



## ***SERVICE MANUAL***



## ***SECOND STAGE LX and LEGEND***

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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 Aqualung 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 Aqualung equipment during a specialised course.

If you do not understand certain procedures in this manual you should contact an Aqualung 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:** Whatever the number of dives carried out during a year, the regulator should receive a complete service each year. If the regulator is used in a chlorinated or aggressive environment the service period should be reduced to six months.

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

## GENERAL INSTRUCTIONS

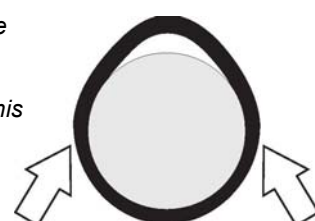
1. In order to carry out the procedures described in this manual correctly it is important that you follow the steps in the exact order indicated. Read the manual through completely so that you become familiar with all the procedures, the special tools and the replacement parts, before starting to disassemble 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 006230 into the HP 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 Aqualung service kits. Never replace an Aqualung 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. 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 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 into this eye to remove the O-ring.*



4. The acronyms used:  
**LP:** Low Pressure  
**MP:** Medium Pressure  
**HP:** High Pressure
5. Numbers in brackets indicate the part number of the component shown on the exploded view attached.

## DISASSEMBLY PROCEDURE

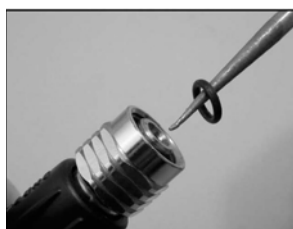


**Note:** Before commencing disassembly, consult the exploded view to check the reference numbers of all parts requiring replacement. These parts should all be replaced by new parts and should not be re-used on the pretext that the regulator has seen little use since its manufacture or since its last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



**Attention:** Use only the special tool 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.

1. Use two 11/16" spanners to block the nut (5) and to unscrew the end nut on the hose. Remove the O-ring from the hose nipple. Take care not to damage the O-ring groove. Remove the O-ring from the hose threaded end.



- 2.

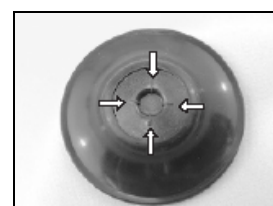
Slide back the hose protectors and check that there are no signs of impact and that the crimped ends are in good condition and that they firmly grip the hose. If not, it should be replaced.



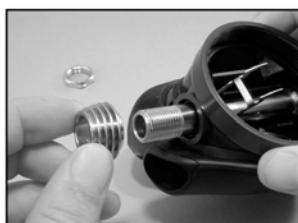
3. Unscrew the outer ring (2). Remove the cover (16).



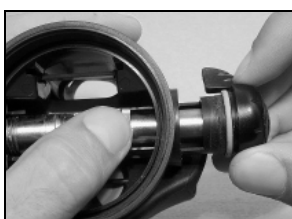
4. Use tool (129001) to unscrew the diaphragm retainer (15). Remove the washer (14) and the diaphragm (13).



5. Use a 11/16" spanner to undo the nut (5). Remove the heat exchanger.



6. Turn the adjustment handwheel anti-clockwise to the end. Hold the lever (8) down against the insert (7) and pull on the handwheel to remove the insert assembly from the casing (1). Remove the O-ring (4).



7. Hold the lever (8) against the insert (7) and remove the venturi control (6). Remove the plug (25). Remove the venturi control O-ring (24).



- 8.

The spring pin (11) should come out. If it remains in the body push it out using a small rod or screw in the adjusting screw one turn using a 4mm Allen key and try again.



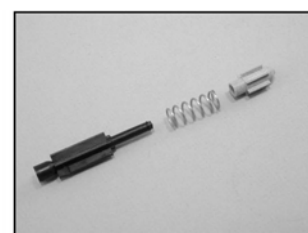
9. Using a 4mm Allen key, unscrew and remove completely the insert adjusting screw. Remove the O-ring (22).



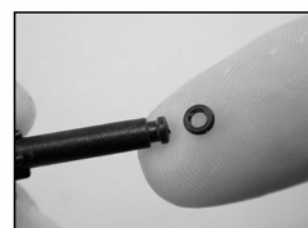
10. Remove the O-ring (4) from the insert.



