



THE MF-101D SERIES

Operating and Service Manual

Series includes all variants of MF-101D

Issue A
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1. Description

The MF-101D is a single stage piston sensed pressure regulator for diving applications, with a large precision machined sensing element that provides excellent downstream pressure control up to a maximum of 40bar. The regulator has a balanced main valve assembly as standard and is available with both venting and non-venting options.

In addition, the MF101D is supplied cleaned and degreased to ASTM G93 Level C.

2. Installation

Before system start-up, it is recommended that all lines should be free from any form of contaminations, as those can affect regulator performance and functionality. All systems to be pressure tested, leak tested and purged with an inert gas such as nitrogen.

Prior to placing into service ensure that the regulator is in the fully closed position, with the adjusting mechanism turned completely anti-clockwise.

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.

***Note:** *Please refer to 'section 8' for company contact details*

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' (ISO-1179) and National Pipe Thread (NPT) 'N' (ASME-1.20.1) 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.

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.

***Note:** *Please refer to 'section 8' for company contact details*

3. Operation

Turning the adjusting mechanism clockwise compresses the spring, which in turn opens the main valve and allows the inlet pressure to pass through the seat orifice until the outlet pressure is equivalent to the loading forces set by the compressed spring. Increase the outlet pressure in this way until the desired pressure is achieved.

To reduce the outlet pressure, the adjusting mechanism should be turned anti-clockwise whilst the media is flowing, or whilst venting downstream of the regulator.

The desired outlet pressure should be set whilst increasing the pressure. Do not exceed the maximum inlet and outlet pressures of the regulator which are indicated on the regulator label.

4. Special Conditions for Safe Use

Important: please ensure that (at a minimum) all components of the MF301D are cleaned and degreased to ASTM G93 Level C.

On the MF-101D series of non-venting type regulators, the outlet pressure shall be reduced by venting downstream of the regulator whilst simultaneously turning the adjusting mechanism anti-clockwise.

For safety and to avoid the risk of venting unwanted fluids to atmosphere, the MF-101D self-venting option should not be used on toxic or liquid media.

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 MF101D 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.

Note: The frequency of servicing is the responsibility of the user based on the application.

Important: please ensure that (at a minimum) all components of the MF101D are cleaned and degreased to ASTM G93 Level C.

Pressure Tech Ltd recommends the use of the following Lubricants and adhesives (or equivalent) during servicing:

- **Krytox GPL 205 lubricant:** For the O-rings.
- **Molykote 1000 paste:** For the adjusting screw.
- **Loctite 243 Thread Locker:** For section 6.1.2 & 6.2.2 (Step: xvi & xvii)

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 and decontaminated sufficiently for safe service
- Ensure that the service engineer has the relevant *Oxygen Cleaned SRK (Standard Repair Kit) for the regulator type that they will be servicing.
***Note:** *Please refer the relevant product Sales GA for the correct SRK part code required.*

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.

It is recommended that all parts in the SRK's are used. Any defect parts removed during the service should be disposed of.

Replacement 'O' rings should be lubricated with suitable non-hydrocarbon grease such as PTFE Lubricant.

6.1. Servicing the MF-101D Non-Venting Design

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

6.1.1. Accessing the Main Valve Assembly

To access the Main Valve Assembly (MVA):

- i. With the flats of the Regulator Body (8) *secured in a vice, loosen and remove the Bonnet (13) using a 47mm wrench ensuring that the Hand Wheel (17) is fully wound anti clock wise (*Ref. 6.1.2*)
**NOTE: Soft vice jaws must be used, when securing the body within the vice against flats. (As without may cause damage to sealing surface for BSP O ring).*
- ii. Remove the 8mm Ball Bearing (1), Upper Spring Rest (14) and Load Spring (12)
- iii. Using needle nosed pliers, remove the Sensor Assembly (5-7, 9, 10)
- iv. The Seat Retainer (19) can then be removed using a 13mm socket.
*Note: As the seat is a compression fit, it is likely that the soft seat (4) will be secured in the retainer (19). As such it is always recommended to replace both the retainer and the *soft seat during service.*

