



GOW-MAC[®]
INSTRUMENT CO.

20 Series Gas Analyzer

Optimized, Self-Contained Gas Flow System

Built-in Gas Selection Manifold

Custom Designed to Your Application

Choice of standard, corrosion resistant or all stainless steel system

Class 1, Div 1 or Div 2, Group B, C, D Available Systems

The GOW-MAC[®] 20 Series Gas Analyzer is designed for quantitative analysis of binary streams of industrial gases, and other gas mixing, cylinder identification, and atmosphere control applications on a non-continuous basis.

Typical Binary Gas Applications

NH ₃ in Air	H ₂ in N ₂
Argon in Helium	H ₂ in O ₂
CO ₂ in N ₂ (flue gas)	Methyl bromide in Air
CO ₂ in Helium	Natural gas in Air
Freon in Air	N ₂ in Argon
Helium in Air	F ₂ in N ₂
Hydrocarbons in He	... and many others
SO ₂ in Air	

Models

The GOW-MAC[®] 20 Series Gas Analyzer is designed as either a single or a dual pass unit. It is supplied as either bench or 19" rack mounted. For special applications, an optional purgeable housing is available. A single pass analyzer has a hermetically sealed reference thermal conductivity detector (TCD). It has a pump (optional), flowmeter with needle valve, leak proof connectors, and a five-way valve for zero, calibration, and sample gases. Materials of constructions are inert to most sample streams normally encountered.* A Dual pass unit has a flowing reference TCD, flowmeters and pump (optional).

An optional diaphragm pump is employed for flows of up to 500 cc/min. A separate compressor type pump is recommended for pumping a sample from long distances.

*NOTE: If questionable and/or corrosive gases are to be used, contact our Technical Sales Department for your special application.



Accuracy

The GOW-MAC[®] 20 Series Gas Master is rugged and simple to operate. Accuracy is 3% of full scale.

Detector

The thermal conductivity detector (TCD) is the GOW-MAC[®] Model 10-454 with either four rhenium-tungsten (WX), tungsten (W2), or nickel (Ni) filaments. The sensing elements have prescribed minimum gas sensitivity and zero stability vs. current change. Response time will be less than 30 seconds for most applications. Where the application requires unusual flow or response characteristics, special cells and/or filaments can be furnished.

An optional TCD temperature controller is available for those applications where stability is essential.

The analyzer is equipped with a solid state power supply and dc milliammeter.

Readout

(1) 4½" Analog meter, 100 divisions (a 3½ digit digital meter is optional); (2) Terminals included for customer's 1 mV potentiometric recorder.

Alarms

Our alarm options come with an alarm board and operational amplifier. Choices include High-High, High-Low, High only, or Low only.

Electrical

The 4-20 mA Voltage to Current Converter (optional) converts a mV signal to a 4-20 mA signal. It is used when the signal is traveling over long distances (>10 feet) without interference or transmitting the signal to a programmable logic controller (PLC).

Calibration

The 20 Series analyzers are not factory calibrated for any specific gas mixture. Calibrations are available at an additional charge and are quoted upon request.

Application Data Sheet

There is an Application Data Sheet enclosed. We specialize in building custom analyzers, therefore, we ask you to give us your specific application parameters so that we can quote the appropriate analyzer for your needs.

Ordering Information (refer to accompanying price list)

20 Series, 115 V, 50 Hz

22 Series, 230 V, 60 Hz

*Calibration additional – quoted upon request

Standard Instrument Specifications

Gas Connections	1/8" o.d. tubing
Mounting	Bench or 19" Rack
Purgeable Case	Optional
Ambient Operating Temp.	32 - 120 °F (0 - 49 °C)
Detector Temperature	100 °C, factory set (Optional)
Temp. Regulation	Optional
Power Required	115/230 V, $\pm$ 50/60 Hz
DC Power Supply	3 - 20 V @ 300 mA
Power Line Regulation	0.5%
Flowmeters w/ Needle Valves	Yes
Sample Flow Rate Range	0 - 1 CFH (472 cc/min.)
Pressure Required (min.)	2 psig (6" H ₂ O)
Pressure Flow Regulator	No
Metering Valve	Yes
Standard Fittings	Brass
Sensitivity	Application dependent
Accuracy	$\leq$ 3% F.S. on meter; 1% on recorder
Response Time	Dependent on cell and flow rate
Drift	Dependent on calibration
Zero Stability	Dependent on calibration
Noise Band	Dependent on calibration
Calibration/Span	10-turn Potentiometer
Readout	
Recorder	0 - 5 mV
Meter	Analog, 0 - 5 mV (standard) Digital w/ alarms (optional)
Alarm Contacts	Optional
Pump	Optional
Dimensions	
Case	10.10"H x 10.10" W x 17.25" D (25.65 x 25.65 x 43.82 cm)
19" Rack Mount	14.00"H (35.56 cm)
Weight	Net: 30 lbs. (13.61 kg) Shipping: 35 lbs. (15.88 kg)

Specifications and features will vary depending upon system configuration and are subject to change without notice. The above specifications are established during design, but are not to be construed as test criteria for every product.



