

Quantim® Series

Coriolis Mass Flow



Model QmB IP40

Low Flow Coriolis Mass Flow Measurement and Control

Overview

Brooks Instrument's Quantim Series is the smallest, lowest flow Coriolis meter and controller available on the market. With a footprint the size of a handheld organizer, you can fit this instrument into any tight space. The heart of the device is a patented Coriolis sensor design which measures low flows independent of the fluid type or process variables. With a range of 0.002 to more than 40 kg/hr, you can measure mass or volume flow and density or temperature all in one compact package. Quantim offers unsurpassed accuracy and unmatched zero stability in demanding low flow applications.

Most critical processes require control as well as measurement, and Quantim offers an optional integrally mounted, in-line control valve. No remote electronics are required as all the transmitting and control electronics are contained within the product housing. A remote valve configuration is also available.

Available with a variety of options and global approvals the Brooks Quantim Coriolis mass flow meters and controllers provide unsurpassed performance, solving specific challenges in demanding low-flow applications.

Product Description

The Quantim family of Coriolis mass flow meters and flow controllers uses a proven mass flow measurement technology to provide direct mass flow measurement and control of liquids and gases that has been employed in a wide variety of markets and applications for more than 15 years. Brooks Quantim products are the smallest and lowest flow Coriolis mass flow meters and controllers available on the market. Coriolis mass flow devices have the option of using an integrally mounted or remote control valve in a miniaturized configuration. They can simultaneously measure mass or volumetric flow and fluid density or temperature.

Product Description

Precision for Even the Most Delicate or Lowest-Flow Processes

Quantim's Coriolis technology allows for precise, direct mass measurements even for very low flow processes. This technology enables for measurement accuracies within 0.2% of the rate for stainless steel construction and 0.5% of the rate for Hastelloy® construction. Quantim is the lowest coriolis flow controller available. The configuration with the lowest flow capability allows for measurement down to 0.001kg/hr, which is perfect for extremely sensitive processes and costly components in any setting.

Process Flexibility

The Coriolis Effect is the deflection of moving objects with respect to a reference point, utilizing this effect allows measurement of flow while negating the need for calibration to a specific fluid or process conditions. The Coriolis technology gives Quantim its' industry-leading accuracy, and allows the direct measurement of mass flow. This allows Quantim to transition between process fluids without the need for recalibration, assuming the fluid change doesn't fall out of specification for the valve assembly.

Material Selection for Any Application

Quantim has material options to allow the best possible match for your needs. Quantim offers both stainless steel and Hastelloy as materials for sensor construction. This accommodates for processes with more corrosive fluids, and reduces maintenance due to corrosion of the mass flow meter/controller. Even more variety can be found in seal choices. Customers have the choice of using Viton® fluoroelastomer, Buna, Kalrez®, EPDM, and Nickel as their seals.

Enclosures to Meet Any Need

Different enclosure types enable equipment to be installed in any environment from an indoor non-hazardous area to an outdoor explosion risk area. Quantim is available in four different enclosure types. The IP40 is a basic enclosure, desired for most enclosed environments. IP66 is weather/waterproof, as well as Class 1, Division 2, Zone 2 certified for hazardous locations. The IP66XP is Division 1, Zone 1 certified for explosive environments. No matter the environment, Quantim can be tailored to fit your needs.

Features and Benefits

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 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
Industry leading mass flow measurement 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, liquid and slurry measurement and control capability in one package	The ultimate in process flexibility
Variety of options, enclosure types and area classifications available	The right product for your application

Features and Benefits

Diagnostic Alarms and Warnings

- Provides early indication of potential process issues for preventative action

User Interface

- Easy installation, start-up, and operation

Advanced Electronics

- Integrated PID control with superior signal filtering

Optical Sensor

- Allows precise measurement of tube movement for direct mass flow measurement

Tube Assembly

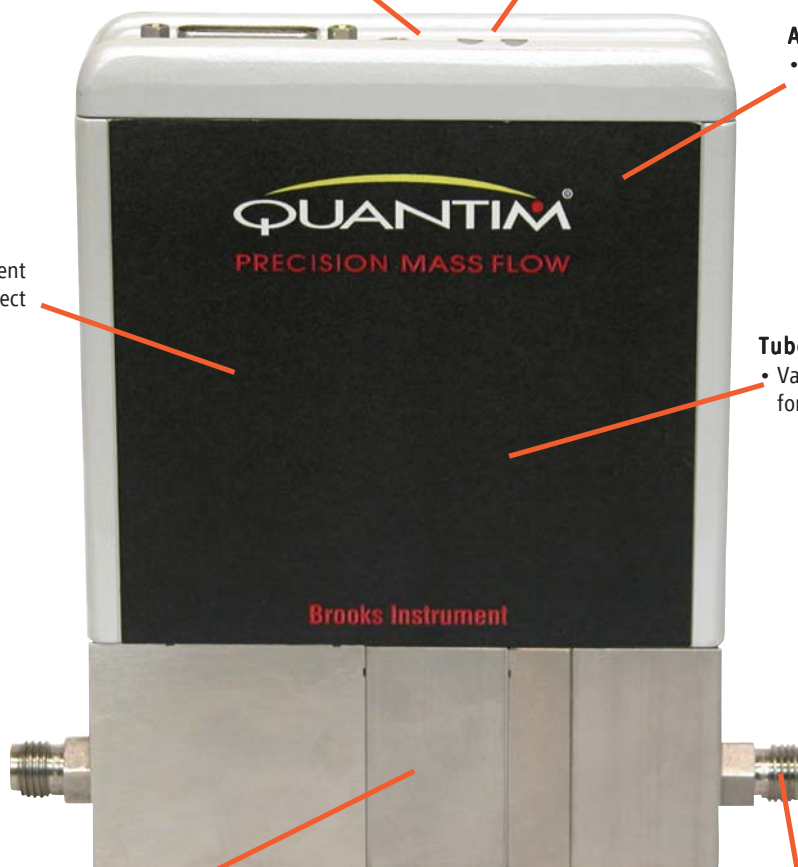
- Varied sizing allows for up to 27 kg/hr of flow

