

4800 Series

Thermal Mass Flow



Ultra-Fast Responding Mass Flow Controllers & Meters

Overview

The Brooks 4800 Series features a broad flow range, compact size, a variety of analog and digital I/O options, a MEMS-based sensor that provides lightning fast response times, and many other benefits for a variety of applications. The 4800 Series of mass flow controllers and mass flow meters is fully RoHS compliant and is an excellent choice for measurement and control of many common gases including air, N₂, O₂, Ar, He, H₂, CO₂, CO, N₂O, CH₄, C₃H₆, and C₃H₈. The optional Local Operator Interface (LOI) provides a convenient user interface to view, control, and configure the 4800 Series devices eliminating the need for remote secondary electronics.

Product Description

The 4800 Series MEMS-based sensor provides lightning fast response times.

The 4800 Series utilizes a Micro Electro Mechanical System (MEMS) based thermal sensor. Similar to typical thermal sensors, it measures a change in temperature to determine mass flow rate. The difference is that gas flows directly across the sensor, achieving extremely fast response times.

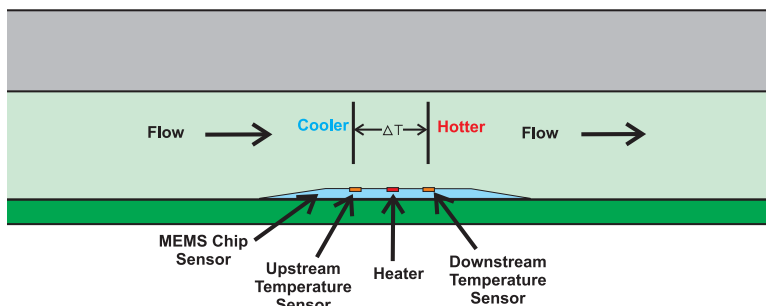


Figure 1 Gas Flow Across the MEMS Sensor

Product Description (Continued)

Fast settling times and stable control come standard with the 4850 controller.

The Model 4850 uses a proprietary PID algorithm to optimize the control valve response to ensure rapid settling times. The 4850 can be counted on to quickly match actual mass flow to any changes in setpoint.

Good things come in small packages.

The MEMS sensor enables a dramatic reduction in size compared to traditional thermal mass flow controllers and thermal mass flow meters. In fact the compact size of the 4800 Series 1" x 3" x 4" (25mm x 76mm x 101mm) takes up less than half the space of typical thermal mass flow controllers.

The 4800 Series is ideal for OEMs.

The broad flow range, fast response time and compact size make for a perfect fit in any OEM system where gas flow needs to be measured or controlled. You can download a free LabView VI to monitor and zero the device.

The Local Operator Interface (LOI) simplifies set-up and operation.

The LOI mounts securely on top of the 4800 Series device. With status LEDs and a large backlit LCD it provides a convenient user interface to view, control and configure the Brooks 4800 Series thermal mass flow devices. This option also allows the user to power the device with a simple power adapter that plugs right in to the wall.

RoHS compliant

Fully RoHS compliant per EU Directive 2011/65/EU.

Variety of input/output options.

The 4800 Series thermal mass flow controllers and thermal mass flow meters come standard with voltage or current and RS-232 I/O.

Easily integrated into modular gas delivery systems

The 4800 Series is available with downport connections making it easy to integrate into modular gas delivery systems.

