





INIR7-R290

Key applications

- R290 leakage detection
- Heat pumps
- Refrigeration
- Chill cabinets
- Vending machines
- Cold storage systems

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- Air Conditioning
- Automotive

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Refrigerant (A3) R290 Leakage detection sensor Gas: Propane

Datasheet

The **INIR7** is a user-friendly digital Gas Sensor, which is based on the Non-Dispersive Infra-Red (NDIR) technology. It has been primarily designed for the purpose of gas leakage detection in both industrial and automotive applications. Temperature compensation, good accuracy and simple implementation into end-user system make this sensor a perfect solution for gas leakage detection.

Quality, Safety, Responsibility



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Functional specifications

Power Supply	Mir	ו Typ	ical	Мах		
Supply Voltage	4.5 V	DC 24 VI	DC	30 VDC		
Current Consu	mption					
Average Current Consumption	-	-	45n	nA @ 5V (MAX for TTL) 25mA @ 12V 15mA @ 24V		
Inrush Current Consumption	-	-		90mA @ 5V 45mA @ 12V 30mA @ 24V		
Measurement			0-	-100 LEL		
Humidity (non-c	ondensing)				
Operating Humid	ity 0%	5 50)%	100%		
Storage Humidity	0%	5 50)%	90%		
Temperature						
Operating Temp.	-40°(C +2	0°C	+75°C		
Storage Temp.	-10°(C +2	0°C	+40°C		
Temp. Cycle Limi	ts			<1.3°C/min		
Pressure (Comp	ensation	will be re	quired)			
Operating Pressu	ire 80kF	Pa -		120kPa		
Serial communication CAN 2.0						
Digital signal form	nat 11 iden	11 identifier bit (CAN 2.0A)				
Standard baud ra	te 500Kbp	os as default				
Serial communio	cation RS	-485 (Moo	dbus)			
Digital signal form	nat 8 data	bits, 1 stop b	it, no parity			
Standard baud ra	te 38400b	ps as defaul	t			
Body Material		PP-C	GF20			
Dimensions						
Length (L)			67.0 mr	n		
Width (W)			76.0 mr	n		
Height (H)			20.5 mr	n		
vveight			26 g			
				ector designed according to		
	1234	<u>156</u>	OPTI	R 120-3-006-1-202 REYING ON:A		
			1			
Pin INIR7	R290-CAN	INIR7-R2	90-RS485	INIR7-R290-TTL		
Pin 1 Vsupply	1	Vsupply		Vsupply		
Pin 2 GND Pin 3 WakeU	o / Alarm	GND WakeUb / A	larm	GND WakeUp / Alarm		
Pin 4 Reques	t	Request		Request		
Pin 5 CAN H	1	RS485 B ²		RXD		
FIII O CAN_L		13400 A				
	Dimensions					





Features

- Factory calibrated for up to 2.1% Propane
- Calibration FREE
- CAN / RS-485 / TTL communication
- High Resolution up to 50 ppm
- Detectivity Level at 200ppm
- Expected Liftime 10 years
- Temperature compensated
- OV or Vsupply (Alarm output)
- Dual channel operation
- Full Faults Diagnostics & Error Generation
- Evaluation software for easy testing and calibration functions
- Designe to meets UL 60335-2-40 / IEC 60079-29-1 / IEC60335-2-40 requirements







NOTE: All Dimensions in mm. All tolerances Linear +/- 0.25mm and Angular 0.5° unless otherwise stated.



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Warm-Up Time

The Warm-Up Time for the INIR7 sensor is 60 seconds after each power "ON" or every time when changing from Configuration to Measurement 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, "INIR7 Protocol & Calibration".

For optimum performance please use following cylinders:

Nitrogen or air

1.05% Propane 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 INIR7.

Typical performance characteristics



Faults Monitoring/Error States

The Error monitoring and Fault generation takes place every second and is transmitted by the CAN/RS485. Regularly check all the Faults generated by the INIR7 to ensure errorless communication and rise appropriate alarms depending on the Fault code.

Alarm Level

Alarm level can be configured withing the software provided with the sensor. The default alarm level is 20% LEL (0.42% volume Propane).

Condensation, Dust & Extreme Conditions

Using the INIR7 in extreme environmental conditions may affect its performance. Typically, the module has a high corrosion resistance and temperature compensated linearized output.

Pressure Compensation

INIR7 is not equipped with pressure compensation. Based on application environment external pressure compensation might be required.

