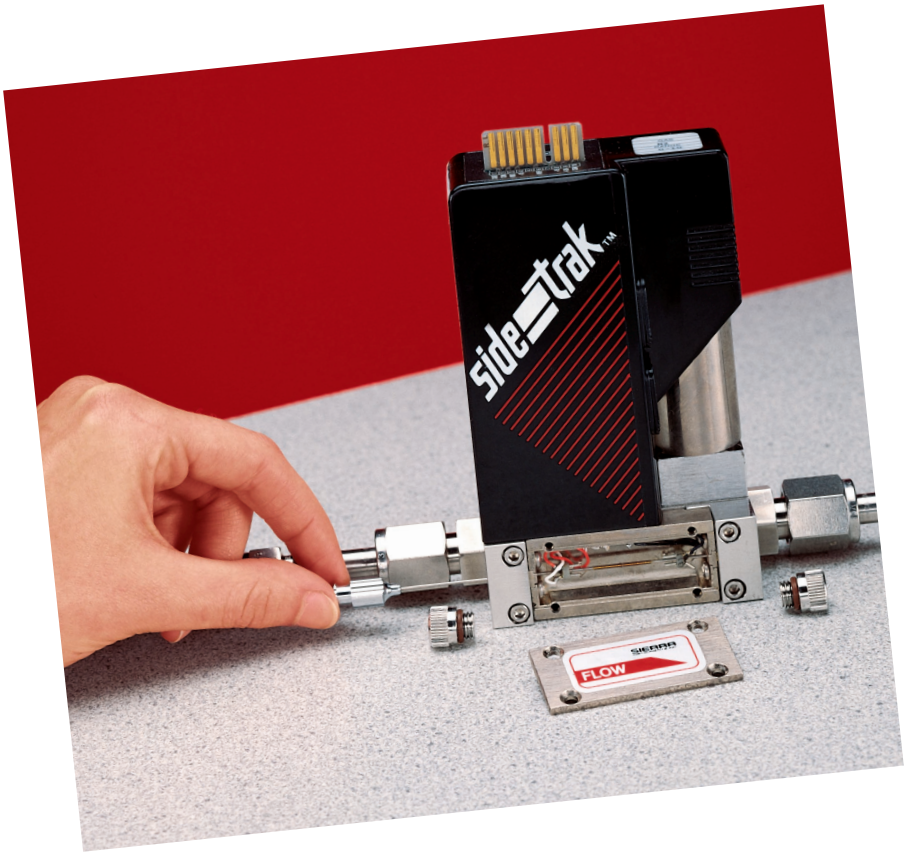
High Performance Mass Flow Meters and Controllers

800 Series Mass Flow
Meters and Controllers

SIERRA
INSTRUMENTS, INC.
THE MASS FLOW COMPANY



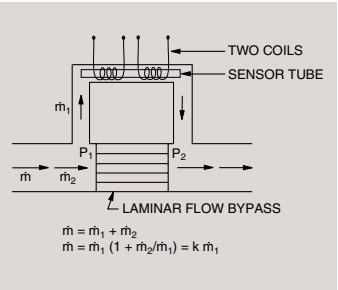
WHY MASS FLOW?

In most processes it is mass, not volume, which is the critical variable. Volumetric flow measurements are less reliable than mass flow measurements because changes in gas temperature and pressure will change the density of a fixed volume of gas. In the control process, additional errors can be propagated by back pressure changes in the process.

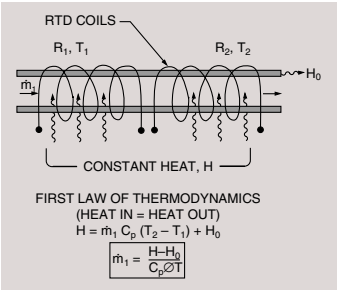
Unlike rotameters, turbine meters and other volumetric flow devices, thermal mass flow meters and controllers are relatively immune to changes in inlet temperature and pressure. Because these instruments directly measure molecular flow, they provide the most reliable, repeatable and accurate method for delivering material from a supply volume to a process at a desired rate.

