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.

⚠️ WARNING: Prior to installation ensure this instrument has the required approval ratings to meet local and national codes. Failure to heed this warning can result in serious personal injury and/or damage to the equipment.

- 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.

### Essential Instructions
**Read before proceeding!**

**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.
- Products described in this manual are in compliance with EN directive 2014/34/EU.
- All Brooks Instrument Flowmeters fall under fluid group 1.
- Products larger than 25mm or 1” (inch) are in compliance with PED category I, II or III.
- Products 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 (EMC directive 2014/30/EU).

**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.
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**

<table>
<thead>
<tr>
<th>PIN #</th>
<th>FUNCTION</th>
<th>Controller</th>
<th>Meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Setpoint Common</td>
<td>*</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>* 0-5 Vdc Flow Signal Output</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>3</td>
<td>Alarm Output</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>* 4-20 mA Flow Signal Output</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>5</td>
<td>14 VDC to 24 VDC Power Supply</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>6</td>
<td>Not Used</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>* 4-20 mA Setpoint Input (+)</td>
<td>*</td>
<td>N/A</td>
</tr>
<tr>
<td>8</td>
<td>0-5 Vdc Setpoint Input (+)</td>
<td>*</td>
<td>N/A</td>
</tr>
<tr>
<td>9</td>
<td>Power Supply Common</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>10</td>
<td>Signal Output Common</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>11</td>
<td>* 5 VDC Reference Output</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>12</td>
<td>Valve Override Input</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>* 4-20 mA or 0-5 Vdc Density or Temp.</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>14</td>
<td>Not Used</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Not Used</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

* * DO NOT APPLY POWER TO THESE PINS

**Vertical Mounting**

1b

2b

**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

<table>
<thead>
<tr>
<th>PIN #</th>
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<td>Alarm Output</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>4</td>
<td>* 4-20 mA Flow Signal Output</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>5</td>
<td>+14 Vdc to 27 Vdc Power Supply</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>6</td>
<td>Not Used</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>7</td>
<td>* 4-20 mA Setpoint Input (+)</td>
<td>*</td>
<td>N/A</td>
</tr>
<tr>
<td>8</td>
<td>0-5 Vdc Setpoint Input (+)</td>
<td>*</td>
<td>N/A</td>
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<tr>
<td>9</td>
<td>Power Supply Common</td>
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<td>10</td>
<td>Signal Output Common</td>
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<tr>
<td>11</td>
<td>+5 Volt Reference Output</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>12</td>
<td>Valve Override Input</td>
<td>*</td>
<td>N/A</td>
</tr>
<tr>
<td>13</td>
<td>* 4-20 mA or 0-5 Vdc Density or Temp</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>14</td>
<td>Not Used</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>15</td>
<td>Not Used</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

* DO NOT APPLY POWER TO THESE PINS

2

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

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.
When wiring terminal block in IP66 device, ensure wires are appropriate length and are properly dressed. Unnecessarily long wires can protrude below the top housing and cause damage to the sensor assembly below.
Quick Start Instructions IP66XP

D-CONNECTOR PINOUTS

<table>
<thead>
<tr>
<th>PIN #</th>
<th>FUNCTION</th>
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</thead>
<tbody>
<tr>
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<td>Setpoint Common</td>
<td>*</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>* 0-5 Vdc Flow Signal Output</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>3</td>
<td>Alarm Output</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>4</td>
<td>* 4-20 mA Flow Signal Output</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>5</td>
<td>+14 Vdc to 27 Vdc Power Supply</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>6</td>
<td>Not Used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>* 4-20 mA Setpoint Input (+)</td>
<td>*</td>
<td>N/A</td>
</tr>
<tr>
<td>8</td>
<td>0-5 Vdc Setpoint Input (+)</td>
<td>*</td>
<td>N/A</td>
</tr>
<tr>
<td>9</td>
<td>Power Supply Common</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>10</td>
<td>Signal Output Common</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>+5 Volt Reference Output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Valve Override Input</td>
<td>*</td>
<td>N/A</td>
</tr>
<tr>
<td>13</td>
<td>* 4-20 mA or 0-5 Vdc Density or Temp</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>14</td>
<td>Not Used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Not Used</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* 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

![Diagram of proper wiring for NEMA 1 / IP40](image)

Notes:
1. Tie cable shields to ground at one end only.

