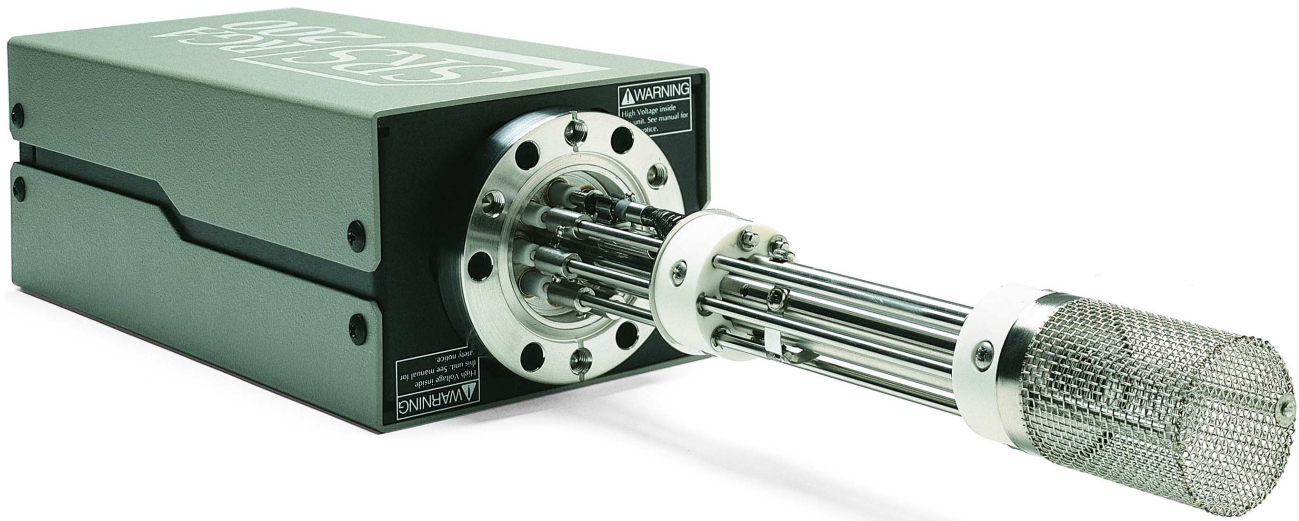


# Residual Gas Analyzers

*RGA100/200/300 — 100 amu, 200 amu and 300 amu RGAs*



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## SRS Residual Gas Analyzers

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- **100, 200 and 300 amu systems**
- **Better than 1 amu resolution**
- **6 decades of dynamic range**
- **$5 \times 10^{-14}$  Torr detection limit**
- **RGA Windows & LabVIEW software**
- **Multi-head operation**
- **Field-replaceable electron multiplier and filament**
- **RS-232 interface**

- **RGA100**
- **RGA200**
- **RGA300**

The 100, 200 and 300 amu residual gas analyzers from SRS offer exceptional performance and value. These RGAs 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.

### 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 2.75" Conflat® flange. It is enclosed within a stainless steel tube, with the exception of the ionizer which requires just 2.5" 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 multiplier, 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 ( $\text{ThO}_2/\text{Ir}$ ) filament is used for electron emission. Dual  $\text{ThO}_2/\text{Ir}$  filaments last much longer than single filaments, maximizing the time between



*Dual  $\text{ThO}_2/\text{Ir}$  filament*

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 all SRS RGAs allowing partial pressure measurements from  $10^{-5}$  Torr to  $5 \times 10^{-11}$  Torr. For increased sensitivity and faster scan



*Continuous dynode electron multiplier*

rates an optional electron multiplier is offered that detects partial pressures down to  $5 \times 10^{-14}$  Torr. This state-of-the-art,

multi-channel, continuous-dynode electron multiplier (EM) offers increased longevity and stability and can also be installed by the user—a first for RGAs.

### Useful Features

SRS 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.

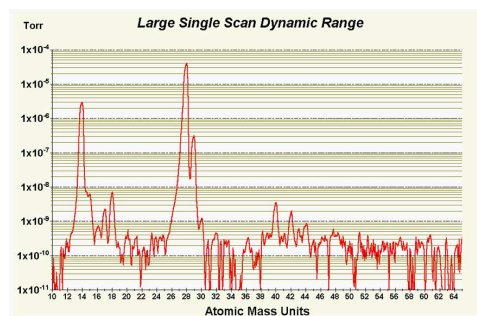
A unique temperature-compensated, logarithmic electrometer detects ion current from  $10^{-7}$  to  $10^{-15}$  amps in a single scan with better than 2 % precision. This huge dynamic range means you can make measurements of small and large gas concentrations simultaneously.

