



Model QMC IP40

Quantim[®] QMC Series

Low Flow Coriolis Mass Flow
Controllers & Meters for Liquids & Gases

Brooks Instrument has developed the third generation of its small, low-flow Coriolis mass flow meter and controller – the new Quantim[®] QMC Series. Compatible in fit, form and function with second generation QMB models, the new QMC model features a modern digital architecture enabling fast response, expanded simultaneous multi-variable outputs and enhanced diagnostics to handle a wide range of challenging applications. A new easy-to-access service port and status LEDs on the top lid simplifies installation, setup and troubleshooting using our free BEST (Brooks Expert Support Tool) software.

The heart of the device is a unique high-performance Coriolis sensor which directly measures mass flow independent of fluid type and process variables. With a range of 0.001 to more than 27 kg/hr, this multi-variable device simultaneously measures and reports mass flow, volume flow, density and temperature along with other valuable diagnostic variables for optimized process control and predictive maintenance. Quantim[®] offers unsurpassed accuracy and zero stability in for demanding low flow applications.

Most critical processes require control as well as measurement, and Quantim[®] offers an integrally mounted, in-line control valve. The integrated control valve and on-board control electronics simplify the installation, setup, operation and maintenance versus other low flow measurement and control techniques. No remote electronics are required as all the transmitting and control electronics are contained within the product housing.

Precision for Critical Low Flow Processes

Coriolis technology enables precise, direct mass measurement and control for very low flow processes. This technology enables measurement accuracies within 0.2% of rate for liquid applications and 0.5% of rate for gas applications. The configuration with the lowest flow capability allows for measurement and control down to 0.001 kg/hr, which is perfect for chemical and petrochemical research, semiconductor, industrial thin film and other critical low flow processes.

Process Flexibility

The Coriolis flow measurement technique eliminates the need for calibration to a specific fluid or process conditions. The third generation sensor and electronics used on Quantim® QMC Series Coriolis mass flow meters and mass flow controllers provides industry-leading accuracy, and allows the direct measurement of mass flow. This means Quantim® Coriolis instruments can easily be used on different process fluids without the need for recalibration.

Material Selection for Any Application

Quantim® has material options to allow the best possible match for your needs. With an all stainless steel construction, Quantim® is compatible with most process fluids. With the all metal valve construction, high alloy stainless steel valve stem and plunger and metal valve seat, maintenance due to corrosion is minimized. For process fluids sensitive to moisture or oxygen, an all metal seal construction using Nickle seals is available. Other seal material selections including Viton® fluoroelastomer, Buna, Kalrez® or EPDM are also available.

Diagnostics, Service Port and BEST Software

Quantim® Coriolis mass flow meters and mass flow controllers have an easy-to-access service port. This, coupled with our free downloadable Brooks Expert Support Tool (BEST) software, facilitates enabling the on-board alarms and diagnostics for enhanced process monitoring and predictive maintenance, simplifies installation, and supports troubleshooting. With the BEST software, the user is able to unlock the full potential of their Quantim® Coriolis mass flow controller.

Features	Benefits
Integrated sensor, valve and PID control all in one small package	Simplifies purchase, installation, and start up by having everything available from one supplier in a single compact unit
Low mass tube drive and optical sensing	Enables accuracy and zero stability at extreme low flow
Multivariable outputs and true mass measurement	Improves and simplifies process monitoring and diagnostics, further reducing cost of ownership
Diagnostic alarms and warnings	Provides early indication of potential process issues so preventative actions can be taken
Direct mass flow measurement with industry leading precision	Process chemistry and/or process conditions can be altered without the need to change or recalibrate the measurement system, providing the user with maximum flexibility
No internal moving parts	Minimizes maintenance requirements and overall cost of ownership
Small physical size	Easily integrated into most intricate process systems
Gas or liquid measurement and control capability in one package	The ultimate in process flexibility
Easy-to-access service port and BEST software	Facilitates enhanced process monitoring and predictive maintenance, simplifies installation, and supports troubleshooting

Features and Benefits

Diagnostic Alarms and Warnings
Provides early indication of potential process issues for preventative action

