



apekS
TECHNICAL SUPPORT



FIRST STAGE REGULATOR



MAINTENANCE MANUAL FOR AUTHORISED TECHNICIANS

Document No. AP4497

Issue 6
28/10/11

APEKS MARINE EQUIPMENT LTD, NEPTUNE WAY, BLACKBURN, LANCASHIRE. BB1 2BT
Tel: 0044 (0) 1254 692200 Fax: 0044 (0) 1254 692211 E-mail: info@apeks.co.uk Web: www.apeks.co.uk

AMENDMENTS RECORD:

Amendments and approval of this document can only be carried out by the relevant people listed on the Approved list of signatures, which is listed in the Apeks Quality Manual. To instigate a change, a Task / Change request form, (Form No. 'DESI/10002'), must be completed and passed to the relevant person(s) for approval which are listed on the Approved List of Signatures. When approval has been granted and recorded this table can then be completed and the document up issued.

Change No.	Change Request No.	Description & Comments:	Change Date	New Issue No.	Changed By:	Approved By:
1116	0247	Add details of new O ring pick	16/02/11	04	RH	ACD
1147	-	notes regarding removal of rubber ring	30/06/11	05	JLH	ACD
1175	NA	Added Twilight Pt No to Drawing	28/10/11	06	AB	ACD

Contents

COPYRIGHT NOTICE.....	3
INTRODUCTION.....	3
WARNINGS, CAUTIONS & NOTES	3
SCHEDULED SERVICE.....	3
GENERAL GUIDELINES.....	3
GENERAL CONVENTIONS.....	4
DISASSEMBLY PROCEDURES.....	4
INSPECTION PROCEDURES	7
REASSEMBLY PROCEDURES.....	7
IMMERSION TESTING	11
TABLE 1 - TROUBLESHOOTING GUIDE.....	12
TABLE 2 - RECOMMENDED TOOL LIST.....	13
TABLE 3 - RECOMMENDED LUBRICANTS AND CLEANERS	14
CLEANING AND LUBRICATION PROCEDURE	15
TABLE 4 -TORQUE SPECIFICATIONS.....	16
TABLE 5 - TEST BENCH SPECIFICATIONS	16
FLIGHT YOKE EXPLODED PARTS DRAWING.....	17
FLIGHT DIN EXPLODED PARTS DRAWING.....	18
FLIGHT NITROX EXPLODED PARTS DRAWING	19

COPYRIGHT NOTICE

This manual is copyrighted, all rights reserved. It may not, in whole or in part, be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine readable form without prior consent in writing from Apeks Marine Equipment Ltd. It may not be distributed through the internet or computer bulletin board systems without prior consent in writing from Apeks Marine Equipment Ltd.

©2011 Apeks Marine Equipment Ltd.

Flight First Stage Maintenance Manual
(AP4497 Issue 6)

INTRODUCTION

This manual provides factory prescribed procedures for the correct maintenance and repair of the Apeks Flight first stage regulators. 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 Flight first stage regulators should be examined annually regardless of usage. A full service should be performed every two years.

However, if at all unsure about the correct functioning of the Apeks first stage, then it must be officially inspected immediately.

All service and inspection details need to be documented in the Regulator Service Record in the back of the Owner's Manual to keep the Limited Lifetime Warranty in effect.

An Official Inspection consists of:

1. A pressurised immersion test of the entire unit to check for air leakage.
2. Checking for stable medium pressure that is within the acceptable range.
3. Checking that all parts are tightly fastened together and that no parts are loose.
4. A visual inspection of the composite Large Spring Adjuster (1) and Composite Diaphragm Clamp (4), checking for any visual cracking, marks or signs of damage or wear. (See page 7. This can be done by peeling off the protector cap (15) and inspecting all external faces where possible without removal or adjustment.
5. A visual inspection of any filters for debris or discoloration.
6. Pulling back hose protectors and checking that the hoses are secure in the hose crimps.

If a regulator fails steps 1,2,3 or 4 the entire regulator should be serviced. If a regulator fails 5 it will be up to the technician's discretion whether or not a full service is required. Failure of step 6 requires replacement of the Hose.

GENERAL GUIDELINES

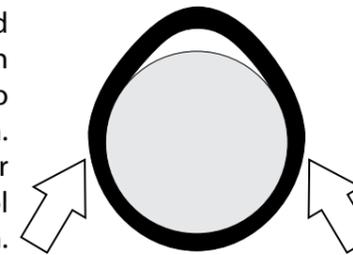
1. In order to correctly perform the procedures outlined in this manual, it is important to follow each step exactly in the order given. Read over the entire manual to become familiar with all procedures and to learn which specialty tools and replacement parts will be required before commencing disassembly. Keep the manual open beside you for reference while performing each procedure. Do not rely on memory.
2. All service and repair should be carried out in a work area specifically set up and equipped for the task. Adequate lighting, cleanliness, and easy access to all required tools are essential for an efficient repair facility.
3. During disassembly, reusable components should be segregated and not allowed to intermix with non-reusable parts or parts from other units. Delicate parts, including inlet fittings and valve seats which contain critical sealing surfaces, must be protected and isolated from other parts to prevent damage during the cleaning procedure.
4. Use only genuine Apeks parts provided in the 1st stage service kit (AP0250). DO NOT attempt to substitute an Apeks part with another manufacturer's, regardless of any similarity in shape or size.
5. Do not attempt to reuse mandatory replacement parts under any circumstances, regardless of the amount of use the product has received since it was manufactured or last serviced.
6. When reassembling, it is important to follow every torque specification prescribed in this manual, using a calibrated torque wrench. Most parts are made of either marine brass or plastic, and can be permanently damaged by undue stress.

