

# Maintenance Specialist Manual

# S-Cap-Air

Compressed Air Escape Apparatus with Hood



## **Dear Maintenance Specialist,**

MSA manufactures respiratory protective equipment for work and rescue.

The staff of MSA conducts courses where participants are trained as „respiratory protective equipment maintenance specialists“ who check the safe functioning of such equipment through continuous maintenance and testing.

With conducting the maintenance and care of your respiratory protective equipment you accept a great deal of responsibility. Always think of the possible consequences should the equipment fail. For this reason, each maintenance specialist should attend a repeat course as a rule every 3 years.

Another precondition for correct work is that the maintenance shop is equipped with the necessary measuring and test equipment.

We wish you all the best for your work.

## **Notice!**

Like any piece of complex equipment, this MSA product will do the job it is designed to do, only, if it is used and serviced in accordance with the manufacturer's instructions. This manual must be read carefully by all individuals who have or will have responsibility for using or servicing this product.

The warranties made by MSA with respect to this product are voided if the product is not used and serviced in accordance with the instructions in this manual.

Before choosing and using this product, it is required to assess whether it is suitable for the application intended.

Selection and use are beyond the control of MSA. Therefore, the liability of MSA covers only the steady quality of this product.

The above does not alter statements regarding the warranties and conditions of sale and deliveries of MSA.

**The S-Cap-Air apparatus described in this Maintenance Manual is in accordance with Directive 89/686/EEC.**

**It is a compressed air escape apparatus with hood according to EN 1146.**

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# 1 Technical Description

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## 1.1 General

The **S-Cap-Air** is a compressed air breathing device to be used for emergency escape from irrespirable atmospheres. It has been designed and tested in accordance with EN 1146 to comply with the safety requirements of EC Directive 89/686. Type examination has been made by Inspec Certification, Notifying body 0194. The **S-Cap-Air** with the 3 litre 200 bar cylinder has a duration of 15 minutes, as required by the International Maritime Organisation [IMO].

We obtain the following certificates for the **S-Cap-Air**:

Approvals:	Germany	GermanLloyd	„GL 40902-01 HH“
	Germany	SeeBG	„N° 208.011“
	Netherlands	The head of the Netherlands Shipping Inspectorate	"DS/5809/2002-2.2.1 KTEK-W/LK"
	Poland	Polski Rejestr Statków	ZC/1730/930049/02
	Italy	Rina - Società per azioni Gruppo Registro Italiano Navale	„FPE 45102 CS“
	Russia	Russian Maritime Register of Shipping	„N° 02.032.009“
	Spain	Ministerio de Fomento Secretaria de Estado de Infraestructuras y Transportes	„N° 003 /0302

**NOTICE ! The S-Cap-Air must be used for emergency escape only.**

The **S-Cap-Air** is quick and simple to don, the air supply is activated automatically, breathing air is delivered into the flexible hood which is easy to don offering immediate protection also for persons wearing beards and/or corrective eyewear.

## 1.2 Cylinder and Bag

The compressed air cylinder of the **S-Cap-Air** complies to EC 84/525 or, if applicable, to national regulations. It is carried in a frontally worn bag. The pressure gauge is visible through a transparent visor in the bag. Rated duration and pictogram instructions are printed on the bag. The cylinder must only be charged with air conforming to EN 12021.

### **WARNING**

**Do not handle the unit by the valve / regulator use carrying strap or cylinder body !**

### 1.3 Regulator / cylinder valve

The regulator is mounted directly on the cylinder and has two connections. One G5/8 standard thread connection for the 200 bar compressor charging adapter, and the second for the supply hose to the hood. The cylinder valve is part of the regulator and can be opened and closed manually by its screw cap with the firing pin in place. For regular starting the firing pin is pulled out of the screw cap and the breathing air is delivered via the connection to the supply hose into the hood. The air outlet is the warning indicator in the hood which is located right in the field of vision. The visual color change warning is activated at the end of service life, when the air flow diminishes and consequently the CO<sub>2</sub> concentration rises towards the limit set down by the EN 1146. A constant reading pressure indicator is fitted to the regulator permitting to read the cylinder pressure through the bag visor.

