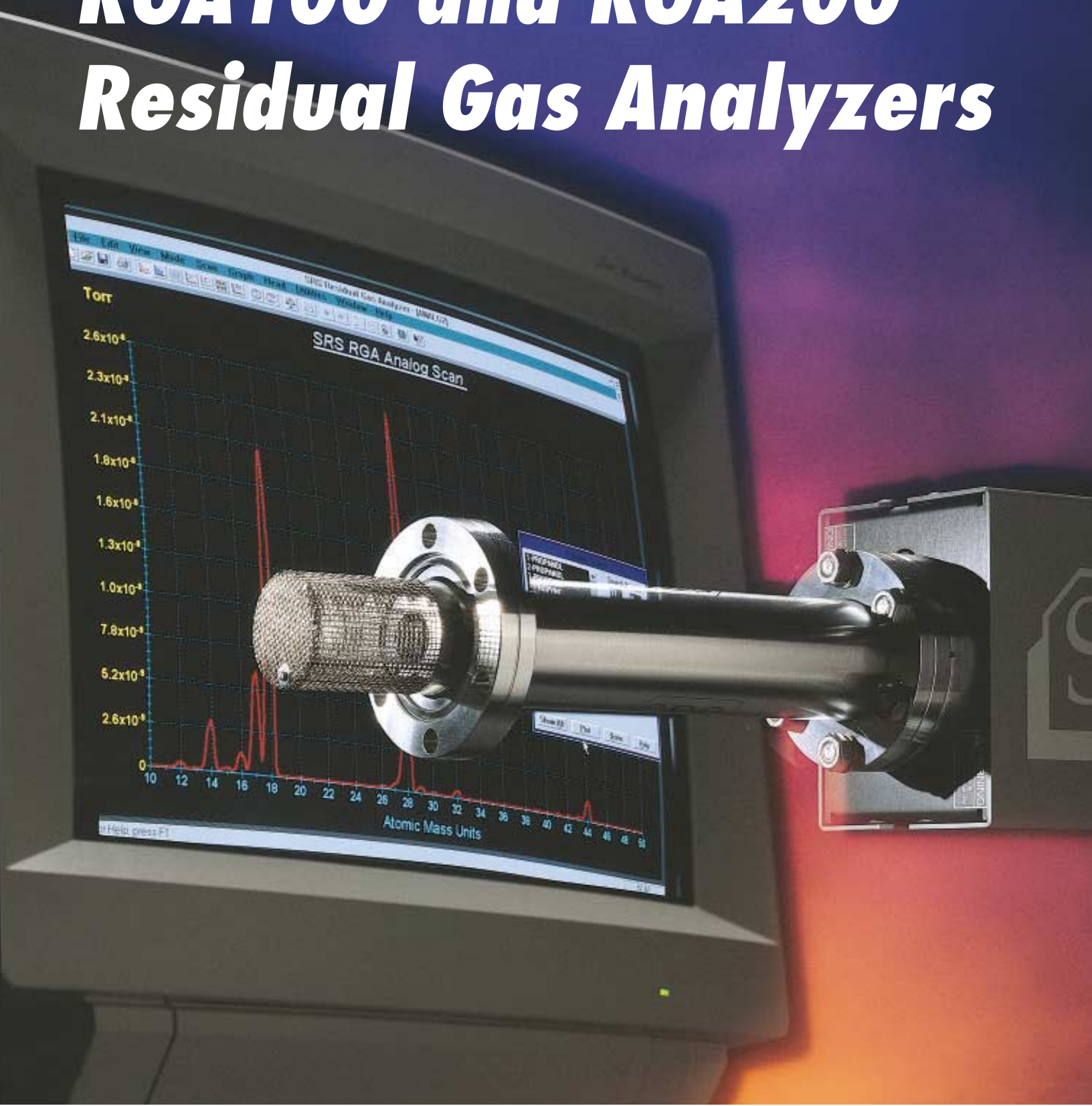




STANFORD RESEARCH SYSTEMS

RGA100 and RGA200 Residual Gas Analyzers



Residual Gas Analyzers

RGA100 ... \$3750 (U.S. list)

