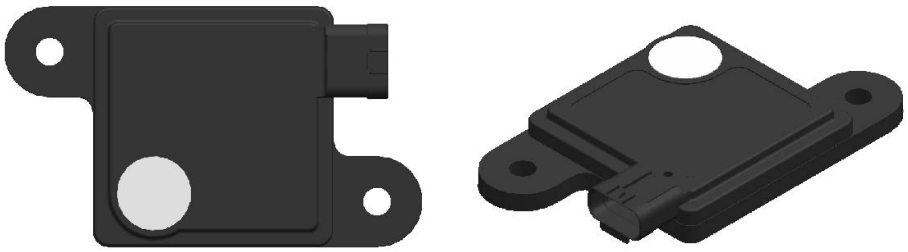
sensience

A2L GAS SENSOR

A2L Gas Detection Sensor

The **Sensience®** A2L Gas Detection Sensor, enabled by patented **NevadaNano* Technology**, is an all-in-one sensing solution for accurate refrigerant detection systems to save development time and effort while providing high system reliability.



High Reliability MEMs Technology

- Meets all AHRTI testing requirements including vibration testing, and is proven to be best-in-class
- Proven technology: hundreds of thousands of devices successfully deployed in hazardous environment applications
- Immune to poisoning; no calibration/maintenance
  - Insensitive to poisoning from chemicals listed in UL-60335-2-40 Annex LL
  - No false alarms due to ambient conditions with the built-in environmental sensor for temperature, humidity, and pressure

Industry Stewardship

- Proven Experience
  - Providing environmental sensing and protection to the HVACR industry for over 70 years
  - 15+ years of successful deployment of flammable gas sensing products
  - Extensive in-house reliability test capability and experience at Therm-O-Disc laboratories
  - Environmental Sustainability
  - Enables hydrofluorocarbon (HFC) phasedown using A2L refrigerants less than 750 GWP
  - Enables air conditioning and refrigeration systems using flammable refrigerants to meet building codes

THE OPERATING PRINCIPLE

The Molecular Property Spectrometer refrigerant gas sensor's transducer is a micro-machined membrane with a precision nano-calorimeter. The transducer continually samples the air to determine if a gas is present that matches the molecular properties of the refrigerant of interest. Sensor data are processed by patented algorithms to accurately report concentration, across a wide environmental range from -40°C to +80°C and 0 to 100% RH condensing conditions.

TECHNICAL SPECIFICATIONS

Refrigerant	• R-32 • R-454 Blends
Communication Interface	• RS-485 Modbus RTU output options: %LFL Alarm Threshold R32 7%-19% LFL R454B 10%-19% LFL • Digital serial UART (5V) - in development • Analog (0-3.3V) - in development • PWM Alarm output R32 7%-19% LFL R454B 10%-19% LFL
Supply Voltage/Current	• 5Vdc ± 10% • 80mA max
Agency/Compliance	• UL 60335-2-40 Annex LL
Operating Temperature	• -40 TO 80°C
Storage Temperature	• -40 TO 85°C (unpowered)
Operating Humidity Ranges	• 0 to 100% RH Condensing
Operating Pressure Ranges	• 65 TO 110 kPa
Measurement Range	• 0-100% LFL
Resolution	• 0.1% LFL
Response Time	• <15 seconds to 25% LFL step change
Lifetime	• 15+ years with no calibration required

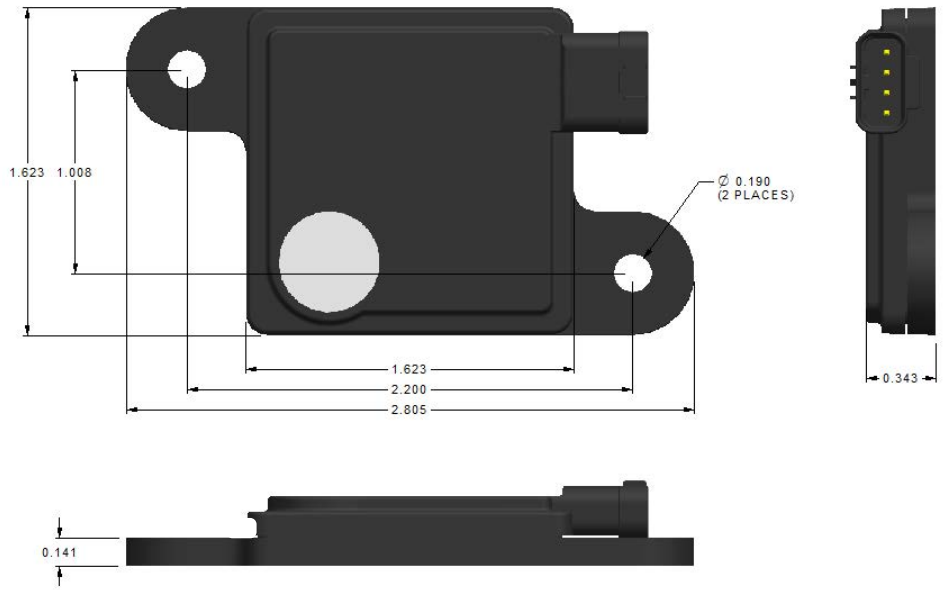
A2L Refrigerant Leak Detection

Long Lifetime Sensor

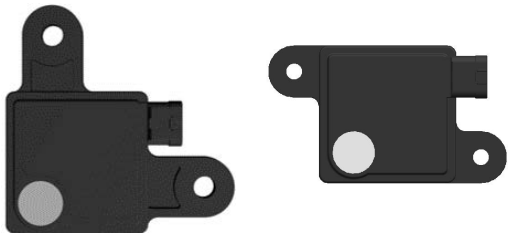
Immune to Poisoning No Calibration Needed

