STANDARDS UPDATE NOTICE (SUN)
ISSUED: August 23, 2017

STANDARD INFORMATION

Standard Number: UL 412
Standard Name: Refrigeration Unit Coolers
Standard Edition and Issue Date: 5th Edition Dated August 22, 2011
Date of Revision: January 9, 2017
Date of Previous Revision of Standard: 5th Edition Dated September 17, 2013

EFFECTIVE DATE OF NEW/REVISED REQUIREMENTS

Effective Date: **January 25, 2019**

IMPACT, OVERVIEW, AND ACTION REQUIRED

Impact Statement: A review of all Listing Reports is necessary to determine which products comply with new/revised requirements and which products will require re-evaluation. **NOTE:** Effective immediately, this revised standard will be exclusively used for evaluation of new products unless the Applicant requests in writing that current requirements be used along with their understanding that their listings will be withdrawn on Effective Date noted above, unless the product is found to comply with new/revised requirements.

Overview of Changes:

- Addition of Requirements for Remotely Operated Unit Coolers
- Update and Clarification of Controls Requirements; Add Alternate Protective Electronic Controls Requirements and Alternate Spacings Requirements
- Addition of Reference to Across-The-Line Capacitor Standards
- Revisions to Refrigerant Requirements

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

If the applicable requirements noted in the table are not described in your report(s), these requirements will need to be confirmed as met and added to your report(s) such as markings, instructions, test results, etc. (as required).

Client Action Required:

Information – To assist our Engineer with review of your Listing Reports, please submit technical information in response to the new/revised paragraphs noted in the attached or explain why these new/revised requirements do not apply to your product (s).

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 – Please immediately identify any current Listing Reports or products that are no longer active and should be removed from our records.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
18	Info	**Bonding for Grounding**
18.13		*New clause added;* Functional grounding shall not be relied upon for equipment grounding or bonding.
19	Info	**Capacitors (Electrical Components)**
19.5		*New clause added – Radio interference capacitors shall comply to UL 60384-14*
19.6		*New clause added – Added requirements for capacitors that complies with UL 60384-14*
24	Info	**Motor Overload Protection**
24.2.3		*Added and revised requirements for protective electronic circuit providing motor protection;* Except as indicated in 24.2.1 (c) and (f), a protective electronic circuit providing motor protection shall comply with one of the following: a) Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991; ~~. When the protective electronic circuit relies upon software as a protective component, that part of the software providing the required motor protection shall comply with the Standard for Software in Programmable Components, UL 1998. If software is relied upon to perform a safety function, it shall be software Class 1.~~ b) Standard for Automatic Electrical Controls – Part 1: General Requirements, UL 60730-1 as well as the Standard for Automatic Electrical Controls for Household and Similar Use, Part 2: Particular Requirements for Temperature Sensing Controls, UL 60730-2-9; ~~. If software is relied upon to perform a safety function, it shall be software Class B.~~ c) 25.21 and the protective electronic circuits tests in Section 70A; or, d) Not create any risk of fire, electric shock or injury to persons under abnormal conditions with the protective electronic circuit rendered ineffective (open or short-circuited), e.g. use of a redundant circuit or control. ~~Exception: A protective electronic circuit providing motor protection is not required to comply with Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991 or Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1 if there is no risk of fire,~~

		~~electric shock or injury to persons during abnormal testing with the protective electronic circuit rendered ineffective. The need for software to comply with Standard for Software in Programmable Components, UL 1998 or Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1 can be based on the actual construction and operation of the motor within the equipment. This could include a consideration of the protective electronic circuit being provided with independent redundant protective devices.~~
24.2.5		*Added new clause – Added new requirements for software in a protective electronic circuit*
25	Info	**Switches and Controllers**
25.1		*Added new requirement;* A switch or other control device shall be rated for the load which it controls as determined by the Temperature Test – Cooling Mode, Section 50, and the Electric Defrost Test, Section 51. <u>Items to consider in determining the device rating could include the voltage, current, power factor, control device ambient temperature and other similar parameters. Power factor requirements for each specific load type are specified in 60A.5 (a) – (d).</u>
25.3.1		*New clause added;* As an alternative to complying with 25.1 – 25.3, a switch or other similar controlling device shall comply with the Overload and Endurance Test – Switching Devices, Section 60A.
25.10	Info	*Added new alternative standards about defrost cycle and temperature limiting controls. They shall comply with one of the following:* *g) UL 508 or* *h) clause 25.21 and the protective electronic circuits tests in Section 70A.*
25.11.1		*New clause added;* In reference to 25.10 (b), (c), (e), and (h), when determining the acceptability of a protective control, the control pollution degree shall be as specified in 40A.3 (a) – (d). If the protective control: a) Has a protective electronic circuit, the factors in Table 24.2 shall be considered; and, b) Uses software as a required part of the protective electronic circuit, the software shall comply with 24.2.5 (b) or (c).
25.11.2		*New clause added;* In reference to 25.10 and 25.11, a device providing motor overload protection shall comply with the requirements in Section 24.

