# Intelligent Series Gas Sensors (iseries)

Hydrogen Sulfide (H_2S) Sensor: **iH$_2$S**
Part Number: AC400-R00D-CIT

Document Purpose

The purpose of this document is to present the performance specification of the intelligent iH$_2$S hydrogen sulfide gas sensor.

This document should be used in conjunction with the Product Safety Datasheet (PSDS 5). For guidance on the safe use of the sensor, please refer to the Communication Protocol (SDCS) and Sensor Mounting Application Note.
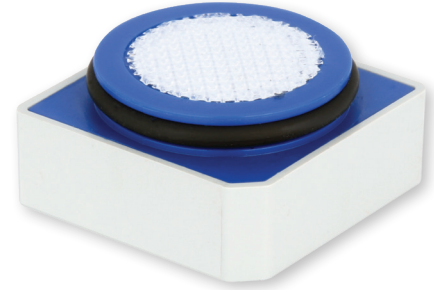
KEY FEATURES & BENEFITS

Digital interface
The sensor has a UART protocol to communicate with the instrument with chip select option as described in Communication Protocol (SDCS).

Interchangeable
All intelligent sensors have the same dimensions and communication protocol.

All sensors in the range will work with a supply voltage from 3.1 V to 3.3 V

Digital traceability
Sensors contain the following data: serial number, manufacturing date, and gas type for quick and easy identification of the sensor.

OEM lock
Sensors have two levels of lock codes. The first one is an OEM specific code programmed in during manufacture and cannot be modified. This lock code is provided by the OEM. Instrument can check if the sensor has the unique code – if not the instrument can refuse the sensor. The second level of lock code is left blank and can be updated by OEM/Partners during sensor integration into the instrument as needed.

Pre-calibrated
Sensors will be calibrated during manufacturing and calibration data is written in the sensor. Sensor will output gas concentration when interrogated by instrument.

Predictive calibration
Sensors can predict in advance when its accuracy is becoming too poor to give a reliable, accurate reading (advanced warning of when recalibration is needed).

End-of-life indication
Sensors can predict in advance when its sensitivity is falling too low to give a reliable, accurate reading (advanced warning for sensor replacement).

Fault indication
Intelligent sensors can detect several internal faults like open circuit sensing/high impedance electrode, drift/fault in reference electrode, electrolyte concentration out of range, counter electrode fault; therefore notifying the user to take corrective actions.

Designed to meet global performance standards

ATEX and IEC Ex Certified per EN IEC 60079-0 and EN IEC 60079-11
Designed to meet performance standards: BS EN 45544-1, AS/NZS 4641 and ANSI/ISA 92.00.01

RoHS⬯
RoHS compliant

5-year life

Compact form-fit

TECHNICAL SPECIFICATIONS

MEASUREMENT

Operating Principle	Electrochemical
Target Gas	H_2S
Range	0 ppm to 200 ppm
Accuracy	±5 % of measuring value
T90* Response Time	<30 seconds, typ.
T50* Response Time	<15 seconds <30 seconds across temperature range
Output	ppm compensated for temperature
Overload (maximum concentration that can be reached before damaging the sensor)	1000 ppm
Recovery Time from 200 ppm to <4 ppm	<180 seconds
Linearity*	Linear (±5 % from linear, up to 200 ppm)
Measurement Interval	1 sample per second (1 Hz)
Resolution	0.1 ppm
Baseline Offset*	<±0.5 ppm H_2S equivalent
Equilibrium Baseline Shift from −40°C to 60°C	<±3 ppm
Repeatability*	±5% of measured value
Orientation Sensitivity	None
Serial Comunication	UART with Chip Select