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Analytical instruments since 1935

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GOW-MAC[®]
INSTRUMENT CO.

Series 590 DID Gas Chromatograph

Trace Gas Analysis

Electronic, Specialty & Industrial Bulk Gases

High sensitivity - Impurity levels in the low ppb range

Bench or 19" rack mount

Stainless steel or corrosion resistant materials

Detector

The Series 590 DID GC contains a single, GOW-MAC[®] patented* discharge ionization detector (DID) which is non-radioactive, universal, and concentration dependent. The detector uses an electrical discharge in helium to generate high energy UV photons and metastable helium which ionizes all compounds except helium. The DID exhibits a dynamic range of < 5 ppb to < 1% by volume.

The most significant feature of the DID is the utilization of an electrical discharge as the radiation source, not a radioactive source. Series 590 DID Gas Chromatographs in operation have displayed a stability and reliability not generally attributed to ppb detection.

The extremely sensitive DID is placed in a helium purged housing to eliminate possible system contamination. Background noise and detector limits are dependent upon the use of an ultrapure helium carrier gas. The system is designed to prevent contamination by utilizing bellows type metering valves and by locating gas sample valves in a helium purged housing.

Sample gas "memory" within the system has been eliminated through the use of sample isolation valves. This configuration has proven to be reliable with faster and easier start-up.

*U.S. Pat. No. 4,975,648



System

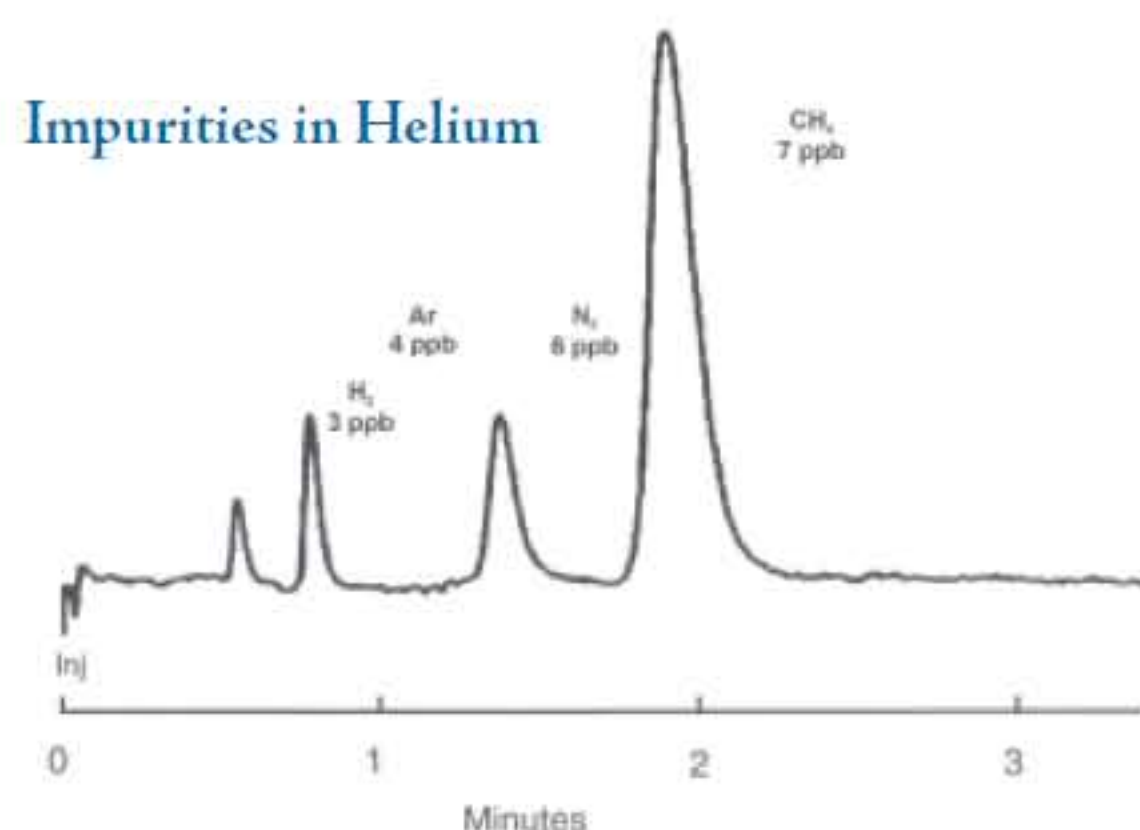
The Series 590 DID GC is offered in several different configurations, each having a unique valving and flow system to accomplish a variety of trace impurity gas applications. When a base gas other than helium is to be analyzed, the separation of the trace impurities from the base gas peak is critical to the analysis. Each system has been developed to chromatographically manipulate this base gas peak.

All Series 590 DID GC systems can be manufactured with corrosion resistant materials. Corrosion resistant refers to the wetted surface area that comes in contact with the sample. All Series 590 DID GC systems are available in either 19" rack or bench top chassis.



