MSA
The Safety Company

Operating Manual

MSA AirElite 4h

Breathing Apparatus

CE

Order No.: 10067731/06

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Contents

1. Safety Regulations

1.1. Correct Use

The MSA AirElite 4h breathing apparatus - hereinafter referred to as apparatus - is a closed circuit apparatus with breathing air regeneration. It permits working and rescuing for long periods of time, e.g. firefighting or interventions by mine rescue teams with up to 4 hours operating time.

The use of this breathing apparatus is permissible only for skilled and trained personnel.

It is imperative that this operating manual be read and observed when using the apparatus. In particular, the safety instructions, as well as the information for the use and operation of the apparatus, must be carefully read and observed. Furthermore, the national regulations applicable in the user's country must be taken into account for a safe use.

Danger!

This product is supporting life and health. Inappropriate use, maintenance or servicing may affect the function of the device and thereby seriously compromise the user's life.

Before use, the product operability must be verified. The product must not be used if the function test is unsuccessful, it is damaged, a competent servicing/maintenance has not been made, genuine MSA spare parts have not been used.

Alternative use, or use outside this specifications will be considered as non-compliance. This also applies especially to unauthorised alterations to the apparatus and to commissioning work that has not been carried out by MSA or authorised persons.

1.2. Liability Information

MSA accepts no liability in cases where the product has been used inappropriately or not as intended. The selection and use of the product are the exclusive responsibility of the individual operator.

Product liability claims, warranties also as guarantees made by MSA with respect to the product are voided, if it is not used, serviced or maintained in accordance with the instructions in this manual.

2. Description

2.1. Apparatus Overview

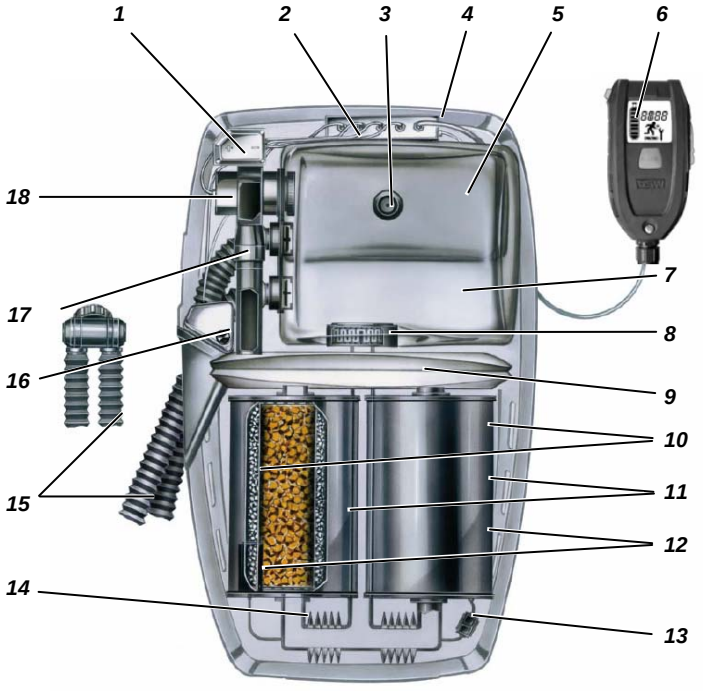


Fig. 1 Overview

1	*Battery (rechargeable)*	*11*	*Chemical canister (2x)*
2	*Electronic distributor*	*12*	*Quick starter (2x)*
3	*Surplus valve (on breathing bag reverse)*	*13*	*Connection starter cable*
4	*Charging jack*	*14*	*Ventilation pipe with cooler*
5	*Exhalation bag*	*15*	*Breathing hose assembly*
6	*IC-Air (on the right-hand shoulder harness)*	*16*	*Sensor assembly*
7	*Inhalation bag*	*17*	*Valve control*
8	*Particle filter*	*18*	*Blower*
9	*Air distributor*	*--*	*Mask connection with autostart (on left shoulder harness)*
10	*Cooling jacket (2x)*		

The apparatus is housed in an impact-resistant and shockproof plastic housing. It is worn on the user's back by shoulder harnesses and waist belt.

