

Model 933 H₂S Analyzer

THE NEED

A critical measurement of natural gas quality is the concentration of hydrogen sulfide (H₂S). Remarkably, the common technique for making this measurement, lead acetate tape, is at least 70 years old. Users of this archaic technology report general dissatisfaction with it due to: high maintenance, the cost and shelf life of tape cassettes, the need for reagents, difficulty handling H₂S overload conditions, the sensitivity of the technology to ambient extremes, and, not least, used cassette disposal.

AMETEK Western Research® has responded to the need for a low maintenance, reliable, and rugged H₂S analyzer by developing the Model 933. The Model 933 uses AMETEK Western Research's proprietary frontal elution chromatography sampling technique, combined with our exceptionally high resolution multi-wavelength UV optical bench. The result is a unique low level H₂S analyzer that is designed to operate unattended for six months or more.

THE MEASUREMENT

AMETEK Western Research's unique sample conditioning system uses frontal elution chromatography to separate and eliminate interfering species. This ensures an accurate analysis of the gas via direct-UV absorption spectroscopy. In sales gas applications, H₂S and COS are the first absorbing species to elute through the chromatography column. These compounds are analyzed photometrically. The next species to elute is methyl mercaptan, which is also measured, and finally, the interfering ethyl mercaptan. Interference by ethyl mercaptan is prevented by terminating the sample analysis before it elutes, and then switching to a fresh column so that the analysis may continue. Two columns are employed in the 933. While one column is conditioning the gas sample, the other is automatically regenerated.

In normal operation, the 933 uses its analysis of the COS and methyl mercaptan concentrations to provide real time compensation for the H₂S measurement. Optionally, the 933 can be configured to output concentration values for these compounds.

The Model 933 utilizes two onboard microprocessors that provide concentration calculations, data processing, calibration, sophisticated self-diagnostics, and column switching control.



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APPLICATIONS

- Gas sweetening
- Pipeline quality/custody transfer
- Synthetic natural gas (SNG)
- Blending stations

BENEFITS

- Extended, unattended operation for up to 6 months or longer
- Self-recovery after high concentration H₂S events
- Fast response time to increasing or decreasing H₂S concentrations
- Concentration measurements of COS and methyl mercaptan optionally available
- No consumables, reagents, or disposables other than zero gas

*For water dew point or concentration, please refer to AMETEK's 3050-OLV quartz crystal moisture analyzer.
For hydrocarbon dew point measurement, please refer to our Western Research® Model 241CE Analyzer.*

PERFORMANCE SPECIFICATIONS

Methodology: Proprietary frontal elution sampling; nondispersive ultraviolet analysis for hydrogen sulfide (H₂S), carbonyl sulfide (COS) and methyl mercaptan (MeSH)

Full Scale Ranges: ppm ranges are standard; mg/Nm³ and other ranges are available

Standard Range:

- H₂S: 0 to 25 ppm min. to 0 to 100 ppm max.
- COS option: 0 to 100 ppm min. to 0 to 500 ppm max.
- MeSH option: 0 to 50 ppm min. to 0 to 250 ppm max.

Low Range:

- H₂S: 0 to 5 ppm min. to 0 to 50 ppm max.
- COS option: 0 to 25 ppm min. to 0 to 250 ppm max.
- MeSH option: 0 to 15 ppm min. to 0 to 100 ppm max.

Measurement Accuracy:

- Standard range: ±2% of full scale
- Low range: ±5% of full scale

Zero Drift:

- Standard range: less than ±2% of full scale in 24 hours
- Low range: less than ±5% of full scale in 24 hours

Response Time, Excluding Sampling System

- H₂S: less than 30 seconds to 90% response
- COS: less than 60 seconds to 90% response
- MeSH: less than 180 seconds to 90% response

Sensitivity: 0.5% of full scale

Cross-interference: H₂S concentration measurement—less than 2% of the sum of COS and MeSH

Sample Stream Requirements: greater than 80% methane, less than 10% ethane, less than 3% propane, less than 1.25% total butanes, less than 0.5% C5+. Maximum water content is 0.6%.¹

Zero Gas: Instrument zero purity carbon dioxide; UHP nitrogen, or UHP methane. Minimum auto-zero interval is once per 24 hours.