**Note: when replacing the soft seat (20), guide the seat with the external chamfer leading into the retainer (19).*

- v. Carefully remove the Main Valve (21) from the assembly.
- vi. Visually inspect the Main Valve (21) and Soft Seat (20) for damage under a microscope and replace as required.
- vii. Replace the Main Valve Spring (11), O-ring (4) and Back Up Ring (23) in the Regulator Body (8) as required.
- viii. Secure the Lower Spring Rest (10) into a vice and use a 21mm open ended wrench or adjustable to remove the Sensor (7).
- ix. Place/tighten against the flats of sensor (7) into a vice.
- x. Remove/replace the O-rings (5,6) around the Sensor Holder (9).
- xi. Position the Sensor (7) into the Sensor Holder (9).
IMPORTANT: *Ensure that the Sensor Holder (9) is correctly oriented, such that the counter bore is upright to accommodate the Lower Spring Rest (10) (*Ref. 6.2.3)*
- xii. Screw the Lower Spring Rest (10) into the Sensor (9). To secure, grip the lower spring rest (10) into a vice and use a 21mm open ended wrench or adjustable to tighten against the Sensor (7).
- xiii. Place the sensor assembly (5-7, 9, 10) into the Regulator Body (8)
- xiv. Position the Load Spring (12) on to the Lower Spring Rest (10) and place the Upper Spring Rest (14) and 10mm Ball Bearing (1) to the assembly.
- xv. Screw the Bonnet (13) onto the assembly and using a torque wrench with a 47mm open ended attachment, tighten to 90Nm

It is recommended that all parts in the repair kits are used. Any defect parts removed during the service should be disposed of. Parts should be kept clean in line with media requirements. Following re-assembly of the regulator, pressure tests should be made to both the inlet and outlet side of the regulator, to ensure there is no internal or external leakage across the regulator.

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 70-3 Class VII.