#### **WARNING**

**Do not handle the unit by the valve / regulator use carrying strap or cylinder body !**

### 1.4 Hood

The hood assembly consists of an oro-nasal nose cup with head harness, the supply hose with visual colour change warning, simultaneously used as air outlet and the hood with visor and flexible neck seal. The air supplied to the hood generates an air reservoir, the breathing air is taken through the nose cup from the reservoir. The exhaled air is released via the nose cup and the integrated exhalation valve into the ambient atmosphere. The visor offers an almost unimpaired field of vision. The warning indicator displays the effective air flow. The elastic head harness cares for the automatic nose cup adjustment over chin, mouth and nose. In combination with the flexible neck seal a wide variety of face sizes is covered.

### 1.5 Warning indicator and duration alarm

When the end of service life is reached, the warning indicator changes slowly from **GREEN** to **RED** warning from the reducing air flow to the hood. This is proportional to increasing levels of CO<sub>2</sub> from the exhalation air. The hood **must** then be removed.

## 2 Charging and Packing

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### 2.1 Charging the Air Cylinder

**NOTICE!** Air used to charge cylinders must conform to EN 12021 or USCGA grade D (or better). High pressure compressors and charging appliances must only be used by trained operators and all safety procedures must be observed.

1. Break tamper tag or remove remnants of it (if necessary), open bag zipper entirely.
2. Remove hood, uncover the valve and check that the firing pin is in place [the top of the pin is parallel in line with the hose connection] and the valve is closed [cap hand screwed in position]
3. Prior to the filling procedure the burst disc should be checked for right torque. The retaining screw is fitted with a locking force of  $5,9 \pm 0,3$  Nm torque
4. Remove the dust cap from the charging port of cylinder valve.  
Connect charging port to a standard 200 bar compressor outlet, charge the cylinder to 207 bar. After charging allow cylinder to cool down and top up the cylinder if necessary.  
(Observe compressor instructions, if required, use country specific adapter)

**Note:** There is a restrictor inside the filling port. This may cause repeated filling cycles of the compressor - depending on the capacity of the compressor – to reach the required 207 bar. Compressors with a high capacity fill the cylinder and the filling system quickly. The safety pressure switch will turn off the compressor at a maximum of approximately 220 bar. The pressure inside the cylinder then, needs to balance with the pressure in the system. This causes a pressure drop inside the system so the procedure must be repeated until the cylinder and the filling system balance at 207 bar.

5. After charging, open air cylinder valve briefly by turning open the valve cap, close again immediately until the air flow stops. Then turn in another  $60^\circ$  (see pictures below). Now the firing pin must be in line with the hose connection. If it is not, turn valve cap loose again, pull firing pin out and put it back into the cap on the opposite side. Then close the valve again as explained above.



60° Gauge (paper-version)

Cutout sample at the end of this manual.



60° Gauge (tool order no. 10045531)

**Note:** The additional turn of  $60^\circ$  beyond the valve closing point [air flow stops] assures a properly and tightly closed valve. Turning the cap through greater angles may result in excessively high pull out forces for the firing pin.

Check the cylinder pressure and top up if necessary [normally this is not required].

6. After the cylinder is fully charged, depressurize the compressor outlet, and loosen the pressure free connection (remove adapter possibly used).

7. Check cylinder pressure indicator. The indicator reading must be in the green section, after cylinder has cooled down to ambient temperature.
8. After each charging procedure a leaktest is required. Check for leaktightness using liquid leak detector, leak detector spray, or soap solution with brush.
9. Close charging port with dust cap again.
10. Pack the apparatus as described under Packing instructions (see 2.2).

## **2.2 Packing Instructions**

1. After the S-Cap-Air is recharged and the charging port is closed again, the hood is put back in its place. To do so, run the supply hose along the cylinder until its end, then put hood into opposite direction above supply hose and cylinder. The hood in proper position must not reach the valve.
2. Connect the clip at the end of firing strap to the firing pin. Make sure that the firing strap is not twisted, it must be moving freely, and it must lie on top of the hood.
3. Now close zipper entirely until its end over the break gap in the zipper chain, keep hood well in its position. Observe that nothing is trapped in the zipper chain and keep the loop at the end of the firing strap outside the bag.
4. Make sure that the pressure gauge is visible and readable through the bag visor [the hood must not be visible].
5. Fold the bag flap over and feed it through the firing strap loop to fix loop outside bag.
6. Feed the anti-tamper tag through the eyelets in the bag and the flap to fix the flap and the firing strap loop. Adjust the length of the anti-tamper tag such that it is tight but not under tension and slightly movable
7. Now the **S-Cap-Air** is ready for use.