UL 60335-2-40 Annex LL Compliant

Basic Dimensions



30G A2L Refrigerant Sensor: Flexible Options, Easy to Apply



Custom Mounting Configurations Available

R32 **R454B** **R454C**

RS-485 Modbus RTU Best for Longer Distances; Temperature, RH, Absolute Pressure also Available.

UART Serial* Good for Engineering Development Testing

3.3V Analog* Short to Medium Distance; Only LFL% and Status Codes.

Pulse Width Modulation (PWM)* Alarm Output

***IN DEVELOPMENT**

A2L Gas Sensing Technology Comparison[1]

THERMODISC

REQUIREMENT	DESCRIPTION	MMM	NDIR1	TC	NDIR2	MOS1	MOS2	SOS	MOS3	NDIR3	MOS4	NDIR4
												[2]
Capable of Sensing A2L Gas		✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓
Capable to be Installed within Unit, Remote, Coil and Duct Work		✓	✓	✓	✓	✓	✓	✓	✓	✓	N/A	✓
UL60335-2-40 Annex LL Compatibility		✓	✓	✓	?	✗	✗	✓	✗	?	N/A	?
Voltage Operation	Can Operate with ± 10% Applied Rated Voltage	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓
Operation Cycle	Capable of 300 Operation Cycles for Self-resetting and 30 for Non-self Resetting	✓	✓	✓	✓	✓	?	✓	✓	✓	N/A	✓
Not Multiport device		✓	✓	✓	✓	✓	✓	✓	✓	✓	N/A	✓
Setpoint <25% LFL / Output when Exceeded		✓	✓	✓	✓	✓	✓	✓	✓	✓	N/A	✓
Preset Setpoint at Factory		✓	✓	✓	✓	✓	✓	✓	✓	?	N/A	✓
Non Adjustable Setpoint by User		✓	✓	✓	✗	✓	✓	✓	✓	?	N/A	✗
IEC 60079-29-1 for Group II Compatibility		✓	✓	✓	✓	✗	?	?	✓	?	?	?
Exposure Resistance	Operational for 480-490 minutes at 100% refrigerant exposure	✓	✓	✓	✓	?	✗	✓	✗	✗	N/A	✓
Nuisance Trips Avoidance	Requirements based on UL/CSA 60335 -2-40 LL.4ADV	✓	✓	✓	✓	✓	?	✓	✓	✗	N/A	✓
Response Time	Requirements based on IEC UL/CSA 60335-2-40, ASHRAE direct systems, machinery rooms and small residential direct systems and JRA 4068T:2016R requirements	✓	✓	✓	✓	✓	✓	✓	✓	✓	N/A	✗
Condensation Resistance	Requirements based on JRA 4068T:2016R requirements	✓	✓	✓	✓	✓	✗	✓	✗	✗	N/A	✗
Operating Temperatures	Sensor to meet full range as specified by manufacturer with lowest of -40°C	✓	✓	✗	✗	✗	✓	✗	✗	✗	N/A	✗
Accuracy of Setpoint	±20% of setpoint	✓	✓	✓	✓	?	?	✓	✓	?	N/A	✓
Output Signal for Trigger of Action		✓	✓	✓	✓	✓	✓	✓	✓	✓	N/A	✓
Vibration Resistance	Tested 1 hour in 3 planes and verified to detect refrigerant of 25% LFL or lower	✓	?	?	?	✓	?	✓	?	?	N/A	?
Self Testing / Hourly Self Test		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Active Trouble Alarm when Failure Detected		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Defined Life	Requirements based on IEC and UL/CSA LL.7	✓	✓	✗	✗	✓	✗	✓	✓	✗	N/A	✗
End of Life Indication	Sensor capability to indicate that replacement is required	✓	✓	✗	✗	✗	✗	✗	✓	✓	N/A	✓

LEGEND ✓ Yes ✗ No ? Not Specified

MMM	Micro Machined Membrane	**SS**	Speed of Sound
NDIR	Nondispersive Infrared	**NA**	Not Applicable
TC	Thermal Conductivity	**LFL**	Lower Flammability Limit, as Defined by ASHRAE Standard 34 LFL for R-32 is 14.4% v/v
MOS	Metal-Oxide Semiconductor		

[1] Study is based on AHRTI Report No. 9014.

[2] These are different manufacturers using the same technology.