6.1.2. Adjusting the Set Point

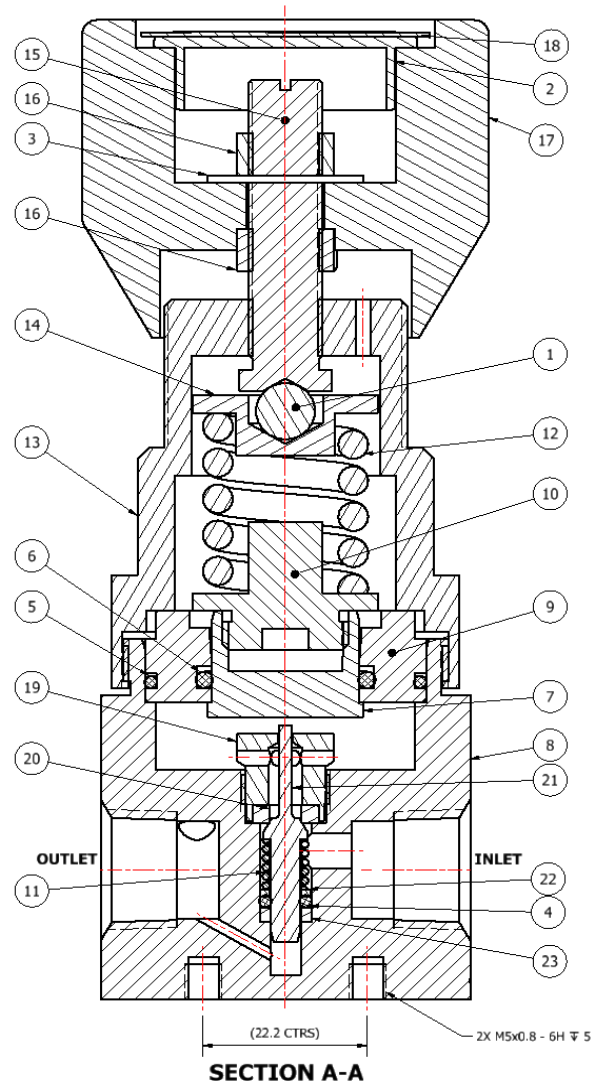
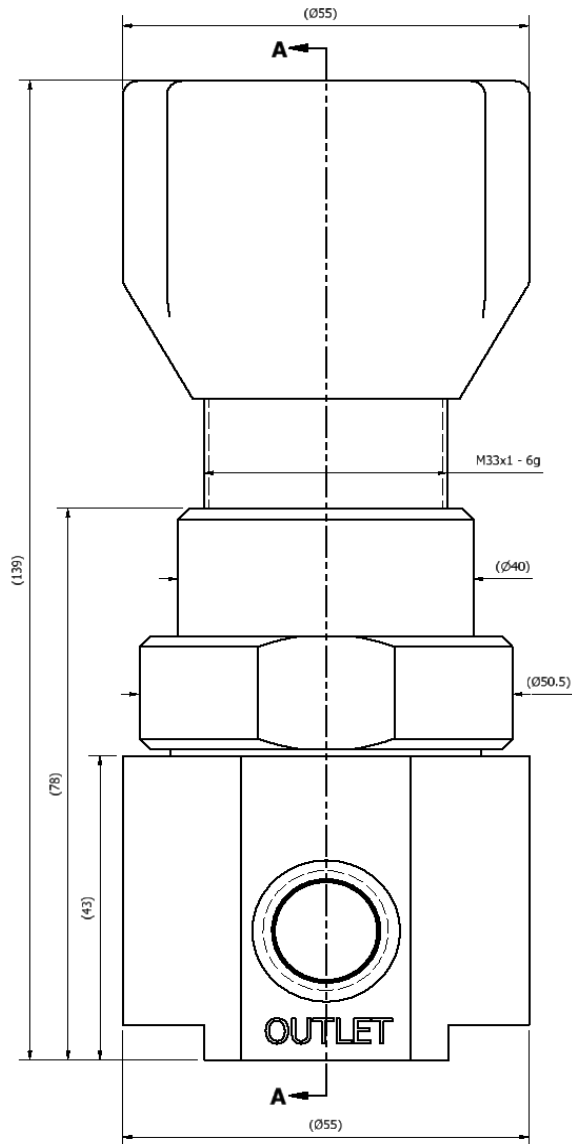
It is not recommended (or necessary) to remove the Hand Wheel during service as this will affect the set point of the regulator. Should it be required to adjust the set point please follow the instructions below:

- i. Remove the Nameplate (18) and Cap (2) from the Hand Wheel (17) and loosen the upper Lock Nut (16)/Washer (3) such that the Hand Wheel is able to spin freely on the Adjusting Screw (15).
- ii. Connect the correct fittings to the Inlet and Outlet ports of the regulator. Ensure that any gauge ports are plugged or that the correct gauge is fitted.
- iii. With the Regulator Body (8) *secured in a vice apply the Maximum Working Pressure (MWP) to the Inlet of the regulator
**NOTE: Soft vice jaws must be used, when securing the body within the vice against flats. (As without may cause damage to sealing surface for BSP O ring).*
- iv. Connect the Outlet port to a calibrated pressure test gauge appropriate to the required set pressure. As the regulator is non-venting, ensure that a ball/needle valve is fitted to allow pressure to be relieved downstream of the regulator
- v. Using a slotted screwdriver, turn the Adjusting Screw (15) clockwise until the desired set point has been reached.
- vi. Ensure repeatability by allowing flow through the regulator using the ball/needle valve.
- vii. With the outlet pressure set, screw the lower Lock Nut (16) to the base of the Adjusting Screw (15) against the Bonnet (13).
- viii. Position the Hand Wheel (17) onto the lower Lock Nut (16). Ensure that the Lock Nut and Hand Wheel become engaged.
- ix. Fasten the upper Lock Nut (16) against the top of the Hand Wheel (17)/Washer (3) and gently begin to tighten using a 13mm socket until it begins to secure itself.
- x. At this point, whilst holding the Hand Wheel (17) continue to tighten whilst simultaneously turning slightly anti-clockwise to prevent it from locking against the Bonnet (13).
- xi. Ensure that the upper Lock Nut (16) is sufficiently tightened, taking care not to adjust the set point.
- xii. Turning of the Hand Wheel (17) should now also turn the Adjusting Screw (15) which will control the pressure.
- xiii. Turn the Hand Wheel clockwise until it reaches its set point and check to make sure that the desired outlet pressure is correct.
- xiv. If the set point is not correct, repeat steps v. to xiii.
- xv. Reduce the pressure downstream by venting the pressure through ball/needle valve and then turning the Hand Wheel anti-clockwise until the regulator closes

