

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
AMENDEMENT 1

Household and similar electrical appliances – Safety –
Part 2-107: Particular requirements for robotic battery powered electrical
lawnmowers

Appareils électrodomestiques et analogues – Sécurité –
Partie 2-107: Exigences particulières relatives aux tondeuses à gazon
électriques robotisées alimentées par batterie



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FOREWORD

This amendment has been prepared by IEC technical committee 116: Safety of motor-operated electric tools.

The text of this amendment is based on the following documents:

| FDIS | Report on voting |
|--------------|------------------|
| 116/429/FDIS | 116/443/RVD |

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

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,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

iTeh STANDARD PREVIEW

NOTE The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests.

[IEC 60335-2-107:2017/AMD1:2020](https://standards.iTech.ai/catalog/standards/sist/59b734ed-b79f-4d14-a17e-33766e300000/iec-60335-2-107-2017-amd1-2020)

It is the recommendation of the committee that the content of this publication be adopted for implementation nationally not earlier than 36 months from the date of publication.

2 Normative references

Delete the following reference:

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

Add, after ISO 7010, the following new reference:

ISO 8295:1995, *Plastics – Film and sheeting – Determination of the coefficients of friction*

3 Terms and definitions

3.101

automatic mode

Add the following Note to entry to the definition:

Note 1 to entry: Operation of the machine without the use of a **manual controller** and without the **cutting means** operating during set up of the **working area** is considered not to be operation in **automatic mode**.

Replace the existing Definition 3.128 with the following:

3.128

peripherals

equipment additional to the machine itself that is provided by the manufacturer for intended use of the machine, e.g. charging station(s), manual controller, signal source for **perimeter delimiter**

Add, at the end of Clause 3, the following new definitions:

3.138

switched circuit

circuit that is a low-power circuit when the **power switch** is in the “off” position

Note 1 to entry: The requirements for a low-power circuit are given in 19.11.1.

3.139

power switch

device that electrically activates the **cutting means** and/or **traction drive** of the machine in the “on” position and deactivates the same function of the machine in its “off” position

Note 1 to entry: The device is comprised of all primary and ancillary components (e.g. tactile switch, relays, load switches) of the electrical control circuit that activates the **cutting means** and/or **traction drive** of the machine.

6 Classification

(standards.iteh.ai)

Replace the existing Subclause 6.1 with the following:

IEC 60335-2-107:2017/AMD1:2020
<https://standards.iteh.ai/catalog/standards/sist/59b734ed-b7f1-4d14-a17e-5f27d2c6dbe4/iec-60335-2-107-2017-amd1-2020>

6.1 Replacement:

This subclause is not applicable for machines and non-mains-powered **peripherals**.

NOTE Machines and non-mains-powered **peripherals** covered by this standard are limited to those where the only power source is a **battery** and are therefore considered not to be a **class I appliance**, **class II appliance**, or a **class III appliance** and are not required to have **basic insulation**, **supplementary insulation** or **reinforced insulation**. Electric shock hazard is considered to exist only between parts of opposite polarity where **hazardous voltage** is present.

Mains-powered **peripherals** shall be of one of the following classes with respect to protection against electric shock:

- **class II appliance**;
- **class III appliance**.

Compliance is checked by inspection and by the relevant tests.

Replace the existing Subclause 6.2 with the following:

6.2 Addition:

Enclosures of machines shall be at least IPX1, except enclosures containing parts having a **working voltage** that is a **hazardous voltage**, which shall be at least IPX4. Enclosures of **charging stations** and other **peripherals** intended to be installed outdoors (e.g. a signal source for a **perimeter delimiter**) shall be at least IPX1 if of **class III construction**. Constructions other than **class III construction** shall be at least IPX4.

7 Marking and instructions

7.1

Replace the existing text of Note 8 with the following new text:

NOTE 8 Void

Replace the existing text of Note 11 with the following new text:

NOTE 11 Void

20 Stability and mechanical hazards

Delete the third dashed item of 20.102.2 (“**rollover sensor**”).

Replace the existing Subclause 20.102.4.1.1 with the following:

20.102.4.1.1 General

Inadvertent access to the **cutting means** by the feet during operation shall be prevented, so far as reasonably practicable by the **cutting means enclosure**.