Coplanar Valve

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

Liquid or Gas Connections

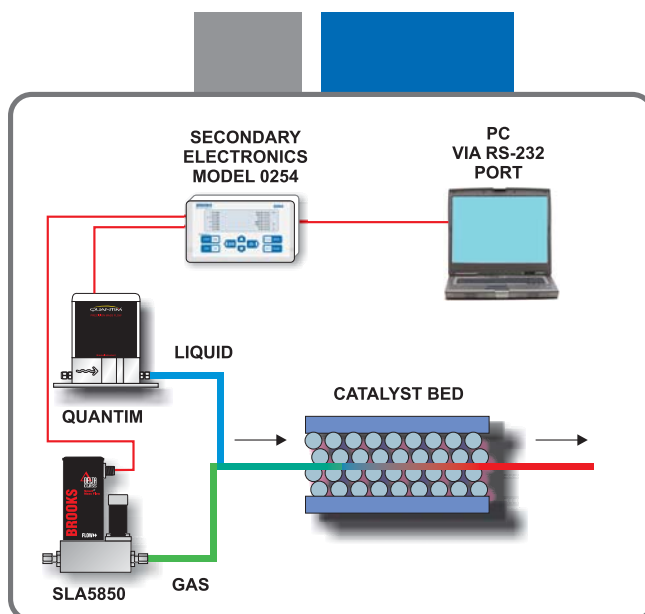
- Seals are available in Viton, Hastelloy, Buna, EPDM and Nickel
- Flow-thru or Downported Configurations



Product Applications

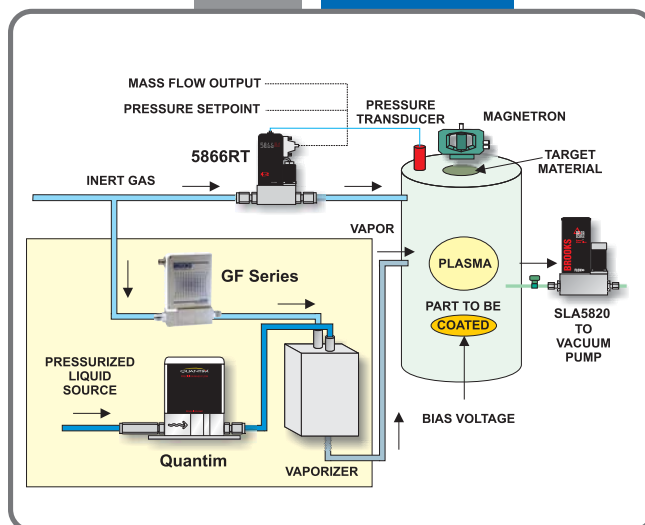
Catalyst Research

The Quantim coriolis mass flow controllers have been selected by many companies participating in catalyst research due to the precise measurement requirements for accurately calculated conversion rate and selectivity, which allows for successful scaling up of processes. Quantim is preferred due to its exceptional precision, wide dynamic range, and super stability. The coriolis technology within Quantim makes them extremely well suited for critical measurements where the composition or thermal properties of feeds vary. It is also available for extremely high pressure service, with appropriate area classifications, and wetted materials.



Vacuum Process

Brooks offers many exceptionally performing products for CVD, ALD, etch, diffusion, and other vacuum operations. The Quantim coriolis mass flow controller provides precision, accuracy, and repeatability for liquid precursor applications.

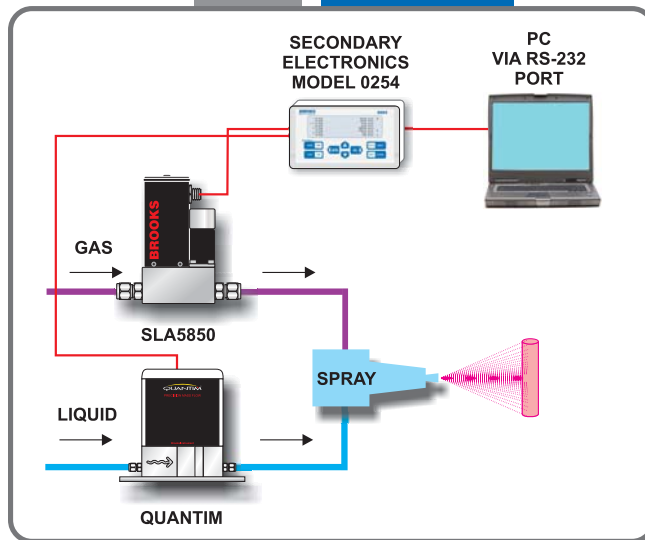


Precision Coating

Many coating processes use liquids that are sprayed onto substrates. The liquid delivery rate to the spray nozzles controls the film thickness on the substrate, while gas flow determines droplet size and spray pattern.

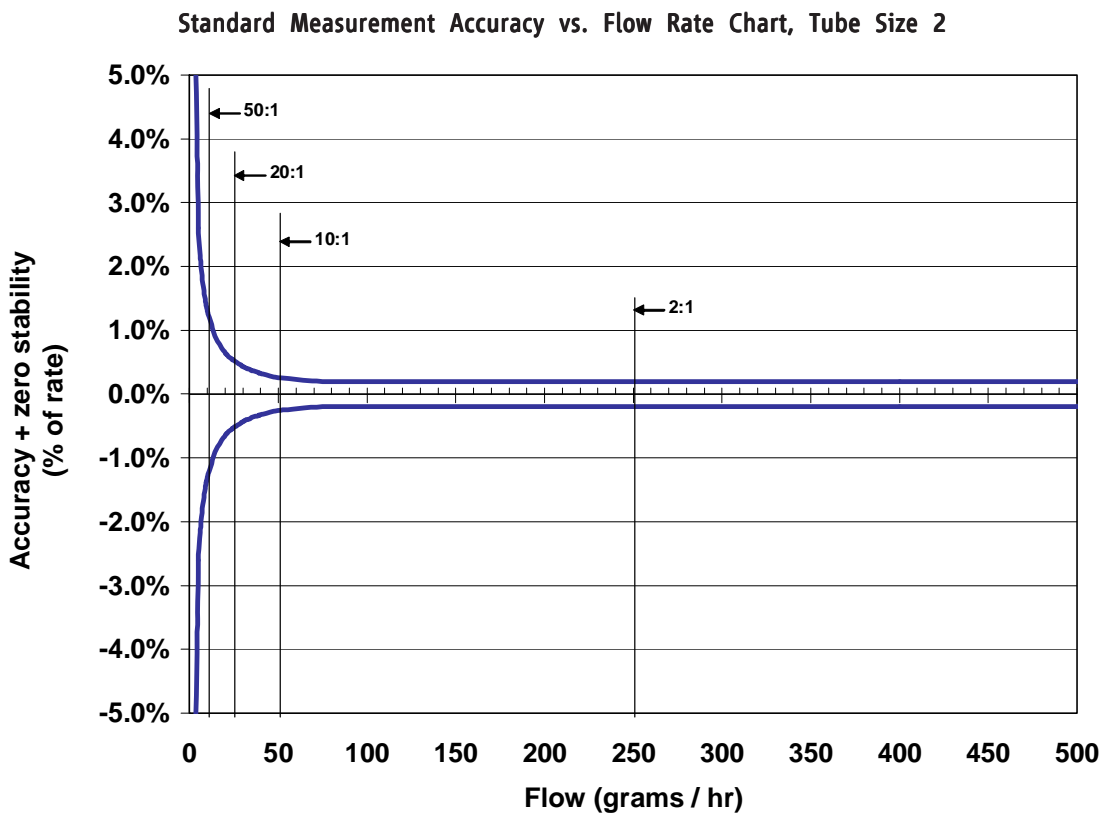
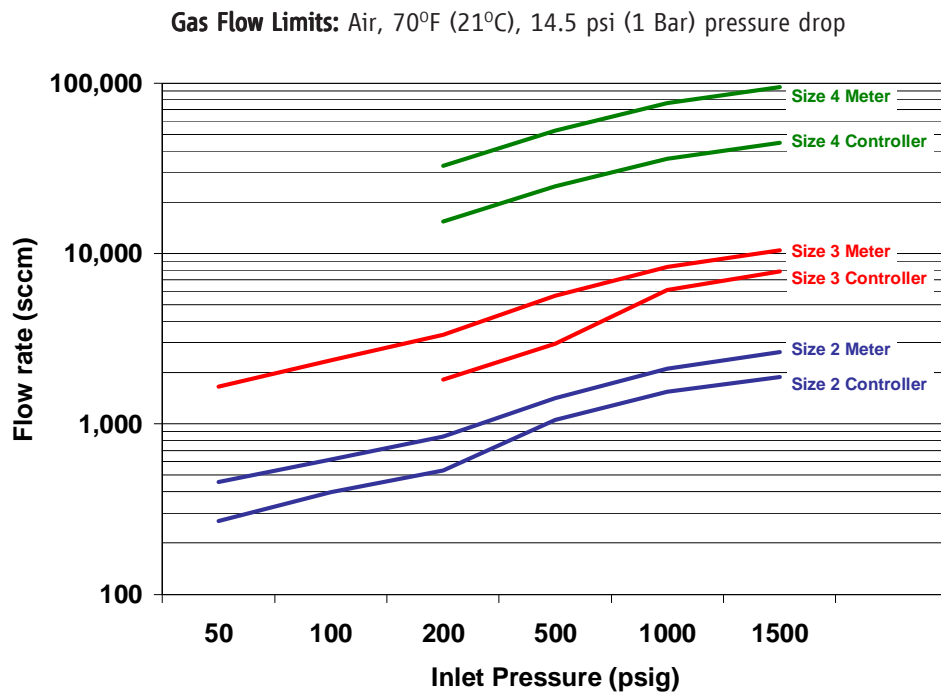
The Quantim mass flow controller is perfect for controlling the liquid flow rate to the spray nozzle. In addition, the instantaneous density output available from the Quantim Series can be employed diagnostically to detect the presence of gas bubbles in the liquid stream.