- xvi. Apply a small amount of Loctite 243 Thread Locker, all around the top diameter of the upper lock nut (16), so that the Loctite penetrates the thread, where the nut makes contact with the adjusting screw (15).
- xvii. The Cap (2) and Nameplate (18) can now be placed into the Hand Wheel (17). Ensure that the information stated on the Nameplate is in accordance with the set pressure of the regulator.

6.1.3. Figure 1 – Sectional View of the MF-101D (Non-Venting)

* ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE STATED.



| PARTS LIST | | |
|------------|------------------------|--|
| ITEM | PART NUMBER | DESCRIPTION |
| 1 | BALL-008-SS-316 | BALL BEARING - 8mm |
| 2 | FIT-CAP-4343092 | NAMEPLATE CAP |
| 3 | FIT-M10-A2-CRI-WASHER | M10 CRINKLE WASHER |
| 4 | OR-BS007 | O' RING STD |
| 5 | OR-BS028 | O' RING STD |
| 6 | OR-BS4518-0196-24 | O' RING STD |
| 7 | PT-101-001 | 20MM SENSOR |
| 8 | PT-101-MF-N-BR-03N-001 | MF101 BODY - 'N' PORTING - 3/8" NPT - BALANCED |
| 9 | PT-BP-301-001 | 20mm SENSOR HOLDER |
| 10 | PT-BP-301-003 | SPRING REST |
| 11 | PT-C-006-009-001 | MAIN VALVE SPRING |
| 12 | PT-C-011-003 | LOAD SPRING - 86 kg |
| 13 | PT-C-015-014 | BONNET - TOP WEEP HOLE |
| 14 | PT-C-017 | UPPER SPRING REST |
| 15 | PT-C-019-003 | ADJUSTING SCREW |
| 16 | PT-C-020 | LOCKNUT |
| 17 | PT-C-021 | SMALL HANDWHEEL |
| 18 | PT-C-022 | NAMEPLATE |
| 19 | PT-C-080 | SEAT RETAINER |
| 20 | PT-C-081-008 | SEAT |
| 21 | PT-LCR-414-001-001 | MAIN VALVE |
| 22 | PT-LCR-414-002 | FRONT BACK UP |
| 23 | PT-LCR-414-003 | PTFE BACK UP RING |

6.2. Servicing the MF-101D Self-Venting Design

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

6.2.1. Accessing the Main Valve Assembly

To access the Main Valve Assembly (MVA):

