INSTRUCTIONS FOR USE – Unbalanced in-line orifice adjustment tool

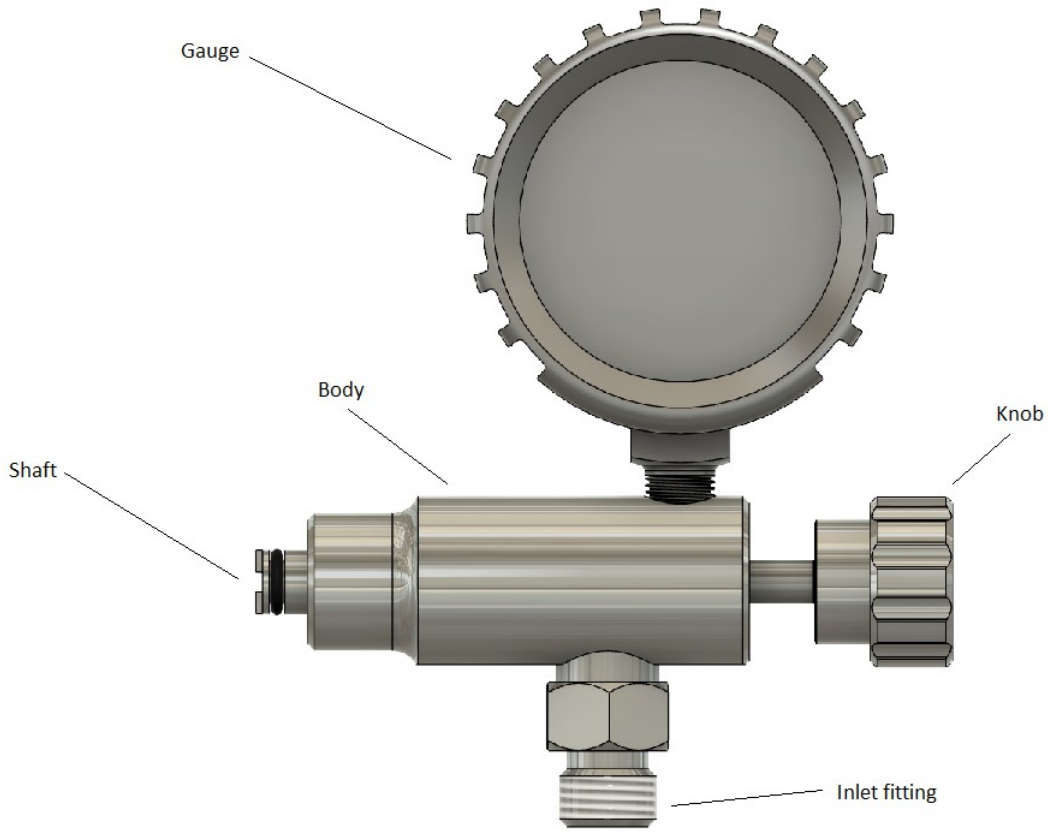
TYPES:

There are 4 types of unbalanced in-line orifice adjustment tool available. The operation of each model is identical. Hence this instruction manual covers all 4 models.

The models available are:

- Unbalanced slotted w/o gauge: SCT-0823
- Unbalanced hex w/o gauge: SCT-0824
- Unbalanced slotted with gauge: SCT-0806
- Unbalanced hex with gauge: SCT-0822

