



# THE HF-210 SERIES

Operating and Service Manual

Series includes all variants of HF-210/211

**Issue A**

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**\*Section 6.1 in development**



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## 1. Description

The HF-210 series are high flow pressure regulators with a Cv of 13.0 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 210 bar.

The diaphragm sensed HF-210 is capable of a maximum outlet pressure of 10 bar. The piston sensed HF-211 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-210 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-210/211 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-210**

\*Note: This section is currently in development, please contact the office for further information

## 6.2. Servicing the HF-211

\*Note: fig 1 and 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 secured upside down in a vice (or resting on its side), loosen and remove the eight M8x25 socket head cap screws (2)
- ii. Grip and remove the bottom nut (3) from the regulator body (19)
- iii. The bottom nut (3) uses an internal spiral ring (12) to retain the main valve assembly. To remove the internal spiral ring (12)\*:
  - a. insert a screwdriver or dental pick into the removal notch
  - b. Use the tool to pry out the first end of the ring
  - c. Manually spiral the ring around until it is free from the groove  
*\*ref. [www.tfc.eu.com](http://www.tfc.eu.com)*
- iv. The metal seat (11), seat retainer (7), soft seat (10), seat fastener (8), valve spring (4) and o-rings (6, 9, 13) can then be removed from the bottom nut (3)
- v. Grip the seat retainer (7) in a vice and use a 10mm socket to remove the seat fastener (8) and remove the soft seat (10)
- vi. Visually inspect the soft seat (10) and metal seat (11) for signs of damage or contamination and replace as necessary
- vii. Replace the o-rings (6 and 9) on the seat retainer (7) and secure the soft seat (10) by tightening the seat fastener (8)  
*\*Note: Ensure that the soft seat is inserted with the large internal chamfer facing outwards*
- viii. Place the main valve spring (4) into the bottom nut (3)
- ix. Use an appropriate lubricant for the o-ring (6) on the seat retainer (7) and then position carefully into the bottom nut (3)
- x. Carefully place the metal seat (11) into the bottom nut (3) and install the internal spiral ring (12)\* whilst maintaining pressure on the seat fastener:
  - a. Insert one end of the ring into the grove
  - b. Wind the ring down around the circumference until the entire ring is inserted into the groove
- xi. Position the o-ring (13) around the metal seat (11) and replace the o-ring (5) around bottom nut (3)
- xii. Place the bottom nut (3) assembly into the regulator body (19) ensuring that the seat fastener (8) locates into the main valve connector (14)
- xiii. Secure the eight M8x25 socket head cap screws (2) (recommended torque 14Nm)

