



## MAINTENANCE PROCEDURE FOR MK19





## MAINTENANCE PROCEDURE FOR MK 19 1<sup>ST</sup> STAGE

**WARNING: this maintenance procedure is only for appointed Scubapro technicians that followed a complete course on equipment repair and in no case can replace a technical repair course delivered by an appointed SCUBAPRO/ UWATEC appointed staff.**

### **Tools needed:**

- |  |                 |
|--|-----------------|
| 1. universal tool                            | P/N 43.040.000  |
| 2. socket                                    | P/N 43.191.107  |
| 3. socket extension                          | P/N 43.300.009  |
| 4. field handle tool                         | P/N 43.300.127  |
| 5. o-ring extractor                          | P/N 43.300.107  |
| 6. filter retainer mounting tool             | P/N 43.026.101  |
| 7. balance chamber tool                      | P/N 43.300.240  |
| 8. torque wrench                             | P/N 43.300.988  |
| 9. 2 <sup>nd</sup> stage adjustment tool     | P/N 41.043.000  |
| 10. 1 <sup>st</sup> stage chamber tool       | P/N 43.300.999  |
| 11. Scubapro blow gun                        | P/N 40.978.000  |
| 12. MK 17 dry chamber tool                   | P/N 43 117 130P |
| 13. interstage pressure gauge                |                 |
| 14. 4 mm Allen key                           |                 |
| 15. 6 mm Allen key                           |                 |
| 16. screwdriver                              |                 |
| 17. work bench with vice                     |                 |
| 18. 7/32" Allen extension or 7/32" Allen key |                 |
| 19. Adjustable spanner                       |                 |

### **DISASSEMBLY**

1. Unscrew all hoses from the 1<sup>st</sup> stage with the adjustable spanner being careful not to damage the chrome plating. Remove all the plugs from the 1<sup>st</sup> stage with the 4 mm Allen key or with the universal tool. Remove the o rings from the plugs with the o ring extractor tool and inspect.
2. Remove the inlet protector.
3. Take the field handle tool and use preferably for strength, the bigger thread (7/16") and screw it in one of the HP ports.

For the **INT** version: Remove the yoke screw, then firmly hold the field handle tool fixed to the body of the 1<sup>st</sup> stage in the vice and use the socket and socket extension to carefully remove the yoke retainer. Remove the yoke and saddle. Remove the filter retainer with the screwdriver, the filter and the o ring with the o ring remover. Put aside the o ring (01.050.138) for inspection.



For the **DIN** version: Remove with the o ring extractor the "tank" o ring, then with the 4 mm Allen key unscrew the filter retainer. Remove the spring and the filter. Firmly hold the field handle tool in the vice and use the 6 mm socket extension to unscrew with care the DIN knob retainer. Remove the o-ring and the knob. Put aside the o ring (01.050.138) for inspection.

4. Remove the bumper cap on the fins side with the small screwdriver.
5. Unscrew with the multifunction tool or 1<sup>st</sup> stage chamber tool the diaphragm retainer. Carefully remove the washer, the silicone diaphragm and the load transmitter.
6. Unscrew the spring adjustment screw with the 6 mm. Allen key. Remove the nylon washer in the spring adjustment screw and the spring.  
**Note!** : The diaphragm disc will not come out trough the spring adjustment screw hole.
7. With the MK 17 dry chamber tool mounted on a drive, unscrew carefully the dry ambient chamber; remove the diaphragm disc and the 2 washers with the small screwdriver. Remove the field handle tool.
8. With the screwdriver, carefully remove the diaphragm. Now remove the thrust disc, the metal disc insert and the pin.
9. Fix the field handle tool to one of the interstage pressure ports of the swivel. Unscrew with the 4 mm Allen key the LP plug situated on the top of the swivel head. With the 7/32" extension or Allen key, unscrew the swivel retainer (**screwing clock wise**). Remove the plastic bumper from the swivel holder and unscrew the chamber with the universal tool or the 1<sup>st</sup> stage chamber tool. Remove the aspirator. Remove with the o-ring extractor the 2 o-rings and the washer from the swivel holder. Remove the field handle tool from the LP port.
10. Unscrew the balance chamber with the balance chamber tool. Remove the spring, the spring centring washer, the balance chamber o ring and the bushing ring from the inside. Remove also the o ring from the chamber.
11. Remove the spacer, the guide from the HP poppet.
12. Use the MK 16 new generation tool (plastic tip) and lightly push the tool against the orifice while blowing into the 1<sup>st</sup> stage body from the opposite side (diaphragm side) with the blowgun to carefully remove the orifice. With the o ring extractor tool, remove the o ring from the orifice.

