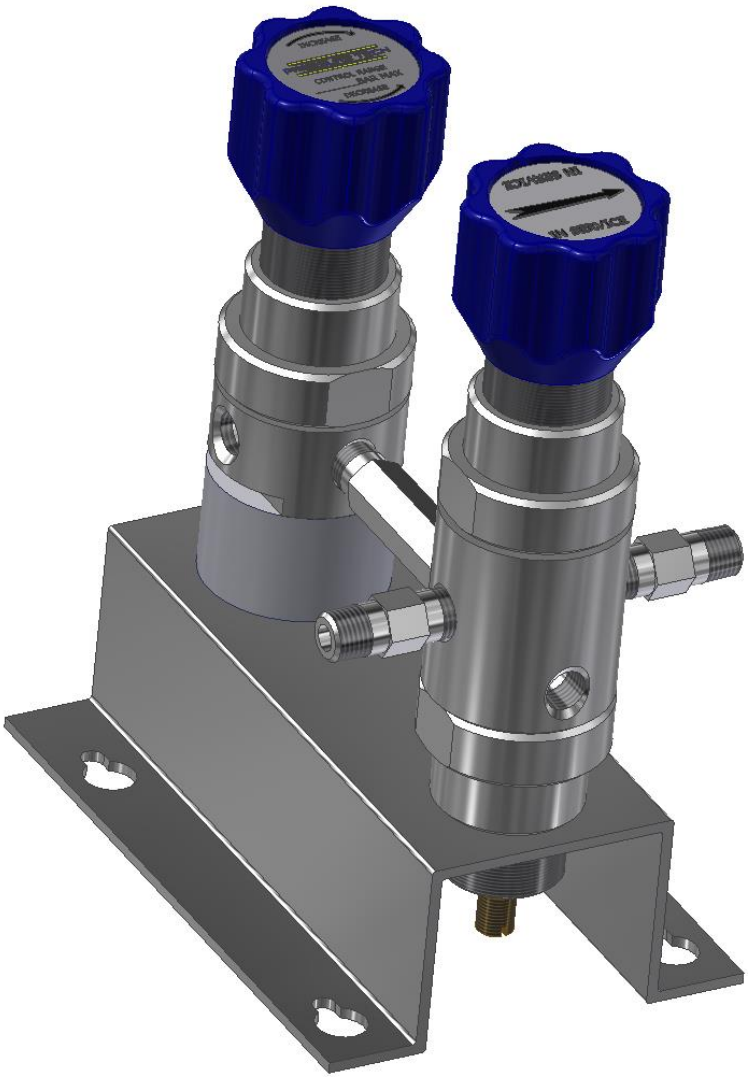
PRESSURE TECH



THE ACU-310 SERIES

Operating and Service Manual

Series includes all variants of ACU-310

Issue A
Feb 2023

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1. Description

The ACU-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 ACU-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 10 bar (145 Psi).

The ACU-310 is available to purchase in two configurations:

Option 1: A standalone changeover regulator comprising of two pressure regulators within one regulator body. This allows the continual supply of gas between two bottles due to the differential pressure setting of the two regulators. This will lead to a change in the outlet pressure as the changeover between the primary and secondary supply takes place.

Option 2: A compact wall-mounted changeover unit that provides a steady outlet pressure from a second-stage pressure regulator as the first-stage changeover regulator controls the pressure from the primary and secondary gas cylinders.

Check valves are fitted as standard to both options to prevent gas from escaping whilst bottles are replaced. Ancillary equipment such as pressure gauges and relief valves can also be added.

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 second stage regulator is in the fully closed position, with the adjusting mechanism turned completely anti-clockwise.

Important: *standalone changeover regulators are always supplied in the fully opened positions and must be isolated or piped off safely downstream of the regulator, Prior to placing into service*

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 ACU-310 Inlet and Outlet ports are clearly marked and are supplied with ¼" NPT threads as standard, please ensure that PTFE tape is applied correctly to the fittings, by 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 ¼" NPT unless otherwise stated. If any gauge port is not required, ensure that the port is plugged prior to installation.

