DS-CM-QmB-eng
January, 2017

Data Sheet

Quantim® Series

Model QmB IP40

Coriolis Mass Flow

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 0.001 to more than 27 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 Alloy C-22 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 and liquid measurement and control capability in one package	The ultimate in process flexibilty
Variety of options, enclosure types and area classifications available	The right product for your application

Features and Benefits

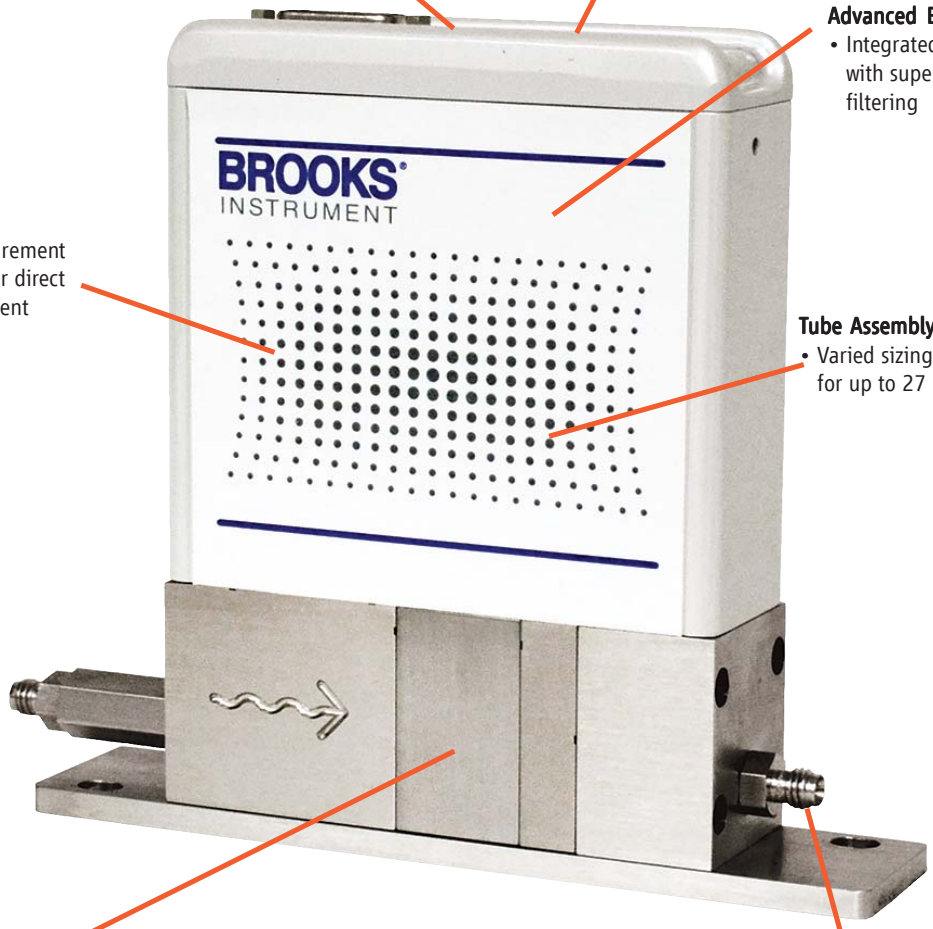
Diagnostic Alarms and Warnings
- Provides early indication of potential process issues for preventative action

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



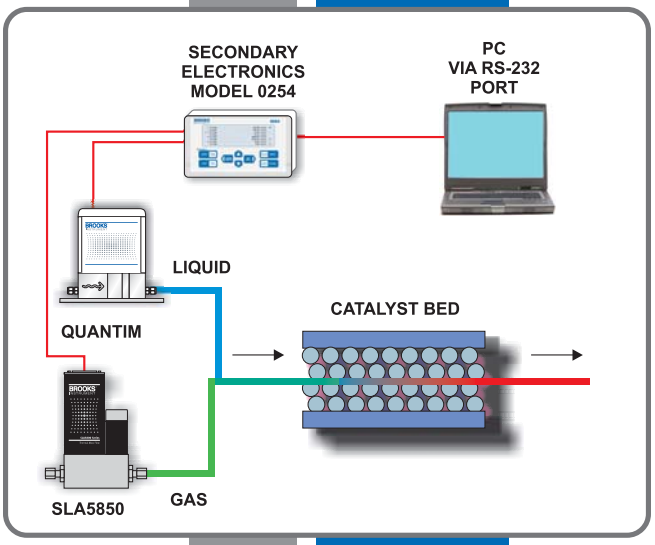
Coplanar Valve
- Super-fast response times (<400 msec typical)
- Minimum valve leak-by (<0.2% FS)

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

Product Applications

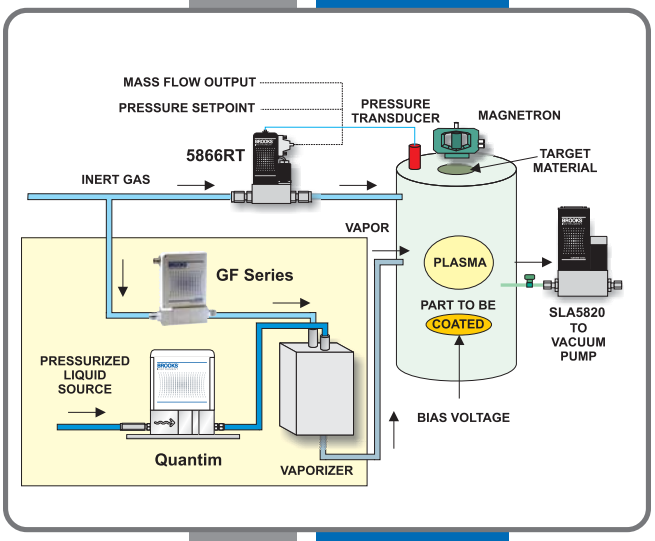
Catalyst Research

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.

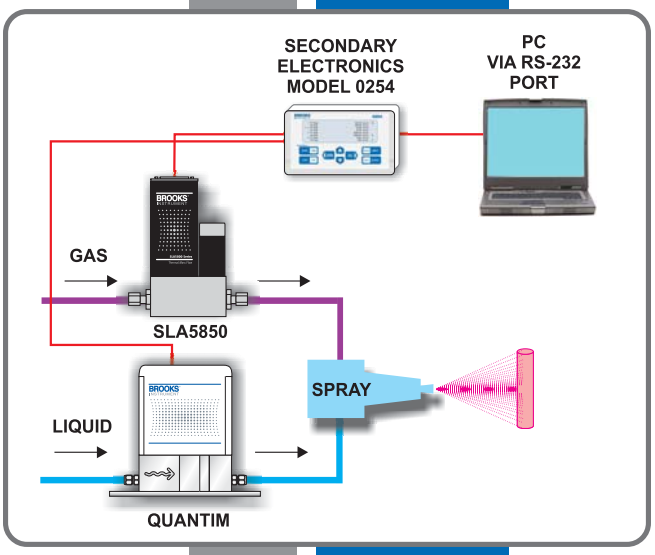


Precision Coating

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.

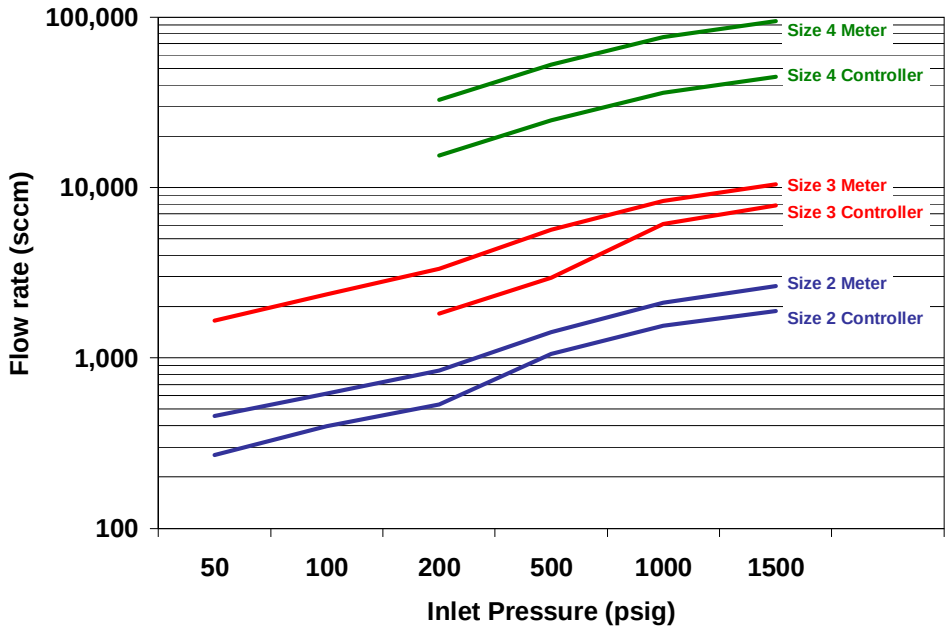
The Brooks Model 0254 secondary electronics may be used to provide power, local display, and setpoint for both flow devices. The liquid density measurement, used for quality control, is also displayed. A totalizer function may be used to track liquid inventory to ensure that the process supply does not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

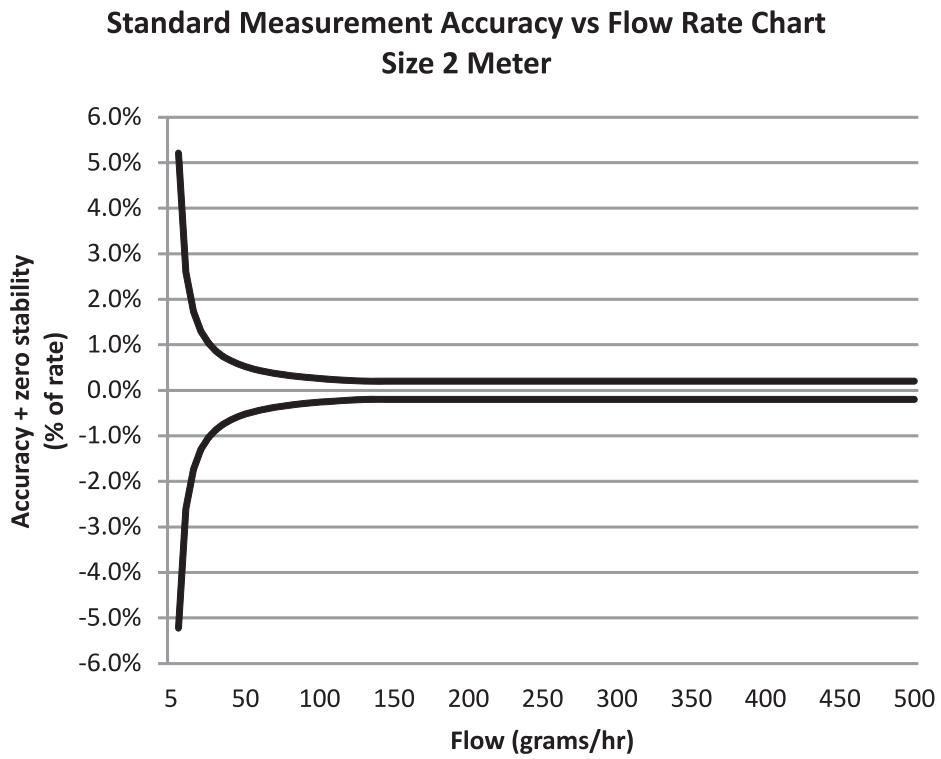


Product Specifications

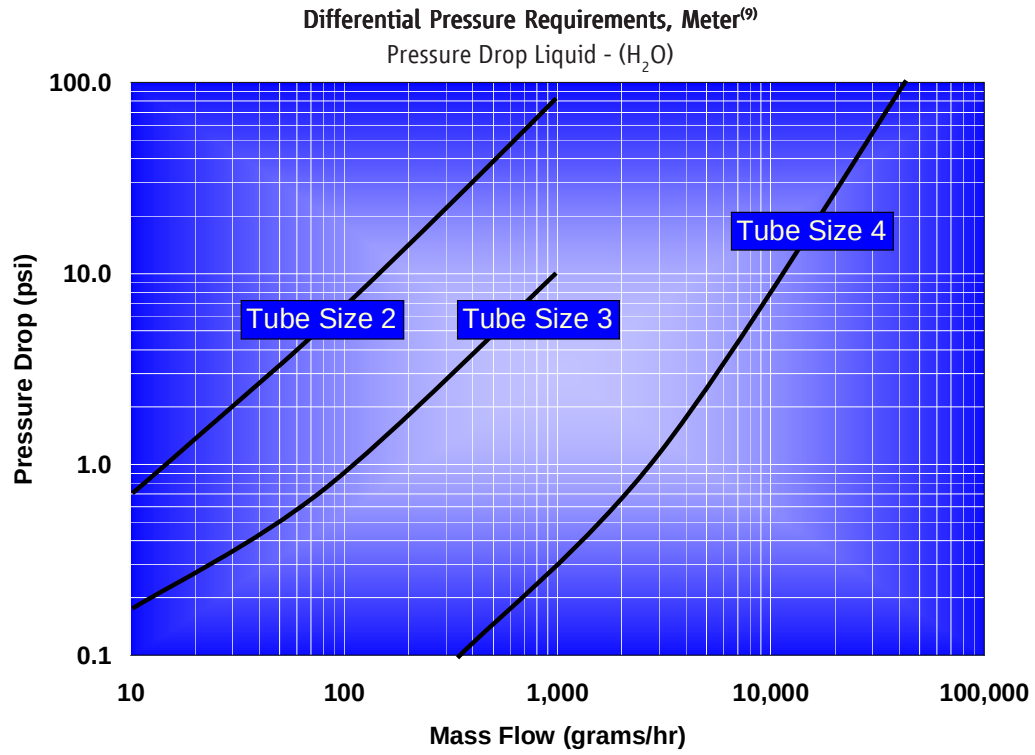
Performance Specifications

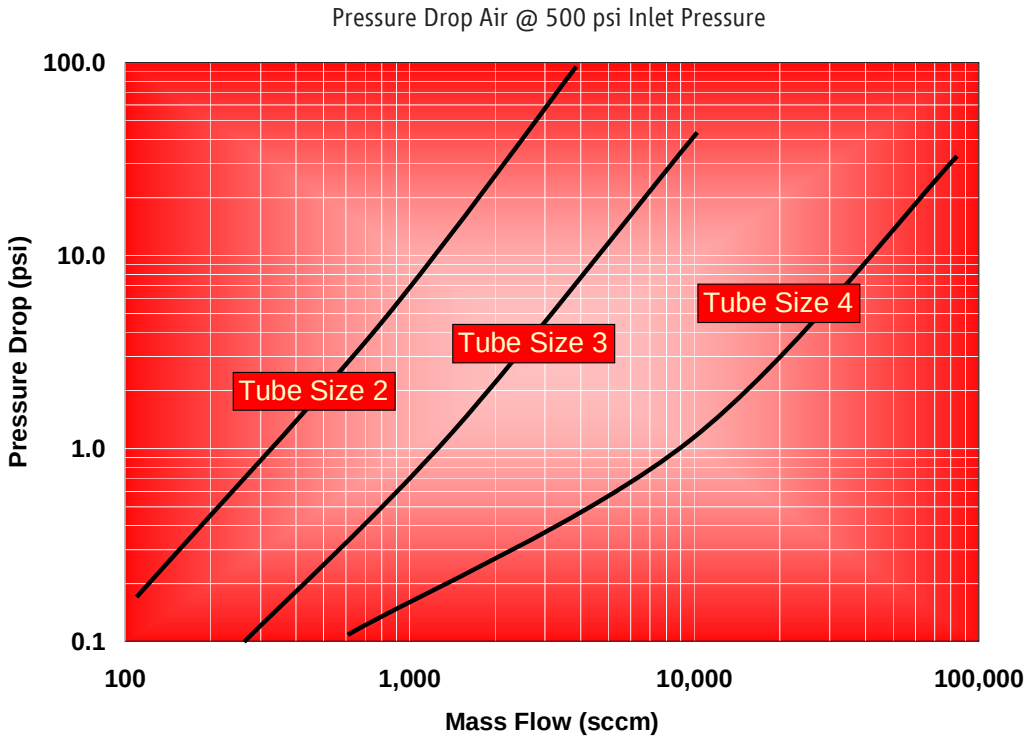
Gas Flow Limits: Air, 70°F (21°C), 14.5 psi (1 Bar) pressure drop





Product Specifications





Product Specifications

Performance

	QMBC (Controller)			QMBM (Meter)		
Tube Size:	**2**	**3**	**4**	**2**	**3**	**4**
Nominal Flow Range:						
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
Minimum Measurable Flow Liquid (kg/hr)	0.001	0.010	0.100	0.001	0.010	0.100

Zero Stability:	QMBC (Controller)			QMBM (Meter)		
Stainless Steel Sensor (kg/hr):	0.00026	0.0020	0.0120	0.00026	0.0020	0.0120
Alloy C-22 Sensor (kg/hr):	0.0004	0.0030	0.0240	0.0004	0.0030	0.0240

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,	Stainless Steel: <2 seconds	<0.5 seconds
(per SEMI Guideline E17-91)	Alloy C-22: <12 seconds	<0.5 seconds

Flow Accuracy (Standard Flow):	Standard Flow Accuracy or [(zero stability/flow rate) x 100]% of rate, whichever is greater
Stainless Steel Sensor:	Liquid: 0.2% Gas: 0.5% of rate
Hastelloy Sensor:	Liquid: 0.5% Gas: 0.5% of rate

Ratings

Operating Temperature Range:	0 to 60°C
Temperature Accuracy:	± 0.5°C
Differential Pressure Range:	Liquid: 10 to 200 psi
	Gas: 10 to 150 psi
Density Range:	0 to 0.3 and 0.5 to 2.0 g/cc
Density Accuracy:	± 0.005 g/cc
Maximum Operating Pressure:	
Standard:	500 psi
Optional:	1500 psi
Optional:	4500 psi
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
Optional:	Alloy C-22 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[3]
	And simultaneously available 4-20 mA or 0-5 Vdc active ouput 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:	*US and Canada*	
		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; C-22.2 No. 14-M91 Ex nC IIC T4 per CSA E79-15
	Europe	
		KEMA 04ATEX1241 X II3G Ex nA II T4 per EN 60070-15: 2003
IP66 Series:	*US and Canada*	
		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; C-22.2 No. 14-M91 Ex nC IIC T4 per CSA E79-15 Class 1, Zone 2, AEx nC IIC T4 per ANSI/UL 60079-15
	Europe	
		ATEX 4 IECEx II 3 G Ex nA II T4 and II 3D T 135°C per EN 60079-0: 2006, EN 60079-15: 2005, EN 61241-0: 2006, EN 61241-1: 2004, IEC 60079-0: 2004, IEC 60079-15: 2005, IEC 61241-0: 2004, IEC 61241-1: 2004
IP66XP Series:	*US and Canada*	
		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 Class 1 Zone 1, ex d IIB per CSA E600 79-0, CSA E60079-1 Class 1 Zone 1, AEx d IIB per UL 60079-0, UL 60079-1
	Europe	
		II 2 G Ex d IIB T6 and II 2 D T 85°C per EN 60079-0: 2006, EN 60079-1: 2007, EN 61241-0: 2006, EN 61241-1: 2004
Environmental Compliance		EMC Directive 2004/108/EC per EN 61326-1: 2006
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 70ºF.

(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 77ºF (20 to 25ºC) and 15 to 30 psig (1 to 2 bar).

(5) Differential pressures are based on reference conditions of water and air at 68 to 77ºF (20 to 25ºC).

(6) The density measurement at temperatures other than 21ºC (70ºF) has an additional error of approximately 0.0005 grams/cc per ºC.

(7) A temperature rise of up to 20ºC (68ºF) from internal heating can occur in an open environment where ambient temperature is 23ºC (73ºF). 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 - QmB IP40 - Downported

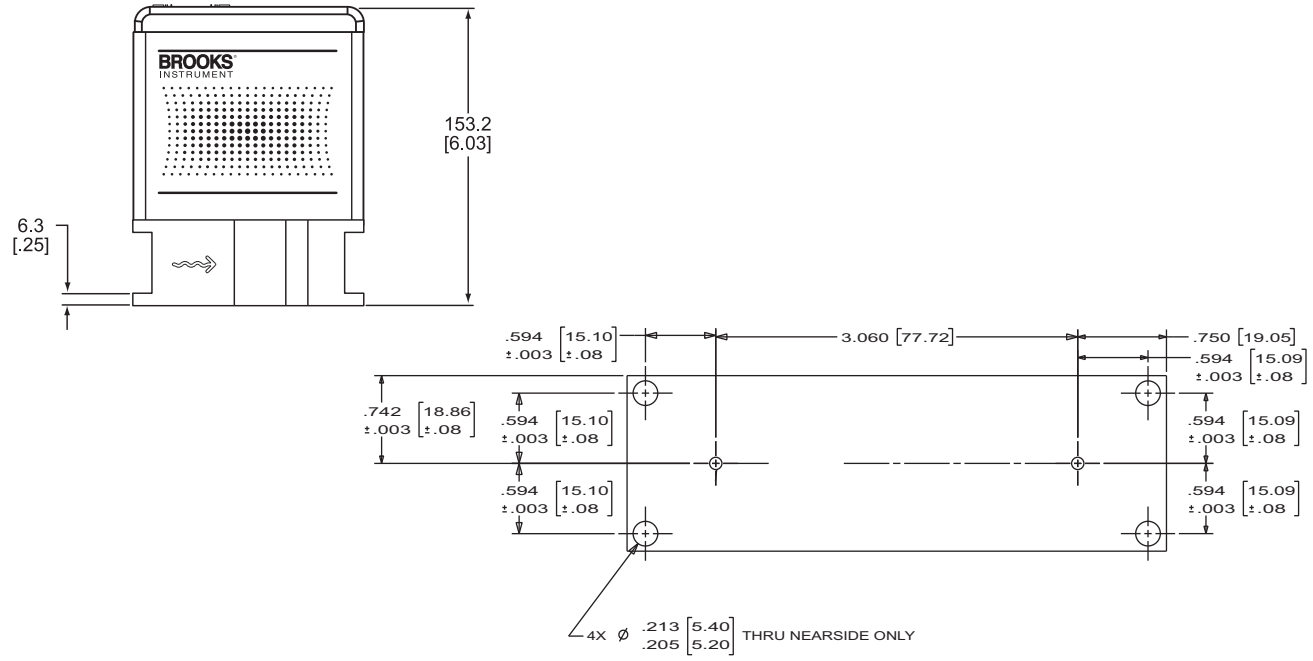


Figure 1 Dimensional Drawing QmB IP40 Downported

Quantim Patent Numbers as follows:

ArgentinaAR026329B1, ... 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 - QmBIP40 - Thru-Flow

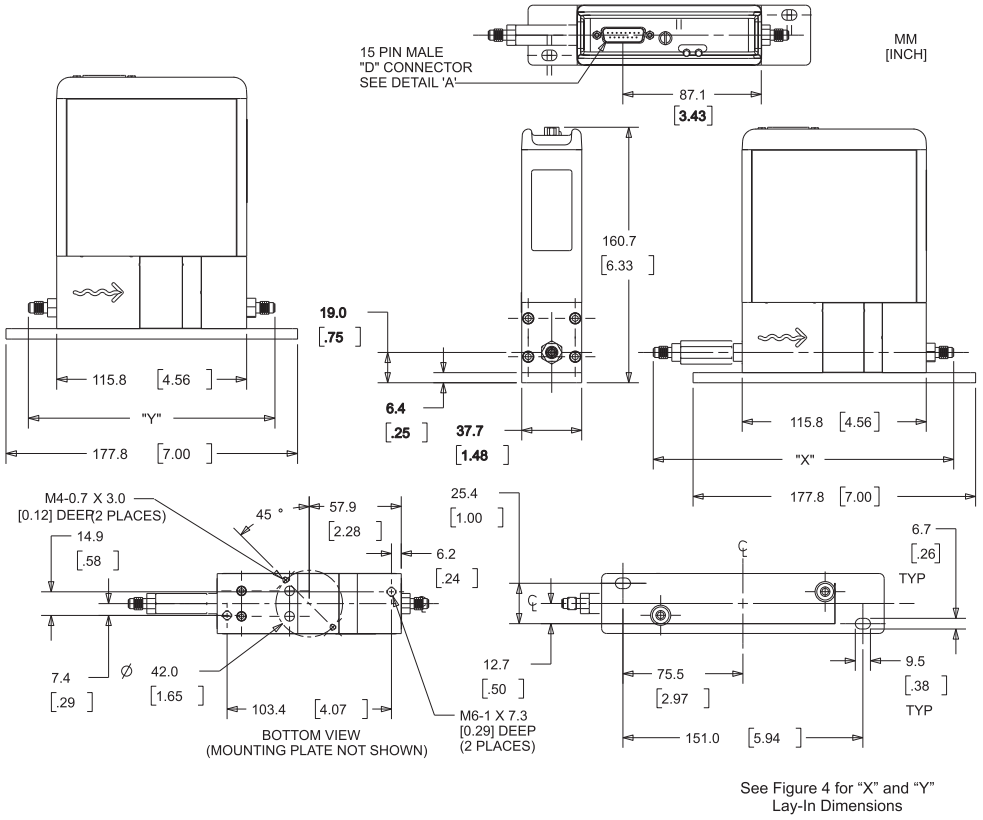
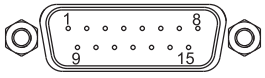


Figure 2 Dimensional Drawing QmB IP40



D-CONNECTOR CONNECTIONS

PIN #	FUNCTION
1	SETPOINT COMMON
2	*0-5 VDC FLOW SIGNAL OUTPUT
3	(TTL) 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]* 167.3 [6.59]**	151.9 [5.98]* 135.1 [5.32]**	340.1 [13.39] 323.3 [12.73]	307.9 [12.12] 291.1 [11.46]
1/8" Tube Compression	192.7 [7.59]* 167.3 [6.59]**	160.5 [6.32]* 135.1 [5.32]**	348.7 [13.73] 323.3 [12.73]	316.5 [12.46] 291.1 [11.46]
1/4" Tube Compression	197.3 [7.77]* 166.8 [6.57]**	165.1 [6.50]* 134.6 [5.30]**	353.6 [13.92] 323.1 [12.72]	321.4 [12.65] 290.9 [11.45]
6 mm Tube Compression	197.6 [7.78]* 167.0 [6.78]**	165.4 [6.51]* 134.8 [5.31]**	353.9 [13.93] 323.2 [12.72]	321.7 [12.67] 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 - QmB IP40 with Remote Valve & QmB IP66