(When the firing strap is pulled, the anti-tamper tag breaks, the firing pin is pulled from the cylinder valve cap, the valve opens, the air supply starts, the zipper opens, and the hood can be drawn out.)

## **WARNING**

**Do not handle the unit by the valve / regulator use carrying strap or cylinder body !**

## **2.3 Storage / Stowage**

The equipment must be stored / stowed in accordance with MSC / Circ. 849 "Guidelines for the performance, location, use and care of Emergency Escape Breathing Devices (EEBD's)" suitably protected from the environment. The unit shall be stored / stowed in a clean and dry condition, free of contaminants and protected from direct sunlight.

**WARNING:** During storage / stowage do not forcefully bend materials, seams and zipper.

### 3 Maintenance

#### 3.1 Schedule

MSA uses the most modern production technologies and best design practice to keep maintenance expenses as low as possible.

**In case of doubt regarding the maintenance and inspection intervals, please contact your local sales organisation and / or check your local regulations and requirements.**

Component	Work to be performed	On pick- ing up	After use	Monthly	Annu- ally	Notes
<b>Hood</b>	Clean, disinfect		<b>X</b>			4.2
	Inspect		<b>X</b>		<b>X</b>	3.3
<b>Hose</b>	Clean, disinfect		<b>X</b>			4.2
	Inspect		<b>X</b>		<b>X</b>	3.3
<b>Regulator Cylinder Valve</b>	Clean		<b>X</b>			4.2
	Inspect		<b>X</b>		<b>X</b>	3.3
<b>Gauge / Tamper Tag</b>	Inspect	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	3.2
<b>Bag</b>	Clean		<b>X</b>			4.2
	Inspect		<b>X</b>		<b>X</b>	3.3
<b>Cylinder</b>	Clean		<b>X</b>			4.2
	Inspect		<b>X</b>		<b>X</b>	3.3
	Charge		<b>X</b>			2.1
	Hydrostatic Test					*)
<b>S-Cap-Air Assembly</b>	Functional Check		<b>X</b>		<b>X</b>	3.4

This maintenance schedule is recommended by the manufacturer.

\*) The official hydrostatic test should be carried out as required by national regulations.

**Please observe national regulations and contact your national authorities for further information.**

Rubber components are subject to ageing according to conditions and therefore must be checked in regular intervals and replaced if necessary.

**Note: Some maintenance works may only be made by trained and authorised technicians**

#### 3.2 Monthly checks

Check cylinder for full charge [pressure gauge indication in green section]. Check that tamper tag is intact, check entire S-Cap-Air for visible external damage.

### 3.3 Annual Checks

Complete visual inspection for any mechanical damage such as cuts, tears, abrasion, or other mechanical damage on the following components:

- Bag, harness and firing strap.
- Air hose, hose connector and its O-ring. Damaged, stiffened, brittle hoses and O-rings must be replaced. O-ring for hose connection port [part no. 10024118]
- Hood, neck-seal and nose cup. The exhalation valve disk must be replaced all 3 years [part no. D2055749].
- Regulator valve and pressure indicator.
- Cylinder. Test cylinder according to national regulations.
- Any damaged or disabled parts/components must be replaced.

### 3.4 Functional Checks

In addition to the visual inspection described above, the **S-Cap-Air** must be tested for its proper function. The tests and test results are to be recorded and filed with respective serial numbers and date. Any parts/components damaged or disabled must be replaced.

#### 3.4.1 Standard Functional Test

To do so, a properly charged **S-Cap-Air** is started, the warning indicator is kept under observation. It must change from **GREEN** to **RED** after 15 minutes at the earliest and after 18 minutes at the latest. During this period, the pressure indicator indication must change slowly but continuously from full to empty. After the test is successfully passed, the S-Cap-Air must be recharged and packed again (see 2.1 and 2.2).