The apparatus contains two chemical canisters (11), connected in parallel. These canisters contain potassium hyperoxide required for regenerating the breathing air. The canisters are provided with quick starters (12) and surrounded with a service free cooling jacket (10). **The chemical canisters can only be used once and must be replaced after use.**

Above the air distributor (9) is the breathing bag unit with an inhalation bag (7), an exhalation bag (5) and the surplus valve (3). A class P3 particle filter (8) to EN 143 is fitted on the air inlet side of the inhalation bag.

The valve control (17) connects the breathing hose assembly (15) to the inhalation bag and exhalation bag. The blower (18) and the sensor assembly (16) are attached to the valve control.

On the intake side, the blower is connected to the exhalation bag and on the outlet side with the air distributor. The sensor assembly provides data for calculating the residual capacity.

The blower, the quick starter, the sensor assembly, as well as the monitoring unit and control monitor IC-Air (6), are supplied with energy by the battery (1). The battery can be recharged via the charging jack (4) using the battery charger for AirElite 4h batteries (order no. 10068542).

The breathing hose assembly is protected from damage by a flash-over protection. It is connected to the valve control of the apparatus. The breathing hose assembly is attached to and lead sealed in a socket on the left-hand shoulder harness. When removing the breathing hose assembly from the socket an electrical contact triggers an autostart which puts the apparatus into operation.

Above the breathing bag unit is the electronic distributor (2) with connections for the IC-Air, the autostart, the blower, the sensor assembly and the battery. The connections to the distributor are identified by symbols.

Fig. 2 Symbols at the distributor

The apparatus can, alternatively, be used with chemical canisters for operating times of up to 4 hours (at a breathing minute volume of 30 l/min) or with chemical canisters for operating times of up to 2 hours (at a breathing minute volume of 40 l/min) or with a training canister depending on the ambient atmosphere (with a special non-interchangeable housing cover). The electronic control of the IC-Air identifies the type of canister being used automatically, displays it and calculates the percentage residual capacity accordingly.

The full face masks 3 SR AirElite or Advantage AirElite are available as options (see the operating manuals for the full face masks).

Attention!

The AirElite 4h is a breathing apparatus for gaseous atmospheres. It must not be used for diving.

2.2. Function

The apparatus is a closed circuit breathing air regeneration apparatus based on chemical oxygen. The regeneration of breathing air is carried out with potassium hyperoxide.

In use, the exhaled air is transferred to the chemical canisters with the potassium hyperoxide. The potassium hyperoxide reacts with the humidity and the carbon dioxide of the exhaled air and, at the same time, develops oxygen and heat. The amount of the resulting oxygen is dependent on the intensity of respiration. Increased respiration (more carbon dioxide, more humidity) increases the formation of oxygen or vice versa.

The breathing air temperature is reduced by coolers located before the inhalation bag.

At any given time, more oxygen is developed than consumed. The breathing air provided is dry.

The residual capacity is monitored and displayed in percent by the electronic monitoring unit and consumption indicator (IC-Air). In addition to the indication, acoustic and visual warnings are produced when reaching a residual capacity of 50%, 20% and 5%.

The IC-Air is equipped with a motion detector. In the event of motionlessness of the apparatus user, it automatically sounds an alarm. If required, the alarm can also be activated manually.

The apparatus and the IC-Air start automatically as soon as the mask connection of the hose assembly is disconnected from the socket with autostart on the shoulder harness.

Attention!

Never remove the breathing hose assembly for trial from the socket of the shoulder harness.

When removing the breathing hose assembly from the socket on the left-hand shoulder harness the apparatus starts.

Also the chemical canisters are started and must be replaced before another use.

Attention!