The Brooks Model 0254 secondary electronics may be used to provide power, local display, and setpoint for both flow devices. The liquid density measurement, used for quality control, is also displayed. A totalizer function may be used to track liquid inventory to ensure that the process supply does not run low.

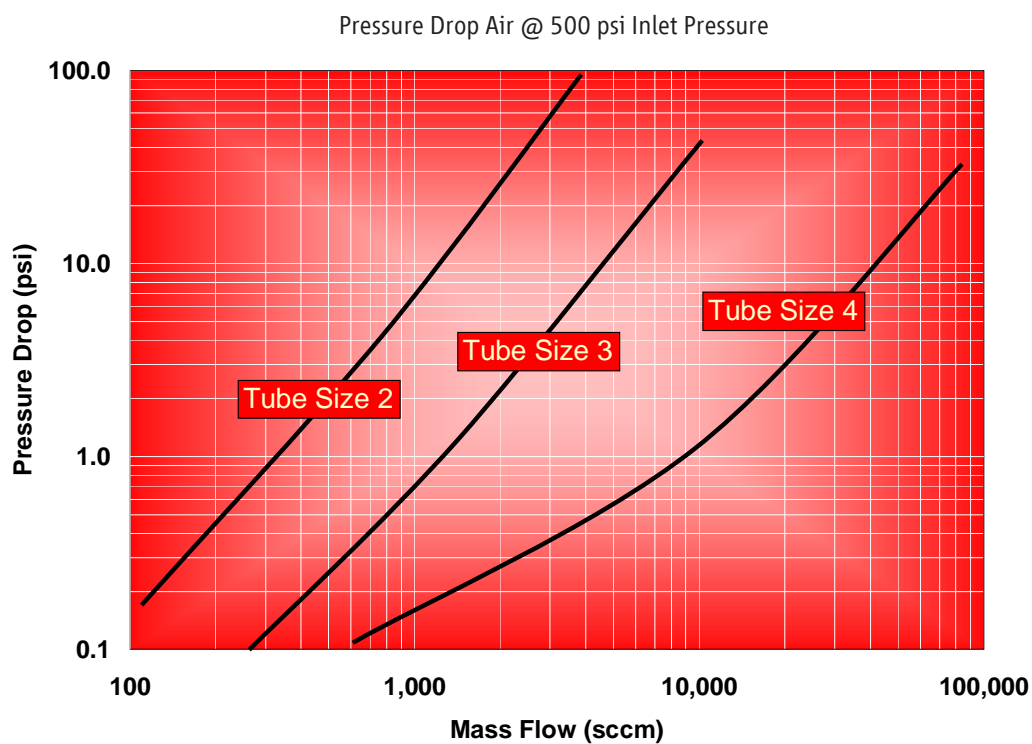
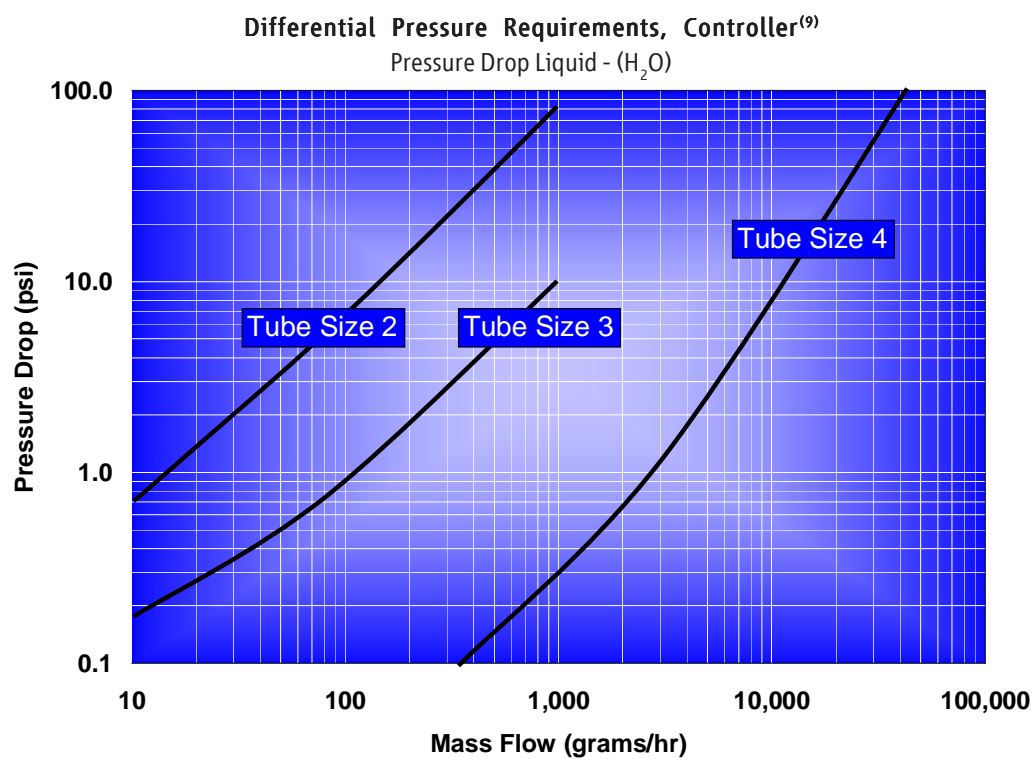