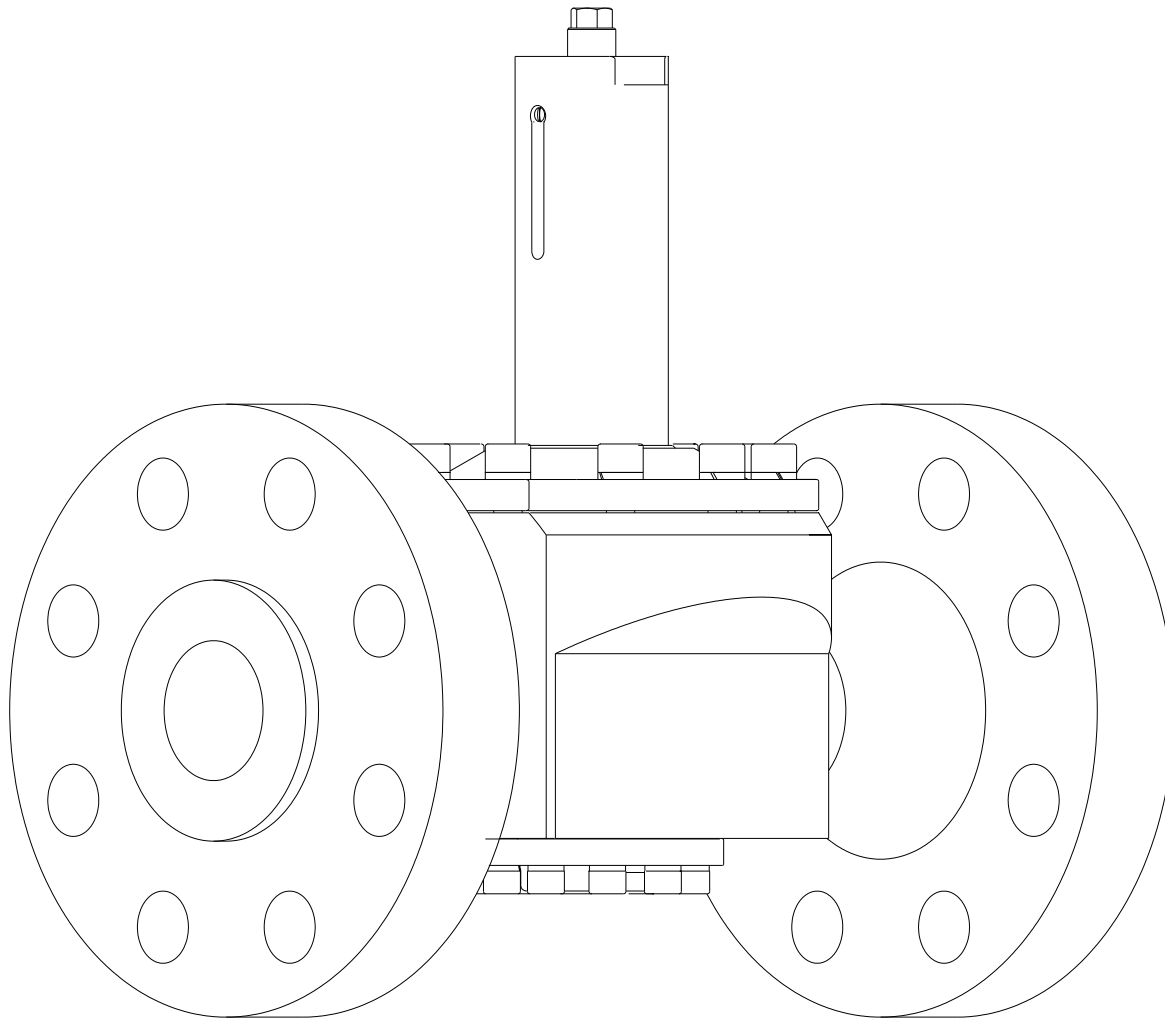
To ensure that the main valve assembly has been correctly and effectively installed it may be required to perform the appropriate seat leak test as per ANSI/FCI 70-2.

## 6.2.2. Accessing the Sensor Assembly

The loading mechanism and sensor assembly for the HF-210 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 ten M10 socket head cap screws (24) which secure the bonnet (22, 29) to the regulator body (19)
- ii. Lift the top works away from the body (19)  
\*Note: The spring rest (24) houses an o-ring (23) which should hold the load spring (25) and adjusting mechanism (26, 27, 28, 30) in place when lifting the top works, however the weight of the spring and mechanism is such that it may overcome this. If this is the case it is recommended that the spring is supported from underneath or the top works is tilted on its side whilst lifting away from the body
- iii. Remove the sensor (17) from the regulator body (9) using pliers  
\*Note: an M6 tapping has been made to facilitate a screw to aid in the removal of this part
- iv. The main valve connector (14) can be removed from the assembly
- v. To access the lower sensor holder o-ring (18) remove the sensor holder (16) from the regulator body (19)  
\*Note: M5 tapping's have been made to facilitate a screw to aid in the removal of this part
- vi. Position the sensor holder (16) into the regulator body (19) ensuring the o-ring (15) is suitably greased
- vii. Insert the main valve connector (14) ensuring that it locates into the seat fastener (8)
- viii. Carefully push the sensor (17) into the sensor holder (16) ensuring that the o-ring (18) is suitably greased
- ix. Press firmly down on the sensor (17) to confirm that it is acting against the main valve assembly  
\*Note: The sensor should spring back and feel smooth and responsive
- x. With the load spring (25) and spring rest (24) in place, take the top works and carefully place onto the regulator body (19) aligning the holes on the PCD
- xi. Secure the ten M10 socket head cap screws (24) in place and tighten securely (recommended torque 24Nm)

