

# Hydrogen Sulfide Analyzer

## Model 330S & 331S (Patented)

## Model 330SDS & 331SDS

### User's Manual



Last Updated: December 12, 2022  
Revision: 2.8



# Table of Contents

<b>1.0</b>	<b>Introduction</b>	<b>1</b>
1.1	About This Manual	1
1.2	Warranty & Liability Statements	1
1.2.1	Limitation of Warranty	2
1.2.2	Disclaimer	2
1.3	Safety Information	2
1.3.1	Key Symbols	3
<b>2.0</b>	<b>Equipment overview</b>	<b>4</b>
2.1	Theory of Operation	4
2.2	Analysis Cycles	6
2.3	Dual Sensor Analysis cycle (SDS)	7
2.4	Technical Specifications	8
<b>3.0</b>	<b>Installation</b>	<b>10</b>
3.1	Unpacking	10
3.1.1	Standard spare parts for 330S H <sub>2</sub> S analyzers:	10
3.1.2	Standard spare parts for 331S H <sub>2</sub> S analyzers:	11
3.2	Site Requirements	11
3.3	Mounting Requirements	12
3.3.1	Space Requirements	14
3.3.2	Sample Point Selection	15
3.3.3	Sample inlet & sample sweep	15
3.3.4	Vent line	15
3.3.5	Sample Volume & Flow Rate	16
3.3.6	Installation of Analyzer Components	17
<b>4.0</b>	<b>Operation &amp; Configuration</b>	<b>24</b>
4.1	Start-up Procedure	24
4.2	Analyzer Display Interface	25
4.3	Calibration Procedure	26
4.3.1	H <sub>2</sub> S Gas Calibration	26
4.3.2	Re-zero Sensor Procedure	28
<b>5.0</b>	<b>Maintenance</b>	<b>29</b>
5.1	H <sub>2</sub> S Sensing Tape Change Procedure	30
5.2	Sample Conditioning System Cleaning Procedure	31
5.2.1	Material List	31
5.2.2	Cleaning Procedure	31

<b>6.0 Troubleshooting</b>	<b>33</b>
<b>Appendix A - Recommended Spare Parts List</b>	<b>43</b>
<b>Appendix B – Sealing Compound Information</b>	<b>44</b>
<b>Appendix C – Safety Data Sheet for H<sub>2</sub>S Sensing Tape</b>	<b>47</b>
<b>Appendix D – Risk assessment – Safety information</b>	<b>52</b>

## List of Figures

Figure 1. H <sub>2</sub> S Analyzer Principle of Operation	5
Figure 2. H <sub>2</sub> S Analysis Cycle	6
Figure 3. Space Requirements for the 330S & 331S H <sub>2</sub> S Analyzers	14
Figure 4. 331S Recommended Venting for 331S (Same for 330S model)	16
Figure 6. Sample Chamber (exploded view)	19
Figure 7. Envent's Humidifier for 330S & 331S (PN 3100006)	21
Figure 8. Humidifier Unit Installed in a 331S H <sub>2</sub> S Analyzer	22
Figure 9. Eductor Block (Venturi Effect)	23
Figure 10. 330S Display (left) & 331S Display (right)	25
Figure 11. 331S & 331SDS Sensing Tape Change Procedure (Same as 330S & 330SDS models)	30

## List of Tables

Table 1. 330S/331S H <sub>2</sub> S Analyzer Specifications	9
Table 2. Sample Volume & Flow Rate	16
Table 3. Aperture Strips & Ranges	20
Table 4. Display Button Description/Function	26
Table 5. Display LED Description/Function	26
Table 6. H <sub>2</sub> S Sensing Troubleshooting	36
Table 7. Sensing Tape Troubleshooting	38
Table 8. Electronics Troubleshooting	41
Table 9. Sample Conditioning System Troubleshooting	42
Table 10. Calibration Troubleshooting	42
Table 11: Recommended Spare Parts	43
Table 12. Hydrogen Sulfide Properties	52
Table 13. Hydrogen Sulfide Quantities & Health Effects	53
Table 14: Risk Assessment	56

## **1.0 INTRODUCTION**

---

### **1.1 About This Manual**

This manual provides all the necessary information to install, operate and maintain the 330S, 330SDS, 331S and 331SDS model H<sub>2</sub>S Analyzer units and the related options. This manual is intended for all technical level users.

The Envent 330S/331S hydrogen sulfide (H<sub>2</sub>S) Analyzer is a uniquely rugged and simple design that utilizes lead acetate-based detection which provides a linear and interference-free output of H<sub>2</sub>S concentration. This analyzer can measure a wide range of H<sub>2</sub>S concentrations from parts per billion (ppb) concentrations to parts per million (ppm) concentrations. With the addition of a dilution sample system, it can read high concentrations in percentage up to 100%. There are other options available such as the sample system for H<sub>2</sub>S analysis in liquids or the addition of a hydrogen reaction furnace for total sulfur measurements.

This document will be referring to models 330S and 331S. However, the information applies equally to the 330SDS and 331SDS (dual sensor), unless otherwise stated. To clarify, the difference between an S model and an SDS model analyzer is the second sensor. The "SDS" has the capability to measure H<sub>2</sub>S from two different samples at the same time.

### **1.2 Warranty & Liability Statements**

Products produced and supplied by the manufacturer (Envent Engineering Ltd), unless otherwise stated, are warranted against defects in materials and workmanship for up to 18 months from the shipping date or up to 12 months from the start-up date (whichever comes first). During the warranty period the manufacturer can choose to either repair or replace products which prove to be defective.

The manufacturer or its representative can provide warranty service at the buyer's facility only upon prior agreement. In all cases, the buyer has the option of returning the product for warranty service to a service facility designated by the manufacturer or its representative. The buyer shall prepay all shipping charges for products returned to a service facility. The manufacturer or its representative shall pay all shipping charges for the return of products to the buyer. The buyer may also be required to pay round-trip travel expenses and labour charges (at prevailing labour rates) if the warranty has been violated. The warranty may be considered violated for any of the reasons listed below.

### **1.2.1 Limitation of Warranty**

The foregoing warranty shall not apply to defects arising from:

- Improper or inadequate maintenance of the product by the user
- Improper unpacking or installation procedures
- Inadequate site preparation
- Unauthorized modification or misuse of the product
- Operation of the product in unfavorable environments such as at high temperatures, high humidity, or in corrosive atmospheres
- Operation of the product outside of the published specifications

Envent Engineering Ltd carries no responsibility for damage caused during transportation or unpacking, unless otherwise specified in the incoterms.

An extended warranty may be available with certified start-up. Contact Envent Engineering Ltd for details.

Envent Engineering Ltd reserves the right to change the product design and specifications at any time without prior notice.

### **1.2.2 Disclaimer**

No other warranty is expressed or implied. The manufacturer specially disclaims the implied warranties of merchantability and fitness for a particular purpose. The sole remedy of the buyer shall in no case exceed the purchase price of the analyzer. The manufacturer shall not be liable for personal injury or property damage suffered in servicing the product. The product should not be modified or repaired in any manner differing from procedures established by the manufacturer.

## **1.3 Safety Information**

The procedures and settings outlined in this manual constitute what is considered proper use of the equipment in question. The equipment was designed and tested under the assumption that these procedures and settings will be adhered to. Applying values outside of the provided ranges (such as permitting excessive pressures) or modifying provided procedures is considered improper use of the equipment. Envent Engineering Ltd is not responsible for any injury or property damage caused by improper use of the equipment. Once in the field, the user is solely responsible for the safe operation of the equipment.

### 1.3.1 Key Symbols

The following symbols are used throughout the manual to call attention to important information. We recommend familiarizing yourself with them before reading further.



Indicates a potential hazard that, if not properly addressed, could result in damage to the equipment or injury to the operator



Caution: hot surface.



Indicates additional information intended to help clarify an earlier statement or to aid in the reader's understanding of a given topic.

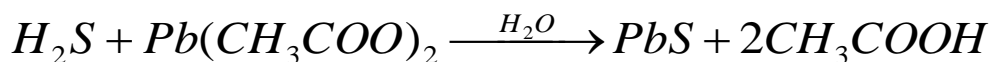
## 2.0 EQUIPMENT OVERVIEW

---

### 2.1 Theory of Operation

Envent's models 330S and 331S H<sub>2</sub>S analyzers use ASTM D4084 – 07: Standard Test Method for analysis of hydrogen sulfide in gaseous fuels (Lead Acetate reaction rate method). This method uses lead acetate impregnated paper. Throughout this document the term lead acetate tape will be written as "H<sub>2</sub>S sensing tape".

The H<sub>2</sub>S sensing tape reacts when in contact with hydrogen sulfide by the compound relationship shown below. This tape does not react to any other sulfur compounds in the gas stream. This makes it free from interference when more than one sulfur compound is present in the sample stream. The H<sub>2</sub>S reaction is visibly evident by a brown stain directly on the H<sub>2</sub>S sensing tape.



Equation 1: H<sub>2</sub>S & Lead Acetate Reaction

The electronics built into the models 330S and 331S have been programmed to measure the rate of darkening over time which, in turn, gives the hydrogen sulfide concentration level. When no H<sub>2</sub>S is in contact with the H<sub>2</sub>S sensing tape, the analyzer sensor reads 1000 mV (+/- 100 mV).

The sensor block has a LED and a photodiode detector. The LED emits a red beam of light which is reflected off the H<sub>2</sub>S sensing tape to the photodiode which detects the light intensity. The darker the H<sub>2</sub>S sensing tape becomes, when in contact to H<sub>2</sub>S, the less light the photodiode detector receives reducing the millivolt value, which in turn, increases the H<sub>2</sub>S value. The "SDS" models uniquely measures rate of change on both sides of the H<sub>2</sub>S sensing tape, allowing for simultaneous readings of two separate samples.



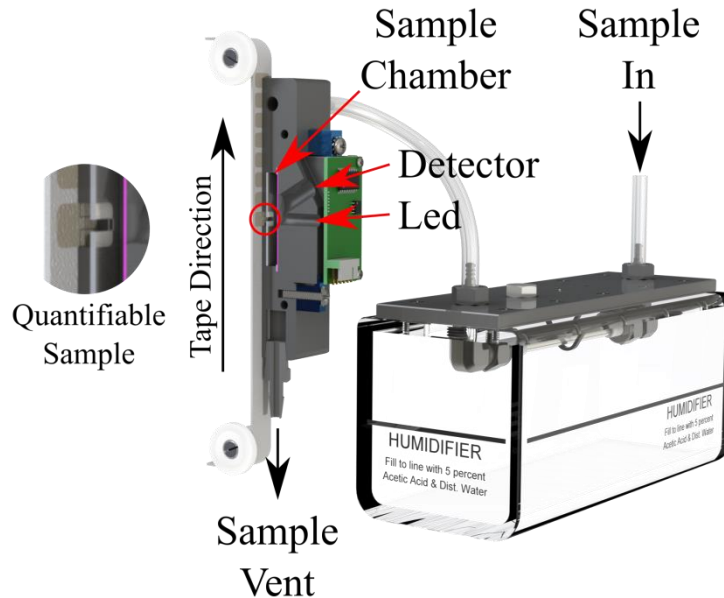


Figure 1: H2S Analyzer Principle of Operation

Figure 1 above, illustrates flow and pressure regulated, filtered sample gas passing through the humidifier to the sample chamber. An aperture in the sample chamber, which differs in sizes depending on the application, allows the gas to come into contact with the H<sub>2</sub>S sensing tape, creating a brown stain.

## i

Flow and pressure are the most important variables when measuring H<sub>2</sub>S and must be kept at a constant state for the analyzer to measure H<sub>2</sub>S properly. Pressure should be kept at a constant 15 psig, unless otherwise stated. The lowest pressure found to be tolerable for proper H<sub>2</sub>S measurement is 0.5 psig. Flow must be kept at a constant flow of 2 cm (approximately 83.63 cc/min). A change in flow of +/- 1 cm affects the reading by 10% of full range.

## 2.2 Analysis Cycles

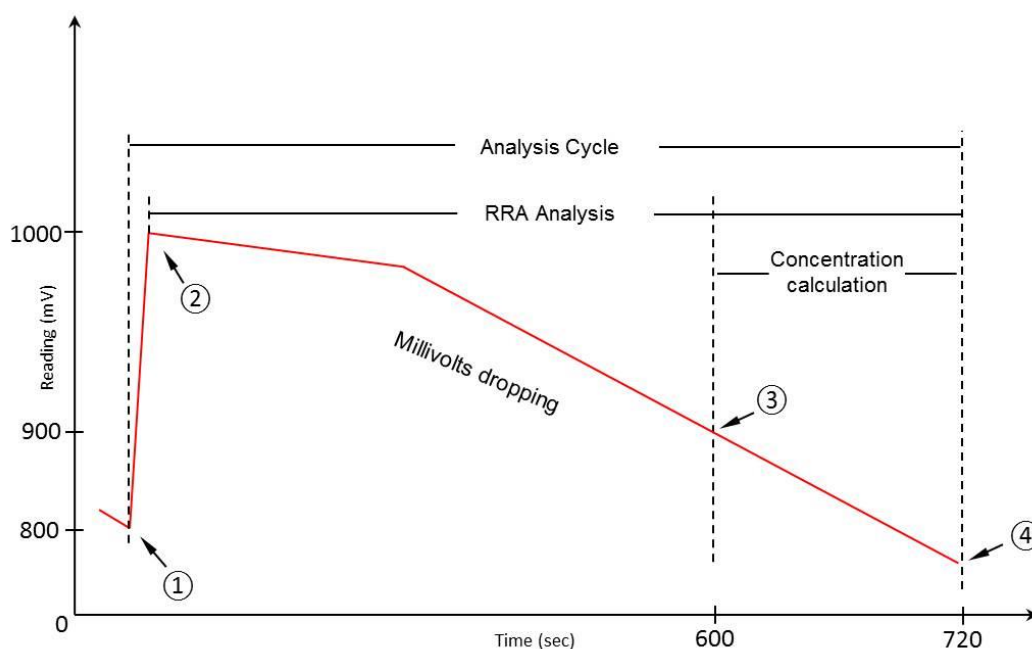
The analysis of the color rate of change on the H<sub>2</sub>S sensing tape is measured in analysis cycles. An analysis Cycle lasts up to a maximum of 720 seconds (12 minutes).



**Do not change the Maximum Analysis Time, consult Envent Engineering Ltd.**

**Analyzers sold prior to Mid-August 2016 are set to have a 360 second analysis cycle.**

Once an analysis cycle is complete, the motor moves the H<sub>2</sub>S sensing tape giving the sensor block new tape surface area to start the analysis again. In normal operation, if the analyzer is being exposed to H<sub>2</sub>S within its range, the analysis cycle should last between 150 to 210 seconds (1.5 to 2.5 min); the cycle lasts 720 seconds if no H<sub>2</sub>S is present.



