IEC 60335-2-107

Edition 1.0 2012-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

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

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

FDIS	Report on voting
116/79/FDIS	116/86/RVD

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

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

This part 2 is to be used in conjunction with the fourth edition (2001) of IEC 60335-1 and its amendments.

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

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Safety requirements for robotic battery powered electrical lawnmowers.

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

NOTE 2 The following numbering system is used:

– subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;
– unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;
– additional annexes are lettered AA, BB, etc.

NOTE 3 The following print types are used:

– Requirements: in roman type
– *Test specification: 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.

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 this publication will remain unchanged until the stability date indicated on the IEC web site 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.

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 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 standard 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 standard 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 is a product family standard 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 standards.

A machine 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.

A machine 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.

The non-electrical safety requirements covering non-electrical hazards have been taken from IEC 60335-2-77 where appropriate.

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

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

1 Scope

This clause of Part 1 is replaced by the following.

This standard deals with the safety of **robotic** battery powered electrical **rotary lawnmowers** with the **rated voltage** of the battery being not more than 75 V d.c. charged by mains electrical and/or solar power. This International Standard does not apply to non-robotic machines such as **lawn trimmers**, **lawn edge trimmers**, **lawn edgers**, **ride-on lawnmowers** or **pedestrian controlled lawnmowers**.

This standard is not applicable to EMC and environmental hazards (except noise)

This standard deals with the common hazards presented by battery powered **robotic lawnmowers** for use around the home or for similar purposes.

Requirements for batteries are covered by IEC 62133.

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

NOTE This standard does not apply to battery chargers (IEC 60335-2-29).

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 60335-1: 2001, *Household and similar electrical appliances – Safety – Part 1: General requirements*
Amendment 1 (2004)
Amendment 2 (2006)[1]

IEC 60335-2-77, *Household and similar electrical appliances – Safety – Part 2-77: Particular requirements for pedestrian controlled mains-operated lawnmowers*

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

[1] There exists a consolidated edition 4.2 (2006) comprising IEC 60335-1 (2001) and its Amendments 1 (2004) and 2 (2006).

IEC 62133, *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 683-9, *Heat-treatable steels, alloy steels and free-cutting steels – Part 9: Wrought free-cutting steels*

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 3767-1, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment – Symbols for operator controls and other displays – Part 1: Common symbols*

ISO 3767-3, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment – Symbols for operator controls and other displays – Part 3: Symbols for powered lawn and garden equipment*

ISO 7010:2011, *Graphical symbols – Safety colours and safety signs – Registered safety signs*

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

ISO 11684, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment – Safety signs and hazard pictorials – General principles*

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

ISO 13857:2008, *Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs*

3 Definitions

This clause of Part 1 is applicable except as follows.

3.101
blade
term used in warnings and instructions to denote "**cutting means**"

Note 1: See 3.103.

3.102
control
means or device which will control the operation of the machine or any specific operating function thereof

3.103
cutting means
the mechanism used to provide the cutting action of a **lawnmower**

3.104
cutting means enclosure
the part or assembly which provides the protective means around the **cutting means**

3.105
cutting means tip circle
the path described by the outermost point of the **cutting means** as it rotates about its shaft axis

3.106
cutting position
any height setting of the **cutting means** designated by the manufacturer for cutting grass

3.107
disabling device
a) **removable**
detachable part, such as for example a key, which prevents operation of the **lawnmower** when it is removed

b) **code protected**
device which, when operated, prevents operation of the **lawnmower** and requires a coded input (such as via a keypad) before it can operate

Note 1: See 22.103.

3.108
discharge chute
extension of the **cutting means enclosure** from the **discharge opening**, generally used to control the discharge of material from the **cutting means**

3.109
discharge opening
gap or opening in the **cutting means enclosure** through which grass may be discharged

3.110
charging station
automatic battery charging facility located on or within the delimited or pre-programmed area

3.111
manual stop
device using software-based or hardware-based components that overrides all other **controls** and removes power to the motor(s) and brings all moving parts to a stop

3.112
grass catcher
part or combination of parts which provides a means for collecting grass clippings or debris

3.113
guard
part of the machine or a component incorporated to provide protection for the operator and/or bystander

3.114
intended use
any use of the machine which is reasonably foreseeable, as described in the instruction manual, and which is consistent with such activities as cutting grass, starting, stopping, or connecting to (or disconnecting from) a source of power

3.115
lawn edge trimmer
powered grass cutting machine for trimming lawn edges usually in a vertical plane

3.116
lawn edger
powered machine suitable for cutting lawn and soil, usually in a vertical plane

3.117
lawnmower
grass-cutting machine where the **cutting means** operates in a plane approximately parallel to the ground and which uses the ground to determine the height of cut by means of wheels, air cushion or skids, etc., and which utilises an electric motor for a **power source**

3.118
lawn trimmer
powered grass-cutting machine where the operator determines the plane of operation of the **cutting means** and the height of cut, possibly assisted by a wheel or skid, etc.

