This Manual describes the combination of the Digital Control Valve BV88 with the BV50 Pilot for Flow Control and Backpressure Control. The pictures above show these two items separately.

Please also see Manual X-BVX for the standard Control Valve.
1 Read Me First

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Brodie International
Statesboro, Georgia, USA

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2 Essential Instructions

General

Brodie Meter Co., LLC designs, manufactures and tests its products to meet many international standards. As the instruments are sophisticated technical products they must be installed, used and maintained properly to ensure they continue to operate within their normal specifications. The following instructions must be adhered to and incorporated into onsite safety programs where possible.

Read all instructions prior to installing, operating or servicing the product. If the instruction manual is not the correct one telephone +1 912 489 0200. Retain the instruction manual for future reference.

If you do not understand any of the instructions, contact your local Brodie representative for clarification.

Follow all warnings, cautions and instructions marked on or supplied with the product. It is the end users responsibility to operate the instrument within the specifications as defined within the instruction manual or marked on the instruments name plates.

Install the equipment as specified in the installation instructions of the appropriate manual and in accordance to local and national codes.

To ensure proper performance, use qualified personnel to install, operate, program and maintain the product.

Some types of equipment contain Carbon Steel, Cast Iron and/or Aluminum wetted parts, these instruments are not for use on water service.

It is the end users responsibility to assess the surface temperature of the device when it is in service, and if required take the necessary precautions to avoid personnel injury or damage to other equipment.

When replacement parts are required, ensure that qualified people use replacement parts specified by the manufacturer. Unauthorized parts and procedures can affect the products performance and place the safe operation of the process at risk. Look alike substitution may result in explosion, fire, electrical hazards, improper operation or personnel injury.

Use of this equipment for any other purpose than it is intended for may result in property damage and/or serious personal injury or death.

Essential Instructions for Measuring Equipment Including the European Union (Directive 2004/22/EC MID)

Although measurement transducers are not specifically included in the MID regulations as they do not form a complete measuring (system) instrument ref Article 1 and 4, Annex I and Annex MI-005.

Brodie Meter Co., LLC implements the same stringent regulations for all products and tests to the same standards which are used for complete (systems) instruments.

The complete system must contain all the necessary components to meet the requirements of the local regulations. These components may include, pumps, air eliminators, strainers, valves, flow computers, etc.

The unit must be sealed in accordance with the local regulations; it is the end users responsibility to ensure this happens.

Flow measuring devices are provided with two labels which specify flow ranges. The name plate label which includes the factory serial number; details the operating flow range, this is the flow range the device will operate within without causing damage, and the custody transfer label; this label details the working flow range associated with a particular weights and measures approval.

It should be noted that these may not be the same; therefore in trade applications the flow ranges specified on the custody transfer label should be followed.
**Essential Instructions for Electrical Equipment Including the European Union**

*Directive 2004/108/EC and 2004/22/EC*

This unit contains Electrostatic sensitive circuit boards. Electrostatic safety precautions should be taken to prevent damage.

When connecting wiring it is good practice to use shielded cable. The shield should be connected to earth at the read out or control systems end of the cable; the other end of the shield should not be connected.

This wiring practice is mandatory in order to comply with the requirements for electromagnetic compatibility as per the EMC directive 2004/108/EC and MID 2004/22/EC of the council of the European Union.

It is the end users responsibility to ensure that all protective covers are in place to prevent electrical shock and/or personnel injury.

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**Essential Instructions for Pressure Containing Equipment, Including the European Union**

*Directive 97/23/EC*

When installing the equipment the bolting must conform to the requirements of ASME B16.5 paragraph 5.3 and to the material requirements of ASME B16.5 Table 1B. Gaskets must conform to the requirements of ASME B16.20.

Although it is not expected for the device to be used in a service where it would come in to contact with unstable fluids, it is the end users responsibility to assess any risks and take any precautions necessary.

It is the end users responsibility to ensure that piping and other attachments connected to the Brodie instrument do not place adverse stresses upon it, the design of the instrument has not been assessed for the effects of traffic, wind or earthquake loadings.

It is the end users responsibility to ensure that the instrument is mounted when required on suitable supporting foundations.