THE THERMAL SENSING PRINCIPLE

Gas enters the flow body and divides into two flow paths. Most of the flow goes through the laminar-flow bypass. This creates a pressure

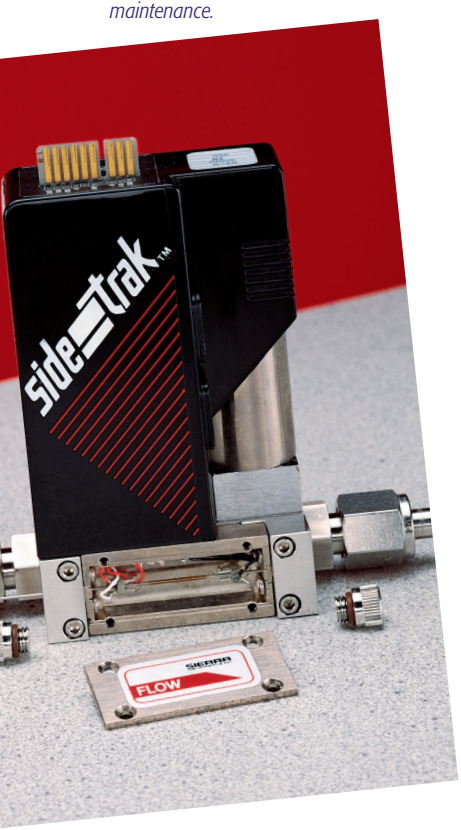


Flow Splitting



Sensing Technique

Sierra's patented straight sensor and removable access ports facilitate instrument maintenance.



drop that forces a known fraction of the flow through the sensor tube.

Two resistance temperature detector (RTD) coils around the sensor tube direct a constant amount of heat into the gas stream. Heat transfer between these elements results from interaction with the molecules of the flowing gas, independent of pressure or temperature fluctuations.

In actual operation, the gas mass flow carries heat from the upstream coil to the downstream coil. The downstream coil, therefore, has a higher temperature and more reistance than the upstream coil. The coils are legs of a bridge circuit with an output voltage proportional to the difference in the coils' resistance, which is proportional to the mass flow rate in the capillary tube. The two other parameters, heat input and coefficient of specific heat, are both constant.

Although the output is not intrinsically linear with mass flow, it is nearly linear over the normal operating range. Sierra mass flow meters and controllers use a five to ten break-point linearizer to ensure specified linearity over the entire range of the instrument.

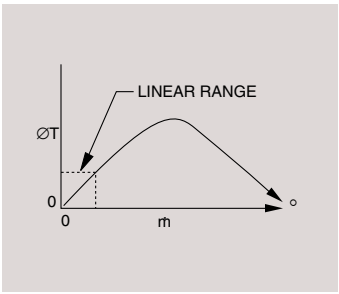
A CLEANABLE STRAIGHT SENSOR IMPROVES PERFORMANCE AND REDUCES MAINTENANCE

The outstanding accuracy of Sierra's 800 Series mass flow meters and controllers is, in great part, the function of a high-stability flow sensor. Because the sensor windings are constructed of platinum, the NIST standard for temperature detection and the most stable sensing element known, the device is virtually drift-free. The maximum deviation (drift) of this sensor during a two-year test was less than 0.5%.

