

DIVATOR

MAINTENANCE AND REPAIR MANUAL



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1 INTRODUCTION

■ Divator is a self-contained underwater breathing apparatus (SCUBA). The apparatus is designed to suit every category of diver that works under water with air. Environmental factors such as cold, heat, or type of water (chemical compounds, salt or ice) have little or no effect on the operation of the apparatus.

When designing the system, great importance was attached to safety and safety functions. The diving apparatus fulfils all the requirements of The Swedish Work Environment Authority (Arbetsmiljöverket) and also the requirements for CE approval.

Handling in the field has been considered, with a view to simplifying the assembly and dismantling of the main parts of the system under difficult working conditions.

2 GENERAL INFORMATION

2.1 SAFETY NOTICE

■ Only holders of a valid Interspiro Service Certificate for the equipment in question may carry out service and repairs on Interspiro breathing equipment. Unauthorized service may result in malfunction and users relying there on could sustain severe respiratory injury or death.

Every time an apparatus is dismantled and assembled it must be subjected to a performance test as described in Interspiro Test Instructions. Failure to comply may cause the breathing apparatus to malfunction and persons relying on the equipment could sustain severe respiratory injury or death.

Changes may be made to this manual without prior notice.

Always refer to **www.interspiro.com** for product or document updates and for service bulletins.

The method of handling and maintaining technically advanced products is of great importance to their reliability and service life. It is important that these instructions are carefully followed and that any defects in the equipment are corrected immediately.

Prior to work read the entire relevant text section.

2.2 COMPOUNDS FOR SERVICE

■ Lubricants, locking compounds and sealing compounds are specified by their part numbers. The same numbers will be retained even if other grades or makes that fulfils Interspiro requirements are introduced. Lubricants, locking compounds, sealing compounds and degreasing agents that are not recommended by Interspiro must not be used when servicing the apparatus described in these instructions.

Parts that are secured with locking compound must be well cleaned and free from grease before the locking compound is applied. It is advisable to use an alcohol-based degreasing agent free from oil on a lint-free cloth. Follow the instructions for use and the safety precautions specified on each package.

For cleaning and disinfection Interspiro recommends the use of *Spiroclean* and *Spirodec Plus*.

Locking nuts and screws with “patch-lock” must not be reused more than ten times.

Silicone rubber parts must not be exposed to lubricant 331 900 269.

>>> NOTE

Never let locking compound come in to contact with plastic or rubber parts. Never use compressed air to remove residues or for cleaning since particles and moisture could be pushed into the parts and affect the function of the unit.

2.3 SERVICE INTERVALS

■ For relevant service intervals refer to the “maintenance chart” at the end of the Service Manual. Local requirements may be different from Interspiro's minimum recommendations.

Contact your local Interspiro representative for guidance.

3 OVERVIEW

3.1 USE

■ Divator MK II is a lightweight SCUBA-type diving apparatus (SCUBA: self-contained underwater breathing apparatus). The apparatus is intended for diving to a depth of not more than 50 metres. The apparatus is an open system; the air used by the diver is exhaled to the environment.

The equipment is not intended for smoke diving.

The equipment is suitable for use under water conditions that are normal for diving.

3.2 MAIN PARTS

■ The Divator MK II diving apparatus consists of the following main parts:



- Cylinder pack
- Regulator
- Full face mask
- Breathing valve
- Octopus
- BC-life jacket
- Weight kit

3.3 STORAGE

CYLINDER

■ Before long-term storage the cylinders should be fully charged and provided with tightened dust plugs. Make sure that necessary warning signs have been put up at the storage room entrance in accordance with local instructions.

BC / LIFE JACKET

■ The BC / Life jacket should be cleaned, dried and stored in a dry place.

FULL FACE MASK OR MOUTH PIECE WITH BREATHING VALVE

■ All parts made of rubber or parts containing rubber components should be stored in a cool, dry and dark place and in a sealed plastic bag.

4 PROTECTION, SAFETY AND ENVIRONMENT

4.1 GENERAL

■ Divator MK II diving apparatus may only be used, maintained and repaired by trained and certified personnel.

4.2 MAINTENANCE

■ The maintenance intervals and instructions in Chapter 6, "Maintenance", must be observed. At 12-months intervals (+max 3 months) the diving apparatus must be handed in to an approved maintenance workshop for inspection. Equipment that has not passed scheduled inspection must not be used.

4.3 ERGONOMICS

■ Divator diving apparatus is ergonomically designed, with particular consideration given to the special conditions imposed by the regulations governing working divers. There is a weight to compensate for the buoyancy of the air cylinder pack. The weight is removed from the air cylinder pack for easier handling. At the dive site, a prepared diver must wait for the weight to be attached before entering the water. After a dive, the weight can be removed by the diving assistant while the diver is still in the water, making it easier for the diver to climb into the boat.

4.4 AIR

■ The air must be carefully monitored, classed as breathing gas. As a guide, it should as a minimum meet the requirements of standard SS EN 132 Appendix A, EN 120 21 or FED SPEC BB-A-1043 Grade A.

4.5 CHEMICALS

■ The presence of chemicals, oils (e.g. diesel) or solvents in the water or in the air may affect the life of the material. All equipment that has been exposed to chemicals must be thoroughly cleaned and then handed in to an approved maintenance workshop for inspection.

4.6 SAFETY

CARELESS HANDLING

>>> NOTE

Pressurised systems must always be handled with caution. In extreme cases, fractures can occur in high pressure parts which can pose a danger to life.

■ Blows and/or impacts on unprotected threads may make it impossible to connect parts.

Blows or impacts on the air cylinder pack may cause skewing and/or damage which may weaken the unit. Skewing or damage must be checked and corrected by an approved maintenance workshop. Carelessness when handling the air cylinder pack with its weight fitted may result in deformation of the distance bar or weight shaft.

Blows or impacts on parts made of plastic may cause deformation or cracks. This reduces the performance of the equipment. The visor of the full face mask is especially sensitive to scratching.

Blows, impacts and cuts to hoses may cause hoses to fail. If the pressure gauge hose fails, the pressure gauge stops working because only a small flow passes through the restrictor in the regulator housing, and because the pressure gauge hose has flow-limiting orifices to minimise air loss.

5 DATA AND PERFORMANCE

- See *User Manual Divator*

6 MAINTENANCE

6.1 GENERAL

■ This manual describes the necessary maintaining procedures for this diving apparatus to perform according to specification.

The manual is divided into three chapters describing:

- ▶ Annual maintenance - With operations to be performed at annual inspection.
- ▶ Six-year maintenance - Operations to be performed at six-yearly inspection.
- ▶ Repairs - Set out instructions for the complete dismantling and assembly of the repairable equipment sub assemblies.

Each chapter describes what needs to be done during maintenance, provided that the equipment is not damaged. If the equipment is damaged, repair work must also be done according to chapter Repair.

Each maintenance chapter is divided into four parts, which is recommended to be carried out in chronological order:

- ▶ Cleaning - Every form of maintenance must be preceded by cleaning
- ▶ Checking - Certain parts need to be checked
- ▶ Preventive Maintenance - Certain parts need to be replaced to ensure a high degree of safety.
- ▶ Testing - Maintenance and repair work on the equipment shall be completed by a full functional test.

6.2 TIMES FOR MAINTENANCE AND REPLACEMENT OF PARTS

■ The recommended time between maintenance actions and replacement of parts is based on international standard requirement as well as on Interspiro's experience and tests.

The manual provides the service personnel with detailed instructions to be followed during the repair work.

Maintenance and or repair work should be done according to the relevant parts of this document i.e. 1-year maintenance, 6- year maintenance or Repair.

To perform any maintenance or repair work, the technicians must be trained and certified by Interspiro on the specific unit.

6.3 STORAGE

■ Equipment placed in store must undergo annual service as equipment in use.

Equipment that has been in store may be issued to users subject to the following conditions:

- ▶ When the equipment is issued from the stores, the pressure in the air cylinder pack must not be less than 10 bar (0.1 MPa).

1
Year

6.4 ANNUAL MAINTENANCE

■ The annual maintenance mainly covers:

- external cleaning of regulator, cylinder pack, hoses, breathing valves and full face mask.
- checks of pressure gauge, hoses, cylinder connection, antifreezing caps and cylinder straps.

TOOLS

TOOLS PART	PART NO.	NOTES
Hexagonal key 5 mm	941 901 106	Tool #3
Screwdriver, slotted, 5,5 x 100	993 900 064	Tool #5
Socket; 5 mm hexagonal	336 900 224	Tool #17
Fixture, regulator	336 100 751	Tool #19
Discharge Plug (DIN)	331 190 800	Tool #21
Torque wrench	336 190 478	Tool #26

DOCUMENTS	PART NO.	NOTES
User manual		
Spiromatic test manual	99 056	
Spare parts list	336 100 528	International version
Spare parts list, U.S.A.	99 578	U.S. version

SPARE PARTS

All service kits and service parts listed below shall be replaced during service.

FULL FACE MASK - EVERY YEAR

SPARE PART	PART NO.	NOTES
Service kit for 1 apparatus	460 190 900	
Service kit for 10 apparatus	460 190 901	

BREATHING VALVE - EVERY YEAR

SPARE PART	PART NO.	NOTES
Service part for 10 apparatus	336 190 226	

REGULATOR - EVERY YEAR

SPARE PART	PART NO.	NOTES
Service part for 10 apparatus	346 190 643	
Service part for 10 apparatus	336 190 272	
Service part for 100 apparatus	346 190 644	
Service part for 100 apparatus	460 190 237	

CONSUMABLES

SPARE PART	PART NO.	NOTES
Hand detergent, low pH		
Lubricant, silicone	331 900 269	Tool #25
Solution of 0.1 % chlorhexidine in water		

6.4.1 CLEANING

REGULATOR AND AIR CYLINDER PACK

1. Assemble air cylinder pack, regulator and breathing valve. Open the cylinder valve. If the pressure gauge shows that the air cylinder pack contains less than 10 bar (145 psi) the air cylinder pack must be changed or filled before you continue. If the system has not already been pressurised, do so now. Place the apparatus, without the full face mask and breathing valve, in a bath of clean water. If there are leaks in the regulator, these must be located by tracing the air bubbles.

>>>**NOTE**

Bubbles may come from cavities in the equipment. To determine whether this is leakage, check by holding the apparatus in several positions under the water. Try to clear all suspect air pockets manually.

2. The apparatus can normally be cleaned by scrubbing the outside of the regulator with a brush and a solution of an ordinary hand detergent with a relatively low pH.

BREATHING VALVE

1. Remove the cover assembly by unscrewing the two screws. Remove the breathing valve from the full face mask by turning it clockwise to release the bayonet coupling.



2. Wash the breathing valve with a mild hand detergent and warm water (not above 40 °C). Use a brush if necessary. Do not use powerful solvents as these may damage the rubber and plastic.
3. Check that the system is still pressurised.
4. So that the breathing valve does not blow when immersed in water, it must be immersed with the hose first and the positive pressure attachment nearest to the surface.
5. After cleaning the parts, rinse them in clean water.

FULL FACE MASK

1. Wash the full face mask with a mild hand detergent and warm water (not above 40 °C). Use a brush if necessary (do not use powerful solvents as these may damage the rubber and plastic.).
2. After cleaning the parts, rinse them in clean water.
3. Regularly disinfect the mask and breathing valve. After washing and rinsing, the parts must be left to soak for one hour in a 0.1 % solution of chlorhexidine in water.
4. Rinse the parts thoroughly in clean water and allow to dry.

6.4.2 CHECKING

MOVEMENT OF THE PRESSURE GAUGE POINTER

■ The restrictor orifice in the pressure gauge hose may get blocked if moisture gets into the breathing circuit. The purpose of the orifice is to limit the loss of gas in the event of hose failure. If a pressurised pressure gauge hose without an orifice fails, people nearby may be injured.

1. Assemble the diving apparatus, following the instruction in the Diver's Manual
2. Pressurize the diving apparatus, observing the pressure gauge at the same time.
3. Check that the pointer moves normally and smoothly. If the pointer moves jerkily or not at all, either the orifice is blocked or the pressure gauge is faulty.
4. Vent the system and repeat the pressure gauge pointer check.
5. Rinse the pressure gauge well, including under the rubber cover. Let it dry thoroughly before putting back the rubber cover.

HOSES

■ Normally hoses in a diving apparatus should last for many years, but in view of the severe wear that hoses in diving apparatus can be subjected to it's recommended to closely inspect all hoses for damages after approx. every 100 dives or at least once per year. Hoses are recommended to be replace after maximum twelve years of use.

>>>NOTE

A damaged suit hose can allow just as much air to escape as a breathing hose. This means that failure of a suit hose is just as serious as failure of either of the two breathing hoses.

1. Check that there are no ageing cracks on the intermediate pressure hoses (# 3, # 6 and # 15) and the high pressure hoses (# 14 and 24). If cracks are found the hoses shall be replaced. Special attention shall be taken to the hose connections that are the weakest part of the hose assembly if the hose is subjected to heavy pulling.
2. Check that the high-pressure hoses (# 14 and 24) are not kinked or have any other damages. If damaged the high-pressure hose shall be replaced.

3. For instruction on how to change hoses see chapter Repair below.

FULL FACE MASK

■ Equipment that has been exposed to sunlight, salt water, chemicals (including mild detergents) and ozone, suffers ageing and becomes perished.

1. Inspect the mask body (#11), the mask edges shall be smooth. Stretch and bend the rubber parts of the mask and check visually for damages, there shall be no sign of cracks in the surface of the rubber material.
2. Inspect the inner mask (#1) edges and the direction valves (#3). The valve discs (#2) shall seal well against seat (#3) of the direction valve.
3. Check the head harness (#17), there shall be no cracks in the surface of the harness bands. Replace if damaged.
4. Check the fixing points around the buckles (#12) and metal band.
5. Inspect the plastic parts (sealing surfaces, bayonet coupling, cover and its fixings). If dry cracking or other damage is found, the part must be replaced.

RETIGHTENING THE AIR CYLINDER PACK

>>>WARNING

Composite air cylinder packs expands considerably when pressurised. This increases the strain on the tension straps. The described retightening procedure must be done to prevent the tension straps to loose so that the air cylinder pack moves and cause skew damages to the cylinders.

>>>NOTE

For new cylinders the tension straps need to be retightened after the first four pressurizations.

1. Check that the pressure in the air cylinder pack not less than 30 bar.
2. Use a 5 mm hex socket (tool #17) and a torque wrench. Check that the two screws (#8) holding the cylinder straps (#12) are tightened to 5 Nm.

MOISTURE ACCUMULATION

■ Even though the fill air contains less than 30 mg of water/m³, there is a risk of moisture accumulating in the air cylinder pack. This especially applies if a cylinder is partly used and then refilled, or is seldom emptied completely.

