

# AQUA LUNG®

## SERVICE MANUAL



## CORE SECOND STAGE

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## INTRODUCTION

This manual gives the instructions and the recommendations for the disassembly, the cleaning, the checking, the reassembly and the adjustment of an Aqua Lung regulator. This manual is not an instruction manual for unqualified personnel. The procedures described in this manual are intended only for qualified personnel who have been trained in the servicing of Aqua Lung equipment during a specialised course.

If you do not understand certain procedures in this manual you should contact an Aqua Lung service consultant before undertaking any operation.

## WARNINGS, ATTENTION, NOTES

Certain icons have been used to facilitate the reading and understanding of this manual. They have the following meanings:



**WARNING:** Indicates situations that could result in serious or fatal accidents if the advice given is not followed correctly.



**ATTENTION:** Indicates a situation or action that could cause serious damage to the product, making it dangerous if the advice given is not followed correctly.



**NOTE:** Notes are used to emphasize important points as well as information which needs to be remembered.

## MAINTENANCE



**ATTENTION:** According to Aqua Lung specifications, any regulator should undergo servicing at least once every two years and visual inspection at least once per year. These two checks must be performed by an authorized Aqua Lung dealer. Depending on the conditions and the number of dives, the regulator may need to be serviced more often.

In order to conform with the Aqua Lung Regulator Lifetime Guarantee, all servicing (inspection, servicing and repairs) should be recorded in the Service Record incorporated in the regulator User Manual.

## GENERAL INSTRUCTIONS

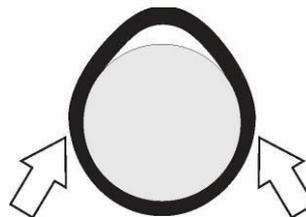
1. In order to carry out the procedures described in this manual correctly, it is important that you follow the steps in the exact order indicated. Read the manual through completely so that you become familiar with all the procedures, the special tools and the replacement parts, before starting to disassemble the product. Keep this manual open near to you so that you can refer to it step by step. Do not rely on your memory.
2. All servicing and repair procedures should be carried out in a workshop that is clean, well lit, easy to access and specially fitted for the purpose.
3. The regulator body should never be directly held in the jaws of a vice. To hold the body, screw the tool (116230) into a HP or MP port and then grip the tool with the vice.
4. Once the regulator has been disassembled, the re-usable components should be separated from the components that need to be replaced. Fragile items with seats or crowns with critical sealing surfaces should be separated and protected during servicing in order to prevent any damage.
5. Use only spare parts from Aqua Lung service kits. Never replace an Aqua Lung part with one from another manufacturer, even if it appears similar.
6. Never re-use regulator parts which should be replaced on the pretext that the regulator has seen little use since its manufacture or since its last service.
7. When reassembling, check that the torque used conforms with that shown in Table 4. Torque values. Some parts can be irretrievably damaged if the acceptable torque is exceeded.

## GENERAL CONVENTIONS

The conventions described below define the actions to be carried out when an instruction is given.

1. **Unscrew:** to unscrew a threaded part, turn it anti-clockwise.
2. **Screw:** to screw a threaded part, turn it clockwise.
3. **Remove the O-ring:** To remove an O-ring follow the method below, using the special tool (506001) provided for this purpose. Any tool that could damage the O-ring should be avoided. In every case, replace the O-ring removed with a new one.

*Press simultaneously on the two sides of the O-ring in order to form an 'eye'. Insert the special tool (506001) into this eye to remove the O-ring.*



4. The acronyms used:
  - LP:** Low Pressure
  - MP:** Medium Pressure (or IP: Intermediate Pressure)
  - HP:** High Pressure
5. Bracket numbers indicate components references from exploded views.

## DISASSEMBLY PROCEDURE



**NOTE:** Before commencing disassembly, consult the exploded view to check the reference numbers of all parts requiring replacement. These parts should all be replaced by new parts and should not be re-used on the pretext that the regulator has seen little use since its manufacture or since its last service.



**ATTENTION:** Use only the special tool (506001) when removing O-rings in order to avoid damaging the seal recess. The slightest scratch on a sealing surface could cause a leak. If a surface should be damaged then this part should be replaced with a new one. Do not use any pointed instrument or metal tool to remove O-rings.

- Using two 11/16" keys, block the insert screw (127818) for standard version or the heat exchanger (129914) for supreme version and octopus and unscrew the end nut on the hose (124567).