Compliance is checked by the tests of 20.102.4.1.2, 20.102.4.1.3 and 20.102.4.1.4.

The tests are made with the **cutting means** in the most unfavourable **cutting position**. If the **cutting means** path height is different at different **cutting means** speeds, the test is conducted so as to include the extremes of **cutting means** height.

<https://standards.iteh.ai/catalog/standards/sist/59b734ed-b7f1-4d14-a17e-5b743c0b102e/iec-60335-2-107:2017/AMD1:2020>

Replace the existing Subclauses 20.102.4.1.2 and 20.102.4.1.3 with the following:

20.102.4.1.2 Adult foot probe test

The machine shall be placed on a hard, flat surface. The **guards** shall be in the normal operating position on the **cutting means enclosure** and the machine support members in contact with the supporting surface. Components of machines, such as wheels and frames, are where relevant considered as part of the **cutting means enclosure** for the purpose of these tests. The tests are conducted under static conditions.

The foot probe of Figure 102 shall be inserted towards the **cutting means** around the machine's external enclosure. The base of the probe is held horizontally at any height and then inclined up to 15° forward or backward from the horizontal (see Figure 102). The probe is applied around the entire machine as described in Figure 102 until a horizontal force of 20 N maximum is reached, or until the machine's enclosure lifts or moves from the original position, or until contact is made with the cutting means path, whichever occurs first.

The test probe shall not enter the path of the **cutting means** assembly.

20.102.4.1.3 Foot probe test for standing child

The machine shall be placed on a hard, flat surface. The **guards** shall be in the normal operating position on the **cutting means enclosure** and the machine support members in contact with the supporting surface. Components of machines, such as wheels and frames, are where relevant considered as part of the **cutting means enclosure** for the purpose of these tests. The tests are conducted under static conditions.

The foot probe of Figure 107 shall be inserted towards the **cutting means** around the machine's external enclosure. The base of the probe is held horizontally at any height and then inclined up to 15° forward or backward from the horizontal (see Figure 102). The probe is applied around the entire machine as described in Figure 102 until a horizontal force of 20 N maximum is reached, or until the machine's enclosure lifts or moves from the original position, or until contact is made with the **cutting means** path, whichever occurs first.

The test probe shall not enter the path of the **cutting means** assembly.

Add the following new subclause:

20.102.4.1.4 Foot probe test for kneeling child

The machine is placed on a test surface as described in Annex CC, except that

- the minimum size as described in Clause CC.2 shall be such that the machine is capable of attaining its maximum **traction drive** speed in automatic mode during normal use with the **cutting means** operating; and
- an injection tube as shown in Figure CC.1 need not be incorporated into the test surface.

The machine is tested by means of the foot probe shown in Figure 109. The sole of the foot probe shall be constructed of a material with a 70 Shore A hardness (nominal) and a thickness of $(3 \pm 0,5)$ mm. The sole of the foot probe shall be free from dust and grease. Prior to the series of tests, the sole of the foot probe in Figure 109 shall be checked to ensure a dynamic coefficient of friction of $(0,6 \pm 0,06)$ with respect to the same material surface in accordance with ISO 8295:1995.

The machine is operated in automatic mode with the **cutting means** operating. While the machine is operating, the foot probe of Figure 109 is placed in each of the ten test positions shown in Figure 110, as applicable to the anticipated movement of the machine, such that

- the foot probe is aligned with the direction of the machine's movement with the toe pointing toward the machine; and
- the foot probe is placed on the test surface and care is taken that foot probe movement is minimised if the machine comes into contact with the foot probe;

NOTE A spike or other feature located on the knee of the probe has been shown to be helpful in minimising movement of the foot probe during the test.

- an injection tube, if any, in the coconut matting does not influence the test result.

If, in automatic mode, it is not possible for the machine to move in accordance with any of the test positions shown in Figure 110, then it is not necessary to conduct the test for those test positions.

The foot probe remains in place at each test position until

- the machine has moved completely away from the foot probe; or
- the foot probe has been in place for 20 s; or
- the machine stops such that a manual reset is required,

whichever occurs first.

For each test position, the foot probe shall not contact the **cutting means** whilst the **cutting means** is rotating. If the sole of the foot probe is damaged during the test, it shall be repaired or replaced as necessary.

