



# THE HF-250 SERIES

Operating and Service Manual

Series includes all variants of HF-250/251

**Issue A**  
**September 2013**



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## 1. Description

The HF-250 series are high flow pressure regulators with a Cv of 7.0 and are available for use on both gas or liquid applications. Diaphragm and piston sensed options are available. The maximum rated inlet pressure for this series is 250 bar.

The diaphragm sensed HF-250 is capable of a maximum outlet pressure of 10 bar. The piston sensed HF-251 option is able to control pressures of up to 200 bar.

The regulator housing and 'wetted' components are precision machined from 316 Stainless Steel unless otherwise specified.

## 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**

### **3.1. Spring Loaded**

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.

### **3.2. Dome Loaded**

Dome loaded control mechanisms require a control of pressure to a port in the regulator bonnet. An increase in pressure supplied to the dome results in an increase in the outlet pressure downstream of the regulator. A specific ratio of dome pressure to outlet pressure may apply. Please contact the office for further information.

To reduce the outlet pressure, reduce the pressure supplied to the dome whilst the media is flowing or vented downstream.

Ensure that an inlet pressure is supplied to the regulator at all times whilst dome pressure is applied. Failure to do so may result in damage to the regulator.

### **3.3. Pilot Dome Loaded**

The pilot controlled dome loading mechanism operates in a similar way to the standard dome loading mechanism, whereby increasing pressure into the dome will result in an increase in outlet pressure downstream of the regulator.

The pilot regulator feeds off the same supply as the regulator itself and can be monitored on the inlet pressure gauge connected to the pilot regulator. Turning the hand wheel clockwise on the pilot regulator allows pressure to increase in the dome. The dome pressure can be monitored on the outlet pressure gauge connected to the pilot regulator.

The pilot regulator is 'self venting' and pressure in the dome may be reduced by turning the hand wheel on the pilot regulator anti-clockwise. The outlet pressure of the regulator will then be reduced provided that the media is flowing or vented downstream.

## **4. Special Conditions for Safe Use**

The HF-250 series are non-venting type regulators, therefore outlet pressure shall be reduced by venting downstream of the regulator whilst simultaneously turning the adjusting mechanism anti-clockwise.

## **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 HF-250/251 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 will be used on, 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 HF-250**

\*Note: fig 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 regulator body (9) firmly gripped in a vice, use an adjustable or open ended wrench to loosen and remove the bottom nut (10)

- ii. The main valve (11), soft seat (12), valve spring (14) and o-rings (18, 19, 20) can then be removed from the assembly
- iii. Visually inspect the soft seat and main valve for signs of damage or contamination and replace as necessary
- iv. Replace the o-rings (18, 19, 20) around the main valve (11), soft seat (12) and bottom nut (10)
- v. Place the main valve spring (14) into the bottom nut (10)
- vi. Use an appropriate lubricant for the o-ring (20) on the main valve (11) and then position carefully into the bottom nut (10)
- vii. Carefully place the soft seat (12) over the main valve (11) and locate into the bottom nut (10)
- viii. Position the o-ring (19) around the soft seat (12)
- ix. Screw the assembly into the regulator body (9) ensuring that the main valve (11) locates between the pin holder (6)

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.