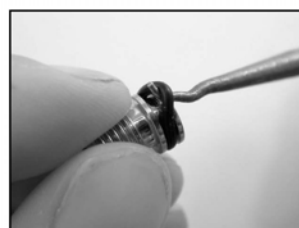
11. Insert a rod or tool (116236) into the insert (threaded side) and push out the valve seat assembly. Separate the components of the valve seat.



12. Use your fingernail to remove the seat (18) and the small O-ring (20) of the shuttle valve (12).



13. Unscrew the seat (9) 6 or 7 turns using a screwdriver. Push the plastic part of tool (116236) into the insert to push out the seat. Remove the seat O-ring (10).



14.

To remove the bubble deflector (28), first immerse the casing in hot water (50°C) for 2-3 minutes. Pull on one end of the deflector to remove it.



15.

Lift the exhaust valve (27) and check that its surface is clean and free of scratches. It should be flexible and its edges should be clean. If it is in good condition it is not necessary to remove it and it can be re-used. If there are any signs of deterioration it should be replaced.



16. If the regulator is a Legend LX Supreme, remove the lip shield (36). Remove the mouthpiece collar (29) then the mouthpiece (17).



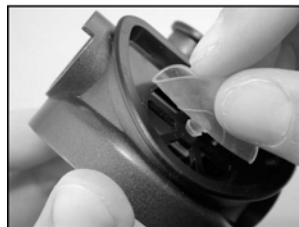
## END OF DISASSEMBLY



**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 on page 13.**

## RE-ASSEMBLY PROCEDURE

1. If the exhaust valve has been removed, pass the valve tail through the hole in the casing from the outside and pull gently until the notch is inside the casing. If it is a new valve cut off any excess tail leaving about 5mm.

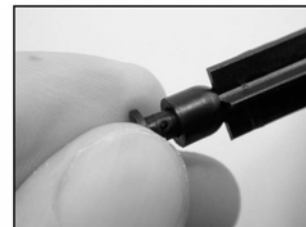
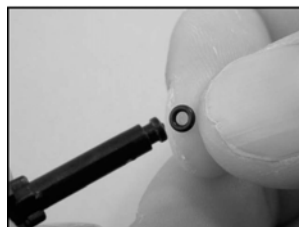


2.

Immerse the deflector in hot water (~50°C) for 2-3 minutes. Fit the deflector (28) over the moulding on the casing and press on the domed part to push the deflector home.



3. Fit a new lubricated O-ring (20) into the shuttle valve throat (12). Insert a new valve seat (18) into the shuttle valve.



4. Insert the spring (19) into the balancing chamber (21). Carefully guide the shuttle valve tail into the spring and insert it into the balancing chamber.



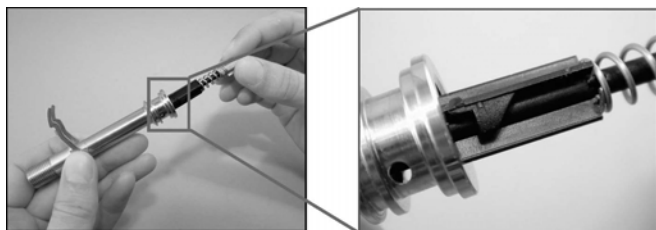
5.

If the lever has been disassembled, replace it taking care to put it on the same side as the indent on the insert. The insert hole should be on the right when the insert is seen thread uppermost.





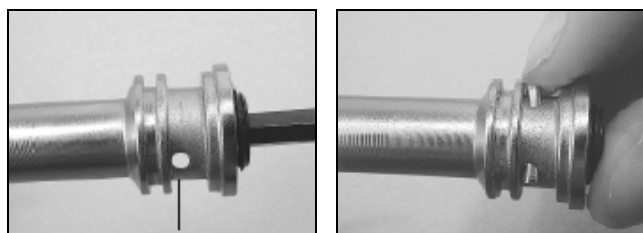
6. Insert the assembled shuttle valve, notch downwards, into the insert, holding the lever at right angles to the insert. Push the shuttle valve in until it passes the notch. To check that it is correctly fitted, turn the insert over, the shuttle valve should stay inside.



7. Fit a new lubricated O-ring (22) on the adjusting screw.

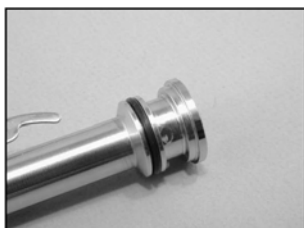


8. Fit the adjusting screw into the insert. The lever should now be under tension (due to the spring). Screw the adjusting handwheel in until the hole that accepts the spring pin is exposed. Fit the spring pin (11) into its position. Gently unscrew the adjusting handwheel until it applies sufficient tension on the spring pin to prevent it from falling out.



