



THE LF-310 SERIES

Operating and Service Manual

Series includes all variants of LF-310 and CYL-310

Issue B
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1. Description

The LF-310 series has been designed with quality and reliability in mind, with genuinely unique features designed into this single stage regulator. Finite Element Analysis, combined with physical cycle tests, created an Inconel X750 diaphragm that lasts 50% longer than typical stainless-steel designs. The metal diaphragm means that leak integrity is maintained, and that no sample media is absorbed by the sensing element - reducing purge times between sample analyses. A Brass machined Washer also ensures no torsional load is applied to the diaphragm during assembly. The unique soft seat design ensures particles flow over its surface, rather than perpendicular to it, which helps minimise damage from potential particles in the system.

The LF-310 incorporates a disk type main valve arrangement, which allows a Maximum Working Pressure of 300 bar (4350 Psi) or 414 bar (6000 Psi) when fitted with a PEEK seat and is capable of accurately controlling outlet pressures of up to 35 bar (510 Psi).

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 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' and National Pipe Thread (NPT) 'N' options are available on this regulator. Use the correct dowty or bonded seal for BSPP connections, self-centring 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 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

The LF-310 series are non-venting type regulators; therefore, the outlet pressure shall be reduced by venting downstream of the regulator whilst simultaneously turning the adjusting mechanism anti-clockwise.

The LF310 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 downstream 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 LF-310 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.
- **Loctite 243 Thread Locker:** For section 6.1.2 (Step: xvi)

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.

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.

We recommend that the filter should be removed and the vent port should be piped off to safe location or drain and should not point towards the operator during **service work**, if using a hazardous media through the regulator.

6.1. Servicing the LF-310

*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):

Disassembly

- i. With the flats of the Regulator Body (9) secured in a vice, loosen* the Bonnet (15) using a 47mm wrench ensuring that the Hand Wheel (21) is fully wound anti clock wise (**Ref. 6.1.2*)
*NOTE: That the Bottom Nut has been torqued to 160Nm.
- ii. Remove the Upper Spring Rest (17), 10mm Ball Bearing (1), Load Spring (14), Diaphragm Washer (16), Lower Spring Rest (18) and Diaphragm (13) from the assembly.
- iii. The Seat Nut (12) can then be removed using a 12mm socket.

- iv. Remove and replace the 9x1 O-ring (7) and 6x1 O-ring (7) from the assembly.
- v. Remove the Soft Seat (23) and visually inspect the sealing face for any protentional contamination or damage. Replace where necessary
- vi. Lift/remove the Main Valve (10), along with the Main Valve Spring (11), away from the assembly.
- vii. Visually inspect the Main Valve (10), sealing face (cone), for any protentional contamination or damage and replace where necessary.

Re-assembly

- viii. Place the Main Valve Spring (11), over the lower stem Main Valve (10) and place both parts into the regulator body (9)
- ix. Guide the Soft Seat* (23) over the upper stem of the Main Valve (10) and into the regulator body (9).
*NOTE: Taking care not to damage its sealing face against the tip of the valve.
- x. Place the 6x1 O-ring (6) onto the O-ring groove of the Soft Seat (23).
- xi. Place the 9x1 O-ring (7) onto the O-ring groove of the Regulator Body (9).
- xii. Guide the Seat Retainer (12), over the upper stem of the Main Valve (10) and screw/tighten into the regulator body (9), using a 12mm socket and torque to 17Nm.
- xiii. To ensure positive sealing, it is recommended that a new Diaphragm (13) is placed centrally into Regulator Body (9) ensuring that the outermost convolutions are facing towards the Bonnet (15)
- xiv. Replace the 21x1 mm O-ring (8) around the Lower Spring Rest (18) and insert* into the Diaphragm Washer (16), then place on top of the Diaphragm (13).
*NOTE: Ensure that the Lower Spring Rest (18) is correctly orientated within the Diaphragm Washer (16) (*Ref. 6.1.3).
- xv. Place the Load Spring (14), Upper Spring Rest (17) and 10mm Ball Bearing (1) to the assembly
- xvi. Screw the Bonnet (15) onto the assembly and using a torque wrench with a 47mm open ended attachment, tighten to 160Nm

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.

