AMETEK® PROCESS INSTRUMENTS

WESTERN RESEARCH®

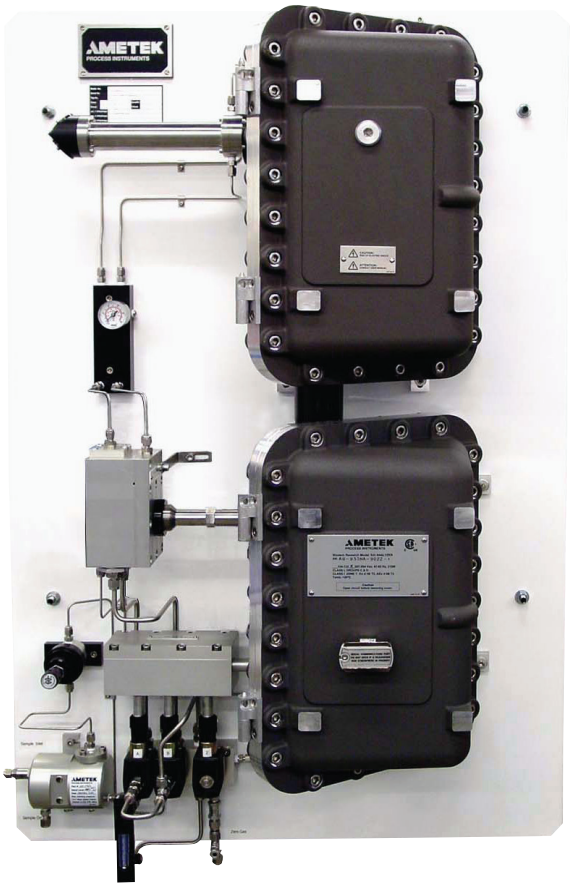
Model 933 H_2S Analyzer

Introduction

The measurement of hydrogen sulfide (H_2S) is a critical quality control parameter in natural gas and other process industries. Conventional detection principles, such as lead acetate tape devices, require frequent maintenance intervention and disposal of potentially hazardous materials (used cassette tapes). Additional problems associated with lead acetate paper tape analyzers are: the inherent difficulty handling H_2S overload conditions during process or pipeline upsets, sensitivity to changes in ambient conditions and slow response speed.

The Solution

The AMETEK Western Research® Model 933 is a unique UV-based photometric analyzer system for H_2S analysis when present in concentrations below 100 ppm in natural gas and other applications. The Model 933 uses AMETEK Western Research's proprietary auto carrier chromatography sampling technique, combined with the exceptionally high resolution, multi-wavelength AMETEK 900 Series UV optical bench to provide an accurate, interference free measurement of H_2S. The result is a unique low level H_2S analyzer that is designed to operate unattended for six to nine months, or longer.



Class I, Div 1 and ATEX Zone 1 Version

Benefits

- Extended, unattended operation for 6 – 9 months or longer
- Self-recovery after high concentration H_2S events
- Fast response time to increasing or decreasing H_2S concentrations
- Concentration measurements of COS and methyl mercaptan (MeSH) optionally available
- No consumables, reagents, or disposables other than zero gas