3.119
manual controller
device either connected by a wire or wireless that allows manual control of the movement and **cutting means** operation of the machine

3.120
maximum operating motor speed
the highest motor speed obtainable when adjusted in accordance with the manufacturers specifications and/or instructions, with the **cutting means** engaged

3.121
mowing attachment
cutting means designed to be easily detached from the machine, generally to allow the machine to be used for other purposes

3.122
mulching lawnmower
rotary lawnmower without **discharge openings** in the **cutting means enclosure**

3.123
no load
the minimum load attainable at **rated voltage**

3.124
operator control
any **control** requiring operator actuation to perform specific functions

Note 1: This includes **controls** on a **manual controller**.

3.125
operator presence control
control on a **manual controller** designed so that it will automatically interrupt power to a drive when the operator's actuating force is removed

3.126
pedestrian controlled lawnmower
grass-cutting machine, either pushed or self-propelled, normally controlled by the operator holding a handle walking behind the unit

3.127
perimeter delimiter
a device(s) that define the perimeter of the area within which the machine can operate automatically

3.128
power source
motor which provides mechanical energy for linear or rotational movement

3.129
ride-on lawnmower
self-propelled **lawnmower** on which an operator rides and which is designed primarily for cutting grass

3.130
robotic lawnmower
unattended **lawnmower** that operates automatically

Note 1: When the term 'machine' is used in the text of this standard, it is used to denote a **robotic lawnmower**.

3.131
rotary lawnmower
lawnmower in which the **cutting means**, cutting by impact, rotate about an axis (axes) normal to the cutting plane

3.132
sensor
device that responds to physical stimuli (such as, but not limited to, heat, light, sound, pressure, magnetism, motion) and transmits the resulting signal or data providing a measurement, operating a **control**, or both.

a) lift sensor

device that senses when the machine is lifted bodily from the ground

b) obstruction sensor

device that senses when the machine contacts an obstruction

c) tilt sensor

device that senses when the machine is at or above a predetermined angle of incline

d) rollover sensor

device that senses when the machine is inverted

3.133
stopping time
the time elapsed between the instant when either a **sensor** is activated or the actuator on a **manual controller** is released and the instant at which the machine or component comes to a stop

3.134
thrown object hazard
the potential for injury caused by object(s) propelled by the moving **cutting means**

3.135
traction drive
the means (system) used to transmit power from the **power source** to the ground drives means

3.136
remote setting device
a setting device which is not connected by wire to the **lawnmower** and designed to set the basic functions of the **lawnmower** but not for controlling the **lawnmower**

3.137
working area
any defined area in which the machine can function automatically

4 General requirement

This clause of Part 1 is applicable except as follows.

4.101 Mowing attachments

Where mowing attachments are available from the original manufacturer which modify the use of a **robotic lawnmower**, the complete machine shall still comply with the safety requirements of this standard.

Compliance is checked by inspection and by the relevant tests, where applicable.

5 General conditions for the tests

This clause of Part 1 is applicable except as follows.

5.1 *Addition:*

Where an electronic speed **control** device can be adjusted, it is set for the highest speed.

5.2 *Replacement*:

A new machine shall be used for each of the tests of Clause 21, unless otherwise agreed by the manufacturer.

5.8.1 *Replacement:*

Unless otherwise specified, a fully charged battery shall be used for each test. Where for consecutive tests the same battery is specified, there shall be a minimum of 1 min rest time between tests.

6 Classification

This clause of Part 1 is applicable except as follows.

6.1 *Replacement:*

Machines shall be of one of the following classes with respect to protection against electric shock:

– machines and **charging stations** with a rated voltage above 42 V shall be **class II**;
– parts of machines with an integrated mains powered charger shall be **class II**; other parts complying with **SELV** shall be at least **class III**;
– **charging stations** supplied with **SELV** shall be at least **class III**;
– other machines shall be at least **class III**.

Compliance is checked by inspection and by the relevant tests.

6.2 *Addition:*

Class II parts of machines shall be at least IPX4.

Class III machines shall be at least IPX1.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 *Addition:*

Add the following indents:

– business name and full address of the manufacturer and, where applicable, his authorized representative;
– year of construction;
– mass in kilograms;
– designation of machinery. This may be achieved by a combination of letters and/or numbers;
– designation of series or type, allowing the technical identification of the product. This may be achieved by a combination of letters and/or numbers and may be combined with the designation of machinery;
– rated power in kilowatts or rated current in amperes;
– cutting width in centimetres.

Controls which may give rise to a hazard when operated shall be marked or so placed as to indicate clearly which part of the machine they control.

The following warnings shall be located in easily visible positions, indicating:

On the machine:

WARNING – Read instruction manual before operating the machine.

WARNING – Keep a safe distance from the machine when operating.

WARNING – Do not ride on the machine.

WARNING – Remove (or operate) the **disabling device** before working on or lifting the machine.

NOTE Use “Remove” or “Operate” as appropriate to the type of **disabling device** that is fitted to the machine.

CAUTION – Do not touch rotating blade.

For machines equipped with a **manual controller**, the **manual controller** shall be marked with:

WARNING – Read instruction manual before operating the machine.

WARNING – Keep a safe distance from the machine when operating.