



IEC 60335-2-107

Edition 2.2 2021-11  
CONSOLIDATED VERSION

# INTERNATIONAL STANDARD



---

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





## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2021 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

#### IEC publications search - [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

#### IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [sales@iec.ch](mailto:sales@iec.ch).

#### IEC online collection - [oc.iec.ch](http://oc.iec.ch)

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.



IEC 60335-2-107

Edition 2.2 2021-11  
CONSOLIDATED VERSION

# INTERNATIONAL STANDARD



---

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

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 65.060.70

ISBN 978-2-8322-1055-8

**Warning! Make sure that you obtained this publication from an authorized distributor.**



# REDLINE VERSION



---

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

## CONTENTS

FOREWORD .....	5
INTRODUCTION .....	8
1 Scope .....	9
2 Normative references .....	9
3 Terms and definitions .....	10
4 General requirement.....	14
5 General conditions for the tests .....	14
6 Classification.....	15
7 Marking and instructions.....	15
8 Protection against access to live parts.....	20
9 Starting of motor-operated appliances .....	21
10 Power input and current.....	21
11 Heating.....	21
12 Void.....	21
13 Leakage current and electric strength at operating temperature.....	21
14 Transient overvoltages .....	21
15 Moisture resistance .....	21
16 Leakage current and electric strength.....	22
17 Overload protection of transformers and associated circuits .....	22
18 Endurance .....	22
19 Abnormal operation .....	22
20 Stability and mechanical hazards.....	23
21 Mechanical strength .....	34
22 Construction .....	37
23 Internal wiring.....	47
24 Components .....	47
25 Supply connection and external flexible cords .....	48
26 Terminals for external conductors.....	48
27 Provision for earthing .....	48
28 Screws and connections .....	48
29 Clearances, creepage distances and solid insulation .....	48
30 Resistance to heat and fire .....	50
31 Resistance to rusting .....	50
32 Radiation, toxicity and similar hazards.....	51
Annexes .....	66
Annex B (normative) Appliances powered by rechargeable batteries.....	66
Annex R (normative) Software evaluation .....	67
Annex S (normative) Battery-operated appliances powered by batteries that are non-rechargeable or not recharged in the appliance .....	69
Annex AA (normative) Calculation of kinetic energy of pivoting cutting elements.....	70
Annex BB (normative) Test enclosure construction .....	72

Annex CC (normative) Base for thrown object test enclosure .....	77
Annex DD (normative) Target panel elevation zones and recommended test report for thrown object test .....	79
Annex EE (normative) Safety signs .....	81
Annex FF (informative) Noise test code – Engineering method (grade 2) .....	84
Annex GG (informative) Example of a material and construction fulfilling the requirements for an artificial surface .....	89
Annex HH Void .....	91
Annex II Void .....	92
Annex JJ (informative) Operation of the lift sensor, tilt sensor, obstruction sensor and rollover sensor .....	93
Annex KK (normative) Additional requirements for battery operation and charging .....	98
Bibliography .....	106
Figure 101 – Example of test cycles (see 20.102.2.2) .....	51
Figure 102 – Foot probe test (see 20.102.4.1.2 and 20.102.4.1.3) .....	52
Figure 103 – Impact test fixture (see 21.101.2) .....	53
Figure 104 – Example of structural integrity test fixtures (see 21.101.4.2.1) .....	55
Figure 105 – Finger probe test – Illustrations showing application of probe, insertion depth limited according to the geometry of the enclosure .....	57
Figure 106 – Obstruction sensor test – Illustration showing typical arrangement (see 22.105.2) .....	58
Figure 107 – Foot probe for standing child .....	59
Figure 108 – Measurement of clearances .....	60
Figure 109 – Foot probe for kneeling child .....	61
Figure 110 – Foot probe for kneeling child test positions .....	63
Figure 111 – Test probe for the tests of 20.102.4.2.2.1 and 20.102.4.2.3 .....	65
Figure AA.1 – Measurement of the reckonable length $L$ .....	71
Figure BB.1 – Thrown object test enclosure – General layout .....	73
Figure BB.2 – Thrown object test enclosure .....	74
Figure BB.3 – Test enclosure walls and base .....	75
Figure BB.4 – Test fixture for corrugated fibreboard penetration test .....	76
Figure CC.1 – Thrown object test enclosure – Base detail .....	77
Figure CC.2 – Nail plan of test enclosure base .....	78
Figure DD.1 – Recommended test data sheet .....	80
Figure EE.1 – Safety sign illustrating – "WARNING – Read user instructions before operating the machine" .....	81
Figure EE.2 – Alternative safety sign for the supplementary safety information panel of EE.1 (safety sign 1641 of ISO 7000) .....	81
Figure EE.3 – Alternative safety sign for the supplementary safety information panel of EE.1 (safety sign M002 of ISO 7010) .....	81
Figure EE.4 – Safety signs illustrating – "WARNING – Keep a safe distance from the machine when operating" .....	82
Figure EE.5 – Safety sign illustrating – "WARNING – Remove the disabling device before working on or lifting the machine" .....	82

Figure EE.6 – Safety sign illustrating – "WARNING – Operate the disabling device before working on or lifting the machine" .....	83
Figure EE.7 – Safety sign illustrating – "WARNING – Do not ride on the machine" .....	83
Figure FF.1 – Microphone positions on the hemisphere (see Table FF.1).....	85
Figure GG.1 – Sketch of the measurement surface covered with an artificial surface (not to scale).....	90
Figure JJ.1 – 22.105.3 Lift sensor (LS) and 22.105.1 Tilt sensor (TS) .....	94
Figure JJ.2 – 22.105.2 Obstruction sensor (OS).....	95
Figure JJ.3 – 22.105.4 Rollover sensor (RS).....	97
Table 101 – Sizing of test fixture air inlet holes .....	36
<del>Table 102 – Minimum creepage distances and clearances between parts of opposite polarity .....</del>	
Table 102 – Minimum creepage distances and clearances between parts of different potential.....	49
Table 103 – Minimum total sum of creepage distances and clearances to accessible surfaces for hazardous voltages .....	50
Table FF.1 – Co-ordinates of microphone positions .....	85
Table FF.2 – Absorption coefficients .....	86