Replace the text of the first paragraph of 20.102.4.2.2.1 with the following new text:

A mechanical test probe as shown in Figure 111 is used for the test. The joints shall be locked firmly into their straight positions or replaced by a solid portion.

NOTE The probe of Figure 111 is similar to test probe B of IEC 61032 but having a circular stop face with a diameter of 50 mm, instead of the non-circular face.

Replace the text of the first paragraph of 20.102.4.2.2.2 with the following new text:

Test probe 18 (Figure 12) of IEC 61032:1997 shall be used, but with the extension handle attached throughout the test. The joints shall be allowed to articulate.

Replace the subclause number of 20.102.4.2.2.3 with the following new subclause number:

20.102.4.2.3

Replace the text of the third paragraph of 20.102.4.2.2.3 with the following new text:

A mechanical test probe as shown in Figure 111 is used for the test.

Replace the first three paragraphs of 20.102.5.1 with the following new text:

The machine shall be provided with a means to stop the **traction drive** when a stopping command is generated from any of the following:

- **manual stop;**
- **manual controller;**
- **lift sensor;**
- **tilt sensor;**
- **obstruction sensor** (when activated for more than 10 s according to 22.105.2).

*Compliance is checked by 20.102.5.2 for the **manual stop** and **manual controller**, by 20.102.5.3 for the **lift sensor** and **tilt sensor** and by 22.105.2 for the **obstruction sensor**.*

*If compliance relies on the operation of an **electronic circuit**, the test of 20.102.5.2 and 20.102.5.3, as applicable, is repeated under the following condition:*

Replace the existing text of 20.102.5.4 with the following new text:

20.102.5.4 Void

21 Mechanical strength

Replace the existing text of the last dashed item of 21.1 with the following new text:

- power supplies or **battery** chargers that are covered by a separate end product standard.

21.101.4.1 General

Replace the existing text of the test specification by the following:

Compliance is checked by the test described in 21.101.4.2 to 21.101.4.4. During the test, personnel should be protected against possible thrown objects.

22 Construction

Add the following new subclause:

22.46

NOTE 101 Hazards that can be created due to the loss of functional control are addressed in the relevant subclauses. Other electronic fault conditions of 19.11.2 that result in dangerous malfunction are understood to not require an evaluation of software using Annex R.

Replace the existing Subclause 22.105.4 with the following:

22.105.4 Rollover sensor

A **rollover sensor** shall be provided on all machines. The **rollover sensor** shall prevent the **traction drive** and **cutting means** starting when the machine is inverted.

NOTE The machine does not have to incorporate discrete sensing devices for each **sensor** requirement. The various sensing functions can be achieved by fewer devices that respond to multiple stimuli. Sensing requirements can also be fulfilled by mechanical devices instead of **electrical circuits**.

Compliance is checked by inspection and the following test.

*The machine shall be inverted and placed on a flat level surface, within 1 m either side of the **working area**. It shall not be possible to start the **traction drive** and/or the **cutting means**. For the purposes of this test, the machine shall not be moved from its inverted resting position.*

*If compliance relies on the operation of an **electronic circuit**, the test is repeated under the following conditions applied separately:*

- 1) *the fault conditions in a) to g) of 19.11.2 applied one at a time to the **electronic circuit**;*
- 2) *the electromagnetic phenomena tests of 19.11.4.1 and 19.11.4.2 applied to the machine when the **rollover sensor** has been activated for more than 10 s.*

*If the **electronic circuit** is programmable, the software shall contain measures to control the fault/error conditions specified in Table R.1 and is evaluated in accordance with the relevant requirements of Annex R.*

*For machines equipped with a **manual controller**, it shall not be possible to start the **traction drive** and/or the **cutting means** when the operator is able to use the **manual controller**.*

If the machine is placed back in its correct orientation, the **cutting means** and **traction drive** may only be restarted by fulfilling the requirements of the restart procedure in 20.102.6.

Compliance is checked by inspection and by practical tests.

Replace the existing Subclause 22.112 with the following:

22.112 Obstruction sensor contact surfaces

The surface contacted when striking an obstruction shall be designed to minimize the risk of injury and shall not have a perpendicular protrusion greater than 5 mm unless the protrusion has

- a surface area greater than 20 mm²; and
- a minor dimension greater than 5 mm.

