



THE LW351 SERIES

Operating and Service Manual

Series includes LW351-06-A-XX-X-K-XX-XXXX

Issue 002

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1. Description

The LW351 is a piston-sensed pressure regulator, designed specifically to provide constant pressure supply to the hydrogen fuel cell for lightweight applications. With a low 0.15% decaying pressure effect, it offers accurate control in a single-stage pressure reduction.

Pressure Equipment Directive (PED) 2014/68/EC Declaration

This pressure regulator is designed and manufactured in accordance with Sound Engineering Practice (SEP) Article 4, Paragraph 3 of the directive 2014/68/EC. As such, CE marking must not be applied. The equipment is marked under section 3.3 of Essential Safety Requirements of the directive.

2. Installation

Important: Please note that this pressure regulator is supplied as a 'pressure accessory' and not a 'safety accessory'. As such a suitably sized pressure relief device is required on the downstream of the LW351.

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 system service pressure.

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*

Select the correct size and type of connection fittings for each relevant port, as indicated in the regulators part number and also in-line with the product data sheet. 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 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 LW351 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.

Sudden dynamic high-pressure inlet pressures should be avoided, and preferably the inlet pressure should be gradually increased to protect against damage to the regulator. Any resonating within regulator may cause the regulator to malfunction and it is not recommended to be used under these conditions.

Periodic inspection and scheduled maintenance of your equipment is required for continued safe operation.

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

Important: if the regulator has been supplied with an integrated **Manual Isolation Valve (MIV)** or **Solenoid Valve** on the downstream of the regulator, please ensure that a suitably sized pressure relief device has been fitted to the additional downstream port of the LW351.

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

The following section takes examples of the LW351 with the aim of covering most options available. The product supplied may vary from these examples. Should any assistance be required then please do not hesitate to contact the office.

Servicing and maintenance work on the LW351 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 themselves or others by working on this regulator without prior knowledge on the Health and Safety concerns relating to handling of group 1 gases as defined by 97/23/EC. Any uncertainty should be clarified with Pressure Tech before working on the regulator.

Pressure Tech Ltd recommends the use of the following Lubricants/Adhesives (*or equivalent*) during servicing:

- **Krytox GPL 205 lubricant:** For the O-rings and adjusting screw thread.

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
- Ensure that the service engineer has the relevant *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.

6.1. Servicing the LW351

*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 (1) secured in a vice, ensuring that the Adjusting Screw (7) is fully wound anti-clockwise (**Ref. 6.1.2*), loosen and remove the Bonnet Assembly (7, 9, 12, 15) using a 27mm wrench
- ii. Remove the Upper Spring Rest (10) and Load Spring (11)
- iii. Using needle nosed pliers, remove the sensor assembly (8,17)
- iv. The Seat Retainer (3), Soft Seat (2) and O-ring (19) can then be removed using a 12mm socket.

- v. Visually inspect the O-ring (19) and soft seat (2) for any potential damage.
- vi. Remove the Main Valve (4) and Main Valve Spring (6) from the regulator body (1)
- vii. Visually inspect the Main Valve (4) for any potential damage under a microscope
- viii. Remove the support ring (5) and the main valve O-Ring (16)

Reassembly

- i. Place the O-ring (16) into the regulator body (1), followed by the support ring (5).
- ii. Place the Main Valve Spring (6) and Main Valve (4), into the Regulator Body (1).
- iii. Place the O-ring (19) into the regulator body (1).
- iv. Guide the Soft Seat (2) (*with the raised face leading into the regulator body*), *over the stem of the Main Valve (4) and locating onto the O-ring (19).
***Note:** *taking care not to damage its sealing face against the tip of the valve.*
- v. Guide the Solid Disk Seat (3), over the stem of the Main Valve (4), then screw into the regulator body (1) and tighten to 4.5Nm, using a 12mm socket.
- vi. Replace the O-ring (17) from around the sensor (8), then place the sensor assembly (8,17), into the Regulator Body (1).
- vii. Position the Load Spring (11) around the top of sensor (8) and place the Upper Spring Rest (10) on the to the assembly.
- viii. Screw the Bonnet assembly (7, 9, 12, 15) into the Regulator Body (1) and using a torque wrench with a 27mm open ended attachment, tighten to 15Nm.

It is recommended that all parts in the repair kits are used. Any defective 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.

