

BiRotor Plus
Positive Displacement Flow Meter

B27X	[3"]	B30X	[6"]
B28X	[4"]	B31X	[8"]
B29X	[6"]	B32X	[10"]

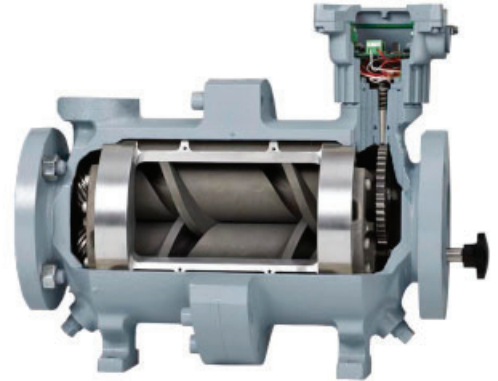


Table of Contents

1 Read Me First	3
2 Essential Instructions	4
3 Warranty Claim Procedures	8
3.1 - Limited Warranty	8
3.2 - Limitation of Remedy and Liability	9
4 Receipt of Shipment	10
5 Return of Equipment	10
6 Storage	11
7 Description	11
8 Installation and Operation	12
8.1 - Installation Requirements	12
8.2 - Installing the Instrument	13
8.3 - Meter Start Up and Operation	14
8.4 - Higher Temperature Start Up	15
8.5 - Custody Transfer	15
9 Maintenance	17
9.1 - Removal/Replacement of Circuit Board	18
9.3 - Removal of the Measuring Unit from the Process Line	19
9.4 - Removal of the Measuring Unit from the Instrument Body	19
9.5 - Measuring Unit Disassembly While Maintaining Clearance Settings	20
9.6 - Complete Disassembly of the Measuring Unit	20
9.8 - Setting Clearances	23
10 Troubleshooting	24
11 Strainers	25
12 Parts Lists	26
Appendix A	34
Appendix B	36

1 Read Me First

Notice

Brodie International, a Brodie Meter Co., LLC Company (“Brodie”) shall not be liable for technical or editorial errors in this manual or omissions from this manual.

Brodie makes no warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose with respect to this manual and, in no event, shall Brodie be liable for any special or consequential damages including, but not limited to, loss of production, loss of profits, etc.

Product names used herein are for manufacturer or supplier identification only and may be trademarks/registered trademarks of these companies. The contents of this publication are presented for informational purposes only, and while every effort

has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, expressed or implied, regarding the products or services described herein or their use or applicability. We reserve the right to modify or improve the designs or specifications of such products at any time.

Brodie does not assume responsibility for the selection, use or maintenance of any product. Responsibility for proper selection, use and maintenance of any Brodie product remains solely with the purchaser and end-user.

No part of this work may be reproduced or copied in any form or by any means - graphic, electronic or mechanical - without first receiving the written permission of Brodie International.

2 Essential Instructions

General

Brodie International 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, and servicing the product. If this instruction manual is not the correct manual, telephone +1 912 489 0200 and the requested manual will be provided.

Save this instruction manual for future reference. If you do not understand any of the instructions, contact your Brodie representative for clarification.

Follow all warnings, cautions, and instructions marked on and supplied with the product. Inform and educate your personnel in the proper installation, operation, and maintenance of the product. Install your equipment as specified in the installation instructions of the appropriate instruction manual and per applicable local and national codes. Connect all products to the proper electrical and pressure sources.

To ensure proper performance, use qualified personnel to install, operate, update, program, and maintain the product. When replacement parts are required, ensure that qualified personnel use replacement parts specified by the manufacturer.

Unauthorized parts and procedures can affect the product's performance and place the safe operation of your process at risk. Look-alike substitutions may result in fire, electrical hazards, or improper operation.

Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified personnel, to prevent electrical shock and personal injury.

When installing this equipment, 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.

It is the customer's responsibility to ensure that piping or other attachments connected to the valve do not place adverse stresses on the valve. The design of the valve has not been assessed for the effects of traffic, wind, or earthquake loading.

It is the customer's responsibility to provide fire prevention measures and equipment per local regulations.

The valve has been designed without allowance for corrosion. The customer should implement a periodic inspection and maintenance program to ensure that no part of the valve's pressure retaining components has been subjected to corrosion.

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

Essential Instructions for Measuring Equipment, Including the European Union (Directive 2014/32/EU MID)

Although measurement transducers are not specifically included in the MID regulations as they do not form a complete measuring instrument system, in accordance with Article 1 and 4, Annex I and Annex VII, Brodie Meter Co., LLC implements the same stringent regulations for all products and tests to the same standards which are used for complete measuring instrument systems.

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 user's

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. The custody transfer 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 2014/30/EU and 2014/32/EU)

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 2014/30/EU and MID 2014/32/EU of the council of the European Union.

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

Essential Instructions for Pressure Containing Equipment, Including the European Union (Directive 2014/68/EU)

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 user's responsibility to assess any risks and take any precautions necessary.

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

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

It is the end user's 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 have 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 user's responsibility to ensure that the device 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.

It is the customer's responsibility to install this equipment in a system that provides adequate over-pressure protection and that limit pressure surges to 10% of the maximum allowable working pressure of the instrument.

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

Essential Instructions for Equipment to be Used in Hazardous Locations, Including the European Union (Directive 2014/34/EU)

Any Hazardous area approval applies to equipment without cable glands. When mounting the flame-proof 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. Cable glands and cable must be suitable for the operating temperature of the device under its rated conditions, this is especially important if the device has an operating temperature above 1580F (700C). It is the end user's responsibility to ensure this happens.

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 user's 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 user's responsibility to ensure, when the instrument is located in a hazardous area, that all cable glands and conduit seals are installed in accordance with all local codes and regulations.

It is the end user's responsibility to ensure that before opening an electronic enclosure in a flammable atmosphere that all the electrical circuits have been 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 M6-1x16 (6g) mm hex head socket 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 inch lbs. upon installation. It is the end user's responsibility to ensure this happens.

It is the end user's 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 Aluminum; 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 dust from forming a possible source of ignition.

The power supply requirements for this product are specified within the operating and maintenance manual, it is the end user's responsibility to operate the product within these specified limits.

The instrument may contain surfaces that constitute flames paths, these surfaces should not contain any marks 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 user's responsibility to inspect these surfaces every time the enclosure is opened.

When flanged flame paths are reassembled the gap between them should be less than 0.0015" (0.038 mm) such that a 1/2" (12.5mm) wide 0.0015" (0.038 mm) feeler gauge will not enter the gap more than 1/8" (3mm). It is the end user's responsibility to ensure this happens each time the enclosure is reassembled.

3 Warranty Claim Procedures

3.1 - Limited Warranty

Brodie Meter Co., LLC ("Brodie") warrants the Goods-manufactured 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 installation and 18 months from date of shipment, whichever occurs 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, Brodie shall, at its option, repair or replace, that portion of the Goods found by Brodie to be defective or refund the purchase price of the defective portion of the Goods/Services.

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

Brodie shall not be obligated to pay any costs or

charges incurred by Buyer or any other party except as may be agreed upon in writing in advance by an authorized Brodie representative.

All costs of dismantling, reinstallation and freight and the time and expenses of Brodie's personnel for site travel and diagnosis under this warranty clause shall be borne by Buyer unless accepted in writing by Brodie.

Brodie is not responsible for damages that incur during shipment to Buyer for shipments that are F.O.B. Brodie Factory, FCA Brodie Factory, or EXWORKS Brodie Factory. Shipping charges for goods returned to Brodie under warranty will be at Buyer's expense.

Products found not to be warranted can be repaired and returned at Buyer's expense and return charges born by Brodie will be added to the cost of repair or returned to Buyer "as received" at Buyer's expense. Insurance for returned products will be at Buyer's expense.

For all returned products please package to prevent damage, or future damage during shipment.

Make sure the products are cleaned, free from grease oil, chemicals and other materials that may hamper defect detection and impede repair.

All returned items must be accompanied with a MSDS for the products that have been in contact with the equipment, including cleaning agents.

3.1 - Limited Warranty Continued

A decontamination statement, RMA, and Customer Problem Report must also accompany equipment returned. Product received in an unsuitable condition will be returned at Buyer's expense without being examined.

Goods repaired, and parts replaced during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer.

This limited warranty is the only warranty made by Brodie and can be amended only in a writing signed by an authorized representative of Brodie.

Except as otherwise expressly provided in the Agreement, there are no representations or warranties of any kind, expressed or implied, as to merchantability, fitness for a particular purpose, or any other matter with respect to any of the goods or services.

It is understood that corrosion or erosion of materials is not covered by our guarantee unless the Buyer has notified the Seller the product will be used in an environment conducive to corrosion and/or erosion and the product has been coated with Brodie's recommended method of protection against corrosion / erosion.

3.2 - Limitation of Remedy and Liability

Brodie International, a Brodie Meter Co., LLC Company ("Brodie") shall not be liable for damages caused by delay in performance.

The sole and exclusive remedy for breach of warranty hereunder shall be limited to repair, correction, replacement or refund of purchase price under the limited warranty clause in Section 1 herein.

In no event, regardless of the form of the claim or cause of action (whether based in contract, infringement, negligence, strict liability, other tort or otherwise), shall "Brodie's" liability to buyer and/or its customers exceed the price to buyer of the specific goods manufactured or services provided by Brodie giving rise to the claim or cause of action.