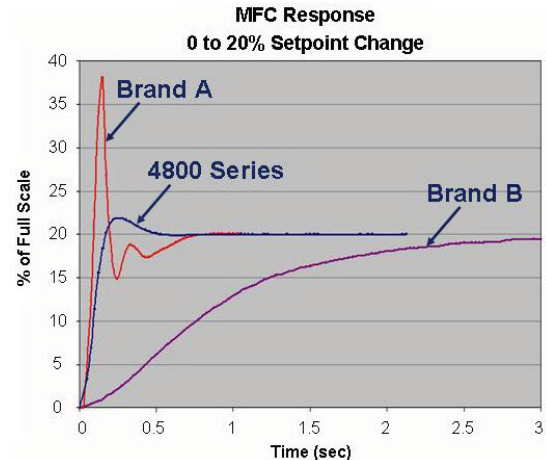


Figure 2 Fast Settling Time

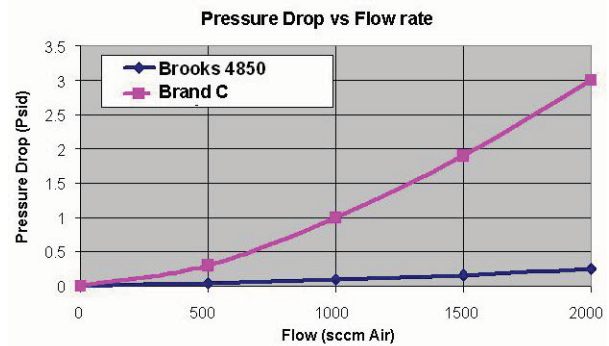


Figure 3 Low Pressure Drop

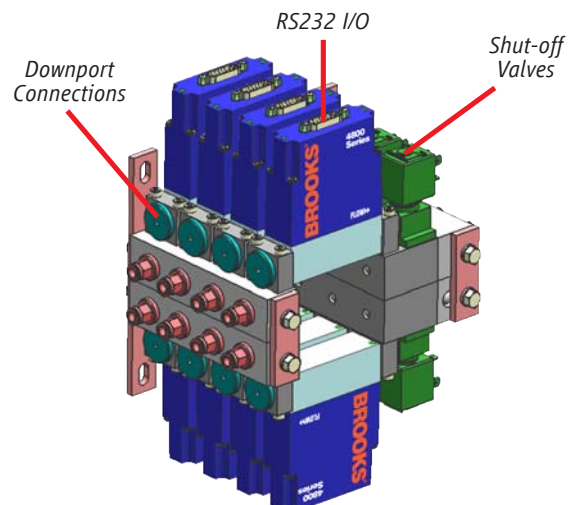


Figure 4 Modular Gas Delivery System



Figure 5 4800 Series with Local Operator Interface

Features and Benefits

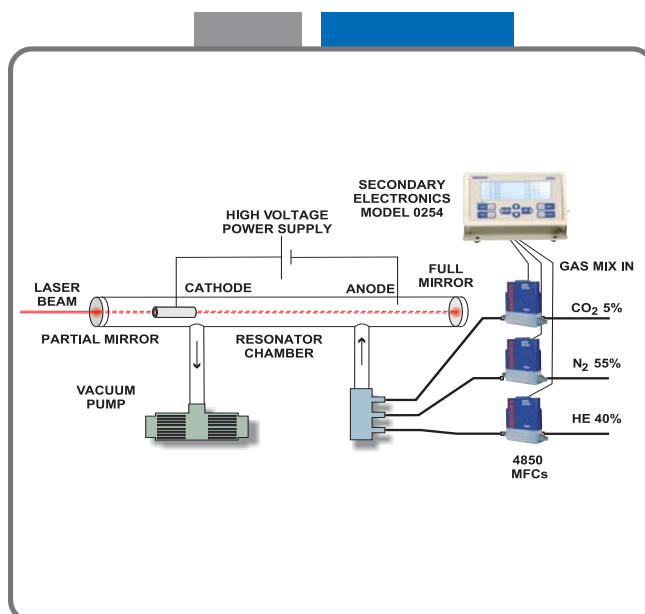
Features	Benefits
Fast response time	Ensure rapid step during process recipe changes
Compact size	Reduces space and eases installation
Optional Local Operator Interface (LOI)	Provides a turnkey solution for local indication, set point control and device configuration eliminating the need for remote secondary electronics
Low pressure drop across the sensor	Provide flow measurement with minimal pressure budget
Variety of analog and digital I/O	Easily aligns with user requirements
Fully RoHS compliant	Meets emerging environmental requirements

Product Applications

Heat Treating, Cutting/Welding, And Other Thermal Processes

The thermal process market is diverse, but the application demands are similar: reliable, accurate control of inert shielding gases and excellent control of O_2 and combustion gasses to ensure that the desired outcome is achieved time after time.