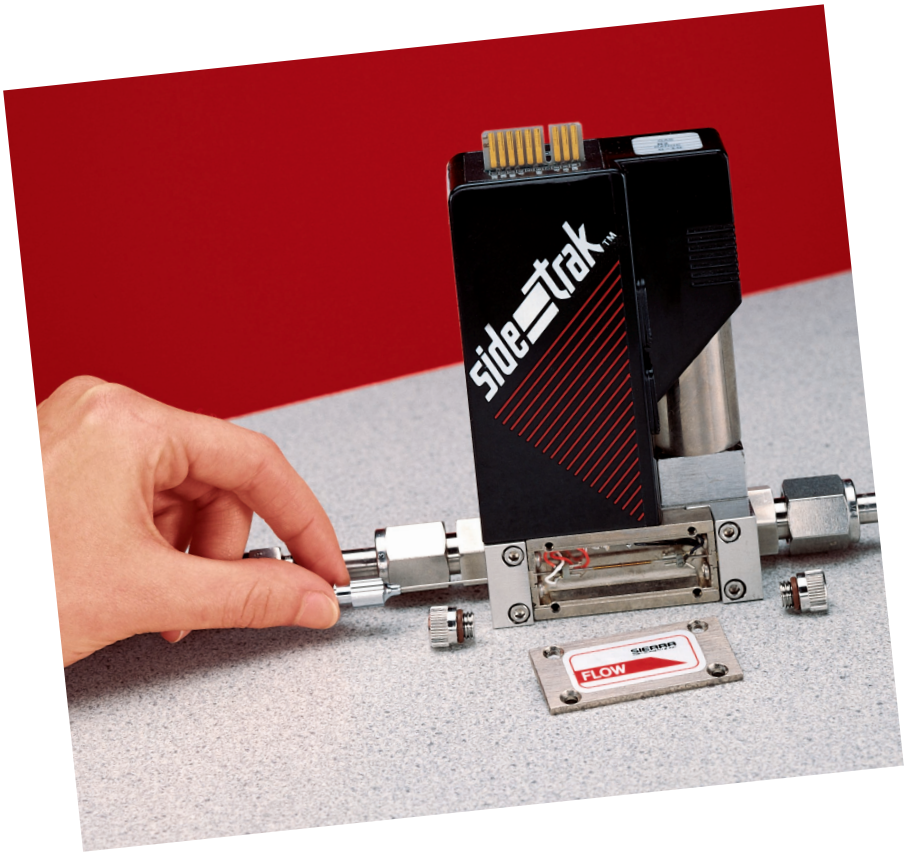
Sierra's patented sensor is straight, has a large internal diameter and, in the Models 820-S, 830, 840, provides access ports for cleaning. A common complaint about mass flow meters and controllers is that they clog with particulate and are difficult to clean. Because a microscopic layer of contamination has a major effect on a small diameter sensor tube, many mass flow meters and controllers suffer, over time, from degradation of accuracy and repeatability.

Because the Sierra sensor tube is straight, rather than "U"-shaped, and has an exceptionally large internal diameter of 0.031 inches, it is virtually clog free. On the stainless-steel flow body models, the sensor is mounted along the side of the flow body and has removable access ports at either end. Quick, efficient cleaning is achieved with a 0.030-inch diameter cleaning rod that is available from Sierra.

These instruments also incorporate a machined laminar flow bypass, which is easily removed with the inlet fitting for fast cleaning. The valve orifice is large (0.020 inches minimum diameter) and clog-resistant. It is easily accessed by removing the valve body from the instrument.



Output Linearity



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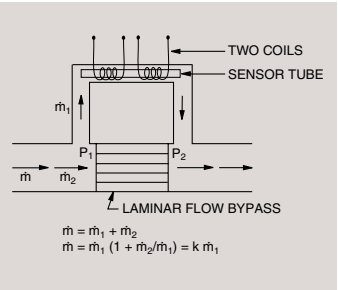

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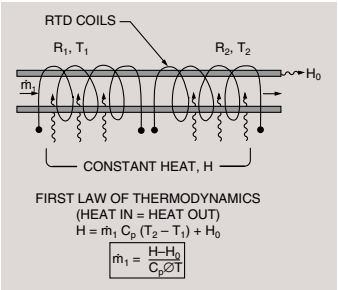


