

Mass Flowmeters for Gases



FLOW INSTRUMENTS

Mass Flowmeters



TRUST. SCIENCE. INNOVATION.

Designed for Performance

TSI thermal mass flowmeters incorporate a proprietary platinum film sensor design for measuring gas flows in applications demanding fast response and high accuracy over a wide flow range. TSI flowmeters have turn-down ratios greater than 1000:1 due to our thermal flow sensing technology and extensive gas calibration process. The TSI 4000 Series was designed for ultra-low pressure loss to minimize any undesirable effects the flowmeter can have on the readings when installed in-circuit.

Industries

- Medical
 - Ventilators
 - Anesthesia
 - CPAP
- Environmental
- Analytical
- Aerosol Science

Applications

- Product Development
- Manufacturing
- Research
- Field Service
- Quality Assurance

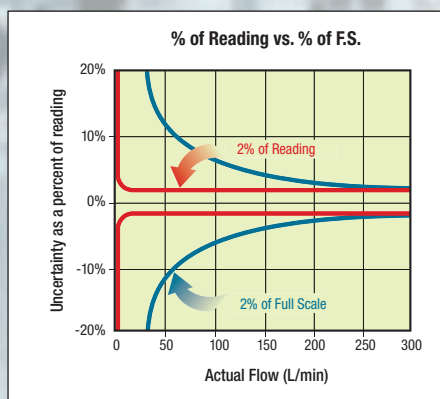
Features

- 4 millisecond flow response
- High accuracy $\pm 2\%$ of reading
- High turndown ratio
- Low pressure drop
- Convenient analog output of flow rate
- Versatile digital output of flow rate, volume, pressure, temperature
- Built-in temperature and pressure compensation
- NIST-traceable calibration certificate included at no additional cost

RS232 Interface For Digital Outputs and Configurable Device Options

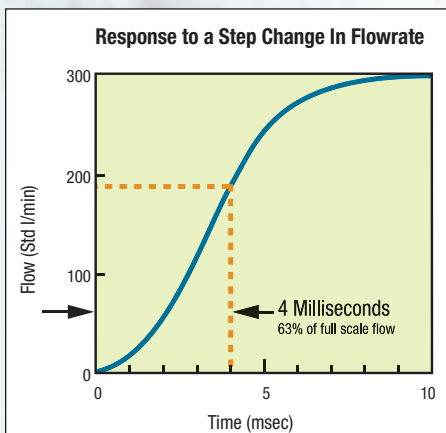
- Set analog output zero and scaling
- Specify start/stop trigger levels for volume measurement
- Set update rate for LCD display
- Set sampling rate for analog and digital outputs
- Select gas calibration
- Select either standard or volumetric flow measurement
- Set display units for Model 4140/4143 to L/min or cm^3/min
- Compute volume

Accurate



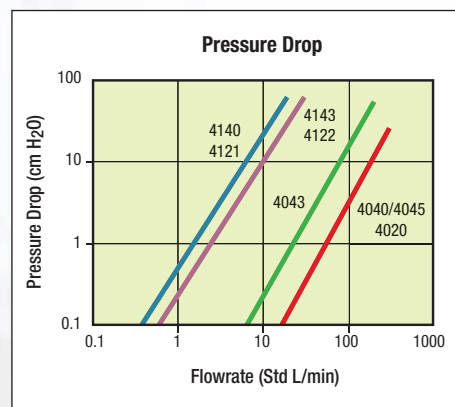
A flowmeter specified as ± 2 percent of Full Scale is most accurate at full scale. If full scale is 300 L/min, then the uncertainty for all readings is ± 6 L/min. TSI flowmeters are specified as ± 2 percent of Reading and have an uncertainty of ± 2 percent of the actual reading from full scale all the way down to a specified lower limit. TSI flowmeters, therefore, provide dependable accuracy over a wide range of flow rates. One TSI flowmeter covers the same range as three or more "percent of full scale" devices...with better accuracy at all points!

Fast



Fast 4 millisecond response ensures accuracy in fluctuating flows. This fast response is ideal for closed-loop control systems and integrated volume measurements. Pressure and temperature measurements are also extremely fast.

Low Pressure Drop



Low pressure drop minimizes flow circuit back pressure and its impact on the system under test.

and Temperature...all in one instrument!



