

STANDARD INFORMATION

Standard: UL 60335-2-40 / CSA C22.2 No. 60335-2-40

Standard ID:

Household and Similar Electrical Appliances - Part 2 - 40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners, and Dehumidifiers [UL 60335-2-40:2019 Ed.3]

Household and Similar Electrical Appliances - Safety - Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers [CSA C22.2#60335-2-40:2019 Ed.3]

Previous Standard ID:

Household and Similar Electrical Appliances - Part 2 - 40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners, and Dehumidifiers [UL 60335-2-40:2017 Ed.2]

Household and Similar Electrical Appliances - Safety - Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers [CSA C22.2#60335-2-40:2017 Ed.2]

EFFECTIVE DATE OF NEW/REVISED REQUIREMENTS

Effective Date: **January 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 Reports not updated to this version by the effective date above will be withdrawn.

Overview of Changes:

- New instruction and marking requirements
- Additional requirements for tests
- Addition of requirements for cables and wiring

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 – Please immediately identify any current Listing Reports or products that are no longer active and should be removed from our records.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
		<i>Additions to existing requirements are <u>underlined</u> and deletions are shown lined out below.</i>
7	Info	Marking and instructions
7.1-7.2DV D1		<i>New clauses added for marking and instructions for A2L refrigerants;</i> See standard for details.
7.12.1		In particular, the following information shall be supplied: • <u>instructions on charging of refrigerants when addition of charge is required by the manufacturer for completing the REFRIGERATING SYSTEM.</u>
7.103-7.111		<i>New clauses added for marking and instructions for UV-C systems;</i> See standard for details.
11	Info	Heating
11.2.1DV.3 D2		<i>New clause added;</i> For appliances with water heat exchangers intended to heat water and that are provided with storage tanks, after a full tank of water has been heated to the temperature at which the temperature-regulating thermostats open, one-fourth of the water shall be drawn off and replaced promptly with cold water. The appliance shall then be allowed to heat again until the thermostats open, at which time temperatures shall be observed immediately. The temperature of the water at the water outlet shall be measured as water is drawn off immediately following the second opening of the temperature-regulating control. For appliances with water heat exchangers intended to heat water and that are not provided with storage tanks, the water flow rate through the unit shall be reduced until a temperature-regulating control operates, at which time the control shall be bypassed. The unit shall then be operated continuously until temperatures and pressures have stabilized.
11.2.3		<i>New clause added;</i> For the evaluation and testing of PARTIAL UNITS, the following test setup and conditions are to be applied. • EVAPORATOR UNITS and CONDENSER UNITS are tested as individual units at the maximum ambient temperature stated in the instructions. If not stated in the



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		<p>instructions, these units shall be tested at an ambient temperature that is equal to the saturated temperature of the refrigerant at the marked MAXIMUM ALLOWABLE PRESSURE ($\pm 0,1$ MPa) minus 10 K (± 1 K).</p> <ul style="list-style-type: none"> • CONDENSING UNITS are tested in the cooling mode only, at the maximum specified ambient temperature with 9 K (± 1 K) sub-cooling and the maximum specified evaporating pressure with 11 K (± 1 K) superheat. <p>For CONDENSING UNITS provided with expansion device(s), the superheat/sub-cooling is to be as under the normal control of the expansion device(s).</p> <ul style="list-style-type: none"> • EVAPORATING UNITS, intended for cooling only, are tested in the cooling mode only with a condensing pressure that is equal to the marked MAXIMUM ALLOWABLE PRESSURE ($\pm 0,1$ MPa) with 9 K (± 1 K) subcooling. • EVAPORATING UNITS that are intended for reverse cycle operation are tested in the heating mode only, at the maximum specified evaporating pressure.
13	Info	<p>Leakage current and electric strength at operating temperature</p> <p><i>New clause added;</i></p>
13.2DV.1		<p>For permanently connected stationary class I appliances, the leakage current may exceed 3,5 mA, but shall not exceed 2 mA per kilowatt rated power input with a maximum value of 10 mA for appliances accessible to the general public, and a maximum value of 30 mA for appliances not accessible to the general public.</p>
15	Info	<p>Moisture resistance</p> <p><i>New clause added;</i></p>
15.1DV D2		<p>If the appliance is equipped with an outdoor service receptacle, the test is to be conducted with a plug inserted in the receptacle.</p>
16	Info	<p>Leakage current and electric strength</p> <p><i>New clause added;</i></p>
16.2DV D1		<p>For permanently connected stationary class I appliances, the leakage current may exceed 3,5 mA, but shall not exceed 2 mA per kilowatt rated power input with a maximum value of 10 mA for appliances accessible to the general public, and a maximum value of 30 mA for appliances not accessible to the general public.</p>
19	Info	<p>Abnormal operation</p> <p>Appliances with a heat exchanger for the purpose of heating water shall be operated under the conditions specified in Clause 11 at rated voltage with the temperature-regulating control bypassed.</p>
19.106DV D1		<p>Appliances with a heat exchanger for the purpose of heating water shall not have a water temperature exceeding 99°C during the test.</p> <p>Heat Pump Pool Heaters shall not have a water temperature exceeding 60° C during the test.</p>



