



# Interspiro Steel Cylinders

PERIODIC INSPECTION MANUAL

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MODULE 5-3

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# 1 GENERAL

This inspection manual is for qualified cylinder inspectors only. Incorrect action may result in severe injury.

The periodic inspection is carried out in the following steps:

- ▶ Preparation
- ▶ External inspection
- ▶ Internal inspection
- ▶ Pressure test
- ▶ Inspection of valve
- ▶ Final operations
- ▶ Rejections & rendering

Re-inspect steel cylinders every fifth year or according to national regulations.

The content of applicable international and local standards must be known and followed during the periodic inspection. The standards includes, but are not limited to, the following standard and regulations:

- EN 1968 Transportable gas cylinders - Periodic inspection and testing of seamless steel gas cylinder.
- ADR/RID

# 2 PERIODIC INSPECTION

For periodic inspection of steel cylinders, local regulations may differ from the five year time between inspections, recommended in EN 1968. However, the inspection shall be done in accordance with the instructions for inspection and testing, given in the latest revision of EN 1968.

## 2.1 IDENTIFICATION

Before any work is carried out the relevant cylinder data and the gas contents shall be identified. Cylinders with unknown gas contents or those which cannot be safely emptied of gas shall be set aside for special handling.

## 2.2 DISASSEMBLY

TOOLS PART	PART NO.	NOTE
Torque wrench 20-200 Nm (15-148 ft*lb)	31 165-01	
Cylinder Valve Tool R 5/8 (new version)	32 111-01	
Discharge Plug (DIN)	460 190 770	
U-spanner 23 mm	460 200 009	
Plug with O-ring	460 190 220	
Fixture for cylinder	31 988-01	
Control gauge, DIN 300 bar	99 804-01/331 190 381	(Recommended)

## CONSUMABLES

Curacid PSA Rinse, 1 L	336 921 330	or hand detergent, low pH
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Note:

Other suitable cleaning agents may also be used. Follow the cleaning procedures as recommended by the manufacturer/supplier of the cleaning agent.

Silicone lubricant	331 900 269	
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## SERVICE PARTS

O-ring, 10-pack	460 190 304	
Gasket, 10-pack	460 190 301	Cylinder pack only
Sealing tape	995 100 327	Conical version only

## 2.2.2 PROCEDURE

### »»»WARNING

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Always empty the cylinder before starting to work on the cylinder valve, Easy-Fill valve or nipple.

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#### ► Discharge the high pressure in the cylinder / cylinder pack.

1. Before any work on the cylinder valve or the Easy-Fill valve the cylinder/cylinder pack must be fully discharged. Use the discharge plug for a controlled discharge of the high pressure.
2. Fit the discharge plug to the cylinder valve.
3. Open the cylinder valve slowly and let the high pressure in the cylinder/cylinder pack discharge.

### »»»WARNING

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Risk for hearing damage. Always use hearing protection when discharging high pressure air.

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4. The discharge plug will automatically shut off when approx. 3 bar pressure remains in the cylinder/cylinder pack.
5. Close the cylinder valve and remove the discharge plug.
6. Open the cylinder valve to discharge the remaining pressure.

#### ► Disassembly of single cylinder

### »»»WARNING

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Secure the cylinder firmly using a holding fixture designed to prevent any damage on the cylinder.

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1. Remove the cylinder valve from the cylinder. Use the cylinder valve tool and the torque wrench to unscrew the valve counter clockwise from the cylinder.



## ► Disassembly of cylinder pack

### »»»WARNING

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Secure the cylinder firmly using a holding fixture designed to prevent any damage on the cylinder.

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The cylinder pack is to be disassembled first in order to make it possible to handle the cylinders separately.

Follow the instructions in the Module 5-1 "SERVICE AND REPAIR - Cylinders and Cylinder packs" document regarding disassembly.

1. Remove the cylinder valve from the cylinder. Use the cylinder valve tool and the torque wrench to unscrew the valve counter clockwise from the cylinder.
2. The "second" cylinder in a cylinder pack is equipped with a nipple or an Easy-Fill valve. The nipple is unscrewed counter clockwise using a 26 mm U-spanner. The Easy-Fill valve is unscrewed counter clockwise using the cylinder valve tool.

## 2.3 CLEANING

Cleaning of the outside of the cylinder is needed in order to ensure that subsequent inspection can be carried out properly.

### »»»WARNING

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Make sure that no cleaning solutions, degreasing agents or solvents enters the inside of the cylinder.

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Cylinders can normally be cleaned by scrubbing the outside of the cylinder with a brush and Curacid solution or a solution of an ordinary hand detergent with a relatively low pH.

Should it be necessary ultrasonic cleaning equipment or high pressure water jet cleaning equipment may be used.

Degreasing agents may also be used.

At this point all labels (except the label with the mandatory information) that have been added to the cylinder are to be removed to allow full possibility to inspect the outer surface.