RGA200 ... \$4500 (U.S. list)

RGA300 ... \$6000 (U.S. list)

- **100 and 200 amu systems**
- **Better than 1 amu resolution**
- **6 orders of magnitude dynamic range in a single scan**
- **Detectable partial pressures to 10^{-14} Torr**
- **Real-time RGA Windows software**
- **Mass spectra, leak detection and pressure vs. time modes**
- **Multi-head operation**
- **Field replaceable electron multiplier and filament**



The new 100 and 200 amu residual gas analyzers from SRS offer exceptional performance and value. These RGA's provide detailed gas analysis of vacuum systems at about half the price of competitive models. Each RGA system comes complete with a quadrupole probe, electronics control unit (ECU) and a real-time Windows software package that is used for data acquisition and analysis as well as probe control.

A rugged probe design

The probe consists of an ionizer, quadrupole mass filter and a detector. The simple design has a small number of parts which minimizes outgassing and reduces the chances of introducing impurities into your vacuum system. The probe assembly is rugged and mounts onto a standard 2 3/4 inch CF flange. It is covered with a stainless steel tube with the exception of the ionizer which requires just 2 1/2 inches of clearance in your vacuum system about that of a standard ion gauge. The probe is designed using self-aligning parts so it can easily be reassembled after cleaning.

Compact electronics control unit

The densely packed ECU contains all the necessary electronics for controlling the RGA head. It is powered by either an external +24 VDC (2.5 A) power supply or an optional, built-in power module which plugs into an AC outlet. LED indicators provide instant feedback on the status of the electron multi-

plier, filament, electronics system and the probe. The ECU can easily be removed from the probe for high temperature bakeouts.

Unique filament design

A long-life dual Thoriated-Iridium (ThO_2Ir) filament is used for electron emission. Dual thoriated filaments last much longer than single filaments, maximizing the time between filament replacement. Unlike other designs, SRS filaments can be replaced by the user in a matter of minutes.



Continuous dynode electron multiplier

A Faraday cup detector is standard with both 100 and 200 amu systems allowing partial pressure measurements from 10^{-5} to 10^{-8} Torr. For increased sensitivity and faster scan rates an optional electron multiplier is offered that detects partial pressures down to 10^{-14} Torr. This state-of-the-art macro multi-channel continuous dynode electron multiplier (CDEM) offers increased longevity and stability and can also be installed by the user – a first for RGAs!

Useful features

Both RGAs have a built-in degassing feature. Using electron impact desorption, the ion source is thoroughly cleaned, greatly reducing the ionizer's contribution to background noise.

A firmware driven filament protection feature constantly monitors (675 Hz) for over pressure. If over pressure is detected the filament is immediately shut off, preserving its life.

A unique temperature compensated logarithmic electrometer detects ion current from 10^{-7} to 10^{-15} Amps in a single scan with better than 2% precision. This huge dynamic range means you can make measurements of small and large gas concentrations simultaneously.

Complete programmability

Communication with computers is made via the RS-232 interface. Analog and histogram (bar) scans, leak detection, total pressure, and probe parameters are all controlled and monitored through a high level command set. This allows easy integration into preexisting processing programs.

RGA Windows software

The RGA systems are supported with a real-time Windows® software package that runs on IBM compatible PCs (486 or greater). The intuitive graphical user interface allows measurements to be made quickly and easily. The program is fully interactive giving the user complete control of the graphical display. Screens can be split for dual mode operation, scales can be set to linear or log format, and data can be scaled manually or automatically. Data is captured and displayed in real-time or scheduled for acquisition at a given time interval for long term data logging. Features include user selectable units (Torr, mBar, Pascals and Amps), programmable audio and visual

alarms, and comprehensive, on-line help.

The software also allows complete RGA head control with easy mass scale tuning, sensitivity calibration, ionizer setup and electron multiplier gain adjustment. For further analysis, data files can be saved in ASCII format for easy transfer into spreadsheets. Graphic images can be saved as META files or copied to the clipboard for importing directly into other Windows® programs. The software also provides password protection for locking out head parameters so that casual users can't alter important settings.