- If the regulator is a supreme version, remove the lip shield (125613). Remove the mouthpiece strap (129154) and then the mouthpiece (123697 for standard and supreme versions, 123698 for octopus).



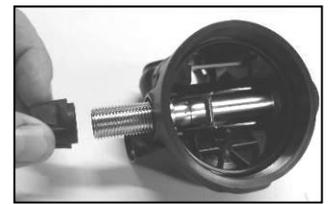
- Unscrew the front cover holder (129913) using a lug spanner (129198). Remove the front cover (129912, 129917 or 129918).



- Using the tool (129001), unscrew the diaphragm retainer (129195). Remove the washer (129133) and the second stage diaphragm (129150).

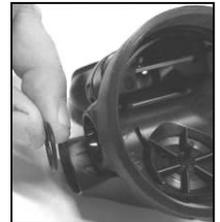
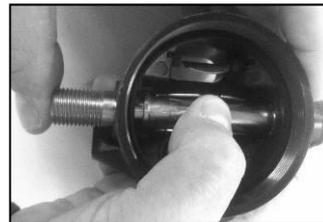


- Using an 11/16" key, unscrew the insert screw (127818) for standard version or the heat exchanger (129914) for supreme version and octopus.



- While holding the lever (129178) down against the valve spindle (129146), push the valve spindle assembly outside the case (129931 or 129932). If the Venturi plug (129911) has not fell down itself, remove it.

Remove O-ring (124706), hose side.



- Remove the Venturi lever (129909) from the case (129931 or 129932).



Remove the Venturi lever O-ring (AP1438). This O-ring could have stayed in the case, during the Venturi lever removing.



- Using a 4 mm Allen key, lightly screw the adjusting screw (129162), and then remove the tension pin (AP1151).



- Using a 4 mm Allen key, unscrew and remove the adjusting screw (129162). With the tool (506001), remove the O-ring (124703) from the adjusting screw.



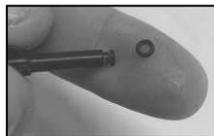
10. With the tool (506001), remove the O-ring (124706) from the valve spindle (129146).



11. Insert a 4 mm Allen key in the valve spindle (thread side) and push out the shuttle valve assembly. Separate the components of the valve seat.



12. Use a fingernail to remove the rubber seating (129638) and the small O-ring (AP2041) of the shuttle valve (AP2036).



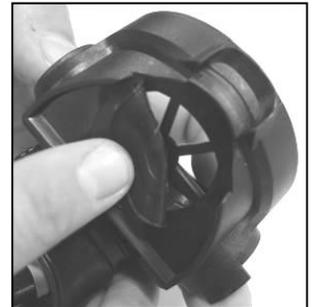
13. Using a flat screwdriver, unscrew the valve seat (AP2033) until feeling thread end. Insert metallic part of the tool (116236) in the valve spindle (not threaded side). Grab the tool metallic part on the other side, pull the valve seat out.  
Using the tool (506001), remove the O-ring (444243) from the valve seat.



14. By hand or with a coin, unclip the exhaust tee (129908). Be careful not to damage the case (129931 or 129932).



15. Lift the exhaust valve (129174). Check that the contact surface is clean and free of scratches. The exhaust valve should be clean, flexible and should have clean edges.



If it is in good condition, it is not necessary to remove it and it can be re-used. If there is any sign of deterioration, it must be replaced.

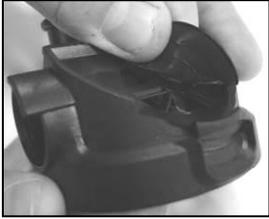
Do not remove the baffle (129648) from the case (129931 or 129932).

## DISASSEMBLY END

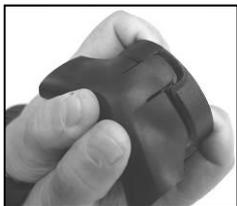
**Before starting to re-assemble the regulator, make sure that all replacement parts have been cleaned and lubricated in accordance with Procedure A – Cleaning and Lubricating, page 15.**

## REASSEMBLY PROCEDURE

1. If the exhaust valve (129174) has been removed, pass the valve tail through the case hole (129931 or 129932), from outside and pull gently until the notch is inside the case. If it is a new exhaust valve, one installed, cut off any excess tail leaving about 5mm.



