

STANDARD INFORMATION

Standard: UL 60335-2-89 / CSA C22.2 No. 60335-2-89

Standard ID:

Household and Similar Electrical Appliances - Safety - Part 2-89: Particular Requirements for Commercial Refrigerating Appliances and Ice-Makers with an Incorporated or Remote Refrigerant Unit or Motor-Compressor [UL 60335-2-89:2021 Ed.2]

Household and Similar Electrical Appliances - Safety - Part 2-89: Particular Requirements for Commercial Refrigerating Appliances and Ice-Makers with an Incorporated or Remote Refrigerant Unit or Motor-Compressor [CSA C22.2#60335-2-89:2021 Ed.2]

Previous Standard ID:

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EFFECTIVE DATE OF NEW/REVISED REQUIREMENTS

Effective Date: **October 27, 2025**

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 Reports not updated to this version by the effective date above will be withdrawn.

Overview of Changes:

- requirements for commercial ice-makers have been added
- installation of appliances with a remote refrigerant unit or motor-compressor has been clarified
- installation instructions for appliances with a remote refrigerant unit employing R-744 refrigerant in a transcritical refrigeration system have been added
- a pressure test for appliances employing R-744 refrigerant has been added
- additional requirements for appliances with a refrigerant charge exceeding 150 g of flammable refrigerant within each refrigerating circuit have been added
- Annex AA has been modified to cover motors that are supplied at a voltage that is different from the rated voltage of the appliance

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 – Please immediately identify any current Listing Reports or products that are no longer active and should be removed from our records.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>
5	Info	<p>General conditions for the tests</p> <p><i>New clause added;</i></p> <p>For ICE-MAKERS, the tests in accordance with Clauses 10, 11 and 13 are performed at an ambient temperature of $32\text{ °C} \pm 2\text{ °C}$</p>
5.7		<p>For other appliances, tests in accordance with Clauses 10, 11 and 13 are performed at an ambient temperature of</p> <ul style="list-style-type: none">– $32\text{ °C} \pm 2\text{ °C}$ on appliances of test room climatic class 0, 1, 2, 3, 4, 6 or 8;– $43\text{ °C} \pm 2\text{ °C}$ on appliances of test room climatic class 5 or 7.
5.10		<p><i>New clause added;</i></p> <p>For appliances with a remote REFRIGERANT UNIT, the REFRIGERANT UNIT is connected to the cabinet in accordance with the instructions provided with the appliance before testing.</p> <p>For the tests of 22.111, 22.112 and 22.113, the appliance is empty with doors or lids closed, or roller blinds closed or open, whichever is the more unfavourable, and is installed as follows.</p> <p>Appliances, other than BUILT-IN APPLIANCES, are placed in a test enclosure, the walls of which enclose the appliance as closely as possible to all its sides and top surface, unless the manufacturer indicates in the instructions that a free distance shall be observed from the walls or the ceiling, in which case this distance is observed during the test. If the appliance has a REMOTE REFRIGERANT UNIT or motor-compressor, then only the REFRIGERATED DISPLAY AND STORAGE CABINET is installed in the test enclosure, the remote REFRIGERANT UNIT or motor-compressor is placed on the floor of the test corner away from walls.</p> <p>For appliances incorporating remote REFRIGERANT UNITS or remote motor-compressors, the refrigerant line between the REFRIGERANT UNIT or motor-compressor and the REFRIGERATED DISPLAY AND STORAGE CABINET shall have a length of 5 m to 7,5 m. The refrigerant line shall be installed with thermal insulation applied in accordance with the instructions. If the appliance employs R-744 refrigerant in a TRANSCRITICAL REFRIGERATION SYSTEM, a PRESSURE RELIEF DEVICE shall be installed on the high-pressure side between the motor-compressor and the GAS COOLER unless it is pre-fitted to the motor-compressor.</p>



