TRANSITIONING HVAC APPLIANCE CERTIFICATIONS

TO UL 60335-2-40 / CSA C22.2 NO. 60335-2-40

THIS INFORMATION APPLIES TO: UL 1995 / CSA C22.2 No. 236, UL 484, CSA C22.2 No. 117, UL 474, CSA C22.2 No. 92, AND OTHER HVAC APPLIANCE SAFETY STANDARDS

This revision addresses the new effective date January 1, 2024 for HVAC Appliances described here within to certify under the superseding standard UL 60335-2-40 / CSA C22.2 No. 236 2nd Edition.

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INTRODUCTION

An evolving regulatory landscape will be ushering in major changes for HVAC equipment in the coming years. The transition to a new standard will bring about more stringent testing requirements for which equipment must comply in order to reach the market. With that in mind, it is crucial for the HVAC industry to gain an in-depth understanding of these new regulations in order to know what is required of their products. Developing a broad knowledge of these requirements now will provide for a smoother road through testing later, avoiding costly delays and increasing speed to market.

Currently, UL 1995 / CSA C22.2 No. 236 serves as the overarching harmonized standard for HVAC equipment, the 4th Edition having been in effect since February 2015, and a 5th Edition published in June 2015. The current 4th Edition standard will remain active for ETL certification through January 1, 2024. After that date, products must be certified to the superseding standard UL 60335-2-40 / CSA C22.2 No. 60335-2-40 or other applicable equipment standards. The 5th Edition of UL 1995 will only be required for equipment not within the scope of UL 60335-2-40.

While it is anticipated that the majority of products within the scope of UL 1995 / CSA C22.2 No. 236 will be placed into UL 60335-2-40 / CSA C22.2 No. 60335-2-40, please note that some equipment will be covered by other standards. For example, refrigeration equipment such as rack systems and remote refrigeration systems will be covered by UL 60335-2-89 / CSA C22.2 No. 60335-2-89. The transition to these standards will bring new, more stringent testing requirements to HVAC products than have been seen in the past with UL 1995.

The majority of products on the market that are affected by this change are currently certified to UL 1995, but it also affects Room Air-Conditioners and Dehumidifiers certified to UL 484, CSA C22.2 No. 117, UL 474, and CSA C22.2 No. 92 respectively. To help provide for a smooth transition of all affected HVAC certified appliances to UL 60335-2-40, this white paper provides an overview of UL 60335-2-40, giving a glimpse of the test requirements, highlights its differences from current HVAC standards and the benefits of working with a third party organization to conduct your HVAC equipment testing.

Effective Dates:

The previous effective date for transitioning UL 1995 products to UL 60335-2-40 was November 30, 2022. Manufacturers and industry representatives requested the date be pushed to align with other regulatory requirements. Therefore, the new effective date is January 1, 2024 and applies to all products within the scope of the 2nd Edition of UL 60335-2-40 / CSA C22.2 No. 60335-2-40.

Some products are already on the market which were certified to the 1st Edition of UL 60335-2-40 and CSA C22.2 No. 60335-2-40. These products must comply with the new safety requirements of the 2nd Edition sooner than products certified to the legacy HVAC industry standards which are still in effect. The effective date for products certified to the 1st Edition to comply with the 2nd Edition is November 30th, 2020.

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*This table clarifies the different effective dates dependent on which standard the HVAC Appliance is currently certified.

Standard to which Appliance is Currently Certified	Effective Date
UL 60335-2-40 1st Edition	November 30, 2020
CSA C22.2 No. 60335-2-40 1st Edition	
UL 1995 – Heating and Cooling Equipment	January 1, 2024
CSA C22.2 No. 236 – Heating and Cooling Equipment	
UL 484 – Room Air Conditioners	
CSA C22.2 No. 117 – Room Air Conditioners	

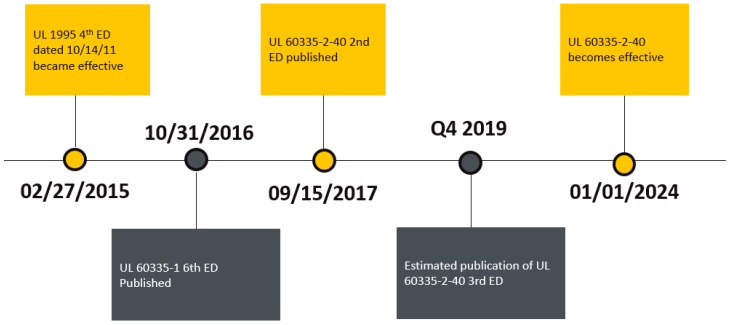
UL 60335-2-40: 2nd Edition

While not required until January 1, 2024 for products certified to UL 1995, the UL 60335-2-40 standard is currently active and includes in its scope matched and packaged air conditioners/heat pumps, partial units (standalone systems), liquid chillers and hydronic fan coil units, hot water heat pumps, dehumidifiers and supplemental heaters (designed as part of an appliance package). The scope of the 2nd Edition does not specifically state the industry product term "Room Air-Conditioner", but the standard does provide coverage for these appliances as air conditioners/heat pumps as defined by NFPA 70: 2017 clause 440.60. Examples are PTAC: Packaged Terminal, CRAC: Computer Room, Console Type, Enclosure Type, In-Wall, Portable or Spot, RV: Recreational Vehicle, and Window-installed Type.

