

# MASS FLOWMETERS FOR GASES



UNDERSTANDING, ACCELERATED

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# MEASURE FLOW, PRESSURE, AND TEMPERATURE... ALL IN ONE INSTRUMENT!

## 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

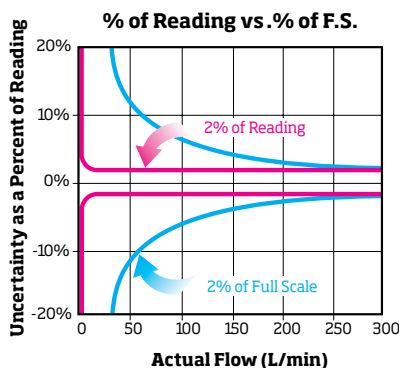
- + Product Development
- + Manufacturing
- + Research
- + Field Service
- + Quality Assurance

## 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

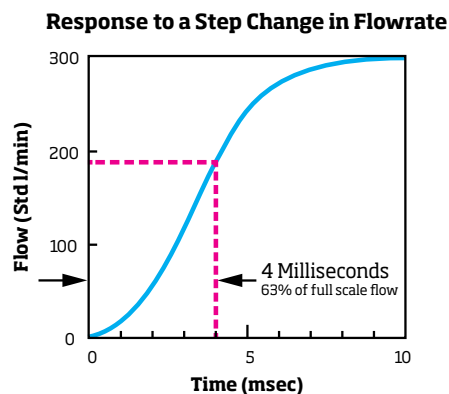
## RS232 Interface For Digital Outputs and Configurable Device Options

- + 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  $\text{cm}^3/\text{min}$
- + Compute volume



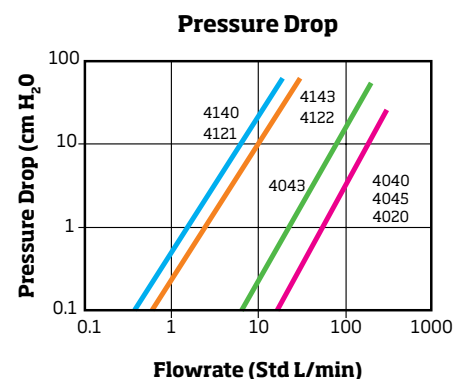
## Accurate

A flowmeter specified as  $\pm 2\%$  of full scale is most accurate at full scale. If full scale is 300 L/min, then the uncertainty for all readings is  $\pm 6$  L/min. TSI flowmeters are specified as  $\pm 2\%$  of reading and have an uncertainty of  $\pm 2\%$  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.

# SPECIFICATIONS – DIGITAL DISPLAY MODELS



		Low Flow – 4140 Series				High Flow – 4040 Series		
Model		4140	41403	4143	41433	4040	4043	4045
Gas Calibration		Air, O <sub>2</sub> , N <sub>2</sub>	Air, O <sub>2</sub> , N <sub>2</sub> , N <sub>2</sub> O	Air, O <sub>2</sub> , N <sub>2</sub>	Air, O <sub>2</sub> , N <sub>2</sub> , N <sub>2</sub> O	Air, O <sub>2</sub> , N <sub>2</sub> , Air/O <sub>2</sub> Mixture		
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)
Flow Measurement	Range	0.01-20 Std L/min				0-300 Std L/min	0-200 Std L/min	0-300 Std L/min
	Accuracy – Air and O <sub>2</sub>	±2% of reading or 0.005 Std L/min, whichever is greater				±2% of reading or 0.05 Std L/min, whichever is greater		
	Accuracy – N <sub>2</sub>	±3% of reading or 0.010 Std L/min, whichever is greater				±3% of reading or 0.1 Std L/min, whichever is greater		
	Accuracy – Air and O <sub>2</sub> mixture	N/A				±3% of reading or 0.1 Std L/min, whichever is greater		
	Accuracy – N <sub>2</sub> O	N/A	±3% of reading or 0.010 Std L/min, whichever is greater	N/A	±3% of reading or 0.010 Std L/min, whichever is greater	N/A		
	Response	4 ms to 63% of full scale flow				4 ms to 63% of full scale flow		
LCD Display Units		L/min, Std L/min, cm³/min, Std cm³/min				L/min, Std L/min		
Overall Dimensions		5" x 2" x 1.25" (127 mm x 49 mm x 32 mm)				7.2" x 2.5" x 2.1" (182 x 63 x 53 mm)		
Volume* Measurement	Range	0.01 - 99.9 liters				0.01 - 99.9 liters		
	Accuracy	±2% of reading (see Operator's Manual for additional details)				±2% of reading (see Operator's Manual for additional details)		
Pressure Measurement	Range	50-199 kPa absolute				50-199 kPa absolute		
	Accuracy	±1 kPa				±1 kPa		
	Response	< 4 ms to 63% of final value for step charge				< 4 ms to 63% of final value for step charge		
Temperature Measurement	Range	0-50°C				0-50°C		
	Accuracy	±1°C at flow greater than 1 Std L/min				±1°C at flow greater than 1 Std L/min		
	Response	< 75 ms to 63% of final value for step change				< 75 ms to 63% of final value for step change		
Outputs	Analog	0-10 VDC flow only, zero and span adjustable via RS232				0-10 VDC flow only, zero and span adjustable via RS232		
	Digital	RS232				RS232		
DC Power Input		7.5 VDC ±1.5 V, 300 mA max				7.5 VDC ±1.5 V, 300 mA max		