#### 3.4.2 Functional Test with Flow Meter

Pull clip from hose connection, then pull supply hose off the connection. Connect Flow Meter (30 up to 50 l/min) with hose connector. Open cylinder valve of a properly charged **S-Cap-Air** briefly by turning open the valve cap and read value on the scale of the flow meter. The value must be between 35 and 41 l/min. Close the air cylinder valve again until the air flow stops. Disconnect Flow Meter and connect hose and clip back to the hose connector. Open cylinder valve briefly by turning open the valve cap and read warning indicator. The warning indicator must be fully **GREEN**. Close the air cylinder valve again until the air flow stops. The warning indicator now must change from **GREEN** to **RED**. Then turn in the valve cap another 60°. Now the firing pin must be parallel in line with the hose connection. If it is not, turn valve cap loose again, pull firing pin out and put it back into the cap on the opposite side. Then close the valve again as explained above.

**Note :** The additional turn of 60° beyond the valve closing point [air flow stops] assures a properly and tightly closed valve. Any over-tightening beyond this would considerably increase the required activation force.

Check the cylinder pressure and top up if necessary (see 2.1)

## 4 Inspection, Repair and Testing

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### 4.1 Requirements

- Components damaged or disabled by material fatigue, corrosion, strong wear and tear, or disabled in any other way must not be used any longer.
- All components must be clean and free from contamination that may affect the quality of breathing air or the user.
- **S-Cap-Air** sets and all their components must be inspected according to this manual. The inspection intervals must not exceed 1 year. Defective or suspicious units must be inspected immediately.
- Service, maintenance, and repairs shall be made in a clean environment.

### 4.2 Cleaning

The cleaning of **S-Cap-Air** sets and their components shall be done as following:

- **Note! Do not submerge S-Cap-Air in cleaning solutions or in water.**
  1. Disconnect hood and hose from valve.
  2. Wipe hood interior and exterior thoroughly with a moist cloth, then disinfect with a disinfection cloth. Finally dry with a soft lint free cloth.
  3. Disinfect nose cup in a mild disinfection solution (follow disinfectant instructions), rinse thoroughly in clean water and finally dry with a lint free cloth, or use warm air at 50°C max (avoid direct sunlight or heat radiation).
- **Notice: Do not submerge pressure indicator, clean only with a moist cloth.**

### 4.3 Disassembly and Tests

The **S-Cap-Air**, if damaged or defective, can be disassembled into the following sub-assemblies/components and is tested as described:

**Notice: Before working on the valve and/or the cylinder, the cylinder must be entirely empty.**

- **Compressed Air Cylinder:**

Check coating and markings on cylinder: If applicable, remove incorrect or supplementary unauthorised markings. Minor defects in the coating can be repaired, if the cylinder has major damages, it must be replaced. Internally the cylinder must be free from contaminants, it must be dry and free from odours. The cylinder thread must be checked with a thread gauge.

Defective or faulty cylinders are to be replaced.

The cylinder must also be pressure tested in accordance with the national regulations. The next due pressure test date (e.g. TÜV) must not be exceeded until the next S-Cap-Air annual inspection.

- **Pressure Indicator:**

Check for damages

- **Supply Hose and Hood:**

Examine for defects including the connection and retaining clip. Check the visor for kinks and disturbing creases, that may impair vision. Examine hood for rips, holes, abrasion, examine neck seal for tears, elasticity and possible ageing, and loss of elasticity. Replace the hood if any of these defects are found.

- **Bag:**  
Check for damaged stitching, rips, holes, abrasion etc. Check carrying strap and buckles. Examine completeness of the instructions for donning. If repair is not possible, replace bag.

#### 4.4 Functional Tests

- **Pressure Indicator**  
Check against a standard gauge (e.g. that of a compressor), at 207 bar cylinder pressure the indication must be in the green segment (cylinder full).
- **Cylinder and Valve**  
Check assembled and charged cylinder with closed valve (Screw cap with firing pin in position) for leaks (use a suitable liquid leak detector, detector spray, or soap solution and brush) Check burst disc, pressure indicator, charging port (without dust cap), hose connector [valve closed] and charging port O-ring seat. Repair or replace gaskets as necessary to eliminate all leaks. Check warning indicator (see 3.4). The leak test can also be done with a properly charged (see 2.1) S-Cap-Air. Allow the unit to stand for 3 days and verifying that pressure has not dropped.

#### 4.5 Reassembly

On reassembly avoid thread over tightening which may cause damage to the threads or components. Only apply sufficient torque as given in this manual to achieve the necessary thread engagement and "nip" on seals. Mark month and year of test on the carry bag label.

