



RB05 Diluent and Oxygen Manual Inflator Maintenance Manual

Version 1.0
October 2024
Written by Tino de Rijk

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1. Introduction

1.1 Functional description and limitation

The RB05C and RB05D manual inflators are pressure-balanced inflators, typically fitted to over-the-shoulder counterlungs of the AP Inspiration line of closed-circuit rebreathers. Their purpose is to make it possible for the diver to manually inject diluent gas or oxygen into the breathing loop of the rebreather.

They are attached to the respective diluent or oxygen first stages through medium pressure hoses, attached with a quick-connect, supplying a medium pressure (between 7 and 10 bar) gas flow to the inflators. The push-button operation injects gas into the breathing loop on demand.

For easy maintenance and also for enabling the internal rinsing of the counterlungs, the inflators can be easily removed by unscrewing their lock ring.

- The RB05C is fitted with a blue push button with the text "**Diluent**" engraved.
- The RB05D is fitted with a green push button with the text "**O₂**" engraved.

Maximum CE-certified depth of all AP rebreathers and components is 100m.

1.2 Servicing

When you operate this valve, if the button travel is not smooth, or requires extra effort, then it needs servicing. The oxygen valve generally requires more frequent servicing than the diluent due to the different lubricants used.


Before servicing these products, you must receive instruction and certification in the maintenance of these products by AP Diving.


Without the correct training it is possible to service and configure the RB05 inflators incorrectly, in an unsafe manner.

Please read the instructions in this manual carefully before servicing the product.

Factory or Dealer prescribed service for this product is recommended at least once annually.

The Inspiration, Evolution and Evolution+ closed circuit rebreathers' meet the requirements of the [Personal Protective Equipment Regulation \(EU\) 2016/425](#) and the requirements of [EN14143:2013](#).

 **WARNING:** When servicing the RB05 manual inflators it is VERY important that all parts that may suffer wear and tear are replaced. It is also very important that the correct tools are used to avoid damaging any part of the product in the disassembly and assembly process. Please don't try to save money by re-using parts that really should be replaced during a proper servicing action.

 **WARNING:** it is essential to use new inflator buttons during a service and discard the old ones. It is also essential to ensure the correct travel: the buttons must be screwed onto the stem until the travel, the maximum stem movement is 0.100" or 2.54mm.

1.3 Warranty

The RB05 inflators are covered by an AP Diving 1-year warranty against defects in materials or workmanship. This warranty is only offered to the original purchaser and is not transferable. A copy of the receipt must be presented whenever obtaining warranty service.

1.4 Copyright and Applicable Law

Copyright Notice

This maintenance manual is copyrighted, all rights reserved. It may not, in whole or part be copied, photocopied, reproduced, translated to any electronic medium or machine-readable form without prior consent from Ambient Pressure Diving Ltd.

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Applicable Law:

All products are sold on the strict understanding that only English Law applies in cases of warranty claims and product liability, regardless of where the equipment is purchased or used. Should a claim be made then the venue for this would be in Truro, England. If this clause is not acceptable to you or your family then return the product unused to your place of purchase for a refund.

Manufacturer:

Manufactured in the UK by Ambient Pressure Diving Ltd, Unit 2C, Water-Ma-Trout Industrial Estate, Helston, Cornwall, TR13 0LW, Telephone +44(0)1326 563834.

EC Type Approval & Conformity Assessment:

EC Type certification, module B & D of PPE regulation (EU) 2016/425, by SGS FIMKO OY, Takomotie 8, FI-00380 Helsinki, Finland.
Notified Body Number 0598.



UK Type Approval & Conformity Assessment:

UKCA certification. Module B & D of PPE Regulation EU 2016/425 as brought into UK law, by SGS UK Approval Body 0120; SGS UK Ltd, Rossmore Business Park, Ellesmere Port, Cheshire CH65 3EN.

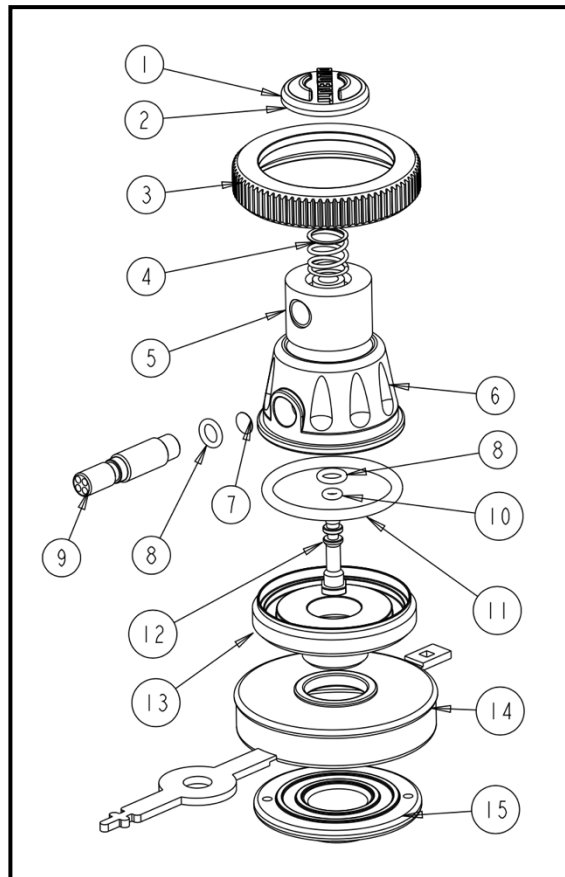


EC & UK Declaration of Conformity:

The latest manufacturers Declaration of Conformity can be found on the Ambient Pressure Diving website: <https://www.apdiving.com/en/rebreathers/resources/eu-certification/>

2. RB05 Manual Inflator Exploded Diagrams and Parts Lists

2.1 RB05C Diluent Manual Inflator and RB05D Oxygen Manual Inflator




<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>QUANTITY</u>
1	Blue Diluent button (for RB05C)	RB_05_07_DIL	1
2	Green Oxygen button (for RB05D)	RB_05_07_O2	1
3	Lock ring	AP_35D	1
4	Spring	RB_05_06	1
5	Insert	RB_05_05	1
6	Valve body	RB_05_01	1
7	Mesh filter 7 mm	AP_400_4	1
8	O-ring	BS_010_N70	2
9	Side stem	AP_400_6	1
10	O-ring	BS_006_N70	1
11	O-ring	BS_222_N50	1
12	Spindle	AP_400_3	1
13	Cylinder post base	AP_35_E	1
14	Protector (small)	AP_15	1
15	Inner lock ring	AP_35L	1