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		<p>No other limiting or other protective device shall function except as specified in Clause 22.132DV.9.</p> <p>– For units with storage tanks after a tankful of water has been heated to the temperature at which the temperature regulating thermostats open, one-fourth of the water shall be drawn off and replaced promptly with cold water. Immediately after the first closure of the temperature-regulating thermostat thereafter, the temperature regulating thermostats shall be bypassed and operation shall be continued until the temperature-limiting control opens. Immediately thereafter, hot water shall be drawn off and its temperature shall be measured at the hot water outlet.</p> <p>– For units without storage tanks, the water flow rate through the unit shall be reduced with the temperature-regulating thermostat by-passed until the temperature limiting control operates, at which point the outlet water temperature shall be measured.</p>
21	Info	<p>Mechanical strength</p> <p><i>New clause added;</i></p> <p>Safety requirements specified in ANSI/ASHRAE 15 (USA) and CSA B52 (Canada) shall apply.</p>
21.1DV.1 D1		<p>Safety requirements specified in Annex EE shall apply. The pressure test in Annex EE applies to parts other than pressure vessels.</p> <p>Compliance shall be shown by test. The tests shall be conducted in accordance with the tests of Clause EE.5 of Annex EE.</p>
		<p><i>New clause added;</i></p>
21.1DV.2		<p>For appliances with refrigerant to water heat exchangers for the purpose of heating water, the water side of the heat exchanger shall have sufficient strength to withstand a pressure of not less than 2,1 MPa when two samples are tested for 1 min.</p>
21.101DV D1		<p>A window-type air conditioning unit shall withstand a static load of 180 kg applied to the outer 130 mm of the outdoor portion of the unit when mounted in a simulated window in accordance with the instructions provided by the manufacturer.</p> <p><u>A load of 180 kg acting vertically downward shall be applied along the edge parallel with and farthest from the plane of the window. If the simulated window fails, the test shall be repeated with a stronger window.</u></p>



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		<i>New clause added;</i>
21.101DV.8		Appliances intended to be suspended from the wall or ceiling shall withstand the test described in Clause 21.101DV.9 without falling from its intended mounting location.
		<i>New clause added;</i>
21.101DV.9		The appliance shall be installed in accordance with the manufacturer's instructions. A load equal to three times the weight of the unit but not exceeding 180 kg mass, acting vertically downwards, shall be applied uniformly to the unit for minimum of 1 min.
22	Info	Construction
		<i>New clause added;</i>
22.2DV.2 D1		The controller for a motor-compressor employed on a unit in which water is used as the heat exchange medium shall open all ungrounded conductors to the motor-compressor unless: a) the unit uses double walled heat exchangers that employ a vented interface; or b) the unit is equipped with a refrigerant pressure relief valve or a rupture member that will safely relieve pressure.
		<i>New clause added;</i>
22.11DV.1		A door or cover of an enclosure giving access to a fuse shall be hinged, sliding type, pivoted, or equivalent and provided with an automatic latch, and secured in a manner that requires a tool for opening, for fuses other than: a) fuses connected in Class 2 circuits; b) extractor type fuses that have their own enclosures; c) control circuit fuses, provided that the control circuit loads (other than fixed loads, such as pilot lamps) are housed in the same enclosure as the fuses; or d) supplementary type fuses rated 2 A or less used in small, auxiliary resistance heater circuits having a maximum rating of 100 W. This is not required if more than one door or cover has to be opened to provide access; only one of these doors or covers needs to comply with this requirement.
		<i>New clause added;</i>
22.11DV.2		An interlock that is required to reduce the risk of electric shock shall open all supply conductors. An interlocking mechanism shall be: – engaged before parts in a hazardous voltage circuit can be energized; and – located so that unintentional operation is unlikely during normal servicing.