It is the end users responsibility to install the device in a well designed system to avoid potential hazards such as water hammer, vacuum collapse or uncontrolled chemical reactions.

It is the end users responsibility to provide fire protection measures and equipment in accordance with the local regulations.

It is the end users responsibility to install suitable straining and air/gas elimination systems.

The instrument has been designed without allowance for corrosion or other chemical attack. The end user should implement a periodic inspection and maintenance program to ensure that none of the instruments pressure containing components has been subject to any corrosion. It is possible to examine the instrument for evidence of corrosion through the inlet and the outlet.

When the ambient temperature is below the minimum operating temperature specified on the device, it is the end users responsibility to ensure that the devise is warmed to an appropriated temperature before being pressurized.

Do not exceed the operating pressure and temperature limits of the instrument as stamped on the nameplates.
Essential Instructions for When Equipment Is To Be Used In Hazardous Locations, Including the European Union (Directive 94/9/EC)

Any Hazardous area approval applies to equipment without cable glands. When mounting the flameproof enclosure in a hazardous area only cable glands / conduit seals certified to meet or exceed the rating of the equipment should be used, refer to the type approval documentation for further details. It is the end users responsibility to ensure this happens.

Cable glands and cable must be suitable for the operating temperature of the device under its rated conditions, this is especially important is the device has an operating temperature above 1580°F (700°C).

The meter has been provided with an approved sealing device in one of the cable entries, the other entry has been closed with a plastic cap plug. It is the end users responsibility to remove the cap plug and replace it with a suitable cable gland or conduit seal before the equipment is put into service.

It is the end users responsibility to ensure when the instrument is located in a hazardous area that all Cable glands and conduit seals must be installed in accordance with the local codes and regulations.

It is the end users responsibility to ensure that before opening an electronic enclosure in a flammable atmosphere; all the electrical circuits must be interrupted.

If replacement of the screws which secure the sensor housing, the UMB cover of the electronic register and its cover are required, they must be replaced with either factory direct parts or M6-1 x 16 (6g) mm hex socket head screws of equal length. The screws must be made from stainless steel grade A1-70 or A2-70 and be torqued to a value of 55 in lbs upon installation, its is the end users responsibility to ensure this happens.

It is the end users responsibility to assess the maximum surface temperature of the device and the equipment the device is attached to and located next to as this may exceed the temperature ratings of the device itself. If this happens, additional safety precautions will need to be implemented by the end user.

Flame proof housings contain Aluminium; although the composition of these enclosures is carefully maintained to prevent any risk of an ignition source it is the end users responsibility to ensure that the housing is not struck by rusty tools or objects.

If the equipment is to be installed in an area where dust deposits and build up are to be expected, a maintenance plan should be arranged to include regular removal of the dust build up. This will prevent the dusts forming a possible source of ignition.

The power supply requirements for this product are specified with in the operating and maintenance manual, it is the end users responsibility to operate the product with in these specified limits.

The instrument contains surfaces that constitute flames paths, these surfaces should not contain any mars or scratches, if any are present the factory or the local representative should be contacted immediately to obtain a new housing as the safety of the enclosure may be impaired. It is the end users responsibility to inspect these surfaces every time the enclosure is opened.

When flanged flame paths are re assembled the gap between them should be less than 0.0015” (0.038 mm) such that a ½” (12.5mm) wide feeler 0.0015” (0.038mm) gauge will not enter the gap more than 1/8” (3mm). It is the end users responsibility to ensure this happens each time the enclosure is reassembled.
3 Receipt of Shipment

When the instrument is received, inspect the outside of the packing case for any damage that may have occurred during shipment.

Any damage incurred during shipment is the carrier’s responsibility and is not part of the factory warranty. If the packing case is damaged notify the carrier immediately and follow their claim procedures.

If the packaging is undamaged locate the envelope containing the packing list, this will generally be on the outside of the box. Carefully remove all the contents from the packaging checking for any damage. Make certain spare or replacement parts are not discarded with the packing material.

Check the items against the packing list for correct parts and quantities. If any items are incorrect or damage please contact your sales representative immediately, quoting the sales order reference number.

4 Return of Shipment

To be able to process returned goods quickly and efficiently, it is IMPORTANT that you provide essential information.