If this moisture is not eliminated, there is risk of freezing in the cylinder valve, regulator unit and breathing valve. Interspiro recommends clearing moisture from the air cylinder pack every tenth filling, with Draining plug 331 190 800 (tool #21).

1. Make sure that the air cylinder pack is placed in room temperature.
2. Fit the draining plug (tool #21) to the regulator connection on the cylinder valve.
3. Open the cylinder valve.
4. An internal valve in the draining plug closes automatically at a pressure of about 3 bar (43 psi).
5. Fill the cylinder with air after draining.

>>>WARNING

When filling cylinders or cylinder packs that contains air with less pressure than 30 bar (435 psi) arrangement shall be made in order to limit the filling rate so that it does not exceed 30 bar/435 psi per minute. It is recommended to use the Interspiro Filling Adapter. See Product Bulletin - 99370.

PRESSURE IN AIR CYLINDER PACK

>>>NOTE

The liner material is thermoplastic and is therefore not proofed for diffusion. If the air cylinder pack is stored for a long time, it may be necessary to top it up. As a guide, the diffusion amounts to about 1 bar/week.

■ It is recommended to regularly check the pressure in stored cylinders.

To check the pressure use the pressure gauge (#20) connected to regulator housing.

1. Open the cylinder valve.
2. Read of the pressure gauge and note the pressure reading.
3. Close the cylinder valve.

If no regulator manifold is connected to the cylinder

pack the pressure can be checked using the Interspiro pressure check gauge, part number 99804-01 (bar) or 99804-02 (psi).

6.4.3 PREVENTIVE MAINTENANCE

■ To minimise the risk of malfunctions and increase user safety, it is recommended that parts should be replaced in accordance with the instructions below.

■ The Divator system comprises of three different breathing valves.

There are two types for the full face mask: with safety pressure and without safety pressure.

The third type is the "Octopus" breathing valve, equipped with a mouth piece and no safety pressure.

When the different breathing valves contains similar component but with different performance it is important not to mix different types of valves during the maintenance work.

FULL FACE MASK

■ For references to parts when dismantling and assembly see Spare Part List DIVATOR.



1. Remove the cover (#10) by unscrewing the two screws. Discard the O-ring (#7) and replace it with a new O-ring lubricated with a thin layer of lubricant (tool # 25).
2. Mount the cover (#10) on the mask.
3. Check the valve disk (#2) on the valve seat (#3) in the inner mask (#1). The valve disc shall be clean, smooth and make contact all round the valve seat (#3).
4. If necessary replace the valve disk by pulling the valve disc off the holder in the middle of valve seat (#3). Fit a new valve disc (#2) by pressing it around the holder in the valve seat (#3). Check that the valve disc is smooth and makes contact

all round the valve seat

BREATHING VALVE

■ For dismantling and assembly of the breathing valve see Spare Parts List.

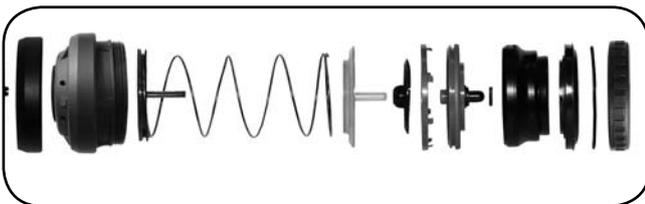


Dismantle the breathing valve into its three main parts, the diaphragm assembly (#1), the valve housing (#2) and the valve insert (#8), as follows:

1. Unscrew the locking ring (#20) and remove the diaphragm attachment (#1). Then unscrew the nut (#11). Take out the valve insert (#8) by carefully pulling the connection nipple (#4).

Tip: If the valve insert (#8) is stuck, connect the breathing hose to make the dismantling easier.

► Dismantling the positive pressure assembly



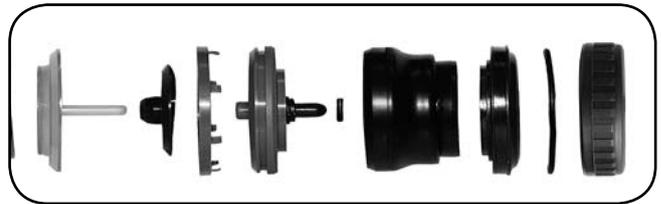
1. Carefully take the diaphragm assembly (#35) out of the cover (#22) by squeezing the thread of the cover and at the same time grasping the outer flange of the diaphragm assembly so that it comes free and can be caught in a hand.



2. Lift spring (#24) and guide disc (#23) (assembled together) out of the cover (#22).



3. Disassemble the diaphragm assembly (#35).



4. Clean the parts in water with a mild hand detergent. After rinsing, soak the parts in a 0.1 % solution of chlorhexidine in water for one hour. Rinse them thoroughly in fresh water and allow them to dry.

► Assembling positive pressure assembly

1. Lubricate all rubber parts except the exhalation diaphragm (#26) with a thin layer of lubricant (tool #25). Too much lubricant on the diaphragm can cause leakage, since sand and other particles stick to the sealing edge of the diaphragm.

Check that there are no holes or other damages on the diaphragm (#30)

2. At one point, press the fixing flange of the diaphragm (#30) into the groove of the diaphragm holder (#31). Place the diaphragm holder on the bench and then run two fingers around the diaphragm in either direction, pressing the diaphragm into the groove in the diaphragm holder.



3. Make sure that the diaphragm is evenly distributed in the groove in the diaphragm holder. If

this is not the case, the shape of the outside of the diaphragm will be oval. Then press the outer edge out and in to give an equal gap all round. If the gap will not become equal, use your fingers to adjust the fixing of the diaphragm in the diaphragm holder.

4. Press the inner edge of the diaphragm (#30) into the groove of the diaphragm ring (#28). The projecting guide pin (#29) in the middle of the diaphragm ring shall face towards the diaphragm holder (#31).



5. Check that the sealing edge of the diaphragm (#30) has fitted well into the groove of the diaphragm ring (#28). Check that the diaphragm is not twisted (free from radial stress creases). Check that the sealing edge of the diaphragm is free from defects.
6. Carefully push on the securing ring (#27) over the edge of the diaphragm ring (#28) to secure the diaphragm (#30).



>>NOTE

The eight holders on the securing ring must be facing towards the diaphragm. They must fit between the fourstop lugs of the diaphragm, but not go past them. To simplify maintenance, the entire diaphragm assembly (#35) can be removed.

7. Fit the exhalation diaphragm (#26) to the center pin on the diaphragm ring (#28). Press the exhalation diaphragm well down into the valve seat so that the sealing edge is pre-loaded towards the diaphragm ring with the projecting part facing outwards.



8. Install the sealing disc (#25) and fit the O-ring (#32) (lubricated with a thin layer of lubricant (tool #25) in the O-ring groove. Make sure that guide pin (#29) and washer (#33) are in place.



9. Put guide disc (#23) with positive pressure spring (#24) in cover (#22), then press in the diaphragm assembly (#35). Check that the spring enters the guide in the sealing disc. Press straight down on the outer part of the diaphragm assembly (#35), but do not turn it as this may affect the spring force. Make sure that the diaphragm assembly goes down to the stop. Check that the shield ring (#21) and purge button (#34) remain in place on cover (#22).



10. Check that the unit is working correctly by pressing down lightly the guide pin a few times. The diaphragm assembly should move freely.

11. Place the locking ring on the valve housing and screw the positive pressure attachment on to the valve.
- 12 Check that the guide pin on the positive pressure attachment is correctly placed in the slot of the lever fork and that the black lever is in the "on" position (away from the valve housing).

► **Valve housing**

1. Remove non-return valve (#9) by pressing with a finger from the inside of the valve housing. Remove the O-ring (#10) from the valve housing. Discard the valve and the O-ring.

VALVE HOUSING

- See spare part list for references.



1. Remove non-return valve (#9) by pressing with a finger from the inside of the valve housing. Remove and discard the O-ring (#10) from the valve housing.
2. Clean the valve housing, the non return valve (#9) and the nut (#11) in water with a mild hand detergent. After rinsing, soak the parts in a 0.1 % solution of chlorhexidine in water for one hour. Then rinse them thoroughly.
3. Check that the membrane in the non return valve (#9) seals against the seat . If the valve membrane is damage in any way or does not seal well the non return valve shall be replaced.

VALVE INSERT ASSEMBLY

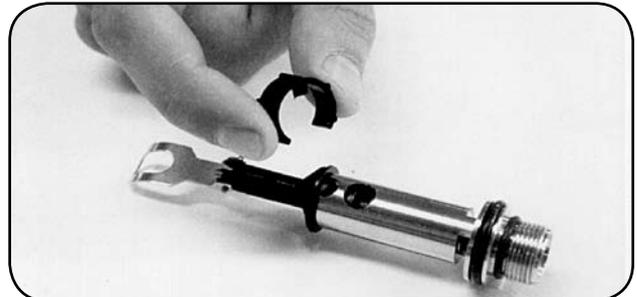
- See the spare parts list for references.



- The valve insert assembly consists of the following main components: valve insert (#16), retaining ring (#7), connection nipple (#4) and O-rings (#5 and 6).

► **Dismantling the valve insert**

1. Remove the retaining ring (#7) and pull out the Valve insert (#16) out of the connection nipple (#4).



3. Carefully remove the O-rings (#5 and 6) from the connection nipple (#4).

4. Check the parts and replace any that are damaged.

The complete valve insert assembly is available as a complete spare part (#16) to enable quick repairs.

5. Clean the parts in water with a mild hand detergent. After rinsing, the parts must be disinfected by soaking the parts in a 0.1 % solution of chlorhexidine in water for one hour. Then rinse them thoroughly.

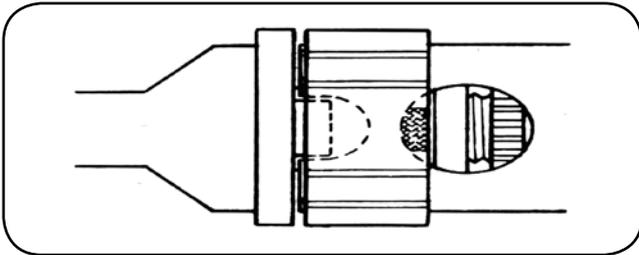
6. Let the valve insert dry thoroughly in air after washing.

>>> **NOTE**

If moisture has got into the inhalation side of the valve insert, the entire valve must be thoroughly dried, otherwise freezing may occur in the valve insert.

► **Installing the valve insert**

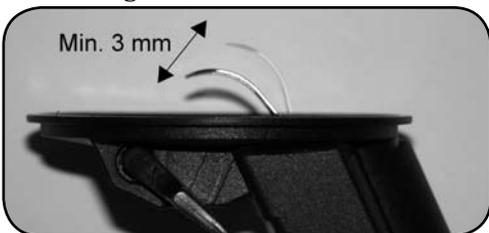
1. Lubricate the O-rings (#5 and #6) very thinly with Lubricant (tool #25), and fit them to the connection nipple (#4).
2. Assemble the connection nipple (#4) and the valve insert (#16). Press the units together and fit the retaining ring (#7) described below. Make sure that the latching lug on the retaining ring (#7) goes down and engages between the flange on the valve insert (#3) and the edge of the side hole in the connecting nipple (#4).



3. If the valve is of Safety Pressure type - make sure that the lever (#14) is in open position, away from the housing.

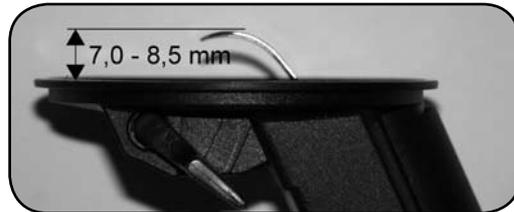


4. Install the valve insert into the valve housing. Check that the “key shape” of the valve insert engages in the valve housing.
5. Check that the lever has a movement as shown in illustration below. Make sure that the valve insert (#8) is pushed in as far as possible into the valve housing (#2).



6. If the lever clearance needs adjusting, remove the valve insert, pull the lever outside the lever support groove and then turn the lever support. Unscrewing the lever support reduces the clearance and vice versa.
7. After adjustment, check that the lever has been returned to the deep groove in the lever support.
8. Reinstall the valve insert into the valve housing. Check that the “key shape” of the valve insert engages in the valve housing and that the valve insert (#8) is pushed in as far as possible into the valve housing (#2).

9. Check that the height of the lever fork above the valve housing is 7.0-8.5 mm (see illustration below. NOTE! Locking removed.)



10. Screw on the retaining nut (#11) by hand.
11. Fit the locking ring (#20) over the valve housing and attach the diaphragm attachment (#1)



12. Connect the medium pressure hose (#6) to the connection nipple (#4) (With the regulator connected to the cylinder pack).
13. Open the cylinder valve and pressurize the valve.
14. Fill the free space in the non-return valve disc (#9) with water.
15. Check that no water leaks into the breathing valve. The level in the valve housing must not drop. If leakage is found, clean or replace the check valve.
16. Blow the valve dry by pressing the draining button. Check that the check valve disc lies flat after the valve has blown dry.



>>> **NOTE**

When rinsing a removed breathing valve, keep a thumb over the edge of the non-return valve, otherwise the non-return valve may come loose. If this happens, the breathing valve must be blown dry before the non-return valve is fitted. Lay out the parts of the apparatus to dry before the next dive or before putting them into storage.

17. Close the cylinder valve.
18. Let the valve housing dry thoroughly in the air.

ANTIFREEZING CAP

■ A leaking antifreezing cap not only increases the risk of freezing; it makes the regulator work less efficiently. Oxides and salt deposits in the regulator may stop the flow of air. For dismantling of the antifreezing cap, see the regulator spare parts list.

► Remove the antifreezing cups

1. Remove the clamp (# 24) holding the antifreeze cover (#23), use a slotted screwdriver (tool #5).



2. Open the antifreezing cover (#23). It is hinged at the top. Remove the cover assembly from the regulator housing.



3. Remove (pull off) the antifreezing cap (#22) from the groove on the regulator housing. Check that the antifreezing cap is free from damages.
4. Check that no water has leaked in. If water has leaked in, the regulator must be blown dry. Blow compressed air from a nozzle into one of the two holes in the bottom of the regulator. Blow the regulator housing dry.

► Assemble the antifreezing cups and cover

5. Mount the antifreeze cover (#22) onto the regulator housing. Carefully pull the antifreeze cover up against the flange on the regulator housing. Pull slightly on the cover edge to allow the cover to fill with air.