Electronics

Electronics for the Series 590 DID GC consist of a high voltage detector power supply and an electrometer amplifier. The DID Power supply provides the high voltage necessary to produce the ionization arc in the DID. Readout occurs on two separate LED displays; one for the discharge current (mA) and one for the dc voltage.



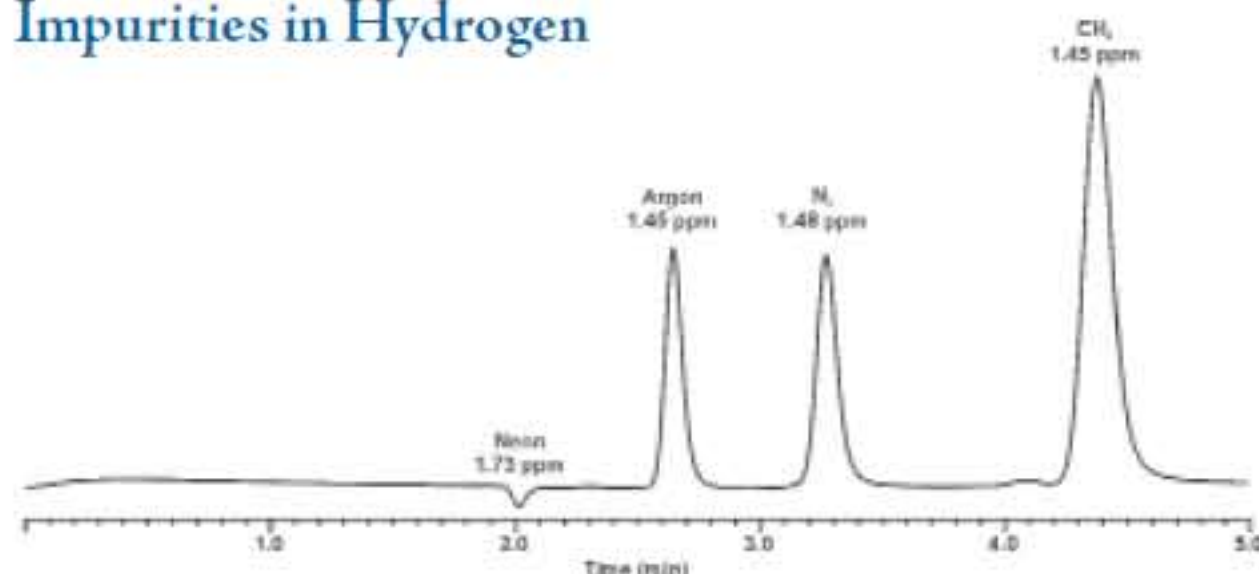
Temperature Controls

Temperature controls are solid state proportioning type with direct dial setting. Temperature readout for the column oven and detector is displayed on a digital LED meter. Selector switches are used to set and read the desired temperature.

Column Oven

A centrifugal blower circulates and distributes heated air, thereby eliminating temperature gradients. Linear temperature range is ambient to 300 °C. Columns of appropriate length and kind, with 1/8" VCR[®] connections, are quoted for a specified type of analysis.