All protrusions shall have rounded edges.

The surface contacted when striking an obstruction shall be located at a height not greater than 150 mm from the ground plane.

Compliance is checked by inspection and by measurement.

29 Clearances, creepage distances and solid insulation

Replace the existing text of 29.101 with the following new text:

29.101 For the machine and non-mains-powered **peripherals**, **creepage distances** and **clearances** shall not be less than the values in millimetres shown in Table 102. The **clearances** specified do not apply to the air gap between the contacts of thermal controls, overload protection devices, switches of micro-gap construction, and the like, or to the air gap between the current-carrying members of such devices where the **clearances** vary with the movement of the contacts. **Creepage distances** and **clearances** also do not apply to the construction of battery cells or the interconnections between cells in a battery pack. The values specified in Table 102 do not apply to cross-over points of motor windings.

The values in Table 102 are equal or larger than the values required by IEC 60664-1, when

- an overvoltage category I;
- a material group III;
- a pollution degree 3;
- inhomogeneous electric field

are applied.

Protection against deposition of dirt may be achieved through the use of

- encapsulation with a minimum thickness of 0,5 mm; or
- protective coatings that prevent the combined deposition of fine particles and moisture on surfaces between conductors. Requirements for these types of protective coatings are described in IEC 60664-3; or
- enclosures that prevent the ingress of dust by means of filters or seals, provided that no dust is generated within the enclosure itself.

NOTE 1 An example of encapsulation is potting.

For parts of different potential in **switched circuits** only, **clearance** and **creepage distances** less than those given in Table 102 are acceptable if the shorting of the two parts does not result in the machine starting.

NOTE 2 The risk of fire due to spacings below the required values is covered by the requirements of KK.19.4.

**Table 102 – Minimum creepage distances and clearances
between parts of different potential**

Dimensions in millimetres

| Conditions | Working voltage ≤ 15 V | | Working voltage > 15 V and ≤ 32 V | | Working voltage > 32 V and ≤ 130 V | | Working voltage > 130 V and ≤ 280 V | | Working voltage > 280 V and ≤ 480 V | |
|---|---------------------------|-----------|---|-----------|--|-----------|---|-----------|---|-----------|
| | Creepage distance | Clearance | Creepage distance | Clearance | Creepage distance | Clearance | Creepage distance | Clearance | Creepage distance | Clearance |
| Protected against deposition of dirt | | | | | | | | | | |
| – Switched circuits | 0,8 | 0,8 | 1,0 | 1,0 | 1,0 | 1,0 | 2,0 | 2,0 | 2,0 | 2,0 |
| – Non-switched circuits | 0,8 | 0,8 | 1,5 | 1,5 | 1,5 | 1,5 | 2,0 | 2,0 | 2,0 | 2,0 |
| Not protected against deposition of dirt | 1,1 | 0,8 | 1,5 | 1,5 | 2,5 | 1,5 | 4,0 | 2,5 | 8,0 | 3,0 |

For conductive patterns on printed circuit boards, except at their edges, providing functional insulation, the values given in Table 102 between parts of different potential may be reduced, as long as the peak value of the working voltage does not exceed:

- 150 V per mm with a minimum distance of 0,2 mm, if protected against the deposition of dirt;
- 100 V per mm with a minimum distance of 0,5 mm, if not protected against the deposition of dirt.

When the limits mentioned above lead to higher values than those of the Table 102, the values of Table 102 apply.

NOTE 3 The above values are equal or larger than the values required by IEC 60664-3.

For parts having a **hazardous voltage** between them, the sum total of the measured distances between each of these parts and their nearest accessible surface shall not be less than the values shown in Table 103.

NOTE 4 Figure 109 provides clarification on the measurement method.

**Table 103 – Minimum total sum of creepage distances and clearances
to accessible surfaces for hazardous voltages**

Dimensions in millimetres

| Hazardous voltage with a working voltage of | | | | | |
|---|-----------|---------------------|-----------|---------------------|-----------|
| ≤ 130 V | | > 130 V and ≤ 280 V | | > 280 V and ≤ 480 V | |
| Creepage distance | Clearance | Creepage distance | Clearance | Creepage distance | Clearance |
| 5,0 | 1,5 | 8,0 | 3,0 | 16,0 | 4,0 |

Compliance is checked by measurement.