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22.104DV DR		<p><i>New clause added;</i></p> <p>Hot water storage tanks connected to refrigerating systems shall meet the requirements of CSA 22.2 No. 110, and UL 174 or UL 1453.</p>
22.112DV.9		<p><i>New clause added;</i></p> <p>The requirements for the pressure relief indicated in Clauses 22.112DV.6 through 22.112DV.8 are:</p> <p>a) a rupture member or pressure relief valve that will relieve the pressure at not more than 40% of the highest pressure defined in Annex EE; or</p> <p>b) a fusible plug, provided that the critical pressure of the refrigerant used does not exceed the relieving pressure specified above, and that the saturation pressure of the refrigerant used, at the temperature marked on the plug, does not exceed the relieving pressure specified above. However, the pressure-relief device required in accordance with Clause 22.112DV.7 shall not be a fusible plug.</p>
22.115DV D1		<p><i>New clause added;</i></p> <p>Charges greater than m³ may be used if in compliance with the charge limits and mitigation methods of ANSI/ASHRAE 15 (USA) and/or CSA B52 (Canada). All other requirements of this standard still apply.</p> <p>The refrigerant mass of each refrigerating system with A2 and A3 refrigerant shall not exceed m1 as defined in Annex GG.</p> <p>The refrigerant mass of each refrigerating system for non-fixed factory sealed single package units with A2L refrigerant shall not exceed m1 as defined in Annex GG.</p>
22.116		<p><i>New clause added;</i></p> <p>This clause contains requirements for flammable refrigerants. See standard for details.</p>
22.117		<p><i>New section added;</i></p> <p>Hot surfaces</p> <p>See standard for details.</p>
22.119- 22.137DV.4		<p><i>New clauses added;</i></p> <p>These sections contain requirements for UV-C systems.</p> <p>See standard for details.</p>



CLAUSE	VERDICT	COMMENT
		<i>New clauses added;</i>
23		<p>Internal wiring</p> <p>This section contains requirements for internal wiring exposed to UV-C radiation. See standard for details.</p>
24	Info	<p>Components</p> <p>Modification:</p>
24.1.4		<ul style="list-style-type: none"> • REFRIGERANT DETECTION SYSTEMS SELF RESETTING 300 • REFRIGERANT DETECTION SYSTEMS NON SELF RESETTING 30 • electromechanical proof of airflow control 100 000 • self-resetting electrical PRESSURE-LIMITING DEVICE 3 000 • non-self-resetting electrical PRESSURE-LIMITING DEVICE 300
		<i>New clause added;</i>
24.1.3DV.1		<ul style="list-style-type: none"> • SELF-RESETTING THERMAL CUT-OUTS 100 000 • NON-SELF-RESETTING THERMAL CUT-OUTS 6 000
		<i>New clause added;</i>
24.1.4DV.3 D2		<ul style="list-style-type: none"> • contactors which control the motor-compressor or other motor loads 100 000 • contactors, relays, and sequencers/time delay relays controlling electric heat elements 100 000 • safety shut-off valves, normally open 300 • safety shut-off valves, normally closed 100 000
		<i>New clause added;</i>
24.102		<p>The PRESSURE-LIMITING DEVICES used in TRANSCRITICAL REFRIGERATING SYSTEMS shall comply with IEC 60730-2-6 and</p> <ul style="list-style-type: none"> – shall be of type 2A or 2B; – shall have a trip free mechanism of type 2J; – the deviation and drift shall not exceed + 0 %.
25	Info	<p>Supply connection and external flexible cords</p>
25.3 DV DR		<p><u>Knockouts intended for field wiring connections shall remain in place when a force of 44 N is applied at a right angle to the knockout by a 6.4 mm diameter mandrel having a flat end.</u></p> <p>Compliance is determined by test.</p> <p>The mandrel shall be applied at the point considered most likely to cause movement of the knockout.</p>