Proper wiring of a Brooks Quantim NEMA 4X / IP66

![Diagram of proper wiring for NEMA 4X / IP66](image)

Notes:
1. Tie cable shields to ground at one end only.
Proper wiring of a Brooks Quantim Explosion Proof NEMA 4X / IP66XP

DB15 Connector

Notes:
1. Tie cable shields to ground at one end only.

Current Signal: Setpoint and Output

Quick Start Instructions for Connecting Alarm Output

Alarm Output Option 1 - Relay

Alarm Output Option 2 - TTL
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<thead>
<tr>
<th>Table Number</th>
<th>Table</th>
<th>Page Number</th>
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<tr>
<td>2-1</td>
<td>Electrical Interfacing for Quantim</td>
<td>20</td>
</tr>
<tr>
<td>4-1</td>
<td>Troubleshooting</td>
<td>30</td>
</tr>
</tbody>
</table>
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 & Troubleshooting
- Section A Essential Instructions
- 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.

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).
Performance Specifications

Performance Specifications:

Flow:
Liquid Flow Specifications, Metric Units:

<table>
<thead>
<tr>
<th>Product Type</th>
<th>QUANTIM Model(1)</th>
<th>QUANTIM Tube Size</th>
<th>Maximum Flow Rate(2)</th>
<th>Nominal Flow Rate(2)</th>
<th>Minimum Full Scale</th>
<th>Minimum Measurable Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Kg/hr or l/hr</td>
<td>Kg/hr or l/hr</td>
<td>Kg/hr or l/hr</td>
<td>Kg/hr or l/hr</td>
</tr>
<tr>
<td>Controller</td>
<td>QMBC</td>
<td>2</td>
<td>0.30</td>
<td>0.15</td>
<td>0.01</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>1.00</td>
<td>0.78</td>
<td>0.10</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>15.94</td>
<td>7.97</td>
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<td>QMBM</td>
<td>2</td>
<td>0.38</td>
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<td>4</td>
<td>27.00</td>
<td>13.50</td>
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Liquid Flow Specifications, English Units:

<table>
<thead>
<tr>
<th>Product Type</th>
<th>QUANTIM Model(1)</th>
<th>QUANTIM Tube Size</th>
<th>Maximum Flow Rate(2)</th>
<th>Nominal Flow Rate(2)</th>
<th>Minimum Full Scale</th>
<th>Minimum Measurable Flow</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>lb/hr</td>
<td>gal/hr</td>
<td>lb/hr</td>
<td>gal/hr</td>
</tr>
<tr>
<td>Controller</td>
<td>QMBC</td>
<td>2</td>
<td>0.66</td>
<td>0.08</td>
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<td>0.26</td>
<td>1.72</td>
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<td></td>
<td></td>
<td>4</td>
<td>35.15</td>
<td>4.21</td>
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<td>Meter</td>
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<td>0.84</td>
<td>0.10</td>
<td>0.42</td>
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<td></td>
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<td>3</td>
<td>2.21</td>
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<td>4</td>
<td>59.54</td>
<td>7.13</td>
<td>29.77</td>
<td>3.57</td>
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</tbody>
</table>

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):

<table>
<thead>
<tr>
<th>Product Type</th>
<th>QUANTIM Model(1)</th>
<th>QUANTIM Tube Size</th>
<th>Nominal Mass Flow Rate</th>
<th>Nominal Volume Flow Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>lb/hr</td>
<td>Kg/hr</td>
</tr>
<tr>
<td>Controller</td>
<td>QMBC</td>
<td>2</td>
<td>0.168</td>
<td>0.076</td>
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<tr>
<td></td>
<td></td>
<td>3</td>
<td>0.472</td>
<td>0.214</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>3.960</td>
<td>1.796</td>
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<td>0.227</td>
<td>0.103</td>
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<td></td>
<td></td>
<td>3</td>
<td>0.893</td>
<td>0.405</td>
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<tr>
<td></td>
<td></td>
<td>4</td>
<td>8.467</td>
<td>3.840</td>
</tr>
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Section 1 Introduction

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

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

Measurement Accuracy

<table>
<thead>
<tr>
<th>Sensor Tube Material</th>
<th>Fluid Type</th>
<th>Standard Flow Measurement Accuracy (% of rate)</th>
<th>Optional Flow Measurement Accuracy (% of rate)</th>
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</thead>
<tbody>
<tr>
<td>Steel</td>
<td>Liquid</td>
<td>0.2%</td>
<td>0.5%</td>
</tr>
<tr>
<td></td>
<td>Gas</td>
<td>0.5%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Hastelloy</td>
<td>Liquid</td>
<td>0.5%</td>
<td>1.0%</td>
</tr>
<tr>
<td></td>
<td>Gas</td>
<td>0.5%</td>
<td>1.0%</td>
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Zero Stabilities