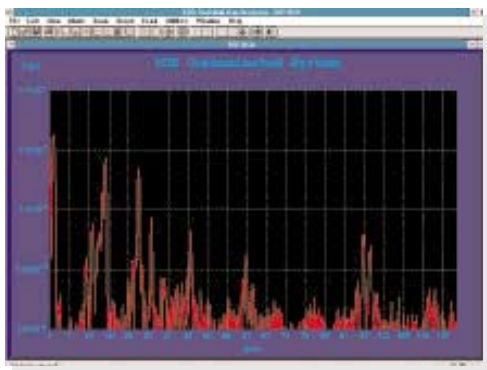
Multiple-head operation

The software supports multiple head operation when more than one RGA is needed. Up to eight ECUs can be monitored from the software.

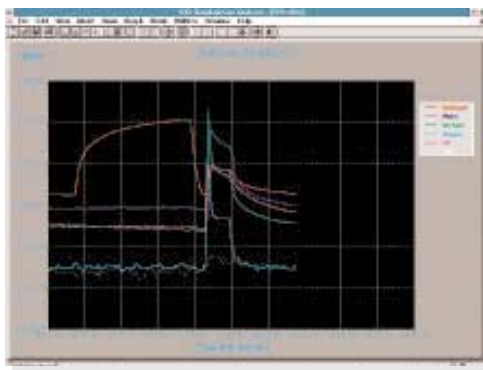
Performance and value

The SRS family of RGAs is ideal for applications involving gas analysis, leak detection and vacuum processing. We offer 100 and 200 amu systems with supporting Windows® software, and options that include electron multiplier, built-in power module, 19 inch rack mount enclosure, and complete computer systems. A demo version of the RGA Windows software is available on the World Wide Web at <http://www.srsys.com/srsys/>. For more details or to place an order call SRS at (408)744-9040.





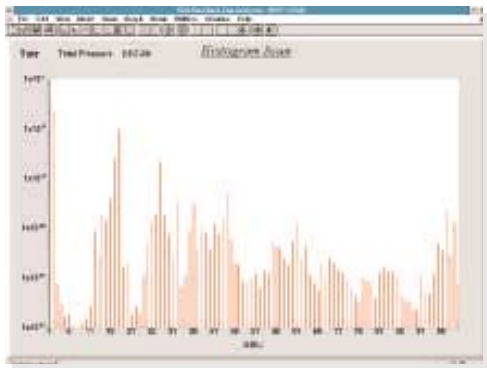
Analog mode provides a line graph representation of the acquired mass spectrum (partial pressure vs. mass number). Span, resolution and noise floor can each be set. Scans can be single-shot, timed or taken continuously. Total pressure is available in analog and most other modes of operation.



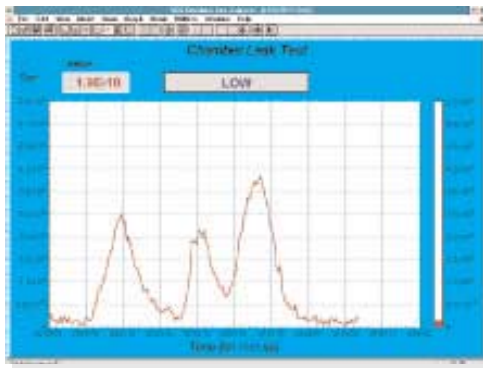
Pressure vs. time presents a strip chart of partial pressures for selected masses and provides a complete time history of your data. Complete scrolling and zoom control is available even while data is being acquired. This mode is most often used for monitoring process trends.



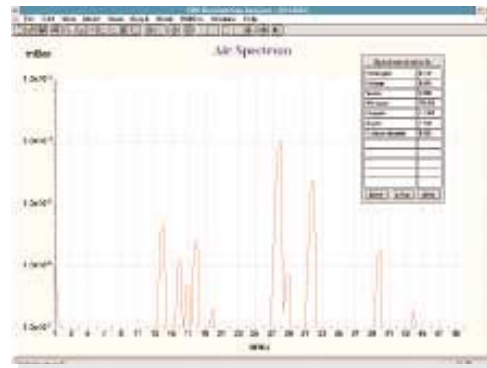
Library mode contains a comprehensive list of gases that can be used to compare against the current spectrum. A search mode allows you to select up to 12 masses and identify and display (numerically and graphically) the intensity of all gases that contain these masses.