Buyer agrees that in no event shall Brodie's liability to buyer and/or its customers extend to include incidental, consequential or punitive damages.

The term "consequential damages" shall include, but not be limited to, loss of anticipated profits, loss of use, loss of revenue and cost of capital.

Brodie International
P.O. Box 450 (30459-0450)
19267 Highway 301 North
Statesboro, GA 30461, USA

www.brodieintl.com
Phone: +1 (912) 489-0200

4 Receipt of Shipment

When you receive your equipment inspect the outside of the packing case for damage which may have incurred during shipping. Damage incurred during shipment is the responsibility of the carrier and is not part of the factory warranty. If the packing case is damaged, notify the local carrier immediately.

If the package is in good condition remove the en-

velope containing the packing list and carefully remove the equipment and all components included in the shipment from the packing case. Inspect for damaged or missing parts, referring to the packing list, and prior to discarding the packing material.

If Items are missing from your shipment, contact your sales representative. Your sales order number will be required.

5 Return of Equipment

If the equipment must be returned to the factory for repair or replacement, a Returned Materials Authorization (RMA) must be included with the components.

RMA forms may be obtained from your sales representative or from the Product Service Department. In addition to the RMA, a Material Safety Data Sheet and a Decontamination Statement must be included with Items being returned to the factory. A Decontamination Statement is included in the back of this manual.

If the equipment is removed from service it must be thoroughly drained and neutralized before it is packed for shipment. Care must be taken to ensure that product removed from the equipment is disposed of in accordance with all applicable local, state and federal regulations.

The flanges should be sealed to keep residual fluid from leaking out of the meter during transport. The type of flange seal required will vary with the form of transportation used. Contact the carrier for specific instructions.

The equipment should be securely mounted on a wooden skid for shipment. The original container or a solid wooden box should be used to protect the exterior of the components.

When packing the components for return to the factory, place the RMA and a copy of the packing list that was delivered with the equipment inside an envelope. Place the envelope inside the shipping container with the Item being returned and reference the RMA number on the outside of the shipping container.

Equipment returned to the factory without the proper documentation will be returned to sender at their expense.

Ship the container to:
Brodie Meter Co., LLC
Product Service Department
19267 Highway 301 North
Statesboro, GA 30461, USA

Phone: +1 (912) 489-0200
Fax: +1 (912) 489-0294
service@brodieintl.com

6 Storage

Brodie International instruments are precision devices and should be handled and stored with care. They should not be subjected to rough or improper handling or stored in an environment where moisture, extreme temperatures, or foreign material can damage the meter.

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

If extended storage is required it is recommended that the instrument be placed in an environmentally controlled warehouse. If this is not possible the

instrument should be stored in a waterproof 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 on the equipment and accessories. Caution must be used to ensure desiccant packs are removed prior to installation.

Depending on the storage time it may also be preferable to use a compatible corrosion inhibitor.

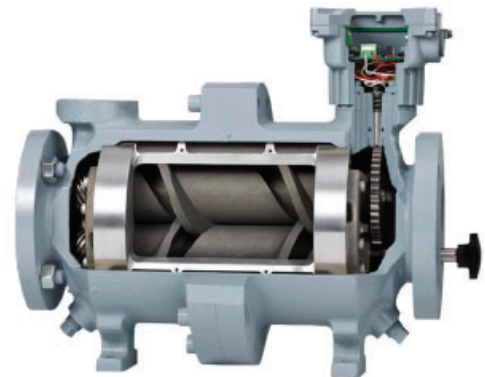
If the valve is removed from service for an extended period of time it should be flushed with a light oil before being placed into storage.

7 Description

General

The BiRotor Plus is an extremely accurate, dual-cased, flow measuring device. It produces a high resolution signal, via the use of non-wetted pick offs, which is directly proportional to the rate of liquid flow through the meter. These signals can be shaped by a simple pre-amplifier for transmission to ancillary equipment.

The BiRotor Plus meter utilizes the exclusive BiRotor principle. There are no sliding, oscillating, or reciprocating parts.

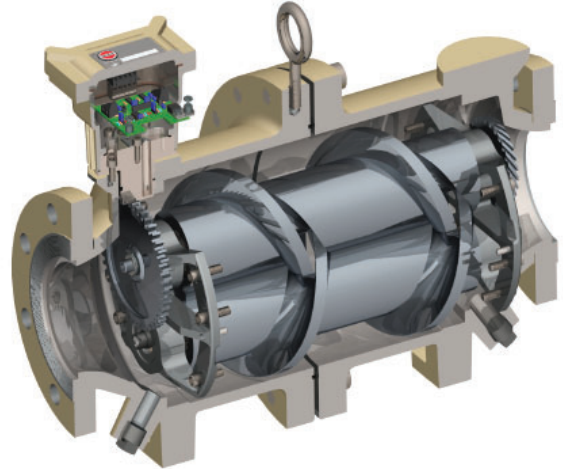


8 Installation and Operation

General

The operation of the meter is embodied in the function of the measuring rotors; they are always dynamically balanced but hydraulically unbalanced during operation. The rotors have no metal to metal contact with each other or the housing in which they rotate. Clearances between moving components are maintained with the use of timing gears.

The BiRotor Plus is a positive displacement (PD) meter. A PD meter uses a mechanical principle that measures flow by continuously dividing the flowing stream into known volumetric segments, isolating those segments momentarily, and then returning them to the flowing stream while counting the number of displacements. This is a direct volume measurement, there is no inferred, or software generated, measurement.



8.1 - Installation Requirements

1. The instrument should be mounted on a secure foundation. Provisions should be made for vertically mounting the meter to ensure stability.
2. The process piping should not place any undue strain on the instrument.
3. Precautions should be taken to ensure that thermal fluid expansion does not raise the line pressure above the maximum working pressure of the instrument.
4. Process piping must be clean and free of any foreign matter.
5. A strainer should be installed upstream of the instrument.
6. An air eliminator should be installed upstream of the instrument if the process fluid is expected to contain entrained air.
7. A flow limiting valve should be installed downstream of the instrument, this will maintain a back pressure on the instrument and prevent excessive flow rates.
8. Isolation valves should be located at either ends of the instrument run and a bypass section installed. This will facilitate ease of component removal, when required, and reduce loss of product.

8.2 - Installing the Instrument

1. Remove the inlet and outlet protection covers.
2. Install the instrument into the pipe work using suitable hardware as specified in the local codes and regulations. Ensure that the connections are made tight and torqued to the correct values.
3. Connect the instrument wiring, refer to Figures 9-1 and 9-2. Cable entry into the electrical enclosure is by two 3/4-14 NPT female threads.
4. Use wiring appropriate for the location and operating conditions. Wiring glands and/or conduits must conform to local electrical codes and regulations if wiring is to be installed in a hazardous area.

NOTE:

For additional requirements on installation please refer to Chapter 2, Essential Instructions, at the beginning of this manual.

If the instrument is being installed with additional accessories, the instructions for those accessories should be read and understood before continuing with the installation. The output signal from the preamplifier, if one is fitted, can be altered to interface with most electronic accessories. This is accomplished by the use of jumpers on the circuit board. Refer to Figure 8-1 for their configurations.

The UMB housing may be rotated in 90° increments to accommodate the mounting of accessories. If the UMB housing is removed for any reason, care must be taken to disconnect the sensor wires to prevent sensor damage. It is essential that the four retaining screws used to secure the UMB housing to the meter body be torqued to 55 in/lbs.

Internal grounding terminal must be used for the equipment grounding connection, and the external terminal is for supplementary bonding connection.

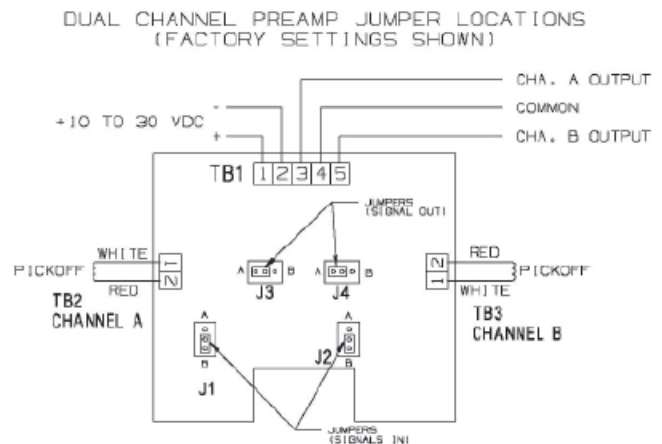


Figure 8-1 Wiring Connections

TB1	Function
1	9-28 VDC Supply
2	V Comm
3	Channel A Signal
4	Channel A and B Common
5	Channel B Signal

Jumper	Position	
J1 (Channel A)	B ¹	
J2 (Channel B)	B ¹	
	5 VDC Pulse	V Supply Pulse ²
J3 (Channel A)	A	B
J4 (Channel B)	A	B

NOTE:

¹ Do not Change without consulting factory.

² V Supply Pulse = Input V minus approximately 2 volts

The instrument should not be located in a location where excessive vibration is to be expected.

Care should be taken not to locate the instrument near any source of electromagnetic interference, such as those produced by electric motors, transformers, solenoids, etc.

Either of these factors could induce a signal into the flow sensing pickoff and interfere with the accuracy of line product measurement.