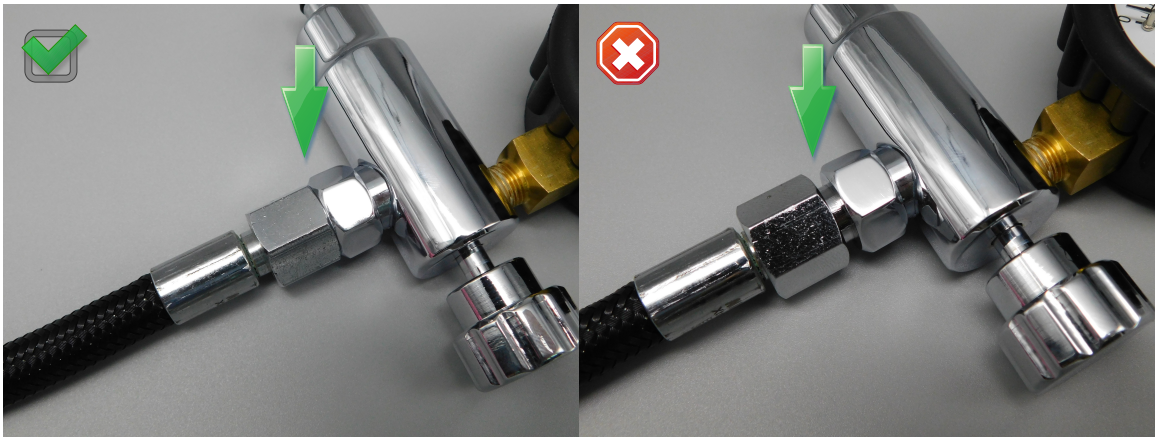
MAIN COMPONENTS:



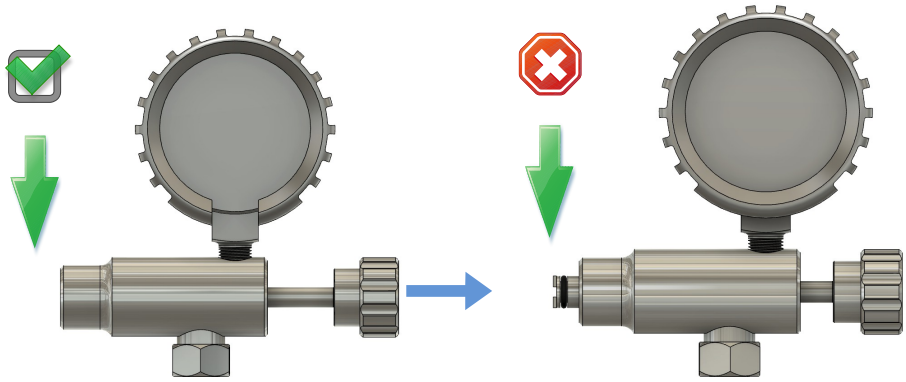
INSTRUCTIONS FOR USE:

- Depending on type of orifice that needs adjusting choose the appropriate unbalanced in-line orifice adjuster: hex or slotted.

- Connect the tool to an unpressurised low pressure hose which is in turn connected to the first stage. Remember that the first and second stages should be paired and set up / adjusted together. Finger tight will do, there is no need to use a spanner to tighten the connection as the hose end will seal with the inside of the fitting. There should be no gap between the hose and hose and the inlet fitting.



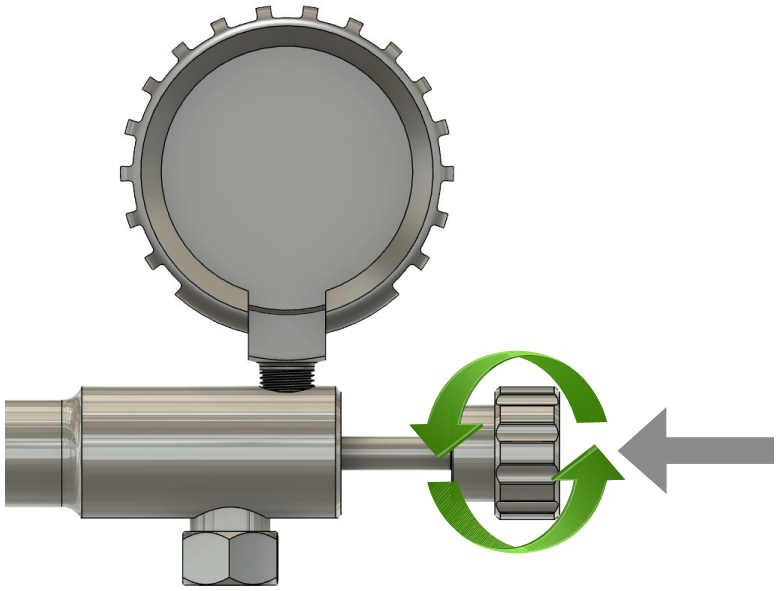
- Connect the second stage to the tool. We recommend the slotted or hex side to sit flush with the end of the tool (or fully retracted) prior to screwing the second stage onto the tool. Screw the regulator all the way down onto the tool. Finger tight will do, there is no need to use a spanner to tighten the connection as the shaft of the tool will seal with the inside of the regulator barrel.