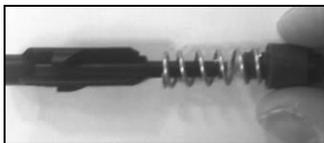
2. Place the exhaust tee (129908) on both case notches (129931 or 129932) and pull on its low part to clip it.



3. Fit a new O-ring (AP2041) in the shuttle valve groove (AP2036). Insert a new rubber seating (129638) in the shuttle valve. With a brush, lubricate the shuttle valve tail (O-ring side).



4. Insert the spring (AP2021) in the counter balance cylinder (129784). Guide carefully the shuttle valve tail (AP2036) inside the spring and insert it in the counter balance cylinder.



5. If the lever (129178) has been removed, place it again, take care to install it at the same side as the valve spindle punch (129146).



6. Fit a new lubricated O-ring (124706) on the valve spindle (129146).



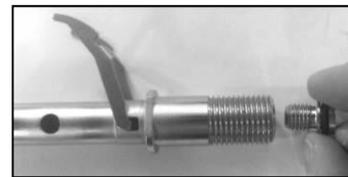
7. Fit a new lubricated O-ring (124703) on the adjusting screw (129162).



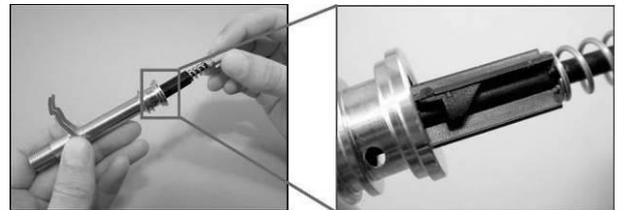
8. Fit a new lubricated O-ring (444243) on the valve seat (AP2033).



Insert the valve seat, thread first, inside the valve spindle (129146), thread side, and push until stop.



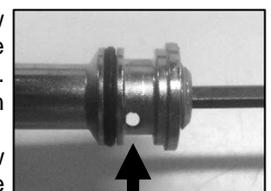
9. Insert the assembled shuttle valve in the valve spindle (129146), not threaded side. Shuttle valve notches should be at the opposite side of the lever.



With the plastic side of the tool (116236), push on the counter balance cylinder (129784) and check that the lever raise.



10. Insert the adjusting screw (129162) in the valve spindle (129146), not threaded side. There should be a tension on the lever (due to the spring). Using a 4 mm Allen key, screw the adjusting screw until the tension pin hole is clear.

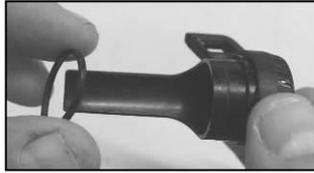


Clear hole

Fit the tension pin (AP1151) into its position, centre it. Gently unscrew the adjusting screw until it applies sufficient tension on the tension pin that prevent it from falling out.



11. Fit a new lubricated O-ring (AP1438) on the Venturi lever (129909).



12. While holding the lever (129178) down, insert the valve spindle (129146) in the Venturi lever (129909).



13. While holding the lever (129178) down, and placing the Venturi lever up, insert the assembly in the case (129931 or 129932) until stop.



Make sure the valve spindle planes (129146) are well placed in case planes.



14. Fit a new lubricated O-ring (124706) on the valve spindle, thread side and push it against the case (129931 or 129932).



**For standard version:** screw the insert screw (127818) on the valve spindle. Tighten to **0.3 m.kg (2.17 ft.lb)**.

**For supreme version and octopus:** screw the heat exchanger on the valve spindle. Tighten to **0.5 m.kg (3.7 ft.lb)**.

15. While placing the flat side of the case (129931 or 129932) at eye level, screw the valve seat (AP2033) with a flat screwdriver, until the lever (129178) lever is about 4mm below the level of the case edge.

Unscrew the valve seat to raise the lever up.

Screw the valve seat again until the lever slightly move.



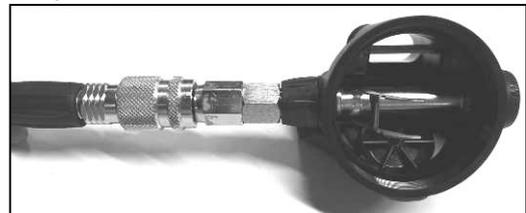
16. Using a 4 mm Allen key, screw the adjusting screw (129162) of :

- 3/4 of turn for standard version
- 1 turn and 1/4 of turn for supreme version and octopus



17. Lever adjustment:

Connect the tool (122046 + 122041) on the 2<sup>nd</sup> stage and the hose (124567) on the tool. Connect this system to its 1<sup>st</sup> stage.