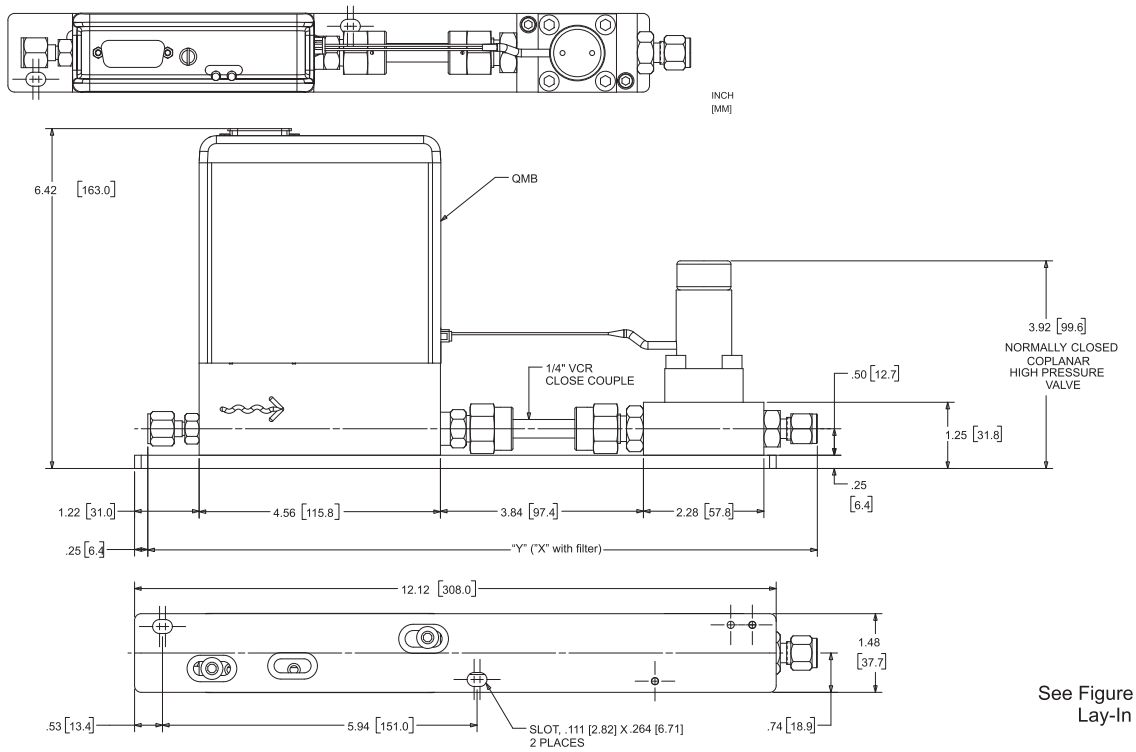


Figure 5 Dimensional Drawing QmB IP40 with Remote Valve

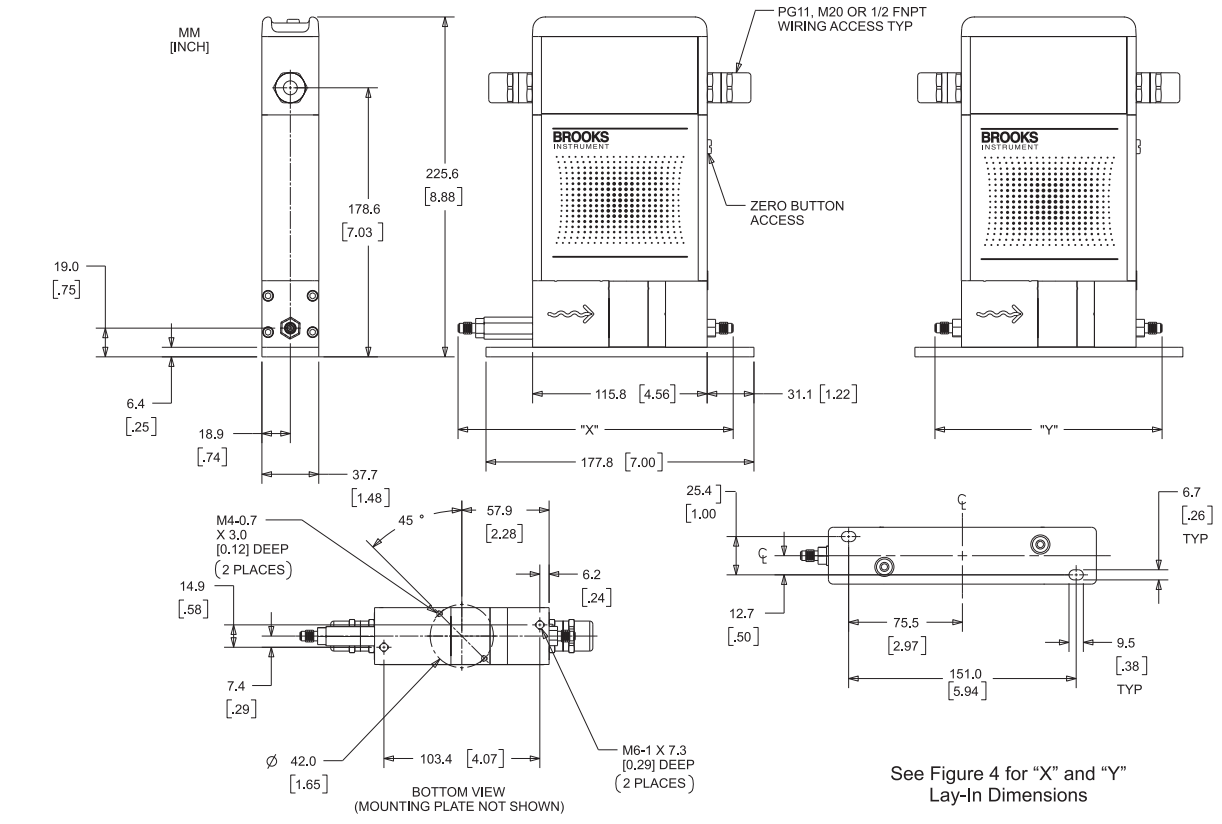


Figure 6 Dimensional Drawing QmB IP66

Product Dimensions - QmB IP66XP

FITTING	"X" DIMENSION
1/8 TUBE COMP	442 (17.4)*
1/4 TUBE COMP	446.5 (17.58)*
1/8 NPT	443 (17.44)
1/4 NPT	439 (17.27)

* OVERALL LENGTH FINGER TIGHT

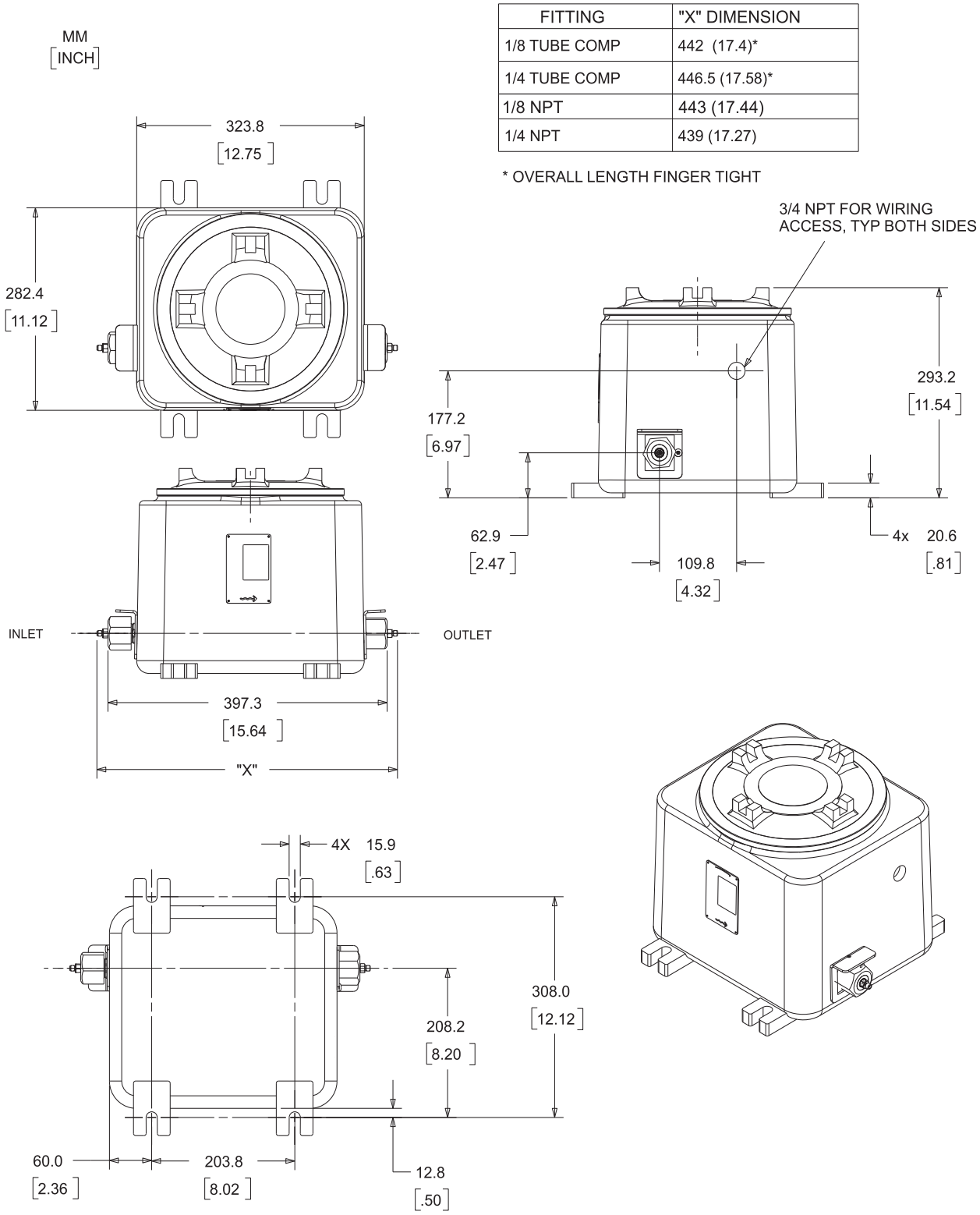


Figure 7 Dimensional Drawing QmB IP66XP

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	
			liqud	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	liquidliquid to gas and vice-versa. Rezeroing is required.	

IV.	Pressure Transducer	**1**	no transducer

V.	Valve Type	**A**	no valve (product type = flow meter)
		B	normally closed internal valve
		C	remote normally closed high pressure

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 1/ IP40	
		B	NEMA 1/ 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	Alloy C-22 (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 - Alloy C-22 (meter)

XI.	Maximum Temperature Rating	**A**	65 Deg. C (149 Deg F)

XII.	Process Connections	**1A**	standard body connections 5/16" -24 UNF
		1B	1/16" tube compression fittings
		1C	1/4" tube compression fittings
		1D	1/8" tube compression fittings
		1G	6mm tube compression fittings
		1J	1/8" NPT
		1K	1/4" NPT
		1L	1/8" VCR
		1M	1/4" VCR
		1P	1/4" VCO
		1Y	downport ANSI/ISA - 76.00.02
		2A	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 4X/ IP66
		4	1/2" FNPT conduit	Enclosure NEMA 4X/ IP66
		6	M20 FNPT conduit	Enclosure NEMA 4X/ IP66
		8	3/4" FNPT conduit	Enclosure NEMA 4X/ IP66XP

XV.	Seals		Sensor	Valve Stem	Fitting	Orifice Seal
		A	Viton	Viton	Viton	Stainless Steel
		B	Buna	Buna	Buna	Stainless Steel
		C	Kalrez 4079	Kalrez 4079	Kalrez 4079	Stainless Steel
		D	Kalrez 6375	Kalrez 6375	Kalrez 6375	Stainless Steel
		E	EPDM	EPDM	EPDM	Stainless Steel
		F	Nickel	Nickel	Viton	Stainless Steel
		G	Nickel	Nickel	Buna	Stainless Steel

(Model Code continued on next page)

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 traceble to NIST
	3	calibration measurement capability certificate (NVLAP)
	4	certificate of conformance
	5	calibration certificate traceble 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

Brooks Service and Support

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.

CUSTOMER 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.

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HART® Operation Manual
X-CM-QmB-HART-eng
Part Number: 541B043AHG
April, 2015

QUANTIM® Precision Mass Flow Meters/Controllers HART® Communication Operation and Set-Up Manual

BROOKS® INSTRUMENT

HART® Operation Manual
X-CM-QmB-HART-eng
Part Number: 541B043AHG
April, 2015

Essential Instructions

Read this page before proceeding!

Brooks Instrument designs, manufactures and tests its products to meet many national and international standards. Because these instruments are sophisticated technical products, you must properly install, use and maintain them to ensure they continue to operate within their normal specifications. The following instructions must be adhered to and integrated into your safety program when installing, using and maintaining Brooks Instrument Products.

- Read all instructions prior to installing, operating and servicing the product. If this instruction manual is not the correct manual, please see back cover for local sales office contact information. Save this instruction manual for future reference.
- If you do not understand any of the instructions, contact your Brooks Instrument representative for clarification.
- Follow all warnings, cautions and instructions marked on and supplied with the product.
- Inform and educate your personnel in the proper installation, operation and maintenance of the product.
- Install your equipment as specified in the installation instructions of the appropriate instruction manual and per applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- To ensure proper performance, use qualified personnel to install, operate, update, program and maintain the product.
- When replacement parts are required, ensure that qualified people use replacement parts specified by Brooks Instrument. Unauthorized parts and procedures can affect the product's performance and place the safe operation of your process at risk. Look-alike substitutions may result in fire, electrical hazards or improper operation.
- Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified persons, to prevent electrical shock and personal injury.

ESD (Electrostatic Discharge)

⚠ CAUTION

This instrument contains electronic components that are susceptible to damage by static electricity. Proper handling procedures must be observed during the removal, installation or other handling of circuit boards or devices.

Handling Procedure:

1. Power to unit must be removed.
2. Personnel must be grounded, via a wrist strap or other safe, suitable means before any printed circuit card or other internal device is installed, removed or adjusted.
3. Printed circuit cards must be transported in a conductive container. Boards must not be removed from protective enclosure until immediately before installation. Removed boards must immediately be placed in protective container for transport, storage or return to factory.

Comments

This instrument is not unique in its content of ESD (electrostatic discharge) sensitive components. Most modern electronic designs contain components that utilize metal oxide technology (NMOS, SMOS, etc.). Experience has proven that even small amounts of static electricity can damage or destroy these devices. Damaged components, even though they appear to function properly, exhibit early failure.

Section 1 Introduction

Section 2 Operation and Setup

Figures

Tables

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1-1 Introduction

This manual provides information about the Brooks® QUANTIM's support of the HART® Communications protocol and only applies to devices equipped with 4-20 mA analog I/O with HART. For complete installation and operation instructions for your QUANTIM Precision Mass Flow Product please see the Installation and Operation Manual provided with your device.

The HART Communication Protocol describes a network of devices that consists of one "Master" device and one or more Slave device(s) which are connected by and communicate using FSK Physical Layer Interface. FSK Physical Layer Interface uses 1200 baud binary phase-continuous Frequency-shift Keying (FSK) resulting in a high frequency current superimposed on the 4-20 mA current output of the device. Brooks' QUANTIM supports HART Revision 5 communications protocol with the FSK Physical Layer Interface and is implemented as a "Slave" device on HART network. QUANTIM cannot be implemented as a "Master" device or support Burst Mode as a "Slave" device.

Any master with a HART compatible modem can communicate with a Brooks QUANTIM Mass Flow Device by using the HART Communications protocol as defined by the HART Communication Foundation. For more information on the HART Communications protocol, visit the HART Communication Foundation website at **www.hartcomm.org.**

Brooks' QUANTIM fully supports the HART Universal Command Set and provides additional functionality via many HART Common Practice commands and product specific commands. Table 2-1 contains a summary of the commands supported by Brooks' QUANTIM. For detailed documentation on the commands supported by Brooks' QUANTIM, contact the factory.

The most common master used for communications is an Emerson HART Handheld Communicator, commonly referred to as the HART Communicator. When connected to a Brooks QUANTIM, the HART Communicator allows the user to view process information and to modify configuration parameters via a series of menus and displays that are customized for Brooks QUANTIM. Functionality available when using a HART Communicator includes:

- Viewing process parameters
  - Mass Flow
  - Density
  - Volumetric Flow
  - Temperature
  - Setpoint
- Re-ranging the Analog Inputs and Outputs
- Triming the Analog Inputs and Outputs
- Zeroing the Flow Sensor
- Output Damping
- Remote Valve Override
- Configuring and Monitoring Alarms
- View device specific information
  - Tag Name
  - Model Number
  - Serial Number

HART Nomenclature

Before proceeding, it is important to understand some important HART "jargon" and how it relates to a Brooks QUANTIM. The Underlined words in the following paragraphs are frequently used HART "jargon".

A **Process Variable** is the process data measured or computed within a device. Brooks QUANTIM has 5 Process Variables: Mass Flow, Density, Volumetric Flow, Temperature, and Setpoint. Each Process Variable has the following common attributes: Value and Unit of Measure. The Units of Measure for each Process Variable is configurable by the user but limited to Units which are meaningful to the Process Variable.

The Process Variables are assigned to four Dynamic Variables: **Primary Variable (PV), Secondary Variable (SV)**, **Tertiary Variable (TV),** and **4th Variable (QV)**. The assignment of Process Variables to Dynamic Variables serves two purposes. First, many commands in the Hart Universal Command Set and many in the Common Practice command set access transmitter information via the Dynamic Variables. This allows some HART masters to access Process Variables generically, without any "inner working" knowledge of the device. Second, the Analog Outputs of a device are associated with the Process Variables via their Dynamic Variable assignments. The Brooks QUANTIM Dynamic Variable assignments are shown in Table 1-1. These assignments are not user configurable.

Table 1-1 Varible Assignments

Process Variable	Dynamic Variable
Mass Flow	PV
Density	SV
Volumetric Flow	TV
Temperature	QV

The Brooks QUANTIM has 2 analog outputs that are designated the **Primary Output** and the **Secondary Output.** The Primary Output will always represent the value of the Primary Variable (PV) and the Secondary Output will always represent the value of the Secondary Variable(SV).

PV and SV each have two attributes for setting the range of the associated analog output. These attributes are **Upper Range Value** (URV) and **Lower Range Value** (LRV). The Upper Range Value attribute defines the value of the PV or SV which will be represented by the analog output as the full-scale value, normally 20 mA. Likewise, the Lower Range Value attribute defines the value of the PV or SV which will be represented by the analog output as the minimum-scale value, normally 4 mA.

Example

A Brooks QUANTIM is configured with:
Upper Range Value is 1000 grams/hr
Lower Range Value is 0 grams/hr
PV is Mass Flow with a current flowrate of 500 grams/hr which is 50% of the range specified by the Upper Range Value and the Lower Range Value. Therefore, the analog output will be set to 50% of its range which, for a 4-20 mA output would be 12 mA.

The Setpoint Process Variable is an unusual variable in that it is associated with an Analog Input instead of an Analog Output. It has Value, Units of Measure, Upper Range Value, and Lower Range Value attributes, just as the Primary Variable and the Secondary Variable have.

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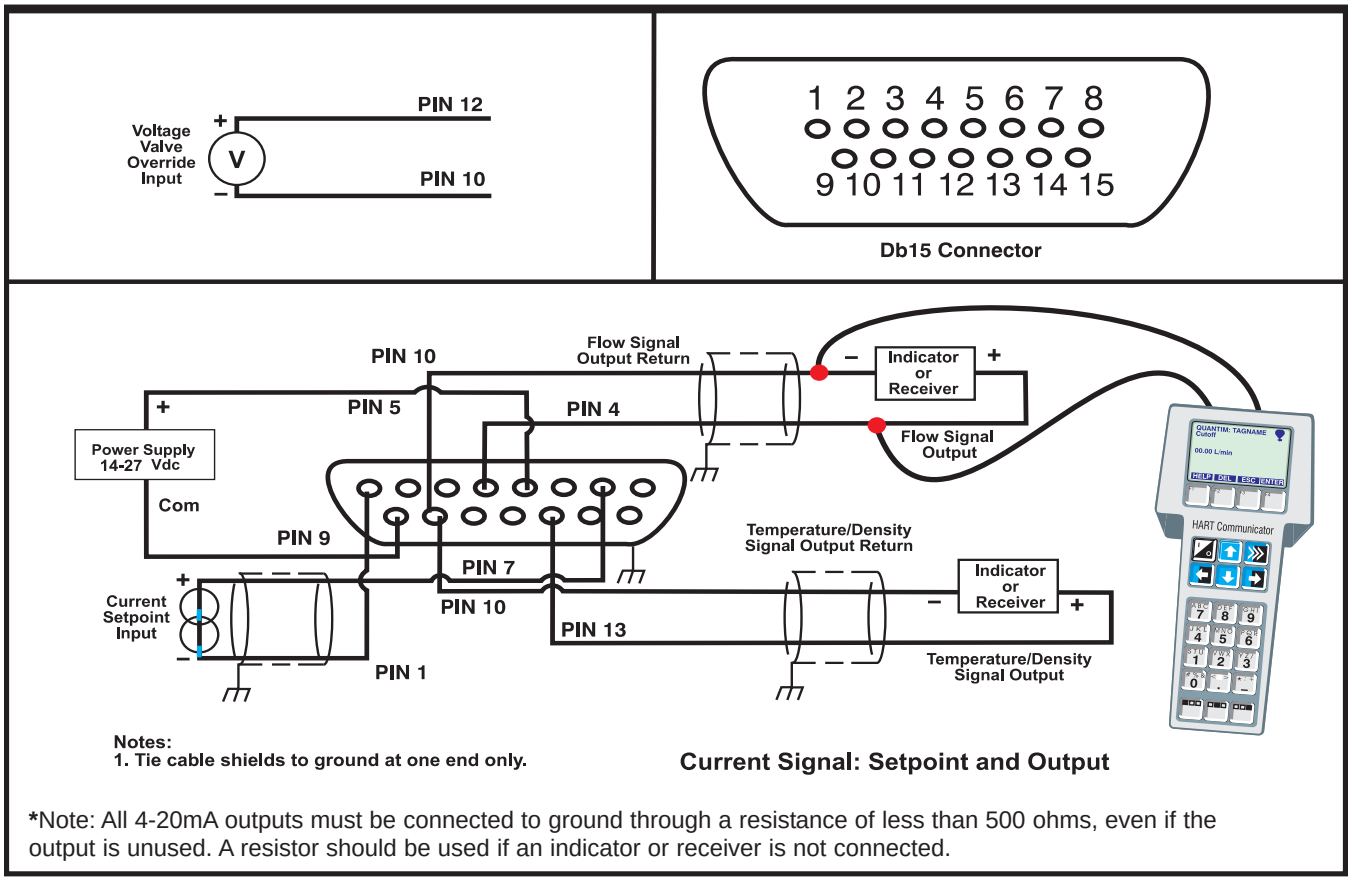
2-1 Connecting a HART® Communicator

Refer to Figure 2-1 for proper wiring of a Brooks QUANTIM™. It is important to note that unlike most HART® compatible transmitters, the Brooks QUANTIM is not a loop powered device. It requires separate power inputs. Thus, the Brooks QUANTIM is able to source current for the Primary and Secondary Analog Outputs.

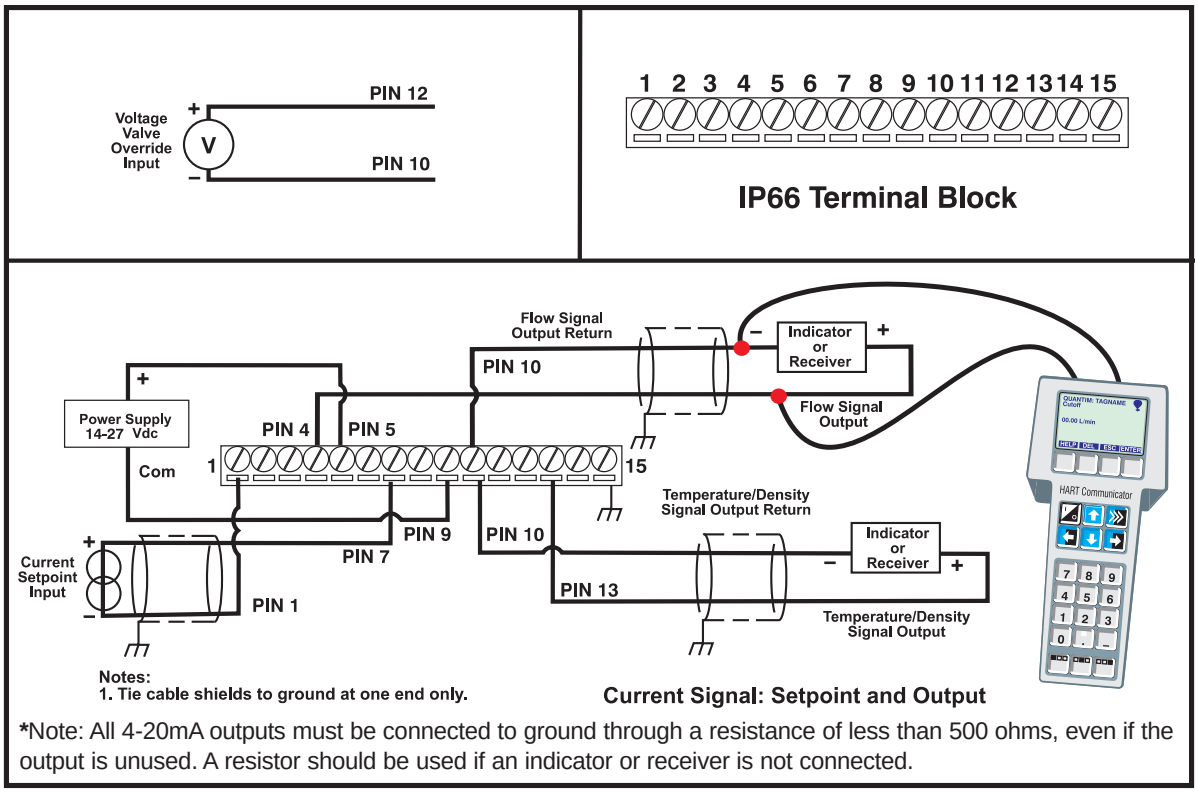
HART Communications is provided on the Primary Output of the Brooks QUANTIM device. Connecting a HART Communicator, or any HART Modem, requires a connection between pins 4 and 10 as shown in Figure 2-1. This connection can be anywhere on the current loop as shown in the diagram.

Push the ON button (labeled I/O) on the HART Communicator to begin communications.



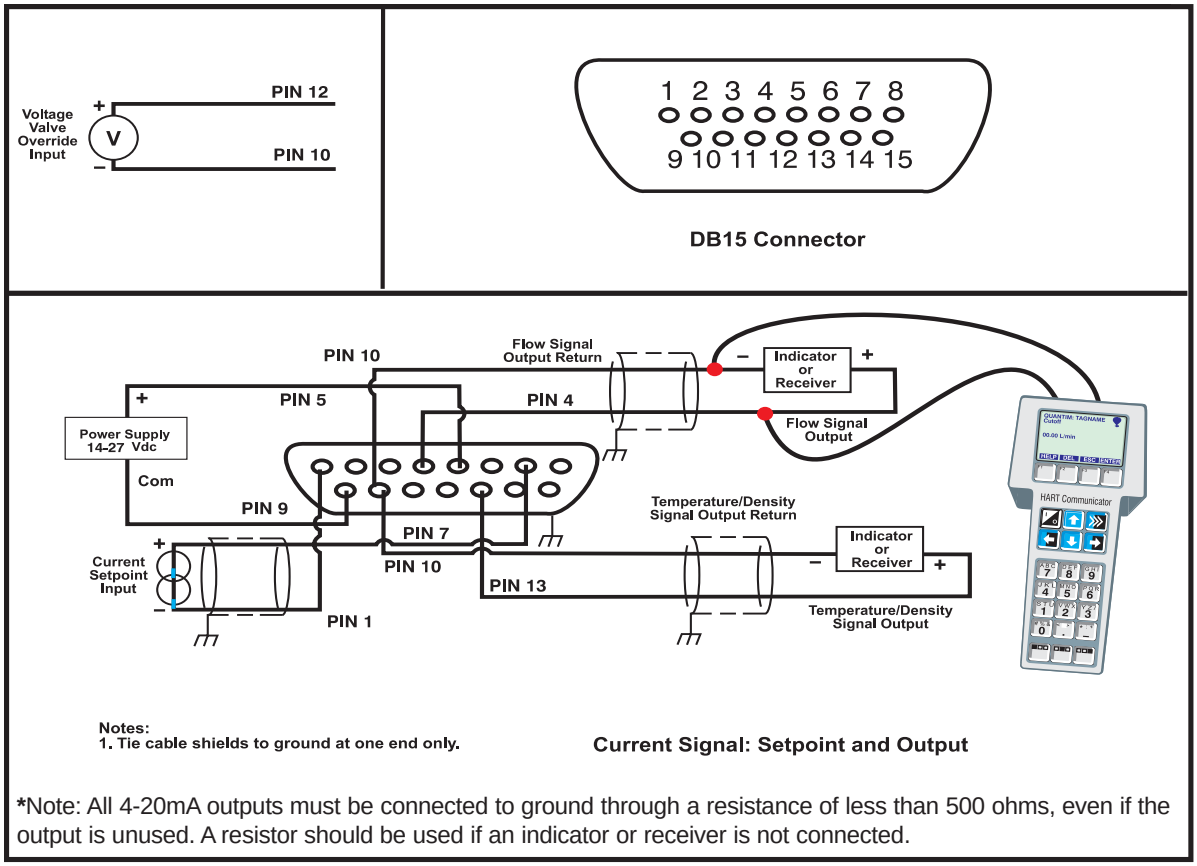
*Note: All 4-20mA outputs must be connected to ground through a resistance of less than 500 ohms, even if the output is unused. A resistor should be used if an indicator or receiver is not connected.

Figure 2-1 Proper Wiring of a Brooks QUANTIM NEMA 1/ IP40



*Note: All 4-20mA outputs must be connected to ground through a resistance of less than 500 ohms, even if the output is unused. A resistor should be used if an indicator or receiver is not connected.

Figure 2-2 Proper Wiring of a Brooks QUANTIM NEMA 4X/ IP66



*Note: All 4-20mA outputs must be connected to ground through a resistance of less than 500 ohms, even if the output is unused. A resistor should be used if an indicator or receiver is not connected.

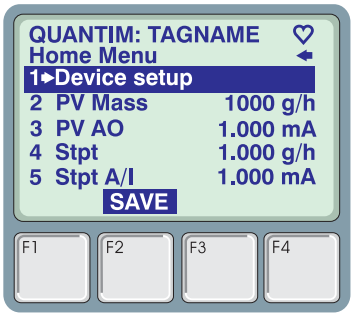
Figure 2-3 Proper Wiring of a Brooks QUANTIM NEMA 4X/ IP66XP

2-2 Establishing Communications

Once the ON button is pressed, the HART Communicator will attempt to establish communications with the Brooks QUANTIM. If successful, the QUANTIM Home Menu will be displayed as shown below. The Home Menu actively displays the device type, QUANTIM, followed by the device tagname, the current values of the Primary Variable and the Setpoint Variable as well as their respective analog output and input values. These values are updated continuously.

Selecting “Device Setup” allows the user to enter the custom QUANTIM menu tree which allows the user to view and/or modify other device parameters.