## 5 Component Level Servicing Instructions

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### 5.1 Replacement of Hood

[Part number 10019509, Service Hood ( without items 9,10 and 11, see illustration on page 14)]

Pull clip from hose connection, then pull supply hose off the connection. Unscrew the exhalation valve. Pull warning indicator/air outlet off hose, and pull hose out of hood. Take new service hood and reassemble in reverse order.

Hose [Part number 10018456, Hose assembly spare part]

Push hose through hose loops into the hood, push indicator/air outlet [part number 10018455, Warning Indicator/air outlet spare part] on to hose when it is in the hood. It must be impossible to pull the properly positioned hose out of the hood. The indicator must be visible through the hood visor.

Screw in exhalation valve [part number 10019487, Exhalation valve assembly spare part]. Check O-ring on hose connection, replace if necessary [part number 10024118, O-ring for hose connection, pg 10].

Check the two felt disks in the hose connection for cleanliness, if necessary, replace [part number 10019508, felt disk, spare, pg 10]. Carefully push hose entirely on hose connection, lock it in position with the clip [part number 10019483, clip spare part, pg 5]. Finally make function test.

## 5.2 Replacement of Hood using Hood Assembly

[Part number 10019481 Hood assembly spare part].

Pull clip from hose connection, then pull supply hose off the connection. Take new hood assembly, place 2 off felt discs [part number 10019508, felt discs spare part, pg 10] in the free end of hose. Check O-ring on hose connection, replace if necessary [part number 10024118, O-ring for hose connection, pg 10]. Carefully push hose entirely on hose connection, lock it in position with the clip [part number 10019483, clip spare part, pg 5].

Finally make function test.

## 5.3 Replacement of Pressure Indicator

**Note: Prior to any servicing ensure that cylinder is fully discharged.**

[Part number 10019482 pressure indicator spare part]

Unscrew old indicator. Check seal whilst indicator is dismantled, clean if required. Screw in new indicator [18 Nm] **using a hexagonal nut**. Check for leaktightness by pressurising cylinder and using liquid leak detector, leak detector spray, or soap solution with brush.

## 5.4 Replacement of Valve Assembly

**Note: Prior to any servicing ensure that cylinder is fully discharged.**

[Part number 10019485 valve assembly spare part]

Disconnect hood from valve. Pull clip from hose connection, then pull supply hose off the connection. Unhook clip from firing pin. Unbutton pressure indicator from bag loop, then withdraw complete cylinder / valve assembly from bag. Unscrew pressure indicator. Remove valve cap and firing pin. Clamp cylinder securely, and dismantle complete valve assembly from cylinder with 26-mm wrench (25,4-mm for old ones). Check cylinder interior for contamination and that it is dry. Check cylinder thread with thread gauge for any damage. The cylinder thread must be dry and free from contamination.

The replacement valve assembly comes complete with o-ring. The valve is screwed into the cylinder with a locking force of 60 + 20 Nm torque. Check seal in gauge connection, clean if required. Screw in pressure indicator [18 Nm]. Screw valve cap with firing pin back in place, then charge cylinder. Check for leaktightness by using liquid leak detector, leak detector spray, or soap solution with brush. After leak test put cylinder and valve assembly back in the bag. Check O-ring on hose connection, replace if necessary [part number 10024118, O-ring for hose connection, pg 10]. Check the two felt disks in the hose connection for cleanliness, if necessary, replace [part number 10019508, felt disk, spare, pg 10]. Carefully push hose entirely on hose connection, lock it in position with the clip [part number 10019483, clip spare part, pg 5].

Finally make function test.

## 5.5 Replacement of Bag

[Part number 10018520 spare part bag **S-Cap-Air**]

[Part number 10034562 spare part bag S-Cap-Air 'Light']

Disconnect hood from valve. Pull clip from hose connection, then pull supply hose off the connection. Unhook clip from firing pin. Unbutton pressure indicator from bag loop, then withdraw complete cylinder / valve assembly from old bag and put it back again into new bag in reverse order.

## 5.6 Replacement of Cylinder

**Note:** Prior to any servicing ensure that cylinder is fully discharged.

[Part number 10034231 Steel cylinder 3 litres with valve (15 min.)]

[Part number 10033901 Composite cylinder 3 litres with valve (15 min.)]

Disconnect hood from valve. Pull clip from hose connection, then pull supply hose off the connection. Unhook clip from firing pin. Unbutton pressure indicator from bag loop, then withdraw complete cylinder / valve assembly from bag.