Put the regulator under pressure. Slide tool (125727) flat side (without drop) along the top edge of the case. The lever should touch the tool but it should not produce an airflow. Screw or unscrew the valve seat (AP2033) thanks to the tool (122046 + 122041).



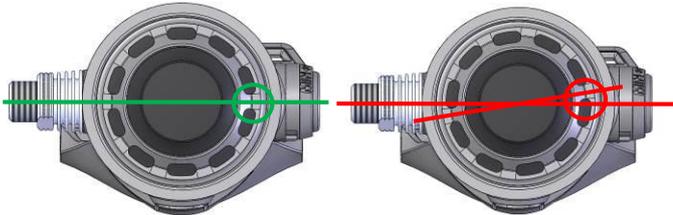
Screwing the valve seat, take down the lever. Unscrewing the valve seat, raise the lever.

Turn off the air supply and purge the second stage.

18. Fit the diaphragm (129150) in the case (129931 or 129932). Press all around the edges with a finger to ensure that it is in place. Fit the washer (129133) directly in contact with the diaphragm.



19. Manually screw the diaphragm retainer (129195), flat face toward the diaphragm (129150), until stop. Using the tool (129001) tighten it an additional 1/4 of turn. Align a diaphragm retainer fin with the valve spindle axis (129146).

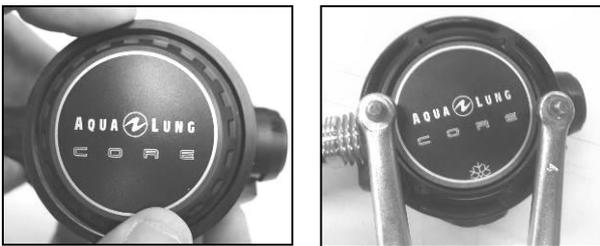


Good alignment

Wrong alignment

After tightening the diaphragm retainer, hold the top of the diaphragm and gently pull it in all directions to ensure that it is firmly in place in the housing. If not, refit it.

20. Fit the front cover (129912, 129917 or 129918) and align the marking with the valve spindle axis (129146). Screw by hand the front cover holder (129913) on the case until stop. Tighten it using a lug spanner (129198).



21. Turn off the air supply and purge the second stage. Remove the tool (122046 + 122041). Move the end nut of the hose (124567) into the insert (129146).

**For standard version:**

Using one 11/16" key, block the insert screw and, using a 11/16" fitting, tighten the end nut of the hose to **0,3 m.Kg (2.17ft-lb)**.

**For supreme version and octopus:**

Using one 11/16" key, block the heat exchanger and, using a 11/16" fitting, tighten the end nut of the hose to **0,5 m.Kg (3.7 ft-lb)**.



**REASSEMBLY END**

## CONTROLE FINAL

1. Put the regulator under pressure at 200 bar ( $\pm 10$  bar).



**NOTE:** Tests 2, 3 and 4 require the use of a Regulator Test bench.

2. **Opening effort check.** Apply an increasing inhalation flow. When the MP starts to fall, note the opening effort reading and compare it with the limits shown on Table 5. Checking specifications. If the opening effort is outside the limits then check Table 1. Troubleshooting Guide.
3. **Flow/effort test.** Place the Venturi lever (129909) on the MAX position. Apply an inhalation flow of 400 l/min and check that the effort does not exceed 15 mbar. If the effort exceeds this then check Table 1. Troubleshooting Guide.
4. **Leak test.** Connect the first stage to a cylinder charged to 200 bar, open the cylinder valve and immerse the set in a fresh water bath for one minute. Check that there are no leaks.



**NOTE:** Do not confuse bubbles trapped in the regulator with a leak. In case of leak, bubbles should appear constantly.

If a leak is detected, disassemble the entire 2<sup>nd</sup> stage; check all sealing surfaces and the correct positioning of all parts.

## FINAL REASSEMBLY

1. Fit the Venturi plug (129911).



2. Fit the mouthpiece (123697 for standard and supreme versions, 123698 for octopus) on the case (129931 or 129932). If it is a Comfobite mouthpiece (123697), check that the support section is on top.

Fit the mouthpiece strap (129154) into its groove. The collar lever should point down on the hose side.