(A chart of the QUANTIM menu tree is provided in Figure 2-4).



If “GENERIC” appears on the Top line of the display, then the Memory Module of the HART Communicator does not have the information required to display the QUANTIM custom menu tree. Some limited functionality is still available in the Generic Menu tree, however, to gain access to the custom QUANTIM menu tree, contact your nearest Fisher-Rosemount Service Representative to have your memory module upgraded.

If the HART Communicator cannot establish communications with the Brooks QUANTIM, then “No Device Found” will be displayed for a short period, followed by the Offline menu. For details on using the Offline Menu, refer to the **Hart Communicator Users Manual**.

2-3 Device Setup

The Device Setup menu is the gateway to the Brooks QUANTIM menu tree. Select one of the four menu choices to continue.

1. **Process Variables** - Displays the values and Units of Measure of all the Process Variables. The values are continuously updated. In order to display a single Process Variable, select the desired Process Variable and the value of the single Process Variable will be updated at a faster rate than when all Process Variables are displayed.

2. **Diags and Services** - Allows the user to monitor Alarm Status, Background Diagnostic and Sensor Status, to clear latched alarms, and to manually override valve operation.

3. **Basic Setup** - Provides quick access the to most common adjustments including Process Variable Units and re-ranging of the Analog Input and Outputs.

4. **Detailed Setup** - Provides access to all other adjustable device parameters.

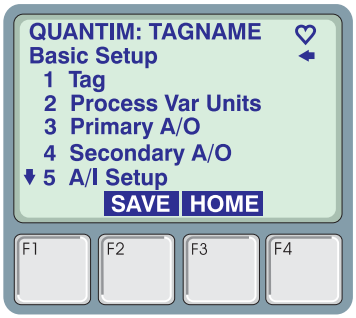
2-4 Diagnostics and Setup

The Diagnostics and Services menu provides user with a list of functions and services that aid the user in diagnosing problems with the Brooks QUANTIM, the process, and/or the installation.

1. **Alarms & Warnings** - View the status of each alarm type. Possible status values are Normal (No Alarm), Warning, and Alarm.
2. **Reset Alarms** - Resets all latched alarms to Normal. (See the Alarms Section 2-10 for more details).
3. **Diag Results** - View the status of each background diagnostic test. Possible status values are Normal and Failure.
4. **Valve Operations** - Manually override Valve Control and monitor the actual Valve Drive current
5. **Zero Sensor** - Allows the user to remotely zero the sensor. This operation has the same effect as pressing the zero button on the top of the Brooks QUANTIM.
6. **Sensor Status** - Monitor detailed status of the Sensor Circuitry
7. **Sensor Data** - Monitor detailed information related to the Sensor circuitry.

2-5 Basic Setup

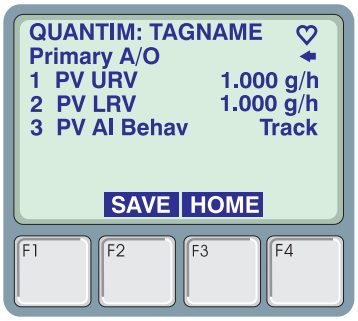
The Basic Setup menu provides access to the most common adjustments that a user would normally perform to a Brooks QUANTIM.



1. **Tag** - Up to 8 Alpha-numeric characters which identify this device. The tagname of the connected device is always displayed on the top line of the HART Communicator. (Refer to the HART Communicator manual for information on entering text from the HART Communicator keypad).
2. **Process Var Units** - Change the Units of Measure for any process variable.
3. **Primary A/O** - Re-range the Primary Analog Output
4. **Seondary A/O** - Re-range the Secondary Analog Output
5. **A/I Setup** - Re-range the Analog Input
6. **Process Damping** - Allows the user to set the damping values for Mass Flow and Density Process Variables.

2-6 Primary and Secondary A/O Menus

The Primary and Secondary Analog Output menus allow the user to re-range the Primary and Secondary Analog Output. The Primary Analog Output is a 4 – 20 mA representation of the Primary Variable, which for Brooks QUANTIM is the Mass Flow Process Variable. Likewise, the Secondary Analog Output is a 4 – 20 mA representation of the Secondary Variable, which for Brooks QUANTIM is the Density Process Variable. The Upper Range Value and the Lower Range Value control the relationship between the Process Variable and the 4 – 20 mA analog output, i.e., the value of the analog output for any given value of the process variable. These menus allow the user to change this relationship.



1 **PV URV** - The Primary Variable Upper Range Value
2 **PV LRV** - The Primary Variable Lower Range Value
3 **PV AI Behav** – This defines the behavior of this analog output when an alarm is currently active.
The options are:

Track - continue to represent the Primary/Secondary Variable,

Hold - hold the value of the Primary/Secondary Variable when the alarm occurred,

Upscale - sets the output to 22 mA when an alarm is active,

Downscale - sets the output to 3.8 mA when an alarm is active.

Example - Configuring the Range of the Secondary Analog Output

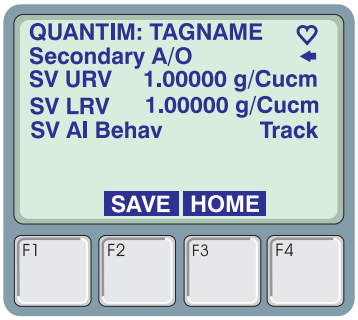
The user desires to have the Secondary Analog Output represent the Density Process Variable in the following manner:

4 mA when Density = 0.75 g/cc

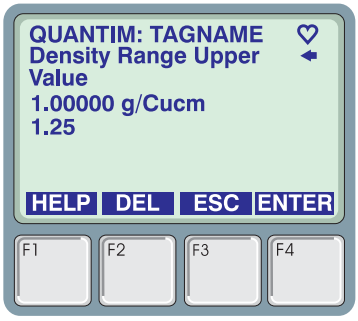
20 mA when Density = 1.25 g/cc

Step 1 - From the Home Menu, the user would traverse the menu tree until reaching the Secondary A/O menu as follows:

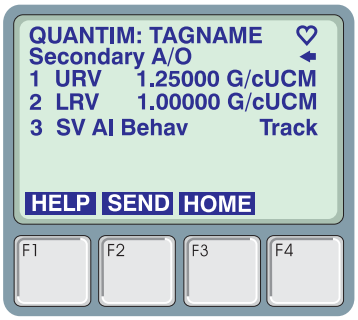
Home ⇨Device Setup ⇨Basic Setup ⇨Secondary A/O



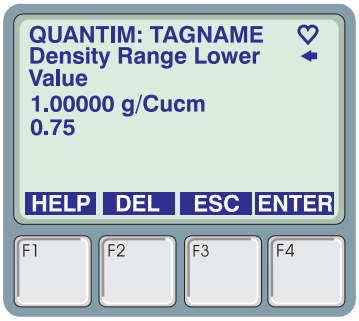
Step 2 – Select URV or press the “Fast Select Key” 1



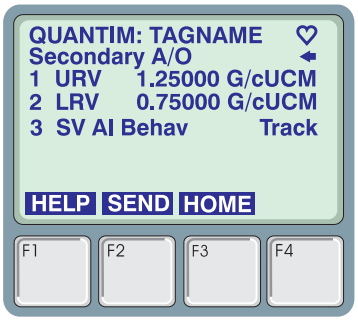
Step 3 - Enter the desired Upper Range Value, 1.25 and press the ENTER function key. Note that the DEL function key will delete a single digit that you have entered and the ESC function key will exit this screen with out changing the value.



Step 4 - Select LRV or press the “Fast Select Key” 2



Step 5 - Enter the desired Lower Range Value, 0.75 and press the ENTER function key (F4)

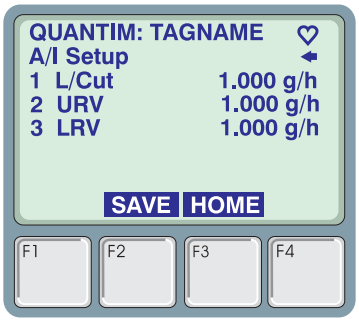


Step 6 - Note that the modified values have only been changed in the HART Communicator. In order to have the values transferred to the Brooks QUANTIM, do any ONE of the following:

- Press SEND and the values will be sent immediately.
- Press ⇦ENTER
- Press HOME

2-7 A/I Setup

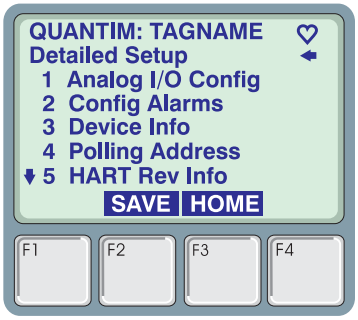
The Analog Input Setup menu allows the user to configure the range relationship between the Analog Input and the Setpoint Process Variable.



1. **L/Cut** - Low Flow Cutoff allows the user to specify a value of the Setpoint Process Variable below which the Setpoint Process Variable is forced to zero. This can be used to prevent the Brooks QUANTIM from attempting to control flow at very low flowrate in response to noise on the Analog Input.
2. **URV** - The Setpoint Process Variable Upper Range Value
3. **LRV** - The Setpoint Process Variable Lower Range Value

2-8 Detailed Setup

The Detailed Setup menu provides access to the all adjustments that a user can perform to a Brooks QUANTIM that have not been covered in other menus.

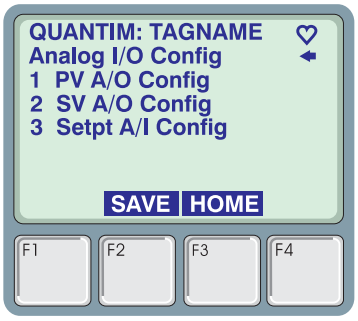


1. **Analog I/O Config** - allows the user to configure and trim the analog inputs and outputs.
2. **Config Alarms** - allows the user to configure and enable alarms
3. **Device Info** - allows the user to view Device Information such as Model Number, Serial Number, etc.
4. **Polling Address** - allows the user to change the Network Polling Address of the HART Communicator.
5. **Revision Info** - A menu which displays all Revision information about the Device.
6. **Sensor F/W Rev** - Revision of Sensor Firmware.

1. **Universal Rev** - The revision of the HART Protocol Universal Com mands Document that the device supports.
2. **Fld Dev Rev** - The revision of the Device Specific HART Protocol Commands Document that the device supports.
3. **Hardware Rev** - The revision of the Hardware of the device.
4. **Firmware Rev** - The revision of the Firmware in the device.

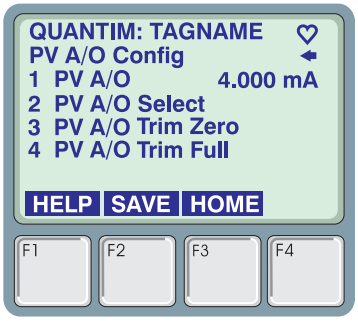
2-9 Analog I/O Configuration

The Analog I/O Configure Menu allows the user to configure the physical I/O type and to trim/calibrate the output or input. From this menu the user must select the Input or Output to be configured/trimmed.



PV A/O Config

The features of this menu operate only on the Primary Output.



Example - Trimming the Primary Output

While the Analog Output is calibrated at the factory for the devices specified accuracy, the user may wish to trim the output values in order to account for long wire runs, equipment variations, etc. This example shows how to perform the Trim operation.

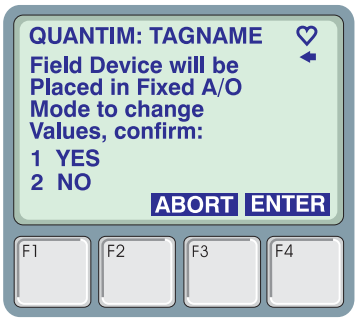
1. **PV A/O** - The actual value on the Primary Output, updated continuously.
2. **PV A/O Trim Zero** - Allows the user to trim the zero or min-scale output. (See example below)
3. **PV A/O Trim Full** - Allows the user to trim the full-scale output. (See example below)

Step 1 - The user must connect a field calibrator or high accuracy DVM in series with the current loop at the desired location. This meter will be referred to as the “Reference Meter”.

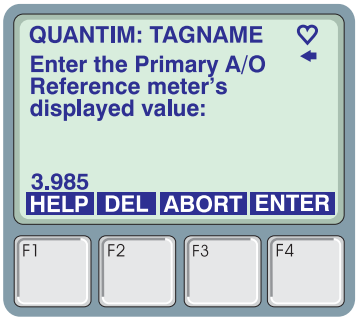
Step 2 - From the Home Menu, the user would traverse the menu tree until reaching the Primary A/O menu as follows:

Home➪Device Setup➪Detailed Setup➪Analog I/O Config➪Primary A/O

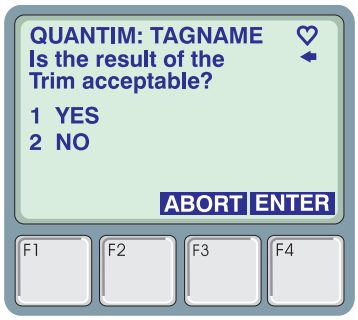
Step 3 - Select PV A/O Trim Zero or press the Fast Select key 2



Step 4 - The user must acknowledge the warning that the analog output is about to be placed in a fixed output mode and will no longer refect the value of the Primary Variable. Selecting YES confirms that user has taken the necessary precautions so that this action will not interfere with the process that the Brooks QUANTIM is installed in. Selecting NO aborts the Trim operation.



Step 5 - Enter the value as displayed on the Reference Meter and then press ENTER.

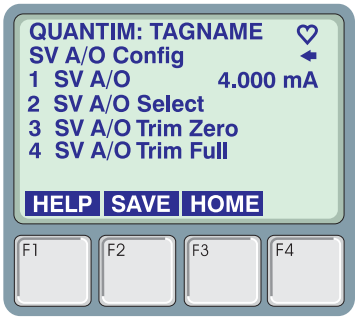


Step 6 - Read the value displayed on the Reference Meter. If the adjusted value is acceptable, select YES and the Trim operation is complete. If the value is not acceptable, select NO and repeat steps 5 and 6. If the error between the actual value as displayed on the Reference Meter and the ideal value of 4 mA is too large, it may require several passes of repeated steps 5 and 6 before an acceptable value is achieved.

Step 7 - Repeat Steps 3 – 6 for the Full Scale output.

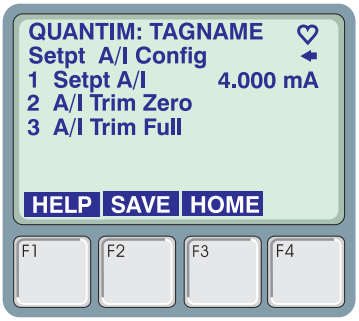
SV A/O Config

The features of this menu operate only on the Secondary Output.



1. **SV A/O** - The actual value on the Secondary Output, updated continuously.
2. **SV A/O Trim Zero** - Allows the user to trim the zero or min-scale output. (See example for Primary Output)
3. **SV A/O Trim Full** - Allows the user to trim the full-scale output. (See Section 2-6 for example Primary Output)

Setpt A/I Configuration



1. Stpt A/I - The actual value measured on the analog input

2. A/I Trim Zero - Allows the user to trim the zero or min-scale input.

(See example below)

3. A/I Trim Full - Allows the user to trim the full-scale input.

(See example below)

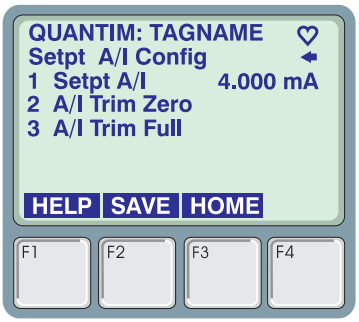
Example - Trimming the Analog Input

Note: To perform this operation, the user must have a current source connected to the analog input which can be manipulated to min-scale and full-scale values.

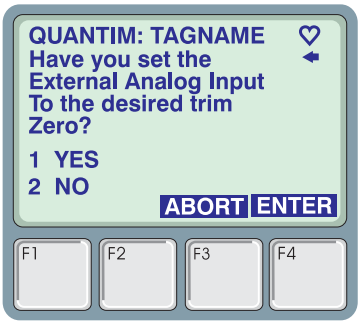
Step 1 - Connect a current source to the analog input and set the input to the desired min-scale value, normally 4.000 mA.

Step 2 - From the Home Menu, the user would traverse the menu tree until reaching the Setpt A/I Confg menu as follows:

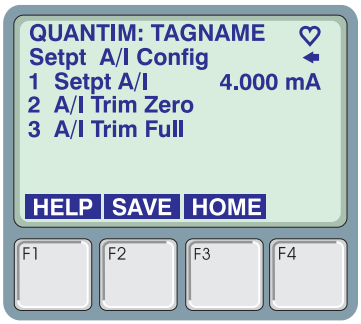
Home⇨Device Setup⇨Detailed Setup⇨Analog I/O Config⇨Setpt A/I Confg



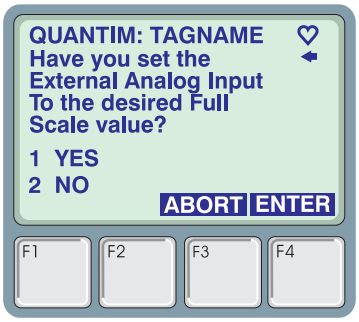
Step 3 – Select A/I Trim Zero or press Fast Select Key 2



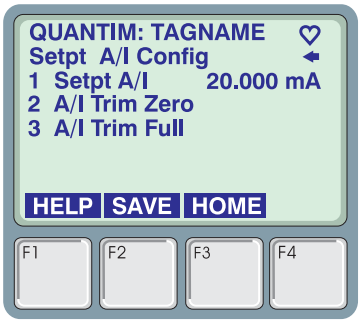
Step 4 - Select YES to confirm that the current source is connected and set to the desired min-scale value. Selecting NO will terminate the Trim operation.



Step 5 - Change the current source to provide the desired full-scale value, normally 20 mA. Then select A/I Trim Full or press Fast Select key 3.



Step 6 - Select YES to confirm that the current source is connected and set to the desired full-scale value. Selecting NO will terminate the Trim operation.



The Trim operation is complete.

2-10 Alarms

Brooks' QUANTIM provides the user a flexible alarm/warning system that monitors Process Variables for conditions that fall outside configurable limits and then provides feedback to the user visually via the alarm LED, via an alarm contact, and via HART.

There are two types of Alarms/Warnings: Those that monitor a Process Variable and compare the value to specified limits and those that monitor a state of the device such as a Diagnostic Failure. The available alarms/ warnings are:

- MassFlow
- Density
- Volumetric Flow
- Temperature
- Slug Flow
- Diagnostic Failure

The alarm/warning named Slug Flow monitors the Density Process Variable, but allows the user to specify conditions for the alarm that may be different from the Density alarm. Typically, the Density alarm would be used to detect small changes in the density of the fluid passing through a Brooks QUANTIM, while, as the name implies, the Slug Flow alarm would be used to detect a slug of a different fluid with much different density characteristics (such as air when measuring a liquid).

Each alarm has several attributes which may be configured by the user. These attributes control the conditions which cause the alarm/warning to occur and also specify actions to be taken when the Process Variable is outside the specified conditions.

These attributes are:

1. **Severity** - The options are 0 = Off, 1 = Warning, 2 = Alarm. When set to Off, the conditions are not monitored and no actions will be taken. When set to Warning, the Alarm LED will flash Green when the monitored value exceeds the specified conditions.
   (See Alarm Code attribute). When set to Alarm, the Alarm LED will flash Red and the Analog Outputs will act based on the assigned Alarm Behavior (See Basic Setup, Primary and Secondary A/O Menus) when the monitored value exceeds the specified conditions.

2. **Alarm Code** - The alarm code specifies the code to be flashed on the LED to indicate that an alarm/warning condition has occurred. When more than one alarm/warning is active, then the LED will indicate the most severe alarm with the highest Alarm Code. An Alarm is more severe than a Warning. Alarm Codes do not have to be unique, i.e., more that one alarm/warning type can use the same alarm code.

3. **Latching Enable** - When set to 0, the alarm/warning is non-latching. That means the alarm is indicated only when the monitored value exceeds the specified conditions. When set to 1, the alarm/warning is Latching. This means that the alarm/warning will be indicated when the monitored value first exceeds the specified conditions, and will be indicated until the user clears the alarm. If the user clears the alarm while the monitored value still exceeds the specified conditions, then the alarm will be re-latched and continue to be indicated. The user must clear the alarm/warning via the Diags and Services menu, Reset Alarms selection.

4. **Contact Enable** - QUANTIM has an Alarm contact (0 to 5 V) on pin 3. 5V indicates no alarm, 0 V indicates alarm. If the alarm condition is detected and the severity is alarm or warning, and the alarm contact is enabled, then the alarm contact is “closed” (0 V).

5. **Low Limit** - The value of the monitored value below which is considered an alarm/warning condition.(This attribute not valid for alarms that monitor a state condition of the device.)

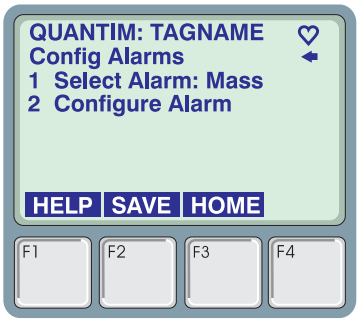
6. **High Limit** - The value of the monitored value above which is considered an alarm/warning condition.(This attribute not valid for alarms that monitor a state condition of the device.)

7. **Delay** - The time in seconds that the value must remain above the high limit or below the low limit before an alarm/warning condition is indicated.

2-11 Configuring Alarms

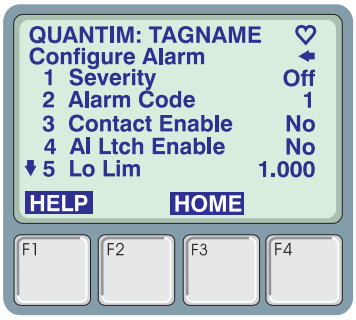
The user can enable and configure all alarms/warnings via the menu:

Device Setup➪Detailed Setup➪Config Alarms



1. Select Alarm - allows the user to select the alarm to be configured. The currently selected alarm is displayed.
2. Configure Alarm - allows the user to configure the 7 attributes of the selected alarm.

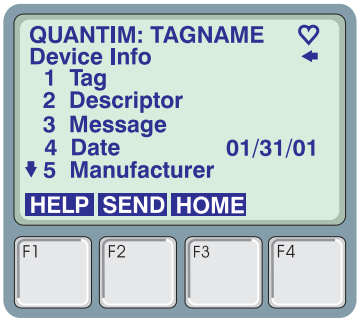
The user selects an alarm by scrolling up/down the list of available alarms until the desired alarm is highlighted and then presses ENTER.



1. **Severity** - Enables the alarm and set the severity. Options are Off, Warning, Alarm.
2. **Alarm Code** - Specifies the Code to be flashed on the Alarm Led. When multiple alarms are active, the alarm with the highest alarm code is displayed.
3. **Contact Enable** - Enables the alarm contact for this alarm. Options are No and Yes.
4. **Al Ltch Enable** - When set to Yes the alarm will latch when detected and must be cleared via the Diags and Services menu.
5. **Lo Lim** - The value of the monitored Process Variable below which the alarm will activated.
6. **Hi Lim** - The value of the monitored Process Variable above which the alarm will activated.
7. **Delay** - The time in seconds that the Process Variable must be outside the limits specified by Lo Lim and Hi Lim before the alarm will be activated.

2-12 Device Informatiom

The Device Info menu provides access to informational parameters of the device. None of the items in this menu affect the opearation of this device and most of the items in this menu cannot be modified.



1. **Tag** - Up to 8 Alpha-numeric characters which identify this device. The tagname of the connected device is always displayed on the top line of the HART Communicator. (Refer to the HART Communicator manual for information on entering text from the HART Communicator keypad).
2. **Descriptor** - Up to 16 Alpha-numeric characters which can be used to further identify this device.
3. **Message** - Up to 32 Alpha-numeric characters which can be used for service information or any other user specific purpose.
4. **Date** - A date field that the user can modify that can be used for calibration date, service date, etc.
5. **Manufacturer** - View only field which identifies the manufacturer of this device.
6. **Dev ID** - View only Unique Device ID that is assigned by the manufacturer.
7. **Model #** - Model Number of the device and is set by the manufacturer.
8. **Serial #** - Serial Number of the device and is set by the manufacturer.
9. **PV Snsr S/N** - Serial Number of the Sensor sub-assembly.

2-13 Hot Keys

The Hot Key menu provides quick access to frequently used menus. The Hot Key menu is access by pressing the >>> button. The menus that are available via the Hot Key are shown in diagram below. User-definable Hot Key menus are not supported.

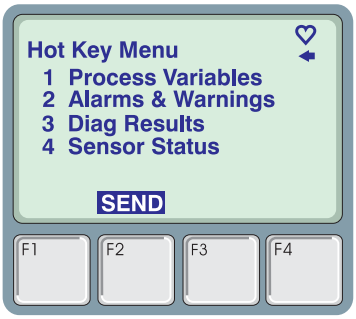


Table 2-1 Supported HART Protocol Commands

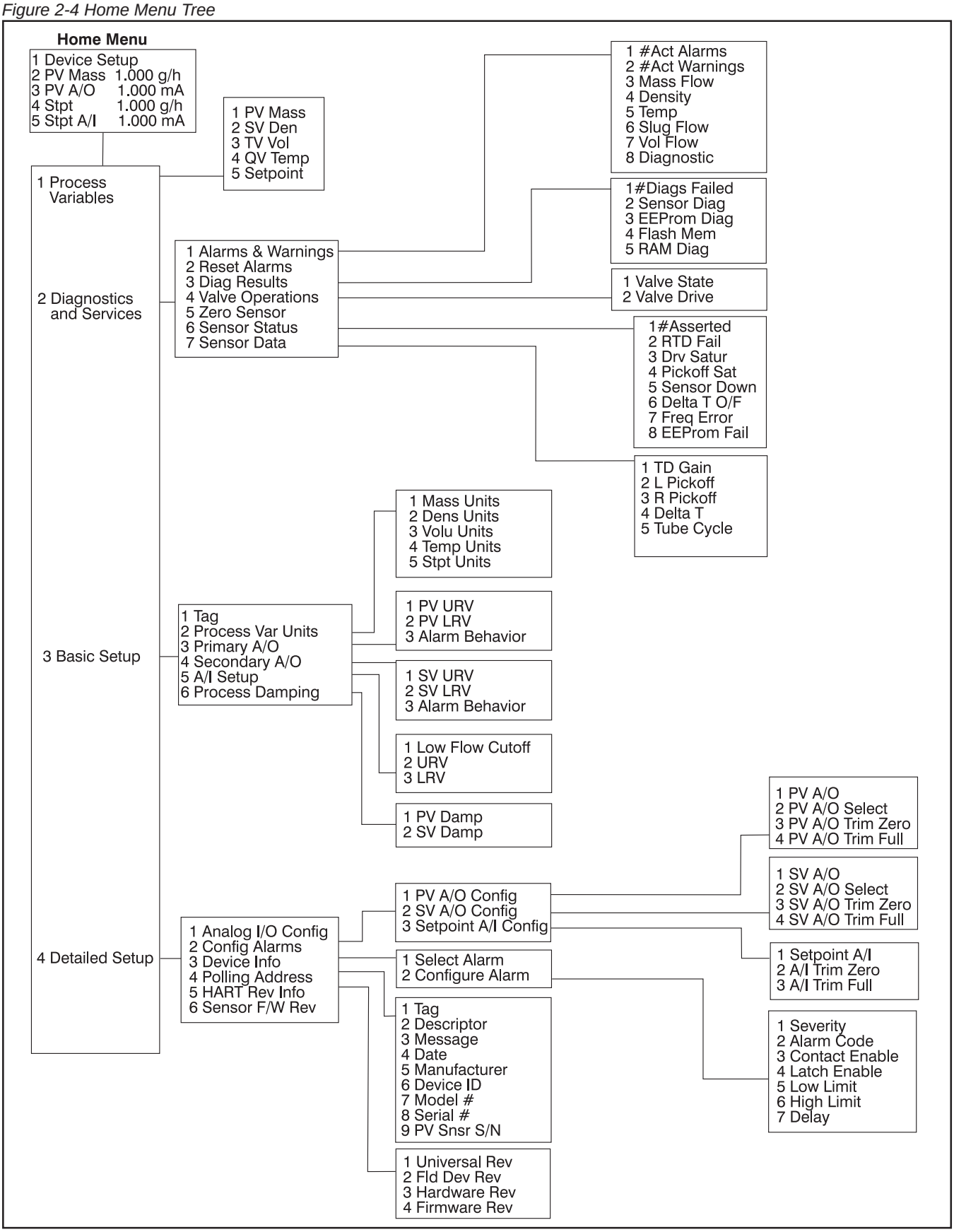
Cmd #	Cmd Type			Command Description
	U 1	C 2	D 3	
0	●			Read Unique Identifier
1	●			Read Primary Variable
2	●			Read PV Current and Percent of Rate
3	●			Read Dynamic Variables and PV Current
6	●			Write Polling Address
11	●			Read Unique Identifier with Associated Tag
12	●			Read Message
13	●			Read Tag, Descriptor, Date
14	●			Read Primary Variable Sensor Information
15	●			Read Primary Variable Output Information
16	●			Read Final Assembly Number
17	●			Write Message
18	●			Write Tag, Descriptor, Date
19	●			Write Final Assembly Number
33		●		Read Transmitter Variables
35		●		Write Primary Variable Range Values
38		●		Reset Configuration Changed Flag
44		●		Write Primary Variable Units
48		●		Read Additional Transmitter Status
53		●		Write Transmitter Variable Units
54		●		Read Transmitter Variable Information
55		●		Write Transmitter Variable Damping Value
59		●		Write Number of Response Preambles
60		●		Read Analog Output and Percent of Range
66		●		Enter/Exit Fixed Analog Output Mode
67		●		Trim Analog Output Zero
68		●		Trim Analog Output Gain
110		●		Read All Dynamic Variables
128			●	Perform User Zero
131			●	Read Software Rev
132			●	Read Model Number

Table 2-1 Supported HART Protocol Commands (Continued)

Cmd #	Cmd Type			Command Description
	U 1	C 2	D 3	
134			●	Read Serial Number
136			●	Read Alarm Configuration
137			●	Write Alarm Configuration
138			●	Clear Alarms
140			●	Write Secondary Variable Units
141			●	Write Secondary Variable Range Units
142			●	Read Secondary Variable
143			●	Read Secondary Variable Current and Percent of Range
144			●	Read Secondary Variable Output Information
155			●	Read Transmitter Variable Damping Value
160			●	Trim Analog Input Zero
161			●	Trim Analog Input Gain
165			●	Read Output Configuration
166			●	Write Output Configuration
170			●	Read Primary Output Analog Output Alarm Behavior
171			●	Write Primary Output Analog Output Alarm Behavior
172			●	Read Secondary Output Analog Output Alarm Behavior
173			●	Write Secondary Output Analog Output Alarm Behavior
200			●	Read Setpoint Low Flow Cutoff
201			●	Write Setpoint Low Flow Cutoff
202			●	Read Setpoint Current and Percent of Range
203			●	Write Setpoint Range Values
204			●	Read Setpoint Range Values
205			●	Read Valve Override State and Valve Drive Value
206			●	Write Valve Override State
207			●	Write Setpoint and Setpoint Source
210			●	Read Sensor Processor Information

Command Types 1 – Universal Command Set , 2 – Common Practice Command Set, 3 – Device Specific Commands

Figure 2-4 Home Menu Tree



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HART® Operation Manual
X-CM-QmB-HART-eng
Part Number: 541B043AHG
April, 2015

LIMITED WARRANTY

Seller warrants that the Goods manufactured by Seller will be free from defects in materials or workmanship under normal use and service and that the Software will execute the programming instructions provided by Seller until the expiration of the earlier of twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by Seller. Products purchased by Seller from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer.