ENVIRONMENTAL

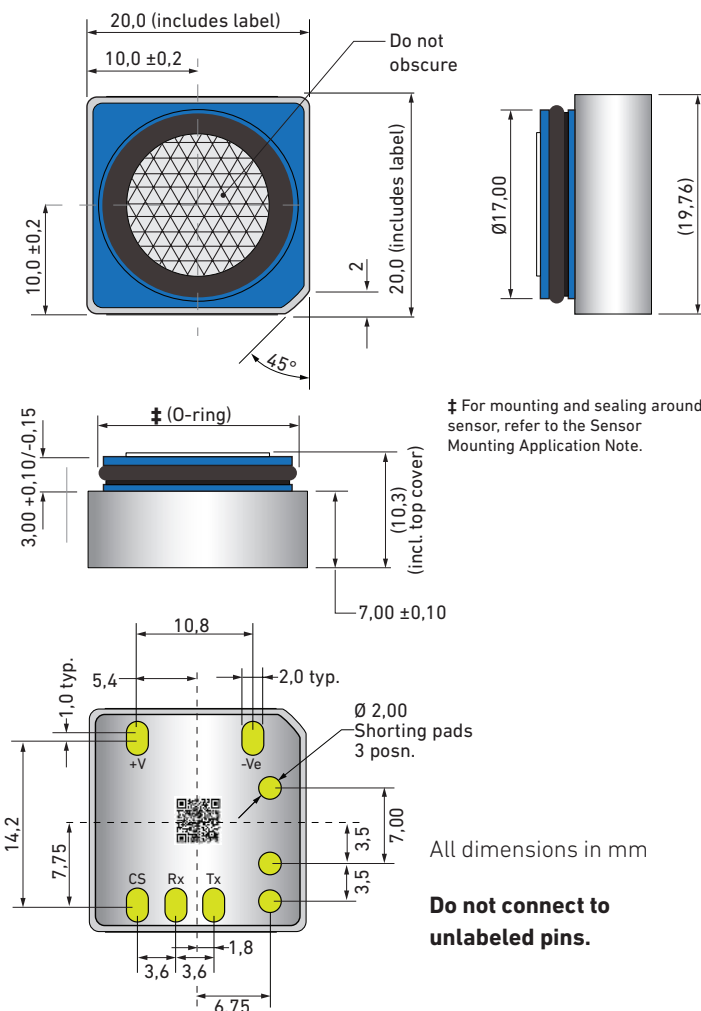|	
Operating Temperature Range	−40°C to 60°C
Operating Humidity Range	5 % RH to 95 % RH (non-condensing)
Operating Pressure Range	600 mbar to 1200 mbar
Recommended Storage Temperature	0°C to 20°C
Flow Rate	Typical: 200 ml/min when using recommended gassing hood. (Consult iseries Sensor Mounting Application Note).

LIFETIME

Long-Term Output Drift*	<10% signal life per annum
Expected Operating Life	5 years in air

PHYSICAL CHARACTERISTICS

Weight	<6 g
Contact Material	Gold plated
O-Ring Material	FKM60 ±5 shore A
Outer Plastic Body Material	Modified PPO

* Specifications are valid at 20°C, 50 % RH, and 1013 mbar using City Technology recommended circuitry. Performance characteristics outline the performance of sensors supplied within the first three months. Output signal can drift below the lower limit over time.

Product Dimensions

20,0 (includes label)
10,0 ±0,2
10,0 ±0,2
20,0 (includes label)
2
45°
Do not obscure

Ø17,00
(19,76)

‡ (O-ring)
3,00 +0,10/−0,15
(10,3) (incl. top cover)
7,00 ±0,10

‡ For mounting and sealing around sensor, refer to the Sensor Mounting Application Note.

10,8
1,0 typ.
5,4
2,0 typ.
Ø 2,00 Shorting pads 3 posn.
+V
−Ve
14,2
7,75
3,5
7,00
3,5
CS   Rx   Tx
1,8
3,6 3,6
6,75

All dimensions in mm

Do not connect to unlabeled pins.

Electrical Specifications

	Min.	Max.	Typ.	Unit
Supply Voltage (Vdd)	3	3.6	3.3	Vdc
Voltage of any pin relative to ground	0	3.6	–	Vdc
Peak supply current (typ. volt)		25		mA
Current: at stand–by mode	–	–	15.49	µA
Current: at active mode	–	–	26.67	µA
Average power consumption	0.046	90	0.088	mW

For compatibility with the whole iseries range, the supply voltage should be between 3.1 V and 3.3 V.

Pinout

Pin	Description
+V	Positive power supply
–V	Ground
Rx	Data transmitted from instrument to sensor
Tx	Data transmitted from sensor to instrument
CS	Chip Select
Other Pads	Do not connect, shorting link contacts only

NOTE: H_2S cells are shipped with a shorting clip which must be removed prior to installation.