3. If the regulator is a supreme version, fit the lip shield (125613) over the mouthpiece and against the mouthpiece strap (129154).

## FINAL REASSEMBLY END

## APPENDIX

Table 1. Troubleshooting Guide

SYMPTOM	POSSIBLE CAUSE	TREATMENT
Leak or free flow at 2 <sup>nd</sup> stage	1. The MP is too high	1. Refer to First stage Troubleshooting Guide
	2. The rubber seating (129638) is worn or damaged	2. Replace the rubber seating
	3. The valve seat (AP2033) is not correctly adjusted	3. Readjust the valve seat
	4. The lever (129178) is bent	4. Replace the lever
	5. The sealing face of the valve seat (AP2033) is damaged	5. Replace the valve seat
	6. The spring (AP2021) is damaged	6. Replace the spring
Insufficient purge flow or work of breathing too high	1. The MP is too low	1. Refer to First stage Troubleshooting Guide
	2. The valve seat (AP2033) is not correctly adjusted, the lever adjustment is too low	2. Readjust the lever and the valve seat
	3. The MP hose is obstructed	3. Clean or replace the hose
	4. The lever (129178) is bent	4. Replace the lever
Water leak	1. There is an hole in the mouthpiece (123697 or 123698)	1. Replace the mouthpiece
	2. The diaphragm (129150) is damaged	6. Replace the diaphragm
	3. The exhaust valve (129174) is damaged	7. Replace the exhaust valve
	4. The Venturi lever O-ring (AP1438) is dirty, worn or damaged	4. Replace the O-ring
	5. The diaphragm is not correctly fitted between the case (129931 or 129932) and the washer (129133)	5. Disassemble the front cover and refit the assembly correctly
	6. The case (129931 or 129932) is damaged	6. Check the sealing face of the exhaust valve. Replace the case.
	7. The valve spindle O-ring (124706) is damaged	7. Replace the O-ring

Table 2. Tools and service kits list

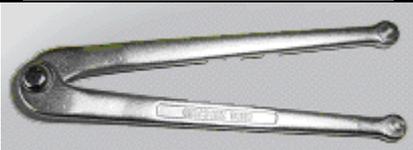
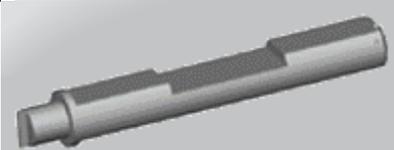
REF	DESCRIPTION	PICTURES	APPLICATION	US PART NO.
506001	O-ring tool		Fitting and removing O-rings	944022
116236	Disassemble tool HP club		Seat assembly / disassembly	109437
129198	Hook wrench		Front cover holder screwing / unscrewing	129198
129001	2 <sup>nd</sup> stage LX tool		Diaphragm retainer screwing / unscrewing	129001
125727	Lever / crown adjustment tool		Lever adjustment	125727
122154	Torque wrench SAM		Insert screw or heat exchanger screwing	n/a
122046 + 122041	Adjusting tool artic + Adapter adjust tool micra		Lever adjustment under pressure	n/a
n/a	11/16" open end torque wrench		Insert screw or heat exchanger screwing	n/a
n/a	Medium flat screwdriver		Valve seat screwing / unscrewing	n/a
n/a	Two 11/16" keys		Hose nut and insert screw or heat exchanger screwing / unscrewing	n/a
n/a	Allen 4mm Allen key		Adjusting screw screwing / unscrewing Pushing of shuttle valve outside valve spindle	n/a
128019	Service kit second stage balanced		BP Core, BP Core supreme, BP Octopus	n/a

Table 3. Recommended cleaners and lubricants

LUBRICIANT / CLEANER	APPLICATION	SOURCE
Christo-Lube MCG 111	All O-rings	Aqua Lung, ref. 480025
 <b>ATTENTION:</b> <i>Silicone parts do not require lubrication. Do not grease them. Greasing silicone parts can change their molecular construction and cause premature degradation of the material.</i>		
Oakite #31	Acid bath for cleaning brass and stainless steel parts	Oakite Products, Inc.
NETALU	Acid bath for cleaning brass and stainless steel parts	Aqua Lung, ref. 455001
Diluted white vinegar	Acid bath for cleaning brass and stainless steel parts	Household stores
 <b>ATTENTION:</b> <i>Do not use hydrochloric acid for cleaning parts. Hydrochloric acid, even when well diluted, attacks the coating of metal parts and leaves a corrosive deposit that damages plastic parts and O-rings.</i>		
Washing-up liquid (diluted with hot water)	Degreases brass and stainless steel parts; general cleaning of plastic and rubber parts	Household stores
Disinfectant STERANIOS 2%	Disinfectant for all plastic and metal parts	Aqua Lung ref : 382062