### Complete Programmability

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

### RGA Windows Software

The RGA systems are supported with a real-time Windows software package that runs on IBM compatible PCs. The intuitive graphical user interface allows measurements to be



*RGA Windows software—Analog mode*

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, Pa and A), 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. A LabVIEW driver is also available on the SRS website.

An optional stand-alone monitor (PPM100) can be used to control the RGA without a host computer.

### Multi-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.

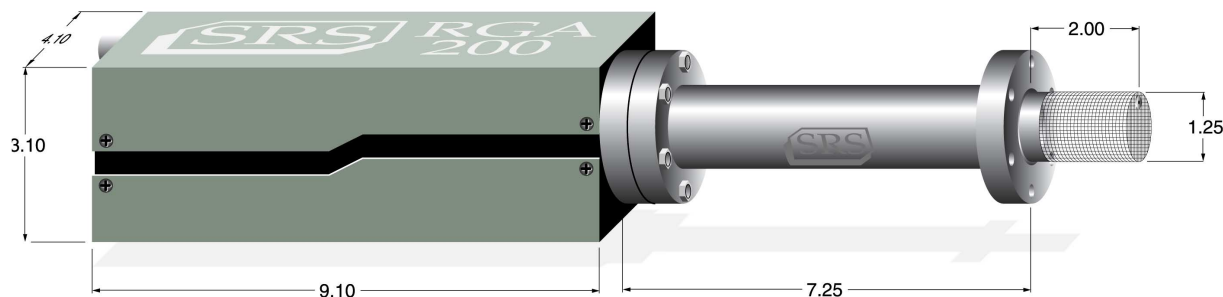
### Performance and Value

The SRS family of RGAs is ideal for applications involving gas analysis, leak detection and vacuum processing. We offer 100, 200 and 300 amu systems with supporting Windows software, and options that include an electron multiplier and a built-in power module for AC line operation. The RGA Windows software is available on the web at [www.thinkSRS.com](http://www.thinkSRS.com).

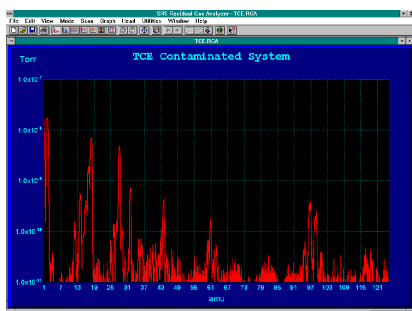


*RGA rear panel  
(without AC power module)*

*RGA rear panel  
(with AC power module)*



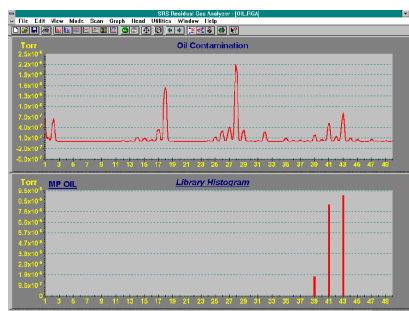
*RGA dimensional drawing (inches)*



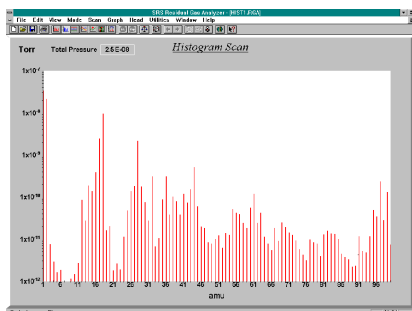
**Analog mode** provides a line graph representation of the acquired mass spectrum (partial pressure vs. mass number). Span, resolution and noise floor can each be set. Scans can be single-shot, timed or taken continuously.



