknown, the *LEL* of the solvent component with the lowest value should be taken. If the data are not available, the value of 40 g/m^3 shall be used.	in g/m³
$M_{\max}$	Maximum quantity of organic adhesives charged per hour	in g/h
k_1	Mass percentage of organic solvents content in the organic adhesives	in %
k_2	Estimated percentage of organic solvents evaporated inside the flock application booth	in %
$Q_{\min}$	Minimum exhaust volume flow drawn in the flock application booth which dilutes the released organic solvents to the required concentration level	in m³/h

B.2 Example for calculation - Determination of minimum exhaust volume flow based on a design concentration value

Formulae (B.1) and (B.2) can also be used for calculations of minimum exhaust volume flow.

If:

$C_{LEL,max}$ maximum concentration (design value) in terms of *LEL*

Q_{min} minimum exhaust volume flow drawn in the flock application booth to maintain $\overline{C}_{max}$ inside

according to Formula (B.1):

$$\overline{C}_{max} = \frac{C_{LEL,max} \times LEL}{100} \quad \text{(B.3)}$$

according to Formula (B.2):

$$Q_{min} = \frac{M_{max} \times k_1 \times k_2 \times k_3}{\overline{C}_{max}} \quad \text{(B.4)}$$

a) Assumptions:

Air flow parameter of a flock application booth:

width	B	= 4 m
length	L	= 8 m
design value of concentration	$C_{LEL,max}$	= 20 %
quantity of charged adhesives	M_{max}	= 60 000 g/h
lower explosion limit	*LEL*	= 40 g/m³
organic solvent content	k_1	= 50 % (0,50)
fraction of evaporation within the booth	k_2	= 40 % (0,40)

according to Formula (B.3):

$$\overline{C}_{max} = \frac{20 \times 40\ g/m^3}{100} = 8\ \text{g/m}^3$$

according to Formula (B.4):

$$Q_{min} = \frac{60\,000\ g/h \times 0{,}50 \times 0{,}40}{8\ g/m^3} \times 2 = 1500\ m^3/h$$

b) Result:

To maintain a nominal maximum concentration (design value) of solvent of $C_{LEL,max}$ = 20 % (with the assumptions described above including a safety factor) a minimum fresh air flow of Q_{min} = 1 500 m³/h drawn into the booth is necessary.

Annex C
(informative)

Classification of areas with potential explosion hazard

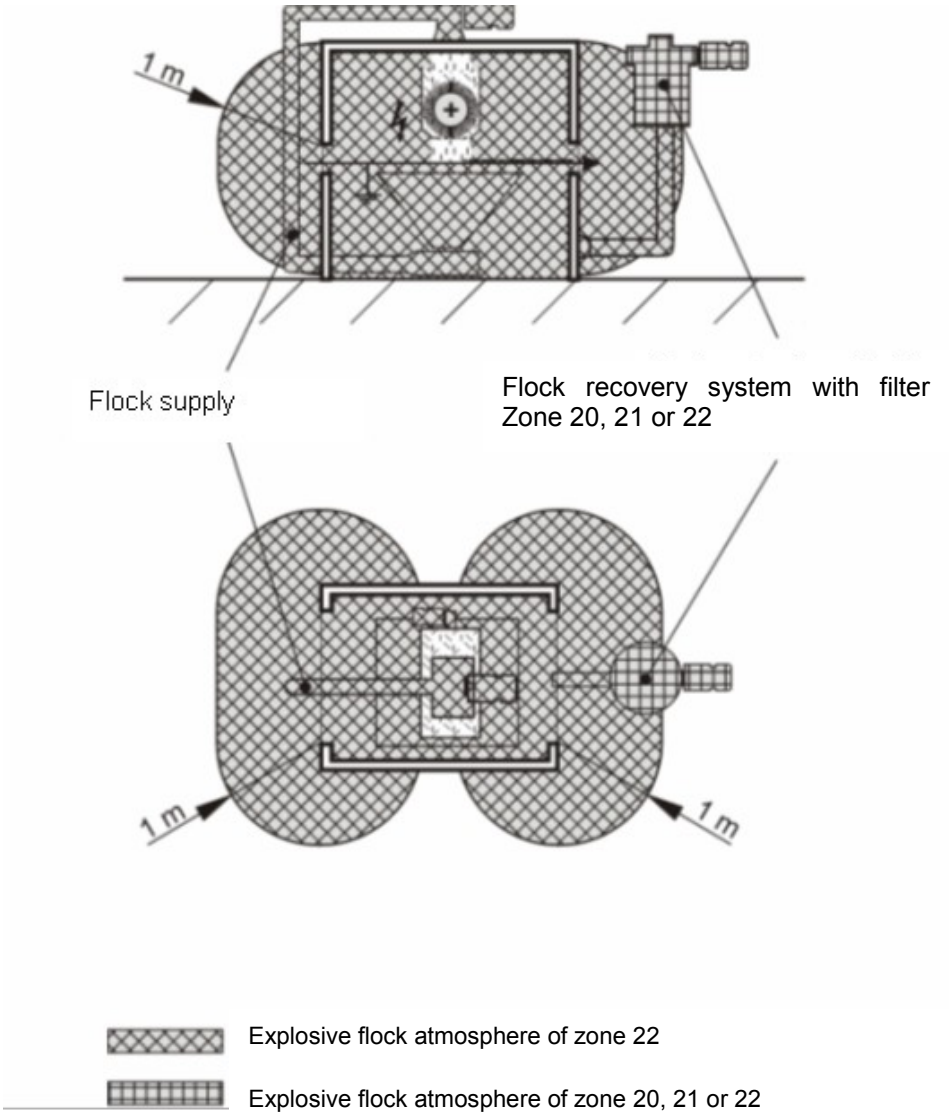

Figure C.1 — Flock application booth with closed flock recovery system

NOTE National regulations may recommend different zoning.