All replacements or repairs necessitated by inadequate preventive maintenance, or by normal wear and usage, or by fault of Buyer, or by unsuitable power sources or by attack or deterioration under unsuitable environmental conditions, or by abuse, accident, alteration, misuse, improper installation, modification, repair, storage or handling, or any other cause not the fault of Seller are not covered by this limited warranty, and shall be at Buyer's expense.

Goods repaired and parts replaced during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer. This limited warranty is the only warranty made by Seller and can be amended only in a writing signed by an authorized representative of Seller.

BROOKS LOCAL AND WORLDWIDE SUPPORT

Brooks Instrument provides sales and service facilities around the world, ensuring quick delivery from local stock, timely repairs and local based sales and service facilities.

Our dedicated flow experts provide consultation and support, assuring successful applications of the Brooks flow measurement and control products.

Calibration facilities are available in local sales and service offices. The primary standard calibration equipment to calibrate our flow products is certified by our local Weights and Measures Authorities and traceable to the relevant international standards.

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.

CUSTOMER 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.

HELP DESK

In case you need technical assistance:

Americas	☎ 1-888-554-FLOW	
Europe	☎ +(31) 318 549 290	Within Netherlands ☎ 0318 549 290
Asia	☎ +011-81-3-5633-7100	

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
Emerson ..... Emerson Electric Co.
HART ..... HART Communications Foundation
QUANTIM ..... Brooks Instrument, LLC

ISO 9001 QUALITY SYSTEM

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BROOKS® INSTRUMENT

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Installation and Operation Manual
X-CM-QmB-eng
Part Number: 541B029AAG
June, 2011

Brooks® Quantim Low Flow Coriolis Precision Mass Flow Measurement and Control

NEMA1 / IP40
General Purpose
Configuration

NEMA 4X / IP66
Weather Proof
Configuration

IP66XP
Explosion Proof
Configuration

HART
FIELD COMMUNICATIONS PROTOCOL

"Quantim Coriolis mass flow controllers
enable precision measurement and control with
maximum flexibility and lowest overall cost of ownership."

BROOKS® INSTRUMENT

QmB Series IP40, IP66, IP66XP

Essential Instructions
Read before proceeding!

Brooks Instrument designs, manufactures and tests its products to meet many national and international standards. These products must be properly installed, operated and maintained to ensure they continue to operate within their normal specifications. The following instructions must be adhered to and integrated into your safety program when installing, operating and maintaining Brooks Instrument products.

- To ensure proper performance, use qualified personnel to install, operate, update, program and maintain the product.
- Read all instructions prior to installing, operating and servicing the product. If this instruction manual is not the correct manual, please see back cover for local sales office contact information. Save this instruction manual for future reference.

⚠ **WARNING: Do not operate this instrument in excess of the specifications listed in the Instruction and Operation Manual. Failure to heed this warning can result in serious personal injury and / or damage to the equipment.**

- If you do not understand any of the instructions, contact your Brooks Instrument representative for clarification.
- Follow all warnings, cautions and instructions marked on and supplied with the product.
- Install your equipment as specified in the installation instructions of the appropriate instruction manual and per applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- Operation: (1) Slowly initiate flow into the system. Open process valves slowly to avoid flow surges. (2) Check for leaks around the flow meter inlet and outlet connections. If no leaks are present, bring the system up to the operating pressure.
- Please make sure that the process line pressure is removed prior to service. When replacement parts are required, ensure that qualified people use replacement parts specified by Brooks Instrument. Unauthorized parts and procedures can affect the product's performance and place the safe operation of your process at risk. Look-alike substitutions may result in fire, electrical hazards or improper operation.
- Ensure that all equipment doors are closed and protective covers are in place to prevent electrical shock and personal injury, except when maintenance is being performed by qualified persons.

⚠ **WARNING: For liquid flow devices, if the inlet and outlet valves adjacent to the devices are to be closed for any reason, the devices must be completely drained. Failure to do so may result in thermal expansion of the liquid that can rupture the device and may cause personal injury.**

European Pressure Equipment Directive (PED)

All pressure equipment with an internal pressure greater than 0.5 bar (g) and a size larger than 25mm or 1" (inch) falls under the Pressure Equipment Directive (PED).

- The Specifications Section of this manual contains instructions related to the PED directive.
- Meters described in this manual are in compliance with EN directive 97/23/EC.
- All Brooks Instrument Flowmeters fall under fluid group 1.
- Meters larger than 25mm or 1" (inch) are in compliance with PED category I, II or III.
- Meters of 25mm or 1" (inch) or smaller are Sound Engineering Practice (SEP).

European Electromagnetic Compatibility (EMC)

The Brooks Instrument (electric/electronic) equipment bearing the CE mark has been successfully tested to the regulations of the Electro Magnetic Compatibility (2004/108/EC (EMC directive 89/336/EEC)).
Special attention however is required when selecting the signal cable to be used with CE marked equipment.

Quality of the signal cable, cable glands and connectors:

Brooks Instrument supplies high quality cable(s) which meets the specifications for CE certification.
If you provide your own signal cable you should use a cable which is overall completely screened with a 100% shield.
"D" or "Circular" type connectors used should be shielded with a metal shield. If applicable, metal cable glands must be used providing cable screen clamping.
The cable screen should be connected to the metal shell or gland and shielded at both ends over 360 Degrees.
The shield should be terminated to an earth ground.
Card Edge Connectors are standard non-metallic. The cables used must be screened with 100% shield to comply with CE certification.
The shield should be terminated to an earth ground.
For pin configuration : Please refer to the enclosed Instruction Manual.

ESD (Electrostatic Discharge)

⚠ **CAUTION: This instrument contains electronic components that are susceptible to damage by static electricity. Proper handling procedures must be observed during the removal, installation or other handling of internal circuit boards or devices.**

Handling Procedure:

1. Power to unit must be removed.
2. Personnel must be grounded, via a wrist strap or other safe, suitable means before any printed circuit card or other internal device is installed, removed or adjusted.
3. Printed circuit cards must be transported in a conductive container. Boards must not be removed from protective enclosure until immediately before installation. Removed boards must immediately be placed in protective container for transport, storage or return to factory.

Comments

This instrument is not unique in its content of ESD (electrostatic discharge) sensitive components. Most modern electronic designs contain components that utilize metal oxide technology (NMOS, SMOS, etc.). Experience has proven that even small amounts of static electricity can damage or destroy these devices. Damaged components, even though they appear to function properly, exhibit early failure.

Dear Customer,

We appreciate this opportunity to service your flow measurement and control requirements with a Brooks Instrument device. Every day, flow customers all over the world turn to Brooks products for solutions to their gas and liquid low-flow applications. Brooks provides an array of flow measurement and control products for various industries from biopharmaceuticals, oil and gas, fuel cell research and chemicals, to medical devices, analytical instrumentation, semiconductor manufacturing, and more.

The Brooks product you have just received is of the highest quality available, offering superior performance, reliability and value to the user. It is designed with the ever changing process conditions, accuracy requirements and hostile process environments in mind to provide you with a lifetime of dependable service.

We recommend that you read this manual in its entirety. Should you require any additional information concerning Brooks products and services, please contact your local Brooks Sales and Service Office listed on the back cover of this manual or visit www.BrooksInstrument.com

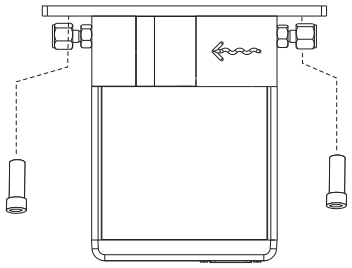
Yours sincerely,

Brooks Instrument

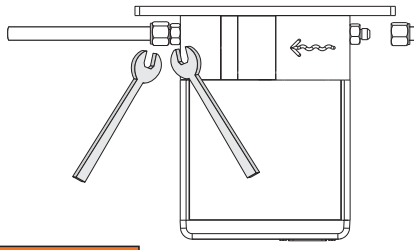
Quick Start Instructions IP40 - For Liquid Service

Horizontal Mounting

1a

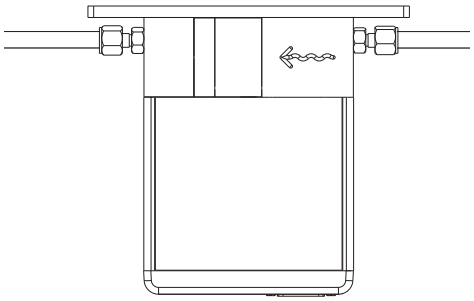


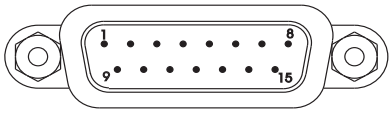
2a



⚠WARNING
Any rotation of the inlet or outlet fitting during installation of a metal seal device may result in a leak. Always use two wrenches when attaching fluid lines to prevent rotation.

3a





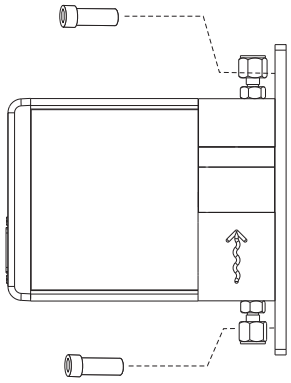
D-CONNECTOR PINOUTS

PIN #	FUNCTION	Controller	Meter
1	Setpoint Common	•	N/A
2	0-5 Vdc Flow Signal Output	•	•
3	Alarm Output		
4	* 4-20 mA Flow Signal Output	•	•
5	+14 Vdc to _27 Vdc Power Supply	•	•
6	Not Used		
7	* 4-20 mA Setpoint Input (+)	•	N/A
8	0-5 Vdc Setpoint Input (+)	•	N/A
9	Power Supply Common	•	•
10	Signal Output Common	•	•
11	+5 Volt Reference Output		
12	Valve Override Input	•	N/A
13	* 4-20 mA or 0-5 Vdc Density or Temp.	•	•
14	Not Used		
15	Not Used		

* DO NOT APPLY POWER TO THESE PINS

Vertical Mounting

1b



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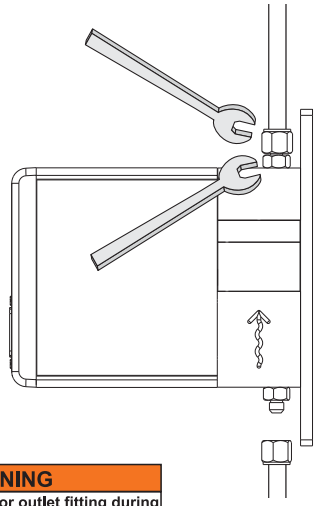
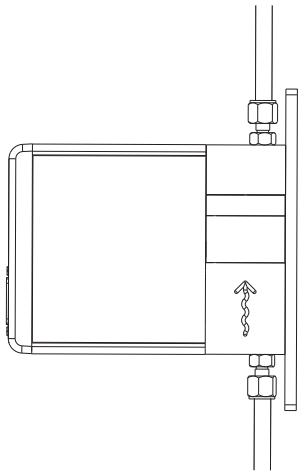


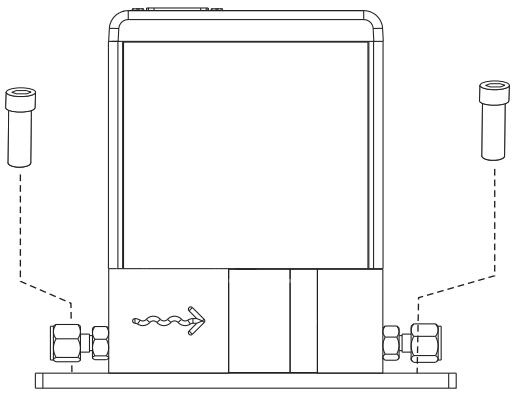
⚠WARNING
Any rotation of the inlet or outlet fitting during installation of a metal seal device may result in a leak. Always use two wrenches when attaching fluid lines to prevent rotation.

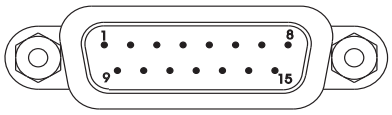
3b



Quick Start Instructions IP40 - For Gas Service

1



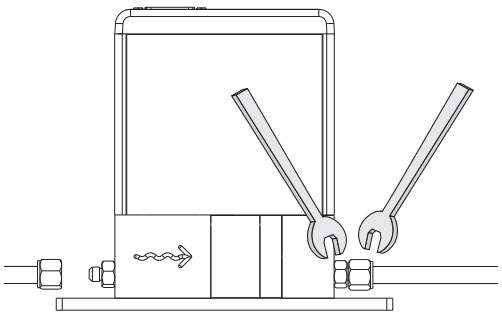


D-CONNECTOR PINOUTS

PIN #	FUNCTION	Controller	Meter
1	Setpoint Common	•	N/A
2	0-5 Vdc Flow Signal Output	•	•
3	Alarm Output		
4	* 4-20 mA Flow Signal Output	•	•
5	+14 Vdc to _27 Vdc Power Supply	•	•
6	Not Used		
7	* 4-20 mA Setpoint Input (+)	•	N/A
8	0-5 Vdc Setpoint Input (+)	•	N/A
9	Power Supply Common	•	•
10	Signal Output Common	•	•
11	+5 Volt Reference Output		
12	Valve Override Input	•	N/A
13	* 4-20 mA or 0-5 Vdc Density or Temp.	•	•
14	Not Used		
15	Not Used		

* DO NOT APPLY POWER TO THESE PINS

2



⚠WARNING

Any rotation of the inlet or outlet fitting during installation of a metal seal device may result in a leak. Always use two wrenches when attaching fluid lines to prevent rotation.

⚠CAUTION

- **Incorrect voltage will cause flowmeter damage or failure.**
- **Quantim is an input sinking device. Do not use a current sinking PLC output card.**
- **Quantim sources its own 4-20mA output signal. Do not source this output with an external supply.**

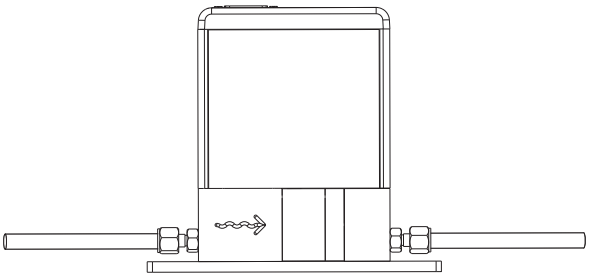
⚠WARNING

Operating Procedure: Do not operate this instrument outside the specifications listed in Section 1 of this manual. Before bringing the unit into operation, make sure all fluid connections have been correctly tightened and that all electrical connections have been made.

⚠WARNING

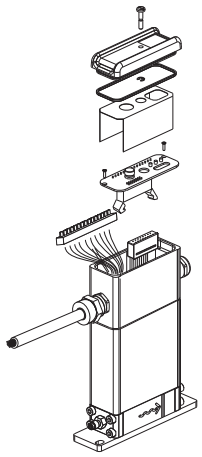
When used with a reactive (sometimes toxic) chemical, contamination or corrosion may occur as a result of plumbing leaks or improper purging. Plumbing should be checked carefully for leaks.

3



Quick Start Instructions IP66

1



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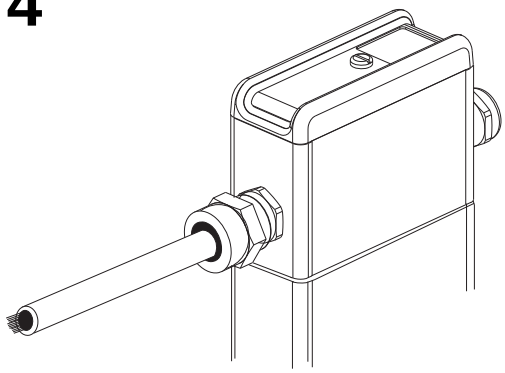

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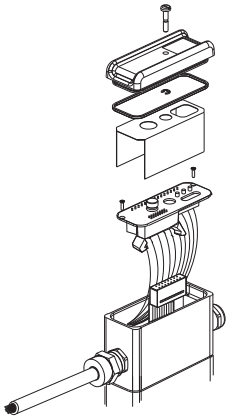

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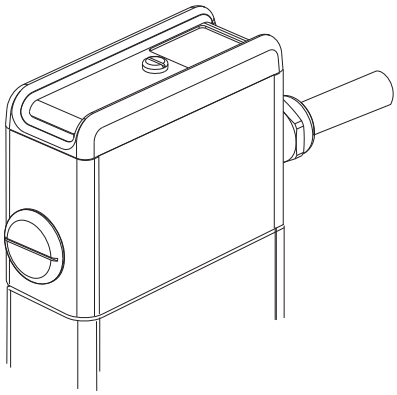

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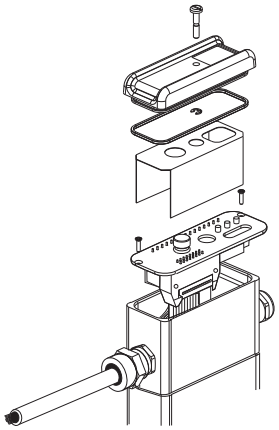
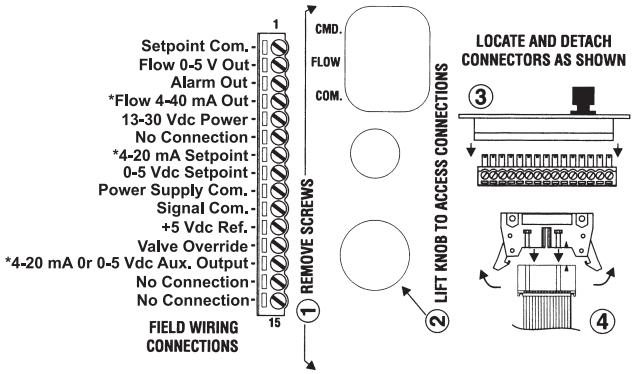
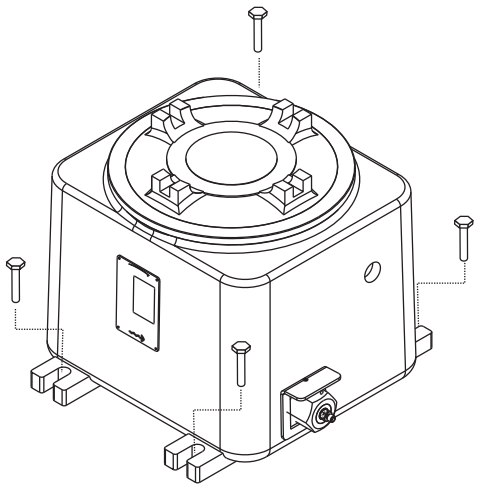




Quick Start Instructions IP66XP

1



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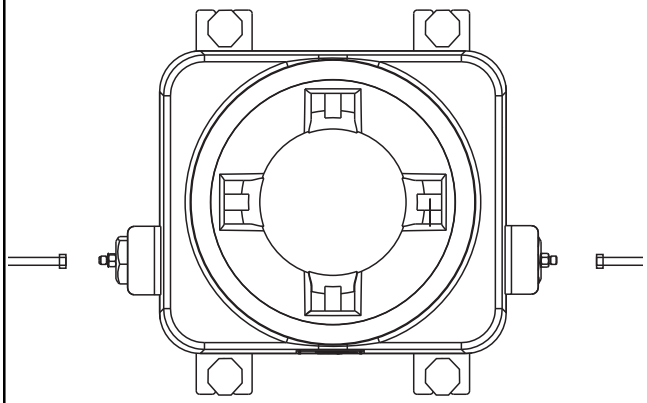

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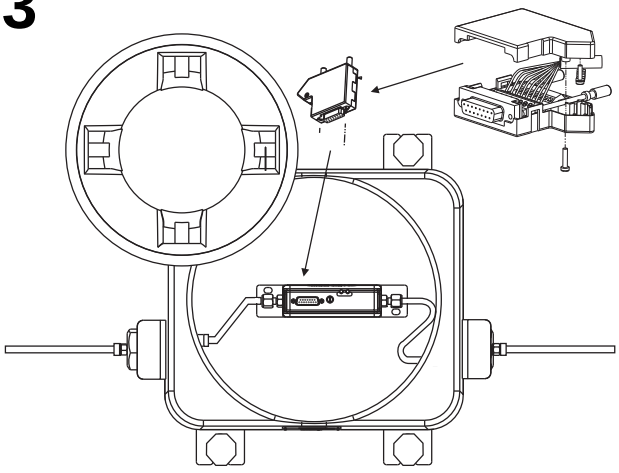

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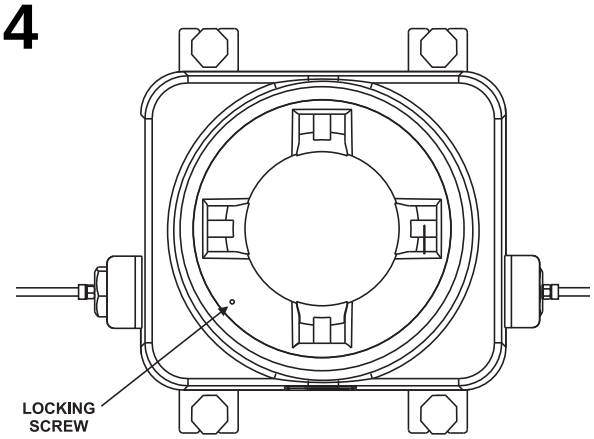
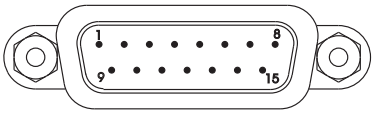




D-CONNECTOR PINOUTS

PIN #	FUNCTION	Controller	Meter
1	Setpoint Common	•	N/A
2	0-5 Vdc Flow Signal Output	•	•
3	Alarm Output		
4	* 4-20 mA Flow Signal Output	•	•
5	+14 Vdc to 27 Vdc Power Supply	•	•
6	Not Used		
7	* 4-20 mA Setpoint Input (+)	•	N/A
8	0-5 Vdc Setpoint Input (+)	•	N/A
9	Power Supply Common	•	•
10	Signal Output Common	•	•
11	+5 Volt Reference Output		
12	Valve Override Input	•	N/A
13	* 4-20 mA or 0-5 Vdc Density or Temp.	•	•
14	Not Used		
15	Not Used		

* DO NOT APPLY POWER TO THESE PINS

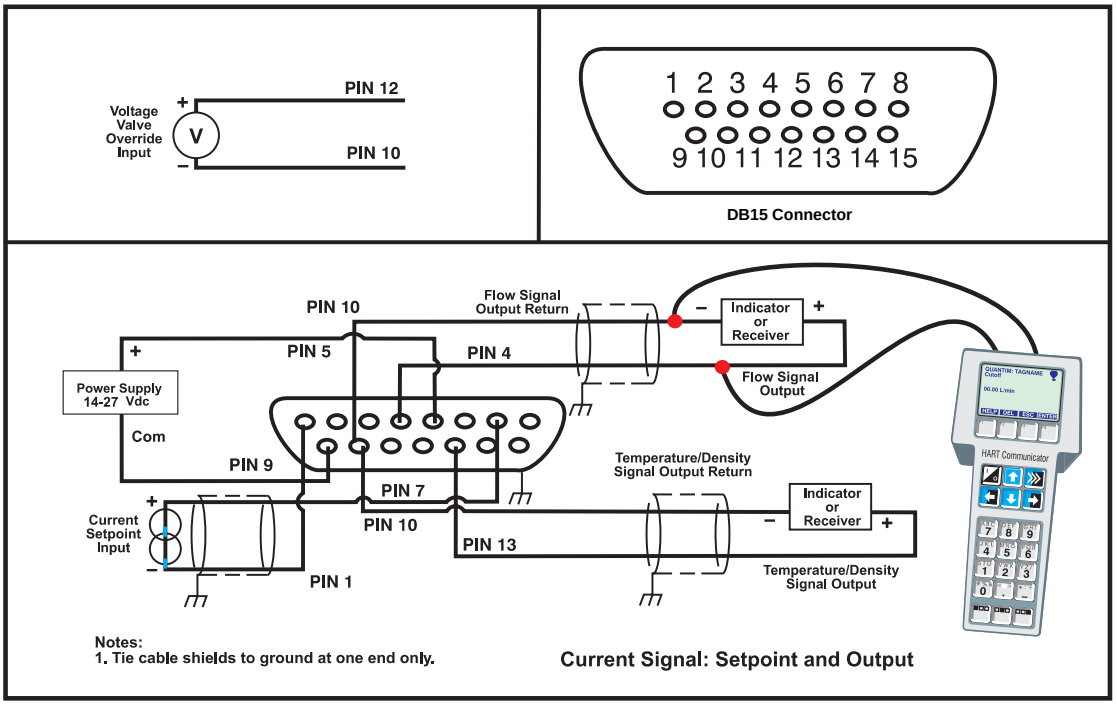
⚠WARNING

Lifting hazard. Single person lift could cause injury. Use assistance.

