

830 Vacuum Quality Monitor System

FROM THE GRANVILLE-PHILLIPS® PORTFOLIO

Product Highlights

- 1–135 amu total and partial pressure measurement information in 85 ms
- Instant information: 10 most prevalent gases in normalized, percentage and absolute, total pressure & partial pressure trend graphs
- Accurate hydrogen and helium measurements (no zero blast)
- Data logging at 85 ms sample rates
- Easy single-gas calibration using a gas already in your vacuum system
- Low power - only 15 W
- Compact design and remotely mounted gauge using a 1-meter or 3-meter long cable

Simplicity Solutions™ by Granville-Phillips® combines the highest performance gas analysis technology with intelligent functional design that transforms complex measurement into actionable information. The Simplicity Solutions 830 Vacuum Quality Monitor (VQM™) system is the world's fastest, lowest power, gas compositional analysis instrument with full data collection, spectral deconvolution, and data logging at 85 ms capture rates over the full 1–135 amu measurement range.

In any vacuum system, it is critical to know the vacuum pressure. In many cases, it can be just as important to know the composition of the gases in the system.

The 830 VQM is a mass spectrometer that operates from UHV to 10^{-5} Torr and accurately measures gases in the 1–135 amu range. The system consists of an autoresonant ion trap mass spectrometer gauge, a VQM Controller and VQM Viewer software that converts raw data to actionable information. The system is ratiometric, meaning that it determines the ratio of each gas to other gases in a vacuum chamber. It is usually coupled with a total pressure gauge to provide partial pressures of each gas which provides an indication of the quality of the gas in a chamber.

Out-of-the-box you see your 10 most prevalent gases, total pressure trending, partial pressure trending, spectral display, data logging, data (screen) capture, gas fitting library for 10 gases, and leak check – all at the 85 ms sampling rate. The Controller and Gauge system requires only 15 watts to operate and offers the flexibility to remotely mount the 830 VQM Gauge using a 1-meter or 3-meter long cable.

A Revolutionary Approach

Simplicity Solutions introduces the next generation mass separation technology based on the electrostatic ion trap which:

- scans more than 20 times faster
- requires 80% less power
- calibrates dramatically faster
- accurately represents low masses
- and is significantly smaller than legacy quadrupole or magnetic-sector technologies.



830 VQM Technology and Uses

Autoresonant ion trap mass spectrometer technology represents an entirely new way of mass selectively ejecting ions from an electrostatic ion trap. The 830 VQM mass spectrometer gauge is natively a ratiometric measurement device that provides detailed compositional analysis of a gas mixture.

Theory of Operation

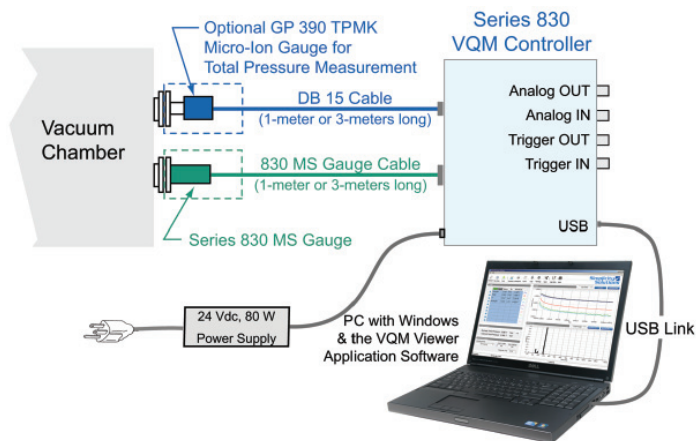
The ionizer is a filament assembly which generates ions directly inside the ion trap through electron ionization of gas molecules. An electrostatic field traps the ions, and they oscillate at their natural frequency within the ion trap. The frequency of oscillation is inversely proportional to the square root of their mass-to-charge ratio – i.e. lighter ions oscillate at higher frequencies than heavier ions. The ions are ejected through an autoresonant energy pumping process using a low amplitude RF frequency scan. An electron multiplier collects the ejected ions and produces a current proportional to the ion concentration.