Hole exposed

9. Fit a new lubricated O-ring (4) on the insert (7).



10. Fit a new lubricated O-ring (24) onto the venturi control (6). Position the control handle upwards and push it fully home into the casing.



11. While holding the lever down, fit the insert inside the casing from the venturi control side. Make sure that the flats on the insert fit into the flats on the casing.



12. Fit a new lubricated O-ring (4) on the insert and fit it against the casing. Slide the heat exchanger (3), it's widest part first, onto the insert. Screw on the nut (5) and tighten it at 0.5 m.kg.



13. Fit a new lubricated O-ring (10) onto the adjustable seat (9). Fit the seat (threaded part first) into the insert and push it fully home using a screwdriver.



14. With the flat side of the casing at eye level, screw in the adjusting knob until the lever is about 4mm below the level of the casing edge. Now unscrew it until the lever just shows above the edge of the casing.



15. Using a 4mm Allen key tighten the adjusting screw one turn for Supreme models and  $\frac{3}{4}$  turn for other models.



16. Fit a new lubricated O-ring on the threaded end of the hose. Fit a new lubricated O-ring on the hose nipple.



17. Lever adjustment: Connect the tool (122046) to the second stage and the MP hose to the tool. Connect this assembly to a Legend first stage adjusted as follows:

*Titan LX, Legend : MP = 9.5b*  
*Titan LX Suprême, Legend Suprême : MP = 8.5 b*

Put the regulator under pressure. Slide tool (129001) along the top edge of the casing. In the highest position the tool should press on the lever, causing an airflow. In the lowest position the 2<sup>nd</sup> stage should not leak air. Adjust the seat using the tool until the adjustment is correct.



20.1

18. Fit the diaphragm (13) in the casing. Press all around the edges with a finger to ensure that it is in place. Fit the washer (14) directly in contact with the diaphragm..



19. Manually screw the diaphragm retainer (15) fully home, flat face toward the diaphragm. Use tool (129001) to tighten it an additional  $\frac{1}{4}$  turn. The spring pins for the Titan and Legend are different in shape.



After tightening the diaphragm retainer (15), 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 Legend or LX purge button making sure that the name plate is the right way up. While holding the purge button screw the ring fully home.

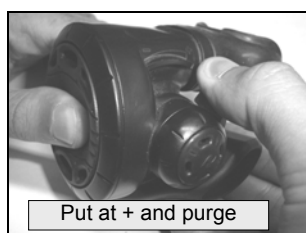


21. Checking the venturi

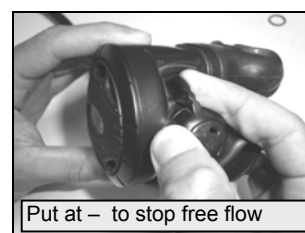
21.1 Place the venturi control in the “ + ” position.

21.2 Press on the purge button. The regulator should free flow.

While the regulator is free flowing, move the control to the “ – ” position. The free flow should stop immediately. If it does not stop, screw the seta in  $\frac{1}{8}$  turn and try again.



Put at + and purge



Put at – to stop free flow



22. Turn off the air supply and purge the second stage. Tighten nut (5) using a 17 mm torque wrench at 0.5 m.kg



**Note :** If you have a regulator Test Bench, carry out these test before refitting the mouthpiece. Instructions for the check are given in the paragraph **Final Checks**

23. Refit the mouthpiece (17) onto the casing. If it is a Comfobite mouthpiece, check that the support section is on top. Fit the mouthpiece strap (29) into its groove. The collar lever should point down on the hose side.