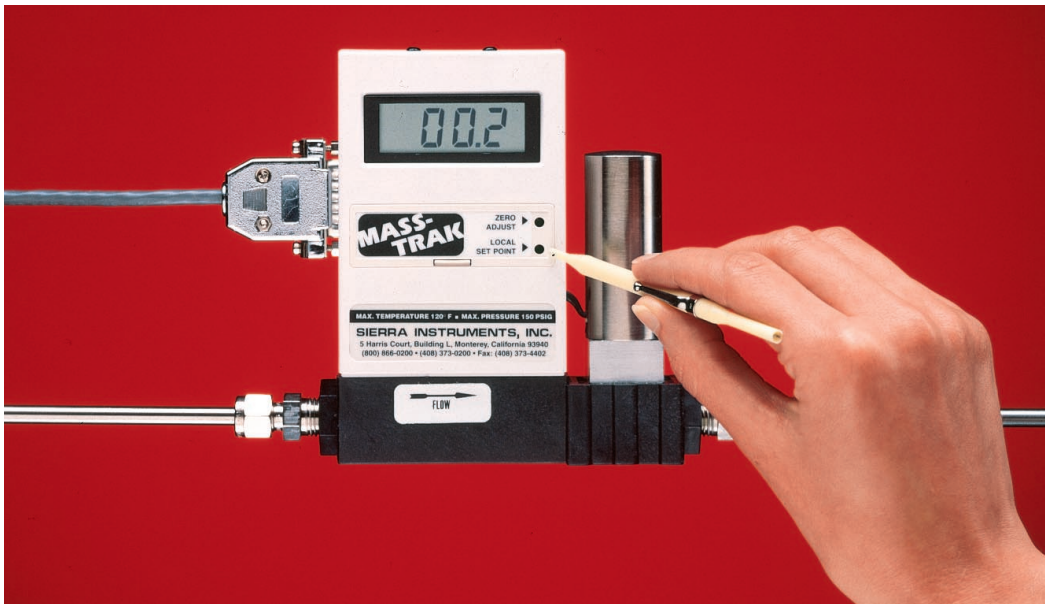
Sensing Technique

MODEL 810 MASS-TRAK® MASS FLOW CONTROLLER

Industry's Most Affordable MFC!

Designed to reduce costs in analytical, laboratory and OEM instrument applications, Mass-Trak provides all the performance features of a standard mass flow controller (MFC) at an affordable price. The Model 810 offers exceptional mass flow control capabilities at a lower cost than any other thermal mass flow controller. Available in any range from 0-10 sccm to 0-50 slpm, the instrument is suitable for any clean, non-corrosive gas flow control application.

Mass-Trak's on-board display and local setpoint potentiometer allows for adjustment of the command signal from the face of the instrument enclosure, thereby eliminating the need for external readout/setpoint electronics. The instrument also offers a switch-selectable remote setpoint capability from either a 4-20 mA, 0-5 or 0-10 VDC command signal, which can be easily interfaced with a process control system or workstation. Unlike any other mass flow controller, Mass-Trak provides both of these signals simultaneously. Typically, power is supplied via a 110 VAC/24 VDC converter available from Sierra, or in OEM applications, from the system's internal source.



Mass-Trak® provides on-board set point adjustment.

MODEL 820 TOP-TRAK® MASS FLOW METER

Replaces Obsolete Rotameters!

Sierra Instruments' Model 820 Top-Trak Mass Flow Meter is designed to replace volumetric measuring devices at a comparable installed cost. It is widely used in a variety of flow validation and calibration applications, by dozens of instrument OEMs, and in a multitude of laboratory, test and analytical operations.

With Top-Trak, no temperature or pressure corrections are required, as in the case of most other flow monitoring devices such as rotameters, turbine meters or critical orifices.

Top-Trak measures and displays mass flow rates from 0-10 sccm to 0-50 slpm. Its built-in tiltable display can also be removed for remote panel mounting. A 0-5 VDC or 4-20 mA output signal is provided for recording, data-logging or control, and a 9-pin "D" connector for the output signal, input power, and remote display drive is included in the instrument package.