Common Uses

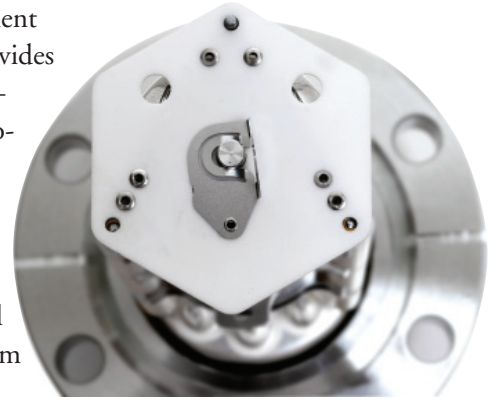
The 830 VQM is typically used for any manufacturing or experimentation process that occurs in a vacuum (glass coating, semiconductor manufacturing, beam line gas analysis, etc.). Primary usage includes leak detection, contamination monitoring, process monitoring, and checking the quality of the vacuum in the system.

830 VQM System Standard Setup



Field Replaceable Filament Assembly

The filament is very easy to replace by your own service technicians. A filament replacement kit provides everything needed – including an easy-to-follow instruction guide – to assure quick, simple, and cost effective replacement, as well as maximizing system uptime.



Compact Size and Remote Mounting

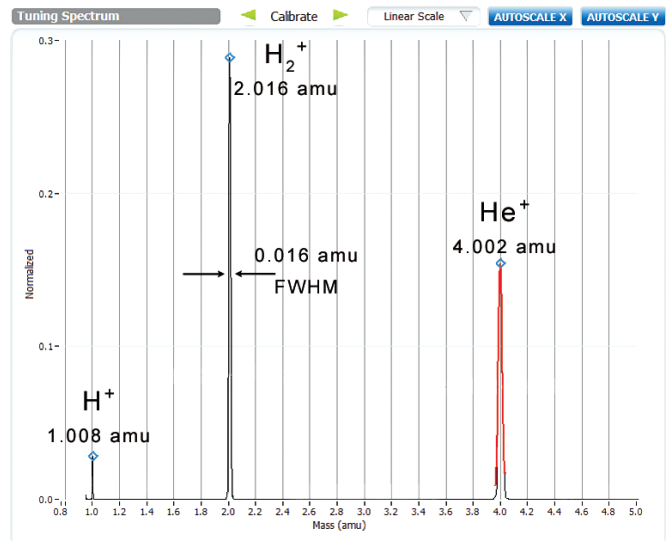
The small size of the VQM gauge allows the system to be used in applications where space and weight limitations are crucial. The gauge is not mounted to the controller, thereby making the system ideal for use in harsh environments such as accelerators and beam lines where radiation is known to cause some electronics to malfunction. In addition, multiple gauges can be operated by just one VQM Controller by simply moving the interconnect cable to a different VQM gauge, thereby eliminating the requirement of multiple controllers on a process chamber or system.

UHV Compatibility

The materials, composition and construction of the 830 VQM Gauge are commensurate with standard ultra-high vacuum technology and UHV gauging including stainless steel, ceramics, and refractory materials.

High Resolution Low Mass Spectra

Unlike current quadrupole mass spectrometers, the VQM System accurately reports the spectra of gases, such as helium and hydrogen in the low amu range.



Super fast Vacuum Quality Measurement

The VQM System provides full data collection, spectral deconvolution, and data logging at 85 ms capture rates over the full 1–135 amu range.

Ultra Low Power Requirement

The VQM Controller and Gauge system requires only 15 watts (maximum) to operate. Using a low-power electrostatic field together with a small RF signal for ion ejection delivers a system that requires very low power.