iH$_2$S Parameters

	iH$_2$S parameters	Default Values	Configurable Range	Customisable: Implemented by City Technology (Non-configurable through the communication protocol)	Configurable: The parameter can be changed through the communication protocol by users	Notes
OEM Lock	OEM code (First layer)	Password is customisable.* (**NoLock** will be set by default in case the OEM lock is not required)	No more than 6 characters (ASCII format)	✓		* OEM code will be set by City Technology during sensor manufacturing. Code to be provided by OEM
	Partner code (Second layer)	–	No more than 6 characters (ASCII format)		✓	Once this code has been set by user, it is not possible to change it
User Factor		User factor 0: 100 User factor 1: 95 UF 2-3: Reserved UF 4-9: Customisable —————— User factors can be added to include auto-compensation for using different membranes or instruments	10 allocated slots —————— 2 user factors are already implemented (no additional membrane and with recommended membrane), 2 are reserved and the remaining 6 can be customised	✓*	✓**	* User factor 0 and 1 programmed into the sensor during manufacturing. Additional User Factors can be added to the selectable list during the manufacturing process. This user factor has to be provided by the user. ** Users can select the desired user factor from the selectable list
Calibration	Zero (clean air)	0 ppm			✗	Calibration is performed at two points throughout the operating range of the sensor. The calibration points are defined by the zero and span values. The zero value represent the response of the sensor in clean air
	Span (target gas)	20 ppm			✓	Span is the calibration point that is done in the pressence of the target gas. The span concentration can be configured through the communication protocol
Alarms	Low	10 ppm	Limit LOW lower: 0.5 Limit LOW upper: 100		✓	
	High	20 ppm	Limit HIGH lower: 0.5 Limit HIGH upper: 100		✓	
	STEL	15 ppm over 15 minutes	Limit STEL lower: 0.5 Limit STEL upper: 100		✓	Short-Term Exposure Limit: STEL is a limit value above which exposure to a chemical substance should not occur. It usually references a 15-minute period. STEL works to prevent adverse health effects along with other unwanted effects due to peak exposure that could possibly not be controlled by the application of an 8 hour TWA limit
	TWA	10 ppm over 8 hours	Limit TWA lower: 0.5 Limit TWA upper: 100		✓	Time-Weighted Average: TWA for chemical exposure can be used when each of the chemical concentration and time of exposure varies over time. It conveys the average exposure to a contaminant to which workers may be exposed without adverse effect over a period of time such as an 8-hour day or 40-hour week (an average work shift). The measurement is expressed in units of ppm
Predictive calibration	*The recalibration alarm will be tiggered when either the countdown or the accuracy threshold are reached (whichever is triggered first).*					
	Countdown timer (Cal due days)	180 days			✓	The alarm will be flagged when the countdown reaches 0. The countdown restarts when the sensor is calibrated
	Accuracy threshold	±20%	±10% to ±50%		✓	The predictive calibration estimation will depend on the accuracy of the sensor (this parameter can be configured by the user). The tighter the accuracy value, the more frequent calibration needed. The sensor will request a recalibration when the default accuracy(±20% of measuring value) is reached
End of Life	*The EoL alarm will be tiggered when either the countdown or the future prediction algorithm conditions are met*					
	Future prediction algorithm				✗	The algorithm triggers an alarm when the sensitivity < 50% of original sensitivity at minimum recent temperature
	Countdown timer	1825 days			✗	The countdown timer is set for 1825 days, i.e. 5 years
Deadband	Active by default	✓			✓	With the deadband enabled the sensor will read zero until the concentration exceeds the deadband value. Is normally used to prevent measurement oscillations. This function can be configured to different limits
	Incoming	0.1 ppm	Whole measurement range		✓	Incoming: As the reading decays down it will read zero once it has fallen below the incoming threshold
	Outgoing	0.2 ppm	Incoming ≤ Outgoing		✓	Outgoing: As the reading increases it will read zero until it exceeds the outgoing threshold
Bump Due Days		1 day			✓	A bump test is a brief exposure of the sensor to the target gas. The test has the objective of verifying that the sensor responds and the instrument acts accordingly. The sensor will tell the user when the bump interval has been exceeded

Intrinsic Safety	
Entity Parameters	Ui = 5.88 V, Ii = 1.1 A, Pi = 1.2 W, Ci = 13.14 uF, Li = 0 uH
Intrinsic Safety Rating	IIC T4, ia, 60°C
ATEX Marking	⟨Ex⟩ I M1 II 1G Ex ia I Ma Ex ia IIC Ga

Poisoning

Gas sensors are designed for operation in a wide range of environments and harsh conditions. However, it is important that exposure to high concentrations of solvent vapours is avoided, both during storage, fitting into instruments, and operation. When using sensors with printed circuit boards (PCBs), degreasing agents should be used before the sensor is fitted.

Do not glue directly on or near the sensor as the solvent may cause crazing of the plastic.

Under no circumstances should intelligent sensor pads be soldered to, as this can cause leakage of electrolyte. Connection should be made via a mounting socket and spring connector.

WARNING: SOLDERING TO PADS WILL RENDER YOUR WARRANTY VOID.

SAFETY NOTE

This sensor is designed to be used in safety-critical applications. To ensure that the sensor and/or instrument in which it is used, are operating properly, it is a requirement that the function of the device is confirmed by exposure to target gas (bump check) before each use of the sensor and/or instrument. Failure to carry out such tests may jeopardize the safety of people and property.

For more information
www.citytech.com

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