

A2L LEAK DETECTION IN COMMERCIAL REFRIGERATION SYSTEMS

Background

Many commercial refrigeration systems are built around the larger compressors needed to manage CO₂ refrigerant loops (which need to reach pressures of up to 150 Bar/2100 psi). Others leverage ammonia as a refrigerant, but its toxicity means it may not be the ideal solution for some applications.

While some systems today leverage HFC refrigerants, those high-GWP compounds are also being phased out as part of the Kigali Amendment to the United Nations' Montreal Protocol. This international agreement sets benchmarks for countries around the world to phase out their use and deploy more environmentally friendly options.

Without a system redesign to accommodate the type of compressor needed to manage a CO₂-based system – which may not make sense for smaller convenience-store style systems - these platforms are shifting toward hydrofluoro-olefin refrigerants (sometimes known as A2L) which have a lower GWP than HFCs.

However, these refrigerants are also slightly flammable, and as such need a leak detection sensor in order to comply with UL requirements (specifically UL60335-2-40)

The evaporator coil of these systems – where a leak may be most likely to occur – is a challenging environment for sensor, with high condensation and variations in temperature. In addition, the mobile nature of commercial refrigeration equipment means the systems may be moved repeatedly to different locations.

Solution

The requirements under UL 60335-2-40 (as well as UL 60335-2-89) have many layers, but the core functionality requires that these systems have a system in place to detect the presence of a flammable refrigerant gas, and respond with a mitigation system (such as a fan) to eliminate any buildup before it can reach that refrigerant's lower flammability limit (LFL).

The sensors must all be factory-calibrated (and non-adjustable) and cannot be subject to poisoning from cleaning chemicals or other expected environmental conditions.

Sensata's Resonix™ RGD sensors feature a unique, patented technology that measures the acoustic resonance of the surrounding air in real-time. Typically mounted near the evaporator coil, the sensors can trigger mitigation, such as a fan, when A2L gas is detected - venting it before it reaches unsafe levels.

Contrary to residential HVAC systems, these components in these systems also generally run off an output of 12-24V DC, meaning the leak detection system must either use that voltage or incorporate a transformer - a feature available for the RGD sensor.



RECOMMENDED PRODUCTS

Reference on Diagram	Product	Features	Function
1	 Resonix RGD Leak Detection Sensor	<ul style="list-style-type: none">• Comply to UL60335-2-40 ed.4• Works with R32, R454A, R454B, R454C and R455A refrigerants• 15+ year lifetime	Detect A2L refrigerant leaks and help trigger mitigation

DIAGRAM



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Mailing Address: Sensata Technologies, Inc., 529 Pleasant Street, Attleboro, MA 02703, USA

CONTACT US

Regional head offices:
United States of America
Sensata Technologies
Attleboro, MA
Phone: 508-236-3800
E-mail: support@sensata.com
Netherlands
Sensata Technologies Holland B.V.
Hengelo
Phone: +31 74 357 8000
E-mail: support@sensata.com
China
Sensata Technologies China Co., Ltd.
Shanghai
Phone: +8621 2306 1500
E-mail: support@sensata.com