3. Service Kit Contents and Tools needed

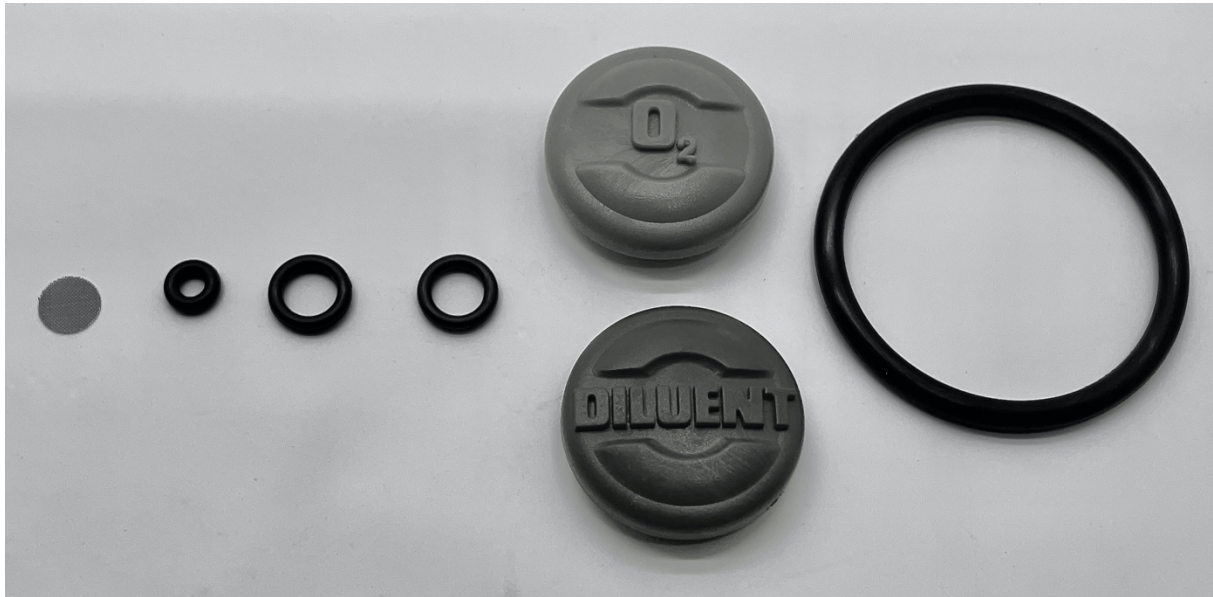
3.1 RB05B and RB05B/1 Service Kit Contents

The service kits RB05B (for the diluent inflator) and RB05B/1 (for the oxygen inflator) contain the following items:

<u>RB05B or RB05B/1</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>
1a	Diluent button (for RB05C; only in kit RB05B)	1
1b	Oxygen button (for RB05D; only in kit RB05B/1)	1
2	Mesh filter 7 mm	1
3	O-ring BS 010 N70	2
4	O-ring BS 006 N70	1
5	O-ring BS 222 N50	1

 **WARNING:** For proper operation, it is essential to replace O rings with correct size, material and hardness.





3.2 Tools Needed

Special tool

There are no special tools needed.

Normal tools

Normal tools needed are:

- A 13mm Allen key or torque wrench with low torque settings down to 2 Newton Meter
- O-ring picking tools
- Silicone grease (for diluent inflator) or O₂-compatible grease (for oxygen inflator)
- (Access to) an ultrasonic bath for cleaning

! WARNING: Do NOT use oil or grease or petroleum jelly or any other hydrocarbon based lubricant on this product. Use only silicone grease or oxygen compatible grease.

! WARNING: Do NOT use aggressive chemicals. They might damage the surface plating of the metal parts of the inflators. Use an ultrasonic cleaning bath with a suitable cleaning fluid. A very good cleaning fluid is Biox "O₂" immersion fluid, but the exposure time to this fluid must be limited to 10 minutes.

See WWW.BIOXINT.COM for further information and distributors.

4. Disassembly Instructions

4.1 General overview: main disassembly steps

There are 6 steps in the disassembly process:

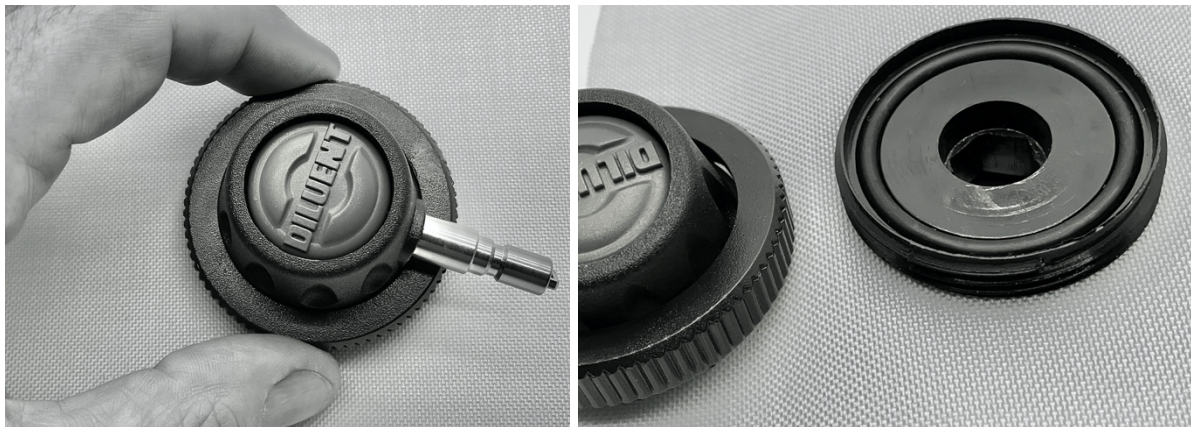
1. Unscrew the lock ring from the cylinder post base
2. Unscrew the push button from the spindle
3. Remove the spindle from the valve body
4. Unscrew the side stem from the valve body
5. Remove the O-ring from the valve body
6. Remove the mesh filter from the valve body

In the pictures you only see the oxygen inflator. However, all procedures are exactly the same for both the diluent as well as the oxygen inflator.

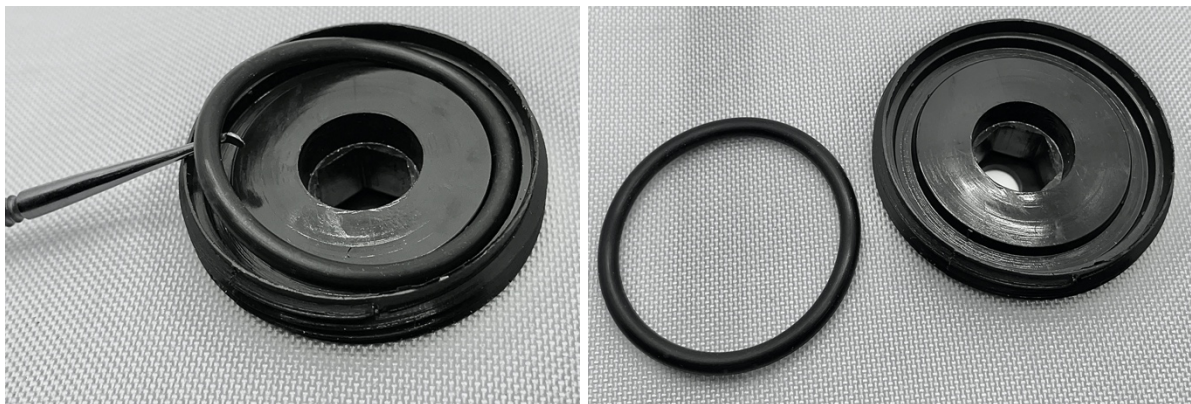
4.2 Unscrew the lock ring from the cylinder post base

Unscrew the lock ring from its cylinder post base.