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 Spring Carrier '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 AT79) 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 hose

1. Using the appropriate spanners, remove all of the hoses from the first stage. Refer to 2nd stage manual for removal of the 2nd stage and 'O' ring removal. Exercise caution not to scratch the 'O' ring groove. Remove the 'O' ring from the Hose Nut end of the Hose.



2. Pull back the two Hose Protectors and inspect the Hose Crimps. If either Crimp is damaged or the Hose is pulling out of the crimp then the Hose must be replaced.



Removal of Blanking Plugs

3. Using a 5mm Allen key remove all of the MP and HP Blanking Plugs and remove all of the 'O' Rings.



Removal of DIN Connection.

4. Using the First Stage Work Handle Tool (PN AT 48), secure the Regulator in a bench fixed vice. Using a 6mm Allen Key Unscrew the Din Handwheel / Balance Chamber Assembly from the 1st Stage Body.



 **NOTE:** The Din Handwheel / Balance Chamber Assembly may not unscrew as one component. In some cases the DIN Bolt (24) may unscrew from the Din Connector (21). If this happens remove the DIN Moulded Handwheel (22) and use a 22mm spanner or deep socket to unscrew the DIN Connector.

5. Separate the HP Valve (16) and Spring (17) from the end of the Balance Chamber (19) and remove the 'O' Ring, taking care not to scratch the O-Ring Groove.



Separating the Din Handwheel Assembly.

6. Using a 22mm deep socket, fix the handwheel into a vice. Using a 6mm Allen Key/Hex wrench, loosen the Din Bolt (24) and remove both O-Rings.



7. Remove the DIN Filter (23) from the DIN Connector (21). To do this, first try to remove the filter by gently tapping the connector on a flat surface at the end face. The filter should start to ease out.



8. If necessary, insert an O-ring pick through the legs of the balance chamber, NOT the centre, to gently push out the filter. The filter must be kept square to the face of the connector as it is removed otherwise it will jam inside.



9. Remove the O-Ring (18), using the hooked end of the AT79 O ring pick. Push it through the center of the O ring and gently pull out.



NOTE: When servicing flight regulators it is good practice to follow the sequence of operations stated below:

- 1) Strip down both the 1st stage and 2nd stage
- 2) Clean and inspect all regulator parts as laid out in the procedures in both manuals.
- 3) Reassemble the 2nd stage (but do not adjust or set)
- 4) Reassemble and set the 1st stage (following procedures as laid out in the 1st stage manual)
- 5) Set the 2nd stage (following procedures as laid out in the manual).

The reason for leaving the 2nd stage before setting is to allow the seating area to "seat and bed in" better, therefore optimising performance and adjustment.

Removal of YOKE Connection.

10. Remove the Plastic Clip (30). Unscrew the Yoke Knob (35) from the Yoke Clamp (31). The Handwheel Hex Axle (36) can then be removed, by continuing to unscrew the Yoke knob. Slide the Yoke Knob laterally on the solid internal side, to remove the knob.



11. Separate the Dust Cap (33) from the Yoke Knob (35). Remove the O-ring (34) from the inside of the Dust Cap (33).



12. With the Flight First Stage secured in a vice using the work handle tool (PN AT48), fit the Yoke connector tool (PN AT74) and a long 6mm allen/hex socket. Unscrew the Yoke Connector (27) and separate from the Yoke Clamp (31). The body can then be removed from the vice.



Separation of the Balance Chamber / Yoke Connector

13. The HP Valve (16) and Spring (17) can be separated from the Yoke Connector (27). Remove both 'O'Rings. Using a pair of internal Circlip removal pliers, remove the Circlip (29) and take the disc filter (28).



Removal of the Composite Diaphragm Clamp.



14. Remove the Hood (15) from the 1st Stage body. Using the work handle tool fit the 1st Stage into a vice. Using the Diaphragm clamp tool PN AT71 and a 3/8" drive socket wrench carefully unscrew the Composite Diaphragm clamp in a counter clock wise direction (4).



- CAUTION:** The Diaphragm Clamp Tool (AT71) has three node points that engage on the Composite Diaphragm Clamp (4). Ensure that these nodes are correctly aligned into the Composite Diaphragm Clamp (4) and that steady pressure is applied to the top of the tool whilst slowly unscrewing, ensure that socket, tool and wrench are square at all times.