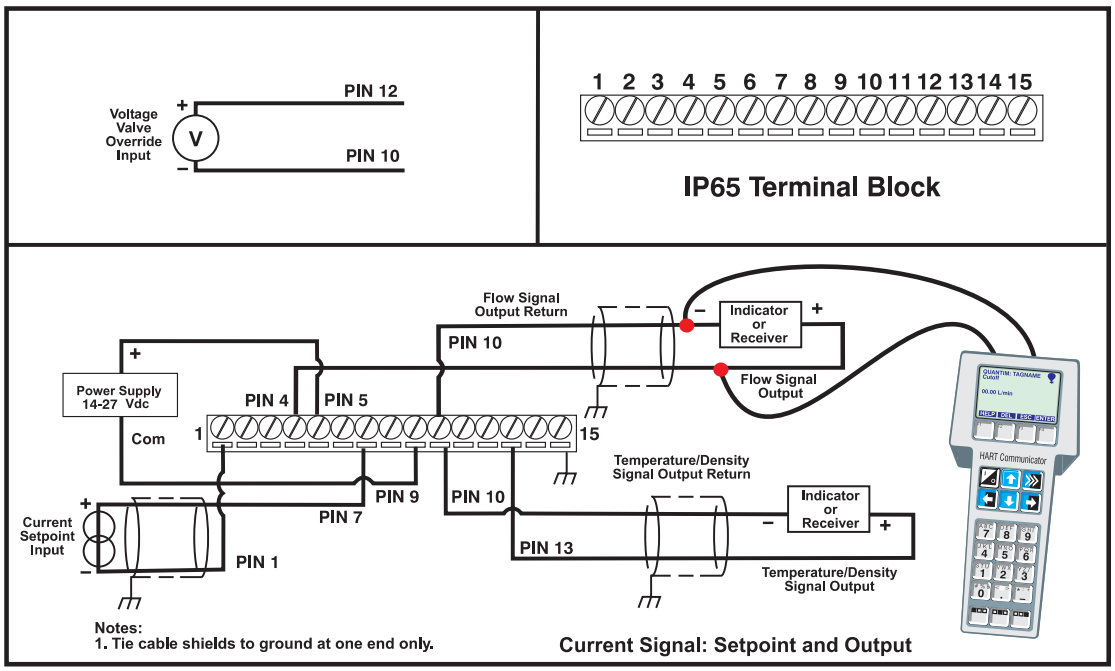
Quick Start Instructions for Connecting HART® on 4-20 mAmp I/O

Refer to the X-Qm-HART Installation and Operation Manuals for complete wiring of a Brooks Quantim for HART interface. HART Communications is provided on the Primary Output of the Brooks Quantim device. Connecting a HART Communicator, or any HART modem, requires a connection between pins 4 and 1 as shown below. This connection can be anywhere on the current loop.

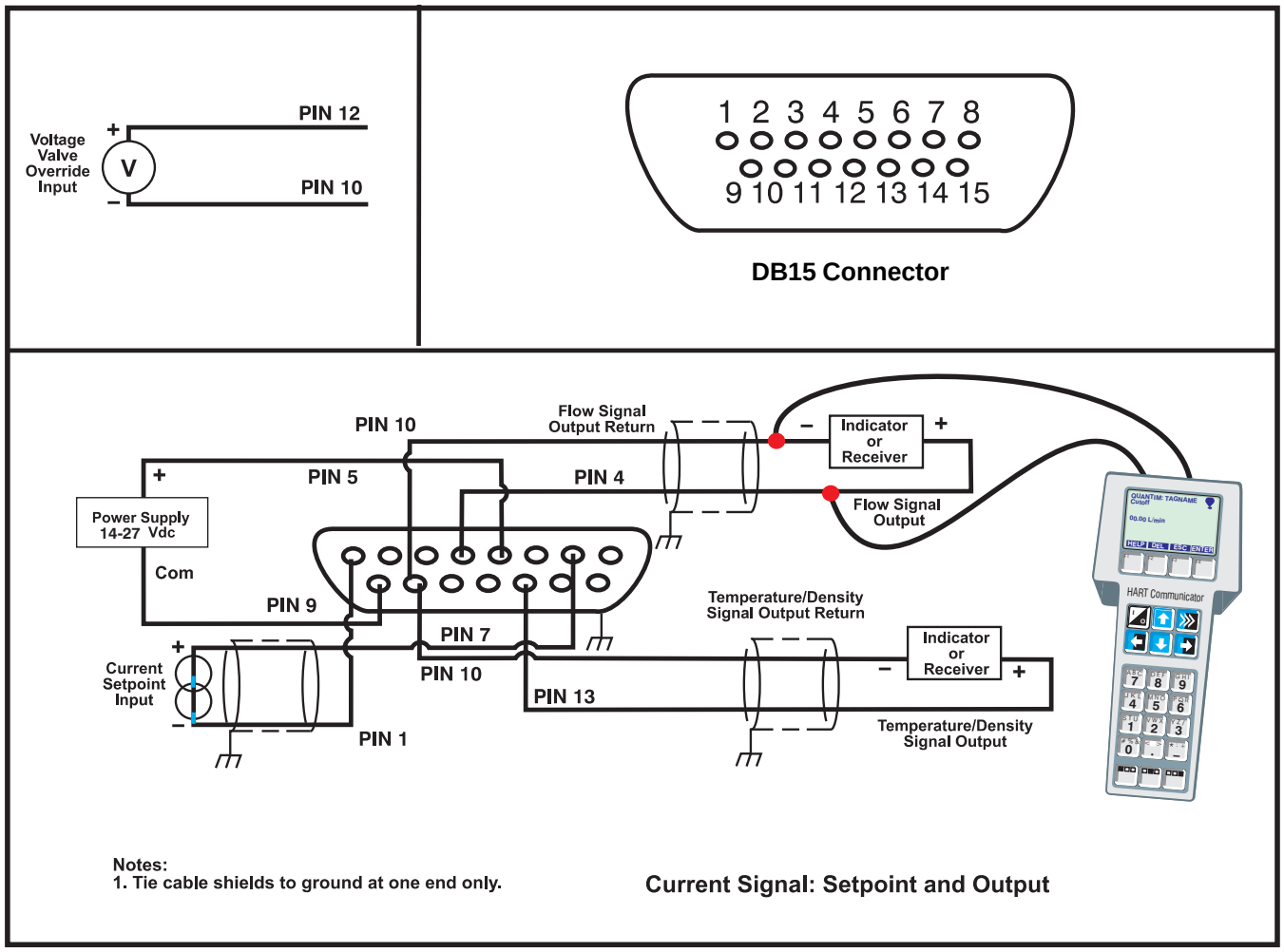
Proper wiring of a Brooks Quantim NEMA 1 / IP40



Proper wiring of a Brooks Quantim NEMA 4X / IP65

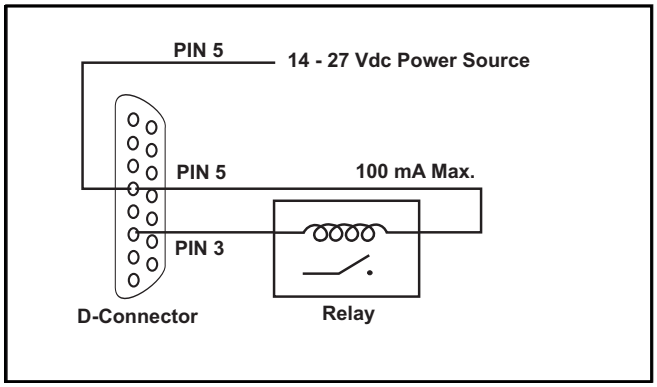


Proper wiring of a Brooks Quantim Explosion Proof NEMA 4X / IP66XP

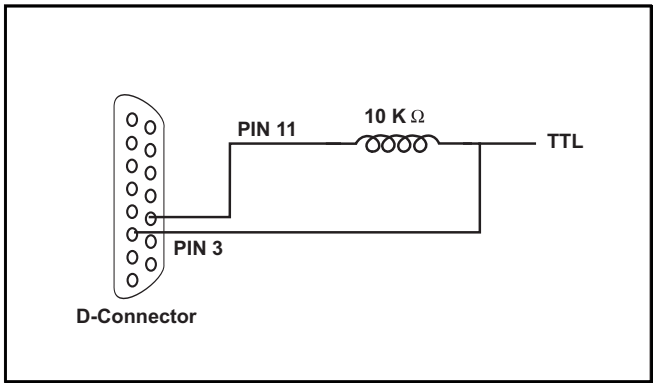


Quick Start Instructions for Connecting Alarm Output

Alarm Output Option 1 - Relay



Alarm Output Option 2 - TTL



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Figures

Tables

1-1 How to Use This Manual

It is recommended to read this manual before installing, operating or troubleshooting your Quantim® Mass Flow Meter/Controller.

This manual is organized into the following sections:

Section 1.	Introduction
Section 2.	Installation
Section 3.	Operation
Section 4.	Maintenance
Section 5.	Specifications and Approvals
Sections A-B	Appendices
Back Cover	Warranty, Local Sales/Service Contact Information

The Quality System at Brooks Instrument conforms to the quality standards set forth in ISO 9001.

This instruction manual is intended to provide the user with all the information necessary to install, operate and maintain the Brooks Quantim Mass Flow Meters and Controllers.

1-2 Description

Brooks Quantim Mass Flow Meters are used to provide accurate measurements of fluid flow, fluid density and temperature. The heart of these systems is the Coriolis mass flow sensor, which produces an electrical output signal directly proportional to mass flow rate and density. Brooks Quantim Mass Flow Controllers couple the Coriolis sensor with a control valve. Dependant on the application, this can be fully integrated within the product or remote but close-coupled. The Brooks Quantim additionally possesses digital signal processing (DSP) electronics and PID control electronics to provide measurement and control in one complete package.
The Quantim device is available for a wide range of gas and liquid flows. (See specifications, Section 1-3 for details).

1-3 Performance Specifications

Performance Specifications:

Flow:

Liquid Flow Specifications, Metric Units[9]

Product Type	Quantim Model[1]	Quantim Tube Size	Maximum Flow Rate[2]	Nominal Flow Rate[2]	Minimum Full Scale	Minimum Measurable Flow
			Kg/hr or l/hr	Kg/hr or l/hr	Kg/hr or l/hr	Kg/hr or l/hr
Controller	QMBC	2	0.30	0.15	0.01	0.001
		3	1.00	0.78	0.10	0.010
		4	15.94	7.97	1.00	0.100
Meter	QMBM	2	0.38	0.19	0.01	0.001
		3	1.00	1.00	0.10	0.010
		4	27.00	13.50	1.00	0.100

Liquid Flow Specifications, English Units[9]

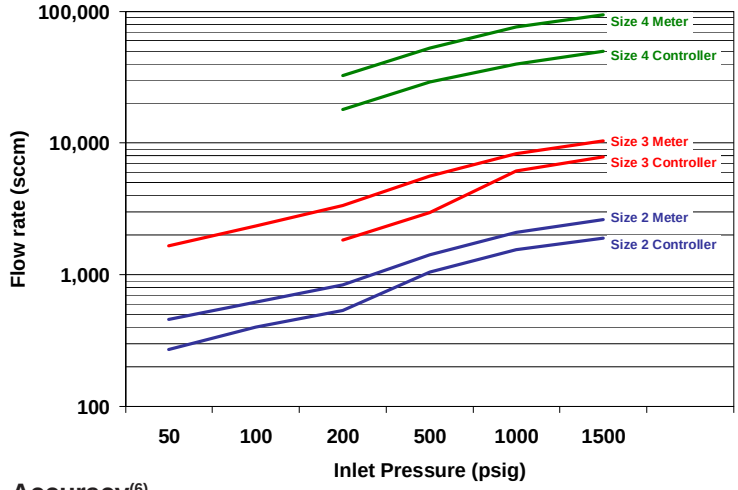
Product Type	Quantim Model[1]	Quantim Tube Size	Maximum Flow Rate[2]		Nominal Flow rate[2]		Minimum Measurable Flow
			lb/hr	gal/hr	lb/hr	gal/hr	lb/hr
Controller	QMBC	2	0.66	0.08	0.33	0.04	0.002
		3	2.21	0.26	1.72	0.21	0.022
		4	35.15	4.21	17.57	2.11	0.221
Meter	QMBM	2	0.84	0.10	0.42	0.05	0.002
		3	2.21	0.26	2.21	0.26	0.022
		4	59.54	7.13	29.77	3.57	0.221

Gas Flow Specifications
Flow rates that produce approximately 14.5 psig (1bar) pressure drop on air at 70°F (21°C) with an inlet pressure of 500 psi (35 bar)

Product Type	Quantim Model[1]	Quantim Tube Size	Nominal Mass Flow Rate		Nominal Volume Flow Rate		
			lb/hr	Kg/hr	scfh[3]	sccm[3]	ml/min[5]
Controller	QMBC	2	0.168	0.076	2.227	1051	975.2
		3	0.472	0.214	6.261	2955	2743
		4	3.960	1.796	52.52	24787	23009
Meter	QMBM	2	0.227	0.103	3.034	1432	1329
		3	0.893	0.405	11.86	5595	5193
		4	8.476	3.840	112.6	53116	49319

Gas Flow Limits

Air, 70°F (21°C), 14.5 psi (1 bar) pressure drop



Accuracy[6]

± measurement accuracy % of rate or [(zero stability/flowrate) x 100] % of rate, which ever is greater

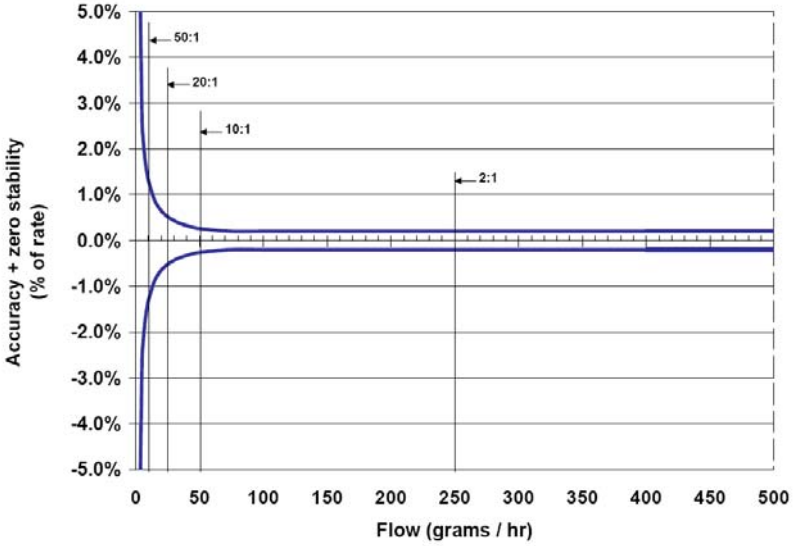
Measurement Accuracy

Sensor Tube Material	Fluid Type	Standard Flow Measurement Accuracy (% of rate)	Optional Flow Measurement Accuracy (% of rate)
Stainless Steel	Liquid	0.2%	0.5%
	Gas	0.5%	1.0%
Hastelloy	Liquid	0.5%	1.0%
	Gas	0.5%	1.0%

Zero Stabilities

Sensor Tube Material	Tube Size	Zero Stability (Kg/hr)	Zero Stability (Lb/hr)
Stainless Steel	2	0.00013	0.0003
	3	0.0010	0.0022
	4	0.0040	0.0088
Hastelloy	2	0.0002	0.0004
	3	0.0015	0.0033
	4	0.0120	0.0265

Standard Measurement Accuracy vs Flow Rate Chart, Tube Size 2



Repeatability[7]:

± 0.05% or ± [0.5 x (zero stability/flowrate) x 100]% of rate whichever is greater

Device Leak Integrity[8]:

Elastomer Sealed Device: Outboard 1 x 10^{-9} atm. cc/sec., helium (maximum)
Metal Sealed Device: 1 x 10^{-10} atm. cc/sec., helium (maximum)

Turn Down:

Controller: 100:1 or down to the minimum measurable flow, whichever flow rate is greater
Meter: to minimum measurable flow

Settling Time:

Controller (Stainless Steel sensor tube): Less than 2 seconds within 2 % full scale of final value, ± [(zero stability/flowrate) x 100]% of rate per SEMI Guideline E17-91
Controller (Hastelloy sensor tube): Less than 12 seconds within 2 % full scale of final value per SEMI Guideline E17-91
Meter: Less than 0.5 seconds within 2 % full scale of final value, ± [(zero stability/flowrate) x 100]% of rate per SEMI Guideline E17-91

Maximum Operating Pressure[8]:

Standard: 3.5 MPa, 35 bar or 500 psi
Optional: 10 MPa, 100 bar or 1500 psi
Optional: 30 MPa, 300 bar or 4500 psi (Hastelloy sensor tube only)

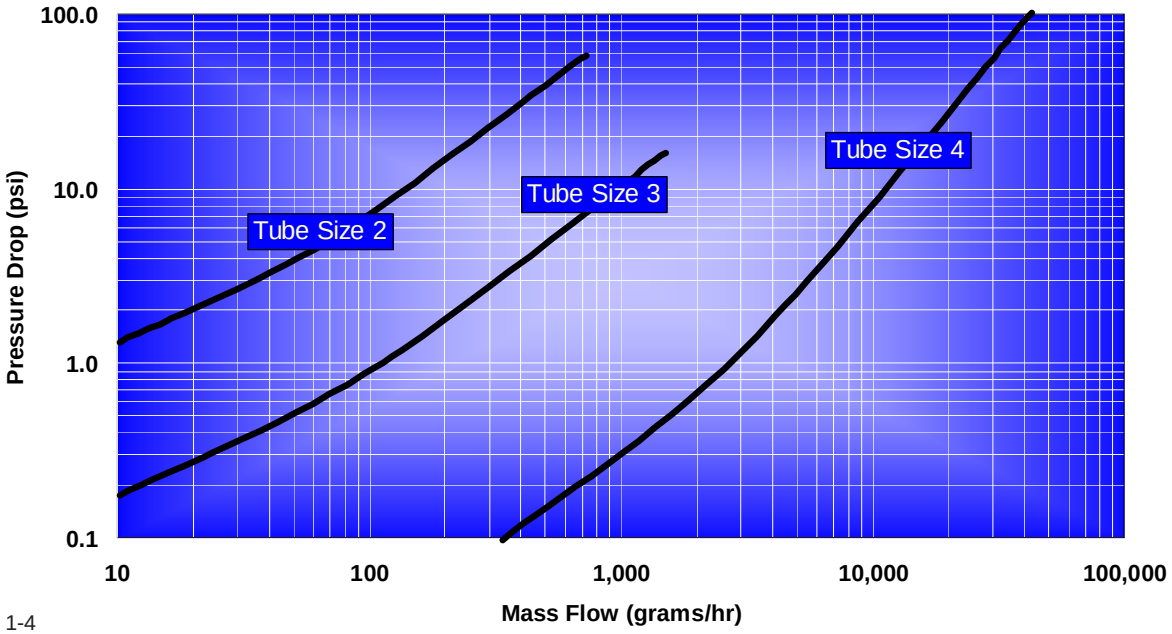
Differential Pressure Requirements, Controller[9]:

		Liquid						Gas					
Quantim	**Quantim**	**KpA**		**bar**		**psi**		**KpA**		**bar**		**psi**	
Model[1]	**Tube Size**	**min**	**max***	**min**	**max***	**min**	**max***	**min**	**max***	**min**	**max***	**min**	**max***
QMBC	**2**	69	1034	0.7	10.3	10	150	69	1724	0.7	17.2	10	250
	3	69	1379	0.7	13.8	10	200	69	1034	0.7	10.3	10	150
	4	69	1379	0.7	13.8	10	200	69	1034	0.7	10.3	10	150

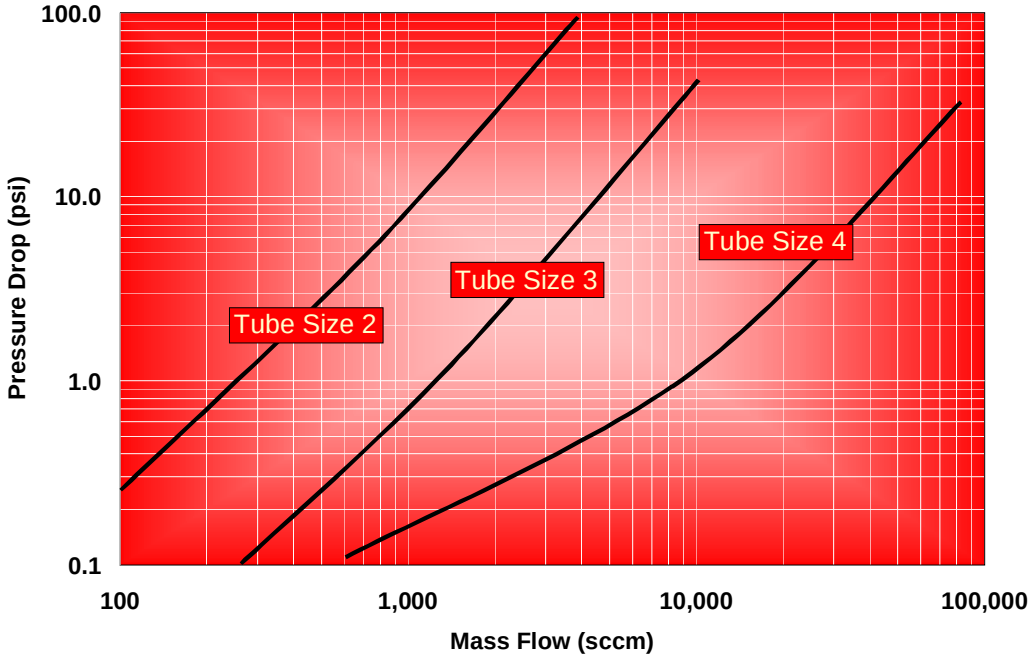
* Actual maximum pressure drop will depend on process conditions and orifice selection.

Differential Pressures , Meter[9]

Pressure Drop Liquid - (H_20)



Pressure Drop Air @ 500 psi Inlet Pressure



Density[10]:

Range:	0.2 to 2.0 grams/cc
Accuracy:	±0.005 grams/cc
Repeatability:	±0.002 grams/cc

Temperature[11]

Device Temperature Range:	0 to 65°C or 32 to 149°F
Accuracy:	± 0.5°C or ± 1.0°F

Notes

(1) QMBC - Brooks Quantim controller with integral control valve. QMBM - Brooks Quantim meter (no valve).

(2) 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.

(3) Standard volumetric conditions are 14.696 psia and 70°F.

(4) Actual volumetric flow is a function of the mass flow and density measurements; Therefore, the accuracy of the actual volumetric flow is a function of the mass flow and density accuracy.

(5) ml_n/min Reference Conditions 0°C at 1013.25 mbar.

(6) 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).

(7) Repeatability- The maximum difference between output readings when the same input is applied consecutively; the closeness of agreement among consecutive measurements of an output for the same value of input under the same operating conditions, approaching from the same direction.

(8) Helium leak and pressure test of elastomer sealed devices is performed with integral 5/16" -24 UNF connection.

(9) Differential pressures are based on reference conditions of water and air at 68 to 77°F (20 to 25°C).

(10) For applications with fluid density in the range from 0.3 to 0.5 grams/cc the device may be sensitive to 50Hz or 60Hz vibration. The density measurement at temperatures other than 21° C (70° F) has an additional error of approximately 0.0005 grams/cc per deg C. The density output signal is available below 0.2grams/sec. The density accuracy is applicable over the stated density range.

Physical Specifications

⚠ CAUTION

It is the user's responsibility to select and approve all materials of construction. Careful attention to metallurgy, engineered materials and elastomeric materials is critical to safe operation.

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, Down Port 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: ¾" NPT wiring access to IP40 Device with 15 pin D-Type connector.

Dimensions:

See Figures 1-1 through 1-7

Functional Specifications

Output Signals[13]:

- 4-20 mA or 0-5 Vdc active outputs represent mass flow or volume flow[4].
- 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[13]:

- 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

Signal Specifications:	Pin 4	4-20 mA output	< 500 ohm series resistance
	Pin 2	0-5 Vdc output	> 1K ohm load
	Pin 13	4-20 mA output	< 500 ohm series resistance
		0-5 Vdc output	> 1K ohm load
	Pin 7	4-20 mA input	250 ohm input impedence
		0-5 Vdc input	200 ohm input impedence
	Pin 12	Valve override input	> 50K ohm input impedence
	Pin 3	Alarm output	100 mA maximum current sink

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 mA @ 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.

Alarms and Warnings: Alarms accessed via HART or the Brooks Service Tool can be configured to monitor the following variables[13]:

- Mass Flow
- Density
- Volumetric Flow
- Temperature
- Slug Flow
- Diagnostic Failure
- Setpoint Deviation
- Valve Drive

LED's[14]:

'STAT'
solid green: system operative.
solid red: system fault.
'AL'
flashing green: warning
flashing red: alarm

Pushbutton[15]: 'ZERO' setting pushbutton.

Notes (continued)

[11] The device temperature is affected by the ambient and process temperature as well as internal warming when the device is powered. The device should be maintained in the specified temperature range at all times. 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).

[12] Ensure the minimum required voltage and current is available at the mass flowdevice taking into consderation any losses in the interconnecting cable.

[13] If the Quantim is configured for HART® communication protocol, only 4-20 mA I/O option is available.

[14] IP66 and IP66XP Series external housing cover must be removed to gain access to status LED's.

[15] IP66XP series external housing cover must be removed to gain access to zero push button.

Certifications and Approvals

IP40 Series

Non Incendive/ Non Sparking
United States and Canada- UL Recognized E73889, Vol. 3, Sect. 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

Class I, Zone 2, AEx nC IIC T4
Per ANSI/UL 60079-15

Ambient Temperature: 0° C to 65° C

Enclosure: Type 1/ IP40

Europe - KEMA 04ATEX1241 X

II 3 G EEx nA II T4
Per EN 60079-15: 2003

Ambient Temperature: 0°C to 65°C

Enclosure: IP40
The modules shall be installed in a suitable enclosure providing a degree of at least IP54 according to EN60529, taking into account the environmental conditions under which the equipment will be used.

IP66 Series

Non Incendive/ Non Sparking
United States and Canada- UL Recognized E73889, Vol. 1, Sect. 26. (conduit entry)
United States and Canada Recognized, UL E73889, Vol. 3, Sect. 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 N0. 213 1987; C22.2 No. 14-M91

Ex nC IIC T4
Per CSA E79-15

Class I, Zone 2, AEx nC IIC T4
Per ANSI/UL 60079-15

Ambient Temperature: 0° C to 65° C

Enclosure: Type 4X/ IP66

Certifications and Approvals
Europe - KEMA 05ATEX1068 X

II 3 G EEx nA II T4
II 3 D T 135 C
Per EN 60079-15: 2003, EN 50281-1-1: 1998 + A1

Ambient Temperature: 0° C to 65° C

Enclosure: IP66

IP66XP Series Explosion-proof/ Flame-proof

United States and Canada- UL Recognized E73889, Vol. 1, Sect. 21.

Explosion-proof , Class I, Division 1, Groups C and D;
Dust Ignition-proof, Class II, 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 E79-1

Class I, Zone 2, AEx nC IIC T4
Per UL 60079-1

Ambient Temperature: 0° C to 65° C

Enclosure: Type 4X/ IP66

Europe - KEMA 05ATEX2052X

Ex d IIB T6 / Ex tD A21 IP66 T85° C, per EN 60079-0:2006, EN 60079-1:2007
EN 61241-0:2006 and EN 61241-1:2004

IECex-KEM 09,0007X, Ex d IIB T6, Ex tD A21 IP66 T85° C, per IEC60079-0:2006, EN 60079-1:2007, IEC 61241-1:2004, Ambient temperature 0° deg. C to +65° deg. C (pending).

Ex d certified cable glands, blind plugs and conduit seals shall be used. A conduit seal shall be installed immediately at the emclosure wall. Use wiring/cables suitable for at least 80° deg. C

NOTE: Ex d slits on the breather drain valve acc. to IECEx TSA 07.0053 U

⚠ WARNING

Do not open when an explosive atmosphere may be present.

Environmental effects

EMC effects: The Brooks Quantim series meets the requirements of the EMC directive 89/336EEC per EN 50081-2 and EN 61326-1. To meet these specifications, the Brooks Quantim device must be directly connected to a low impedance (less than 1 Ohm) earth ground. Signals must use a standard twisted-pair, shielded instrument wire.

Pressure effects: The Brooks Quantim series meets the requirements of the Pressure Equipment Directive 97/23/EC. The unit falls into the category "Sound Equipment Practice".