Histogram mode displays a bar graph of partial pressure vs. mass allowing the spectrum to easily be interpreted. This mode is often used for quick and easy vacuum analysis. The screen can be split for viewing two modes of operation simultaneously.



Leak detection mode monitors a particular mass number (not just Helium) over time, and combines many features of the previous modes. A vertical bar graph provides a visual reference for viewing changes in intensity from a distance. A programmable audible tone that changes pitch proportionally with partial pressure is useful in detecting the location of a leak. A large numeric read-out and visual alarm are also provided.



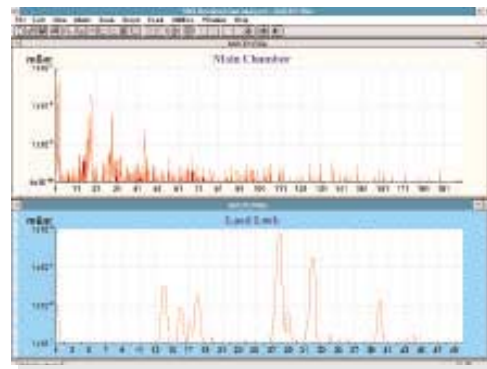
Analysis utility provides an approximation of the composition of gases being monitored by the RGA. Since more than one gas can contribute to a particular amu's partial pressure, the analysis mode is extremely useful in determining the make-up of complex gases. Up to 12 common gases can be selected for the analysis.



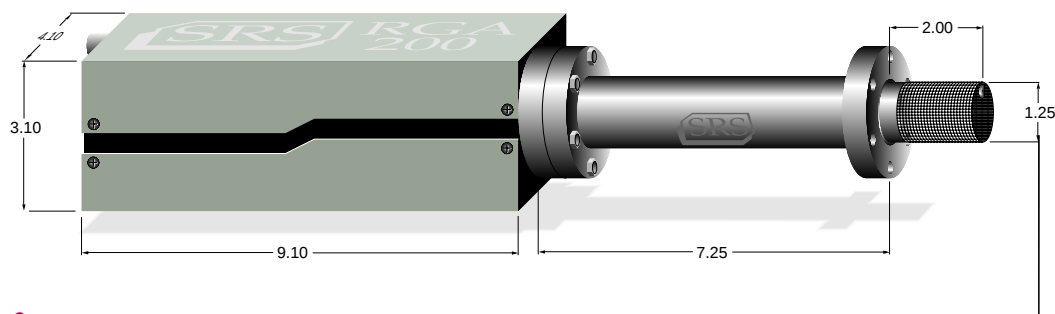
Table mode provides a readout of mass, scaling factor and true partial pressure for numerical analysis. The display shows the peak heights and alarm status of up to 10 masses and their corresponding parameters. The electron multiplier can be independently set on or off for each mass being displayed. This allows the user to view minor species even in the presence of high total pressure.



Annunciator mode is provided for conveniently monitoring up to 10 masses. The screen is large enough to be seen from across the room. If a particular mass has tripped its preset alarm, the large box will turn red indicating a problem. An audible alarm will also be present until the mass falls back within its preset limits. This mode is most often used for Go/No-Go testing.



Multi-head operation is available when more than one RGA is needed for analysis. Up to eight heads can be monitored simultaneously from the software.



