



BSI Standards Publication

**Automatic floor treatment machines for
commercial use — Particular requirements**

National foreword

This British Standard is the UK implementation of EN IEC 63327:2021. It is identical to IEC 63327:2021.

The UK participation in its preparation was entrusted to Technical Committee CPL/61/10, Floor treatment machines (industrial).

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Published by BSI Standards Limited 2021

ISBN 978 0 539 01116 6

ICS 13.120; 97.080

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 August 2021.

Amendments/corrigenda issued since publication

Date	Text affected
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EUROPEAN STANDARD

EN IEC 63327

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2021

ICS 13.120; 97.080

English Version

**Automatic floor treatment machines for commercial use -
Particular requirements
(IEC 63327:2021)**

Machines automatiques de traitement des sols à usage
commercial - Exigences particulières
(IEC 63327:2021)

Automatische Bodenbehandlungsmaschinen für den
gewerblichen Gebrauch - Besondere Anforderungen
(IEC 63327:2021)

This European Standard was approved by CENELEC on 2021-06-08. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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

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

European foreword

The text of document 61J/734/CDV, future edition 1 of IEC 63327, prepared by SC 61J "Electrical motor-operated cleaning appliances for commercial use" of IEC/TC 61 "Safety of household and similar electrical appliances" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 63327:2021.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2022-03-08
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2024-06-08

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

Endorsement notice

The text of the International Standard IEC 63327:2021 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60068-2-78:2012	NOTE	Harmonized as EN 60068-2-78:2013 (not modified)
IEC 60204-1:2016	NOTE	Harmonized as EN 60204-1:2018 (modified)
IEC 60335 (series)	NOTE	Harmonized as EN 60335 (series)
IEC 60335-2-2	NOTE	Harmonized as EN 60335-2-2
IEC 60335-2-10:2002	NOTE	Harmonized as EN 60335-2-10:2003 (not modified)
IEC 60335-2-29:2016	NOTE	Harmonized as EN 60335-2-29:— ¹ (not modified)
IEC 60335-2-100	NOTE	Harmonized as EN 50636-2-100
IEC 60601-1	NOTE	Harmonized as EN 60601-1
IEC 61508 (series)	NOTE	Harmonized as EN 61508 (series)
IEC 62885-9:2019	NOTE	Harmonized as EN IEC 62885-9:2019 (not modified)
ISO 3691-4	NOTE	Harmonized as EN ISO 3691-4
ISO 3743-1:2010	NOTE	Harmonized as EN ISO 3743-1:2010 (not modified)
ISO 3744:2010	NOTE	Harmonized as EN ISO 3744:2010 (not modified)

¹ To be published. Stage at the time of publication: FprEN 60335-2-29:2020.

ISO 4871:1996	NOTE	Harmonized as EN ISO 4871:2009 (not modified)
ISO 9614-2:1996	NOTE	Harmonized as EN ISO 9614-2:1996 (not modified)
ISO 11203:1995	NOTE	Harmonized as EN ISO 11203:2009 (not modified)
ISO/TR 11688-1	NOTE	Harmonized as EN ISO 11688-1
ISO 13482:2014	NOTE	Harmonized as EN ISO 13482:2014 (not modified)
ISO 13732-1	NOTE	Harmonized as EN ISO 13732-1
ISO 13856-3:2013	NOTE	Harmonized as EN ISO 13856-3:2013 (not modified)

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60335-1	2020	Household and similar electrical appliances - Safety - Part 1: General requirements	EN IEC 60335-1	— ²
IEC 60335-2-69	2021	Household and similar electrical appliances - Safety - Part 2-69: Particular requirements for wet and dry vacuum cleaners, including power brush, for commercial use	-	-
IEC 60335-2-72	2021	Household and similar electrical appliances - Safety - Part 2-72: Particular requirements for floor treatment machines with or without traction drive, for commercial use	-	-
IEC 61032	-	Protection of persons and equipment by enclosures - Probes for verification	EN 61032	-
IEC 61058-1	-	Switches for appliances - Part 1: General requirements	EN IEC 61058-1	-
IEC 61770	2008	Electric appliances connected to the water mains - Avoidance of backsiphonage and failure of hose-sets	EN 61770	2009
-	-		+ AC	2011
-	-		+ A11	2018
IEC 62061	-	Safety of machinery - Functional safety of safety-related control systems	EN IEC 62061	-
ISO 13849-1	-	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design	EN ISO 13849-1	-

² To be published. Stage at the time of publication: FprEN IEC 60335-1:2020.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO 13857	2019	Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs	EN ISO 13857	2019
ISO 18646-1	2016	Robotics - Performance criteria and related test methods for service robots - Part 1: Locomotion for wheeled robots	-	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**AUTOMATIC FLOOR TREATMENT MACHINES FOR COMMERCIAL USE –
PARTICULAR REQUIREMENTS**

FOREWORD

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IEC 63327 has been prepared by subcommittee 61J: Electrical motor-operated cleaning appliances for commercial use, of IEC technical committee 61: Safety of household and similar electrical appliances. It is an International Standard.

The text of this International Standard is based on the following documents:

CDV	Report on voting
61J/734/CDV	61J/747A/RVC

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The requirements for the construction and testing covered by this document are applied in addition to the particular requirements for floor treatment machines with or without traction drive, for commercial use given in IEC 60335-2-72:2021.

NOTE 1 The following print types are used:

- requirements: in roman type;
- *test specifications: in italic type;*
- notes: in small roman type.

Words in **bold** in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and the associated noun are also in bold.

NOTE 2 The 100 numbering is applied in certain clauses of this standard as these are additions to certain existing clauses of IEC 60335-1, IEC 60335-2-69, and IEC 60335-2-72.

NOTE 3 The 200 numbering in certain clauses of this standard is applied to avoid overlap with the numbering of the corresponding clauses of IEC 60335-1, IEC 60335-2-69, and IEC 60335-2-72.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

It has been assumed in the drafting of this International Standard that the execution of its provisions is entrusted to appropriately qualified and experienced persons.

This standard recognizes the internationally accepted level of protection against hazards such as electrical, mechanical, thermal, fire and radiation of appliances when operated as in normal use taking into account the manufacturer's instructions. It also covers abnormal situations that can be expected in practice and takes into account the way in which electromagnetic phenomena can affect the safe operation of appliances.

This standard takes into account the requirements of IEC 60364 as far as possible so that there is compatibility with the wiring rules when the appliance is connected to the supply mains. However, national wiring rules may differ.

This standard is a product family standard dealing with the safety of appliances and takes precedence over horizontal and generic standards covering the same subject.

NOTE Horizontal and generic standards covering a hazard are not applicable since they have been taken into consideration when developing the general and particular requirements for the IEC 60335 series of standards. For example, in the case of temperature requirements for surfaces on many appliances, generic standards, such as ISO 13732-1 for hot surfaces, are not applicable in addition to Part 1 or part 2 standards.

An appliance that complies with the text of this standard will not necessarily be considered to comply with the safety principles of the standard if, when examined and tested, it is found to have other features that impair the level of safety covered by these requirements.

An appliance employing materials or having forms of construction differing from those detailed in the requirements of this standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be considered to comply with the standard.

AUTOMATIC FLOOR TREATMENT MACHINES FOR COMMERCIAL USE – PARTICULAR REQUIREMENTS

1 Scope

This International Standard deals with the safety of powered **automatic floor treatment machines** intended for **commercial use** indoors for the following applications:

- sweeping,
- scrubbing,
- wet or dry pick-up,
- polishing,
- application of wax, sealing products and powder-based detergents,
- shampooing

of floors.

The requirements given by this standard are applied in addition to the requirements for commercial floor treatment machines in IEC 60335-2-72, as far as applicable.

For **automatic floor treatment machines** solely designed for wet or dry pick-up, additional or modified requirements of IEC 60335-2-69 where stated are applicable.

Machines covered by this standard can operate in **automatic** or **manual mode**.

Modified requirements are given in Annex FF of this standard for **automatic floor treatment machines** not equipped with a **manual mode**.

The **automatic floor treatment machines** covered by this standard are designed to avoid hazardous contact with persons in the environment applied. It is recognized that **automatic floor treatment machines** for **commercial use** might require operation within close proximity to large groups of people, such as in shopping malls and schools.

Throughout this standard, the term “machine” is used to refer to an **automatic floor treatment machine**.