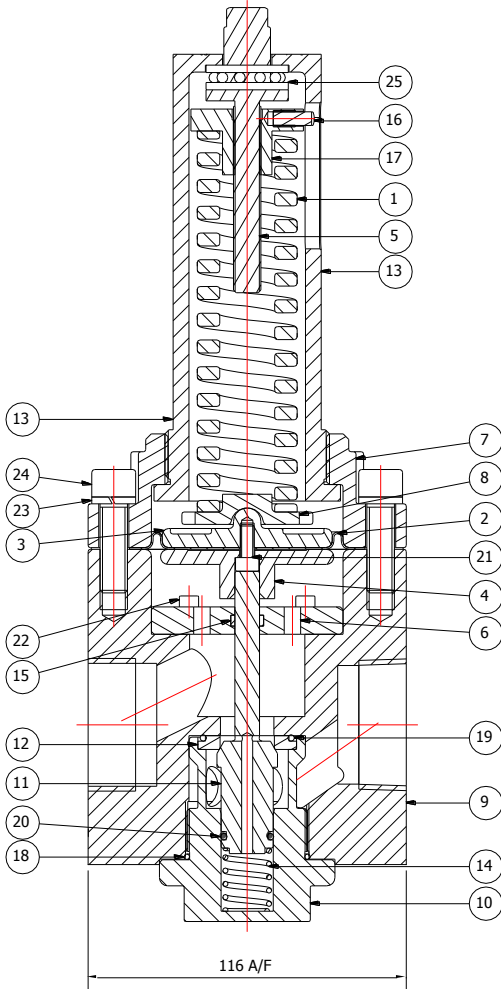
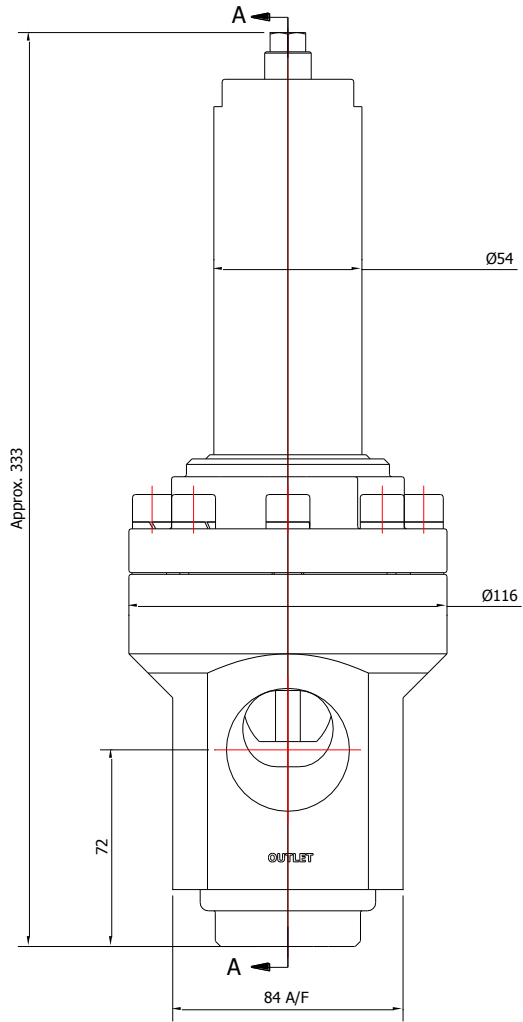
### **6.1.2. Accessing the Diaphragm Assembly**

The loading mechanism and diaphragm assembly for the HF-250 can be accessed from the top of the regulator. Ensure that the spring is de-compressed by rotating the adjusting mechanism fully anti-clockwise and follow the instructions below:

- i. Loosen and remove the eight M10 socket head cap screws (24) which secure the bonnet (7, 13) to the regulator body (9)
- ii. Lift the bonnet assembly (7, 13) away from the body (9).  
\*Note - It is useful to tilt the bonnet assembly to the side until the spring may be supported which then keeps the adjusting assembly secured inside the upper bonnet
- iii. Remove the lower spring rest (8)
- iv. The diaphragm assembly (2, 3, 4, 21) can then be removed from the regulator body (9)
- v. To replace the diaphragm (2), secure the lower diaphragm washer (4) and remove the M5 screw (21), the upper and lower diaphragm supports (3, 4) can now be separated (discard of any used or damaged diaphragms)
- vi. Position the new diaphragm between the upper and lower diaphragm supports and secure the M5 screw in place
- vii. Locate the lower diaphragm support (4) over the main valve (11) and line the perforations of the diaphragm (2) up with the tapped holes in the regulator body (9)
- viii. Place the spring rest (8) onto the upper diaphragm support (3)
- ix. Lift the bonnet assembly (7, 13) carefully whilst supporting the load spring (1) from below, this is to ensure that the adjusting mechanism (5, 16, 17, 25) within remains in place
- x. Guide the load spring (1) onto the spring rest (8) and then position the bonnet assembly over the regulator body (9) carefully, aligning the three sets of holes on the PCD
- xi. Secure the eight M10 socket head cap screws (24) in place and tighten securely

6.1.3. Figure 1 – Sectional View of the HF-250

\* ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE STATED.