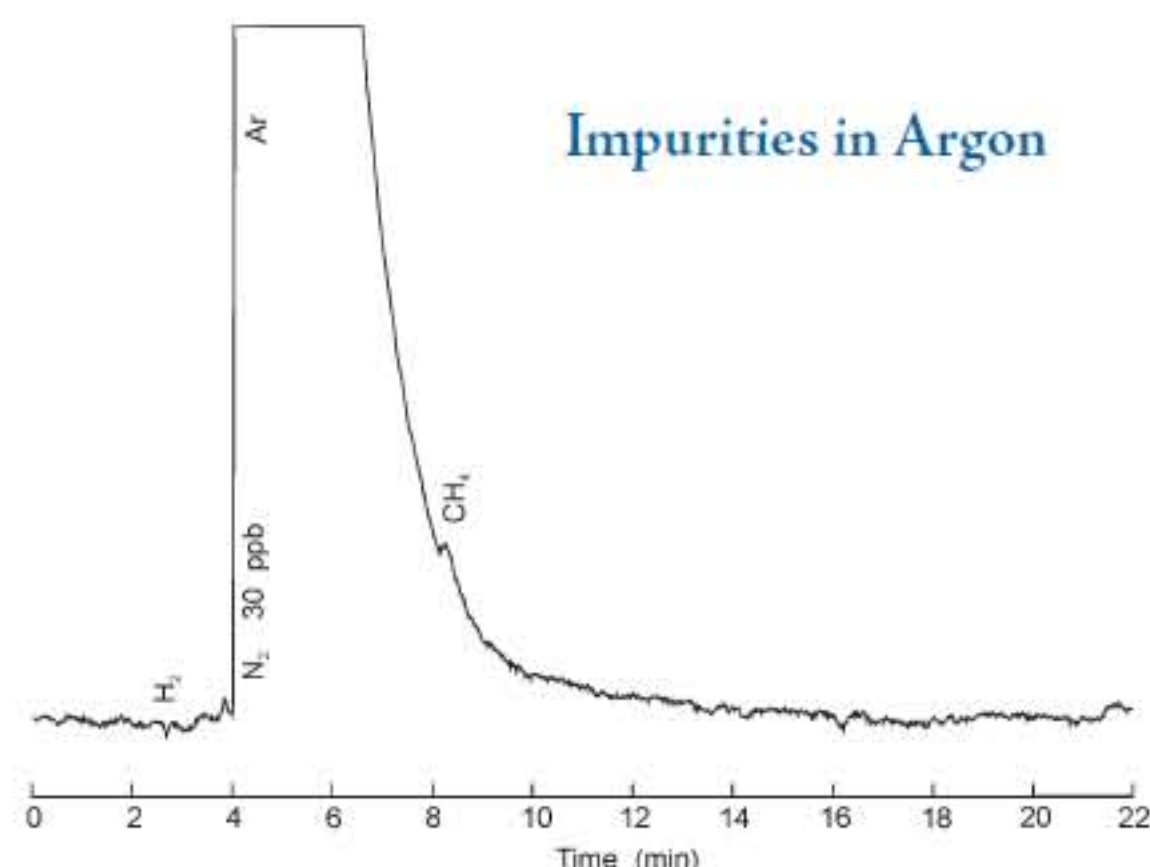
Impurities in Hydrogen



Flow System

Two gases are required to operate the Series 590 DID GC. Ultra-high purity helium is used for both the carrier gas and the discharge gas. Zero grade helium is used for purging the detector and valve housing, and to actuate all valves. Bellows metering valves are used to control the carrier gas flow throughout the system. All critical gas connections possess 1/4" VCR[®] fittings.

The GOW-MAC[®] Series 590 GC with Discharge Ionization Detector is a complete, dedicated gas chromatographic system requiring only data handling and a few accessories.

