



# THE MF-414 SERIES

Operating and Service Manual

Series includes all variants of MF-414

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## 1. Description

The MF-414 is a 'medium flow' piston sensed pressure reducing regulator, which incorporates a balanced main valve to provide stable control under varying inlet pressures. The regulator has the option of a PEEK seat for gas service, or TX 2000 ceramic for hydraulic service.

Both designs have a segregated captured vent to allow pressure reduction of the outlet pressure through a ¼" NPT port on the side of the regulator body.

An internal sensing line protects the sensing mechanism from potential damage as the main valve opens.

## 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.

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.

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.

Any gauge ports on the regulator will be 1/4" NPT unless otherwise stated. If any gauge port is not required, ensure that the port is plugged prior to installation.

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

Turning the hand wheel (or T-Bar) clockwise compresses the load spring, which in turn opens the main valve, and allows the inlet pressure to pass through the orifice until the outlet pressure is equivalent to the loading forces set by the compressed spring.

Self venting regulators can reduce the outlet pressure by turning the hand wheel anti-clockwise, which will allow the excess pressure to vent through the vent port located on the side of the regulator body. This port should not be plugged or blocked at any time.

Note: Turning the hand wheel anti-clockwise (with pressure on the outlet) should be refrained on non-venting regulators. Pressure should be reduced in this case by venting downstream of the regulator, and turning the hand wheel simultaneously anti-clockwise.

The MF-414 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 downstream 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**

Sudden dynamic high-pressure inlet pressures should be avoided, and preferably be gradually increased to protect against damage to the regulator.

#### **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 MF-414 regulators should only be performed after fully reading and understanding the Operating and Servicing Manual. Due to the typical nature of the gases the regulator can be used with, the operator should not endanger himself/herself or others by working on this regulator without prior knowledge on the Health and Safety concerns 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 Krytox GPL 205 during servicing.

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 MF-414G

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

### 6.1.1. Accessing the Main Valve Assembly

\*The top works and sensor assembly must first be removed to access the main valve assembly. Before continuing follow the steps 'i. – vi.' shown in - '6.1.2. Accessing the Sensor Assembly'.

To access the Main Valve Assembly:

- i. Unscrew the body nut (2) from the body (1) of the regulator to access the lower section of the main valve assembly.
- ii. Remove the Valve Spring (3).
- iii. Secure the upper section of the main valve (10) with a 10mm socket and use a screwdriver to turn the seat nut (4) anti-clockwise.
- iv. Remove the seat nut, 'O' rings and soft seat (4, 6, 9 and 8) from the lower main valve assembly.
- v. The main valve pin (10) should be removed through the top of the regulator to avoid damaging the 'O' ring (11) located on it.
- vi. Remove the hard seat (7) from the body of the regulator (1) by turning it anti-clockwise with a 19mm socket.
- vii. Insert a new hard seat (7) into the regulator body after carefully positioning the 12mm x 1mm 'O' ring (9) into the body.
- viii. Place two drops of Loctite thread lock 638 (or equivalent) on the M6 thread on the main valve pin (10)
- ix. Replace the 'O' ring (11) and back-up ring (12) on the main valve (10) and place the main valve into position through the top of the regulator body with the hex section facing upwards.
- x. Turn the regulator body upside down so that the lower section of the main valve is visible and place a new soft seat (8) onto the main valve stem.
- xi. Replace the BS-610 'O' ring (6) and place into the seat nut (4).
- xii. Screw the seat nut (4) on to the main valve (10) and tighten both parts together using a 10mm socket and a screwdriver.
- xiii. Place the valve spring (3) into the bottom nut (2) and screw into the regulator body (1). Tighten the bottom nut to 30Nm.

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.