This allows you to service the inflator completely detached from the rebreather counterlung. Unscrew counter-clockwise.



Next, remove and discard the big O-ring from the cylinder post base.



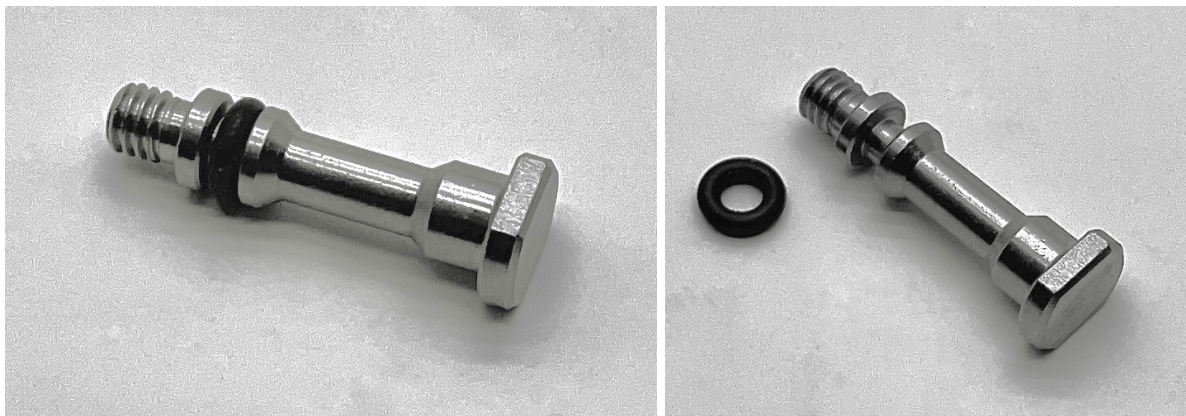
4.3 Unscrew the push button from the spindle

The push button is screwed onto the spindle. It is kept in place by the nyloc-effect (friction). Use a spanner to keep the bottom of the spindle in place, while you unscrew the coloured button counter-clockwise from the spindle. Discard the plastic push button, it must not be used again.



4.4 Remove the spindle from the valve body

Pull out the spindle from the body. Remove and discard its O-ring.



4.5 Unscrew the side stem from the valve body

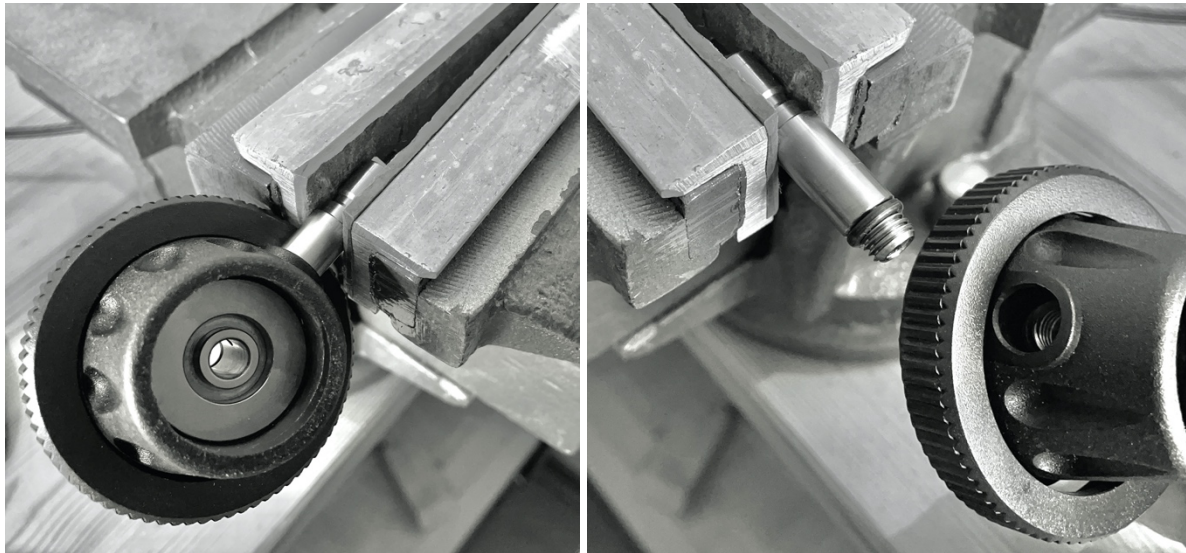
The side stem can be unscrewed by holding the side stem in either a soft-jaws bench vice or soft-jawed pliers. Clamp the side stem into a bench vice. Unscrew counter-clockwise.

ATTENTION: when using the vice, make sure to fit it with soft jaws (plastic or fibre).

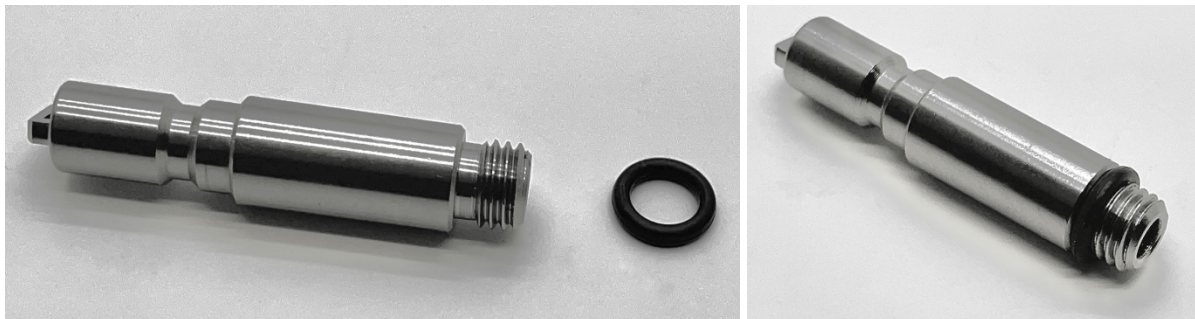
This avoids damaging the stem and its nickel-plated coating.

WARNING: Do NOT use a vice with steel jaws.

Do NOT use a spanner on the small bridge at the gas inlet end of the stem, you will break the bridge, rendering the product unusable.

