



THE BP-690 SERIES

Operating and Service Manual

Series includes all variants of BP-LF/BP-MF-690/691

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1. Description

The BP-690 is a piston sensed Back Pressure Regulator which can be used as a precision relief valve to maintain a constant set pressure within gas or hydraulic systems. The BP-690 series has options for both 'low flow' (LF) and 'medium flow' (MF) rate applications.

The housing has been machined from 316 SS to ensure maximum protection against the media on which it will be used, and the environment in which it will be placed.

The BP-LF690 regulator incorporates a 2.5mm diameter seat which provides a Cv capacity of 0.1 and the BP-MF690 regulator incorporates a 4.5mm diameter seat which provides a Cv capacity of 0.5. The regulators accurately control inlet pressures of up to 414 bar (6000 Psi) and vent excess pressure back via the outlet connection port. The control on the regulator is set via compression of an adjustable spring.

The Model number will contain a 'G' for Gas or an 'H' for Hydraulic depending upon the type of service. As standard the BP-LF690H and BP-MF690H are fitted with 316SS and Hastelloy seats respectively. The BP-LF690H also has an option for ceramic seating which provides ultimate protection against cavitation and erosion on aggressive application media such as water glycol and methanol. For gas applications, PEEK seats are fitted to the BP-LF690G and BP-MF690G as standard. Other seat materials are available for both gas and hydraulic service*.

The BP-LF/MF691 option incorporates a specific sensor assembly design which allows for an increased maximum working pressure of 1034 bar (15000 Psi) and greater inlet control pressure of up to 900 bar (13000 Psi).

*Please contact the office for further information.

2. Installation

Before system start-up, it is recommended that all systems be pressure tested, leak tested and purged with an inert gas such as nitrogen.

Check the model number reference to ensure that the pressure range complies with the installation requirements.

Visually inspect the regulator for any signs of damage or contamination. If any foreign materials are present and cannot be removed from the regulator, or if the threads on the regulator appear to be damaged, please contact the office immediately to arrange for the regulator to be returned for service.

The Inlet and Outlet ports are clearly marked. Select the correct size and type of connection fittings for these ports which are indicated in the regulators part number. Both British Standard Pipe (BSPP) 'B' and National Pipe Thread (NPT) 'N' options are available on this regulator. Use the correct dowty or bonded seal for BSPP connections, self centering seals are recommended. For NPT threads, ensure that PTFE tape is applied correctly to the fittings, applying two overlapping layers in the direction of the thread, taking care that the tape does not come into contact with the first thread.

For BP-LF/MF690 regulators supplied with Flange Connections, ensure that the following actions are carried out, prior to *use*:

- a. Select the correct size flange, for the related regulator, which are indicated in the regulators part number. Gasket and Bolts to be selected in accordance with the relevant flange specification standards
- b. The flange and gasket mating faces are free from any damage, which may prevent the proper sealing of the gasket.
- c. The bolt holes are aligned, and that the gasket is sat in a central position before mating the two flanges together.
- d. Insert the bolts through the bolt holes and screw the nuts on finger tight, until all the bolt holes have been fitted.
- e. Tighten the bolts/nuts alternately and evenly so that the flange(s) face remains parallel. All bolts/nuts must be tightened to the flange bolts specific torqued value, In accordance with the relevant flange specification standards.

The media supplied to the regulator must be clean. Contamination can damage the seat which may cause the regulator to fail. Filtration suited to the application is recommended upstream of the regulator.

Should further assistance or information be required in relation to installation of any Pressure Tech regulator please contact the office, giving reference to the regulators part number and/or serial number.

3. Operation

Adjusting the loading spring sets the controlled inlet pressure to the regulator. Pressure exceeding this set value allows the main valve to open and vent off the excess pressure through the seat orifice - until the inlet pressure is equivalent to the loading force set by the spring against the pressure sensing element, at which point the Main Valve closes the flow through the seat. Compressing the spring increases the pressure at which the regulator will relieve excess pressure.

The BP-690 series may be offered with pressure limiting, pressure locking or pre-set pressure options:

Pressure limited regulators are fitted with locknuts on the adjusting mechanism in order to limit the maximum allowable control pressure. Regulators fitted with pressure limiting

locknuts will state the limited pressure on the regulator label and this will also be indicated in the part number.