## 6.1.2. Accessing the Sensor Assembly

The loading mechanism and vent seat for the MF-414 can be accessed from the top of the regulator. Ensure the spring is de-compressed by rotating the hand wheel fully anti-clockwise and follow the instructions below:

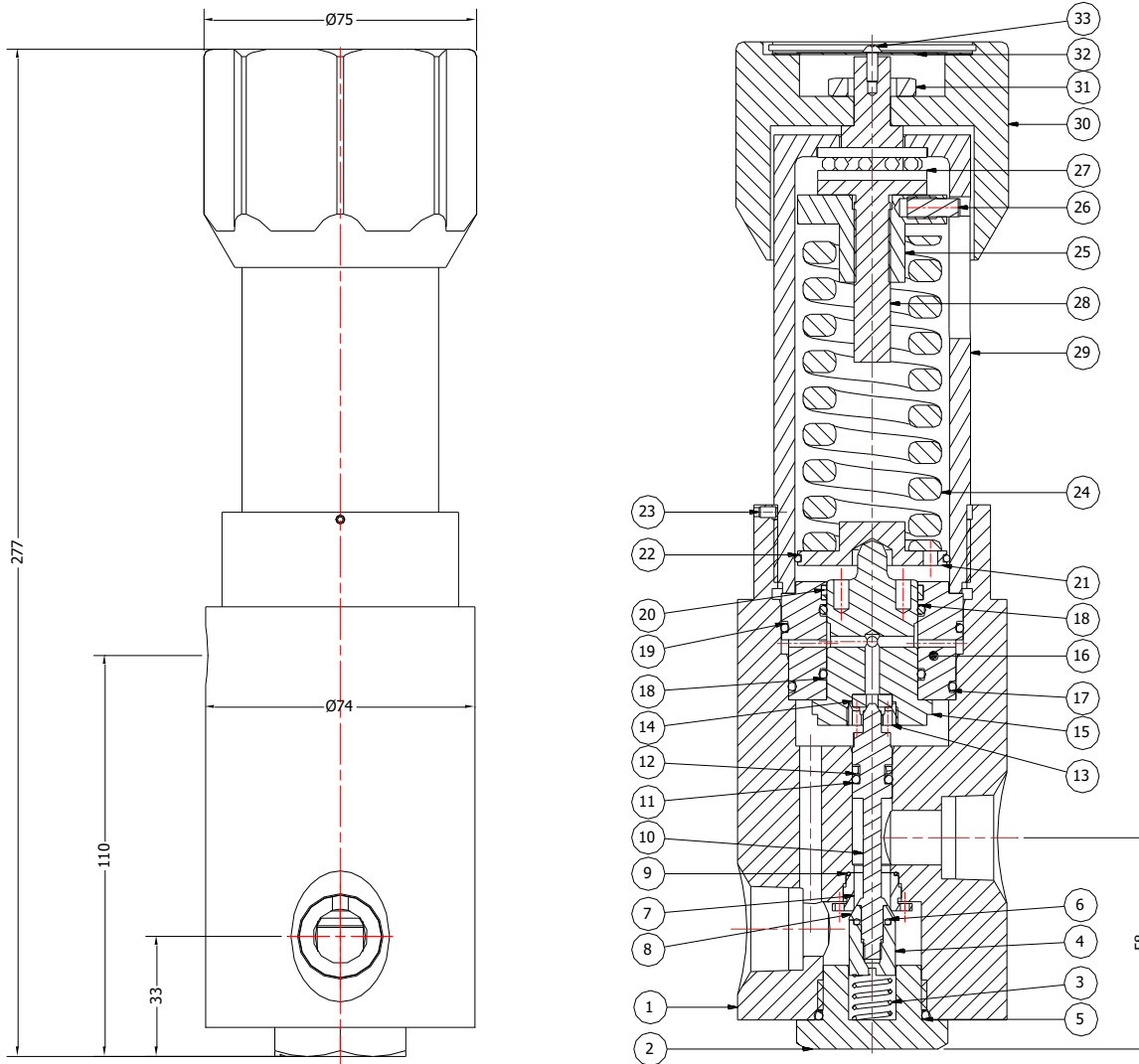
- i. Remove the securing grub screw (23) from the regulator body (1).
- ii. Unscrew the pan screw (33) and remove the name plate (32) from the hand wheel (30).
- iii. Unscrew the locknut (31) and remove the hand wheel (30) from the adjusting screw (28).
- iv. With the regulator secured up-right in a vice, remove the bonnet (29) 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 (29), load spring (24), adjusting mechanism (25, 26, 27 & 28) and lower spring rest (21) from the body.
- vi. The sensor assembly (13, 14, 15 & 16) can be removed from the body by using an M5 bolt (supplied with kit) and pliers.
- vii. The vent seat (14) can be accessed by removing the sensor (15) from the sensor holder (16) and gripping the sensor firmly in a vice with the vent seat nut (13) facing upwards.
- viii. The vent seat nut (13) can be removed using a pin spanner or equivalent and the vent seat (14) can then be removed from the sensor (15).
- ix. Inspect the vent seat (14) for damage and replace if necessary.
- x. Replace all 'O' rings (17, 18 & 19) located on the sensor (15) and sensor holder (16) prior to reassembly, ensuring adequate lubrication is used.
- xi. After reassembling the sensor and holder, place the assembly into the regulator body (1) ensuring that it is firmly in place.
- xii. Remove the M5 screw from the sensor holder if used.
- xiii. Screw the top works onto the regulator body and using a torque wrench, tighten to 120Nm.
- xiv. Tighten the securing grub screw (23) against the bonnet (29).
- xv. The hand wheel (30) can now be secured on to the adjusting screw (28) using the locknut (31).
- xvi. The name plate (32) can then be secured using the pan screw (33).