6. Place the antifreeze cover (#23) over the antifreeze cup (#22) and secure it with the clamp (#24). Use a slotted screwdriver (tool #17) to tighten the clamp. Make sure that the plastic halves do not pinch the antifreezing cap (#22) or crush the antifreezing cap at any point. The clip must be tightened moderately. Check this by manually turning the antifreezing cover (#23). The antifreezing cap (#22) must not rotate with the antifreezing cover (#23).



CORROSION IN THE REGULATOR

■ The regulator assembly may be affected by dirty air from stores. The filter in the connecting piece must therefore be changed yearly. Corrosion may also occur if water leaks in from the antifreezing cap.

► Cylinder connection

1. Place the regulator housing in a fixture (tool #19) secured in a vice, to void damages on the regulator housing.
2. Unscrew nipple (#13) one-quarter turn with a hexagonal key 5 mm, (tool #3). Lift the regulator housing out of the fixture, with the connection pointing downwards, and unscrew the nipple (#13). Take the filter (#11) out of the connection nipple (#25). Carefully tap the connection nipple against a soft surface so that possible loose particles will fall out, put back the regulator housing in the fixture.



3. Remove the O-ring (#12) from the nipple (#13). Discard the O-ring.

>>NOTE

To avoid risk of accidentally air leakage it is recommended to replace the O-ring (#12) at least once a year, or immediately if damaged.

4. Remove and discard the filter (#11).
5. Lubricate a new O-ring (# 12) with a thin layer of lubricant (tool #25) and position the O-ring in the groove in the nipple (#13). Push the filter down so that it is centered and screw in the nipple by hand. The point of the nipple (#13) must fit into the hole in the filter. Using a hexagon wrench, tighten the nipple with moderate force.

6.4.4 TESTING IN A TEST UNIT

■ The regulator and full face mask/valve must be tested (for ex. with the Spirotest unit) annually and after every repair. For a general description of and operating instructions for the test unit see the User manual for test unit.

Test results shall be logged using a Interspiro test protocol.

6
Year

6.5 SIX-YEARLY MAINTENANCE

TOOLS

TOOLS PART	PART NO.	NOTES
Awl	336 900 065	Tool #1
Assembly Punch tool	336 100 758	Tool #2
Wrench, hexagonal key 5 mm	941 901 106	Tool #3
Screwdriver, Phillips cross head	336 900 095	Tool #4
Screwdriver, slotted 5,5 x 100	993 900 064	Tool #5
Screwdriver, socket 5/16"		Tool #6
Socket; Cylinder valve	336 100 752	Tool #9
Piston extractor tool	99 211-01	Tool #10
Barrel brush	336 900 219	Tool #11
U-spanner 10/13	336 900 222	Tool #12
U-spanner 14/15	336900223	Tool #13
Socket; 5 mm hexagonal	336 900 224	Tool #17
Fixture; Regulator	336 100 751	Tool #19
Socket; Torx T30	99 533	Tool #20
Discharge Plug (DIN)	331 190 800	Tool #21
Torque wrench adapter 29 mm	99 534-51	Tool #23
Punch tool for O-ring and support washer	346 100 115	Tool #24
Silicone lubricant	331 900 269	Tool #25
Torque wrench w adapter	336 190 478	Tool #26
Adjusting key, Warning unit	336 100 756	Tool #28
Fixture for manifold	460 190 850	Tool #29
U-spanner 24 mm	99 519	Tool #30
Long nosed pliers	331 190 033	Tool #31
Wrench, hexagonal key 1/4"		Tool #37
Wrench, hexagonal key 3/16" long		Tool #38
Socket 15 mm long	336 900 221	Tool #43

DOCUMENTS

PART NO.

User manual, Divator Scuba
Test report

99 841

SPARE PARTS

SPARE PART	PART NO.
FULL FACE MASK - EVERY YEAR	
Service kit for 1 apparatus	460 190 900
Service kit for 10 apparatus	460 190 901
BREATHING VALVE - EVERY YEAR	
Service part for 10 apparatus	336 190 226
BREATHING VALVE - EVERY 6TH YEARS	
Service kit for 1 apparatus	460 190 902
Service kit for 10 apparatus	460 190 903
Service kit for 1 apparatus	460 190 904
Service kit for 10 apparatus	460 190 905
REGULATOR - EVERY YEAR	
Service part for 10 apparatus	346 190 643
Service part for 10 apparatus	336 190 272
Service part for 100 apparatus	346 190 644
Service part for 100 apparatus	460 190 237
REGULATOR - EVERY 6TH YEARS	
Service kit for 10 apparatus	460 190 756
Service kit for 10 apparatus	460 190 757
WARNING DEVICE - EVERY 6TH YEARS	
Service kit for 10 apparatus	460 190 908
Service kit for 10 apparatus	460 190 909
CYLINDER VALVE - EVERY 5* YEARS	
Service kit for 10 apparatus	460 190 686
Service kit for 10 apparatus	460 190 687

CONSUMABLES

SPARE PART	PART NO.	NOTES
Hand detergent, low pH		
Lubricant for cylinder valves	331 900 268	Tool #22
Lubricant	331 900 269	Tool #25
Locking compound	331 900 035	Tool #27
Solution of 0.1 % chlorhexidine in water		

6.5.1 CLEANING

REGULATOR AND AIR CYLINDER PACK

1. Assemble air cylinder pack, regulator and breathing valve. Open the cylinder valve. If the pressure gauge shows that the air cylinder pack contains less than 10 bar (145 psi) the air cylinder pack must be changed or filled before you continue. If the system has not already been pressurised, do so now. Place the apparatus, without the full face mask and breathing valve, in a bath of clean water. If there are leaks in the regulator, these must be located by tracing the air bubbles.

>>>NOTE

Bubbles may come from cavities in the equipment. To determine whether this is leakage, check by holding the apparatus in several positions under the water. Try to clear all suspect air pockets manually.

2. The apparatus can normally be cleaned by scrubbing the outside of the regulator with a brush and a solution of an ordinary hand detergent with a relatively low pH.

BREATHING VALVE

1. Remove the cover assy by unscrewing the two screws. Remove the breathing valve from the full face mask by turning it clockwise to release the bayonet coupling.



2. Wash the breathing valve with a mild hand detergent and warm water (not above 40 °C). Use a brush if necessary. Do not use powerful solvents as these may damage the rubber and plastic.
3. Check that the system is still pressurised.
4. So that the breathing valve does not blow when immersed in water, it must be immersed with the hose first and the positive pressure attachment nearest to the surface.
5. After cleaning the parts, rinse them in clean water.

FULL FACE MASK

1. Wash the full face mask with a mild hand detergent and warm water (not above 40 °C). Use a brush if necessary (do not use powerful solvents as these may damage the rubber and plastic.).
2. After cleaning the parts, rinse them in clean water.
3. Regularly disinfect the mask and breathing valve. After washing and rinsing, the parts must be left to soak for one hour in a 0.1 % solution of chlorhexidine in water.
4. Rinse the parts thoroughly in clean water and allow to dry.

6.5.2 CHECKING

■ Before starting the check the diving apparatus shall be complete assembled, following the instruction in the User's Manual

■ Movement of the pressure gauge pointer

The pressure gauge hose connection to the regulator manifold is fitted with a restrictor orifice. The purpose of this orifice is to limit the gas flow in the event of hose failure.

The restrictor orifice may get blocked if moisture gets into the breathing circuit. A blocked restrictor orifice will affect the function of the pressure gauge.

1. Pressurize the diving apparatus, observing the pressure gauge at the same time.
2. Check that the pointer moves normally and smoothly. If the pointer moves jerkily or not at all, either the orifice is blocked or the pressure gauge is faulty. See chapter Repair.
3. Vent the system and repeat the pressure gauge pointer check.
4. Rinse the pressure gauge well, including under the rubber cover. Let it dry thoroughly before putting back the rubber cover.

REGULATOR CORROSION

■ The regulator may be affected by moisture which may get in from the air supply, damaged hoses, couplings, antifreezing cap and quick coupling. This may lead to corrosion, so that the regulator must be checked. Take care if there is water inside the regulator. If this happens, the regulator should undergo comprehensive inspection and repair.

RETIGHTENING THE AIR CYLINDER PACK

>>>WARNING

Air cylinder packs of composite expand considerably when pressurised. This increases the strain on the tension straps. This need to be done to prevent the tension straps to loose so that the air cylinder pack moves and cause skew damages to the cylinders.

1. Check that the pressure in the air cylinder pack not less than 30 bar.
2. Use a 5 mm hex socket (tool #17) and a torque wrench. Check that the two screws (#8) holding the cylinder straps (#12) are tightened to 5 Nm.

MOISTURE ACCUMULATION

■ Even though the fill air contains less than 30 mg of water/m³, there is a risk of moisture accumulating in the air cylinder pack. This applies especially if a cylinder is partly used and refilled, and is seldom emptied completely.

If this moisture is not eliminated, there is a risk of freezing in the cylinder valve, regulator unit and breathing valve. Interspiro recommends clearing moisture from the air cylinder pack every tenth filling, with draining plug (tool #21).

1. Make sure that the air cylinder pack is at room temperature.
2. Fit the discharge plug.
3. Open the cylinder valve.
4. A valve in the discharge plug closes automatically at a pressure of about 3 bar.
5. Fill the cylinder after draining.

PRESSURE IN AIR CYLINDER PACK

>>>NOTE

The liner material is thermoplastic and is therefore not proof against diffusion. If the air cylinder pack is stored for a long time, it may need to be topped up. As a guide, the diffusion amounts to about 1 bar/week.

■ It is recommended to regularly check the pressure in stored cylinders.

To check the pressure use the pressure gauge (#1) connected to regulator housing.

1. Open the cylinder valve.
2. Read of the pressure gauge and note the pressure reading.
3. Close the cylinder valve.

If no regulator manifold is connected to the cylinder pack the pressure can be checked using the Interspiro pressure check gauge, part number 99804-01 (bar) or 99804-02 (psi).

6.5.3 PREVENTIVE MAINTENANCE

■ To minimise the risk of malfunctions and increase user safety, it is recommended that parts should be replaced in accordance with the instructions below.

■ The Divator system comprise three different breathing valves.

There are two types for the full face mask with safety pressure and without safety pressure.

The third type is the "Octopus" breathing valve, equipped with a mouth piece and no safety pressure.

When the different breathing valves contains similar component but with different performance it is important not to mix different types of valves during the maintenance work.

FULL FACE MASK



■ Equipment that has been exposed to sunlight, salt water, chemicals (including mild detergents) and ozone, suffers ageing and becomes perished.

1. Inspect the mask body (#11), the mask edges shall be smooth. Stretch and bend the rubber parts of the mask and check visually for damages, there shall be no sign of cracks in the surface of the rubber material.
2. Inspect the inner mask (#1) edges and the direction valves (#3). The valve discs (#2) shall seal well against seat (#3) of the direction valve.
3. Check the head harness (#17), there shall be no cracks in the surface of the harness bands. Replace if damaged.
4. Check the fixing points around the buckles (#12) and metal band.
5. Inspect the plastic parts (sealing surfaces, bayonet coupling, cover and its fixings). If dry cracking or other damage is found, the part must be replaced.

■ For references to parts when dismantling and assembly see Spare Part List DIVATOR.

6. Remove the cover (#10) by unscrewing the two screws. Discard the O-ring (#7) and replace it with a new O- ring lubricated with a thin layer of lubricant (tool #25).
7. Remove and discard the valve discs (#2) from the valve seats (#3).
8. Fit a new valve disc (#2) on both the valve seats (#3). Press the valve disk over and around the holder in the middle valve seat (#3). Check that the valve disc makes contact all round the valve seat (#3).

BREATHING VALVE

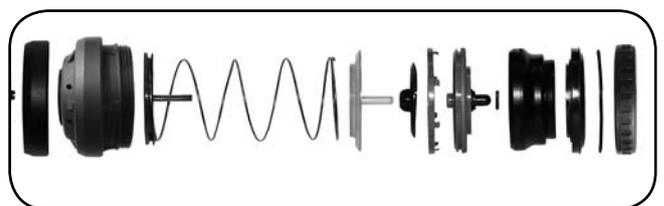
■ For dismantling and assembly of the breathing valve see Spare parts list.



Dismantle the breathing valve into its three main parts, the diaphragm assembly (#1), the valve housing (#2) and the valve insert (#8), as follows:

1. Unscrew the locking ring (#20) and remove the diaphragm attachment (#1). Then unscrew the nut (#11). Take out the valve insert (#8) by carefully pulling on the connection nipple (#4).

Tip: If the valve insert (#8) is stuck, connect the breathing hose to make dismantling easier.



► **Dismantling the positive pressure assembly**

1. Carefully take the diaphragm assembly (#35) out of the cover (#22) by squeezing the thread of the cover and at the same time grasping the outer flange of the diaphragm assembly so that it comes free and can be caught in a hand.
2. Lift spring (#24) and guide disc (#23) (assembled together) out of the cover (#22).



3. Discard diaphragm assembly (#35)
4. Clean the remaining parts in water with a mild hand detergent. After rinsing, soak the parts in a 0.1 % solution of chlorhexidine in water for one hour. Rinse them thoroughly in fresh water and allow them to dry.

► **Assembling positive pressure assembly**

1. Place the guide disk (#23) and the positive pressure spring (#24) in the cover (#22).



2. Place the new diaphragm assembly (#35) on top of the positive pressure spring (#24) (the sealing disc has a guide groove for spring). Push the diaphragm assembly down into the positive pressure cover without twisting it as the spring tension could be altered.



- 3 Check that the unit is working correctly by pressing down lightly the guide pin a few times. The diaphragm assembly should move freely.

VALVE HOUSING

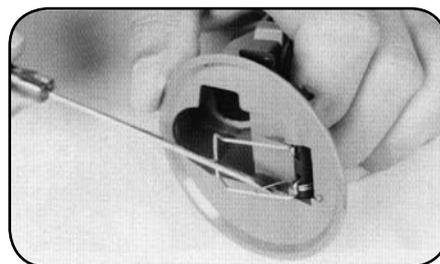
► **Dismantling the valve housing**

- See the spare parts list for references.

1. Remove non-return valve (#9) by pressing with a finger from the inside of the valve housing. Remove the O-ring (#10) from the valve housing.



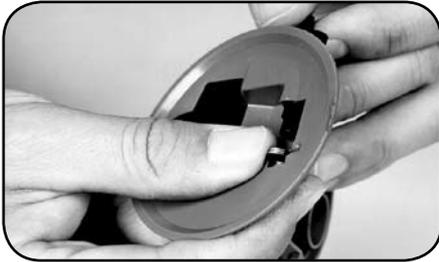
2. Disassemble the lever assembly (#14) by lifting off the hook of the lever spring (#14b).



3. Push the black lever (#14a) against the valve housing and press the locking spring (#14d) together and remove it from the valve housing .