<table>
<thead>
<tr>
<th>Sensor Tube Material</th>
<th>Tube Size</th>
<th>Zero Stability (Kg/hr)</th>
<th>Zero Stability (Lb/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless Steel</td>
<td>2</td>
<td>0.00013</td>
<td>0.0003</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0.0010</td>
<td>0.0022</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>0.0040</td>
<td>0.0088</td>
</tr>
<tr>
<td>Hastelloy</td>
<td>2</td>
<td>0.0002</td>
<td>0.0004</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0.0015</td>
<td>0.0033</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>0.00120</td>
<td>0.0265</td>
</tr>
</tbody>
</table>

Standard Measurement Accuracy vs Flow Rate Chart, Tube Size 2
Section 1 Introduction

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):

<table>
<thead>
<tr>
<th>Quantim</th>
<th>Tube Size</th>
<th>Liquid KpA</th>
<th>Liquid bar</th>
<th>Liquid psi</th>
<th>Gas KpA</th>
<th>Gas bar</th>
<th>Gas psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>QMBC</td>
<td>2</td>
<td>69</td>
<td>0.7</td>
<td>10.3</td>
<td>10</td>
<td>150</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>69</td>
<td>0.7</td>
<td>13.8</td>
<td>10</td>
<td>200</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>69</td>
<td>0.7</td>
<td>13.8</td>
<td>10</td>
<td>200</td>
<td>0.7</td>
</tr>
</tbody>
</table>

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

Differential Pressures, Meter(9)
Pressure Drop Liquid - (H₂O)

![Graph showing differential pressures for various tube sizes and mass flows]
Density\textsuperscript{(10)}:
\begin{itemize}
  \item Range: 0.2 to 2.0 grams/cc
  \item Accuracy: ±0.005 grams/cc
  \item Repeatability: ±0.002 grams/cc
\end{itemize}

Temperature\textsuperscript{(11)}:
\begin{itemize}
  \item Device Temperature Range: 0 to 65°C or 32 to 149°F
  \item Accuracy: ±0.5°C or ±1.0°F
\end{itemize}

Notes
\begin{enumerate}
  \item QMBC - Brooks Quantum controller with integral control valve. QMBM - Brooks Quantim meter (no valve).
  \item The nominal 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.
  \item Standard volumetric conditions are 14.696 psia and 70°F.
  \item 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.
  \item ml./min Reference Conditions 0°C at 1013.25 mbar.
  \item 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).
  \item 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.
  \item Helium leak and pressure test of elastomer sealed devices is performed with integral 5/16" -24 UNF connection.
  \item 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 0.2 grams/sec. The density accuracy is applicable over the stated density range.
\end{enumerate}
Section 1 Introduction

Physical Specifications

**Materials of Construction:**
- **Process Wetted:** 316L, 316L VAR, High Alloy Ferritic Stainless and 17-7PH
- **Optional:** Nickel 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, 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:**
- 4-20 mA or 0-5 Vdc active outputs represent mass flow or volume flow.
- And simultaneously available 4-20 mA or 0-5 Vdc active output, represents on-line density or temperature information.
- Alarm output, max. voltage 30 Vdc, max. current 100 mA

**Input Signals:**
- Command (setpoint) that drives the control valve, either 4-20 mA or 0-5 Vdc input signals.
- Valve Override Function:
  - Left floating/unconnected - instrument controls flow at setpoint
  - Connected to signal at or above 5.0 Volts - valve is forced open
  - Connected to signal at or below 0.0 Volts - valve is forced closed
### Section 1 Introduction

#### 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
- **Pin 7**: 4-20 mA input, 250 ohm input impedance
- **Pin 12**: Valve override input, > 50K ohm input impedance
- **Pin 3**: Alarm output, 100 mA maximum current sink

#### Power Requirements:
- **Voltage**: +14 to 27 Vdc<sup>12</sup>.
- **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<sup>13</sup>:
  - Mass Flow
  - Density
  - Volumetric Flow
  - Temperature
  - Slug Flow
  - Diagnostic Failure
  - Setpoint Deviation
  - Valve Drive

#### LED's<sup>14</sup>:
- 'STAT'
  - solid green: system operative.
  - solid red: system fault.
- 'AL'
  - flashing green: warning
  - flashing red: alarm

#### Pushbutton<sup>15</sup>:
- ‘ZERO’ setting pushbutton.

---

**Notes (continued)**

<sup>11</sup>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).