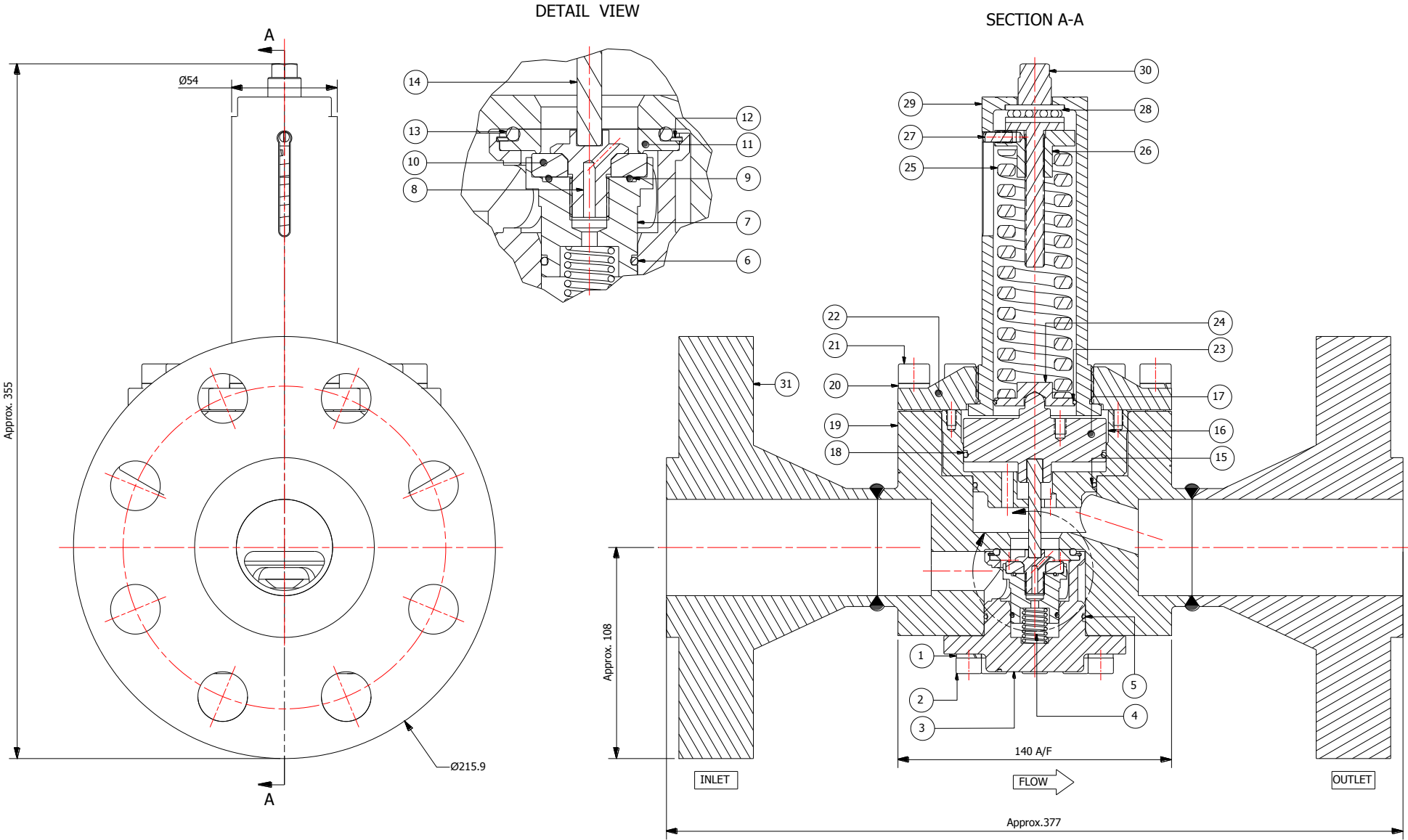
### 6.2.3. Figure 1 – 3D View and BOM of the HF-211



