

SulfaTrack™ Sensor Gen3/Gen3M

Product Specification Sheet



SulfaTrap LLC

SulfaTrack™ Sensor – Gen3

TECHNICAL SPECIFICATION

SulfaTrack™ Sensor Gen3

TYPICAL APPLICATIONS

SulfaTrack™ sensors are designed for use in gas phase systems to detect various sulfur species including sulfides, mercaptans and thiophenes at sub ppm levels. SulfaTrack™ sensors can be used for remote sensing and in control systems to protect downstream equipment, such as fuel cells, catalysts or other sensitive components from sulfur poisoning.

OPERATING PRINCIPLE

SulfaTrack™ color change indicators use a chemical adsorbent media that changes color upon exposure to sulfur compounds. The granular adsorbent media is loaded into a transparent flow sight housing to allow process gas to flow through the media. The sulfur compounds in the gas react with the media causing its color to change. A photo-sensor detects the color change and generates an output to alert the presence of sulfur in the gas. The sensor comes standard with two optical sensors; one to detect carbonyl sulfide (COS) (with the use of proper media) and a second to detect the remaining sulfur species. It is also possible to use the two sensors with a single indicator media. Figure 1 shows the two configurations. The flow sight on the left has two separate media; the SulfaTrack™-V2 indicator (with the white color) located in the top portion for COS detection, and the SulfaTrack™-V1 indicator (the blue media) located in the bottom to detect all other sulfur compounds. The indicator on the right contains only the SulfaTrack™-V1 indicator material. The sensor can be configured to use both types of indicators. Each optical sensor has a light-emitting diode (LED) to illuminate that section of adsorbent. In addition to the RS485 Modbus output and control system that tracks the color of the indicator, the color change can also be manually viewed through the sensor window. Once a SulfaTrack™ sensor has been exposed to targeted sulfur compounds the adsorbent will change color and the sensor output can be monitored via Modbus RTU RS485 communications and the corresponding output registers. After detecting the color change (hence sulfur presence in the gas) the adsorbent cartridge should then be replaced with a new one for further use.

ENVIRONMENTAL SPECIFICATIONS

Temperature Limits:

Storage:	-40 to +135°C (-40 to 275°F)
Process Gas:	-20 to 40°C (-4 to 104°F)
Ambient Operating:	-20 to +60°C (-4 to 140°F)
Humidity Effects:	None from 0 to 95% RH, non-condensing



Figure 1. Color indicators used in sensor assembly; the indicator on the left capable of speciating COS and the indicator on the right without COS detection capability.

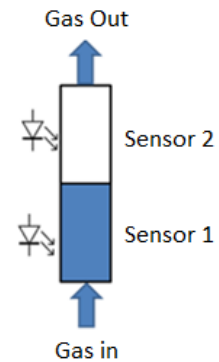


Figure 2: Flow and sensor schematic (LEDs are shown on the left with sensor positions shown on the right).

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FUNCTIONAL SPECIFICATIONS

Refresh Time:	5 seconds
Pressure Ranges:	0-125 psig (0-8.6 barg)
Recommended Flow:	0.42-4.2 scfh (200-2000 sccm)
Sensor Dimensions:	4.23" long (11.1 cm) 1.73" wide (4.4cm) 1.92" depth (4.9 cm)
Weight:	<0.67 lbs (300 grams)
Gas Connections:	¼" VCO Fitting

ELECTRICAL/COMMUNICATION SPECIFICATIONS

Supply Voltage:	9-28 VDC
Output Communication:	Modbus RTU RS485, USB
Modbus Parity:	1 start bit, 8 data bits, 1 stop bit
Maximum Power:	<1.0 W
Electrical Terminations:	Screw Terminal