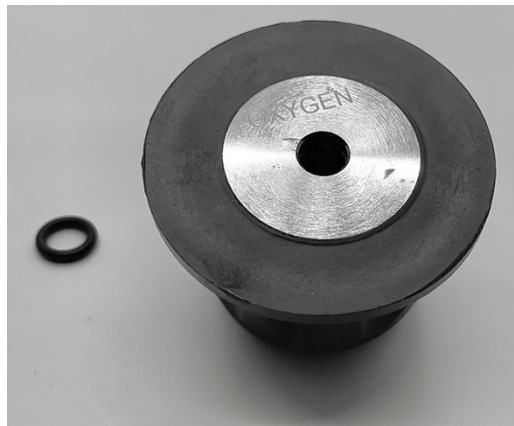
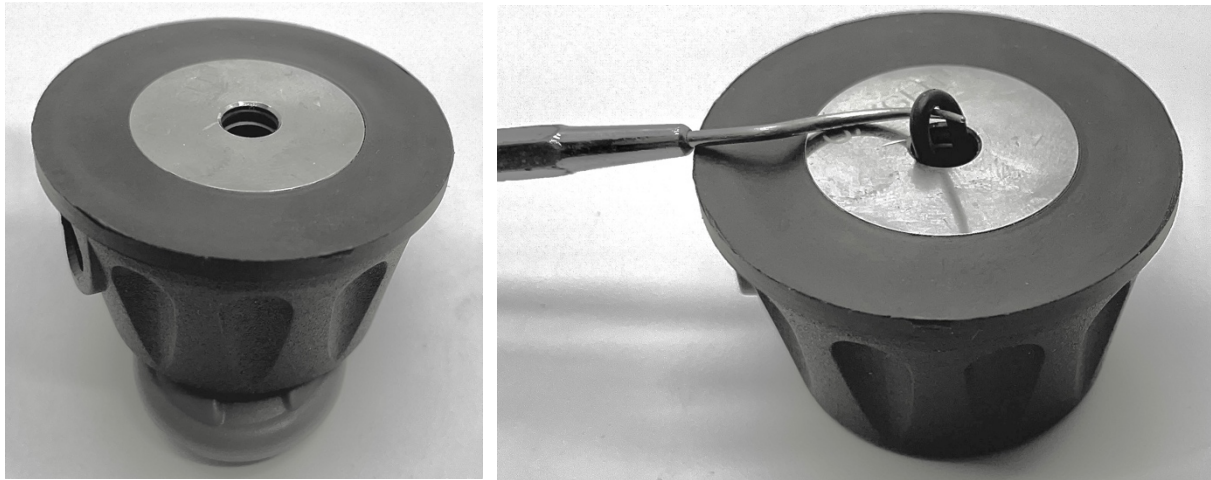


Once unscrewed, remove and discard the O-ring from the side stem.



4.6 Remove the O-ring from the valve body

Using a dentist pick or similar device, remove and discard the O-ring from the valve body, taking care to not scratch the metal O ring groove.



4.6 Remove the mesh filter from the valve body

Again, using a dentist pick or similar, push the mesh filter out from the valve body.





4.7 Inspect all disassembled elements carefully for wear and tear

Carefully inspect all parts.

If any sign of damage or wear is spotted replace the associated element with a new one, using the part numbers as shown in paragraph 3.1.

This completes the disassembly of the RB05 Manual Inflator.

5. Clean and Replace Service Parts

The servicing of the RB05 manual inflators contains 4 “action groups”:

1. Removing and discarding all parts that should be replaced. This includes all O-rings.
2. Inspect all parts for wear and tear. If necessary, replace damaged parts.
3. Ultrasonic-cleaning of all disassembled parts. This is recommended in all servicing situations.
4. Lightly grease new parts, fit them, and re-assemble the RB05 manual inflators with the correct tools and the correct torques. Use appropriate silicon grease (e.g. AP70) for the diluent valve (blue button) and use an appropriate oxygen grease (e.g. RB72) for the oxygen valve (green button),
Use the smallest amount of grease possible.

As described in paragraph 3.1, the service kits RB05B (for the diluent inflator) and RB05B/1 (for the oxygen inflator) contain the following items:

<u>RB05B or RB05B/1</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>
1a	Blue Diluent button (for RB05C; only in kit RB05B)	1
1b	Green Oxygen button (for RB05D; only in kit RB05B/1)	1
2	Mesh filter 7 mm	1
3	O-ring BS_010_N70	2
4	O-ring BS_006_N70	1
5	O-ring BS_222_N50	1

5.1 Ultrasonically clean deposits from all metal parts



WARNING: Do NOT use aggressive chemicals. They might damage the metal plating or plastic parts.

Use an ultrasonic cleaning bath with a suitable cleaning fluid instead. A good cleaning fluid is Biox “O₂” immersion fluid, but the exposure time to this fluid must be limited to 10 minutes. See WWW.BIOXINT.COM for further information and distributors.

5.2 Replace all O-rings with new ones from the Service Kit



WARNING:

- Replace all O-rings: do NOT re-use old ones.
- ONLY use original parts from APDiving, to make sure the O-rings:
 - o Are the exact size
 - o Are of the correct material (especially important in a high oxygen content and overpressure environment)
 - o Are of the correct stiffness (degrees Shore).

5.3 How to lightly grease O-rings

When greasing O-rings, use silicone grease (for the diluent inflator) or O₂-compatible grease (for the oxygen inflator) and make sure NOT to use too much grease.

The best way to grease O-rings is by using a simple “grease bag”.

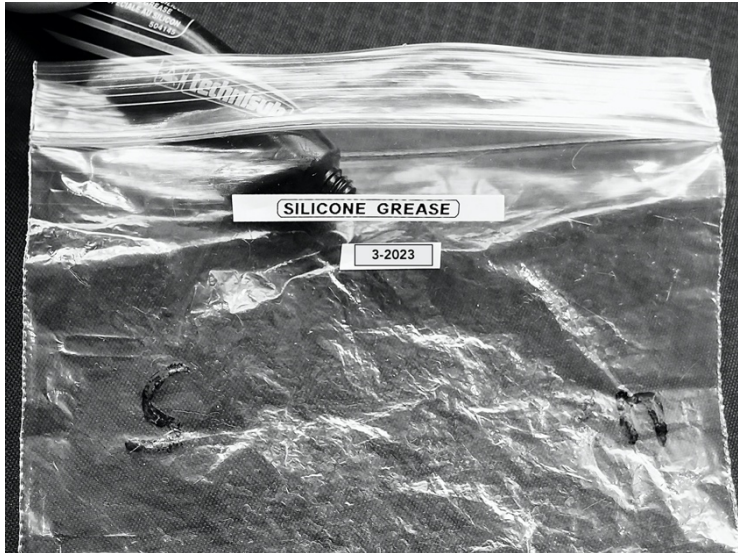
A grease bag is a clean and clear plastic bag, into which you put a small amount of grease. Optionally you can make two bags: one with O₂ compatible grease, and one with normal silicone grease. Make sure you label them properly to avoid mixing them up! Also put a date on it, so you know how old your grease bag is. Don't use them longer than a year.