NEW Easy-to-Access Service Port
Easy installation, start-up and operation

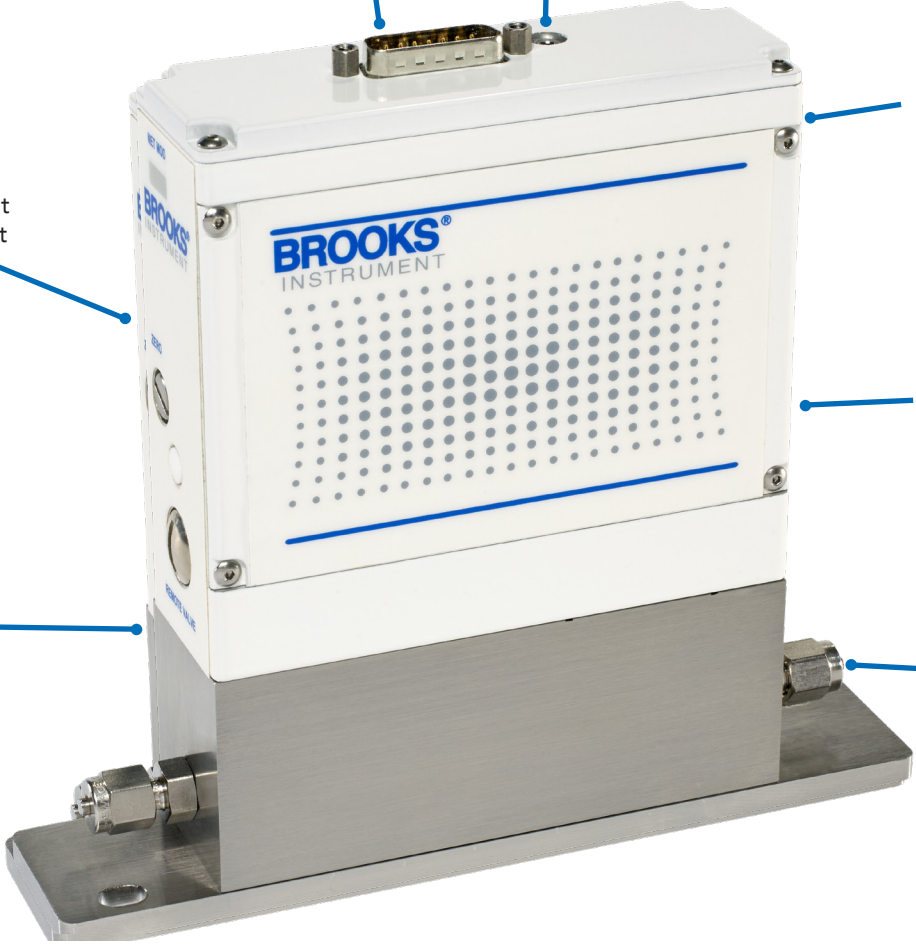
Optical Sensor
Allows precise measurement of tube movement for direct mass flow measurement

Advanced Electronics
Integrated PID control with superior signal filtering

Coplanar Valve
Super-fast response times (<400 msec typical)
Minimum valve leak-by (<0.2% FS)

Tube Assembly
Varied sizing allows for up to 27 kg/hr of flow

Liquid or Gas Connections
Seals are available in Viton®, Kalrez®, Buna, EPDM and Nickel
Flow-thru or downported configurations