- Pull out the lever (#14a) holding a finger over the lever spring (#14b). Remove distance ring (#14c), O-ring (#15) and lever spring (#14b).



- Clean the parts in water with a mild hand detergent. After rinsing, soak the parts in a 0.1 % solution of chlorhexidine in water for one hour. Then rinse them thoroughly.

► **Assembling the valve housing**

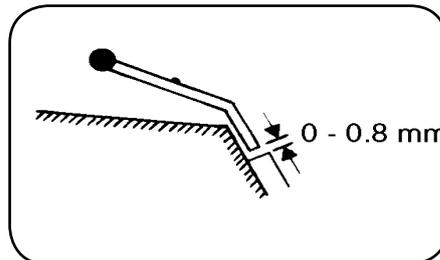
- Install a new non-return valve (#9) by carefully pressing it down into the valve housing.
- Fit new O-ring (#10) to the valve housing.
- Apply a thin layer of lubricant (tool #25) on the new O-ring (#15) on the lever (#14a) and push the lever into the valve housing half way.
- Place the distance ring (#14c) and the lever spring (#14b) with the loop outwards on the lever (#14a).
- Push in the lever (#14a) and push the distance ring (#14c) against the valve housing on the lever side and the lever spring (#14b) against the other side. Mount the locking spring (#14d) into the oblong holes on the lever and between the lever spring and distance ring.
- Lift the hook of the lever spring (#14b) on to the locking spring (#14d). Check that the straight end of the lever spring is on the outside of the little knob in the valve housing.



- Check that the front part of locking spring (#14d) is 1 - 3.5 mm above the plane of the valve housing. The tip of the locking spring should point downwards.



- Turn the lever (#14a) out from the valve housing and check that the locking spring lies flat against the valve housing and the tip is 0 - 0.8 mm from the ridges in the valve housing



VALVE INSERT ASSEMBLY

- See the spare parts list for references.
- Note that there are two different types of valve insert assemblies, one for breathing valves with safety pressure and one for breathing valves with out safety pressure. Make sure not to mix valve inserts components.

► Dismantling the valve insert

1. Remove the retaining ring (#7) and pull out the valve insert if not previously done.
2. The valve insert assembly is made up of the following main components: valve insert (#16), retaining ring (#7), connection nipple (#4) and O-rings (#5 and #6).



3. Remove and discard the O-rings (#5 and 6).
4. Discard the valve insert (#16).
5. Clean the connection nipple (#4) thoroughly in water with a mild hand detergent. After rinsing, the connection nipple must be disinfected by soaking the parts in a 0.1 % solution of chlorhexidine in water for one hour. Then rinse it thoroughly.
6. Check whether there are any deposits remaining around the seat in the connection nipple (#4). If there are, discard the connection nipple and use a new one.

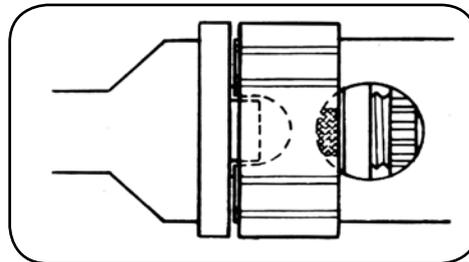
>>> NOTE

If moisture has got into the inhalation side of the valve insert, the entire valve insert must be thoroughly dried, otherwise freezing may occur in the valve insert.

► Installing the valve insert

1. Lubricate new O-rings (#5 and #6) very thinly with (tool #25) and fit them to the connection nipple (#4).
2. Install a new valve insert (#16) in the connection nipple (#4).

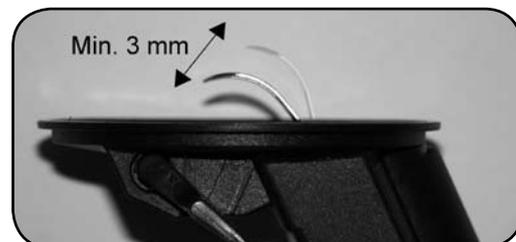
3. Press the units together and fit the retaining ring (#7). Press down the retaining ring (#7) and make sure that its latching lug goes down and engages between the flange on the valve insert (#3) and the edge of the side hole in the connecting nipple (#4).



4. If the valve is of Safety Pressure type - make sure that the lever (#14) is in open position, away from the housing.

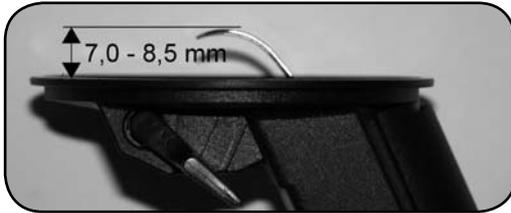


5. Install the valve insert into the valve housing. Check that the “key shape” of the valve insert engages in the valve housing.
6. Check that the lever has a movement as shown in illustration below. Make sure that the valve insert (#8) is pushed in as far as possible into the valve housing (#2).



7. If the lever clearance needs adjusting, remove the valve insert, pull the lever outside the lever support groove and then turn the lever support. Unscrewing the lever support reduces the clearance and vice versa.
8. After adjustment, check that the lever pin has returned to the deep groove in the lever support.
9. Reinstall the valve insert into the valve housing. Check that the “key shape” of the valve insert engages in the valve housing. Make sure that the valve insert (#8) is pushed in as far as possible into the valve housing (#2).

10. Check that the height of the lever fork above the valve housing is 7.0-8.5 mm (see illustration below. NOTE! Locking removed.)



11. If necessary adjust the position of the lever, the valve insert (#8) must be removed from the valve housing, after which the lever support is adjusted as described above.
12. Screw on the retaining nut (#11) by hand.

►Assembling the breathing valve

- For assembly of the breathing valve see the Spare part list for references.

Assemble the breathing valve and its three main parts, the diaphragm assembly (#1), the valve housing (#2) and the valve insert (#8), assembly, as follows:

1. Install the valve insert (#8) by carefully pressing on the connection nipple (#4). Check that the keying of the valve insert fits into that of the valve housing and screw on the nut (#11).
2. Fit the locking ring (#20) over the valve housing and attach the diaphragm attachment (#1).

►Install non-return valve

1. Install a new non-return valve (#9) by carefully pressing the non-return valve down into the valve housing.



2. Connect the medium pressure hose (#6) to the connection nipple (#4) (With the regulator connected to the cylinder pack).
3. Open the cylinder valve and pressurize the valve.
4. Fill the free space in the non-return valve disc with water.

5. Check that no water leaks into the breathing valve. The level in the valve housing must not drop. If leakage is found, clean or replace the check valve.
6. Blow the valve dry by pressing the draining button. Check that the check valve disc lies flat after the valve has blown dry.



>>>NOTE

When rinsing a removed breathing valve, keep a thumb over the edge of the non-return valve, otherwise the non-return valve may come loose. If this happens, the breathing valve must be blown dry before the non-return valve is fitted. Lay out the parts of the apparatus to dry before the next dive or before putting them into storage.

7. Close the cylinder valve and vent the system.
8. Let the valve housing dry thoroughly in the air.

REGULATOR

- Regulator housing
- See the spare parts list for references.
- For maintenance, the regulator housing must be removed from the air cylinder pack.

► Remove the antifreezing cap and cover

1. Remove the clamp (#24) holding the antifreeze cover (#23), use slotted screwdriver (tool #5).



2. Open the cover assembly (#23). It is hinged at the top. Remove the cover assembly from the regulator housing.
3. Remove (pull away) and discard the antifreezing cap (#22) from the groove on the regulator housing.



4. Check that no water has leaked in to the anti-freezing cap. If water has leaked in, the regulator must be blown dry. Blow compressed air from a nozzle into one of the two holes in the bottom of the regulator. Blow the regulator housing dry.

► **Cylinder connection**

1. Place the regulator housing in a fixture (tool #19) secured in a vice, to void damages on the regulator housing.
2. Unscrew nipple (#13) one-quarter turn with a hexagonal key 5 mm, (tool #3). Lift the regulator housing out of the vise, with the connection pointing downwards, and unscrew the nipple (#13). Take the filter (#11) out of the connection nipple (#25). Carefully tap the connection nipple against a soft surface so that possible loose particles will fall out, put back the regulator housing in the fixture.



3. Remove the O-ring (#12) from the nipple (#13). Discard the O-ring.

>> **NOTE**

To avoid risk of accidentally air leakage it is recommended to replace the O-ring (#12) at least once a year, or immediately if damaged.

4. Remove and discard the filter (#11).
5. Lubricate a new O-ring (#12) with a thin layer of lubricant (tool #25) and position the O-ring in the groove in the nipple (#13). Push the filter down so that it is centred and screw in the nipple by hand. The point of the nipple (#13) must fit into the hole in the filter. Using a hexagon wrench, tighten the nipple to the stop.

DISMANTLING OF PRESSURE REGULATOR

► **Dismantling the 4-port swivel**

1. Place the regulator in the regulator fixture (tool #19) and secure the fixture in a vice.
2. Unscrew the medium pressure hose(s) from the 4-port swivel using a 13 mm U-spanner (tool #12).
3. Unscrew the screw (#34) on top of the swivel head (#31) using a T30 torx socket (tool #20).



4. Remove the swivel head (#31) and remove and discard the two O-rings (#30).



5. Use a wrench and a 29 mm torque wrench adapter (tool #23) to unscrew the regulator head with the swivel axis.



6. Remove and discard the O-ring (#4) from the swivel axis (#29).



7. Screw on the piston extractor (tool #10) to the top of the piston (#7) and pull out the piston by screwing out the big hand-wheel of the extractor.



8. Lift out the two springs (#9 and 10) and remove and discard the O-ring (#8) on the piston (#7).
9. Take the regulator out of the fixture and turn the other side up.
10. Remove the sealing plate (#20) with help of a awl (tool #1) discard the sealing plate.



11. Unscrew the adjustment screw (#19) and remove the valve seat (#17) with it's O-ring (#18). The spring (#16) should come out at the same time.



12. Push, with help of the punch tool (tool #2), from the piston side out the two support rings (#14) and the O-ring (#15).



13. Discard the valve seat with O-ring (#17 and 18), spring (#16), O-ring (#15) and the back up rings (#14). Clean the regulator, make sure to remove all rest of locking compound from the threads of the adjusting screw (#19) as well as on the corresponding threads in the regulator housing.

ASSEMBLY OF PRESSURE REGULATOR

1. Lubricate a new piston O-ring (#8) sparingly with lubricant (tool #25) and mount onto piston.



2. Apply a thin layer of lubricant (tool #25) inside the regulator housing where the large diameter of the piston (#7) is located and on the part of the piston shaft.
3. Apply a thin layer of lubricant (tool #25) to the end coils of the springs (#9 and 10).
4. Fit the springs (#9 and 10) onto the piston shaft (#7).



5. Slide the narrow end of the punch tool (tool #2) into the piston shaft.



6. Push in the piston in to the regulator housing as far as it will go.



7. Disassemble the regulator Cover/Axis (#29). Remove the stop ring (#6) and the diffuser (#28).



8. Clean the inside of the cover/axis (#29), the diffuser (#28) and the stop ring (#6). Mount the items back into the cover/axis.
9. Apply a thin layer of lubricant (tool #25) on a new O-ring (#4) and fit it on to the regulator cover/axis (#29).
10. Attach the regulator cover/axis to the regulator housing. Tighten with 20 Nm using a 29 mm torque wrench adapter (tool #23) on a torque wrench (tool #26).



11. Fit a new O-ring (#30) on the lower end of the axis of the regulator cover (#29).



12. Apply a thin layer of lubricant (tool #25) on the bottom side of the 4-port swivel housing (#31).



13. Slide the 4-port swivel housing over the axis on the regulator cover (#29). Fit the second, lubri-

cated (tool #25), O-ring (#30) around the top of the axis.



14. Apply a drop of locking compound (tool #27) on the screw (#34). Fit the washer (#33) and the screw (#34) at the top of the axis. Tighten the screw with 10 Nm: using a torx T30 socket (tool #20) and a torque wrench (tool #26).

15. Place the punch tool (tool #2), with its narrow end first, into the piston shaft in the primary pressure side of the regulator. Slide one of the two support rings (#14) onto the punch tool (tool #2) and press it well down in to its seat using the assembly tool (tool #24).



16. Apply a fine layer of lubricant (tool #25) on the O-ring (#15), slide it onto the punch tool (tool #23) together with the other support ring (#14) - the O-ring first. Press the O-ring and support ring down over the piston shaft using the assembly tool (tool #24).



17. Apply a thin layer of lubrication on the O-ring (#18) on the new regulator seat (#17).

18. Place a the new spring (#16) over the piston shaft.

19. Place the new regulator seat (#17) over the spring (#16) with the recessed end of the regulator seat facing the piston shaft.



20. Attach the adjusting screw (#19) and screw it down until the back of the adjusting screw levels with the start of the threads of the housing.

21. This is a basic adjustment of the secondary pressure, that needs to be checked with the test equipment and finally adjusted. See the test instruction for the test equipment.

22. After the final adjustment of the secondary pressure, lock the adjustment screw (#19) with a small drop locking compound (tool #27).

>>>NOTE

Be careful not to get locking compound into the hole of the adjusting screw.

Use the tip of a small screwdriver to apply the locking compound.



21. Mount the sealing plate (#20). Use a small hammer to tap the sealing plate in place.



WARNING DEVICE

► **Dismantling of the secondary pressure.**

■ The secondary pressure side must dismantled before dismantling the primary pressure side

1. Remove the covers (#18) and the retraining clip (#25) by loosening the two screws (#22). Use a slot screw driver (tool #5).
2. Place the handle (#4) in normal position and remove the cap (#1). The cap can be pushed off with help of a slot screwdriver fitted in the small slot in the cap.



3. Remove and discard the locking pin (#2) using a pincers (tool #31) and unscrew the nut (#3) by hand.



4. Remove and discard the handle (#4) and the torsion spring (#5). Unscrew the adjustment nipple (#6) using the adjustment tool (tool #28).



5. Lift out the valve stem (#9) with O-ring (#26) and valve disk (#10).
6. Pull off and discard the valve disk (#10) and the O-rings (#26 and 8).

► **Dismantling of the primary pressure.**

1. Secure the manifold fixture (tool #8) in a vice, tighten moderately.

2. Place the manifold in the fixture and loosen the plug (#16) with help of a 15 mm U-spanner (tool #13).

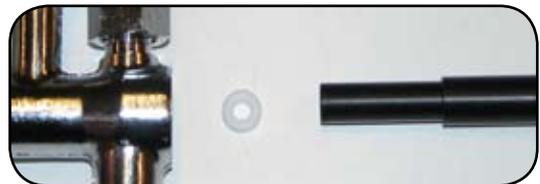


3. Unscrew the plug, remove and discard the O-ring (#15). Pull out the guide bushing (#12), spring (#13) and piston (#14).
4. Pull out the teflon O-ring (#11) located inside the manifold. Use one of the mounting screws (#22) as a tool, screw it in a few turns into the teflon O-ring and pull out. Discard the teflon O-ring.



