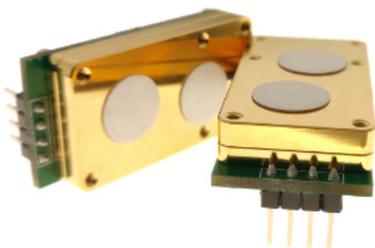


# SGX

## SENSORTECH

An Amphenol Company



### INIR4-R32

#### Key applications

- R32 leakage detection
- Residential gas monitoring
- Heat pumps
- Refrigeration
- Chill cabinets
- Vending machines
- Cold storage systems
- Air Conditioning



F-gas Regulation  
Kigali Amendment

# Refrigerant (A2L) R32 leakage detection sensor

# Datasheet

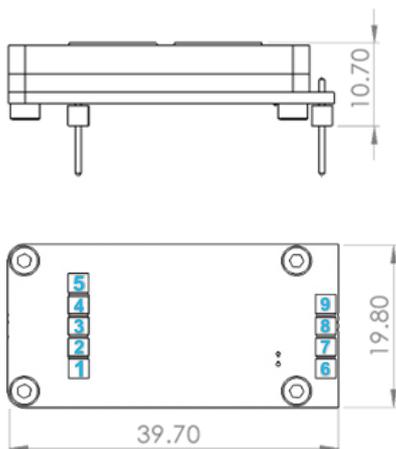
The **INIR4** is a user-friendly digital Gas Sensor, which is designed to use the latest SGX Sensortech's Non-Dispersive Infra-Red (NDIR) technology. It has been primarily designed for the purpose of gas leakage detection in both industrial and residential environments. Designed with the latest generation of power efficient CORTEX microcontrollers allows for high flexibility and functionality. Temperature compensation, good accuracy and simple implementation into end-user system make this sensor a perfect solution for gas leakage detection.



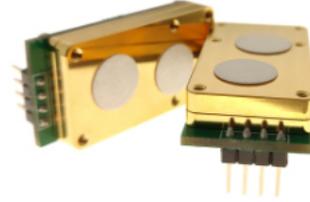
*Quality, Safety, Responsibility*

# Functional specifications

Power Supply	Min	Typical	Max
Supply Voltage	3.2 VDC	5 VDC	5.25 VDC
Average Current Consumption	30mA	32mA	35mA*
*Inrush Current can be up to 60mA			
Logic Outputs Level	LOW Voltage Level (VOL): 0.6V Maximum HIGH Voltage Level (VOH): 2.0V Minimum 1.6mA source current maximum		
Logic Inputs Level	LOW Voltage Level (VINL): 0.4V Maximum HIGH Voltage Level (VINH): 2.0V Minimum		
<b>Humidity (non-condensing)</b>			
Operating Humidity	0%	50%	99%
Storage Humidity	0%	50%	90%
<b>Temperature</b>			
Operating Temp.	-20°C	+20°C	+60°C
Storage Temp.	-20°C	+20°C	+60°C
Temp. Cycle Limits		0.8°C/min	1.3°C/min
<b>Pressure ( Compensation will be required )</b>			
Operating Pressure	60kPa	-	120kPa
Storage Pressure	60kPa	-	120kPa
<b>Output</b>			
PWM output	100Hz, 10-90% duty cycle for 0-7% R32 (5% duty cycle used for error indication) 0-2.8V amplitude		
<b>Serial communication</b>			
Digital signal format	8 data bits, 1 stop bit, no parity		
Standard baud rate	38400 as default		
<b>Dimensions</b>			
Length (L)	39.7 mm		
Width (W)	19.8 mm		
Height (H)	10.7 mm		
Weight	15 g		



**NOTE: All Dimensions in mm. All tolerances Linear +/- 0.1mm and Angular 0.5° unless otherwise stated.**



## Features

- **Factory calibrated** for up to 7% R32
- Linear approximation for 100% of range
- **High Resolution** up to 0.04% LFL
- **Detectivity Level** at 0.14% LFL
- **Temperature compensated**
- Serial port communication
- PWM output
- 0V/2.8V Alarm output
- **Dual channel operation**
- **Full Faults Diagnostics & Error Generation**
- **Typical Low power** consumption < 100mW (Average) in measurement mode, <30mW in standby mode.
- **Evaluation Kit** available including **PC software** for easy testing and calibration functions
- Meets UL 60335-2-40 / IEC 60079-29-1 / IEC60335-2-40 requirements