1-4 Dimensions

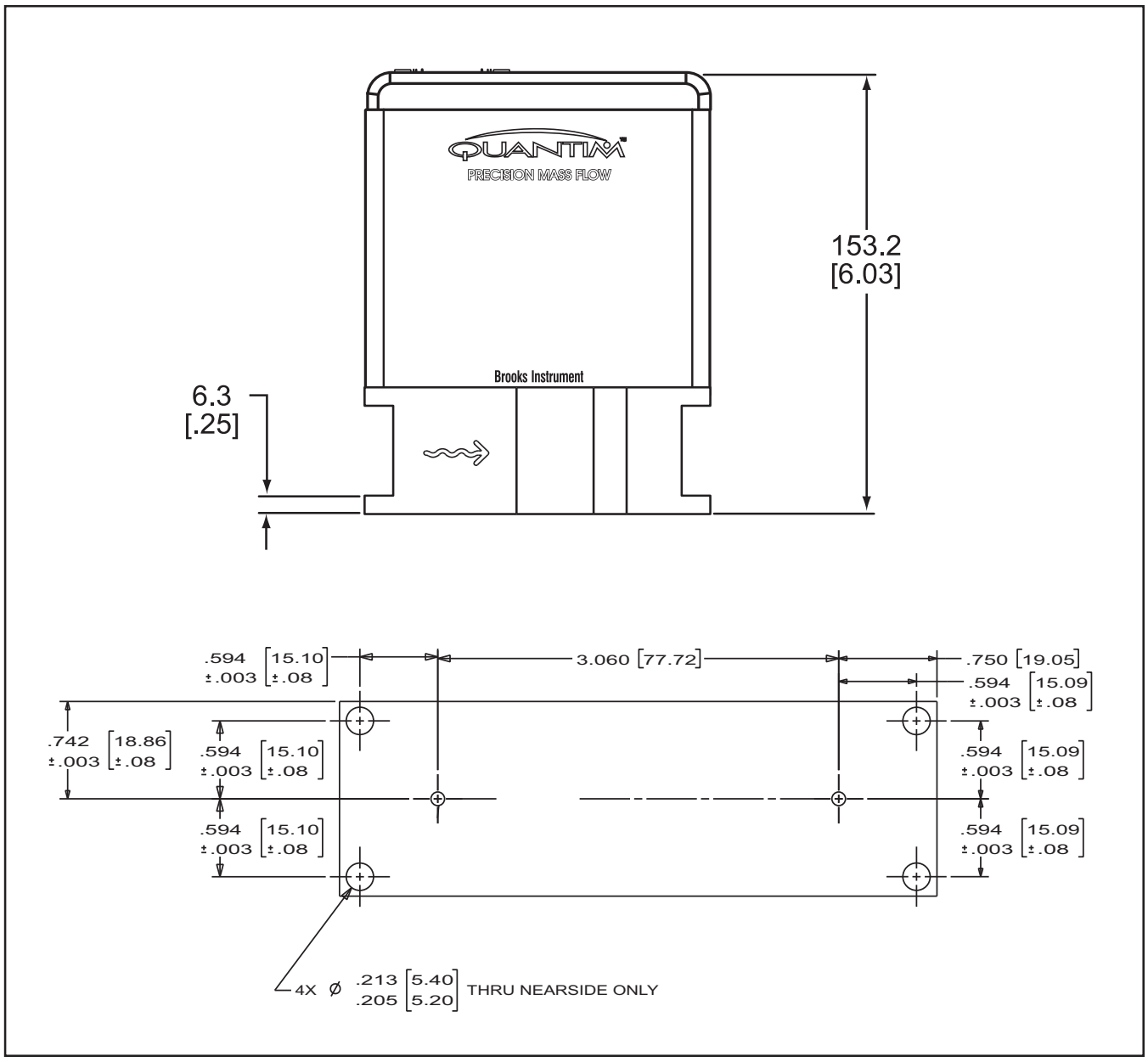


Figure 1-1 Dimensional Drawing QmB IP40 Downported

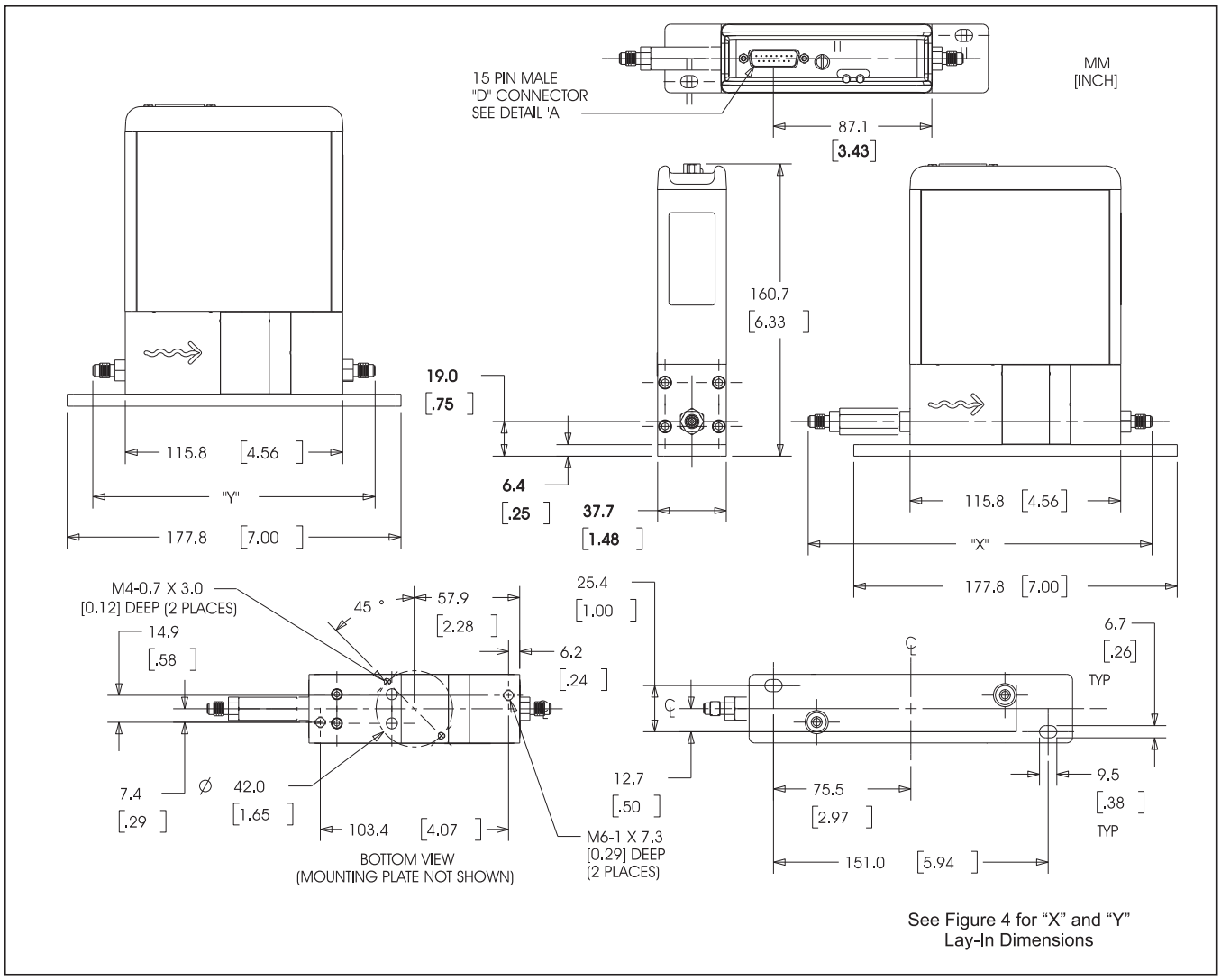
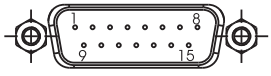


Figure 1-2 Dimensional Drawing QmB IP40



D-CONNECTOR CONNECTIONS

PIN #	FUNCTION
1	SETPOINT COMMON
2	0-5 VDC FLOW SIGNAL OUTPUT
3	(TTL) 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 1-3 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]* 167.3 [6.59]**	151.9 [5.98]* 135.1 [5.32]**	340.1 [13.39] 323.3 [12.73]	307.9 [12.12] 291.1 [11.46]
1/8" Tube Compression	192.7 [7.59]* 167.3 [6.59]**	160.5 [6.32]* 135.1 [5.32]**	348.7 [13.73] 323.3 [12.73]	316.5 [12.46] 291.1 [11.46]
1/4" Tube Compression	197.3 [7.77]* 166.8 [6.57]**	165.1 [6.50]* 134.6 [5.30]**	353.6 [13.92] 323.1 [12.72]	321.4 [12.65] 290.9 [11.45]
6 mm Tube Compression	197.6 [7.78]* 167.0 [6.78]**	165.4 [6.51]* 134.8 [5.31]**	353.9 [13.93] 323.2 [12.72]	321.7 [12.67] 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 1-4 Lay-In Dimensions Integral and Remote Valves

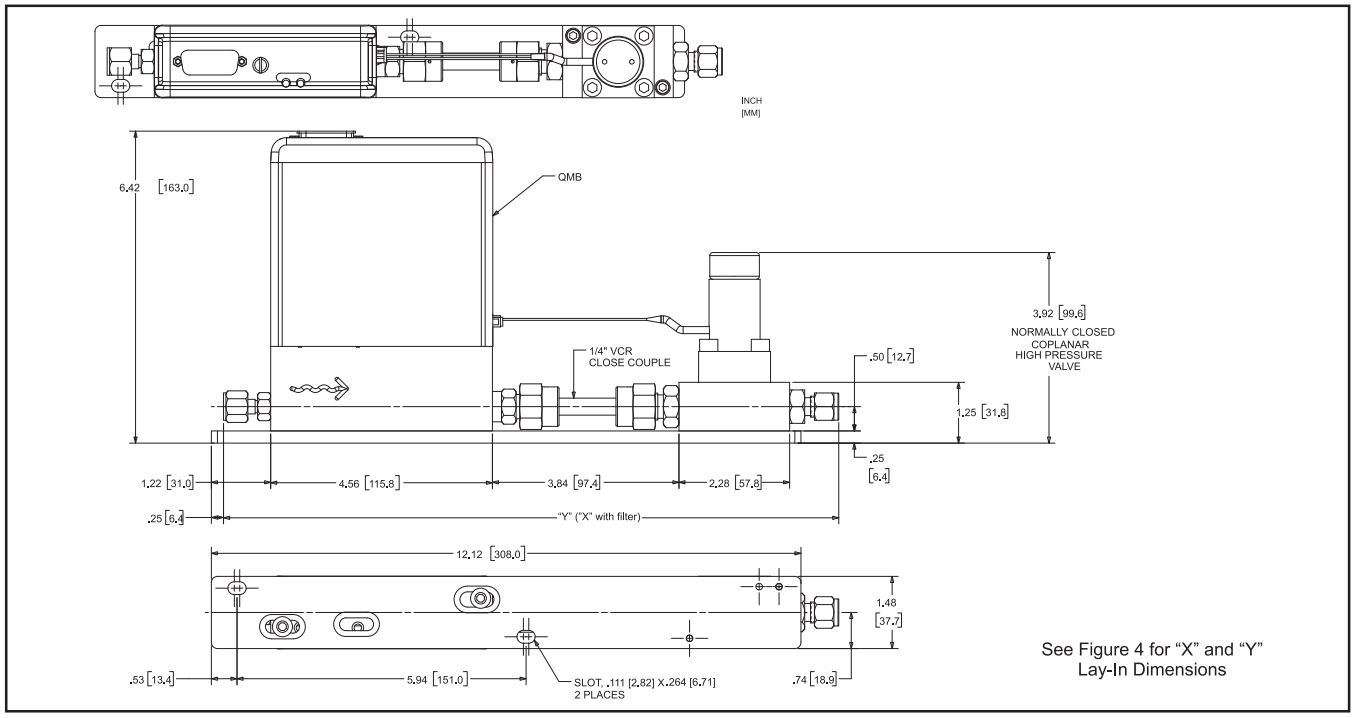


Figure 1-5 Dimensional Drawing QmB IP40 with Remote Valve

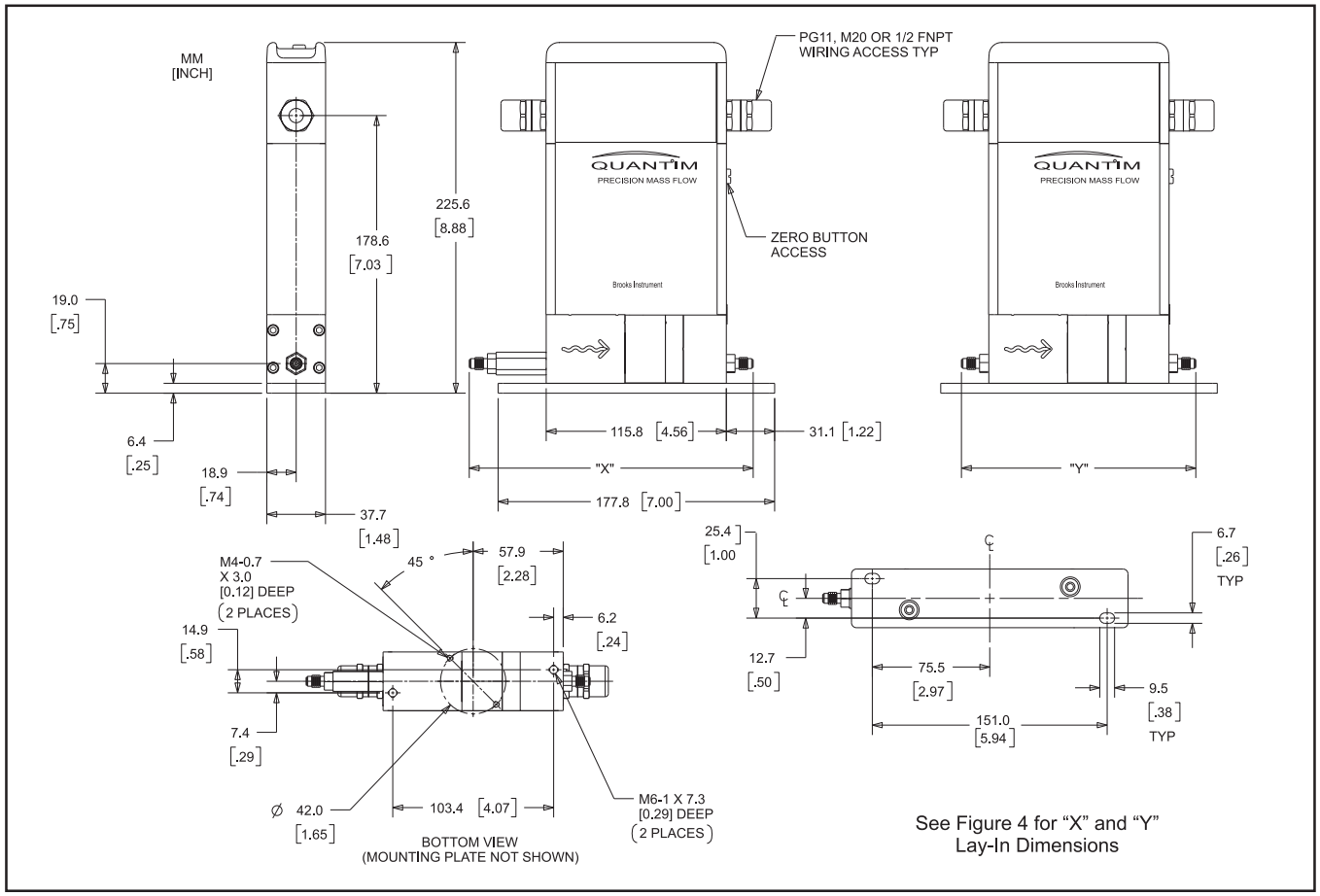


Figure 1-6 Dimensional Drawing QmB IP66

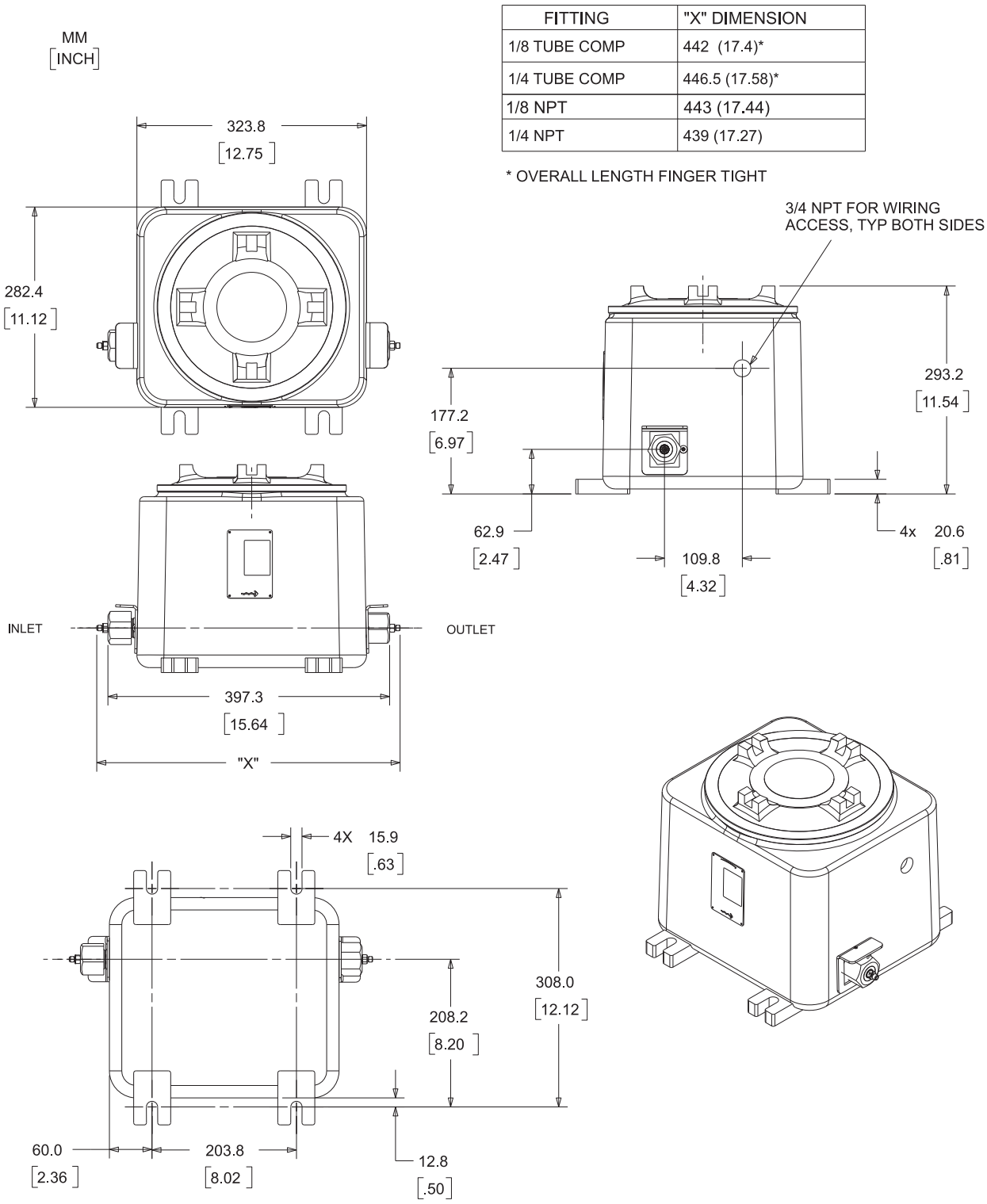


Figure 1-7 Dimensional Drawing QmB IP66XP

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2-1 General

⚠ WARNING

Operating Procedure: Do not operate this instrument outside the specifications listed in Section 5. Before bringing the unit into operation, make sure that all fluid connections have been correctly tightened and that all necessary electrical connections have been made.

2-2 Receipt of Equipment

When the instrument is received, the outside packing case should be checked for damage incurred during shipment. If the packing case is damaged, the local carrier should be notified at once regarding their liability. A report should be submitted to your nearest Product Service Department.

Brooks Instrument
407 W. Vine Street
P.O. Box 903
Hatfield, PA 19440 USA
Toll Free (888) 554-FLOW (3569)
Tel (215) 362-3700
Fax (215) 362-3745
E-mail: BrooksAm@BrooksInstrument.com
http://www.BrooksInstrument.com

Brooks Instrument
Neonstraat 3
6718 WX Ede, Netherlands
P.O. Box 428
6710 BK Ede, Netherlands
Tel 31-318-549-300
Fax 31-318-549-309
E-mail: BrooksEu@BrooksInstrument.com

Brooks Instrument
1-4-4 Kitasuna Koto-Ku
Tokyo, 136-0073 Japan
Tel 011-81-3-5633-7100
Fax 011-81-3-5633-7101
Email: BrooksAs@BrooksInstrument.com

Remove the envelope containing the packing list. Carefully remove the instrument from the packing case. Make sure spare parts, accessories and documentation are not discarded with the packing materials. Inspect for damaged or missing parts.

2-3 Recommended Storage Practice

If intermediate or long-term storage is required, it is recommended that the instrument be stored in accordance with the following:

a. In the original vacuum bag and shipping container.
b. In a sheltered area with the following conditions:
Ambient temperature 70^0C (160^0F) maximum and 0^0C (32^0F) minimum.
c. Relative humidity 45% nominal, 60% maximum, 25% minimum.

Upon removal from storage a visual inspection should be conducted to verify the condition of equipment is "as received".

2-4 Return Shipment

Prior to returning any instrument to the factory, contact your nearest Brooks agent or a Brooks location listed below for a Return Materials Authorization Number (RMA#). Information describing the reason for return, details on the problems encountered, if any, as well as any requested work or corrective action requests must be included with the returned device.

Brooks Instrument
407 W. Vine Street
P.O. Box 903
Hatfield, PA 19440 USA
Toll Free (888) 554-FLOW (3569)
Tel (215) 362-3700
Fax (215) 362-3745
E-mail: BrooksAm@BrooksInstrument.com
http://www.BrooksInstrument.com

Brooks Instrument
Neonstraat 3
6718 WX Ede, Netherlands
P.O. Box 428
6710 BK Ede, Netherlands
Tel 31-318-549-300
Fax 31-318-549-309
E-mail: BrooksEu@BrooksInstrument.com

Brooks Instrument
1-4-4 Kitasuna Koto-Ku
Tokyo, 136-0073 Japan
Tel 011-81-3-5633-7100
Fax 011-81-3-5633-7101
Email: BrooksAs@BrooksInstrument.com

A copy of Brooks Instrument Decontamination Statement, as well as a Material Safety Data Sheet (MSDS) for the fluid(s) used in the instrument must be included with the returned device. This documentation is required before any Brooks personnel can begin processing the equipment. Copies of the forms can be obtained from any Brooks Instrument agent or on-line at www.brooksinstrument.com listed under the Support button.

Any assembly or part must be returned with a Return Material Authorization, which details the particulars about the device, the concerns and any process situations that need to be noted. A copy of the RMA is available on-line at www.brooksinstrument.com under the Support button.

2-5 Transit Precautions

To safeguard against damage during transit, transport the instrument to the installation site in the same container used for transportation from the factory if circumstances permit.

2-6 Fluid Connections

General Mounting Practices

Use good piping practices to minimize transmitting any torque or bending loads onto the process connections on the Quantim. Always verify there are no leaks prior to starting Quantim on process fluid. The instrument is delivered from the factory with a rigid surface mounting plate. For optimum performance, this mounting plate should be used to mount Quantim to a rigid surface. If panel mounting is required, the bottom of the instrument is provided with two M4 and M6 (see dimensional drawings, Section A) mounting holes to properly install the instrument on a rigid flat plate. Panel mounting is not recommended for Quantim flow controllers with remote valve configuration.

⚠ WARNING

Any rotation of the inlet or outlet fitting during installation of a metal seal device may result in a leak. Always use two (2) wrenches when attaching gas lines to prevent rotation.

Prior to installation:

a. Verify that tube fittings match the fitting type and size supplied with your Quantim instrument.
b. Make certain that all piping and fittings are clean and free of obstructions for the instrument and filter.
c. Assure that the final installation permits easy access to the instrument.

2-7 Mechanical Installation

(For Dimensional Drawings see Section 1-4 Dimensions)

⚠ CAUTION

When installing the Mass Flow device, care should be taken to prevent foreign materials from entering the instrument's inlet or outlet. Internal passages are very small. It is recommended that an inlet filter be used to limit the chance of clogging. Do not remove the protective end-caps until the actual moment of installation. When used with reactive fluids (some of which may be toxic), contamination or corrosion may occur as a result of plumbing leaks or improper purging. Plumbing should be checked carefully for leaks.

⚠ CAUTION

When installing the IP66 and IP66XP Mass Flow Devices, note that there are (2) 3/4" NPT conduit entries supplied. If both entries are not in use, the unused entry must be sealed via an approved method per the hazard level of the atmosphere in which it is installed.

Recommended installation procedures:

a. All models should be mounted to a stable surface that is relatively free from mechanical shocks and mechanical vibration using the supplied mounting plate.
b. Leave sufficient room for access to the electrical connections.
c. Install in a manner that allows the instrument to be easily removed.
d. Install the instrument with an appropriate filter on the fluid inlet side.
e. It is recommended that a positive shutoff valve be installed downstream of the Quantim product to allow for proper zeroing after installation.

Manifold Mounting

If the Quantim is provided with the downport option it should be mounted to the proper manifold. Make sure the correct seals are used between the Quantim and the manifold to prevent leaks.

⚠ WARNING

When using ANSI/ISA SP-76 downport process connections, refer to substrate manufacturer's operating pressure limits (some substrates are rated lower than 70 bar / 1000 psi).

⚠ CAUTION

The control valve of the Quantim Mass Flow Controller provides precision control and is not designed for positive shutoff. If positive shutoff is required, it is recommended that a separate shut-off valve be installed in-line, downstream from the Quantim Mass Flow Controller.

⚠ CAUTION

If the power supply to the Quantim Mass Flow Controller is interrupted, a NORMALLY CLOSED valve will be fully closed. However, a shutoff valve is recommended if the process architecture requires it as the Quantim control valve may not provide positive shutoff.

⚠ WARNING

To prevent ignition of hazardous atmospheres disconnect supply circuits before opening. Keep cover tight when in operation. Conduit runs must have seal fittings installed within 3 inches of enclosure.

2-8 Process Mounting

The Brooks Quantim will function in any orientation if the Coriolis sensor and the control valve remain filled with process fluid. Entrapped gas in a liquid application and entrapped liquid in a gas application should be prevented as it may disturb the Coriolis sensor and the control valve.
Install the Brooks Quantim in the direction of the FLOW arrow.
The arrow indicating proper flow direction is engraved on the front of the instrument between the process fittings. (See Figure 2-1 below.)

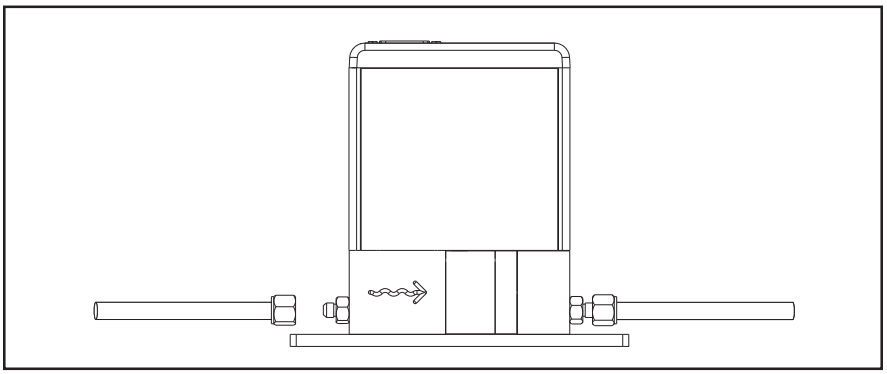

Figure 2-1 Flow Direction Through the Quantim, as Indicated by the Arrow Engraved on the Meter/Controller Body.

Horizontal Mounting

If installing the Brooks Quantim in a horizontal orientation, liquids should flow in the direction of the flow arrow. Situations of entrapped gas in the liquid process should be avoided. In liquid flow applications, it is recommended to mount the Quantim in an inverted attitude on the underside of the pipe to limit the possibilitiy of entrapped gas collecting in the sensor, which can cause errors (See Figure 2-2).

For use in gas flow measurement, the Quantim should be mounted on the topside of the pipe to limit the possibility of entrapped fluid collecting in the sensor, which can cause errors. (See Figure 2-3).

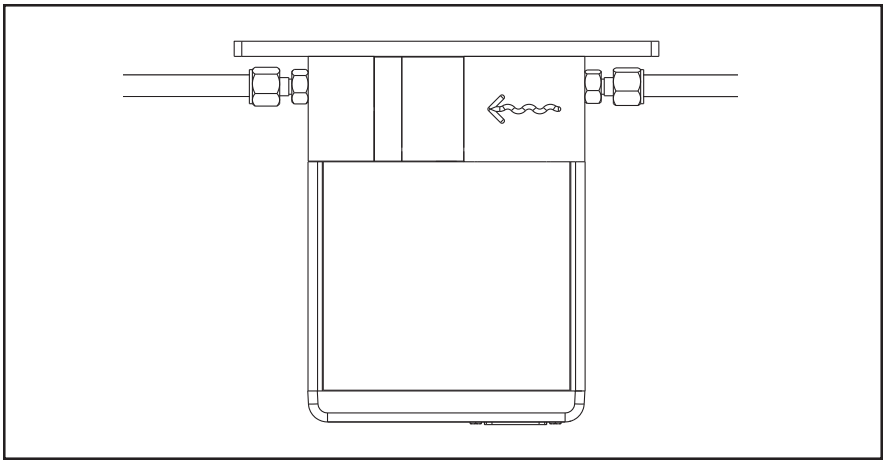

Figure 2-2 Horizontal Inverted Installation

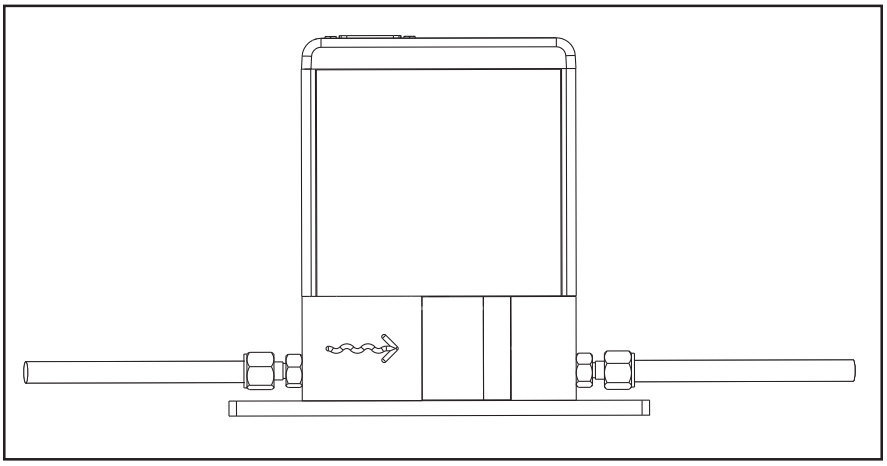

Figure 2-3 Horizontal Right Side Up Installation

Vertical Mounting
If the Brooks Quantim is installed in a vertical orientation, for use in a liquid application liquid should flow upwards through the instrument to help minimize errors due to entrapped gas (See Figure 2-4). For gas flow vertical orientation, flow up or down is acceptable.