Charge new cylinder. Put new cylinder and valve assembly into the bag. Check O-ring on hose connection, replace if necessary [part number 10024118, O-ring for hose connection, pg 10]. Check the two felt disks in the hose connection for cleanliness, if necessary, replace [part number 10019508, felt disk, spare, pg 10]. Carefully push hose entirely on hose connection, lock it in position with the clip [part number 10019483, clip spare part, pg 5].

Finally make function test.

## 5.7 Replacement of Burst Disc

**Note:** Prior to any servicing ensure that cylinder is fully discharged.

[Part number 10032930 Burst disc spare part kit]

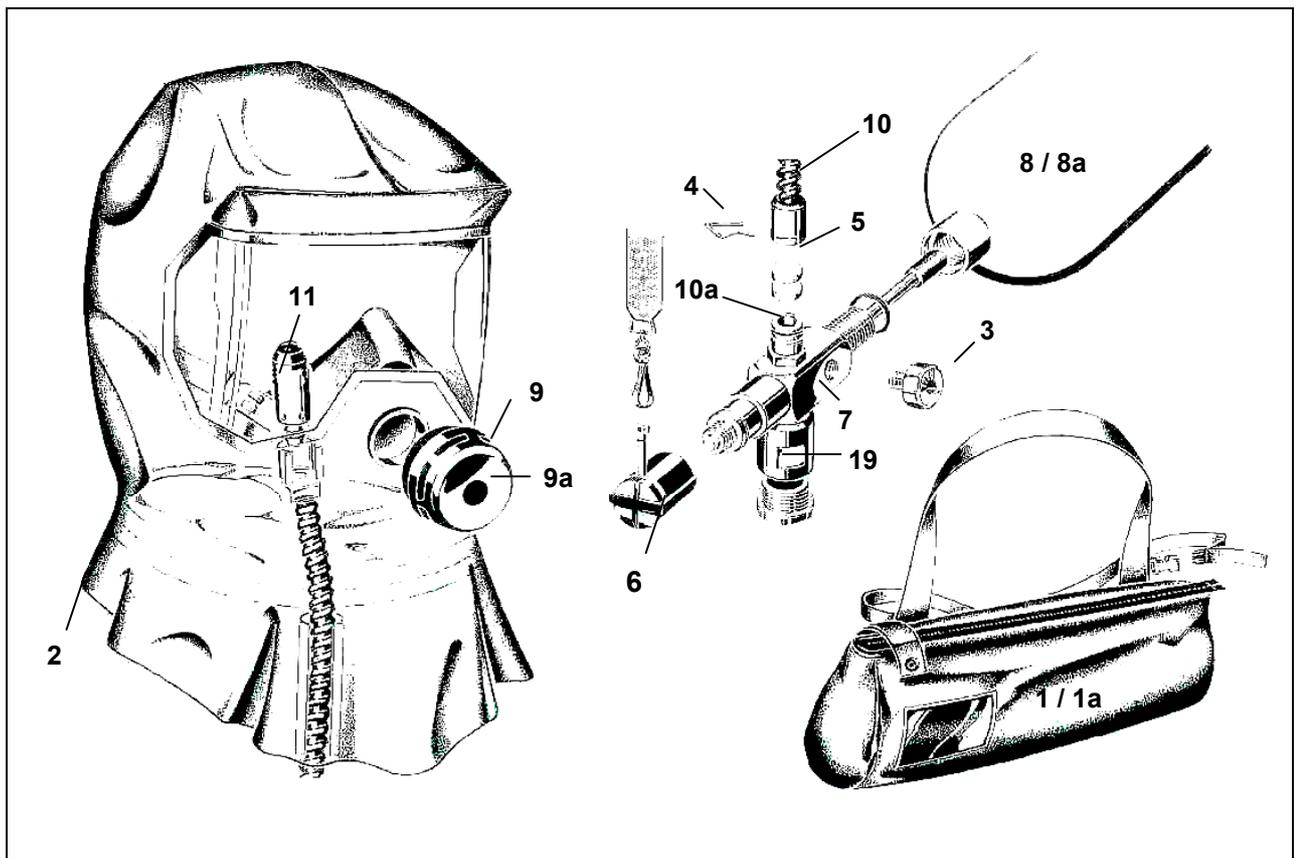
Unscrew burst disc retaining screw (opposite to indicator) remove old burst disc and gasket. All 3 components must be replaced since they are calibrated to each other. Fit new gasket, observe cleanliness. Fit new burst disc with bulging to outside. The new retaining screw is fitted with a locking force of  $5,9 \pm 0,3$  Nm torque. Charge cylinder. Check for leak-tightness by using liquid leak detector, leak detector spray, or soap solution with brush.