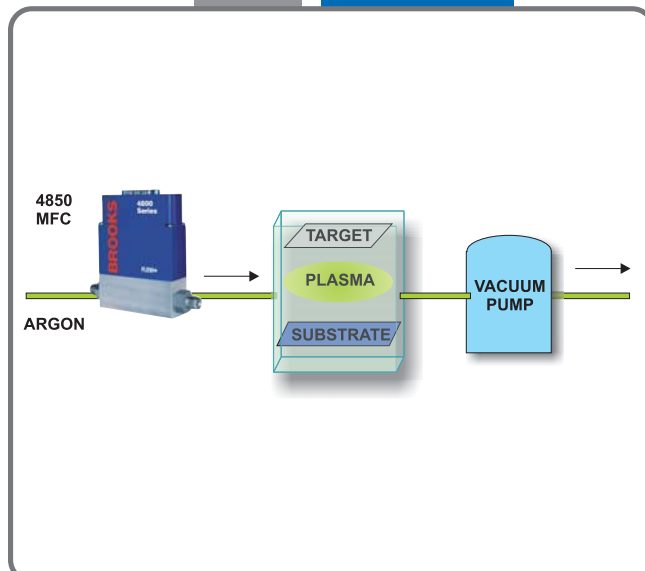
The Model 4850 provides an economical thermal mass flow control solution for flows up to 40 slpm. The 4800 Series utilizes a MEMS mass flow sensor designed specifically for inert and non-corrosive gasses such as those found in thermal applications.



Solar / Thin Film Processing (Physical Vapor Deposition)

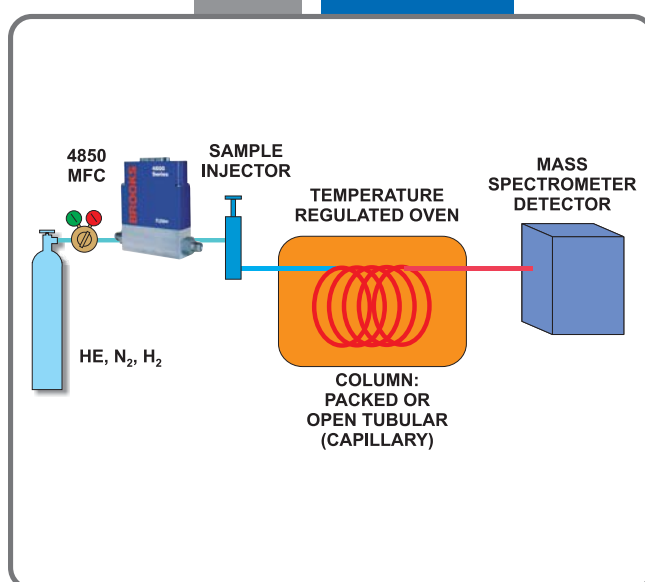
Physical vapor deposition or sputtering is commonly used for creating films of material, often metal, on a substrate. Plasma is used to move and accelerate the atoms of interest toward the target placed in a vacuum chamber. Mass flow controllers are used to control the gas flow to the chamber. Our advanced control valve PID controller can eliminate overshoot that can quench and destabilize the plasma.

The Brooks 4800 Series is a great solution for controlling argon in a plasma process. This product has a very fast response to setpoint without overshoot along with having a very small footprint.



Analytical OEM

Analytical OEMs need to measure and control reagent, calibration and sample gas flows. These applications often require that the flow control device have small physical size, low pressure drop, excellent repeatability and be easy to integrate into their system. The Brooks 4800 Series provides all this and much more. The Model 4850 mass flow controller can store multiple gas calibrations to reduce spares and inventory requirements. This product can also be private labeled for specific OEM requirements.