15. Remove the Large MP Spring (2) and Rubber Ring (5). Also remove the Large Spring carrier (3).



NOTE: The rubber Ring (5) is no longer used and can be discarded when re-assembling.

16. Replace three of the MP blanking plugs (no O rings required) and screw them in finger tight. Put the nozzle of a compressed air blow gun in the remaining MP port and blow a sharp blast of air to remove the diaphragm (6). Remove the Splitter (7), and then the Valve Lifter (8). Note the balance chamber on one side of the Valve Lifter shaft and check to make sure that the shaft is not bent in any way. Remove the blanking plugs.



NOTE: Take care when removing the Diaphragm (6) so as not to damage the seating face of the Flight Body (9).

17. Unscrew the Large Spring Adjuster (1) from the Composite Diaphragm Clamp (4).



18. Finally, remove the Jacket (10) by separating it from the Flight body by peeling away from one of the high pressure ports, and working around to the other high pressure port. (9).



This Ends Disassembly

INSPECTION PROCEDURES

NOTE: Before performing any reassembly procedures several parts must be inspected. The following section details the parts and areas that must be checked.

The following parts should be checked for cracks, deep scratches, excessive wear and tear and distortion. Sealing faces, grooves and bores should be checked for scratches. Inspection should be performed in a well lit area.

IF IN DOUBT REPLACE PART

Composite diaphragm clamp (4)

1. This component must be thoroughly visually inspected for signs of cracks, deep scratches, excessive wear and distortion. pay special attention to the area around the thread and were the thread stops.



Composite spring adjuster (1)

1. This component must be thoroughly visually inspected for signs of cracks, deep scratches, excessive wear and distortion, the face of the component and the thread must be thoroughly inspected.



Diaphragm clamp and spring adjuster assembly

1. Once the two components are assembled it is important that there is no excess movement between the two threads or any signs of excess wear.



Before starting reassembly, perform parts cleaning and lubrication according to the procedures outlined in 'Cleaning & Lubrication' on page 15 and 16.

REASSEMBLY PROCEDURES

Assembling and fitting of Composite Diaphragm Clamp

1. Refit the Jacket (10) onto the Flight body (9). Start by inserting one of the HP connection ports of the Body (9) into the Jacket (10) and slowly ease the Jacket around onto the Body.



2. Insert the Valve Litter (8) into the Flight Body (9). Place the Splitter (7) into the Flight Body (9) locating the round leg into the hole, this prevents the Splitter from rotating.



3. Press a new Diaphragm (6) into the Flight Body (9). Run your finger around the edge of the diaphragm to make sure it is properly seated.



4. Screw the Large Spring Adjuster (1) into the Composite Diaphragm Clamp (4) until the threads of the Adjuster are covered and they become flush.



5. Insert the Large MP Spring (2) into the Large Spring Adjuster (1).

NOTE: The rubber Ring (5) is no longer used and can be discarded when re-assembling.



6. Place the Large Spring Carrier (3) onto the end of the Large MP Spring (2).



CAUTION: When reassembling the diaphragm clamp into the body ensure that no cross threading occurs. Safety critical component!

7. Holding the Flight Body (9) with the Diaphragm (6) facing down, thread the Composite Diaphragm Clamp (4) into the Body (9), making sure that the Large Spring Carrier (3) stays in place, until finger tight.



CAUTION: If the Composite Diaphragm Clamp Assembly is not held vertically whilst it is screwed into the Body, the Large Spring Carrier (3) may not remain in the correct position.

8. Secure the Valve Body (9) back into the vice using the First Stage Work Handle (PN AT48). Tighten the Composite Diaphragm Clamp using a torque wrench and AT71 Diaphragm Clamp Tool to 20 N/M (OR 15 FT.LBS)

See warning over the page.

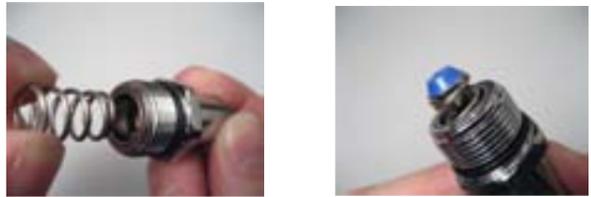


! WARNING: The Diaphragm Clamp Tool (AT71) has three node points that engage on the Composite Diaphragm Clamp (4). Ensure that these nodes are correctly aligned into the Composite Diaphragm Clamp (4) and that steady pressure is applied to the top of the tool whilst slowly torquing to 20 N/m (or 15 ft/lbs) to prevent the Tool from Slipping. Excessive torque on this component will result in damage and failure. Do not overtighten past 20 N/m (or 15 ft/lbs). A calibrated torque wrench must be used. Ensure that the torque wrench is the correct **Fitting of DIN Connection**

9. Install a new 'O' ring (18) into the Balance Chamber (19) and a new 'O' ring (20) onto the DIN Connector (21).



10. Insert the Spring (17) onto the end of the Balance Chamber (19). Insert a new HP Valve (16) into the Spring (17).



11. Carefully insert the HP Valve (16) into the Flight Body (9) making sure that it slides onto the shaft of the Valve Lifter (8). Hand tighten the DIN Connector (21).