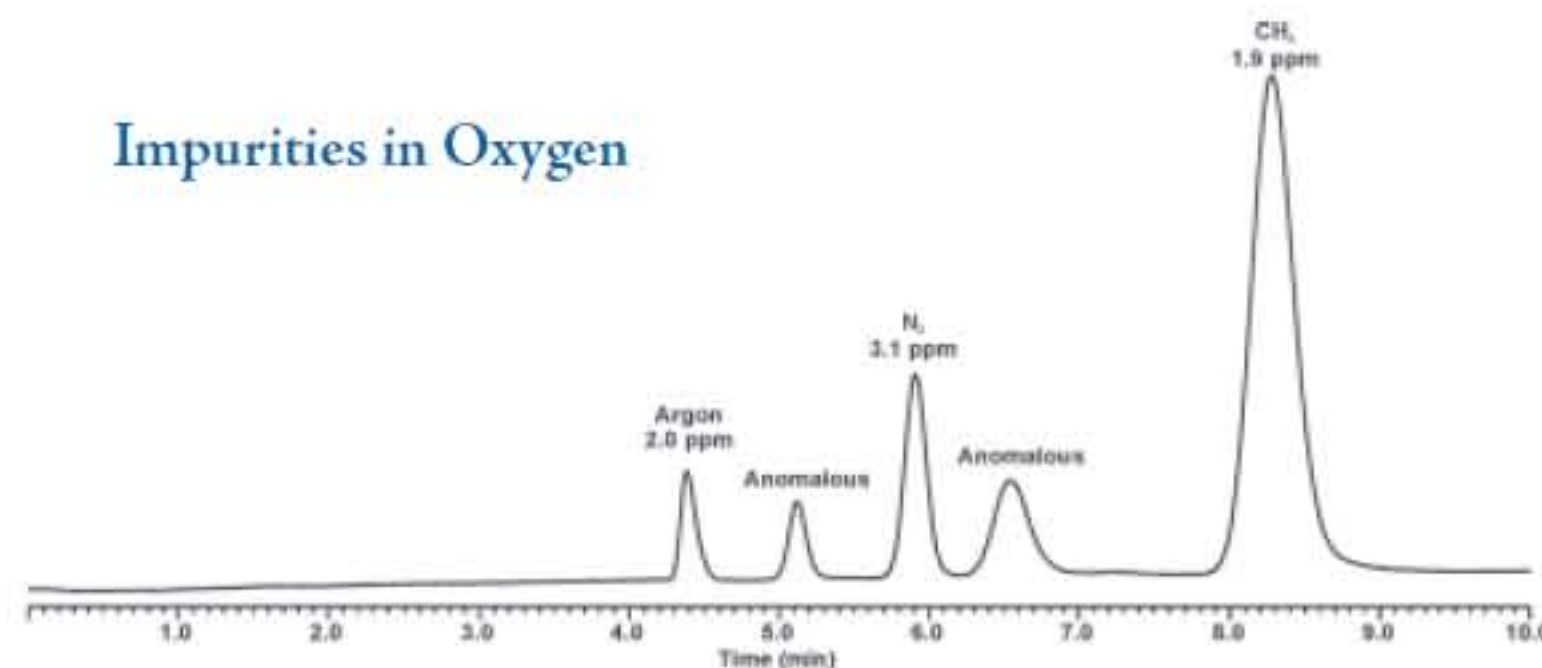


Data Handling Capabilities

Software

GOW-MAC offers the powerful Chrom Perfect[®] chromatography software. A variety of interactive PC chromatography data software packages are available. A chromatographer can create methods, design custom reports, view calibration curves, acquire and process data, and create and run batch sequences from a single window. Chrom Perfect requires the use of a PC that operates MS Windows[®] XP Pro (SP3) or Windows Vista[®] Ultimate operating systems efficiently.

Impurities in Oxygen



Specifications

Column Oven

Dimensions	10" W x 4 1/2" D x 7 1/2" H (25.64 cm x 11.54 cm x 19.23 cm)
Temperature Range	Ambient to 300 °C
Temperature Control	Direct reading, ambient to 300 °C
Oven Capacity	Can accommodate up to four (4) 20' to 30' 1/8" columns

Detector

Type	Discharge Ionization
Design	low volume
Sensitivity	<10 ppb CH ₄
Carrier Gas	Ultra-high purity helium
Discharge Gas	Ultra-high purity helium
Temperature Range	Ambient to 120 °C
Linearity	< 10 ⁵

Gas Flow

Valves for separate flow control of purged housing and helium actuated valves.

Bellows-type metering valves for separate flow control of column carrier gases and detector discharge gas.

Power Requirements

Series 590	105 - 125 Vac, 60 Hz
Series 592	200 - 240 Vac, 50 Hz
Circuit Breaker	Series 590: 10 amp Series 592: 5 amp

Overall Dimensions

Bench Top	26" W x 23" D x 12.5" H (66.04 cm x 58.42 cm x 31.75 cm)
Rack Mount	19" W x 23" D x 21" H (48.26 cm x 58.42 cm x 53.34 cm)

Weight

	Bench Top	19" Rack Mount
Net	125 lbs. (56.70 kg)	140 lbs. (63.50 kg)
Shipping	140 lbs. (63.50 kg)	165 lbs. (74.84 kg)