PARTS LIST		
ITEM	PART NUMBER	DESCRIPTION
1	SPR-B40X139	MAIN LOAD SPRING
2	PT-HF-300-014	4C-275-25-DPJ DIAPHRAGM
3	PT-HF-300-013	UPPER DIAPHRAGM WASHER
4	PT-HF-300-012	LOWER DIAPHRAGM WASHER
5	PT-HF-300-011	ADJUSTING SCREW
6	PT-HF-300-008	PIN HOLDER
7	PT-HF-300-005	LOWER BONNET
8	PT-HF-300-003	SPRING REST
9	PT-HF-250-7-N-SS-12N	BODY - N PORTING
10	PT-HF-250-007	BOTTOM NUT
11	PT-HF-250-006	MAIN VALVE PIN
12	PT-HF-250-003-001	SOLID DISK SEAT
13	PT-HF-250-002	UPPER BONNET
14	PT-HF-250-001	VALVE SPRING
15	PT-C-097	SLIDE RING
16	PT-C-046	SET SCREW
17	PT-C-045	ADJUSTING NUT
18	OR-0420-20	O' RING STD
19	OR-0296-24	O' RING STD
20	OR-0146-24	O' RING STD
21	FIT-M5-14-A2-70-SKT-CAP	SCREW
22	FIT-M4-20-A2-70-SKT-CAP	HEAD CAP SCREW
23	FIT-M10-A4-SPR-WASHER	SPRING WASHER
24	FIT-M10-35-ZP-12.9-SKT-CAP	HEAD CAP SCREW
25	BEAR-51103-SS	BEARING 420SS

## 6.2. Servicing the HF-251

\*Note: fig 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 regulator body (8) firmly gripped in a vice, use an adjustable or open ended wrench to loosen and remove the bottom nut (9)
- ii. The main valve (7), soft seat (10), valve spring (12) and o-rings (16, 17, 18) can then be removed from the assembly
- iii. Visually inspect the soft seat and main valve for signs of damage or contamination and replace as necessary
- iv. Replace the o-rings (16, 17, 18) around the main valve (7), soft seat (10) and bottom nut (9)
- v. Place the main valve spring (12) into the bottom nut (9)
- vi. Use an appropriate lubricant for the o-ring (18) on the main valve (7) and then position carefully into the bottom nut (9)
- vii. Carefully place the soft seat (10) over the main valve (7) and locate into the bottom nut
- viii. Position the o-ring (17) around the soft seat (10)
- ix. Screw the assembly into the regulator body (8) ensuring that the main valve (7) locates into the sensor holder (2)