Specifications

Low Flow—Models 4140 and 4143

High Flow—Models 4040, 4043 and 4045

Flow Measurement Range

0.01 to 20 standard L/min

Model 4040 and 4045: 0 to 300 standard L/min

Accuracy

±2% of reading or 0.005 standard L/min, whichever is greater, for air and O₂;
±3% of reading or 0.010 standard L/min, whichever is greater, for N₂O (Models 41403 and 41433 only) and N₂

Model 4043: 0 to 200 standard L/min
±2% of reading or 0.05 standard L/min, whichever is greater, for air and O₂
±3% of reading or 0.1 standard L/min whichever is greater, for N₂ and air/O₂ mixtures

Response

4 ms to 63% of full scale flow

4 ms to 63% of full scale flow

Overall Dimensions

127 x 49 x 32 mm (5" x 2" x 1.25")

182 x 63 x 53 mm (7.2" x 2.5" x 2.1")

All Models

Volume Measurement*

Range

0.01 to 99.9 liters

Accuracy

±2% of reading

Pressure Measurement

Range

50 to 199 kPa absolute

Accuracy

±1 kPa

Response

<4 ms to 63% of final value for step change

Temperature Measurement

Range

0 to 50°C

Accuracy

±1°C at flows greater than 1 standard L/min

Response

<75 ms to 63% of final value for step change

Outputs

Analog Output

0 to 10 VDC flow only, span adjustable via RS232

Digital

RS232

Power

DC Power Input

7.5 VDC ±1.5 V, 300 mA max

Accessories

Supplied

Power Supply, RS232 Cable, Analog Cable, Inlet Filter

Optional

Battery pack/stand (pn 4199), Carrying case for Models 4140, 4143 (pn 1319201), Carrying case for Models 4040, 4043, and 4045 (pn 1319176)



Shown with optional Battery Pack/Stand

Model Selection Guide for Series 4040 and 4140

Model	4140	4143	4040	4043	4045
Flow Range	0.01-20 Std L/min	0.01-20 Std L/min	0-300 Std L/min	0-200 Std L/min	0-300 Std L/min
Inlet/Outlet Diameter	0.25" (6.4 mm)	0.375" (9.53 mm)	22 mm ISO tapered	0.50" (12.7 mm)	0.75" (19.1 mm)
Gas Calibrations	Air, O ₂ , N ₂ (Model 41403 includes N ₂ O)	Air, O ₂ , N ₂ (Model 41433 includes N ₂ O)		Air, O ₂ , N ₂ Air/O ₂ Mixture	
LCD Display Units	L/min, Std L/min cm ³ /min, Std cm ³ /min	L/min, Std L/min cm ³ /min, Std cm ³ /min		L/min, Std L/min	

*Supplied through RS232 port only. Specifications subject to change without notice.



Specifications

Low Flow—Models 4121 and 4122

High Flow—Models 4021 and 4024

Flow Measurement

Range	0.01 to 20 standard L/min	0 to 300 standard L/min
Accuracy	±2% of reading or 0.005 standard L/min whichever is greater, for air and O ₂ ; ±3% of reading or 0.010 standard L/min whichever is greater, for N ₂	±2% of reading or 0.05 standard L/min, whichever is greater, for air and O ₂ ; ±3% of reading or 0.1 standard L/min whichever is greater, for N ₂
Response	4 ms to 63% of full scale flow	4 ms to 63% of full scale flow
Overall Dimensions	127 x 49 x 29 mm (5" x 2" x 1.1")	182 x 63 x 38 mm (7.2" x 2.5" x 1.5")

All Models

Temperature Measurement

Range	0 to 50° C (32° to 122° F)
Accuracy	±1°C at flows greater than 1 standard L/min
Response	<75 ms to 63% of final value for step change

Pressure Measurement

Not available in Series 4020/4120

Outputs

Analog	0 to 4 VDC flow only, span adjustable via RS232
Digital Output	RS232

Power

DC Power Input (user supplied)	5.0 VDC ±0.25 V, 300 mA max
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Recommended Filtration

HEPA-grade filter

Accessories

Supplied	Interface cable (mini-DIN to tinned wire)
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Model Selection Guide for Series 4020 and 4120

Model	41211	41212	41216	41221	41222	41226	40211	40212	40241	40242	40246
Gas Calibration	Air	O ₂	N ₂	Air	O ₂	N ₂	Air	O ₂	Air	O ₂	N ₂
Flow Range	0.01-20 Std L/min			0.01-20 Std L/min			0-300 Std L/min		0-300 Std L/min		
Inlet/Outlet Diameter	0.25" (6.4 mm)			0.375" (9.53 mm)			22 mm ISO tapered		0.75" (19.1 mm)		

Specifications subject to change without notice.

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Contact your local TSI Distributor or visit our website www.tsi.com for more detailed specifications.