SLOVENSKI STANDARD
SIST EN 17348:2022

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Zahteve za načrtovanje in preskušanje sesalnikov za uporabo v potencialno eksplozivnih atmosferah

Requirements for design and testing of vacuum cleaners for use in potentially explosive atmospheres

Anforderungen an die Konstruktion und Prüfung von Staubsaugern zur Verwendung in explosionsgefährdeten Bereichen

Exigences relatives à la conception et aux essais des aspirateurs destinés à être utilisés en atmosphère explosible

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Anforderungen an die Konstruktion und Prüfung von Staubsaugern zur Verwendung in explosionsgefährdeten Bereichen

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 17348:2022) has been prepared by Technical Committee CEN/TC 305 “Potentially explosive atmospheres – Explosion prevention and protection”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2022, and conflicting national standards shall be withdrawn at the latest by November 2022.

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

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade association and supports essential requirements of EU Directive(s) / Regulation(s).

For relationship with EU Directive(s) / Regulation(s), see informative Annexes ZA and ZB, which are an integral part of this document.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This document is a type C standard as stated in EN ISO 12100:2010.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

— machine manufacturers (small, medium and large enterprises);

— health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

— machine users/employers (small, medium and large enterprises);

— machine users/employees (e.g. trade unions, organizations for people with special needs);

— service providers, e.g. for maintenance (small, medium and large enterprises);

— consumers (in case of machinery intended for use by consumers).

The machinery concerned and the extent to which hazards, hazardous situations and events are covered, are indicated in the scope of this document.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

1 Scope

This document specifies requirements for design, construction, testing and marking of hand-held, portable and transportable vacuum cleaners, including their accessories, constructed to Group II, categories 2G or 3G (of explosion groups IIA, IIB, IIB plus hydrogen), and to Group II, categories 2D or 3D (of explosion groups IIIA, IIIB and IIIC), intended for the collection of combustible or non-combustible dusts and flammable or non-flammable liquids in potentially explosive atmospheres. A potentially explosive atmosphere could be generated by the equipment during its intended use.

NOTE 1 The accumulation of 1 mm or more of combustible dust on surfaces in a working area can create an explosive atmosphere (see reference to 1/32 in. of Depth of Dust Accumulation for Guidance for Area Electrical Classification in NFPA 654, 2017 Edition).

This document applies to equipment driven by electric power and by pneumatic power.

This document gives guidelines for dealing with significant hazards, hazardous situations and/or events relevant to vacuum cleaners when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer.

Typical applications for the concerned equipment are:

— collection of dust produced by machinery at the point of generation;

— general housekeeping around machinery and of working areas; and/or

— collection of spills;

— cleaning of equipment during maintenance operations; and/or

— collection of specific waste.

For the collection of dust in the presence of flammable liquids or vapours, a specific risk assessment is performed if this is part of the vacuum cleaners intended conditions of use and additional precautions beyond what is described in this document can be required.

NOTE 2 The passage of dust through a vacuum cleaner will generate high levels of electrostatic charge which, in most situations, will be a potential source of ignition to a flammable gas or vapour atmosphere.

For the collection of low-conductivity flammable liquids, a specific risk assessment is performed if this is part of the vacuum cleaners intended conditions of use and additional precautions beyond what is described in this document can be required.

NOTE 3 The resulting liquid velocities are likely to be in excess of the limits required to maintain electrostatic charge generation at a non-hazardous level according to CLC/TR 60079-32-1:2018.

This document does not apply to equipment used to collect toxic dusts where there is a health risk if dust passes through the filter elements. This document does not apply to the collection of dusts which have explosive and unstable properties (UN transport class 1, class 4.1 and class 5.2).

NOTE 4 Hazards related to the use of vacuum cleaners for the collection of hazardous dusts are the subject of other standards.

This document applies to vacuum cleaners with an internal dirty air volume of maximum 250 l.

NOTE 5 250 l is the volume above which it is recognized a vacuum cleaner might not be considered as transportable by an operator, and above which additional explosion protections can be required.