## **PARTS CLEANING**

**WARNING: refer to parts cleaning procedure.**



## **ASSEMBLY**

After careful inspection of the cleaned parts and the static o rings that do not need replacement, prepare all the parts that need to be changed at every annual service.

- |    |   |            |
|----|---|------------|
| a. | the filter  | 01.028.109 |
| b. | the filter retaining clip ( only for INT version) | 01.073.101 |
| c. | the HP seat                                       | 10.117.209 |
| d. | the poppet stem o ring                            | 01.050.317 |
| e. | the balance chamber o ring                        | 01.050.145 |
| f. | the swivel o ring                                 | 01.050.161 |
| g. | or the repair kit for MK 17/19                    | 10.117.040 |

1a. For the **INT** version: insert the filter in the yoke retainer and then fit the filter retainer with the filter retainer tool. Fit the o ring 01.050.138 in its cavity. Slightly grease the threads of the yoke retainer and the o ring before inserting in the yoke and the saddle.

Firmly hold the 1<sup>st</sup> stage body with the field handle tool screwed in a HP port and fixed in a vice. Place the socket on the yoke retaining screw, and the socket extension on the torque wrench.

**Adjust the torque wrench to 30 Newton meter and tighten. Never use a torque exceeding 30 Newton meter.**

1b. For the **DIN** version, assemble the o ring 01.050.138 in its cavity; slightly grease the threads and the o ring before inserting in the DIN wheel. Place the wheel retaining o- ring and the saddle. Only use the 6 mm socket extension for tightening

**Adjust the torque wrench to 30 Newton meter and tighten. Never use a torque exceeding 30 Newton meter.**

Now place the conical filter upside down (the tip of the filter facing the tank valve), then the spring, slightly grease the threads before screwing the filter retainer with a 4 mm Allen key to 4 Newton meter torque. Insert the "tank" o ring

**WARNING: The use of a torque wrench is highly recommended, if unavailable, for a torque of 30 Newton meter, screw hand tight, then use a wrench and tighten 1/8 of a turn!!! An excess torque can lead to a permanent deformation or even a rupture of the parts.**

2. Place the o ring on the orifice and insert this assembly inside the body of the 1<sup>st</sup> stage taking care to guide its way in with the MK16 new generation tool. Press the orifice slightly down in the chamber with the tool.
3. Slightly grease the bushing, the o-ring and centring washer and place the 3 parts inside the balance chamber.
4. Slightly grease the o-ring and thread of the balance chamber and place the o ring on the balance chamber.
5. Slide the spacer and guide on the HP-poppet. Slightly grease the shaft of the HP-poppet before inserting the spring.



6. Insert the assembled HP-poppet inside the assembled balance chamber.
7. Insert the whole system inside the 1<sup>st</sup> stage and screw snug with the balance chamber tool. **Warning!** : Do not over torque.
8. Remove the field handle tool from the HP-port, reassemble the HP-plugs, slightly grease the o-rings and threads and replace them in the body. Do not over torque (4 to 5 Newton meter maximum)
9. Place the 2 o-rings on the swivel holder and slightly grease the o-rings. Slightly grease the washer and place it in its groove.
10. Place the aspirator on the balance chamber. Place the swivel retainer on the aspirator and screw the swivel holder with the universal tool or the 1<sup>st</sup> stage chamber tool and only hand tighten moderately.
11. Fix the field handle tool in one of the side LP ports and hold in the vice. Fix the 7/32" Allen extension on the torque wrench.  
Place the bumper on the swivel holder. Position the swivel head on the swivel holder and screw the swivel retainer through the top LP port (**screw counter clock wise**) with the 7/32" Allen key hand tight.

**Adjust the torque wrench to 5 Newton / meter and tighten anticlockwise. Never use a torque exceeding 5 Newton / metre. If a torque wrench is not available, use a 7/32" Allen key and tighten slightly!!!**

12. Replace the LP plug on the top of the swivel head and remove the field handle tool.
13. Place the diaphragm pin in the HP poppet followed by the metal disc insert and the disc.