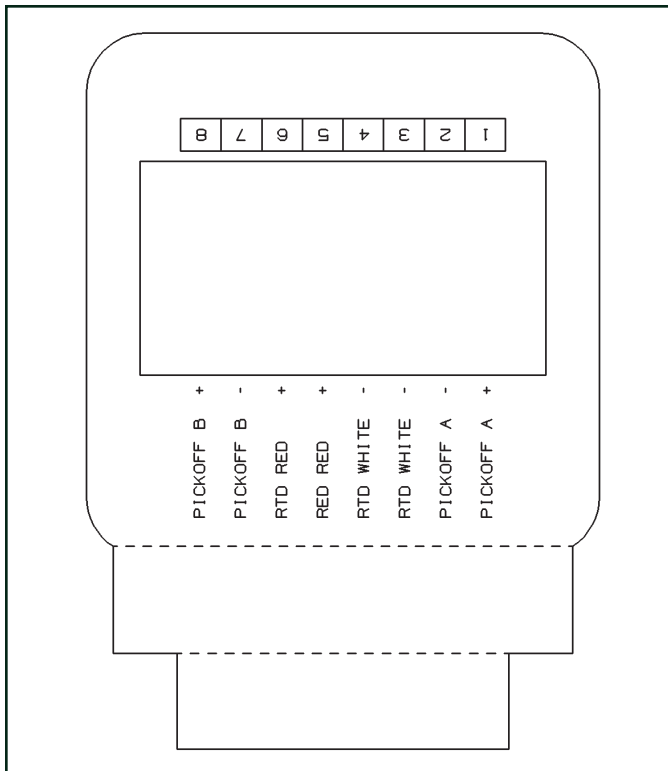


Figure 8-2 Wiring Connections

Integral Brodie Electronic Rate Totalizer (BERT-E)

If the instrument has been supplied with an integral electronic register, the internal wiring connections will already be in place. For additional functions and wiring possibilities please refer to the BERT-E's instruction manual.

8.3 - Meter Start Up and Operation

Review the system installation to ensure all the components are in proper sequence, all isolation valves must be closed, all electrical connections are complete, and all covers are in place.

1. To pressurize the system, slowly open the inlet valve so as to prevent system shock. Slowly allow product to enter the system whilst keeping the downstream isolation valve closed.
2. Open the downstream valve (10%) to allow any air to be flushed from the system. Do not over-speed the instrument.
3. Once the air has been flushed from the system, close the downstream isolation valve and check for any leaks. If leaks are found, check all seals and retighten connections.
4. Fully open the upstream isolation valve to pressurize the system.

Flow start up can commence once the system has been pressurized.

1. Turn on all electronic circuits and check for proper function.
2. Open flow control valves and allow the instrument to run at 20% of its rated flow for 5 minutes.
3. During this initial run, check all other components in the system for functionality.
4. Once this run is complete, set the flow control valve to the required flow and ensure that the maximum flow for the instrument is not exceeded.

8.4 - Higher Temperature Start Up

On higher temperature start up above 212°F (100°C), based on an ambient temperature of 70°F (21°C), special start up procedures are required to prevent damage to the flow meter components. A similar procedure should be followed on any thermal shock in excess of 176°F (80°C). The following equation may be used to determine the approximate flow meter warm up time.

$$t_h = [(C_{nom}) \cdot (OT_{of} - 212)]/100$$

t_h = Warm Up Time in Hours
 C_{nom} = Nominal Connection Size
 OT_{of} = Operating Temperature in °F

During this warm up time the meter should be operated at approximately 5% of maximum flow to allow the temperature to stabilize.

8.5 - Custody Transfer

A meter factor will need to be established under actual operating conditions if the instrument is to be used in custody transfer applications. This initial proving run should be carried out following the completion of the meter start up procedure, and in accordance with local regulations.

NOTE: There are no user adjustable parts in these instruments, however, the instrument housing is provided with two cross-drilled bolts and drain plugs to facilitate sealing if required by the local weights and measurements regulations.

Typical Horizontal Installation with Associated Accessories

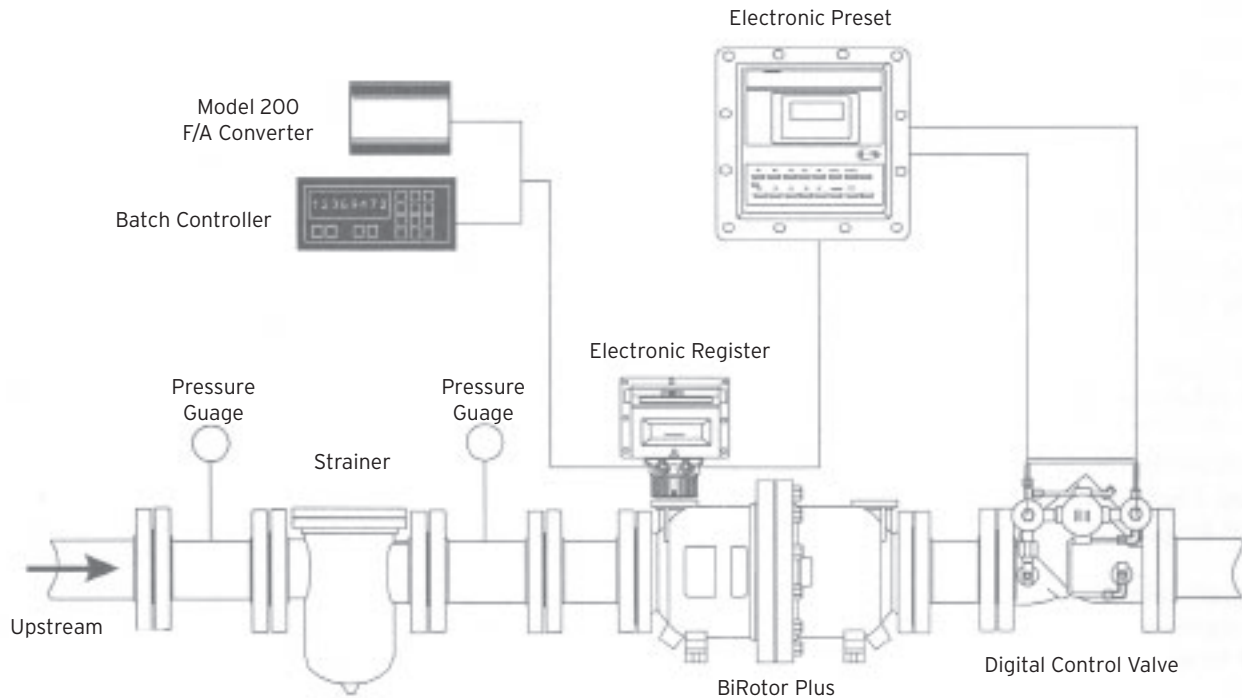


Figure 8-3 Horizontal Installation

Truck Loading - Vertical Installation for Marketing Terminal Applications

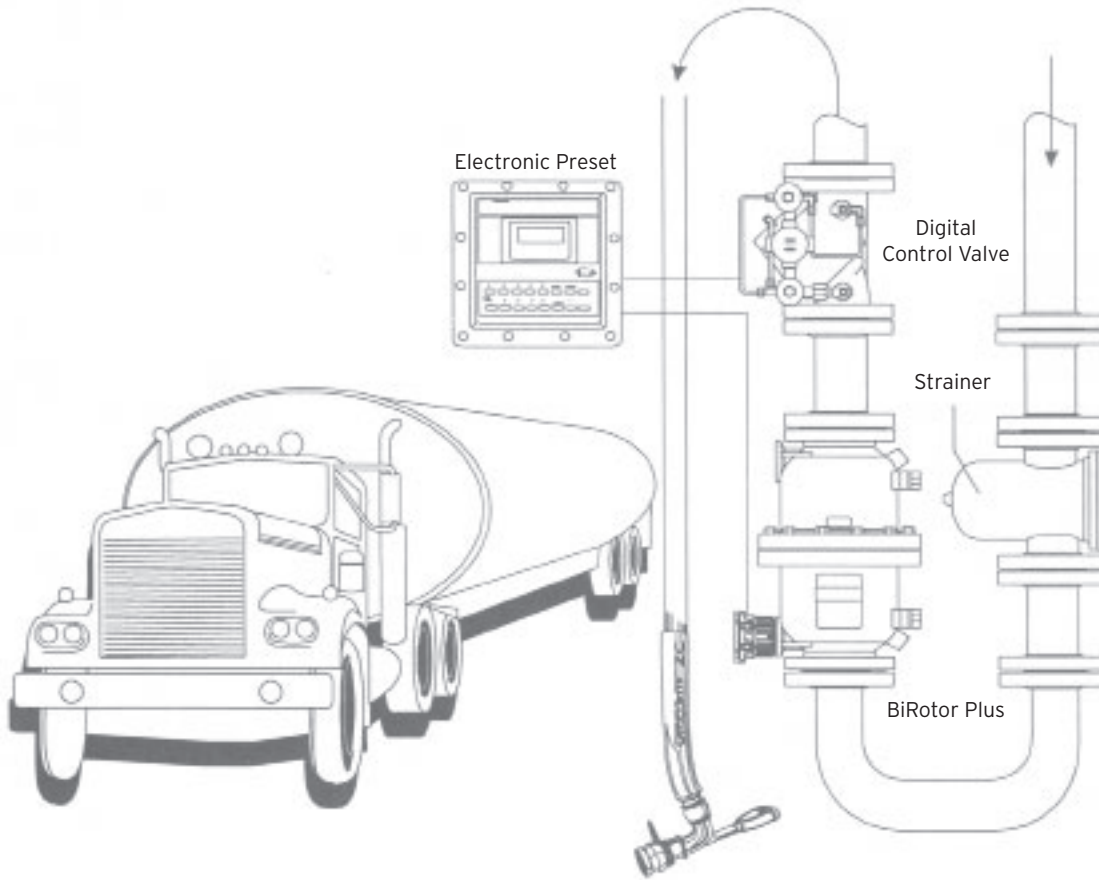


Figure 8-4 Vertical Installation

9 Maintenance

General

The Brodie BiRotor Plus will give many years of consistent performance with little need for maintenance or service. There are, however, several recommendations which, if followed, will further extend the instrument's service life.