Annex D
(informative)

Example of marking

Name of the manufacturer, registered trademark	"Admissible combinations of devices, see information for use"		
Type	Production number	123456	2009
	Serial number	123456	
II 3 D X	**ATEX**	**EN 50223**	
Discharge energy [mJ]	**IP54**		
Input voltage [V]	maximum surface temperature "T" [°C]	Output voltage [kV]	
Input power [W]	Input frequency [Hz]	Output current [µA]	

Annex ZY
(informative)

Significant changes between this European Standard and EN 50223:2010

This European Standard will supersede EN 50223:2010.

The significant changes with respect to EN 50223:2010 are as listed below.

Table ZY.1 — Significant changes between this European Standard and EN 50223:2010

		Type		
	Clause/ Table/ Figure/ Annex	**Minor and editorial changes**	**Extension**	**Substantial change regarding ESR´s [a]**
Clarification of the scope	1		X	
Omission of requirements for gas explosion protection	Complete standard			
Revision of normative references	2		X	
Revision of the terms and definitions	3		X	
Revision of the list of significant hazards	4		X	
Revision of the safety requirements and/or measures	5		X	
Renumbering of the types of flock application systems	Table 1		X	
Rearrangement of the requirements for flock systems	Table 2		X	
Revisions of the requirements for flock application booths	5.5		X	
Deletion of hazardous areas related to hybrid mixtures	5.5.6.3.2		X	
Revision of the verification of explosion protection measures	6.3.7		X	
Adaptation of information for use	7	X		
Adaptation of the normative Annex A “Determination of the concentration of ignitable flock material in terms of LEL”	Annex A	X		
Modification of the normative Annex B “Determination of concentration of organic solvents in terms of LEL”	Annex B		X	
Modification of the normative Annex C “Classification of hazardous zones for explosive atmosphere”	Annex C		X	

		Type		
	Clause/ Table/ Figure/ Annex	**Minor and editorial changes**	**Extension**	**Substantial change regarding ESR´s [a]**
Modification of the informative Annex ZY "Significant changes between this European Standard and EN 50223:2010"				
Modification of the informative Annex ZZB "Relationship between this European Standard and the Essential Requirements of EU Directive 94/9/EC"	Annex ZZB		X	
[a] ESR = Essential Health and Safety Requirements (Annex I of Directive 2006/42/EC and Annex II of Directive 94/9/EC)				

General conclusion on the change of the State of the Art by this standard

CLC/TC 31 as the responsible committee has concluded that this new edition does not contain substantial changes regarding the ESRs.

Annex ZZA
(informative)

Coverage of Essential Requirements of EU Directive 2006/42/EC

This European Standard has been prepared under a mandate given to CENELEC by the European Union and the European Free Trade Association and within its scope the standard covers all relevant essential requirements as given in Annex I of the EU Directive 2006/42/EC.

Compliance with this standard provides one means of conformity with the specified essential requirements of the Directive concerned.

WARNING: Other requirements and other EU Directives may be applicable to the products falling within the scope of this standard.

Annex ZZB
(informative)

Coverage of Essential Requirements of EU Directive 94/9/EC

This European Standard has been prepared under a mandate given to CENELEC by the European Union and the European Free Trade Association and within its scope the standard covers only the following essential requirements out of those given in Annex II of the EU Directive 94/9/EC:

- Essential Requirement 1.0
- Essential Requirement 1.0.1 (satisfied with type B-F, not satisfied with types C-F and D-F)
- Essential Requirement 1.0.2
- Essential Requirement 1.0.3
- Essential Requirement 1.0.4
- Essential Requirement 1.0.5
- Essential Requirement 1.0.6
- Essential Requirement 1.1
- Essential Requirement 1.1.1
- Essential Requirement 1.2
- Essential Requirement 1.2.1
- Essential Requirement 1.2.2
- Essential Requirement 1.2.3
- Essential Requirement 1.2.4
- Essential Requirement 1.2.6
- Essential Requirement 1.2.7 a)
- Essential Requirement 1.2.7 c)
- Essential Requirement 1.2.7 d)
- Essential Requirement 1.2.8
- Essential Requirement 1.3
- Essential Requirement 1.3.1
- Essential Requirement 1.3.2
- Essential Requirement 1.3.3
- Essential Requirement 1.4.1
- Essential Requirement 1.5.1
- Essential Requirement 1.5.2
- Essential Requirement 1.5.5
- Essential Requirement 1.5.6
- Essential Requirement 1.5.7
- Essential Requirement 1.5.8
- Essential Requirement 1.6.1
- Essential Requirement 1.6.2
- Essential Requirement 1.6.3
- Essential Requirement 1.6.4
- Essential Requirement 1.6.5
- Essential Requirement 2.2.1.1
- Essential Requirement 2.2.1.3
- Essential Requirement 2.2.2
- Essential Requirement 2.3.1.1

Compliance with this standard provides one means of conformity with the specified essential requirements of the Directive(s) concerned.

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