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

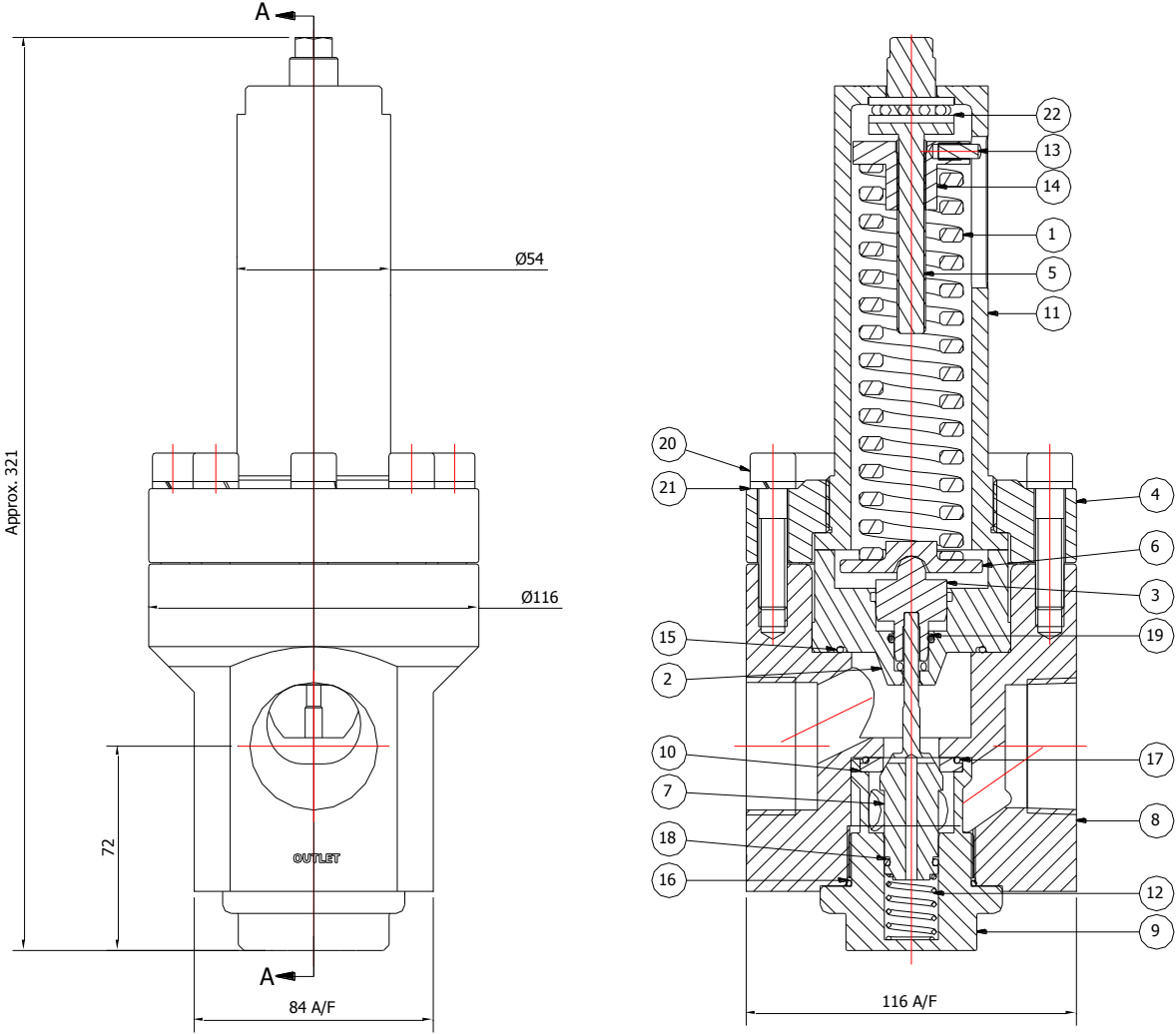
The loading mechanism and sensor assembly for the HF-251 can be accessed from the top of the regulator. Ensure that the spring is de-compressed by rotating the adjusting mechanism fully anti-clockwise and follow the instructions below:

- i. Loosen and remove the eight M10 socket head cap screws (20) and lift the bonnet assembly (4, 11) away from the body (8)  
\*Note - It is useful to tilt the bonnet assembly to the side until the spring may be supported which then keeps the adjusting assembly secured inside the upper bonnet
- ii. Remove the lower spring rest (6)
- iii. The sensor assembly (2, 3) can now be removed from the regulator body (8) and the sensor (3) and sensor holder (2) can be separated
- iv. Check and replace all o-ring seals
- v. Position the sensor holder (2) back into the regulator body (8) and insert the sensor (3)
- vi. Place the spring rest (6) onto the sensor (3)
- vii. Lift the bonnet assembly carefully whilst supporting the load spring (1) from below, this is to ensure that the adjusting mechanism (5, 13, 14, 22) within remains in place
- viii. Guide the load spring (1) onto the spring rest (6) and then position the bonnet assembly (4, 11) over the regulator body (8) carefully, aligning the holes on the PCD
- ix. Secure the eight M10 socket head cap screws (20) in place and tighten securely



6.2.3. Figure 2 – Sectional View of the HF-251

\* ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE STATED.



