

STANDARD INFORMATION

Standard: CSA C22.2 No. 60335-2-107

Standard ID: Household and Similar Electrical Appliances - Safety - Part 2-107: Particular Requirements for Robotic Battery Powered Electrical Lawnmowers [CSA C22.2#60335-2-107:2020 Ed.1+U1]

Previous Standard ID: Household and Similar Electrical Appliances - Safety - Part 2-107: Particular Requirements for Robotic Battery Powered Electrical Lawnmowers [CSA C22.2#60335-2-107:2020 Ed.1]

EFFECTIVE DATE OF NEW/REVISED REQUIREMENTS

Effective Date: **December 1, 2024**

IMPACT, OVERVIEW, AND ACTION REQUIRED

Impact Statement: Per our accreditation, Intertek is required to review reports against the standard revisions to confirm compliance. Once compliance is confirmed, the standard reference in the report is updated to show continued compliance to the technical requirements of the standard. Reports not updated to this version by the effective date above will be withdrawn.

CSA C22.2#60335-2-107:2020 Ed.1+U1 is aligned with ANSI/OPEI 60335-2-107-2020, Amd. 1.

Overview of Changes:

- Additional requirements for markings
- Additional requirements for inadvertent foot access to the cutting means
- Additional requirements for robotic lawnmowers
- Additional requirements for sensors
- Additional requirements for battery operation and charging

Specific details of new/revised requirements are found in table below.

Current Listings Not Active? – Please immediately identify any current Listing Reports or products that are no longer active and should be removed from our records. We will do this at no charge as long as Intertek is notified in writing prior to the review of your reports.



STANDARD INFORMATION

CLAUSE	VERDICT	COMMENT
		<p>Additions to existing requirements are <u>underlined</u> and deletions are shown lined-out below.</p>
6	Info	<p>Classification</p> <p><i>New clause added;</i></p> <p>This subclause is not applicable for machines and non-mains-powered peripherals.</p> <p>NOTE 101 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.</p> <p>Mains-powered peripherals shall be of one of the following classes with respect to protection against electric shock.</p> <ul style="list-style-type: none">- class II appliance;- class III appliance. <p>Compliance is checked by inspection and by the relevant tests.</p>
6.1DV DE		
7	Info	<p>Marking and instructions</p> <p>Machines and peripherals shall be marked as indicated below and additionally, as required, by 7.1.101. Additional markings are allowed provided they do not give rise to misunderstanding. Warnings shall be located in easily visible positions. If the first numeral for the IP numbering is omitted, the omitted numeral shall be replaced by the letter X, for example IPX4.</p> <p>On the machine:</p> <p><u>WARNING – Remove (or activate) the disabling device before working on or lifting the machine”.</u></p>
7.1DV.2 DE		



CLAUSE	VERDICT	COMMENT
		This instruction manual shall include: <u>u) instructions to disconnect the supply (e.g. remove the plug from the mains or remove/activate the disabling device)</u>
7.12DV.1		– before clearing a blockage on the machine; – before checking, cleaning or working on the machine or charging station; – after striking a foreign object to inspect the machine for damage; – if the machine starts to vibrate abnormally, and to check for damage before restarting;
19	Info	Abnormal operation <i>New clause added;</i>
19.DV		This includes leakage of electrolyte from the battery. These requirements do not apply to the functional performance of lithium-ion charging systems. NOTE The requirements for lithium-ion charging systems are specified in KK.19.1.
20	Info	Stability and mechanical hazards
20.102	Info	Safety requirements
20.102.4	Info	Inadvertent access to the cutting means
20.102.4.1	Info	Inadvertent foot access to the cutting means <i>New clause added;</i>
20.102.4.1.1		Inadvertent access to the cutting means by the feet during operation shall be prevented, so far as reasonably practicable by the cutting means enclosure.
DV		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.
20.102.4.1.2		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.
DV		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



