TECHNICAL SUPPORT

SWIVEL SUIT INFLATOR VALVE

MAINTENANCE MANUAL FOR AUTHORISED TECHNICIANS

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Swivel Suit Inflator Valve Maintenance Manual

(AP5926 Issue 1)

INTRODUCTION

This manual provides factory prescribed procedures for the correct maintenance and repair of the Apeks Swivel Suit Inflator Valve. It is not intended to be used as an instructional manual for untrained personnel. The procedures outlined within this manual are to be performed only by personnel who have received factory authorised training through an Apeks Service & Repair Seminar. If you do not completely understand all of the procedures outlined in this manual, contact Apeks to speak directly with a Technical Advisor before proceeding any further.

WARNINGS, CAUTIONS & NOTES

Pay special attention to information provided in warnings, cautions, and notes that are accompanied by one of these symbols:

WARNINGS indicate a procedure or situation that may result in serious injury or death if instructions are not followed correctly.

CAUTIONS indicate any situation or technique that will result in potential damage to the product, or render the product unsafe if instructions are not followed correctly.

NOTES *are used to emphasise important points, tips, and reminders.*

SCHEDULED SERVICE

It is recommended that the Apeks Swivel Suit Inflator Valve should be rinsed in fresh water after use, and they should be stripped down and serviced annually.

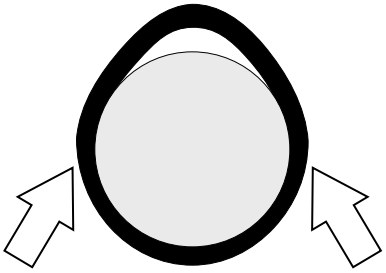
However, if at all unsure about the correct functioning of the Apeks Swivel Suit Inflator valve, then it must be officially inspected immediately.

GENERAL CONVENTIONS

Unless otherwise instructed, the following terminology and techniques are assumed:

1. When instructed to *remove*, *unscrew*, or *loosen* a threaded part, turn the part anti-clockwise.
2. When instructed to *install*, *screw in,* or *tighten* a threaded part, turn the part clockwise.
3. When instructed to remove an 'O' Ring, use the pinch method (see figure below) if possible, or use a brass, aluminium or plastic 'O' Ring removal tool. Avoid using hardened steel picks, as they may damage 'O' Ring sealing surfaces. All 'O' Rings that are removed are discarded and replaced with brand new 'O' Rings.

Pinch Method
Press upwards on sides of 'O' Ring to create a protrusion. Grab 'O' Ring or insert 'O' Ring tool at protrusion.



4. The following acronyms are used throughout the manual: MP is Medium Pressure; HP is High Pressure; PN is Part Number.
5. Numbers in parentheses reference the key numbers on the exploded parts schematics. For example, in the statement, "...remove 'O' ring (4) from...", the number 4 is the key number to the 'O' Ring.

DISASSEMBLY PROCEDURES

NOTE: *Before performing any disassembly, refer to the exploded parts drawing, which references all mandatory replacement parts. These parts should be replaced with new, and must not be reused under any circumstances - regardless of the age of the regulator or how much use it has received since it was last serviced.*

CAUTION: Use only a plastic, brass or aluminium 'O' Ring removal tool (PN AT54) when removing 'O' Rings to prevent damage to the sealing surface. Even a small scratch across an 'O' Ring sealing surface could result in leakage. Once an 'O' Ring sealing surface has been damaged, the part must be replaced with new. DO NOT use a dental pick, or any other steel instrument.

Removal of valve From The Suit.

1. Using the Apeks back nut tool (AT43) and appropriate wrench, remove the back nut from the valve.

NOTE: *Rotate the valve body (5) anti clockwise until it reaches its stop, and then rotate the back nut (11) to untighten. This aides disassembly and also reduces the chance of damaging the backing patch or suit.*

2. Remove the valve from the suit

Separation of Valve Body, Base and Button.

3. Depress the button (2) fully and, using an 'O' Ring removal tool, remove the circlip (8) from the stem of the button.

4. Lift out the button (2) and spring (4) from the valve body (5).

5. Screw the separation tool (AT7009) onto the thread of the valve body (5) until the base (9) and valve body separate. Once complete, unscrew the separation tool from the valve body.