Do not return any assembly or part without an “R.M.A.” (Return Material Authorization). A letter describing the problem; corrective action (if any); and the work to be performed at the factory should be included with the shipment. “R.M.A.” forms can be obtained from the local Sales Agent or Brodie International.

If an instrument has been exposed to process fluid, in addition to the RMA, a decontamination statement will be required.

A decontamination form is included in the back of this manual.

Note: When an instrument is removed from service it must be thoroughly drained and hazardous substances neutralized. Any material removed from the meter must be disposed of in accordance with local regulations.

Placing the instrument upright on the inlet flange will aid drainage.

Process connections must be sealed to prevent leakage of residual product during shipment. Contact the local carrier for information on requirements.

Any item must be securely packed and larger instruments mounted on wooden pallets or skids for shipment. The exterior of pallet mounted items should be protected by a suitable means such as a wooden crate.

Place a copy of the RMA inside the shipping container and attach it physically to the material being returned. A copy of your packing list should be placed inside an envelope and attached to the outside of the shipping container or placed inside the container.

Failure to follow the above procedures could possibly result in a considerable delay due to improperly or totally unidentified items.

Return shipping address:

Brodie International
Product Service Department
19267 Hwy. 301 North
Statesboro, GA 30461

5 Storage

Brodie International instruments are precision devices and should be handled and stored with care.

The inlet and outlet covers should remain on the instrument until the unit is ready for installation.

If extended storage is required it is recommend that the instrument be placed in an environmentally controlled warehouse, if it is not possible, the instrument should be stored in a water proof lined wooden box, desiccant packs should be taped to the inside of the instrument end connections before they are sealed to reduce the effect of humidity, depending on the storage time it may also be preferable to use a compatible corrosion inhibitor.

Care should be taken to remove any storage protection items before installing the instrument.

If an instrument is removed from service for an extended period of time it should be flushed with an appropriate corrosion inhibitor before being place in long term storage as mentioned above.
## Position of Valve Piston

<table>
<thead>
<tr>
<th>Flowcomouter Commands</th>
<th>Solenoid Normally Open</th>
<th>Solenoid Normally Closed</th>
<th>Pilot NO DP</th>
<th>Valve Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed</td>
<td>Open</td>
<td>Closed</td>
<td>Closed</td>
<td>Closed</td>
</tr>
<tr>
<td>Opening [ramp up flow]</td>
<td>Closed</td>
<td>Open</td>
<td>Closed</td>
<td>Opening</td>
</tr>
<tr>
<td>Set flow met</td>
<td>Closed</td>
<td>Closed</td>
<td>Closed</td>
<td>Fixed Open</td>
</tr>
<tr>
<td>Closing [ramp flow down]</td>
<td>Open</td>
<td>Closed</td>
<td>Closed</td>
<td>Closing</td>
</tr>
<tr>
<td></td>
<td>Open</td>
<td>Closed</td>
<td>Open</td>
<td>Closed</td>
</tr>
<tr>
<td>Opening [ramp up flow]</td>
<td>Closed</td>
<td>Open</td>
<td>Open</td>
<td>Closed/Closing</td>
</tr>
<tr>
<td>Set flow met</td>
<td>Closed</td>
<td>Closed</td>
<td>Open</td>
<td>Closed/Closing</td>
</tr>
<tr>
<td>Closing [ramp flow down]</td>
<td>Open</td>
<td>Closed</td>
<td>Open</td>
<td>Closed/Closing</td>
</tr>
</tbody>
</table>

The table shows the position of the valve piston in response to the input from the flow computer in DCV mode and includes the action of the Normally Open BV50 pilot.

If the backpressure is less than the set pressure of the pilot, the pilot will shift to its Normally Open position thereby overriding the flow computer command closing or throttling the main valve to maintain minimum backpressure.