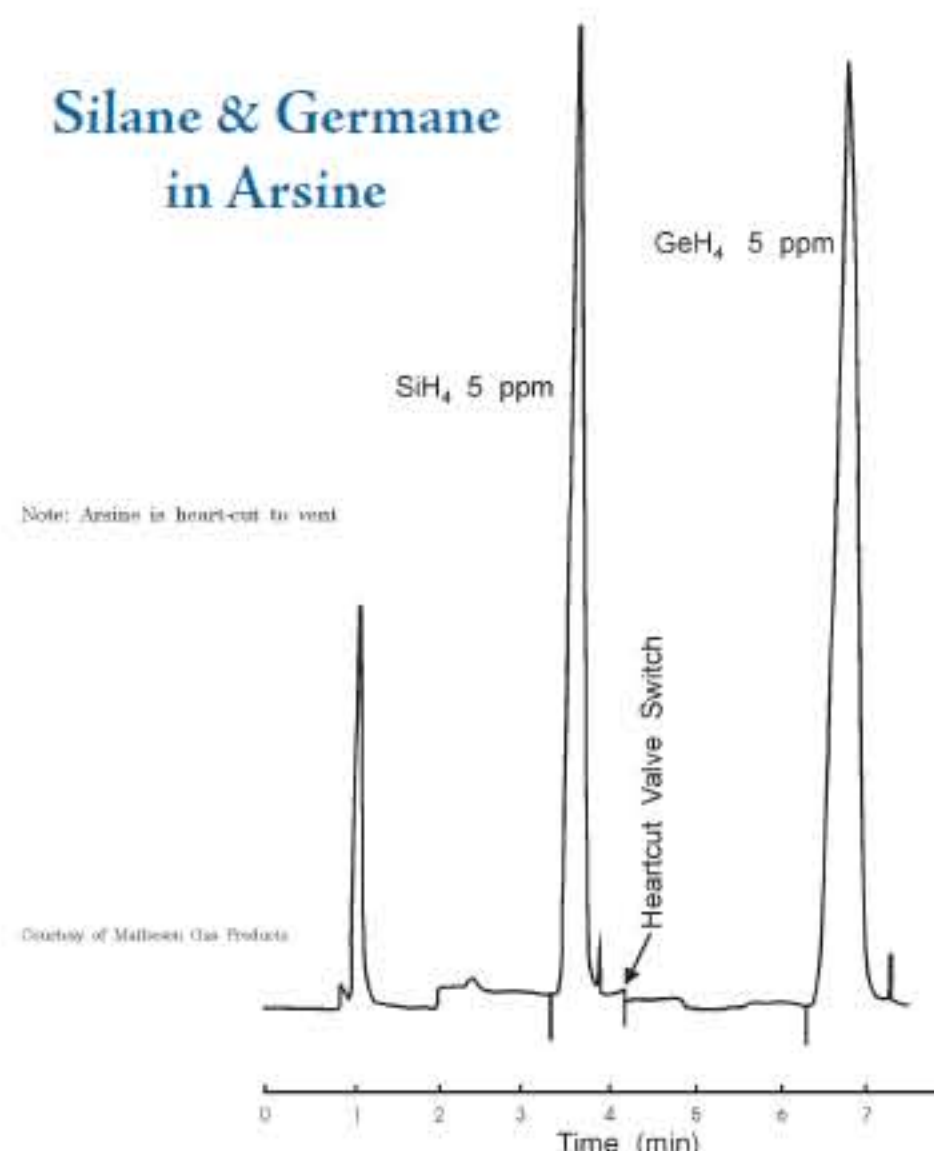
Ordering Information

Each Series 590 is custom built to a particular application. Call GOW-MAC or your local representative to discuss the details of your specific requirements.

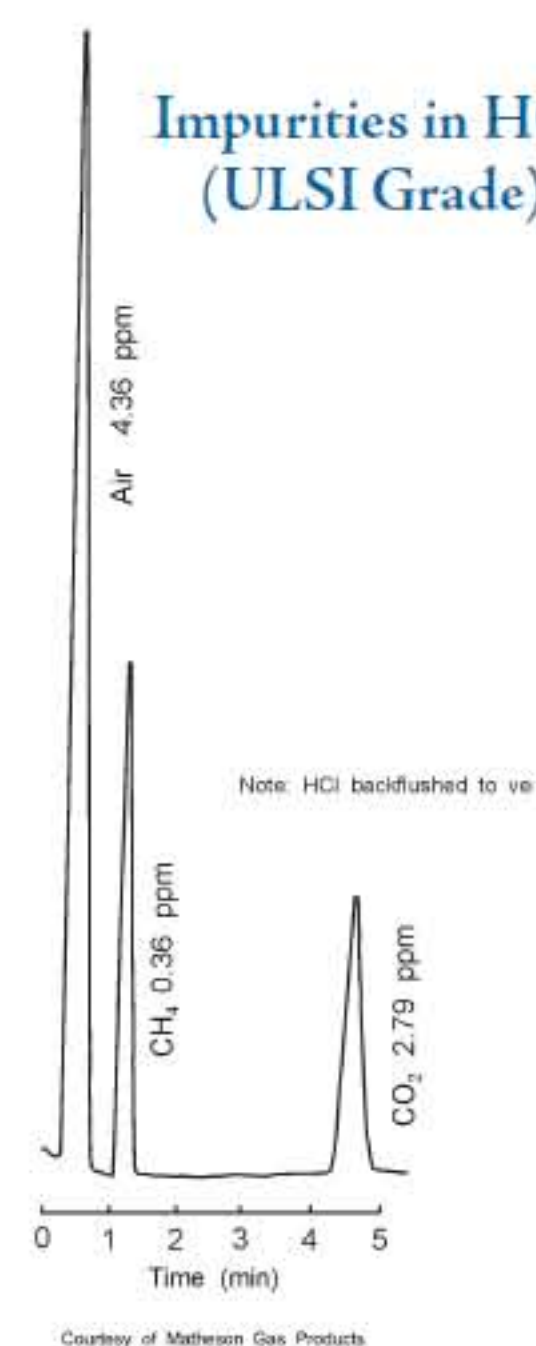
Accessories

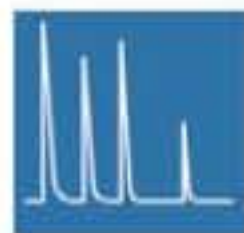
Model	75-500	Combined He Purifier, H ₂ Separator, & O ₂ Trap System
Model	75-800	Noble Gas Purifier
Model	75-850-BV	Hydrogen Separator
Model	75-900	Oxygen Trap
Model	21-070	Mini Gas Leak Detector
Part No.	180-567	Digital Flowmeter (for non-corrosive gases)
Part No.	180-380	Digital Flowmeter (for corrosive gases)
Part No.	59-595	Complete DID Accessory Package (REQUIRED to install and operate a GOW-MAC DID-GC system)

Silane & Germane in Arsine



Impurities in HCl (ULSI Grade)





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SB-590 1009

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GOW-MAC[®]
INSTRUMENT CO.