The following power systems are covered:

- rechargeable batteries that are recharged by **built-in battery chargers** or off-board battery chargers which may be incorporated within the circuitry of the machine, or mounted on the machine and incorporated within the enclosure of the **automatic floor treatment machine**; or powered by batteries that need to be removed to be recharged with a charger that is external to the machine,
- Other systems are under consideration.

This standard does not apply to

- vacuum cleaners and water-suction cleaning appliances and automatic battery-operated cleaners for household use (IEC 60335-2-2);
- floor treatment machines and wet scrubbing machines for household use (IEC 60335-2-10);
- battery chargers (IEC 60335-2-29);

- floor treatment machines for **commercial use** (IEC 60335-2-67);
- spray extraction machines for **commercial use** (IEC 60335-2-68);
- road sweepers;

NOTE 101 In Europe, the EN 17106 series covers road sweepers.

- machines designed for use on **slopes** with a gradient exceeding 20 %;
- machines equipped with a power take-off (PTO);
- machines designed for use in corrosive or explosive environments (dust, vapour or gas);
- machines designed for use in vehicles or on board of ships or aircraft.
- vacuum cleaners designed for pickup of combustible dust;
- appliances for medical purposes (IEC 60601-1);
- driverless industrial trucks and their systems (ISO 3691-4);
- robots and robotic devices: Safety requirements of personal care robots (ISO 13482)
- machines with parts that extend beyond the **contact zone** of the machine;

NOTE 102 Components of the machine that operate outside the **contact zone** can be evaluated differently.

- machines designed for picking up liquids with a flash point below 55 °C.

NOTE 103 The flash point temperature limit can vary in different countries. National regulations will need to be taken into account.

NOTE 104 Attention is drawn to the fact that in many countries additional requirements on the safe use of the equipment covered can be specified by the national health authorities, the national authorities responsible for the protection of labour, the national water supply authorities and similar authorities.

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.

IEC 60335-1:2020, *Household and similar electrical appliances – Safety – Part 1: General requirements*

IEC 60335-2-69:2021, *Household and similar electrical appliances – Safety – Part 2-69: Particular requirements for wet and dry vacuum cleaners, including power brush, for commercial use*

IEC 60335-2-72:2021, *Household and similar electrical appliances – Safety – Part 2-72: Particular requirements for floor treatment machines with or without traction drive, for commercial use*

IEC 61032, *Protection of persons and equipment by enclosures – Probes for verification*

IEC 61058-1, *Switches for appliances – Part 1: General requirements*

IEC 61770:2008, *Electric appliances connected to the water mains – Avoidance of backsiphonage and failure of hose-sets*

IEC 62061, *Safety of machinery – Functional safety of safety-related control systems*

ISO 13849-1, *Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design*

ISO 13857:2019, *Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs*

ISO 18646-1:2016, *Robotics – Performance criteria and related test methods for service robots – Part 1: Locomotion for wheeled robots*

3 Terms and definitions

Clause 3 of IEC 60335-2-69:2021 and IEC 60335-2-72:2021 applies, except as follows:

NOTE The 200 numbering in Clause 3 of this standard is applied to avoid overlap with the numbering of Clause 3 of IEC 60335-2-69 and IEC 60335-2-72.

Addition:

3.201

automatic floor treatment machine

machine that operates automatically on a defined working area and that may also be able to be operated in a **manual mode**

Note 1 to entry: Definition of the work area and floor surface can be done by **operator** action, (temporary) physical limitations or by autonomous (initial) exploratory mode of the machine.

3.202

type 1 machine

automatic floor treatment machine having

- a maximum **rated automatic speed** not exceeding 3 km/h, and
- a height during **normal operation** not exceeding 50 cm above the ground, and
- a mass during **normal operation** not exceeding 20 kg

Note 1 to entry: If a **GVW** is available, the mass is replaced by this value.

3.203

type 2 machine

automatic floor treatment machine other than a **type 1 machine**

3.204

control system

set of logic control and power functions which allows to monitor and control the mechanical structure of the machine and to communicate with the environment (equipment and **operators**)

[SOURCE: ISO 8373:2012, 2.7 modified – "monitoring" has been changed to "to monitor", "robot" has been changed to "machine", "communication" has been changed to "communicate" and "users" has been changed to "operators"]

3.205

manual mode

operating mode in which the machine can be operated by, for example, pushbuttons or a joystick and that excludes operation in **automatic mode**

Note 1 to entry: It includes manual cleaning and transportation modes.

[SOURCE: ISO 8373:2012, 5.3.10.2, modified – "robot" has been changed to "machine", "operation" has been changed to "mode" and the note to entry has been added]

3.206**automatic mode**

operating mode in which the machine accomplishes its assigned mission without direct human intervention

3.207**locked state**

condition in which the driving wheels are being prevented from moving with a locking mechanism that can be unlocked by the intervention of the authorized **operator** only

Note 1 to entry: A locking mechanism can be the **traction drive** or the service brake.

3.208**rated automatic speed**

maximum speed of the machine during operation in **automatic mode** in **open space**

3.209**access control**

security measure enabling the **operator** to gain access to the control of the machine

Note 1 to entry: It includes, but is not limited to, a key-protected control device.

3.210**stopping distance**

maximum distance travelled by the **machine** between the initiation of the stop and the complete standstill

Note 1 to entry: The **stopping distance** in 7.3 includes machine reaction time.

[SOURCE: ISO 18646-1:2016, 3.10, modified – "mobile platform origin" has been changed to "machine", "full stop of the mobile platform" has been changed to "complete standstill" and the note to entry has been added]

3.211**stop category 0**

stopping by immediate removal of power to the machine actuators (i.e., an uncontrolled stop)

Note 1 to entry: It is understood that **operator** attention will be required to re-enable power to the actuators.

[SOURCE: IEC 60204-1:2016, 9.2.2, modified – Note to entry has been added]

3.212**stop category 1**

controlled stop with power available to the machine actuators to achieve the stop and then removal of power when the stop is achieved

Note 1 to entry: It is understood that **operator** attention will be required to re-enable power to the actuators.

[SOURCE: IEC 60204-1:2016, 9.2.2, modified – Note to entry has been added]

3.213**stop category 2**

controlled stop with power left available to the machine actuators

Note 1 to entry: It is understood that **operator** attention is not required to re-enable power to the actuators.

[SOURCE: IEC 60204-1:2016, 9.2.2, modified – "remaining" has been changed to "left" and the note to entry has been added]

3.214**stopping zone**

fixed or variable-sized zone in which the machine has the capabilities to avoid a static object

Note 1 to entry: See Figure 2.

3.215**contact zone**

boundary in which the machine is assumed to be in contact with the object, and the allowable motion of the machine could be hazardous at that boundary

Note 1 to entry: See Figure 2.

Note 2 to entry: Hazardous exposed moving side brushes are included in the **contact zone**.

3.216**open space**

area that is not considered to be a **confined space**

3.217**confined space**

area in which the distance from the nearest continuous wall or obstacle is less than 0,5 m from the **machine transport width** parallel to the direction of motion

Note 1 to entry: See Figure 2.

3.218**machine transport width**

minimum width the machine can pass through to indicate the maneuverability of the machine during transport

Note 1 to entry: It does not indicate the effective cleaning width of the machine.

[SOURCE: IEC 62885-9:2019, Clause 7, modified – "not the effective cleaning width of the machine" has been deleted and the note to entry has been added]

3.219**docking station**

unit that may provide one or more of the following functions for the **automatic floor treatment machine**:

- manual or automatic battery charging facilities,
- AC and/or DC power supply,
- filling water with or without detergents,
- filling detergents,
- filling water for wet batteries,
- emptying of wastewater, dust, coarse dirt,
- communication connections,
- navigation information

Note 1 to entry: A **docking station** is also known as a base unit.

4 General requirements

The machine shall be constructed as follows:

The machine when in **manual mode** shall fulfil the requirements for commercial floor treatment machines according to IEC 60335-2-72:2021 unless stated otherwise in this standard. Further requirements for the **automatic mode** are given within the main body of this standard. Machines shall be constructed in their **manual** and **automatic mode** so that they function safely to cause no danger to persons or surroundings during normal use, even in the event of carelessness, and during installation, adjusting, maintenance, cleaning, repairing, or transportation. For **ride-on machines** in **automatic mode**, **operator** presence on the machine shall be prevented either by sensing which stops the machine from operating, or design features which prevent **operator** presence.

