



ENGLISH

Additional instructions to EN-ISO 11623

Spirolite and Divator Lite and IS-Mix cylinders

34793F01
Module 5-2
2024-11

Copyright © 2024 Interspiro

This publication contains or refers to proprietary information which is protected by copyright. All rights are reserved. Interspiro® and Divator® are registered trademarks belonging to Interspiro. This publication may not be copied, photocopied, reproduced, translated, or converted to any electronic or machinereadable form in whole or in part, without prior written approval from Interspiro.

Table of Contents

Introduction	5
Change log	5
Safety terminology and symbols	5
Sections	7
Section 4: "Due dates for periodic inspection and testing" (2015), "Intervals between periodic inspection and testing" (2002)	7
Section 5: "Procedures for periodic inspection and testing" (2015), "Procedures for periodic inspection and test" (2002)	7
Section 6: "Identification of cylinder and preparation for periodic inspection and testing" (2015), "Identification of cylinder and preparation for periodic inspection and test" (2002)	7
Section 7: "External visual inspection"	8
Section 8: "Internal visual inspection"	8
Section 9: "Pressure test" (in 2002 this is section 10)	10
Section 10: "Leak test" (2015), "Permability testing" (2002, in 2002 this is section 9)	10
Section 11: "Inspection of valve"	10
Section 12: "Final operations"	10
Section 13: "Rejection and rendering cylinders unserviceable"	14

Introduction

Periodic inspection of Composite Cylinders shall be conducted in accordance with ADR 2017 following EN ISO 11623.

This instruction contains additional instructions specific to Interspiro Spirolite, Divator Lite and IS-Mix cylinders for sections of the EN ISO 11623 standard where necessary.

Tools	Part No.	Note
Torque wrench 40-200 Nm (15-148 ft*lbf)	31165-51	
Cylinder Valve Tool R 5/8 (new version)	32111-01	SCUBA/SCBA cylinders
Cylinder Valve Tool M26	32111-03	IS-Mix cylinders
Sealing cone extractor tool	99214-01	
Assembly tool for sealing cone, M18	30507-51	M18 cylinders
Pressure test adapter, 3.4L, 1L, M17	31211-01	
Pressure test adapter, 6.7L, 5L, M17	31211-02	
Pressure test adapter, 6.7L, 5L M18	31211-03	
Torque wrench adapter 26 mm 100 Nm	31166-51	Cylinder packs only
U-spanner 26 mm	31282-51	M17 cylinders
U-spanner 28 mm	460200527	M18 cylinders
Feeler gauge 0,05 mm		M17 cylinders only

Consumables	Part No.	Note
Silicone lubricant	331900269	SCUBA/SCBA cylinders
Krytox 205	331900540	IS-Mix cylinders
Locking compound	460190846	IS-Mix cylinders

Service kits for periodic inspection	Part No.	Note
M17 SCUBA/SCBA cylinders	96085	O-ring and support ring kit M17 sealing cone, 10 pack
M17 SCUBA/SCBA cylinders	31115-51	O-ring, 10-pack (for M17 cylinder vales with O-ring groove)
M18 SCUBA/SCBA cylinders	460190103	O-ring and support ring kit M18 sealing cone, 10-pack
M18 SCUBA/SCBA cylinders	460190304	O-ring, 10-pack
SCUBA/SCBA cylinder packs	460190301	Gasket 10-pack
IS-Mix cylinders 1L	51076-951	O-ring and support ring kit, for one cylinder
IS-Mix cylinders 1L	96796-951	O-ring NM 1-pack
IS-Mix cylinders 5L	51076-951	O-ring and support ring kit, for one cylinder
IS-Mix cylinders 5L	51015-9031	O-ring NM 1-pack

Change log

Changes from revision E - F

- In section 8, step 1, point f has been added.

Safety terminology and symbols

In this document, the terms WARNING and NOTICE are used to indicate potential hazards. Read the accompanying information carefully and follow the safety instructions.



WARNING

The WARNING type of hazard statement signifies that there is a risk of serious injury or death.



NOTICE

The Notice type of hazard statement signifies that there may be a risk of damage to equipment or property.