A nice advantage of using a grease bag is that you use only a tiny amount of grease for greasing many O-rings, so there is little waste.

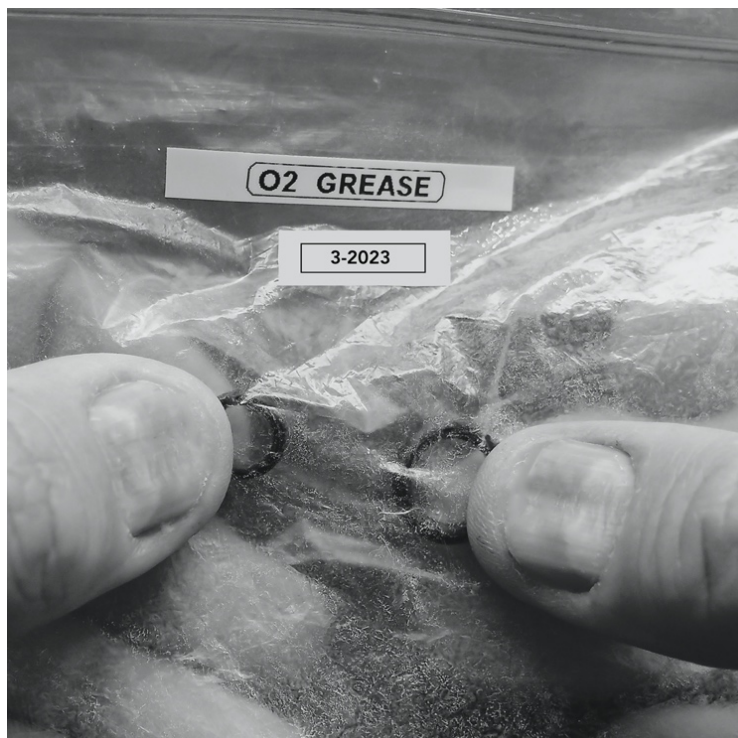
We recommend that you use resealable bags, e.g. the ones with a plastic zipper, typically used for airtight food storage. This allows you to zip up the bag after use, keeping the contents clean for repeated use.

The simple steps are as follows:

- Take a plastic bag and deposit a SMALL amount of silicone grease in it.



- Massage this grease all around the bag until it is evenly distributed over the inside surface area.
- Take the O-rings to be greased out of their storage container, either using gloves or using an instrument like a dentist hook.
- Drop them in the grease bag, and from the outside of the bag move them around with your fingers, making sure they are in full contact with the grease.



- Open the bag and, using a clean instrument like a dentist hook, take the now properly greased O-rings out.



- Inspect them to make absolutely sure that the grease is evenly and lightly distributed on the O-rings and that there are no areas of excess grease - no globs or strands.
- Fit them where they belong on your diving equipment, still making sure not to touch them with your bare hands.

6. Assembly Instructions

6.1 General overview: main assembly steps

There are 9 steps in the assembly process:

1. Replace and grease all O-rings
2. Refit the mesh filter into the valve body
3. Refit the O-ring into the valve body
4. Screw the side stem into the valve body
5. Refit the spindle into the valve body
6. Screw the new push button onto the spindle
7. Put a new O-ring into the cylinder post base
8. Check if the cylinder post base is still firmly screwed into the counterlung
9. Screw the lock ring onto the cylinder post base

6.2 Replace and grease all O-rings



WARNING: Replace all O-rings: do NOT re-use old ones.

- ONLY use original parts from APD, to ensure the O-rings:
 - o Are the exact size;
 - o Are of the correct material (especially important in an overpressure environment);
 - o Are of the correct hardness (degrees Shore).

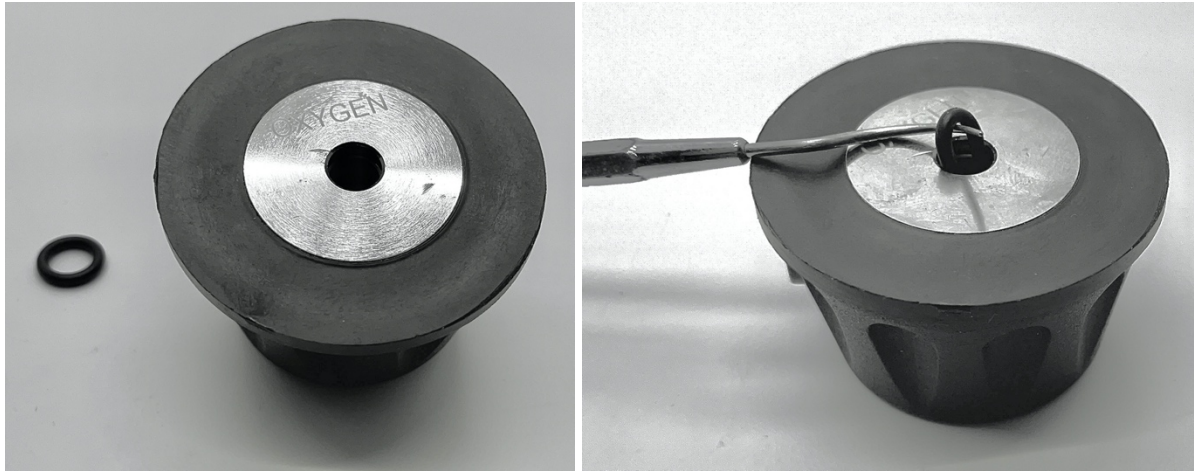
6.3 Refit the mesh filter into the valve body

Drop a new 7 mm mesh filter into the screw hole of the valve body.
Make sure it sits flush at the bottom.



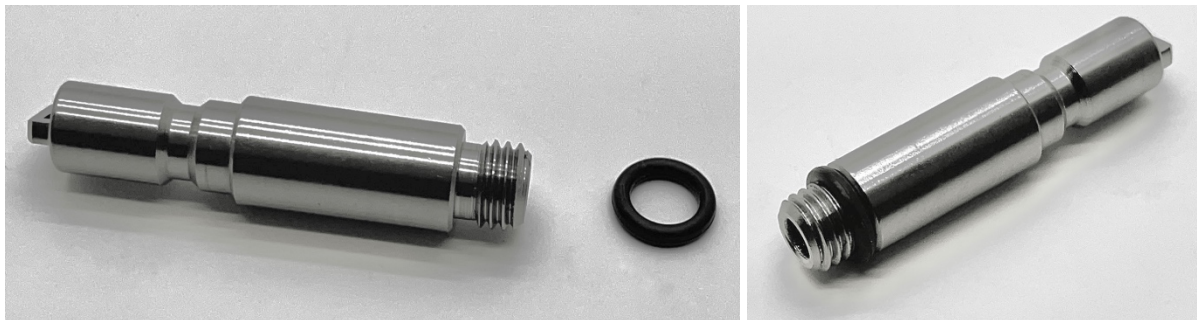
6.4 Refit the O-ring into the valve body

Put a new and lightly greased O-ring back into the entrance of the valve body.