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25.7DV DR		<p>The supply cord of appliances for outdoor use shall be between 1,5 and 3 m long and shall be either an EXTRA HARD USAGE or a HARD USAGE CORD.</p> <p><u>A dehumidifier intended for use for water damage restoration of commercial/household properties shall employ an outdoor-use power-supply cord that is not less than 1,83 m or more than 7,6 m. The cord shall be flexible and of Type SOW, SOOW, STW, STOW, STOOW, SEW, SEOW, SEOOW, SJOW, SJOOW, SJTW, SJTOW, SJTOOW, SJEW, SJEOW, or SJEOW.</u></p> <p>Cord connected appliances installed in an Information Technology Equipment (ITE) room may have a power supply cord of up to 4,5 m in length.</p>
27	Info	<p>Provision for earthing</p> <p><i>New clause added;</i></p>
27.5DV.2		<p>Heat Pump Pool Heaters shall have a provision for equipotential bonding by at least one wiring connection located on the external surface of the supply terminal box. The connection point must be suitable to terminate a 6 AWG solid copper conductor.</p>
30	Info	<p>Resistance to heat and fire</p>
30.103DV.1		<p>Materials in a compartment handling conditioned air for circulation through a duct system shall have a flame spread rating of not more than 25, and a smoke developed rating of not more than 50, when tested as specified in CAN/ULC-S102 and UL 723. Alternately, the material shall be evaluated and determined to have a maximum optical density of 0.5 or less and an average optical density of 0.15 or less and a peak heat release rate of 100 kW or less when tested in accordance with UL 2043. If a unit is intended for installation in a building plenum, then the entire unit shall be considered to be in a compartment handling conditioned air for circulation through a duct system. This requirement does not apply to the following:</p> <p>e) moulded or formed components (not liners) of polymeric materials in such quantities that their total exposed surface area within the compartment does not exceed 0.93 m². <u>Materials shall have a flame spread rating of not more than 25, or shall comply with the requirements of the vertical burning test for classifying materials 5 VA or 5VB in accordance with UL 94 and Test 5 V (500 W) of CAN/CSAC22.2 No. 0.17 with a flammability rating of 5 VA;</u></p> <p><u>h) air filters and media wheels or plates meeting the test requirements in UL 900 or ULC S111.</u></p>
31	Info	<p>Resistance to rusting</p>



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		<i>New clause added;</i>
31DV.1 D1		The test does not apply to enclosures that are intended for outdoor use and are protected against corrosion by a coating designated G90 in accordance with ASTM A90/A90M or by other metallic or non-metallic coatings that provide equivalent protection.
		<i>New section added;</i>
32		Radiation, toxicity and similar hazards This section contains requirements for the UV-C irradiance test. See standard for details.
Annex DD	Info	Requirements for operation, service and installation manuals of appliances using flammable refrigerants
		<i>New clause added;</i>
DD.1DV		For appliances that are not intended to be serviced, the following shall apply: a) Maintenance and repair manuals and decommissioning manuals are not required. b) Installation instructions do not need to include content of DD.9, DD.10, or DD.13.
		<i>New section added;</i>
DD.3		Information in manual The following information shall be specified in the manual where the information is needed for the function of the manual and as applicable to the appliance. See standard for details.
		Removal and evacuation When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, for FLAMMABLE REFRIGERANTS it is important that best practice is followed since flammability is a consideration. The following procedure shall be adhered to:
DD.9		<ul style="list-style-type: none">• remove refrigerant;• purge the circuit with inert gas (optional for A2L);• evacuate (optional for A2L);• purge with inert gas (optional for A2L);• open the circuit by cutting or brazing. <u>The REFRIGERANT CHARGE shall be recovered into the correct recovery cylinders. For appliances containing FLAMMABLE REFRIGERANTS other than A2L REFRIGERANTS, the system shall be purged with oxygen-free nitrogen to render the</u>