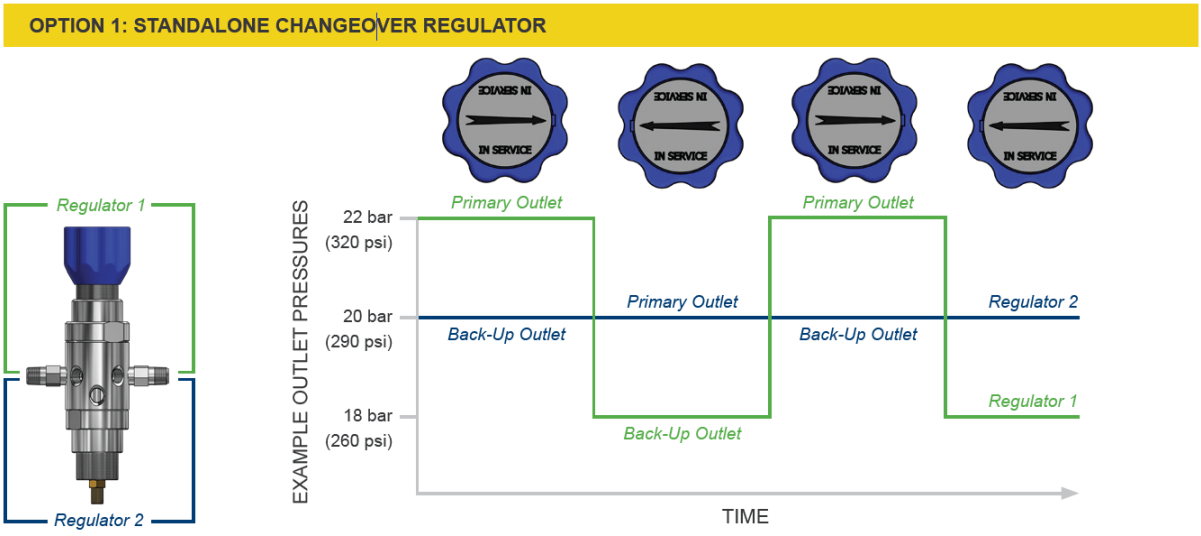
The media supplied to the regulator must be clean. Contamination can damage the seat which may cause the regulator to fail. Filtration suited to the application is recommended upstream of the regulator. Should further assistance or information be required in relation to installation of any Pressure Tech regulator please contact the office, giving reference to the regulators part number and/or serial number.

3. Operation

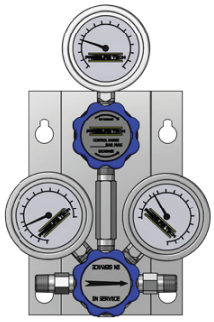
PRINCIPLES OF OPERATION

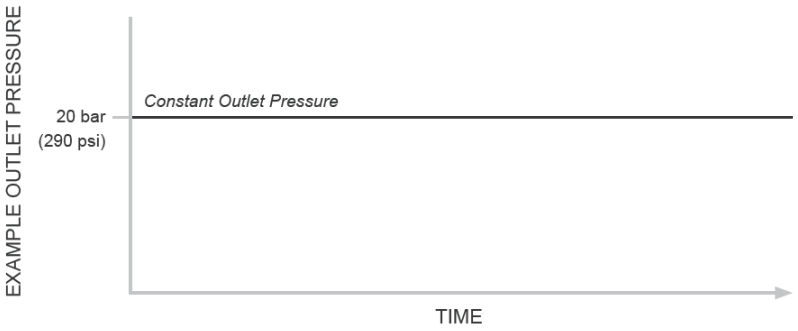
Changeover pressure regulators operate by using two pressure regulators (within the same body) with differing outlet pressures supplying into a common outlet port. Whilst the primary regulator provides a higher pressure than the secondary regulator, the latter will remain closed and prevent any gas from the gas cylinder (connected to the inlet port) from being supplied to the process. This secondary regulator will only start to open when the pressure from the primary supply drops below the setpoint pressure.

A 180° handwheel turn resets the outlet pressure so that the roles of the primary and secondary regulators are reversed - the depleted gas cylinder can then be replaced. This mode of operation means there is always a variance in the outlet pressure, typically 5-6 bar (72-85 psi), when the ACU-310 is used in isolation. A second-stage pressure regulator (shown on option 2) ensures a steady outlet pressure to the process whilst the ACU-310 ensures a constant supply from two banks of gas cylinders.



OPTION 2: WALL-MOUNTED CHANGEOVER UNIT





4. Special Conditions for Safe Use

The ACU-310 series of regulators are classed as Pressure Accessories and not Safety Accessories under the European Directive 2014-68-EC, and as such, a suitably sized pressure relief device is required on the both the upstream and downstream of the regulator.

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

For standalone changeover regulator – Isolate all supply pressure to the regulator and vent the pressure by venting downstream of the regulator.

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 ACU-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 or suitable alter 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 6.1.3.2 (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.

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.

6.1. Servicing the ACU-310

6.1.1. Disassembly of the ACU-310

*Note: please refer to section *6.1.1.2,* for the following set of instructions

1. With the fully assembled ACU-310, place the body of the changeover unit in the vice on its side so that the underside is accessible. (The check valves from the inlets may need to be removed in order to hold the regulator).
2. Disconnect the two Allen Key bolts (3,4) to the second stage LF-310 regulator using a 4mm Allen Key, taking care not to allow the PTFE spacer-block (2) to drop.
3. Use an adjustable wrench to remove the hex nut (6) which holds the changeover unit to the wall bracket (5) and remove the plate from the assembly.
4. Use a 9/16” wrench to separate the second stage regulator from the assembly by removing the connecting hex extension piece (1) from the body of the changeover unit.
   ***Note:** if fitted the regulator is fitted with gauges, they should also be removed at this stage.*

6.1.1. Reassembly of the ACU-310

1. Secure the second stage LF-310 regulator into a vice, against the flats located at the base of the regulator.
2. Use a 9/16” wrench to attach the connecting hex extension piece* (1) to the inlet port of the second stage regulator.