**Figure 2: H<sub>2</sub>S Analysis Cycle**

Figure 2 shows a complete analysis cycle from when the motor has finished advancing the H<sub>2</sub>S sensing tape from a previous analysis (1) to the end of the current analysis (4). Once the H<sub>2</sub>S sensing tape has finished moving and new tape surface area is exposed, the reflection of light from the LED to the photodiode detector is at its maximum and results in a voltage output from the sensor block of 1000 mV (+/- 100 mV). This mV reading is captured by the analyzer, and it is

referred to as the "Zero Voltage" or "mV Zero". The zero voltage will vary for each surface area of the H<sub>2</sub>S sensing tape and will represent the starting point for the H<sub>2</sub>S reading for that cycle.

From stage (2) to (4) the H<sub>2</sub>S value starts increasing as the millivolt value drops from exposure to H<sub>2</sub>S. This stage is called "RRA Analysis". The RRA stands for Rapid Response Algorithm, and it is the instantaneous H<sub>2</sub>S readings calculated every 67 mS. As the H<sub>2</sub>S sensing tape darkens, the RRA value starts increasing every second. Although the RRA values are calculated almost instantaneously, they are not as accurate as the final reading obtained at the "Concentration Calculation" stage (3) to (4). However, RRA values can be used as a trigger alarms setpoint in case the application requires a rapid response time (less than the RRA Analysis completion). The first part of the RRA Analysis (2) to (3) completes when the mV value drops 100 mV from the zero voltage. After the 100-mV drop, stage (3) to (4) "Concentration Calculation" starts.

On this stage, the H<sub>2</sub>S slope is optimal for calculating the final H<sub>2</sub>S value for that Cycle. Algorithms are used by the controller board to calculate as accurately as possible the H<sub>2</sub>S final value. Once the final value is obtained, it will stay at that value (shown in the display and 4-20 mA analog outputs) until the next cycle has finished and updates the H<sub>2</sub>S current reading. This stage will always be 1/5 of the amount of time it takes stage (2) to (3) to complete. Thus, if stage (2) to (3) took 600 seconds, then stage (3) to (4) will take 120 seconds.



---

**It is important that the analyzer is used for its calibrated H<sub>2</sub>S range. Do not use this unit for an application that will require readings outside of its calibrated range. This will cause the H<sub>2</sub>S sensing tape to run out faster and may cause less accurate readings. The range is determined by the aperture strip in the sample chamber. For more information analyzer ranges, refer to "Aperture Strip" on page 20.**

---

## **2.3 Dual Sensor Analysis cycle (SDS)**

Dual sensor analyzers have two sensors that read H<sub>2</sub>S from two different samples at the same time (example: Sensor 1: 0-20 ppm & H<sub>2</sub>S Sensor 2: 0-200 ppm H<sub>2</sub>S). The analysis cycle process is the same per sensor as explained earlier in this section; however, some extra algorithms have been implementing to help with the interaction between the two sensors and their analysis cycles' timing.

Both analysis cycles for each sensor will always start at the same time. When the motor moves and new H<sub>2</sub>S sensing tape area is exposed, a new analysis cycle has started for both sensors. However, the analysis cycles from each sensor will finish at different times. Either sensor 1 or sensor 2 will finish its analysis cycle first. Regardless of which sensor finishes first, the analyzer will wait for the other sensor to complete its analysis cycle. Once both sensors have completed

their analysis cycles, the motor will move and new H<sub>2</sub>S sensing tape area is exposed for a new analysis cycle.

It is important to clarify that when the first sensor has finished its analysis cycle, even when it is waiting for the second sensor to complete its analysis cycle, it immediately updates any outputs associated with that sensor (Analog output 4-20 mA, alarms, display H<sub>2</sub>S value, etc.).

## 2.4 Technical Specifications

Analyzer Specification		
Measurement Method	ASTM D4084 - 07: Standard Test Method for Analysis of Hydrogen Sulfide in Gaseous Fuels (Lead Acetate Reaction Rate Method)	
Ambient Temperature	0-50 °C (standard) consult factory for other requirements, 0 to 90% humidity (non-condensing)	
Power	12-24 VDC @ less than 3W	
	Or, 100-240 VAC 50/60 Hz, 5W, (300W when total sulfur option is included)	
	Fuse Rating: 5 Amps, 250V, Slow blow, Size: 0.201" Dia x 0.787", Package/Case: 5 mm x 20 mm	
	Battery (for 1d Controller Board only): Lithium 3.6V, Dia 0.571" & 0.992" Long	
Electrical Certification	330S-DS	Class I, Division 1 Groups B C D T3C Tamb 0 °C to + 50 °C
	331S-DS	Class I, Division 2 Groups B C D T3C Tamb 0 °C to + 50 °C
	For more information on Hazardous location certification, refer to the Envent's Website.	
Output Ranges	Standard ranges are between 10-100 ppb and 0-100 ppm	
Response Time	20 seconds to 90% of step change	
Accuracy	±1.5% of full range on channel 1 (for SDS Models, channel 2 has an accuracy of ± 2.0%). For dilution (option): ±2.5% For Total Sulfur (Option): ±2.0% For PPB (Option): Based on "base noise average"	
Display	Graphic Liquid Crystal Display menu is scrolled by internal button or magnetic wand (330S)	
Outputs	Two 4-20mA outputs (loop power required), optional 4-20mA powered output boards are available	
	Serial Communication: (1) RS-232 Modbus protocol	

Outputs (continued)	(3) RS-485 Modbus protocol (One RS-485 for remote display option) Ethernet port as an optional feature
	4 SPDT relays (120 VAC 5A maximum)
	4 solid state solenoid drivers
Low Tape Sensor	Utilized for an alarm is when the H2S sensing tape needs to be changed
<b>Optional Features</b>	
Total Sulfur (Appendix E)	Utilized when all sulfur compounds need to be measured. A Total sulfur reaction furnace is added which allows the analyzer to measure total sulfur
Dilution Sample System (Appendix F)	Utilized when the analyzer needs to measure ranges above 100 ppm. A permeable membrane dilution system
Liquid Sampling	Utilized when a liquid sample conditioning system is required to measure hydrogen sulfide in Liquids
Parts Per Billion	Utilized when analyzer requires to read in parts per billion (<1 ppm)
Low Pressure Switch	Utilized for alarming when sample pressure drops below 10 PSI
AO Powered Boards	Utilized for loop-powered analog outputs
Expander AO Board	Utilized when more than two analog outputs are required
Ethernet Port	Utilized for TCP/IP communication capabilities
Auto Calibration	Utilized to initiate a calibration based on time of day or manually

**Table 1: 330S/331S H2S Analyzer Specifications**

## 3.0 INSTALLATION

---

### 3.1 Unpacking

Upon arrival, the packaging should be immediately inspected for any external damage that may have occurred during shipping. If any damage is present, please contact Envent Engineering Ltd and request that the carrier's agent be present when the analyzer is unpacked. If a disagreement arises, the incoterms agreed to by the seller and the customer will overrule any dispute.

Once the integrity of the packaging has been confirmed, open the shipping container, and remove the packing materials from the shipping box. Remove all provided components from the shipping container and inspect them for any damage that may have been sustained during shipping. Compare the provided components to the shipping manifest to ensure that all parts are present.



---

**The 330S H<sub>2</sub>S analyzer with a standard Sample conditioning system weight approximately 105 lb. Unpacking and transporting requires a minimum of two persons.**

---

Make sure the start-up kit is complete (refer to list below). For some special and more complex analyzers, there might be extra parts in the start-up kit (refer to packing slip).

#### 3.1.1 Standard spare parts for 330S H<sub>2</sub>S analyzers:

1. 330S Customer Binder
  - Customer Manual(s) and Addendums
  - Factory Calibration Certificate
  - Factory Configuration
  - Drawing Package
2. USB flash drive (containing all documentation)
3. 300' H<sub>2</sub>S Sensing Tape. **Part No. 2000040**
4. 1 Liter Analyzer Fluid. **Part No. 2000035**
5. Funnel
6. 330S Serial Comm. External Cable (USB to Mini USB). **Part No. 1300245**
7. Humidifier (uninstalled). **Part No. 3100006 (Part No. 3100007 for SDS)**
8. Bolts For explosion proof enclosure (x22)

### 3.1.2 Standard spare parts for 331S H<sub>2</sub>S analyzers:

1. 331S Customer Binder
  - Customer Manual(s)
  - Factory Calibration Certificate
  - Factory Configuration
  - Drawing Package
2. USB flash drive (containing all documentation)
3. 300' H<sub>2</sub>S Sensing Tape. **Part No. 2000040**
4. 1 Liter Analyzer Fluid. **Part No. 2000035**
5. Funnel
6. 331S Serial Comm. External Cable (USB to Mini USB). **Part No. 1300245**
7. Humidifier (uninstalled). **Part No. 3100006 (Part No. 3100007 for SDS)**



Envent Engineering H<sub>2</sub>S Sensing Tapes are suitable for use, if stored in the original sealed package, for 10 years from date of manufacture. Tapes should be stored in a cold dry location. If the seal on the package has been broken in storage, the H<sub>2</sub>S Sensing Tape should be discarded.

## 3.2 Site Requirements

The model 331S & 331SDS are designed for cETLus Class 1, Division 2, Groups BCD, Temp Code T3C (Tamb 0°C to 50°C). These models are designed for indoor use only. Ensure that the analyzer received is suitable for the electrical classification of the installation site.

The model 330S & 330SDS are designed for cETLus Class 1, Division 1, Groups BCD, Temp Code T3C (Tamb 0°C to 50°C). These models are designed for indoor use only. Ensure that the analyzer received is suitable for the electrical classification of the installation site.

---

**Substitution of components may impair intrinsic safety and suitability for Class I, Division 1.**



**Substitution of components may impair suitability for Class I, Division 2.**

**The glass window on the XP enclosure must remain installed in order to maintain area classification.**

---

### 3.3 Mounting Requirements

The analyzer should be mounted in an enclosed area in which it is not exposed to vibrations, excessive pressures, extreme temperatures, or environmental variations.

The selected installation site should provide adequate room for maintenance and repair procedures.

The installation site should be as close as possible to the process stream being measured. The sample delivered to the analyzer must be representative of the stream and as such, should be taken from a point as close as possible to the analyzer. This proximity will prevent lag times and sample degradation in the lines.

No modifications or repairs to the flame paths are permitted.

Substitution of components may impair flameproof safety and suitability for Class I, Division 1.

All NPT thread entries must meet the minimum requirement of 5 threads.



XP enclosures must have conduit plugs installed for unused conduit entries.

Conduit seal(s) must be installed at a minimum distance of 18" from any XP enclosure's conduit entries.

Conduit seals must be poured after wiring is completed and before powering up the unit.

The XP enclosure covers must be installed and fully engaged to maintain area classification. They must be secured with the provided 6/32 x 1/2 set screw. A 1/16 hex key is required for removal.

When operating in low temperatures the flame arrestors and sample inlet line must be properly insulated to prevent the cooling of the sample gas.

The analyzer's input voltage range shown in Certification Nameplate (e.g., 120 – 240VAC) is limited when installing external devices (e.g., Solenoids).

Before opening line pressure, be sure that all port connections, sample sweep and sample conditioning system are securely installed.

This unit requires a disconnect device rated 24 VDC and 5A max. It must be protected by a circuit breaker rated 24 VDC and 5A max, and it is to be installed in accordance with local electrical codes.



**This unit requires a disconnect device rated 240 VDC and 5A max. It must be protected by a circuit breaker rated 240 VDC and 5A max, and it is to be installed in accordance with local electrical codes.**

---

### 3.3.1 Space Requirements

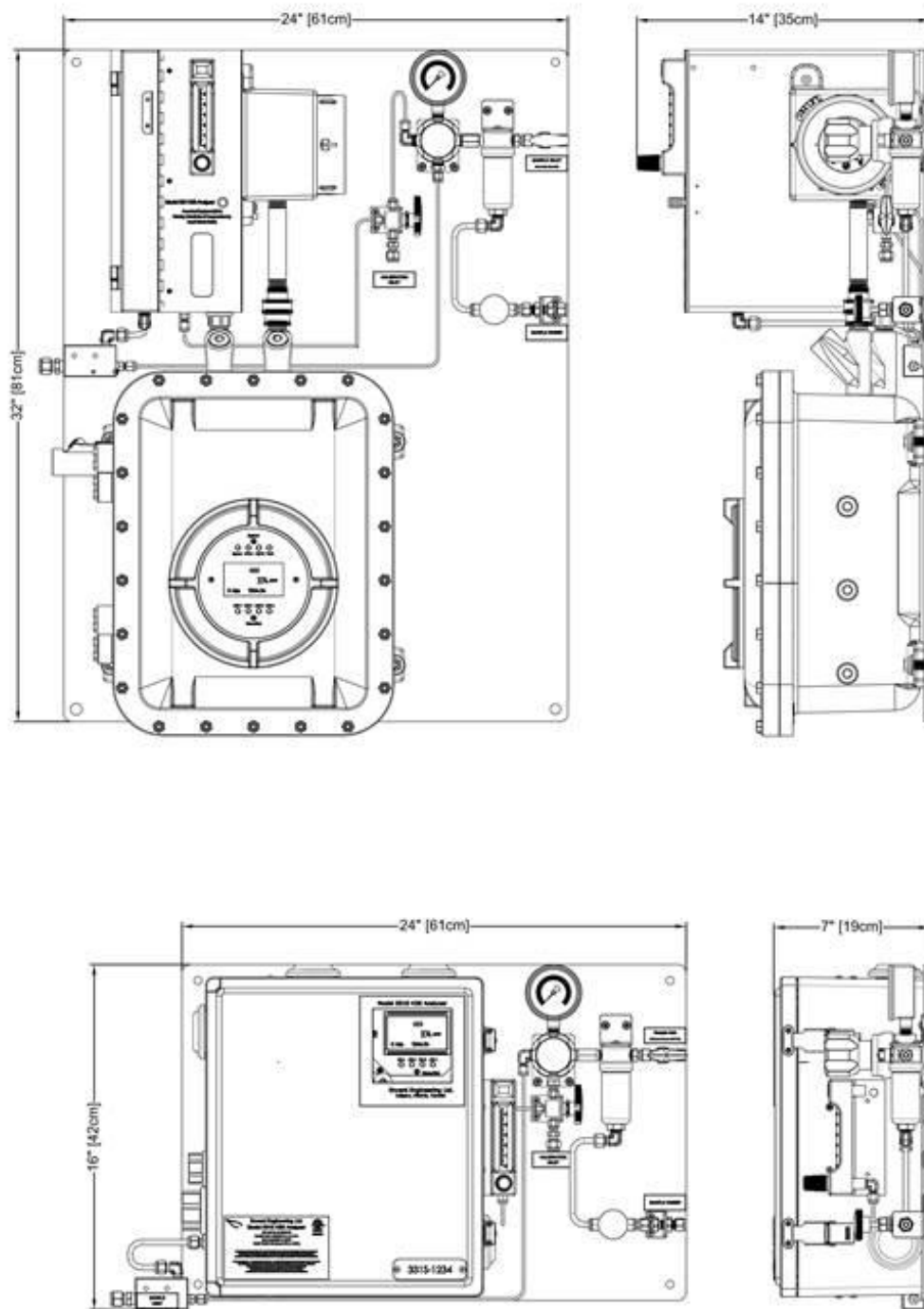


Figure 3: Space Requirements for the 330S & 331S H<sub>2</sub>S Analyzers



Make sure to leave at least 1 foot of extra space on the left side of the 330S H<sub>2</sub>S analyzer. This will allow proper opening of the side door located at the upper blue chassis where the H<sub>2</sub>S sensing tape is located.