CLAUSE	VERDICT	COMMENT
		<p>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.</p> <p>The test probe shall not enter the path of the cutting means assembly.</p> <hr/> <p><i>New clause added;</i></p> <p>The machine shall be placed on a test surface as described in Annex CC, except that</p> <ul style="list-style-type: none">- the minimum size as described in 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. <p>The machine shall be tested by means of the foot probe shown in Figure 109DV. 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 109DV 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.</p> <p>The machine shall be operated in automatic mode with the cutting means operating. While the machine is operating, the foot probe of Figure 109DV shall be placed in each of the ten test positions shown in Figure 110DV, as applicable to the anticipated movement of the machine, such that</p> <ul style="list-style-type: none">- 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; <p>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.</p> <ul style="list-style-type: none">- an injection tube, if any, in the coconut matting does not influence the test result. <p>If, in automatic mode, it is not possible for the machine to move in accordance with any of the test positions shown in Figure 110DV, then it is not necessary to conduct the test for those test positions.</p> <p>The foot probe shall remain in place at each test position until</p> <ul style="list-style-type: none">- the machine has moved completely away from the foot probe; or
20.102.4.1.4 DV		



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- 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.

New clause added;

Guarding to reduce the possibility of contact with the cutting means during an attempted lift shall be provided.

Compliance is checked by the following test.

A mechanical test probe as shown in Figure 111DV is used for the 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 this test. The test is conducted under static conditions.

The test is 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.

20.102.4.2.3
DV

The finger portion of the probe shall be inserted towards the cutting means around and under the edge of the outer periphery of the machine until the 50 mm stop face contacts the outer periphery of the machine in any area where the machine can be lifted. For test purposes, the machine may be supported in its normal orientation above the hard flat supporting surface so that the insertion of the probe is not limited by the hard flat surface. The axis of the probe is held horizontally. The articulated finger joints shall be moved through their full range of angular movements. The probe is applied with a force not exceeding 5 N until contact is made by the 50 mm stop face of the probe with the outer periphery of the machine or until any portion of the machine is displaced from its original position, or until contact is made with the cutting means path, whichever occurs first. For examples of the intended application of the probe, see Figure 105.

No vertical force shall be applied to the probe, except as necessary to maintain the horizontal position.



CLAUSE	VERDICT	COMMENT
		<p>The finger part of the test probe shall not enter the path of the cutting means. Contact with parts of the cutting means that are circular, smooth and unbroken is allowed.</p> <p>NOTE The positioning of the stop face of the probe is determined by assessing what parts of the enclosure are most likely to be grasped when lifting the stationary machine from the ground and noting where the root of the fingers is placed.</p>
21	Info	Mechanical strength
21.101	Info	Additional requirements for robotic lawnmowers
		<i>New clause added;</i>
		<p>A manual controller, if any, shall be dropped three times from a height of 1,0 m onto a smooth concrete floor in the position most likely to damage the controller, while powered on and communicating with the machine.</p>
21.101.6DV		<p>The manual controller shall have failed the test if one or more of the following occurs:</p> <ul style="list-style-type: none">- there is access to a working voltage, exceeding hazardous voltage, using test probe 13 of IEC 61032:1997;- loss of operator presence control functionality, either through mechanical or electrical damage, unless the cutting means is rendered inoperable in manual mode;- unintended motion of the machine; or- any breakage that allows access to uninsulated parts that could short due to the loss of the enclosure.
22	Info	Construction
22.105	Info	Sensors
		<p>The machine shall be provided with a lift sensor. The lift sensor shall detect when the machine is lifted both fully from the ground and when it is lifted from only a single point causing it to be tilted.</p>
22.105.3DV		<p>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.</p> <p><u>In automatic mode, if the sensor(s) have not become deactivated as specified in 20.102.5.3, the machine may be restarted providing the restart procedure in 20.102.6 is completed.</u></p>



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New clause added;

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.

22.104.4DV

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.