Sections

Section 4: "Due dates for periodic inspection and testing" (2015), "Intervals between periodic inspection and testing" (2002)

No additional instructions.

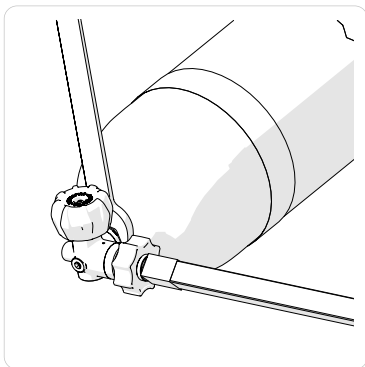
Section 5: "Procedures for periodic inspection and testing" (2015), "Procedures for periodic inspection and test" (2002)

No additional instructions.

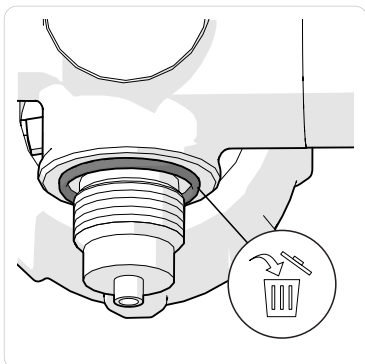
Section 6: "Identification of cylinder and preparation for periodic inspection and testing" (2015), "Identification of cylinder and preparation for periodic inspection and test" (2002)

Additional instructions:

1. Empty the cylinder(s) according instructions in "General description".
For cylinder packs, disassemble the cylinder pack according instructions in "Type II cylinder valve and Divator Lite cylinder pack".
2. Hold the cylinder by the metal cylinder neck using a U-spanner (26 mm for M17 cylinders and U-spanner 28 mm for M18 cylinder).
Remove the cylinder valve using the cylinder valve tool mounted in a torque wrench.

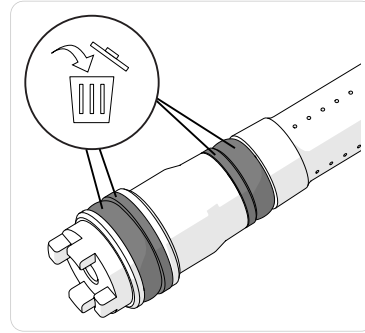
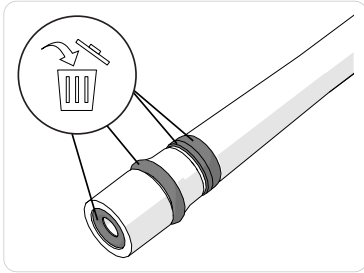


3. Remove and throw away the O-ring.



4. Pull out the sealing cone using the sealing cone extractor.
NOTE: Early versions of Spirolite / Divator Lite cylinders may have sealing cones without support rings. This version must be replaced by the current type with support rings.

5. Remove and throw away the O-rings and the support rings.



Section 7: "External visual inspection"

Additional instructions:

1. Original labels with good adhesion, which have been in place since the production of the cylinder, can be left in place during the inspection. In case of doubt whether the labels are original or not, they should be removed. Labels that are damaged or starting to become loose must be removed before the inspection. If mandatory labels are removed they must be replaced after the inspection.
2. Clean the outside of the cylinder with clean water and normal household detergent with tensides. If necessary use ultrasonic equipment or high pressure water jet. Strong solvents like acetone must be used with care and wiped off within 5 minutes
3. During manufacturing, more or less of the end nipple is left visible. If necessary, excess material is removed around the end nipple of the cylinder.
These kind of grindings from the manufacturing process may be present elsewhere on the cylinder. They shall not be considered as a damage to the cylinder.



4. For this cylinder type, Table 1 – "Acceptance/rejection criteria for external damage" in edition 2023 of EN 11623 (with damages defined as %) is replaced by the same table in edition 2016 of the standard (expressing damages in absolute measures).

Section 8: "Internal visual inspection"

The instructions below supersedes section 8.2.3 Table 2 – "Description of damage levels for various types of imperfections" in EN 11623.