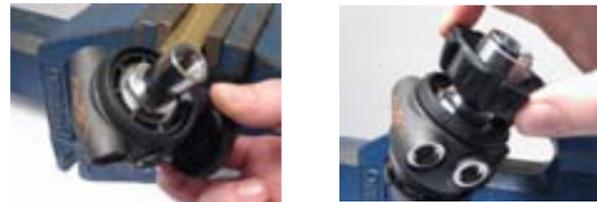


! CAUTION: Care must be taken not to touch the face of the H.P valve with mating part or finger nails, as this will cause damage to the part.

12. Using a 22mm Deep Socket and a torque wrench, torque the DIN Connector (21) to 25 N/m (or 18 ft/lbs).



13. Insert a new DIN Filter (23) into the DIN Connector (21), ensuring that the recessed side is facing down. Fit the bottom of the Hood (15) onto the Jacket ensuring correct alignment. (10). Slide the DIN Moulded Handwheel (22) onto the DIN Connector (21).



! CAUTION: Ensure that the DIN Filter (23) sits flat and is fully pressed down in the DIN Connector (21), otherwise damage may be caused when fitting the DIN Bolt (24).

14. Install two new 'O' Rings (14 & 25) onto the DIN Bolt (24). Using a torque wrench and a 6mm Allen key bit, carefully torque the DIN Bolt to 25 N/m (Or 18 ft/lbs).



Fitting of Yoke Connection

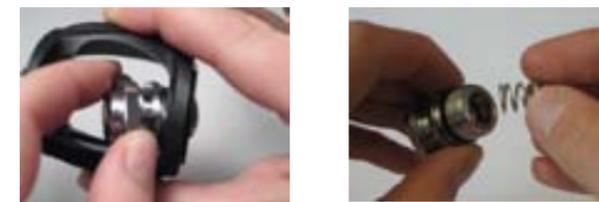
15. Install a new 'O' ring (18) into the Balance Chamber (19) and a new 'O' ring (20) onto the Yoke Connector (27).



16. Drop a new Disc Filter (28) into the Yoke Connector (27). Using a pair of Circlip pliers insert the Circlip (29) into the Yoke Connector (27) ensuring that it fits securely into



17. Insert the Yoke Connector through the Yoke Clamp (31) and fit the spring (17) onto the end of the Balance Chamber (19).



18. Fit the bottom of the Hood (15) onto the Jacket ensuring correct alignment. (10). Insert a new HP Valve (16) into the Spring (17). Carefully insert the HP Valve (16) into the Flight Body (9) making sure that it slides onto the shaft of the Valve Lifter (8). Hand tighten the Yoke Connector ensuring that it is square. (27).



! CAUTION: Care must be taken not to touch the face of the H.P valve with mating part or finger nails, as this will cause damage to the part.

19. Using AT74 Yoke Connector Socket and a long 6mm Allen key bit, carefully torque the Yoke Connector to 25N/m.



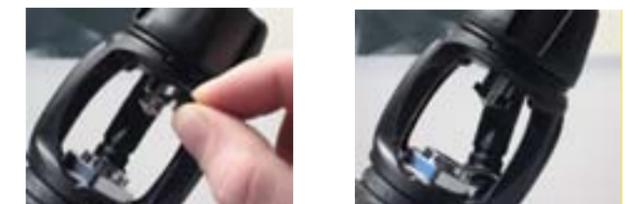
20. Fit a new 'O' Ring (34) into the end of the Dust Cap (33).



21. Fit the loop end of the Dust Cap (33) onto the top of the Yoke Covers (32). Ensure that the two lugs on the Dust Cap fit into the two recesses in the Yoke Covers. Slide and push the Yoke Knob (35) onto the top of the Yoke Clamp (31).



22. Screw the Handwheel Hex Axle (36) through the Yoke Knob (35) into the Yoke (31) until the end of the Axle is engaged in the Knob. Turn the Yoke Knob (35) until the Hex Axle (36) protrudes through the Yoke Clamp (31) so that the Plastic Clip (30) can be fit into the groove on the Axle.



WARNING: Compressed air can be highly explosive and is dangerous if misused. Ensure cylinder valve is opened slowly. Use Eye and Ear Personal Protective Equipment when performing any tests involving Compressed air.

Adjusting the First Stage

1. Attach the first stage (with no Blanking Plugs fitted) to a fully charged 232 or 300 bar cylinder. Slowly open the cylinder valve, this will remove any particles or contaminants from the first stage.



2. Install new lubricated 'O' rings (12,14) on all of the Blanking Plugs (11,13). Using a 5mm Allen key, install all of the Blanking Plugs into the Valve Body.



3. Attach a MP test gauge (0 - 20 bar) to a medium pressure hose and thread the hose into a MP port. If your test gauge does not have an over pressure relief valve, you must also attach a properly adjusted second stage to the first stage to act as the relief valve in case of a HP leak. Make sure Blanking Plugs are installed in any open ports.