► **Assembly of the primary pressure.**

1. Push a new teflon O-ring (#11), sparingly lubricated (tool #25), into place from the primary pressure side, use sleeve for support washer (tool #24).



2. Assemble guide bushing (#12), spring (#13) and piston (#14) and place them in to the primary pressure side with the guide bushing (#12) first.



3. Apply a thin layer of lubricant (tool #25) on a new O-ring (#15) and fit it on the plug (#16).



4. Center the guide-spring-piston assembly parts, screw on and tighten the plug (#16) using socket 15 (tool #23) fitted in a torque wrench (tool #26). Tighten with a torque of 20 Nm. Remove the punch tool (tool #2) and the socket tool (tool #24).

► **Assembly of the secondary pressure.**

1. Apply a thin layer of lubrication on O-ring (#26) and push it on to the end of the valve stem (#9) together with the valve disk (#10). Make sure that the valve disk (#10) is well pushed on to the valve stem (#9) (not as shown in figure below).



2. Lubricate sparingly a new O-ring (#8) and fit it onto the valve stem (#9).
3. Place the assembled valve stem (#9) into the manifold with the valve disk (#10) end first.
4. Lubricate sparingly a new O-ring (#7) and fit it onto the nipple (#6).
5. Use the adjustment tool (tool 28) to screw in the adjustment nipple (#6) into the manifold housing until the outer part of the nipple is even with the housing. Turn the adjustment nipple a extra one quarter turn (90 degrees) inwards. This is a basic adjustment of the warning pressure that needs to be checked with the Interspiro test equipment. See test equipment instruction.

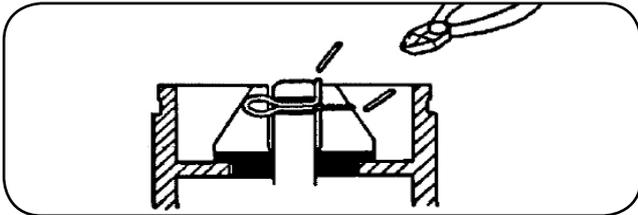


6. After that the warning pressure has been tested and adjusted the torsion spring (#5) shall be fitted over the valve stem end with the angled spring end towards the housing.



7. Push the protruding spring end in to the little hole in the manifold housing.
8. Mount the handle (#4) placing the angled spring end into the inside of the handle. The handle should now be opposite the protective section on the cover (#18). Turn the handle (#4) towards the protective section of the cover (#18) making sure that the torsion spring end is still in the groove of the handle.
9. If correctly assembled the handle should spring back approx. 1/4 turn when turned against the protective section, stopping against the protruding knob on the housing.
10. Screw the nut (#3) on to the valve stem by hand until stop. Turn the handle to mid position between the knob and the protective section. Tighten the nut (#3) until the handle remains in this position.

11. Unscrew the nut (#3) just enough to allow the handle to flip back against the knob.
12. If the locking pin hole in the valve stem can be seen through the slit in the nut (#3), unscrew the nut one slit more.
13. If the hole is not visible unscrew the nut until the hole is visible and one slit more.
14. Secure the nut (#3) by inserting a new locking pin (#2) into the hole and bend and cut the ends according to illustration below.



15. Fit cover (#1) to the handle (#4).

► **Assemble the antifreezing cups and cover**

1. Mount the antifreeze cover (#22) onto the regulator housing. Carefully pull the antifreeze cover up against the flange on the regulator housing. Pull slightly on the cover edge to allow the cover to fill with air.



2. Place the antifreeze cover (#23) over the antifreeze cup (#22) and secure it with the clamp (#24). Use a slotted screwdriver (tool #5) to tighten the clamp. Make sure that the plastic halves do not pinch the antifreezing cap (#22) or crush the antifreezing cap at any point. The clip must be tightened moderately. Check this by manually turning the antifreezing cover (#23). The antifreezing cap (#22) must not rotate with the antifreezing cover (#23).



► **Checking and setting the regulator**

1. Install the regulator in the Test unit for Divator. For a general description of and operating instructions for the test unit, see User manual Spiromatic-Test unit for Divator.

Perform the test according to the test instructions for the test equipment.

CYLINDER VALVE

- The cylinder valve will normally be maintained together with the regulatory inspection and pressure test of the cylinders.

>>> **WARNING**

Always empty the air supply before starting to work on the cylinder valve.

Use discharge plug (tool #21)

► **Dismantling of valve stem and slug.**

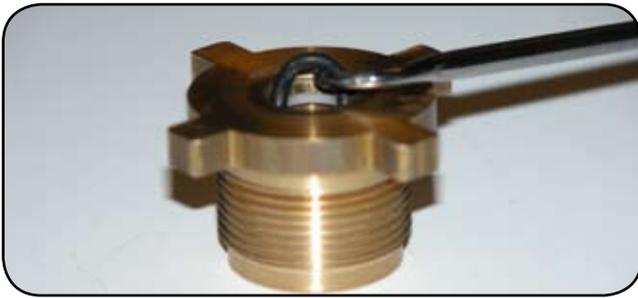
1. Close the cylinder valve. Hold the handwheel, loosen and unscrew the screw (#1) use a screw driver Philips (tool #4) and take out washer (# 2).

Turn the handwheel until it comes off the nipple (#10) and lift off the handwheel (#3), washer (# 5) and spring (#4).
2. Close the cylinder valve by using the top of the handwheel.



3. Use the socket for cylinder valve (tool #9) to unscrew the nipple (#6). Press out the valve stem

(#10), pull out and discard the backup ring (#7) and the O-ring (#8).



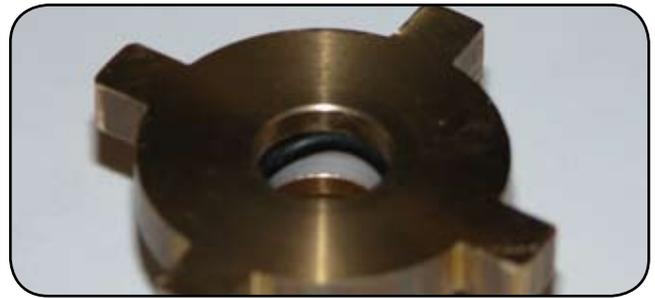
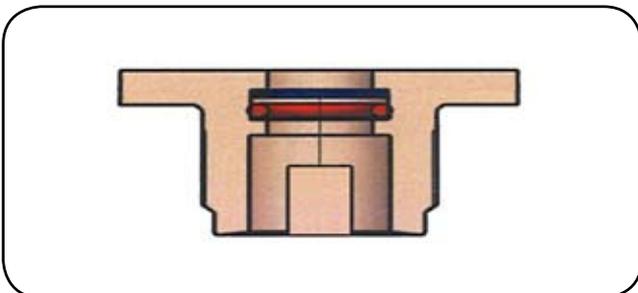
4. Use the handwheel (#3) together with the valve stem (#10) to unscrew the valve slug (#11), discard the valve slug.



5. Clean the inside of the valve housing and remove locking compound residues from the screw (#1) for the hand wheel (#3) and from the threads of the gland nut (#6).

►Assembly

1. Lubricate the threads of the new valve slug (#11) (not the plastic seat), valve stem (#10), back-up ring (#7) and O-ring (#8) with lubricant for cylinder valve (tool #22).
2. Mount the back-up ring (#7) and O-ring (#8) in the gland nut (#6). Make sure that the back-up ring is mounted above the O-ring in the gland nut groove.



3. Use the valve stem (#10) to install the valve slug (#11), tightening the valve slug to the stop. Place valve stem (#10) with glide washer (#9) on the valve slug.



4. Apply a drop of locking compound (tool #27) on the gland nut (#6) threads and install the gland nut in the cylinder valve.



5. Use the socket for cylinder valve (tool #9) and the torque wrench (tool #26) to tighten the gland

nut (#6) to a torque of 50 Nm. Place the washer (#5) and the spring washer (#4) on the valve stem (#10).



6. Place the handwheel (#3) on the valve stem, press it down and slowly turn the wheel until it is locked in the pressed-down position by gland nut (#6). Fit washer (#2). Apply, with the top of a screwdriver, a drop of locking compound (tool #27) to the thread of screw (#1) and tighten the screw .
7. Close the cylinder valve.
8. Fill the cylinder with air and check for leaks.

>>>WARNING

When filling cylinders or cylinder packs that contains air with less pressure then 30 bar (435 psi) arrangement shall be made in order to limit the filling rate so that it does not exceed 30 bar/435 psi per minute. It is recommended to use the Interspiro Filling Adapter. See Product Bulletin - 99370A01

9. Fit the blanking plug by hand.

6.5.4 TESTING IN A TEST UNIT

■ The regulator and full face mask/valve must be tested with Spiromatic-Test unit for Divator at annual or six-year inspection and after repair at an approved maintenance workshop. For a general description of and operating instructions for the test unit see the User manual for Spiromatic test 99056.

LOGGING OF TEST RESULTS AND COMMENTS

■ Test results must be logged with test reports according to the manual 99056 or in an equivalent or better system.

INFLATOR ASSEMBLY

- Tools
- Side Cutter

- Awl (tool #1)
- 1/4" mm hex key (tool #37)
- Philips screwdriver #2 (tool #4)
- Screwdriver socket 5/16" (tool #6)
- 3/16" hex key long (tool #38)

►Dismantling

1. Open up the velcro band holding the Divator inflator assembly.
2. Unscrew the inflator connection to the outer bladder (#9a). Do not drop the seal ring (#1).



3. Cut the tie wrap band (#18), securing the inflator hose to the inflator (#13).



4. Pull of the filling hose from the inflator house and push out the locking pin(#4) to release the wire to the exhaust valve seat (#2). Use an awl (tool #1).



5. Unscrew the valve insert assembly (#12) use a 1/4" mm hex key (tool #37).



6. Pull out valve insert (#12) and spring (#11).
7. Unscrew screw (#2) from the inflate shaft (#10). Remove the inflate button (#3) and the inflate shaft (#10). Use a Phillips screwdriver (tool #4) and a screwdriver socket 8 mm (tool #6) to hold the inflate shaft (#10).



8. Unscrew the dump valve (#6) and discard the O-ring (#5). Use a 3/16" hex key long (tool #38).



9. Remove the spring (#14) and the dump button (#16). Discard the O-ring (#15) on the dump button.
10. Check the mouth piece (#17), replace if necessary.

►Assembling the dump button

1. Apply a thin layer of lubrication on the new O-ring (#15) and place it on the dump button (#15).



2. Apply a thin layer of lubrication on the new O-ring (#5) and place it on the bump valve (#6).



3. Place the spring (#14) with the wide side first down in the valve housing (#13).



4. Place the dump button on top of the spring (#13), press down and hold the button.



- Place the dump valve (#6) (with O-ring) on the 3/16" hex key (tool # 38), push it in to the valve housing (#13) and screw it in the dumb button (#16)



- Apply a thin layer of lubricant on the O-ring (#9) on the new inflate shaft (#10).
- Place the new inflate shaft (#10) (with O-ring #9) on the screwdriver socket (tool #6). Push the inflate shaft (#10) through the valve housing (#13) so that the end of the inflate shaft is visible.



- Place inflate button (#3) on top of the inflate shaft (#10) and put in the screw (#2). Tighten the screw moderately with a Philips screw driver (tool #4).
- Turn the valve with the inflate button (#3) down. Drop a new spring (#11) down on the inflate shaft (#10)



- Put the valve insert assembly (#12) in the valve housing (#13). Tighten the valve assembly using a 1/4" hex key (tool #37)



- Mount a new label sticker (#1) on the dump button (#3).



- Unscrew the cap of the exhaust valve (#5).



- Take out the one-way-valve (#4). Remove and discard the O-ring (#3) from the valve seat (#2).
- Apply a thin layer of lubricant (tool #32) on the O-ring (#3) and mount it on the valve seat (#2). Push back the valve seat (#2) into the exhaust valve housing. Make sure that the wire is feed through the filling hose.



- Inspect the one-way valve, it shall be free from damages. The valve membrane shall be smooth and lay flat on the seat. Replace it if necessary.

Put the valve on top of the valve seat (#2).



16. Attach the cap (#5) to secure the dump valve.



17. Check that the exhaust valve gasket (#1) is clean and soft. Check also that the bladder connection is clean.

18. Place the exhaust gasket (#1) in to the seat.



19. Attach the exhaust valve assembly to the bladder connection.



20. Push the pin (#4) half way through the hose connection on the inflator house. Pull out and hook on the wire to the exhaust valve and push the pin all the way through.



21. Push on the filling hose onto the hose connection. Attach a new tie wrap band (#18) around the hose at the hose connection. Tighten well and cut off the band at the locking.



22. Fasten the inflator hose to the shoulder straps with the velcro band.



23. Connect the air supply from the regulator. Pressurize the regulator and fill the BCW.

24. Check that there is no leakage in the exhaust valve.

25. Pull the exhaust hose to empty the BCW. Check that the exhaust valve opens and releases the air from the BCW.

7 REPAIR

7.1 GENERAL INSTRUCTIONS

- Daily maintenance and care of the SCUBA that shall be done by the users is described in the User's Manual.
- Preventive maintenance performed regularly on a 1 year or six year base can only be done by trained and certified technicians.
- Repair work shall only be performed at certified workshops with trained and certified personnel.
- The repair instructions below are limited to exchange of components that can be dismantled and assembled outside a certified workshop.
- Every time the apparatus is dismantled and assembled it must undergo a function test in accordance with the instruction for the test unit.

TOOLS

- A test unit and tool kit for the Divator apparatus shall be available for maintenance work and function checking at an approved maintenance workshop.

To make maintenance easier, Divator is largely assembled with threaded joints, allowing the replacement of individual parts, instead of major components. In certain cases, threaded components must be tightened to a given torque, partly to achieve the desired strength and partly to avoid overloading the threads. The instruction state when a torque wrench must be used and specify the correct torque for each part.

Tools, fixtures, lubricants etc needed for servicing are described under each part of this manual.

LUBRICANTS, LOCKING COMPOUND AND DEGREASANTS

- The instructions below specify lubricants and locking compound with part numbers; see under the title Tools.

The numbers will remain unchanged even if a different quality or type is introduced.

Locking compound must not come into contact with plastics or rubber parts. In other respects, follow the instructions for use and the safety regulations given by the manufacturer on the pack.