Pressure locking regulators are fitted with a locking cap which may be set (when specified) to pre-determined requirements. It is secured in place by three M5 grub screws which lock against the bonnet of the regulator creating an anti-tamper device to ensure the pressure cannot be adjusted accidentally.

Pre-set pressure regulators are adjusted (factory set) to specified customer requirements within a given pressure range.

Both pressure locking and pre-set pressure regulators will be fully adjustable through a given pressure range and the maximum allowable working pressures will be indicated on the regulator label and in the part number.

*Note: A table is available on request defining allowable tolerances for set points within a given pressure range.

4. Special Conditions for Safe Use

The BP-690 series of regulators are classed as Pressure Accessories and not Safety Accessories under the European Directive 2014-68-EC, and as such, should be installed with a pressure relief valve to protect the user's system from over pressurisation.

5. Hazardous Location Usage

This equipment has not been manufactured specifically for use in potentially explosive atmospheres and as such an ignition hazard assessment has not been carried out on this product. If the user should wish to use this product in such an environment where there may be a potentially explosive atmosphere then it is the responsibility of the user to conduct an ignition hazard assessment against 99/92/EC.

6. Servicing and Maintenance

Servicing and maintenance work on the BP-690 series regulators should only be performed after fully reading and understanding the Operating and Servicing Manual. Due to the compressibility of gases, the operator should not endanger themselves or others by working on this regulator without prior knowledge of the Health and Safety risks relating to handling of technical gases. Any uncertainty should be clarified with Pressure Tech before working on the regulator.

Pressure Tech Ltd recommends the use of the following Lubricants/Adhesives during servicing:

- **Krytox GPL 205 lubricant:** For the O-rings.
- **Molykote 1000 paste:** For the adjusting screw.

Prior to commencing service, please ensure that:

- The equipment has been de-pressurised
- The load spring has been de-compressed by turning the adjusting mechanism fully anti-clockwise
- Applications involving toxic, flammable or corrosive media have been fully purged

To ensure the best possible results from servicing, when re-assembling the regulator and any assemblies within it, ensure that all areas of the components and the regulator body are cleaned and free from contaminants which may result in failure of the regulator.

6.1. Servicing the BP-LF691 (High Pressure 10mm Sensor Assembly)

*Note: fig 1 should be used as a reference for the following set of instructions

6.1.1. Accessing the Main Valve Assembly

- i. Remove the securing grub screw (2) from the regulator body (14).
- ii. Unscrew the pan screw (3) and remove the name plate (23) from the hand wheel (22).
- iii. Unscrew the locknut (26) and remove the hand wheel (22) from the adjusting screw (19).
- iv. With the regulator secured up-right in a vice, remove the bonnet (17) by using a torque wrench or equivalent with 47mm open end.
- v. Un-screw and lift the top works from the assembly, inclusive of the bonnet (17), load spring (18), adjusting mechanism (1, 19, 20 and 21) and spring rest (11).
- vi. The sensor assembly (8, 9, 10a, 10b and 15) can be removed from the body by using pliers*.
*An M5 mounting point is located in the sensor holder (15) which can be used along with an appropriate screw to remove the assembly to avoid causing any damage to the sensor (10b).
- vii. Remove the sensor (10a, 10b) from the sensor holder (15) and inspect and replace the o-rings (6, 7, 24 and 25) as required.
- viii. Secure the flats on the sensor (10b) in a vice (with the main valve (8) pointing upwards) and using a 17mm long socket, open ended spanner or adjustable, loosen the main valve retainer (10a) from the sensor (10b) and remove together with the main valve (8).
- ix. Inspect the main valve (8) for any defects or damage to the sealing edge and replace as required.
- x. Using a 22mm socket, remove the seat retainer (13) from the regulator body (14) and remove the seat (12) and o-ring (5).
- xi. Inspect the seat (12) for any defects or damage to the sealing edge and replace the seat (12) and o-ring (5) as required.

