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Marking Guidance for Air Conditioners with Low GWP Refrigerants

Reference UL 60335-2-40 4th Edition

LET'S GO

Introduction

Environmental policy is driving a shift from the current refrigerants used in appliances to the adoption of low global warming potential (GWP) refrigerants. The lower GWP alternatives present new hazards, including increased flammability risks. With the shift towards more environmentally friendly refrigerants, preparation is necessary for fire protection and the safe usage of flammable refrigerants. 2022 marked the first phase of the Environmental Protection Agency's phase-down of R410-a refrigerant in new HVAC systems, aligning with Congress' American Innovation and Manufacturing (AIM) Act. The goal is to replace it with more environmentally friendly alternatives, specifically A2L refrigerants. A2Ls, as categorized by ASHRAE, are low-GWP refrigerants and are expected to replace the phased-out HFCs in most applications. Globally, A2Ls have been used safely for years. More than 8 million mini-split systems using R-32 and more than 68 million automobile air conditioners using A2Ls have been installed. In line with the AIM Act, the use of R410-a refrigerant will continue to be phased down and as of 2025, new systems may no longer be produced with refrigerants having a GWP over 700.

The transition will not occur overnight. For many years, there will be a mix of products in the field. Some will operate with "legacy" refrigerants (A1 refrigerants), while new products are more likely to have lower GWP flammable refrigerants (A2L refrigerants). During this phase, proper labeling of refrigerant type is crucial for the public, as well as for service personnel and first responders attending or operating near the equipment.

To enhance their safety, the Environmental Protection Agency (EPA) has referenced industry Standard UL 60335-2-40, the Standard for Household and Similar Electrical Appliances – Safety – Part 2-40: Particular Requirements for Electrical Heat Pumps, Air Conditioners and Dehumidifiers, and ASHRAE 15 in the use of conditions for the refrigerants listed as acceptable. UL 60335-2-40 was published recently by UL Standards & Engagement.

Marking and instruction requirements as per UL 60335-2-40

Markings and labeling on a product provide a multitude of information for installation and use of the product. The markings can also provide warnings to consumers and technicians about the classification of refrigerants used in an air conditioner unit.

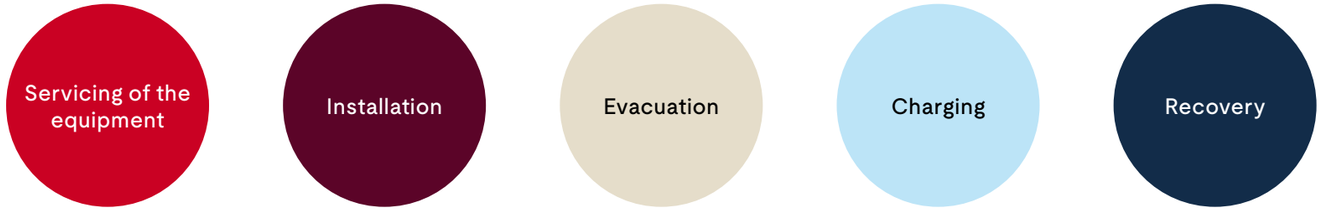
The HVACR industry's transition to low-global warming potential (GWP) refrigerants has the industry seeking clarification on the marking of refrigerants in an air conditioner unit. Clause 7 of UL 60335-2-40 gives a complete list of markings required on the outside of the product. The UL/CSA 60335-2-40 Technical Committee reviewed a request for interpretation related to the marking of refrigerant classes on appliances as per 4DV.1 D2 2DV, note 2DV, with multiple safety classes of refrigerants (for example, A1s and A2Ls).

The Technical Committee overwhelmingly confirmed that equipment must permanently identify the refrigerant installed and that equipment cannot be marked with alternative refrigerants of different safety classifications per ISO 817 (ASHRAE 34).

Implications of marking more than one classification of refrigerant

The alternative substances to HFC refrigerants, including but not limited to flammable A2L refrigerants, pose potential hazards that are not present with HFC refrigerants. As such, anyone using these substances in a professional setting should demonstrate a minimum basic competency regarding proper storage, safe handling and ignition prevention.

Permanent marking of the refrigerant in the units as per UL 60335-2-40 is essential for service personnel and consumers that will help in addressing the safe handling of refrigerant for the following purposes:



This step was considered necessary to limit not only errors in installation and servicing but also potential hazards that can manifest when an incorrect refrigerant is used or assumed to be used during the refrigerant transition period. For manufacturers, equipment containing flammable refrigerants must be designed and sold with additional safeguards, such as properly positioned sensors and alarms that sound when leaks are sensed. The application of additional markings and warnings for users, service personnel and first responders may also be overlooked if an A1, A2L, A2 or A3 product is marked incorrectly or not marked at all.