Distances through slots or openings in external parts of insulating material are measured to the metal foil in contact with the accessible surface; the foil is pushed into corners and the like by means of the standard test probe B of IEC 61032:1997, but is not pressed into openings.

The sum total of distances measured between parts operating at **working voltage** that is a **hazardous voltage** and **accessible surfaces** is determined by measuring the distance from each part to the **accessible surface**. The distances are to be added together to determine the sum total. See Figure 109.

In addition, one of the **creepage distances** or **clearances** to the nearest **accessible surface** shall be at least 1 mm.

If necessary, a force is applied to any point on bare conductors and to the outside of metal enclosures, in an endeavour to reduce the **creepage distances** and **clearances** while taking the measurements.

The force is applied by means of the test probe B of IEC 61032:1997 and has a value of:

- 2 N for bare conductors;
- 30 N for enclosures.

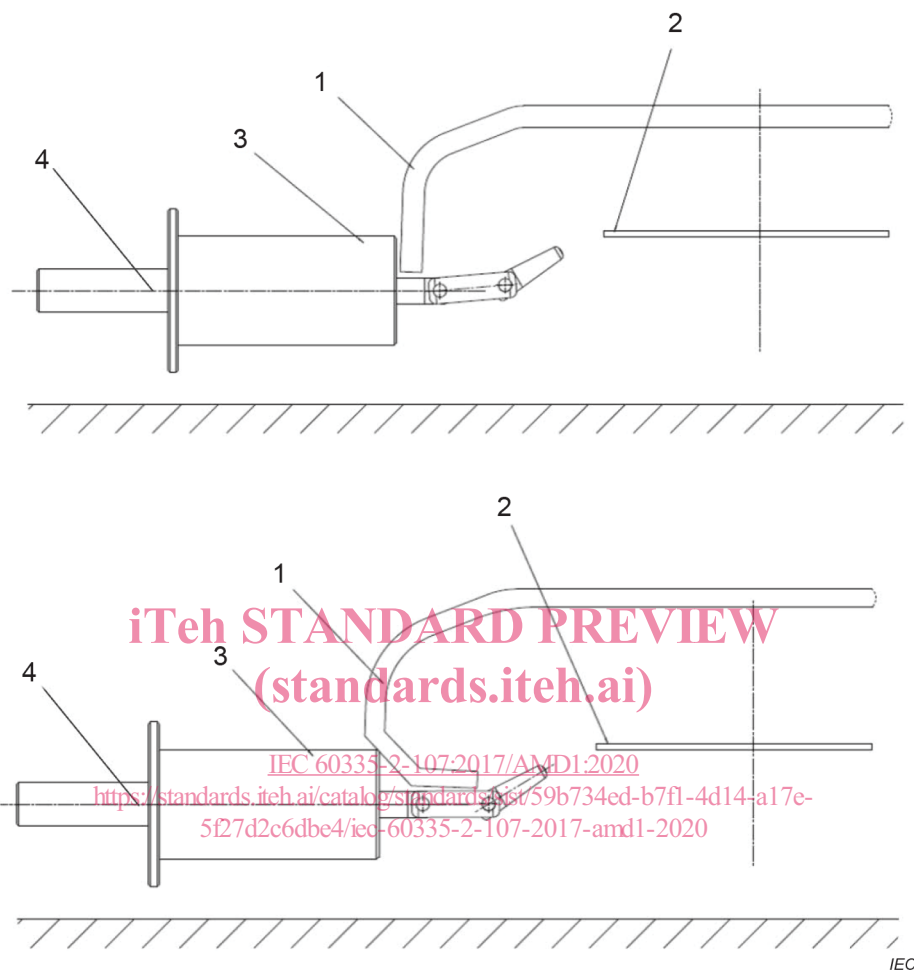
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Figures

Replace the existing Figure 105 with the following new figure:



Key

- 1 machine external enclosure
- 2 **cutting means**
- 3 mechanical test probe
- 4 axis of the test probe held horizontally

Figure 105 – Finger probe test – Illustrations showing application of probe, insertion depth limited according to the geometry of the enclosure