25.11.3	*New clause added;* Protective controls other than those referenced in 24.2.1(a), 24.2.1(b) and 25.9(b) shall: a) Be an integral part of the appliance; b) Control the load(s) directly other than as specified in 25.11.4; and c) Comply with the endurance cycle requirements as specified for temperature-limiting controls in 56.1.2 (b) or (c).
25.11.4	*New clause added;* In reference to 25.11.3(b), if a protective control indirectly controls the load through a switching device, the switching device shall be an integral part of the appliance and comply with the endurance cycle requirements specified for temperature-limiting controls in 56.1.2 (b) or (c).
25.11.5	*New clause added;* The cutout calibration temperature of a heater protective (temperature-limiting) or defrost cycle control shall be ±10°F (±6°C) of its maximum marked set-point temperature.
25.11.6	*New clause added;* The cutout calibration pressure of a pressure protective control (pressure-limiting device) shall not exceed 105 percent of its maximum marked setting.
25.12	*Addition and revision of requirements about switch or control provided as interlock;* A switch or control provided as an interlock or interlocking mechanism shall comply with 25.10, 25.11.1, 25.11.3, and 25.11.4.~~the Standard for Industrial Control Equipment, UL 508; the Standard for Special-Use Switches, UL 1054; or the Standard for Switches for Appliances – Part 1 General Requirements, UL 61058-1. The interlock switch or control shall have an endurance rating of 100,000 cycles of operation at not less than the load it controls.~~
25.12.1	*New clause added;* Appendix B, Operating and Protective (”Safety Critical”) Control Functions, shall be referenced to determine whether a control function is considered to result in a risk of fire, electrical shock or injury to persons.
25.14	~~An operating control, including of the electronic type, shall comply with 25.10 or one of the following:~~ ~~a) The Standard for Solid-State Controls for Appliances, UL 244A;~~ ~~b) The Standard for Industrial Control Equipment, UL 508; or~~ ~~c) The Standard for Power Conversion Equipment, UL 508C.~~ Except as specified in 25.16, an operating control, including of the electronic type, shall comply with: a) One of the standards specified in 25.10 (a) – (g);

	b) The requirements in this Standard as far as they reasonably apply; or c) One of the following standards: 1) Standard for Solid-State Controls for Appliances, UL 244A 2) Standard for Automatic Electrical Controls – Part 1: General Requirements, UL 60730-1, and the applicable Part 2 standard from the UL 60730 series; or 3) Standard for Power Conversion Equipment, UL 508C.
25.15	*New clause added;* A general-use snap switch shall comply with the Standard for General-Use Snap Switches, UL 20.
25.16	*New clause added;* An operating control not complying with 25.14: a) Shall be powered entirely by no more than one extra-low-voltage circuit; comply with the Limiting Impedance Test in the Standard for Industrial Control Equipment, UL 508; or comply with the low-power test requirement determined as specified in Clause 19.11.1 of the Standard for Safety of Household and Similar Electrical Appliances, Part 1: General Requirements, UL 60335-1; and b) if used to control a motor-compressor, shall comply with the endurance cycle requirements in 56.1.2(a).
25.17	*New clause added;* An operating control that complies with 25.14 shall also comply with the following: a) For electronic controls – Installation Class 2 for electromagnetic Compatibility (EMC) shall be in accordance with Electromagnetic Compatibility (EMC) – Part 4-5: Testing and Measurement Techniques – Surge Immunity Test, IEC 61000-4-5; b) Category II shall be the overvoltage category; c) Insulating materials shall have a minimum comparative tracking index (CTI) of 100 (Material Group III); d) The applicable pollution degree shall be as specified in 40A.3 (a) – (d); and, e) The endurance cycle requirements specified by either: 1) Table CC.2 of the Standard for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Temperature Sensing Controls, UL 60730-2-9, with the operating control (limiters) endurance cycle requirements being applied; or, 2) The Overload and Endurance Test – Switching Devices, Section 60A.