---

### 3.3.2 Sample Point Selection

The sample to the 330S/331S H<sub>2</sub>S analyzer must be representative of the process stream and should be taken from a point as close as possible to the analyzer to avoid lag times and sample degradation in the tubing. A probe must be installed vertically on a horizontal section of pipe ensuring that the sample is drawn from the middle third of the pipeline.

An optional Genie GPR Probe regulator may be used. The function of this probe is to ensure a clean dry sample to the analyzer and to reduce the pressure of the sample. The lower pressure will improve the response time of the analyzer. Refer to Figure 4.



It is advisable that the probe is not installed on a vertical pipe.

---

### 3.3.3 Sample inlet & sample sweep

1/4-inch 316 stainless steel tubing and fittings are recommended for the sample inlet and sample sweep tubing. Sample sweep can be connected to a flare line if available. Refer to Figure 4.



1/8-inch 316 stainless steel tubing can also be used if the response time of the analyzer is of particular concern.

### 3.3.4 Vent line

3/8-inch stainless steel tubing and fittings are recommended for the vent line to a maximum of 6 feet in length. 1/2-inch stainless steel tubing should be used for vent lines exceeding 6 feet. The tubing should be installed with a slight downward slope and should be as short as possible. Refer to Figure 4.



The sample vent line must be tubed to atmospheric pressure outside and cannot be connected to a flare line or header.

---

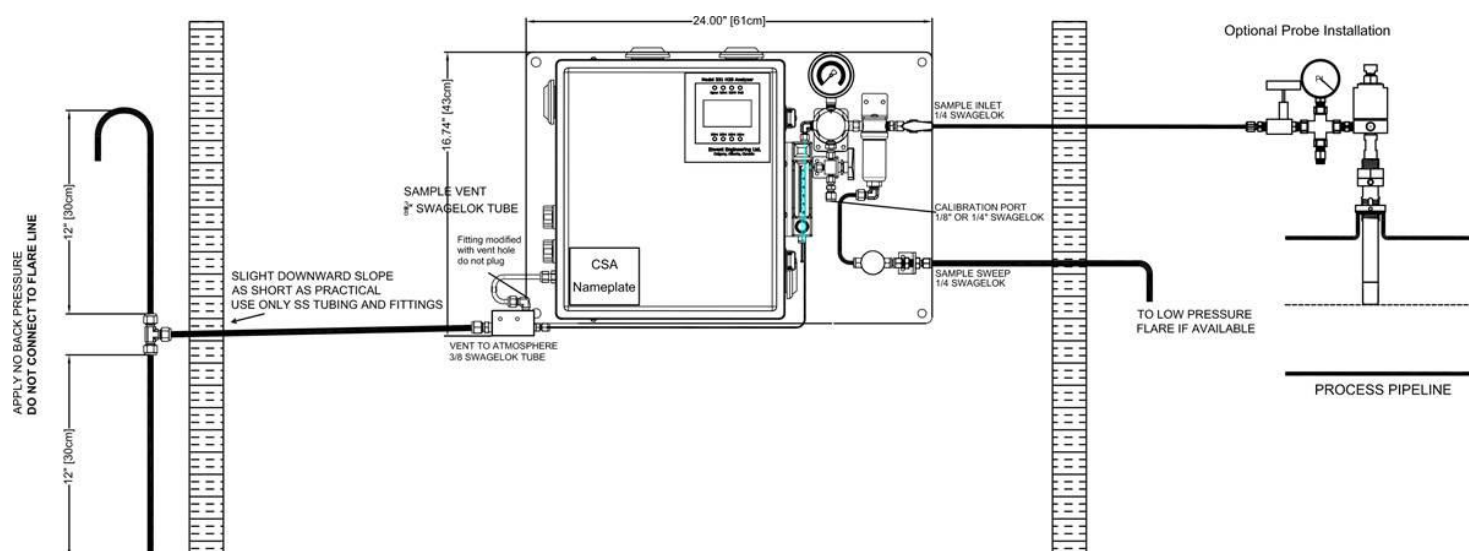


Figure 4: 331S Recommended Venting for 331S (Same for 330S model)

### 3.3.5 Sample Volume & Flow Rate

The sample should be supplied to the 330S/331S H<sub>2</sub>S analyzer at 10-15 psig and at a flow of 83.63 cc/min (set flowmeter at 2.0). A bypass sweep is recommended to reduce sample lag time in the sample line if it is at high pressure or if it is longer than 15 feet (The Standard H<sub>2</sub>S conditioning sample system has a bypass sweep). The standard sample tubing material is 1/4" 316 stainless steel; however, 1/8" stainless steel tubing can be used if the response time is critical (refer to Table 2: Sample Volume & Flow Rate

Tube Size (")	Tube Gauge	ID (")	ID (cm)	Flow (SCFH)	Flow Std. (cc/min)	Pressure (PSIA)	Lag Time per 100' (min)	Lag Time per 100' (sec)
3/8	20	0.319	0.810	5	2359	800	36.30	2178
3/8	20	0.319	0.810	5	2359	200	9.07	544
3/8	20	0.319	0.810	5	2359	50	2.27	136
1/4	20	0.181	0.459	5	2359	800	11.69	701
1/4	20	0.181	0.459	5	2359	200	2.92	175
1/4	20	0.181	0.459	5	2359	50	0.73	44
1/8	20	0.081	0.205	5	2359	800	2.34	140
1/8	20	0.081	0.205	5	2359	200	0.59	35
1/8	20	0.081	0.205	5	2359	50	0.15	9

Table 2: Sample Volume & Flow Rate



Carbon steel sample line and/or fittings are not acceptable.

### **3.3.6 Installation of Analyzer Components**

In this section, the description and installation of the main components of the 330S & 331S H<sub>2</sub>S analyzers are covered.



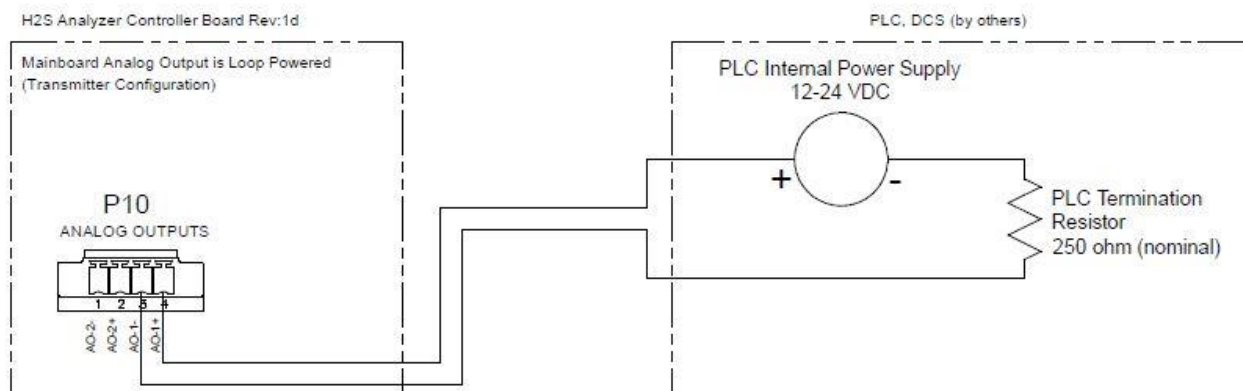
Total Sulfur and Dilution system options are not covered in this section. Please refer to Total Sulfur and Dilution manuals.

#### **3.3.6.1 Analog Outputs**

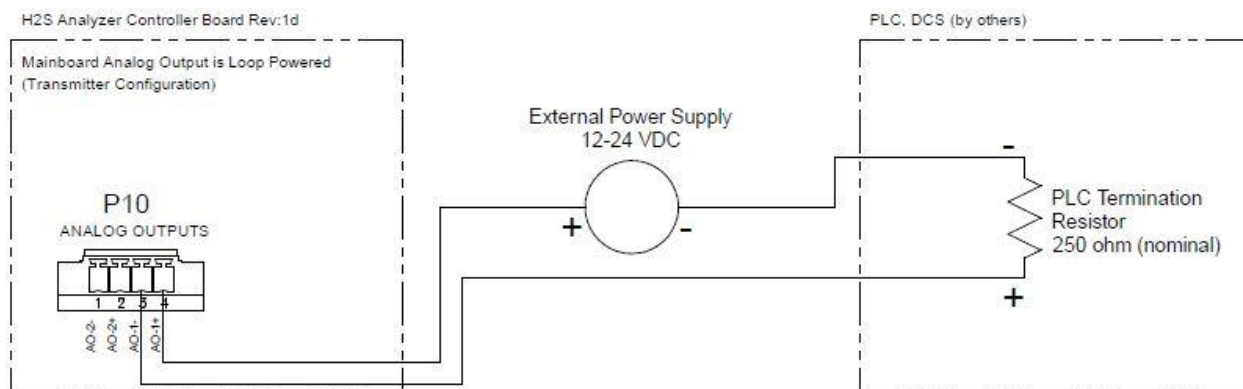
The H<sub>2</sub>S controller board has two isolated loop power 4-20mA outputs which can be set up for different variable outputs. Loop power (10-32 Volts) sourced from the end device (PLC) is required for the analog to output. Figure 5 shows the different wiring set ups for the analog outputs.

The third wiring option shown in Figure 5 uses Envent's powered AO board(s) to provide self-powered analog outputs. These boards are available at Envent Engineering Ltd.

### PLC set for loop power (Two-wire Transmitter)



### PLC Set for Externally Supplied Loop Power (Three-wire Transmitter)



### Envent Powered Analog Output Board Option

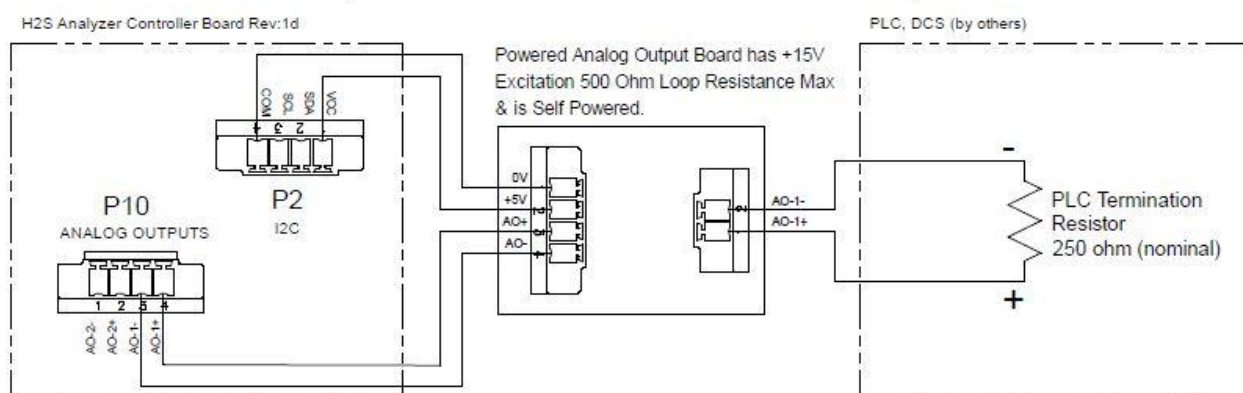


Figure 5: AO 4-20 mA Output Wiring Options

### 3.3.6.2 Sample Chamber

The sample chamber is the component that allows the H<sub>2</sub>S sample to come in contact to the H<sub>2</sub>S sensing tape which in turn is read by the sensor block. The sample chamber is made of the following components:

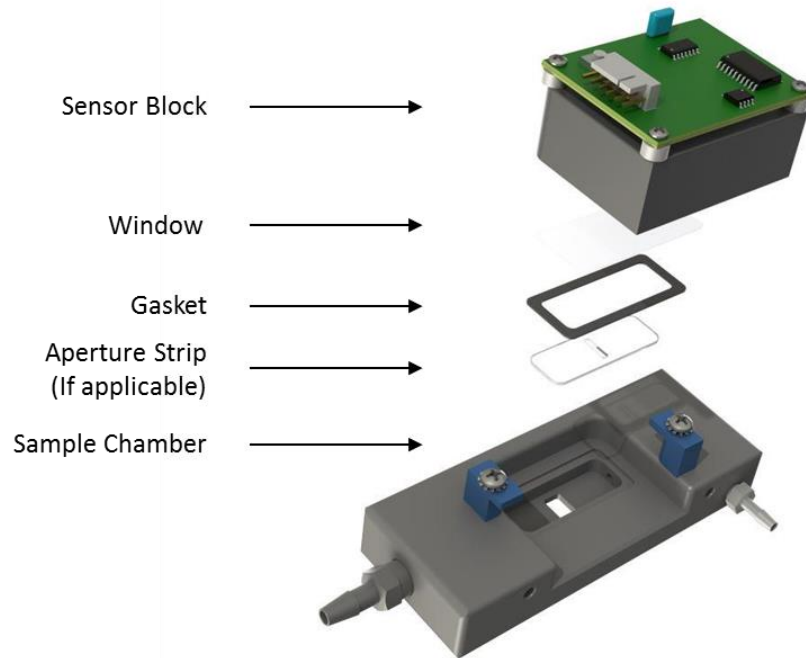


Figure 6: Sample Chamber (exploded view)

#### Sensor Block

The sensor block measures the intensity of the LED light reflected off of the H<sub>2</sub>S sensing tape. It is composed of an electronic board, a red-light emitting diode, and a photodiode, refer to Figure 6. As the tape gets darker due to exposure to H<sub>2</sub>S, the photodiode receives less light. Less light translates to more H<sub>2</sub>S.

