



# THE LW-TS414 SERIES

Operating and Service Manual

Series includes all variants of LW-TS414

Issue A  
Feb 2023



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## 1. Description

The LW-TS414 is a lightweight, two-stage piston-sensed regulator, providing stable pressure control under decaying inlet conditions, capable of a maximum 414bar inlet pressure (300bar with PCTFE seat), which can then be reduced down to a maximum 12bar outlet pressure.

Its 'solid disk' seat design is more robust for aggressive or high temperature applications, offering users an extended life cycle."

## 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 recommended on both the inter-stage port (*RLF Port*) and downstream of the LW-TS414.

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. National Pipe Thread (NPT) 'N' options are available as standard on this regulator. 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**

The first stage of the regulator is pre-set at the factory and locked to prevent alteration. The second stage of the regulator, with a PCTFE seat as standard, can be adjusted by the user between various outlet pressures with the selected range. The first pressure reduction acts as the supply to the second stage. As a result, the LW-TS414 regulator is able to provide a stable pressure control under decaying inlet conditions.

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 LW-TS414 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.

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.

### **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 LW-TS414 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 Krytox GPL 205 as a lubricant (*or equivalent*) for O-rings and the Adjusting Screw 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 actuator fully anti-clockwise
- Applications involving toxic, flammable or corrosive media have been fully purged
- Ensure that the service engineer has the relevant Service Repair Kit (*SRK*) for the regulator type that they will be servicing.

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.

It is recommended that all parts in the repair kits are used. Any defect parts removed during the service should be disposed of.

## 6.1. Servicing the LW-TS414

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

### 6.1.1. Accessing the Main Valve Assembly 1<sup>st</sup> Stage

Please be aware that the first stage let down pressure will require re-setting after service.

To access the Main Valve Assembly (MVA):

- i. With the flats of the regulator body (17) secured in a vice\*, use a 13mm open ended spanner to remove the dome nut (22).  
**\*NOTE:** *Soft vice jaws must be used, when securing the body within the vice against flats. Due to the position of the flats, it may be necessary to angle the body in the vice with the 1<sup>st</sup> stage facing upright for access.*
- ii. Using a slotted screwdriver, turn the short adjusting screw (11) anti clockwise until the load from the spring (9) has been released.
- iii. Loosen and remove the 1<sup>st</sup> stage bonnet (13) using a 27mm open ended wrench.
- iv. Remove the upper spring rest (16) and load spring (9) from the assembly.
- v. Remove the sensor (14) (inclusive of O-ring 5), by using pliers to grip the flats of the sensor and lift from the assembly.
- vi. Remove/replace the O-ring (5) from around the sensor (14), ensuring that adequate lubrication is used.
- vii. The seat retainer (8) can then be removed using a 12mm socket.
- viii. Remove the soft seat\* (15) and O-ring (4).  
**\*NOTE:** *inspect the sealing face of the soft seat, for any potential damage and replace where necessary.*
- ix. Remove the main valve\* (6) and main valve spring (7) from the assembly.  
**\*NOTE:** *inspect the sealing cone face of the main valve, for any potential damage and replace where necessary.*

#### Re-assembly

- x. Place the main valve spring (7) over the lower stem main valve (6) and place both parts into the regulator body (17)
- xi. Place the O-ring (4) into regulator body (17).
- xii. Guide the soft seat\* (15) over the upper stem of the main valve (6) and into the regulator body (17), ensuring that the O-ring (4) is seated into the O-ring groove of the soft seat (15).  
**\*NOTE:** *Taking care not to damage its sealing face against the tip of the valve.*
- xiii. Guide the seat retainer (8), over the upper stem of the main valve (6) and screw/tighten into the regulator body (17), using a 12mm socket and torque to 17Nm.
- xiv. Place the sensor (14) (inclusive of O-ring 5), into the regulator body (17).
- xv. Place the load spring (9) onto the sensor (14) and place the upper spring rest (16) onto the top of the load spring (9).
- xvi. Screw the 1<sup>st</sup> stage bonnet (13) onto the assembly and using a torque wrench with a 27mm open ended attachment, tighten to 20Nm.