Modified requirements to IEC 60335-2-72:2021 are given in normative Annex FF of this standard for **automatic floor treatment machines** not equipped with a **manual mode**.

For the purposes of this standard, the term 'appliance' as used in IEC 60335-1:2020 is to be read as 'machine'.

Safety of the machine shall not depend on remote operation. Resetting of **stop category 0** or **stop category 1** shall not be possible remotely.

Compliance is checked by the following:

The tests of this standard shall be performed after disabling remote operations.

5 General conditions for the tests

5.1 The following test obstacles, taken from ISO 13856-3, shall be covered in black felt or coarse fabric with a reflectance between 5 % and 10 %:

- a) Obstacle 1 – a cylinder with a diameter of 200 mm and a length of 600 mm, placed horizontally; and
- b) Obstacle 2 – a cylinder with a diameter of 70 mm and a height of 400 mm, placed vertically.

NOTE To perform the test, the obstacle can be attached to a flat plate with a handle or a cord can be used to place the obstacle.

5.2 Tests shall be conducted at lighting level between 100 lx and 1000 lx.

6 Starting of motor operated appliances

It shall only be possible to start the **type 2 machine** in **automatic mode** from initial start-up by intended actuation of an **access control** provided for the purpose. The same requirement applies when restarting the **type 2 machine** in **automatic mode** after a **stop category 0**. This requirement only applies to components where the unexpected starting might cause a hazard. It does not apply to components such as suction units, pumps, etc.

Compliance is checked by inspection and test.

7 Stability and mechanical hazards

7.1 Machines in **automatic mode**, operating in an **open space** environment, shall not exceed 6 km/h. Machines in **automatic mode** operating in a **confined space** environment shall not exceed 4 km/h.

NOTE 1 As specified in this standard, **manual mode** speed can be higher than **automatic mode** speed.

*Compliance for machine **speed operating in confined space** environment is checked by measurement in accordance with the test procedure as described below.*

*The test area of the **confined space** environment consists of two continuous walls or obstacles, each with a minimum length equal to the machine transport length and a minimum height of 1 m. One wall is located on one side of the machine, and the other wall is located on the opposite side of the machine starting from the location where the first wall ends. The two walls are placed in the direction of travel of the machine so that they are within the **confined space** distance on each side from the **machine transport width**. Sensors are allocated at each end of the test area to measure the start and finish of the machine traversal.*

NOTE 2 An example of test set up is shown in Figure 1.

*The machine, loaded to the **GVW** rating, traverses towards the confined space test set-up area at the maximum **open space** speed and enters the **confined space** test area. The **confined space** speed is measured from the start and end of the machine traversal through the **confined space** test set-up area. The average speed shall be measured over three successful speed measurements.*

*Compliance is checked by measurement in accordance with ISO 18646-1:2016, Clause 5, with the machine loaded to the **GVW** rating.*

7.2 Machines that can function in **manual mode** as **ride-on machine** or a **walk-behind machine** with **traction drive** shall not be possible to operate with the higher speed of **manual mode** when operating in **automatic mode**.

Compliance is checked by inspection and measurement.

7.3 The maximum allowed **stopping distance**, S_a , shall be calculated using the following formula:

$$S_a < 1,2 \times V_a$$

where

S_a is **stopping distance in automatic mode** (m);

V_a is maximum **rated automatic speed** of the machine in the direction of test (m/s).

NOTE **Stopping distance** is based on a reaction time below 0,5 s.

Compliance is checked by functional test.

7.4 The detection system shall be capable of avoiding contact with obstacles in the directions in which the machine is capable of motion at distances greater than S_a , as calculated in 7.3, for the maximum speed the machine can travel in that direction. This requirement is not applicable to **type 1 machines** not exceeding a speed of 1,5 km/h and to **automatic floor treatment machines** during the docking process to the **docking station**.

Obstacles according 5.1 shall be used for testing.

Compliance is checked by functional test.

7.5 A machine shall not fall over abrupt surface elevation changes such as staircases, unprotected drop-offs, and the like.

*Compliance is checked by the following test: The machine shall be tested on a surface (11 ± 1) cm above an adjacent surface. The lower surface shall be a minimum 1 m in length from where it meets the upper surface; the lowest surface is concrete. The test shall be conducted under the most unfavourable conditions, based on sensor positions, both starting from rest and in motion towards the abrupt surface elevation change under **normal operation** and at loaded to the **GVW** rating.*

The machine shall be able to detect and stop in the presence of abrupt surface elevation changes of (11 ± 1) cm or greater in all directions of travel.

7.6 The **control system** of safety-critical functions in the machine (i.e., electric, hydraulic, pneumatic, and software) shall be designed so that they comply with the PL levels and structures as described in ISO 13849-1. The tests of 7.1 to 7.5 and 7.7 to 7.10 shall be conducted using only the **control system** of the safety-critical functions which meet the requirements of 7.7. Software in programmable **electronic circuits**, necessary to fulfil the safety critical functions and that can interfere with them, shall fulfil the requirements of Annex R of IEC 60335-1:2020. References in R.2.2.5 and R.2.2.9 to Clause 19 shall instead refer to 7.6 of this standard.

Alternative methods for determining the required safety integrity level/performance level, for example IEC 62061, are acceptable in achieving the required risk reduction (see normative Annex JJ). The safety-critical functions are identified in Table 1.

Table 1 – Minimum required performance levels

Type and purpose of safety-critical function (SCF)	Minimum required performance level (PL) as described in ISO 13849-1	
	Type 1 machines	Type 2 machines
Prevent traversing over abrupt surface elevation changes such as staircases, unprotected drop-offs, and the like referred to in 7.5	PL = d	PL = d
Prevent intrusions into the stopping or contact zones to prevent crushing of and collision with parts of the body and objects referred in 7.7 to 7.11	PL = b	PL = d
Prevent exceeding the automatic mode speed referred to in 7.1 and 7.2	PL = b	PL = d
Provide locked state of drive wheels referred to in 7.8	PL = b	PL = b
Provide desired switch-off of the machine, or emergency switch-off	PL = b	PL = c
Provide desired stop category 0, 1, or 2	PL = b	PL = d

7.7 In the initial start-up state, while the machine is at rest, each of the obstacles described in 5.1 is placed in turn in contact with the machine at various locations representative of the **contact zone**. The machine shall not initiate motion unless after selection of automatic mode by an **operator** the machines moves directly away from the obstacle.

The machine shall not initiate motion, unless

- it moves directly away from the obstacle after **automatic mode** is initiated by the **operator**, and
- it can determine that nothing is in the **contact zone**, through **guards** or sensing, in the direction of motion without contacting the obstacle.

This requirement is not applicable to **type 1 machines** not exceeding a speed of 1,5 km/h and to **automatic floor treatment machines** during the docking process to the **docking station**.

Compliance is checked by functional test. Test duration is 5 min or less if the machine moves away from the obstacle.

7.8 The machine shall monitor the operating status of all safety-related control parts of the **control system** before starting and during operation.

Any detected failure in the safety-related parts of the **control system** shall result in a **stop category 0** or **stop category 1** with the driving wheels in a **locked state**. The machine shall require the intervention of the **operator** to restart.

The safety-related parts of the **control system** are the relevant parts of the safety-critical functions (SCFs) identified in Table 1.

Compliance is checked by an evaluating system in accordance with Table 1.

7.9 The machine shall avoid contact with any static objects that enter the **stopping zone**. When any obstacle described in 5.1 enters the **stopping zone**, at least a **stop category 2** or obstacle avoidance shall be initiated. This requirement is not applicable to **type 1 machines** not exceeding a speed of 1,5 km/h and to **automatic floor treatment machines** during the docking process to the **docking station**.

When a **stop category 2** is achieved and the machine is at rest, the **contact zone** sensors may be disabled.

NOTE When the obstacle is removed, the machine can resume movement automatically unless contact with the obstacle is made.