Product Specifications

Performance

Full Scale Flow Range	50 ml/min - 40 l/min
	(50 sccm - 40 slpm)
	(N ₂ eq., at 0°C Ref)
Control Range	2 - 100%
Flow Accuracy	+/- 3.0% of FS, +/- 1.0% FS optional
Flow Repeatability	+/- 0.15% of FS
Response Time	Flow signal: <0.3 sec Flow control: Settling time <0.75 sec from 0 to 100% FS (typical <0.5 sec for all steps)
Temperature Coefficient	+/- 0.1% of FS/°C (N ₂)

Ratings

Gases	Air, N ₂ , O ₂ , Ar, He, CO ₂ , CO, N ₂ O, CH ₄ , C ₃ H ₆ , C ₃ H ₈ (other gases upon request)		
Operating Limits	Pressure	0 - 10 barg (0 - 150 psig)	
	Temperature	0 - 50°C	
	Humidity	5 to 95% R.H. (ambient)	
Differential Pressure Range (Controllers)	Minimum: 0.35 bar (5 psid)		
	Maximum: 10 bar (150 psid)		
Leak Integrity	Inboard to Outboard: 1x10 ⁻⁹ atm scc/sec Helium max.		

Mechanical

Materials of Construction	Wetted parts: stainless steel, fluoroelastomers, silicon-based sensor		
RoHS	Fully RoHS compliant per EU Directive 2011/65/EU		
Outline Dimensions	Refer to Figures 6 through 8		
Process Connections	Inlet/Outlet threads: 9/16" - 18 UNF threads, Refer to Figure 6 for available process connections.		

Electrical

Electrical Connections	15-pin D-sub connector Analog/RS-232: 15-pin D-sub connector		
Power Supply Voltage**	+15 Vdc + 10% or +24 Vdc + 10% Device only uses single sided power supply Inrush current: < 1 A		
Power Requirements	Model	Device	15 Vdc
		Type	Typical (mA) Max (mA)
	4850	Controller	130 160
	4860	Meter	30 60
			24 Vdc
			Typical (mA) Max (mA)
			150 200
			30 60
Analog Input/Output	0-5 Vdc or 4-20 mA		
Digital Input/Output	RS-232 (Standard with all analog I/O options)		
Valve Override Signal	Valve Controller: Input Open Valve Closed: <0.3 V; open valve: >4.8 V		

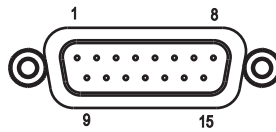
** For high flows and/or low differential pressures (using orifices 0.049" (1.25mm) or 0.079" (2.0mm)) only 24 Vdc power is available.

Local Operator Interface (LOI)

Display	Effective display area: 28mm wide, 11mm high Display Contents: 8x2 dot matrix display		
Operating Limits	Temperature	0-50°C	
	Operating Humidity	5 to 95% R.H. (ambient)	
Electrical Connections	2 15-pin D-sub connectors, one for the connection to the 4800 Series and one for the remote connection		
Power Supply Voltage	The LOI optionally includes a wall mount power adaptor with a 3.5-mm DC-plug. The adaptor works with input voltages of AC 90-240 V/47-63Hz. The adaptor supports European, U.K., Australia and U.S. wall plugs. Power can also be supplied by a remote connection via the D-connector.		
Materials of Construction	Enclosure: ABS plastic with CU-Ni plating		
RoHS	Fully RoHS compliant per EU Directive 2011/65/EU.		
Outline Dimensions	Refer to Figure 8		

Product Dimensions

15 Pin D-Sub Connector



PIN#	4800 Series / LOI
1	Setpoint Signal Common
2	Flow Voltage Output
3	Not used
4	Flow Current Output
5	Positive Supply Voltage
6	Not used
7	Setpoint Current Input
8	Setpoint Voltage Input
9	Power Supply Common
10	Flow Signal Common
11	Not used
12	Valve Override Input
13	Not used
14	RXD
15	TXD