Product Specifications

	QMCC (Controller)			QMCM (Meter)		
Performance						
Tube Size:	2	3	4	2	3	4
Nominal Flow Range ¹ :						
Liquid (kg/hr):	0.15	0.78	7.97	0.19	1.30	13.50
Gas (kg/hr):	0.076	0.214	1.796	0.103	0.53	3.840
Gas (scm) ² :	1051	2955	24787	1432	7207	53116
Minimum Measurable Flow Liquid (kg/hr):	0.001	0.010	0.100	0.001	0.010	0.100
Zero Stability Stainless Steel Sensor (kg/hr):	0.00013	0.0010	0.0040	0.00013	0.0010	0.0040
Repeatability & Reproducibility:	+0.05% or +[0.5 x (zero stability/flowrate) x 100]% of rate whichever is greater					
Response Time (Settling Time): 2% F.S. of final value, (per SEMI Guideline E17-91)	<2 seconds			<0.5 seconds		
Flow Accuracy ^{3,4} :	Standard Flow Accuracy or [(zero stability/flow rate) x 100]% of rate, whichever is greater					
Standard Flow Accuracy:	Liquid: 0.2% Gas: 0.5% of rate					
Ratings						
Operating Temperature Range ⁵ :	0 to 65°C					
Temperature Accuracy (Device):	± 0.5°C					
Differential Pressure Range:	Liquid: 10 to 200 psi Gas: 10 to 150 psi					
Maximum Operating Pressure:	Standard: 500 psi Optional: 1500 psi					
Density Range:	0 to 2.0 g/cc					
Density Accuracy ⁶ :	± 0.005 g/cc					
Leak Integrity (External):	Elastomer: Outboard 1 x 10 ⁻⁹ atm. cc/sec., helium (max) Metal Seal: 1 x 10 ⁻¹⁰ atm. cc/sec., helium (max)					
Mechanical						
Materials of Construction (Process Wetted):	316L, 316L VAR, High alloy ferritic stainless and 17-7PH					
Materials of Construction (Process Seals):	Elastomer Seal: Viton® fluoroelastomers, Buna, Kalrez® or EPDM Metal Seal: stainless steel and nickel					
Housing:	IP40: polyurethane painted aluminum					
In-Line Filter ⁷ :	Tube size 2 controller: 1 micron or 10 micron filter recommended Tube size 3 or 4: 10, 20, 30 & 40 micron filters available					
Weight:	2.4 kg (5.4 lbs.)					
Moisture Content:	Purged to exhaust dew point less than -40°C (-40°F) prior to shipment to remove calibration liquid, to prevent process contamination. Then vacuum bagged at ambient room conditions.					
Process Fitting Options:	Elastomer Seal: 1/16", 1/8", 1/4" or 6mm tube compression, 1/8" or 1/4" NPT(F), 1/8" or 1/4" VCR, 1/4" VCO Metal Seal: 1/8" VCR, 1/4" VCR, 3.2 mm UPG					
Electrical Connections:	15 pin D-Type connector (See Figure 2).					
Dimensions:	(See Figures 1 through 3)					
Vibration:	Tested per: IEC 60068-2-64 Ed 2.1, Table A.3, Category 1, per ETSI EN 300 019-2-3, T 3.2., 30 min / axis, 1.1m/s ² (0.1g), 5 to 100Hz IEC 60068-2-6, Table A.1, 75min / axis, Peak Acceleration of 9.8m/s ² (1g), 5 to 2,000Hz, 5 Sweeps					

Diagnostics	
Status Lights:	Status and Alarm LEDs
Alarms:	Mass Flow, Density, Volumetric Flow, Temperature, Slug Flow, Diagnostic Failure, Setpoint Deviation, Valve Drive
Electrical	
Output Signal:	Digital: RS485 S-Protocol (See RS485 Supplemental Manual – QMC for additional details) Analog: Primary: 0-20 mA, 4-20 mA, 0-5 Vdc, or 0-10 Vdc active output represents mass flow or volume flow(3) Secondary: 0-20 mA, 4-20 mA 0-5 Vdc or 0-10 Vdc active output represents density or temperature. Alarm output, max. voltage 30 Vdc, max. current 100 mA
Input Signal:	Digital: RS485 S-Protocol (See RS485 Supplemental Manual – QMC for additional details) Analog: Command (setpoint): 0-20 mA, 4-20 mA, 0-5 Vdc or 0-10 Vdc input signals Valve Override (VOR) Function: Left floating/unconnected - instrument controls flow at setpoint Connected to signal at or above 5.0 volts - valve is forced open Connected to signal at or below 0.0 volts - valve is closed
Power Requirements:	Voltage: +14 to 27 Vdc
Nominal Current:	Controller: 300 mA to 400 mA Meter: 100 mA to 150 mA
Max Current	Controller: 715 @ 14 Vdc Meter: 470 mA @ 14 Vdc
Max Power	Controller: 10.0 W Meter: 6.6 W
Additional Functions & Outputs	
Damping:	Factory set time constant from 0 to 10 seconds
LED's:	'STAT' solid green: system operative 'AL' solid red: system fault
Pushbutton:	'ZERO' setting pushbutton
Certifications and Compliance	
Environmental Compliance:	EMC Directive 2014/30/EU per EN 61326-1: 2013 ROHS Directive 2011/65/EU and 2015/863
Pressure Effects Compliance:	Pressure Equipment Directive 2014/34/EU "Sound Engineering Practice"
Additional Certifications (Optional)	Material 2.1 EN10204, Material 3.1B EN10204, Calibration Traceability, Oxygen Clean, Certificate of Conformance