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	INIR7-R290
Warm-up Time*	60 s for full operation @ 25 °C
Basic Error	0 to 100% of full range -> 0.06%vol. or 6% of reading whichever is greater
Repeatability	±2% of full scale
Short Term Stability	0%vol> 0.01%vol. 1.05%vol> 0.02%vol.
Minimum Resolution	From 0 to 2.1% vol> 0.005%vol.
Long Term Drift	±3% of full scale / year (with zero autocalibration ON)
Temperature Error (-20°C to +60°C, relative to 20°C)	0%vol. to 2.1%vol> 0.04%vol. or 4% of reading, whichever is greater
Zero level Humidity Error (10%RH to 90%RH, relative to 45%RH)	±1% of full scale
Response Time	T90 <30s
Power Supply Variations (at ±5% of Nominal Voltage)	The Performance of the INIR7 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 ±5% of Nominal Voltage)	at 1 MHz -> 50 dB, at 100 kHz -> 68 dB, at 10 kHz -> 88 dB

*At least 45 minutes for full specification @ 25 °C



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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.



Sensor Stabilization @ Nitrogen



Typical Short Term Stability @ Nitrogen



Typical t90 response @1.05% Propane (averaging 20s)



Typical Short Term Stability @1.05% Propane



Typical t10 response @1.05% Propane (averaging 20)





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CAN frame description

The default ID is 0x256 and CAN frame layout is as shown below:

	7	6	5	4	3	2	1	0
0	Temperature_u8 msb	, 6	5	4	3	2	1	lsb 0
1	msb 1:	5 14	13	12	11	10	9	8
2	gas_concentrartion u16 23	, 22	21	20	19	18	17	lsb 16
3	Low_Power_bit	Sensor_replacement	undervoltage 29	Temperature_issue 28	Over_range	Alarm 26	Reserved 25	overvoltage
4	Voltage_u8 msb 39	38	37	36	35	34	33	lsb 32
5	msb 42	46	45	44	43	42	41	lsb 40
6	msb 55	5 54	53	52	Roll_Counter_u8	50	49	lsb 48
7	Pressure msb 63	62	61	60	59	58	57	56

Signal factor and offset are described below:

Name	Message	Start bit	Length	Byte Order	Value Type	Initial Value	Factor	Offset	Unit
Temperature (u8)	Sensor_Status_1	0	8	Intel	Unsigned	-55	1	-55	°C
Gas percent (u16)	Sensor_Status_1	16	16	Motorola	Unsigned	0	0.01	0	%
Overvoltage	Sensor_Status_1	24	1	Intel	Unsigned	0	1	0	
Reserved	Sensor_Status_1	25	1	Intel	Unsigned	0	1	0	
Alarm	Sensor_Status_1	26	1	Intel	Unsigned	0	1	0	
Over range	Sensor_Status_1	27	1	Intel	Unsigned	0	1	0	
Temperature issue	Sensor_Status_1	28	1	Intel	Unsigned	0	1	0	
Undervoltage	Sensor_Status_1	29	1	Intel	Unsigned	0	1	0	
Sensor replacement	Sensor_Status_1	30	1	Intel	Unsigned	0	1	0	
Low power bit	Sensor_Status_1	31	1	Intel	Unsigned	0	1	0	
Voltage (u8)	Sensor_Status_1	32	8	Motorola	Unsigned	0	0.2	0	V
Pressure* (u8)	Sensor_Status_1	56	8	Motorola	Unsigned	0	2	1000	hPa
Roll Counter (u4)	Sensor_Status_1	48	4	Motorola	Unsigned	0	1	0	

*If the sensor includes an additional module with a pressure sensor



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Modbus registers description (for -RS485 and -TTL versions)

Sensor always responds at address 0x00 and the address that is set in parameters.

Firmware revision < 0.75

Supported modbus functions					
Function	Name				
0x03	Read Holding Registers				
0x10	Preset Multiple Registers				

Mesurement results							
Value name	Unit	Example	Data type	Word (16 bits)	Register address	Access	
Gas Concentration	% vol	1 234	float32_t	Low Word	0x00	R	
Gas concentration	/0 001.	1.234	hoat52_t	High Word	0x01	R	
Temperature	ĸ	207 15	float22 t	Low Word	0x02	R	
lemperature	ĸ	237.13	noat32_t	High Word	0x03	R	
Foulto	N/A	0.000.000.000.000	uin+22 +	Low Word	0x04	R	
Faults	N/A	UXAAAAAAAA	unitsz_t	High Word	0x05	R	
Def Average	NI/A	20000	floot22 t	Low Word	0x06	R	
Rel_Average	N/A	50000	noatsz_t	High Word	0x07	R	
Act Average	NI/A	20000	floot22 t	Low Word	0x08	R	
Act_Average	N/A	50000	noatsz_t	High Word	0x09	R	
Deconved			floot22 t	Low Word	0x0A	R	
Reserved	N/A		noatsz_t	High Word	0x0B	R	
On cretine mede	NL/A			Low Word	0x0C	R	
Operating mode	N/A		umusz_t	High Word	0x0D	R	
Concentration Dense	N1/A			Low Word	0x0E	R	
Concentration Range	N/A		uint32_t	High Word	0x0F	R	