24. If the regulator is a Legend Supreme, fit the lip shield (36) over the mouthpiece and against the mouthpiece strap.

## FINAL CHECKS

1. Put the regulator under pressure with a 200 bar ( $\pm 10$  bar) supply.



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

## END OF REASSEMBLY

**Table 1. Troubleshooting Guide**

SYMPTOM	POSSIBLE CAUSE	TREATMENT
Leak or free flow at 2 <sup>nd</sup> stage	1. MP too high	1. Refer to First stage Troubleshooting Guide
	2. The valve (18) is worn or damaged.	2. Replace the valve
	3. The seat (9) is not correctly adjusted	3. Readjust the seat
	4. The lever (8) is bent	4. Replace the lever
	5. The sealing face of the seat (9) is damaged.	5. Replace the seat
	6. The spring (19) is damaged	6. Replace the spring
Insufficient purge flow or work of breathing too high	1. MP too low	1. Refer to First stage Troubleshooting Guide
	2. The valve (9) is not correctly adjusted, the lever adjustment is too low	2. Readjust the lever and the valve
	3. MP hose obstructed	3. Clean or replace the hose
	4. Le lever (8) is bent	4. Replace the lever
Water leak	1. Hole in mouthpiece (17)	1. Replace the mouthpiece
	2. Diaphragm (13) damaged	2. Replace the diaphragm
	3. Exhalation valve (27) damaged	3. Replace the valve
	4. The venturi control O-ring (24) is dirty, worn or damaged	4. Replace the O-ring
	5. The diaphragm is not correctly fitted between the casing (1) and the washer (14)	5. Disassemble the purge button and refit the assembly correctly
	6. The casing is damaged.	6. Check the sealing face of the exhalation valve. Replace the casing
	7. The O-ring (4) is damaged.	7. Replace the O-ring
	8. The insert O-ring (4) is damaged.	8. Replace the O-ring



**Table 2. List of Tools and Service Kits**

REF	DESCRIPTION	APPLICATION	US PART NO.
116222	MP pressure gauge complete 0/16B	Checking medium pressure	111610
N/C	O-ring tool	Fitting and removing O-rings	944022
129001	Spring clip tool	Fitting and removing diaphragm clip (15)	129001
116236	Seat fitting tool	Seat assembly/disassembly	109436
129198	Ring tool for Legend LX	Tighten/loosen gold/silver ring on Legend LX	N/a
N/C	Seat adjustment tool	Adjusting seat under pressure	100190
N/C	Torque wrench 0.5 m.kg	Plugs	N/a
N/C	17mm flat wrench	Nut (5)	N/a
N/C	Medium flat wrench	seat	N/a
N/C	Flat wrench 17mm (x2)	Hose nut	N/a
N/C	4mm Allen key	MP et HP plugs	N/a
<b>129007</b>	<b>Service kit 2<sup>nd</sup> stage Legend / LX</b>	<b>BP Legend, BP LX, BP Legend LX</b>	<b>900012</b>

**Tools from service kit 116245 :**



Table 3. Recommended cleaners and lubricants

LUBRICANT / CLEANER	APPLICATION	SOURCE
Cristo-Lube MCG 111	All O-rings	Aqualung, ref. 480025
 <b>Attention:</b> 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.		
Oakite #31	Acid bath for cleaning brass and stainless steel parts.	Oakite Products, Inc.
NETALU	Acid bath for cleaning brass and stainless steel parts.	Aqualung, ref. 455001
Diluted white vinegar	Acid bath for cleaning brass and stainless steel parts.	Household stores
 <b>Attention:</b> 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.		
Washing-up liquid (diluted with hot water)	Degreases brass and stainless steel parts; general cleaning of plastic and rubber parts.	Household stores

## Procedure A Cleaning and Lubricating (All Aqualung 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 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:** *D not place plastic and rubber parts in contact with acid solutions. This could alter their physical properties and cause degradation and premature breakdown.*

### 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.

If there is significant corrosion then it is permissible to soak only the ends in an ultrasonic bath, avoiding any possibility of the solution entering the hose. Rinse in fresh water and allow to dry with the connections hanging down. Dry the inside with filtered compressed air before reconnecting the hose to the regulator.

### 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 Cristolube 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 which could damage the O-rings.



Table 4. Torque values

N° REFERENCE	DESCRIPTION	FORCE
AP2031	Nut (5)	0.5 m.kg.