The instrument should be kept filled with the process fluid it is measuring. This prevents the exposure to any product vapor which, in the case of petroleum products, are more corrosive than their liquids. In addition, this also prevents the formation and build up of deposits or gums, which would cause increased mechanical friction. The instrument should always be kept free of water, keeping it full of process fluid will accomplish this, but if this is not possible a regular inspection program should be set up and any water drained from the measuring unit.

Filter and strainer baskets should be cleaned frequently. Debris and foreign matter are the biggest cause of meter wear and damage.

All other associated equipment within the system should be regularly maintained and checked for functionality.

NOTE:

If the instrument is being used in hazardous areas, all instructions on the labels and in this manual must be followed before the start of any maintenance.

If the instrument is removed from the process line, the line should be sealed with suitable blanking flanges to prevent any possible leakage of product.

WARNING:

The internal measuring element contains closely meshed moving parts, care should be taken not to insert fingers into the rotors or timing gears as this will cause injury.

NOTE:

All Item Numbers referenced in this section can be found on Figure 11-1 in Chapter 12, Parts Lists.

Performance Considerations

The amount of maintenance necessary for efficient instrument performance is dependant on many factors; some of these are listed below.

Continuity of Operation: An instrument that operates continuously will require more attention than one used intermittently.

Working Flow Rate: The life of the instrument is proportional to the speed of its operation. If the instrument is operating at or near the maximum flow rate it will have a shorter life expectancy than if it were operating at its minimum flow rate.

Lubricity: The lower the lubrication properties of the process fluid being measured then the lower the life expectancy should be.

Cleanliness: A product contaminated with abrasive particulate will accelerate the wear of the instrument.

Electronics

This instrument can be provided with up to two inductive pick off sensors and an optional preamplifier. Maintenance of the electronics does not require the system line pressure to be drained or the instrument to be removed from the system.

ESD precautions must be followed.

9.1 - Removal/Replacement of Circuit Board

1. Disconnect all power to the instrument.
2. Remove the electronics lid , or electronics register, if one is fitted, by removing four Allen screws.
3. Disconnect terminals and wiring to the circuit board.
4. Remove circuit board by removing the screws that attach it to the housing.

To reinstall, reverse the removal instructions and torque the four Allen screws to 55 in/lbs.

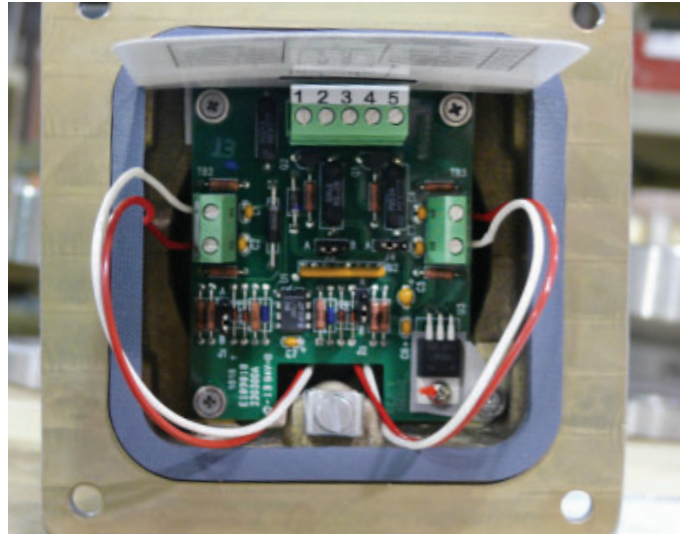


Figure 9-1 Circuit Board and Housing

9.2 - Removal/Replacement of Pick Off Sensors

1. Remove the circuit board as detailed above.
2. Remove the center screw from the sensor housing and lift off the hold down washer.
3. Lift out the inductive sensor(s) and spring.

Resistance between sensor leads:

For Sensor with ident marker on Sheath = 1000 Ohms +/-15%

For Sensor with ident marker on sensor = 750 Ohms +/-15%

Resistance between leads and housing when installed: 10 M Ohms

If any of this is not the case the pick off should be replaced. To reassemble, replace the pick off sensor in the sensor housing. If only one pick off sensor is present it should be inserted in the hole labelled 'A'. Secure with the hold down washer and Allen screws

and replace the circuit board (Item 38).

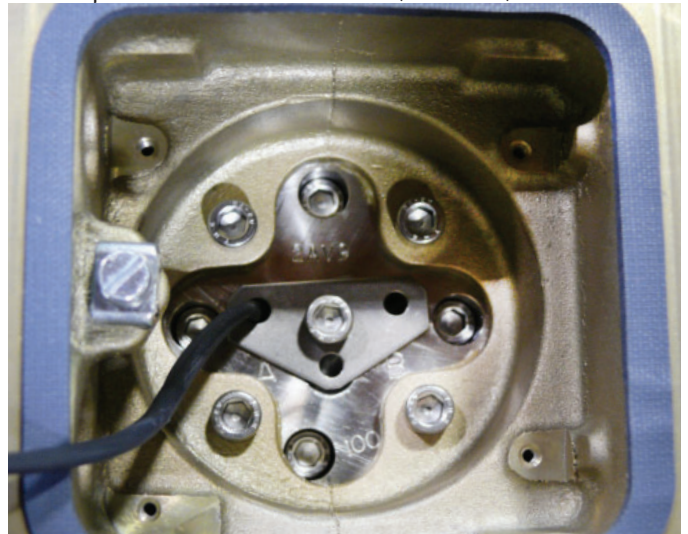


Figure 9-2 Pick Off Sensor Installation

9.3 - Removal of the Measuring Unit from the Process Line

1. Disconnect all power to the instrument.
2. Relieve all system pressure and drain the meter.
3. Disconnect all external wiring from the electronics unit.
4. Unbolt the instrument from the process piping and remove to a workshop for further disassembly.

NOTE:

Care should be exercised to prevent the intrusion of foreign material into the instrument end connections.

9.4 - Removal of the Measuring Unit from the Instrument Body

1. Turn the meter on end so that it stands on its inlet flange, this will also facilitate in fully draining the instrument of process fluid.
2. Remove screws and lift off the outlet housing.
3. Remove O-ring.
4. Holding the measuring unit assembly by the ribs, carefully lift straight up until the assembly clears the inlet housing.
5. Place the measuring unit in the horizontal position.

At this stage the assembly can be inspected for wear or damage. If the assembly had jammed it may be possible to unblock the rotors by flushing it with a cleaning solvent or kerosene without the need for further disassembly.

Further disassembly of the measuring unit for cleaning or inspection can be achieved while maintaining clearance settings. This procedure is covered in the next section. To fully disassemble the measuring unit proceed to Section 9.6.

9.5 - Measuring Unit Disassembly While Maintaining Clearance Settings

1. Place a folded rag between the timing gears to prevent the rotors from turning during disassembly.
2. Remove the pulse wheel by removing the screw, washer, and retaining washer.
3. Remove the screw from the end plate at the timing gear end of the measuring unit assembly.

NOTE:

A flat head screwdriver may be used in conjunction with the slots on the end plate to aid in its removal. Excessive force is not required.

4. Use a plastic or rubber mallet and strike the rotor shafts at the pulse wheel end of the housing to aid in the removal of the rotor assembly.
5. Once the rotor assembly has been removed from the housing any blockage or foreign material can be cleaned away.

At this stage the meter can be reassembled by reversing the disassembly procedures without the need to reset any clearances.

NOTE:

Any elastomers that have been removed should be replaced with new parts during reassembly.

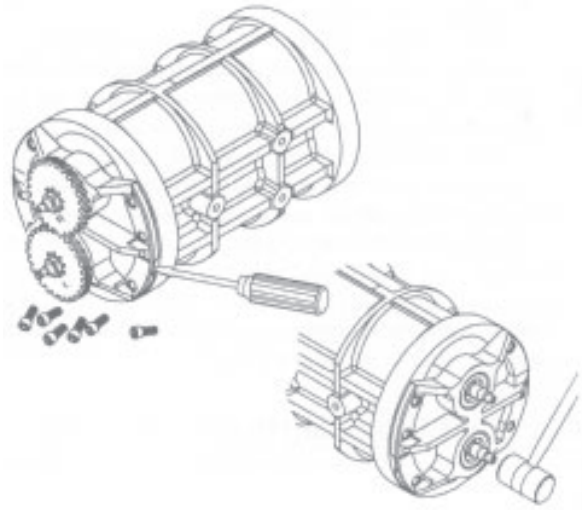


Figure 9-3 Measuring Unit Disassembly

9.6 - Complete Disassembly of the Measuring Unit

1. Place a folded rag between the timing gears to prevent the rotors from turning during disassembly.
2. Remove the pulse wheel by removing the screw, washer, and retaining washer.
3. Remove the screws from the end plate at the timing gear end of the measuring unit assembly.