## 5.8 Replacement of Charging Port

**Note:** Prior to any servicing ensure that cylinder is fully discharged.

[Part number 10044717 Charging Port complete]

Unscrew the filling port with 27-mm wrench. Screw in new filling port [30 Nm]. Check for leak-tightness by pressurising cylinder and using liquid leak detector, leak detector spray, or soap solution with brush.



## 6.1 Spare Part List S-Cap-Air

Item	Designation	Part Number
1	Carrying Bag	10019480
1a	Carrying Bag „Light“	10034562
2	Hood Assembly	10019481
3	Pressure Indicator	10019482
4	Clip (pg 5)	10019483
5	Felt Disc (pg 10)	10019508
6	Valve Cap, Firing Pin, O-ring	10019484
6a	O-ring 17,04 x 3,53 (pg 5)	10034230
7	Valve Assembly	10019485
8	Steel cylinder 3l [15 min], with valve	10034231
8a	Composite cylinder 3l [15 min], with valve	10033901
9	Exhalation Valve Assembly	10019487
9a	Exhalation Valve Disc (pcs 10)	D2055749
10	Hose Assembly	10018456
10a	O-ring for hose connection	10024118
11	Warning Indicator / air outlet	10018455
12	Service Hood (w/o parts 9,10 and 11)	10019509
13	Anti Tamper Tags (pcs 25)	10023512
14	Cleaner Disinfectant AUER 90 (2 l)	D2055765
14a	Cleaner Disinfectant AUER 90 (6 l)	D2055766
15	Sanitising wipe (200 pcs)	10000442
16	Demisting Compound (Gel) 50 ml	D2260700
16a	Demisting Compound (Spray) 100ml	10032164
17	Burst disc (1 set)	10032930
18	60° Gauge Valve Cap	10045531
19	Charging Port complete	10044717

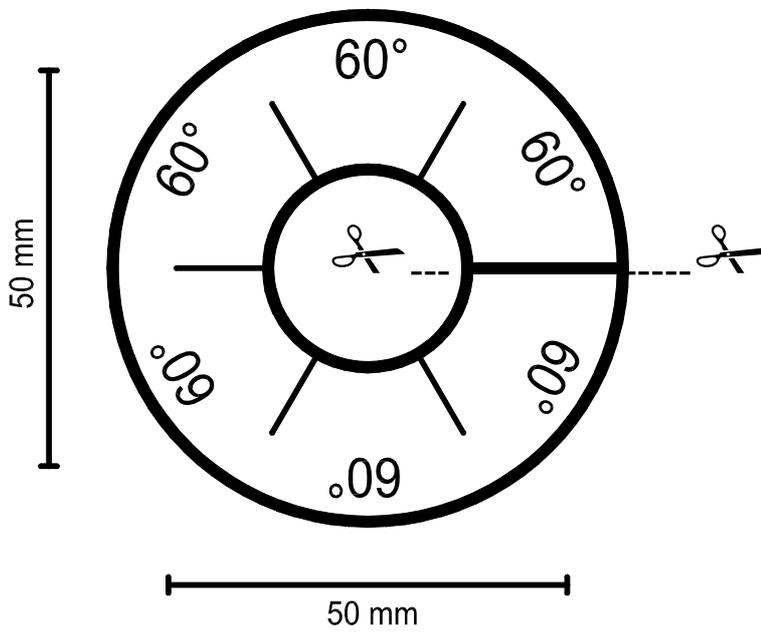
## 7 Ordering Information

S-Cap-Air 15, cylinder empty	10017668
S-Cap-Air 15, cylinder charged	10032181
S-Cap-Air 15 'Light' cylinder empty	10033919
S-Cap-Air 15 'Light' cylinder charged	10034561

## 60° Tool

please cut out

how to use see 2.1.4 in the instructions



**Notes:**

# MSA in Europe

## Northern Europe

### Regional Head Office

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