Table 5. Checking specifications

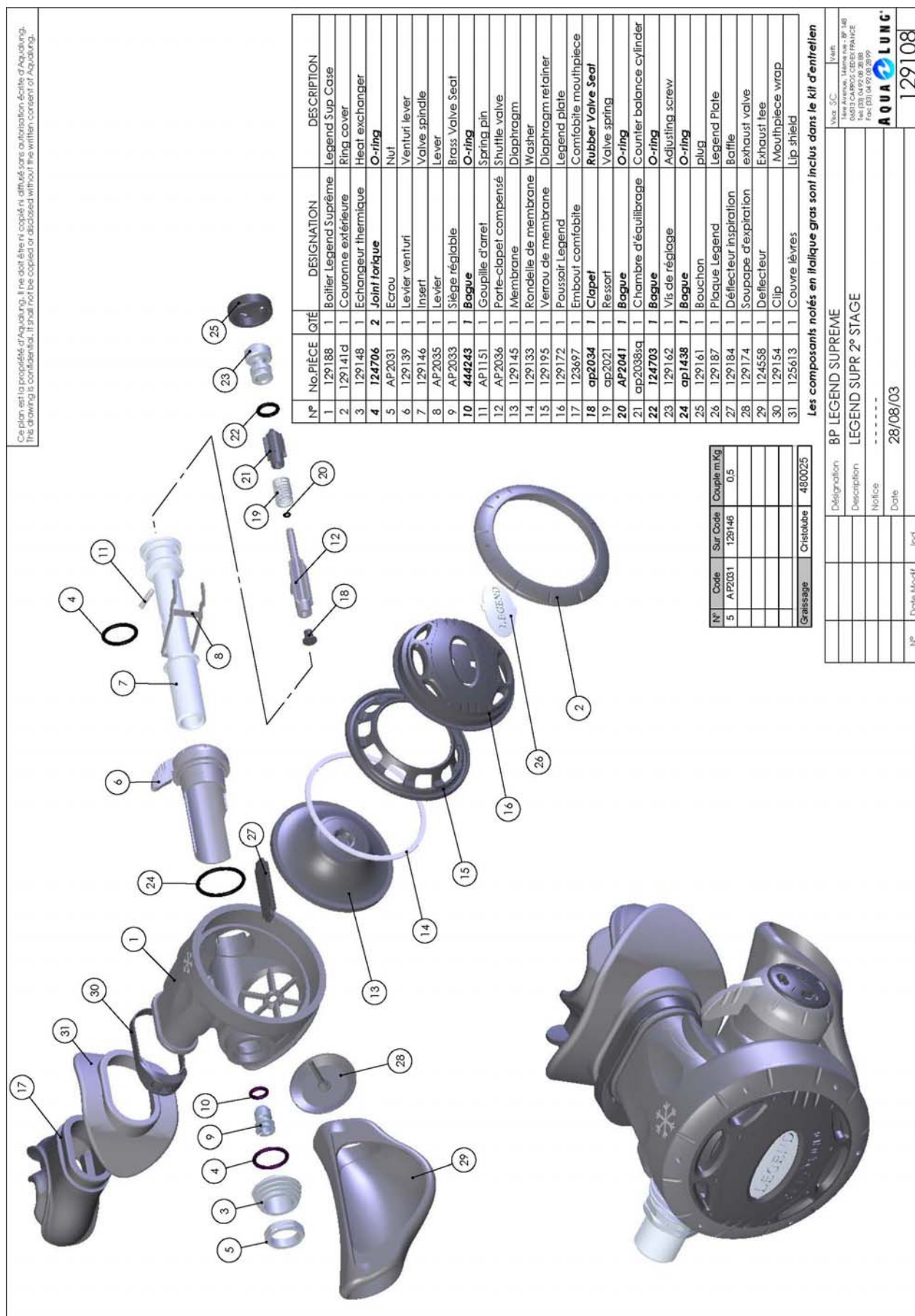
TEST	INSTRUCTIONS	SPECIFICATIONS
Leak Test	160 bar < Working pressure < 200 bar	No leak
Medium Pressure	160 bar < Working pressure < 200 bar	<b>MP at 9.5 bar ± 0.5 bar:</b> Legend and Titan LX <b>MP at 8.5 bar ± 0.5 bar:</b> Legend Supreme and Titan LX Supreme
Opening effort	160 bar < Working pressure < 200 bar	Legend: between <b>2.5 mbar</b> and <b>3.5 mbar</b> Titan LX: between <b>2 mbar</b> and <b>4 mbar</b> Legend Supreme and Titan LX Supreme : between <b>3.3 et 4.3 mbar</b>
Effort / Flow	<b>MP at 9.5 bar ± 0.5 bar:</b> Legend, Titan LX <b>MP at 8.5 bar ± 0.5 bar:</b> Versions Supreme	15 mbar maxi at 400 L/min

### Maintenance Notes.

[illegible]



### Exploded view of Legend Supreme second stage.



Exploded view of LX second stage.