Applications

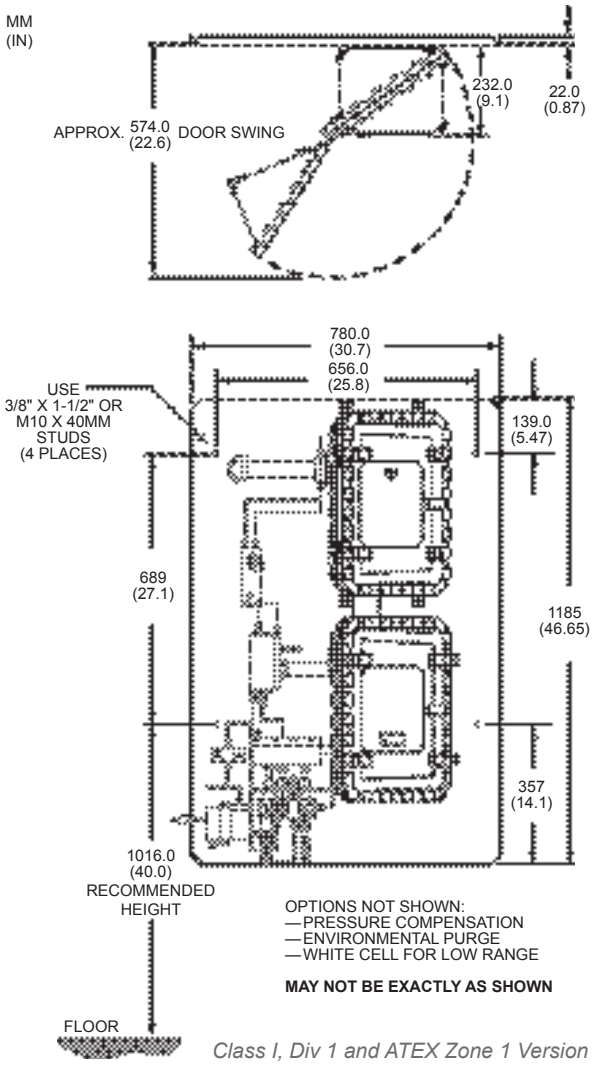
- Gas sweetening
- Pipeline quality / custody transfer
- Synthetic natural gas (SNG)
- Blending stations
- CO_2 purity
- Biogas

The Measurement

AMETEK Western Research's unique sample conditioning system uses auto carrier frontal elution chromatography to separate interfering species. This ensures an accurate analysis of the H_2S concentration in the gas via direct-UV absorption spectroscopy. H_2S is the first absorbing species to elute through the chromatography column, followed by carbonyl sulfide (COS) and methyl mercaptan (MeSH), which are also independently measured. In normal operation, the 933 uses the analysis of the COS and MeSH concentrations to provide real time compensation for the H_2S. Optionally, the 933 can be configured to output concentration values for these compounds.

Two columns are employed in the 933, providing virtually continuous monitoring of the H_2S concentration. While the first column is conditioning the gas sample, the standby column is automatically regenerated. AMETEK's unique frontal elution chromatography sampling system eliminates the need for carrier gas, as the sample background gas is used as the carrier. The Model 933 utilizes two onboard microprocessors that provide concentration calculations, data processing, calibration, sophisticated self-diagnostics, and column switching control.

Class I, Div 2 Version



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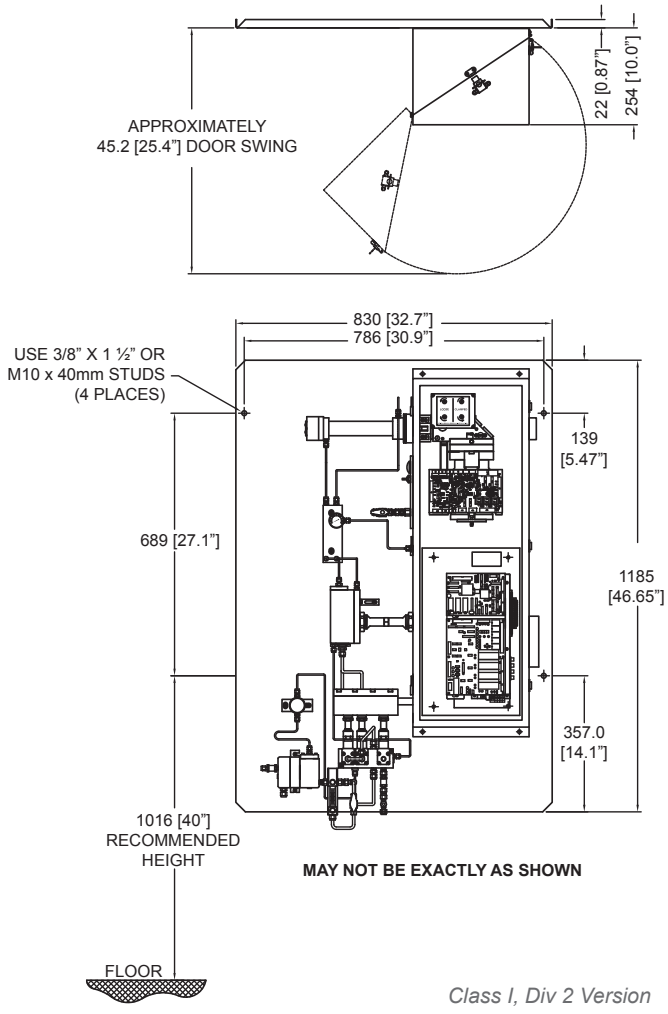