\*Note: The first stage will now require pressure setting before the regulator can be used (\*Ref. 6.1.3).

### 6.1.2. Accessing the Main Valve Assembly 2<sup>nd</sup> Stage

To access the Main Valve Assembly (MVA):

- i. With the flats of the regulator body (17) secured in a vice\*, use a 13mm open ended spanner to loosen/remove the lock nut (10).  
**\*NOTE:** *Soft vice jaws must be used, when securing the body within the vice against flats. Due to the position of the flats it may be necessary to angle the body in the vice with the 2<sup>nd</sup> stage facing upright for access.*
- ii. Using a slotted screwdriver, turn the short adjusting screw (11) anti clockwise until the load from the spring (9) has been released.
- iii. Loosen and remove the 2<sup>nd</sup> stage bonnet (13) using a 27mm open ended wrench.
- iv. Remove the upper spring rest (12) and load spring (20) from the assembly.
- v. Remove the sensor (14) (inclusive of O-ring 5), by using pliers to grip the flats of the sensor and lift from the assembly.
- vi. Remove/replace the O-ring (5) from around the sensor (14), ensuring that adequate lubrication is used.
- vii. The seat retainer (8) can then be removed using a 12mm socket.
- viii. Remove the soft seat\* (15) and O-ring (4).  
**\*NOTE:** *inspect the sealing face of the soft seat, for any potential damage and replace where necessary.*
- ix. Remove the main valve\* (6) and main valve spring (7) from the assembly.  
**\*NOTE:** *inspect the sealing cone face of the main valve, for any potential damage and replace where necessary.*

#### Re-assembly

- i. Place the main valve spring (7) over the lower stem main valve (6) and place both parts into the regulator body (17)
- ii. Place the O-ring (4) into regulator body (17).
- iii. Guide the soft seat\* (15) over the upper stem of the main valve (6) and into the regulator body (17), ensuring that the O-ring (4) is seated into the O-ring groove of the soft seat (15).  
**\*NOTE:** *Taking care not to damage its sealing face against the tip of the valve.*
- iv. Guide the seat retainer (8), over the upper stem of the main valve (6) and screw/tighten into the regulator body (17), using a 12mm socket and torque to 17Nm.
- v. Place the sensor (14) (inclusive of O-ring 5), into the regulator body (17).
- vi. Place the load spring (20) onto the sensor (14) and place the upper spring rest (12) onto the top of the load spring (20).
- vii. Screw the 2<sup>nd</sup> stage bonnet (13) onto the assembly and using a torque wrench with a 27mm open ended attachment, tighten to 20Nm.

**\*NOTE:** *The first stage will now require pressure setting before the regulator can be used (\*Ref. 6.1.3)*

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.

### 6.1.3. Re-setting the First Stage

The following instruction should only be performed after complete reassembly of the regulator as per 6.1.1 and 6.1.2.

- i. Secure the regulator firmly in a vice\* and install correct fittings to the regulator inlet port and inter-stage port (*relief port*).  
*\*NOTE: Soft vice jaws must be used, when securing the body within the vice against flats. Due to the position of the flats, it may be necessary to angle the body in the vice with the 1st stage facing upright for access.*
- ii. Connect upstream pipe work and connect a suitable pressure gauge to the inter-stage port.
- iii. Remove the dome nut (22), using a 13mm spanner.
- iv. Ensuring that the adjusting screw (11) of the first stage is completely wound off, apply inlet pressure up to the maximum working pressure allowed by the seat material (*\*Ref. Section 7.*)
- v. Use a slotted screwdriver to increase the outlet pressure of the first stage by turning the short adjusting screw (11) (this will be seen on the pressure gauge via the inter-stage port).
- vi. For second stage pressure ranges <1 Bar, increase until ~12 Bar is achieved on the first stage.
- vii. When the pressure has been set, install the dome nut (22) onto the adjusting screw (11) to lock and set.
- viii. Isolate pressure supply to the regulator and then gradually deplete all the pressure from the regulator.
- ix. Ensure that the relief port is plugged using the hex hollow plug (21) after re-setting.