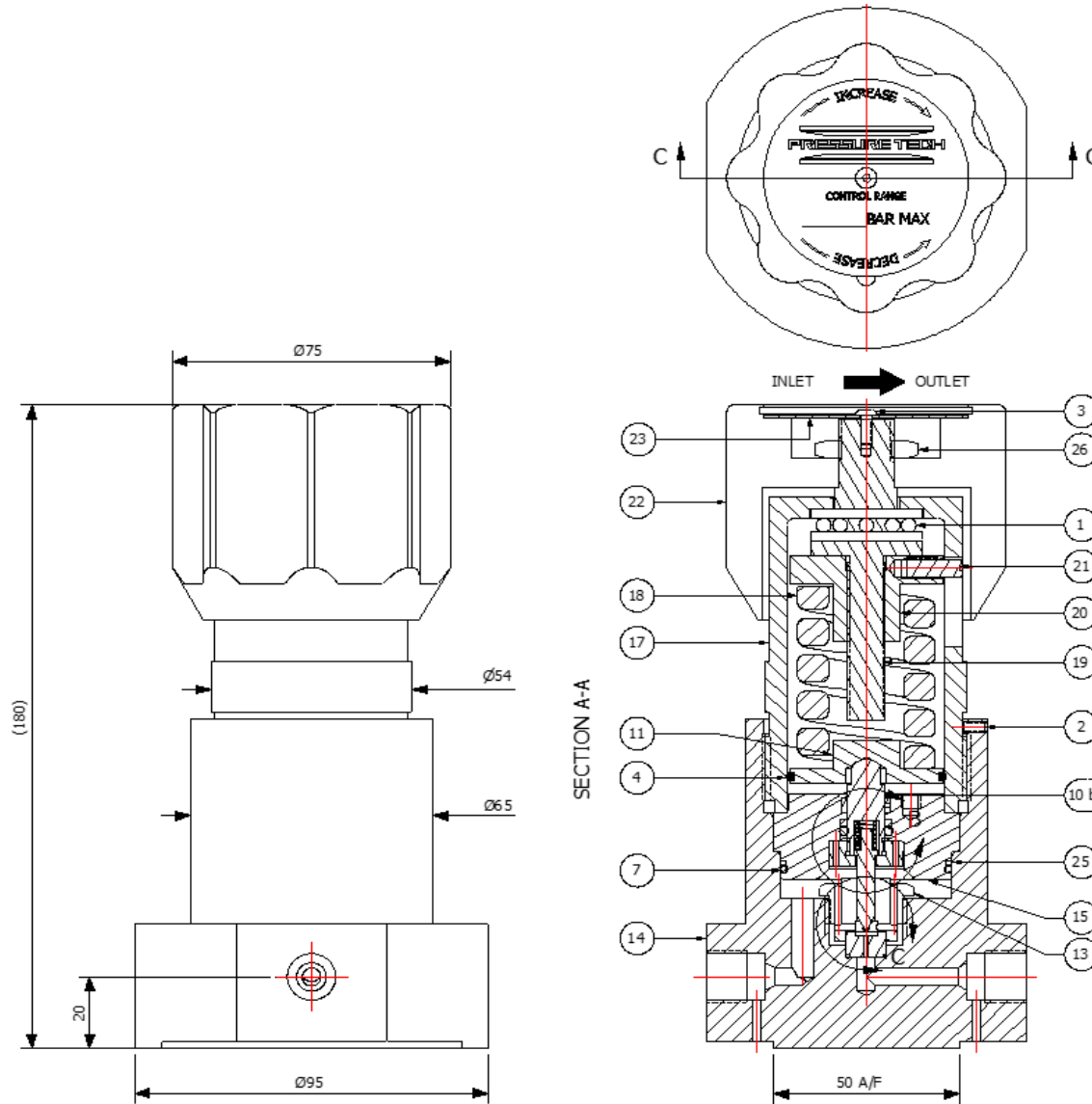
6.1.2. Reassembly

- i. Place the o-ring (5) into the bore in the bottom of the regulator body (14).
- ii. Position the seat (12) into the same bore ensuring that the o-ring groove on the outer diameter of the seat is facing downwards towards the o-ring (5).
- iii. Screw the seat retainer (13) into the regulator body (14) and tighten to 20Nm to secure the seat (12) using a torque wrench and 22mm socket.
- iv. Place the main valve (8) into the main valve retainer (10a) and position the main valve spring (9) onto the valve stem.
- v. With these parts in place, screw the sensor (10b) into the main valve retainer (10a). To tighten, secure the flats on the sensor (10b) in a vice and use a 17mm long socket, open ended spanner or adjustable on the main valve retainer (10a).
- vi. Locate the sensor (10b) into the sensor holder (15) and then place the sensor assembly into the regulator body (14) ensuring that the main valve (8) locates into the seat retainer (13).
- vii. Where necessary, reassemble the top works by placing the adjusting mechanism (1, 19, 20 and 21), load spring (18) and spring rest (11) into the bonnet (17).
- viii. Screw the bonnet with top works into the regulator body (14) and using a 47mm torque wrench, tighten the bonnet to approximately 90 – 100 Nm.
- ix. Fit the M3 grub screw (2) to secure the bonnet (17).
- x. Place the hand wheel (22) onto the adjusting screw (19) and screw and tighten the lock nut (26).
- xi. Secure the nameplate (23) with the M3 pan screw (3).