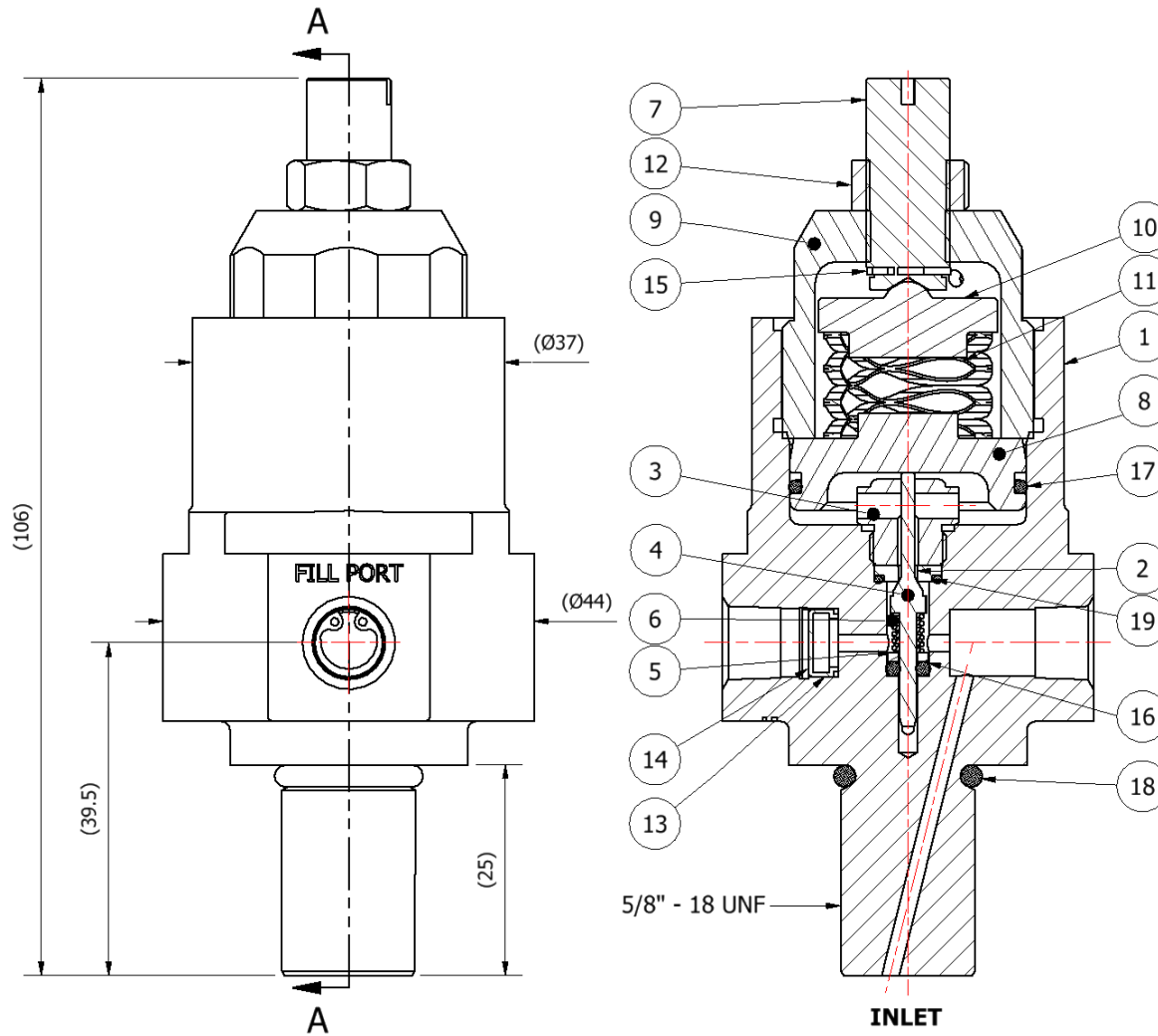
To ensure that the main valve assembly has been correctly and effectively installed it may be required to perform the appropriate seat leak test as per ANSI/FCI 70-3 Class VII.

6.1.2. Adjusting the Set Point

- i. Loosen the Lock Nut (12), from the Adjusting Screw (7).
- 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 (1) secured (either in a vice or other safe means of securing the regulator) apply the Maximum Working Pressure (MWP) to the Inlet (Q1C = 5/8"-18 UNF or Q2C = M18 base stem) 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 (7) 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 *Lock Nut (12) to the base of the Adjusting Screw (7) and tighten against the top of the Bonnet (9)
**Note: Ensure that the Lock Nut (12) is sufficiently tightened, taking care not to adjust the set point.*
- viii. If the set point is not correct, repeat steps v. to vii.
- ix. Isolate the upstream pressure, then allow pressure to be released by opening the downstream valve until flow diminishes completely – then the regulator can be removed from test set up.

* ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE STATED.