PARTS LIST		
ITEM	PART NUMBER	DESCRIPTION
1	FIT-M8-A4-SPR-WASHER	SPRING WASHER
2	FIT-M8-25-A4-80.0-SKT-CAP	CAP SCREW
3	PT-HF-210-001	BOTTOM NUT
4	PT-HF-300-001	VALVE SPRING
5	OR-0480-20	O' RING STD
6	OR-0210-20	O' RING STD
7	PT-HF-210-004	SOFT SEAT RETAINER BALANCED
8	PT-HF-210-011	SEAT FASTENER
9	OR-BS4518-0191-16	O' RING STD
10	PT-HF-210-005-001	SOFT SEAT
11	PT-HF-210-003	METAL SEAT
12	CIRC-XVH181-S16	SPIRAL RING
13	OR-0355-35	O' RING STD
14	PT-HF-211-003	MAIN VALVE CONNECTOR
15	OR-BS4518-0586-24	O' RING STD
16	PT-HF-211-002-002	73mm SENSOR HOLDER
17	PT-HF-211-007	73mm SENSOR
18	OR-BS147	O' RING STD
19	PT-HF-210-N-16WF-S080-SS	BODY - N PORTING
20	FIT-M10-A4-SPR-WASHER	WASHER
21	FIT-M10-40-A4-80.0-SKT-CAP	CAP SCREW
22	PT-HF-211-001	LOWER BONNET
23	OR-0350-20	O' RING STD
24	PT-C-095-001	SPRING REST - DOME
25	SPR-A40-127	SILVER LOAD SPRING
26	PT-C-045	ADJUSTING NUT
27	PT-C-046	SET SCREW
28	BEAR-51103-SS	SS BALL BEARING
29	PT-HF-250-002	UPPER BONNET
30	PT-HF-300-011	ADJUSTING SCREW
31	FLA-16WN-ASME-CL1500-S080-RF	ASME Flange 2" - Class 1500 - Sch80 - Weld Neck - F316 - Rise Face