Compliance is checked by the following test:

*The machine is driven toward the test obstacles, at both **confined space** speed and **rated automatic speed**. The obstacles are placed outside of the **stopping zone** ahead of the machine. The machine shall avoid contact with any objects when entering the **stopping zone**. When any obstacle described in 5.1 enters the **stopping zone**, at least a **stop category 2** or obstacle avoidance shall be initiated. Each obstacle shall be tested separately. Test obstacle 1 shall be laying down and at 0°, 45°, and 90° to the path of the machine, at a range greater than the machine safe **stopping distance**, and positioned at the left-most (one-half the width of the machine from the centreline), right-most, and centre of the machine travel path. Test obstacle 2 shall be set vertically at a range equivalent to the machine safe **stopping distance** and positioned at the left-most, right-most, and centre of the machine path (see Figure 2 for obstacle positioning).*

7.10 Following a **stop category 2**, each of the obstacles described in 5.1 is placed in contact with the machine at various locations representative of the **contact zone**. The machine shall not initiate motion, unless the system ensures during motion to brake on time to prevent further contact with the obstacle. This requirement is not applicable to **type 1 machines** not exceeding a speed of 1,5 km/h and to **automatic floor treatment machines** during the docking process to the **docking station**.

Compliance is checked by functional test. Test duration is 5 min or less if the machine moves away from the obstacle.

7.11 When either of the obstacles described in 5.1 enters the **contact zone** while the machine is moving, a **stop category 0** or **stop category 1** shall be initiated. This requirement is not applicable to **type 1 machines** not exceeding a speed of 1,5 km/h and to **automatic floor treatment machines** during the docking process to the **docking station**.

Compliance is checked by the following test:

*The obstacle is moved in front of the machine's direction of motion inside the **stopping zone**. The machine's **contact zone** shall initiate a **stop category 0** or **stop category 1**, due to anticipated contact with the obstacle. When the obstacle is removed, the machine shall not resume movement without **operator** intervention.*

Requirements for machines intended to pick up hazardous dust are specified in IEC 60335-2-69:2021, normative Annex A, Clause A.4 and normative Annex AA.

Requirements for machines intended to pick up dust in ESD protected areas, are specified in IEC 60335-2-69:2021, normative Annex DD.

7.12 Automatic floor treatment machines intended to be used with **docking stations** and able to perform an automatic docking process shall not pose a crushing hazard during the docking process.

NOTE 1 Requirements for docking stations are given in normative Annex GG.

NOTE 2 Emission of acoustical noise of docking stations is dealt with in informative Annex II.

Before the docking process starts, the safety distances given in ISO 13857:2019, except Table 5 shall be kept and the **automatic floor treatment machine** shall stop completely.

During the docking process, the **automatic floor treatment machine** shall

- give acoustic or visual warnings,
- not exceed a maximum speed of 0,05 m/s,
- not move more than 0,2 m in linear direction to complete the docking process, and
- be equipped with a detection system being capable of avoiding contact with objects in the vicinity of the **docking station**.

Compliance is checked by inspection, by measurement and the following test:

*Obstacle 1 according to 5.1 is placed standing vertically on each critical side of the **docking station**, the obstacle having a maximum distance from the outline of the **docking station** of 300 mm. When an obstacle is detected, at least a **stop category 2** shall be initiated. See also Figure 3 for obstacle positioning.*

8 Construction

8.1 Machines shall be provided with a pre-start audio or visual warning signal of 2 s minimum before the **traction drive** starts to operate. The warning signal shall be sufficient to be seen or heard, or both, by the **operator** and only required upon initial start-up or restart after a **stop category 0** or **stop category 1**.

There shall be a visual warning signal that remains activated while the machine is performing the programmed cleaning task in the working area.

The sound pressure of audible indicators shall be at least 35 dB(A) at a minimum distance of 1,5 m in any direction from the center of the machine and at a height of 1,75 m.

Compliance is checked by inspection.

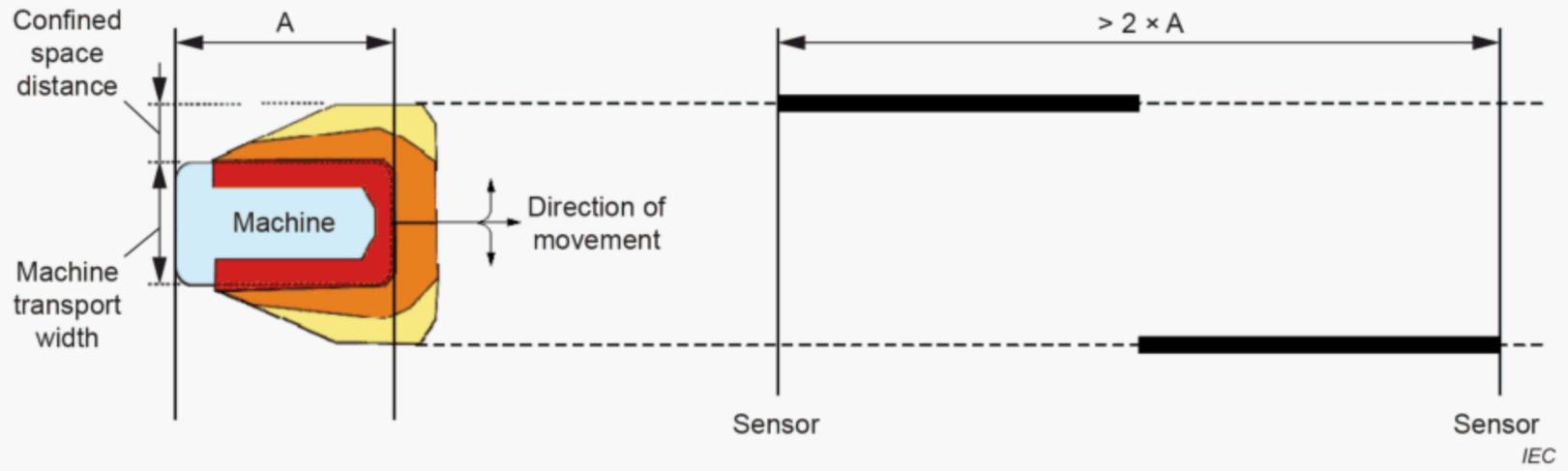


Figure 1 – Measurement of confined space speed

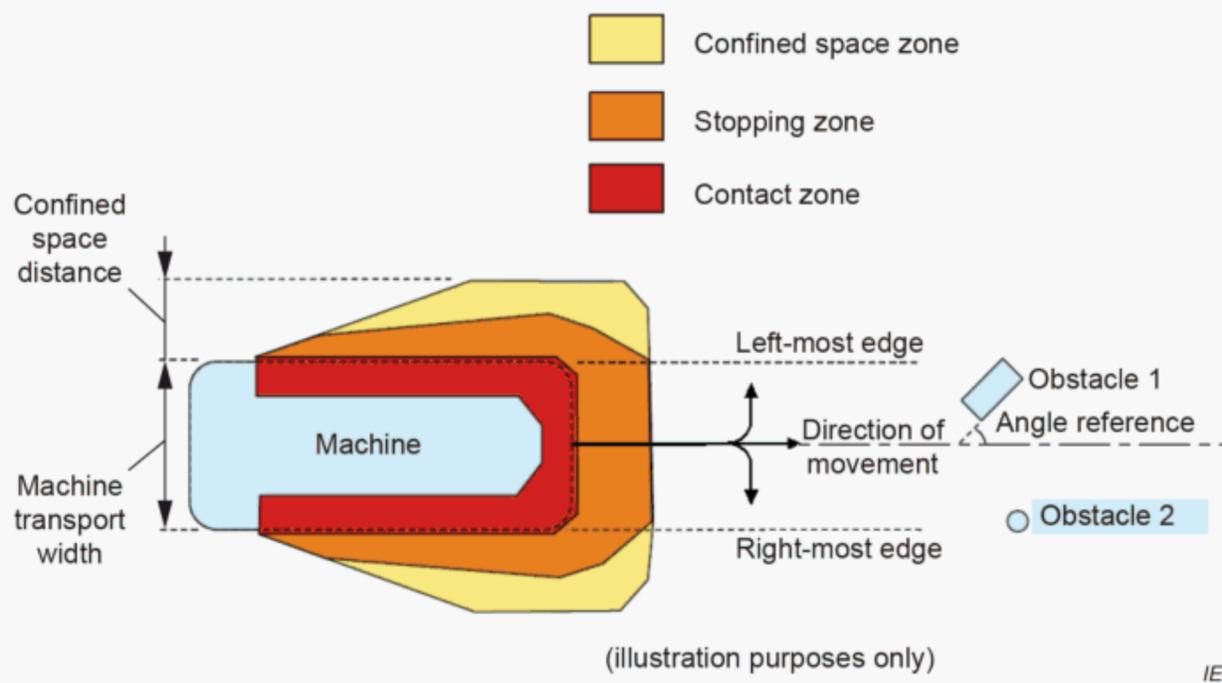


Figure 2 – Confined space, stopping zone, and contact zone

NOTE Positioning of obstacles in Figure 2 are for example purposes only.