#### Window & Gasket

These two components seal the small compartment where the H<sub>2</sub>S comes inside the sample chamber, refer to Figure 6. The window keeps a clear view for the LED and the photodiode to work properly and isolates them from the sample gas. The rubber gasket seals the Sample Chamber compartment preventing any leaks.

## Aperture Strip

The sample chamber has a fixed size aperture of ¼ inch which is used for concentrations in between 1 ppm to 16 ppm.

For concentration applications below 1 ppm or above 16 ppm an aperture strip is installed behind the window in the Sample Chamber, refer to Figure 6. These aperture strips keep the analysis time to be approximately the same regardless of the range.

Various sizes of apertures match different measurement ranges. Table 3 shows the aperture size according to its range.

H <sub>2</sub> S Range	Aperture Strip	Starting Gain	Envent PN
50 ppb to 1 ppm	ppb style	Consult Factory	2000033
1 ppm to 16 ppm	None (1/4" fixed aperture size)	2.7	N/A
16 ppm to 30 ppm	1/16"	7.5	2000026
30 ppm to 50 ppm	1/32"	12	2000025
50 ppm to 100 ppm	Pin Holes	18	2000023
100 ppm to 500 ppm	Laser Dot	Consult Factory	2000032
Over 500 ppm	Addition of a dilution panel. Consult Factory.		

Table 3: Aperture Strips & Ranges

Aperture strips can be changed to accommodate for a different range application. Refer to Table 3 shown above to select the best option on the new concentration application. Contact Envent Engineering Ltd to purchase an aperture strip.



**Remember:** gain and span values on analog outputs will have to change based on new range application. Please re-calibrate analyzer. Refer to "4.3.1 H<sub>2</sub>S Gas Calibration" on page 26.

The adhesive used to glue the aperture strip in its place is RTV108 Translucent Adhesive. RTV102, RTV103, and RTV109 could also be used.



### 3.3.6.3 Humidifier Unit



The analyzer should not be exposed to ambient temperatures lower than 0 °C.  
By default, all 330S/331S H<sub>2</sub>S analyzers have a temperature alarm set to 0 °C descending.

---

For the H<sub>2</sub>S to adhere to the surface of the H<sub>2</sub>S Sensing tape, it needs to be humidified. The humidifier unit helps having constant moisture content in the sample which increases the chemical reaction on the H<sub>2</sub>S Sensing tape. Envent Engineering Ltd offers a unique design of humidifiers meant to meet the requirements for humidification of the sample before it gets into contact with the H<sub>2</sub>S sensing tape; refer to Figure 7.

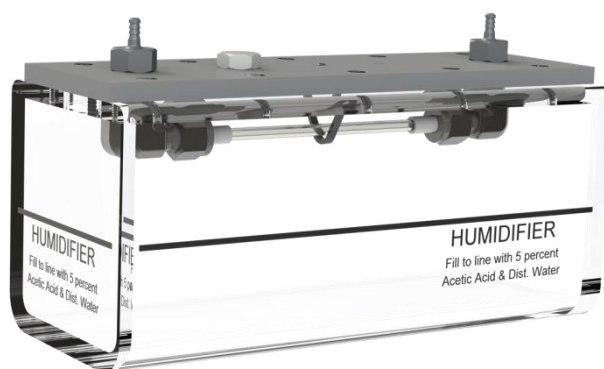


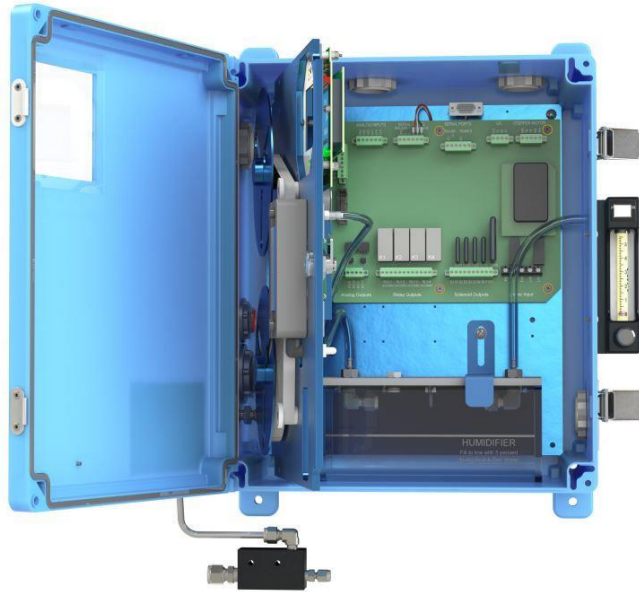
Figure 7: Envent's Humidifier for 330S & 331S (PN 3100006)

The humidifier works by using Nafion Tubing, which has the capability to transport water vapor from the most humidified medium to the driest medium. The sample gas traveling inside the Nafion tube is dryer than the outside of the tube, which is being saturated with water, thus, humidifying the gas sample. It is important to have a constant flow to cause a constant humidification of the sample gas.

The humidifier unit can be filled with distilled water or 5% Acetic Acid up to the indication line. Acetic acid is preferable over distilled water as it prevents mold and fungus development. Moreover, the freezing point for water is 0 °C and -2 °C for 5% Acetic Acid, making it more reliable under freezing temperatures.

For the SDS models, the humidifier has two inlet and two outlet ports. It is important to ensure that the tubing is connected to the correct port. The Vinyl tubing that connects to the humidifier are label with 1 and 2, make sure they are matched when installing them to the humidifier.

Figure 8 shows how to install the humidifier unit in a model 331S H<sub>2</sub>S analyzer. Same principle applies for the model 330S H<sub>2</sub>S analyzer.



**Figure 8: Humidifier Unit Installed in a 331S H<sub>2</sub>S Analyzer**

### 3.3.6.4 Eductor Block

The analyzer's reading can be affected by positive or negative pressure on the sample vent line. Pressure changes can be caused by strong winds blowing across or directly into the vent; or by mechanical venting (exhaust fan). The eductor will minimize any influence on the analyzer reading; refer to Figure 9.

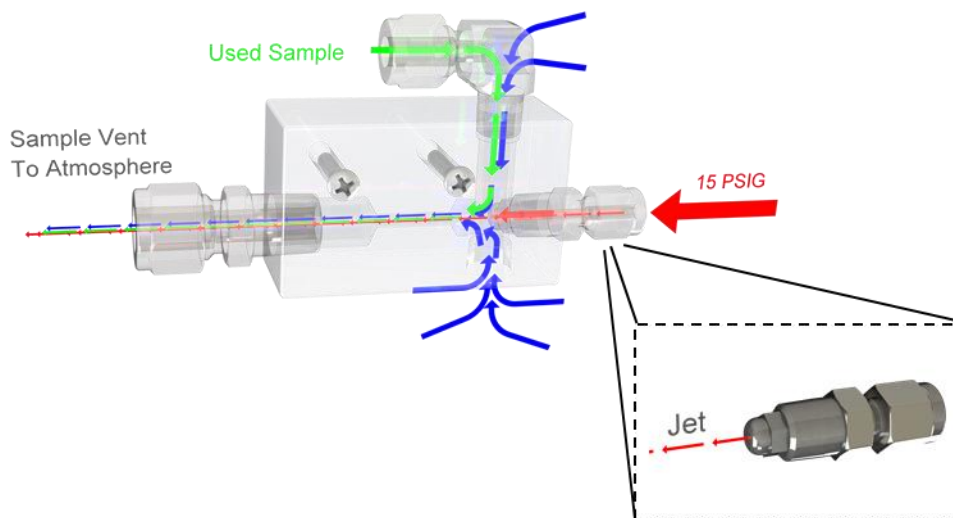


Figure 9: Eductor Block (Venturi Effect)



The eductor is required with this model to maintain electrical safety and certification in division 2 areas.

---

In cold climates, since the analyzer is venting a moist sample, freezing can occur. The eductor will help reduce freezing problems in the vent line due to the increased velocity and drying effect of the sweep gas. The eductor vent can be retrofitted to existing analyzers.



In normal conditions, the eductor makes a noise similar to a gas leak. This noise is normal, and it is due to the 15-psig pressure being expelled through the restricted fitting creating suction from the gas vent line (Venturi Effect). DO NOT block the opening at the bottom of the eductor or the modified elbow fitting.

---

## 4.0 OPERATION & CONFIGURATION

---

### 4.1 Start-up Procedure

The following steps should be followed for proper installation and start-up of the analyzer.



Before commencing the start-up procedure for the analyzer, please ensure that all sections within “Installation” (Sections 3.0) have been understood and addressed. Do not proceed until this is done as significant safety hazards can arise if the analyzer is not properly set-up prior to start-up.

During start-up, it is possible that the analyzer and/or the SCS will be contaminated with a scavenger solution. The flow meter should be inspected for liquids to ensure that the float moves freely.

---

1. Ensure there is enough H<sub>2</sub>S Sensing tape.
2. Ensure the humidifier is filled with 5% acetic acid or distilled water and that the fluid in the humidifier is up to the temperature of the room the analyzer will be operating in.
3. Apply power to the analyzer. The display will illuminate and the H<sub>2</sub>S sensing tape will advance for a few seconds.
4. Press the menu button until “mV” is displayed. Check that the reading is 1000 mV (± 100 mV). Check “4.2 Analyzer Display Interface” section on page 25.



There are two mV values shown in the display, the "mV Zero" and the "mV" Values. Check for the "mV" Values.

For the SDS models, check for "Sensor 1 mV" and "Sensor 2 mV".

5. Make sure the sample inlet valve, sample sweep valve, and pressure regulator are completely closed. The pressure regulator is closed when the knob handle is counterclockwise.
6. Turn on the sample gas flow to the sample conditioning system and then open the sample inlet valve.
7. Open the sweep valve slightly (1/8 of a turn) and adjust pressure regulator to 15 psig and the flow meter to 2.0. On a new commission, it is advised to let the sample sweep for 5-10 minutes

before introducing gas to the rest of the sample system. This allows contamination from construction to be purged prior to entering the analyzer.

8. Allow twenty minutes for the analyzer to stabilize. The analyzer calibration can be verified if calibration gas is available. If no calibration gas is available, the analyzer may be operated using the factory calibration settings until calibration gas is available.

## 4.2 Analyzer Display Interface

By using the analyzer's display, the user can only view and/or change certain parameters set at the factory. The display is made up of a Graphic Display, four (4) pushbuttons and (8) LED's. Refer to Figure 10.



Figure 10: 330S Display (left) & 331S Display (right)

The Descriptions and Function of the display buttons and LEDs are described in Table 4 & Table 5.

Button	Description/Function
Bypass	Used to inhibit all analyzer alarms to a non-alarm state and sets the analog 4-20 mA output to 2 mA. The Bypass LED illuminates when Bypass mode is enabled.
Scroll Right [→]	Used to move the cursor to the right. Also used to SAVE configuration adjustments when moved all the way to the right of the screen.
Scroll Left [←]	Used to move the cursor to the left. Also used to CANCEL configuration adjustments when moved all the way to the left of the screen.
Menu/Set	Used to cycle through the menu options. Also used to increase numerical values when making configuration adjustments.

Table 4: Display Button Description/Function

LED	Description/Function
Bypass	Illuminates when the analyzer is in bypass mode.
LED A & B	Red LEDs that can be used for different alarm configurations. By default, these LEDs are left as spare.
Fault	Illuminates when there is a fault in the Analyzer. Fault is used for Board temperature, Sensor High/Low, Low H <sub>2</sub> S sensing tape sensor, Pressure switch, etc.
LED 1 to 4	Green LEDs that can be used for different alarms or conditions. By default, H alarm activates LED-1 and HH alarm activates LED-2. (Refer to the LED Sticker on the analyzer door on the inside (331S) or to the right side of the blue chassis on of the XP enclosure).

Table 5: Display LED Description/Function

## 4.3 Calibration Procedure

### 4.3.1 H<sub>2</sub>S Gas Calibration

Depending on the application, the 330S/331S H<sub>2</sub>S analyzer will require more or fewer periodic calibrations. There is no specific time as to how often the H<sub>2</sub>S analyzer should be calibrated. It will depend on the application, importance of accuracy for the application, and how dirty or clean the environment and sample are. The following is the calibration procedure for the 330S/331S H<sub>2</sub>S analyzer:

1. Source a calibration gas of H<sub>2</sub>S in a balance of N<sub>2</sub> regulated to 15 psi (check expiry date). H<sub>2</sub>S concentration to be approximately 2/3 of full-scale range or close to the H<sub>2</sub>S alarm set point.

2. Press the bypass button and verify the "Bypass" LED illuminates (alarms will be held in the non- alarm state).
3. Turn off all gas supplies to the analyzer and check that a sufficient amount of H<sub>2</sub>S sensing tape is installed.
4. Press the "Menu/Set" button until "Mtr Run" is displayed. Press the right arrow [→], the H<sub>2</sub>S sensing tape will advance for approximately 10 seconds.
5. Press the "Menu/Set" button until "mV" is displayed ("###mV"). If the mV reading is 1000mV (±100mV), proceed to the next step, otherwise re-zero. Refer to “4.3.2 Re-zero Sensor Procedure” Section on page 28.
6. Connect calibration gas to calibration port and turn the 3-way calibration valve 180°. The valve handle should be pointing towards where the gas bottle tubing is connected to (Calibration Inlet).
7. Turn on sample inlet valve, ensure that the sample regulator is supplying 15psig to the eductor (make sure there is suction from the eductor block). Adjust the flow meter to 2.0.
8. Wait until the H<sub>2</sub>S reading has stabilized (20 to 30 minutes).
9. With calibration gas applied, if H<sub>2</sub>S reading is satisfactory (±2% of analyzer full range) skip to step 16, if H<sub>2</sub>S reading is not satisfactory a gain adjustment is required, continue to step 10.
10. Press the "Menu/Set" button until the gain setting is displayed ("### Gain").
11. Using the average of minimum 3 stable readings, calculate the new gain. New gain value should be within approximately 25% of the gain installed at the factory.

$$\left[ \frac{\text{Cal Gas Concentration}}{\text{Current Readings}} \right] \times (\text{Current Gain}) = (\text{New Gain})$$

**Equation 2: Gain Calculation**

12. To adjust the gain setting such that the analyzer displays the correct H<sub>2</sub>S concentration, press the right [→] and / or left [←] arrows until the cursor is underneath the number you wish to change.
13. Adjust the number using the "Menu/Set" button (it will increase until "9" then will cycle back to "0").
14. Save the new gain value by pressing the right arrow [→] until "Saved" appears or discard by pressing the left [←] arrow until "Cancel" appears.
15. Allow the analyzer to complete at least two stable cycles using the new gain value. The H<sub>2</sub>S reading should match the calibration gas concentration. Repeat step 10 if necessary.