<sup>12</sup>Ensure the minimum required voltage and current is available at the mass flow device taking into consideration any losses in the interconnecting cable.

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

<sup>14</sup>IP66 and IP66XP Series external housing cover must be removed to gain access to status LED's.

<sup>15</sup>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 Ex 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 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 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 4X/ IP66

**Europe - KEMA 05ATEX1068 X**

- II 3 G Ex na II T4 and II 3 D Ex tD A22 IP66 T 85 °C
  - IECEEx KEM 08 0037 X
  - Ex na II T4 and Ex tD A22 IP66 T85 °C
  - Ambient Temperature: 0o C to 65o C, Enclosure: IP66
  - *The equipment shall be installed in such a way that the risk of mechanical damage is low.

**Korea - KOSHA**

- 20-AV4BO-0108X
- Ex na 11CT4
- Ex tD A22 IP66 T85°C
Certifications and Approvals
IP66XP Series Explosion-proof/ Flame-proof

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,

Ex d certified cable glands, blind plugs and conduit seals shall be used. A conduit seal shall
be installed immediately at the enclosure 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 2014/30/EU per EN
61326-1:2013 and has options supporting RoHS directive 2011/65/EU. To meet these specifications, the
Brooks Quantim device must be ordered with one of the appropriate options and be directly connected
to a low impedance (less than 1 Ohm) earth ground. Signals use a standard twisted-pair, shielded
instrument wire.

Pressure effects:  The Brooks Quantim series meets the requirements of the Pressure Equipment Directive 2014/34/EU.
The unit falls into the category "Sound Equipment Practice".
Dimensions

Figure 1-1 Dimensional Drawing QmB IP40 Downported
Section 1 Introduction

Figure 1-2 Dimensional Drawing QmB IP40 Thru-Flow

Figure 1-3 D-Connector Electrical Pin Connections

Figure 1-4 Lay-In Dimensions Integral and Remote Valves

<table>
<thead>
<tr>
<th>PIN #</th>
<th>FUNCTION</th>
<th>D-CONNECTOR CONNECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SETPOINT COMMON</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5-VDC FLOW SIGNAL OUTPUT</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>(TTL) OPEN COLLECTOR ALARM OUTPUT</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4-20 MA FLOW SIGNAL OUTPUT</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>+14.0 VDC TO +27 VDC POWER SUPPLY</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>NOT USED</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>4-20 MA SETPOINT INPUT (V)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0-5 VDC SETPOINT INPUT (V)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>POWER SUPPLY COMMON</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>SIGNAL OUTPUT COMMON</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>4-20 VOLT REFERENCE OUTPUT</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>VALUE OVERRIDE INPUT</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>4-20 MA OR 0-5 VDC DENSITY OR TEMPERATURE</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>NOT USED</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>NOT USED</td>
<td></td>
</tr>
</tbody>
</table>