Dimensions in millimetres

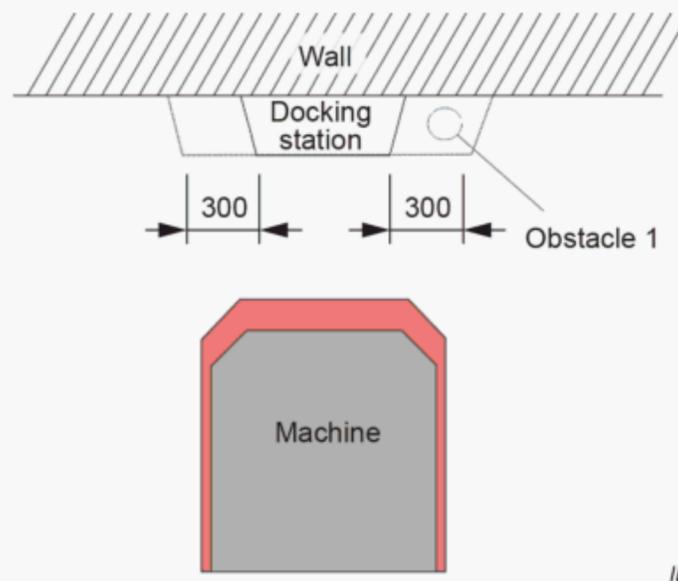


Figure 3 – Obstacle positioning during docking process

Annexes

The annexes of IEC 60335-1:2020, IEC 60335-2-69:2021, and, IEC 60335-2-72:2021, except normative Annexes CC and DD, apply together with the following new annexes.

NOTE The annex numbering is chosen to avoid confusion with the annexes of IEC 60335-2-69 and IEC 60335-2-72.

Annex FF (normative)

Additional requirements for automatic floor treatment machines not equipped with a manual mode

Modified requirements to IEC 60335-2-72:2021 are given in this annex for **automatic floor treatment machines** not equipped with a **manual mode**. The clauses of IEC 60335-2-72:2021 not mentioned in this annex are by default applicable.

7 Marking and instructions

Machines shall fulfill the requirements of Clause 7 of IEC 60335-2-72:2021, yet, the last paragraph of IEC 60335-2-72:2021, Subclause 7.12 is not applicable. However, for machines solely designed for wet or dry pick-up where the information on **GVW** is not applicable, the information requirement regarding mass information is to be given according to IEC 60335-2-69:2021. The height of the applicable symbols is given in Subclause 7.14 of IEC 60335-2-69:2021 and IEC 60335-2-72:2021.

7.12.102 Information on noise

Information on noise as required by IEC 60335-2-72:2021 shall be provided. However, if the measurement is not applicable for machines solely designed for wet or dry pick-up, the requirements as given in Subclause 7.12.102 of IEC 60335-2-69:2021 apply.

7.12.103 Information on vibration

This subclause is not applicable.

FF.7.201 Machines solely designed for wet or dry pick-up which include a blowing or inflating function shall include the instructions required in Subclause 7.12.104 of IEC 60335-2-69:2021.

9 Starting of motor operated appliances

Clause 9 of IEC 60335-2-72:2021 is replaced by the following:

It shall only be possible to start the **type 2 machine** in **automatic mode** from initial start-up by intended actuation of an **access control** provided for the purpose. The same requirement applies when restarting the **type 2 machine** in **automatic mode** after a **stop category 0**. This requirement only applies to components where the unexpected starting might cause a hazard. It does not apply to components such as suction units, pumps, etc.

Compliance is checked by inspection and test.

19 Abnormal operation

The machine shall fulfil the requirements of Clause 19 of IEC 60335-2-72:2021, and for machines solely designed for wet or dry pick-up, additionally Subclause 19.2 of IEC 60335-2-69:2021 applies.

22 Construction

The machine shall fulfil the requirements of Clause 22 of IEC 60335-2-72:2021 except for 22.112.

FF.22.201 Operators shall not be able to modify or disable safety critical parameters and functions.

*Compliance is determined by functional test without the use of tools, unless the instructions recommend **operator** adjustments utilizing a tool.*

FF.22.202 Machines shall be equipped with a switch-off device for the driving operation, which can be operated rapidly without danger from the **operator's** position, in case the controls for **normal operation** fail. The switch-off device can be an interruption of the mechanical or electrical drive. These devices may be combined into one device, for example a key-operated switch.

Compliance is checked by inspection and functional test.

24 Components

The machine shall fulfil the requirements of Clause 24 of IEC 60335-2-72:2021 except for 24.1.3, and for machines solely designed for wet or dry pick-up, additionally Subclause 24.101 of IEC 60335-2-69:2021 applies, if relevant.

30 Resistance to heat and fire

The machine shall fulfil the requirements of Clause 30 of IEC 60335-2-72:2021, except as follows: Subclause 30.2.2 is not applicable.

32 Radiation, toxicity and similar hazards

The machine shall fulfil the requirements of Clause 32 of IEC 60335-2-72:2021.

Requirements for machines intended to pick up hazardous dust are specified in IEC 60335-2-69:2021, normative Annex A, Clause A.3 and normative Annex AA.

Requirements for machines intended to pick up dust in ESD protected areas, are specified in IEC 60335-2-69:2021, normative Annex DD.

Annex GG (normative)

Requirements for docking stations for automatic floor treatment machines for commercial use

The requirements in this normative annex are to be used in conjunction with IEC 60335-1:2020, except where otherwise stated. The clauses of IEC 60335-1:2020 not mentioned in this annex are by default applicable.

1 Scope

This normative annex deals with the safety of **docking stations** for indoor use of **automatic floor treatment machines**.

This normative annex does not apply to

- vacuum cleaners, water-suction cleaning appliances, automatic-battery powered cleaners including their docking stations for household use (IEC 60335-2-2);
- floor treatment machines for household use (IEC 60335-2-10);

This standard does not apply to **docking stations**

- providing fuel (gasoline, diesel, LPG, hydrogen) supply;
- providing hazardous mechanical cleaning of components of **automatic floor treatment machines**;
- with mechanical conveyor systems for dirt transport into external waste containers;
- for mechanical battery exchange;
- for handling of substances hazardous to health;
- with automatic hopper lifting performed by the **docking station**.

3 Terms and definitions

Clause 3 of IEC 60335-1:2020 and of the main part of this standard are applicable except as follows.

NOTE The 200 numbering in Clause 3 of this Annex is applied to avoid overlap with the numbering of Clause 3 of IEC 60335-1:2020.

3.1.9 *Replacement:*

normal operation

operation of the **docking station** under the following conditions:

The **automatic floor treatment machine** is in direct contact/connected/docked onto the **docking station**, all possible functions of the **docking station** that can be operated at the same time running in accordance with the manufacturer's instructions

3.8.5 *Replacement:*

maintenance operation

operation performed by the **operator** in the **maintenance area**, such as unloading or reloading the **docking station**, cleaning and setting of controls or similar operations

GG.3.201

commercial use

intended use of machines covered by this standard, i.e. not intended for normal housekeeping purposes by private persons but which may be a source of danger to the public

I.e. in particular that

- the machines may be used or supervised by cleaning contractors, cleaning staff, etc.;
- they are used in commercial or public premises (i.e. offices, shops, hotels, hospitals, schools, etc.) or in industrial (plants etc.) and light industrial (workshops etc.) environments

Note 1 to entry: **Commercial use** is also called professional use.

GG.3.202

operator

person installing, operating, adjusting, cleaning, moving, or performing **user maintenance** on the **docking station**

GG.3.203

maintenance area

area for maintenance purposes, where access can only be gained by the use of an access key

Note 1 to entry: An access key means a key or other means that gives access to the **maintenance area**. "Other means" includes a tool or operation by codes or signals produced by optical or electromagnetic sources.

GG.3.204

override key

key or other means that is used to render an interlock inoperative

6 Classification

Clause 6 of IEC 60335-1:2020 is applicable except as follows.

6.1 Modification:

Docking stations shall be **class I** or **class II**.

6.2 Addition:

Docking stations shall have a degree of protection against harmful ingress of water according to Table GG.1.

