UL Solutions

Certification of Coolant Distribution Units

What is a coolant distribution unit?

A coolant distribution unit (CDU) is an integral part of thermal management architecture. These devices are used in data centers and industrial cooling applications to manage and supply coolant to various equipment that needs to be cooled, such as servers, storage devices, electronics or various machinery.

The CDU plays a crucial role in the liquid cooling system, ensuring that the coolant is delivered at the correct temperature and pressure to maintain efficient heat removal and thermal management.

A typical CDU is designed with two individual liquid loops, which are separated by the heat exchanger. The heat exchanger absorbs the heat returning from the equipment and transfers it to another medium, which could be water, water-glycol based coolant or another refrigerant.

In data center applications, CDUs are used for liquid and immersion cooling of high-performance computing nodes/clusters where traditional air cooling is insufficient. Distributing coolant directly to the heat sources — either through the rack or directly to the component CDUs — helps manage thermal loads in an efficient and sustainable way.

Safety certification of coolant distribution units

Considering the two different design approaches and various industrial application, determining which ANSI/IECEE standards are applicable for a particular device is of high importance.

There are two ANSI/IECEE standards applicable to CDUs:

- UL/CAN/IEC 62368-1 Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements
- UL/CAN/IEC 60335-2-40 Household and Similar Electrical Appliances – Safety – Part 2-40: Particular Requirements for Electrical Heat Pumps, Air Conditioners and Dehumidifiers

Determining which of the two standards is applicable is straightforward:

CDUs designed for data centers and information technology equipment (ITE) applications shall be evaluated and certified under UL/CAN/IEC 62368-1 Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements 4th Edition unless they contain refrigerant liquid, in which case they should be certified under UL/CAN/IEC 60335-2-40.

UL/CAN/IEC 62368-1 4th Edition
This IEC-based standard covers audio, video and information and communication technology equipment, and includes a wide range of data center equipment and components. It is also a globally recognized and harmonized standard.

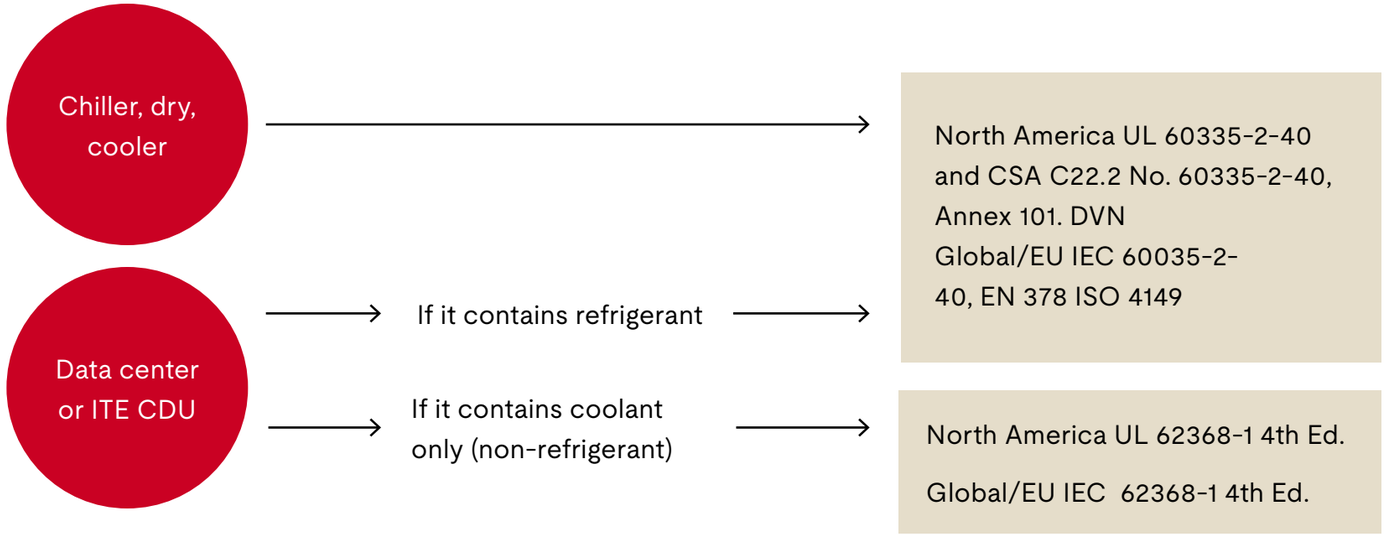
The following clauses of the standard reference requirements related to liquid cooling and insulating liquids.

- Clause 3.3.5.4: Insulating liquid terms and definition
- Clause 4.1.8: Liquids and liquid-filled components
- Annex G.15: Pressurized liquid-filled components or LFC assemblies
- Clause 4.4.4: Displacement of a safeguard by an insulating liquid
- Clause 5.4.12.1: General requirements
- Clause 5.4.12.2: Electric strength of an insulating liquid
- Clause 5.4.12.3: Compatibility of an insulating liquid
- Clause 5.4.12.4: Container for insulating liquid
- Clause 6.4.9: Flammability of an insulating liquid

For all other non-data center or ITE applications, CDUs shall be evaluated and certified to UL/CAN/IEC 60335-2-40.

The diagram below simplifies the decision-making process when determining the correct standard.

Certification of CDUs designed for data center or ITE application



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