MODEL 826/827 HI-FLO MASS FLOW METER

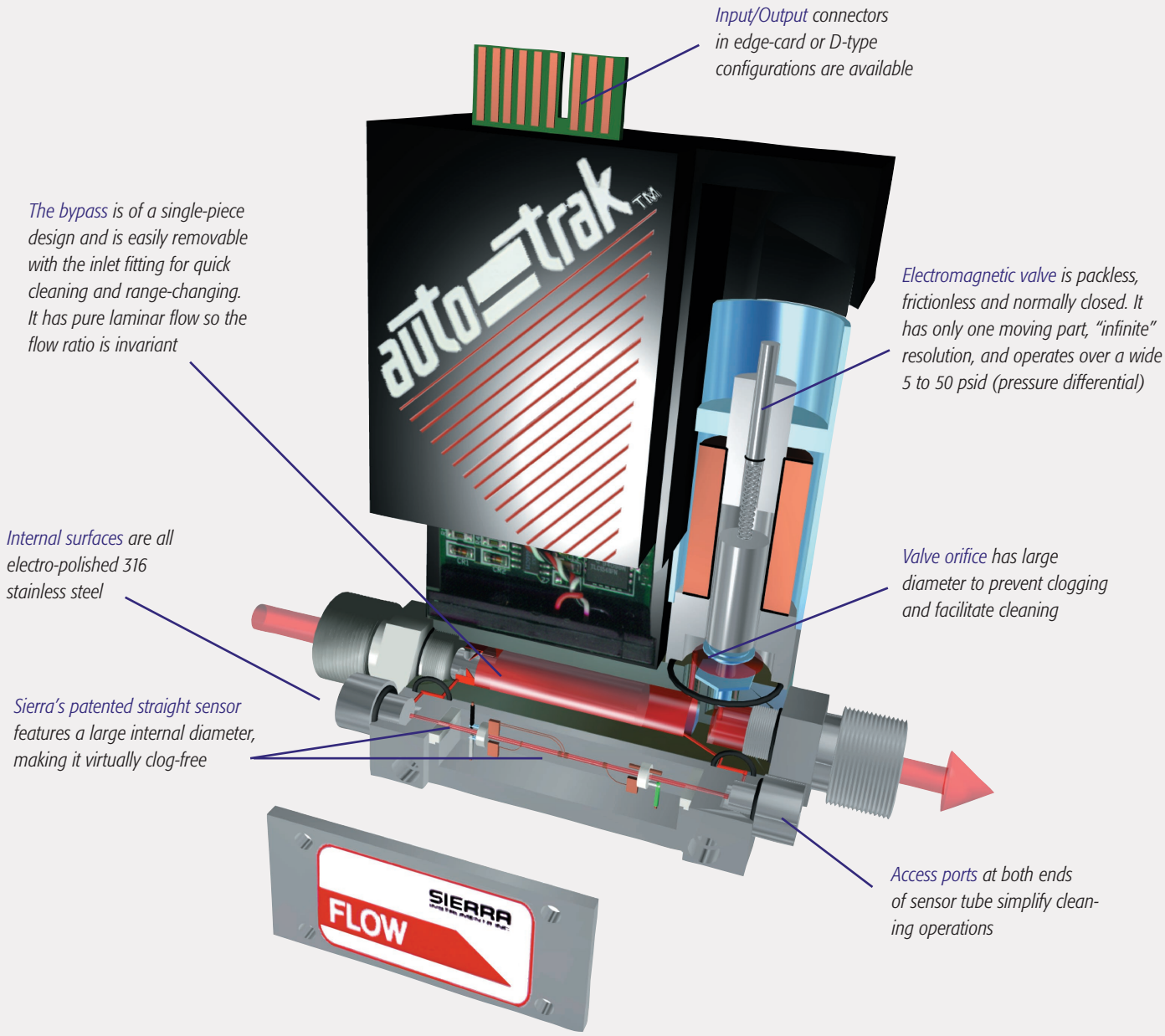
Monitors Higher Flow Rates of Air and Inert Gases