PARTS LIST		
ITEM	PART NUMBER	DESCRIPTION
1	SPR-B40X139	MAIN LOAD SPRING
2	PT-HF-301-004-001	SENSOR HOLDER
3	PT-HF-301-003	SENSOR 12MM/25MM
4	PT-HF-301-001	LOWER BONNET
5	PT-HF-300-011	ADJUSTING SCREW
6	PT-HF-300-003	SPRING REST
7	PT-HF-251-001	MAIN VALVE PIN
8	PT-HF-250-7-N-SS-12N	BODY - N PORTING
9	PT-HF-250-007	BOTTOM NUT
10	PT-HF-250-003-001	SOLID DISK SEAT
11	PT-HF-250-002	UPPER BONNET
12	PT-HF-250-001	VALVE SPRING
13	PT-C-046	SET SCREW
14	PT-C-045	ADJUSTING NUT
15	OR-0476-24	O' RING STD
16	OR-0420-20	O' RING STD
17	OR-0296-24	O' RING STD
18	OR-0146-24	O' RING STD
19	OR-0116-24	O' RING STD
20	FIT-M10-45-ZP-12.9-SKT-CAP	HEAD AP SCREW
21	FIT-M10-A4-SPR-WASHER	SPRING WASHER
22	BEAR-51103-SS	BEARING 420SS

## 6.3. Servicing the Pilot Dome Loaded Regulators

### 6.3.1. Accessing the Diaphragm Assembly of the HF-250 Dome Option

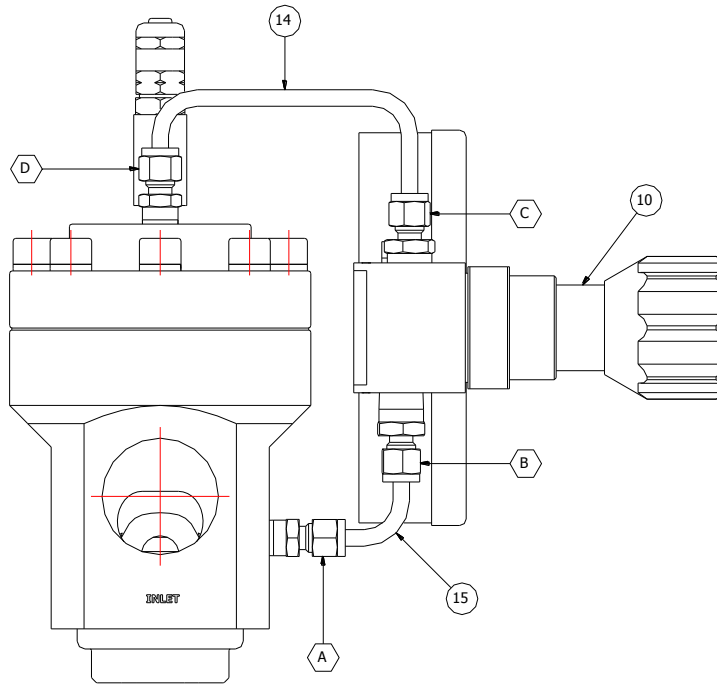
\*Note: fig 3 should be used as a reference for the following set of instructions

The diaphragm assembly for the HF-250 can be accessed from the top of the regulator. Ensure that the dome pressure is released by venting off through the Pilot Regulator, then de-pressurise the Regulator and follow the instructions below:

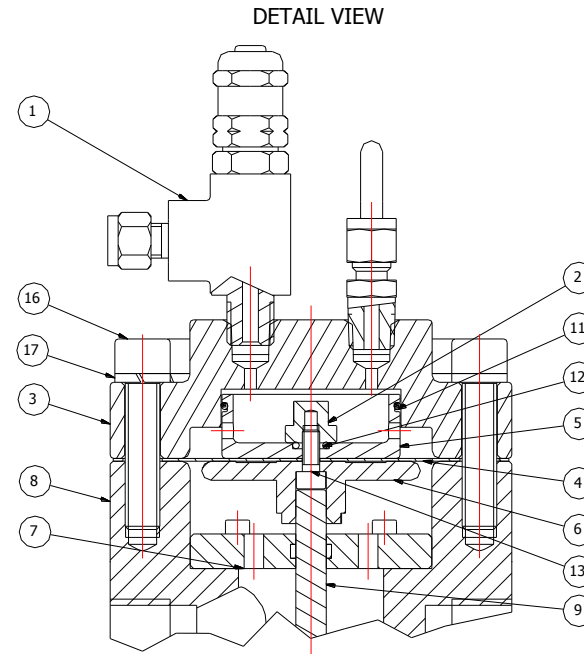
- i. Disconnect the downstream tube (14) by loosening the compression fittings at point C and D using a 9/16" open ended spanner
- ii. Disconnect the Pilot Regulator (10) from the upstream tube (15) by loosening the compression fitting at point B  
\*Note - This is to prevent the upstream tube from bending, it is not necessary to remove the upstream tube from the regulator
- iii. Loosen and remove the eight M10 socket head cap screws (16) and lift the bonnet (3) away from the regulator body (8)
- iv. The diaphragm assembly (2, 4, 5, 6) can then be removed from the regulator body (8)  
\*Note - Due to the fit between the upper diaphragm support and the dome bonnet, the diaphragm assembly may be removed whilst removing the bonnet. In this instance simply remove the assembly from the bonnet
- v. Secure the flats of the lower diaphragm support (6) in a vice and remove the nut (2) using a 10mm socket, the M5 screw (13) will then be released and can be removed from beneath the lower diaphragm support
- vi. Separate the upper diaphragm support (5) from the assembly and replace the o-rings (11, 12)
- vii. The diaphragm (4) can then be removed from the assembly and replaced as necessary
- viii. Position the diaphragm (4) and upper diaphragm support (5) over the lower diaphragm support (6) and place the M5 screw (13) through the base of the assembly. Secure the screw with a 4mm Allen key and tighten the nut (2) against it with a 10mm socket
- ix. The diaphragm assembly can then be placed into the regulator body (8), locating the lower diaphragm support (6) to the main valve (9)
- x. Align the holes on the PCD of the diaphragm (4) to the regulator body (8)
- xi. Position the bonnet (3) carefully over the upper diaphragm support (5), aligning the holes on the PCD to those on the body. It may be necessary to assemble the diaphragm assembly (2, 4, 5, 6) into the bonnet (3) and then position to the regulator body (8)  
\*Important – Ensure the correct orientation of the two 1/4" NPT holes in the dome bonnet to the regulator body. (Orientation of these holes should follow the direction of flow, with the port for the pilot regulator on the high pressure side)
- xii. Secure the eight M10 socket head cap screws (16) in place and tighten securely
- xiii. Connect the Inlet port of the pilot regulator to point B of the upstream tube (15)
- xiv. Connect the downstream tube (14) to points C and D  
\*Important - Ensure that compression fittings are tightened securely – It may be necessary to use leak detection fluid to confirm that the connections are leak tight after servicing

\*Note – To service the pilot regulator, please contact the office for further information

### 6.3.2. Figure 3 – Sectional View of the HF-250 Pilot Dome Loaded Regulator



PARTS LIST		
ITEM	PART NUMBER	DESCRIPTION
1	SLOK-SS-4R3A1	RELIEF VALVE
2	PT-HF-300-016	NUT - DOME APPL.
3	PT-HF-300-015	BONNET - DOME APPL.
4	PT-HF-300-014-001	DIAPHRAGM
5	PT-HF-300-013-001	UPPER DIAPHRAGM WASHER - DOME APPL.
6	PT-HF-300-012-001	LOWER DIAPHRAGM WASHER - DOME APPL.
7	PT-HF-300-008	PIN HOLDER
8	PT-HF-250-7-N-SS-12N-001	BODY 1 1/2" BSP 'N' PORTING
9	PT-HF-250-006	MAIN VALVE PIN
10	MF101-5-S-10-N-K-02N-A-026	PILOT REGULATOR
11	OR-0480-20	O' RING STD
12	OR-0070-20	O' RING STD
13	FIT-M5-12-SS-A2-SKT-CAP	HEAD CAP SCREW
14	FIT-TUBE-04-1725-0016-SS	PILOT REGULATOR DOWNSTREAM TUBE
15	FIT-TUBE-04-0670-0016-SS	PILOT REGULATOR UPSTREAM TUBE
16	FIT-M10-45-ZP-12.9-SKT-CAP	HEAD CAP SCREW
17	FIT-M10-A4-SPR-WASHER	SPRING WASHER