# 3 EXTERNAL VISUAL INSPECTION

Interspiro steel cylinders shall be inspected according to the instructions in EN 1968 "Transportable gas cylinders - Periodic inspection and testing of seamless steel gas cylinder".

## 3.1 RECOMMENDED EQUIPMENT

The following equipment is recommended for visual inspection of the cylinder:

- |                    |   |
|--------------------|---|
| - Vernier gauge    | Used for measuring the depth, length and width of damage. |
| - Camera           | Used for documenting the appearance of damage.            |
| - Lamp             | Used to permit study of damage in detail.                 |
| - Magnifying glass | Used to permit study of damage in detail.                 |

## 3.2 INSPECTION PROCEDURE

The external surface of each cylinder shall be inspected for:

- a) dents, cuts, gouges, bulges, cracks, laminations or excessive base wear.
- b) heat damage, torch or electric arc burns.
- c) corrosion.
- d) other defects such as illegible or unauthorized stamp markings, unauthorized additions or modifications.
- e) integrity of all permanent attachments.
- f) vertical stability (if relevant).

The conditions for rejection from Annex C in EN 1968 shall be applied.

Where there is doubt concerning the type and/or severity of a defect found on visual inspection, additional tests or methods of examination may be applied, e.g. ultrasonic techniques, check weighing or other non-destructive tests. Only when all doubts are eliminated may the cylinder be further processed.



# 4 INTERNAL VISUAL INSPECTION

## 4.1 GENERAL

Interspiro steel cylinders shall be inspected according to the instructions in EN 1968 Transportable gas cylinders - Periodic inspection and testing of seamless steel gas cylinder.

Each cylinder shall be inspected internally, using adequate illumination to identify any defects such as dents, cuts, gouges, bulges, cracks, laminations, excessive base wear or corrosion. Precautions shall be taken to ensure that the method of illumination presents no hazards to the tester whilst performing the operation.

Any cylinder showing presence of foreign matter or signs of more than light surface corrosion shall be cleaned internally under closely controlled conditions by shot blasting, water jet abrasive cleaning, flailing, steam jet, hot water jet, rumbling, chemical cleaning, or other suitable method. Care shall be taken to avoid damage to the cylinder. If cleaning is required, the cylinder shall be re-inspected after the cleaning operation.

Where there is doubt concerning the type and/or severity of a defect found on visual inspection, additional tests or methods of examination may be applied, e.g. ultrasonic techniques, check weighing or other non-destructive tests. Only when all doubts are eliminated may the cylinder be further processed.

## 4.2 INSPECTION OF CYLINDER NECK THREADS

### 4.2.1 NECK THREADS

The neck threads of the cylinder shall be inspected and gauged to ensure that they are:

- Clean and of full form
- Free from burrs or damage
- Free from cracks and other imperfections

Cracks manifest themselves as lines which run vertically down the thread and across the thread faces. They should not be confused with tap marks (thread machining marks). Special attention should be paid to the area at the bottom of the thread.

### 4.2.2 DAMAGED NECK THREADS

Damaged neck threads must not be re-tapped. Interspiro will not take responsibility for cylinders with threads which have been re-tapped.

# 5 PRESSURE TEST

Hydrostatic pressure test is carried out in accordance with EN 1968 Transportable gas cylinders - Periodic inspection and testing of seamless steel gas cylinder.

# 6 INSPECTION OF VALVES

## 6.1 INSPECTION

The cylinder valve as well as the Easy-Fill valve shall be visually inspected to ensure that the complete cylinder valve / Easy-Fill valve is undamaged.

Especially important is it to inspect the connection threads of the cylinder valve/Easy-Fill valve.

If damage is detected, the cylinder valve / Easy-Fill valve shall be repaired or replaced.

All service and repair of the cylinder valve or Easy-fill valve must be done according to the Module 5-1, "SERVICE AND REPAIR - Cylinders and Cylinder packs" document.

# 7 FINAL OPERATIONS

## 7.1 DRYING

The interior of each cylinder shall be thoroughly dried by a suitable method, such as blowing the cylinder dry using a steady flow of breathing quality air, immediately after hydraulic pressure testing. There shall be no trace of free water and the interior of the cylinder shall be inspected to ensure that it is dry and free from other contaminants.

## 7.2 PAINTING

If painting is required, it shall be applied in such a way that all markings stamped on the cylinder are legible.

## 7.3 ASSEMBLY OF THE CYLINDER/CYLINDER PACK

- ▶ Check that the cylinder is properly marked for the period of use covered by the inspection and test.
- ▶ Make sure that the interior of the cylinder has been properly dried in accordance with section 7.1.
- ▶ If applicable, make sure that the cylinder valve has been serviced according to Module 5-1, "SERVICE AND REPAIR - Cylinders and Cylinder packs.