The standard is based upon IEC 60335-2-40, 5th Edition and now includes equipment with flammable refrigerants (with limitations similar to what is in UL 484). It should be noted that Part 1, UL 60335-1 is used as the basis for most of the requirements. UL 60335-2-40 replaces, adds, deletes, or otherwise modifies Part 1 requirements as they are applicable to specific HVAC equipment.

The standard is harmonized with CAN/CSA-C22.2 NO. 60335-2-407 (Canada). Specific bi-national deviations are shown in UL 60335-2-40 to address regulatory and safety situations present in both Canada and the U.S.

Currently legacy industry standards UL 1995, CSA C22.2 #236, UL 484, CSA C22.2 #117, UL 474 and CSA 22.2 #92 may still be used to certify equipment that will eventually require certification to UL 60335-2-40/CSA C22.2 No. 60335-2-40.



Future Standard Development

It is anticipated that UL 60335-2-40 / CSA C22.2 No. 60335-2-40 will be updated multiple times before the effective date January 1, 2024. Intertek is engaging with the industry and conducting our own investigation of a range of current products on the market to propose corrections and adjustments. Our experts' goals are to ensure test requirements are realistic to the application, and we aren't placing undue burdens on the construction which aren't in alignment with regulations and installation codes. Work is in progress for the 3rd Edition which is based on the 6th Edition of IEC 60335-2-40. Some of the major changes include:

- Expansion of the scope to include dehumidifiers without motor-compressors (desiccant type).
- Expansion of the scope to include thermoelectric heat pumps.
- Expansion of the scope to include Class A2L flammable refrigerants.
- Expansion of the scope to include Class B1 refrigerants.
- UV-C requirements for appliances incorporating germicidal type lamps
- Adoption of many of the existing flammable refrigerant language within the standard, but also setting a further compliance landscape for multi-split systems.
- Expanding flammable refrigerants to appliances that are not considered factory sealed appliances (such as split systems), and increasing flammable refrigerant charge levels.

Harmonized IEC Standard

Of the many benefits to certifying your products to the harmonized IEC standard, perhaps foremost among them is the ability to design units to one base standard. The capability to design and test with that level of uniformity can help expedite the development and testing process, increasing your speed to market. In addition, IEC standards are international standards which are globally recognized.

While certain countries may have their own national deviations or other required national standards, there are more than 50 member countries of the IECEE for the CB Scheme. Utilizing this

harmonized standard provides the ability to test for multiple countries and regions in one project. For example, testing for the Saudi Arabian and North American markets simultaneously would have many tests that overlap, saving time and money on the overall testing process.

UL 1995 vs. UL 60335-2-40

Legacy HVAC industry safety standards were focused on the construction of the appliance. As an example materials had specific requirements for thickness and protective coatings. The transition to UL 60335-2-40 / CSA C22.2 No. 60335-2-40 will bring about more rigorous testing requirements in place of construction requirements. Instead of requiring a specific material thickness or coating, under the new requirements we perform impact tests and accelerated environmental tests to determine if the construction is safe. The new testing protocols are conducted to assess a number of criteria including input and temperature, resistance to fire, stability and durability, among others. It is these testing protocols that represent the major testing differences between UL 1995 and UL 60335-2-40. UL 60335-2-40 has a similar type test for each of the tests used in UL 1995 or UL 484, but it goes beyond that as it has many tests which are unique compared against what has been done in the past for product certifications.

DISSIMILAR UL 60335-2-40 TESTS	UL 60335-2-40 ED 2
Test	**Test Clause**
Marking Durability	7.14
Transformer + Associated Circuits Overload	17
Locked Rotor	19.7
Loss of Phase (Single Phasing)	19.8
Electronic Circuit Fault	19.11
Abnormal Temperatures	19.103
Loss of Charge	19.101DV.1
Impact Resistance	21.1
Capacitor Discharge (cord connected)	22.5
Non-detachable Parts	22.11
Handle/Knob/Grip/Lever Strain	22.12
Heater Element Rupture	22.24
Capacitor Voltage Rating	24.5
Ground Bond	27.5
Screw/Nut Torque	28.1
Ball Pressure	30.1
Glow Wire	30.2
Nichrome Wire Test	101.DVI.3

Input and Temperature Testing

Under UL 60335-2-40, the manufacturer declares the most severe conditions for testing, and input marking restrictions are placed on combined appliances (motor and heating elements). These restrictions are as follows: +5% or 20W (whichever is greater), -10% and +5% or 0.10 A (whichever is greater), -10%.