6.5 Screw the side stem into the valve body

Put a new and lightly greased O-ring on the side stem.





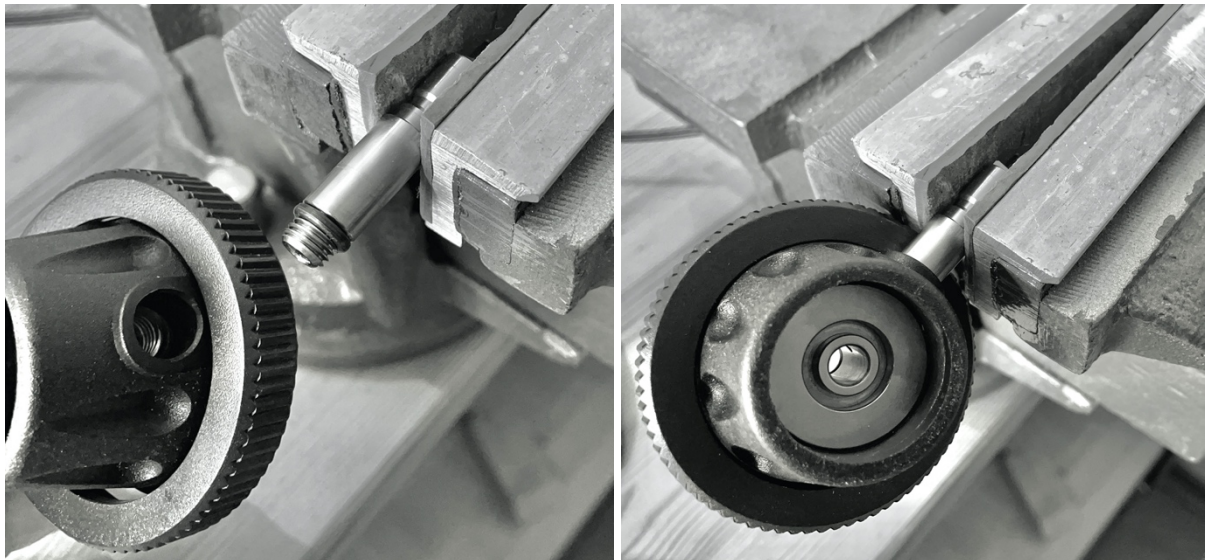
Put the lock ring back onto the valve body.

Clamp the side stem into a bench vice. Screw the stem in clockwise.

ATTENTION: when using the vice, make sure to fit it with soft jaws (plastic or fibre).

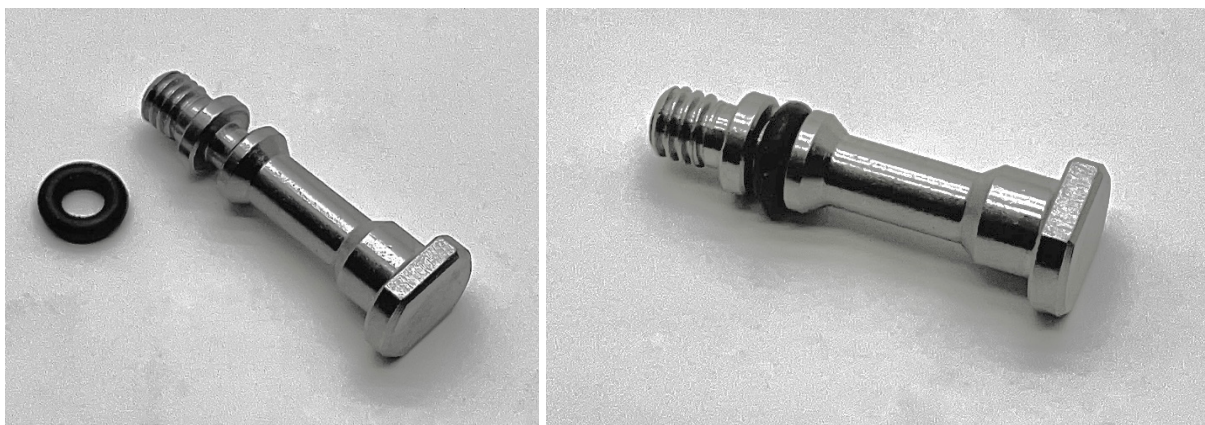
This avoids damaging the stem and its nickel-plated coating.

WARNING: Do NOT use a vice with steel jaws.

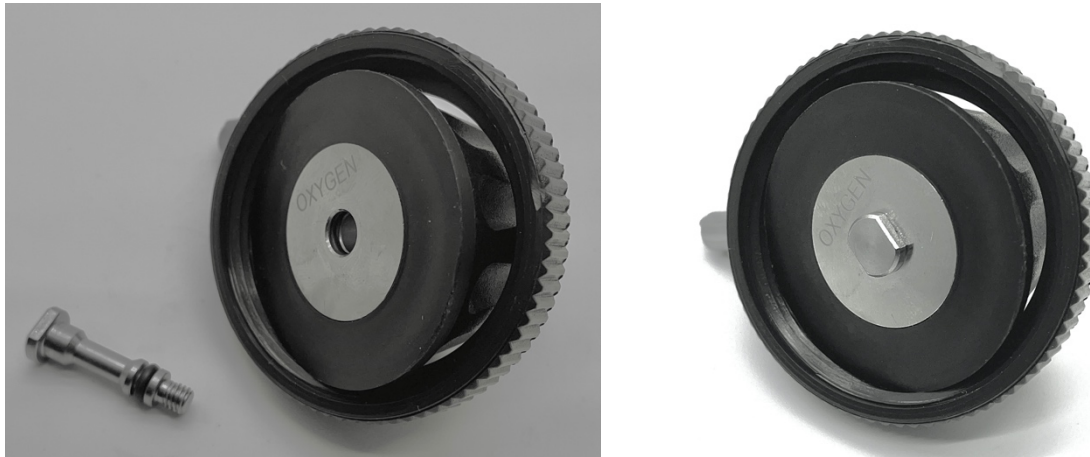


6.6 Refit the spindle into the valve body

Put a new and lightly greased O-ring onto the spindle.



Push the spindle back into the valve body.