NOTE:

A flat head screwdriver may be used in conjunction with the slots on the end plate to aid in its removal. Excessive force is not required.

4. Use a plastic or rubber mallet and strike the rotor shafts at the pulse wheel end of the housing to aid in the removal of the rotor assembly.
5. Fold down the lock washer tabs to enable the nuts to be undone and remove them from the rotor shafts. The timing gears can be released from the shaft by striking them with a plastic or rubber mallet.
6. Remove the rotors from the end plate by gently tapping the rotor shafts with a plastic or rubber mallet.
7. Remove the O-rings from the rotor shafts.

8. The bearings can be removed from the end plates by pressing on the inner race of the bearings from the outside of the plate. If the bearings are removed from the endplates then they must be replaced. Timing gears must be replaced whenever bearings are replaced.
9. Remove the other end plate from the measuring element housing and remove the bearings.
10. Remove the sensor housing from the inlet housing by removing four Allen screws located in the counter sunk holes under the circuit board .

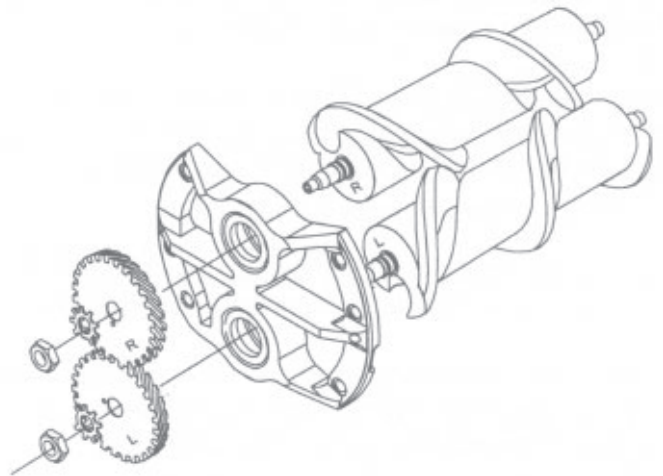


Figure 9-4 Rotor and Gear Orientation

9.7 - Complete Reassembly

1. Ensure all parts are clean and free of debris.
2. Lubricate all bearings and internal O-rings with a light oil.

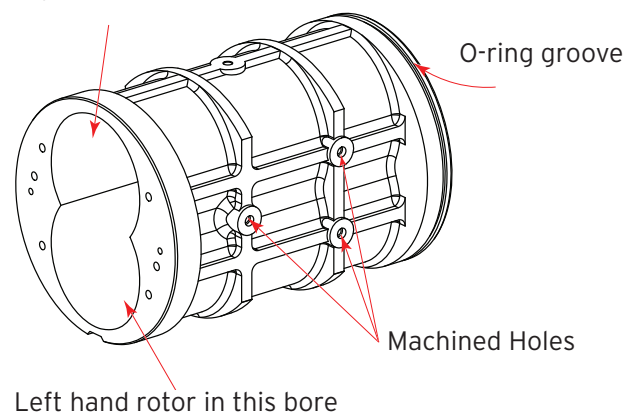
NOTE:

All O-rings should be replaced with new ones during reassembly.

3. Press bearings in to the end plates. Use a hand press and ensure that the bearing is pressed on the outer race to avoid damage. The bearing races should be flush with the bottom of the end plate once the bearings have been pressed in correctly. The outer race of an old bearing can be used to assist in proper seating.
4. Attach one end plate to the measuring unit body at the end opposite the O-ring groove in the measuring unit body. Align the dowel pins and gently tap into place with a plastic or rubber mallet. Once fully seated secure the end plate with screws.
5. Each rotor and timing gear is marked with an 'R' or an 'L'. During assembly the inscriptions need to be matched. To orientate the rotors during assembly the measuring element body

has three holes machined into it for manufacturing purposes. These holes should be positioned so that they face upwards. With these holes facing upwards turn the housing so that the end with O-ring groove is closest to you. With the housing in this position the rotor marked with an 'R' goes in the right hand cavity and the rotor marked with an 'L' goes in the left hand cavity.

Right hand rotor in this bore



Left hand rotor in this bore

Figure 9-5 Measuring element body

-
6. Lubricate O-rings and install on the rotor shafts. Mesh the two rotors together ensuring that the tapered shafts are at the same ends. The rotors should be held together with the tapered end of the shaft facing the end plate which is attached to the measuring element housing. While keeping the rotors meshed and even, insert them into the measuring chamber. Use a plastic or rubber mallet to gently seat the rotor shafts into the bearings.
 7. Install the other end plate and screws on to the other end of measuring element body ensuring that the rotor shafts seat within the bearings.
 8. Place the timing gears onto the respective tapered rotor shaft. The timing gears have a small hole for the location of the lock washer tab; this should be facing outward from the measuring element.
 9. Install the lock washer ensuring the 90° tab locates in the hole of the timing gears and nuts to the rotor shafts. Tighten these only finger tight until the clearances have been correctly set. (Refer to section 9.8 Setting clearances)
 10. Replace the pulse wheel on the right hand rotor. Use thread locking compound on the threads and secure with the retaining washer, washer and screw.
 11. Lower the complete measuring unit assembly into the inlet housing by aligning on to the dowel pins.
 12. Position the main housing O-ring in the groove on the inlet housing and position O-ring on timing gear end of the measuring element body.
 13. Lower the outlet housing onto the inlet housing, aligning the dowel pins to ensure correct installation. Avoid damage to the O-rings.
 14. Complete the assembly by securing all screws and tightening them to their required torque value.
- NOTE:**
For B27X, B28X, & B29X
150# and PN 16 - 80 ft/lbs
300# and PN40 - 150 ft/lbs
- For all models B3XX, 325 ft/lbs
15. Install the O-ring on the sensor housing and insert the assembly into the inlet housing. Secure with four Allen screws and torque to 55 in/lbs.

9.8 - Setting Clearances

With gear movement restricted:

1. Torque the nut on the right hand timing gear to (For B27X, B28X, & B29X) 15-20 ft/lbs. For B30X, B31X, & B32X 45-50 ft/lbs
2. Loosen the nut on the left hand timing gear.
3. Place a (0.005" shim for B27X, B28X, B29X, 0.008" shim for all B3XX) in front of, and behind, the tooth of the left hand rotor . Once the shims are in place, and with the rotor movement still restricted, torque the nut on the left hand timing gear to 15-20 ft/lbs for B27X, B28X, & B29X or 45-50 ft/lbs for B30X, B31X, & B32X.
4. Remove the shims and folded rag and check for correct clearance by slowly rotating the rotors. Listen for sound of binding, rotors should turn freely and not make contact at any point.
5. If the rotors bind, or make noise, repeat this procedure. This time loosening the right hand rotor instead of the left.
6. Once clearances are set use a small flat head screw driver to bend up one tab on each of the timing gear lock washers to secure the location of the nut.

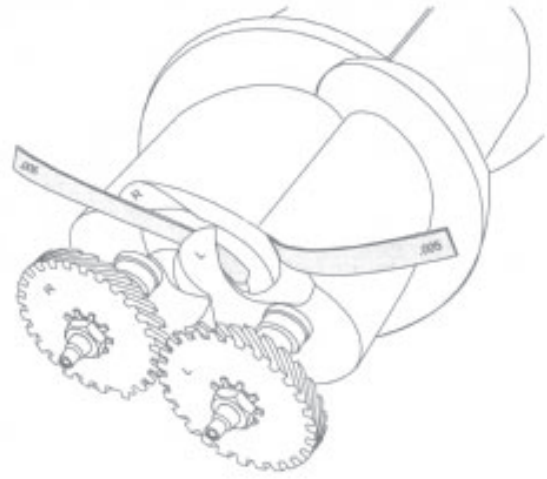


Figure 9-6 Shim Placement for Setting Rotor Clearance

10 Troubleshooting

General

The information in this section has been provided as an aid for basic troubleshooting. Disassembly procedures have been outlined in Chapter 10, Maintenance. If the BiRotor Plus has been found to be in need of repair it is recommended the user contact the nearest Brodie Service Office or Representative. It is important that servicing is performed by trained and qualified personnel.

Condition	Probable Cause	Corrective Actions
No Pulse Output is present	No flow through meter.	Ensure the pipeline has flow.
	Improper electrical connection.	Ensure proper wiring connections have been made.
	Insufficient voltage to preamplifier (if fitted).	Supply sufficient voltage to the pre-amplifier board (reference Section 8, Specifications).
	Power failure.	Ensure power is connected to the device and all associated accessories.
	Meter rotors jammed with debris.	Remove debris from rotors, and check for damage to rotors, timing gears, and bearings (reference Section 9.4).
	Damaged pick off/amplifier board.	Replace pick offs/preamplifier board (reference Sections 9.1 and 9.2).
Erratic or Nonuniform Pulse Signal	Improper electrical connection.	Ensure proper wiring connections have been made.
	Insufficient or fluctuating voltage to the preamplifier board (if fitted).	Supply sufficient voltage to the pre-amplifier board (reference Section 8, Specifications).
	Improper grounding or shielding of connection cable.	Replace wiring and/or grounds and shielding.
	Power failure/damaged pick offs or pre-amplifier board.	Ensure power supply and/or pick offs and preamplifier board are functioning as required (reference Sections 9.1 and 9.2).
	Damaged/worn bearings or timing gears.	Replace bearings and/or timing gears (reference Sections 9.6 and 9.7).