Intuitive Operation

The easy-to-use 830 VQM Viewer application provides a full set of features and functions to enable quick vacuum quality measurement and data logging, flexible data presentation and viewing options, leak detection mode, and system configuration options.

Out-of-the-box Functionality

The VQM System provides unparalleled ease of use with a clear listing of the 10 most prevalent gases (Top 10) by ratio (normalized), percent (%), or absolute amplitudes that are listed by amu or from a library of Reference Gases. You also get total pressure and partial pressure trend graphs, and full spectral data. A few mouse clicks gives you a log of the histogram data at 85 ms acquisition rates that is readable using Microsoft® Excel® or other common data analysis programs.

Hassle-free Installation

The VQM mass spectrometer gauge is remote mounted using interconnect cables up to 3 meters long. The VQM Controller can be used as a bench-top, rack-mount, or custom-mount solution.

Simple Calibration

Calibration can be completed in seconds with just a few clicks of the mouse using any single gas (1–135 amu), including any gas that is already in your vacuum system.

Total Pressure Measurement Kit (Optional)

The 390802 provides accurate, continuous pressure measurement from ATM to 10^{-9} Torr. Integrating it with the ratiometric VQM system adds partial pressure data and automatic high pressure protection for the VQM gauge.

For pressures below 10^{-9} Torr, a Series 370 Stabil-Ion Gauge and Controller can be connected to the 830 VQM Controller with the 801202-0100 cable.



The 830 VQM Controller is only 4.13 inches wide x 7.03 inches deep x 1.58 inches high, making it an easy fit on nearly any system.



The VQM mass spectrometer gauge is the size of a typical ionization gauge – only 7.52 inches long including the cable connector. The mounting flange is the common 2.75 inch (NW35CF) fitting.



The VQM Controller-to-Gauge interconnect cable is available in 1-meter or 3-meter lengths.

Overview:

Speed: Scan 1 to 135 amu in 85 ms

Power: Only 15 watts (maximum)

Size: Compact Controller and remotely mounted gauge

Software: Intuitive, comprehensive, easy to use

Communication: USB 2.0, Trigger I/Os, Analog I/Os, RS-485 to Granville-Phillips total pressure gauge

Easy calibration: Use any gas already in the vacuum chamber

Leak Detection: With leak trend graphs

Proven: Developed by the leader in vacuum instrumentation

830 VQM Viewer Software Application

The 830 VQM Viewer Software Application provides the fastest and easiest way to access the full functionality and optimize the performance of the instrument. The Viewer Application is Windows-based and communicates with the VQM Controller through a USB 2.0 COM port.

Vacuum technologists will immediately benefit from the data-mining functions built into the application, including mass peak finding and gas identification. There is no need for an advanced mass spectrometry expert to determine what gases are in your system. Simple, easy-to-understand screens instantly display exactly what gases, percentages, ratios, and pressures are present.

Advanced users will find that the full set of adjustments (advanced settings) and data embedded into the Tune screens provide a very convenient way to characterize and optimize the performance of the system.

Easy Navigation

When the VQM System is connected to a Host/PC with the VQM Viewer Application, the displays on the computer monitor enable the user to select and view many functions and readouts. A row of icons across the top of the screen provide quick links to all of the operation and tuning functions.

The first group of icons (on the left side of the screen) are the primary functions used for connecting and powering the gauge and starting the spectral scan. The second group of icon control the data display, modes of operation, and system settings (preferences). The third group of icons are for logging and save functions.