[Diagram showing valve piston positions]

Digital valve control with backpressure regulation:
Valve will close on decreasing back pressure even when both solenoids hydraulically hold the main piston i.e. when max flow or back is reached.
Model BV50 Pressure Reducing Pilot
# Parts List Model BV50, Pressure Reducing Pilot

<table>
<thead>
<tr>
<th>Item #</th>
<th>Description</th>
<th>Part Number</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cover</td>
<td>VP60006-600M</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Spring Guide</td>
<td>VP60017</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Pressure Spring 0-40 psi</td>
<td>VP60022</td>
<td>1</td>
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<tr>
<td>4</td>
<td>Piston</td>
<td>VP60111</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Thrust Washer</td>
<td>VP600013</td>
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</tr>
<tr>
<td>6</td>
<td>Damper Spring</td>
<td>VP600021</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Guide Bushing</td>
<td>VP600008</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Pilot Valve Cage</td>
<td>VP600007</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Poppet Shaft</td>
<td>VP600011</td>
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</tr>
<tr>
<td>10</td>
<td>Retainer Sleeve</td>
<td>VP600002</td>
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<td>11</td>
<td>Pilot Valve Body, Steel</td>
<td>VP53301M</td>
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<td>13</td>
<td>Vent Plug Assembly</td>
<td>VP60015-500</td>
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<td>14</td>
<td>Adjustment Stem Assembly</td>
<td>150687-024</td>
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<tr>
<td>15</td>
<td>Hex Nut</td>
<td>151543-019</td>
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<tr>
<td>16</td>
<td>Retaining Ring - Internal</td>
<td>156465</td>
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<tr>
<td>17</td>
<td>Lockwasher SS</td>
<td>152267</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>Retaining Ring - Cage Assembly</td>
<td>156466</td>
<td>1</td>
</tr>
<tr>
<td>19</td>
<td>Retaining Ring - Guide Bushing</td>
<td>156467</td>
<td>1</td>
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<tr>
<td>20</td>
<td>Lockwasher SS</td>
<td>152119</td>
<td>1</td>
</tr>
<tr>
<td>21</td>
<td>Hex Nut</td>
<td>151544-019</td>
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<tr>
<td>24</td>
<td>Seal Wire</td>
<td>155051</td>
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<td>25</td>
<td>Lead Seal</td>
<td>151831</td>
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<td>27*</td>
<td>Poppet Shaft O-Ring Seat</td>
<td>152067-XXX</td>
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<tr>
<td>28*</td>
<td>Lower Cage O-Ring</td>
<td>157009-XXX</td>
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<tr>
<td>29*</td>
<td>Guide Bushing O-Ring</td>
<td>152090-XXX</td>
<td>1</td>
</tr>
<tr>
<td>30*</td>
<td>O-Ring - Upper Cage</td>
<td>157010-XXX</td>
<td>1</td>
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<tr>
<td>31*</td>
<td>Poppet Shaft O-Ring to Guide Bushing</td>
<td>152066-XXX</td>
<td>1</td>
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<tr>
<td>32*</td>
<td>Piston O-Ring</td>
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<tr>
<td>33*</td>
<td>Shaft to Piston O-Ring</td>
<td>152064-XXX</td>
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<tr>
<td>34*</td>
<td>Cover O-Ring</td>
<td>157011-XXX</td>
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<td>Seal Kit, Viton-A</td>
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<tr>
<td></td>
<td>Seal Kit, FluoroSilicon</td>
<td>WVP53600-536</td>
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</tr>
</tbody>
</table>

Notes:
1. O-ring material suffix is as follows:
   - 022 : Viton A
   - 120 : Low swell nitrile
   - 026 : Viton F
   - 016 : FluoroSilicon
1. Limited Warranty
Subject to the limitations contained in Section 2 herein and except as otherwise expressly provided herein, Brodie International, a Brodie Meter Co., LLC Company (“Brodie”) warrants that the firmware will execute the programming instructions provided by Brodie, and that the Goods-manufactured or Services provided by “Brodie” will be free from defects in materials or workmanship under normal use and care until the expiration of the applicable warranty period.

Goods are warranted for twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by “Brodie”, whichever period expires first. Consumables and Services are warranted for a period of 90 days from the date of shipment or completion of the Services.

Products purchased by “Brodie” from a third party for resale to Buyer (“Resale Products”) shall carry only the warranty extended by the original manufacturer.

Buyer agrees that “Brodie” has no liability for Resale Products beyond making a reasonable commercial effort to arrange for procurement and shipping of the Resale Products.

If Buyer discovers any warranty defects and notifies “Brodie” thereof in writing during the applicable warranty period,