



# sensience<sup>®</sup>

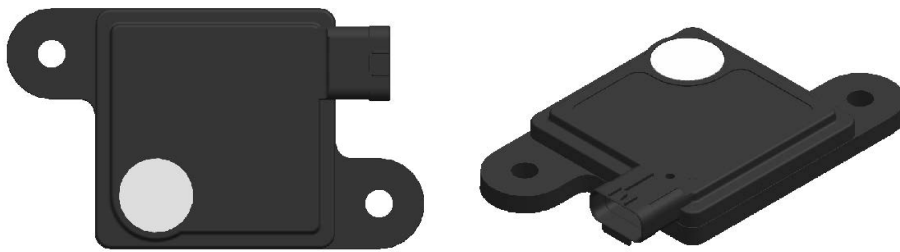
## A2L GAS SENSOR



# SENSIENCE<sup>®</sup>

## A2L Gas Detection Sensor

The **Sensience<sup>®</sup>** A2L Gas Detection Sensor, enabled by patented **NevadaNano<sup>®</sup> 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

<b>Refrigerant</b>	<ul style="list-style-type: none"><li>• Dual Detection R32/R454B</li><li>• R-32</li><li>• R-454 Blends</li></ul>
<b>Communication Interface</b>	<ul style="list-style-type: none"><li>• RS-485 Modbus RTU output options:<ul style="list-style-type: none"><li>• %LFL</li><li>• Alarm Threshold<ul style="list-style-type: none"><li>• R32 7%-19% LFL</li><li>• R454B 10%-19% LFL</li></ul></li></ul></li><li>• Digital serial UART (5V) - in development</li><li>• Analog (0-3.3V) - in development</li><li>• PWM Alarm output<ul style="list-style-type: none"><li>• R32 7%-19% LFL</li><li>• R454B 10%-19% LFL</li></ul></li></ul>
<b>Supply Voltage/Current</b>	<ul style="list-style-type: none"><li>• 5Vdc <math>\pm</math> 10%</li><li>• 80mA max</li></ul>
<b>Agency/Compliance</b>	<ul style="list-style-type: none"><li>• UL 60335-2-40 Annex LL</li></ul>
<b>Operating Temperature</b>	<ul style="list-style-type: none"><li>• -40 TO 80°C continuous, 85C intermittent</li></ul>
<b>Storage Temperature</b>	<ul style="list-style-type: none"><li>• -40 TO 85°C (unpowered)</li></ul>
<b>Operating Humidity Ranges</b>	<ul style="list-style-type: none"><li>• 0 to 100% RH Condensing</li></ul>
<b>Operating Pressure Ranges</b>	<ul style="list-style-type: none"><li>• 65 TO 110 kPa</li></ul>
<b>Measurement Range</b>	<ul style="list-style-type: none"><li>• 0-100% LFL</li></ul>
<b>Resolution</b>	<ul style="list-style-type: none"><li>• 0.1% LFL</li></ul>
<b>Response Time</b>	<ul style="list-style-type: none"><li>• &lt;15 seconds to 25% LFL step change</li></ul>
<b>Lifetime</b>	<ul style="list-style-type: none"><li>• 15+ years with no calibration required</li></ul>



**A2L Refrigerant  
Leak Detection**



**Long Lifetime Sensor**

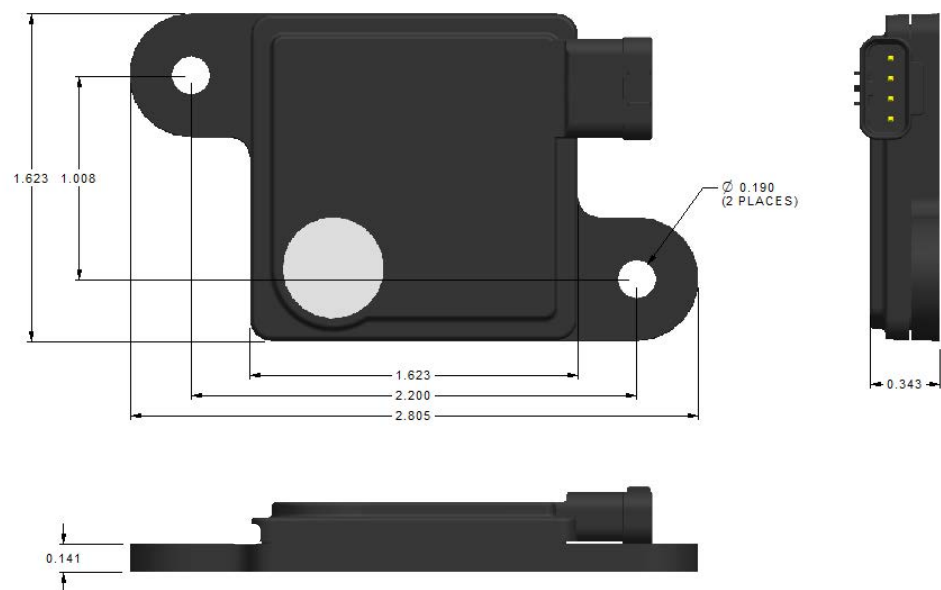


**Immune to Poisoning  
No Calibration Needed**



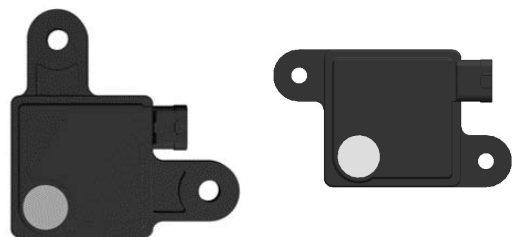
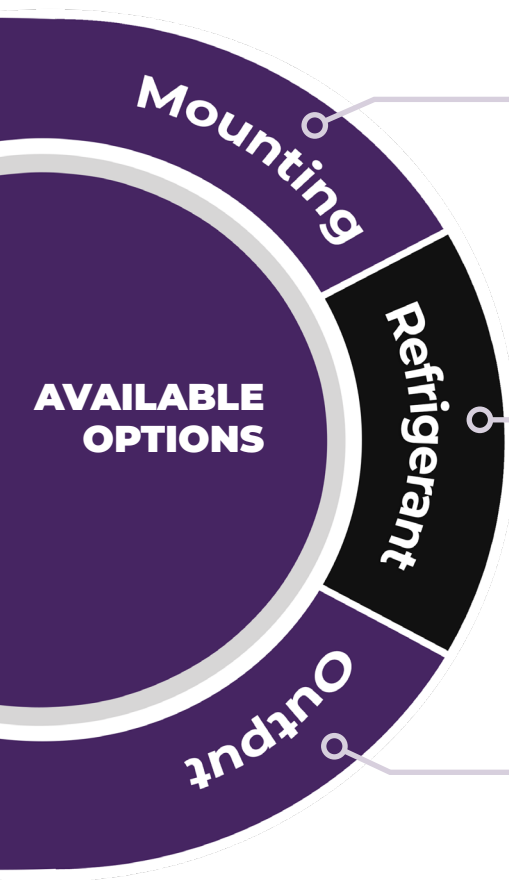
**UL 60335-2-40  
Annex LL Compliant**

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<sup>1</sup>

THERMO DISC

REQUIREMENT	DESCRIPTION	MMM	NDIR1	TC	NDIR2	MOS1	MOS2	SOS	MOS3	NDIR3	MOS4	NDIR4
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

<sup>1</sup> Study is based on AHRTI Report No. 9014.

<sup>2</sup> These are different manufacturers using the same technology.