Product Specifications

Performance Specifications



Product Specifications



Product Specifications

Performance

Tube Size Nominal Flow Range:	QMBM (Controller)			QMBM (Meter)		
	2	3	4	2	3	4
Liquid (kg/hr) ⁽⁵⁾ :	0.15	0.78	7.97	0.19	1.00	13.50
Gas (kg/hr):	0.076	0.214	1.796	0.103	0.405	3.840
Gas (sccm) ⁽²⁾ :	1051	2955	24787	1432	5595	53116

Zero Stability:	QMBM (Controller)			QMBM (Meter)		
	2	3	4	2	3	4
Stainless Steel Sensor (kg/hr):	0.00013	0.0010	0.0040	0.00013	0.0010	0.0040
Hastelloy Sensor (kg/hr):	0.0002	0.0015	0.0120	0.0002	0.0015	0.0120

Repeatability & Reproducibility:	$\pm 0.05\%$ or $\pm [0.5 \times (\text{zero stability/flowrate}) \times 100]\%$ of rate whichever is greater					
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Response Time (Settling Time): 2% F.S. of final value, $\pm [(\text{zero stability/flowrate}) \times 100]\%$ of rate per SEMI Guideline E17-91						
	Stainless Steel: <2 seconds			<0.5 seconds		
	Hastelloy: <12 seconds			<0.5 seconds		

Flow Accuracy (Standard Flow):						
Stainless Steel Sensor:	Liquid: 0.2%			Gas: 0.5%		
Hastelloy Sensor:	Liquid: 0.5%			Gas: 0.5%		

Ratings

Operating Temperature Range:	0 to 65°C
Differential Pressure Range:	Liquid: 10 to 200 psi Gas: 10 to 150 psi
Density Range:	0.2 to 2.0 g/cc
Maximum Operating Pressure:	
Standard:	500 psi
Optional:	1500 psi
Optional:	4500 psi
Leak Integrity (external):	Elastomer: Outboard 1×10^{-9} atm. cc/sec., helium (max) Metal Seal: 1×10^{-10} atm. cc/sec., helium (max)

Mechanical

Materials of Construction	
Process Wetted:	316L, 316L VAR, High alloy ferritic stainless and 17-7PH
Optional:	Hastelloy sensor tube
Process Seals:	Elastomer Seal: Viton®fluoroelastomers, Buna, Kalrez or EPDM Metal Seal: stainless steel and nickel
Housing:	IP40: polyurethane painted aluminum IP66: polyurethane painted aluminum IP66XP: aluminum
Inlet Filter:	Tube size 2 controller: 1 micron or 10 micron inlet filter recommended Tube size 3 or 4: 10, 20, 30 & 40 micron filters available
Weight:	Housing IP40: 1.6 kg or 3.5 lbs. Housing IP66: 1.9 kg or 4.2 lbs. Housing IP66XP: 24 kg or 52 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:	1/16", 1/8", 1/4" or 6mm tube compression, VCR, VCO or NPT(F), 3.2 mm UPG, Downport ANSI/ISA 76.00.02 (See Model Code)
Electrical Connections:	IP40: 15 pin D-Type connector (See Figure 3). IP66: Unpluggable Terminal Block 28-16 Awg. IP66XP: 3/4" NPT wiring access to IP40 device with 15 pin D-Type connector.
Dimensions:	(See Figures 1 through 7)

Diagnostics

Status Lights:	Status and Alarm LEDs
Alarms:	Mass Flow, Density, Volumetric Flow, Temperature, Slug Flow, Diagnostic Failure, Setpoint Deviation, Valve Drive

Product Specifications

Electrical

Output Signals:	4-20 mA and 0-5 Vdc active output represents mass flow or volume flow ⁽⁹⁾
	And simultaneously available 4-20 mA or 0-5 Vdc active output represents on-line density or temperature information Alarm output, max. voltage 30 Vdc, max. current 100 mA
Input Signals:	Command (setpoint) that drives the control valve, either 4-20 mA or 0-5 Vdc input signals
	Valve Override 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 forced closed
Power Requirements:	Voltage: +14 to 27 Vdc ⁽¹²⁾
Nominal Current:	Controller: 300 mA to 400 mA Meter: 100 mA to 150 mA
Maximum Current:	Controller: 715 @ 14 Vdc Meter: 470 mA @ 14 Vdc
Maximum Power:	Controller: 10.0 W Meter: 6.6 W

Additional Functions and 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, Approvals and Compliance