Table GG.1 – Degree of protection against harmful ingress of water

Location of docking station	Type of cleaning process	Degree of protection
Indoors	Dry	IP X0
Indoors	Wet	IP X3

7 Marking and instructions

Clause 7 of IEC 60335-1:2020 is applicable as follows.

7.1 Replacement of the 4th dashed item as follows:

- the business name and address of the manufacturer and, if applicable, his authorized representative; any address shall be sufficient to ensure postal contact;

Addition:

Docking stations shall be marked in addition with the following:

- serial number, if any;
- designation of the **docking station** and series or type, allowing the technical identification of the product. This may be achieved by a combination of letters and/or numbers;

NOTE 101 Designation of **docking station**, series or type includes the model or type reference as required in Part 1.

- year of construction, i.e. the year in which the manufacturing process is completed;

NOTE 102 The year of construction can be part of the serial number.

- mass of the **docking station**, in kg;
- model or type reference of the **automatic floor treatment machine** it is intended to be used with. If more than one type of **automatic floor treatment machine** can be used with the **docking station**, at least one shall be referenced by a model or type on the **docking station** together with the symbol ISO 7000-0790 (2004-01).

7.12 Modification:

Replace the 4th paragraph by the following text.

This **docking station** is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge.

Addition:

The front cover of the instructions of the **docking station** shall include the substance of the following warning:

CAUTION Read the instructions before using the machine.

This wording may be replaced by symbols ISO 7000-0434A (2004-01) and ISO 7000-0790 (2004-01).

The instructions of the **docking station** shall contain at least the following:

- the business name and full address of the manufacturer and, if applicable, his authorized representative;
- designation of series or type of the **docking station** as marked on the machine itself, except for the serial number;

NOTE 101 The designation of series or type can be abstracted, as long as the identification of the product is ensured.

- the general description of the **docking station**;
- the mass of the **docking station** in kilograms;
- the intended use of the **docking station** and the auxiliary equipment as covered by the scope of this standard;

NOTE 102 Examples of auxiliary equipment for **docking stations** are supply hoses, wastewater hoses and waste containers.

- the meaning of the symbols used on the **docking station** and in the instructions;
- drawings, diagrams, descriptions and explanations necessary for the safe use, maintenance and repair of the **docking station** and for checking its correct functioning;
- technical data on the **docking station**;

- information regarding putting into service, safe operation, handling, transportation, and storage of the **docking station**;
- instructions to enable adjustment and maintenance to be carried out safely, including the protective measures that should be taken during these operations;
- the conditions in which the **docking station** meets the requirement of stability during use, transportation, assembly, dismantling when out of service, testing or foreseeable breakdowns;
- the procedure to be followed to prevent unsafe situations in the event of accident (e.g. contact with or spillage of detergents, battery acid, fuel or oil) or equipment breakdown;
- the substance of the following:

This machine is intended for **commercial use**, for example in hotels, schools, hospitals, factories, shops, offices and rental businesses.

The instructions of the **docking station** shall indicate the type and frequency of inspections and maintenance required for safe operation, including preventive maintenance measures. If applicable, they shall give the specifications of the spare parts if they affect the health and safety of the **operator**.

In addition, the instructions for **docking stations** shall give the following information, if applicable:

- information on the detergents or other liquids that may be used including the choice and use of personal protective equipment (PPE);
- essential characteristics of auxiliary equipment which may be fitted to the machine;

GG.7.12.201 The instructions of **docking stations** shall include warnings concerning ways in which the machine shall not be used, which in the experience of the manufacturer are likely to occur. At least, it shall include the substance of the following warnings, if applicable.

- WARNING Operators shall be adequately instructed on the use of these machines.
- WARNING This machine is for dry use only.
- CAUTION This machine is for indoor use only.
- CAUTION This machine shall be stored indoors only.
- WARNING The docking station shall be disconnected from its power source during cleaning or maintenance by removing the plug from the socket outlet;
- WARNING Do not allow the supply cord to come into contact with the rotating brushes, wheels or casters of the automatic floor treatment machine.

Compliance is checked by inspection.

GG.7.12.202 Information on noise

NOTE The instructions can provide information on airborne noise emission as indicated in informative Annex JJ.

7.13 Addition:

The words “Original instructions” shall appear on the language version(s) verified by the manufacturer.

8 Protection against access to live parts

Clause 8 of IEC 60335-1:2020 is applicable except as follows.

8.1 Addition:

Water and water-borne cleaning agents are considered conductive.

11 Heating

Clause 11 of IEC 60335-1:2020 is applicable except as follows.

11.5 Addition:

Docking stations are operated as **motor-operated appliances**.

11.7 Addition:

Docking stations are operated until steady conditions are established, unless their operation mode is cyclic. If one operation cycle of the **automatic floor treatment machine** exceeds 1 h, only one cycle of the **docking station** has to be measured.

A temperature is considered steady when readings taken during any continuous 1 h period of the test indicate an increase of no more than 3 K, or until the batteries have been fully charged, whichever comes first.

13 Leakage current and electric strength at operating temperature

Clause 13 of IEC 60335-1:2020 is applicable except as follows.

13.2 Addition:

For **portable class I docking stations** where several motors operate at the same time, the leakage current shall not exceed 3,5 mA.

15 Moisture resistance

Clause 15 of IEC 60335-1:2020 is applicable except as follows.

15.2 Replacement:

Docking stations subject to spillage of liquids or solids in normal use shall be constructed so that spillage does not affect their electrical insulation. The electrical insulation shall not be affected by cleaning and similar operations.

Compliance is checked by the tests of GG.15.2.201 to GG.15.2.206.

Water used for the tests shall contain approximately 1 % NaCl and 0,6 % rinsing agent.

Any commercially available non-ionic rinsing agent may be used, but if there is any doubt with regards to the test results, the rinsing agent shall have the following properties:

- viscosity, 17 mPa s;
 - pH 2,2 (1 % in water)
 - and its composition shall comprise the following substances
- | | |
|------------------------------------|----------------------|
| – Plurafac ® LF 221 ¹ | 15,0 % parts by mass |
| – Cumene sulfonate (40 % solution) | 11,5 % parts by mass |
| – Citric acid (anhydrous) | 3,0 % parts by mass |
| – Deionized water | 70,5 % parts by mass |

Docking stations with type X attachment, except those having a specially prepared cord, are fitted with the lightest permissible type of flexible cord of the smallest cross-sectional area specified in Table 11.

Docking stations incorporating an appliance inlet are tested with or without an appropriate connector in position, whichever is more unfavourable.

Containers that are connected to the water mains are prefilled with the saline/rinsing agent solution.

Containers of **docking stations** for the following liquids are excluded from the tests:

- hydraulic oil;
- coolant;
- fuel (diesel, gasoline, LPG).

After each overfilling or application of liquid, the **docking station** shall withstand the electric strength test of 16.3 and inspection shall show that there is no trace of liquid or solids on insulation that could result in a reduction of **clearances** and **creepage distances** below the values specified in Clause 29. All residues are then removed and the appliance is dried.

Detachable parts in the **maintenance area** are placed in their normal position following a **maintenance operation**.

GG.15.2.201 Containers for detergents or other products in powdered or granulated form are filled with dry granulated sugar, ignoring any level indication. A further quantity equal to 15 % of the total capacity of the container is then poured in steadily over a period of 1 min.

Containers that are intended to be filled outside the **docking station** are replaced without removing any excess sugar from the outside of the container. Lids are replaced after overfilling.

GG.15.2.202 Liquid containers that are filled manually are filled with saline/rinsing agent solution and a further quantity equal to 15 % of the total capacity of each container or 0,25 l, whichever is the greater, is poured in steadily over a period of 1 min.

¹ Plurafac ® LF 221 is the trade name of a product supplied by BASF. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named.