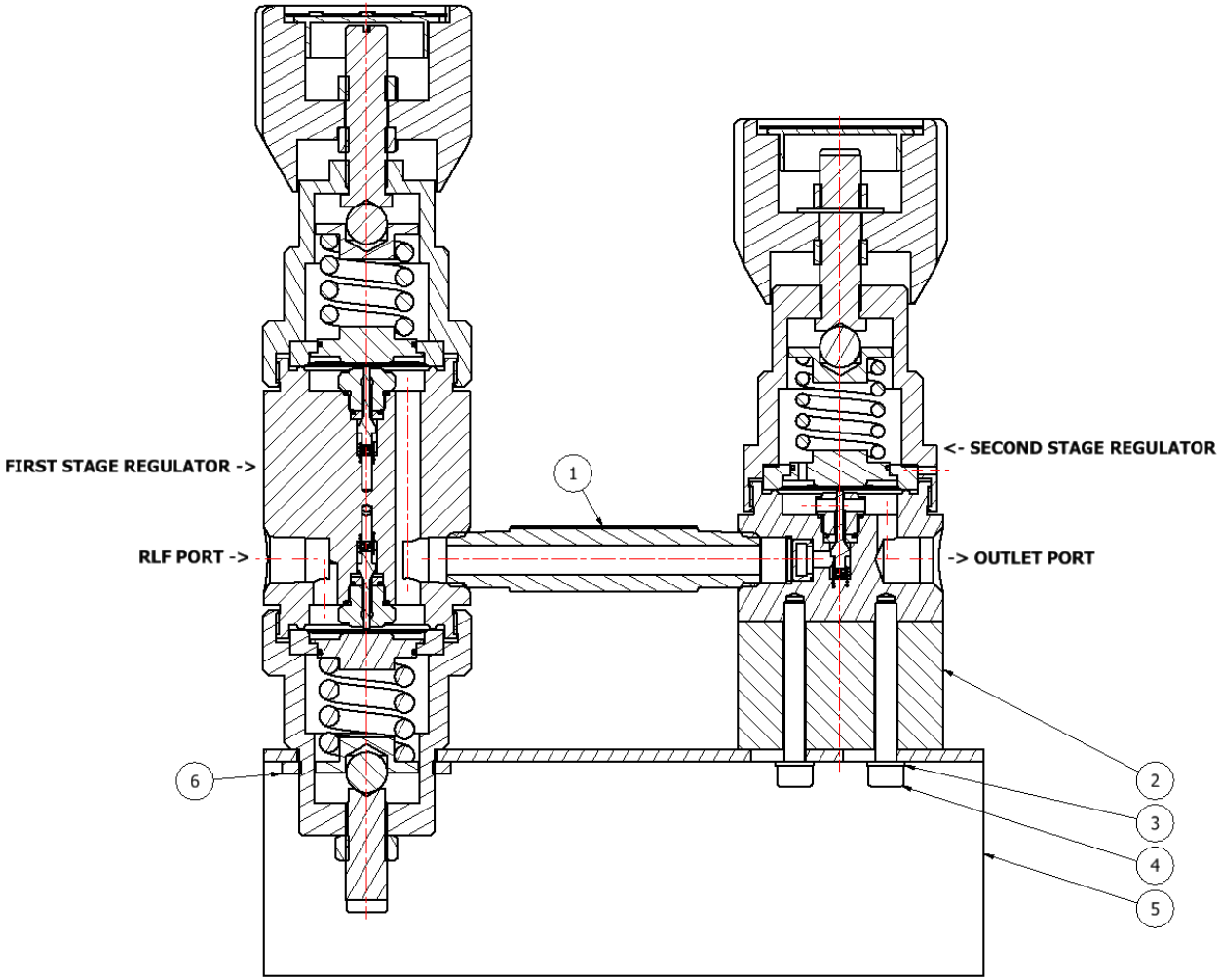
***Note:** please ensure that PTFE tape is applied correctly to both ends of fitting, by applying two overlapping layers in the direction of the thread, taking care that the tape does not come into contact with the first thread.*

***Note:** if fitted the regulator is fitted with gauges, they should also be removed at this stage.*

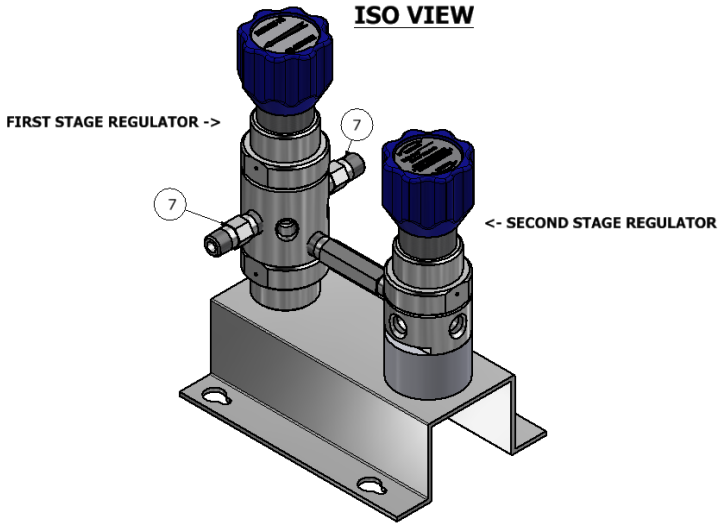
3. Screw* the other end of the connecting hex extension piece (1) to the outlet port of the second stage regulator, by using a 9/16" wrench.
   ***Important:** ensure that both regulators are perfectly in-line with each other.
4. Secure the wall bracket (5) into a vice on its side so that the underside is accessible.
5. Place the PTFE spacer-block (2) onto the wall bracket (5) and Aline with the 2x holes on with the wall bracket.
6. Locate the lower section of the first stage regulator into the wall bracket (5) and the second stage regulator onto the PTFE spacer-block (2).
7. Guide the 2x Allen Key bolts (with washers) (3,4) through both the wall bracket (5) & PTFE spacer-block (2), then screw/tighten them into the base of the second stage LF-310 regulator using a 4mm Allen Key.
8. Screw the hex nut (6) onto the thread of lower section of the first stage regulator and into tighten against the wall bracket (5).