Table 1 4800 Series Pin-Out Diagram

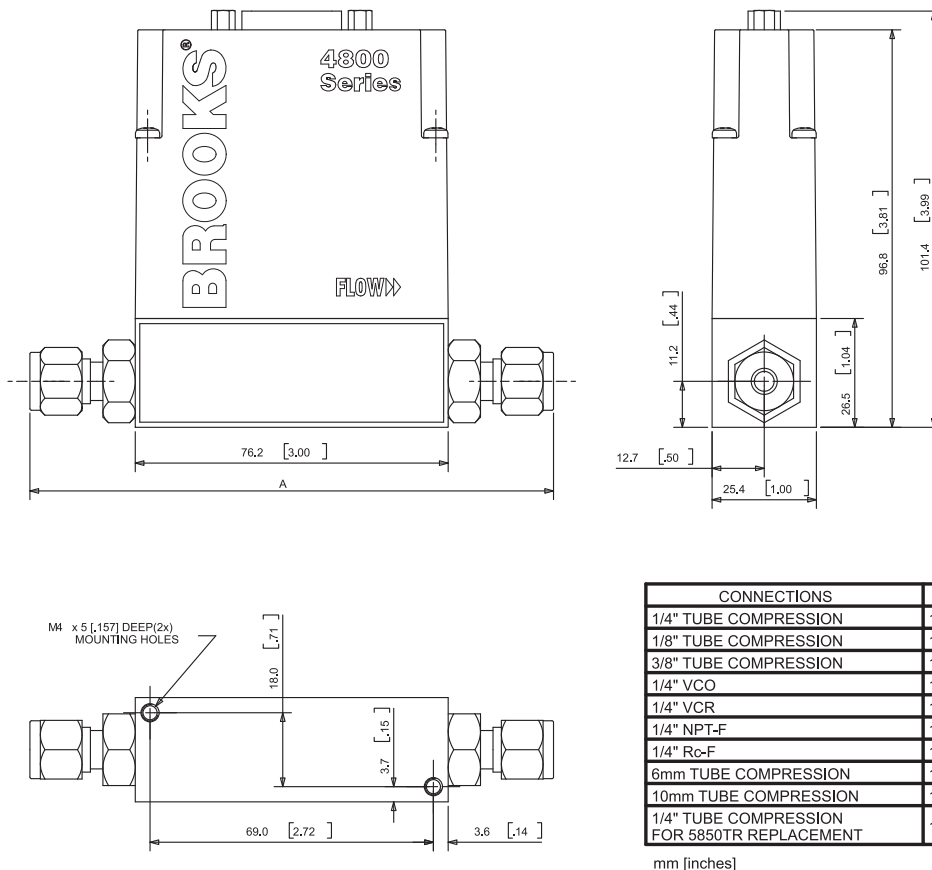


Figure 6 Dimensions for 4800 Series Devices with Standard Process Connections

Product Dimensions

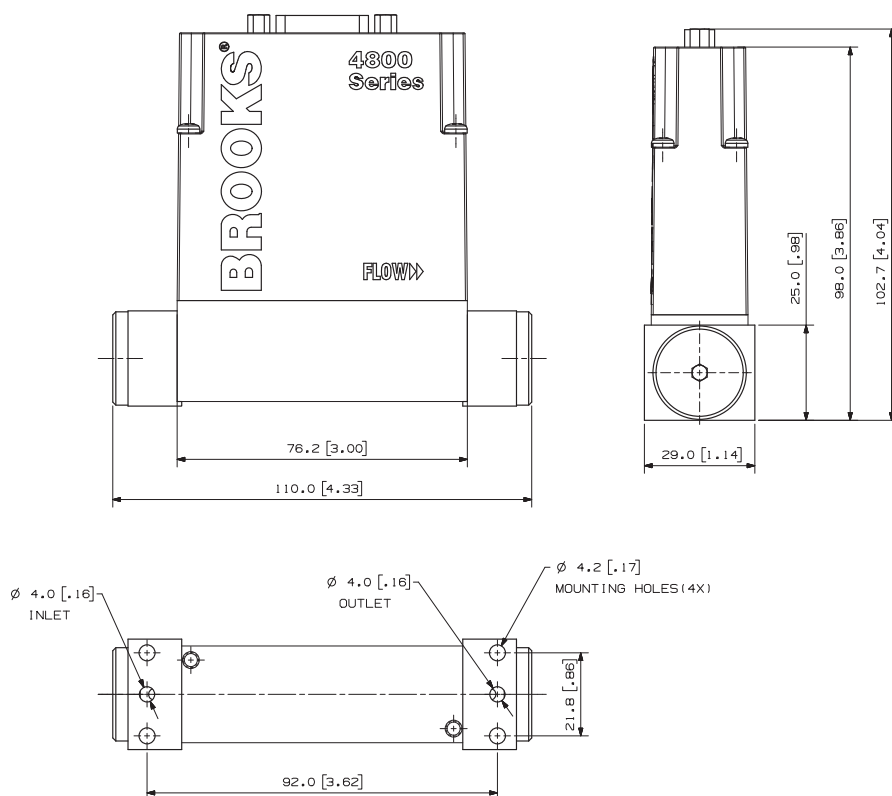


Figure 7 Dimensions for 4800 Series Devices with Downport Connections

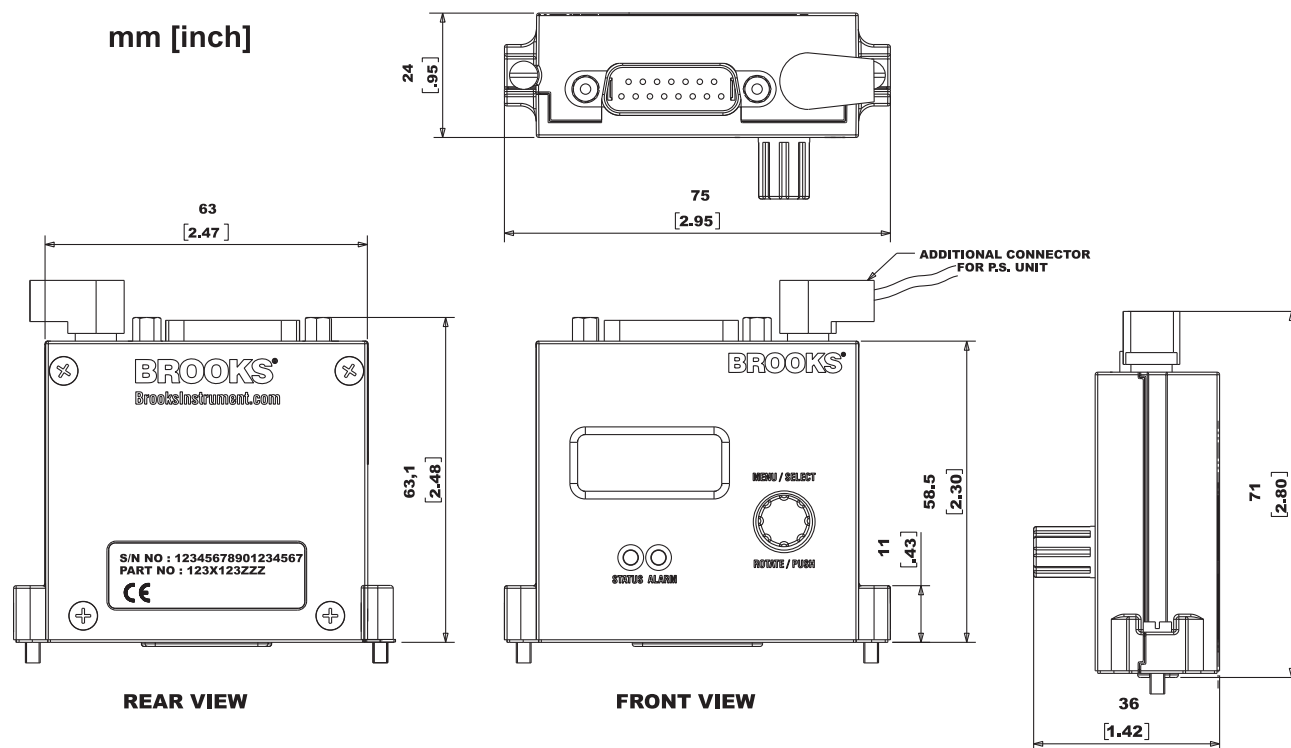


Figure 8 Dimensions for 4800 Series LOI Module

Product Certifications

These certifications cover the 4800 Series thermal mass flow devices as well as the Local Operator Interface (LOI).

EMC Directive 2004/108/EC: per EN 61326:2006

Hazardous Location Classification

The modules shall be installed in a suitable enclosure providing a degree of protection of at least IP54 according to EN 60529, taking into account the environmental conditions under which the equipment will be used. Provisions shall be made to prevent the rated voltage from being exceeded by transient disturbances of more than 40%.

