

Binary Gas Analyzer

BGA244 — Gas ratio measurement to 0.1 % accuracy



BGA244 Binary Gas 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 (opt.)**

• **BGA244 ... \$3950 (U.S. list)**

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, ozone purity and general research where precise measurements of gas mixtures are necessary.

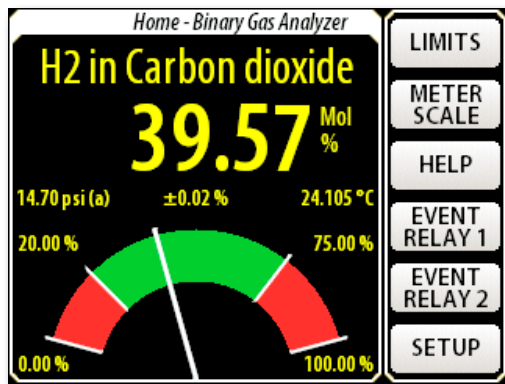
The BGA244 operates without lasers, filaments, chemical sensors, optical sources, separation columns, reference gases, or reagents, and runs virtually maintenance-free.

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

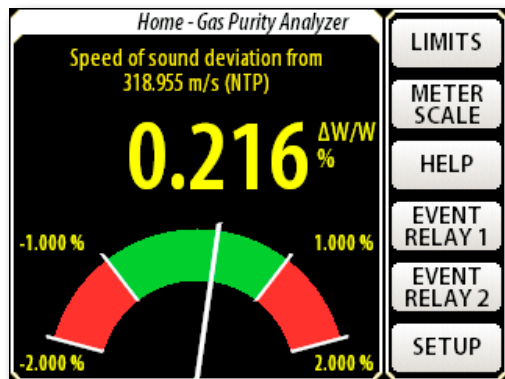
The BGA244 has three basic measurement modes: Binary Gas Analyzer, Gas Purity Analyzer, and Physical Measurements Analyzer.



Binary Gas Analyzer mode

In Binary Gas Analyzer mode, two gases for analysis can be chosen by name, formula, or CAS number on the touchscreen display. When operating in Gas Purity Analyzer mode, the user simply selects the single gas of interest.

In Physical Measurements mode, the BGA244 reports the speed of sound, temperature, and gas pressure. This extends



Gas Purity Analyzer mode

the BGA244's utility beyond gas analysis, for example, to enable the measurement of thermodynamic properties of gas mixtures.

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 250 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

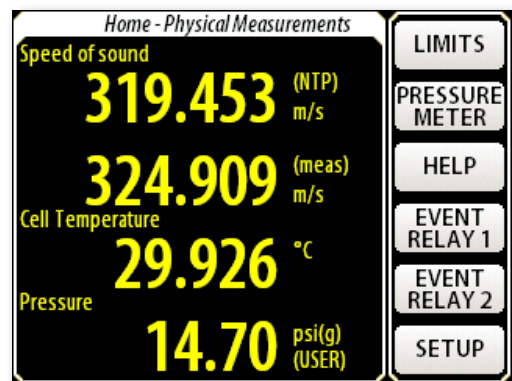
The accuracy of the gas composition result depends on the difference in the speed of sound between the gas species. Shown below are the typical composition errors for several gases mixed with air.

Gas (in air)	Error
Hydrogen	± 0.04%
Helium	± 0.03%
Methane	± 0.09%
Water	± 0.11%
Neon	± 0.08%
Nitrogen *	± 1.03%
Ethane	± 0.09%
Oxygen	± 0.31%
Argon	± 0.13%
Carbon dioxide	± 0.05%
Propane	± 0.03%
1,1-Difluoroethane	± 0.02%
Tetrafluoromethane	± 0.01%
Sulfur hexafluoride	± 0.01%

* Dry air is 78 % N₂, 21 % O₂, and 1 % Ar. Since the speed of sound in N₂ (349 m/s) is very close to that of air (343 m/s), the largest composition error in the table occurs when nitrogen is mixed into air.

Operating Pressure

The accuracy of the BGA244 is improved when the pressure is known. The user can enter the operating pressure, or a pressure transducer can be connected to one of the instrument's analog inputs. The BGA244 operates over a pressure range that extends from a few psia up to 150 psia.



Physical Measurements Analyzer mode

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, an RS-422 port for robust serial communications, 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 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 displays acoustic spectra, resonance line fitting, and can be used to update gas property tables.