The present version of the document does not apply to battery operated equipment.

NOTE 6 Battery operated equipment might be part of the scope of this document in a subsequent version.

This document does not apply to vacuum trucks.

This document applies to vacuum cleaners of canister and back-pack types. This document does not apply to upright vacuum cleaners.

This document does not apply to motorized cleaning head accessories.

NOTE 7 This document does not apply to household appliances which are the subject of other standards.

This document does not apply to applications where the substances are conveyed into a separate receiving container.

This document does not apply to equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines endangered by firedamp and/or combustible dust.

For an easier readability, all types of equipment concerned by this document are referred as a “vacuum cleaner”.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CEN/TR 16793:2016, *Guide for the selection, application and use of flame arresters*

CLC/TR 60079-32-1:2018, *Explosive atmospheres — Part 32-1: Electrostatic hazards, guidance (IEC TS 60079-32-1:2013, IEC/TS 60079-32-1:2013/A1:2017)*

EN 1127-1:2019, *Explosive atmospheres — Explosion prevention and protection — Part 1: Basic concepts and methodology*

EN 1149-1:2006, *Protective clothing — Electrostatic properties — Part 1: Test method for measurement of surface resistivity*

EN 13237:2012, *Potentially explosive atmospheres — Terms and definitions for equipment and protective systems intended for use in potentially explosive atmospheres*

EN 14797:2006, *Explosion venting devices*

EN 14986:2017, *Design of fans working in potentially explosive atmospheres*

EN 60079-14:2014, *Explosive atmospheres — Part 14: Electrical installations design, selection and erection (IEC 60079-14:2013)*

EN 60079-31:2014, *Explosive atmospheres — Part 31: Equipment dust ignition protection by enclosure “t” (IEC 60079-31:2013)*

EN 60204-1:2018, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2016, modified)*

EN 60335-1:2012[1], *Household and similar electrical appliances — Safety — Part 1: General requirements (IEC 60335-1:2010, modified)*

[1] As impacted by EN 60335-1:2012/A1:2019, EN 60335-1:2012/A2:2019, EN 60335-1:2012/A11:2014, EN 60335-1:2012/A13:2017, EN 60335-1:2012/A14:2019 and EN 60335-1:2012/A15:2021.

EN IEC 60079-0:2018[2], *Explosive atmospheres — Part 0: Equipment — General requirements (IEC 60079-0:2017)*

EN ISO 3744:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane (ISO 3744:2010)*

EN ISO 4126-2:2019, *Safety devices for protection against excessive pressure — Part 2: Bursting disc safety devices (ISO 4126-2:2018)*

EN ISO 4871:2009, *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

EN ISO 8031:2020, *Rubber and plastics hoses and hose assemblies — Determination of electrical resistance and conductivity (ISO 8031:2020)*

EN ISO 11201:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections (ISO 11201:2010)*

EN ISO 11203:2009, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions from the sound power level (ISO 11203:1995)*

EN ISO 11688-1:2009, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning (ISO/TR 11688-1:1995)*

EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

EN ISO 13849-1:2015, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2015)*

EN ISO 13849-2:2012, *Safety of machinery — Safety-related parts of control systems — Part 2: Validation (ISO 13849-2:2012)*

EN ISO 16852:2016, *Flame arresters — Performance requirements, test methods and limits for use (ISO 16852:2016)*

EN ISO 20643:2008, *Mechanical vibration — Hand-held and hand-guided machinery. Principles for evaluation of vibration emission (ISO 20643:2005)*

EN ISO 80079-36:2016[3], *Explosive atmospheres — Part 36: Non-electrical equipment for explosive atmospheres — Basic method and requirements (ISO 80079-36:2016)*

ISO 14694:2003, *Industrial fans — Specifications for balance quality and vibration levels*

ISO 22883:2004, *Castors and wheels — Requirements for applications up to 1,1 m/s (4 km/h)*

[2] As impacted by EN IEC 60079-0:2018/AC:2020-02.

[3] As impacted by EN ISO 80079-36:2016/AC:2019.