- i. With the flats of the Regulator Body (8) *secured in a vice, loosen and remove the Bonnet (13) using a 47mm wrench ensuring that the Hand Wheel (17) is fully wound anti clock wise (*Ref. 6.2.2*)
**NOTE: Soft vice jaws must be used, when securing the body within the vice against flats. (As without may cause damage to sealing surface for BSP O ring).*
- ii. Remove the 8mm Ball Bearing (1), Upper Spring Rest (14) and Load Spring (12).
- iii. Using needle nosed pliers, remove the Sensor Assembly (5-7, 9, 10, 24, 25).
- iv. The Seat Retainer (21) can then be removed using a 13mm socket.
*Note: As the seat is a compression fit, it is likely that the soft seat (22) will be secured in the retainer (21). As such it is always recommended to replace both the retainer and the *soft seat during service.*
**Note: when replacing the soft seat (22), guide the seat with the external chamfer leading into the retainer (21).*
- v. Carefully remove the Main Valve (23) from the assembly.
- vi. Visually inspect the Main Valve (23) and Soft Seat (22) for damage under a microscope and replace as required.
- vii. Replace the Main Valve Spring (11), O-ring (4) and Back Up Ring (23) in the Regulator Body (8) as required.
- viii. Secure the Lower Spring Rest (10) into a vice and use a 21mm open ended wrench or adjustable to remove the Sensor (7).
- ix. Place/tighten the flats of sensor (7) into a vice, with the vent seat (24) facing upwards.
- x. Using a flat headed screw driver, remove/replace the vent seat (24) and 5x1 O-ring (25), from the sensor (7).
- xi. Remove/replace the O-rings (5,6) around the Sensor Holder (9).
- xii. Position the Sensor (7) into the Sensor Holder (9).
IMPORTANT: Ensure that the Sensor Holder (9) is correctly oriented, such that the counter bore is upright to accommodate the Lower Spring Rest (10) (*Ref. 6.2.3)
- xiii. Screw the Lower Spring Rest (10) into the Sensor (7). To secure, grip the lower spring rest (10) into a vice and use a 21mm open ended spanner or adjustable to tighten against the Sensor (7).
- xiv. Place the sensor assembly (5-7, 9, 10, 24, 25) into the Regulator Body (8).
- xv. Position the Load Spring (12) on to the Lower Spring Rest (10) and place the Upper Spring Rest (14) and 10mm Ball Bearing (1) to the assembly.

- xvi. Screw the Bonnet (13) onto the assembly and using a torque wrench with a 47mm open ended attachment, tighten to 90Nm.