*DO NOT APPLY POWER TO THESE PINS.*

<table>
<thead>
<tr>
<th>FITTING</th>
<th>&quot;X&quot; Dimension</th>
<th>&quot;Y&quot; Dimension</th>
<th>&quot;X&quot; Dimension</th>
<th>&quot;Y&quot; Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compression</td>
<td>197.3 [7.77&quot;]</td>
<td>151.9 [5.98&quot;]</td>
<td>340.1 [13.39&quot;]</td>
<td>307.8 [12.12&quot;]</td>
</tr>
<tr>
<td>Compression</td>
<td>197.3 [7.77&quot;]</td>
<td>151.9 [5.98&quot;]</td>
<td>340.1 [13.39&quot;]</td>
<td>307.8 [12.12&quot;]</td>
</tr>
<tr>
<td>Compression</td>
<td>197.3 [7.77&quot;]</td>
<td>151.9 [5.98&quot;]</td>
<td>340.1 [13.39&quot;]</td>
<td>307.8 [12.12&quot;]</td>
</tr>
<tr>
<td>8 mm NPT (F)</td>
<td>197.6 [7.78&quot;]</td>
<td>151.9 [5.98&quot;]</td>
<td>340.1 [13.39&quot;]</td>
<td>307.8 [12.12&quot;]</td>
</tr>
<tr>
<td>1/4&quot; NPT (F)</td>
<td>197.6 [7.78&quot;]</td>
<td>151.9 [5.98&quot;]</td>
<td>340.1 [13.39&quot;]</td>
<td>307.8 [12.12&quot;]</td>
</tr>
<tr>
<td>1/8&quot; VCR</td>
<td>182.6 [7.19&quot;]</td>
<td>150.4 [5.92&quot;]</td>
<td>338.6 [13.32&quot;]</td>
<td>306.4 [12.05&quot;]</td>
</tr>
<tr>
<td>1/4&quot; VCR</td>
<td>200.0 [7.91&quot;]</td>
<td>158.7 [6.24&quot;]</td>
<td>356.2 [14.02&quot;]</td>
<td>324.0 [12.76&quot;]</td>
</tr>
<tr>
<td>1/4&quot; VCO</td>
<td>188.2 [7.41&quot;]</td>
<td>156.0 [6.14&quot;]</td>
<td>344.1 [13.55&quot;]</td>
<td>312.0 [12.28&quot;]</td>
</tr>
<tr>
<td>3.2MM UPG</td>
<td>N/A</td>
<td>150.3 [5.92&quot;]</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>ANSI/ISA 76.00.02</td>
<td>N/A</td>
<td>Contact Factory</td>
<td>Not Available</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*OVERALL LENGTH FINGER TIGHT*  **OVERALL LENGTH DIMENSION IS TO THE INTERNAL TUBE LOCATING SHOULDERS**

See Figure 4 for "X" and "Y" Lay-In Dimensions
Section 1 Introduction

Figure 1-5 Dimensional Drawing QmB IP40 with Remote Valve

Figure 1-6 Dimensional Drawing QmB IP66
Section 2 Installation

General

WARNING

Operating Procedure: Do not operate this instrument outside the specifications listed in Section 1. 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.

Receipt of Equipment

When the equipment 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 his liability. A report should be submitted to the nearest Brooks Instrument location listed on the Global Service Network page on our website: BrooksInstrument.com/GlobalSupportCenters

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.

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°C (160°F) maximum and 0°C (32°F) minimum.
   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".

Return Shipment

Prior to returning any instrument to the factory for any reason, visit our website for instructions on how to obtain a Return Materials Authorization Number (RMA #) and complete a Decontamination Statement to accompany it: BrooksInstrument.com/Service. All instruments returned to Brooks also require a Material Safety Data Sheet (MSDS) for the fluid(s) used in the instrument. Failure to provide this information will delay processing of the instrument.

Instrument must have been purged in accordance with the following:

WARNING

Before returning the device, purge thoroughly with a dry inert gas such as Nitrogen before disconnecting process connections. Failure to correctly purge the instrument could result in fire, explosion or death. Corrosion or contamination may occur upon exposure to air.
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.

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.

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.
Section 2 Installation

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.
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.)

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 possibility 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).

**Vertical Mounting**

![Figure 2-3 Horizontal Right Side Up Installation](image_url)

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](image_url)
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 impedance 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 impedance 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.

EMC note: The DC Input Port of the EUT is not intended to be connected to a DC Distribution Network; therefore the DC Input Leads were tested as I/O signal / control ports.

**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 impedance on Pin 12 is >50K ohms.

>5 Vdc @ Valve Open
0 Vdc @ Valve Closed
Section 2 Installation

Secondary Output, Density or Temperature (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.

Note: Not all models have a secondary output.

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

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

* Do not apply power to these Pins.

WARNING

When wiring terminal block in IP66 device, ensure wires are appropriate length and are properly dressed. Unnecessarily long wires can protrude below the top housing and cause damage to the sensor assembly below.
Section 2 Installation

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

**Figure 2-6 Alarm Output Wiring Options**

*Notes:*
1. Tie cable shields to ground at one end only.

**Alarm Output Option 1 - Relay**

- PIN 5: 14 - 27 Vdc Power Source
- PIN 5: 100 mA Max.
- D-Connector: Relay

**Alarm Output Option 2 - TTL**

- PIN 11: 10 K Ω TTL
- PIN 3: D-Connector

*Figure 2-6 Alarm Output Wiring Options*
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
### Section 2 Installation

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

*DO NOT APPLY POWER TO THESE PINS*

---

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

Cable Assembly for 'D' Type Connector
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.