The test voltage for temperature is determined by the most unfavorable overvoltage or overvoltage condition within 6% of the marked rating.

Rain, Marking Durability, Leakage Current, and Ground Bond Testing

UL 60335-2-40 also calls for increased requirements such as the IP Test from IEC 60529 to prove protection against the ingress of water. The IPX4 rating is required at a minimum for outdoor appliances and can be more stringent than the UL 1995 Rain Test, as a handheld spray device is used to spray water at more unfavorable angles.

Marking durability tests are also required by using a petroleum spirit to ensure that the markings are still legible after rubbing. Additionally, leakage current and ground bond testing must be conducted on all non-cord connected products.

Abnormal Testing

UL 60335-2-40 requires additional abnormal testing of components and temperatures of which HVAC developers should be aware:.

- Temperature tests must be performed at 10 Kelvin above and 5 Kelvin below the manufacturer specified conditions from the Input Temperature test.
- Transformer protection compliance is now tested by performing a short circuit and overload test.
- Motors may require additional abnormal testing under locked rotor conditions.
- 3 Phase motors must comply with loss of phase where one phase is disconnected under normal operation.
- Electronic circuits exceeding 15W may require fault testing by open or short circuits applied to the component. Compared to UL 1995 4th Edition, the standard will also now require that a non-self-resetting thermal cut-out be provided and proven to operate during the abnormal electric heat testing.
- Heater elements are subjected to a rupture test to ensure they do not contact metal parts in case of rupture or sagging.
- There are new requirements for polymeric materials and non-metallic material in proximity to electrical connections. More information on this provided in the next section.

Resistance to fire (Section 30) and Non-Metallic Material Flammability in Proximity to Electrical Connections (Annex 101.DVI)

In order to determine the overall stability and flammability of HVAC products, the standard includes two testing protocols to assess these criteria. The ball pressure test (IEC 60695-10-2) determines a materials dimensional stability when subjected to stress at elevated temperatures. This test is conducted on non-metallic external parts, insulating material supporting live parts, and supplementary and reinforced insulation made of thermoplastic. Although, components which comply with the standards in Annex DVA of UL 60335-1 and UL 60335-2-40 are not required to comply with the ball pressure test.

The glow wire test (IEC 60695-2-11) is conducted on non-metallic materials to assess the material's ability to not produce particles capable of spreading fire. In the event that there is a fire, the test assesses the ability of the flame to extinguish within 30 seconds.

For connections carrying more than 0.2 A, and parts within a 3mm distance of such connections, the requirements are as follows:

- Material to be at least V-1/VTM-1.
- Material to pass Glow Wire Test at 850°C and 750°C
- Material to have Glow Wire Flammability Index (GWFI) of at least 850°C and pass Glow Wire Test at 750°C

It should be noted that GWFI is determined in IEC 60695-2-12, V-1 rating is determined by IEC 60695-11-10 and VTM-1 rating is determined by ISO 9773.

Annex 101.DVI evaluates materials that are in proximity to circuits which have a circuit load greater than 60 W. It applies to connections which are not welded or soldered and only to connections mated to the component from the appliance. It does not apply to the internal connections of components that are compliant with a component standard. Dependent on the materials flammability classification it may or may not be in compliance without the need for further testing. Materials that don't comply with the required flammability classification require additional testing to the new Nichrome Wire Test to determine whether or not non-metallic materials in proximity of electrical connections pose a fire hazard to the equipment.

Conclusion

Although UL 60335-2-40 will not go into effect until 2024, it is important for the HVAC industry to be informed, and start planning now for their products to be tested to the new standard. Not having an in depth understanding of the requirements of the new standard can bring about unexpected delays, costing additional time and money.

Working with Intertek provides you with a partner with years of experience within the IEC/EN 60335 standards in international certifications and testing. Intertek has numerous CB testing laboratories and offers hands on training for SATELLITE™ Testing personnel. Our preliminary design reviews ease client transitions by making them aware of current construction issues. Intertek Consulting Services also supplements any areas where clients may not have sufficient resources or expertise.

Intertek is a leading Total Quality Assurance provider to industries worldwide. Our network of more than 1,000 laboratories and offices and over 43,000 people in more than 100 countries, delivers innovative and bespoke Assurance, Testing, Inspection and Certification solutions for our customers' operations and supply chains. Intertek Total Quality Assurance expertise, delivered consistently with precision, pace and passion, enabling our customers to power ahead safely.

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