**Note:** *It is recommended that where possible, a pressure relief valve is installed in the relief port. The relief valve should be set approximately 4 Bar higher than the set point of the first stage. This relief valve would protect the second stage in the event of a potential seat failure.*



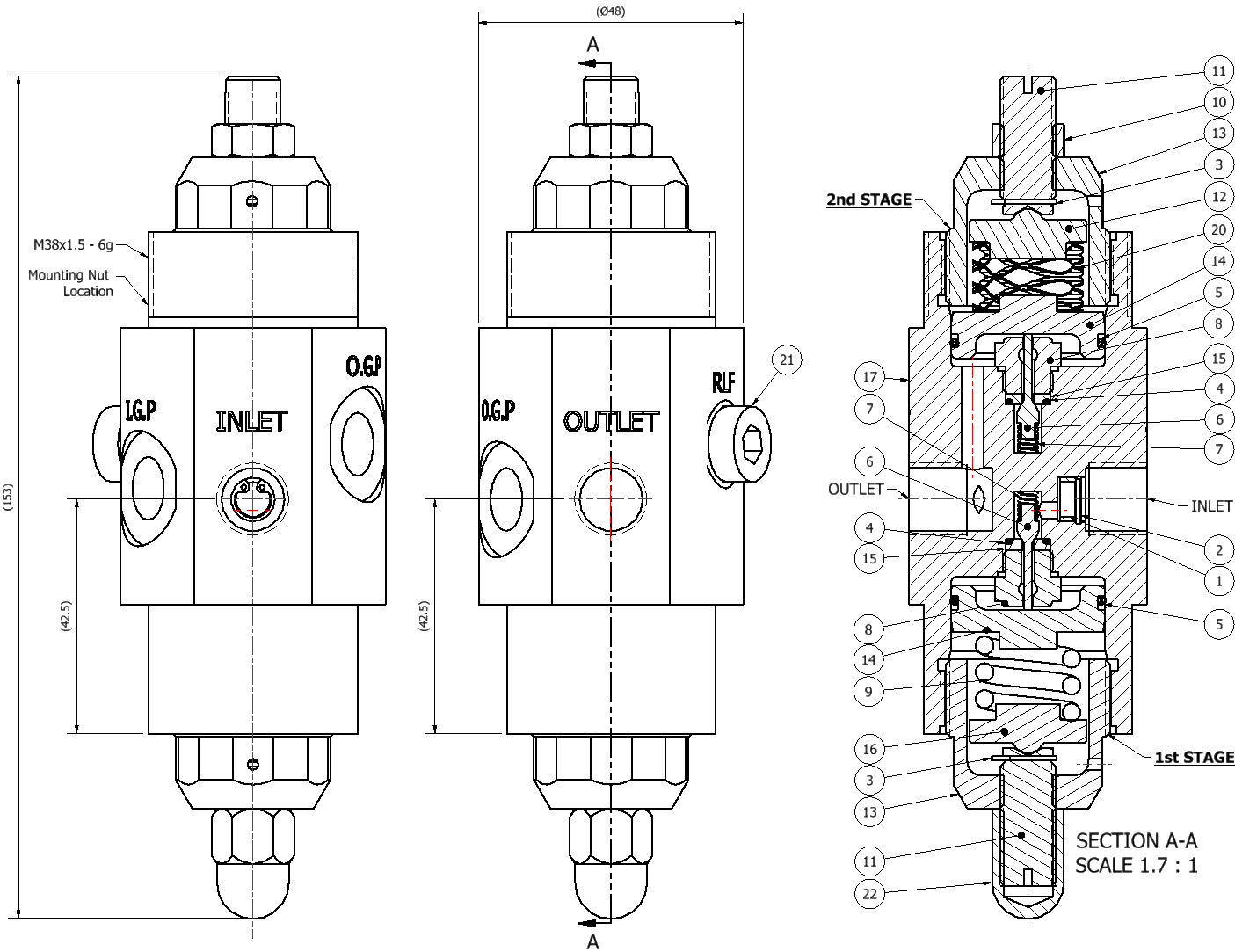
#### 6.1.4. Adjusting the Set Point

**Note:** *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. Secure the regulator firmly in a vice\* and install correct fittings to the regulator inlet port and inter-stage port (*relief port*).  
**\*NOTE:** *Soft vice jaws must be used, when securing the body within the vice against flats. Due to the position of the flats, it may be necessary to angle the body in the vice with the 2nd stage facing upright for access.*
- i. Loosen the lock nut (10) such that it is able to spin freely on the adjusting screw (11).
- ii. Connect the correct test fittings to the Inlet and Outlet ports of the regulator.  
**NOTE:** *Ensure that any gauge ports are plugged or that the correct gauge is fitted.*
- iii. Gradually 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 (11) clockwise until the desired set point has been reached.
- vi. Ensure repeatability by allowing flow through the regulator using the downstream ball/needle valve.
- vii. With the outlet pressure set, screw the lock nut (10) to the base of the adjusting screw (11) against the bonnet (13) and ensure that the lock nut (10) is sufficiently tightened, taking care not to adjust the desired set point.
- viii. If the set point is not correct, repeat steps v. to viii.