It is very important that surfaces which are to be treated with locking compound are completely free from grease and that every trace of old locking compound has been removed. Remove locking compound with a grease-free steel wire brush. Avoid touching the threads. Greasy and dirty parts must be degreased before locking compound is applied. It is advisable to use alcohol-based oil-free degreasants. After degreasing the parts, wipe them with a clean lint-free cloth.

Do not use degreasants on plastics or rubber parts.

UNITS

- In this publication the SI unit Pascal (Pa) is used for pressure.

$$1 \text{ MPa} = 1\,000\,000 \text{ Pa} = 10 \text{ bar}$$

- The approximate conversions below may be used for rough calculations:

$$1 \text{ MPa} = 10,2 \text{ kp/cm}^2 = 10 \text{ bar} = 145 \text{ psi}$$

$$1 \text{ Pa} \sim 0.1 \text{ mm water column.}$$

- In the following all pressures will be given in bar together with the corresponding psi value within parentheses

$$10 \text{ bar (145 psi)}$$

TIGHTENING TORQUE

- In these instructions, torque is stated in Nm (Newton-metres).

7.2 FULL FACE MASK

7.2.1 REPLACING THE VISOR AND FRAME

- See the spare parts list for references.

- Tools

- Philips cross head screwdriver (tool #4)

►Dismantling

1. Remove the visor (#16) by unscrewing the two screws (#14) on each side of the frame (#13). Use a Philips cross head screwdriver (tool #4).



2. Wipe off any sand or dirt (external as well) from the rubber bead of the mask frame.

►Assembly

1. Clean the rubber flange of the mask where the visor sits.
2. Position the bottom edge of the visor into the flange so that the center mark at the edge lines up with the corresponding mark on the face mask.



3. Line up the top edge of the visor in the same way. Hold the visor in its position. Fold over the rest of the rubber flange, make sure that the rubber flange is evenly distributed around the edge of the visor.
4. Fit the mask frame halves (#13) by hand and press them together by hand. Use a small amount of soapy water or hand detergent solution on the inside of the frame halves to make them fit easily.

5. Fit the two stainless screws (#14) and tighten them alternately. The frame halves (#13) has a stud that protect the visor from being crushed by the frame halves.

►Test

Connect the breathing apparatus. Don the mask with the breathing valve (or put the mask with the breathing valve on the head of the test unit). Brush plenty of soap water around the frame on the outside of the visor. If bubbles appear, the visor is not correctly fitted and the above procedure must be repeated.

7.2.2 REPLACING THE BUCKLE

- Tools

- Slotted screwdriver (tool #5)

- See the spare parts list for references.

►Dismantling

1. With the screw driver (tool #5), bend open the hooks that fix the buckle to the mask and pull out buckle.

►Assembly

1. Use a small amount of soapy water as lubricant to reduce the friction when the hooks on the new buckle are threaded into the mask fittings.

7.2.3 REPLACING THE INNER MASK

- Tools

- Slotted screwdriver (tool #5)

- For reference numbers to described items see the Spare parts list for corresponding numbers.

►Dismantling

1. Unscrew the two screws (#5) that are securing the pressure equalizer (#18).



2. Unscrew the single screw (#4) securing the re-training plate (#6). Use a slotted screw driver (tool #5).



3. Pull out the inner mask (#1) together with the retaining plate (#6).



4. Pull out the flange of the inner mask (#1) from the groove of the retaining plate (#6).



►Assembly

1. Guide the flange of the new inner mask (#1) into the groove in the retaining plate (#6).

Note! The flat side of the retaining plate (#6) must be facing inwards, with the screw hole downwards. Begin by lining up the centre mark at the top of the inner mask with the corresponding mark on the retaining plate.



2. Position the inner mask (#1) with the retaining plate (#6) in the full face mask. Fit the screw (#4) at the bottom and tighten easy. Fit the pressure equalizer (#18) with it's two screws (#5). Tighten all three screws moderately.

7.2.4 REPLACING THE PRESSURE EQUALIZING PAD

■ Tools

- No tools required

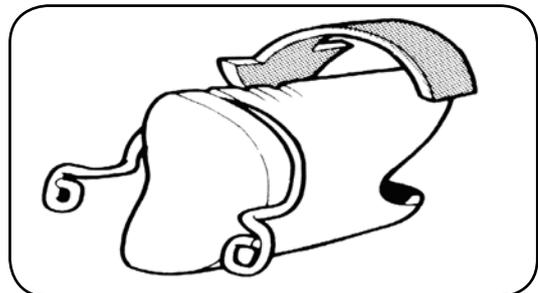
■ See the spare parts list for references.

►Dismantling

1. Before removing the equalizing pad (#19) note (if possible) the mounting height.
2. Remove the pressure equalizing pad (#19) from the bar by pressing the pad together and twist it loose by pulling away from the wire bar.

►Assembly

1. Install the new pressure equalizing pad (#19) on the same mounting height as the old one. Push and twist it into the wire bar.



2. Check the height by doning the mask and try it out. The pressure equalizing pad shall be positioned so that no obstructed breathing through the nose is possible, and at the same time the underside of the mask can be pushed upwards to allow pressure equalizing of the ears.

7.2.5 REPLACING THE VALVE SEAT AND THE VALVE DISC

■ Tools

- No tools required

■ See the spare parts list for references.

►Dismantling

1. Release the valve seat (#3) from the inner mask (#1) by stretching the mask at the side of the valve seat.



2. Pull the valve disc (#2) off the valve seat (#3).

►Assembly

1. Fit the new valve seat (#3) to the inner mask in the corresponding way as it was dismantled.
2. Fit the new valve disk (#2) to the the valve seat by pulling the valve disk over the center pin (see illustration above).

7.3 BREATHING VALVES

■ The Divator breathing valves are of two types - with and without safety pressure. When performing repair work on the breathing valves make sure not to mix parts from the different types of breathing valves. Breathing valves with safety pressure can be recognized by the lever that is used for turning on/off the safety pressure.

A third version of the breathing valve is the Octopus breathing valve which has no safety pressure valve but is fitted with "safety pressure" lever. This lever is only for turning on and off the breathing valve. The Octopus breathing valve can also be recognized by it's yellow shield ring (#21) on the diaphragm attachment.

Normal pressure breathing valve (without safety pressure) has a green O-ring (#6) visible at the breathing hose connection.

7.3.1 BREATHING VALVE

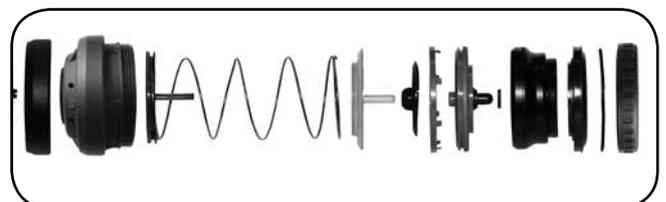
■ See the spare parts list for references.



Dismantle the breathing valve into its three main parts, the diaphragm assembly (#1), the valve housing (#2) and the valve insert (#8), as follows:

1. Unscrew the locking ring (#20) and remove the diaphragm attachment (#1). Then unscrew the nut (#11). Take out the valve insert (#8) by carefully pulling the connection nipple (#4).

Tip: If the valve insert (#8) is stuck, connect the breathing hose to make dismantling easier.



► **Dismantling the positive pressure assembly**

1. Carefully take the diaphragm assembly (#35) out of the cover (#22) by squeezing the thread of the cover and at the same time grasping the outer flange of the diaphragm assembly so that it comes free and can be caught in a hand.
2. Lift spring (#24) and guide disc (#23) (assembled together) out of the cover (#22).



3. Discard the diaphragm assembly (#35)
4. Clean the remaining parts in water with a mild hand detergent. After rinsing, soak the parts in a 0.1 % solution of chlorhexidine in water for one hour. Rinse them thoroughly in fresh water and allow them to dry.

► **Assembling positive pressure assembly**

1. Place the guide disk (#23) and the positive pressure spring (#24) in the cover (#22).



2. Place the new diaphragm assembly (#35) on top of the positive pressure spring (#24) (the sealing disc has a guide groove for spring). Push the diaphragm assembly down into the positive pressure cover without twisting it as the spring tension could be altered.



3. Check that the unit is working correctly by pressing down lightly the guide pin a few times. The diaphragm assembly should move freely.

7.3.2 VALVE HOUSING

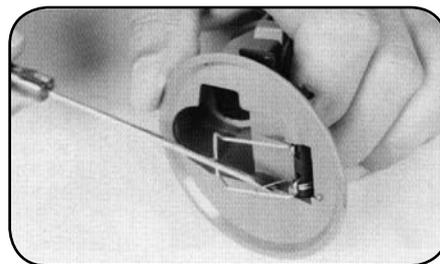
- See the spare parts list for references.

► **Dismantling the valve housing**

1. Remove non-return valve (#9) by pressing with a finger from the inside of the valve housing. Remove the O-ring (#10) from the valve housing.



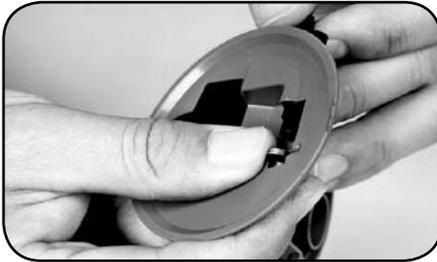
2. Disassemble the lever assembly (#14) by lifting off the hook of the lever spring (#14b).



3. Push the black lever (#14a) against the valve housing and press the locking spring (#14d) together and remove it from the valve housing .



4. Pull out the lever (#14a) holding a finger over the lever spring (#14b). Remove the distance ring (#14c), O-ring (#15) and lever spring (#14b).



5. Clean the parts in water with a mild hand detergent. After rinsing, soak the parts in a 0.1 % solution of chlorhexidine in water for one hour. Then rinse them thoroughly.

► **Assembling the valve housing**

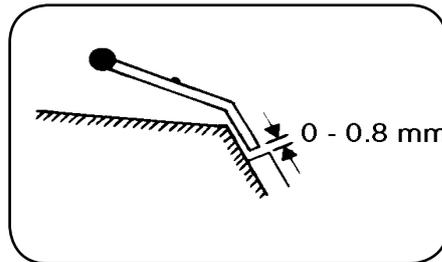
1. Install a new non-return valve (#9) by carefully pressing it down into the valve housing.
2. Fit new O-ring (#10) to the valve housing.
3. Apply a thin layer of lubricant (tool #25) on the new O-ring (#15) on the lever (#14a) and push the lever into the valve housing half way.
4. Place the distance ring (#14c) and the lever spring (#14b) with the loop outwards on the lever (#14a).
5. Push in the lever (#14a) and push the distance ring (#14c) against the valve housing on the lever side and the lever spring (#14b) against the other side. Mount the locking spring (#14d) into the oblong holes on the lever and between the lever spring and distance ring.
6. Lift the hook of the lever spring (#14b) on to the locking spring (#14d). Check that the straight end of the lever spring is on the outside of the little knob in the valve housing.



10. Check that the front part of locking spring (#14d) is 1 - 3.5 mm above the plane of the valve housing. The tip of the locking spring should point downwards.



11. Turn the lever (#14a) out from the valve housing and check that the locking spring lies flat against the valve housing and the tip is 0 - 0.8 mm from the ridges in the valve housing



7.3.3 VALVE INSERT ASSEMBLY

- See the spare parts list for references.

► **Dismantling the valve insert**

1. Remove the retaining ring (#7) and pull out the valve insert in not previously done.
2. The valve insert assembly consists of the following main components: valve insert (#3), retaining ring (#7), connection nipple (#4) and O-rings (#5 and 6).



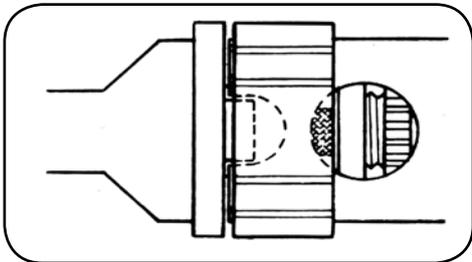
3. Remove and discard the O-rings (#5 and 6).
4. Discard the valve insert (#16).
5. Clean the connection nipple (#4) thoroughly in water with a mild hand detergent. After rinsing, the connection nipple must be disinfected by soaking the parts in a 0.1 % solution of chlorhexidine in water for one hour. Then rinse it thoroughly.
6. Check whether there are any deposits remaining around the seat in the connection nipple (#4). If there are, discard the connection nipple and use a new one.

>>> **NOTE**

If moisture has got into the inhalation side of the valve insert, the entire valve insert must be thoroughly dried, otherwise freezing may occur in the valve insert.

► **Installing the valve insert**

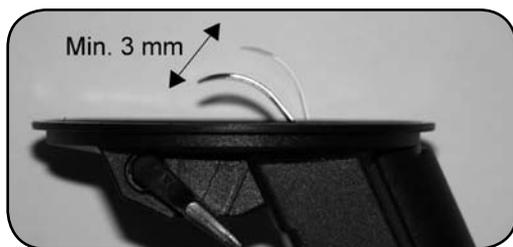
1. Lubricate new O-rings (#5 and #6) very thinly with (tool #25) and fit them to the connection nipple (#4).
2. Install a new valve insert (#16) in the connection nipple (#4).
3. Press the units together and fit the retaining ring (#7). Press down the retaining ring and make sure that its latching lug goes down and engages between the flange on the valve insert (#3) and the edge of the side hole in the connecting nipple (#4).



4. Make sure that the lever (#14) is in open position, away from the housing.
5. Install the valve insert into the valve housing. Check that the “key shape” of the valve insert engages in the valve housing.

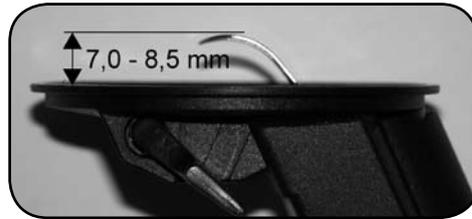


6. Check that the lever has a clearance as shown in illustration below. Make sure that the valve insert (#8) is pushed in as far as possible into the valve housing (#2).



7. If the lever clearance needs adjusting, remove the valve insert, pull the lever outside the lever support groove and then turn the lever support. Unscrewing the lever support reduces the clearance and vice versa.

8. After adjustment, check that the lever pin has returned to the deep groove in the lever support.
9. Reinstall the valve insert into the valve housing. Check that the “key shape” of the valve insert engages in the valve housing. Make sure that the lever (#14) is in open position, away from the housing.
10. Check that the height of the lever fork above the valve housing is 7.0-8.5 mm.



11. If necessary adjust the position of the lever, the valve insert (#8) must be removed from the valve housing, after which the lever support is adjusted as described above.
12. Screw on the retaining nut (#11) by hand.

► **Assembling the breathing valve**

- See the spare parts list for references.