NOTE: *The separation tool will become tight and separation of the base (9) and valve body (5) may involve pulling the two components apart once the tool is fully screwed in.*

6. Remove all four 'O' Rings from the valve body (5), the base (9) and the button (2).

This Ends Disassembly

WARNING: Do not attempt to remove the nipple (13/13a) from the valve body (5) as it is designed to be an integral part of the valve body. Doing so can cause damage to the valve and leakage may occur.

Before starting reassembly, perform parts cleaning and lubrication according to the procedures outlined in 'Cleaning & Lubrication' on page 9.

REASSEMBLY PROCEDURES

1. Slide a new, lubricated 'O' Ring (7) onto the stem of the valve body (5).

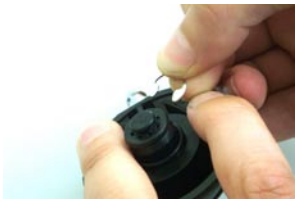
2. Place a new, lubricated 'O' Ring (6) into the groove of the base (9).

3. Slide two new, lubricated 'O' Rings (3) onto the stem of the button (2) and locate in the two grooves.

NOTE: *The 'O' Rings must locate in the grooves shown below, and not the circlip groove nearest the end.*

4. Place the spring (4) over the stem of the button (2), and locate the button in the valve body (5).

5. Push button (2) into valve body (5), and whilst fully depressed, push the circlip (8) into the groove of the button.



6. Push valve body (5) into base (9) ensuring that the 'O' Rings are still in place. All the legs on the base will click into the groove of the valve body when assembled correctly.

7. Rotate the valve body (5). It should rotate smoothly through an angle of approximately 350° without being over tight.

WARNING: Ensure all legs are correctly clipped into the groove, otherwise leakage may occur and/or the valve may seperate during use.

8. If a new decal (1) is to be fitted, the button (2) must be degreased first.

9. Refit the valve to the suit using a torque wrench and a back nut tool (AT43). The valve should be torqued to 4lbs/ft or 5.4Nm.

NOTE: *Rotate the valve body (5) clockwise until it reaches it' stop and, whilst holding the valve, rotate the back nut (11) to tighten. This aides assembly and also reduces the chance of damaging the backing patch or suit. An Apeks backing patch (AP0166) should be used to ensure no leaks can occur between the valve and the suit.*

Testing Procedures

CAUTION: Protective eyewear must be worn at all times during testing.

1. This test should be carried out before the valve is fitted to the suit;

   Attach the Swivel Suit Inflator Valve to a suitable MP gas supply using a quick release hose (AP0157 if Apeks type, or AP0153 if Seatec type).

   Pressurise slowly and submerse valve in water; there should be no leakage of gas. If leakage occurs, refer to "Table 1 - Troubleshooting Guide" for corrective actions.

   Now, depress the button fully; gas should flow audibly through the valve. If there is no flow of gas, refer to "Table 1 - Troubleshooting Guide" for corrective actions.

2. Check that the valve body rotates approx 350°.

3. Fit the valve to the suit following the re-assembly procedure. Seal off the neck and cuffs then submerge the chest area of the suit, inspect the inside of the suit for any sign of water ingress.

Table 1 - Troubleshooting Guide

SYMPTOM	POSSIBLE CAUSE	TREATMENT
Valve leaks when button not de-pressed.	1. 'O' Rings (3) damaged or worn.	1. Replace 'O' Rings.
	2. Internal sealing surface damaged.	2. Replace valve body.
	3. 'O' Ring grooves in button damaged.	3. Replace button.
	4. Dirt /salt deposits present on internal sealing surface.	4. Disassemble valve and thor-oughly clean all parts before re-assembly.
Valve does not operate correctly	1. Dirt /salt deposits present within valve assembly.	1. Disassemble valve and thor-oughly clean all parts before re-assembly.
	2. Spring damaged or not fitted.	2. Replace spring.
Water leakage into suit	1. 'O' Rings (6) and/or (7) damaged or worn.	1. Replace 'O' Rings.
	2. The valve has not been tightened in the suit properly.	2. Re-tighten the valve.
	3. An incompatible backing patch has been fitted to the suit.	3. Fit an Apeks backing patch AP0166.
	4. There is no backing patch fitted.	4. Fit an Apeks backing patch AP0166.
	5. Dirt/salt deposits present internally.	5. Clean the valve.
Restricted air flow	1. M.P of supply gas too low.	1. Ensure M.P is set at 9.5 ±0.5 bar.
	2. Dirt /salt deposits present within valve assembly	2. Disassemble valve and thor-oughly clean all parts before re-assembly.
	3. Restrictions from undersuit.	3. Ensure undersuit allows gas to vent out of the valve.