6.7 Screw the push button onto the spindle

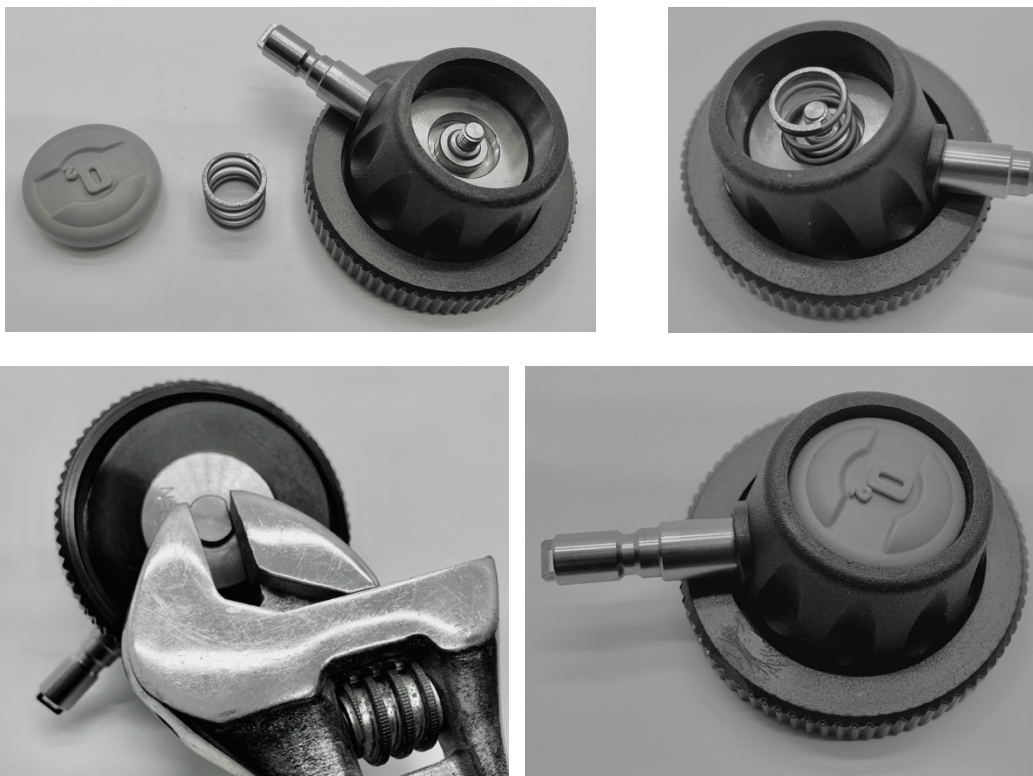
Remember that you are screwing a hard metal part into a softer plastic part, and that the push button is prevented from unscrewing by the nyloc friction effect, not by the force with which it is screwed onto the spindle. So do NOT use excessive force.

ATTENTION: always use a new push button during service; NEVER reuse the old one. The push button “sticks” to the inflator spindle by friction (the nyloc effect). A pre-used button loses it’s nyloc effect and in time the push button may come inadvertently unscrewed.

Place the spring on top of the new push button.

Use a spanner to fixate the bottom of the spindle, preventing it to rotate.

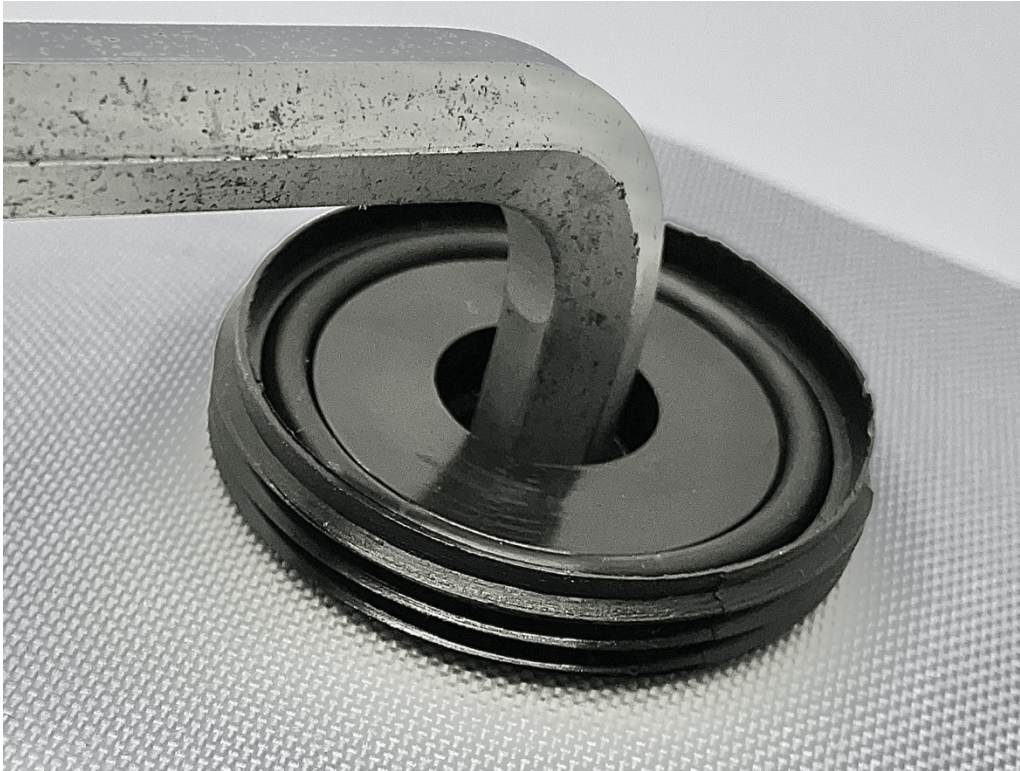
Screw the coloured push button onto the thread of the spindle, using a non-slip surface that has sufficient friction, like a piece of rubber from a car or bike inner tube. Screw it on until the spindle travel is 2.54mm, 0.100”.



6.8 Check if the (left-hand thread) cylinder post base is still firmly screwed into the counterlung

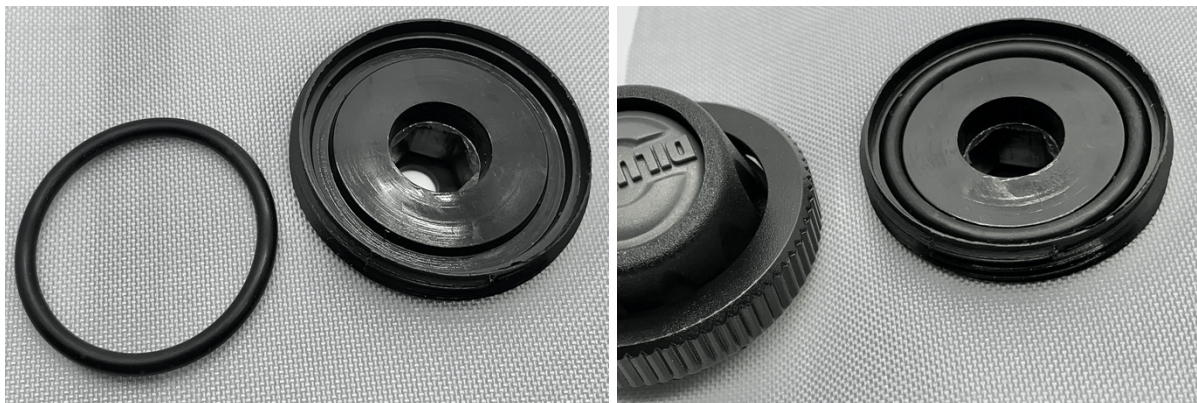
Using a 13 mm Allen (Inbus) key, check if the cylinder post base is still firmly screwed into the inner lock ring and rubber protector, which both sit inside the counterlung.