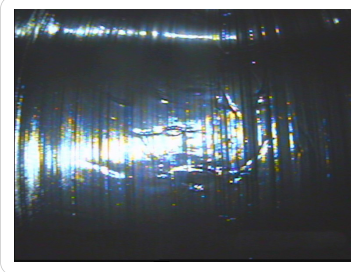
Spirolite / Divator Lite liner is "non-metallic" as defined in EN 11623.

Re-tapping of defect cylinder neck threads is not allowed.

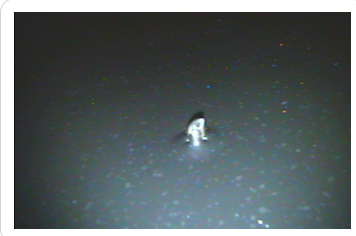
Additional instructions:

1. The following are accepted:

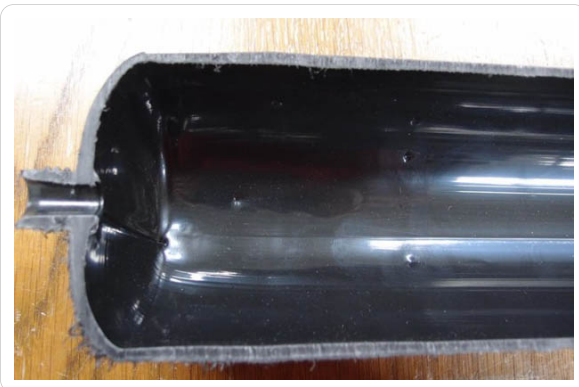
- a. Fast emptying of the cylinder can create inward bubbles made by air trapped between the liner and the composite. These bubbles are allowed to be several centimeters wide and are accepted as long as the shape of the bubbles is soft and without sharp edges or cracks. The bubbles will be squeezed back when the cylinder is recharged.
- b. Irregularities in the liner surface from the production of the liner.
Image below shows accepted irregularities.



- c. Cracks in the bottom with a maximum length of 5 mm.
- d. Thin eruptions of plastic protruding from the surface on the cylindrical part of the liner.
Image below shows accepted eruption.

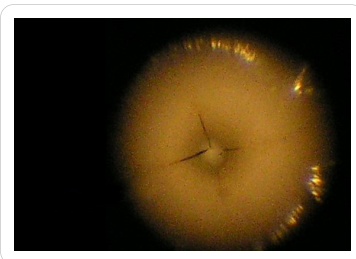


- e. Dividing lines in the neck of the cylinder that doesn't cause any leakage. These lines occur during the production of the cylinder and does not grow over time.
- f. A few pits in the liner surface.



2. The following are not accepted:

- a. Cracks in the bottom longer than of 5 mm.
Image below shows unacceptable cracks (longer than 5 mm).



- b. Traces of oil.

Section 9: "Pressure test" (in 2002 this is section 10)



WARNING

Make sure to only use clean water and clean pressure test equipment without traces of oil.

Additional instructions:

Water jacket test shall not be used with Spirolite/Divator Lite cylinders.

- Special pressure test adapters must be used:
 - Spirolite/Divator Lite 1L and 3.4L, M17 Part number: 31 211-01
 - Spirolite/Divator Lite 5L and 6.7L, M17 Part number: 31 211-02
 - Spirolite/Divator Lite 5L and 6.7L, M18 Part number: 31 211-03

Section 10: "Leak test" (2015), "Permability testing" (2002, in 2002 this is section 9)

No additional instructions.

Section 11: "Inspection of valve"

Additional instructions:

Perform preventative maintenance and replace service part in accordance with service instructions for the cylinder valve.

Section 12: "Final operations"

Additional instructions:



WARNING

Make sure to only use clean water and clean pressure test equipment without traces of oil.