CLAUSE	VERDICT	COMMENT
		<i>New clause added;</i>
5.101		<p>Appliances that use FLAMMABLE REFRIGERANTS and that, according to the instructions, may be used with other electrical appliances inside a food/ice storage compartment are tested with such recommended appliances incorporated and in operation as they would be in normal use.</p> <p>NOTE An example of such electrical appliances are deodorizers.</p> <p>ICE-MAKERS that use FLAMMABLE REFRIGERANTS and that, according to the instructions, may be used in conjunction with accessories such as ice-bins are tested with such recommended accessories installed and in operation as they would be in normal use</p>
7	Info	Marking and instructions
7.1		<p>Appliances that use FLAMMABLE REFRIGERANTS shall be marked with the warning sign ISO 7010-W021 (2011-05).</p> <p><u>Appliances having a REFRIGERANT CHARGE exceeding 150 g of FLAMMABLE REFRIGERANTS within any REFRIGERATING CIRCUIT shall be marked with the maximum allowable pressure for which the system is designed to withstand.</u></p> <p><u>Appliances having a REFRIGERANT CHARGE within any REFRIGERATING CIRCUIT exceeding 4 times the lower flammability limit (LFL) for refrigerants having a flammability classification of Class A2 or Class A3 and exceeding 6 times the lower flammability limit (LFL) for refrigerants having a flammability classification of Class A2L, shall be marked with symbol IEC 60417-6412 (2019-03).</u></p> <p><u>For appliances with a remote REFRIGERANT UNIT employing R-744 refrigerant in a TRANSCRITICAL REFRIGERATION SYSTEM, unless the appliance incorporates a PRESSURE RELIEF DEVICE pre-fitted to the high-pressure side of the motor-compressor, the instructions shall include a statement containing the substance of the following:</u></p>
7.12.1		<p><u>A pressure relief device shall be installed in the high-pressure side of the refrigeration system between the motor-compressor and the gas cooler. There shall be no shut off devices or other components except piping between the motor-compressor and the pressure relief device that could introduce a pressure drop.</u></p> <p><u>The pressure relief device shall be mounted so that any refrigerant released from the system during its operation cannot cause harm to the user of the appliance. The aperture shall be located so that it is unlikely to be obstructed in normal use.</u></p>



CLAUSE	VERDICT	COMMENT
		<p><u>The installed pressure relief device shall have no provisions for setting by the end user. The pressure setting of the installed pressure relief device shall be no higher than the design pressure of the high-pressure side.</u></p> <p>For appliances intended for connection to a water supply for cooling purposes, the instructions shall contain information on the maximum permitted temperature of the inlet water consistent with safe operation of the appliance.</p> <p><u>If symbol IEC 60417-6375:2017-03 is used, its meaning shall be explained.</u></p>
11	Info	Heating
		<i>New clause added;</i>
		BUILT-IN APPLIANCES are installed in accordance with the instructions.
11.2		<p>Other appliances are placed in a test enclosure with the walls and ceiling enclosing the appliance being as close as possible to all its sides and top surface. If the instructions state that the appliance is to be installed with a free distance between the appliance and the walls or the ceiling, then the appliance is installed in the test enclosure in accordance with these instructions. If the appliance has a remote REFRIGERANT UNIT or motor-compressor, then only the REFRIGERATED DISPLAY and STORAGE CABINET is installed in the test enclosure, the remote REFRIGERANT UNIT or motor-compressor is placed on the floor of the test corner away from walls.</p> <p>Dull black painted plywood approximately 20 mm thick is used for the test corner, the supports and for the installation of BUILT-IN APPLIANCES and the test enclosure for other appliances.</p>
		<i>New clause added;</i>
		<p>During the test, PROTECTIVE DEVICES other than self-resetting thermal motor-protectors for motor-compressors shall not operate. When steady conditions are established, thermal motor-protectors for motor-compressors shall not operate.</p> <p>During the test, sealing compound, if any, shall not flow out.</p>
11.8		<p>During the test, the temperature rises are monitored continuously.</p> <p>For ICE-MAKERS and REFRIGERATED DISPLAY AND STORAGE CABINETS of test room climatic classes 0, 1, 2, 3, 4, 6 or 8, the temperature rises shall not exceed the values given in Table 3.</p> <p>For REFRIGERATED DISPLAY AND STORAGE CABINETS of test room climatic class 5 or 7, the temperature rises shall not exceed the values given in Table 3, reduced by 7 K.</p>