6.1.1.2 Figure 1 – Sectional View of the ACU310 (*Full Assembly*)

*ALL DIMENSIONS ARE IN MILIMETERS, UNLESS OTHERWISE STATED



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	SLOK-SS-4-HLN-3.00	SWAGELOK HEX EXTENSION
2	1	PT-ACU-300-002	PCTFE SPACER
3	2	FIT-M5-A4-SPR-WASHER	M5 - A4 - SPRING WASHER
4	2	FIT-M5-40-A4-70.0-SKT-CAP	CYLINDER HEAD CAP SCREW
5	1	PT-ACU-300-001	WALL BRACKET
6	1	PT-C-024	PANEL MOUNTING RING
7	2	SLOK-SS-4CPA2-50	UPSTREAM CHECK VALVE



6.1.2. First Stage Regulator - Accessing the Main Valve Assembly *(MVA)*

***Note:** please refer to section 6.1.2.7, for the following set of instructions*

***Important:** care being taken to ensure that the correct spring is used in each stage. The upper stage consists of the heavier spring and the bonnet with the long adjusting screw. The lower stage should consist of the lighter spring and the bonnet with the short adjusting screw.*

6.1.2.1 Procedure Part 1: Disassembly of the upper section of the first stage regulator

1. With the first stage regulator unit now separated from the assembly, secure the regulator within a vice *(against the flats of the regulator body)*, with the hand wheel (16) upright.
2. With a small slotted screwdriver remove the top cap (24)/service nameplate (27) so that the adjusting screw (18) is visible.
3. To remove the hand wheel (16), first remove the Allen Key bolt (28) with a 4mm Allen Key and then loosen the locking nut (15) with a 13mm socket or ring spanner.
4. Using a slotted screwdriver turn the adjusting screw (18) anti-clockwise until it is fully backed off so that there is no compression on the load spring (9).
   ***Note:** This is necessary so that on removal of the bonnet (19), the threads will not bind together.*
5. Remove the *(upper)* bonnet (19) from the regulator body (1), by using an 48mm open ended attachment with torque wrench or an adjustable wrench on the flats of the bonnets and turn in an anti-clockwise direction and remove the bonnets.
   Note: *That the bonnet is tightened to 160 Nm.*
6. Remove the following internal components; load spring (9), upper spring rest (13), lower spring rest (12), diaphragm washer (11) and diaphragm* (10).
   ***Note:** If the diaphragms are deformed in any way, then they must be replaced*
7. Remove the 21x1mm O-ring (20) from the lower spring rest (12), and replace where necessary.
8. Using a 12mm socket remove the seat nut (4).
   ***Note:** Check the sealing face of the seat nut under the microscope for nicks and scratches; if any are found it will be necessary to replace it.*
9. Remove the 9x1mm (7), 6x1mm (6) O-ring's and soft seat (5), and replace where necessary.
10. The main valve (2) and main valve spring (3) can be removed by hand.
    ***Note:** Check the main valve for any potential damage and replace where necessary.*

6.1.2.2 Procedure Part 2: Re-assembly of the upper section of the first stage regulator

Important: *The body of the regulator and other internal components should be cleaned prior to re-assembly.*

Note: *if fitted the regulator is fitted with gauges, they should be installed at this stage*

1. Place the Main Valve Spring (3), over the lower stem Main Valve (2) and place both parts into the regulator body (1)
2. Guide the Soft Seat* (5) over the upper stem of the Main Valve (2) and into the regulator body (1).
   ***Note:** Taking care not to damage its sealing face against the tip of the valve.*
3. Place the 6x1 O-ring (6) onto the O-ring groove of the Soft Seat (5).
4. Place the 9x1 O-ring (7) onto the O-ring groove of the Regulator Body (1).
5. Guide the Seat Retainer (4), over the upper stem of the Main Valve (2) and screw/tighten into the regulator body (1), using a 12mm socket and torque to 17Nm.
6. To ensure positive sealing, it is recommended that a new diaphragm (10) is placed centrally into Regulator Body (1) ensuring that the outermost convolutions are facing upwards towards the Bonnet (19).
7. Insert* the Lower Spring Rest (12) and the 21x1 mm O-ring (20) into the Diaphragm Washer (11), then place on top of the Diaphragm (10).
   ***Note:** Ensure that the Lower Spring Rest (12) is correctly orientated within the Diaphragm Washer (11) (*Ref. 6.1.2.7).*
8. Place the Load Spring (9), Upper Spring Rest (13) and 10mm Ball Bearing (14) to the assembly.
9. Screw the Bonnet assembly (15,15a,16,18,19) onto the assembly and using a torque wrench with a 48mm open ended attachment, tighten to 160Nm.