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N°	Code	Sur Code	Couple m.kg
5	AP2031	129148	0.5

Grainage	Cristalobe	480025

N°	Date Modif	Ind

Désignation		BP LX
Description	LX 2nd STAGE	
Notice	-----	
Date	21/10/03	

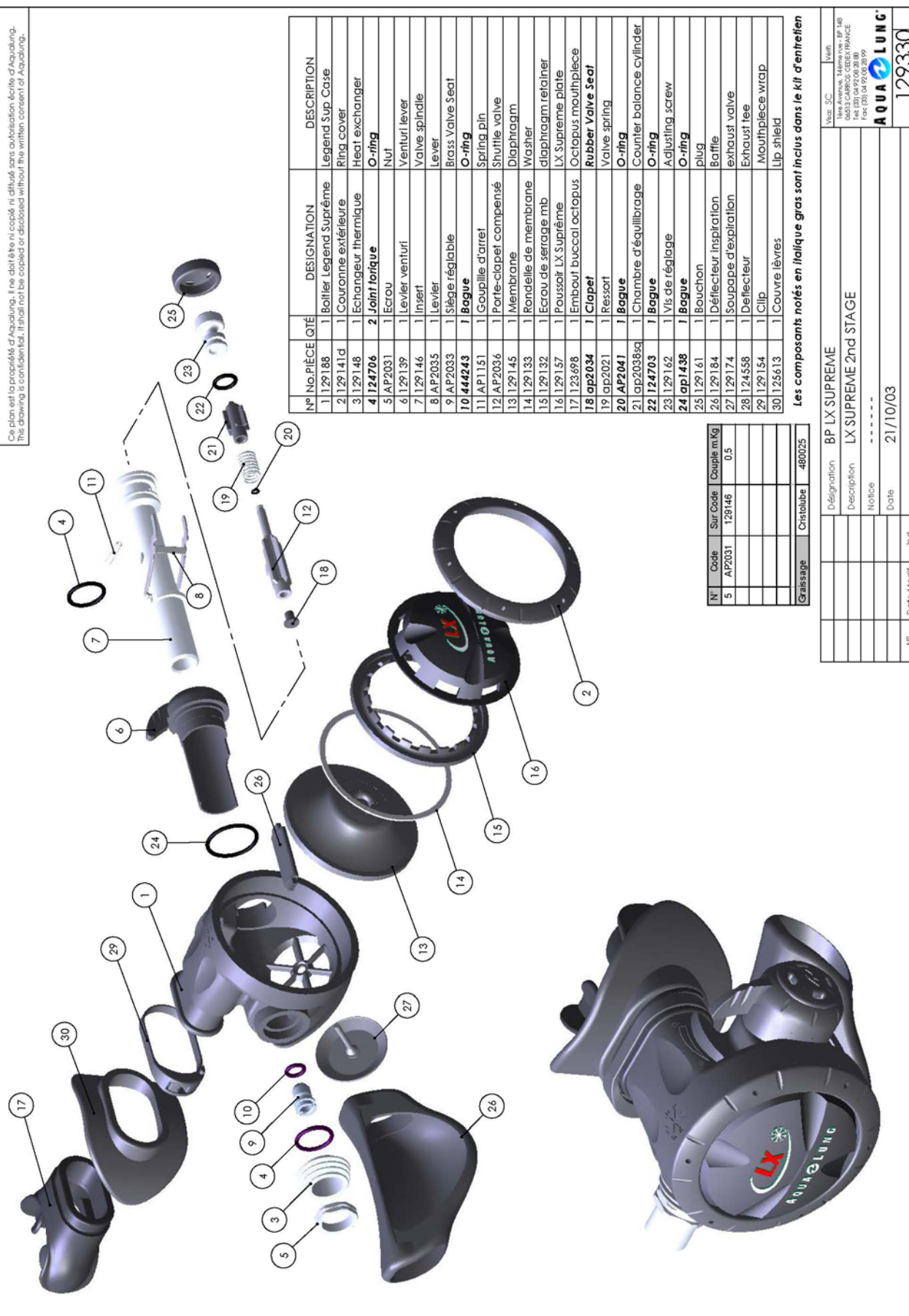
Vues SC		Verif:
Tête Avenue, 14ème coe - BP 148		
94100 Arcueil Cedex FRANCE		
Tel: (33) 04 92 00 10 00		
Fax: (33) 04 92 00 20 99		

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## Exploded view of LX Supreme second stage.

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