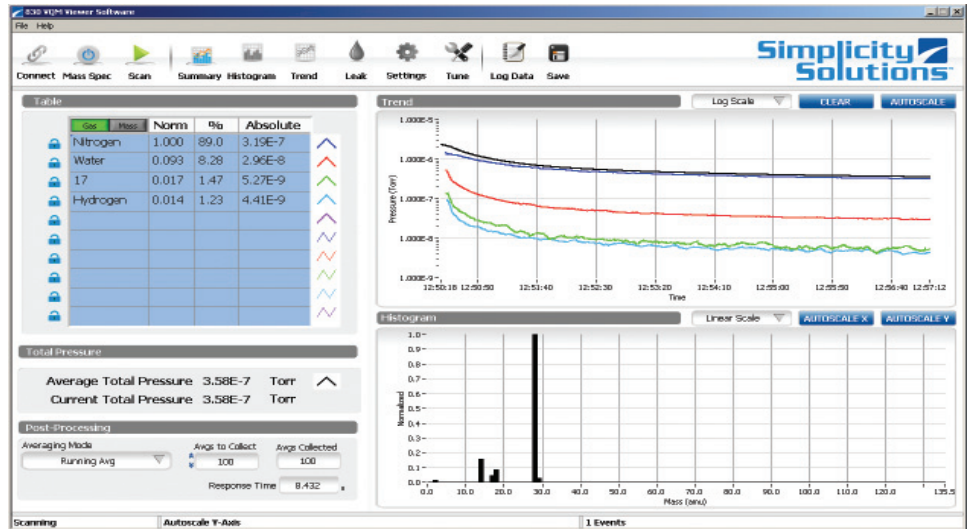
Context sensitive help is available to provide system operation guidance.

Viewer Application Highlights

- Intuitive graphical user interface
- Displays the top 10 gases in the chamber
- Single gas calibration
- Mass spectrum output
- Pressure vs. time trend display
- Leak detection with graphic display
- DSP for noise reduction and peak finding
- Logging of data
- Advanced settings and tuning functions
- Built-in contextual help files

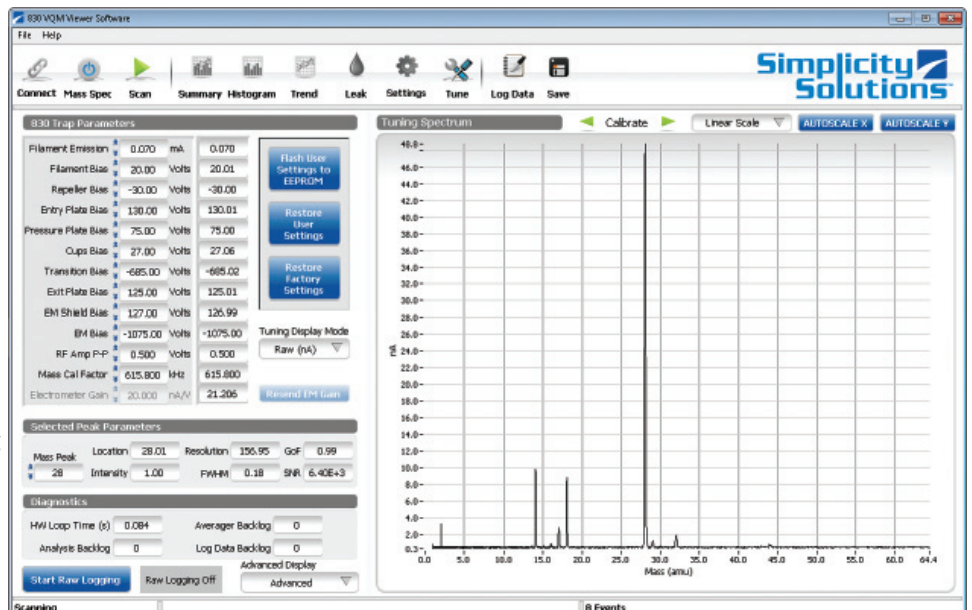
Summary Screen

The Viewer software collects, analyses, and interprets mass spectra. The software averages the mass spectra, finds and quantifies the peaks, and displays that information on the computer monitor. Live displays of scan data show the gases in the vacuum chamber (up to 10 gases/masses), pressures, trends, total pressure, averaging, and the spectrum histogram.