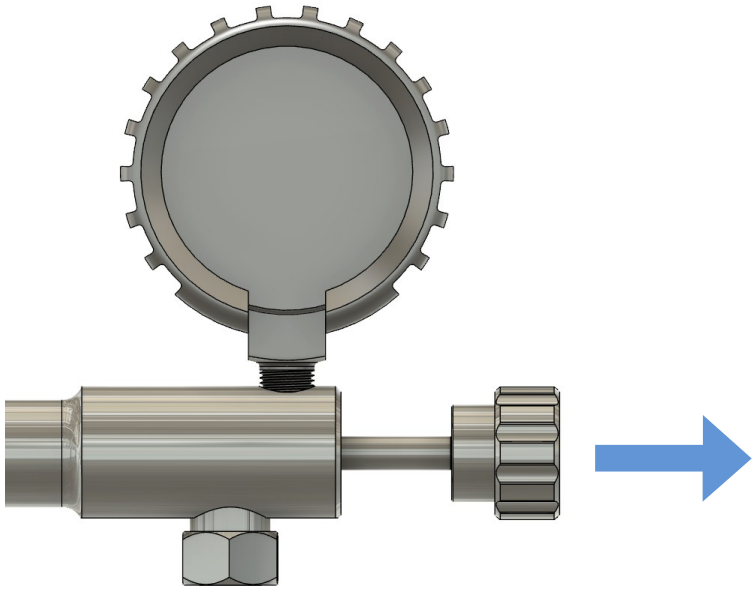
- Pressurize the assembly. If leaks occur, the following are the most obvious causes and cures:

    - Leaky connections: turn of the air supply, depressurize and correct.
    - The orifice of the second stage is improperly adjusted resulting in a free flow of the second stage (the orifice is too far out): screw the orifice in to remove the free flow.
    - Shaft or body O-ring(s) are damaged or missing: replace the damaged O-ring(s).
    - Shaft of the tool not engaged with the barrel of the regulator. This is 'rare' but could be due to the large variety in regulators on the market. We have designed the tool to fit the majority of models on the market. You can overcome this issue by putting a 013 or 014 O-ring (depending on the model of regulator) on the threads of the regulator fitting. This case would manifest itself by air leakage between the regulator and the tool despite the tool being seated against the regulator.

- With the assembly pressurized, turn the knob whilst advancing the shaft towards the orifice in order to line up and engage the slotted or hex side with the orifice. Make the necessary adjustment as per manufacturers recommendations. Note that you will push and adjust against the pressure, which is a little 'though'. This is perfectly normal due to the nature of an unbalanced in-line orifice adjuster design. Once you release the pressure on the knob/shaft assembly, the shaft will disengage from the orifice and be pushed backwards, This is perfectly normal and inherent to unbalanced in-line orifice adjustment tools.



- Once the adjustments are completed:
    - Ensure the shaft is fully retracted. Failure to do so might result in the orifice losing its position or setting once the tool gets disconnected.



    - Shut of the air supply and depressurize the system (purging the second stage will accomplish this).
    - Disconnect and remove the tool.

MAINTENANCE – TAKING CARE OF YOUR TOOL:

The tool can be cleaned using a soft damp cloth. Do not use any detergents or chemical cleaning agents on any of the surfaces.

Before storage ensure the tool is dry and store the tool in a dry environment.