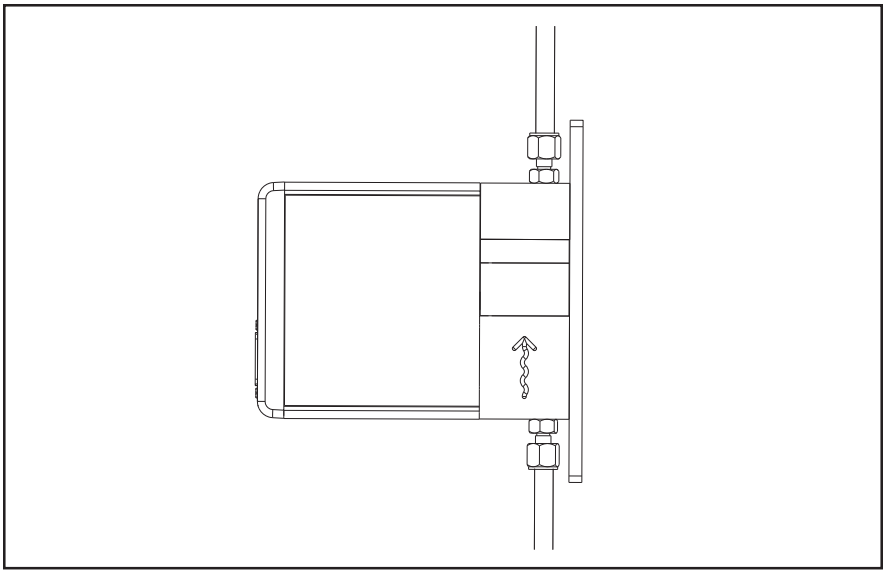

Figure 2-4 Vertical Flow Up Installation

2-9 Electrical Interfacing

Meter and Controller
Flow Output (Pins 2, 4 and 10)
Flow Output configuration is a factory selected option.

Each Quantim instrument is calibrated as either 0-5 Vdc or 4-20 mA at the factory as specified when ordering. Pin 2 indicates the flow rate, represented by a 0-5 Vdc signal proportional to flow, if so configured. Recommended load on Pin 2 is

>1K ohm. Pin 4 indicates the flow rate, represented by a 4-20 mA signal current proportional to flow, if so configured. Maximum series resistance on Pin 4 is 500 ohms. Do not apply power to Pin 4. The current and voltage signals are returned via Pin10.

Analog Setpoint Input (Pins 7, 8 and 1; Controller models only)
Signal Input configuration is a factory selected option.

The Mass Flow Controller can be used either with a current or voltage setpoint as configured when ordered. If configured for current (4-20 mA) setpoint, connect the setpoint signal to Pin 7 and the setpoint return signal to Pin 1. Input impedence on Pin 7 is 250 ohms. Do not apply power to Pin 7. If configured for voltage (0-5 Vdc) setpoint, connect the setpoint signal to Pin 8 and the setpoint return to Pin 1. Input impedence to Pin 8 is 200K ohms.

Power Supply (Pin 5 and Pin 9)

Both Mass Flow Meter and Controller models are connected via Pins 5 (+14 to +27 Vdc) and 9 (power supply common) on the customer connector. See Section 5, Functional Specifications for current requirement.

⚠ WARNING

With regard to power supply connections, the user must ensure that the minimum required voltage and current is available at the mass flow device taking into consideration any losses in the interconnecting cable.

Valve Override (Pin 12; Controller models only)

To open or close the control valve independently of the setpoint signal (e.g. for process reasons), Pin 12 is available to carry a valve override signal. Leave floating (i.e. not connected) to allow for normal control operation. Input impedence on Pin 12 is >50K ohms.

>5 Vdc @ Valve Open
0 Vdc @ Valve Closed

Density or Temperature Output (Pin 13 and Pin 10)

Pin 13 indicates the density or temperature, represented by a 4-20 mA or 0-5 Vdc signal, proportional to density or temperature. The current and voltage signals are returned via Pin 10. Maximum series resistance on Pin 3 is 500 ohms when configured for 4-20 mA. Recommended load on Pin 13 is >100K ohms when configured for 0-5 Vdc. Do not apply power to Pin 13.

Alarm Output (Pin 3 and Pin 9)

Pin 3 indicates an alarm condition as an open drain FET configuration. Maximum voltage is 30 Vdc, maximum current is 100 mA. (See Figure 2-6 on page 2-8.)

Table 2-1 Electrical Interfacing for Quantim

PIN NO.	FUNCTION	Controller	Meter
1	Setpoint Common	•	N/A
2	0 - 5 Vdc Flow Signal Output	•	•
3	Alarm Output	•	•
4	*4 - 20 mA Flow Signal Output	•	•
5	+14 Vdc to +27 Vdc Power Supply	•	•
6	not used		
7	*4 - 20 mA Setpoint Input	•	N/A
8	0 - 5 Vdc Setpoint Input	•	N/A
9	Power Supply Common	•	•
10	Signal Output Common	•	•
11	+5 Vdc Reference Output	•	•
12	Valve Override Input	•	N/A
13	*4 - 20 mA or 0 - 5 Vdc Density or Temperature	•	•
14	not used		
15	not used		

* Do not apply power to these Pins.

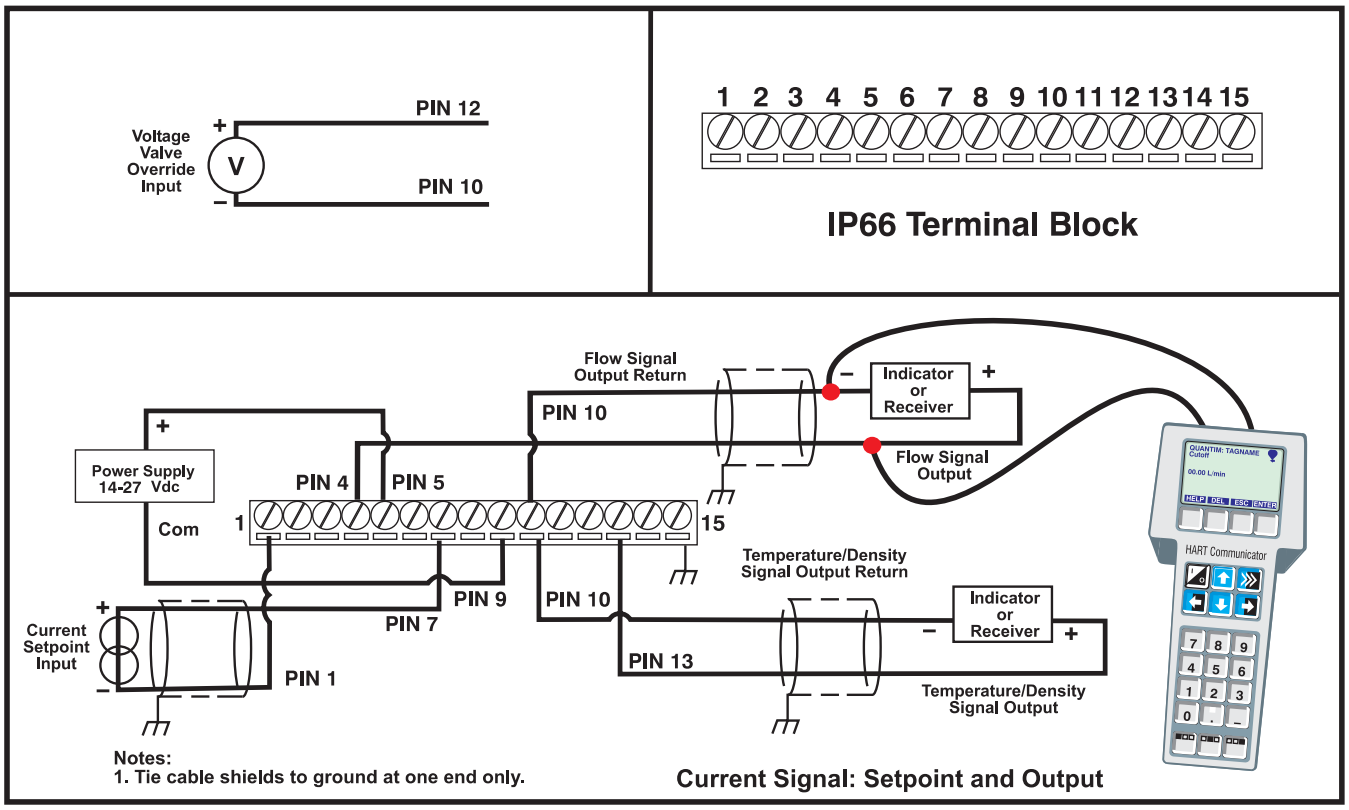

Figure 2-5 Proper Wiring of a Brooks QmB IP66 NEMA 4X

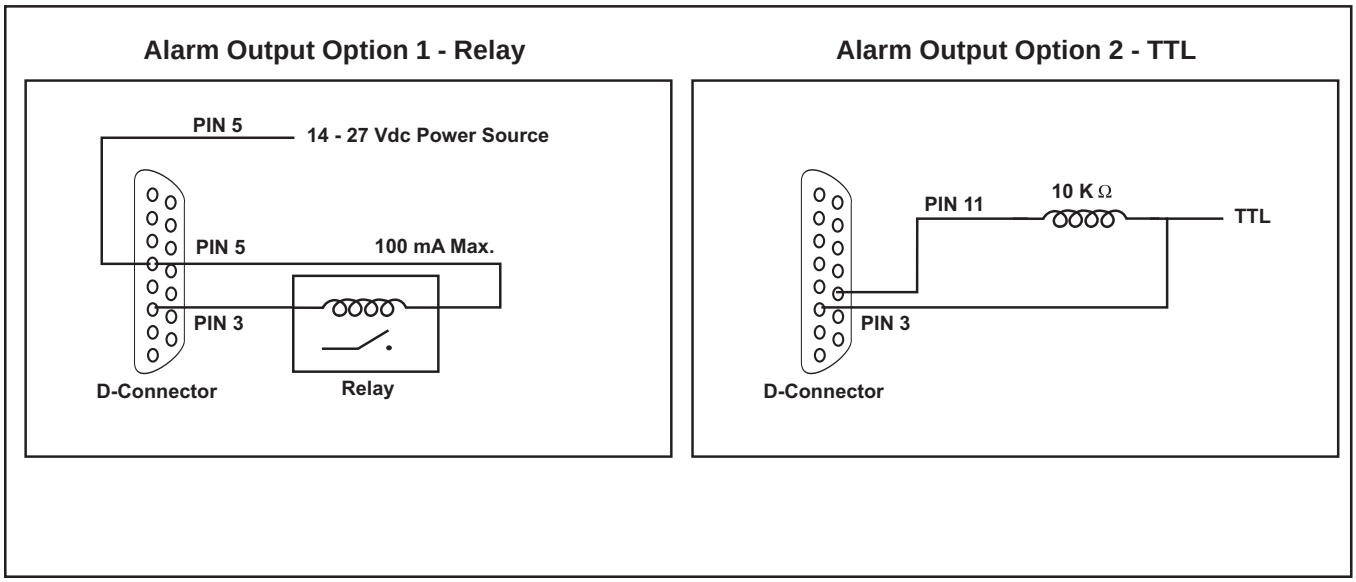

Figure 2-6 Alarm Output Wiring Options

2-10 Interconnection with Peripheral Equipment

Quantim Meter/Controller and Brooks Instrument Models 0152, 0154 or 0254 interconnection.

The following cables are available for connection of the Quantim Mass Flow Meter/Controller to the Brooks Microprocessor Control & Read-out Unit: Models # 0152, 0154 or 0254

Length: 3ft (1m);	part number	124Y054AAA
Length: 5ft (1.5m);	part number	124Y050AAA
Length: 10ft (3m);	part number	124Y051AAA
Length: 25ft (7m);	part number	124Y052AAA
Length: 50ft (15m);	part number	124Y053AAA

Or in case both Flow and Density or Temperature functions have to be made available: (For 4-20 mA secondary output only)

Length: 5ft (1.5m);	part number	124Z906ZZZ
Length: 10ft (3m);	part number	124Z907ZZZ
Length: 25ft (7m);	part number	124Z908ZZZ
Length: 50ft (15m);	part number	124Z909ZZZ

The following open frame cables are available for connection of the QUANTIM Mass Flow Meter/Controller to any secondary electronic device.

Length: 5ft (1.5m);	part number	124Z361AAA
Length: 10ft (3m);	part number	124Z362AAA
Length: 25ft (7m);	part number	124Z363AAA
Length: 50ft (15m);	part number	124Z435AAA
Length: 75ft (22m);	part number	124Z876AAA
Length: 100ft (30m);	part number	124Z868AAA
Length: 150ft (45m);	part number	124Z757AAA
Length: 200ft (60m);	part number	124Z773AAA

See Figure 2-7 for Wire Color Code Diagram

Cable Shielding Earth
Cable requirements:
Compliance with EMC directive 89/336/EEC, requires that the equipment be fitted with fully screened signal cables with at least 80% shielding. The cable shielding should be connected to the D-connector's metal shell and have 360° shielding at both ends. The shielding should be connected to an earth terminal.

PIN	COLOR	FUNCTION
1	BLK	SETPOINT COMMON
2	WHT	0-5 VDC FLOW SIGNAL OUTPUT
3	RED	(TTL) OPEN COLLECTOR ALARM OUTPUT
4	GRN	*4-20 MA FLOW SIGNAL OUTPUT
5	ORG	+14.0 VDC TO +27 VDC POWER SUPPLY
6	BLUE	NOT USED
7	WHT / BLK	*4-20 MA SETPOINT INPUT (+)
8	RED / BLK	0-5 VDC SETPOINT INPUT(+)
9	GRN / BLK	POWER SUPPLY COMMON
10	ORG / BLK	SIGNAL OUTPUT COMMON
11	BLU / BLK	+5 VOLT REFERENCE OUTPUT
12	BLK / WHT	VALVE OVERRIDE INPUT
13	RED / WHT	*4-20 MA OR 0-5 VDC DENSITY OR TEMP.
14	GRN / WHT	NOT USED
15	BLU / WHT	NOT USED

* DO NOT APPLY POWER TO THESE PINS

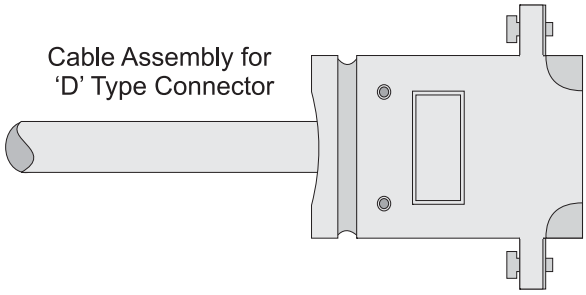

Figure 2-7 Wire Color Codes for 'D' Connector Assembly

3-1 Operating Procedure

⚠ CAUTION

Any sudden change in system pressure may cause mechanical damage to elastomer materials. Damage can occur when there is a rapid expansion of fluid that has permeated elastomer materials. The user must take the necessary precautions to avoid such conditions.

After the wiring cable has been connected, power can be supplied to the instrument. During initialization, the instrument remains in start-up mode for about 5 seconds. The START-UP mode is indicated by the alternately flashing red/green status LEDs on the Meter/Controller.
LEDs are visible through the top cover of the instrument in the NEMA 1/ IP40 package (See Figure 3-1). The top cover must be removed to gain access to the LEDs in the NEMA 4X / IP66 and the Explosion Proof IP66XP package options.

Status LED
The Status LED, indicates the operation condition of the instrument. During start-up, the status LED blinks red/green once per second to indicate proper start-up operation of the meter/controller. Then a solid green is displayed to indicate proper function.

The status LED will be illuminated a solid green color for the meter/ controller, indicating that the instrument is ready for operation.

If the status LED is illuminated a solid red color, a START-UP issue has been determined by the onboard diagnostic programs. This condition can only be cleared by cycling power to the instrument. If the issue persists, call the Quantim Helpdesk at Brooks Instrument.

Customer Service
The Brooks Helpdesk is available to assist with start-up if you experience issues you cannot solve on your own. You will be asked to provide the model code and serial number of your Brooks equipment, which will assist us in answering your questions. For telephone references, please refer to the back cover of this instruction manual.

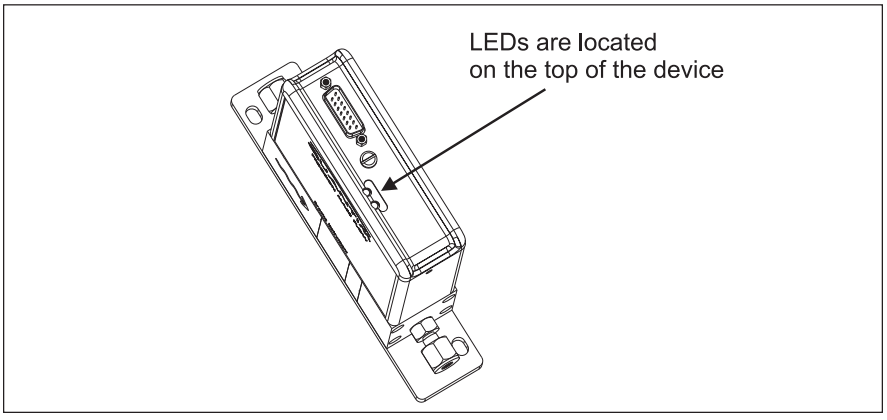

Figure 3-1 Location of the LEDs

3-2 Zero Adjustment

After the Brooks Quantim has been fully installed, you must perform the zeroing procedure. This procedure ensures that the instrument responds properly to zero flow condition and sets a baseline for flow. To perform the zeroing operation on the meter/controller, use the ZERO button, which is located on top right hand side (outlet side) of the instrument. Zero button must be pressed for at least 3 seconds to initiate zeroing procedure. The status LED will flash red on and off during the zeroing procedure. (See Figure 3-2).

⚠ CAUTION

After the instrument has been installed, you must perform the re-zeroing procedure. See Section 3-2 for the re-zeroing procedure. A true zero flow condition must be present and the Coriolis sensor and control valve must both be completely full of process fluid during the re-zeroing procedure. This is done best by eliminating any pressure differential across the instrument. A shutoff valve, downstream from the instrument, is recommended to halt flow during the re-zeroing procedure.

Failure to zero the instrument after initial startup could cause measurement error.

Zero the instrument before putting the instrument in operation.

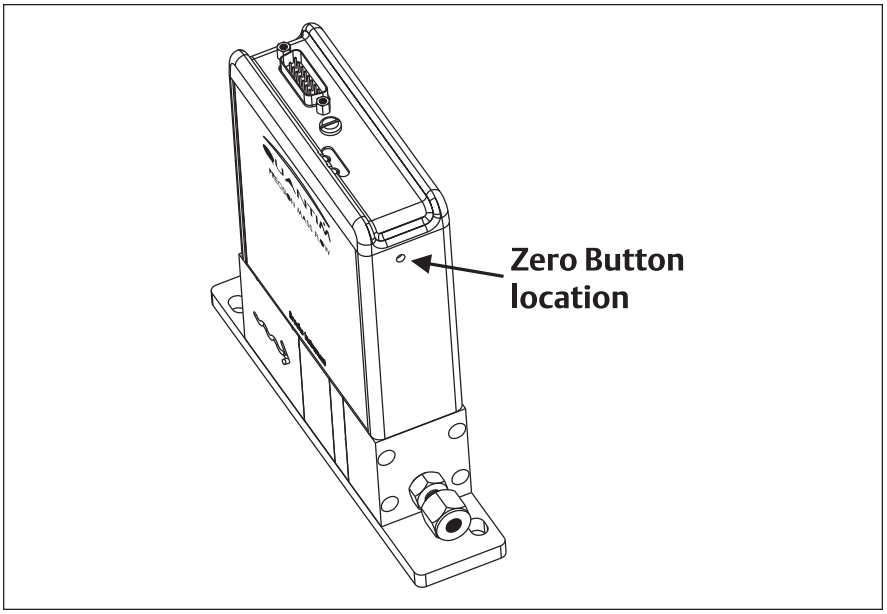

Figure 3-2 Location of the Zero Button.

Zero Procedure

1. Prepare the instrument for zeroing:
   a. Install the instrument according to the instructions in this manual.
   b. Power-up sequence. Isolate device from flow pressure when applying power. Once the status indicator is illuminated green, pressure may be applied.
   c. Apply power to the instrument and allow approximately 45 minutes to reach a stable condition.
   d. Run the process fluid to be measured and controlled through the instrument until the temperature of the instrument approximates the normal process operating temperature. Use the Valve Override (V.O.R.) function to fully open the control valve to facilitate temperature stabilization.

2. Once the instrument has reached process temperature, close the external shutoff valve downstream from the instrument and wait for the flow to stop. Set the control function to zero and V.O.R. to normal once flow has stopped and all pressure differential across the instrument has been bled off.

3. Make sure that the instrument is completely filled with the process fluid under normal process conditions of temperature, pressure, density, etc. make sure there is no entrapped gas in the sensor tube and ensure a zero flow condition through the instrument.

⚠ CAUTION

Flow through the instrument during zeroing procedure will result in an inaccurate zero setting.

Make sure fluid flow through the instrument is completely stopped during the zeroing procedure.

4. After confirming that fluid flow through the instrument is completely stopped, actuate the zero function as previously stated.

5. The default zero sample interval is 30 seconds. A successful zero operation on the controller and meter will be indicated by a solid green color status LED. A solid red color status LED indicates a failed zero process. A non-steady flash will indicate a failed condition. A failed condition can only be cleared by a power cycle.

6. Once the status LED turns green, zero process is complete and the instrument is ready for operation.

Please note that zero command will only be accepted when the output change is less than 1% of the maximum full scale of the device. This logic prevents an accidental zero command from being initiated when flow is present, through the device.

3-3 Calibration Procedure

The Quantim calibration is not described in this manual.
If your Quantim requires calibration, please contact one of the Brooks Instrument locations for technical assistance (See Back Cover for Contact Information).
Or visit our website: www.BrooksInstrument.com/Service & Support.

4-1 General

There are no routine maintenance procedures required to keep the Quantim device in good operating condition. It is however, very important to keep the fluid entering the Quantim clean, and as a result periodic replacement of the inlet guard filter is recommended at a frequency determined by the cleanliness of the fluid. At a minimum this guard filter should be replaced on an annual basis.

⚠ WARNING

METER/CONTROLLER SEAL COMPATIBILITY

Products in this manual may contain metal or elastomeric seals, gaskets, O-rings or valve seats. It is the "user's" responsibility to select materials that are compatible with their process and process conditions. Using materials that are not compatible with the process or process conditions could result in the Meter or Controller leaking process fluid outside the pressure boundary of the device, resulting in personnel injury or death.

It is recommended that the user check the Meter or Controller on a regular schedule to ensure that it is leak free as both metal and elastomeric seals, gaskets, O-rings and valve seats may change with age, exposure to process fluid, temperature, and /or pressure.

⚠ WARNING

If it becomes necessary to remove the MFC/MFM from the system after exposure to toxic, pyrophoric, flammable or corrosive fluids, purge the flowmeter thoroughly before disconnecting the fluid connections. Failure to correctly purge the MFC/MFM could result in fire, explosion or death. Corrosion or contamination of the MFC/MFM upon exposure to air, may also occur.

⚠ CAUTION

It is important that this MFC/MFM only be serviced by properly trained and qualified personnel.

4-2 Troubleshooting

System Checks

⚠ WARNING

Internal seals and component alignments are extremely critical within this device. Improper servicing of your Quantim can cause malfunction of the device and/or personal injury. This device must be serviced by factory personnel only. There are no customer serviceable components within the device. Disassembly of this device voids all warranties, explicit or implied.

Quantim Flow Meters and Controllers are typically used as a critical component in fluid systems. These systems can be complex in nature and therefore isolating a malfunction has to be done with a system perspective. An incorrectly diagnosed malfunction can cause many hours of unnecessary downtime. If possible, perform the following system checks before removing a suspect Mass Flow Meter or Controller for bench troubleshooting or return to the factory
(especially if the system is new):

1. Identify a low resistance common connection and make sure that the correct power supply voltage and signals are present at the connector of the Quantim device.

2. Verify that the process fluid connections have been made correctly, and that they have been tested for leaks.

3. If the Mass Flow Controller appears to be functioning but cannot achieve setpoint, verify that there is sufficient inlet pressure and pressure drop at the controller to provide the required flow.

4. Flow control instability can be a result of using Quantim in a system that includes other active control elements such as pressure regulators. Depending on the tuning constants used in the Quantim and the control dynamics of the other active elements, these devices can interfere with each other and cause flow instabilities. It is very important to take a complete system perspective when applying Quantim to flow control applications.

Table 4-1 Troubleshooting

Observation	Cause	Resolution
Oscillating mass flow output can cause diagnostic alarm	Bubbles dissolved in the liquid. High pressure push gas can cause bubbles to disolve in fluid. Bubbles then form at the valve due to pressure drop, upsetting valve.	Use a degasser or use Helium as a push gas with 25-50ft. of Teflon® tube. Helium is a light gas and can permeate the Teflon tube to release bubbles.
	Oscillating pump pressure used to move the fluid. Piston action can cause pressure oscillations, upsetting valve.	Avoid using push gas. Use a pump or bladder tank to prevent head pressure. Pressure regulators on inlet and outlet of Quantim to stabilize pressure variations.
	Pressure drop or inlet pressure deviates form calibrated values.	Adjust pressure to original specifications.
	Valve out of adjustment.	Contact Brooks Instrument.
	Unstable inlet pressure.	Check external pressure regulator.
	Defective PC board.	Contact Brooks Instrument.
	Valves are tuned digitally and mechanically for a particular ΔP.	Operate Quantim at specified pressure conditions.
Valve will not open or fully close	Valves are tuned digitally and mechanically for a particular ΔP. Proper valve response requires just the right amount of force to be applied by the valve. With too much or too little ΔP the valve will be mis-tuned.	Operate Quantim at specified pressure conditions. Check valve operation with the Brooks Service Tool.
	Mounting attitude is different from calibration attitude; Reason, gravity effects could pull valve open or closed.	Mount Quantim in the specified mounting attitude.
No Flow or unable to achieve full flow	Insufficient inlet pressure or pressure drop.	Adjust pressures, inspect in-line filters and clean/replace as necessary
	Clogged Valve Orifice or Sensor.	Back flush the device with a solvent or purge gas with valve override "Open" (if controller).

Table 4-1 Troubleshooting (continued)

Observation	Cause	Resolution
No Flow or unable to achieve full flow		If the device has an external control valve you can replace or disassemble and clean the valve. (See Section 4-3)
	Particulates in the flow stream.	Use an inlet filter.
	Agglomeration of fluid at orifice.	Consider a larger orifice (valve stability could suffer).
	Chemical deposits.	Institute regular PM back flushing.
	Poor filtration of process fluid.	Install proper filtration.
	Valve out of adjustment (applicable to Controller).	Contact Brooks Instrument.
Valve out of adjustment	Valve guide spring failure (applicable to Controller).	Contact Brooks Instrument.
	Valve override input is grounded	Check the valve override input (Pin12).
	Defective electronic board	Contact Brooks Instrument.
Output signal follows Setpoint at higher Setpoints but not at lower Setpoints	Control valve leaks or is stuck open.	Exercise the control valve alternating between valve override "open" and closed. If problem persists backflush the device with a solvent or purge gas with valve override "open". If the device has an external control valve you can replace or disassemble and clean the valve. (See Section 4-3)
Output signal stays in approx. 5.5 Vdc or 22 mA (regardless of setpoint) and there is flow trough the meter/controller	Valve leaks or is stuck open (applicable to Controller).	Backflush the device with a solvent or purge gas with valve override "open". If the device has an external control valve you can replace or disassemble and clean the valve. (See Section 4-3)
	+15 Vdc applied to the valve overrride input (applicable to Controller).	Check the valve override terminal (Pin 12).
	Defective PC board.	Contact Brooks Instrument.

Bench Troubleshooting

⚠WARNING

If it becomes necessary to remove the instrument from the system power to the device is disconnected at the power supply.