Tuning Functions

The Tune Screen is used for calibration, electron multiplier gain adjustment, RF amplitude adjustment, and ion trap configuration. The tune screen provides access to the raw spectral output of the mass spectrometer and also to the header information which provides specific information on parameters, status, and hardware. The tune screen also provides access to the factory default and user settings. Advanced mass spectrometry experts can use the tune screen capabilities to customize the instrument for specific operating parameters.



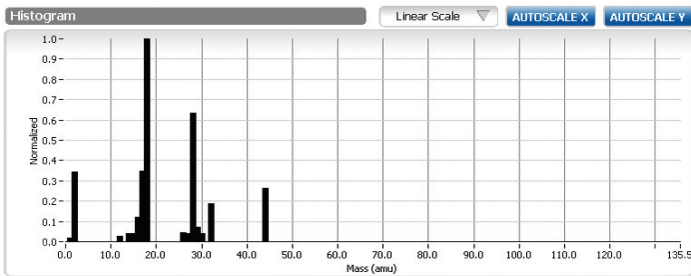
Displayed Results

Gas analysis results can be displayed as ratios (normalized), percentages (%), and absolute values (with the optional total pressure gauge). Graphical screen displays show the total pressure, partial pressure, and full spectral data. Partial pressure trend graphs and a leak testing screen allow monitoring specific gas concentrations and partial pressures as a function of time.

Table				
Gas	Mass	Norm	%	Absolute
Water		1.000	42.5	3.23E-9
Nitrogen		0.480	20.4	1.55E-9
CO ₂		0.254	10.8	8.20E-10
Hydrogen		0.251	10.7	8.11E-10
Oxygen		0.154	6.57	4.98E-10
CO		0.032	1.37	1.04E-10
26		0.031	1.32	1.00E-10
30		0.031	1.31	9.94E-11
17		0.031	1.31	9.90E-11
27		0.028	1.21	9.17E-11

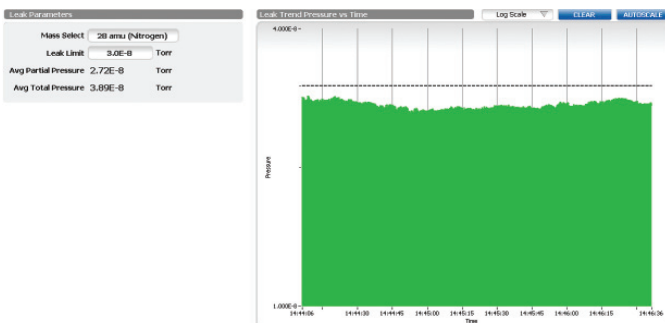
Histogram

The Histogram displays the spectrum in a histogram format in addition to the top 10 table, which contains the normalized intensity, percentage, and absolute partial pressure of the selected gases or masses.



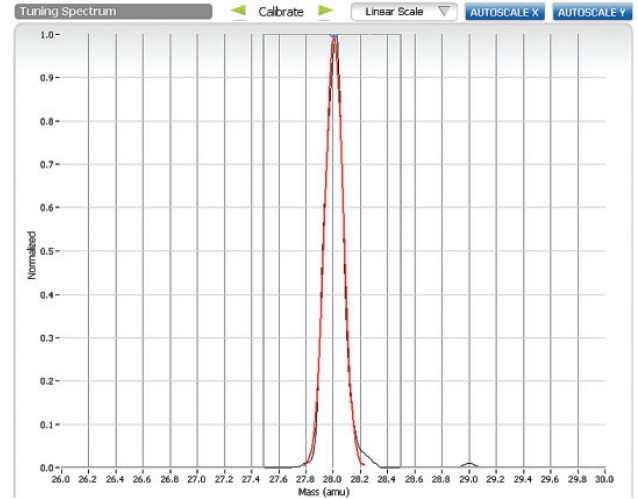
Leak Checking

The leak checking screen allows you to select from a list of leak-check gases (Hydrogen, Helium, Nitrogen, Argon, and Freon) and displays a graph showing the current leak limit and a trend graph of the partial pressure of the selected gas.