Request for interpretation

In 2024, there was a request for interpretation related to clause 7.1 of UL 60335-2-40, part of which states that “a means shall be provided to permanently identify the refrigerant installed. Appliances using flammable refrigerants shall not be marked with alternative refrigerants of different classification per ISO 817.”

For evaluation, the expectation is that compliance with 7.1 must be assessed at the factory with the permanent marking for the refrigerant in use. This expectation for marking the single refrigerant class at the factory was overwhelmingly confirmed through a Technical Committee vote (44-4). Products that do not permanently mark the refrigerant type at the factory are not considered in compliance with the requirements of UL 60335-2-40. Specifically, for A2L refrigerants, this helps ensure that all applicable safety requirements are met before the product leaves the factory.

Note that a new proposed change has been circulated to require that if multiple refrigerants within the same safety class are marked on appliances as per 4DV.1 D2 2DV, note 2DV, then the product in which the coils are installed must comply with all the requirements for all refrigerants marked on the coil. The Technical Committees will consider the proposed change below as further clarification for this topic. Reinforcing refrigerants of different safety classes, shall not be used.

Proposal to the fourth edition UL 60335-2-40 and Amendment 1 currently out for comment.

4DV.1 D2 Unless otherwise stated, all references to “appliance” shall apply to everything covered by the scope of this Part 2. Components and subassemblies evaluated to the following Annex’s of this Part 2 are not an appliance:

- Annex LL
- Annex 101.DVJ
- Annex 101.DVK

Note 2DV: partial units, evaporators, and condensers are examples of subassemblies and components which are evaluated as an appliance when a clause of this Part 2 references “appliance.”

7.1DV.3 DR Modification of Clause 7.1 of the Part 2 by replacing the third dashed item in the “Addition” with the following:

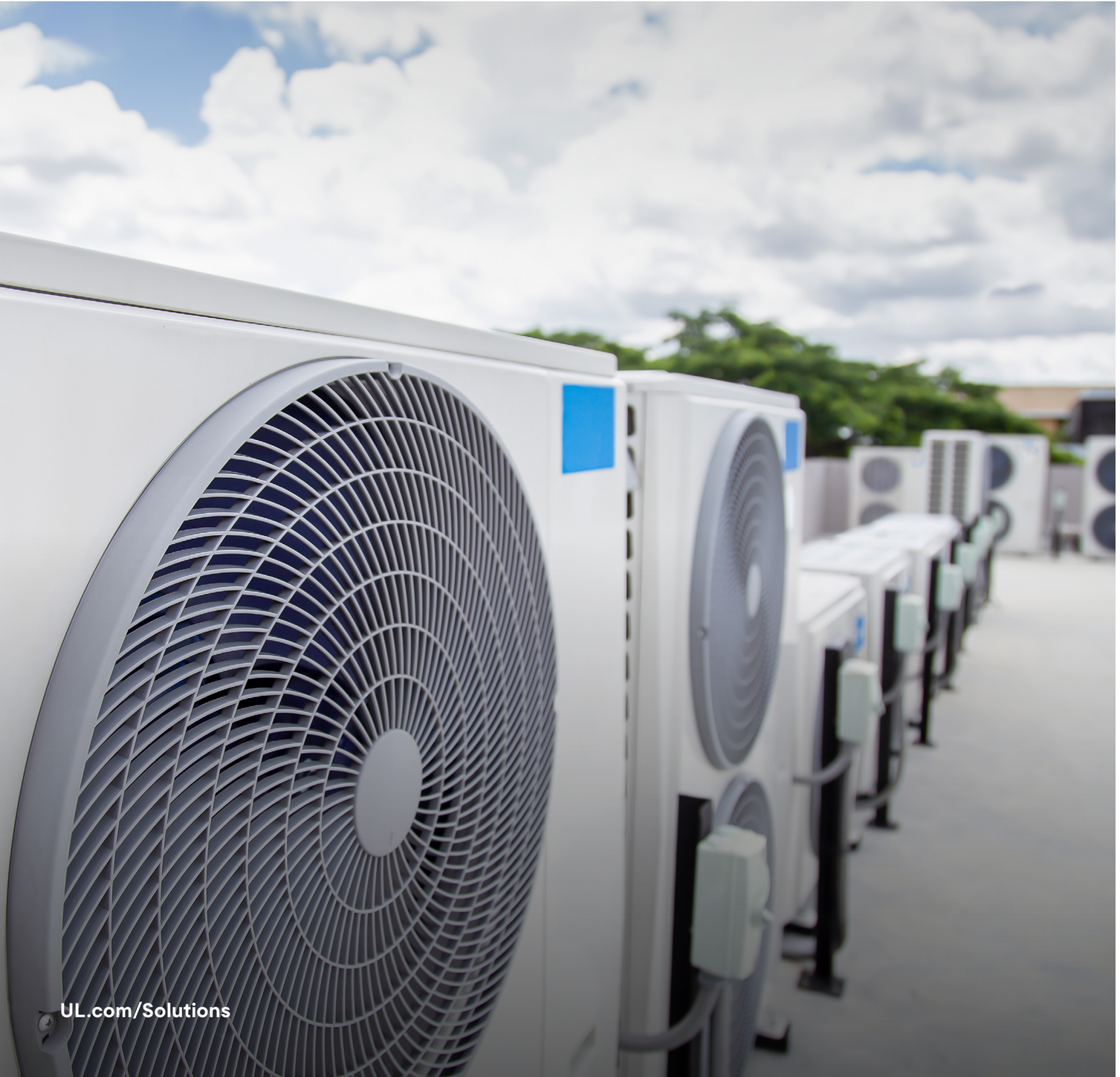
Refrigerant or refrigerants as designated under ISO 817. The appliance shall be permanently marked at the factory A means shall be provided to permanently identify the approved refrigerants. installed. Appliances using flammable refrigerants shall not be marked with alternative refrigerants of a different safety classification per ISO 817.