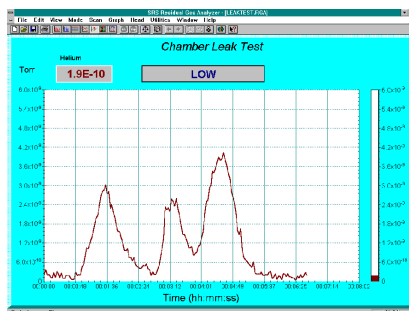
**Pressure vs. time** presents a strip chart of partial pressures for selected masses and provides a complete time history of your data. Complete scrolling and zoom control is available even while data is being acquired. This mode is most often used for monitoring process trends.



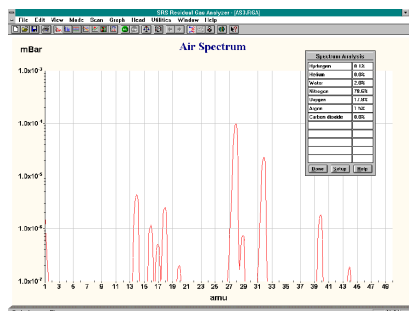
**Library mode** contains a comprehensive list of gases that can be used to compare against the current spectrum. A search mode allows you to select up to 12 masses and identify and display (numerically and graphically) the intensity of all gases that contain these masses.



**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, 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.

RGA Table Scan

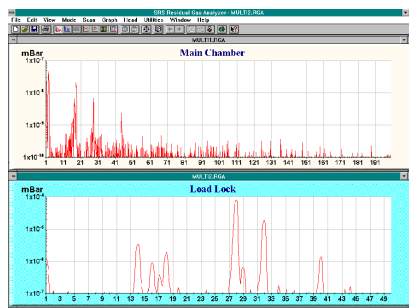
| Ch# | Name     | Mass | Value   | Alarm  | Speed | Cal  | CEM |
|-----|----------|------|---------|--------|-------|------|-----|
| 1   | Hydrogen | 2    | 3.8E-07 | NORMAL | 1     | 1.00 | OFF |
| 2   | Water    | 18   | 7.1E-08 | NORMAL | 1     | 1.00 | OFF |
| 3   | Nitrogen | 28   | 1.4E-05 | NORMAL | 1     | 1.00 | OFF |
| 4   | Oxygen   | 32   | 4.6E-10 | NORMAL | 3     | 1.00 | ON  |
| 5   | CO2      | 44   | 3.4E-11 | NORMAL | 3     | 1.00 | ON  |
| 6   | Oil      | 55   | 1.6E-12 | NORMAL | 3     | 1.00 | ON  |
| 10  | Fluor    | 21   | 1.5E-13 | NORMAL | 1     | 1.00 | ON  |

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

Chamber Leak Test

| Mass     | Value   | Alarm        |
|----------|---------|--------------|
| Hydrogen | 1.1E-07 | NORMAL       |
| Water    | 5.6E-08 | HIGH         |
| Nitrogen | 1.4E-08 | NORMAL       |
| Oxygen   | 2.9E-09 | NORMAL       |
| Oil      | 1.4E-08 | EXTREME HIGH |
| Fluor    | 3.0E-09 | NORMAL       |

**Annunciator mode** is provided for conveniently monitoring up to 10 masses. 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.



**Operational**

|                                        |                                                                                                                                                                                                                                                                 |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mass range                             |                                                                                                                                                                                                                                                                 |
| RGA100                                 | 1 to 100 amu                                                                                                                                                                                                                                                    |
| RGA200                                 | 1 to 200 amu                                                                                                                                                                                                                                                    |
| RGA300                                 | 1 to 300 amu                                                                                                                                                                                                                                                    |
| Mass filter type                       | Quadrupole                                                                                                                                                                                                                                                      |
| Detector type                          | Faraday cup (FC), standard<br>Electron multiplier (EM), optional                                                                                                                                                                                                |
| Resolution<br>(per AVS std. 2.3)       | Greater than 0.5 amu @ 10 % peak<br>height. Adjustable to constant peak<br>width throughout the mass range.                                                                                                                                                     |
| Sensitivity (A/Torr)                   | $2 \times 10^{-4}$ (FC), <200 (EM). User<br>adjustable throughout high voltage<br>range. Measured with N <sub>2</sub> @ 28 amu<br>with 1 amu full peak width,<br>10 % height, 70 eV electron energy,<br>12 eV ion energy and 1 mA electron<br>emission current. |
| Minimum detectable<br>partial pressure | $5 \times 10^{-11}$ Torr (FC),<br>$5 \times 10^{-14}$ Torr (EM)<br>Measured with N <sub>2</sub> @ 28 amu with<br>1 amu full peak width, 10 % height,<br>70 eV electron energy, 12 eV ion<br>energy and 1 mA electron emission<br>current.                       |
| Operating range                        | 10 <sup>-4</sup> Torr to UHV (FC)<br>10 <sup>-6</sup> Torr to UHV (EM)                                                                                                                                                                                          |
| Operating temperature                  | 70 °C (max.)                                                                                                                                                                                                                                                    |
| Bakeout temperature                    | 300 °C (without ECU)                                                                                                                                                                                                                                            |