GG.15.2.203 *The outlets of liquid mixing containers are blocked and the containers are filled with saline/rinsing agent solution. A further quantity equal to 15 % of the total capacity of each container or 0,25 l, whichever is the greater, is poured in steadily over a period of 15 s. If the container has more than one independent outlet, they are blocked in turn.*

GG.15.2.204 *Drains for liquid waste containers are blocked and the containers are filled with saline/rinsing agent solution. A further quantity equal to 15 % of the total capacity of each container or 0,25 l, whichever is the greater, is poured in steadily over a period of 15 s. If the container has more than one independent drain, they are blocked in turn. If there is more than one container, they are tested in turn.*

GG.15.2.205 *Failure of the inlet valve of **docking stations** connected to the water mains is simulated. Water is allowed to flow for 15 min after the first evidence of overflow unless the inflow stops automatically. The failure of only one device is tested at a time.*

GG.15.2.206 ***Maintenance operations** involving the use of liquids are carried out three times.*

15.3 *Addition:*

If it is not possible to place the whole **docking station** in the humidity cabinet, and to comply with the requirements of 4.1 of IEC 60068-2-78:2012, it is also sufficient to monitor the required climate conditions at the relevant locations in the machine.

18 **Endurance**

Clause 18 of IEC 60335-1:2020 is not applicable.

19 **Abnormal operation**

Clause 19 of IEC 60335-1:2020 is applicable except as follows:

19.1 *Addition:*

Detachable parts of docking stations in the maintenance area are placed in their normal position following a maintenance operation.

Containers are filled to their most unfavourable level.

19.4 *Addition:*

If a control also performs other functions, only the part controlling the temperature or pressure is rendered inoperative.

19.7 *Addition:*

Fan blades are not regarded as parts liable to be jammed.

19.9 *Replacement:*

Docking stations incorporating a suction function are tested at **rated voltage** with their air inlet fully blocked until steady conditions are established.

The temperatures of the windings shall not exceed the values specified in Table 8.

20 Stability and mechanical hazards

Clause 20 of IEC 60335-1:2020 is applicable, except as follows.

20.1 Modification:

The **docking station** is tested with doors, lids and similar parts in the **maintenance area** placed in the normal position of use.

Doors, lids and similar parts of **docking stations** which will only be open while the **automatic floor treatment machine** is connected to the **docking station**, are tested in the closed position and with **automatic floor treatment machine** not connected.

The test with the appliance tilted to 15° is not carried out on **docking stations**.

Addition:

On **docking stations**, the test is repeated with doors, lids and similar parts in the **maintenance area** placed in the most unfavourable position, however, the appliance is only tilted to an angle of 5°.

21 Mechanical strength

Clause 21 of IEC 60335-1:2020 is applicable except as follows.

21.1 Addition:

On **docking stations**, the impact energy of 0,5 J is applied in the **maintenance area**. In the user area, the value of the impact energy is 1,0 J.

GG.21.201 Damage to the **docking station** due to crushing forces imparted by the **automatic floor treatment machine** are addressed by the requirements applicable to the **automatic floor treatment machine**.

22 Construction

Clause 22 of IEC 60335-1:2020 is applicable except as follows.

22.14 Addition:

The requirement also applies in the **maintenance area** to parts liable to be touched during **maintenance operations** of **docking stations**.

22.48 Replacement of the compliance paragraph by the following:

Compliance is checked by the relevant tests of IEC 61770, as modified in normative Annex HH of this standard.

GG.22.201 Docking stations shall be equipped with a mains-isolating switch that ensures all-pole disconnection according to overvoltage category III conditions.

Compliance is checked by inspection.

GG.22.202 Guards

Fixed **guards** shall be secured by systems that can be opened or removed only with tools and shall be incapable of remaining in place without their fixings, if applicable.

Their fixing systems shall remain attached to the **guards** or to the machine when the **guards** are removed, with the exception of fixing systems that can remain detachable without impairing safety. This does also not apply if, after removal of the fixing systems, or if the component is incorrectly repositioned, the machine becomes inoperative or is obviously incomplete.

NOTE This requirement does not necessarily apply to fixed **guards** that are only liable to be removed, for example, when the machine is completely overhauled, is subject to major repairs or is dismantled for transfer to another site. For the same reason, it is not necessary to apply the requirement to the casings of machinery intended for use by laymen, where the manufacturer's instructions specify that the repairs requiring removal of these casings are only to be carried out in a specialist repair workshop. In that case, fixing systems can be used that are not easy to remove.

If movable **guards** are interlocked, the interlocking devices shall prevent the start of hazardous machine functions until the **guards** are fixed in their position and give a stop command whenever they are no longer closed.

Interlocking movable **guards** shall, as far as possible, remain attached to the machine when open and they shall be designed and constructed in such a way that they can be adjusted only by means of an intentional action.

Interlocking movable **guards** shall be designed in such a way that the absence or failure of one of their components prevents starting or stops the hazardous functions of the machine.

Adjustable **guards** may be used only to restrict access to those areas of the moving parts strictly necessary for the work. They shall be manually or automatically adjustable based on the type of work involved and shall be adjustable without the aid of a tool.

Compliance is checked by inspection.

GG.22.203 Docking stations shall be designed in such a way to avoid incorrect mounting, if this can lead to an unsafe situation. If this is not possible, information on the correct mounting shall be given directly on the part and/or the enclosure.

Compliance is checked by inspection.

GG.22.204 For **docking stations** where the **operator** is required to use personal protective equipment (PPE), controls shall be designed in such a way that they can be operated safely. Difference necessary for controls used in **maintenance operation** or in **normal operation** shall be taken into consideration.

Compliance is checked by inspection and by functional test.

GG.22.205 Docking stations shall be constructed so that interlocks cannot be rendered inoperative without using an **override key** if they are necessary for compliance with the standard.

Compliance is checked by inspection, by functional test and by applying test probe B of IEC 61032.

23 Internal wiring

Clause 23 of IEC 60335-1:2020 is applicable except as follows.

23.3 Modification:

The requirement also applies to **maintenance operations of docking stations**.

GG.23.201 Anchorages for internal wiring that can easily be replaced shall be constructed and located so that

- the wiring cannot touch the clamping screws of the anchorage if these screws are accessible, unless they are separated from **accessible metal parts** by **supplementary insulation**;
- the wiring is not clamped by a metal screw that bears directly on the wiring;
- for **class I appliances**, the anchorages are of insulating material or are provided with an insulating lining, unless failure of the insulation of the wiring does not make **accessible metal parts** live;
- for **class II appliances**, the anchorages are of insulating material, or if of metal, they are insulated from **accessible metal parts** by **supplementary insulation**.

Compliance is checked by inspection.

GG.23.202 Internal wiring that is accessible in the **maintenance area** and is moved during **normal operation** shall comply with 25.13, 25.15 and 25.23.

Compliance is checked by the relevant tests.

24 Components

Clause 24 of IEC 60335-1:2020 is applicable except as follows.

24.1.3 Addition:

*Main switches of **docking stations** are tested for 10 000 cycles of operation and shall ensure **all-pole disconnection**.*

24.2 Modification:

Switches and automatic controls of **docking stations** operating at **safety extra-low voltage** may be fitted in **interconnection cords** in the **maintenance area**.

GG.24.201 Connection devices of **interconnection cords** of **docking stations** shall be identified if they are interchangeable with other connecting means in the **docking station**, if this could result in a hazard.

NOTE Colour coding can be used for identification.

Compliance is checked by inspection.

GG.24.202 Interlock switches shall comply with IEC 61058-1 as far as is reasonable and shall ensure **all-pole disconnection**. However, single-pole disconnection is allowed for protection against mechanical hazards.

Compliance is checked by testing the switch in accordance with the relevant clauses of IEC 61058-1, the number of cycles of operation for the test being 10 000. This requirement only applies to interlock switches necessary for compliance with this standard.

25 Supply connections and external flexible cords

Clause 25 of IEC 60335-1:2020 is applicable except as follows.

25.14 Addition:

NOTE **Portable docking stations** are not regarded as appliances moved while in operation.

29 Clearances, creepage and solid insulation

Clause 29 of IEC 60335-1:2020 is applicable except as follows.

29.2 Addition:

The microenvironment is pollution degree 3 unless the insulation is enclosed or located so that it is unlikely to be exposed to pollution due to normal use of the **docking station**.

30 Resistance to heat and fire

Clause 30 of IEC 60335-1:2020 is applicable except as follows.

30.2 Addition:

*For **docking stations**, Subclause 30.2.3 is applicable.*

Annex HH (normative)

Requirements to avoid backsiphonage at docking stations

The requirements of IEC 61770:2008 are applicable except as follows:

1 Scope

Replace the text of this clause by the following:

This standard specifies requirements for the connection of **docking stations** for **automatic floor treatment machines** to water mains having a water pressure not exceeding 1,2 MPa. These requirements are intended to prevent the backsiphonage of non-potable water into the potable water mains.