DIMENSIONS

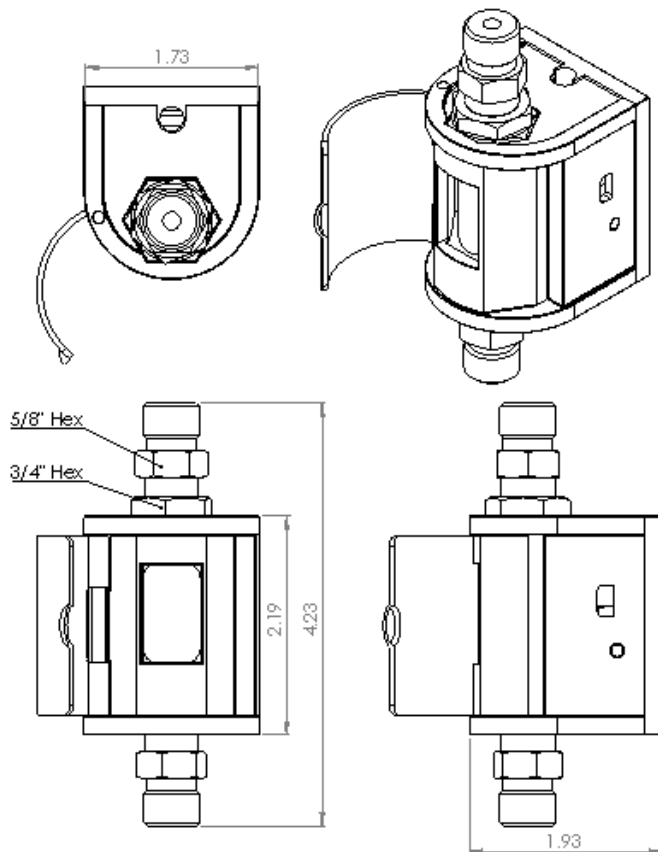


Figure 3: Sensor Dimensions

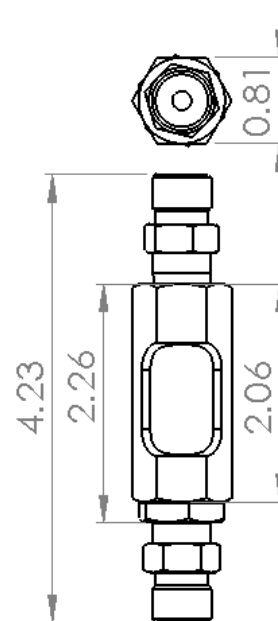


Figure 4: Indicator housing dimensions

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INSTALLATION INSTRUCTIONS

- Unpack from shipping box, verify the sensor and cable are in the box and are in good condition.
- Connect the sensor to the sample line tubing using the Swagelok compression tube fittings. It is recommended that the sensor is placed in a sample line that provides 200-2000 sccm flow rate to the sensor.
- Connect the wiring per the labels on the screw terminals and in the following table.

Pin Number	Description
1	RS485 A
2	RS485 B
3	GND
4	GND
5	9-24 VDC

- Apply power to the sensor and begin communicating with the device via Modbus RS485.