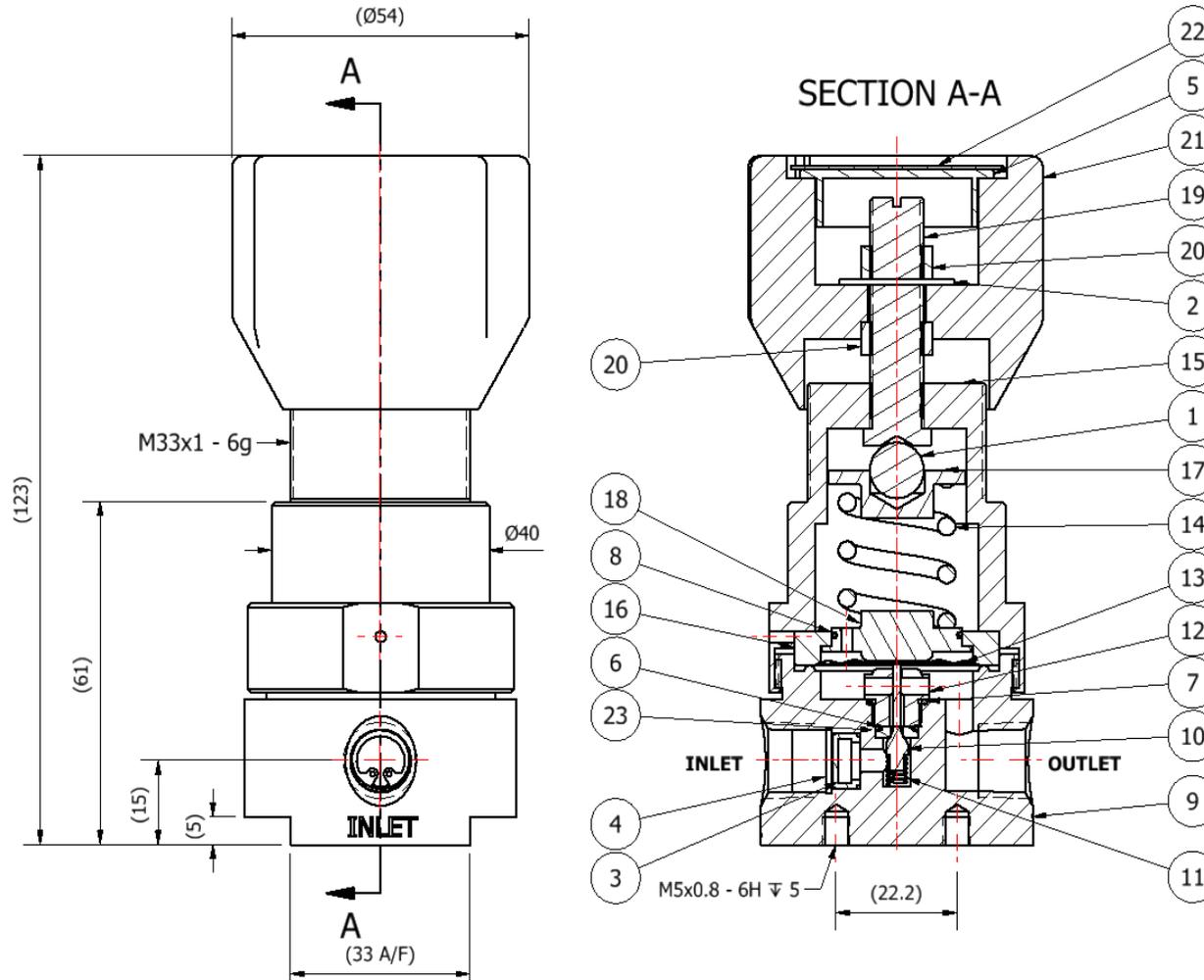
6.1.2. Adjusting the Set Point

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 (22) and Cap (5) from the Hand Wheel (21) and loosen the Upper Lock Nut (20) such that the Hand Wheel (21) / Crinkle Washer (2) are able to spin freely on the Adjusting Screw (19).
- 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 (9) secured in a vice apply the Maximum Working Pressure (MWP) to the Inlet of the regulator.
- 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 (19) 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 (20) to the base of the Adjusting Screw (11) against the Bonnet (15).
- viii. Position the Hand Wheel (21) onto the Lower Lock Nut (20). Ensure that the Lock Nut and Hand Wheel become engaged.
- ix. Fasten the Upper Lock Nut (20) against the Hand Wheel (15) / Crinkle Washer (2) and gently begin to tighten using a 13mm socket until it begins to secure itself.
- x. At this point, whilst holding the Hand Wheel (21) continue to tighten whilst simultaneously turning slightly anti-clockwise to prevent it from locking against the Bonnet (15).
- xi. Ensure that the Upper Lock Nut (20) is sufficiently tightened, taking care not to adjust the set point.
- xii. Turning of the Hand Wheel (21) should now also turn the Adjusting Screw (19) 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 (20), so that the Loctite penetrates the thread, where the nut makes contact with the adjusting screw (19).
- xvii. The Cap (5) and Nameplate (22) can now be placed into the Hand Wheel (21). Ensure that the information stated on the Nameplate is in accordance with the set pressure of the regulator

* ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE STATED.