Cleaning and drying

During the pressure test, cycle water is to some extent pressed into the liner and must be dried out. Do this by:

1. Fill the cylinder with silica gel (Sylobead) during 48 hours.
 - a. 35g in 3,4L cylinder
 - b. 55g in 6,7L cylinder
2. Empty the cylinder by shaking it upside down and thereafter rinse it quickly with warm, clean water to ensure that possible rests of the silica gel are effectively washed out.
3. Blow the cylinder with breathing quality air according EN12021:2014 to dry it completely. For IS-Mix cylinders chapter 6.3.2 "Oxygen compatible air" apply.

4. Make sure to assemble the cylinder valve in the cylinder within 1 hour after drying the cylinder.

Cleaning and drying of IS-Mix cylinders

1. Close the cylinder valves on the gas supply cylinder, the buoyancy gas cylinder and the bail-out gas cylinder.
2. Make sure the apparatus is depressurized.
3. Remove the the gas supply cylinder, the buoyancy gas cylinder and the bail-out gas cylinder.
4. Blow each cylinder valve connection by quickly opening and closing the cylinder valve.
5. Put protective plugs on to the cylinder valves.

Cylinder re-valving

Follow the assembly instructions below, they are specific for Spirolite / Divator Lite cylinder.



WARNING

During service and inspection of cylinder and cylinder valves on the IS-Mix and Ox10 rebreathers make sure that all parts are oxygen clean before assembling. Follow cleanliness requirements as described in "General description for service and repair" with document number 34795.

The new parts in the service kit are delivered oxygen clean. Keep them in their plastic bags until assembling.



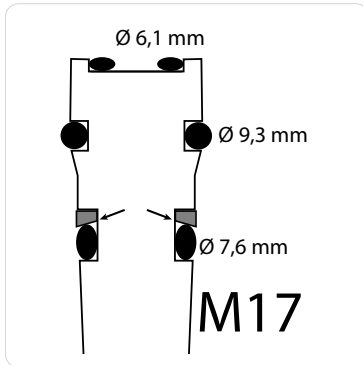
WARNING

Make sure that the cylinder has been dried according to section "Cleaning and drying" above within 1 hour before assembling the cylinder valve.

1. Clean the sealing cone by following the steps for your type of cylinder below:
 - a. SCUBA/SCBA cylinders: Clean the sealing cone by wiping it off with a lint free cloth.
 - b. IS-Mix cylinders: Clean the sealing cone oxygen clean (for example of how to do it see section "Example of procedure for oxygen cleaning in an ultrasonic washer" in "General description for service and repair").
2. Lubricate the new O-rings with:
 - a. SCUBA/SCBA cylinders: Silicone lubricant
 - b. IS-Mix cylinders: Krytox

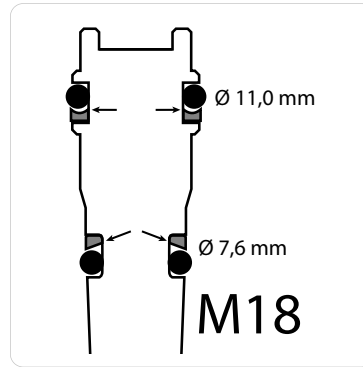
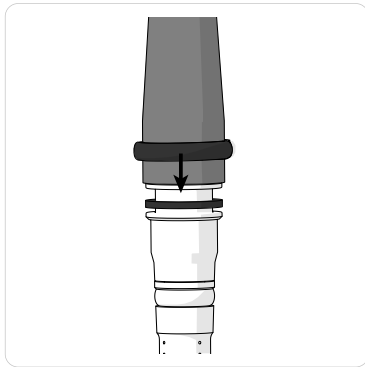
3. Assemble the O-rings and the support ring/s according to the images.
Make sure to get the angled side of the support ring/s in the right direction.

a. **M17:**

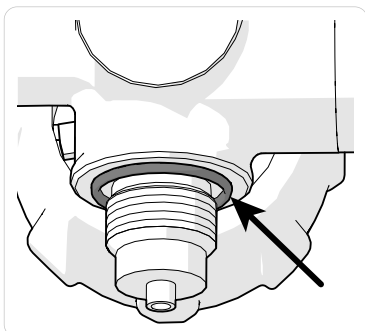


- b. **M18:** Use Assembly tool 30507 to mount the 11,0 mm O-ring and Support ring on the sealing cone.