Table 2 - Recommended Tool List

PART NO.	DESCRIPTION	APPLICATION
AT43	Back Nut Tool	Removal of back Nut.
AT7009	Separation Tool	Separation of valve body and base.
AT54	'O' Ring removal tool	Removal of circlip and 'O' Rings
n/a	Torque Wrench	Removal and fitting of valve to suit.

Table 3 - Recommended Lubricants & Cleaners

LUBRICANT / CLEANER	APPLICATION	SOURCE
Christo-Lube® MCG-111 (Lubricant)	All 'O' Ring seals	Apeks Marine Equipment Ltd PN AP1495, or Lubrication Technologies 310 Morton Street Jackson, OH 45640, USA (800) 477-8704
CAUTION: Silicone rubber requires no lubrication or preservative treatment. DO NOT apply grease or spray to silicone rubber parts (eg. Diaphragm, Exhaust Valves.) Doing so may cause a chemical breakdown and premature deterioration of the material.		
Biox (Cleaning agent)	Biological immersion fluid for reusable stainless steel and brass parts.	Solent Divers Ltd 122-128 Lake Rd, Portsmouth, Hants, PO1 4HH
White distilled vinegar (100 gr.) (Cleaning agent)	Acid bath for reusable stainless steel and brass parts.	"Household" grade
CAUTION: Do not use muriatic acid for the cleaning of any parts. Even if strongly diluted, muriatic acid can harm chrome plating and may leave a residue that is harmful to 'O' Ring seals and other parts		
Liquid dishwashing detergent diluted with warm water (Cleaning agent)	Degreaser for brass and stainless steel parts; general cleaning solution for plastic and rubber	"Household" grade

Cleaning & Lubrication Procedure

General Cleaning of all Parts

1. Place all components in an ultrasonic cleaning bath containing an appropriate cleaning solution, such as Biox.
2. The components should be cleaned for 6 minutes, depending upon their condition. Longer cleaning times may used if required.
3. Rinse the components in warm fresh water.
4. The components should then be blown dry or left to dry naturally.

Lubrication and Dressing

All 'O' Rings should be lubricated with Christo-Lube® MCG-111. Dress the 'O' Rings with a very light film of grease, and remove any visible excess by running the 'O' Ring between thumb and forefinger. Avoid applying excessive amounts of Christo-Lube grease, as this will attract particulate matter that may cause damage to the 'O' Ring.

Nitrox

When it comes to issues of nitrox safety and compatibility, the concerns lie primarily with the first stage as it is subjected to high inlet pressures. High inlet pressures lead to adiabatic compression or heating of the gas. As they leave the factory, standard Apeks regulators are suitable for use with oxygen enriched gases (i.e. nitrox, etc.) providing the oxygen content does NOT EXCEED 40% (EAN40).

Any Apeks regulator, when properly cleaned, lubricated and assembled, is authorised for use with enriched air nitrox (EAN) up to 100% (EAN100). It is authorised because it has undergone adiabatic compression testing and the authorised service kit components and lubricants are compatible in elevated oxygen environments. During cleaning, a mild detergent is used to remove condensed hydrocarbons (compressor oils) from the inside passageways of the first stage. For the first stage to remain EAN100 compatible, only use hyperfiltered compressed gas (hydrocarbons < 0.1 mg/m3). Ordinary compressed breathing air to BS EN 12021:1999 does not meet this criteria. Once ordinary breathing air is used, the first stage is no longer EAN100 compatible until it is cleaned and serviced again.

Although regulator second stage components are not exposed to high pressure EAN, Apeks recommends that the same cleaning procedures be followed for the complete regulator. This prevents the possibility of cross contamination and guarantees the cleanliness of the entire regulator.

WARNING: Please check the regulations regarding Nitrox in your particular country as this may differ from Apeks standard policy.