6.1.3. Figure 1 – Sectional View of the LF-310



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	BALL-010-SS-316	BALL BEARING
2	1	FIT-M10-A2-CRI-WASHER	CRINKLE WASHER
3	1	FILT-SCRM7101040S	10MM DIA SCREEN FILTER
4	1	FIT-472011-SS-CIRCLIP	CIRCLIP
5	1	FIT-CAP-4343092	NAMEPLATE CAP
6	1	OR-0060-10	O' RING STD
7	1	OR-0090-10	O' RING STD
8	1	OR-0210-10	O' RING STD
9	1	PT-50-N-SS-002	BODY - N PORTING
10	1	PT-C-001-023	MAIN VALVE - SOLID
11	1	PT-C-006-002	MV COMPRESSION SPRING
12	1	PT-C-007-015	SEAT RETAINER
13	1	PT-C-010-002	DIAPHRAGM
14	1	PT-C-011-004	LOAD SPRING
15	1	PT-C-015	BONNET
16	1	PT-C-016	DIAPHRAGM WASHER
17	1	PT-C-017	UPPER SPRING REST
18	1	PT-C-018-002	BOTTOM SPRING REST
19	1	PT-C-019-003	ADJUSTING SCREW
20	2	PT-C-020	LOCKNUT
21	1	PT-C-021	SMALL HANDWHEEL
22	1	PT-C-022	NAMEPLATE
23	1	PT-C-205-002	PCTFE SEAT

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7. Technical Data

Fluid Media:	All gases and liquids compatible with materials of construction
Max Inlet Pressure*:	414 bar (6,000 Psi) (with PEEK Seat) 300 bar (4350 Psi) (with PCTFE Seat)
Outlet Pressure Range:	0-35 bar
Operating Temperature:	-20°C to +80°C
Materials:	Body and Trim: 316 SS (Other Materials available) Diaphragm: Inconel X750 Seat: PCTFE / PEEK® / PTFE / FEP
Flow Capacity (Cv):	0.06 (also available in 0.15 see 'Annex A')
Leakage:	Gas: Bubble tight

*Max Inlet Pressure determined by seat material and Cv of regulator.

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.

Pressure Tech (Head Office and Registered Office):

Unit 24 Graphite Way, Hadfield, Glossop, Derbyshire, SK13 1QH.

Telephone: +44 (0)1457 899 307

Email: sales@pressure-tech.com

Annex A. LF-310 – ‘Compression Seat’ Main Valve Design

A.1. Description

The ‘Compression Seat’ type main valve assembly was introduced as an alternative to combat the need for applications, where O-rings aren’t suitable. This option only allows for a Maximum Working Pressure of 50 Bar (725 Psi) and a Cv of 0.15

A.2. Servicing

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

The servicing of the LF-310 regulator should be performed in line with the service instructions as defined in Section 6 of this manual, taking account for the difference in valve assembly. The figures below detail the alternate main valve assembly for reference purposes only.

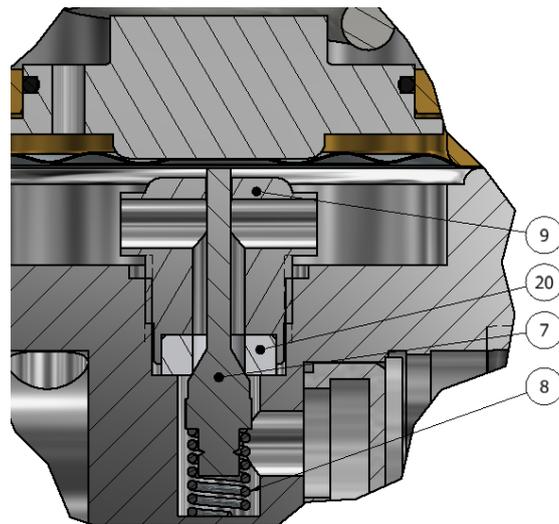
Disassembly

- i. The Seat Nut (9) can then be removed using a 12mm socket.
- ii. Remove the Compression Seat (20) from the *Seat Nut (9).
*NOTE: visually inspect the sealing face of the Seat nut (9) for any protentional contamination or damage. Replace where necessary.
- iii. Lift/remove the Main Valve (7), along with the Main Valve Spring (8), away from the regulator body (9).
- iv. Visually inspect the Main Valve (7) sealing face (cone), for any protentional contamination or damage and replace where necessary.

Reassembly

- v. Place the Main Valve Spring (8), over the lower stem Main Valve (7) and place both parts into the regulator body (9).
- vi. Guide the Soft Seat (20) into the seat nut (9), with the external chamfer leading into the seat nut.
- vii. Guide both the Soft Seat* (20) and seat nut (9) over the upper stem of the Main Valve (7) and screw/tighten into the regulator body (9), using a 12mm socket and torque to 17Nm.
*NOTE: Taking care not to damage its sealing face against the tip of the valve.

A.2.1. Figure 2 – Detail A: LF-310 ‘Compression Seat’ MVA (sectional)



A.2.2. Figure 3 – Exploded View of LF-310 ‘Compression Seat’ MVA