6.1.2.3 Procedure Part 3: Disassembly of the lower section of the first stage regulator

1. Place the regulator body upside down *(so that the lower section for the first stage regulator is facing upwards)* in the vice securely against the flats of the regulator body.
2. Using a 13mm open-ended wrench to loosen the lock nut (15b) from the bonnet (17), by turning in an -anti-clockwise direction.
3. Turn the short adjusting screw (21) in an anti-clockwise direction.
   ***Important:** Taking care not to turn it too far. It will be obvious when to stop as there will be no compression on the spring.*
4. It is now possible to remove the bonnet (17) from the regulator body (1), by using an 48mm open ended attachment with torque wrench or an adjustable wrench on the flats of the bonnet and turn in an anti-clockwise direction to remove the bonnet.

Note: *That the bonnets are tightened to 160 Nm.*

11. Remove the following internal components; spring (8), spring rest (13), sensor (12), diaphragm washer (11) and diaphragm* (10).
    ***Note:** If the diaphragms are deformed in any way, then they must be replaced*
12. Remove the 21x1mm O-ring (20) from the lower spring rest (12), and replace where necessary.
13. Using a 12mm socket remove the seat nut (4).
    ***Note:** Check the sealing face of the seat nut under the microscope for nicks and scratches; if any are found it will be necessary to replace it.*
14. Remove the 9x1mm (7), 6x1mm (6) O-ring's and soft seat (5), and replace where necessary.
15. The main valve (2) and main valve spring (3) can be removed by hand.
    ***Note:** Check the main valve for any potential damage and replace where necessary.*

6.1.2.4 Procedure Part 4: Re-assembly of the lower section of the first stage regulator

***Important:** The body of the regulator and other internal components should be cleaned prior to re-assembly.*

***Note:** if fitted the regulator is fitted with gauges, they should be installed at this stage.*

1. Place the Main Valve Spring (3), over the lower stem Main Valve (2) and place both parts into the regulator body (1)
2. Guide the Soft Seat* (5) over the upper stem of the Main Valve (2) and into the regulator body (1).
   ***Note:** Taking care not to damage its sealing face against the tip of the valve.*
3. Place the 6x1 O-ring (6) onto the O-ring groove of the Soft Seat (5).
4. Place the 9x1 O-ring (7) onto the O-ring groove of the Regulator Body (1).
5. Guide the Seat Retainer (4), over the upper stem of the Main Valve (2) and screw/tighten into the regulator body (1), using a 12mm socket and torque to 17Nm.
6. To ensure positive sealing, it is recommended that a new diaphragm (10) is placed centrally into Regulator Body (1) ensuring that the outermost convolutions are facing upwards towards the Bonnet (19).
7. Insert* the Lower Spring Rest (12) and the 21x1 mm O-ring (20) into the Diaphragm Washer (11), then place on top of the Diaphragm (10).
   ***Note:** Ensure that the Lower Spring Rest (12) is correctly orientated within the Diaphragm Washer (11) (*Ref. 6.1.2.7).*
8. Screw the Bonnet assembly (15b,17,21) onto the assembly and using a torque wrench with a 48mm open ended attachment, tighten to 160Nm.
9. Remove the fittings and refit the gauges to the gauge ports. Care should be taken to ensure that all traces of PTFE are removed from threads prior to fitting the gauges.

6.1.2.6 Adjusting the Set Point of the First Stage Regulator

Important: There must be 2 bar *(+0.3bar Max Tolerance)* differential set pressure between both assemblies within the first stage regulator. This is to ensure that regulator will changeover when operated.

To adjust the set point please follow the instructions below:

i. Remove the Nameplate (27) and Cap (24) from the Hand Wheel (16) and

ii. Remove the Allen Key bolt (28) using a 4mm Allen Key and then loosen the upper locking nut (15) with a 13mm socket or ring spanner, such that the Hand Wheel (16) are able to spin freely on the Adjusting Screw (18).

iii. Using a 13mm open-ended wrench to loosen the lock nut (15b) from the bonnet (17), by turning in an -anti-clockwise direction.

iv. Turn the short adjusting screw (21) in an anti-clockwise direction.
Important: *Taking care not to turn it too far. It will be obvious when to stop as there will be no compression on the spring.*

v. Connect the correct fittings to the Inlet and Outlet ports of the regulator. Ensure that any gauge ports are plugged or that the appropriate gauge is fitted.
Important: *ensure that a ball/needle valve is fitted to both upstream lines to the regulator. This is to isolate the supply prior to carrying out the set point test.*

vi. Connect the Outlet port to a calibrated pressure test gauge appropriate to the required set pressure.
Important: *As the regulator is non-venting, ensure that a ball/needle valve is fitted to allow pressure to be relieved downstream of the regulator.*

vii. Secure the Regulator Body (1) into a vice and orientate such that the relief port (RLF) is facing towards yourself.

viii. Gradually apply the Maximum Working Pressure* *(MWP)* to 'only' Inlet port No.1 *(orientated to the right side of the RLF)* of the regulator.
****Important:*** *ensure that the upstream ball/needle valve for inlet port No.2 is isolated prior to carrying out the set point test.*

ix. Using a slotted screwdriver, turn the Adjusting Screw (21) clockwise until the desired *(Highest)* set point has been reached.

x. Ensure repeatability by allowing flow through the regulator using the ball/needle valve.

xi. With the outlet pressure set, screw the Lock Nut (15b) to the base of the Adjusting Screw (21) against the Bonnet (17).

xii. Isolate the supply pressure to the regulator and gradually deplete all the pressure from the regulator.

xiii. Gradually apply the Maximum Working Pressure* *(MWP)* to 'only' Inlet port No.2 *(orientated to the right side of the RLF)* of the regulator.