Notes

- ¹ The nominal flow rate is the flow rate at which water at reference conditions causes approximately 1 bar of pressure drop or the laminar to turbulent transition flow whichever is lower. Maximum flow rate is higher than the nominal flow rate and is dependent upon process fluid and process conditions.
- ² Standard volumetric conditions are 14.696 psia and 70°F.
- ³ Actual volumetric flow is a function of the mass flow and the density measurements; therefore the accuracy of actual volumetric flow is a function of the mass flow and density accuracy.
- ⁴ Accuracy includes combined repeatability, linearity, hysteresis and calibration system uncertainty. Specifications are based on reference test conditions of water/nitrogen at 68 to 77°F (20 to 25°C) and 15 to 30 psig (1 to 2 bar).
- ⁵ A temperature rise of up to 20°C (68°F) from internal heating can occur in an open environment where ambient temperature is 23°C (73°F). The device temperature is affected by the ambient and process temperature as well as warming when the device is powered. The device should be maintained in the specified temperature range at all times.
- ⁶ The density measurement at temperatures other than 21°C (70°F) has an additional error of approximately 0.0005 grams/cc per °C.
- ⁷ Additional upstream filtration is always recommended to remove any particulate from the process fluid before it flows through these devices. In most applications, Brooks in-line filters are recommended as a secondary filter in addition to other upstream filtering methods. The use of Brooks in-line filters are not recommended in moisture sensitive applications.