Assembly needs to be done with a quick and resolute action to get the support ring in position without breaking. To further ease the assembly, the support rings can be soaked in hot water (60-90 C) for 2 minutes and then immediately assembled onto the sealing cone.



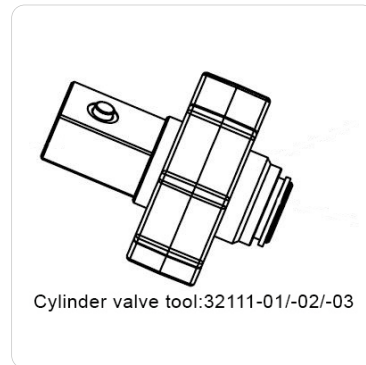
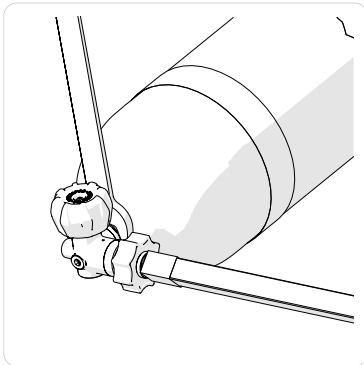
4. Push the sealing cone into the cylinder.
Make sure that the O-rings on the sealing cone stays in place.
5. Assemble a new O-ring on the cylinder valve. Follow the instructions for the right type below:



- a. IS-Mix cylinders: Put 2 drops of locking compound on the threads of the cylinder valve. Make sure there are NO lubricant on the O-ring, the cylinder thread and flange of the cylinder valve.
- b. SCUBA/SCBA cylinders: Lubricate the O-ring with silicone lubricant before assemble it on the cylinder valve.

6. Hold the cylinder by the metal cylinder neck using a U-spanner (26 mm for M17 cylinders and U-spanner 28 mm for M18 cylinder).

Mount and tighten the cylinder valve to the cylinder with the cylinder valve tool 32111-01/-02/-03 to the following torque:



- a. IS-Mix cylinders 5 L & 1 L: 60 ± 5 Nm
IS-Mix cylinders 6 L & 2 L: 85 ± 5 Nm
(only cylinder valve tool 32111 is allowed when assembling IS-Mix cylinder valves)
 - b. M17 SCUBA/SCBA cylinders: 75 ± 5 Nm
(if using the old version of the cylinder valve tool (99048-01) the torque wrench setting must be compensated for the additional lever to 60 ± 5 Nm)
Check with a feeler gauge, 0.05 mm, that there is no gap between the valve flange and the cylinder neck end.
 - c. M18 SCUBA/SCBA cylinders: 100 ± 5 Nm
(if using the old version of the cylinder valve tool (99048-01) the torque wrench setting must be compensated for the additional lever to 85 ± 5 Nm)
7. For cylinder pack variants:
- a. The second cylinder in a cylinder pack is fitted with a nipple or an Easy-Fill valve, which is mounted in the same way as the cylinder valve. The nipple is mounted using a 26 mm torque wrench adapter.
 - b. Assemble cross-over tube, handle and tensions straps according to the instruction in "Type II cylinder valve and Divator Lite cylinder pack".
8. Pressurize the cylinder/cylinder pack according to the instruction in "General description for service and repair".

Leakage check

- Tilt the cylinder and check for leakages by submerging the valve under water. Maximum allowed leakage is 1 bubble per minute.



NOTE

Breathing gas may escape from the composite matrix as the cylinder is being filled. Should that be the case it will show if the cylinder is filled when submerged in water as bubbles, approx. 1 mm in diameter, leaving the cylinder surface during the filling sequence. Another effect that could sometimes be observed is that the small amount of gas that diffuses through the liner material may be collected in noticeable amounts in the small cavities in the composite matrix. From the outside this effect may be visible as an array of very small bubbles (approx. 0.1 mm in diameter) leaving the surface of the cylinder. These two effects are normal for pressure cylinders of this type and does not require any action from the inspector.

Section 13: "Rejection and rendering cylinders unserviceable"

No additional instructions.



Keeps You Breathing