11 Strainers

Strainers are installed in pipe lines ahead of pumps, meters, valves, etc., to protect such equipment against intrusion of pipe scale, welding spatter and other foreign material.

The use of the proper size strainer together with a basket of suitable mesh pays dividends in reduced maintenance on mechanisms which are in contact with flowing liquids. When it is known that comparatively large amounts of lint or iron oxide are present in a stream, a large strainer should be used as these materials clog up basket screens rapidly-especially if resins, gums or varnishes are also present.

Larger size foreign matter such as pebbles, welding beads, etc., should be removed at frequent intervals to prevent their abrasive action from damaging the basket screen.

There is a Brodie Strainer of the proper size and pressure rating to accommodate the full line of Brodie Flow Meters.

Model Strainer	Screen				Pipe Line		Ratio	
	Mesh of screen	Total screen area Sq. in.	Percent Open area	Open Area sq. in.	Size	Area Sq. In.	Toal Area to pipe Area	Open Area to Pipe Area
D-3	20	113	46.2 %	52.2	3"	7.39	15.3 : 1	7.1 : 1
DA-3	40		38.2 %	43.4				5.9 : 1
DA-3A	60		30.5 %	34.5				4.7 : 1
	80		31.4 %	35.5				4.8 : 1
D-3-4	20	113	46.2 %	52.2	4"	12.73	8.9 : 1	4.1 : 1
DA-3-4	40		38.4 %	43.4				3.4 : 1
DA-3-4-A	60		30.5 %	34.5				2.7 : 1
	80		31.4 %	35.5				2.8 : 1
D-6-4 D-6-4-A	20	314	46.2 %	145.1	4"	12.73	24.7 : 1	11.4 : 1
	40		38.2 %	120.6				9.5 : 1
	60		30.5 %	95.8				7.5 : 1
	80		31.4 %	98.6				7.7 : 1
D-6 D-6-A	20	314	46.2 %	145.1	6"	28.89	10.9 : 1	5.0 : 1
	40		38.2 %	120.6				4.2 : 1
	60		30.5 %	95.8				3.3 : 1
	80		31.4 %	98.6				3.4 : 1

Strainer Baskets

To be efficient, strainer baskets must be kept clean. A buildup of sediment increases pressure drop and decreases flow. If a basket is allowed to become completely clogged, damage will result. A regular procedure should be set up for cleaning strainer baskets-the frequency depending on amount and character of foreign material in the stream. It is advisable to keep a spare basket (or inner screen) on hand.

Recommended Screen Mesh For Various Liquids:

Product	Strainer Mesh	Strainer Flange Size
Gasoline and Similar Liquids	60 or 80	3,4,6"
Jet-A, Kerosene, JP4, JP5, JP8	60	3,4,6"
Diesel Oil, #2 Fuel Oil, etc	40 or 60	3,4,6"
Heating Oils- No. 5 or No. 6, etc.	20	

12 Parts Lists

General

This chapter contains the necessary parts required for routine maintenance and service of the Brodie BiRotor Plus. Each parts list contains recommended spare and replacement parts denoted by an asterisk. For items not listed, or additional information, consult the factory. When ordering, the following information must be furnished:

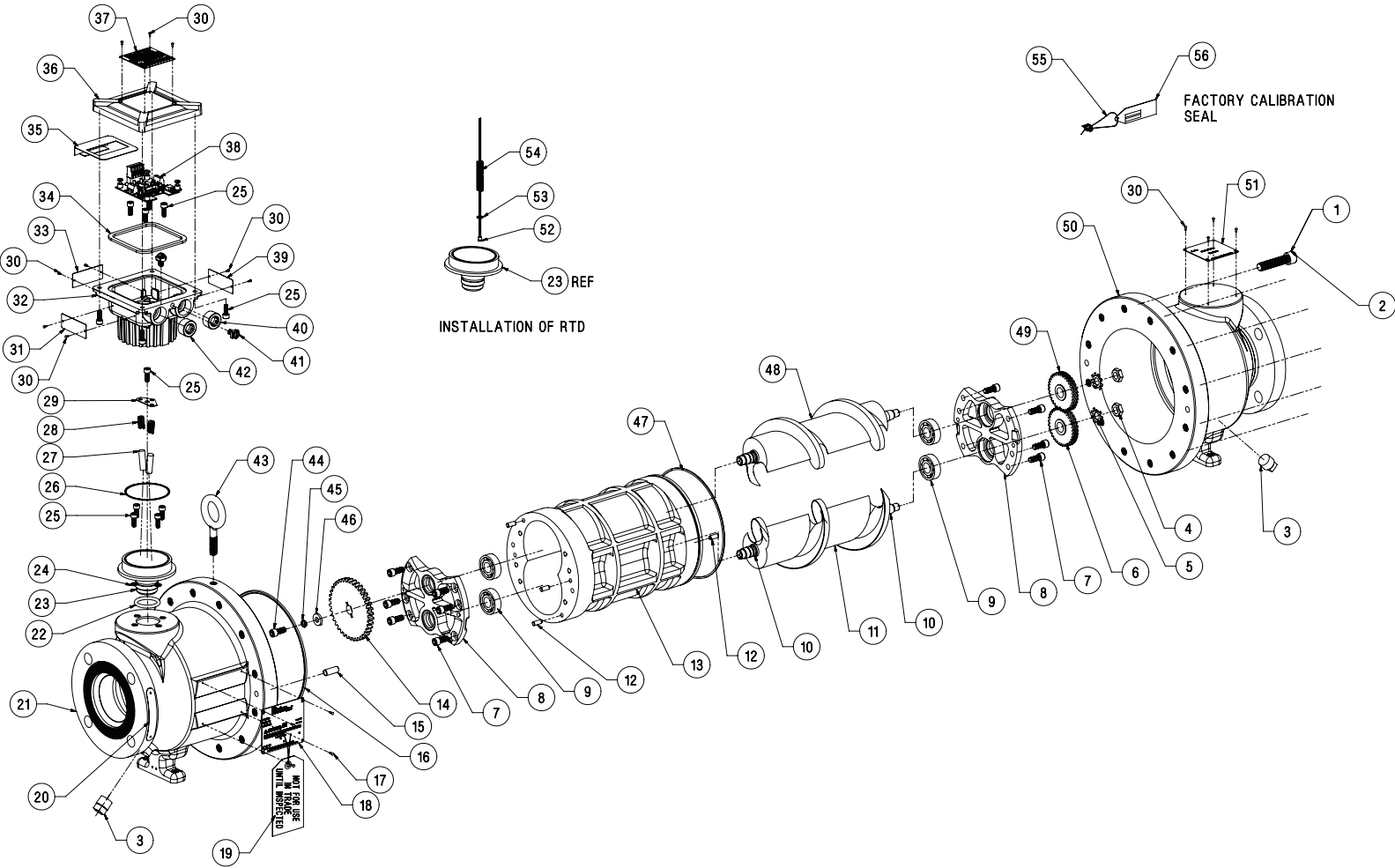
- Model Number
- Serial Number
- Part Number
- Quantity

NOTES:

LH and RH Rotors are only available as a matched set.

O-ring Suffix	O-ring Material
-022	Viton A
-023	Low Temp Viton 1289
-120	Low Swell Nitrile
-026	Viton F
-016	FluoroSilicon