CAUTION: If the pressure gauge rapidly exceeds 11 bar, then there is a HP leak. Quickly close the cylinder valve and purge the regulator. Refer to the troubleshooting table for the causes of the leak. A pressure relief valve or down stream second stage must be fitted to prevent failure or inadequate adjustment.

4. Assuming there are no leaks, close the cylinder valve and depressurise the regulator by opening the gauge relief valve or by pressing the purge button of the second stage regulator. Adjust the medium pressure by turning the Large Spring Adjuster (1) with a 10mm allen key: Turning in the Spring Adjuster increases the MP; Turning out the Spring Adjuster decreases the MP. Turn the Spring Adjuster in 1/8th turn increments and purge the relief valve several times after each adjustment. When the MP is between 9 and 10 bar, purge the relief valve on and off 10-15 times. After cycling, watch the gauge needle. The first stage MP should "lock-up" between 9 and 10 bar. Make any adjustments as necessary. Allow the first stage to stay pressurised for several minutes and check the MP again to make sure it remains "locked-up" between 9 and 10 bar. If the MP creeps upward more than 0.25 bar, then there is a leak. Refer to the troubleshooting table for possible causes.



5. Close the cylinder valve and depressurise the regulator by opening the gauge relief valve or by pressing the purge button of the second stage regulator. Close the relief valve and repressurise the system. The MP should still read between 9 and 10 bar. If the pressure reading is different than the original setting, repeat steps 3 and 4 until the MP is stable.
6. Close the cylinder valve and depressurise the regulator. Remove the test gauge and reinstall the Blanking Plug.

Final Assembly

1. Stretch the top of the Hood (15) over the end of the assembled first stage. Ensure that the spigot of the Hood fits down the hexagonal hole of the Large Spring Adjuster (1) and that the Hood fits without leaving any distortion.



This Ends Reassembly

IMMERSION TEST

With the Blanking Plugs and at least one properly adjusted second stage installed, slowly open the cylinder valve and pressurise the first stage. Completely Submerge the first stage in fresh water and check for leaks.

NOTE: Do not confuse bubbles from trapped air with a true air leak. If there is an air leak, bubbles will come out in a steady constant stream.

Assuming that there are no leaks, close the cylinder valve and depressurise the regulator. Remove the first stage from the valve and secure the Dust Cap (33) in place with the Hex Axle (36). If the regulator has a DIN connection replace the Dust Cap (26).

If a leak is detected, note the source of the leak and refer to the troubleshooting table on page 12 for possible causes and corrective actions.

This Ends Testing

Table 1 - Troubleshooting Guide

SYMPTOM	POSSIBLE CAUSE	TREATMENT
High Pressure Creep (also causes second stage leaks)	1. HP Valve (16) is worn or damaged.	1. Replace HP Valve.
	2. 'O' ring inside HP Balance Chamber (18) is damaged or worn.	5. Replace 'O' ring.
	3. H.P balance chamber damaged	6. Replace balance chamber
	4. HP Valve Seat in Valve Body (9) is worn or damaged.	7. Replace Valve Body.
External air leakage	1. Blanking Plug 'O' rings (12,14) are worn or damaged.	1. Replace 'O' Ring.
	2. Diaphragm (6) worn or damaged.	2. Replace diaphragm.
	3. Diaphragm seating surface damaged.	3. Replace Valve Body (9).
	4. Connector 'O' ring (20) worn or damaged.	4. Replace 'O' Ring.
	5. Diaphragm Clamp (4) loose.	5. Tighten Diaphragm Clamp to specified torque.
	6. 'O' rings on DIN Bolt (14,25) worn or damaged.	6. Replace 'O' Rings.
Restricted air flow or high inhalation resistance through entire system	1. Cylinder valve not completely open.	1. Open valve, check fill pressure.
	2. Cylinder valve requires servicing	2. Switch to different cylinder.
	3. DIN Filter (23) or Disc Filter (27) is blocked.	3. Replace filter.
	4. Very Low Medium Pressure.	4. Adjust Medium Pressure to between 9 and 10 bar.

Table 2 - Recommended Tool List

PART NO.	DESCRIPTION	APPLICATION
AP0430	I.P. test gauge	Intermediate pressure testing
AT79	'O' Ring removal pick	'O' Ring removal
AT71	Diaphragm Clamp Tool	Removal of Composite Diaphragm Clamp
AT48	First Stage Work Handle	Clamping Valve Body in Vice
AT24	Circlip Pliers	Removal and installation of Circlip
n/a	Torque wrench, Nm or lbf/ft	Installation of Composite Diaphragm Clamp, DIN Connection and Yoke Connection
n/a	6mm Allen key bit for torque wrench	Installation of DIN Bolt and Yoke Connector
AT34	11/16" spanner	Hose Removal
AT37	5mm Allen key	Blanking Plugs
AT38	6mm Allen key	Removal of DIN Bolt
n/a	10mm Allen key	Removal and Installation of Large Spring Adjuster
n/a	22mm Deep Socket	Removal and installation of DIN Connector
AT74	Yoke Connector Socket	Removal and installation of Yoke Connector
n/a	22mm Spanner	Removal DIN Connector
n/a	232 or 300 bar Diving cylinder	Testing of regulator



AP0430



AT79



AT71



AT48



AT24



AT34



AT37



AT38



6mm Allen Key Bit



AT74

Notes:
 1. Photos not to scale.
 2. Actual tools may differ from photos.