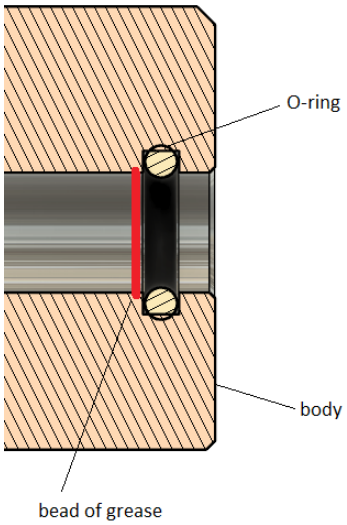
Service notes:

- If over time the tool becomes a little stiff to operate, use a little lubricant (Christo-Lube®) on the 2 shaft O-rings and the inner body o-ring. To access the inner body and shaft O-rings, it is required to unscrew the knob and remove the shaft for greasing the 3 O-rings.

- To reinstall the shaft into the body, gently push the shaft past the inner O-ring using a twisting motion to ensure not to damage the inner O-ring. Visually inspect your work.

- If the shaft is reinstalled, for the hex models do not forget to install the small bushing. There is no bushing for the slotted models.

- If the inner o-ring is replaced or the shaft has been removed for whatever reason, we recommend to place a bead of Christo-Lube® on the inside of the O-ring against the body.



- *NOTE:* the knob is held in place using Loctite® 243 and might therefore a little 'tough' to remove.

  – In order to secure the slotted shaft from rotating during removal of the knob, a pair of pliers can be used. However: make sure the serrated teeth on the pliers are well protected and will not mar the precision shaft.
  – In order to secure the hex shaft from rotating during removal of the knob, a 5mm socket or spanner can be used on the tip of the shaft.

- The inlet fitting seals with a O-ring into the body. Do not over tighten this fitting as this could damage the fragile fine threads.

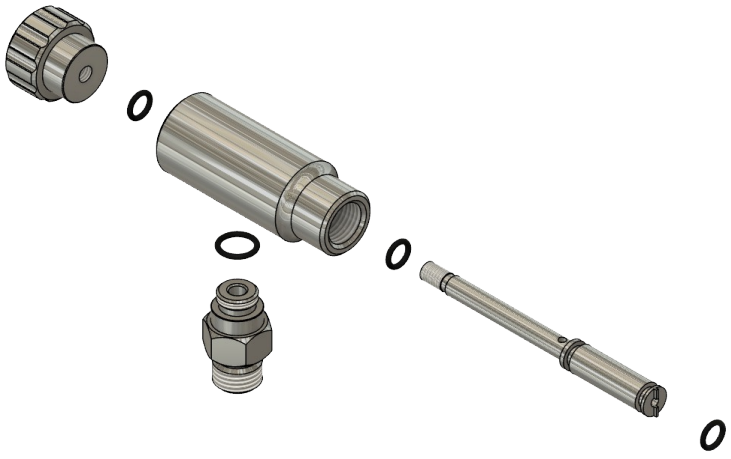
- The gauge can be sealed in place using Loctite® 567 or 3-4 wraps of Teflon tape. Do not over tighten.

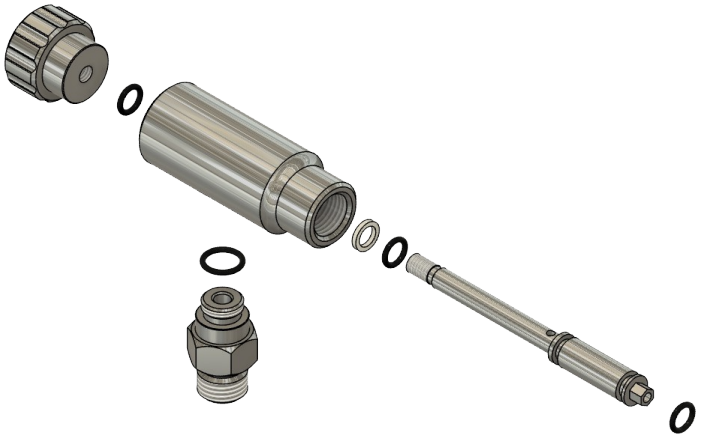
O-ring dimensions for replacement:

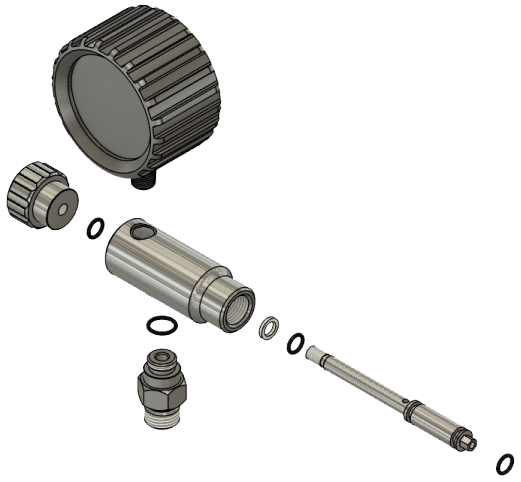
- Shaft O-rings: NBR 010 shore 70 – 2 pcs
- Body O-ring: NBR 010 shore 70– 1 pcs
- Inlet fitting O-ring: NBR 010 shore 75 – 1 pc

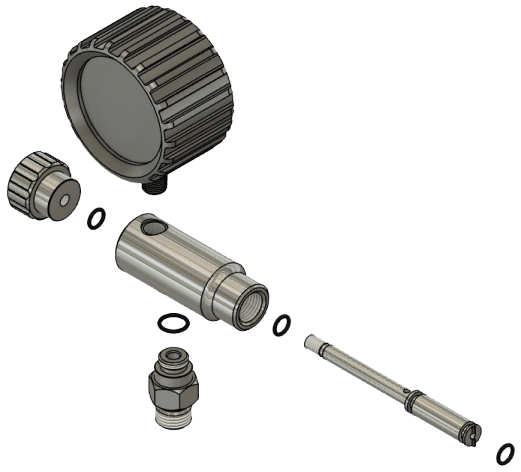
Spec gauge for replacement:

- Fitting 1/8 NPT M
- 0-20 bar
- 0-300 psi









SAFETY WARNINGS:

This tool is only suitable for use with compressed low pressure air (maximum 15 bar). Do not use higher pressures or gas mixtures other than compressed air.

When the unit is pressurised, disconnecting the tool from the regulator-inflator will result in a continuous air flow from the tool. Note that the tool will not shut of the flow of air when disconnected. Never disconnect the tool from the regulator inflator is the system is pressurised.

After a regulator refurbishment, there is always a chance that something is amiss or faulty. One such catastrophic error /failure would be the full air supply pressure to travel through the first stage and into the second stage. This could lead to damage of the regulator(s), hose and tool / gauge and/or personal injury or death. Therefore , when pressurising a rebuilt set for the first time, we recommend to 1/ always slightly depress the purge button on the second stage, 2/ monitor the intermediate pressure and 3/ open the supply pressure slowly. If the intermediate pressure goes up too quickly and beyond the manufacturers settings, immediately shut down the air supply and correct the issue.

Operate this tool only whilst wearing safety glasses.

ADJUSTING DOWNSTREAM SECOND STAGES:

CAUTION:

Always follow the manufacturer's recommendations with regards to setting-up and tuning second stages. Each brand and regulator type will have their own specific settings and procedures. These procedures and setting values can be found in the manufacturer's literature and must be adhered to in order to ensure the correct and safe operation of the regulator. Many manufacturers will require either preset positions or gauges ensure the lever height is set correctly.

NOTES:

The text below uses some simplified schematics to illustrate the effect of different adjustment options for downstream second stages or demand valves. As to isolate the effect of the different adjustment options, one adjustment option at the time is being shown whilst the other adjustment option remains fixed.

In reality both adjustment options go together hand in hand and changing one might require an adjustment of the other option as well.

The illustrations are for balanced second stages; however the principle remains the same for unbalanced second stages.