Specifications

Operational

Mass range	
RGA100	1 to 100 amu
RGA200	1 to 200 amu
Mass filter type	Quadrupole
Detector type	Faraday cup (FC) – standard Electron multiplier (CEM) – optional
Resolution (per AVS std. 2.3)	Greater than 0.5 amu @ 10% peak height. Adjustable to constant peak width throughout the mass range.
Sensitivity (A/Torr)	2x10 ⁻⁴ (FC), <200 (CEM). User adjustable throughout high voltage range. Measured with N ₂ @ 28 amu with 1 amu full peak width, 10% height, 70 eV electron energy, 12 eV ion energy and 1 mA electron emission current.
Minimum detectable partial pressure	5x10 ⁻¹¹ Torr (FC). 5x10 ⁻¹⁴ Torr (CEM). Measured with N ₂ @ 28 amu with 1 amu full peak width, 10% height, 70 eV electron energy, 12 eV ion energy and 1 mA electron emission current.
Operating pressure range	10 ⁻⁴ Torr to UHV (FC) 10 ⁻⁶ Torr to UHV (CEM)
Max. operating temp.	250°C (FC), 100°C (CEM)
Bakeout temperature	350° C (without ECU)
Total press. meas.	Always available

Ionizer

Design	Open ion source. cylindrical symmetry, electron impact ionization.
Material	SS304 construction
Filament	Thoriated Iridium (dual) with firmware protection. Built-in 1 to 10 W degas ramp-up. Field replaceable.
Electron energy	25 to 105 V, programmable.
Ion energy	8 or 12 V, programmable.
Focus voltage	0 to 150 V, programmable.
Electron emission current	0 to 3.5 mA, programmable.

General

Probe dimension	8.75" from flange face to top of ionizer
Probe insertion	2.0"
Probe mounting flange	2.75" CF
Minimum tube I.D.	1.375"
ECU dimensions	9.1" x 4.1"x 3.1". Easily separated from the probe for bakeout.
LED indicators	Power ON/OFF, filament ON/OFF, degas ON/OFF, Elec. mult. ON/OFF, RS-232 Busy, Error, Overpressure, Burnt Filament.
Warm-up time	Peak height ±2% after 3 minutes. Mass stability ±0.1 amu after 30 minutes.
Computer interface	RS-232C, 28,800 Baud with high level command set.
Software	Windows® based application. Requires 486 or better.
Power Requirement	24 VDC @ 2.5 Amps. Male DB9 connector. Optional 120 VAC adapter.
Weight	6 lbs.
Warranty	One year parts and labor on materials and workmanship.



About dynamic range

Dynamic range is defined as the ratio between the smallest signal that can accurately be measured and a full scale signal. Residual gas analyzers typically offer 3 to 4 orders of magnitude dynamic range. SRS RGAs use a logarithmic amplifier in the detector to achieve more than 6 orders of magnitude dynamic range. Figure 1 at the right shows a mass spectrum of 99.999% nitrogen, which was measured using the Faraday cup (FC) detector. The partial pressure scale covers seven decades (10^{-4} to 10^{-11} Torr) and data is acquired in a single scan without range changes. The effect of outgassing of the vacuum chamber has been removed using the background subtraction feature of our software. The RGA has sufficient resolution to detect $^{15}\text{N}_2$, which is naturally present at 15 ppm, even though it is only 2 amu away from a peak that is five decades larger.



Figure 1

Figure 1 shows a high pressure of 4×10^{-5} Torr ($^{14}\text{N}_2$), which is close to the saturation limit of the detector (1×10^{-4} Torr), and a noise floor of about 1×10^{-10} Torr. From these values we can determine that the detection limit of the RGA is a few ppm. Switching to the electron multiplier detector (CDEM) we can improve the signal detection limit of the RGA. Using the software's table mode (see figure 2), the RGA can be set for FC or CDEM detection for up to 10 masses. The Faraday cup is used for major species and the electron multiplier for minor species. Note the dynamic range has been significantly improved (8 orders of magnitude) with the noise floor now at about 10^{-13} Torr.



Figure 2

Ordering Information (All price U.S. list)

Base Units

RGA100

100 amu system with RGA \$3750
Windows® software

RGA200

200 amu system with RGA \$4500
Windows® software

RGA300

300 amu system with RGA \$6000
Windows® software

Options

Opt 01	Electron multiplier (with HVPS)	\$ 1500
Opt 02	Built-in power module (AC line operation)	\$ 250
O100RF	Replacement filament	\$ 200
O100EM	Replacement electron multiplier	\$ 1000



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