6.2.4. Figure 2 – Sectional View of the HF-211



## 6.3. Servicing the Pilot Dome Loaded Regulators

### 6.3.1. Accessing the Sensor Assembly of the HF-211 Dome Option

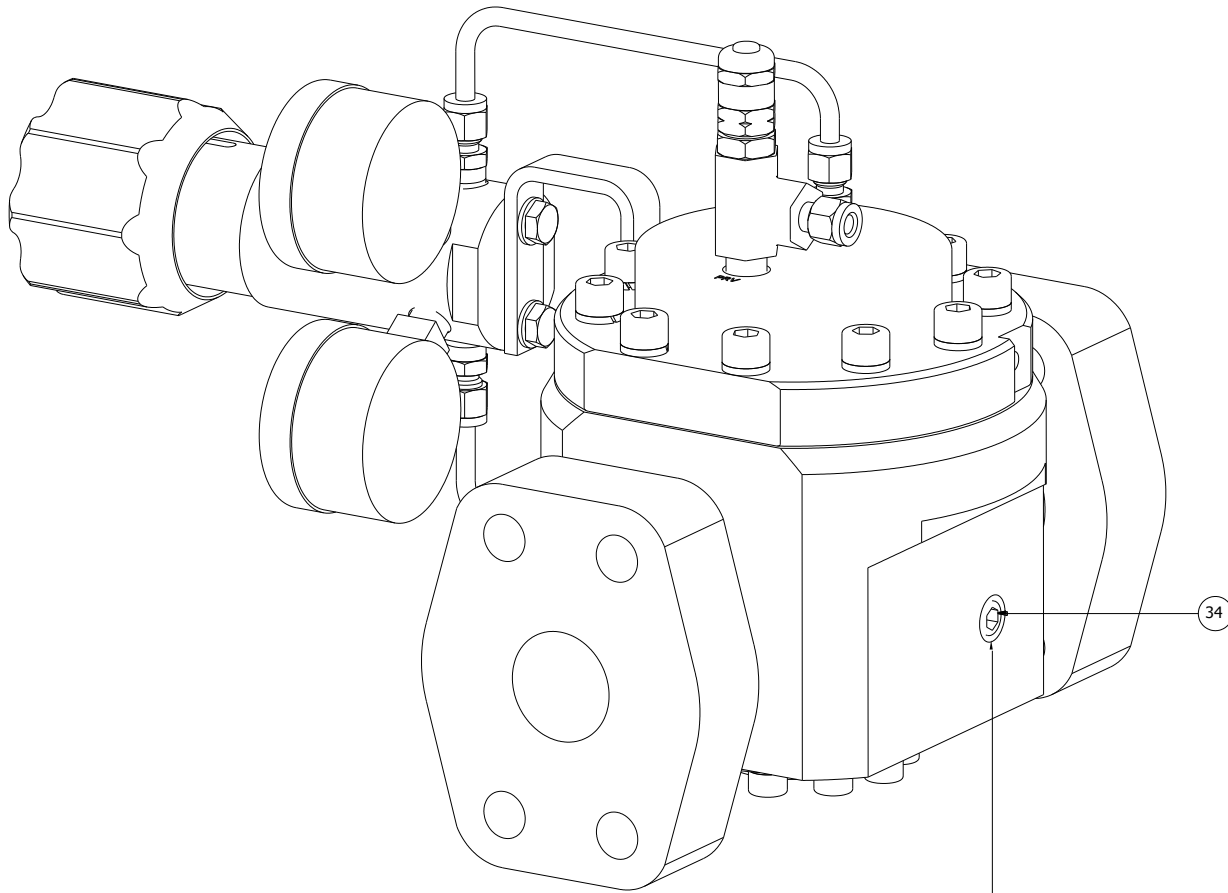
\*Note: fig 3 and 4 should be used as a reference for the following set of instructions

The sensor assembly for the HF-211 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 (28) by loosening the compression fittings at point C and D using a 9/16" open ended spanner
- ii. Disconnect the Pilot Regulator (27) from the upstream tube (26) by loosening the compression fitting at point B
- iii. Whilst supporting the pilot regulator (27), disconnect the pilot bracket (29) from the bonnet (22) by removing the M8 hex screw (31) and lift the pilot away from the assembly
- iv. Loosen and remove the ten M10 socket head cap screws (21) and lift the bonnet (22) away from the assembly
- v. Remove the sensor (17) from the assembly
- vi. Remove and inspect the main valve connector (14)
- vii. To access the lower sensor holder o-ring (15) remove the sensor holder (16) from the regulator body (19)  
\*Note: M6 tapping's have been made to facilitate a screw to aid in the removal of this part
- viii. Using appropriate lubrication for the o-ring (15) carefully fit the sensor holder (16) into the regulator body (19)
- ix. Replace the main valve connector (14) ensuring that it locates onto the seat fastener (8)
- x. Replace the two o-rings (18) (of same size) on the sensor (17) and place into the sensor holder (16)
- xi. Press firmly down on the sensor (17) to confirm that it is acting against the main valve assembly  
\*Note: The sensor should spring back and feel smooth and responsive
- xii. Replace the o-ring (23) around the top of the sensor holder (16)
- xiii. Position the bonnet (22) carefully over the sensor holder (16), aligning the holes on the PCD to those on the body.  
\*IMPORTANT: Ensure the correct orientation of the bonnet by aligning the mount positions for the pilot regulator bracket with the pilots' pipe connections on the regulator body. The port on the top of the bonnet marked 'PRV' should be on the downstream side of the regulator
- xiv. Secure the ten M10 socket head cap screws (21) in place and tighten securely (recommended torque 24Nm)
- xv. Position the inlet connection of the pilot regulator (28) to point B of the upstream tube (26) and locate and secure the M8 hex screw (31) into the pilot bracket (29)
- xvi. Connect the upstream tube (26) to point B and the downstream tube (28) 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