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		<p><u>appliance safe for FLAMMABLE REFRIGERANTS. This process may need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems.</u></p> <p><u>For appliances containing FLAMMABLE REFRIGERANTS, other than A2L REFRIGERANTS, REFRIGERANTS purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum.</u></p> <p><u>This process shall be repeated until no refrigerant is within the system. When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. This operation is absolutely vital if brazing operations on the pipe-work are to take place.</u></p> <p><u>Ensure that the outlet for the vacuum pump is not close to any POTENTIAL IGNITION SOURCES and that ventilation is available.</u></p>
Annex EE	Info	Pressure tests
EE.4	Info	<p>Pressure test value determined under testing carried out under standstill conditions</p> <p><i>New clause added;</i></p>
EE.4.1DV.1		<p>In order to determine the maximum standstill pressure, the appliance shall be charged in accordance with the instructions and then soaked in the highest operating temperature specified by the manufacturer with power off until the refrigerating system pressure has stabilized within $\pm 1\%$ of the mean system pressure for a period of not less than 30 min.</p> <p><i>New clause added;</i></p>
EE.4.1DV.2		<p>For multi-split appliances, using flammable refrigerants and applied in compliance with Annex 101. DVG, the pressure test value for indoor coils shall be at least five times the maximum pressure developed during standstill.</p>
EE.5	Info	<p>Fatigue test option for Clauses EE.1 and EE.4.2</p> <p><i>New clause added;</i></p>
EE.5.1DV D1		<p>For multi-split appliances using flammable refrigerants and applied in compliance with Annex 101. DVG, the test shall be conducted at 100% of the test pressure determined in Clauses EE.2, EE.3, or EE.4.</p>
Annex FF	Info	Leak simulation tests
		General
FF.1		<p>A leakage of refrigerant is simulated at the most critical point in the REFRIGERATING SYSTEM. The method to simulate a leakage at the most critical</p>



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		point is to inject refrigerant vapour through a suitable capillary tube at that point. A critical point is a joint in the refrigerant system tubing, a bend of more than 90°, or other point judged to be a weak point in the refrigerant containing system due to the thickness of the metal, exposure to damage, sharpness of a bend or the manufacturing process. A quantity of refrigerant leaked is equal to the rated REFRIGERANT CHARGE or the amount that will leak as determined by test. The refrigerant is injected at the most critical point and the most unfavourable direction at ambient temperature (20 °C to – 25 ° C). <u>Where LFL is referenced in this annex, the LFL shall be taken at the nominal composition as specified in ISO 817.</u>
FF.2	Info	Test methods
		<i>New clause added;</i>
FF.2.1DV D1		The leak rate shall not exceed 600 g/s.
		<i>New clause added;</i>
FF.2.2DV D1		In "switched off" mode, the appliance shall remain connected to the mains, and safety mitigation controls, such as refrigerant detection system and circulation airflow or safety shut-off valves, shall be allowed to function as intended.
		<i>New clause added;</i>
FF.2.4DV D2		The test shall be conducted in a room that is draft free (less than 0.5 m/s airflow velocity) and of sufficient size to conduct the test.
		<i>New clause added;</i>
FF.2.5DV D2		For appliances using A2L refrigerants, these requirements apply, after replacing "25% of the LFL" with "75% of the LFL" in two places and replacing "15% of the LFL" with "50% of the LFL".
Annex GG		Annex GG has been greatly modified. See standard for new requirements.
		<i>New annex added;</i>
Annex JJ		Allowable opening of relays and similar components to prevent ignition of A2L refrigerants
		See standard for details.
		<i>New annex added;</i>
Annex KK		Test method for hot surface ignition temperature for A2L
		See standard for details.



CLAUSE	VERDICT	COMMENT
		<i>New annex added;</i>
Annex LL		Refrigerant detection systems for A2L refrigerants See standard for details.
		<i>New annex added;</i>
Annex MM		Refrigerant sensor location confirmation test See standard for details.
		<i>New annex added;</i>
Annex NN		Flame arrest enclosure verification test for A2L refrigerants See standard for details.
		<i>New annex added;</i>
Annex OO		UV radiation conditioning See standard for details.
Annex 101.DVB	Info	Electrical Marking Determination <i>New section added;</i>
101.DVB.5		Determination of short-circuit current ratings See standard for details.
		<i>New annex added;</i>
Annex 101.DVF		Additional markings See standard for details.
		<i>New annex added;</i>
Annex 101.DVG		Additional requirements for multi-split system appliances See standard for details.
		<i>New annex added;</i>
Annex 101.DVJ		Non-integral UV-C germicidal lamp systems See standard for details.



CLAUSE	VERDICT	COMMENT
		<i>New annex added;</i>
Annex 101.DVK		Requirements for photovoltaic systems (PVs)
		See standard for details.