ISO 22884:2004, *Castors and wheels — Requirements for applications over 1,1 m/s (4 km/h) and up to 4,4 m/s (16 km/h)*

ISO 29463-1:2017, *High efficiency filters and filter media for removing particles from air — Part 1: Classification, performance, testing and marking*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1127-1:2019, EN ISO 12100:2010, EN IEC 60079-0:2018[2], EN 13237:2012 and EN ISO 80079-36:2016[3] and the following apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
vacuum cleaner
suction device for the collection of solid debris, dust and liquids

3.2
vacuum cleaner type
type based on the substances the vacuum cleaner is designed to collect

Note 1 to entry: There are three types of vacuum cleaners: “dry type dust collector”, “wet type dust collector” and “liquid collector”.

3.3
dry type dust collector
device designed for the collection of dry dust of all types, combustible or non-combustible, in any mix except where self-heating dust and/or chemical aggressive substances result from the mixing, unless specific exclusions are detailed in the information for use

Note 1 to entry: The dust is collected in a collection bag or directly in the collection tank.

3.4
wet type dust collector
device designed for the collection of dust of all types, combustible or non-combustible, in any mix including where chemical aggressive and/or self-heating substances result from the mixing

Note 1 to entry: The collection device is designed to precipitate the collected dust into a neutralizing liquid.

3.5
liquid collector
device designed for the collection of liquids of all types, flammable or non-flammable, in any mix excluding where self-heating substances result from the mixing

Note 1 to entry: The liquids are collected directly in the collection tank.

3.6
transportable vacuum cleaner
vacuum cleaner not intended to be carried by a person nor intended for fixed installation and which can be moved when energized

3.7
portable vacuum cleaner
vacuum cleaner intended to be carried by a person and which can be moved when energized

3.8
canister vacuum cleaner
vacuum cleaner which power source, collection tank and filter chamber are placed on a cart with wheels

Note 1 to entry: The suction nozzle, placed at the end of a wand which is connected to a s suction hose attached to the collection tank or filter chamber, allows the operator to collect substances at distance from the power source.

3.9
back-pack vacuum cleaner
vacuum cleaner designed to have the power source and collector carried on the operator's back by means of a supporting device

3.10
powerhead
upper part of the vacuum cleaner containing the motor or power system which creates the vacuum

Note 1 to entry: The powerhead can be detached from the filter chamber or from the collection tank.

Note 2 to entry: See Figure B.1 and Figure B.2.

3.11
motor cabinet
enclosure which is a part of the vacuum cleaner assembly and which contains the motor

Note 1 to entry: See Figure B.3 and Figure B.4.

3.12
collection tank
part of the vacuum cleaner where the substances collected are contained

Note 1 to entry: See Figure B.1, Figure B.2, Figure B.3 and Figure B.4.

3.13
filter chamber
part of the vacuum cleaner containing filters

Note 1 to entry: See Figure B.2, Figure B.3 and Figure B.4.

3.14
through flow motor
motor where the working air travels through the fan system and is discharged directly over the motor windings as it exits, so the working air also provides cooling for the motor

3.15
bypass motor
motor where the working airflow is independent from the cooling airflow

Note 1 to entry: The working air does not come into contact with motor windings. A separate fan is used for the cooling air.

Note 2 to entry: See Figure C.1 and Figure C.3.

3.16
motor enclosure
enclosure which is part of the motor and which is designed to protect the motor from damages and from contaminants present in the environment it operates

Note 1 to entry: Motor enclosures are categorized as either open (see Figure B.1) or totally enclosed (see Figure C.1 and Figure C.3) and have an impact on how the cooling air circulate.

3.17
open enclosure bypass motor
bypass motor in which the cooling airflow circulates through the windings

3.18
totally enclosed bypass motor
motor in which the cooling airflow circulates on the outside of the frame of the motor

Note 1 to entry: See examples on Figure C.1 and Figure C.3.

3.19
side channel fan
non-positive displacement, high volume, pressure fan that can operate as either a compressor or a vacuum pump

Note 1 to entry: It is also known as other names such as side channel blower, regenerative blower or vortex blower. The fan or blower typically consists of an impeller mounted directly on a motor shaft and is rotated at a high speed.