16. Return to sample gas flow using the 3-way calibration valve.
17. Set the sample gas pressure to 15 psig and set the flow meter to 2.0.
18. Close calibration gas bottle and disconnect.
19. Wait 10 to 15 minutes to confirm the analyzer reads below the H<sub>2</sub>S alarm set points.
20. Remove the analyzer from bypass mode by pressing the bypass button. Verify the "Bypass" LED turns off.



---

**Alarms are armed after removing the bypass mode.**

---

#### **4.3.2 Re-zero Sensor Procedure**

1. Press the bypass button and verify that the "Bypass" LED illuminates.
2. Turn off sample gas flow using sample inlet valve.
3. Press the "Menu/Set" button until "Mtr Run" is displayed. Press the right arrow [→], the H<sub>2</sub>S sensing tape will advance for approximately 10 seconds.
4. Remove the sensor cover.
5. Press the small pushbutton on the sensor block located on the lower left side next to the wire connector.
  - The sensor block will implement a "re-zero" procedure, indicated by a lit, red LED.
  - When the "re-zero" procedure is complete the LED light will turn green.
6. Initiate another motor run (Step 3).
7. Press the "Menu/Set" button until "### mV" is displayed.
  - Value should be 1000mV (±100mV)
8. Put on sensor cover.
9. Turn on sample gas flow using sample inlet valve.
10. Set the gas pressure to 15 psig and the flow meter to 2.0.
11. Confirm the analyzer reads below the H<sub>2</sub>S alarm set points.
12. Remove the analyzer from bypass mode by pressing the bypass button. Verify the "Bypass" LED turns off.



---

**Alarms are armed after removing the bypass mode.**

---



## 5.0 MAINTENANCE

---

Do not disconnect equipment unless power has been switched off or area is known to be non-hazardous.

Turn off power before servicing. Ensure breakers are off before connecting or disconnecting power supply.

Electrostatic Hazard – Backpan and Certification nameplate must be cleaned only with a damp cloth to prevent static charging hazard.

Hydrogen Sulfide and/or other hazardous gases may be present under normal operation – proper precaution and protective equipment is advised.

Incorrect configuration of the analyzer may cause incorrect operation. Injury and/or damage to facilities may occur. Check analyzer's functionality after configuration changes have been made.



Disassembly of the pressure regulator and solenoids in the field is not advised. Consult Envent Engineering Ltd if the regulator or solenoid appears contaminated.

Before resuming line pressure, be sure that all port connections, sample sweep and sample conditioning system are securely installed.

Do not use solvents, brake cleaners, soaps, detergents or rubbing alcohol to clean up analyzer or sample system.

Substitution of components may impair intrinsic safety and suitability for Class I, Division 1.

Open circuit before removing cover.

The glass window on the XP enclosure must remain installed in order to maintain area classification.

Substitution of components may impair suitability for Class I, Division 2.



Total Sulfur Furnace reaches a temperature of up to 900 °C internally after 1 hour on. Do not touch external surface as it can reach up to 150 °C. Allow enclosure at least 1 hour after powering down the analyzer to cool down before servicing.

The 330S/331S H<sub>2</sub>S analyzer will provide reliable service with very little attention. If the analyzer is kept clean there should be no requirement to recalibrate from factory gain settings. However, regular check-ups (at least every three months) will ensure that the analyzer is operating to specifications.

- Ensure that the H<sub>2</sub>S sensing tape take-up and feed reels are tight
- Ensure that the flow meters, humidifier tubing and sample chamber tubing are free of liquid or particulate contamination. If the sample conditioning system is flooded with liquid, refer to "5.2 Sample Conditioning System Cleaning Procedure" on page 31.
- Ensure there is enough H<sub>2</sub>S sensing tape, especially if a low H<sub>2</sub>S sensing tape sensor is not installed. Refer to "5.1 H<sub>2</sub>S Sensing Tape Change Procedure".
- Check the sample conditioning filter(s) every time the H<sub>2</sub>S sensing tape is replaced. Replace the filter(s) as required.

## 5.1 H<sub>2</sub>S Sensing Tape Change Procedure

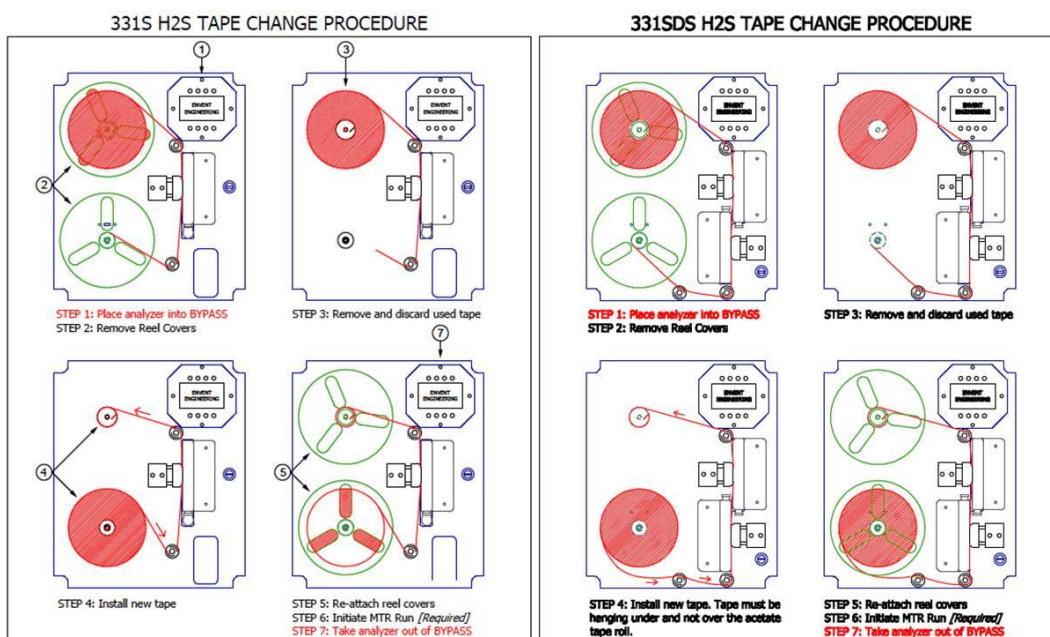


Figure 11. 331S & 331SDS Sensing Tape Change Procedure (Same as 330S & 330SDS models)

## 5.2 Sample Conditioning System Cleaning Procedure

During start-up or plant upset situations, the 330S/331S H<sub>2</sub>S analyzer may become contaminated with amine or hydrogen sulfide scavenger solution. This may cause the analyzer to read low (this can be determined at calibration). If the analyzer reads low, it will require incremental increases in the gain to maintain calibration. Please refer to factory calibration sheet for factory set gain factor. If the scavenger solution is water soluble it should be relatively easy to clean.

### 5.2.1 Material List

Cleaning Kit Part Number: 3000011

- Alconox RBS Solid, powdered precision cleaner w/ MSDS (2.5 tbsp)
- 3000010 – Rear window and gasket
- MIF-225-PP – Small nipple (x2)
- MIF-32-PVC – Grey nipple
- MIF-32-PP – Big nipple
- MIF-24-PVC – Humidifier replacement tube fittings (x2)
- MIP-4 Humidifier replacement plug
- 06349-40 – Black 1/8" male/female elbow
- LT-2-4 (1/4" x 11") – Tubing for sample chamber to humidifier
- LT-2-4 (1/4" x 10") – Tubing for flow meter to humidifier
- LT-3-5 (3/16" x 10") – Tubing for sample chamber to vent block
- PFA (24") – Tubing for flowmeter to bulkhead



**Do not use solvents, brake cleaners, soaps, detergents or rubbing alcohol to clean up analyzer or sample system.**

### 5.2.2 Cleaning Procedure

1. Mix a 1% (2-1/2 tbsp per gallon) of Alconox in warm water
2. Sample line tubing
  - Shut off flow at the sample point prior to sample conditioning system
  - Flush the sample line and components with cleaning solution
  - Rinse with fresh water
  - Flush with isopropyl alcohol
  - Dry with clean, dry instrument air or gas
3. Sample conditioning system – **Take pictures of SCS before disassembling**
  - Remove filter elements from filter housings and discard

- Remove all sample conditioning system components and soak in cleaning solution
- Ensure valves are fully open when cleaning
- Flush sample components with fresh water
- Rinse with isopropyl alcohol
- Blow dry with clean compressed air or fuel gas
- If the clear Vinyl tubing appears discolored, replace the tubing.
- Nafion tubing on humidifier should be replaced if it appears contaminated. **Do not clean Nafion tubing with isopropyl alcohol.**



---

**Disassembly of the pressure regulator and solenoids in the field is not advised. Consult the factory if the regulator or solenoid appears contaminated.**

---

4. Re-assemble Stainless Steel Tubing to analyzer according to analyzer drawing, refer to pictures taken before disassembling or refer to drawing package.
5. Once sample conditioning system has been re-assembled, apply calibration gas to the analyzer. Refer to "4.3.1 H2S Gas Calibration" on page 26.

## 6.0 TROUBLESHOOTING

H2S Readings Issues		
Problems	Possible Reasons	Possible Solutions
Erratic H2S Readings	Trigger slide and H2S sensing tape not seated properly	Ensure trigger slide and H2S sensing tape are seated in the groove of the sample chamber.
	Pressure in building changing from fan, exhaust, or wind	The eductor should counteract this effect; however, the eductor may be plugged, or the vent may be blocked. Check there is no blockage and that all vent tubing and fitting are 316 stainless steel, sized 3/8" or larger on a downward slope.
	Sample vent/Eductor either blocked or frozen	Check there is no blockage on the vent and/or eductor. Check for vacuum in Eductor block. Vent tubing and fittings should be 316 stainless steel 3/8" or larger on a downward slope. Possible heat trace required.
	Analog input 2 jumper removed	Re-install jumper in Analog Input across (+4-20 & -4-20) on the controller board.
	Sensor block fault	Re-zero sensor block. Refer to "Re-zero Sensor procedure" on page 28. Check for green status led on sensor block once procedure is done & proper mV on white H <sub>2</sub> S sensing tape.
	Sensor did not zero on white H2S sensing tape	Check the H <sub>2</sub> S Sensing tape, if not properly installed, refer to "H <sub>2</sub> S Sensing Tape Change Procedure" on page 30 or on sticker in the analyzer's door.  Perform a motor Run: Display>Press Menu Button until "MTR Run">Press right button. This will activate the motor and move the H <sub>2</sub> S Sensing tape for a few seconds. Re-zero sensor block if necessary. Refer to "Re-zero Sensor procedure" on page 28.

	Regulator not maintaining 15 psig (Changing flow rate to analyzer)	Replace Regulator, Consult Envent Engineering Ltd.
	Contaminants in sample chamber	Clean sample chamber, aperture, and window; replace if required. Contact Envent Engineering Ltd for replacement assistance.
	Contaminants or liquid carry over in sample conditioning system	If contaminants or liquid has carried over the sample system, refer to page 31.
	Humidifier leaking	Humidifier needs to either be repaired or replaced. Consult Envent Engineering Ltd.
	Possible high pressure in flare line (Dilution option only)	Install a higher rated check valve.
Slow response	Aperture in chamber not optimized for required range	Consult "Aperture Strip" on page 20 for aperture size and contact Envent Engineering Ltd to order aperture and for assistance to install new aperture and re-calibrate analyzer. Refer to "4.3.1 H2S Gas Calibration" on page 26.
	Contaminants or liquid carry over in sample conditioning system	If contaminants or liquid has carried over the sample system, refer to page 31.
Higher than Expected Readings	Sample vent/Eductor either blocked or frozen	Check for blockage in the vent and/or eductor. Check for vacuum in Eductor block  Vent tubing and fittings should be 316 stainless steel 3/8" or larger on a downward slope. Possible heat trace required.
	Contaminants in sample chamber	Clean sample chamber, aperture, and window; replace if required. Contact Envent Engineering Ltd for replacement assistance.
	Aperture out of place or not optimized for required range	Remove the sample chamber, unscrew the sensor block and check that the aperture is not out of place. Consult "Aperture Strip" on page 20 for aperture size and "4.3.1

		H2S Gas Calibration" on page 26. Contact Envent Engineering Ltd to order aperture (if applicable) and for assistance to install new aperture and re-calibrate analyzer.
	Sensor/ sensor wire failure	Re-zero the sensor block. Refer to "Re-zero Sensor procedure" on page 28. If procedure fails, sensor or sensor wire may require replacement.
	Gain set too high	Gain is too high for the current setup. Re-calibrate analyzer and refer to current gain (from factory). The difference between factory gain and new gain should not be greater than +/- 2%. If necessary, do a gas calibration. Refer to "4.3.1 H2S Gas Calibration" on page 26
	Higher than required pressure/flow	Adjust pressure regulator to 15 psig and flow meter to "2"
	Dilution canister tubing loose (Dilution option only)	Tubing inside the canister leaking. Open canister (follow all safety procedures to bleed out all high H2S level concentrations) and re-connect the tubing to the fittings on canister lid. Contact Envent engineering Ltd for replacement if required.
	Total Sulfur's Hydrogen flow was decreased at the flow meter (Total Sulfur option only)	The flow of hydrogen being mixed with sample gas has been decreased. Either the hydrogen bottle is empty, or the flow was decreased through the flow meter knob. Adjust back to appropriate flow rate.
Lower than Expected Readings	Leaks in the sample system causing lower readings	Do a leak check on the sample system and humidifier. Use Snoop to detect the possible leaks in the system.
	Flow is too low	Make sure that the flow of sample gas coming into the analyzer is set to "2" (83.63 cc/min) at the flow meter.
	Gain set too low	Gain is too low for the current setup. Re-calibrate analyzer and refer to current gain (from factory). The difference between

		factory gain and new gain should not be greater than +/- 2%. If necessary, do a gas calibration. Refer to "4.3.1 H2S Gas Calibration" on page 26.
	Not using the humidifier or humidifier leaking	<p>A humidifier is not necessary if the sample gas inlet is already humidified. If the sample gas inlet is dry, a humidifier must be used. Make sure the humidifier unit is placed and installed correctly. Please refer to "3.3.6.3 Humidifier Unit" on page 21.</p> <p>Humidifier Leaking: it needs to either be repaired or replaced. Consult Envent Engineering Ltd.</p>
	Sensor/ sensor wire failure	<p>Re-zero the sensor block. Refer to "Re-zero Sensor procedure" on page 28.</p> <p>If procedure fails, sensor or sensor wire may require replacement.</p>
	Dilution Instrument air or carrier gas flow was increased (Dilution option only)	If the instrument air or the carrier gas is increased in flow, the readings will be lower. Make sure to keep a constant flow and pressure for the instrument or carrier gas.
	Hydrogen flow has been increased (Total Sulfur option only)	Lower the hydrogen flow to the specified on the flow meter.