Assemble the breathing valve and its three main parts, the diaphragm assembly (#1), the valve housing (#2) and the valve insert assembly (#8), as follows:

1. Install the valve insert (#8) by carefully pressing on the connection nipple (#4). Check that the keying of the valve insert fits into that of the valve housing and screw on the nut (#11).
2. Fit the locking ring (#20) over the valve housing and attach the diaphragm attachment (#1).

► **Install non-return valve**

1. Install a new non-return valve (#9) by carefully pressing the non-return valve down into the valve housing.



2. Connect the medium pressure hose (#6) to the connection nipple (#4) (With the regulator connected to the cylinder pack).

3. Open the cylinder valve and pressurize the valve.
4. Fill the free space in the non-return valve disc with water.
5. Check that no water leaks into the breathing valve. The level in the valve housing must not drop. If leakage is found, clean or replace the check valve.
6. Blow the valve dry by pressing the draining button. Check that the check valve disc lies flat after the valve has blown dry.



>> NOTE

When rinsing a removed breathing valve, keep a thumb over the edge of the non-return valve, otherwise the non-return valve may come loose. If this happens, the breathing valve must be blown dry before the non-return valve is fitted. Lay out the parts of the apparatus to dry before the next dive or before putting them into storage.

7. Close the cylinder valve and vent the system.
8. Let the valve housing dry thoroughly in the air.

7.4 REGULATOR

■ Faulty regulators shall be replaced with a factory repaired regulator at certified workshop.

■ Regulator housing

- See the spare parts list for references.
- For maintenance, the regulator housing must be removed from the air cylinder pack.

■ Tools

Slotted screwdriver (tool #5)

► Remove the anti freezing cap and cover

1. Remove the clamp (#24) holding the antifreeze cover (#23), use slotted screwdriver (tool #5).



2. Open the cover assembly (#23). It is hinged at the top. Remove the cover assembly from the regulator housing.
3. Remove (pull away) the antifreezing cap (#22) from the groove on the regulator housing.



4. Check that no water has leaked into the antifreezing cap. If water has leaked in, the regulator must be blown dry. Blow compressed air from a nozzle into one of the two holes in the bottom of the regulator. Blow the regulator housing dry.

DISMANTLING OF PRESSURE REGULATOR

► Dismantling the 4-port swivel

■ Tools

Awl 336 900 065	(tool #1)
Assembly tool	(tool #2)
Piston extractor	(tool #10)
13 mm U-spanner	(tool #12)
Regulator fixture	(tool #19)
T30 torx socket	(tool #20)
29 mm spanner	(tool #22)
Torque wrench adapter 29 mm	(tool #23)
Silicone lubricant	(tool #25)
Torque wrench	(tool #26)
Locking compound	(tool #27)

1. Remove the antifreezing cap (#22) and place the regulator in the regulator fixture (tool #19) and secure the fixture in a vice.
2. Unscrew the medium pressure hose(s) from the 4-port swivel (#31) using a 13 mm U-spanner (tool #12).
3. Unscrew the screw (#34) on top of the swivel head (#31) using a T30 torx socket (tool #20).



4. Remove the swivel head (#31), remove and discard the two O-rings (#30).
5. Use a wrench and a 29 mm torque wrench adapter (tool #23) to unscrew the regulator head with the swivel axis.



6. Remove and discard the O-ring (#4) from the swivel axis (#29).



7. Screw the piston extractor (tool #10) on top of the piston (#7) and pull out the piston by screwing out the big hand-wheel of the extractor.



8. Lift out the two springs (#9 and 10) and remove and discard the O-ring (#8) on the piston (#7).
9. Take the regulator out of the fixture and turn the other side up.
10. Remove the sealing plate (#20) with help of an awl (tool #1). Discard the sealing plate.



11. Unscrew the adjustment screw (#19) and remove the valve seat (#17) with its O-ring (#18). The spring (#16) should come out at the same time.



12. Push, with help of the assembly tool (#tool 2), from the piston side out the two support rings (#14) and the O-ring (#15).



13. Discard the valve seat with O-ring (#17 and 18), spring (#16), O-ring (#15) and the back up rings (#14). Clean the regulator, make sure to remove all rests of locking compound from the threads of the adjusting screw (#19) as well as on the corresponding threads in the regulator housing.

ASSEMBLY OF PRESSURE REGULATOR

1. Lubricate a new piston O-ring (#8) sparingly with lubricant (tool #25) and mount it onto the piston.



2. Apply a thin layer of lubricant (tool #25) inside the regulator housing where the large diameter of the piston (#7) is located and on the part of the piston shaft.
3. Apply a thin layer of lubricant (tool #25) onto the end coils of the springs (#9 and 10).
4. Fit the springs (#9 and 10) onto the piston shaft (#7).



5. Slide the narrow end of the punch tool (tool #2) into the piston shaft.



6. Push in the piston into the regulator housing as far as it will go.



7. Disassemble the regulator cover/axis (#29). Remove the stop ring (#6) and the difusor (#28).



8. Clean the the inside of the cover/axis (#29), the difusor (#28) and the stop ring (#6). Mount the items back into the cover/axis.
9. Apply a this layer of lubricant (tool #25) on a new O-ring (#4) and fit it onto the regulator cover/axis (#29).
10. Attach the regulator cover/axis to the regulator housing. Tighten with 20 Nm using a 29 mm torque wrench adapter (tool #23) on a torque wrench (tool #26).



11. Fit a new O-ring (#30) on the lower end of the axis of the regulator cover (#29).



12. Apply a thin layer of lubricant (tool #25) on the bottom side of the 4-port swivel housing (#31).



13. Slide the 4-port swivel housing over the axis on the regulator cover (#29). Fit the second, lubricated (tool # 25), O-ring (#30) around the top of the axis.



14. Apply a drop of locking compound (tool #27) on the screw (#34). Fit the washer (#33) and the screw (#34) at the top of the axis. Tighten the screw with 10 Nm, using a torx T30 socket (tool #20) and a torque wrench (tool #26).

15. Place the punch tool (tool #2), with its narrow end first, into the piston shaft in the primary pressure side of the regulator. Slide one of the two support rings (# 14) onto the punch tool (tool #2) and press it down into its seat using the assembly tool (tool #24).



16. Apply a fine layer of lubricant (tool #25) on the O-ring (#15), slide it onto the punch tool (tool #23) together with the other support ring (#14) - the O-ring first. Press the O-ring and support ring down over the piston shaft using the assembly tool (tool #24).



17. Apply a thin layer of lubrication (tool #25) on the O-ring (#18) on the new regulator seat (#17).

18. Place a the new spring (#16) over the piston shaft.

19. Place the new regulator seat (#17) over the the spring (#16) with the recessed end of the regulator seat facing the the piston shaft.



20. Attach the adjusting screw (#19) and screw it down until the back of the adjusting screw levels with the start of the threads of the housing.

21. This is a basic adjustment of the secondary pressure that needs to be checked with the test equipment and finally adjusted. See the test instruction for the test equipment.

22. After the final adjustment of the secondary pressure, lock the adjustment screw (#19) with a small drop locking compound (tool #27).

>> **NOTE**

Be carefull not to get locking compound into the hole of the adjusting screw. Use the tip of a screwdriver to apply the locking compound.

21. Mount the sealing plate (#20)



WARNING DEVICE

■ Tools

Screwdriver, slotted	(tool #5)
Adjustment tool	(tool #28)
Fixture for manifold	(tool #8)
U-spanner 14/15	(tool #13)
Socket 15	(tool #23)
Sleeve for support washer	(tool #24)
Silicone lubricant	(tool #25)
Torque wrench	(tool #26)
Fixture for manifold	(tool #29)
Long nosed pliers	(tool #31)
Lubricant	(tool #32)

◆ The secondary pressure side must be dismantled before dismantling the primary pressure side.

1. Remove the covers (#18) and the retraining clip (#25) by loosening the two screws (#22). Use a slot screw driver (tool #5).
2. Place the handle (#4) in normal position and remove the cap (#1). The cap can be pushed off with help of a slot screwdriver fitted in the small slot in the cap.



3. Remove and discard the locking pin (#2) using a long nosed pliers (tool #31) and unscrew the nut (#3) by hand.



4. Remove and discard the handle (#4) and the torsion spring (#5). Unscrew the adjustment nipple (#6) using the adjustment tool (tool #28).



5. Lift out the valve stem (#9) with O-ring (#26) and valve disk (#10).
6. Pull off and discard the valve disk (#10) and the O-rings (#26 and 8).

► **Dismantling of the primary pressure side.**

1. Secure the manifold fixture (tool #8) in a vice, tighten moderately.
2. Place the manifold in the fixture and loosen the plug (#16) with help of a 15 mm U-spanner (tool #13).



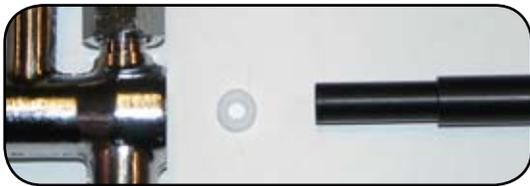
3. Unscrew the plug, remove and discard the O-ring (#15). Pull out the guide bushing (#12), spring (#13) and piston (#14).
4. Pull out the teflon O-ring (#11) located inside the

manifold. Use one of the mounting screws (#22) as a tool, screw it a few turns in to the teflon O-ring and pull out. Discard the teflon O-ring.



► **Assembly of the primary pressure.**

1. Push a new teflon O-ring (#11), sparingly lubricated (tool #32), into place from the primary pressure side, use the sleeve for support washer (tool #24).



2. Assemble guide bushing (#12), spring (#13) and piston (#14) and place them in to the primary pressure side with the guide bushing (#12) first.



3. Apply a thin layer of lubricant (tool #25) on a new O-ring (#15) and fit it on the plug (#16).

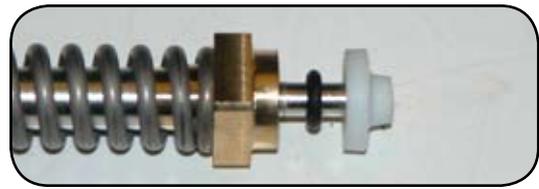


4. Center the guide-spring-piston assembly parts, screw on and tighten the plug (#16) using socket 15 (tool #23) fitted in a torque wrench (tool #26) with a torque of 20 Nm.

► **Assembly of the secondary pressure.**

1. Apply a thin layer of lubrication on O-ring (#26) and push it on to the end of the valve stem (#9) together with the valve disk (#10). Make sure that the valve disk (#10) is well pushed on to the valve

stem (#9) (not as shown in figure below).



2. Lubricate sparingly a new O-ring (#8) and fit it onto the valve stem (#9).
3. Place the assembled valve stem (#9) into the manifold with the valve disk (#10) end first.
4. Lubricate sparingly a new O-ring (# 7) and fit it onto the nipple (#6).
5. Use the adjustment tool (tool #28) to screw in the adjustment nipple (#6) into the manifold housing until the outer part of the nipple is even with the housing. Turn the adjustment nipple a extra one quarter turn (90 degrees) inwards. This is a basic adjustment of the warning pressure that needs to be checked with the Interspiro test equipment. See test equipment instruction.



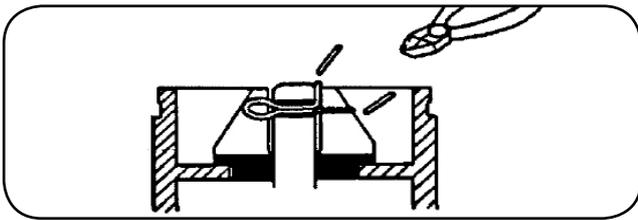
6. After that the warning pressure has been tested and adjusted the torsion spring (#5) shall be fitted over the valve stem end with the angled spring end towards the housing.



7. Push the protruding spring end in to the little hole in the manifold housing.
8. Mount the handle (#4) placing the angled spring end into the inside of the handle. The handle should now be opposite the protective section on the cover (#18). Turn the handle (#4) towards the protective section of the cover (#18) making sure

that the torsion spring end is still in the groove of the handle.

9. If correctly assembled the handle should spring back approx. 1/4 turn when turned against the protective section, stopping against the protruding knob on the housing.
10. Screw the nut (#3) on to the valve stem by hand until stop. Turn the handle to mid position between the knob and the protective section. Tighten the nut (#3) until the handle remains in this position.
11. Unscrew the nut (#3) just enough to allow the handle to flip back against the knob.
12. If the locking pin hole in the valve stem can be seen through the slit in the nut (#3), unscrew the nut one slit more.
13. If the hole is not visible unscrew the nut until the hole is visible and one slit more.
14. Secure the nut (#3) by inserting a new locking pin (#2) into the hole and bend and cut the ends according to illustration below.



15. Fit cover (#1) to the handle (#4).

7.4.1 EXTRA AIR OUTLET

■ Before working on the regulator unit and the warning device it shall be removed from the cylinder.

► Replacing the non-return valve

■ Tools

- Slot screw driver (tool #5)
- Barrel brush (tool #11)
- U-spanner 15 mm (tool #13)
- Torque wrench (tool #26)
- Locking compound (tool #27)
- Manifold fixture (tool #29)
- Long nosed pliers (tool #31)
- 15 mm socket (tool #43)

► Dismantling the extra air connection

1. Place the manifold in the manifold fixture (tool #29).
2. Remove the quick coupling (#28) using a 15 mm U-spanner (tool #13).



3. Pull out and discard the non return valve (seat, spring and cone with O-ring) (#29). Use a long nosed pliers (tool #31).
4. Take the manifold out of the manifold fixture and clean the threads in the manifold from locking compound use a barrel brush (tool #11).

>> NOTE

Turn the manifold upside down to prevent locking compound remains from falling into the manifold.

5. Clean also the threads of the quick coupling (#28).

► Assemble the extra air connection

1. Drop the valve guide and the spring down into the manifold.



2. Place the cone with O-ring (#27) on top of the spring.



3. Apply a small drop of locking compound (tool #27) on the threads of the quick coupling (#28).



4. Place the quick coupling over the non return valve cone (#27) in the manifold.



5. Tighten the quick coupling with 10 Nm torque using a 15 mm socket (tool #43) and torque wrench (tool #26).
6. Mount the protective cap (#19).
7. Mount the covers (#18).

►Test

1. Connect the regulator to the cylinder pack
2. Pressurize the regulator and warning.
3. Check that there are no leakage at the quick coupling.

7.5 HOSES

- Normally hoses in a diving apparatus should last for many years, but in view of the severe wear and tear that hoses in diving apparatus can be subjected to it's recommended to closely inspect all hoses for damage after approx. every 100 dives or at least once every year.
- Hoses are recommended to be replaced after ten years of use.