It is recommended that all parts in the repair kits 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 Krytox GPL 205.

### 6.1.3. Figure 1 – Sectional View of the MF-414G

\* ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE STATED.



PARTS LIST		
ITEM	PART NUMBER	DESCRIPTION
1	PT-305-MF-N-SS-06N	BODY 3/4" NPT
2	PT-305-MF-004	BOTTOM BODY NUT
3	PT-305-MF-005	MAIN VALVE SPRING
4	PT-300-MF-005 -002	SEAL NUT
5	OR-0270-25	O' RING STD
6	OR-BS610	O' RING STD
7	PT-305-MF-008	SEAT
8	PT-C-002-019-001	PEEK SEAT
9	OR-0120-10	O' RING STD
10	PT-305-MF-001-003	MAIN VALVE
11	OR-BS4518-0066-24	O' RING STD
12	PT-C-082	BACK UP
13	PT-C-091-001	VENT SEAT NUT
14	PT-C-029	VENT SEAT
15	PT-C-142-002	25mm SENSOR
16	PT-C-141-002	25mm SENSOR HOLDER
17	OR-BS4518-0416-24	O' RING STD
18	OR-BS4518-0246-24	O' RING STD
19	OR-BS4518-0456-24	O' RING STD
20	PT-C-038	SLIDE RING
21	PT-C-095-001	SPRING REST - DOME
22	OR-0350-20	O' RING STD
23	FIT-M3X5	GRUB SCREW
24	R40X89 SPRING	SPRING
25	PT-C-045	ADJUSTING NUT
26	PT-C-046	SCREW
27	BEAR-51103	BEARING
28	PT-C-043-004	ADJUSTING SCREW
29	PT-C-040-001	BONNET
30	PT-C-048-001	LARGE NYLON HAND WHEEL
31	PT-C-132	LOCK NUT
32	PT-C-049	NAME PLATE
33	FIT-M3X8	SCREW

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## 6.2. Servicing the MF-414H

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

### 6.2.1. Accessing the Main Valve Assembly

\*The top works and sensor assembly must first be removed to access the main valve assembly. Before continuing follow the steps 'i. – iv.' shown in - '6.2.2. Accessing the Sensor Assembly'.

To access the Main Valve Assembly:

- i. Unscrew the body nut (2) from the body (1) of the regulator to access the lower section of the main valve assembly.
- ii. Remove the Valve Spring (3).
- iii. Secure the upper section of the main valve (10) with a 10mm socket and use a screwdriver to turn the seat nut (4) anti-clockwise.
- iv. Remove the seat nut, 'O' rings and ceramic seat (4, 6, 9 and 8) from the lower main valve assembly.
- v. The main valve pin (10) should be removed through the top of the regulator to avoid damaging the 'O' ring (11) located on it.
- vi. Remove the hard seat (7) from the body of the regulator (1) by turning it anti-clockwise with a 19mm socket.
- vii. Insert a new hard seat (7) into the regulator body after carefully positioning the 12mm x 1mm 'O' ring (9) into the body.
- viii. Place two drops of Loctite thread lock 638 (or equivalent) on the M6 thread on the main valve pin (10)
- ix. Replace the 'O' ring (11) and back-up ring (12) on the main valve (10) and place the main valve into position through the top of the regulator body with the hex section facing upwards.
- x. Turn the regulator body upside down so that the lower section of the main valve is visible and place a new ceramic seat (8) onto the main valve stem.
- xi. Replace the BS-610 'O' ring (6) and place into the seat nut (4).
- xii. Screw the seat nut (4) on to the main valve (10) and tighten both parts together using a 10mm socket and a screwdriver.
- xiii. Place the valve spring (3) into the bottom nut (2) and screw into the regulator body (1). Tighten the bottom nut to 30Nm.

