Binary Gas Analyzer

BGA244 — Gas ratio measurement to 0.1 % accuracy

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.

- 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 ... $3950 (U.S. list)**
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.

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

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 BGA244 operates over a pressure range that extends from a few psi up to 150 psi.

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).
**BGA244 Binary Gas Analyzer**

**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.

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.

**Model BGA244OEM**

The BGA244 can be ordered in several OEM configurations and is priced accordingly. Please call us to discuss your application.
**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

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**Cavity**

- Volume: 130 cc
- Operating flow rate: 0 to 3000 sccm
- Min. operating pressure (psi): <5 psia typ. (species dependent)
- Cavity proof pressure: 2,500 psi
- In-bound helium leak rate: $1 \times 10^{-8}$ 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

**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
- +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 detonation 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 $3950
- BGA244HP: Binary gas analyzer $4700
- BGA244E: BGA in environmental enclosure $4350

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BGA244 rear panel

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