## Pin Configuration (Bottom View)

Pin	Name	Description
1	+2.8V	Voltage output
2	RXD	Data received by the INIR4
3	TXD	Data transmitted by the INIR4
4	N/C	Not connected
5	N/C	Not connected
6	VCC	3.2 Volts - 5.25 Volts DC input to INIR4
7	GND	GND Plane - 0V reference for INIR4
8	ALARM	Alarm out
9	PWM	PWM Out (0-2.8V), 5-90% modulation

## Design Considerations & Applications

### Warm-Up Time

The Warm-Up Time for the INIR4 sensor is 60 seconds after each power "ON" or every time when we are changing from Configuration to Normal/Engineering Mode. During this time data is not valid.

The Warm-Up time is not including the period that the sensor needs to reach the ambient temperature. The sensor though is capable of producing readings during the Warm-Up but with a higher error than stated in specifications.

### Calibration

For calibration process please read the appropriate Application Note 1, "Integrated IR Protocol & Calibration".

For optimum performance please use following cylinders:

Nitrogen or air
7% R32 for Span Cal

Always do Zero Calibration first followed by High Span.

### Gas Flow Rate

For valid evaluation and to keep tests consistent it is recommended to use 450 – 500 cc/min. flow rate to minimize any effects due to pressure variations in the INIR4.

### Digital Interface/Communication

Sensor can operate both in connection to computer as well as a standalone alarming component. The digital communication is realized using UART (RS232 TTL).

Sensor is compatible with INIR4 development kit software.

### Faults Monitoring/Error States

The Error monitoring and Fault generation happens every second transmitted by the UART. Regularly check all the Faults generated from the INIR4 to ensure errorless communication and rise appropriate alarms depending on the Fault code. Faults are also indicated using PWM signal (with 5% duty cycle in alarm mode).

### PWM Output

PWM Output duty cycle is updated once per second. Frequency is 100Hz as standard, but can be adjusted to customer requirements.

The sensor will give 10% duty cycle for 0% and 90% duty cycle for 100% of the concentration range.

### Alarm Output

Alarm level can be configured withing the software provided with the sensor. The default alarm level is 20% LEL (2.8% volume R32).

### Condensation, Dust & Extreme Conditions

Using the INIR4 in extreme environmental conditions may affect its performance. Typically, the module has a high corrosion resistance and temperature compensated linearized output.

### Pressure Compensation

INIR4 is not equipped with pressure compensation. Based on application environment external pressure compensation might be required.

## Typical performance characteristics

All Characteristics are related to a calibrated sensor and conditions: Temperature 20°C, Relative Humidity 10%RH, Pressure 101kPa, 500 to 1000 ml/min Gas Flow, averaging of 12 values, unless otherwise stated.

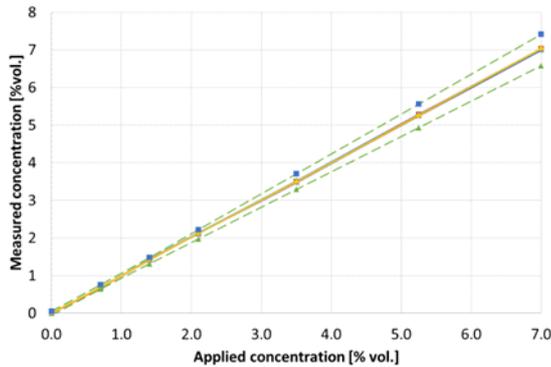
Test	INIR4-R32
Stabilisation or Warm-up Time (EN)*	0%vol. $\pm 0.1\%$ vol. in 60 seconds
Calibration Curve (EN) or Basic Error (AQ)	0 to 100% of full range $\rightarrow 0.1\%$ vol. or $\pm 10\%$ of Reading whichever is greater
Short Term Stability (EN) of the Displayed Value(AQ)	0%vol. = $\pm 0.05\%$ vol. 2.8%vol. = $\pm 0.1\%$ vol.
Minimum Resolution (AQ)	From 0 to 2.8% vol. $\rightarrow \pm 0.005\%$ vol.
Long Term Stability (EN) or Working Stability (AQ)	0%vol. = $\pm 0.2\%$ vol. / Month 2.8%vol. = $\pm 0.2\%$ vol. / Month
Temperature Error (with Compensation) (-20°C to +60°C, relative to 20°C)	0%vol. to 2.8%vol. = $\pm 0.2\%$ vol.
Humidity Error (10%RH to 90%RH, relative to 45%RH)	0%vol. = $\pm 0.1\%$ vol. 2.8%vol. = $\pm 0.3\%$ vol.
Response Time (without dust filter)	T90 <30s
Power Supply Variations (at $\pm 5\%$ of Nominal Voltage)	The Performance of the INIR4 is not affected by power supply variations as long as the power supply provides DC Regulated voltage according to specifications.
Power Supply Rejection Ration (PSRR) (at $\pm 5\%$ of Nominal Voltage)	at 1 MHz $\rightarrow 50$ dB, at 100 kHz $\rightarrow 68$ dB, at 10 kHz $\rightarrow 88$ dB
Uncertainty Error of Calibration	$\pm 0.15\%$ vol. Error of the Actual Reading