**Ionizer**

|                           |                                                                                                                  |
|---------------------------|------------------------------------------------------------------------------------------------------------------|
| Design                    | Open ion source, cylindrical<br>symmetry, electron impact<br>ionization.                                         |
| Material                  | SS304 construction                                                                                               |
| Filament                  | Thoriated iridium (dual) with<br>firmware protection. Built-in<br>1 to 10 W degas ramp-up. Field<br>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                                                                                        |

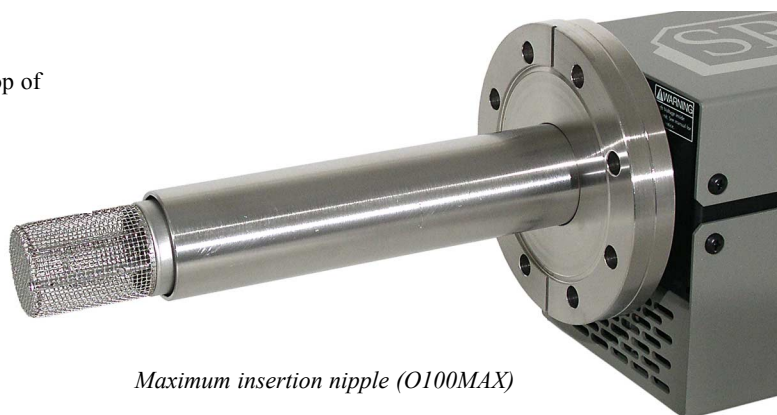
**General**

|                       |                                             |
|-----------------------|---------------------------------------------|
| Probe dimension       | 8.75" from flange face to top of<br>ionizer |
| Probe insertion       | 2.0"                                        |
| Probe mounting flange | 2.75" CF                                    |
| Minimum tube I.D.     | 1.375"                                      |

|                    |                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| ECU dimensions     | 3.1" × 4.1" × 9.1" (WHD). Easily<br>separated from the probe for bakeout.                                                           |
| LED indicators     | Power ON/OFF, filament ON/OFF,<br>degas ON/OFF, electron multiplier<br>ON/OFF, RS-232 Busy, Error,<br>Overpressure, Burnt Filament. |
| Warm-up time       | Mass stability ±0.1 amu after 30<br>minutes                                                                                         |
| Computer interface | RS-232C, 28,800 baud with high-<br>level command set                                                                                |
| Software           | Windows based application                                                                                                           |
| Power requirement  | 24 VDC @ 2.5 amps, male DB9<br>connector, optional built-in power<br>module for AC line operation                                   |
| Weight             | 6 lbs.                                                                                                                              |
| Warranty           | One year parts and labor on defects<br>in materials and workmanship                                                                 |

**Ordering Information**

|           |                                                |
|-----------|------------------------------------------------|
| RGA100    | 100 amu RGA w/ RS-232                          |
| RGA200    | 200 amu RGA w/ RS-232                          |
| RGA300    | 300 amu RGA w/ RS-232                          |
| Option 01 | Electron multiplier                            |
| Option 02 | AC power module                                |
| Option 03 | Ion counting output                            |
| Option 04 | NIST traceable 5 % calibration                 |
| O100HJR   | 200 °C heater jacket                           |
| O100MAX   | Max. insertion nipple (4.5" CF)                |
| O100EM    | Replacement electron multiplier                |
| O100RF    | Replacement ThO <sub>2</sub> /Ir filament      |
| O100RI    | Replacement ionizer kit<br>(includes filament) |
| PPM100    | Optional stand-alone monitor                   |


*Maximum insertion nipple (O100MAX)*