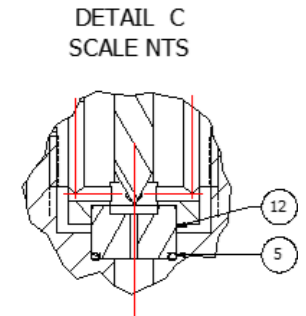
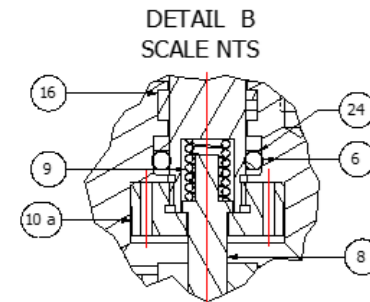
To ensure that the main valve assembly has been correctly and effectively installed it may be required to perform the appropriate seat leak test as per ANSI/FCI 70-2.

6.1.3. Figure 1 – Sectional View of the BP-LF691

* ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE STATED.



| PARTS LIST | | |
|------------|---------------------------|---------------------|
| ITEM | PART NUMBER | DESCRIPTION |
| 1 | BEAR-51103-SS | BEARING |
| 2 | FIT-M3-06-A4-SKT-CON-SET | SET SCREW |
| 3 | FIT-M3-08-A4-70.0-SKT-BTN | SCREW |
| 4 | OR-0350-20 | O'RING STD |
| 5 | OR-0090-10 | O'RING STD |
| 6 | OR-0960-24 | O'RING STD |
| 7 | OR-0420-20 | O'RING STD |
| 8 | PT-BP-550-003-002 | MAIN VALVE |
| 9 | PT-BP-550-004 | MAIN VALVE SPRING |
| 10 a | PT-BP-691-002 | MAIN VALVE RETAINER |
| 10 b | PT-BP-691-001 | 10mm SENSOR |
| 11 | PT-C-095-001 | SPRING REST - DOME |
| 12 | PT-BP-550-002-008 | SS316 SEAT |
| 13 | PT-BP-550-001 | RETAINING SEAT NUT |
| 14 | PT-BP-691-N-LF-03A-001 | BODY- 'N' PORTING |
| 15 | PT-BP-691-003 | 10mm SENSOR HOLDER |
| 16 | PT-BP-550-022 | SLIDE RING |
| 17 | PT-C-040 | BONNET |
| 18 | SPR-G40X51 | LOAD SPRING |
| 19 | PT-C-043-004 | ADJUSTING SCREW |
| 20 | PT-C-045 | ADJUSTING NUT |
| 21 | PT-C-046 | SCREW |
| 22 | PT-C-048-001 | HANDWHEEL |
| 23 | PT-C-049 | NAMEPLATE |
| 24 | ORB-PT-C-207 | PTFE BACK UP RING |
| 25 | ORB-PT-C-139 | PTFE BACK UP RING |
| 26 | PT-C-132 | LOCK NUT |