**Zero Adjustment**

![LEDs are located on the top of the device](Figure 3-1 Location of the LEDs)
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.

---

**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.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow through the instrument during zeroing procedure will result in an inaccurate zero setting.</td>
</tr>
<tr>
<td>Make sure fluid flow through the instrument is completely stopped during the zeroing procedure.</td>
</tr>
</tbody>
</table>

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.
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).
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

**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 corrosion resistant and 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.
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 Maintenance & Troubleshooting

<table>
<thead>
<tr>
<th>Observation</th>
<th>Cause</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oscillating mass flow output can cause diagnostic alarm</td>
<td>Bubbles dissolved in the liquid. High pressure push gas can cause bubbles to dissolve in fluid. Bubbles then form at the valve due to pressure drop, upsetting valve. Oscillating pump pressure used to move the fluid. Piston action can cause pressure oscillations, upsetting valve. Pressure drop or inlet pressure deviates form calibrated values. Valve out of adjustment. Unstable inlet pressure. Defective PC board. Valves are tuned digitally and mechanically for a particular $\Delta P$.</td>
<td>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. 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. Adjust pressure to original specifications. Contact Brooks Instrument. Check external pressure regulator. Contact Brooks Instrument. Operate Quantim at specified pressure conditions.</td>
</tr>
<tr>
<td>Valve will not open or fully close</td>
<td>Valves are tuned digitally and mechanically for a particular $\Delta P$. Proper valve response requires just the right amount of force to be applied by the valve. With too much or too little $\Delta P$ the valve will be mis-tuned. Mounting attitude is different from calibration attitude; Reason, gravity effects could pull valve open or closed.</td>
<td>Operate Quantim at specified pressure conditions. Check valve operation with the Brooks Service Tool. Mount Quantim in the specified mounting attitude.</td>
</tr>
<tr>
<td>No Flow or unable to achieve full flow</td>
<td>Insufficient inlet pressure or pressure drop. Clogged Valve Orifice or Sensor.</td>
<td>Adjust pressures, inspect in-line filters and clean/replace as Back flush the device with a solvent or purge gas with valve</td>
</tr>
</tbody>
</table>
**Table 4-1 Maintenance & Troubleshooting (continued)**

<table>
<thead>
<tr>
<th>Observation</th>
<th>Cause</th>
<th>Resolution</th>
</tr>
</thead>
</table>
| No Flow or unable to achieve full flow | Particulates in the flow stream.  
Agglomeration of fluid at orifice.  
Chemical deposits.  
Poor filtration of process fluid.  
Valve out of adjustment (applicable to Controller). | If the device has an external control valve you can replace or disassemble and clean the valve.  
(See Section 4-3)  
Consider a larger orifice (valve stability could suffer).  
Institute regular PM back flushing.  
Install proper filtration.  
Contact Brooks Instrument. |
| Valve out of adjustment | Valve guide spring failure (applicable to Controller).  
Valve override input is grounded  
Defective electronic board | Contact Brooks Instrument.  
Check the valve override input.  
(Pin 12).  
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).  
+15 Vdc applied to the valve override input (applicable to Controller).  
Defective PC board. | 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)  
Check the valve override terminal (Pin 12).  
Contact Brooks Instrument. |
| No secondary output signal | Not all models have a secondary output. | Check calibration sheet and/or other documentation to confirm if device should have a secondary output.  
If yes, 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. Do 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 assistance.

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**
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 cavity on 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 valve 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 valve 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 x 10^-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.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Part Number</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Valve Nut</td>
<td>533Z275CEF</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Coil Cover Assembly</td>
<td>185Z314AAA</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Socket Head Screw</td>
<td>751Z162AAA</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Stem</td>
<td>94QZ256QOT</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Plunger Assembly</td>
<td>622Z252QOG</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Orifice .014 dia.</td>
<td>577Z529BMG</td>
<td>1</td>
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*Figure 4-2 Parts List*
Figure 4-3 Exploded Diagram of Valve Assembly

Figure 4-4 Valve Torque Pattern
Quantim Patent Numbers as follows:

Argentina.......................................................... AR026329B1, AR021594B1
Australia............................................................... 778137, 771345, 782183
China................................................................. ZL00817949.2, ZL02263425.1, 171140
Federation of Russia............................................ 2272257, 2263264, 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, 6526393, 6748813,
........................................................................... 6769301, 7032462, 7111519, 7117751, 7114517, 7204679
Counterparts in other countries and other patents pending
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