6.1.3. Figure 1 – Sectional View of the LW351



PARTS LIST		
ITEM	PART NUMBER	DESCRIPTION
1	PT-LW351-Z-01C-A-XXX	BODY - 'C' PORTING
2	PT-LW-351-006	PCTFE SOFT SEAT
3	PT-C-007-015	SEAT RETAINER
4	PT-MINI-301-UHP-009-001	METAL MAIN VALVE
5	PT-C-185	SS SUPORT RING
6	PT-C-006-002	MV COMPRESSION SPRING
7	PT-LW351-001	ADJUSTING SCREW
8	PT-LW351-005	28mm SENSOR
9	PT-LW351-003	LW351 BONNET
10	PT-LW351-002	UPPER SPRING REST
11	SPR-YCMS20-H4S17-X	LOAD SPRING
12	PT-C-020	LOCKNUT
13	FILT-SCRM3803040S	8mm DIA SCREEN FILTER
14	FIT-472008-SS-CIRCLIP	CIRCLIP
15	FIT-D1400-0090	CIRCLIP
16	OR-BS004	O' RING STD
17	OR-0251-16	O' RING STD
18	OR-BS1806-112	O' RING STD
19	OR-0060-10	O' RING STD

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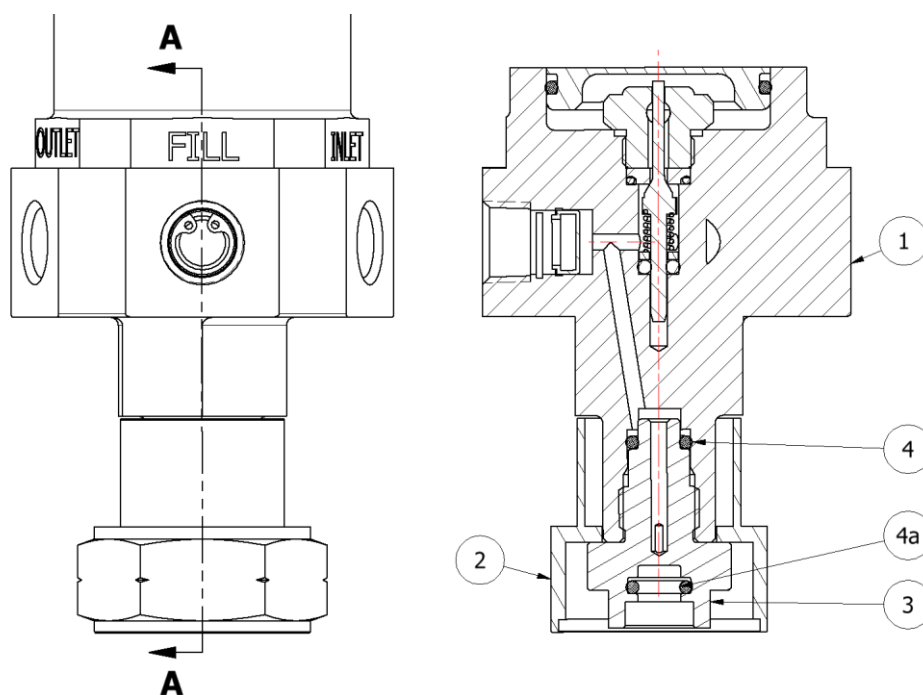
6.2. Servicing the LW351 with VCA Connection

Disassembly

- i. Secure the LW351 within a vice against the flats of the Regulator Body (1) and undo the Cylinder Connector (3) using a 13mm socket & ratchet.
- ii. Remove the Cylinder Retaining Nut (2).
- iii. Ensure that the 5.1x1.6mm O-ring (4) within the internal bore of the base of the Regulator Body (1) is removed.
- iv. Wipe internal bore with a lint-free cloth to remove any dirt and possible cured thread locking compound.

Reassembly

- v. Place the new 5.1x1.6mm O-ring (4) into the internal bore of the base of the Regulator Body (1).
- vi. Place the cylinder Retaining Nut (2) over the stem of the Regulator Body (1).
- vii. Apply a drop of thread locking compound onto the thread of the new *Cylinder Connector (3)
Note: that the new cylinder connector will be supplied with a 5.1x1.6mm O-ring (4a)
- viii. With the LW351 still secured within a vice against the flats of the Regulator Body (1), screw the Cylinder Connector (3) into the base stem of the regulator body and tighten using a 13mm socket & ratchet.



ITEM	QTY	PART No.	DESCRIPTION
1	1	PT-LW351-A-VCA-XXXX	LW351 BODY - VCA
2	1	PT-CV-414-SC-CN-001	CONNECTOR RETAINING NUT M25
3	1	PT-CV-414-SC-RC-001	REGULATOR-CYLINDER CONNECTOR
4/4a	2	OR-0051-16	O-ring

7. Technical Data

Fluid Media:	All gases are compatible with materials of construction
Max Inlet Pressure*:	350 bar (5,075 Psi) (with PCTFE Seat)
Outlet Pressure Range:	0-1 bar (other pressure ranges available are 1-3 bar and 3-5 bar)
Operating Temperature:	-20°C to +80°C
Materials:	Body and Trim: Aluminum 6082 Seat: PCTFE
Flow Capacity (Cv):	0.06
Leakage:	Gas: in accordance with ANSI/FCI 70-3 Class VII

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.

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