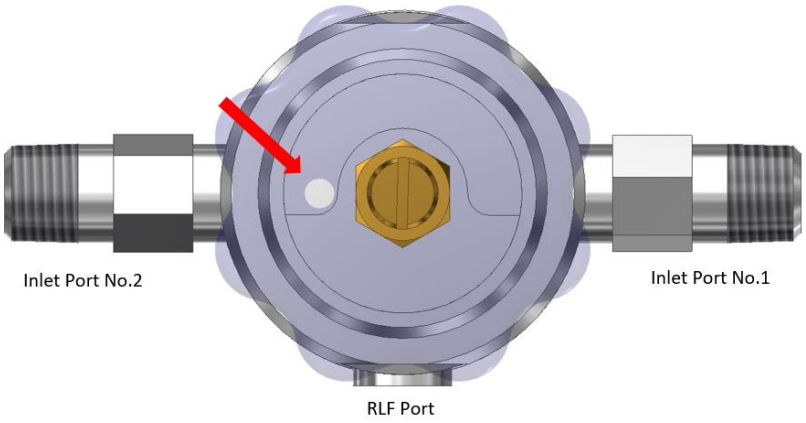
***Important:** ensure that the upstream ball/needle valve for inlet port No.1 is isolated prior to carrying out the set point test.*

xiv. Using a slotted screwdriver, turn the Adjusting Screw (18) clockwise until the desired *(Lowest)* set point has been reached.

xv. Ensure repeatability by allowing flow through the regulator using the ball/needle valve.

xvi. Position the Hand Wheel* (16) onto the Lower Lock Nut (15a), ensuring that the Lock Nut and Hand Wheel become engaged.

***Note:** ensure that the M5 bolt hole is orientated to the position (shown in the image below) to the recess of the bonnet.*



xvii. Fasten the Upper Lock Nut (15) against the Hand Wheel (16) and gently begin to tighten using a 13mm socket until it begins to secure itself.

***Note:** Ensure that a hex flat of the lock nut is in-line with the M5 bolt hole.*

xviii. At this point, whilst holding the Hand Wheel (16). Fasten the Upper Lock Nut (15) against the Hand Wheel, whilst simultaneously turning slightly anti-clockwise to prevent it from locking against the Bonnet (19).

***Important:** Ensure that the Upper Lock Nut (15) is sufficiently tightened, taking care not to adjust the set point.*

***Note:** If the set point is not correct, repeat steps xiv. to xviii.*

xix. Insert the Allen Key bolt (28) into the Handwheel, using a 4mm Allen Key.

xx. Gradually increase the supply pressure to Inlet port No.1 *(orientated to the right side of the RLF)* of the regulator and allow the pressure to stabilise for approximately 30 seconds.

***Note:** the outlet pressure should now show the highest desired set point (as set previously in step 'xi').*

xxi. Isolate all the supply pressure to the regulator and gradually open the outlet isolation valve to allow a small amount of flow through the valve, until all pressure is fully depleted from the assembly.

***Note:** The regulator supply side that is <u>in</u> service will now start to gradually deplete the supply pressure. Once pressure reaches the lowest set pressure, then the*

regulator will automatically change over and start to deplete the supply from the opposite side.

xxii. Close the outlet isolation valve and turn the Handwheel clockwise 180◦.

xxiii. Gradually increase the supply pressure to both Inlet ports of the regulator and allow the pressure to stabilise for approximately 30 seconds.