For higher flow rates of air and inert gases, Sierra offers the Model 826/827 Hi-Flo Top-Trak.® Available in flow ranges from 0-75 slpm to 0-175 slpm, these meters are suitable for any clean gas flow measurement

SIERRA'S ELECTROMAGNETIC VALVE PROVIDES CONTINUOUS CONTROL

In the mass flow controller, the gas leaves the sensor and bypass, and flows through the servo-control valve. Sierra's electromagnetic valve is similar to an on-off solenoid valve, except that the current to the valve coil is modulated so that the valve plug assumes the exact height above the valve orifice necessary to maintain the commanded flow. Built-in PID electronics allow the flow controller to maintain continuous proportional control by comparing the measured sensor signal to the commanded flow rate or setpoint.

Over the last fifteen years, Sierra's control valve has demonstrated its accuracy, reliability and speed of response in more than 100,000 end-user and OEM applications. The normally closed valve provides a two second response to within 2% of set point, without overshoot or undershoot. The design also reduces vibration sensitivity and prevents control-loop instability when restrictions exist in the upstream flow system. Other features include a purge mode and a valve-close command from an external contact. And Sierra MFCs are available with operating pressure differentials as high as 100 psid or as low as 10 to 20 torr.



Top-Trak® meters provide a local or remote display of mass flow rate, in a variety of sizes and wetted materials.

application. The device is available with or without display and with all the input/output options of the standard Model 820.

Wetted surfaces are aluminum and Viton "O" rings, and all are corrosion-resistant. Accuracy is ±1.5% of full scale over a wide temperature and pressure range, and time response is two seconds to within 2% of final flow.

MODEL 820-S TOP-TRAK® MASS FLOW METER

Displays Mass Flow Rate of Corrosive and Reactive Gases

The Model 820-S provides all the electronics and display features of the standard Top-Trak mass flow meter in a 316 stainless steel flow body, in flow ranges from 0-10 sccm to 0-500 slpm. The device accommodates most

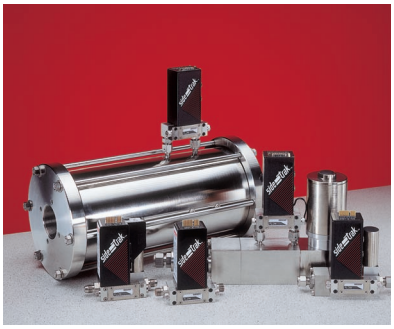
Specifications 800 Series

	810 Mass-Trak®	820 Top-Trak®	826/827 Top-Trak®
			
Description	Low-cost mass flow controller with digital readout ,on-board setpoint control	Gas mass flow meter with tiltable digital display	High flow gas mass flow meters with digital tiltable display
Accuracy	± 1.5% of full scale	± 1.5% of full scale	± 1.5% of full scale
Range	0 - 10 sccm to 0 - 50 slpm	0 - 10 sccm to 0 - 50 slpm	0 - 75 to 0 - 175 slpm
Gases	Air and non-corrosive, non-reactive gases	Air and non-corrosive, non-reactive gases	Air and inert gases
Maximum Gas Pressure	150 psig (10 barg)	150 psig (10 barg)	150 psig (10 barg)
Input Power	0 to 50 slpm: 24 VDC ±10%	12 to 18 VDC Optional 24 VDC	12 to 18 VDC Optional 24 VDC
Wetted Materials	10% glass-filled Nylon® 6/6: 316 stainless steel; 430F stainless steel; nickel plated; Viton® "O"-rings	10% glass-filled Nylon® 6/6: 316 stainless steel; nickel plated; Viton®, Neoprene® or 4079 Kal-Rez® "O"-rings	Anodized aluminum, 316 stainless steel; nickel plated; Viton®, Neoprene® or 4079 Kal-Rez® "O"-rings