GENERAL RULES:

- When considering the options to adjust the cracking effort of second stages, the technician has the following options at his/her disposal:
    - Exchanging parts as required with OEM parts suitable for the particular type of regulator (this could be part of the routine maintenance procedure or part of defective/worn out component replacement)
    - Adjust the intermediate pressure of the first stage
    - Adjust the lever height of the second stage
    - Adjust the spring load of the second stage

- It is futile attempting to adjust second stages if either the intermediate pressure of the first stage is unstable or outside the manufacturers specifications/range. In both cases, this issue has to be addressed prior to adjusting the second stage.

- The cracking effort will increase as the intermediate pressure decreases and vice versa. Therefore it makes sense to set up the cracking effort at the supply pressure that yields the highest intermediate pressure.

- Ensure proper cycling of both the first and second stage to ensure the soft- and hard seats are properly bedded in.

- When adjusting second stages, the final goal is to:

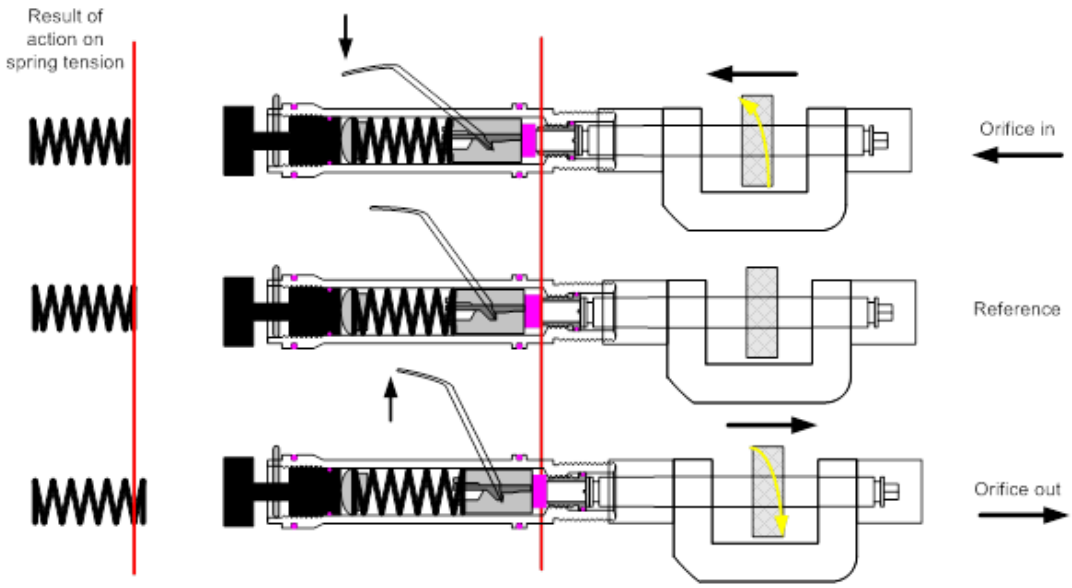
    - Adjust the second stage for maximum lever height in order to allow for the maximum poppet-orifice separation that in turn will give the greatest flow through the second stage.
    - Adjust the second stage for minimal spring tension in order to allow for the most favorable cracking effort.

- In order to achieve the goal mentioned above, it's good to remember that:

    - The amount of inhalation or cracking effort depends on the amount of force that is required to depress the lever; iow. the amount of force required to pull the diaphragm down.
    - The amount of force required to depress the lever and start the flow through the valve (iow. ensuring a positive poppet-orifice separation) depends on the amount of the spring tension.
    - A minimum amount spring tension is required to overcome the downstream force introduced by the intermediate pressure – the intermediate pressure tries to push the valve towards an open position -. This minimum amount of spring tension ensures that poppet-orifice assembly remains airtight (no leakages or free-flow).