Table 4. Torque values

N° REFERENCE	DESCRIPTION	COUPLE
127818	Insert screw	0.3 m.kg (2.17 ft.lb)
129914	Heat exchanger	0,5 m.kg (3.7 ft.lb)
124567	Hose, 2 <sup>nd</sup> stage side	0,3 m.Kg (2.17 ft.lb) when tight against the plastic screw 0,5 m.Kg (3.7 ft.lb) when tight against the metal heat exchanger

Table 5. Checking specifications

TEST	INSTRUCTIONS	SPECIFICATIONS
Leak Test	160 bar < Working pressure < 200 bar	No leak
Medium Pressure	160 bar < Working pressure < 200 bar	<b>MP at 9.5 bar ± 0.5 bar</b> : Core <b>MP at 8.5 bar ± 0.5 bar</b> : Core supreme
Opening effort	160 bar < Working pressure < 200 bar	<b>Between 2.5 mbar and 3.5 mbar</b> : Core <b>Between 3.3 mbar and 4.3 mbar</b> : Core supreme and Octopus
Effort / Flow	<b>MP at 9.5 bar ± 0.5 bar</b> : Core <b>MP at 8.5 bar ± 0.5 bar</b> : Core supreme and Octopus	15 mbar maxi at 400 L/min

## Procedure A – Cleaning and Lubricating (All Aqua Lung regulators)

### Cleaning brass and stainless steel parts.

1. Pre-clean by soaking in NETALU diluted to 25%.
2. Cleaning in an ultra-sonic bath filled with a mixture of washing-up liquid + hot water. If some resistant deposits remain then fill the ultrasonic bath with diluted white vinegar and repeat. DO NOT put plastic, rubber, silicone or anodised aluminium parts in contact with vinegar.
3. Rinse in demineralised or fresh water to avoid calcium deposits. Soak for 10 minutes. Dry with filtered low pressure air and then check that their condition is now suitable for re-use.

### Cleaning plastic, rubber and anodised aluminium parts.

For anodised aluminium parts: soak in a « NETALU diluted to 25% ». Rinse in fresh water and dry with low-pressure filtered air.

For plastic parts. (casings, plugs...): clean in an ultrasonic bath containing a mixture of washing-up liquid and hot water. Use only a toothbrush with nylon bristles to remove any deposits. Rinse in fresh water and dry with low-pressure filtered air.



**ATTENTION:** Do not place plastic and rubber parts in contact with acid solutions. This could alter their physical properties and cause degradation and premature breakdown.

### Disinfecting parts

For disinfection, leave plastic and metal parts to soak for 20 minutes in a bath of STERANIOS 2% ref. 382062 (ready to use). Rinse the parts thoroughly after soaking. Toxic product, follow the instruction for its use.

### Cleaning parts for Nitrox/O2 use.

1. Metal parts: Pre-clean by soaking in NETALU diluted to 25%.
2. Ultrasonic cleaning in Promoclean TP108 diluted at 5%.
3. Rinse in demineralised water. Soak for 10 min.
4. Dry in the open air in a clean and dust-free atmosphere. Place the parts on a white cloth, allow to dry and check after drying that the cloth shows no grease deposits and that the condition of the parts is appropriate for re-use with Nitrox/O2.

### Cleaning hoses.

Refer to support “Hose inspection and cleaning procedure”.

### Wiping.

To wipe parts, use a white filter paper, a pure cotton cloth or any other material that **does not produce fluff**.

### Inspection.

Visually check under a white light (day light or artificial light).

The parts are completely free of any traces of:

1. organic materials (oil, grease, paint, rust...)
2. cleaning agents
3. dust
4. humidity

### Lubrication.

When handling O-rings wear unpowdered latex gloves. It is important not to allow contact between the internal components and the skin or any other source of contamination when the regulator is being prepared for Nitrox use. All seals should be lubricated with Christolube MCG111. Cover the seals with a light film of grease and remove any excess by rolling the seal between finger and thumb. Do not use an excess of grease; this can have the effect of accumulating particles that could damage the O-rings.





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FAX 00.33.(0)4.92.08.28.99