Model Code

Code Description		Code Option	Option Description			
I.	Base Model Number	4850	Flow Controller, Body 0 (50 sccm-40 slpm)			
		4860	Flow Meter, Body 0 (50 sccm-40 slpm)			
II.	Digital I/O Communications	A	RS-232 + Analog, Select applicable analog I/O			
III.	Model Revision Level	B	Revision			
IV.	Analog I/O, Input / Output	B	0-5 Vdc / 0-5 Vdc			
		C	4-20 mA / 4-20 mA			
		D	0-5 Vdc / 4-20 mA			
		E	4-20 mA / 0-5 Vdc			
		0	None			
V.	Power Supply	1	15 Vdc			
		2	24 Vdc			
VI.	Mechanical Connections	1A	9/16" -18unf straight thread			
		B1	1/4" tube compression w/filter			
		C1	1/8" tube compression w/filter			
		D1	3/8" tube compression w/filter			
		E1	1/4" VCR w/filter			
		F1	1/4" VCO w/filter			
		G1	1/4' NPT-F w/filter			
		H1	6mm tube compression w/filter			
		J1	10mm tube compression w/filter			
		S1	Downport, no O-ring cavity			
		T1	1/4" Rc (BSPT) w/filter			
		X1	Downport, with O-ring cavity			
		Y1	1/4" tube w/filter (5850TR replace)			
VII.	Body		Body	O-Ring Seal	Seat	Valve Type
		A	316ss	Viton	None (Meter Only)	None (Meter Only)
		B	316ss	Viton	Viton	Normally Closed
VIII.	Area Classification	1	Standard Location (Safe Area)			
		2	ATEX Zone 2			
		4	CSA Div 2/Zone 2 (Recognized)			
IX.	Valve Orifice Size	A	No Orifice (Meter Only)			
		B	0.001 inch / 0.03mm			
		C	0.002 inch / 0.05mm			
		D	0.003 inch / 0.08mm			
		E	0.005 inch / 0.125mm			
		F	0.008 inch / 0.2mm			
		G	0.012 inch / 0.315mm			
		H	0.020 inch / 0.5mm			
		J	0.031 inch / 0.8mm			
		K	0.049 inch / 1.25mm only available with power supply option code=2 (24 Vdc)			
		M	0.079 inch / 2.0mm only available with power supply option code=2 (24 Vdc)			

Model Code

Code Description	Code Option	Option Description		
X. Mass Flow Restrictor Type		Type or Restrictor	Restrictor Range (sccm N₂ Equivalent @ 0 Deg C ref)	
	A	No Restrictor	NA	NA
	C	Plug	0	180
	K	K	160.4	228.53
	M	M	218.4	310.6
	N	N	265.7	377.7
	P	P	332	471.6
	Q	Q	424.8	603
	R	R	554.8	787
	S	S	736.7	1044.6
	T	T	991.4	1405
	U	U	1348	1910
	V	V	1847	2617
	W	W	2546	3607
	X	X	3524	4992
	Y	Y	4894	6932
	1	1	6811	9647
	2	2	9496	13,453
	3	3	13,250	18,773
	4	4	18,520	30,143
	5	5	30,100	50,143
XI. Calibration		Calibration Condition	Accuracy	Tracability
	A	None-Uncalibrated	NA	NA
	B	Single Gas	+/- 3.0% of FS	None
	C	Single Gas	+/- 1.0% of FS	None
	D	Single Gas	+/- 3.0% of FS	NIST
	E	Single Gas	+/- 3.0% of FS	CMC Cert. (NMI)
XII. Accessories	0	None		
	1	LOI with Power Adapter		
	2	LOI without Power Adapter		
XIII. Certificates	0	None		
	9	Multiple Certs. Describe required certs in notes. Add all applicable changes to list price.		
	A	Declaration of Compliance 2.1 (Certificate of Conformance)		
	B	Declaration of Compliance 2.1 Leak Test		
	C	Declaration of Compliance 2.1 Pressure Test		
	D	Declaration of Compliance 2.1 Oxygen Service		
	E	Declaration of Compliance 2.1 Materials		
XIV. OEM Code	A	Standard Brooks Label		

Sample Model Code

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV
4850	A	B	B	1	1A	A	2	D	K	E	2	9	A