Sensor Info						
Value name	Unit	Example	Data type	Word (16 bits)	Register address	Access
Sonsor tupo	N/A	40	uin+22 +	Low Word	0x100	R
Sensor type	N/A	40	unitsz_t	High Word	0x101	R
Costuno	NI / A	1		Low Word	0x102	R
Gas type	N/A	1	unitsz_t	High Word	0x103	R
Carial number	NI / A	0,07122401		Low Word	0x104	R
Senai number	N/A	UXC/123401	umtsz_t	High Word	0x105	R
Firmwore version	NI / A	42		Low Word	0x106	R
Firmware_version	N/A	42	umtsz_t	High Word	0x107	R
Calibustica times		140521		Low Word	0x108	R
Calibration_time	nnmmss	140531	unt32_t	High Word	0x109	R
	ddmmia	270222		Low Word	0x10A	R
Campration_date	ddmmyy	270323	unitsz_t	High Word	0x10B	R

Gas Types				
0	Methane			
1	R290			
2	R600a			
3	CO2			
4	R32			

Operating mode Config Mode

Operation Mode

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User parameters							
Value name	Unit	Example	Data type	Word (16 bits)	Register address	Access	
Concontration range	% vol	2 10/	float22 t	Low Word	0x200	R/W	
Concentration range	78 VUI.	2.1/0	lioatsz_t	High Word	0x201	R/W	
Span gas concentration	9/ vol	1.05%	float22 t	Low Word	0x202	R/W	
span gas concentration	% VUI.	1.05%	noat32_t	High Word	0x203	R/W	
Alarm gas	0(0.420/	flaat 22 t	Low Word	0x204	R/W	
concentration	% VOI.	0.42%	noat32_t	High Word	0x205	R/W	
Averaging time	<u>,</u>	20	uin+22 +	Low Word	0x206	R/W	
Averaging time	5	20	unitsz_t	High Word	0x207	R/W	
Deserved	NI / A			Low Word	0x208	R/W	
Reserved	N/A		uint32_t	High Word	0x209	R/W	
Reserved	N/A	0x00	uint8_t	Low byte	0204	R/W	
Reserved	N/A	0x00	uint8_t	High byte	UXZUA	R/W	
AutoZero algorithm	N/A	0x01	uint8_t	Low byte	0200	R/W	
Modbus Device Address	N/A	0x05	uint8_t	High byte	UXZUB	R/W	

Commands						
Value name	Register address	Access				
Enter Config Mode	0x300	R/W				
Enter Operation Mode	0x301	R/W				
Calculate NEW Zero	0x302	R/W				
Calculate NEW Span	0x303	R/W				
Reset to Factory Default	0x304	R/W				
Software Reset	0x305	R/W				

Write 1 to execute command

Command result					
Value	Description				
1	Not performed yet				
2	Done without errors				
3	Error during execution of command				

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Intended use

This device is designed for use as a gas detection element, but its 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. INIR7 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.



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Handling precautions

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

Order Information

Comunication

RS485 (TIA/EIA-485)

CAN (CAN 2.0)

INIR7-R290-Y

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



Warranty & Warning

The WARRANTY for all the INIR7 Gas Sensors is 1 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:

- Do not allow water condensing into the sensor or deep the sensor into water. 1.
- 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.
- Do not solder directly onto the pins, pads or the external body of the sensor. 4. Do not drop on the floor or hit it with tools.
- 5. Do not open, cut or break sensor apart.
- 6. Do not expose the sensor to high levels of dust. 7.
- 8.
- Do not expose the sensor to corrosive gases or operate under corrosive environments.
- 9. Do not paint or mark the sensor externally.
- Do not use in acid environment or operate under gases containing acid vapours or particles. 10.
- Do not custom modify the sensor. 11.
- 12. Do not clean the sensor with acid

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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.

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Target Gas

TTL



RóHS