CLAUSE	VERDICT	COMMENT
29	Info	<p>Clearances, creepage distances and solid insulation</p> <p><i>New clause added;</i></p> <p>For the machine and non-mains-powered peripherals, creepage distances and clearances shall not be less than the values in millimeters shown in Table 102DV. 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 102DV do not apply to cross-over points of motor windings.</p> <p>The values in Table 102DV are equal or larger than the values required by IEC 60664-1, when</p> <ul style="list-style-type: none">- an overvoltage category I;- a material group III;- a pollution degree 3;- inhomogeneous electric field. <p>29.101DV</p> <p>are applied.</p> <p>Protection against deposition of dirt may be achieved through the use of</p> <ul style="list-style-type: none">- 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. <p>NOTE 1 An example of encapsulation is potting.</p> <p>For parts of different potential in switched circuits only, clearance and creepage distances less than those given in Table 102DV are acceptable if the shorting of the two parts does not result in the machine starting.</p> <p>NOTE 2 The risk of fire due to spacings below the required values is covered by the requirements of KK.19.4.</p>



CLAUSE	VERDICT	COMMENT
Annex KK	Info	Additional requirements for battery operation and charging
KK.19	Info	Abnormal operation <i>New clause added;</i> Machines and/or peripheral(s), when operating under battery power, and their battery packs, shall be so designed that the risk of fire or electric shock as a result of abnormal operation is obviated as far as is practical. Compliance is checked by the following tests. The abnormal conditions a) to e) below shall be applied. The machine and/or peripheral(s), battery pack and the cords of d), as appropriate, are placed on a soft wood surface covered by two layers of tissue paper; the sample is covered by one layer of untreated 100% cotton medical gauze. For the tests b), c) and e), the machine and/or peripheral(s) are switched on and no additional mechanical load is applied. The test is conducted until failure or until the test sample(s) returns to within 5 K of the ambient temperature or, if neither of these occurs, until at least 3 h has elapsed. A new sample(s) may be used for each fault listed below. No explosion shall occur during or after the test. There shall be adequate protection against electric shock as defined in clause 8. No charring or burning of the gauze or tissue paper shall result. Venting of the cells is permitted. KK.19.4DV Charring is defined as a blackening of the gauze caused by combustion. Discolouration of the gauze caused by smoke is acceptable. The resistance for the short in items a), b), d), and e) shall not exceed 10 mΩ. Charring or igniting of the tissue paper or gauze from the shorting means is not considered a failure. Fuses, thermal cut-outs, thermal links, temperature limiters, electronic devices or any component(s) or conductors(s) that interrupt the discharge current may operate during the above tests. If these devices are relied upon to pass the test, the test is to be repeated two more times, using two additional samples, and shall open the circuit in the same manner, unless the test is otherwise satisfactorily completed. Alternatively, the test may be repeated with the open-circuited device bridged. a) Combinations of exposed terminals of a removable battery are shorted so as to produce the worst result. Battery pack terminals that can be contacted using either test probe B of IEC 61032:1997 or test probe 13 of IEC 61032:1997 are considered exposed. The means of shorting shall be selected or positioned such that charring or ignition of the tissue paper or gauze is not influenced. b) The terminals of each motor are shorted one at a time. c) The rotor of each motor is locked one at a time.



CLAUSE	VERDICT	COMMENT
		<p>d) Any cord provided between the machine and the charger or the peripheral(s) and its charger(s) shall be shorted at the point likely to produce the most adverse effects.</p> <p>e) A short is introduced between any two uninsulated parts of opposite polarity not in accordance with the spacings given in 29.101. A circuit analysis may be used to determine where a short shall or shall not be applied. The test is not conducted on uninsulated parts that are encapsulated.</p>
KK.24	Info	Components <i>New clause added;</i> Rechargeable cells containing alkaline or other non-acid electrolytes employed in machines and/or peripheral(s) shall comply with UL 62133/CAN/CSA-E62133. Batteries are not required to comply with UL 62133/CAN/CSA-E62133. They are tested as part of the appliance according to this standard. NOTE A battery alone may have construction features for physical and electrical protection and monitoring, but their presence is not assumed. Instead, all relevant aspects related to the safety of batteries are addressed in this standard, such that the requirements of UL/CSA/IEC 62133 series standards need not be separately applied.