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 metallic components in an ultrasonic cleaning bath containing an appropriate cleaning solution, such as Biox
2. All plastic and composite components such as diaphragm clamp and spring adjuster must be cleaned in soapy water.
3. The components should be cleaned for 6 minutes, depending upon their condition. Longer cleaning times may be used if required.
4. Rinse the components in warm fresh water.
5. 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.

Enriched Air Nitrox Use –

Outside EEC (European Economic Community) Countries Your Apeks regulator has been prepared for use with Enriched Air Nitrox (EAN) where the percentage of oxygen in the EAN does not exceed 40%. This is possible because each regulator is built to a high standard of cleanliness using EAN compatible components and lubricants. In addition, each regulator design has passed stringent adiabatic compression testing to ensure its safety and compatibility with increased percentages of oxygen. If it is your intention to use your new Apeks regulator with Nitrox EAN (O2 not to exceed 40%), it is imperative that you maintain the internal cleanliness of the regulator (see section on Care and Maintenance). If it is your intention to use the regulator interchangeably with breathing air, the breathing air should be oxygen-compatible or "hyperfiltered" where the condensed hydrocarbons do not exceed 0.1 mg/m3. Your local authorised Apeks dealer can help you determine whether the breathing air that they provide meets this criterion.

Standard compressed breathing air meeting the EN 12021 standard, often referred to as Grade E in the United States, does not necessarily meet this criterion. Grade E or EN 12021 breathing air may contain a certain level of hydrocarbons, including traces of compressor oils that while not considered harmful to breathe, can pose a risk in the presence of elevated oxygen content. Passing hydrocarbons through a valve and regulator creates a cumulative effect where the hydrocarbons build up over time along the internal passageways of the equipment. When these hydrocarbons come into contact with high-pressure oxygen enriched air, they can pose a very real hazard that can lead to combustion. Therefore, if a regulator has had use with Grade E or EN 12021 breathing air, it should be returned to an authorised Apeks dealer for overhaul service including oxygen cleaning, prior to being put back into nitrox service. Although 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.

Enriched Air Nitrox Use –

Inside EEC (European Economic Community) countries EN 1443-3 and EN13949 In CEE countries, diving with Nitrox/O2 is controlled by Standards EN 144-3 – Respiratory protective devices - Gas cylinder valves - Part 3: Outlet connections for diving gases Nitrox and oxygen - and EN 13949 – Respiratory equipment - Open circuit self-contained diving apparatus for use with compressed Nitrox and oxygen - requirements, testing, marking.

NOTE : Apeks offers a range of regulators designed and manufactured specially for use with oxygen-enriched mixtures, over 21% and up to 100% oxygen. This range has been certified according to the EN 144-3 and EN 13949 standards and meets the requirements of the adiabatic compression tests. They have received CE certification for this type. For further information on this range, contact your Apeks specialist center.

WARNING : These regulators fitted with special connections should be used only with complementary equipment (tank valves, tanks, pressure gauges, etc.) designed and prepared for use with an oxygen-enriched mixture. These items are marked Nitrox/O2.

WARNING: If the regulator that you use is fitted with a yoke or DIN connection, it is designed for use only with compressed breathing air (21% oxygen and 79% nitrogen) which meets the EN 12021 standard. DO NOT USE this equipment with other mixtures or with gases containing more than 21% oxygen. Disregarding this rule could result in serious injury or death caused by fire or explosion.

Every Nitrox/O2 regulator is assembled in a clean workshop, using compatible components and special lubricants. It is important to maintain the interior of the regulator in a clean state. Breathing air used in the production of a mixture should be oxygen compatible and double filtered with a hydrocarbon content not greater than 0.1 mg/m3. Your Apeks technical specialist should be able to help you determine if the breathing air he supplied meets these criteria.

 **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
AP5761	DIN Connector (21)	25 Nm / 18.4 lbf/ft
AP5765	YOKE Connector (27)	25 Nm / 18.4 lbf/ft
AP5764	DIN Bolt (24)	25 Nm / 18.4 lbf/ft
AP5752	Composite Diaphragm Clamp (4)	20 Nm / 14.7 lbf/ft

Table 5 - Test Bench Specifications

TEST	CONDITION	ACCEPTABLE RANGE
Leak Test	Inlet pressure 150 - 232 bar	No Leaks allowed
Medium Pressure	Inlet pressure 150 - 232 bar	9 to 10 bar
Medium Pressure Creep	Inlet pressure 150 - 232 bar	0.25 bar max for 15 seconds after purging regulator

FLIGHT Yoke Exploded Parts Diagram



NOTE: Item 5 is no longer used. Discard this part.