12.1. - BiRotor Plus Illustrated Parts List

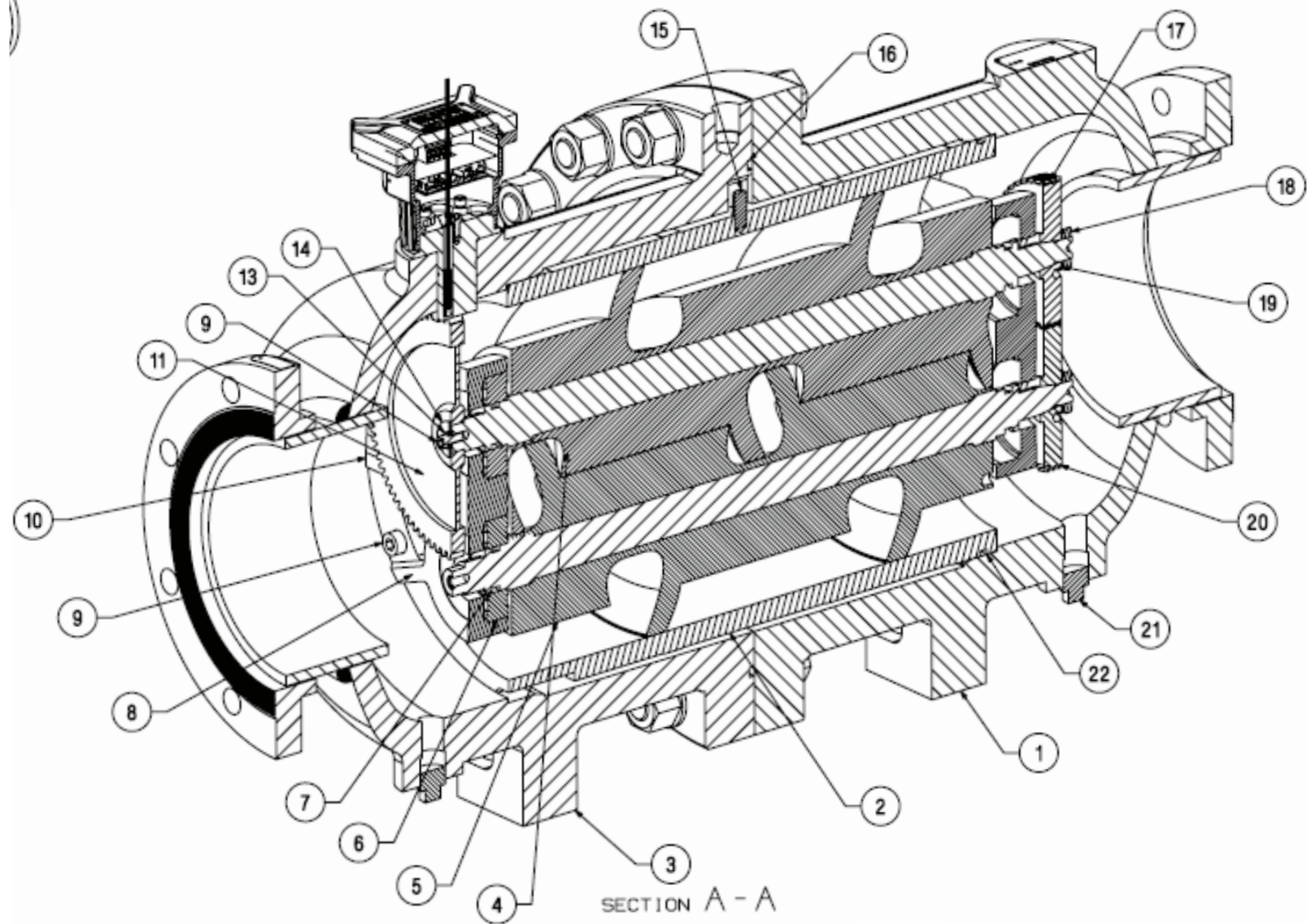


Item #	Description	Model			Qty
		B271	LB271	B274	
1*	Bolt with Seal Hole	151070-024M	1500985-024M	151080-024M	2
2*	Main Body Bolt	151070M (QTY 10)	1500985 (QTY 10)	151080M (QTY 14)	
3	Pipe Plug, MTRs	154704-024M			C/F
	Pipe Plug, MTRs and NACE	154704-024N			C/F
4	Locknut	60592			2
5	Gear Retaining Washer	51593			2
6	LH Rotor Gear	76291			NOTE
7	Endplate Screws	151042			12
8	Endplate	76825-100			2
9*	Bearings, Stainless Steel	155204			4
	Bearings, Ceramic	155204-001CER			4
10*	O-ring	157063-XXX			4
11	LH Rotor	76276-000			1
12	Element Dowel Pin	1559983			6
13	Element Body	76211-100			1
14	Pulse Wheel	76031-043			1
15	Body Dowel Pin	154097			2
16*	O-ring	152057			1
17	Drive Screw	153966			4
21	ANSI Inlet Housing, MTRs	76828-100M	76838-100M	76828-300P	C/F
	ANSI Inlet Housing, MTRs and NACE	76828-100N	N/A	76828-300R	C/F
	DIN Inlet Housing, MTRs	76828-016M	76838-016M	76828-040P	C/F
	DIN Inlet Housing, MTRs and NACE	76828-016N	N/A	76828-040R	C/F
22*	O-ring	157360-XXX			1
23	Sensor Housing, MTRs	86820-500M		86820-500P	C/F
	Sensor Housing, MTRs and NACE	86820-500N		86820-500R	C/F
24*	Weather Seal	152066-026			4
25*	UMB Screws	151496M			13
26*	Weather Seal	1500093-026			1
27*	Pick Off, Standard	899-00-201-00			1
	Pick Off, High Temp	899-00-201-01			1
28	Spring	1500418			1
29	Hold Down	86030-001			1
30	Drive Screw	153991			2
32	UMB Housing	899-00-100-00			C/F
34*	UMB Gasket	CA-375Z-259-XXA			1
36	UMB Cover	CC-219Z-633-EBG			C/F
38*	Pre Amp Board	230-00-300-00			1
	Terminal Board	230-10-300-50			1
40*	Approved Stopping Plug	1500909D			1
43	Lifting Hook	1500468			1
44	Pulse Wheel Screw	1500668			1
45	Lockwasher, Stainless Steel	1500667			1
46	Retainer Washer	86033			1
47*	O-ring	1500810-XXX			1
48	RH Rotor	76286-000			1
49	RH Rotor Gear	76296			NOTE
50	ANSI Outlet Housing, MTRs	76829-100M	76839-100M	76829-300P	C/F
	ANSI Outlet Housing, MTRs and NACE	76829-100N	N/A	76829-300R	C/F
	DIN Outlet Housing, MTRs	76829-016M	76839-016M	76829-040P	C/F
	DIN Outlet Housing, MTRs and NACE	76829-016N	N/A	76829-040R	C/F
52	RTD Sensor	1500574			1
53	RTD Lockwasher	151845-019			1
54	Compression Spring	1500609			1

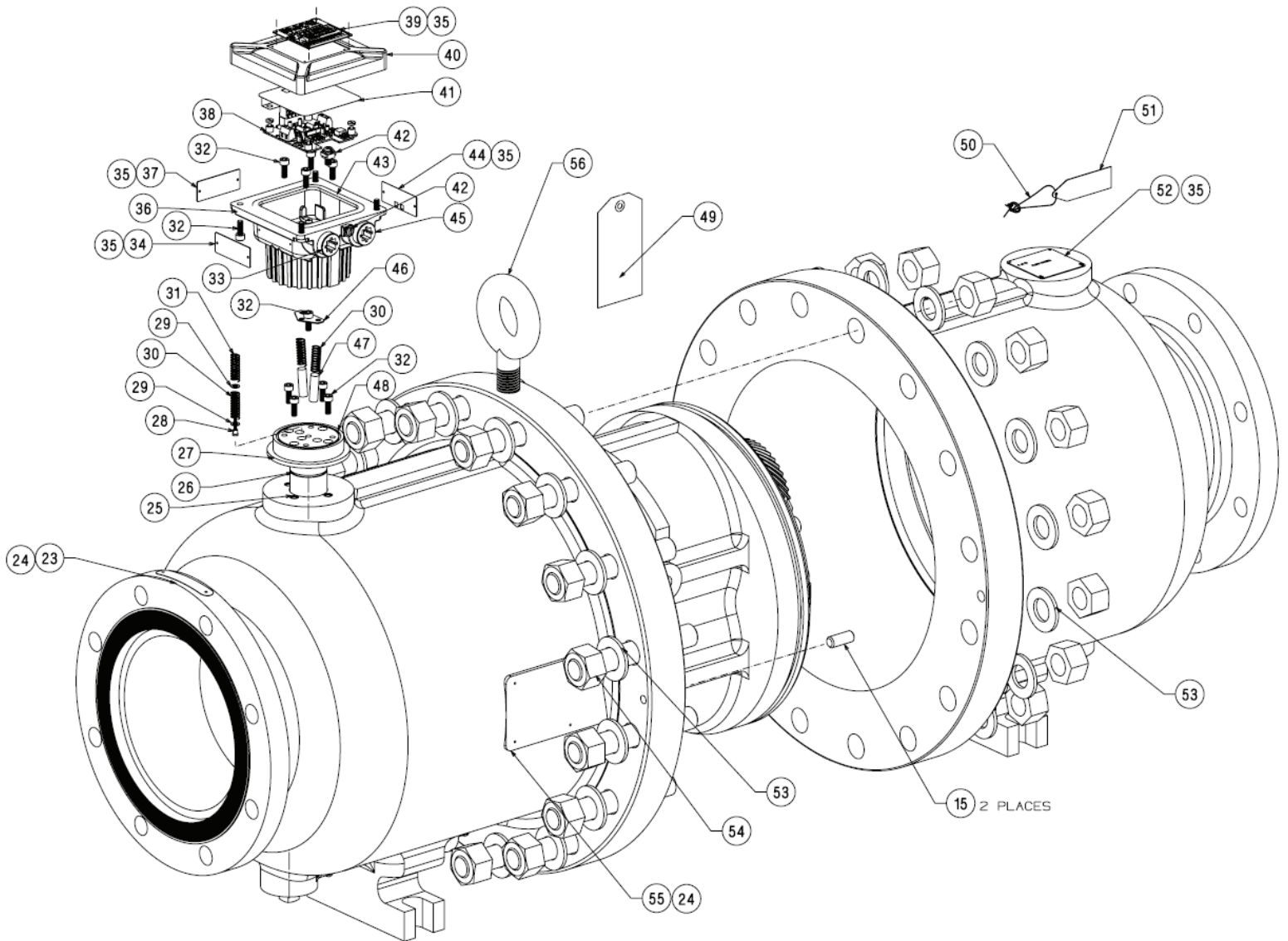
Item #	Description	Model			Qty
		B281	LB281	B284	
1*	Bolt with Seal Hole	151482-024M	1500987-024M	1500132-024M	2
2*	Main Body Bolt	151482M (QTY 10)	1500987M (QTY 10)	1500132M (QTY 14)	
3	Pipe Plug, MTRs	154704-024M			C/F
	Pipe Plug, MTRs and NACE	154704-024N			C/F
4	Locknut	60592			2
5	Gear Retaining Washer	51593			2
6	LH Rotor Gear	86291			NOTE
7	Endplate Screws	151042			12
8	Endplate	86825-100			2
9*	Bearings, Stainless Steel	155197			4
	Bearings, Ceramic	155197-001CER			4
10*	O-ring	152071-XXX			4
11	LH Rotor	86276-000			1
12	Element Dowel Pin	1559983			6
13	Element Body	86211-100			1
14	Pulse Wheel	86031-043			1
15	Body Dowel Pin	154097			2
16*	O-ring	152088-XXX			1
17	Drive Screw	153966			4
21	ANSI Inlet Housing, MTRs	86828-100M	86838-100M	86828-300P	C/F
	ANSI Inlet Housing, MTRs and NACE	86828-100N	N/A	86828-300R	C/F
	DIN Inlet Housing, MTRs	86828-016M	86838-016M	86828-040P	C/F
	DIN Inlet Housing, MTRs and NACE	86828-016N	N/A	86828-040R	C/F
22*	O-ring	157360-XXX			1
23	Sensor Housing, MTRs	86820-500M		86820-500P	C/F
	Sensor Housing, MTRs and NACE	86820-500N		86820-500R	C/F
24*	Weather Seal	152066-026			4
25*	UMB Screws	151496M			13
26*	Weather Seal	1500093-026			1
27*	Pick Off, Standard	899-00-201-00			1
	Pick Off, High Temp	899-00-201-01			1
28	Spring	1500418			1
29	Hold Down	86030-001			1
30	Drive Screw	153991			2
32	UMB Housing	899-00-100-00			C/F
34*	UMB Gasket	CA-375Z-259-XXA			1
36	UMB Cover	CC-219Z-633-EBG			C/F
38*	Pre Amp Board	230-00-300-00			1
	Terminal Board	230-10-300-50			1
40*	Approved Stopping Plug	1500909D			1
43	Lifting Hook	1500468			1
44	Pulse Wheel Screw	1500668			1
45	Lockwasher, Stainless Steel	1500667			1
46	Retainer Washer	86033			1
47*	O-ring	159678-XXX			1
48	RH Rotor	86286-000			1
49	RH Rotor Gear	86296			NOTE
50	ANSI Outlet Housing, MTRs	86829-100M	86839-100M	86829-300P	C/F
	ANSI Outlet Housing, MTRs and NACE	86829-100N	N/A	86829-300R	C/F
	DIN Outlet Housing, MTRs	86829-016M	86839-016M	86829-040P	C/F
	DIN Outlet Housing, MTRs and NACE	86829-016N	N/A	86829-040R	C/F
52	RTD Sensor	1500574			1
53	RTD Lockwasher	151845-019			1
54	Compression Spring	1500609			1