**Table 6. H2S Sensing Troubleshooting**



H2S Sensing Tape Issues		
Problems	Possible Reasons	Possible Solutions
Tape does not advance	No tension on take up reel	Check setscrew in take up reel collars, if loose; tighten up with a 1/16" hex key. Do a manual advance on H2S sensing tape. To do a motor run: Display>Press Menu Button until "MTR Run">Press right button. This will activate the motor and move the H2S Sensing tape for a few seconds.
Tape breaking	High liquid content in sample gas	Genie probe and additional filtration may be required in sample conditioning system.
	Feed wheel not spinning freely	Dust and refuse build up between feed wheel and chassis. Requires removal and cleaning of chassis.
	Tape cover wheels pressing against H2S sensing tape	H2S sensing tape cover wheel became warped. Needs to be flattened to not contact tape when on feed wheel bolt. If replacement needed, consult Envent Engineering Ltd.
	Trigger slide not seated properly	Ensure trigger slide is seated in groove of sample chamber.
Overlapping Stains	This is normal in the 1st 1/4 of a new H2S sensing tape. It should not cause any reading problems.	If it is causing reading problems, the "stop threshold" can be modified from 1,000,000 to 500,000. Please consult Envent Engineering Ltd before proceeding with this change.
Excessive H2S sensing Tape consumption	Sample vent either blocked or frozen	Check there is no blockage on the vent and/or eductor. Vent tubing and fittings should be 316 stainless steel 3/8" or larger on a downward slope. Possible heat trace required.
	Contaminants in sample chamber	Clean sample chamber. Replace aperture and window if required. Contact Envent Engineering Ltd for replacement and assistance.
	H2S Sample inlet constantly being out of range from original analyzer intent	If the H2S sample inlet is greater than the range of the analyzer, the tape will be consumed after than in normal operation.

	Aperture out of place	Take out the sample chamber, unscrew the sensor block and check that the aperture is not out of place. If so, refer to "Aperture Strip" on page 20 for aperture size and "4.3.1 H2S Gas Calibration" on page 26.
	Sensor/ sensor wire failure	Try re-zeroing the sensor. Refer to "Re-zero Sensor procedure" on page 28. If procedure fails, Sensor or sensor wire may require replacement.
H2S sensing Tape coming out of sample chamber/trigger slide	Trigger slide not seated properly	Ensure trigger slide is seated in groove of sample chamber

**Table 7. Sensing Tape Troubleshooting**

<b>Electronics Issues</b>		
<b>Problems</b>	<b>Possible Reasons</b>	<b>Possible Solutions</b>
Fault LED (Sensor High)	Incorrect zeroing	Make sure the H2S Sensing tape is installed properly and do a motor run. To do a motor run: Display>Press Menu Button until "MTR Run">Press right button. This will activate the motor and move the H2S Sensing tape for a few seconds. The alarm should clear.
	Faulty Sensor	Sensor needs to be replaced. Contact Envent Engineering Ltd for replacement.
Fault LED (Sensor Low)	Sensor did not zero on white H2S sensing tape because H2S sensing tape came out of sample chamber slot	Re-install H2S Sensing tape. Refer to "5.1 H2S Sensing Tape Change Procedure" on page 30 or on sticker in the analyzer's door. Re-zero sensor block. Refer to "Re-zero Sensor procedure" on page 28.
	Sensor/ sensor wire failure	Re-zero the sensor block. Refer to "Re-zero Sensor procedure" on page 28. If procedure fails, sensor or sensor wire may require replacement.

	IS Barrier failure (For 330S analyzer series only)	IS Barrier may need replacement. Consult Envent Engineering Ltd.
	Contaminants in sample chamber	Clean sample chamber. Replace aperture and window if required. Contact Envent Engineering Ltd for replacement and assistance.
Fault LED (Low H2S sensing Tape)	New H2S sensing tape is required	H2S Sensing tape requires change (Average of 2 to 3 days left, from the moment alarm goes off, for the tape to be completely used up).
	Low H2S sensing tape sensor failure	If the alarm does not clear once a new H2S sensing tape is installed, the low H2S sensing tape sensor, or its wires have failed and need to be replaced. Consult Envent Engineering Ltd to order a replacement. Low H2S sensing Tape Sensor Part #: <b>4000004</b>
Fault LED (Low Pressure)	Pressure of sample gas is lower than setpoint of pressure switch (factory set to 10 psi descending)	Inspect the sample inlet upstream to troubleshoot the problem.
	Pressure switch failed	If pressure is above 10 psi and alarm continuous, the pressure switch setpoint might have changed. Set back to 10 psi descending. Also, check pressure switch wiring If the problem persists, pressure switch might need replacement. Contact Envent Engineering Ltd.
	Pressure regulator failed	The problem might be coming from the pressure regulator. Troubleshoot and consult Envent Engineering Ltd.
Fault LED (Oven Fail)	Fuse not installed.	Fuse for furnace does not come installed in the controller board. Please check spare fuse bag and install fuse.
	Oven not working properly	Oven failed and temperature has dropped below the optimal temperature. Please consult Envent Engineering Ltd.
Blank Display	Contrast needs adjustment	Change contrast by turning the potentiometer in the display board.

Analyzer not communicating with PC	Multiple reasons could be causing the analyzer to not communicate properly with the PC.	<p>Check that the analyzer is ON.</p> <p>Check that the communication cable is properly connected.</p> <p>If the software application was open before connecting the communication cable from the analyzer to the computer, close the software and re-open it. Try again and enable communication.</p>
Analyzer not turning ON	Blown fuse	Check fuse in the controller board. Replace if required.
	Controller board Malfunction	Consult Envent Engineering Ltd for a controller board replacement.
	Not using the appropriate voltage rating	Make sure to use the appropriate voltage to power the analyzer. DC controller boards can be powered with 12 - 24 VDC and AC controller boards can be powered with 110 to 240 VAC. Keep in mind that if solenoids are controlled by the controller board, the voltage must match the solenoids voltage rating.
Red LED on Sensor Block	Sensor block fault	<p>Re-zero sensor block. Refer to "Re-zero Sensor procedure" on page 28.</p> <p>Check for green status led on sensor block once procedure is done. If sensor LED stays red, consult Envent Engineering Ltd for a replacement.</p>
	Wiring not done properly	Make sure the wiring is done correctly.
Analog Outputs (4-20 mA) not working	Not using an external power supply	The analog outputs in the controller board are loop powered and not self-powered unless AO boards were installed as per customer request. If AO boards were not requested, an external power supply must be used. Refer to "3.3.6.1 Analog Outputs" on page 17 to see different wiring options.

	The system variable for output has been modified.	By factory configuration, the analog outputs (1 & 2) are configured to output based on H2S Sample 1. Make sure that if they are modified, that the right system variables are selected.
Not coming out of alarm	Alarms are latched	If alarms are latched, they need to be acknowledged. Go to the display> cycle through until "ACK" is reached> press the right button to acknowledge all latched alarms.  To deactivate the latching on any alarm, use the ICE software, and connect to the analyzer and de-select latching on any alarm that is latched.
	The analyzer is in an alarm state	Make sure the alarm setpoint values are as desired and that the analyzer is below (or above – like temperature setpoint) those setpoint values.

Table 8. Electronics Troubleshooting

Sample Conditioning System Issues		
Problems	Possible Reasons	Possible Solutions
Liquid Carried over in SCS	Sample too wet for current conditioning sample system.	If a one-time occurrence: Cleaning required for sample system, refer to "Sample Conditioning System Cleaning Procedure" on page 31.  If more than one time occurrence: Sample conditioning system may need a system for wet/dirty sample gas (extra filters set as coalescing, add liquid float stops, etc.). Consult Envent Engineering Ltd.
Regulator not maintaining 15 psi (erratic H2S readings)	Problems with the Regulator (over pressured)	Replace Regulator, Consult Envent Engineering Ltd.

	Liquid carried over into regulator	Consult Envent Engineering Ltd.
	Problems with the (50 psi) sample pre-regulator at the sample point.	Heated regulator may be required if liquid hydrocarbon carry over is present at the pre-regulation sample.
Pressure gauge not working	Over pressured gauge	Replacement is required. Consult Envent Engineering Ltd for replacement.
Flowmeter not working	Liquid carried over into flowmeter	Consult Envent Engineering Ltd.
Frozen humidifier	Analyzer is being exposed to temperatures below 0 degrees °C (or - 2 degrees °C if 5% acetic acid is used)	Do not expose analyzer to temperatures below 0 degrees °C or - 2 degrees °C
Humidifier leaking liquid	The humidifier body cracked - Could be due to extreme temperature changes.	A replacement may be required. Consult Envent Engineering Ltd for a replacement.

**Table 9. Sample Conditioning System Troubleshooting**

Calibration Issues		
Problems	Possible Reasons	Possible Solutions
Change gain more than +/- 25% from original gain after calibration	Not using the right calibration bottle	Make sure the calibration bottle is within analyzer range. It is recommended that calibration gas used is close in value to where the alarm setpoint values need to be (for more accuracy).

**Table 10. Calibration Troubleshooting**

## APPENDIX A – RECOMMENDED SPARE PARTS LIST

Part Number	Quantity	Description
1300111	1	Eductor Block
3100008 (3100009 for SDS)	1	Humidifier Rebuild kit c/w Elbows, Nafion Tubing
3000010	2	Rear Window & Gasket
2000023 - 2000033	1 or (2 for SDS)	Aperture Strip (Associated to measurement range)
2000036	1	4-liter Containers of Acetic Acid
2000040	12	300' Lead Acetate Tape (H2S Sensing Tape)
2000048	1	Box of 10 Micro Filter Glass Fiber Element 12/19-57-50CSK
2000050	2	13" Chubby Quartz Tube (Total Sulfur option only)
1100113	1	TS Ceramic Heater (Total Sulfur option only)
3000022	1	AFLAS O-Ring Kit (Total Sulfur option only)
3000011	1	Tubing, Cleaner, Fittings Maintenance Kit

Table 11: Recommended Spare Parts

### Envent H2S Acetate Tape Statement of Shelf Life




Envent Engineering H2S sensing tapes are suitable for use, if stored in the original sealed envelope, for 10 years from date of manufacture.

Tapes should be stored in a cool dry location.

If the seal on the package has been broken in storage, the H2S sensing tape should be discarded.


## APPENDIX B – SEALING COMPOUND INFORMATION

**KILLARK FITTINGS**




**EY SERIES**


### SEALING FITTINGS




**ENY**  
(For Vertical or Horizontal Conduit)




**ENY with Nipple**  
(For Vertical or Horizontal Conduit)




**EY**  
(For Vertical Conduit)




**EY with Nipple**  
(For Vertical Conduit)




**ENY-2**  
(Fixture Hanger)  
(See Page L146)




**EYS**  
(For Vertical or Horizontal Conduit)



**EYS with Nipple**  
(For Vertical or Horizontal Conduit)



**EYD**  
(Drain/Seal for Vertical Conduit)



**EYD with Nipple**  
(Drain/Seal for Vertical Conduit)

**Class I, Div. 1 & 2, Groups A, B, C, D**  
**Class I, Zone 1, Groups IIC, IIB, IIA**  
**Class II, Div. 1 & 2, Groups E, F, G**  
**Class III**

**FEATURES-SPECIFICATIONS**

**Application & Installation**  
**Class I, Divisions 1 and 2**

The purpose of seals in a Class I hazardous location is to minimize the passage of gases and vapors and prevent the passage of flames from one electrical installation to another through the conduit system. Seals are required to be installed within 18 inches on any conduit run entering an enclosure which contains devices that may produce arcs, sparks, or high temperature. Where two enclosures are connected by a run of conduit not over 3 ft. long, a single seal located at the center of the run is considered satisfactory. Only explosionproof unions, couplings, elbows, and conduit bodies similar to "L", "T", and "X" type shall be permitted between the sealing fitting and the enclosure.

Seals shall be located within 18 inches of the enclosure or fitting on each conduit run of 2 inch size or larger entering an enclosure or fitting that contains terminals, splices, or taps.

Each run of conduit from a hazardous location to a nonhazardous location should be sealed to minimize the amount of gases and vapors communicated beyond the seal.

**Class II, Divisions 1 and 2**

Where a raceway provides communication between an enclosure which is required to be dust-ignitionproof and one which is not, suitable means shall be provided to prevent the entrance of dust into the dust-ignitionproof enclosure through the raceway.

**Consideration for selection seals:**

Select the proper sealing fitting for the hazardous gas/vapor involved; i.e., Class I Groups A, B, C, or D, Zone 1, Groups IIC, IIB, IIC.

Select a sealing fitting for the proper use in respect to mounting position. This is particularly critical when the conduit runs between hazardous and nonhazardous areas. Some seals are designed to be mounted in any position; others are restricted to vertical mounting.

**Drains**

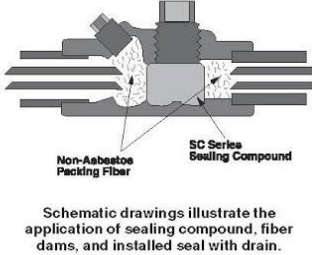
Where there is a probability that liquid or other condensed vapor may be trapped within enclosures for control equipment or at any point in the raceway system, approved means – such as installation of drain seals – shall be provided to prevent moisture accumulation.

For more complete data or special applications, consult the code or your local inspector.

Sealing compounds shall be approved for the purpose and shall not be affected by the surrounding atmosphere or liquids, and shall not have a melting point of less than 93°C. (200°F).

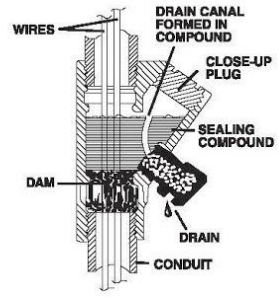
In the complete seal, the minimum thickness of the sealing compound shall not be less than the trade size of the conduit, and in no case less than 5/8 inch.

**NOTE:** The amount of Killark sealing compound and packing fiber required for any seal is determined by volume hub size and mounting position of the seal. Refer to installation data table on page F50 for specific amounts required.



**Non-Asbestos Packing Fiber**  
**SC Series Sealing Compound**

Schematic drawings illustrate the application of sealing compound, fiber dams, and installed seal with drain.



**WIRES**  
**DRAIN CANAL FORMED IN COMPOUND**  
**CLOSE-UP PLUG**  
**SEALING COMPOUND**  
**DAM**  
**DRAIN**  
**CONDUIT**


Splices and taps shall not be made in fittings intended only for sealing with compound, nor shall other fittings in which splices or taps are made be filled with compound.