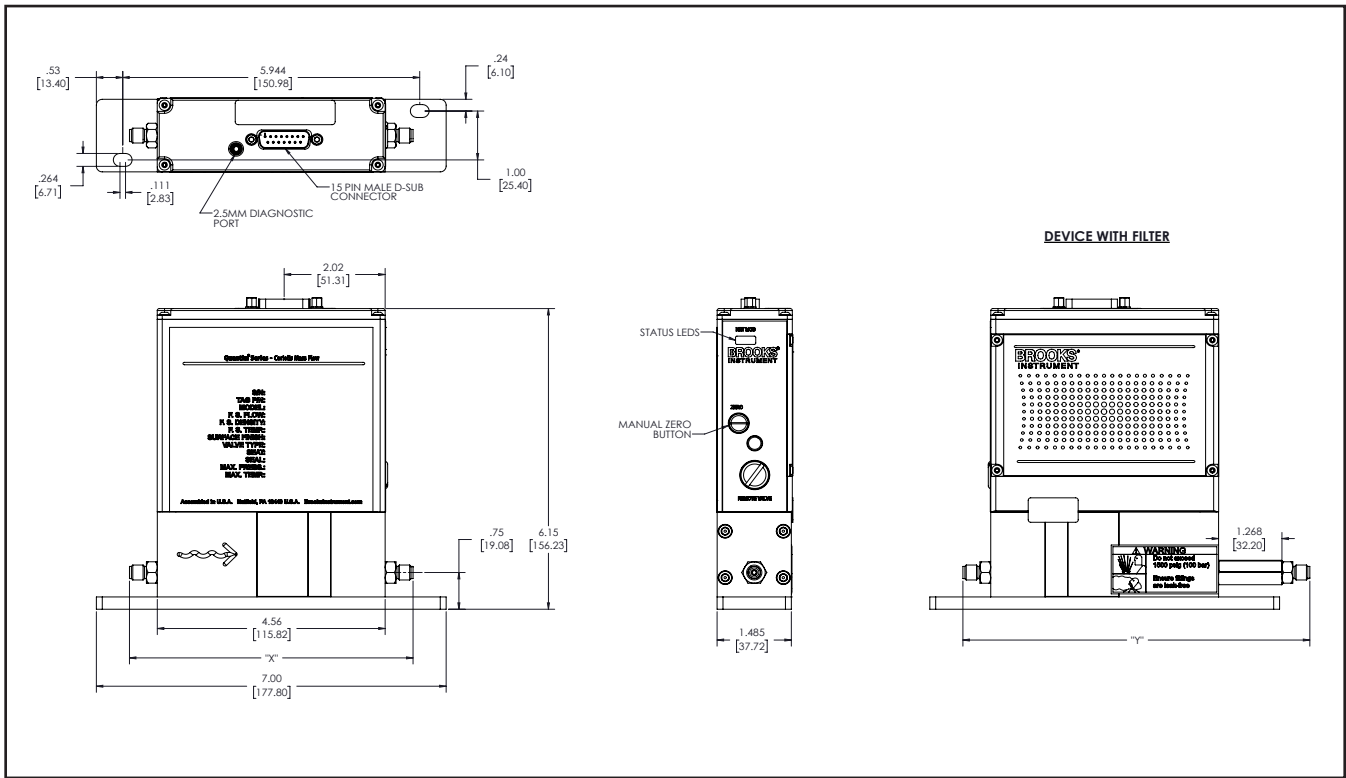


Figure 1 Dimensional Drawing QMC IP40

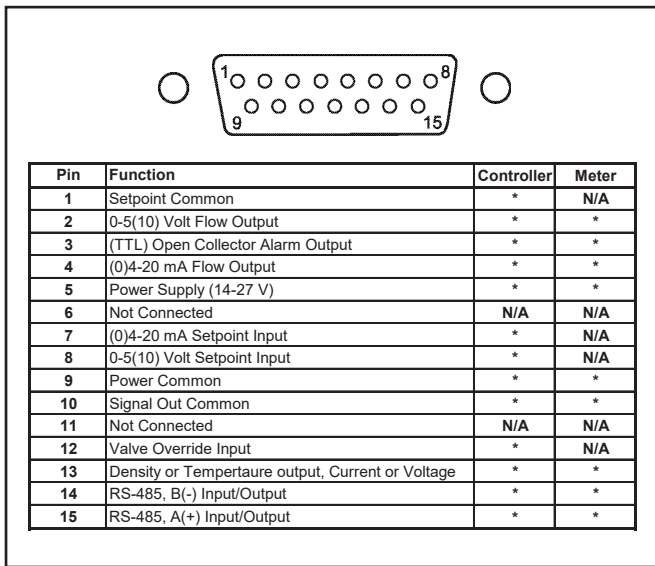


Figure 2 D-Connector Electrical Pin Connections

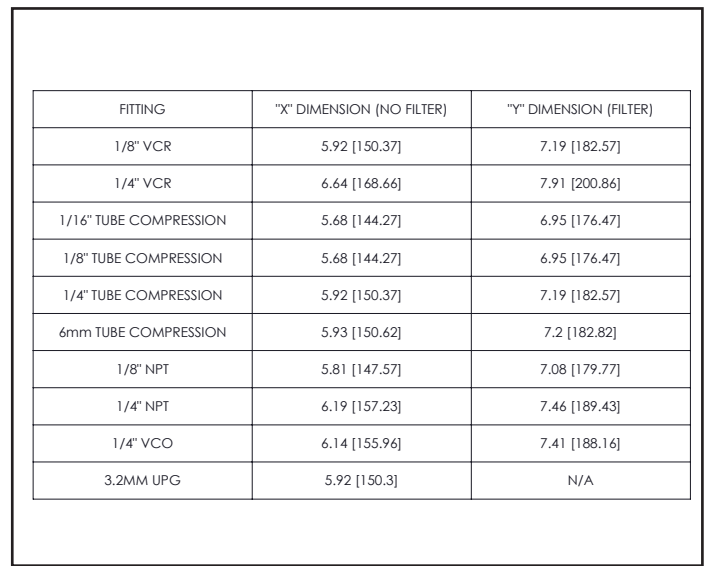


Figure 3 Lay-In Dimensions Integral Valve

Code Position	Code Description	Code Option	Option Description				
1-4	Base Model	QMCC	Flow Controller				
		QMCM	Flow Meter				
5	Tube Size		Meter Nominal Flow		Controller Nominal Flow		
			Liquid	Gas	Liquid	Gas	
		2	190 grams/hr	1430 sccm	150 grams/hr	1051 sccm	
		3	1300 grams/hr	7.27 slpm	780 grams/hr	2.96 slpm	
6	Fluid Type	4	13.5 kg/hr	53.1 slpm	7.97 kg/hr	24.79 slpm	
		L	Liquid				
7	Reserved	G	Gas				
		1	Standard				
8	Valve Type	A	No Valve (Flow Meter)				
		B	Normally Closed Valve				
9	Accuracy	2	0.2% of rate		Standard for Liquid		
		3	0.5% of rate		Standard for Gas, Optional for Liquid		
		4	1.0% of rate		Optional for Gas		
10	Enclosure Type and Safety Certification	A	NEMA 1 / IP 40		Safe Area		
11	Surface Finish	1	Standard Surface Finish (32 Ra)				
12	Sensor Tube Material	A	316L Stainless Steel				
13	Maximum Pressure	1	500 psi (35 bar)				
		2	1500 psi (100 bar)				
14	Reserved	A	Standard				
15-16	Process Connections	1A	Standard Body Connection - 5/6" - 24 UNF				
		1B	1/16" Tube Compression				
		1C	1/4" Tube Compression				
		1D	1/8" Tube Compression				
		1G	6mm Tube Compression				
		1J	1/8" NPT(F)				
		1K	1/4" NPT(F)				
		1L	1/8" VCR	Available with Metal Seals			
		1M	1/4" VCR	Available with Metal Seals			
		1P	1/4" VCO				
		17	Input Output Signals / Communications	2A	3.2mm UPG	Available with Metal Seals	
	Primary I/O			Secondary Output			
A	0-5 VDC			4-20 mA			
B	4-20 mA			4-20 mA			
C	0-5 VDC			0-5 VDC			
S	RS485			RS485			
T	0-10 Volt			0-10 Volt			
U	0-10 Volt			0-5 Volt			
V	0-10 Volt			4-20 mA			
W	0-10 Volt			0-20 mA			
1	0-20 mA			0-10 Volt			
2	0-20 mA			0-5 Volt			
3	0-20 mA		4-20 mA				
4	0-20 mA		0-20 mA				
18	Electrical Connection	1	15 Pin D Type Connector				

Code Position	Code Description	Code Option	Option Description
19	Seals		Sensor, Valve Stem and End Fitting
		A	Viton
		B	Buna
		C	Kalrez 4079
		D	Kalrez 6375
		E	EPDM
20	Valve Seat Material	1	None (Meter)
		7	Metal 17-7pH Stainless Steel
21	Special Processing	A	NONE
		B	2.1 EN 10204 Material Certificate
		C	3.1B EN 10204 Material Certificate
		D	Certified Clean for Oxygen Service
		E	Certified Clean for Oxygen Service & 2.1 EN 10204 Material Certificate
		F	Certified Clean for Oxygen Service & 3.1B EN 10204 Material Certificate