⚠WARNING

If it becomes necessary to remove the instrument from the system after exposure to toxic, pyrophoric, flammable or corrosive chemicals, purge the instrument thoroughly with a inert fluid such as water, alcohol, nitrogen, clean dry air or some other appropriate fluid before disconnecting the fluid connections. Failure to correctly purge the instrument could result in fire, explosion or death. The Quantim Mass Flow device may also become corroded or contaminated upon exposure to air.

Quantim Bench Testing (Refer to Figure 4-1)

1. Establish the proper electrical connection between the Quantim MFC/MFM. Don not connect the device to a fluid source yet.
   a. Connect a +14 Vdc to +27 Vdc power supply to Pin 5 and power supply common to Pin 9.
   b. Connect a voltage output signal read-out device (4-1/2 digit voltmeter recommended) onto Pin 2 (+) and Pin 10 (common).
   c. If applicable, connect current output signal read-out device onto Pin 4 (+) and Pin 10 (common).
   d. Switch on power and allow the instrument to stabilize.
   e. In case of a MFC, adjust the setpoint input to zero.

2. Observe the output signal and if necessary, perform the zero adjustment procedure as outlined in Section 3-2.
   a. Only perform the zero operations with the Coriolis Sensor filled with either 100% fluid or 100% gas at the appropriate pressures and ensure there is no fluid flowing through the device (differential pressure = 0 psi).
   b. Connect the Quantim to a pressurized supply of inert fluid (for example high purity water). Fill the Quantim instrument completely taking care there is no entrained gas in the sensor and perform the zero operation as described in Section 3-2.
   c. When applying Quantim to measure a gas, fill the sensor with an inert gas (nitrogen or clean dry air) at a pressure near the process operating pressure.
   d. If the output signal does not zero properly, please contact Brooks Instrument for technical asistance.

3. For a MFC connect a 0-5 Vdc source to Pin 8 and return to Pin 1 or connect 0-20 mA source to Pin 7 and return to Pin 1.
   (See X-CM-Qm-HART-eng instruction manual for complete HART 4-20 mA I/O electrical hookups).

4. Provide an electrical signal to the Quantim representing a setpoint of 50% of full scale flow and adjust the inlet and outlet pressures to calibration conditions.

4. Provide an electrical signal to the Quantim representing a setpoint of 50% of full scale flow and adjust the inlet and outlet pressures to calibration conditions.

5. Verify that the electrical output signal reaches 100% of flow. For MFC applications vary the setpoint over the 1% to 100% range and verify that the output signal matches the setpoint.
   a. If possible, connect a flow measurement device (such as a rotometer) to the Quantim outlet to monitor the actual flow behavior.

6. If the Quantim is functioning correctly, the problem may lie elsewhere in the flow system. Re-verify the installation as well as the upstream/downstream fluid system configuration.

7. Please contact Brooks Instrument for further assistance in troubleshooting. Refer to the back cover of this manual for contact information.

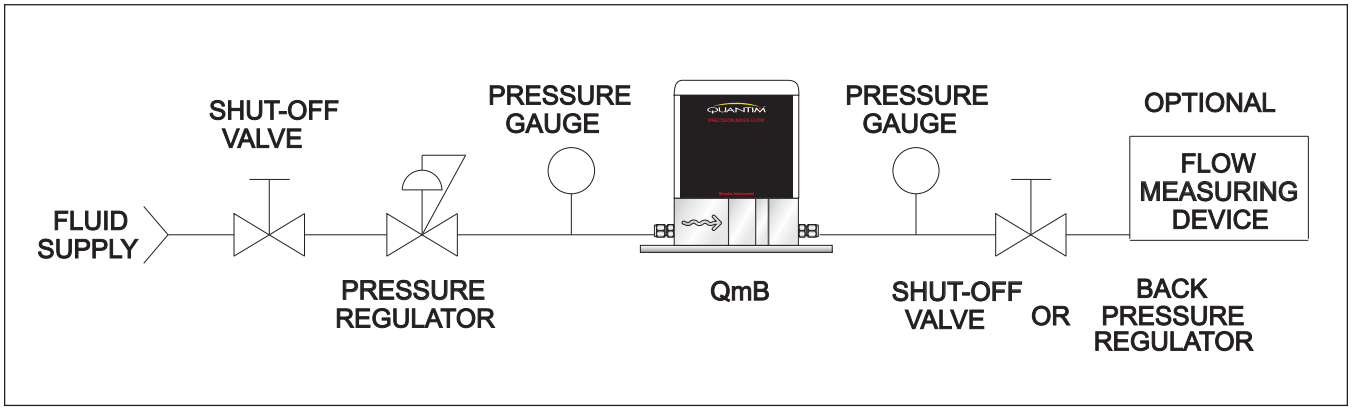

Figure 4-1 Bench Troubleshooting Circuit

4-3 External Valve Service

⚠ WARNING

These instructions must be used in conjunction with the instructions within this manual. Careful attention must be paid to the "essential instructions" before proceeding with any service work or serious injury may result.

Valve Disassembly
The numbers in () refer to the parts in the exploded view diagram Figure 4-2.

⚠ WARNING

Do not attempt to disassemble the valve until pressure has been removed and purging has been performed. Hazardous fluid, gas or liquid, may be trapped in the valve assembly which could result in explosion, fire or serious injury.

1. Remove valve nut, item (9).
2. Remove coil cover and coil, item (8).
3. Remove the four valve stem screws, item (7). Discard and replace with new fasteners. Do not re-use these components!
4. Carefully remove the valve stem, item (6). The valve seat, item (5) may be stuck in the stem, use care not to drop this part. Small tweezers can be used to remove item (5) if stuck in stem recess.

⚠ CAUTION

Do not scratch any of the valves sealing surfaces; inside stem cavity, orifice or seat. Damage to any of these components will cause improper valve performance or possible leakage.

5. Remove stem seal O-ring, item (3) from the valve body, item (1). It is recommended that the seal be discarded and replaced with a new un-used part.
6. Remove the orifice, item (4). Care must be taken to prevent damage to the coplanar top side surface and the lower sealing surface!
7. Remove the lower metal seal, item (2). This part will most likely be found on the bottom of the orifice, item (4) or in the bottom of the valve body, item (1). **Discard this seal as it is a one time use only!** This metal seal must be replaced with a new part or damage to the valve body and/or the orifice can result.
8. Examine the valve body, item (1) and clean if necessary.

Clean all parts prior to inspection and re-assembly using a solvent and soft brush or clean in an ultrasonic cleaner. Care must be taken not to damage any of the valve sealing surfaces.

Assembly

1. Examine all parts for signs of ware or damage, replace as necessary. Refer to the parts list Figure 4-3.
2. Install the metal seal, item (2) in the center of the valve body, item (1).
3. Install the orifice, item (3) in the valve body, item (1). **The lower protrusion on the orifice must center in the orifice seat!** The seal must be new and un-used.
4. Install the valve seat, item (5) in the valve cavityon top of the orifice.
5. Install O-ring, item (3) in the valve body, item (1). it is recommended that a new O-ring be used. Refer to parts list in Figure 4-3. When ordering the O-ring specify the correct compound i.e. Viton, Kalrez etc. depending upon your specific process.
6. Install the vavle stem, item(6) over the valve seat, item (5) and center of the valve body, item (1).
7. Install the four valve screws, item (7) until they make light contact with the base of the valve stem, item (6). Torque the valve screws in a diagonal pattern in three increments slowly rising to a final torque value of 175 inch-pounds (20 N-m). Refer to Figure 4-4.
8. Install the valve coil, item (8).
9. Install the valve cover, item (9).
10. Install the vavle nut, item(10) hand tight (snug).
11. Pressure and leak test to local standards.

Note: Standard Brooks Instrument pressure test is 1.5 times the design pressure marked on the valve and a helium leak test at 1 $x10^{-9}$ bar .cc/s helium maximum.

Note: The above leak test only evaluates the outbound seals. The inbound seal should be also evaluated. This can be accomplished while the unit is on the bench or when returned to normal service.

Item No.	Description	Part Number	Quantity
9	Valve Nut	573Z275CEF	**1**
8	Coil Cover Assembly	185Z314AAA	**1**
7	Socket Head Screw	751Z152AAA	**4**
6	Stem	949Z256QOT	**1**
5	Plunger Assembly	622Z252QOG	**1**
4	Orifice .014 dia.	577Z559BMG	**1**
3a	Stem O-ring, Kalrez	375B024TTA	**1**
3b	Stem O-ring, Viton	375B024QTA	
3c	Stem O-ring, Buna	375B024SUA	
3d	Stem O-ring, EPDM	375B024SOA	
2	Orifice Seal	763Z075AAA	**1**
1	Valve Body	092Y320BMT	**1**

Figure 4-2 Parts List

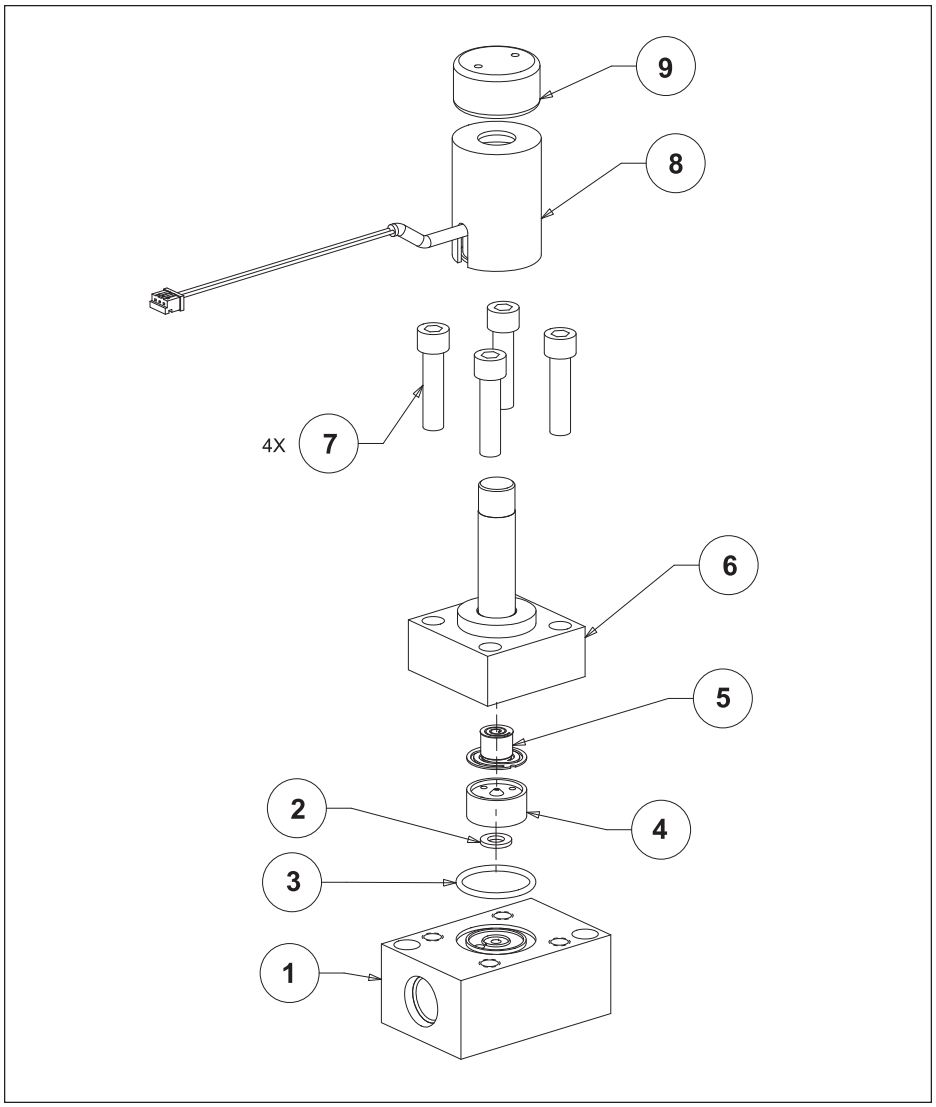

Figure 4-3 Exploded Diagram of Valve Assembly

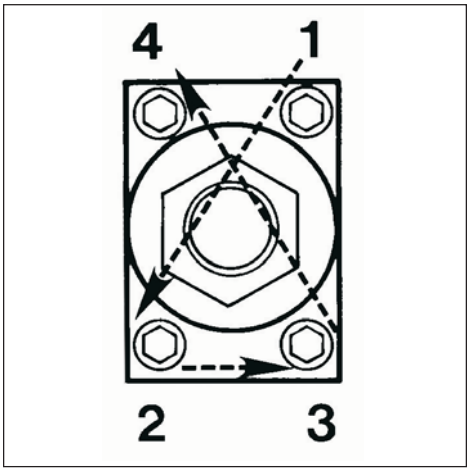

Figure 4-4 Valve Torque Pattern

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TRADEMARKS

Brooks ..... Brooks Instrument, LLC
Brooks Service Tool ..... Brooks Instrument, LLC
Quantim ..... Brooks Instrument, LLC
HART ..... HART Communications Foundation
Hastelloy ..... Haynes International
Kalrez ..... DuPont Performance Elastomers
Viton ..... DuPont Performance Elastomers
VCO ..... Cajon Co.
VCR ..... Cajon Co.

Quantim Patent Numbers as follows:

Argentina AR026329B1, AR021594B1
Australia 778137, 771345, 782183
China ZL00817949.2, ZL02823425.1, 171140
Federation of Russia 2272257, 2263284, 2277227
Germany 40004270.3
Hong Kong HK1051720
India 199406
Indonesia ID0015789
Japan 1111950, 3904926
Malaysia MY-128330-A
Mexico 242129, 244688, 231280
Singapore 88632, 81430, 103761
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, 7114517, 7204679
Counterparts in other countries and other patents pending

QmB Series IP40, IP66, IP66XP

LIMITED WARRANTY

Seller warrants that the Goods manufactured by Seller will be free from defects in materials or workmanship under normal use and service and that the Software will execute the programming instructions provided by Seller until the expiration of the earlier of twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by Seller. Products purchased by Seller from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer.
All replacements or repairs necessitated by inadequate preventive maintenance, or by normal wear and usage, or by fault of Buyer, or by unsuitable power sources or by attack or deterioration under unsuitable environmental conditions, or by abuse, accident, alteration, misuse, improper installation, modification, repair, storage or handling, or any other cause not the fault of Seller are not covered by this limited warranty, and shall be at Buyer's expense.
Goods repaired and parts replaced during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer. This limited warranty is the only warranty made by Seller and can be amended only in a writing signed by an authorized representative of Seller.

BROOKS SERVICE AND SUPPORT

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.

CUSTOMER 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.

HELP DESK

In case you need technical assistance:

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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.

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Quick Start Guide

Quantim® Coriolis Mass Flow Controllers & Meters

Corilois Mass Flow

NEMA 1 / IP40
1/4" VCR

NEMA 4X / IP66
Weather-Proof

⚠ WARNING

- Read all instructions prior to installing, operating and servicing this product.
- Follow all warnings, cautions and instructions marked on and supplied with this product.
- Install your equipment as specified in the installation instructions in the appropriate instruction manual and per local and national codes. Connect all products to the proper electrical and pressure sources.
- Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified persons, to prevent electrical shock and personal injury.
- Do not operate this instrument in excess of the specifications marked on and supplied with this product. Failure to heed this warning can result in serious personal injury and/or damage to the equipment.
- Before operating the device, ensure all electrical connections have been properly terminated.
- If it becomes necessary to remove the device from the system, power to the device must be disconnected.
- If it becomes necessary to remove the device from the system after exposure to toxic, pyrophoric, flammable or corrosive gas, purge the device thoroughly with a dry inert gas such as nitrogen before disconnecting the gas connections. Failure to correctly purge the device could result in fire, explosion or death. Corrosion or contamination of the device upon exposure to air may also occur.

⚠ CAUTION

- Incorrect voltage will cause flowmeter damage or failure.
- QUANTIM is an input sinking device. Do not use a current sinking PLC output card.
- QUANTIM sources its own 4-20mA output signal. Do not source this output with an external supply.

Dear Customer,

Thank you for your purchase. We appreciate this opportunity to service your flow measurement and control needs with a Brooks Instrument device. Brooks' award-winning meters and controllers consistently rank at the top of their category for accuracy, reliability and user preference, as judged by the audience that matters - real users of flow instrumentation, like you.

But Brooks' products are only half of the story. You are backed by Brooks' unsurpassed local technical expertise in virtually every corner of the planet. Your local Brooks product and application specialist is truly your "partner in flow". They have been extensively trained to help you select the optimal solutions for your flow measurement or control needs and offer years of experience solving application problems just like yours.

Should you require any additional information concerning Brooks' products and services, please contact your local Brooks Sales and Service office listed on the back cover of this guide.

Sincerely,
Brooks Instrument

This Quick Start Guide applies to the following Brooks product(s):

- QmB NEMA 1 IP40 Meter/Controller
- QmB NEMA 4X IP66 Weather-Proof Meter/Controller
- QmB IP66XP Explosion-Proof Meter/Controller

In an effort to be more eco-friendly, Brooks is no longer supplying printed instruction manuals with the product shipments to reduce our paper consumption.

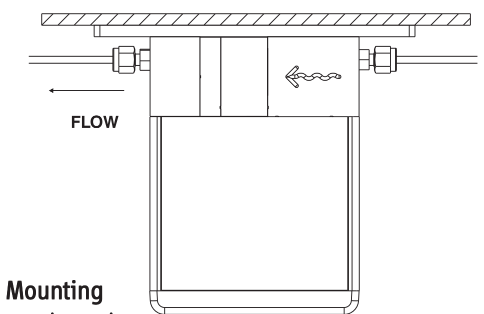
For your product's complete instruction manual, please download it at www.BrooksInstrument.com/Manuals and click on "Coriolis Mass".

Step 1: Location/Orientation

The instrument may be located anywhere in the process line, as long as the following conditions are met:

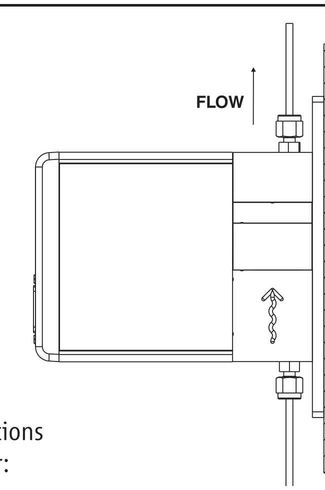
- Before operation, you must be able to stop flow through the meter. During the zeroing procedure, flow must be stopped completely, and the flow meter sensor tube must be full of process fluid to achieve an accurate zero.
- During operation, the flow sensor tube must be full of process fluid.
- Ambient temperature must remain between 0° and 65°C (32°F and 149°F).
- The instrument (cable connections, wiring compartments and/or conduit openings) should be accessible for service.

1-1



Horizontal Down Mounting
Preferred mounting orientation for most **LIQUID** applications:
- Sensor tube **DOWN**
- Horizontal pipeline

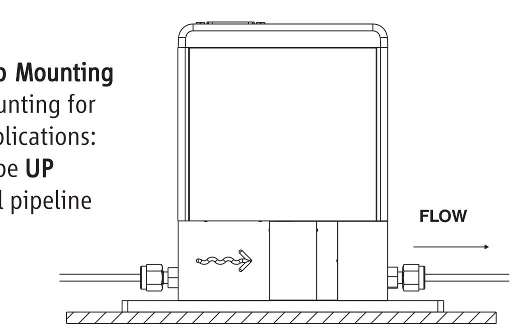
1-2



Vertical Mounting
Orientation for **LIQUID** applications where entrapped gas may occur:
- Flag mount
- Vertical pipeline

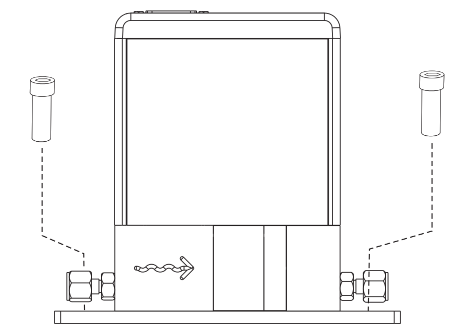
1-3

Horizontal Up Mounting
Preffered mounting for most **GAS** applications:
- Sensor tube **UP**
- Horizontal pipeline



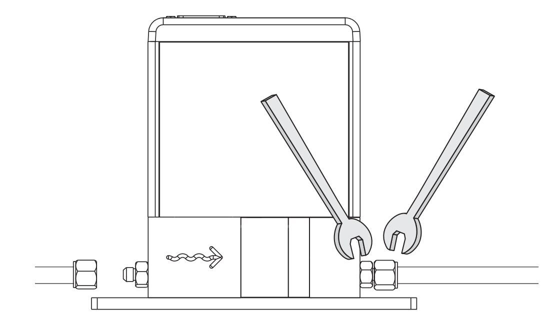
Step 2: Mounting the Quantim

2-1



Mount the device in the proper orientation and location for your process.

2-2



After mounting the device connect the process lines. Carefully tighten the process lines. Using two (2) wrenches to prevent rotation of the inlet/outlet fitting.

⚠ WARNING

Any rotation of the inlet or outlet fitting during installation of a metal seal device may result in a leak. Always use two wrenches when attaching gas line to prevent rotation.

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X-CM-Quantim-QS-eng (0615)
PN: 541B134AAG/D
Reference: 834Z986

ISO 9001 QUALITY SYSTEM

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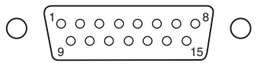
Step 3A: Electrical Connections NEMA 1 / IP40 Meter/Controller

D-Connector Functions Legends:
- • = Feature Available
- N/A = Not Available

NOTE: Chassis ground is available through the D-Connector back shell.

3-A1

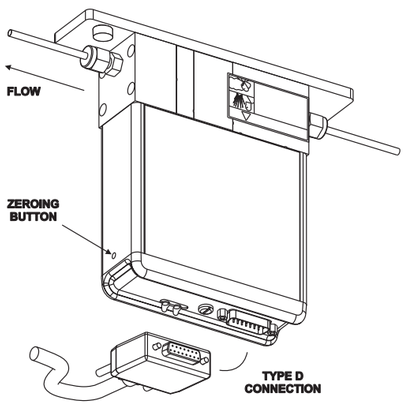
D-Connector for QmB NEMA 1 / IP40
Pin Out Connections



TRMNL #	FUNCTION	Controller	Meter
1	Setpoint Common	•	N/A
2	0 - 5 Vdc Flow Signal Output	•	•
3	Alarm Output	•	•
4	*4 - 20 mA Flow Signal Output	•	•
5	+14 Vdc to +27 Vdc Power Supply	•	•
6	Not used		
7	*4 - 20 mA Setpoint Input (+)	•	N/A
8	0 - 5 Vdc Setpoint Input (+)	•	N/A
9	Power Supply Common	•	•
10	Signal Output Common	•	•
11	+5 Volt Reference Output	•	•
12	Valve Override Input	•	N/A
13	*4 - 20 mA or 0-5 Vdc Density or Temp	•	•
14	Not used		
15	Not used		

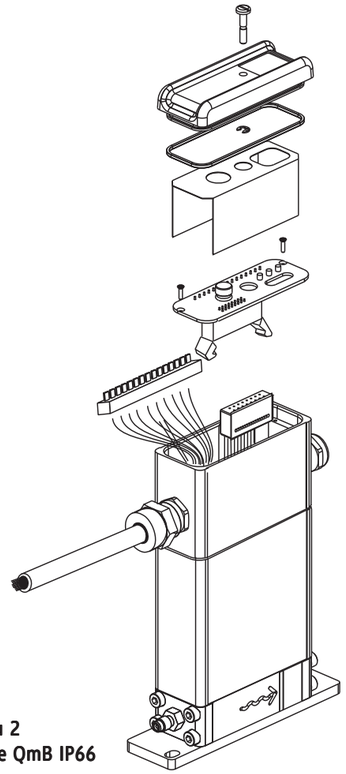
* Do not apply power to these pins.

3-A2



Step 3B: Electrical Connections NEMA 4X / IP66 Weather-Proof Meter/Controller

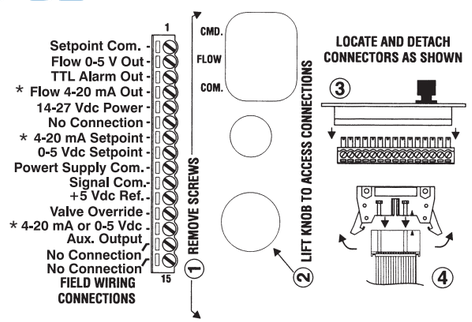
3-B1



Note:
Follow Steps 1 thru 2 for Mounting of the QmB IP66

Terminal Block Pin Out Connections
for QmB NEMA 4X / IP66

3-B2



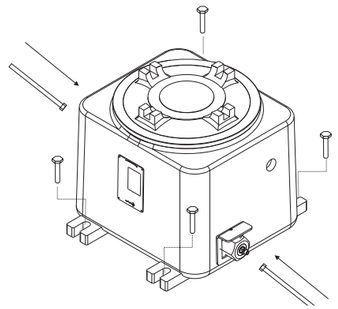
* Do not apply power to these terminals.

Step 3C: Mounting and Electrical Connections IP66XP Explosion-Proof Meter/Controller

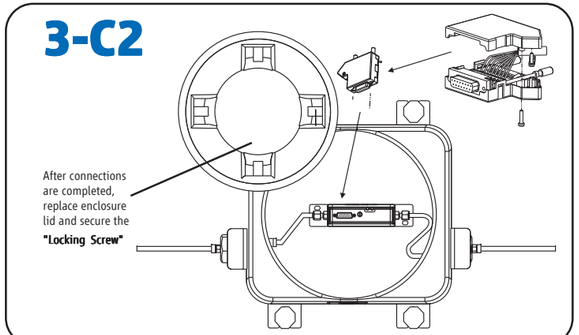
⚠ WARNING

Lifting hazard. Single person lift could cause injury. Use assistance when moving or lifting.

3-C1

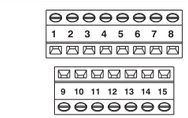


3-C2

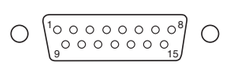


Pin Out Connections
for QmB IP66XP Explosion Proof

3-C3



IP66 XP Terminal Block



D-CONNECTOR CONNECTIONS

TRMNL #	FUNCTION	Controller	Meter
1	Setpoint Common	•	N/A
2	0 - 5 Vdc Flow Signal Output	•	•
3	Alarm Output	•	•
4	*4 - 20 mA Flow Signal Output	•	•
5	+14 Vdc to +27 Vdc Power Supply	•	•
6	Not used		
7	*4 - 20 mA Setpoint Input (+)	•	N/A
8	0 - 5 Vdc Setpoint Input (+)	•	N/A
9	Power Supply Common	•	•
10	Signal Output Common	•	•
11	+5 Volt Reference Output	•	•
12	Valve Override Input	•	N/A
13	*4 - 20 mA or 0-5 Vdc Density or Temp	•	•
14	Not used		
15	Not used		

* Do not apply power to these terminals.

Step 4: Zeroing Procedure

To assure measurement accuracy, the instrument must be zeroed to the operational installation conditions:

- Apply power to instrument for approximately 45 minutes to reach a stable thermal condition prior to applying flow.
- Flow the process fluid into the instrument and allow sufficient time for the sensor to reach normal operating temperature.
- Close the shutoff valve downstream to eliminate any pressure differential across the instrument.
- After confirming a NO flow condition, press the zeroing button for at least 3 seconds
  - Zeroing button is located on the outlet side of the instrument's housing.
- The zeroing process takes approximately 30 seconds. Status light will flash red.
- A solid Green LED means a successful zero.
- A solid Red LED means an unsuccessful zero.
  Note: If a solid Red LED is indicated, recycle power and repeat zeroing proceedure or contact the Technical Services at Brooks Instrument.

Note: The top cover must be removed to gain access to the LEDs in the NEMA 4X / IP66 and the Explosion Proof IP66XP package options.

For information on the proper wiring for HART communication refer to the X-CM-QmB-eng instruction manual.

Step 5: Operation

After the flowmeter or flow controller has been installed in the system it is ready for operation.

Meter: The meter will provide a flow signal proportional to the full scale flow of the device as indicated on the device label.

Controller: You must provide a setpoint/command signal to the controller. The controller will read the setpoint signal and will automatically adjust the valve to the appropriate position to acheive the desired flow and will provide a flow signal proportional to the full scale flow of the device as indicated on the device label.

Equipment Receipt and Return Procedures

Receipt of Equipment

If the packing case is damaged, the local carrier should be notified at once regarding their liability. Carefully remove the equipment from the packing case and inspect for damage or missing parts. If damaged, please contact Brooks Instrument at one of the locations listed on the back of this Quick Start Guide.

Return Shipment

Please note that prior to returning any instrument to the factory Brooks Instrument requires the completion of Form RPR003-1, a Brooks Instrument Decontamination Statement, as well as a Materials Safety Data Sheet (MSDS) for fluid(s) used in the instrument. Copies of these forms can be found online at **BrooksInstrument.com/Returns** along with complete details on how to process your return shipment or you can contact your nearest Brooks location for the necessary forms and instruction.