	New clause added;
25.18	If an operating control complying with 25.14 indirectly controls the load through a switching device, the endurance cycle requirements in 25.17(e) shall be applied to the switching device.
	New clause added;
25.19	If a control can be used to reduce the risk of fire, electric shock or injury to persons under abnormal operating conditions of the appliance, but a redundant control (of similar or different design) operates to perform the identical function, the circuit shall be evaluated to determine which control will be relied upon as the protective control. The control determined to be the protective control shall comply with the protective control requirements in 25.10. The control determined to be the operating control is not required to comply with the protective control requirements but shall comply with the operating control requirements in 25.16 or with 25.14 and 25.17.
	New clause added;
25.20	A thermistor shall comply with Annex J of the Standard for Automatic Electrical Controls – Part 1: General Requirements, UL 60730-1 or the Standard for Thermistor-Type Devices, UL 1434. The calibration shall be as specified in 25.11.5. If a thermistor is used: a) To reduce the risk of fire, electric shock or injury to persons under abnormal operating conditions of the appliance, the minimum number of endurance cycles shall be 100,000. b) In other sensing applications of the appliance, the minimum number of endurance cycles shall be 6,000.
	New clause added;
25.21	A protective control as referenced in 24.2.3(c) or 25.10(h) and having a protective electronic circuit: a) In which electronic disconnection of the circuit could fail, shall have at least two components whose combined operation provides the load disconnection; b) Shall prevent a risk of fire, electric shock or injury to persons under the relevant fault conditions specified in Section 70A.2; c) In which an overcurrent protective device opens during application of any of the fault conditions specified in 70A.2, shall utilize an overcurrent protective device complying with the requirements applicable to that component. The fault condition causing the overcurrent protective device to open shall be repeated and the overcurrent protective device shall again open the protective electronic circuit. If the overcurrent protective device complies with Standard for Miniature Fuses: Part 1, Definitions for Miniature Fuses and General Requirements for Miniature Fuse-Links, IEC 60127-1 as well as an

	applicable Part 2, then the protective device shall additionally comply with the Fuse-Link Test in Section 70A.5; d) d) In which a conductor of the printed wiring board becomes open-circuited during the fault conditions test in 70A.2, then: 1) The printed wiring board shall comply with the Needle-Flame Test in Annex E of Standard for Safety of Household and Similar Electrical Appliances, Part 1: General Requirements, UL 60335-1 or have a minimum flammability rating of V-0 when tested in accordance with the vertical flame test described in the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94; 2) Any loosened conductor shall not reduce spacings below the values specified in the relevant Sections 39 – 40A; and 3) The specific test in which the printed wiring became open-circuited shall be repeated a second time. There shall be no risk of fire, electric shock or injury to persons and spacings shall not be reduced below the values specified in the relevant Sections 39 – 40A; e) Shall maintain its required functions when subjected to the EMC related stresses specified in the Electromagnetic Compatibility (EMC) Tests, Section 70A.3; and, f) That relies upon a programmable component for one or more of its safety functions shall be subjected to the Programmable Component Reduced Supply Voltage Test, Section 70A.4, unless restarting at any point in the operating cycle after interruption of operation due to a supply voltage dip will not result in a risk of fire, electric shock or injury to persons. The test shall be carried out after removal of all batteries and other components intended to maintain the programmable component supply voltage during supply source (mains) voltage dips, interruptions and variations.
25A	*New section added;* **Remotely Operated Unit Coolers** This new section includes new construction requirements for any unit cooler function enabled in response to wireless external communication or data signals (see standard for section details).
38A	*New section added;* **Information Technology Equipment**
38A.1	Information technology equipment such as a printer, visual display unit, router, communication connectors/data ports or computer shall comply with the Standard for Information Technology Equipment – Safety – Part 1: General Requirements, UL 60950-1.