Killark sealing fittings are produced with utmost care to insure a substantial margin of safety. Threads are clean, deep, and snug. When properly installed with Killark sealing compound (SC Type) and Killark non-asbestos fiber (PF Type) for the dams, you can be sure your installation will provide more than adequate safety.

F46

**KILLARK**

WWW.HUBBELL-KILLARK.COM



Harsh & Hazardous



## KILLARK FITTINGS

## FITTINGS

EY SERIES



## 25% FILL VERTICAL SEALING FITTINGS



EY-75M



EY-75TM

## EY Series

Class I, Div. 1 & 2, Groups B, C, D  
Class I, Zone 1, Groups IIB, IIA  
Class II, Div. 1 & 2, Groups E, F, G  
Class III



## FEATURES-SPECIFICATIONS

## Applications

To seal conduits in vertical runs. To minimize the passage of gases and vapors and prevent the passage of flames from one portion of the electrical system to another through the conduit.

## Features

- Large opening for easy packing of fiber dam and pouring of compound
- Integral bushings in conduit hubs to protect conductor insulation from damage
- Npt tapped hubs to ensure ground continuity
- Design provides minimum turning radius
- 25% conductor fill
- EY-T style supplied with removeable close nipples

## Material/Finish

**Copper-free Aluminum**  
(less than 4/10 of 1%)

- Electrostatically applied powder coating

## Duraloy Iron

- Tri-Coat Finish of electrozinc, chromate sealant, and electrostatically applied powder coating

## EY VERTICAL SEALING FITTINGS

HUB SIZE	CATALOG NUMBER	DIMENSIONS		TURNING RADIUS*	SEALING COMPOUND REQUIRED	PER HUB (PF)
	KILLARK ALUMINUM	A	B			
1/2"	EY-50	3-5/16" (84)	1-1/8" (29)	1-11/16" (37)	3/4 oz.	1/32 oz.
3/4"	EY-75	3-11/16" (94)	1-5/16" (33)	2" (51)	1-3/4 oz.	1/16 oz.
1"	EY-100	4-3/8" (111)	1-5/8" (41)	2-7/16" (62)	3-3/4 oz.	1/8 oz.

\*Turning radius with plug removed.

## EY VERTICAL SEALING FITTINGS WITH NIPPLE

HUB SIZE	CATALOG NUMBER	DIMENSIONS		TURNING RADIUS*	SEALING COMPOUND REQUIRED	PER HUB (PF)
	KILLARK ALUMINUM	A	B			
1/2"	EY-50-T	4-3/16" (106)	1-1/8" (29)	1-11/16" (37)	3/4 oz.	1/32 oz.
3/4"	EY-75-T	4-9/16" (116)	1-5/16" (33)	2" (51)	1-3/4 oz.	1/16 oz.
1"	EY-100-T	5-1/2" (140)	1-5/8" (41)	2-7/16" (62)	3-3/4 oz.	1/8 oz.

\*Turning radius with plug removed.

## EY VERTICAL SEALING FITTINGS

HUB SIZE	CATALOG NUMBER	DIMENSIONS		TURNING RADIUS*	SEALING COMPOUND REQUIRED	PER HUB (PF)
	KILLARK IRON	A	B			
1/2"	EY-50M	3-5/16" (84)	1-1/8" (29)	1-11/16" (37)	3/4 oz.	1/32 oz.
3/4"	EY-75M	3-11/16" (94)	1-5/16" (33)	2" (51)	1-3/4 oz.	1/16 oz.
1"	EY-100M	4-3/8" (111)	1-5/8" (41)	2-7/16" (62)	3-3/4 oz.	1/8 oz.

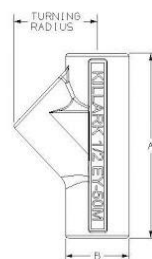
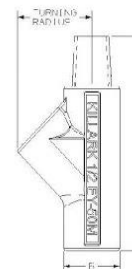
\*Turning radius with plug removed.

## EY VERTICAL SEALING FITTINGS WITH NIPPLE

HUB SIZE	CATALOG NUMBER	DIMENSIONS		TURNING RADIUS*	SEALING COMPOUND REQUIRED	PER HUB (PF)
	KILLARK IRON	A	B			
1/2"	EY-50TM	4-3/16" (106)	1-1/8" (29)	1-11/16" (37)	3/4 oz.	1/32 oz.
3/4"	EY-75TM	4-9/16" (116)	1-5/16" (33)	2" (51)	1-3/4 oz.	1/16 oz.
1"	EY-100TM	5-1/2" (140)	1-5/8" (41)	2-7/16" (62)	3-3/4 oz.	1/8 oz.

\*Turning radius with plug removed.

EY Female to Female

EY with Nipple  
Male to Female

KILLARK®

WWW.HUBBELL-KILLARK.COM



F49

# FITTINGS

SC/PF SERIES

## SEALING MATERIALS

Sealing Compound

Packing Fiber

SC11W

### FEATURES-SPECIFICATIONS

#### Series SC/PF

#### Sealing Materials

SC Series Sealing compound is a cement used extensively for sealing conduit to prevent the spread of explosive gases. It is non-shrinking and a secure seal is formed. SC Series resists acids, water, oil, etc. It is UL Listed for use with Killark ENY, EY, and EYS Series. Also CSA certified for use with any CSA certified sealing fitting.

#### Packing Fiber

Killark's Packing Fiber is made from an environmentally safe, non-asbestos material. It is easy to use and forms a positive dam to hold compound (Killark SC Type) in ENY, EY, and EYS Series fittings.

#### Features of SC with Water

- Exact amount of compound and water are packaged together into a two-compartment plastic pouch.
- The precise amount of compound and water are available for mixing. No mixing or measure implements are required.
- Squeezing the inner water container forces the water into the compartment containing the sealing compound. Complete mixing takes place inside the plastic pouch.
- The mixed sealing compound can be poured directly into the sealing fitting. A tubular straw is provided for those difficult seals to reach.
- The package label indicates the size and quantity of sealing fittings each pouch will properly fill.

OUNCES REQUIRED PER FITTING				
SEALING COMPOUND				PACKING FIBER
HUB SIZE	ENY®	EYS®	EY/EYD	
1/2"	1.5 oz.	3.0 oz.	1.0 oz.	1/16 oz.
3/4"	2.0 oz.	3.0 oz.	2.0 oz.	1/8 oz.
1"	3.0 oz.	8.0 oz.	4.5 oz.	1/4 oz.
1-1/4"	6.5 oz.	8.5 oz.	7.5 oz.	1/2 oz.
1 1/2"	8.5 oz.	17.5 oz.	12.0 oz.	1 oz.
2"	15.0 oz.	27.0 oz.	24.0 oz.	2 oz.
2-1/2"	—	42.0 oz.	44.0 oz.	3 oz.
3"	—	47.0 oz.	44.0 oz.	4 oz.
3-1/2"	—	56.0 oz.	75.0 oz.	6 oz.
4"	—	56.0 oz.	75.0 oz.	9 oz.

® ENYEYS suitable for both horizontal or vertical applications.

SEALING COMPOUND	
CATALOG NUMBER	SIZE PACKAGE
SC-4 OZ	4 oz.
SC-8 OZ	8 oz.
SC-1 LB	1 lb.
SC-5 LB	5 lbs.

PACKING FIBER	
CATALOG NUMBER	SIZE PACKAGE
PF-2	2 oz.
PF-4	4 oz.
PF-16	1 lb.

SEALING COMPOUND						
CATALOG NUMBER	HUB SIZE	WILL FILL THE FOLLOWING SEALS:			CU. IN. FILL PER POUCH	NO. OF POUCHES PER CARTON
		ENY	EYS	EY/EYD		
SC5W®	1/2"	3	1	5	5	5
	3/4"	2	1	2		
	1"	1	—	1		
SC11W®	1/2"	7	3	11	11	5
	3/4"	5	3	5		
	1"	3	1	2		



© Appropriate amount of Packing Fiber is included in carton. Additional Packing Fiber maybe purchased separately.

KILLARK®

WWW.HUBBELL-KILLARK.COM

Harsch & Hazardous

## APPENDIX C – SAFETY DATA SHEET FOR H<sub>2</sub>S SENSING TAPE

		<b>SAFETY DATA SHEET (SDS)</b> <b>Global Harmonization System</b>
<b>SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION</b>		
<b>1.1 Product Identifier / Product Name</b> REF (Product Code) 90746 Product Name Lead Acetate Impregnated Paper Tape 1 x roll Lead acetate paper		
<b>1.2 Relevant identified uses of the substance or mixture and uses advised against</b> <b>Relevant identified uses</b> Product for Analytical Use. The Exposure scenario is integrated into sections 1-16. <b>Uses advised against</b> not described		
<b>1.3 Details of the supplier and of the safety data sheet</b> <b>Manufactured by:</b> Envent Engineering Ltd. 7060 Farrell Road SE Calgary, AB, CANADA Tel.: 1-403-253-4012	E-mail: <a href="mailto:info@envent-eng.com">info@envent-eng.com</a>	
<b>1.4 Emergency telephone number</b> For Chemical Emergency Spill, Leak, Fire, Exposure, or Accident Call Envent Engineering 1-403-253-4012 Toll Free: 1-877-936-8368		
<b>SECTION 2: HAZARDS IDENTIFICATION</b>		
<b>2.1 Classification of the substance(s) or mixture(s)</b> <b>Lead acetate paper</b> EU Directive 1999/45/EC Hazard Symbols R 33-61 GHS Directive Hazard Symbols T Signal Word DANGER Hazard Identification H360Df H412	Hazard Classes/Categories Reproductive Toxicity cat. 1B Hazardous to the aquatic environment - chronic cat. 3	
<b>2.2 Safety, health and environmental regulations/legislation specific for the substance or mixture</b> According GHS inner packages must be only labelled with symbol(s) and product identifier. <b>Lead acetate paper</b> EU Directive 1999/45/E Hazard Symbols:  R 33-61 Danger of cumulative effects. May cause harm to the unborn child. S 53 Avoid exposure — obtain special instructions before use. GHS Directive		
Revision 1	1	



## SAFETY DATA SHEET (SDS) Global Harmonization System

Hazard Symbols:



GHS08

Signal Word: DANGER

H360Df

May damage the unborn child. Suspected of damaging fertility.

P202, P280sh, P308+313, P405

Do not handle until all safety precautions have been read and understood. Wear protective gloves/eye protection. IF exposed or concerned: Get medical advice/attention. Store locked up.

### 2.3 Other hazards

Possible Hazards from physicochemical Properties

Information pertaining to particular Risks to Human and possible Symptoms  
Can accumulate within the body.

Information pertaining to particular Risks to the Environment

---

Other Hazards

---

## SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances or 3.2 Mixtures

#### Lead acetate paper tape

Chemical: lead(II) acetate (trihydrate)

Weight Percent: 10%

Chemical Formula:  $C_4H_6O_4Pb \cdot 3H_2O$

Toxic Substance Control Act (TSCA) Inventory: not listed

Registry of Toxic Effects of Chemical Substances (RTECS): OF8050000

EC No.: 206-104-4

acc. 1999/45/EC: R33-52-53-61

Correlation Factor:  $x \ 0.546 \ (-\%Pb)$

Index No: 082-005-00-8

acc. GHS: H360Df, H412

Chemical: filter paper (cellulose CAS 9004-34-6)

Weight Percent: 80-100%

Chemical Formula:  $(C_6H_{10}O_5)_n$

Toxic Substance Control Act TSCA Inventory: listed

Registry of Toxic Effects of Chemical Substances (RTECS): FJ5691460

EC No.: 232-674-9

acc. 1999/45/EC: -

acc. GHS: not necessary

### 3.3 Remarks

List of R and H phrases: see section

## SECTION 4: FIRST AID MEASURES

### 4.1 Description of First aid measures

Place insured person out of danger zone to fresh air immediately. Ensure quiet, warmth, and provide resuscitation if necessary. If necessary contact medical advice.

#### 4.1.1 After SKIN Contact

Remove dust with wetted tissue. Remove contaminated clothing. Rinse the affected skin or mucous membrane thoroughly under running water.

#### 4.1.2 After EYE Contact

Rub dust with teardrops from eyes or: After contact with the eyes rinse thoroughly under running water with the eyelid wide open with eye washing bottle, eye douche or running water (protect intact eye).

#### 4.1.3 After INHALATION of Vapors

After inhalation of dust fresh air should be inhaled.

#### 4.1.4 After ORAL Intake

After oral intake lots of water should be drunk after it has been ingested.

### 4.2 Most important symptoms and effects, both acute and delayed

### 4.3 Indication of any immediate medical attention and special treatment needed



## SAFETY DATA SHEET (SDS) Global Harmonization System

### SECTION 5: FIREFIGHTING MEASURES

- 5.1 Extinguishable Media**  
Fire extinguishers appropriate to the fire classification, and, if applicable, a fire blanket must be available in a prominent location in the work area. All extinguishers like WATER FOG, WATER SPRAY, alcohol-resistant FOAM, DRY CHEMICAL, CARBON DIOXIDE can be used.
- 5.2 Special hazards arising from the substance or mixture**
- 5.3 Advice for firefighters**  
No, for listed product. Product package burns like paper or plastic.
- 5.4 Additional Information**  
—

### SECTION 6: ACCIDENTAL RELEASE MEASURES

- 6.1 Personal Precautions, Protective equipment and Emergency procedure**  
Regular staff training is necessary.
- 6.2 Environmental precautions**  
—
- 6.3 Methods and material for containment and cleaning up**
- 6.4 Reference to other sections**  
—

### SECTION 7: HANDLING AND STORAGE

- 7.1 Precautions for safe handling**  
Handling in accordance with the test instruction, that comes with the product.
- 7.2 Conditions for safe storage, including any incompatibilities**  
The original product package of Envent Engineering allows a safe storage.  
Storage class: see section 12.1
- 7.2.1 Conditions for safe storage, including any incompatibilities**  
Keep original product packages tightly closed during handling and storage.
- 7.3 Specific end use(s)**  
—

### SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

- 8.1 Control parameters**
- |   |  |   |
|---|--|---|
| <b>Lead acetate paper</b>                     |  | CAS No.: 6080-56-4                      |
| Chemical:                                     | lead(II) acetate (trihydrate)  |   |
| Canada CEPA 1999:                             | not listed   |   |
| TSCA Inventory:                               | not listed   | California Prop. 65 List: listed cancer |
| NIOSH:  | NTP Report on Carcinogens (RoC) List Yes (Lead compound - Reasonably anticipated to be a human carcinogen) |   |
| OSHA:   | not listed   |   |
| EU carcinogen:                                | R <sub>45</sub> 1, R <sub>46</sub> 3   |   |
| EU value:                                     | 0.15 Pb mg/m <sup>3</sup>  |   |
| <b>filter paper (cellulose CAS 9004-34-6)</b> |  | CAS No.: -                              |
| Canada CEPA 1999:                             | DSL yes  |   |
| TSCA Inventory:                               | listed   | California Prop. 65 List: not listed    |
| NIOSH:  | not listed   |   |
| OSHA:   | not listed   |   |
- 8.2 Exposure controls**  
The highest level of cleanliness must be maintained at the workplace.
- 8.2.1 Respiratory Protection**  
Only if additional recommendations in test instruction or packing insert.
- 8.2.2 Hand Protection**  
Yes, gloves (permeation time >30 min - level 2), consist of PVC, Natural latex, Neopren, or Nitril. Use for short times chemical resistant Latex gloves f.ex. with code EN 374-3 level 1.
- 8.2.3 Eye/face Protection**  
Yes, Splash Goggles.
- 8.2.4 Skin Protection**  
Recommended.
- 8.2.5 Hygiene measures**  
Eating, drinking, smoking, taking snuff and storage of food in work areas and at outdoor workplaces is prohibited. Avoid contact with the skin, eyes and clothing. Rinse any clothing on which the substance has been spilled, and soak it in water. Wash hands thoroughly with soap and water when stopping work and before eating, and then apply protective skin cream.