6.2.2. Adjusting the Set Point

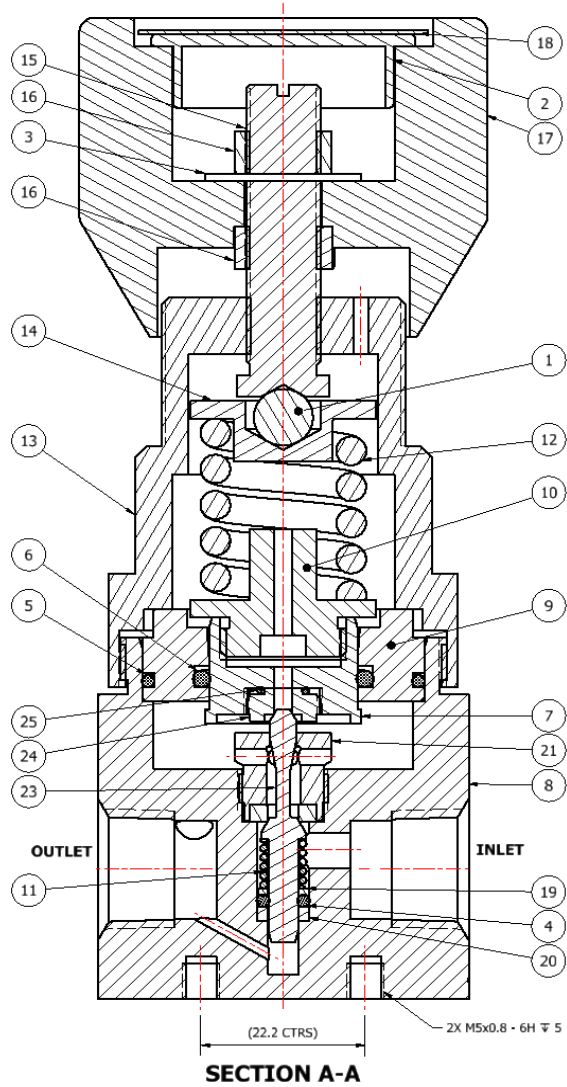
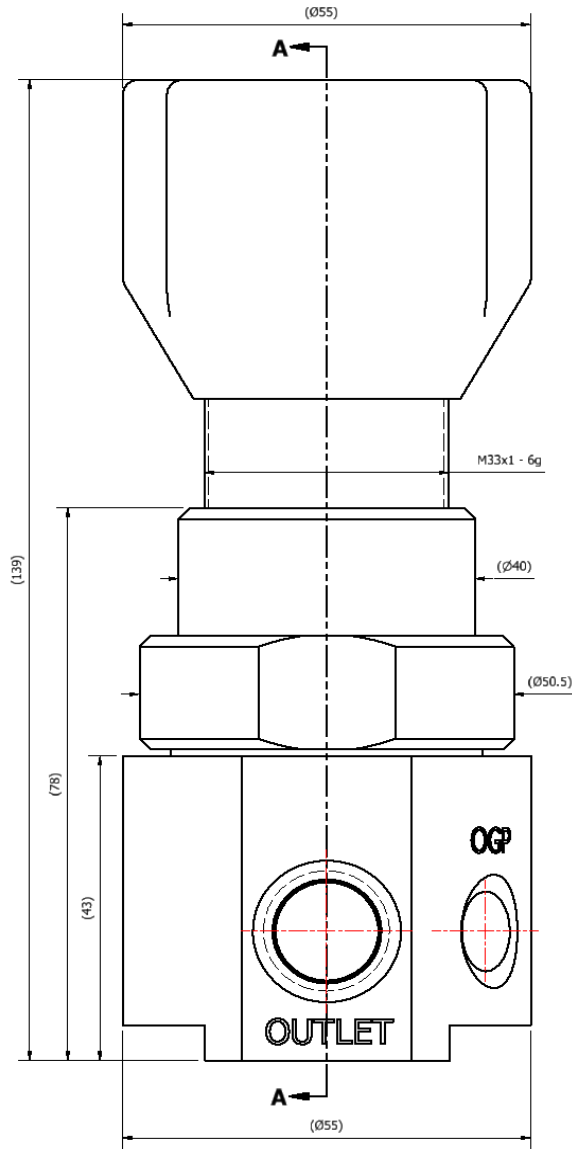
It is not recommended (or necessary) to remove the Hand Wheel during service as this will affect the set point of the regulator. Should it be required to adjust the set point please follow the instructions below:

- i. Remove the Nameplate (18) and Cap (2) from the Hand Wheel (17) and loosen the upper Lock Nut (16)/Washer (3) such that the Hand Wheel is able to spin freely on the Adjusting Screw (15).
- ii. Connect the correct fittings to the Inlet and Outlet ports of the regulator. Ensure that any gauge ports are plugged or that the correct gauge is fitted.
- iii. With the Regulator Body (8) *secured in a vice apply the Maximum Working Pressure (MWP) to the Inlet of the regulator
**NOTE: Soft vice jaws must be used, when securing the body within the vice against flats. (As without may cause damage to sealing surface for BSP O ring).*
- iv. Connect the Outlet port to a calibrated pressure test gauge appropriate to the required set pressure.
- v. Using a slotted screwdriver, turn the Adjusting Screw (15) clockwise until the desired set point has been reached.
- vi. Ensure repeatability by allowing flow through the regulator using the ball/needle valve.
- vii. With the outlet pressure set, screw the lower Lock Nut (16) to the base of the Adjusting Screw (15) against the Bonnet (13).
- viii. Position the Hand Wheel (17) onto the lower Lock Nut (16). Ensure that the Lock Nut and Hand Wheel become engaged.
- ix. Fasten the upper Lock Nut (16) against the top of the Hand Wheel (17)/Washer (3) and gently begin to tighten using a 13mm socket until it begins to secure itself.
- x. At this point, whilst holding the Hand Wheel (17) continue to tighten whilst simultaneously turning slightly anti-clockwise to prevent it from locking against the Bonnet (13).
- xi. Ensure that the upper Lock Nut (16) is sufficiently tightened, taking care not to adjust the set point.
- xii. Turning of the Hand Wheel (17) should now also turn the Adjusting Screw (15) which will control the pressure.
- xiii. Turn the Hand Wheel clockwise until it reaches its set point and check to make sure that the desired outlet pressure is correct.
- xiv. If the set point is not correct, repeat steps v. to xiii.