►Replacing high pressure hose

■ Tools

- U-spanner 10/13 (tool #12)
- Regulator fixture (tool #19)
- Silicone lubricant (tool #25)
- Torque wrench adapter 13-15 (tool #35)
- Torque wrench assembly (tool #36)

1. Remove the antifreezing cap and place the regulator in the regulator fixture (tool #19). Disconnect the high pressure hose (#14) using a 13 mm U-spanner (tool #12).



2. Remove the covers on the warning device and place it in the fixture (tool #19), disconnect the other side of the high pressure hose.
3. Fit new new O-rings (#16 and 20), lubricated with a thin layer of lubricant (tool #25), on the hose nipples. Install the high-pressure hose (#14) in the regulator housing and warning device. The hose nipples must be tightened to a torque of 15 Nm.



>>>NOTE

A damaged suit hose can allow just as much air to escape as a breathing hose. This means that failure of a suit hose is just as serious as failure of either of the two breathing hoses.

7.6 AIR SUPPLY

7.6.1 AIR CYLINDER PACK

CYLINDER VALVE

- Cylinder valves are normally serviced in conjunction with hydrostatic test of the cylinders.
- Always empty the air supply before starting work.

Tools:

- Philips screwdriver (tool #4)
- Philips screwdriver (tool #5)
- Socket for cylinder valve (tool #9)
- Cylinder valve lubricant (tool #22)
- Locking compound (tool #27)
- Torque wrench assembly (tool #36)

►Dismantling the cylinder valve

1. Close the cylinder valve. Hold the handwheel, loosen the screw (#1) and take out washer (#2), use a Philips screw driver (tool #4). Turn the hand wheel until it comes off the nipple (#10) and lift off the hand wheel (#3), washer (#5) and spring (#4).
2. Close the cylinder valve by using the top of the hand wheel.



3. Using socket cylinder valve (tool #9), unscrew and remove the gland nut (#6).



4. Press out the valve stem (#10), the backup ring (#7) and the O-ring (#8). Discard the back-up ring and O-ring. Using hand wheel (#3) and valve stem (#10), remove the valve slug (#11) and discard it.
5. Remove locking compound residue using a barrel brush (tool #11).

►Assembly

1. Lubricate the threads of the new valve slug (#11) (not the plastic seat), valve stem (#10), back-up ring (#7) and O-ring (#8) with cylinder valve lubricant (tool # 22).
2. Mount the back-up ring (#7) and O-ring (#8) in the gland nut (#6). Make sure that the back-up ring is mounted above the O-ring in the gland nut groove.



3. Using valve stem (#10), install valve slug (#11), tightening it to the stop. Place valve stem (#10) with glide washer (#9) on the valve slug.
4. Install gland nut (#6) in the cylinder valve with a drop of locking compound (tool #27) on the thread.



5. Using socket cylinder valve (tool #9) and the torque wrench assembly (tool #36) tighten nipple (#6) to a torque of 50 Nm. Place the washer (#5) and the spring washer (#4) on the valve stem (#10).



6. Place the hand wheel (#3) on the valve stem, press it down and slowly turn the wheel until it is locked in the pressed-down position by nipple (#6). Fit washer (#2). Apply a drop of locking compound (tool #27) to the thread of screw (#1) and tighten the screw in valve stem (#10).
7. Close the cylinder valve.
8. Fill the cylinder with air and check for leaks.
9. Fit the blanking plug by hand.

REPLACING THE HAND WHEEL

■ Tools

- Screw driver, Phillips head (tool #4)
- Locking compound (tool #27)

1. Unscrew the center screw (#1) on top of the hand wheel (#3). Remove the screw together with the washer (#2).
2. Lift off the damaged hand wheel (#3).
3. Place the new hand wheel (#3) on the valve stem, press it down and slowly turn the wheel until it is locked in the pressed-down position by gland nut (#6). Fit washer (#2).
4. Apply a drop of locking compound (tool #27) to the thread of screw (#1) and tighten the screw in the valve stem (#10).
5. Fill the cylinder with air and check for leaks.

>>>WARNING

When filling cylinders or cylinder packs that contains air with less pressure then 30 bar (435 psi) arrangement shall be made in order to limit the filling rate so that it does not exceed 30 bar/435 psi per minute. It is recommended to use the Interspiro Filling Adapter.

See Product Bulletin - 99370A01

6. Fit the blanking plug (#17) by hand.

7.6.2 HANDLE

■ Tools

- Wrench, hexagon key 5 mm (tool #3)



►Dismantling

1. Remove the handle sections (#16) by unscrewing screws (#2 and 23) with a 5 mm hexagon key (tool #3). Remove the nuts (#17).
2. Replace defective parts.

►Assembly

1. Install the handle halves on the necks of the cylinders. The handle sections have projections on the inside which fit into grooves on the necks of the cylinders.
2. Place the nuts (#17) in the glands. Fit the screws (#2 and 23) with moderate torque. Always begin with the screws at the top of the handle. Then tighten the outermost screws around the cylinder necks.
3. Assemble so that the gap between the handle sections is pulled together completely. Then tighten the inner screws.

7.6.3 TENSION STRAPS

■ To be able to correctly assemble cylinder packs that have been dismantled it is necessary to have an assembly fixture and a gauge. This is in order to ensure, for quality assurance purposes, that every weight fits every pack. The assembly fixture and gauge are not included in the tool kit for Divator. If maintenance is required, contact the manufacturer.

RETIGHTENING THE AIR CYLINDER PACK

>>>WARNING

Air cylinder packs of composite material expand considerably when pressurized which in turn increases the strain on the tension straps. After the four first pressurizations (fillings) the tension straps on the cylinder pack must be retightened. This need to be done to prevent the tension straps to loose so that the air cylinder pack moves and cause skew damages to the cylinders.

■ Tools

- 5 mm hexagonal socket 336 900 224 (tool #17)
- Torque wrench (tool #36)

1. Check that the pressure in the air cylinder pack is not less than 30 bar.
2. Use a 5 mm hexagonal socket (tool #17) and a torque wrench (tool #36). Check that the two screws (#8) holding the cylinder straps (#12) are tightened to 5 Nm.

► Cylinder Connection

■ Tools

- Slotted screwdriver (tool #5)
- 5 mm hexagonal key (tool #3)
- Silicone Lubricant 331 900 269 (tool #25)

► Remove the antifreezing cap and cover

1. Remove the clamp (#24) holding the antifreeze cover (#23), use slotted screwdriver (tool #5).



2. Open the cover assembly (#23). It is hinged at the top. Remove the cover assembly from the regulator housing.

3. Remove (pull away) the antifreezing cap (#22) from the groove on the regulator housing.



4. Check that no water has leaked into the anti-freezing cap. If water has leaked in, the regulator must be blown dry. Blow compressed air from a nozzle into one of the two holes in the bottom of the regulator. Blow the regulator housing dry.
5. Place the regulator house in the regulator fixture secured in a vice, to void damages on the regulator housing.
6. Unscrew nipple (#13) one-quarter turn with a 5 mm hexagonal key (tool #3). Lift the regulator house out of the vice with the connection pointing downwards and unscrew the nipple (#13). Take the filter (#11) out of the connection nipple (#25). Carefully tap the connection nipple against a soft surface so that possible loose particles will fall out, put back the regulator housing in the fixture.



7. Remove and discard the O-ring (#12) at the end of the nipple (#13). Discard the O-ring.

>>NOTE

To avoid risk of accidentally air leakage it is recommended to replace the O-ring (#12) at least once a year, or immediately if damaged.

8. Remove and discard the filter (#11).
9. Lubricate a new O-ring (#12) with a thin layer of lubricant (tool # 25) and position the O-ring in the groove in the nipple (#13). Push the filter down so that it is centred and screw in the nipple by hand. The point of the nipple (#13) must fit into the hole of the filter. Using a hexagon wrench, tighten the nipple to the stop.

7.6.4 INSPECTION OF COMPOSITE CYLINDERS

■ Interspiro composite cylinders are designed for long service life for intended use.

How ever if the cylinders are subjected to abnormal wear such as heavy impacts for example against sharp edges the material can be damaged.

Since these damages can be of different natures it is difficult to give guide lines for evaluation of how sever the damages are.

Composite cylinders that are damaged in any way shall therefor either be returned to the manufacturer for evaluation or undergo inspection and test by a qualified party.

7.7 TESTING IN A TEST UNIT

■ The regulator and full face mask/valve must be tested with Spiromatic-Test unit for Divator at annual or six-year inspection and after repair at an approved maintenance workshop. For a general description of and operating instructions for the test unit see the User manual for Spiromatic test 99056.

LOGGING OF TEST RESULTS AND COMMENTS

■ Test results must be logged with test reports according to the manual 99056 or in an equivalent or better system.

7.8 DIVATOR BCW

■ The main repair work on the Divator BCW covers

- Repair of the inflator assembly
- Replacement of over pressure valves
- Replacement of the inner bladder
- Replacement of sternum strap assembly
- Replacement of cummerband waist panels

7.8.1 INFLATOR ASSEMBLY

■ Tools

- Side Cutter
- Awl (tool #1)
- Philips screwdriver (tool #4)
- Screwdriver socket 5/16" (tool #6)
- 1/4" mm hex key (tool #37)
- 3/16" hex key long (tool #38)

►Dismantling

1. Open up the walcro band holding the Divator Inflator assembly.
2. Unscrew the inflator connection to the outer bladder (#9a). Do not drop the seal ring (#1).



3. Cut the tie wrap band (#18) securing the inflator hose to the inflator (#13).



4. Pull of the filling hose form the inflator house and push out the locking pin (#4) to release the wire to the exhaust valve seat (#2). Use an awl (tool #1).



5. Unscrew the valve insert assembly (#12) use a 1/4" hex key (tool #37).



6. Pull out valve insert (#12) and spring (#11).
7. Unscrew screw (#2) from the inflate shaft (#10). Remove the inflate button (#3) and the inflate shaft (#10). Use a Philips screwdriver (tool #4) and a screwdriver socket 8 mm (tool #6) to hold the inflate shaft (#10).



8. Unscrew the dump valve (#6) and discard the O-ring (#5). Use a 3/16" hex key long (tool #38).



9. Remove the spring (#14) and the dump button (#16). Discharge the O-ring (#15) on the dump button.

10. Check the mouth piece (#17), replace if necessary.

►Assembling the dump button

1. Apply a thin layer of lubrication on the new O-ring (#15) and place it on the dump button (#15).



2. Apply a thin layer of lubrication on the new O-ring (#5) and place it on the bump valve (#6).



3. Place the spring (#14) with the wide side first down in the valve housing (#13).



4. Place the dump button on top of the spring (#13), press down and hold the button.



- Place the dump valve (#6) (with O-ring) on the 3/16" hex key (tool # 38), push it in to the valve housing (#13) and screw it in the dumb button (#16)



- Apply a thin layer of lubricant on the O-ring (#9) on the new inflate shaft (#10).
- Place the new inflate shaft (#10) (with O-ring #9) on the screwdriver socket (tool #6). Push the inflate shaft (#10) through the valve housing (#13) so that the end of the inflate shaft is visible.



- Place inflate button (#3) on top of the inflate shaft (#10) and put in the screw (#2). Tighten the screw moderately with a Philips screw driver (tool #4).
- Turn the valve with the inflate button (#3) down. Drop a new spring (#11) down on the inflate shaft (#10)



- Put the valve insert assembly (#12) in the valve housing (#13). Tighten the valve assembly using a 1/4" hex key (tool #37)



- Mount a new label sticker (#1) on the dump button (#3).



- Unscrew the cap of the exhaust valve (#5).



- Take out the one-way-valve (#4). Remove and discard the O-ring (#3) from the valve seat (#2).

- Apply a thin layer of lubricant (tool #32) on the O-ring (#3) and mount it on the valve seat (#2). Push back the valve seat (#2) into the exhaust valve housing. Make sure that the wire is feed through the filling hose.



15. Inspect the one-way valve, it shall be free from damages. The valve membrane shall be smooth and lay flat on the seat. Replace it if necessary. Put the valve on top of the valve seat (#2).



16. Attach the cap (#5) to secure the dump valve.



17. Check that the exhaust valve gasket (#1) is clean and soft. Check also that the bladder connection is clean.

18. Place the exhaust gasket (#1) in to the seat.



19. Attach the exhaust valve assembly to the bladder connection.



20. Push the pin (#4) half way through the hose connection on the inflator house. Pull out and hook no the wire to the exhaust valve and push the pin all the way through.



21. Push on the filling hose onto the hose connection. Attach a a new tie wrap band (#18) around the hose at the hose connection. Tighten well and cut off the band at the locking.



22. Fasten the inflator hose to the shoulder straps with the velcro band.



23. Connect the air supply from the regulator. Pressurize the regulator and fill the BCW.

24. Check that there is no leakage in the exhaust valve.

25. Pull the exhaust hose to empty the BCW. Check that the exhaust valve opens and releases the air from the BCW.

7.8.2 BCW - EXHAUST VALVE

■ Replacing exhaust valve set

■ Tools

- Cutter
- Awl (tool #1)
- Silicone lubrication (tool #25)

►Dismantling

1. Open up the walcro band holding the Divator inflator assembly.



2. Unscrew the inflator connection to the outer bladder (#9a). Do not drop the seal ring (#1).
3. Cut the tie wrap band (#18) securing the inflator hose to the inflator (#13).



4. Pull of the filling hose from the inflator house and push out the locking pin (#4) to release the wire to the exhaust valve seat (#2). Use an awl (tool #1).



5. Unscrew the cap of the exhaust valve (#5).



6. Take out the one-way-valve (#4) and discard the O-ring (#3). Pull out the valve set (#2).

►Assembling

1. Push a new valve set (valve with spring) through the filling hose.



2. Apply a thin layer of lubrication (tool #25) on a new O-ring (#3) and fit it on top of the valve.



3. Inspect the one-way valve, it shall be free from damages. The valve membran shall be smooth and lay flat on the seat. Replace the valve if necessary. Put the valve on top of the valve seat (#2).



4. Attach the cap (#5) to secure the dump valve.



5. Check that the exhaust valve gasket (#1) and the bladder connection is clean and soft.
6. Place the exhaust gasket (#1) into the seat.



7. Attach the exhaust valve assembly to the bladder connection.



8. Push the pin (#4) half way through the hose connection on the inflator house. Pull out and hook on the wire to the exhaust valve and push the pin all the way through.



9. Push on the filling hose onto the hose connection. Attach a new tie wrap band (#18) around the hose at the hose connection. Tighten well and cut off the band at the locking.



10. Fasten the inflator hose to the shoulder straps with the welcro band.



11. Connect the air supply from the regulator. Pressurize the regulator and fill the BCW.
12. Check that there is no leakage in the exhaust valve.
13. Pull the exhaust hose to empty the BCW. Check that the exhaust valve opens and releases the air from the BCW.

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