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.

## 6.2.2. Accessing the Sensor Assembly

The loading mechanism and vent seat for the MF-414 can be accessed from the top of the regulator. Ensure the spring is de-compressed by rotating the hand wheel fully anti-clockwise and follow the instructions below:

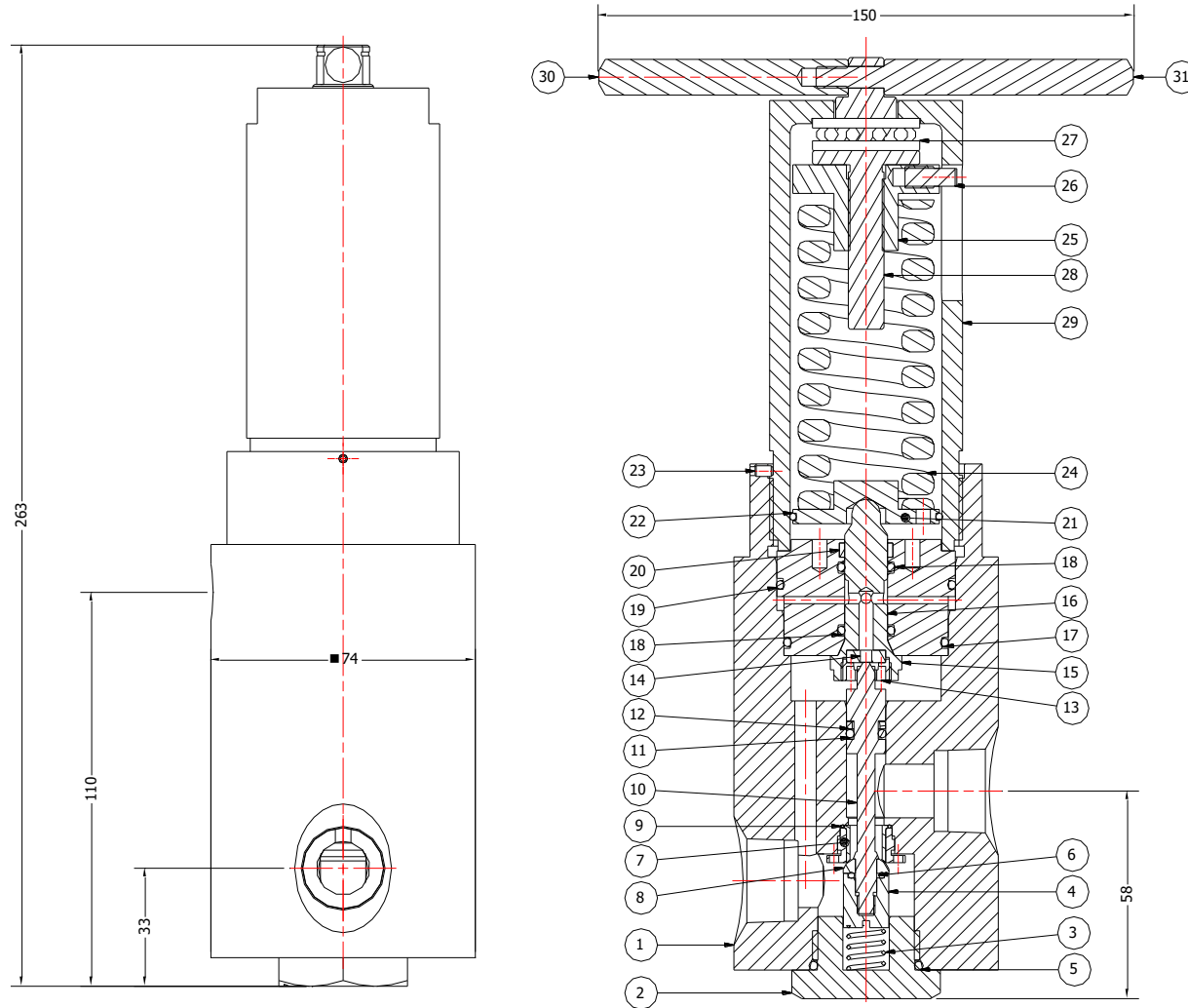
- i. Remove the T-Bar (30, 31) by unscrewing one side whilst firmly gripping the other.
- ii. With the regulator secured up-right in a vice, remove the bonnet (29) by using a torque wrench or equivalent with 47mm open end.
- iii. Un-screw and lift the top works from the assembly, inclusive of the bonnet (29), load spring (24), adjusting mechanism (25, 26, 27 & 28) and lower spring rest (21) from the body.
- iv. The sensor assembly (13, 14, 15 & 16) can be removed from the body by using an M5 bolt (supplied with kit) and pliers.
- v. The vent seat (14) can be accessed by removing the sensor (15) from the sensor holder (16) and gripping the sensor firmly in a vice with the vent seat nut (13) facing upwards.
- vi. The vent seat nut (13) can be removed using a pin spanner or equivalent and the vent seat (14) can then be removed from the sensor (15).
- vii. Inspect the vent seat (14) for damage and replace if necessary.
- viii. Replace all 'O' rings (17, 18 & 19) located on the sensor (15) and sensor holder (16) prior to reassembly, ensuring adequate lubrication is used.
- ix. After reassembling the sensor and holder, place the assembly into the regulator body (1) ensuring that it is firmly in place.
- x. Remove the M5 screw from the sensor holder if used.
- xi. Screw the top works onto the regulator body and using a torque wrench, tighten to 120Nm.
- xii. Tighten the securing grub screw (23) against the bonnet (29).
- xiii. Place the T-Bar piece with the male thread (31) through the hole on the adjusting screw and tighten the second T-Bar piece (30) against it.