Sample Pressure Requirement: 80 psig to 3000 psig (550 kPag to 20700 kPag)

Typical Flow: 2.5 L/min. (5 SCFH)

Outputs: Up to 4 isolated 4 to 20 mA, loop or self-powered; 4 nonisolated 1 to 5 V; 5 independent sets of SPDT, Form C, potential free relay contacts, 2 A at 250 VAC

Digital Communication: RS485 Modbus port; RS232/RS485 service port

Power: 115 VAC ±10%, 47 to 63 Hz; 230 VAC ±10%, 47 to 63 Hz

Maximum Start Up Power: 210 W, with continuous average depending on ambient temperature

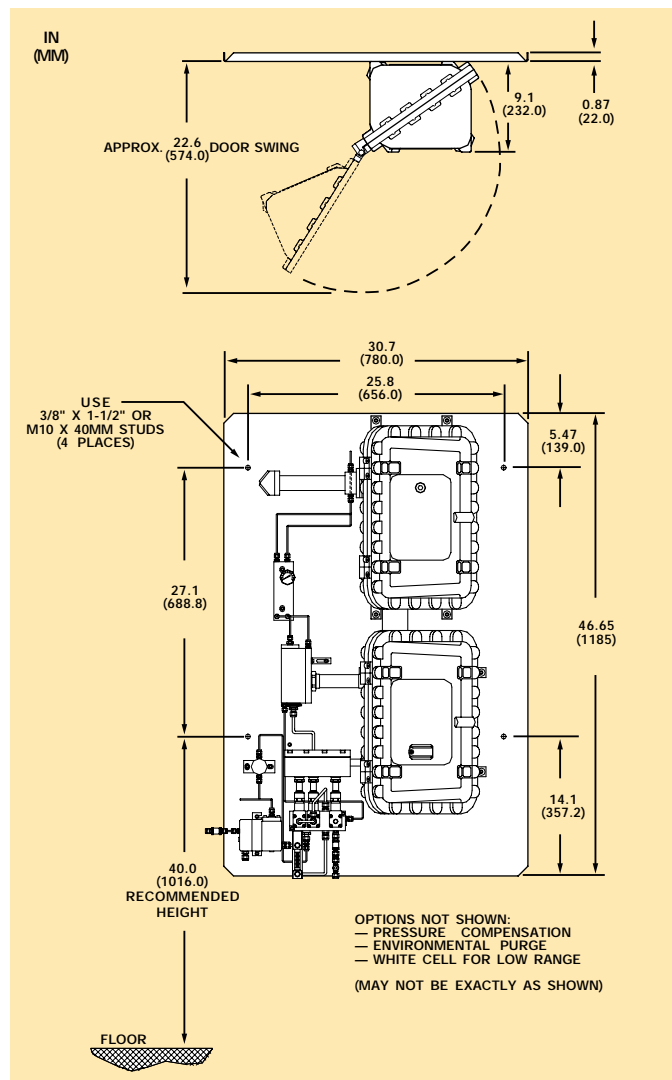
Ambient Temperature: 32°F to 122°F (0°C to 50°C)

Approvals and Certifications:

- CEC Class I, Division 1, Groups C & D; Ex d IIB T3
- NEC Class I, Division 1, Groups C & D; AEx d IIB T3
- CENELEC EEx d IIB T3
- Complies with all relevant European directives
- GOST 1EX d IIBT3 X

Options: Gas/liquid (glycol) separating filter, other measuring ranges, COS and methyl mercaptan measurement, pressure compensation, and up to 4 V/I outputs

¹ 0.6% maximum water content is based on a 35°C maximum water dew point temperature at 120 psig (830 kPag).



One of a family of innovative process analyzer solutions from AMETEK Process Instruments. Specifications subject to change without notice.



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