ATTENTION: To check this, try to gently turn the 13 mm Allen key COUNTER-CLOCKWISE. If you accidentally turn it clockwise, you unscrew it instead of fastening it, causing a leak. This turning direction might be counter-intuitive to what you would expect.



6.9 Put a new O-ring into the cylinder post base

Put a new lightly greased O-ring into the cylinder post base.

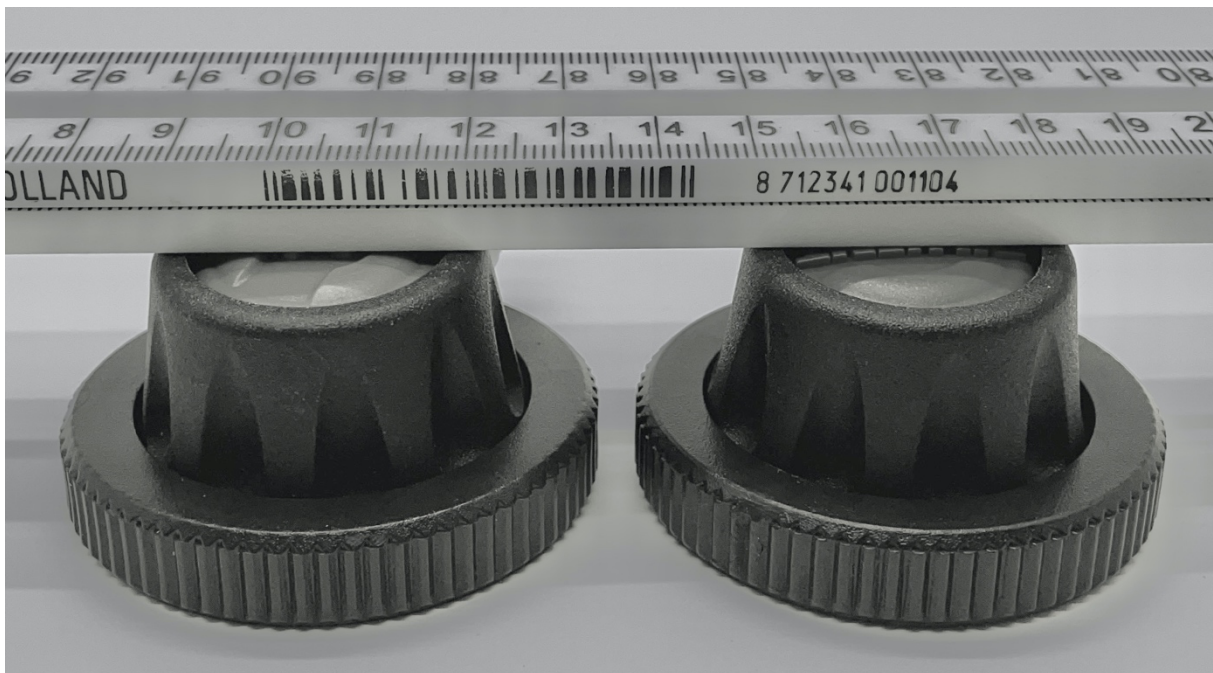


This completes the re-assembly of the RB05 Manual Inflator.

7. Testing Instructions

7.1 Test for leaks and proper operation

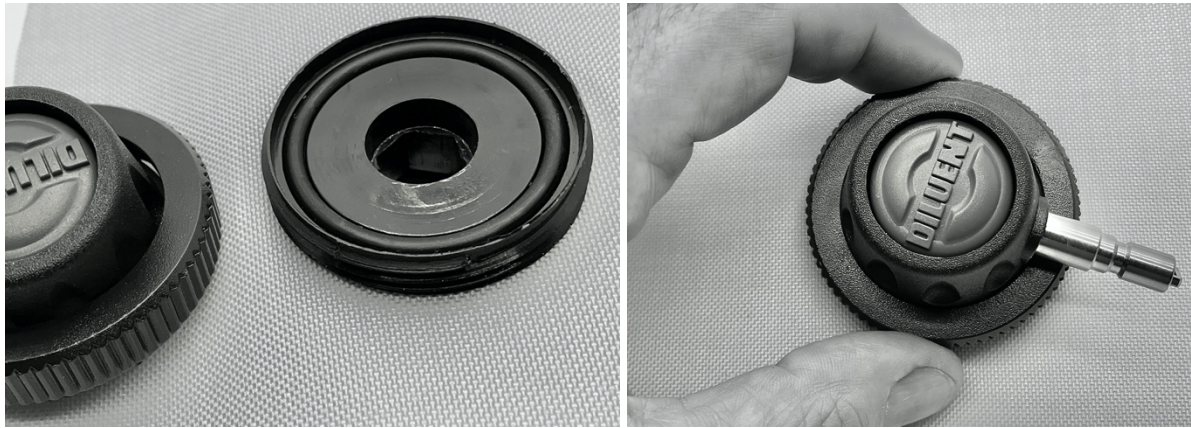
- It is essential to perform a complete test and inspection of your manual inflator after assembly.
 - o NEVER dive with any diving equipment that shows signs of damage, debris, loose connections or unsatisfactory performance.
- Carefully inspect all hose fittings to ensure they are securely connected at both ends.
- Inspect along the length of each hose to ensure that the hoses are not blistered, cut, or otherwise damaged.
- Double-check to see if the push button is completely screwed onto the spindle. It should be flush with the top of the valve body, as indicated below, i.e. not sticking out, and have an operating travel of 2.54mm, 0.100":



- Connect and pressurise the inflator and immerse the RB05 and check for leaks.

7.2 Screw the lock ring onto the cylinder post base

Make sure the new big O-ring still sits firmly in its groove within the cylinder post base. Screw the lock ring with the complete, serviced, inflator onto the cylinder post base. Screw clockwise, hand tight. Do not use tools to tighten it.



7.2 Rebreather leak test

- Conduct a positive and negative pressure test of the breathing loop. Pay extra attention to the area around the serviced manual inflators.
- Either immerse the product or use some soapy water to inspect for tiny leaks.
- Pressurise the inflators and operate them. Make sure gas flows properly when pushing the button, and fully stops when releasing. Look and listen for any leaks around the button and the spindle.

If all tests are passed OK - your maintenance has been successful.