It is recommended that all parts in the repair kits 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 Krytox GPL 205.

### 6.2.3. Figure 2 – Sectional View of the MF-414H

\* ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE STATED.



PARTS LIST		
ITEM	PART NUMBER	DESCRIPTION
1	PT-305-MF-N-SS-06N	BODY 3/4" NPT
2	PT-305-MF-004	BOTTOM BODY NUT
3	PT-305-MF-005	MAIN VALVE SPRING
4	PT-300-MF-005 -002	SEAL NUT
5	OR-0270-25	O' RING STD
6	OR-BS610	O' RING STD
7	PT-305-MF-006	SEAT HOLDER
8	PT-C-002-027	CERAMIC SEAT
9	OR-0120-10	O' RING STD
10	PT-305-MF-001-002	MAIN VALVE PIN CERAMIC DESIGN
11	OR-BS4518-0066-24	O' RING STD
12	PT-C-082	BACK UP
13	PT-C-091-001	VENT SEAT NUT
14	PT-C-029	VENT SEAT
15	PT-C-087-002	12mm SENSOR
16	PT-C-085-002	12mm SENSOR HOLDER
17	OR-BS4518-0416-24	O' RING STD
18	OR-0116-24	O' RING STD
19	OR-BS4518-0456-24	O' RING STD
20	PT-C-037	SLIDE RING
21	PT-C-095-001 ISSD	SPRING REST - DOME
22	OR-0350-20	O' RING STD
23	FIT-M3X5	GRUB SCREW
24	R40X89 SPRING	517 KG SPRING
25	PT-C-045	ADJUSTING NUT
26	PT-C-046	SCREW
27	51103-SS	BEARING 420SS
28	PT-C-043-001	ADJUSTING SCREW
29	PT-C-040-001	BONNET
30	PT-C-107	T BAR HANDLE
31	PT-C-108	T BAR HANDLE

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## 7. Technical Data

Fluid Media:	All gases and liquids compatible with materials of construction
Max Inlet Pressure:	414 bar
Outlet Pressure Range:	5-414 bar
Operating Temperature:	-20°C to +80°C
Materials:	Body and Trim: 316 SS Seat Gas: PEEK®, Seat Hydraulic: Ceramic
Flow Capacity (Cv):	2
Leakage:	Hydraulic: Zero drops of water at max inlet Gas: Bubble tight

## 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.