3.20
non-electrical vacuum cleaner
vacuum cleaner using a non-electrical power source to operate

Note 1 to entry: Electrical monitoring equipment can be associated in some design.

3.21
electrical vacuum cleaner
vacuum cleaner using an electrical power source to operate

3.22
high-efficiency particle air filter
filter certified in conformance with applicable standards for having a minimum filtration efficiency of 99,95 % as specified in EN 1822-1:2019 (H13) or in ISO 29463-1:2017 (ISO 35H)

3.23
coalescing filter
filter specifically designed to filter a humidified air flow and to remove liquid and droplets from the air flow

3.24
mist filtration system
filtration system used as main filter in wet type dust collectors to filter airflow from droplets

3.25
most penetrating particle size
particle size at which the minimum of the particle size efficiency curve occurs under test conditions

[SOURCE: ISO 29464:2017, 3.2.136, modified – Note 1 to entry has been deleted.]

3.26
main filter
filter element filtering the air flow upstream of the motor or power system in order to prevent the majority of collected substances from entering the power system or fan, and to get released into the environment

Note 1 to entry: A main filter is designed for dust or liquid collectors.

3.27
collection bag
bag into which the collected substances are accumulated

3.28
pre-filter
air filter fitted upstream of another filter to reduce the challenge on that filter

[SOURCE: ISO 14644-4:2001, 3.8]

3.29
suction inlet
air intake placed on the vacuum cleaner to which the suction hose is connected

3.30
filter blockage indicator
device indicating the blockage of the filters installed in the vacuum cleaner

3.31
working air
air allowing to collect dusts and/or liquids in the vacuum cleaner

Note 1 to entry: See Figure B.1 for illustration.

3.32
cooling air
air used to cool off the motor of the vacuum cleaner

Note 1 to entry: See Figure B.1 for illustration.

3.33
upstream airflow
flow of air which is located before the motor or power system

Note 1 to entry: See cooling air intake and working air intake on Figure B.1 for illustration.

3.34
downstream airflow
flow of air which is located after the motor or power system

Note 1 to entry: See cooling air exhaust and working air exhaust on Figure B.1 for illustration.

3.35
self-heating dust
dust which, by reaction with air and without energy supply, is liable to self-heat

3.36
degassing vent
safety feature preventing the build-up of gas in the collection tank by allowing it to be vented out when the vacuum cleaner is switched off

3.37
dirty side of the vacuum cleaner
internal part of the vacuum cleaner located between the suction inlet and the first stage of filtration

3.38
clean side of the vacuum cleaner
internal part of the vacuum cleaner located after the last stage of filtration

Note 1 to entry: At this point, the concentration of combustible substances in the airflow is designed to be below the lower explosive limit.

3.39
vacuum relief valve
valve placed on the power system (s.a. motor) to relieve vacuum created inside the vacuum cleaner while the vacuum cleaner is in operation

3.40
machine control system
system which responds to input signals from parts of machine elements, operators, external control equipment or any combination of these and generates output signals causing the machine to behave in the intended manner

Note 1 to entry: The machine control system can use any technology or any combination of technologies (e.g. electrical/electronic, hydraulic, pneumatic, mechanical).

[SOURCE: ISO 13849-1:2015, 3.1.32]

3.41
control device
device which is part of the control system and which detect input signals given by the operator, usually by means of hand

Note 1 to entry: There are many different kinds of control devices including, for example, push-buttons, levers, switches, knobs, sliders, joy-sticks, hand wheels, pedals, keyboards and tactile screens.

3.42
wheel
circular structure able to rotate on an axle, either directly or with the use of bearing(s), with the external part in contact with the ground

[SOURCE: EN 12526:1998, 2.1.1.1, modified – Reference to Figure 1 has been deleted.]

3.43
castor
assembly comprising a housing, one or more wheels, an axle and, if required, accessories

[SOURCE: EN 12526:1998, 2.3.1]