- ix. Isolate the upstream pressure, then allow all the pressure to be depleted by opening the downstream ball/needle valve until flow diminishes completely – then the regulator can be removed from test set up.

6.1.5. Figure 1 – Sectional View of the LW-TS414

\*ALL DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE STATED



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	FILT-SCRM7801040S	SCREEN FILTER - 8mm
2	1	FIT-472008-SS-CIRCLIP	INTERNAL CIRCLIP - 9mm
3	2	FIT-471009-SS-CIRCLIP	EXTERNAL CIRCLIP - 9mm
4	2	OR-0060-10	O' RING STD
5	2	OR-BS4518-0251-16	O' RING STD
6	2	PT-C-001-023	MAIN VALVE - SOLID
7	2	PT-C-006-002	MAIN VALVE SPRING
8	2	PT-C-007-015	SEAT RETAINER
9	1	PT-C-011-020	LOAD SPRING
10	1	PT-C-020-003	LOCKNUT
11	2	PT-LW-351-001	ADJUSTING SCREW
12	1	PT-LW-351-002	UPPER SPRING REST
13	2	PT-LW-351-003	LW351 BONNET
14	2	PT-LW-351-005	LW351 SENSOR - 28mm
15	2	PT-LW-351-006	PCTFE SEAT
16	1	PT-LW-351-009	UPPER SPRING REST
17	1	PT-LW-TS414-A-02B-X1	BODY
20	1	SPR-YCMS20-H4S17-X	LOAD SPRING
21	1	SLOK-SS-4-HP	HOLLOW HEX PLUG 1/4" NPT
22	1	PT-TS-300-004	DOME NUT

## 7. Technical Data

<b>Fluid Media:</b>	All gases and liquids compatible with materials of construction
<b>Max Inlet Pressure*:</b>	300 bar (4350 Psi) (with PCTFE Seat) 414 bar (6,000 Psi) (with PEEK Seat)
<b>Outlet Pressure Range:</b>	0-1 bar
<b>Operating Temperature:</b>	-20°C to +80°C
<b>Materials:</b>	Body and Trim: Aluminum 6082 Seat: PCTFE
<b>Flow Capacity (Cv):</b>	0.06
<b>Leakage:</b>	Gas: Bubble tight Liquid: Zero drops of water at max inlet

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

## 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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