40A	Info	*New section added;* **Alternate Spacings – Clearances and Creepage Distances** Clearances and Creepage requirements in UL 840 are applicable as an alternative to the specified spacings requirements in sections 39 and 40 (see standard for section details).
41	Info	**Refrigerant**
41.1	Info	*Added alternative requirement for refrigerant;* The kind of refrigerant intended for use with the unit cooler shall: ~~comply with the Standard for Refrigerants, UL 2182.~~ a) Have flammability characteristics that have been evaluated in accordance with the Standard for Refrigerants, UL 2182; or, b) Be subjected to a compositional analysis to confirm a composition consistent with a refrigerant specified in the Standard for Designation and Safety Classification of Refrigerants, ANSI/ASHRAE 34.
41.2	Info	In reference to 41.1(b), the chemical composition of the refrigerant, including the nominal composition (types and percentages) of a blended refrigerant, shall be determined by analytical testing in accordance with 70B using: a) Infrared analysis for single component refrigerants; or b) Gas chromatography for blended refrigerants.
56	Info	**Defrost Heater Control Tests**
56.2	Info	**Calibration test**
56.2.1		A defrost cycle control and temperature limiting control, shall comply with the requirements pertaining to the calibration of temperature limiting controls ~~in one of the standards specified in 25.10 (a), (b), or (c)~~ as specified in 25.11.5 for a temperature protective control. A pressure protective control shall comply with the calibration requirements in 25.11.6.
60A		*New section added;* **Overload and Endurance Test – Switching Devices** This test applies to switches or other similar control devices as specified in 25.1, 25.2 or 25.3 (see standard for section details).
70A		*New section added;* **Protective Electronic Circuit Tests**

	For protective electronic circuit tests. Following the application of the operational fault conditions in accordance with 70A.2.2 – 70A.2.5, there shall be no risk of fire, electric shock or injury to persons. Electrical live parts or moving parts shall not be exposed. The appliance shall comply with the Dielectric Voltage Withstand Test in Section 52.
70A.1- 70A.2.5	
70A.3	Added new section “Electronic Compatibility (EMC) Tests”
70A.3.1- 70A.3.9	An appliance having a protective electronic circuit intended to comply with 24.2.3(c) or 25.10(h) shall be subjected to the electromagnetic phenomena specified in 70A.3.3– 70A.3.9, each applied one at a time
70A.4	Added new section “Programmable Component Reduced Supply Voltage Tests”
70A.4.1- 70A.4.3	An appliance shall continue to either operate normally from the same point in its operating cycle at which the voltage decrease occurred or a manual operation shall be required to restart the appliance. In addition, there shall be no risk of fire, electric shock or injury to persons. Electrical live parts or moving parts shall not be exposed. The appliance shall comply with the Dielectric Voltage-Withstand Test in Section 52.
70A.5	Added new section “Fuse-Link Test”
70A.5.1- 70A.5.4	The following test is applicable to an appliance provided with a protective electronic circuit intended to comply with 24.2.3(c) or 25.10(h) and in which a miniature fuse-link opens during the application of one or more of the operational fault conditions specified in 70A.2.
70B	*New section added;* **Refrigerant Identification Tests** These tests are applicable to refrigerants required to be subjected to a compositional analysis in accordance with 41.1(b) and 41.2. The infrared analysis in 70B.2 applies to single component (“pure”) refrigerants. The gas chromatography analysis in 70B.3 applies to blended (more than one component) refrigerants.
70B.2- 70B2.3	Addition of requirements for single component refrigerant. An infrared analysis shall be performed.
70B.3- 70B3.3	Addition of requirements for blended refrigerants. A gas chromatography analysis shall be performed.
72A	*New section added;* **Protective Electronic Circuit Test** The manufacturer shall periodically conduct a test of the protective electronic circuit to verify the device is functional for protecting against conditions that could cause risk of fire, electric shock or injury to persons.

72B		*New section added;* **Annual Refrigerant Identification**
72B.1		A refrigerant tested in accordance with the Infrared Analysis in 70B.2 shall be subjected to an annual Infrared Analysis conducted in accordance with 70B.2. The spectrum obtained shall indicate the same composition as that recorded in the original spectrum.
72B.2		A refrigerant tested in accordance with the Gas Chromatography Analysis in 70B.3 shall be subjected to an annual Gas Chromatography Analysis conducted in accordance with 70B.3. The results obtained shall indicate the same composition as that recorded in the original plot.
APPENDIX B		Added Table B1.1 “Operating and protective (safety critical) control functions
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