6.2. Servicing the BP-MF690

*Note: fig 2 should be used as a reference for the following set of instructions

6.2.1. Accessing the Main Valve Assembly

- i. Remove the securing grub screw (2) from the regulator body (14).
- ii. Unscrew the pan screw (3) and remove the name plate (23) from the hand wheel (22).
- iii. Unscrew the locknut (26) and remove the hand wheel (22) from the adjusting screw (19).
- iv. With the regulator secured up-right in a vice, remove the bonnet (17) by using a torque wrench or equivalent with 47mm open end.
- v. Un-screw and lift the top works from the assembly, inclusive of the bonnet (17), load spring (18) and adjusting mechanism (1, 19, 20 and 21).
- vi. The sensor assembly (8, 9, 10a, 10b, 11 and 15) can be removed from the body by using pliers.
- vii. Secure the spring rest (11) in a vice (with the main valve (8) pointing upwards) and using a 16/20mm open ended spanner (assembly dependant) or adjustable, loosen from the sensor (10) but do not remove completely.
- viii. Take the sensor assembly from the vice and with the main valve (8) pointing downwards, remove the spring rest (11) from the assembly.
- ix. Inspect and replace the o-ring (4) from around the spring rest (11) as required.
- x. The main valve (8) and valve spring (9) can now be removed from the sensor (10).
- xi. Remove the sensor (10) from the sensor holder (15) and inspect and replace the o-rings (6, 7, 24 and 25) as required.
- xii. Inspect the main valve (8) for any defects or damage to the sealing edge and replace as required.
- xiii. Using a 22mm socket, remove the seat retainer (13) from the regulator body (14) and remove the seat (12) and o-ring (5).
- xiv. Inspect the seat (12) for any defects or damage to the sealing edge and replace the seat (12) and o-ring (5) as required.