- xv. Reduce all the pressure downstream, by turning the Hand Wheel anti-clockwise until the regulator starts to vent through the bonnet.
- xvi. Reduce all the supply pressure to the regulator.
- xvii. Apply a small amount of Loctite 243 Thread Locker, all around the top diameter of the upper lock nut (16), so that the Loctite penetrates the thread, where the nut makes contact with the adjusting screw (15).
- xviii. The Cap (2) and Nameplate (18) can now be placed into the Hand Wheel (17) Ensure that the information stated on the Nameplate is in accordance with the set pressure of the regulator.

6.2.3. Figure 2 – Sectional View of the MF-101D (Self-Venting)

* ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE STATED.



| Parts List | | |
|------------|------------------------|--|
| ITEM | PART NUMBER | DESCRIPTION |
| 1 | BALL-008-SS-316 | BALL BEARING - 8mm |
| 2 | FIT-CAP-4343092 | NAMEPLATE CAP |
| 3 | FIT-M10-A2-CRI-WASHER | M10 CRINKLE WASHER |
| 4 | OR-BS007 | O' RING STD |
| 5 | OR-BS028 | O' RING STD |
| 6 | OR-BS4518-0196-24 | O' RING STD |
| 7 | PT-101-001-001 | 20MM SENSOR |
| 8 | PT-101-MF-V-BR-03N-001 | MF101 BODY - 'V' PORTING - 3/8" NPT - BALANCED |
| 9 | PT-BP-301-001 | 20mm SENSOR HOLDER |
| 10 | PT-BP-301-003-002 | LOWER SPRING REST |
| 11 | PT-C-006-009-001 | MAIN VALVE SPRING |
| 12 | PT-C-011-003 | LOAD SPRING - 86 kg |
| 13 | PT-C-015-014 | BONNET - TOP WEEP HOLE |
| 14 | PT-C-017 | UPPER SPRING REST |
| 15 | PT-C-019-003 | ADJUSTING SCREW |
| 16 | PT-C-020 | LOCKNUT |
| 17 | PT-C-021 | SMALL HANDWHEEL |
| 18 | PT-C-022 | NAMEPLATE |
| 19 | PT-LCR-414-002 | FRONT BACK UP |
| 20 | PT-LCR-414-003 | PTFE BACK UP RING |
| 21 | PT-C-080-005 | SEAT RETAINER - SV |
| 22 | PT-C-081-008 | SEAT |
| 23 | PT-LCR-414-001-002 | BALANCED MAIN VALVE |
| 24 | PT-690-016-003 | PCTFE VENT SEAT |
| 25 | OR-0050-10 | O' RING STD |

7. Technical Data

Fluid Media: All gases compatible with materials of construction

Max Inlet Pressure: *Pressure*
300 bar (4350Psi)

Outlet Pressure Range: 0-40 bar (580Psi)

Operating Temperature: -20°C to +180°C

Materials: Body / Trim: HT Brass
Seat: PCTFE

Flow Capacity (Cv): 0.5

Leakage: Gas *1x Bubble per min*
(Ref: ANSI/FCI 70-3 Class VII)

8. Warranty Statement and Company Contact Details

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.

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