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

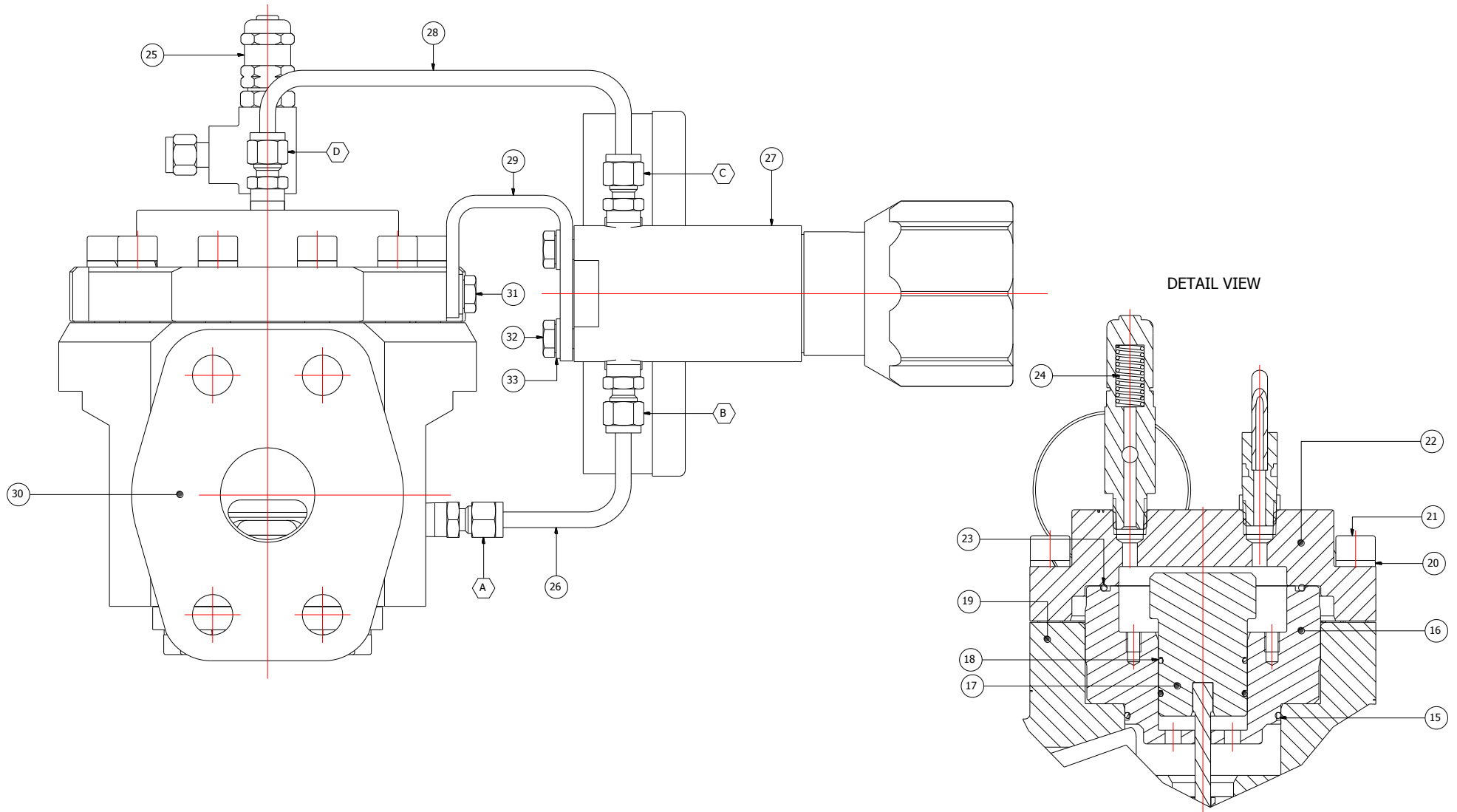
### 6.3.2. Figure 3 – 3D View and BOM of the HF-211 Pilot Dome Loaded Regulator