CLAUSE	VERDICT	COMMENT
		<p>Addition:</p> <p>For motor-compressors not conforming to IEC 60335-2-34 (including its Annex AA), the temperatures of</p> <ul style="list-style-type: none">– housings of motor-compressors and– windings of motor-compressors <p>shall not exceed the values given in Table 101.</p> <p>For motor-compressors conforming to IEC 60335-2-34 (including its Annex AA), the temperatures of their</p> <ul style="list-style-type: none">– housings of motor-compressors,– windings of motor-compressors and– other parts such as its protection system and control system, and all other components that have been tested together with the motor-compressor during the tests of IEC 60335-2-34 and its Annex AA <p>are not measured.</p> <p>The entry in Table 3 relating to the temperature rise of the external enclosure of MOTOR-OPERATED APPLIANCES is applicable to all appliances covered by this standard. However, it is not applicable to those parts of the external enclosure of the appliance,</p> <ul style="list-style-type: none">– for BUILT-IN APPLIANCES, that are not ACCESSIBLE PARTS after installation in accordance with the instructions;– for other appliances, that are on that part of the appliance that, according to the instructions, is intended to be placed against a wall with a free distance not exceeding 75 mm. <p>The temperature of ballast windings and their associated wiring shall not exceed the values specified in 12.4 of IEC 60598-1:2008, when measured under the conditions stated.</p> <p>For ICE-MAKERS, the temperature rises shall not exceed the values given in Table 3.</p>
11.8DV		<p><i>New clause added;</i></p> <p>Where IEC 60335-2-34 is specified, the use of CAN/CSA-C22.2 No. 60335-2-34/UL 60335-2-34 shall be applied. Where Annex AA of IEC 60335-2-34 is referenced, the requirements of Annex 101.DVH can be used.</p>



CLAUSE	VERDICT	COMMENT
19	Info	Abnormal operation <i>New clause added;</i> Appliances shall be constructed so that they shall not cause any risk of fire, mechanical hazard or electric shock even in the case of abnormal operation. 19.102 Compliance is checked by applying any defect which may be expected in normal use, while the appliance is operated under conditions of NORMAL OPERATION at RATED VOLTAGE. Only one fault condition is reproduced at a time. The tests are made consecutively. During the tests, the temperatures of the windings of ICE-MAKERS, shall not exceed the values given in Table 8. During and after the tests, compliance is checked as described in 19.13.
21	Info	Mechanical strength <i>New clause added;</i> For appliances having a REFRIGERANT CHARGE within any REFRIGERATING CIRCUIT exceeding 150 g of FLAMMABLE REFRIGERANT, the refrigerant-containing parts shall be protected and shall not be an ACCESSIBLE PART. Any external surface that is adjacent or in contact with parts containing refrigerant shall have adequate mechanical impact withstand strength. 21.103 Compliance is checked by inspection and by applying blows to the relevant outer surface in accordance with test Eha of IEC 60068-2-75. The appliance is rigidly supported and three blows, having an impact energy of 5,00 J \pm 0,05 J, are applied to points on the surface adjacent to parts containing refrigerant, which are likely to be weak. After the test, the parts containing refrigerant shall remain not ACCESSIBLE PARTS and there shall be no visible deformation of the refrigerant-containing parts. If there is doubt as to whether a defect has occurred by the application of the preceding blow, or the previous tests, this defect is neglected and the group of three blows is repeated to the same place on a new sample which shall then withstand the test.