\* Wait for 45 mins for the Sensor to warm up and reach the Ambient Temperature before power on.

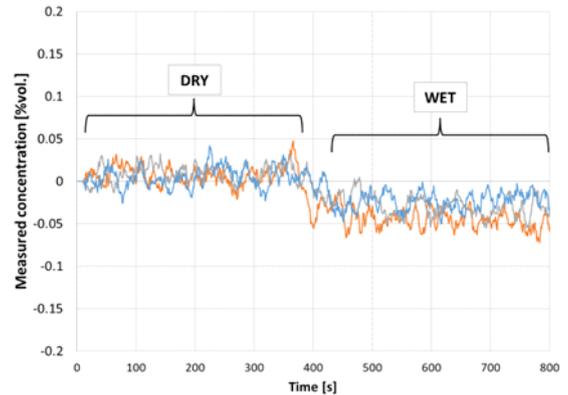
## Typical performance data

All Characteristics are related to a calibrated sensor and conditions, Temperature 20°C, Relative Humidity 10%RH, Pressure 101kPa, 500 to 1000 ml/min Gas Flow, averaging of 12 values, unless otherwise stated.

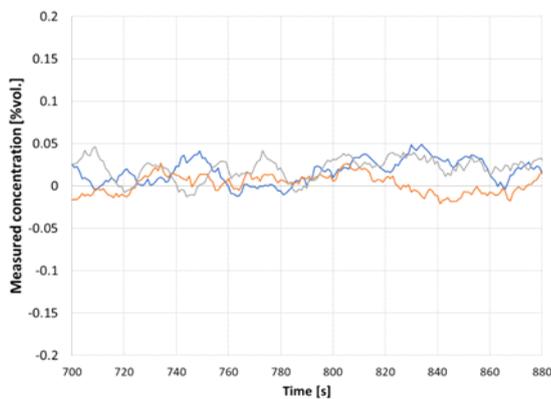
Typical linearity 0-7% R32



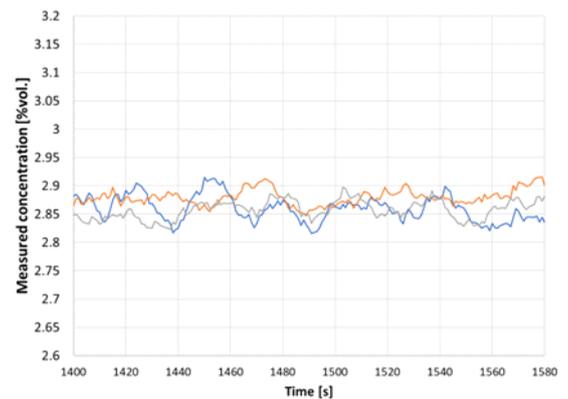
Typical humidity response



Typical Short Term Stability @0% R32



Typical Short Term Stability @2.8% R32



### Intended use

This device has been designed to be used as a gas detection component, but it the design is not certified for use in explosive atmospheres.

### ROHS compliance

Under the EU Directives, compliance testing is necessary for Pb, Cd, Hg, Cr (VI) and Br. The RoHS directive is effective since July 1, 2006. The regulations prohibit the use of these hazardous substances in new products sold after July 2003.