PARTS LIST		
ITEM	PART NUMBER	DESCRIPTION
1	FIT-M8-A4-SPR-WASHER	SPRING WASHER
2	FIT-M8-25-ZP-12.9-SKT-CAP	CAP SCREW
3	PT-HF-210-001	BOTTOM NUT
4	PT-HF-300-001	VALVE SPRING
5	OR-0480-20	O' RING STD
6	OR-0210-20	O' RING STD
7	PT-HF-210-004	SOFT SEAT RETAINER BALANCED
8	PT-HF-210-011	SEAT FASTENER
9	OR-BS4518-0191-16	O' RING STD
10	PT-HF-210-005-001	SOFT SEAT
11	PT-HF-210-003	METAL SEAT
12	CIRC-XVH181-S16	SPIRAL RING
13	OR-0355-35	O' RING STD
14	PT-HF-211-003	MAIN VALVE CONNECTOR
15	OR-BS4518-0586-24	O' RING STD
16	PT-HF-211-005	1:1 SENSOR HOLDER
17	PT-HF-211-006	1:1 SENSOR (36mm)
18	OR-0320-20	O' RING STD
19	PT-HF-210-13-N-SS-16WF-SXXS-001	BODY - N PORTING
20	FIT-M10-A4-SPR-WASHER	SPRING WASHER
21	FIT-M10-50-ZP-12.9-SKT-CAP	CAP SCREW
22	PT-HF-210-012	DOME BONNET
23	OR-BS641-NBR-70	O' RING STD
24	SLOK-177-R3A-K1-E	BROWN SPRING R3A SERIES
25	SLOK-SS-4R3A1	RELIEF VALVE
26	FIT-T-H200-04-016-SS-001A	PILOT REGULATOR UPSTREAM TUBE
27	LF540-01-SS-165S-N-02N-A-SV	LOW FLOW REGULATOR
28	FIT-T-H200-04-016-SS-001B	PILOT REGULATOR DOWNSTREAM TUBE
29	PT-HF-210-014	LF540 PILOT REGULATOR BRACKET
30	FLA-GFX406STU-XXS	2\" SAE FLANGE
31	FIT-M8-16-A4-70.0-HEX-CAP	HEX HEAD SCREW
32	FIT-M8-14-A4-70.0-HEX-CAP	HEX HEAD SCREW
33	FIT-M8-A4-FLT-WASHER	PLAIN WASHER
34	SLOK-SS-4-HP	1/4\" NPT PLUG

1/4" NPT PILOT CONNECTION TO HF211 REGULATOR LOCATED AT EACH SIDE  
TO ENABLE CUSTOMER TO MOVE PILOT REGULATOR TO PREFERRED SIDE OF PIPEWORK  
**IMPORTANT - PLUG THE SIDE NOT IN USE (1/4" NPT)**

6.3.3. Figure 4 – Sectional View of the HF-211 Pilot Dome Loaded Regulator



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## 7. Technical Data

Fluid Media:	All gases and liquids compatible with materials of construction
Max Inlet Pressure:	Nominal 210 bar
*Min Inlet Pressure:	50 bar
Outlet Pressure Range:	HF-210: 0-10 bar HF-211: 0-25 bar HF-211: 0-200 bar (Pilot Dome Loaded)
Operating Temperature:	Nominal -20°C to +80°C
Materials:	Body and Trim: 316 SS Diaphragm: Nitrile Seat: PCTFE or PEEK
Flow Capacity (Cv):	13
Leakage:	Liquid: Zero drops of water at max inlet Gas: Bubble tight (*Minimum Supply Pressure 50 bar)

## 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.