Item #	Description	Model B291	Qty
1*	Bolt with Seal Hole	151482-024M	2
2*	Main Body Bolt	151482M	14
3	Pipe Plug, MTRs	154704-024M	C/F
	Pipe Plug, MTRs and NACE	154704-024N	C/F
4	Locknut	60592	2
5	Gear Retaining Washer	51593	2
6	LH Rotor Gear	86291	NOTE
7	Endplate Screws	151042	12
8	Endplate	86825-100	2
9*	Bearings, Stainless Steel	155197	4
	Bearings, Ceramic	155197-001CER	4
10*	O-ring	152071-XXX	4
11	LH Rotor	86276-000	1
12	Element Dowel Pin	1559983	6
13	Element Body	86211-100	1
14	Pulse Wheel	86031-043	1
15	Body Dowel Pin	154097	2
16*	O-ring	152088-XXX	1
17	Drive Screw	153966	4
21	ANSI Inlet Housing, MTRs	86868-300P	C/F
	ANSI Inlet Housing, MTRs and NACE	86868-300R	C/F
	DIN Inlet Housing, MTRs	86868-040P	C/F
	DIN Inlet Housing, MTRs and NACE	86868-040R	C/F
22*	O-ring	157360-XXX	1
23	Sensor Housing, MTRs	86820-500M	C/F
	Sensor Housing, MTRs and NACE	86820-500N	C/F
24*	Weather Seal	152066-026	4
25*	UMB Screws	151496M	13
26*	Weather Seal	1500093-026	1
27*	Pick Off, Standard	899-00-201-00	1
	Pick Off, High Temp	899-00-201-01	1
28	Spring	1500418	1
29	Hold Down	86030-001	1
30	Drive Screw	153991	2
32	UMB Housing	899-00-100-00	C/F
34*	UMB Gasket	CA-375Z-259-XXA	1
36	UMB Cover	CC-219Z-633-EBG	C/F
38*	Pre Amp Board	230-00-300-00	1
	Terminal Board	230-10-300-50	1
40*	Approved Stopping Plug	1500909D	1
43	Lifting Hook	1500468	1
44	Pulse Wheel Screw	1500668	1
45	Lockwasher, Stainless Steel	1500667	1
46	Retainer Washer	86033	1
47*	O-ring	159678-XXX	1
48	RH Rotor	86286-000	1
49	RH Rotor Gear	86296	NOTE
50	ANSI Outlet Housing, MTRs	86869-100M	C/F
	ANSI Outlet Housing, MTRs and NACE	86869-100N	C/F
	DIN Outlet Housing, MTRs	86869-016M	C/F
	DIN Outlet Housing, MTRs and NACE	86869-016N	C/F
52	RTD Sensor	1500574	1
53	RTD Lockwasher	151845-019	1
54	Compression Spring	1500609	1

12.2 - BiRotor Plus Illustrated Parts List B3XX



12.3 - BiRotor Plus Illustrated Parts List B3XX



Item	Description	Model	Qty	Item	Description	Model	Qty
1	HOUSING ASSEMBLY	108819-XXX	1	30	SPRING	1500609	2
2	MEASURING UNIT BODY	108211-100	1	31	SPRING	1500418	0
3	HOUSING	108818-XXX	1	32	SCREW	151496M	13
4	RIGHT HAND ROTOR	108286-000	1	33	CAPLUG	SD442	1
5	LEFT HAND ROTOR	108276-000	1	34	NAMEPLATE	86902	1
6*	BEARING BALL	1501099-CER	4	35	SCREW	153991	14
7*	O-RING	1501101-XXX	4	36	UMB	899-00-100-00	1
8	PLATE	108825	2	37	NAMEPLATE	86901	1
9	SCREW	151024-019	13	38	BOARD ASSEMBLY	230-00-300-00	1
10	DOWEL PIN	1501106	4	39	TAG	899-01-228-04	1
11	WHEEL	108031	1	40	COVER	CC-219Z-633	1
13	WASHER	152125	1	41	INSTRUCTIONS	899-00-228	1
14	WASHER	1501090	1	42	CLAMP	B18934-004	2
15	DOWEL PIN,	1501103	3	43	GASKET	CA-375Z-259	1
16*	O-RING	1501100-XXX	1	44	NAMEPLATE	86903	1
17	GEAR	108296	1	45	PLUG	1500909D	1
18	GEAR LOCKNUT	82592	2	46	WASHER	86030-001	1
19	LOCKWASHER,	82593	2	47	PICKOFF	899-00-201-00	2
20	GEAR	108291	1	48	WEATHER SEALv	1500093-026	1
21	PLUG	154711M	2	49	TAG	76800	0
22*	O-RING	1501102-XXX	1	50	SEAL	1500931	1
23	LABEL	015-16-090-02	1	51	TAG	76810	1
24	SCREW	153966	6	52	NAMEPLATE	76801	0
25*	WEATHER SEAL	152066-026	4	53	WASHER	1501015-419	32
26*	O-RING	157079-XXX	1	54	STUD & NUT SET	1501104M	16
27	HOUSING	108820P	1	55	NAMEPLATE	86803	1
28	RTD - Miniature	1500574	0	56	EYE BOLT	1501128	1
29	WASHER	151854-019	0				

Decontamination Statement

RMA Number: _____

Item Being Returned: _____

List all chemicals, process fluids and gases that have come in contact with the equipment, including cleaning agents. Attach additional pages of information if necessary. A Material Safety Data Sheet (MSDS) is required if non-food grade products have been used with the item being returned.

Information Required	Product 1	Product 2
Chemical Name		
Health and Safety Hazards		
Precautions, First Aid		

I hereby certify the equipment being returned has been cleaned and decontaminated in accordance with good industrial practices and in compliance with OSHA and DOT regulations. This equipment poses no health or safety risks due to contamination.

Signature: _____

Name (Please Print): _____

Title: _____

Company Name: _____

Phone Number: _____

Fax: _____

E-mail: _____

Reason for Return: _____

REMINDER

All items being returned must be packaged separately. This decontamination statement and the MSDS sheet(s) must be placed on the outside of the shipping container.

Appendix B



Customer Problem Report

For faster service, complete this form and return it along with the affected equipment to customer service at the address indicated below. If you require technical assistance, please contact the Product Service Department at the phone number listed below.

Company Name: _____ Phone: _____

Technical Contact: _____

Repair PO#: _____

Invoice Address: _____

Shipping Address: _____

Return Shipping Method: _____ S/N: _____

Equipment Model #: _____ Failure Date: _____

Description of Problem: _____

What was happening at time of failure: _____

Additional Comments: _____

Report Prepared by: _____ Title: _____

Brodie International

P.O. Box 450 (30459-0450)
19267 Highway 301 North
Statesboro, GA, 30461
USA

Email: sales@brodieintl.com
Phone: +1 (912) 489-0200
Fax: +1 (912) 489-0294