Accessories	Description	TSI Part Number
Supplied	Power Supply	P/N 8918-NA (North America)
		P/N 8918-EC (Continental Europe)
		P/N 8918-GB (United Kingdom)
		P/N 8918-AT (Australia)
	Computer Cable (mini-DIN to 9-Pin D-Sub)	P/N 1303583
	Analog Cable (mini-Din to tinned-wire)	P/N 1303584
	RS232 Serial Command Set Manual	P/N 1980340
	Operator's Manual	P/N 1980339 (404x Series)
		P/N 1980383 (414x Series)
	Calibration Certificate	No P/N assigned
Inlet Filter	P/N 1602292 [Model 4040 (22mm ISO-Taper)]	
	P/N 1602300 [Models 4043, 4045 (0.375" FNPT, HEPA)]	
	P/N 1602317 [Models 4140, 41403 (0.25" tube, 6mm)]	
	P/N 1602342 [Models 4143, 41433 (0.375" tube, 9mm)]	
Optional	Battery Pack/Stand for all Models	P/N 4199 (includes six AA-size batteries)
	Hard-side Carrying Case	P/N 1319176 (404x Series)
		P/N 1319201 (414x Series)
	Filter, Low Pressure Drop, 0.375" FNPT, HEPA Grade	P/N 1602345 (Models 4043, 4045)

\*Supplied through RS232 port only.  
Specifications subject to change without notice.  
See Operator's Manual for full listing.



Shown with optional Carrying Case



Shown with Optional Battery Pack/Stand

# SPECIFICATIONS – NON-DISPLAY MODELS



		Low Flow - 4120 Series						High Flow - 4020 Series				
Model		4121 Series			4122 Series			4021 Series		4024 Series		
		41211	41212	41216	41221	41222	41226	40211	40212	40241	40242	40246
Gas Calibration		Air	O <sub>2</sub>	N <sub>2</sub>	Air	O <sub>2</sub>	N <sub>2</sub>	Air	O <sub>2</sub>	Air	O <sub>2</sub>	N <sub>2</sub>
Inlet/Outlet Diameter		0.25" (6.4 mm)			0.375" (9.53 mm)			22 mm ISO tapered		0.75" (19.1 mm)		
Flow Measurement	Range	0.01-20 Std L/min						0-300 Std L/min				
	Accuracy – Air and O <sub>2</sub>	±2% of reading or 0.005 Std L/min, whichever is greater						±2% of reading or 0.05 Std L/min, whichever is greater				
	Accuracy – N <sub>2</sub>	±3% of reading or 0.010 Std L/min, whichever is greater						±3% of reading or 0.1 Std L/min, whichever is greater				
	Response	4 ms to 63% of full scale flow						4 ms to 63% of full scale flow				
Overall Dimensions		5" x 2" x 1.1" (127 mm x 49 mm x 29 mm)						7.2" x 2.5" x 1.5" (182 x 63 x 38 mm)				
Pressure Measurement		N/A						N/A				
Temperature Measurement	Range	0-50°C						0-50°C				
	Accuracy	±1°C at flow greater than 1 Std L/min						±1°C at flow greater than 1 Std L/min				
	Response	<75 ms to 63% of final value for step change						<75 ms to 63% of final value for step change				
Outputs	Analog	0-4 VDC flow only, zero and span adjustable via RS232						0-4 VDC flow only, zero and span adjustable via RS232				
	Digital	RS232						RS232				
DC Power Input (User Supplied)		5.0 VDC ±0.25 V, 300 mA max						5.0 VDC ±0.25 V, 300 mA max				
Recommended Filtration		HEPA-grade						HEPA-grade				

Accessories	Description	TSI Part Number
Supplied	Analog and Digital Cable (mini-DIN to tinned wire)	P/N 1303584
Optional	Inlet Filter, 22mm ISO Taper	P/N 1602292 (Models 40211, 40212)
	Inlet Filter, 0.25" tube, 6mm	P/N 1602317 (Models 41211, 41212, 41216)
	Inlet Filter, 0.375" tube, 9mm	P/N 1602342 (Models 41221, 41222, 41226)

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