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### 6.3.3. Accessing the Sensor Assembly of the HF-251 Dome Option

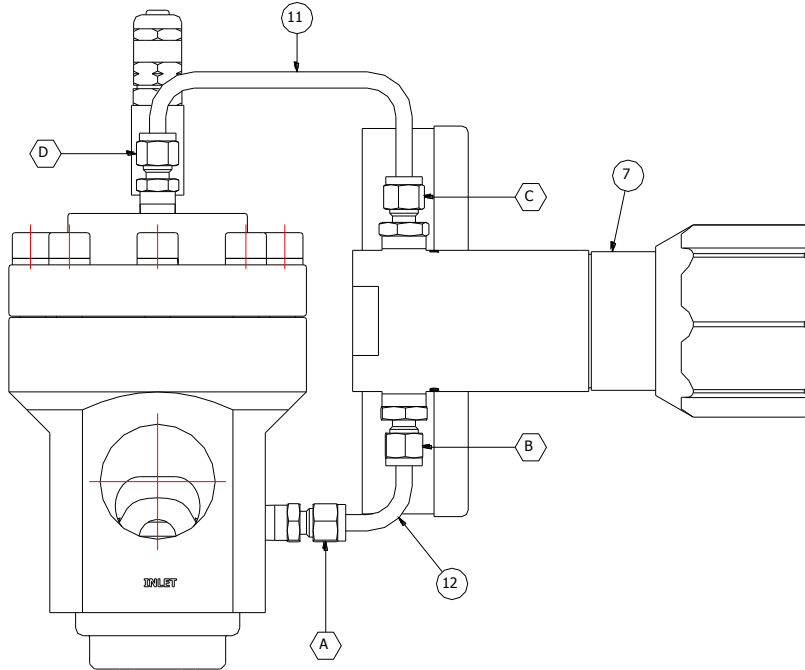
\*Note: fig 4 should be used as a reference for the following set of instructions

The sensor assembly for the HF-251 can be accessed from the top of the regulator. Ensure that the dome pressure is released by venting off through the Pilot Regulator, then depressurise the Regulator and follow the instructions below:

- i. Disconnect the downstream tube (11) by loosening the compression fittings at point C and D using a 9/16" open ended spanner
- ii. Disconnect the Pilot Regulator (7) from the upstream tube (12) by loosening the compression fitting at point B  
\*Note - This is to prevent the upstream tube from bending, it is not necessary to remove the upstream tube from the regulator
- iii. Loosen and remove the eight M10 socket head cap screws (13) and lift the bonnet (4) away from the regulator body (6)
- iv. There are two M5 extraction holes in the sensor holder. Using an M5 screw and some pliers, remove the sensor assembly from the regulator body (6). (This is to prevent causing damage to the sensor holder during its removal)
- v. Discard of any damaged o-rings (8, 9)
- vi. Separate the sensor (3) and sensor holder (2)
- vii. Replace the two o-rings (10) (of same size)
- viii. Using appropriate lubrication for the new o-rings (10) fit the sensor (3) into the sensor holder (2)  
\*Note - Ensure that the sensor (3) moves smoothly within the sensor holder (2)
- ix. Place o-ring (9) around the base of the sensor holder (2)  
\*Note – It may be necessary to secure the o-ring with a small amount of lubricant to ensure that it remains in position whilst re-assembling
- x. With an M5 screw secured into the extraction hole, use pliers to carefully position the sensor holder (2) into the regulator body (6) ensuring that it guides onto the main valve (5)
- xi. Press firmly down on the sensor (3) to confirm that it is acting against the main valve (5)  
\*Note – The sensor should spring back and feel smooth and responsive
- xii. Replace the o-ring (8) around the top of the sensor holder (2)
- xiii. Position the bonnet (4) carefully over the sensor holder (5), aligning the holes on the PCD to those on the body.  
\*Important – Ensure the correct orientation of the two 1/4" NPT holes in the dome bonnet to the regulator body. (Orientation of these holes should follow the direction of flow, with the port for the pilot regulator on the high pressure side)
- xiv. Secure the eight M10 socket head cap screws (13) in place and tighten securely
- xv. Connect the Inlet port of the pilot regulator to point B of the upstream tube (12)
- xvi. Connect the downstream tube (11) to points C and D  
\*Important - Ensure that compression fittings are tightened securely – It may be necessary to use leak detection fluid to confirm that the connections are leak tight after servicing