CLAUSE	VERDICT	COMMENT
22	Info	<p>Construction</p> <p>Appliances, including protective enclosures of a protected cooling system, that use FLAMMABLE REFRIGERANTS shall withstand:</p> <ul style="list-style-type: none">– a pressure of 3,5 times the saturated vapour pressure of the refrigerant at 70 °C, or equal to 3,5 times the pressure at the critical temperature if this is lower than 70 °C, the test pressure being rounded up to the next 0,5 MPa (5 bar), for parts exposed to the high side pressure during normal use;– a pressure of 5 times the saturated vapour pressure of the refrigerant at 20 °C, or equal to 2,5 MPa (25 bar), whichever is the greater, the test pressure being rounded up to the next 0,2 MPa (2 bar) for parts exposed only to low side pressure during normal use.
22.7		<p><u>Appliances that use R-744 refrigerant in subcritical applications, shall withstand, for parts exposed to the:</u></p> <ul style="list-style-type: none"><u>– high side pressure during normal use, 3,5 times the saturated vapour pressure of the refrigerant at 27 °C, rounded up to the next 0,5 MPa;</u><u>– low side pressure during normal use, 5 times the saturated vapour pressure of the refrigerant at –6,5 °C rounded up to the next 0,2 MPa;</u> <p><u>Compliance is checked by the following test.</u></p> <p><u>The appropriate part of the appliance under test is subjected to a pressure that is gradually increased hydraulically until the required test pressure is reached. This pressure is maintained for 1 min. The part under test shall show no leakage.</u></p> <hr/> <p><i>New clause added;</i></p> <p>Appliances having a REFRIGERANT CHARGE within any REFRIGERATING CIRCUIT exceeding 150 g of FLAMMABLE REFRIGERANT shall be constructed so that their operation does not cause excessive vibration or resonance points in the piping connected to the motor-compressor.</p>
22.108		<p>Compliance is checked by the following test:</p> <p>The appliance is installed in accordance with the installation instructions. It is supplied at RATED VOLTAGE or at the upper limit of the RATED VOLTAGE RANGE.</p> <p>For motor-compressors, other than variable speed motor-compressors in the appliance, the supply frequency to the motor-compressor is varied in 1 Hz steps between 0,9 times and 1,1 times the RATED FREQUENCY.</p>



CLAUSE	VERDICT	COMMENT
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For variable speed motor-compressors in the appliance, the supply frequency from the inverter to the motor-compressor is increased in 1 Hz steps from minimum frequency to maximum frequency over the speed range in the appliance.

The vibration amplitude is measured at points in the piping with a large amplitude.

When measured with a low pass filter at 200 Hz, vibrations shall not exceed an acceleration of 0,3 g RMS in the refrigerant containing parts.

Care shall be taken that the measurement sensors do not influence the line vibration level.

New clause added;

The REFRIGERANT CHARGE of FLAMMABLE REFRIGERANT in appliances with an incorporated REFRIGERANT UNIT or motor-compressor shall not exceed 13 times the LFL of the FLAMMABLE REFRIGERANT or 1,2 kg in any REFRIGERATING CIRCUIT, whichever is smaller. The LFL is expressed in kg/m³. The LFL values for refrigerants are given in Table 102.

22.110

The REFRIGERANT CHARGE of FLAMMABLE REFRIGERANT in appliances with a remote REFRIGERANT UNIT or motor-compressor (split system), shall not exceed 150 g in any REFRIGERATING CIRCUIT.

The molar mass of the refrigerant in appliances having a REFRIGERANT CHARGE exceeding 150 g of FLAMMABLE REFRIGERANT in any REFRIGERATING CIRCUIT shall not be less than 30 kg/kmol.

Compliance is checked by inspection.

New clause added;

Appliances having a REFRIGERANT CHARGE exceeding 150 g of FLAMMABLE REFRIGERANT in any REFRIGERATING CIRCUIT shall be constructed such that a leak of refrigerant shall not result in a FLAMMABLE REFRIGERANT concentration surrounding the appliance.

22.116

In the event of a leak from the appliance while energised, if airflow is required to meet these requirements, the airflow shall be guaranteed.

If airflow is not maintained at a level sufficient to comply with the requirements of Annex CC, the motor-compressors and heating elements shall be switched off within 5 minutes and an alarm shall be given. The motor-compressor and heating elements shall only be capable of restarting after the required airflow level has been reinstated.