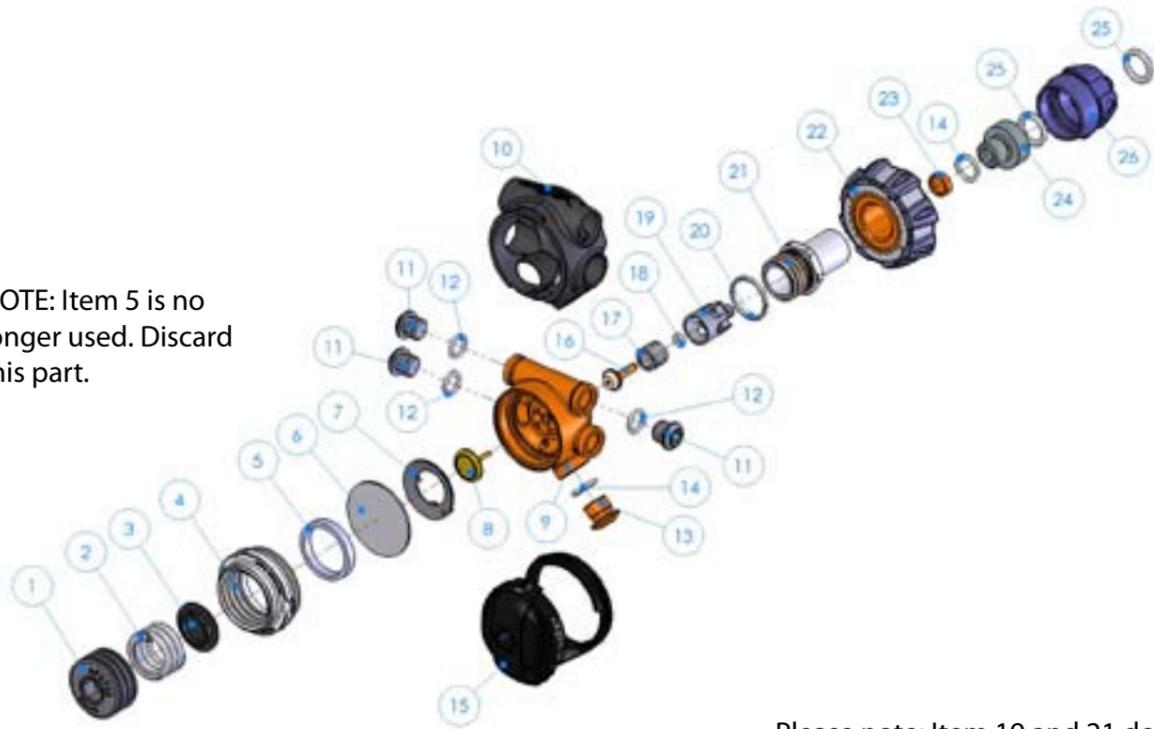
Please note: Item 19 and 27 do not separate, order part AP0168 Yoke Connector sub assembly.

* All marked items must be replaced when serviced.

1	AP5753	Large Spring Adjuster	18*	AP1299	'O' Ring
2	AP5754	Large MP Spring	19	AP0168	Balance Chamber
3	AP5755	Large Spring Carrier	20*	AP1298	'O' Ring
4	AP5752	Composite Diaphragm Clamp	21	N/A	
5	AP5719	Rubber Ring (no longer used)	22	N/A	
6*	AP5756	Small Diaphragm	23	N/A	
7	AP5757	Splitter	24	N/A	
8	AP5717	Valve Lifter	25	N/A	
9	AP5758	Flight Body	26	N/A	
10	AP5751	Pewter Jacket	27	AP0168	Yoke Connector
	AP5751/G	Green Jacket	28*	AP5769	Disc Filter
	AP5751/P	Pink Jacket	29	AP5768	Circlip
	AP5751/Nitrox	Nitrox Jacket	30	AP5695	Plastic Clip
11	AP1408	3/8" UNF Blanking Plug	31	AP5766	Flight Yoke Clamp
12*	AP1409	'O' Ring	32	AP5767	Flight Yoke Cover
13	AP1413	7/16" UNF Blanking Plug	33	AP5714	Dust Cap
14*	AP1445	'O' Ring	34*	AP1166	'O' Ring
15	AP5750	Hood	35	AP5716	Flight Yoke Knob
16*	AP5759	Flight HP Valve	36	AP5713	Handwheel Hex Axle
17	AP1415	Spring	37	AP5770	Flight Decal

FLIGHT DIN Exploded Parts Diagram

NOTE: Item 5 is no longer used. Discard this part.