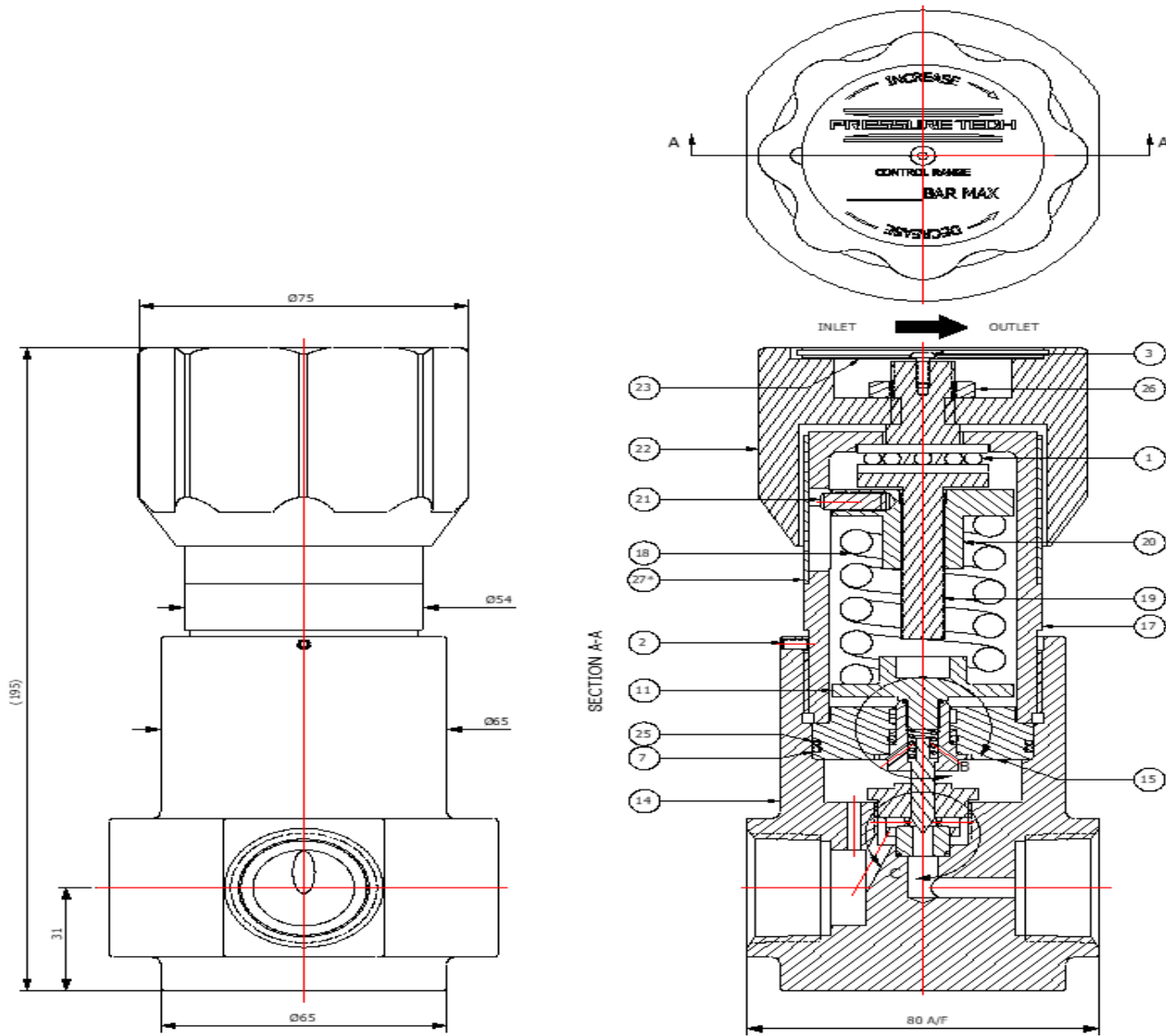
6.2.2. Reassembly

- i. Place the o-ring (5) into the bore in the bottom of the regulator body (14).
- ii. Position the seat (12) into the same bore ensuring that the o-ring groove on the outer diameter of the seat is facing downwards towards the o-ring (5).
- iii. Screw the seat retainer (13) into the regulator body (14) and tighten to 20Nm to secure the seat (12) using a torque wrench and 22mm socket.
- iv. Locate the sensor (10) into the sensor holder (15).
- v. Place the main valve (8) into the sensor (10) and position the main valve spring (9) onto the valve stem.
- vi. Screw the spring rest (11) into the sensor (10), secure the flats of the spring rest in a vice and tighten using a 16/20mm open ended spanner or adjustable.
- vii. Place the sensor assembly into the regulator body (14) ensuring that the main valve (8) locates into the seat retainer (13).
- viii. Place the load spring (18) on the spring rest (11).
- ix. Screw the bonnet with top works into the regulator body (14) and using a 47mm torque wrench, tighten the bonnet to approximately 90 – 100 Nm.
- x. Fit the M3 grub screw (2) to secure the bonnet (17).
- xi. Place the hand wheel (22) onto the adjusting screw (19) and screw and tighten the lock nut (26).
- xii. Secure the nameplate (23) with the M3 pan screw (3).

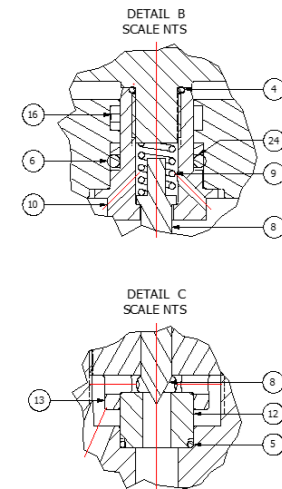
To ensure that the main valve assembly has been correctly and effectively installed it may be required to perform the appropriate seat leak test as per ANSI/FCI 70-2.

6.2.3. Figure 2 – Sectional View of the BP-MF690

* ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE STATED.



| PARTS LIST | | |
|------------|---------------------------|-------------------|
| ITEM | PART NUMBER | DESCRIPTION |
| 1 | BEAR-51103-SS | BEARING |
| 2 | FIT-M3-06-A4-SKT-CON-SET | SET SCREW |
| 3 | FIT-M3-08-A4-70.0-SKT-BTN | SCREW |
| 4 | OR-0070-10 | O'RING STD |
| 5 | OR-0100-10 | O'RING STD |
| 6 | OR-0120-20 | O'RING STD |
| 7 | OR-0460-20 | O'RING STD |
| 8 | PT-BP-550-003-002 | MAIN VALVE |
| 9 | PT-BP-550-004 | VALVE SPRING |
| 10 | PT-BP-550-005-002 | SENSOR |
| 11 | PT-BP-550-007-005 | SPRING REST |
| 12 | PT-BP-550-010-001 | HASTELLOY SEAT |
| 13 | PT-BP-550-011-001 | SEAT NUT |
| 14 | PT-BP-MF690-05-N-08N-D | BODY- 'N' PORTING |
| 15 | PT-C-032-007 | SENSOR HOLDER |
| 16 | PT-C-037 | SLIDE RING |
| 17 | PT-C-040-009 | BONNET |
| 18 | PT-C-041-004 | LOAD SPRING |
| 19 | PT-C-043-004 | ADJUSTING SCREW |
| 20 | PT-C-045 | ADJUSTING NUT |
| 21 | PT-C-046 | SCREW |
| 22 | PT-C-048-001 | HANDWHEEL |
| 23 | PT-C-049 | NAMEPLATE |
| 24 | PT-C-051 | BACK UP RING |
| 25 | PT-C-115 | BACK UP RING |
| 26 | PT-C-132 | LOCK NUT |
| 27 | PT-C-180 | PROTECTIVE SLEEVE |



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6.3. Servicing the BP-690 – with Sacrificial Plug Feature