INTERNATIONAL ELECTROTECHNICAL COMMISSION

---

**HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES –  
SAFETY –**

**Part 2-107: Particular requirements for robotic battery  
powered electrical lawnmowers**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

**This consolidated version of the official IEC Standard and its amendments has been prepared for user convenience.**

**IEC 60335-2-107 edition 2.2 contains the second edition (2017-12) [documents 116/350/FDIS and 116/354/RVD], its amendment 1 (2020-02) [documents 116/429/FDIS and 116/443/RVD] and its amendment 2 (2021-11) [documents 116/516/CDV and 116/540/RVC].**

**In this Redline version, a vertical line in the margin shows where the technical content is modified by amendments 1 and 2. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.**

International Standard IEC 60335-2-107 has been prepared by IEC technical committee 116: Safety of motor-operated electric tools.

This second edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Clause 7: Markings and instructions, new requirements for markings, warnings and the instruction manual;
- b) Clause 8: Protection against access to live parts, new requirements for protection against electric shock for hazardous battery voltages;
- c) Clause 20: Stability and mechanical hazards, revised requirements for manual controller, manual stop, cutting means stopping time, traction drive stopping and restart procedures, as well as a new standing child foot probe test;
- d) Clause 22: Construction, revised requirements for disabling devices, working area, perimeter delimiter, sensors and manual controller, as well as new requirements for machine connectors used for charging and contact surfaces used as obstruction sensing devices;
- e) Clause 24: Components, revised requirements for switches;
- f) Clause 29: Clearances, creepage distances and solid insulation, revised requirements for the machine and non-mains-powered peripherals.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This Part 2-107 is to be used in conjunction with the fifth edition (2010) of IEC 60335-1 and its amendments.

NOTE When “Part 1” is mentioned in this standard, it refers to IEC 60335-1.

This Part 2-107 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert it into the IEC standard: Particular requirements for robotic battery powered electrical lawnmowers.

When a particular subclause of Part 1 is not mentioned in this Part 2-107, that subclause applies as far as is relevant. Where this standard states “addition”, “modification” or “replacement”, the relevant text in Part 1 is to be adapted accordingly.

The following print types are used:

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

The terms defined in Clause 3 are printed in **bold typeface**.

Subclauses, notes and figures which are additional to those in Part 1 are numbered starting from 101. Additional annexes are lettered AA, BB, etc.

A list of all parts of the IEC 60335 series, under the general title: *Household and similar electrical appliances – Safety*, can be found on the IEC website.

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the stability date indicated on the IEC web site under [webstore.iec.ch](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.

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.

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.

**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 document that the execution of its provisions is entrusted to appropriately qualified and experienced persons.

This document recognizes the internationally accepted level of protection against hazards such as electrical, mechanical, thermal, fire and radiation of machines 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 machines.

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

If a machine within the scope of this document also incorporates functions that are covered by another Part 2 of IEC 60335, the relevant Part 2 is applied to each function separately, as far as is reasonable. If applicable, the influence of one function on the other is taken into account.

When a Part 2 standard does not include additional requirements to cover hazards dealt with in Part 1, Part 1 applies.

NOTE 1 This means that the technical committees responsible for the Part 2 standards have determined that it is not necessary to specify particular requirements for the machine in question over and above the general requirements.

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

NOTE 2 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 documents.

A machine that complies with the text of this document 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.

A machine employing materials or having forms of construction differing from those detailed in the requirements of this document 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 document.

## HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

### Part 2-107: Particular requirements for robotic battery powered electrical lawnmowers

#### 1 Scope

##### *Replacement:*

This document specifies safety requirements and their verification for the design and construction of **robotic battery** powered electrical **rotary lawnmowers** and their **peripherals** with the **rated voltage** of the **battery** being not more than 75 V d.c.

EMC and environmental aspects, except noise, have not been considered in this standard.

This document does not apply to the additional risks associated with internal combustion engine(s), hybrid and fuel cell powered machines and associated charging systems.

This document deals with all the significant hazards presented by **battery** powered **robotic lawnmowers** and their **peripherals** when they are used as intended and under conditions of misuse which are reasonably foreseeable.

Throughout this document, the term machine is used to refer to the **robotic lawnmower**, separate from its **charging station**.

This document also provides requirements for the safety of mains powered **charging stations** and signal sources for **perimeter delimiters**.

Additional **battery** operation and charging requirements for **robotic lawnmowers**, including the charging of lithium ion batteries, are specified in Annex KK which replaces Annexes B and S (except for requirements for non-rechargeable **batteries**) of Part 1.

This document is not applicable to machines which are manufactured before the date of publication of this document by IEC.

NOTE Informative Annex FF is provided as a test code for convenience to the users of this document.

#### 2 Normative references

This clause of Part 1 is applicable except as follows.

##### *Addition:*

IEC 60320 (all parts), *Appliance couplers for household and similar general purposes*

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

IEC 62133 (all parts), *Secondary cells and batteries containing alkaline or other non-acid electrolytes- safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications*

ISO 354:2003, *Acoustics – Measurement of sound absorption in a reverberation room*

ISO 683-4:2014, *Heat-treatable steels, alloy steels and free-cutting steels – Part 4: Free-cutting steels*