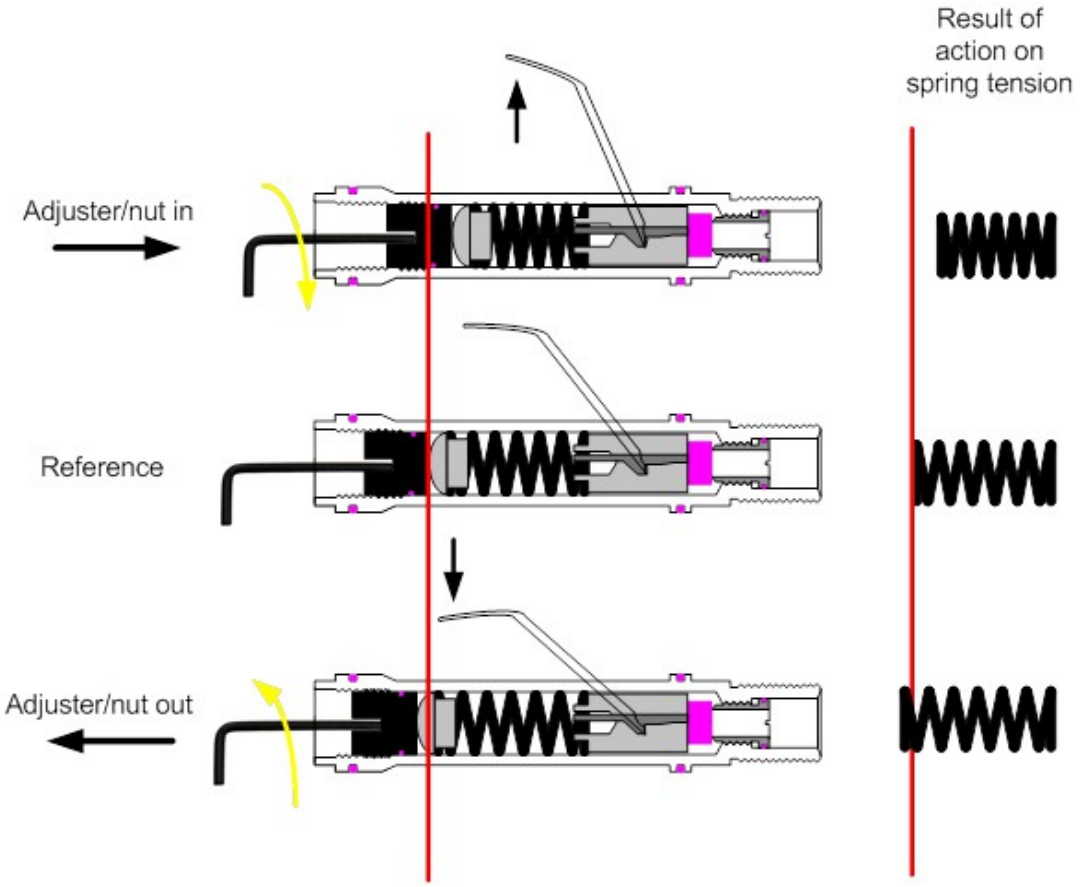
CHANGING THE ORIFICE POSITION – adjuster/nut fixed -:

- Turning the orifice in will:
    - Decrease the lever height
    - Increase the spring tension (spring compressed)
    - Result in an increase of cracking effort
- Turning the orifice out will:
    - Increase the lever height
    - Decrease the spring tension (spring relaxes)
    - Result in an decrease of cracking effort



ADJUSTING THE SPRING TENSION – orifice position fixed -:

- Turning the adjuster/nut in will:
    - Increase the lever height
    - Increase the spring tension (spring compressed)
    - Result in an increase of cracking effort
- Turning the adjuster/nut out will:
    - Decrease the lever height
    - Decrease the spring tension (spring relaxes)
    - Result in an decrease of cracking effort



DISCLAIMER:

Nothing contained in these notes on adjustment second stages shall be construed to over-ride or replace the relevant standards or manufacturer's recommendations, manuals, data or product specific training. The contents are believed to be correct to the best of our knowledge and are offered in good faith. No warranty is expressed or implied. The author, Scuba Clinic Co., Ltd. accept no liability for any loss, damage or injury however caused resulting from information contained in these notes. It is the responsibility of the reader to verify the correct information, practises and procedures prior to commencing work.