**At this stage it is possible to check the perfect seal between the HP seat and orifice.**

14. Connect the 1<sup>st</sup> stage to a tank, **filled to the working pressure** of the 1<sup>st</sup> stage and carefully open the tank valve.

**Once pressurised, there should be no leak. A slight push with the thumb on the disk opens the system and air will flow. It is advisable to cycle the system a few times to check the air lock. Purge the system before removing the 1<sup>st</sup> stage from the tank.**

15. Place the diaphragm in position, (**WARNING: the diaphragm should always be dry, no grease should be used for assembly**) then the 2 diaphragm rings.
16. Place and centre the diaphragm disc on the diaphragm.
17. Lubricate slightly the threads before screwing the dry ambient chamber by hand in the body.



18. Fix the field handle tool again in one of the HP ports and secure the tool in a vice. Use the MK 17 dry chamber tool mounted on the torque wrench set at 35 Newton / meter and tighten the dry ambient chamber on the body

**WARNING: If the diaphragm is not properly secured by a firm tightening, there is a risk of the diaphragm coming off its groove resulting in a heavy air leak that could endanger the diver's life.**

19. Place back the nylon washer inside the cavity of the spring adjustment screw. It is advisable to slightly grease the bottom of the cavity before placing the washer.
20. Slightly grease the threads of the spring adjustment screw and the spring groove before placing the washer.
21. Place the spring in the cavity of the diaphragm disk.
22. Screw the spring adjustment screw in the dry ambient chamber by about 2 / 3 turns.
23. Reassemble all the plugs and / or the hoses after having slightly greased the threads. Do not over torque (4 to 5 Newton meter maximum )

### **THE 1<sup>ST</sup> STAGE IS NOW READY FOR THE ADJUSTMENT PHASE.**

#### **ADJUSTMENT**

**FOR THE ADJUSTMENT, IT IS VERY IMPORTANT TO HAVE A SUPPLY PRESSURE CURRENTLY USED FOR DIVING WITH THE REGULATOR CONCERNED ( 200, 230 or 300 bars ).**

1. Place the 1<sup>st</sup> stage on a full tank as previously indicated.
2. Place a precise interstage pressure gauge either at one of the interstage pressure ports or at the end of the regulator hose

**Warning ! : The gauge found on the adjustment tool is not precise enough because of it's small size and should not be used as a workshop gauge. A bigger size and more precise gauge should be used in a repair workshop.**

3. Slowly open the tank valve.
4. Observe carefully the needle of the gauge that should move in a very smooth way before coming to a sharp stop. Cycle the regulator about 10 times by purging the 2<sup>nd</sup> stage. This is to allow all the moving internal parts to reach their permanent working position.



5. Take note of the interstage pressure when the needle of the gauge comes to a stop. Three cases can occur:
  - the interstage pressure is in between 9 and 10 bars
  - the interstage pressure is lower than 9 bars
  - the interstage pressure is higher than 10 bars
6. If the gauge indicates an interstage pressure between 9 and 10 bars with a good stability of the needle of the gauge, a good adjustment has been reached.
7. If the interstage pressure is less than 9 bars, use a 6 mm Allen key to slowly screw (clockwise) the adjustment screw. Every time the adjustment screw is turned, the regulator should be cycled about 10 times before a reading of the interstage pressure is taken. Proceed by 1/4 turn to reach the correct setting which should be in between 9 and 10 bars.
8. If the interstage pressure is higher than 10 bars, proceed as above but unscrew (anticlockwise) the adjustment screw to reach the correct setting.
9. If after several unsuccessful attempts in reaching a stable interstage pressure, change the diaphragm.

**Note: As we previously carried out the leak test between the HP orifice and seat, a bad interstage pressure lock does not come from these parts. A distorted diaphragm can be responsible for a poor interstage pressure lock!!!**

10. Place back the washer and bumper cap.
11. Now fit the load transmitter through the spring adjustment screw and place the washer and the silicone diaphragm. Slightly lubricate the threads of the retainer ring and tighten with the universal tool.

**Note: Placing the silicone diaphragm should be carried out only when the 1<sup>st</sup> stage is still pressurised. Not doing so will trap air inside the dry chamber and cause a slight overpressure thus affecting the stability of the interstage pressure.**

12. Close the tank valve and remove the 1<sup>st</sup> stage from the tank.
13. Place back the rubber bumpers and the inlet protector.