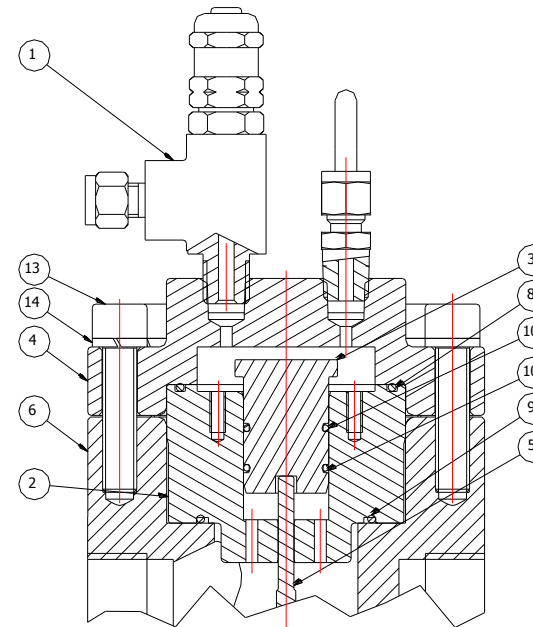
\*Note – To service the pilot regulator, please contact the office for further information

### 6.3.4. Figure 4 – Sectional View of the HF-251 Pilot Dome Loaded Regulator



PARTS LIST		
ITEM	PART NUMBER	DESCRIPTION
1	SS-4R3A1	RELIEF VALVE
2	PT-HF-301-006	25mm SENSOR HOLDER 1:1
3	PT-HF-301-005	25mm SENSOR 1:1
4	PT-HF-300-017	BONNET - DOME APPL.
5	PT-HF-251-001	MAIN VALVE PIN
6	PT-HF-250-7-N-SS-12N-001	BODY 1 1/2" BSP 'N' PORTING
8	OR-BS4518-0596-24	O' RING STD
9	OR-0476-24	O' RING STD
10	OR-0210-20	O' RING STD
7	LF540-01-S-50S-N-02N-A-SV	PILOT REGULATOR
11	FIT-TUBE-04-1725-0016-SS	PILOT REGULATOR DOWNSTREAM TUBE
12	FIT-TUBE-04-0670-0016-SS	PILOT REGULATOR UPSTREAM TUBE
14	FIT-M10-A4-SPR-WASHER	SPRING WASHER
13	FIT-M10-45-ZP-12.9-SKT-CAP	HEAD CAP SCREW

#### DETAIL VIEW



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## 7. Technical Data

Fluid Media:	All gases and liquids compatible with materials of construction
Max Inlet Pressure:	250 bar
Outlet Pressure Range:	0-10 bar (HF-250), 0-200 bar (HF-251)
Operating Temperature:	-20°C to +80°C
Materials:	Body and Trim: 316 SS Diaphragm: Nitrile Seat: PCTFE or PEEK®
Flow Capacity (Cv):	7
Leakage:	Liquid: 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.