Class I, Div 2 Version

Performance Specifications

Methodology: Proprietary auto carrier frontal elution sampling; non dispersive ultraviolet analysis for hydrogen sulfide (H_2S), carbonyl sulfide (COS) and methyl mercaptan (MeSH)

Full Scale Ranges: ppm ranges are standard; mg/Nm^3 and other ranges are available

Standard Range:
H_2S: 0 to 25 ppm, up to 100 ppm; secondary higher ranges available
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.
CO_2 option: 0 to 5%
Higher ranges are available upon request

Low Range:
H_2S: 0 to 3 ppm, up to 50 ppm; secondary higher ranges available
COS option: 0 to 25 ppm, up to 250 ppm
MeSH option: 0 to 9 ppm, up to 100 ppm
CO_2 option: 0 to 1%
Higher ranges are available for H_2S, COS, or MeSH

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

Repeatability: Standard range: ±2% 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
H_2S: 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: H_2S concentration measurement—less than 2% of the sum of COS and MeSH

Sample Stream Requirements: Published specifications are valid for operation in standard pipeline quality natural gas and amine based contactor overheads. Performance specifications may vary based upon review of detailed stream composition for use in non-standard applications, consult AMETEK for details. Applications that exceed the composition limits possible, must be reviewed by the factory as dofferent specifications may apply.

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

Process Pressure Requirement: 830 kPag to 13790 kPag (120 psig to 2000 psig)

Maximum Sample Cell Pressure: 100 psig (6.9 barg)

Maximum Sample Gas Temperature: 50ºC (122ºF)

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

Outputs: Up to 4 isolated 4-to-20 mA, loop or self-powered; 4 non-isolated 1 to 5 VDC; 5 independent sets of SPDT, Form C, potential free alarm relay contacts, 2 A at 240 VAC

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

Power Consumption: <500 W (excluding sample & vent line)

Power: 104 to 132 VAC, 47 to 63 Hz, <3A
207 to 264 VAC, 47 to 63 Hz, <2A

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

Dimensions: HxWxD
1185 x 780 x 254 mm (46.65 x 30.7 x 9.97 in.)

Weight: Approximately 100 kg (220.5 lbs)

Approvals and Certifications:
CEC Class I, Division 1, Groups B,C,D; Ex d IIB+H2 T3
NEC Class I, Division 1, Groups B,C,D/Class 1, Zone 1, AEx d IIB+H2 T3
Optional Class I, Division 2, Groups A, B, C, D purged system available
ATEX II 2 G Ex d IIB T3 Gb (IIB+H2 unit verification pending)
EMC
Russian Ex Proof Certification; 1ExdIIBT3 X
Russian Gosstandart Pattern Approval
Complies with all relevant European directives

Options:

- Pressure compensation
- Various sample probe configurations
- Heated and unheated inlet pressure regulation
- Filters
- Sample conditioning for non-standard applications (includes sample pumps, sample chiller/hydrocarbon removal)
- Additional COS and MeSH component outputs
- Integrated CO_2 sensor
- Sample and vent lines
- Environmental protection (free standing enclosure or shelter)

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

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