Series 1200 Trace N₂ in Ar Analyzer

**Nitrogen impurity measurement
made fast, simple, reliable, and
accurate**



Features

- Guaranteed 10 ppb sensitivity
- Measuring system based on spectral emission of argon plasma
- Exceptional detector performance by utilizing patented electro-optical modulation
- On-line continuous trending
- Fast response...Fast recovery
- 4-20 mA output
- Dry contacts for over range indication
- Dry contacts for range selection indication
- No valves, columns, or carrier gas
- No radioactive source
- No sensor or detector to replace
- Maintenance free
- Available in three configurations
 - + 0-10/0-100 parts per million (ppm)
 - + 0-2/0-20 ppm
 - + 0-20/0-200 ppm

Practical Applications

- Air separation plants
- Argon purification plants
- Cryogenic truck loading stations
- Specialty gas laboratories
- Process control
- New line certification
- Cryogenic steel manufacturing
- Chemical plants
- Gas management/monitoring systems
- Quality control for truck fills & gas cylinders
- Welding gas management
- Semiconductor manufacturing

SB-1200

Specifications — Series 1200 Trace Nitrogen in Argon Analyzer

Measurement Ranges	0 - 2 ppm N ₂ in Argon 0 - 10 ppm N ₂ in Argon 0 - 20 ppm N ₂ in Argon 0 - 100 ppm N ₂ in Argon 0 - 200 ppm N ₂ in Argon
Accuracy	± 0.020 ppm N ₂ in Argon on 0-2 ppm range ± 0.125 ppm N ₂ in Argon on 0-10 ppm range ± 0.250 ppm N ₂ in Argon on 0-20 ppm range ± 1.250 ppm N ₂ in Argon on 0-100 ppm range ± 2.500 ppm N ₂ in Argon on 0-200 ppm range
Response Time	90% of full scale: 11 seconds 95% of full scale: 13 seconds
Sample Flow Required	2 scfh (0.88 slpm)
Sample Conditions	1/4" VCR* sample inlet 1/4" Swagelok* vent
Recommended Calibration Gases	For 0-2 ppm range: zero gas: UHP Argon (99.999%) w/ GOW-MAC Model 75-800-2-AR Noble Gas Purifier span gas: 1.60-2 ppm N₂ in Ar For 0-10 ppm range: zero gas: UHP Argon (99.999%) w/ GOW-MAC Model 75-800-2-AR Noble Gas Purifier span gas: 8-10 ppm N₂ in Ar For 0-20 ppm range: zero gas: UHP Argon (99.999%) w/ GOW-MAC Model 75-800-2-AR Noble Gas Purifier span gas: 16-20 ppm N₂ in Ar For 0-100 ppm range: zero gas: UHP Argon (99.999%) w/ GOW-MAC Model 75-800-2-AR Noble Gas Purifier span gas: 80-100 ppm N₂ in Ar For 0-200 ppm range: zero gas: UHP Argon (99.999%) w/ GOW-MAC Model 75-800-2-AR Noble Gas Purifier span gas: 160-200 ppm N₂ in Ar
Ambient Temperature Limits	60 - 95 °F (16 -35 °C)
Maximum Operating Pressures	10 psig at sample inlet 6 psig on analytical cell
Nominal Sample Inlet Pressure	2- 7 psig
Display	LED Digital
Output	4 - 20 mA Dry contacts for range selection indication Dry contacts for over range indication
Detector Type	Spectroscopic emission
Sensitivity	± 0.01 ppm N ₂ in Ar (Series 1200-A / 1202-A) ± 0.10 ppm N ₂ in Ar (Series 1200-B / 1202-B) ± 0.05 ppm N ₂ in Ar (Series 1200-C / 1202-C)
Power	~ 100 W, 115/230 VAC, 50/60 Hz
Dimensions	5.25" H x 16.625" W x 14.625" D (13.34 x 42.23 x 37.15 cm)
Weight	25 lbs (11.3 kg)

Specifications and features will vary depending upon system configuration and are subject to change without notice. The above specifications are established during design, but are not to be construed as test criteria for every product.

Ordering Information

Series 1200-A.....0-2/0-20 ppm Range, 115 V	Series 1200-C0-10/0-100 ppm Range, 115 V
Series 1202-A.....0-2/0-20 ppm Range, 230 V	Series 1202-C0-10/0-100 ppm Range, 230 V

Series 1200-B.....0-20/0-200 ppm Range, 115 V
Series 1202-B.....0-20/0-200 ppm Range, 230 V



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GOW-MAC[®]
INSTRUMENT CO.

Total Hydrocarbon Gas Analyzer Series 23-550-BG

Operates on 100% H₂, 40/60% H₂/N₂ or
H₂/He Fuel Mixes

Meets ISBT Method 10.0 Criteria

Individual Flow Control Systems

3 Range Sensitivity

Consistent, Precise, Flexible, Compact

19" Rack Mount



General

The GOW-MAC Series 23-550-BG Total Hydrocarbon Gas Analyzer is designed to continuously measure concentrations of total volatile hydrocarbons (THA) in beverage-grade CO₂ gas and vaporized liquid streams pursuant to ISBT Method 10.0 criteria. The analyzer provides long-term stability and accurate performance in gas manufacturing facilities, CO₂ distribution facilities, and bottler's quality control applications. The 23-550-BG limit of detection is 0.1 ppm v/v, exceeding the ISBT detection limit requirements of 1 ppm v/v.

The Series 23-550-BG analyzer incorporates a flow system employed to guarantee the sample integrity for the analysis where low levels of hydrocarbons are monitored on a continuous basis. Samples may be introduced from a vaporized liquid CO₂ source, pressurized tanks and/or individual sample cylinders. The analyzer can be either bench or 19" rack mounted. An output signal is provided for permanent records.

Flow Control

Individual pneumatic controls are used to deliver regulated streams of air, fuel and sample to the FID. In the sample line, which requires a minimum of 3 psig, a back pressure regulator is used to maintain a constant flow to the detector. The Series 23-550-BG utilizes internal, adjustable pressure regulators for the air and fuel to provide for controlled pressure on the downstream side. Excess sample gas is discharged through a sample bypass outlet. This bypass feature allows for stable, constant, sample flow rates into the FID while providing high velocity flow through the analyzer to minimize system response time. A newly designed fuel enrichment system contains porous metal flow restrictors on the fuel line. This creates easier lighting of the FID.

Safety Features

A stable and reliable Flame Out circuit is engineered into each analyzer. The Flame Out circuit will indicate an extinguished flame and automatically shut off the fuel and sample lines to the flame ionization detector.

SB-THA-BG

Principal of Operation

The flame ionization detector (FID) operates on the principle that the electrical conductivity of a gas is directly proportional to the concentration of charged particles within the gas. Ionized carbon atoms are produced when burned in a hydrogen flame. Positive ions, negative ions and electrons present between an electrode gap decrease the gap resistance and cause an electrical current to flow across the gap.¹ The resulting voltage decrease is measured by an amplifier electrometer and then read by a digital meter or potentiometric recorder.

The advantages of digital readout are apparent upon use:

Range 1 = 0.0 ppm to 99.99 ppm

Range 2 = 0.0 ppm to 999.9 ppm

Range 3 = 0.0 ppm to 9,999 ppm

Balanced pneumatics and electronic stability allow for resolution of 0.1 ppm v/v total hydrocarbons over normal temperature ranges using zero grade H₂ as fuel. Electronic stability at maximum sensitivity is $\pm 1\%$ of full scale throughout an ambient temperature range of 25 °C $\pm$ 10 °C. Meets EPA certification for linearity.

¹ McNair, H.M.; Bonelli, E.J. Basic Gas Chromatography; Varian; Berkeley, CA 1968.

Specifications

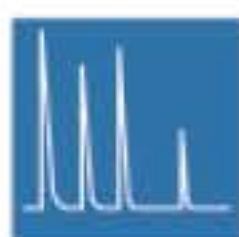
Full Scale Sensitivity Range:	Zero Grade H ₂ or Fuel Mix: spanning from 0.1 ppm CH ₄ to 9999 ppm CH ₄
Fuel Gas Requirements:	Zero Grade H ₂ : 25-35 cc/min. clean, zero grade H ₂ (THC $\leq$ 0.2 ppm) @ 25 psig Fuel Mix: 50-120 cc/min. 40/60% fuel mix (THC $\leq$ 0.5 ppm) @ 25 psig*
Sample Gas Requirements:	Minimum of 3 psig with a minimum flow rate of 0.35 to 1.5 liters/minute
Burner Air Requirements:	Minimum of 25 psig with a minimum flow rate of 230-300 cc/min. zero air (THC $\leq$ 1.0 ppm)
Electronic Stability:	At max. sensitivity: $\pm 1\%$ of F.S. throughout an ambient temperature range of 25 °C $\pm$ 10 °C
Ambient Temperature:	25 °C $\pm$ 10 °C
Output:	Digital Meter, 4½ digit LED 4-20 mA output mV recorder output Hi/Low alarms (optional)
Ranges:	x10, x100, x1000 with 4½ digit DPM
Sensitivity:	0.1 ppm
Safety:	Flame out indication with fuel and sample line shut off (standard)
Drift:	< 1% full scale drift over 24 hours
Reproducibility:	$\pm 1\%$ full scale for successive samples
Operation:	Minimum controls with pressure gauges for sample, air and fuel Large meter, wide dynamic range, easily accessible for maintenance
Mounting:	Bench top or 19" rack mount
Power:	Series 23-550-BG: 100 W @ 115 V, 60 Hz Series 23-552-BG: 50 W @ 230 V, 50 Hz
Dimensions:	19.00" W x 5.25" H x 16.50" D (48.26 x 13.34 x 41.91 cm)
Weight:	Net: 34 lbs. (15.42 kg) Shipping: 48 lbs. (21.77 kg)

*Note: There is a decrease in sensitivity when using a fuel mix other than zero grade H₂.

Ordering Information

<u>115 V Model</u>	<u>230 V Model</u>	
23-550-BG-1	23-552-BG-1	Total Hydrocarbon Gas Analyzer w/Voltage to Current Converter, 4-20 mA
23-550-BG-2	23-552-BG-2	Total Hydrocarbon Gas Analyzer w/Voltage to Current Converter & Hi/Low Alarms

Optional Accessory Part No. 59-300 Pump Assembly, external



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