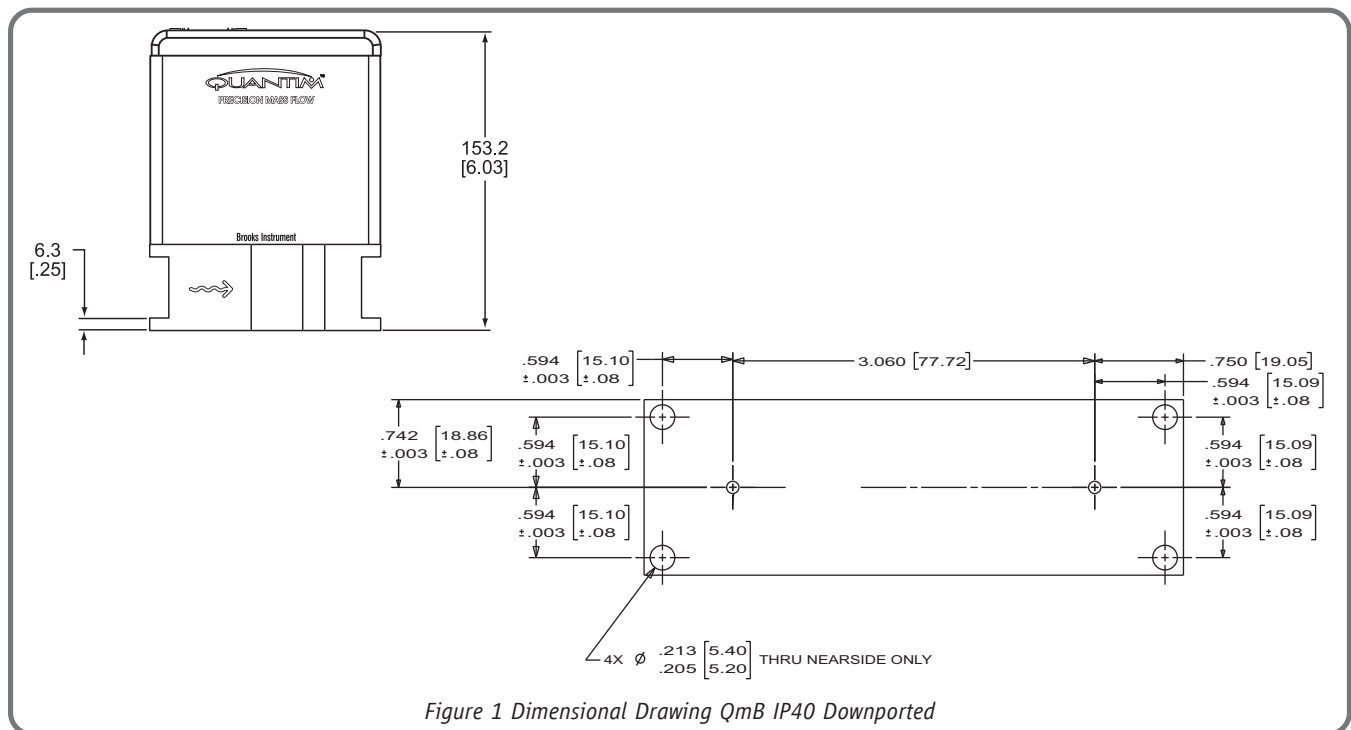
IP40 Series:	<i>US and Canada</i>	UL Recognized E73889, Vol 3, Section 3. Non Incendive, Class I Division 2 Groups A, B, C and D; T4 per UL 1604, UL 508, and CSA 22.2 No. 213 1987; C22.2 No. 14-M91 Ex nC IIC T4 per CSA E79-15
	<i>Europe</i>	KEMA 04ATEX1241 X II 3G EEx nA II T4 per EN 60070-15: 2003
IP66 Series:	<i>US and Canada</i>	UL Recognized E73889, Vol 1, Section 26 (conduit entry) UL E73889, Vol. 3, Section 3 (cable gland entry) Non Incendive, Class I Division 2 Groups A, B, C and D; Dust Ignition-Proof, Class II, Division 2, Groups F and G; Suitable for Class III, Division 2, T4 per UL 1604, UL 508, and CSA 22.2 No. 213 1987; C22.2 No. 14-M91 Ex nC IIC T4 per CSA E79-15
	<i>Europe</i>	Class 1, Zone 2, AEx nC IIC T4 per ANSI/UL 60079-15 II 3 G EEx nA II T4 and II 3D T 135°C per EN 60079-15: 2003 and EN 50281-1-1: 1998 + A1
IP66XP Series:	<i>US and Canada</i>	UL Recognized E73889, Vol 1, Section 21. UL E73889, Vol. 3, Section 3 (cable gland entry) Explosion-Proof, Class I Division 1 Groups C and D; Dust Ignition-Proof, Class I, Division 1, Groups E, F and G; Suitable for Class III, Division 1, T4 per ANSI/UL 1203 and CSA 22.2 No. 30 Ex nC IIC T4 per CSA E79-15
	<i>Europe</i>	Class 1, Zone 2, AEx nC IIC T4 per ANSI/UL 60079-15 II 2 G EEx d IIB T6 and II 2 D T 85°C per EN 50014, EN 50018 and EN 50281-1-1
Environmental Compliance	EMC Directive 89/336/EEC per EN 50081-2 and EN 61326-1	
Pressure Effects Compliance	Pressure Equipment Directive 97/23/EC "Sound Engineering Practice"	

Product Specifications

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 twice nominal flow rate or the laminar to turbulent transition flow whichever is lower.
- (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, and hysteresis. 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) Differential pressures are based on reference conditions of water and air at 68 to 77°F (20 to 25°C).
- (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) 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.

Product Dimensions

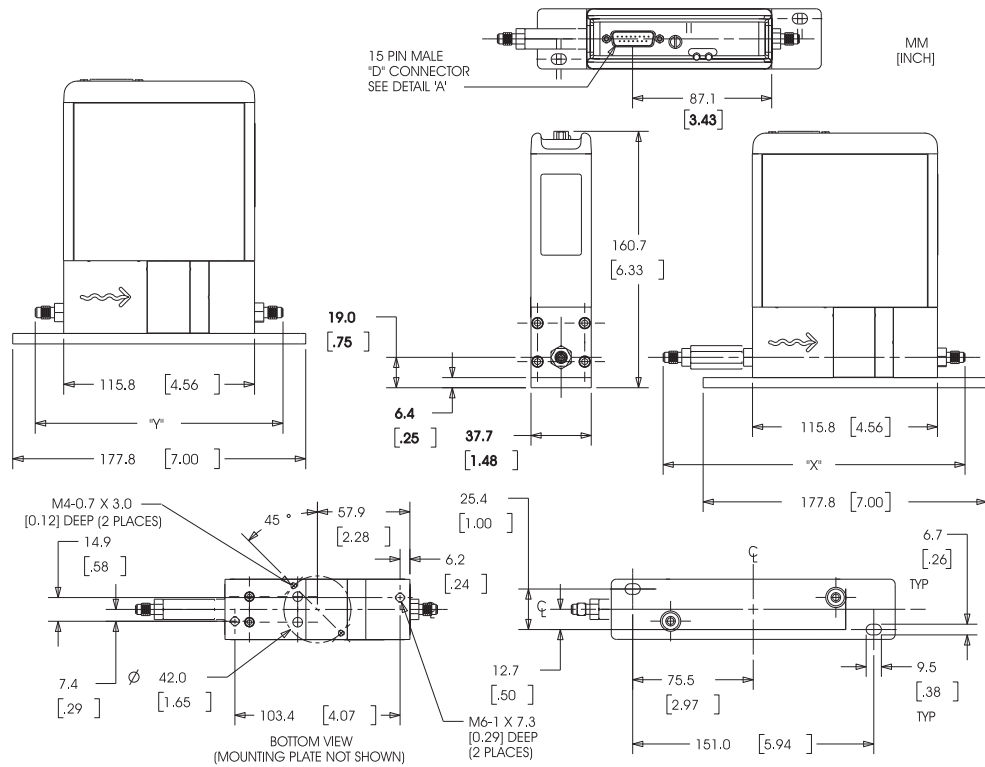


Quantim Patent Numbers as follows:

Argentina AR026329B1, AR021594B1
 Australia 778137, 771345, 782183
 Canada 2389433
 China ZL00817949.2, 171140
 Federation of Russia 2272257, 2263284, 2277227
 Germany 40004270.3
 Hong Kong HK1051720
 India 199406
 Indonesia 3660/2006, ID0015789
 Japan 1111950, 3904926

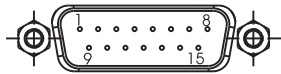
Malaysia MY-128330-A
 Mexico 242129, 244688, 231280
 Singapore 122105, 123306, 88632, 81430
 South Korea 678430
 Switzerland 127118
 UK 2092458
 US D436876, 4843890, 4996871, 5231884, 5295084,
 5555190, 5687100, 5929344, 6226195, 6476522, 6487507,
 6505131, 6505135, 6512987, 6513392, 6526839, 6748813,
 6769301, 7032462, 7111519, 7117751
 Counterparts in other countries and other patents pending

Product Dimensions



See Figure 4 for "X" and "Y" Lay-In Dimensions

Figure 2 Dimensional Drawing Qmb IP40



D-CONNECTOR CONNECTIONS

PIN #	FUNCTION
1	SETPOINT COMMON
2	0-5 VDC FLOW SIGNAL OUTPUT
3	(ITL) OPEN COLLECTOR ALARM OUTPUT
4	*4-20 MA FLOW SIGNAL OUTPUT
5	+14.0 VDC TO +27 VDC POWER SUPPLY
6	NOT USED
7	*4-20 MA SETPOINT INPUT (+)
8	0-5 VDC SETPOINT INPUT (+)
9	POWER SUPPLY COMMON
10	SIGNAL OUTPUT COMMON
11	+5 VOLT REFERENCE OUTPUT
12	VALVE OVERRIDE INPUT
13	*4-20 MA OR 0-5 VDC DENSITY OR TEMPERATURE
14	NOT USED
15	NOT USED

*DO NOT APPLY POWER TO THESE PINS.

Figure 3 D-Connector Electrical Pin Connections

LAY-IN DIMENSIONS	INTEGRAL VALVE		REMOTE VALVE	
FITTING	"X" Dimension	"Y" Dimension	"X" Dimension	"Y" Dimension
1/16" Tube Compression	184.1 [7.25]*	151.9 [5.98]*	340.1 [13.39]	307.9 [12.12]
	167.3 [6.59]**	135.1 [5.32]**	323.3 [12.73]	291.1 [11.46]
1/8" Tube Compression	192.7 [7.59]*	160.5 [6.32]*	348.7 [13.73]	316.5 [12.46]
	167.3 [6.59]**	135.1 [5.32]**	323.3 [12.73]	291.1 [11.46]
1/4" Tube Compression	197.3 [7.77]*	165.1 [6.50]*	353.6 [13.92]	321.4 [12.65]
	166.8 [6.57]**	134.6 [5.30]**	323.1 [12.72]	290.9 [11.45]
6 mm Tube Compression	197.6 [7.78]*	165.4 [6.51]*	353.9 [13.93]	321.7 [12.67]
	167.0 [6.78]**	134.8 [5.31]**	323.2 [12.72]	291.0 [11.46]
1/8" NPT (F)	179.9 [7.08]	147.7 [5.81]	335.9 [13.22]	303.7 [11.96]
1/4" NPT (F)	189.3 [7.45]	157.1 [6.19]	345.3 [13.59]	313.1 [12.33]
1/8" VCR	182.6 [7.19]	150.4 [5.92]	338.6 [13.33]	306.4 [12.06]
1/4" VCR	200.9 [7.91]	168.7 [6.64]	356.2 [14.02]	324.0 [12.76]
1/4" VCO	188.2 [7.41]	156.0 [6.14]	344.2 [13.55]	312.0 [12.28]
3.2MM UPG	N/A	150.3 [5.92]	N/A	N/A
ANSI/ISA 76.00.02	N/A	Contact Factory	Not Available	

* OVERALL LENGTH FINGER TIGHT

** OVERALL LENGTH DIMENSION IS TO THE INTERNAL TUBE LOCATING SHOULDER

MM [INCH]