Models BGA244, BGA244HP & BGA244E

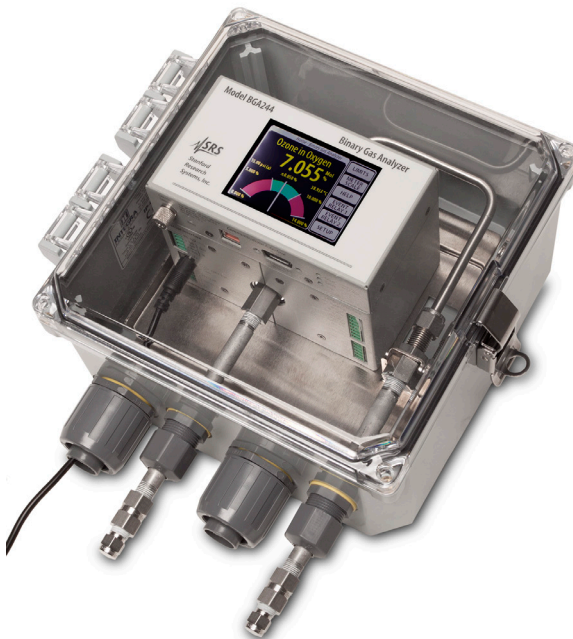
The standard BGA244 comes with 1/8" female NPT gas connectors. A wide variety of stainless steel gas fitting adapters are available for interfacing with NPT, VCR, VCO, tube compression, and flexible hose fittings.

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 (instead of 1/8" female NPT). 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" male NPT stainless steel fittings and the conduits are 3/4" FNMC-B.

Model BGA244OEM

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



BGA244E



BGA244OEM

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	±0.01 % (1 atm N2 at 200 sccm)
FFT frequency range	DC to 36 kHz
Measurement rate	4.39 Hz (36,000 / 8,192)
Exponential averaging	Off, or 2 to 100 periods

Cavity

Volume	130 cc
Operating flow rate	0 to 5000 sccm
Min. operating pressure (psi)	100 / [Mol Wt (amu)]
Cavity proof pressure	2,500 psi
In-bound helium leak rate	1 × 10 ⁻⁸ std-cc/s (typ.)

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
Resolution	16 bits (1 part in 65,536)
Offset error	±0.002 V or ±1 µA
Gain error	±0.1 %
4-20 mA loop power	0 to ±19.0 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

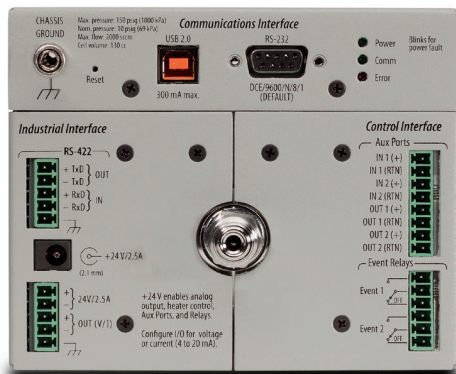
USB	WHQL high speed USB 2.0
RS-232	2400 to 115,200 baud
RS-422	2400 to 115,200 baud

General

USB power	+5 V, 350 mA (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, gold flashed OFHC copper gaskets, nickel plated/Immersion gold copper traces on 0.001" Kapton film, nickel plated NdFeB magnets, glass, Constantan (Cu55/Ni45) wire, and vented 316 stainless steel screws. The BGA244 may be ordered with welded or replaceable gas fittings.
Gas fittings	The welded-in-place gas fittings are TIG welded at the inside surface of the gas cylinder. The replaceable gas fittings connect to the cylinder via a 1/8" female NPT port and use Loctite 565 thread sealant.
Dimensions	5.5" × 4.5" × 3.25" (WHL)
Weight	7 lbs.
Warranty	One year parts and labor on defects in materials & workmanship

Important Safety Note

The BGA244 should not be used to measure explosive, flammable or corrosive gases and should not be used in explosive or flammable atmospheres. The instrument should be ordered with the optional environmental enclosure if used outdoors or subject to corrosive environments, salt spray, or wash down.



BGA244 rear panel

Ordering Information

BGA244	Binary gas analyzer	\$3950
BGA244HP	Process gas analyzer	\$4700
BGA244E	BGA in environmental enclosure	\$4350