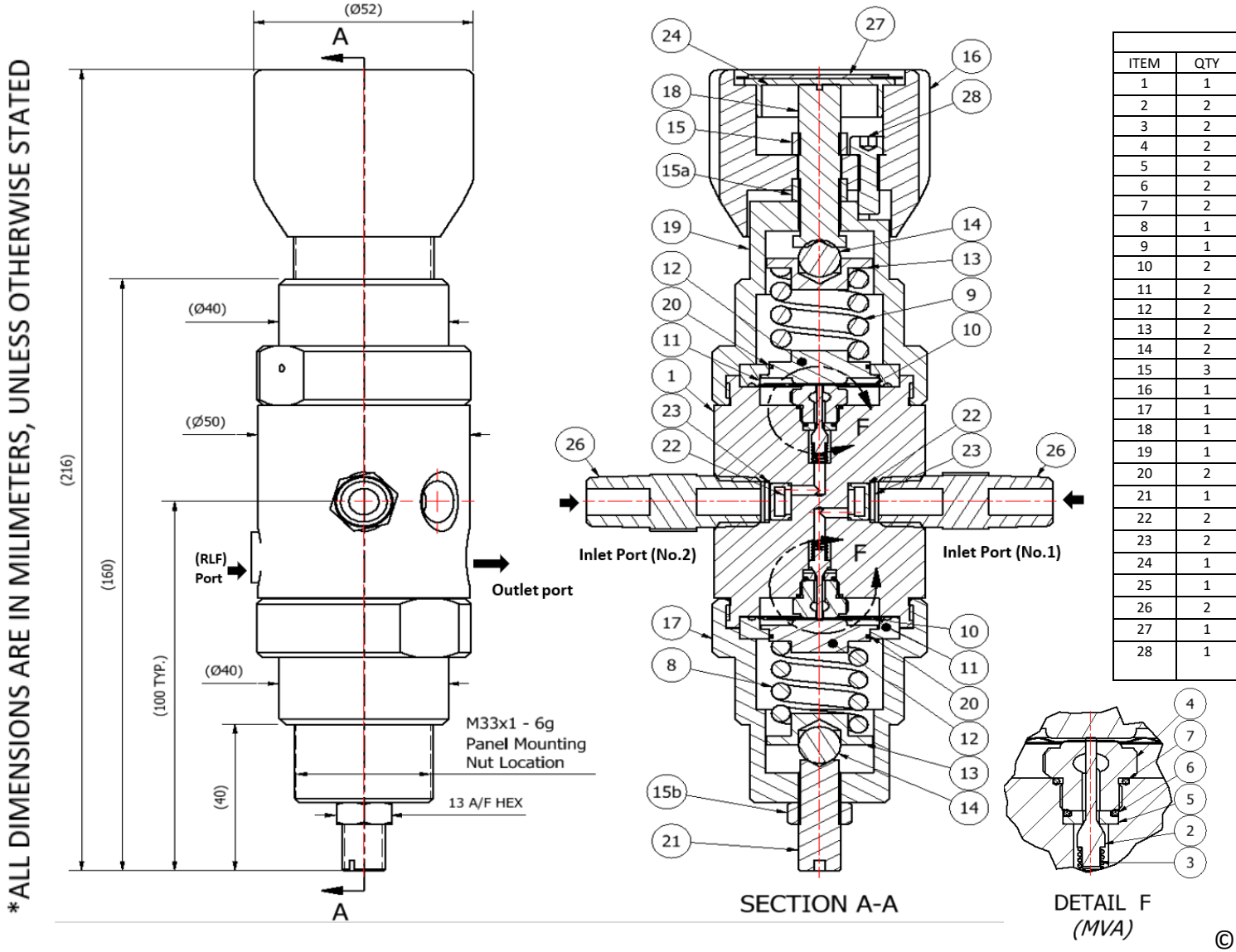
Note: *the outlet pressure should now show 4 bar above the highest desired set point (as set previously in step 'xi').*

xxiv. Isolate all the supply pressure to the regulator and gradually open the outlet isolation valve to allow a small amount of flow through the valve, until all pressure is fully depleted from the assembly.

Note: *The opposite regulator supply side (to the side stated in Step 'xxi') will now become <u>in</u> service will start to gradually deplete the supply pressure. Once pressure reaches the lowest set pressure, then the regulator will automatically change over and start to deplete the supply from the opposite side.*

xxv. Place the Cap (24) into the Handwheel (16) and then place the Name plate (27) onto the cap, with the 'in service' arrow pointing towards the regulator side that is now in service.

6.1.2.7 Figure 2 – Sectional View of the ACU310 First Stage Regulator



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	PT-ACU-310-A-SS-02N	BODY - A PORTING
2	2	PT-C-001-023	MAIN VALVE - SOLID
3	2	PT-C-006-002	MAIN VALVE SPRING
4	2	PT-C-007-015	SEAT RETAINER
5	2	PT-C-205-002	PCTFE SEAT
6	2	OR-0060-10	O' RING STD
7	2	OR-0090-10	O' RING STD
8	1	PT-C-011-002	LOAD SPRING - 170 kg
9	1	PT-C-011-001	LOAD SPRING - 295 Kg
10	2	PT-C-010-002	DIAPHRAGM
11	2	PT-C-016	DIAPHRAGM WASHER
12	2	PT-C-018-002	BOTTOM SPRING REST
13	2	PT-C-017	UPPER SPRING REST
14	2	BALL-010-SS-316	BALL BEARING
15	3	PT-C-020	LOCKNUT
16	1	PT-C-021 (ACU310)	SMALL HANDWHEEL
17	1	PT-C-015	BONNET - 300 SERIES
18	1	PT-C-019-003	ADJUSTING SCREW
19	1	PT-C-015-003	BONNET - HALF TURN CUTOUT
20	2	OR-0210-10	O' RING STD
21	1	PT-TS-300-003	ADJUSTING SCREW
22	2	FILT-SCRM7101040S	SCREEN FILTER - 10mm
23	2	FIT-472011-SS-CIRCLIP	INTERNAL CIRCLIP - 11mm
24	1	FIT-CAP-4343092	NAMEPLATE CAP
25	1	SLOK-SS-4-HP	HOLLOW HEX PLUG 1/4" NPT
26	2	SLOK-SS-4CPA2-50	CHECK VALVE - 50-150 psi
27	1	PT-C-022-001	HANDWHEEL
28	1	FIT-M5-16-A4-70.0-SKT-CAP	M5 x 16mm SS316 HEX CAP SCREW

6.1.3 Servicing the Seconded Stage Regulator (LF310)

Note: *please refer to section 6.1.3.3, for the following set of instructions*

6.1.3.1 Accessing the Main Valve Assembly

To access the Main Valve Assembly (MVA):

<u>Disassembly</u>

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. 6.1.3.3)*
   Note: *That the bonnet 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.