Figure 4 Lay-In Dimensions Integral and Remote Valves

Product Dimensions

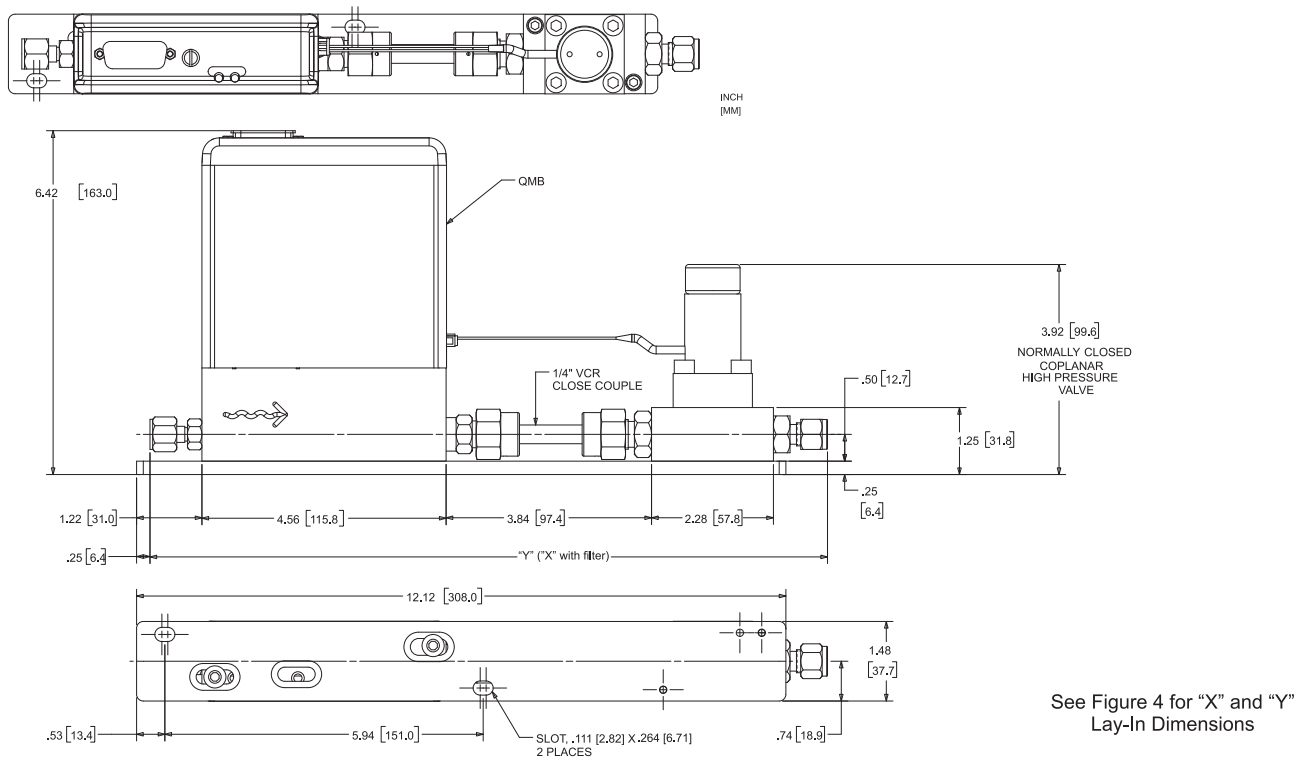


Figure 5 Dimensional Drawing Qmb IP40 with Remote Valve

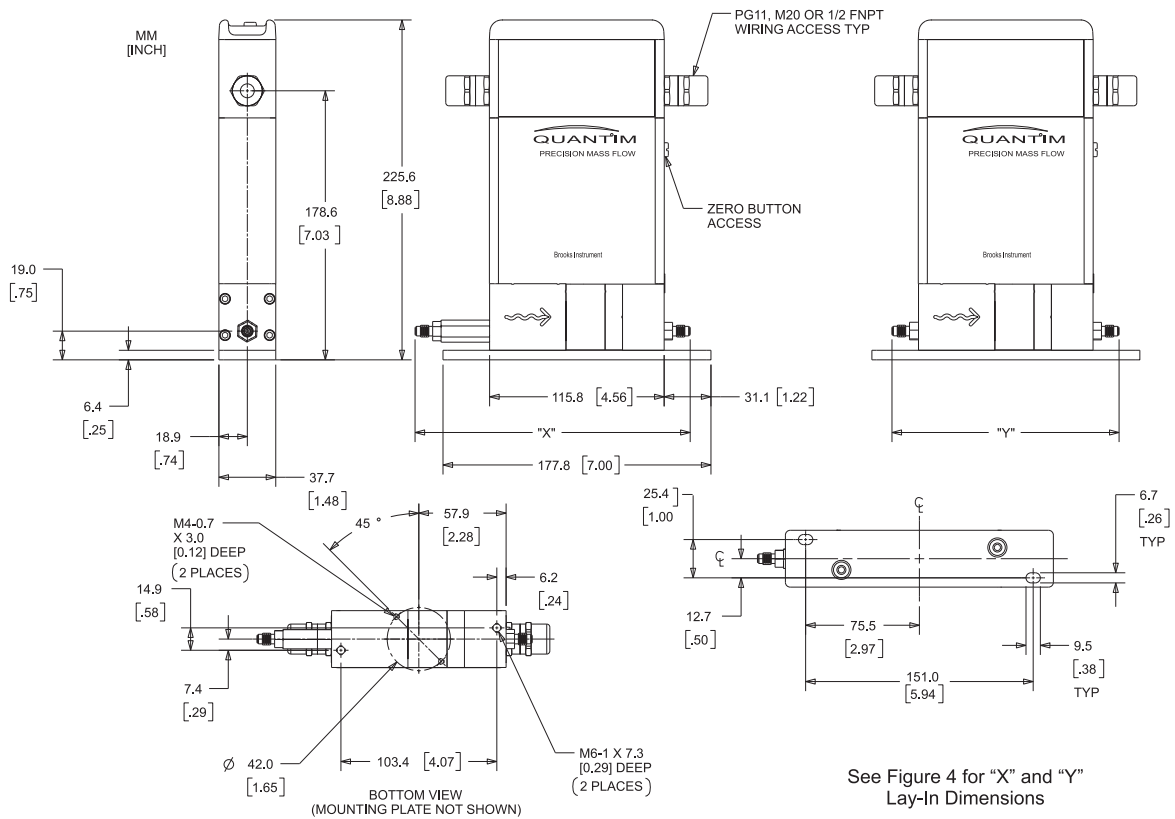


Figure 6 Dimensional Drawing Qmb IP66

Product Dimensions

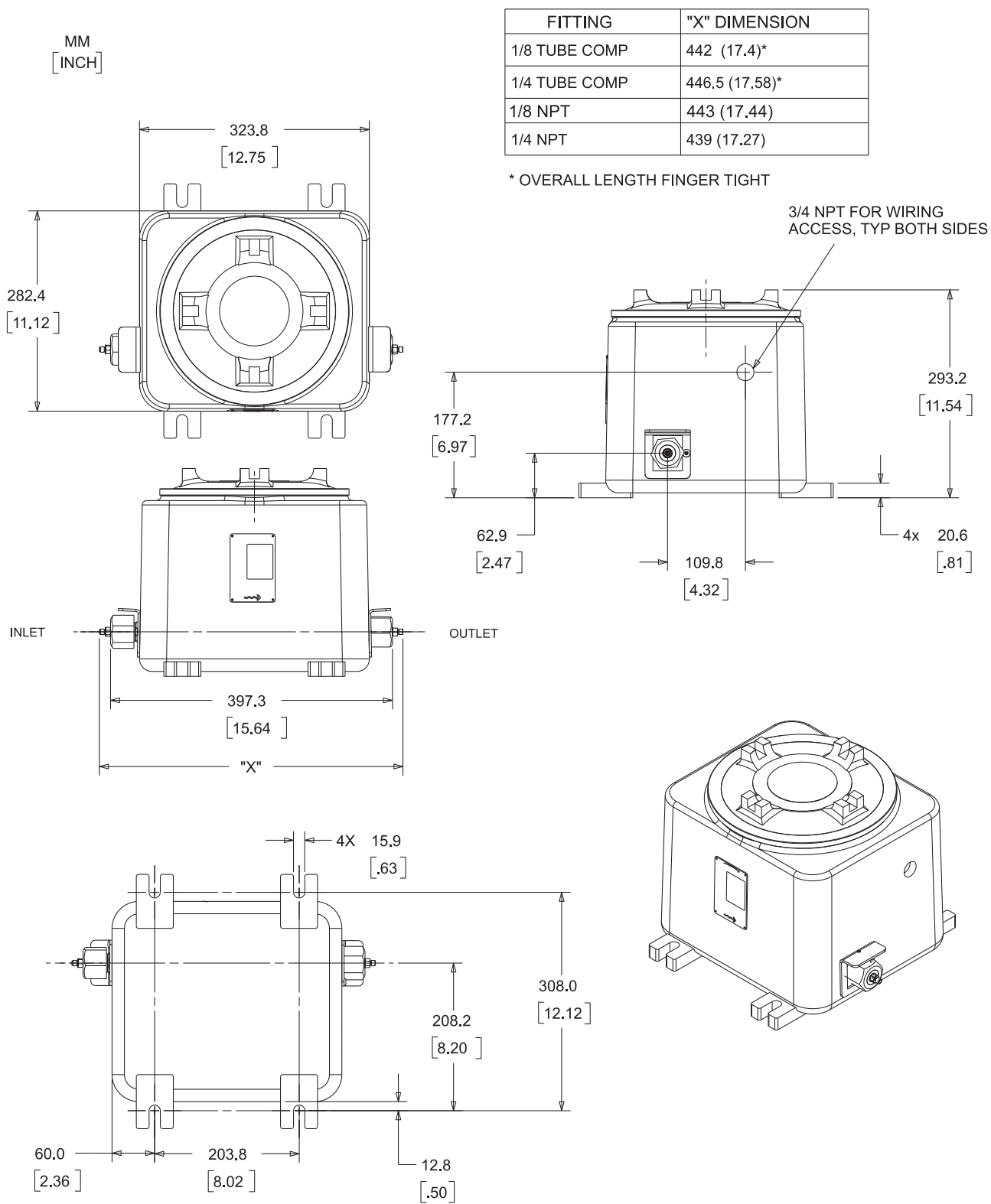


Figure 7 Dimensional Drawing QmB IP66XP

Model Code

Code Description		Code Option	Option Description			
I.	Base Model Code	QMBC	flow controller			
		QMBM	flow meter			
II.	Tube Size		meter nominal flow		controller nominal flow	
			liquid	gas	liquid	gas
		2	190 grams/hr	1432 sccm	150 grams/hr	1051 sccm
		3	1.00 kg/hr	5.595 slpm	780 grams/hr	2.96 slpm
		4	13.5 kg/hr	53.12 slpm	7.97 kg/hr	24.79 slpm
III.	Fluid Type	G	gas	Note: select primary fluid type. User can switch from		
		L	liquid	liquid to gas and vice-versa. Rezeroing is required.		
IV.	Pressure Transducer	1	no transducer			
V.	Valve Type	A	no valve (product type = flow meter/controller)			
		B	normally closed internal valve			
VI.	Accuracy	2	standard 0.2% of rate	liquid & stainless steel		
		3	optional 0.5% of rate	liquid & stainless steel		
		3	standard 0.5% of rate	gas or Hastelloy		
		4	optional 1.0% of rate	gas or Hastelloy		
VII.	Enclosure		Type	Area Classification		
		A	NEMA 4X IP40			
		B	NEMA 4X IP40	Class 1 Div 2 Zone 2		
		C	NEMA 4X IP66			
		D	NEMA 4X IP66	Class 1 Div 2 Zone 2		
E	NEMA 4X IP66XP	Div 1 Zone 1				
VIII.	Surface Finish	1	standard surface finish (32 rA)			
IX.	Sensor Tube Material	A	stainless steel 316L			
		B	Hastelloy, C22 (tubes only)			
X.	Maximum Pressure Rating	1	35 bar or 500 psi			
		2	100 bar or 1500 psi			
		3	300 bar or 4500 psi tube material - Hastelloy (meter)			
XI.	Maximum Temperature Rating	A	65 Deg. C (149 Deg F)			
XII.	Process Connections	1 A	standard body connections 5/16" -24 UNF			
		1 B	1/16" tube compression fittings			
		1 C	1/4" tube compression fittings			
		1 D	1/8" tube compression fittings			
		1 G	6mm tube compression fittings			
		1 J	1/8" NPT			
		1 K	1/4" NPT			
		1 L	1/8" VCR			
		1 M	1/4" VCR			
		1 P	1/4" VCO			
		1 Y	downport ANSI/ISA - 76.00.02			
		2 A	3.2mm UPG			
XIII.	Electrical I/O - Communications		Primary Output	Secondary Output		
		A	0-5 Vdc	4-20 mA		
		B	4-20 mA	4-20 mA		
		C	0-5 Vdc	0-5 Vdc		
		H	HART/4-20mA	HART/4-20mA		
XIV.	Electrical Connection	1	15 pin D-type	Enclosure NEMA 1/IP40		
		3	PG11 cable gland	Enclosure NEMA 1/IP65		