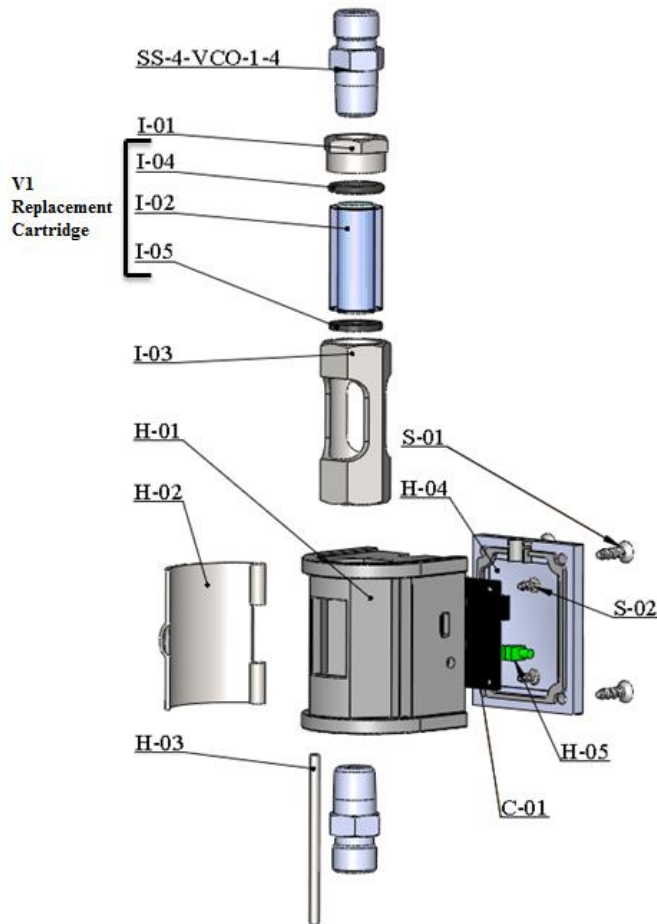
MODBUS RTU DATA REGISTERS

<u>Modbus Address</u>	<u>Typical Offset</u>	<u>Data Type</u>	<u>Access</u>	<u>Notes</u>
40001	0	Word	Read	Slave Address 1-32 (Modify Using USB & Software) Default: 12
40002	1	Word	Read	Baud Rate: 9600, 19200 (Modify Using USB & Software) Default: 9600
40003	2	Word	Read	Sensor 1 Red
40004	3	Word	Read	Sensor 1 Green
40005	4	Word	Read	Sensor 1 Blue
40006	5	Word	Read	Sensor 1 Clear
40007	6	Word	Read	Sensor 1 LUX
40008	7	Word	Read	Sensor 2 Red
40009	8	Word	Read	Sensor 2 Green
40010	9	Word	Read	Sensor 2 Blue
40011	10	Word	Read	Sensor 2 Clear
40012	11	Word	Read	Sensor 2 LUX
40013	12	Word	R/W	Sensor 1 LED brightness
40014	13	Word	Read	Sensor Temperature (Celsius)
40015	14	Word	Read	Error Register
40016	15	Word	Read	Device Heartbeat (counts up to 65535 and resets)
40017	16	Word	R/W	Duty Cycle LED Bool (0: OFF, 1: ON) 5/60 Seconds
40018	17	Word	Read	Sensor 1 Red 8bit(scaled)
40019	18	Word	Read	Sensor 1 Green 8bit(scaled)
40020	19	Word	Read	Sensor 1 Blue 8bit(scaled)
40021	20	Word	Read	Sensor 2 Red 8bit(scaled)

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40022	21	Word	Read	Sensor 2 Green 8bit(scaled)
40023	22	Word	Read	Sensor 2 Blue 8bit(scaled)
40024	23	Word	Read	Major Sensor Revision
40025	24	Word	Read	Minor Sensor Revision

SULFATRACK™ GEN3 SENSOR PARTS LIST



Identifier	Description
SS-4-VCO-1-4	1/4" NPT to 1/4" VCO Swagelok fitting
I-01	Upper hex nut for indicator
I-02	Glass insert w/V1 indicator material
I-03	Galvanized steel housing for indicator
I-04	Upper indicator O-Ring
I-05	Lower indicator gasket
H-01	Main sensor housing
H-02	Door for visual inspection
H-03	Hinge
H-04	Back Cover
H-05	LED light pipe
S-01	Back cover screw
S-02	Circuit board screw
C-01	Circuit board

Figure 3: Sulfatrack™ Gen3 exploded view

8BIT (SCALED) NOTE

To ease the process of viewing the color output on a computer or HMI monitor, which typically accepts RGB values in the range of 0-255, a scaling methodology has been implemented on the 16 bit RGB output from the color sensors incorporated in this device. First a black and white measurement of RGB values is taken at various LED outputs (1500, 2000, and 2500 units). These measurements are taken by placing either a black or white colored cartridge in the sensor and recording the 16bit RGB values that are output from the sensor. A linear regression algorithm is then performed to find both the slope and offset for these white and black readings as a function of the LED output values. The following algorithm is then calculated and stored in the 8bit(scaled) output registers every time 16 bit RGB data is gathered.

$$8bitVal = [(16bitReading - ((ledSetting * blackSlope) + blackOffset)) / ((whiteSlope * ledSetting) + whiteOffset)] * 255$$

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CALIBRATION NOTE

The sensor will come pre-calibrated with these scaling factors. If there is ever a need to adjust these parameters the sensor can be recalibrated using the SulfaTrack™ software included with the unit. For calibrations first ensure that the unit has the most recent software installed. Then connect the unit to the software and view the 16 bit output values. Use the “Set Scaling Factors” button under the “Edit” dropdown menu of the SulfaTrack software. The software will ask you to place a black calibration cartridge in the sensor. The black calibration cartridge is an indicator cartridge with a plain black piece of paper rolled inside the center. The sensor will take approximately 30 seconds to record the RGB values for this black material. You will then be prompted to insert a white calibration cartridge in the sensor. This calibration material consists of a white piece of paper rolled up inside an indicator cartridge. The sensor will again take about 30 seconds to gather the data required for the scaling operation. After the 30 second process is complete the color box outputs for sensor 1 and sensor 2 will display the color that is output in the 8 bit scaled output registers. At this point the color will be white. Place the indicator cartridge back in the sensor and the color displayed by the computer software should be a light blue (or white) color the same as that of the indicator material.

OPERATIONAL NOTES

Due to the nature of the device, outside sources of light can affect the sensor readings. It is recommended that the viewing window be covered when not visually checking the sorbent.

CONTACT

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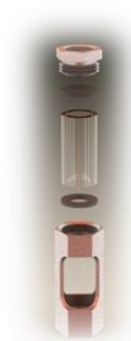


Figure 4: Components of the indicator housing.