## SAFETY DATA SHEET (SDS) Global Harmonization System

### SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

#### 9.1 Information on basic physical and chemical properties

**Lead acetate paper**  
Appearance : solid  
pH: 5-7  
Color : colorless  
Odor : acetic

#### 9.2 Other information

### SECTION 10: STABILITY AND REACTIVITY

#### 10.1 Reactivity

no data available

#### 10.2 Chemical stability

no data available

#### 10.3 Possibility of hazardous reactions

no data available

#### 10.4 Conditions to avoid

#### 10.5 Incompatible materials

Only avoid contact with concentrated acids.

#### 10.6 Hazardous decomposition products

In the original package all parts/all reagents are safety and separated stored. Decompositions are not observed during the expiration period under recommended conditions.

### SECTION 11: TOXICOLOGICAL INFORMATION

#### 11.1 Information on toxicological effects

Following information is valid for pure substances.

##### Lead acetate paper

Chemical: LD50 <sub>rat</sub> :	<i>lead(II) acetate (trihydrate)</i>	CAS No.: 6080-56-4
	4665 mg/kg	
LC <sub>Low</sub> <sub>rat</sub> hmn :	714 mg/kg	
Chemical:	<i>filter paper (cellulose CAS 9004-34-6)</i>	CAS No.: -
LD50 <sub>rat</sub> :	>5000 mg/kg	
LC50 <sub>rat</sub> :	>58004h mg/m <sup>3</sup>	
LD50 <sub>dm</sub> <sub>rat</sub> :	>2000 mg/kg	

### SECTION 12: ECOLOGICAL INFORMATION

#### 12.1 Toxicity

Following information is valid for pure chemicals.

##### Lead acetate paper

Chemical:	<i>lead(II) acetate (trihydrate)</i>	CAS No.: 6080-56-4
-----------	--------------------------------------	--------------------

Chemical:	<i>filter paper (cellulose CAS 9004-34-6)</i>	CAS No.: -
-----------	---	------------

#### 12.2 Persistence and degradability

no data available

#### 12.3 Bioaccumulative potential

no data available

#### 12.4 Mobility in soil

no data available

#### 12.5 Results of PBT and vPvB assessment

no data available

#### 12.6 Other adverse effects

no data available



## SAFETY DATA SHEET (SDS) Global Harmonization System

### SECTION 13: DISPOSAL CONSIDERATIONS

Please observe local regulations for collection and disposal of hazardous waste and contact waste disposal company, where you will obtain information on laboratory waste disposal (RCRA Code D002/D003, EU waste code number 16 05 06).

#### 13.1 Waste treatment methods

### SECTION 14: TRANSPORT INFORMATION

No dangerous goods according the Transport regulations

#### 14.5 Environmental hazards

low, small amounts

#### 14.6 Special precautions for user

not necessary

#### 14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

not applicable

### SECTION 15: REGULATORY INFORMATION

#### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

##### U.S. Federal Regulations

OSHA "A Guide to The Globally Harmonized System of Classification and Labelling of Chemicals (GHS)"

<https://www.osha.gov/dsg/hazcom/ghs.html>

29 CFR 1910.1200 Hazard communication.

NIOSH Workplace Safety & Health Topics

TSCA Inventory

##### U.S. State Regulations

California Prop 65, Safe Drinking Water and Toxic Enforcement Act of 1986

##### Canada

Canada CEPA 1999 - Domestic Substances List (DSL), List of Toxic Substances (Schedule 1)

#### 15.2 Chemical safety assessment

—not necessary for these small amounts

### SECTION 16: OTHER INFORMATION

#### 16.1 List of R and H Phrases

##### 16.1.1 List of relevant R Phrases

R33

Danger of cumulative effects.

R52/53

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

R61

May cause harm to the unborn child.

##### 16.1.2 List of relevant H Phrases

H360Df

May damage the unborn child. Suspected of damaging fertility.

H412

Harmful to aquatic life with long lasting effects.

#### 16.2 Training Advice

Multiple safety training of staffs about danger and protection by using hazards in working area.

#### 16.3 Recommended Restriction on Use

Only for Professional User.

An individual package of this product or test kit has a moderate hazardous potential.

#### 16.4 Further Information

Envent Engineering Ltd. provides the information contained herein in good faith being up-to-date of own realizations at revision time.

This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgement in determining its appropriateness for a particular purpose.

Envent Engineering Ltd. makes NO REPRESENTATIONS or WARRANTIES, either expressed or implied, including without limitation any warranties of merchantability, fitness for a particular purpose with respect to the information set forth herein or the product to which the information refers. Accordingly Envent Engineering Ltd. will not be responsible for damages resulting from use of or reliance upon this information. See terms and conditions at the end of our price lists for additional information.

#### 16.5 Sources of Key Data

GHS: EU Regulation 1272/2008/EC on Classification, Labelling and Packaging of Substances and Mixtures, amending and repealing EU Directives 67/548/EEC and 1999/45/EC, and amending EU Regulation 1907/2006/EC

MSDS: EU Regulation 453/2010/EU REACH - Requirements for the Compilation of Safety Data Sheets

KÖHN, BIRETT (German), Data Sheets of Hazardous Substances

Prepared: June 2015  
Expiry Date: June 2018

## APPENDIX D – RISK ASSESSMENT – SAFETY INFORMATION

Hydrogen Sulfide Properties	
Physical State	Usually encountered as a gas
Color	Colorless - No visible sign of H <sub>2</sub> S to warn you of its presence
Odor	Characteristic smell of rotten eggs at 0.5 ppb; paralyzes the olfactory nerve around 100 ppm
Vapor Density	<p>Heavier than air (1.19 compared to 1.0 for air)</p> <ul style="list-style-type: none"> <li>&gt; In gas mixtures, it will be present wherever the gas mixture is found</li> <li>&gt; Gas mixtures may be heavier or lighter than air, depending upon their vapor density and temperature compared to the ambient atmosphere (i.e. usually air)</li> <li>&gt; In its pure state, or as a high proportion of a gas mixture, it may flow or settle into low-lying areas, such as pits, trenches, and natural depressions</li> </ul>
Flammability	<p>Flammable - Flammable at 4.3 - 46 percent vapor concentration in air, by volume</p> <p>Burns with a blue flame and gives off Sulphur dioxide (SO<sub>2</sub>) gas SO<sub>2</sub> is also hazardous and irritates the eyes and the respiratory system</p>
Solubility	Soluble in water and oil, solubility is inversely proportional to fluid temperature
Common Locations for H <sub>2</sub> S	Piping systems, pipelines, wellheads or wellbores, vessels, production facilities, tanks, pits, and low spots, confined or enclosure spaces, shacks or buildings, bermed or diked area, sour spills.

Table 12. Hydrogen Sulfide Properties

Hydrogen Sulfide Quantities and Health Effects	
H <sub>2</sub> S Exposure	Possible health Effects
Less than 1ppm	you can smell it
10 ppm	<ul style="list-style-type: none"> <li>&gt; No known health effects for most people</li> <li>&gt; For 10 ppm or less, the exposure limit is 8 hours - Check your local legislation as they vary.</li> <li>&gt; For 15 ppm, the exposure limit is 15 min with 60 minutes breaks. Check your local legislation as they vary.</li> </ul>
20-200 ppm	<ul style="list-style-type: none"> <li>&gt; Eye and respiratory tract irritation and loss of smell</li> <li>&gt; Headache and nausea - loss of smell after 2 - 5 min</li> <li>&gt; Respiratory Protection is required beyond this level such as SCBA (Self-contained Breathing Apparatus) and SABA (Supplied Air Breathing Apparatus)</li> </ul>
200 - 500 ppm	<ul style="list-style-type: none"> <li>&gt; Above effects, but sooner and more severe</li> <li>&gt; Loss of breathing and death in 30 min to 1 hour</li> </ul>
500 - 700 ppm	> Affects the central nervous system



	> Rapid unconsciousness, cessation of breathing, and death
700 ppm and above	> Immediate loss of consciousness > Permanent brain damage and death in a few minutes even if removed to fresh air at once

Table 13. Hydrogen Sulfide Quantities & Health Effects

Risk Assessment			
Hazard Identification - Task	Who might be harmed by this hazards	Health and Safety Risks	Hazard Control Recommended
Maintenance: Changing the H2S sensing Tape (Acetate Tape)	Operator(s)	Long term exposure (through skin and inhaling) could potentially cause cancer and other health problems - Not an immediate safety risk	Due to the long-term health effects of Lead which is contained in the H2S Acetate tape, the operator is recommended to wear gloves & mask when handling the tape. If gloves where not worn, hands must be properly washed with soap and water  As an overall practice when doing maintenance into an H2S analyzer, the operator should carry a personal H2S monitor, wear a hard hat, hearing protection (if applicable), safety glasses, hand protection, steel toed boots. Depending on the location of the H2S analyzer, appropriate breathing device might be required such as SCBA (Self-contained Breathing Apparatus) and SABA (Supplied Air Breathing Apparatus)
Maintenance: Changing filter in SCS	Operator(s)	Potential safety risk - release of gases at a high-pressure level can cause serious injuries	Due to the fact that the filter is located before the pressure regulator, the operator could be dealing with pressures up to 3600 PSI. The operator must isolate the sample system before changing the filter

			As an overall practice when doing maintenance into an H2S analyzer, the operator should carry a personal H2S monitor, wear a hard hat, hearing protection (if applicable), safety glasses, hand protection, steel toed boots. Depending on the location of the H2S analyzer, appropriate breathing device might be required such as SCBA (Self-contained Breathing Apparatus) and SABA (Supplied Air Breathing Apparatus)
H2S Exposure (Atmosphere)	Operator(s)	Potential safety and health risk - Death - Consult Table Hydrogen Sulfide Quantities and Health Effects.	<p>For atmospheres where there is H2S, depending on the levels and company policy, the operator must wear the appropriate equipment before servicing an H2S analyzer</p> <p>As an overall practice when doing maintenance into an H2S analyzer, the operator should carry a personal H2S monitor, wear a hard hat, hearing protection (if applicable), safety glasses, hand protection, steel toed boots. Depending on the location of the H2S analyzer, appropriate breathing device might be required such as SCBA (Self-contained Breathing Apparatus) and SABA (Supplied Air Breathing Apparatus)</p>
H2S Exposure (Leakage - Overpressure)	Operator(s)	Potential safety and health risk - Death - Consult Table Hydrogen Sulfide Quantities and Health Effects.	In case of a leakage, follow company's health and safety policies on how to deal with an H2S leak. Depending on the application and location of the H2S analyzer, the operator might have to use the proper breathing equipment

			As an overall practice when doing maintenance into an H2S analyzer, the operator should carry a personal H2S monitor, wear a hard hat, hearing protection (if applicable), safety glasses, hand protection, steel toed boots. Depending on the location of the H2S analyzer, appropriate breathing device might be required such as SCBA (Self-contained Breathing Apparatus) and SABA (Supplied Air Breathing Apparatus)
Flooding the Sample system & analyzer	Operator(s)	Not immediate safety and health concern	<p>If the analyzer is flooding, the analyzer needs to be immediately isolated, turned off and cleaned. Refer to "5.2 Sample Conditioning System Cleaning Procedure" on page 31</p> <p>As an overall practice when doing maintenance into an H2S analyzer, the operator should carry a personal H2S monitor, wear a hard hat, hearing protection (if applicable), safety glasses, hand protection, steel toed boots. Depending on the location of the H2S analyzer, appropriate breathing device might be required such as SCBA (Self-contained Breathing Apparatus) and SABA.</p>
Voltage hazards	Operator(s)	Immediate safety and health risk.	It is important that the operator is trained on handling the analyzer when it is on. The analyzer does not need to be off when it goes into maintenance. However, it is very important that the operator is aware of the danger of an electric shock
TS Enclosure heat	Operator(s)	Medium safety risk	The inside of the Total Sulfur Enclosure can get up to 900 °C,

			however, the outside walls will only reach approximately 150 °C. Do not touch surface of the TS enclosure when operating. If the TS enclosure needs to be serviced, allow 1 hour after powering down the analyzer to cool down
Electrostatic hazard - Explosion hazard	Operator(s)	Immediate safety and health risk.	Electrostatic Hazard – Backpan and Certification nameplate must be cleaned only with a damp cloth to prevent static charging hazard which could result in an explosion

**Table 14: Risk Assessment**

## Contact Us

---

In the event that a situation arises that is not covered by this manual, we encourage you to contact us so that we can help you resolve any issues you may have. Please have this manual readily available when calling for assistance.

For further information on our products or to access our most recently updated manuals and product catalogues, please visit our website at [www.enventengineering.com](http://www.enventengineering.com).

### Canada (Main)

Toll Free: 1 (877) 936 – 8368  
Tel: (403) 253-4012  
Fax: (403) 253 -4016  
Email: [info@enventengineering.com](mailto:info@enventengineering.com)

2721 Hopewell Place NE  
Calgary, Alberta, Canada T1Y 7J7

### USA

Tel: 1 (713) 567 – 4421

13219 B Stafford Road  
Missouri City, Texas, USA 77489

### China

Tel: 86 (138) 0119 – 1148  
Email: [julie.lu@enventengineering.com](mailto:julie.lu@enventengineering.com)

Room 305, Bld. No.9, Greenland Qihangguoji  
Shunyi District, Beijing, China

### International Sales

Tel: (403) 253-4012  
Email: [international@envent-eng.com](mailto:international@envent-eng.com)