### WEEE directive

WEEE (Waste from Electrical and Electronic Equipment) is a directive that controls how electric and electronic equipment is handled and recycled effective since August 13, 2005. INIR4 clustered as component and SGX do not need to have a recycling scheme in place, but manufacturers may need to ensure WEEE compliance for their systems.



### Handling precautions

- Do not drop the sensor on the floor as this could cause damage to the pins or internal components.
- Avoid mechanical force against pins. Protect from dust and sprayed acidic particles.
- Do not immerse in water or other fluids.



### ESD precaution

ESD (Electrostatic Discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary subjected circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

**Warning! Plugging or Unplugging the Sensor while in operation may damage the device beyond repair. Always power down the instrument when performing maintenance.**



## Sensor Development Kit (SDK)

Sensor Development Kit is used as an efficient way to test and integrate the SGX Sensortech sensors into any application.

SDK includes everything needed to run INIR4 including an integration board and a PC application.



## Warranty & Warning

**The WARRANTY for all the INIR4 Gas Sensors is 2 years from the purchased date based on use according to this document and the INIR Application Note.**

**Warranty period or any extended warranties would be confirmed with the order confirmation.**

The warranty is invalidated if the sensor is used under conditions other than those specified in this datasheet. In addition, please pay attention to the following conditions as they will void immediately the WARRANTY:

1. Do not allow water condensing into the sensor or deep the sensor into water.
2. Do not change label or cover it with other stickers.
3. Do not over voltage or overcurrent the sensor; always observe the correct polarity of the input.
4. Do not solder directly onto the pins, pads or the external body of the sensor.
5. Do not drop on the floor or hit it with tools.
6. Do not open, cut or break sensor apart.
7. Do not expose the sensor to high levels of dust.
8. Do not expose the sensor to corrosive gases or operate under corrosive environments.
9. Do not paint or mark the sensor externally.
10. Do not use in acid environment or operate under gases containing acid vapours or particles.
11. Do not custom modify the sensor.
12. Do not clean the with acid.

## Certification

	INIR4	
Certificate	OBAC 22 ATEX 0196U	IECEX OBAC 20.0006U
Standards	PN-EN IEC 60079-0:2018-09, IEC 60079-0:2017 Ed. 7 IEC 60079-11:2011 Ed. 6	IEC 60079-0:2017 Ed. 7 IEC 60079-11:2011 Ed. 6
Product Marking	II 1G Ex ia IIB T4 Ga Pi=0.8W, Ui=6V, Li=0H, Ci=8.5µF	Ex ia IIB T4 Ga Pi=0.8W, Ui=6V, Li=0H, Ci=8.5µF
Special Conditions for Safe Use	<b>Power Input: 0.8W Maximum</b>	<b>Ambient temperature range: -40°C to +60°C</b>
Manufacturing & Certificate Address	SGX Europe sp. z o. o., 40-155 Katowice, 42 Konduktorska str., POLAND	

### DISCLAIMER:

SGX Europe Sp. z o.o. reserves the right to change design features and specifications without prior notification. We do not accept any legal responsibility for customer applications of our sensors. SGX Europe Sp. z o.o. accepts no liability for any consequential losses, injury or damage resulting from the use of this document, the information contained within or from any omissions or errors herein. This document does not constitute an offer for sale and the data contained is for guidance only and may not be taken as warranty. Any use of the given data must be assessed and determined by the user thereof to be in accordance with federal, state and local laws and regulations. All specifications outlined are subject to change without notice.

SGX Europe Sp. z o.o. sensors are designed to operate in a wide range of harsh environments and conditions. However, it is important that exposure to high concentrations of solvent vapours is to be avoided, both during storage, fitting into instruments and operation. When using sensors on printed circuit boards (PCBs), degreasing agents should be used prior to the sensor being fitted. SGX Europe Sp. z o.o. makes every effort to ensure the reliability of its products. Where life safety is a performance requirement of the product, we recommend that all sensors and instruments using these sensors are checked for response to gas before use.

Copyright© 2012-2022 SGX Sensortech All rights reserved.

Trademarks and registered trademarks are the property of their respective owners.

No part of this publication may be reproduced, distributed, or transmitted in any form or by any means, including photocopying, recording, or other electronic or mechanical methods, without the prior written permission of the publisher, except in the case of brief quotations embodied in critical reviews and certain other non-commercial uses permitted by copyright law.

For permission requests or technical support please contact or write to the publisher, addressed "Attention: Permissions Coordinator."