CLAUSE	VERDICT	COMMENT
		<p>The airflow shall be produced by components that are part of the appliance.</p> <p>Compliance is checked by inspection and by the tests specified in Annex CC. If compliance relies on the operation of an ELECTRONIC CIRCUIT, the tests in Annex CC are repeated under the following conditions applied separately:</p> <ul style="list-style-type: none">– the fault conditions in a) to g) of 19.11.2 applied one at a time to the electronic circuit;– the electromagnetic phenomena tests of 19.11.4.2 and 19.11.4.5 applied to the appliance. <p>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.</p>
		<p><i>New clause added;</i></p>
22.117		<p>In appliances having a REFRIGERANT CHARGE exceeding 150 g of FLAMMABLE REFRIGERANT in any REFRIGERANT CIRCUIT, the refrigerant tubing shall be protected from potential damage during normal use relocation, repositioning and user maintenance.</p> <p>Compliance is checked by inspection.</p>
		<p><i>New clause added;</i></p>
22.118		<p>Low-temperature solder alloys having melting point of less than 450 °C shall not be used for pipe connections in a REFRIGERATING CIRCUIT, if the refrigerant charge exceeds 150 g of FLAMMABLE REFRIGERANT</p> <p>Compliance is checked by inspection and test.</p>
		<p><i>New clause added;</i></p>
22.119		<p>Capped valves and capped service ports fitted to HERMETICALLY SEALED SYSTEMS for the purposes of compliance with the requirements for permanent connections on systems containing FLAMMABLE REFRIGERANTS shall comply with the requirements of ISO 14903, tightness control level A1.</p> <p>Compliance is checked by inspection and the tests in ISO 14903.</p>



CLAUSE	VERDICT	COMMENT
22.120		<p>New clause added;</p> <p>Only HERMETICALLY SEALED SYSTEMS shall be used in appliances with FLAMMABLE REFRIGERANT.</p> <p>All the connections in a HERMETICALLY SEALED SYSTEM shall comply with ISO 14903 tightness control level A1.</p> <p>Compliance is checked by inspection and the relevant tests.</p>
22.121		<p>New clause added;</p> <p>If symbol IEC 60417-6412:2019-03 is marked on the appliance, the value of A in the symbol shall be equal to or greater than the largest value of the room floor area limit A_{lim} that is determined from the following:</p> $A_{lim} = \frac{M}{2,2 \times (0,25 \times LFL)}$ <p>where</p> <p>M is the REFRIGERANT CHARGE (kg);</p> <p>LFL is the lower flammability limit of the FLAMMABLE REFRIGERANT (kg/m³);</p> <p>2,2 is the assumed minimum room height (m);</p> <p>0,25 coefficient that gives 25 % of LFL</p> <p>Compliance is checked by inspection.</p>
Annex AA		<p>Locked-rotor test of fan motors</p> <p>The winding of a fan motor shall not reach excessive temperatures if the motor locks or fails to start.</p> <p>Compliance is checked by the following test.</p> <p>The fan and its motor are mounted on wood or similar material. The motor's rotor is locked. Fan blades and motor brackets are not removed.</p> <p>The motors <u>are supplied at their supplied voltage when the appliance is supplied at RATED VOLTAGE or at the upper limit of the RATED VOLTAGE RANGE.</u> The supply circuit is given in Figure AA.1.</p> <p>The assembly is to operate under these conditions for 15 days (360 h) unless the PROTECTIVE DEVICE, if any, permanently open circuits prior to the expiration of that time. In this case, the test is discontinued.</p>



CLAUSE	VERDICT	COMMENT
		<p>If the temperature of motor windings stays lower than 90 °C, the test is discontinued when steady conditions are established.</p> <p>Temperatures are measured under conditions specified in 11.3.</p> <p>During the test, winding temperatures shall not exceed the values given in Table 8. After a period of 72 h from the beginning of the test, the motor shall withstand the electric strength test of 16.3.</p> <p><u>For other than DC motors</u>, a residual current device with a rated residual current of 30 mA is connected so as to disconnect the supply in the event of an excessive earth leakage current.</p> <p>At the end of the test, the leakage current is measured between windings and the body at a voltage equal to twice the RATED VOLTAGE; its value shall not exceed 2 mA.</p>
		<hr/> <p><i>New annex added;</i></p> <p>Test method for determining gas concentration beyond the boundary of the appliance</p> <p>The appliance is installed according to the instructions empty with doors or lids closed, or roller blinds closed or open, whichever is the more unfavourable and energized if necessary. Positioning of the appliance shall be against the centre of the shortest wall within the test room at a distance from the wall of the distance specified in the instructions or 50 mm whichever is greater. If the appliance can be fitted with any accessories, they shall be used or arranged in a manner that gives the most unfavourable result.</p> <p>See standard for details.</p> <hr/>
Annex CC		