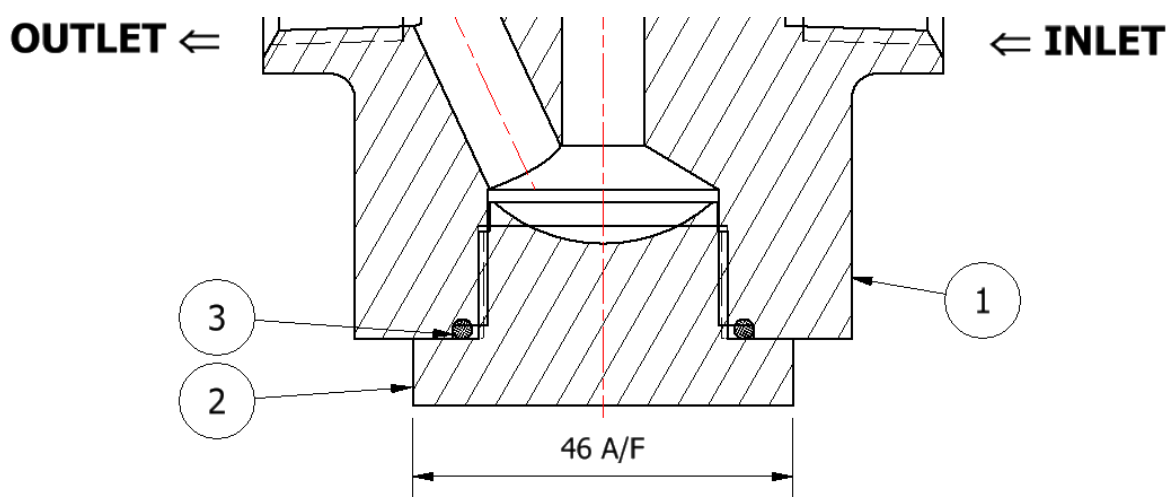
The BP-690 series is supplied with a Sacrificial Plug feature as standard on all other porting configurations, apart from the 'Z' porting option and is usually located at the base of the regulator body.

This feature allows the plug to be 'sacrificed' and easily be replaced, to protect the regulator body from excessive erosion due to the combination of high pressure/media exposure.

The Sacrificial Plug is not supplied as standard, within the related regulator Standard Repair Kits (SRK's) and would need to be requested as an additional item, when placing an order for a replacement. The related O-ring is included as standard within the SRK's (see image below).

To service the BP-690 series, with Sacrificial plug:

- i. With the flats of the regulator body (1) secured in a vice*, Unscrew the sacrificial plug (2) from the Body (1), using
*NOTE: Soft vice jaws must be used, when securing the body within the vice against flats. Due to the position of the flats it may be necessary to angle the body in the vice with the bottom nut upright for access.
- ii. Inspect the sacrificial plug (2) for any potential corrosion/damage and replace where necessary.
- iii. Remove and replace the 'O' ring (3) located on the sacrificial plug (2)
- iv. Screw the sacrificial plug (2) into the regulator body (1) and torque to 40Nm, using an open-ended adjustable wrench or 46mm socket.



| ITEM | DESCRIPTION |
|------|------------------------|
| 1 | BP-MF690 BODY - Cv 1.5 |
| 2 | SACRIFICIAL PLUG |
| 3 | O' RING STD |

7. Technical Data

| | |
|-------------------------|---|
| Fluid Media: | All gases and liquids compatible with materials of construction |
| Max Inlet Pressure: | 550 bar (BP-690) 1034 bar (BP-691) |
| Pressure Control Range: | 5-414 bar (BP-690) 5-900 bar (BP-691) |
| Operating Temperature: | -20°C to +80°C |
| Materials: | Body and Trim: 316 SS Seat Gas: PEEK Seat Hydraulic: 316SS/Hastelloy/Ceramic Main Valve: 718 Alloy |
| Flow Capacity (Cv): | 0.1/0.2 (BP-LF690/691) 0.5 (BP-MF690/691) |
| Leakage: | Gas: Bubble tight Hydraulic: Zero drops of water at max inlet |

8. Warranty Statement

Pressure Tech Ltd guarantee all products correspond with their specification at the time of delivery and, with exception to wear and tear, wilful damage, negligence, and abnormal working conditions, will be free from defects for a period of 12 months from date of delivery.