22	Quality Certifications	1	None
		2	Calibration Certification Traceable to NIST
		4	Certificate of Conformance
		5	Calibration Certification Traceable to NIST and Certificate of Conformance
23	In-Line Filter*	A	None
		B	In-Line Cartridge Filter, 10 Micron
		C	In-Line Cartridge Filter, 20 Micron
		D	In-Line Cartridge Filter, 30 Micron
		E	In-Line Cartridge Filter, 40 Micron
		F	In-Line Cartridge Filter, 1 Micron
		Z	Filter Housing Only / No Filter Element
24	OEM Code	A	Brooks
		N	No Logo

* Additional upstream filtration is always recommended to remove any particulate from the process fluid before it flows through these devices. In most applications, Brooks in-line filters are recommended as a secondary filter in addition to other upstream filtering methods. The use of Brooks in-line filters are not recommended in moisture sensitive applications.

Sample Model Code

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX
QMCC	2	G	1	A	2	A	1	A	1	A	1A	A	1	A	1	A	1	A	A

Brooks is committed to assuring all of our customers receive the ideal flow solution for their application, along with outstanding service and support to back it up. We operate first class repair facilities located around the world to provide rapid response and support. Each location utilizes primary standard calibration equipment to ensure accuracy and reliability for repairs and recalibration and is certified by our local Weights and Measures Authorities and traceable to the relevant International Standards.

Visit www.BrooksInstrument.com to locate the service location nearest to you.

START-UP SERVICE AND IN-SITU CALIBRATION

Brooks Instrument can provide start-up service prior to operation when required. For some process applications, where ISO-9001 Quality Certification is important, it is mandatory to verify and/or (re)calibrate the products periodically. In many cases this service can be provided under in-situ conditions, and the results will be traceable to the relevant international quality standards.

SEMINARS AND TRAINING

Brooks Instrument can provide customer seminars and dedicated training to engineers, end users, and maintenance persons. *Please contact your nearest sales representative for more details.* Due to Brooks Instrument's commitment to continuous improvement of our products, all specifications are subject to change without notice.

TRADEMARKS

Brooks Brooks Instrument, LLC

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INSTRUMENT

Beyond Measure