The connection of the machine to the water mains may be temporary or permanent.

4 General requirements

4.2 *Replace the existing text by:*

Backflow prevention devices shall be incorporated in, or fixed to, the machine or the water supply system and constructed so that their functional characteristics cannot be changed, even intentionally.

4.3 Not applicable.

4.4 Not applicable.

9 Hose-sets

Clause 9 of IEC 61770:2008 is not applicable.

Annex II (informative)

Emission of acoustical noise of docking stations

II.1 Noise reduction

Noise reduction for **docking stations** is an integral part of the design process and shall be achieved by applying measures to control noise at the source, see for example ISO TR 11688-1.

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 type.

II.2 Noise test code

II.2.1 Emission sound pressure level determination

The emission sound pressure level shall be measured in accordance with ISO 11203:1995, applying the method described in 6.2.3 d) with the measurement distance $d = 1$ m.

Measurements shall be done by time averaging over the whole duration of the operation of the **docking station** during **normal operation**.

II.2.2 Sound power level determination

A-weighted sound power level shall be measured in accordance with ISO 3744, or with ISO 3743-1 if a suitable hard-walled test room is available or ISO 9614-2, grade 2. When applying ISO 3744 or ISO 9614-2 the parallelepiped measurement surface shall be used.

Measurements shall be done by time averaging over the whole duration of the operation of the **docking station** during **normal operation**.

II.2.3 Operating and mounting conditions

Care shall be taken that any electrical connections, piping or the like connected to the appliance do not significantly contribute to the noise emission of the **docking station**.

The installation conditions of the **docking station** are the same for determining both the emission sound pressure level and the sound power level.

The **docking station** is supplied at **rated voltage** and operated under **normal operation** conditions.

II.2.4 Measurement uncertainties

The total measurement uncertainty of the noise emission values determined according to this standard is depending on the standard deviation σ_{R0} given by the applied noise emission measurement method and the uncertainty associated with the instability of the operating and mounting conditions σ_{omc} . The resulting total uncertainty is then calculated from

$$\sigma_{tot} = \sqrt{\sigma_{R0}^2 + \sigma_{omc}^2}$$

The upper bound value of σ_{R0} is about 1,5 dB for the grade 2 measurement methods dealing with the determination of the emission sound pressure level or the sound power level.

NOTE 1 For **docking stations** with a rather constant noise emission, a value of 0,5 dB for σ_{omc} can apply. In other cases, e.g. a large influence of the transported material in the **docking station** which may vary in an unpredictable manner, a value of 2 dB could be more appropriate. Methods to determine σ_{omc} are described in the basic measurement standards.

The expanded measurement uncertainty U , in decibels, shall be calculated from

$$U = k \sigma_{tot},$$

where

k is the coverage factor.

NOTE 2 The expanded measurement uncertainty depends on the degree of confidence that is desired. For the purpose of comparing the result with a limit value, it is appropriate to apply the coverage factor for a one-sided normal distribution. In that case, the coverage factor $k = 1,6$ corresponds to a 95 % confidence level. Further information is given in ISO 4871. Please note that the expanded measurement uncertainty U is denoted as K in ISO 4871.

NOTE 3 The expanded measurement uncertainty as described in this standard does not include the standard deviation of production which is used in ISO 4871 for the purpose of making a noise declaration for batches of machines.

II.2.5 Information to be recorded

The information to be recorded covers all the technical requirements of this noise test code. Any deviations from this noise test code or from the basic standards upon which it is based are to be recorded together with the technical justification for such deviations.

II.2.6 Information to be reported

The information to be given in the test report shall include at least

- the data required by the manufacturer for inclusion in the noise declaration,
- the data required by the user to verify the declared values.

II.2.7 Declaration and verification of noise emission values

The declaration of the noise emission values shall be made as a dual number noise emission declaration according to ISO 4871 where it exceeds 70 dB(A). Where the emission sound pressure level does not exceed 70 dB(A), this fact may be stated in place of the emission value and uncertainty, e.g. by declaring $L_{pA} \leq 70$ dB(A).

It shall declare the emission sound pressure level L_{pA} and separately the respective uncertainty K_{pA} .

The sound power level shall be given as a dual-number noise emission declaration according to ISO 4871, where the emission sound pressure level exceeds 80 dB(A).

It shall declare the noise emission value L_{WA} and separately the respective uncertainty K_{WA} .

NOTE K_{pA} and K_{WA} are expected to be 2 dB.

The noise emission declaration shall state that the noise emission values have been obtained according to this noise test code. Any deviations from this noise test code or from the basic standards upon which it is based shall be clearly indicated.

If undertaken, verification of the noise emission values shall be conducted according to ISO 4871, using the same mounting, installation and operating conditions as those used for the initial determination.

Annex JJ (informative)

Alternative route to fulfil safety critical functions

The hydraulic, pneumatic and mechanical **control system** safety functions shall be designed to comply with ISO 13849-1. The electronic and complex electronic **control system** safety functions (e.g. software and the related electronics) shall be designed so that they comply with IEC 62061 or IEC 61508 (all parts). The safety functions are identified in Table JJ.1.

Table JJ.1 – Safety functions

Safety function	Minimum safety integrity level	
	Type 1 machines	Type 2 machines
Prevent traversing over abrupt surface elevation changes such as staircases, unprotected drop-offs, and the like referred to in 7.5	SIL 2	SIL 2
Prevent intrusions into the stopping or contact zones to prevent crushing of and collision with parts of the body and objects referred in 7.7 to 7.10	SIL 1	SIL 2
Prevent exceeding the automatic mode speed referred to in 7.1 and 7.2	SIL 1	SIL 2
Provide locked state of drive wheels	SIL 1	SIL 1
Provide desired switch-off of the machine, or emergency switch-off	SIL 1	SIL 1
Provide desired stop category 0, 1, or 2	SIL 1	SIL 2

Bibliography

The bibliography of IEC 60335-1:2020 is applicable except as follows.

Addition:

IEC 60068-2-78:2012, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60204-1:2016, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

IEC 60335 (all parts), *Household and similar electrical appliances – Safety*

IEC 60335-2-2, *Household and similar electrical appliances – Safety – Part 2-2: Particular requirements for vacuum cleaners and water-suction cleaning appliances*

IEC 60335-2-10:2002, *Household and similar electrical appliances – Safety – Part 2-10: Particular requirements for floor treatment machines and wet scrubbing machines*
IEC 60335-2-10:2002/AMD1:2008

IEC 60335-2-29:2016, *Household and similar electrical appliances – Safety – Part 2-29: Particular requirements for battery chargers*
IEC 60335-2-29:2016/AMD1:2019

IEC 60335-2-67:2021, *Household and similar electrical appliances – Safety – Part 2-67: Particular requirements for floor treatment machines, for commercial use*

IEC 60335-2-68:2021, *Household and similar electrical appliances – Safety – Part 2-68: Particular requirements for spray extraction machines, for commercial use*

IEC 60335-2-100, *Household and similar electrical appliances – Safety – Part 2-100: Particular requirements for hand-held mains-operated garden blowers, vacuums and blower vacuums*

IEC 60601-1, *Medical electrical equipment – Part 1: General requirements for basic safety and essential performance*

IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC 62885-9:2019, *Surface cleaning appliances – Part 9: Floor treatment machines with or without traction drive, for commercial use – Methods for measuring the performance*

ISO 3691-4, *Industrial trucks — Safety requirements and verification — Part 4: Driverless industrial trucks and their systems*

ISO 3743-1:2010, *Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods for small movable sources in reverberant fields – Part 1: Comparison method for a hard-walled test room*

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 4871:1996, *Acoustics – Declaration and verification of noise emission values of machinery and equipment*

ISO 8373:2012, *Robots and robotic devices – Vocabulary*

ISO 9614-2:1996, *Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 2: Measurement by scanning*

ISO 11203:1995, *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 TR 11688-1, *Acoustics – Recommended practice for the design of low-noise machinery and equipment – Part 1: Planning*

ISO 13482:2014, *Robots and robotic devices – Safety requirements for personal care robots*

ISO 13732-1, *Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 1: Hot surfaces*

ISO 13856-3:2013, *Safety of machinery – Pressure-sensitive protective devices – Part 3: General principles for design and testing of pressure-sensitive bumpers, plates, wires and similar devices*

EN 17106 (all parts), *Road operation machinery – Safety*

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BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK