Binary Gas Analyzer

BGA244 — Gas ratio measurement to 0.1 % accuracy



- Measures ratio of two gases
- Analyzes purity of a single gas
- <0.1 % accuracy (typ.)
- Touch screen display
- Data acquisition software (BGAMon)
- 4 Hz measurement rate
- USB, RS-232 and RS-422

- BGA244 ... $4500 (U.S. list)

BGA244 Binary Gas Analyzer

The BGA244 Binary Gas Analyzer quickly, continuously, and non-invasively determines the ratio of gases in a binary mixture, or checks the purity of a single gas.

It's ideal for a host of applications including binary gas blending, PSA (pressure swing adsorption), helium recovery, dopants in carrier gases, ozone purity and general research where precise measurements of gas mixtures are necessary.

The BGA244 operates without lasers, filaments, chemical sensors, optical sources, separation columns, reference gases, or reagents, and runs virtually maintenance-free.

Principle of Operation

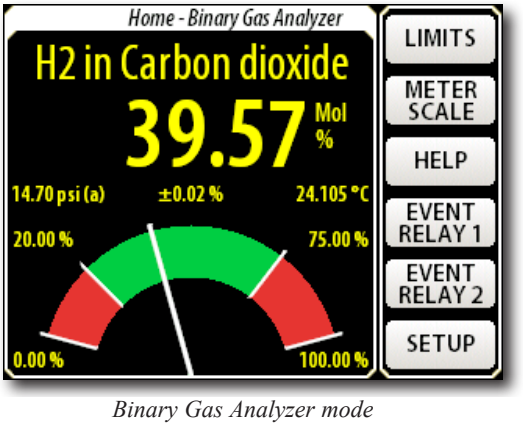
The speed of sound in a gas depends on the temperature, specific heat, and the molar mass of the gas. By precisely measuring the speed of sound and temperature in a gas mixture, and knowing the thermodynamic properties and molar masses of the gases, the BGA244 determines the composition of gas mixtures with an accuracy of about 0.1 %.

Operating Modes

The BGA244 has three basic measurement modes: Binary Gas Analyzer, Gas Purity Analyzer, and Physical Measurements Analyzer.

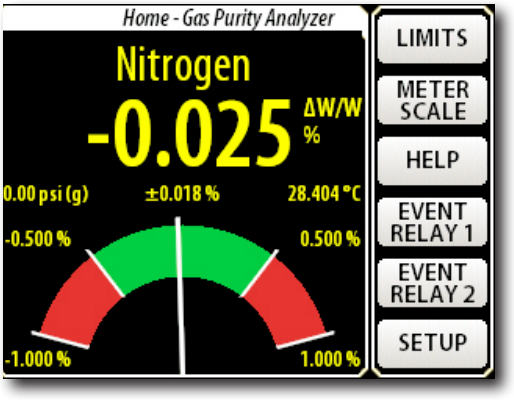
SRS Stanford Research Systems

phone: (408)744-9040
www.thinkSRS.com



Binary Gas Analyzer mode

In Binary Gas Analyzer mode, the ratio of two gases is reported. In Gas Purity Analyzer mode, the purity of a single gas is reported. In Physical Measurements mode, the BGA244 reports the speed of sound, temperature, and gas pressure. This extends the BGA244's utility beyond gas analysis, for example, to enable the measurement of thermodynamic properties of gas mixtures.



Gas Purity Analyzer mode

Gases can be chosen by name, formula, or CAS number on the touchscreen display or over the computer interfaces. In each mode, the BGA244 displays large numeric readouts of the parameters being measured. In the Binary Gas Analyzer and Gas Purity Analyzer modes, a needle graph shows the user-defined operating range in green, and higher and lower limits in red.

Limits can be set in all modes of operation. High and low limits can be defined for gas composition, gas purity, speed of sound, temperature, and pressure. Limits can generate "events", setting or clearing relays.

Comprehensive Database

Thermodynamic and molar mass data for more than 500 gases have been tabulated in the BGA244, enabling the instrument to measure tens of thousands of mixtures. Gases can be added to the data tables, as can pseudo-gases (user-defined gas mixtures which are treated as one gas species).

Remarkable Accuracy

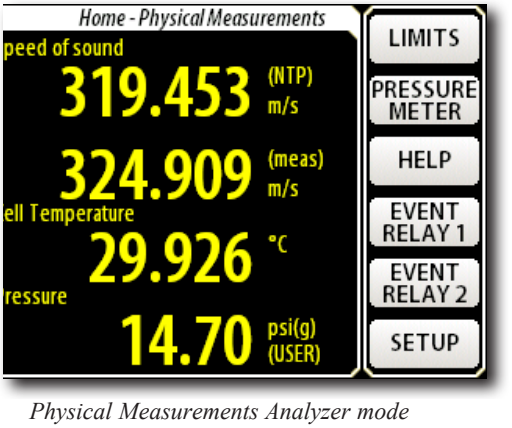
The accuracy of the gas composition result depends on the difference in the speed of sound between the gas species. Shown below are the typical composition errors for several gases mixtures.

For measurements requiring greater accuracy, a REL to the dominant gas species can be performed to remove most of the systematic errors. With this, an accuracy of 10 ppm is possible (depending on the gas species). Contact SRS for information on your specific gas mixture.

Gases	*Composition Error Range*
Hydrogen/Helium	0.04 % to 0.14 %
Helium-3/Helium-4	0.11 % to 0.14 %
Helium/Deuterium	0.13 % to 0.29 %
Hydrogen/Argon	0.002 % to 0.049 %
Helium/Air	0.005 % to 0.035 %
Hydrogen/Oxygen	0.002 % to 0.035 %
Oxygen/Ozone	0.053 % to 0.11 %
Oxygen/Nitrogen	0.24 % to 0.26 %
Nitrogen/Carbon Dioxide	0.051 % to 0.12 %
Diborane/Hydrogen	0.003 % to 0.086 %
Sulfur Hexafluoride/Air	0.007 % to 0.155 %
TMI/Hydrogen	0.001 % to 0.002 %
TMI/Nitrogen	0.006 % to 0.008 %

Operating Pressure

The accuracy of the BGA244 depends on knowing the operating pressure. In many cases, the pressure is stable and can be entered on the front panel or over the computer interfaces. For applications that have varying operating pressures, an external pressure gauge can be easily connected to one of the analog inputs.The BG244 operates over a pressure range that extends from a few psi up to 150 psi.



Physical Measurements Analyzer mode

Heaters, Relays, I/Os & Power

The BGA244 comes equipped with several multipurpose analog I/Os, two user-defined event relays for process control or alarms, and cavity heaters for temperature regulation and condensation prevention. There is an input for an external 24 VDC power supply. Many customers will choose to order the optional BGA-24 power supply which can supply +24 VDC to the BGA244.

Communication

With the standard RS-232, RS-422 and USB computer interfaces, all instrument functions can be set and queried remotely. The instrument can operate independently or via a host computer. A Windows monitor program, BGAMon, records and displays time records of gas composition, temperature, and pressure. The program also can be used to remotely configure the instrument, copy configurations to multiple instruments, and add user gas information.

Models BGA244, BGA244HP & BGA244E

The standard BGA244 comes with 1/8”-27 female NPT gas connectors. A wide variety of stainless steel gas fitting adapters are available for interfacing with NPT, VCR, VCO, tube compression, and flexible hose fittings.

The model BGA244HP High Purity Process Gas Analyzer is designed for use in high purity or corrosive environments. This model comes with welded-in-place 1/4” male VCR fittings. The BGA244HP is helium leak checked.



BGA244E

The model BGA244E gas analyzer is a standard BGA244 analyzer installed inside of an IP66/NEMA-4X rated, impact, UV and corrosion resistant polycarbonate enclosure. A clear, hinged door allows viewing of the BGA244 display and quick access to the instrument. The sealed enclosure protects the BGA244 from dust, weather and hose directed water. Liquid tight gas ports and flexible non-metallic cable conduit ports are located on the bottom edge of the wall mounted enclosure. The gas ports are 1/8”-27 female NPT stainless steel fittings. Electrical connections are made through 3/4” FNMC-B conduit fittings.



BGA244 without display

Operation

Operating temperature	–20 °C to +70 °C
Temperature resolution	0.001 °C
Temperature accuracy	±0.1 °C
Speed of sound range	100 to 1500 m/s
Speed of sound resolution	0.001 m/s
Speed of sound accuracy	±0.05 % (1 atm argon at 200 sccm)
Concentration accuracy	±0.1 % typ. (species dependent)
Measurement rate	4.4 Hz
Exponential averaging	Off, or 2 to 100 periods

Cavity

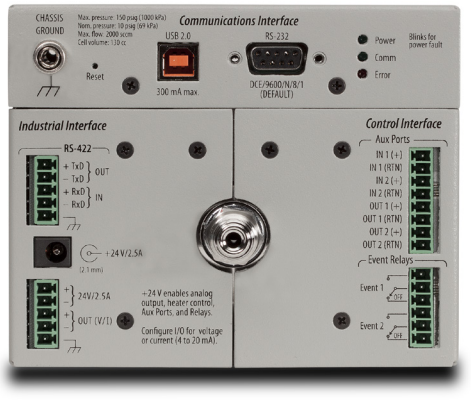
Volume	130 cc
Operating flow rate	0 to 5000 sccm
Min. operating pressue (psi)	<5 psia typ. (species dependent)
Cavity proof pressure	2,500 psi
In-bound helium leak rate	1×10^{-8} std-cc/s (BGA244HP only)

Analog I/O

Ports	3 output ports, 2 input ports
I/O port ranges	0 to 5 V, 0 to 10 V, and 4 to 20 mA
Accuracy	Voltage: ±0.1 % + 1 mV Current: ±0.1 % + 10 µA
4-20 mA loop power	6 to 19 VDC
4-20 mA compliance	0 to 16.8 VDC

Cavity Heaters

Set temperature	0 °C to 70 °C
Power limit	Off, or 0.5 W to 60 W



BGA244 rear panel

Serial Communication

USB	WHQL high speed USB 2.0
RS-232	2400 to 115,200 baud
RS-422	2400 to 115,200 baud

General

USB power	+5 V, 350 mA (when not using +24 V)
+24 V Current	0.1 A to 2.5 A depending on heater power
Wetted materials	Electropolished 304 stainless steel, OFHC copper gaskets (gold flashed, BGA244HP only), nickel plated/ Immersion gold copper traces on 0.001” Kapton film, glass, nickel plated Dumet wire, and vented 316 stainless steel screws. Loctite 565 thread sealant used on gas fittings for BGA244 and BGA244E.
Gas fittings	
BGA244	1/8”-27 female NPT
BGA244HP	Welded 1/4” male VCR
BGA244E	1/8”-27 female NPT
Dimensions	
BGA244/BGA244HP	5.5” × 4.5” × 3.25” (WHD)
BGA244E	10” × 11” × 5.5” (WHD)
Weight	
BGA244/BGA244HP	7 lbs.
BGA244E	10.2 lbs.
Warranty	One year parts and labor on defects in materials & workmanship

Important Safety Note

The BGA244 is not ATEX rated. Under normal operating conditions the BGA244 cannot ignite the gas being analyzed. However, if the instrument is used with flammable or explosive gas mixtures we recommend the use of flame arrestors on both gas ports.

The instrument’s proof pressure (2,500 psia) is sufficient to contain the denotation of an explosive gas mixture of up to 30 psia. The instrument would not operate after such an event.

The instrument’s acoustic transducer consists of a nickel-plated copper spiral on a 40 µm thick Kapton polyimide film. For gases that may react with copper or Kapton, we recommend corrosion testing of this component on a case-by-case basis.

Ordering Information

BGA244	Binary gas analyzer	$4500
BGA244HP	Binary gas analyzer	$5150
BGA244E	BGA in environmental enclosure	$4900