<u>Re-assembly</u>

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 48mm open ended attachment, tighten to 160Nm

6.1.3.2 Adjusting the Set Point of the Second Stage Regulator

Note: *It is not recommended (or necessary) to remove the Hand Wheel during service as this will affect the set point of the regulator.*

Important: 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.

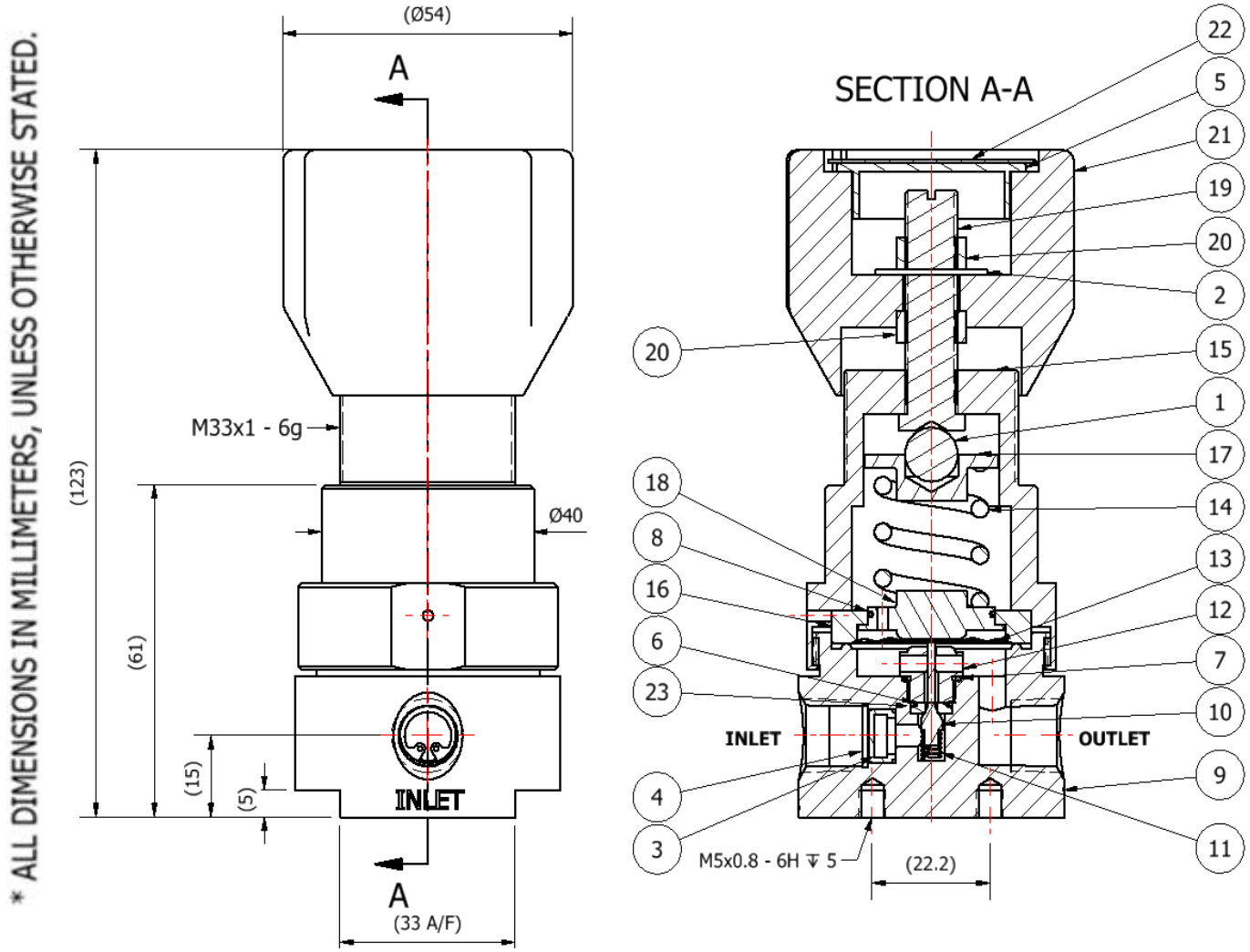
Should it be required to adjust the set point please follow the instructions below:

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 30bar pressure 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

6.1.3.3 Figure 4 – Sectional View of the ACU310 Second Stage Regulator



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

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:	0-10 bar
Operating Temperature:	-20°C to +180°C
Materials:	Body and Trim: 316 SS (Other Materials available) Diaphragm: Inconel X750 Seat: PCTFE / PEEK®
Flow Capacity (Cv):	0.06
Leakage:	Gas: *1x Bubble per min (Ref: ANSI/FCI 70-3 Class VII)*

*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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