Specifications
800 Series

820-S Top-Trak®	**830 Side-Trak®**	**840 Side-Trak®**
		
Mass flow meters for corrosive and toxic gases	Process gas mass flow meters	Process gas mass flow controllers
± 1.5% of full scale ± 1% of full scale (optional)	± 1% of full scale	± 1% of full scale
0 - 10 sccm to 0 - 500 slpm	0 - 10 sccm to 0 - 5600 slpm	0 - 10 sccm to 0 - 5600 slpm
All clean gases including corrosives and reactives.	All clean gases including corrosives and reactives.	All clean gases including corrosives and reactives.
1000 psig (68.9 barg) for low flow bodies only; 500 psig (34 barg)	1000 psig (68.9 barg) for low flow bodies only; 500 psig (34 barg)	1000 psig (68.9 barg) for low flow bodies only; 500 psig (34 barg)
12 to 18 VDC Optional 24 VDC	± 15 VDC	± 15 VDC
316 stainless steel; nickel plated; Viton®, Neoprene® or 4079 Kal-Rez® "O"-rings	316 stainless steel; Viton®, Neoprene® or 4079 Kal-Rez® "O"-rings	316 stainless steel; 430F stainless steel; Viton®, Neoprene® or 4079 Kal-Rez® "O"-rings and valve seat; Teflon® valve seat

Side-Trak® meters and controllers are available for flow rates from 0–10 sccm to 0–5600 slpm.



clean gases, including corrosives and toxics.

The 820-S Top-Trak offers a cleanable sensor and is available with a higher accuracy specification (±1% of full scale) than the standard Top-Trak. This meter is widely used as a laboratory transfer standard and as an OEM flow sensor.

MODEL 830/840 SIDE-TRAK® MASS FLOW METERS AND CONTROLLERS

Tens of Thousands of Satisfied Customers Recommend Sierra's Side-Trak!

Sierra Instruments' Model 830 Side-Trak mass flow meters and Model 840 mass flow controllers are designed for precise measurement and control of air and process gases in ranges from 0-10 sccm to 0-200 scfm. Because all wetted materials are 316 stainless steel, the device accommodates most clean gases, including corrosives.

Side-Trak's built-in servo-control valve provides precise, instantaneous control of gas delivery to a test, batch or continuous process operation at an accuracy of ±1% of full scale. Speed of response, accuracy and reliability characterize the Model 840 and have made it the instrument of choice in thousands of gas flow control applications – from laboratory and test benches to instrument OEMs, in analytical and process industries, and as a transfer standard in metrology labs.

POWER SUPPLY AND READOUT ELECTRONICS

Sierra Instruments' 900 Series Electronics include single-channel, dual-channel and five-channel power and readout systems, as well as auxiliary totalizers.

Designed for use with Sierra's 800 Series mass flow meters and controllers, these systems include the power supply (±15DVC), setpoint control, LCD display of flow rate in engineering units, and optional totalizers and alarms.

PRIMARY STANDARD CALIBRATION ENSURES STARTING POINT ACCURACY

Accurate initial calibration is the key to instrument performance and reliability. Every Sierra mass flow meter and controller is individually calibrated over its entire flow range on Sierra's patented Cal-Bench®.

Cal-Bench is a NIST-traceable, automated positive displacement system which yields 0.2% calibration accuracy. This primary standard is used to perform a five to ten point calibration on every mass flow meter and controller. It is also used to check the instrument's time response and print a NIST-traceable calibration certificate for each device.

WE MEASURE OUR SUCCESS BY THE RESULTS YOU ACHIVE

Sierra Instruments' extensive line of mass flow meters and controllers represents our commitment to making each individual customer successful, and to maintaining our reputation for high performance products. We know that by providing flow instruments that can be used with confidence, we are building relationships with our loyal and successful customers.

Single-channel, dual-channel and five-channel electronics systems provide readouts and setpoint contro

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