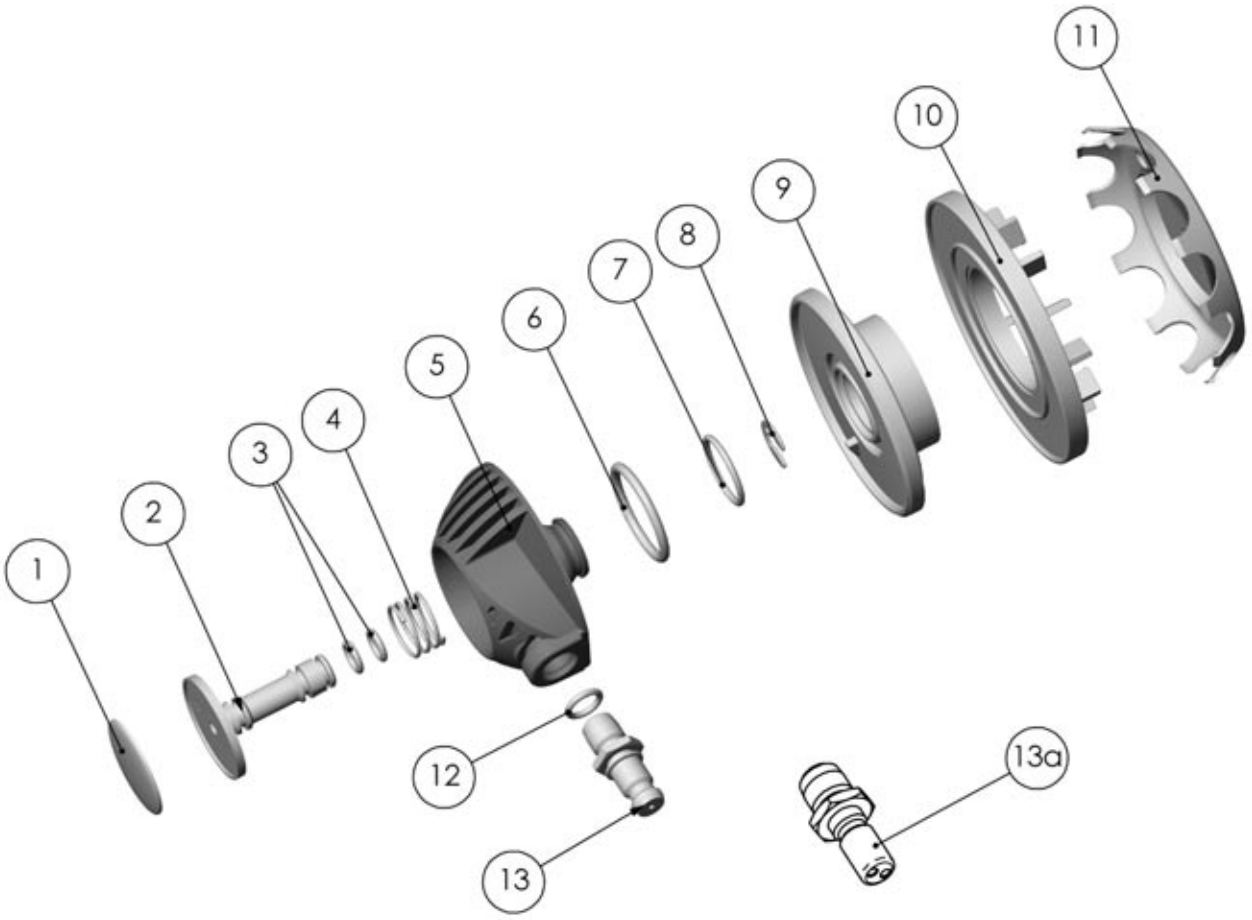
Table 4 - Torque Specifications

PART NUMBER	DESCRIPTION / KEY NUMBER	TORQUE
AP1572,AP1573	Extended Back Plate, Back Nut.	4lbs/ft (5.4Nm)

Table 5 - Test Bench Specifications

TEST	ACCEPTABLE RANGE
Leak Test	No Leaks permitted

Swivel Suit Inflator Valve Exploded Parts Diagram



* All marked items must be replaced when serviced. Service Kit Part No. AP0224/S

1	AP5015	Decal	9	AP7006	Base
2	AP7008	Button	10	AP1573	Back Nut
3	AP1154*	‘O’ Ring (2x)	11	AP1572	Extended Back Plate
4	AP7002	Spring	12	AP1409	‘O’ Ring
5	AP7007	Valve Body	13	AP7004	Nipple
6	AP1277*	‘O’ Ring	13a	AP7005	SeaTec Nipple
7	AP1298*	‘O’ Ring			
8	AP7010	Circlip			

Notes

LOW PROFILE SUIT INFLATOR VALVE MAINTENANCE MANUAL

FOR AUTHORISED TECHNICIANS

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