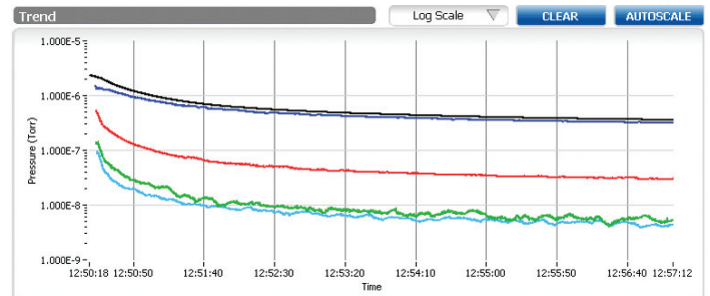
Easy to Calibrate

The VQM System is very easy to calibrate using any gas (1–135 amu) already in the vacuum chamber. Simply select the gas you want to use for the calibration, and click on the arrows to align the known mass to the proper amu setting. Then all other gases will also display correctly. A zoom function makes it easy to see the waveform of the selected peak.



Trending

The Trend graph on the summary screen shows a 15 minute view of the top 10 gases in the system. The display can use either log or linear scale. A zoom function allows better visibility. There is also a trend graph that does not impose a 15 minute time limit. To fit a longer time scale on the graph and keep the data storage size reasonable, the trend screen will drop intermediate data points as needed.



Data Logging

Raw data or processed data can be logged at full scan rates for a selected length of time. The processed data is much smaller as it only saves the amplitude at each amu. Processed data logging allows you to select the logging interval to save disk space when recording for long periods of time. There is also a save function that saves a snapshot of the raw, averaged data. Logged data is stored in a csv (comma-separated values) ASCII file.

830 VQM Controller Specifications

Parameter	Specification
Mass Range/Scan Time	1–135 amu in 85 ms
Inputs and Outputs:	
390802 Total Pressure Module	Rear panel connection, 1-meter or 3-meter long cable, RS-485; 50 ms response time for overpressure protection
830 VQM MS Gauge	Rear panel connection, 1-meter or 3-meter long cable
Data I/O, USB (Type B)	USB 2.0, full speed, 12 Mb/sec
Trigger In (BNC)	50 ohm, positive TTL edge trigger, 1 ms minimum
Trigger Out (BNC)	50 ohm, active high, TTL frame scan
Analog In (BNC)	10K ohm, 0-10 V, 12 bit resolution
Analog Out (BNC)	0 to +5 V with 30 KHz 3 db bandwidth, raw data scan output
LEDs, Front Panel	EXT TP, USB, Trigger IN, Trigger OUT, Analog IN, Analog OUT
Power, Controller and MS Gauge Only	24 Vdc, 8 watts typical, 15 watts maximum; a universal power supply is available
Power, with optional Total Pressure Module	24 Vdc, 75 watts maximum
Input Power Plug	DC power jack, 5.5 mm OD x 2.5 mm ID x 11 mm long
Operating Temperature	0 °C to 40 °C (32 °F to 104 °F)
Non-operating Temperature	0 °C to 80 °C (32 °F to 176 °F)
Relative Humidity	< 90%, non-condensing
Physical Dimensions	17.85 cm long x 10.49 cm wide x 4.01 cm. high (7.03 x 4.13 x 1.58 inches)
Environmental	RoHS and CE Compliant
Weight	720 grams (25 ounces)

Specifications and dimensions are subject to change without notice.