		4	1/2" FNPT conduit	Enclosure NEMA 1/IP65		
		6	M20 FNPT conduit	Enclosure NEMA 1/IP65		
		8	3/4" FNPT conduit	Enclosure Ex-Proof		
XV.	Seals		Sensor	Valve Stem	Fitting	Orifice Seal
		A	Viton	Viton	Viton	Stainless Steel
		B	Buna	Buna	Buna	Stainless Steel
		C	Kalrez	Kalrez	Kalrez	Stainless Steel
		E	EPDM	EPDM	EPDM	Stainless Steel
		F	Nickel	Nickel	Viton	Stainless Steel
		G	Nickel	Nickel	Buna	Stainless Steel

Model Code continued

XV. Seals (continued)		Sensor	Valve Stem	Fitting	Orifice Seal
	H	Nickel	Nickel	Kalrez	Stainless Steel
	J	Nickel	Nickel	EPDM	Stainless Steel
	K	Nickel	Nickel	Nickel	Stainless Steel
XVI. Valve Seat Material	1	none (meter)			
	7	material 17-7PH Stainless Steel (controller)			
XVII. Special Processing	A	none			
	B	certified material 2.2 EN 10204			
	C	certified material 3.1 EN 10204			
	D	cleaning for oxygen service			
	E	cleaning for oxygen service + certified material 2.2 EN 10204			
	F	cleaning for oxygen service + certified material 3.1 EN 10204			
XVIII. Quality Certifications	1	none			
	2	calibration certificate traceable to NIST			
	3	calibration measurement capability certificate (NMI)			
	4	certificate of conformance			
	5	calibration certificate traceable to NIST + certificate of conformance			
	6	calibration measurement capability certificate + certificate of conformance			
XIX. Inline Filter	A	none (metal seal or downport)			
	B	inline filter cartridge filter, 10 micron (recommended for QMBC2)			
	C	inline filter cartridge filter, 20 micron			
	D	inline filter cartridge filter, 30 micron			
	E	inline filter cartridge filter, 40 micron			
	F	inline filter cartridge filter, 1 micron (recommended for QMBC2)			
XX. OEM Code	A	Brooks			
	N	no logo			

Sample Model Code

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

HELP DESK

In case you need technical assistance:

Americas ☎ 1 888 554 FLOW
Europe ☎ +31 (0) 318 549 290
Asia ☎ +81 (0) 3 5633 7100

Due to Brooks Instrument's commitment to continuous improvement of our products, all specifications are subject to change without notice.
Visit www.BrooksInstrument.com for the service center nearest to you.

DS-CM-QmB-eng (0711)

TRADEMARKS

Brooks Brooks Instrument, LLC
DeviceNet Open DeviceNet Vendors Association, Inc.
HART HART Communication Foundation
Hastelloy Haynes International Co.
Kalrez DuPont Performance Elastomers
ODVA Open DeviceNet Vendors Association, Inc.
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