A partial unit or auxiliary devices that cannot be marked or provided with a nameplate, such as uncased coils, shall be provided with a distinctive model, part number, or type designation or the equivalent legibly marked on a tag attached to the partial unit or device. Partial units for use with flammable refrigerants shall be provided with a tag or plate which contains all required markings of Clause 7 and Annex 101.DVF. This tag or plate shall comply with Clause 7.1DV.3 so that it is visible after installation.

22.135DV D2 Add subclause 22.135DV to Clause 22 of the Part 2:

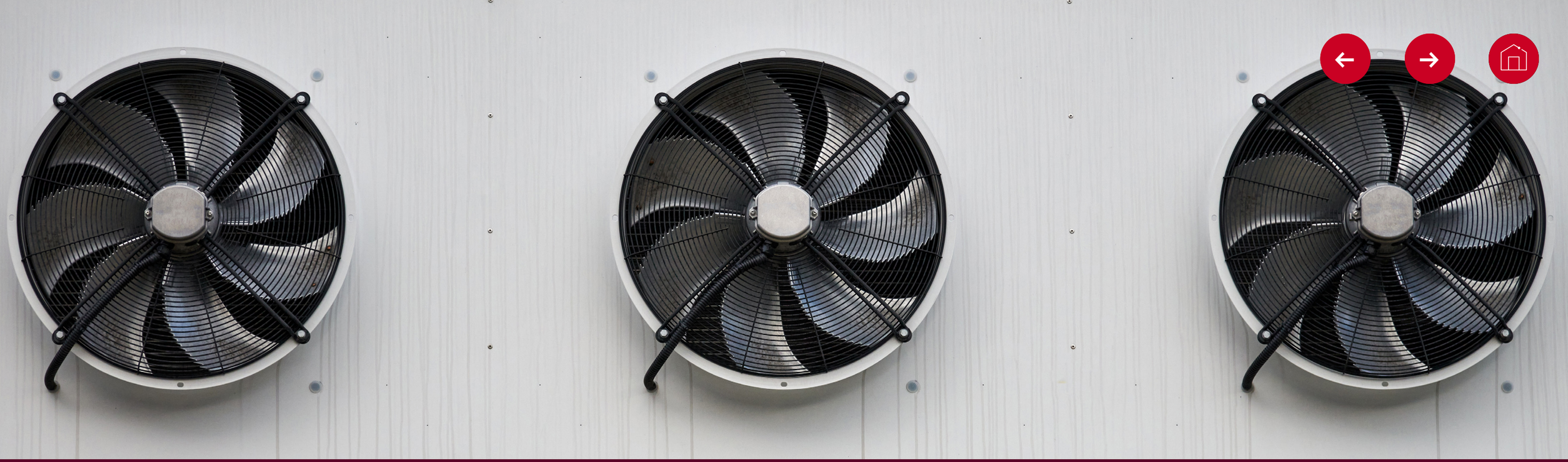
If an appliance is marked for use with alternative refrigerants of the same safety class, the appliance shall comply with all of the requirements of this standard for each refrigerant. The refrigerants shall be the same safety class in accordance with ISO 817.

DD.3.1DV.D1 If an appliance has labels or markings required by Clause 7 or Annex 101.DVF that are to be visible in the as-installed state, the installation manual shall have language that instructs the installer to not cover the labels or markings and shall give clear indication as to which labels or markings to which this applies.



UL Mark on air conditioning products

The UL Listed Mark on an HVAC unit lets homeowners know that the unit has met the required standards. When a unit is UL Certified, it means the components inside are also UL Recognized Components. This means that the manufacturers of these approved listings are inspected at a minimum of four times per year. This helps increase consumer confidence that the products are being manufactured to the UL Standard and the quality of the product hasn't deteriorated. Nearly 22 billion products annually hold the UL Mark.



Final note

The majority of the UL Technical Committee agrees that the marking shall be permanently fixed at the factory and that only one safety class shall be on all partial systems that make up the appliance.

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