830 VQM Viewer Software Specifications

Parameter	Specification
Supported Hardware:	
830 VQM Controller	
830 VQM MS Gauge	
390802 Micro-Ion ATM Total Pressure Monitor	
Interface, USB Port	USB 2.0, full speed (12 Mb/s)
Vacuum Quality Monitor:	
Top Ten Gases Display Table	Automatic listing by amu or gas type (user selectable)
Gas Recipe Fit	Correlation fit against expected gas spectrum
Gas Recipe Fit Response Time	85 ms, 1–135 amu, 10-gases, with the recommended PC
Total Pressure Response Time	85 ms - including overpressure protection
Pressure Trend of User Selected Gases	10 maximum plus total pressure, user selection in display table
Sensor Spectrum	Displayed, 1–135 amu
Data Capture & Logging	
Capture, Display Information	1–135 amu scan, total pressure, timestamp, status
Logging, VQM Data	Comma delimited text format (MS Excel Compatible) 1–135 amu scan, total pressure, timestamp, status per scan, 85 ms logging rate using the recommended PC
830 VQM Controller Configuration	Acquisition Modes via application control or external trigger control, calibration, ON/OFF, run/stop, gauge settings, user configuration, save and restore, factory setting restore, logging
Other Features	
Leak Detection	User assigned limit and leak gas detection

Specifications and dimensions are subject to change without notice.

830 VQM Mass Spectrometer Gauge Specifications

Parameter	Specification
Measurement Range	UHV to 1×10^{-5} Torr
Mass Range	1 to 135 amu
Mass Separator Type	Autoresonant Ion Trap
Resolution (m/ Δ m)	150 Full Width Half Maximum (FWHM)
Dynamic Range	2 decades for single scan, 3 or more with averaging
Response Time	85 ms (1–135 amu)
Filament	Single Yttria coated Iridium, field replaceable
Detector Type	Electron Multiplier, factory replaceable
Operating Temperature	0 °C to 50 °C (32 °F to 122 °F), non-condensing
Bakeout Temperature	200 °C maximum, non-operating, cable disconnected
Mounting Flange	NW35CF 2.75 Inch ConFlat type
Interconnect cable	1 meter long, 11.6 oz. / 3 meters long, 28 oz.
Physical Dimensions	19.10 cm long (including connector) x 3.81 cm dia. (7.52 x 1.5 inches)
Weight	420 grams (14.8 ounces)
Materials exposed to process environment	304 L Stainless Steel, 316 L Stainless Steel, Alumina Ceramic, Al ₂ O ₃ 98% Min., Nickel, Molybdenum, Ag/Cu eutectic braze, Gold, Iridium, Yttria, Y ₂ O ₃ 99.95%, Lead Glass (multiplier body), Chromium

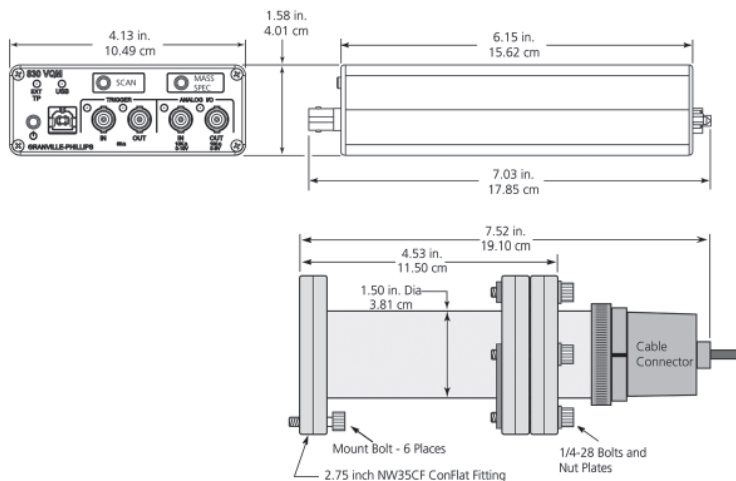
Specifications and dimensions are subject to change without notice.