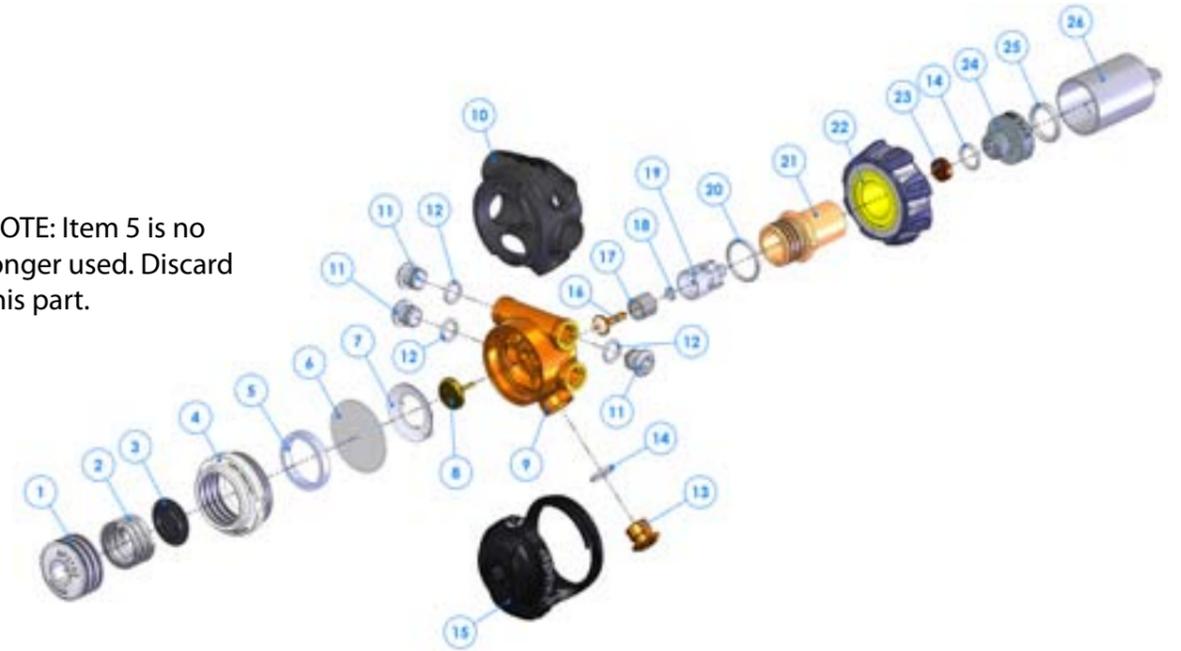
Please note: Item 19 and 21 do not separate, order part AP0163 DIN Connector sub assembly.

* All marked items must be replaced when serviced.

1	AP5753	Large Spring Adjuster	13	AP1413	7/16" UNF Blanking Plug
2	AP5754	Large MP Spring	14*	AP1445	'O' Ring
3	AP5755	Large Spring Carrier	15	AP5750	Hood
4	AP5752	Composite Diaphragm Clamp	16*	AP5759	Flight HP Valve
5	AP5719	Rubber Ring (no longer used)	17	AP1415	Spring
6*	AP5756	Small Diaphragm	18*	AP1299	'O' Ring
7	AP5757	Splitter	19	AP0163	Balance Chamber
8	AP5717	Valve Lifter	20*	AP1298	'O' Ring
9	AP5758	Flight Body	21	AP0163	DIN Connector
10	AP5751	Pewter Jacket	22	AP6201	DIN Moulded Handwheel
	AP5751/G	Green Jacket	23*	AP5763	DIN Filter
	AP5751/P	Pink Jacket	24	AP5764	Flight DIN Bolt
	AP5751/TL	Twilight Jacket	25*	AP1166	'O' Ring
11	AP1408	3/8" UNF Blanking Plug	26	AP6202	DustCap
12*	AP1409	'O' Ring			

FLIGHT M26 Nitrox Exploded Parts Diagram

NOTE: Item 5 is no longer used. Discard this part.



Please note: Item 19 and 21 do not separate, order part NP0163 M26 Connector sub assembly.

* All marked items must be replaced when serviced.

1	AP5753	Large Spring Adjuster	14*	AP1445	'O' Ring
2	AP5754	Large MP Spring	15	AP5750	Hood
3	AP5755	Large Spring Carrier	16*	AP5759	Flight HP Valve
4	AP5752	Composite Diaphragm Clamp	17	AP1415	Spring
5	AP5719	Rubber Ring (no longer used)	18*	AP1299	'O' Ring
6*	AP5756	Small Diaphragm	19	NP0168	Balance Chamber
7	AP5757	Splitter	20*	AP1298	'O' Ring
8	AP5717	Valve Lifter	21	NP0163	M26 Connector
9	AP5758	Flight Body	22	NP6201	M26 Moulded Handwheel
10	AP5751/Nitrox	Nitrox Jacket	23*	AP5763	DIN Filter
11	AP1408	3/8" UNF Blanking Plug	24	NP5764	Nitrox Flight DIN Bolt
12*	AP1409	'O' Ring	25*	AP1166	'O' Ring
13	AP1413	7/16" UNF Blanking Plug	26	NP6202	Nitrox DustCap



FLIGHT FIRST STAGE REGULATOR

MAINTENANCE MANUAL FOR AUTHORISED TECHNICIANS

Apeks Marine Equipment Ltd
Neptune Way, Blackburn, Lancs, England, BB1 2BT