1. Lubricate new O-ring(s) with silicone lubricant.
2. Replace the O-ring(s), according the spare part list Module 5-1, "Cylinders and Cylinder packs", for the connection between cylinder and cylinder valve/cylinder pack nipple/Easy-Fill valve.

### ▶ Cylinders with parallell (cylindrical) threads, M18

- 3a. Tighten the cylinder valve using the cylinder valve tool fitted to the torque wrench.

All steel cylinders except cylinders for OX10: Torque setting: 100 ( $\pm$  5) Nm.

For 1.5 L steel and aluminium cylinder for OX10 Rebreather: Torque setting: 55 ( $\pm$  5) Nm.

### ▶ Cylinders with conical (tapered) threads, 17E

- 3b. Wind sealing tape clockwise (when looking from the cylinder connection end) starting at the small end of thread on the cylinder valve. Tape shall be overlapped during wrapping to give an even double thickness (2 layers) all the way. Work the tape carefully into the thread profile. Make sure that the end thread on the small end is completely covered with tape, without leaving any tape inside the cylinder after installing the cylinder valve. The tape shall not be excessively stretched and shall be carefully torn or cut.

Screw the cylinder valve into the cylinder by hand. Tighten the cylinder valve using the cylinder valve tool fitted to the torque wrench.

Torque setting: 90 ( $\pm$  5) Nm.

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### »»»WARNING

Secure the cylinder firmly using a holding fixture designed to prevent any damage on the cylinder.

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### »»»WARNING

For older version of cylinder valve tool see instructions below regarding correct torque value.

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► **Old version cylinder valve tool (#99 048-01)**

It is recommended to replace this older version cylinder valve tool with the new version (#32 111-01). If the older version is used, the torque wrench setting must be compensated for the additional lever added when using this version of the cylinder valve tool:

Parallell (Cylindrical) threads, M18: 85 Nm ( $\pm$  5 Nm) setting to reach 100 Nm.

Concial (tapered) threads, 17E: 75 Nm ( $\pm$  5 Nm) setting to reach 90 Nm.

► **Cylinder pack versions**

4. The second cylinder in a cylinder pack is fitted with a nipple or an Easy-Fill valve. The Easy-Fill valve is mounted in the same way as the cylinder valve. The nipple is mounted using a torque wrench fitted with a 26 mm torque wrench adapter.
5. Mount the tension straps and handle according to the instructions in Module 5-1, "SERVICE AND REPAIR - Cylinders and Cylinder packs" document.
6. Used cross over tubes shall be inspected to ensure that there are no traces of beginning cracks.

**>>>NOTE**

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Do not re-use the cross-over tube more than three times due to the small axial rotations the tube will be exposed to when tightened.

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Mount the cross over tube according to the instructions in the Module 5-1, "SERVICE AND REPAIR - Cylinders and Cylinder packs" document.

## 7.4 LEAKAGE CHECK

Pressurize the cylinder/cylinder pack.

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

An alternative method is to use leak detection spray.

If applicable, attach the cylinder boot(s).

Attach appropriate labels.

## 7.5 MARKING

After satisfactory completion of the periodic inspection and test, each cylinder shall be permanently marked according to EN 1089-1 with the present test date followed by the symbol of the inspection body or test station.

### »»NOTE

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Take account of legal requirements on identification which may be applicable in the country of use.

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### 7.5.1 REFERENCE TO NEXT TEST DATE

The next test date shall be shown in a clearly visible manner by an appropriate method such as a label or a disc fitted between the valve and the cylinder, indicating the year of the next periodic inspection or periodic inspection and test.

## 7.6 RECORDS

The test shall be recorded by the test station and following information shall be available:

- Owner's name
- Interspiro's or owner's serial number
- Cylinder mass or tare where applicable
- Test pressure
- Present test date
- Identification symbol of inspection body or test station
- Identification of inspector
- Details of any modifications made to the cylinder by inspector

All information regarding the test shall be retained by the test station and shall be made available to the manufacturer for the life of the cylinder.

# 8 REJECTION & RENDERING CYLINDERS UNSERVICEABLE

The decision to reject a cylinder may be taken at any stage during the inspection and test procedure. If it is not possible to recover a rejected cylinder it shall, after notifying the owner, be made unserviceable by the test station for holding gas under pressure so that it cannot be reissued into service.

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**»»NOTE**

In case of disagreement, ensure that the legal implications of the contemplated action are fully understood.

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One of the following methods shall be employed:

- By crushing the cylinder using mechanical means
- Cutting the neck in an irregular fashion
- Cut the cylinder including the shoulder into two or more irregular pieces
- Burst in a safe manner

# 9 DELIVERY CONDITION

Before the cylinder is sent back to the owner (or user) it has to be filled with breathing quality air at least to a "protection" pressure level of 2-5 bar.

Mount the protective plug with a 23 mm U-spanner.