830 VQM Viewer Software Computer Requirements

Parameter	Minimum
Processor	Intel® Core™ Duo; AMD Athlon™ 64
RAM	2 GB
Operating System	Windows® XP, 32 bit / Windows 7, 32 or 64 bit
Communications	USB 2.0
Disk Space	1 GB
Display Resolution	1280 x 1024 pixels
Recommended (full speed data processing)	
Processor	Intel® Core™ 2 Quad, Core™ i7 or later; AMD Athlon™ 64, Phenom™ X3 or later
RAM	4 GB or better
Operating System	Windows® XP, 32 bit / Windows 7, 32 or 64 bit
Communications	USB 2.0
Disk Space	2 GB, 7200, SATA 4Gb/s or better, 64MB buffer
Display Resolution	1280 x 1024 pixels

Specifications and dimensions are subject to change without notice.

Dimensions



Ordering Information

830 VQM Mass Spectrometer Gauge Controller

Description	Catalog Number
Controller, Single Gauge, Benchtop, USB 2.0, 1–135 AMU	830501-U1-0
Universal Power Supply for 830 Controller, AC to 24 Vdc, with power cord	801201-# (*)
Cables, Controller-to-Gauge	
1 meter (3.28 ft)	830301-0010
3 meters (9.84 ft)	830301-0030
Cable, for log/linear analog output (1/8" miniature phone jack) from a G-P Ion Gauge Controller (such as a Series 370 Stabil-Ion) to the analog input (BNC) on the 830 VQM Controller, 10 meters (32.81 ft)	801202-0100
CD, 830 Viewer Application Software	830251

Note: The User Manual can be downloaded at no charge from the Brooks.com website.

830 VQM Mass Spectrometer Gauge

830 Gauge, 1-135 AMU, Channel Electron Multiplier Detector, Yttria-coated Iridium filament, 2.75-inch (NW35CF)	
Nude	830100-NYG
Demountable Envelope	830100-DYG
Demountable Envelope (Nipple) for Nude Gauge, 2.75 inch (NW35CF) flange, includes port screen	801270
T-Flange, 2.75 inch (NW35CF) flanges	801272
Hardware/Bolt Kit, includes 6 flange bolts and washers, 3 plate nuts, and 1 copper gasket	801274-1
Wrench, 1/4", 12 pt.	801275
Field Replaceable Filament Assembly Kit	830105-Y-K
Heater Jacket, 120 Vac, with power cord	801203-1
Heater Jacket, 240 Vac, with power cord	801204-# (*)
Rebuild Service, Replacement of Electron Multiplier and Filament	830107-E

(*) # -1 = North American 115 Vac & Japan 100Vac, -2 = North American 240 Vac, -3 = Universal European 220 Vac, -4 = United Kingdom 240 Vac

802 VQM Total Pressure Measurement Gauge

Total Pressure Kit for Absolute & Ratiometric Pressure, 10 ⁻⁹ to ATM, RS-485, dual Yttria-coated Iridium filaments, gauge filament protection, digital display with total pressure, 2.75-inch (NW35CF) ConFlat-type fitting, Torr	390802-2-YG-T
Cables, 830 VQM Controller to Micro-Ion ATM Module	
1 meter (3.28 ft)	802301-0010
3 meters (9.84 ft)	802301-0030

Backed by Guts®

With Simplicity Solutions, you get more than rugged, reliable, and high-performance instruments. You get an exceptional end-to-end customer experience – from hassle-free sales and delivery through connect-and-go equipment installation, to responsive worldwide service and support. The Simplicity Solutions 830 VQM system is backed by global Sales, Service, and Support teams, including GUTS (Guaranteed Uptime Support) emergency support.

When you call a GUTS Service Center you are guaranteed immediate response by a vacuum expert from our worldwide technical support staff. We are at work for you 24 hours a day, 365 days year at +1-800-FOR GUTS (+1-800-367-4887).



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