Observe temperature limitations in use. The minium temperature for starting must not be less than – 6°C. If the apparatus has been stored at 20 +/- 5°C right before use, – 15°C is permissible.

3. Technical Data

Dimensions H x W x D (housing)	:	600 mm x 360 mm x 190 mm
Weight ready for use	:	approx. 15 kg (less mask)
Maximum service life [1]	:	Depending on consumption With breathing canisters for 4 hours' operation: ▪ 4 hours at BMV 30 l/min ▪ 6 hours maximum operational duration at reduced BMV < 20l/min With breathing canisters for 2 hours' operation: ▪ 2 hours at BMV 40 l/min ▪ 3 hours maximum operational duration at reduced BMV < 20l/min
Storage in readiness and starting	:	-6°C to +60°C
Operational temperature (after starting)	:	-15°C to +60°C
Breathing resistance with breathing canisters with a 4 hour operating time at BMV 30 l/min [2]	:	Inhalation: -3 mbar Exhalation: +5 mbar
Breathing resistance with breathing canisters with a 2 hour operating time at BMV 40 l/min [2]	:	Inhalation: -4 mbar Exhalation: +6 mbar
Inhalation Air		
Temperature	:	+30 °C to +45 °C
Humidity	:	20 % to 40 %
Carbon dioxide	:	< 1.0 vol.% (mask not considered)
Oxygen	:	> 80 vol.%

[1] BMV - Breathing minute volume according to DIN 58652-2

[2] Mask not taken into consideration

Maximum surface temperature	:	Temperature class T4 (with a 4 hour operation time according to EN 50014).
Electronic control	:	Ex-protected according to EEX ia IIC T4 ATEX 94/9, Group 1, cat. M1 dust and water protection tested acc. to IP 67 EMC according to EN 61000-6-1 and EN 61000-6-2
Housing	:	Plastic, self-extinguishing, impact-resistant, antistatically treated
Breathing connection	:	3 SR AirElite or Advantage AirElite full face masks

4. Operation

4.1. Preparing for Use

Attention!

The apparatus is delivered without chemical canisters. For storage in readiness, the apparatus must be prepared for use by trained personnel.

On delivery ex factory the battery is not connected to the electronic distributor. For charging connect battery first.

(1) Remove housing cover (→ Section 5.2 item. (1)).

(2) Connect battery to electronic distributor and charge the battery for 24 hours using the charging jack (→ Section 2.1 and 5.1).

(3) Fit chemical canisters (do not connect starter cable plugs). (→ Section 5.10)

(4) Check apparatus for tightness (→ Section 5.11).

(5) Connect chemical canister starter cable plugs (→ Section 5.11, item 2).

(6) Check apparatus for operational readiness (→ Section 5.12, item 7).

(7) Lead seal housing and mask connecting piece (→ Section 5.12, item 8).

The apparatus stored in readiness can immediately be used. In standby mode, the harness should always be extended to full length.

4.2. Donning the Apparatus

(1) Don the shoulder harnesses

(2) Tighten shoulder harnesses as required.

(3) Don waist belt

(4) Tighten waist strongly.

(5) Loosen shoulder harness slightly, the apparatus weight rests on the hip.

(6) Close breathing hose support.
(7) Tighten hose support as required.

(8) Press test button on IC-Air for approx. 1 second (→ Section 4.5).
- LED lights red and changes to green.
- LCD symbols and software version appear on the display.
- Brief acoustic signal sounds.
- Background light in the display illuminates.
- Indication of canisters fitted (2 h or 4 h) and indication "go“. The apparatus is ready for use.
- Thereafter the IC-Air switches off.

The apparatus is ready, however has not yet started. If not used, the lead sealed apparatus can be returned to storage in readiness.

During test do not start the apparatus. However, if you have disconnected the breathing hose assembly from the socket on the shoulder harness, the display "go" remains stable, as the device remains in test mode, the canisters are not started. In this case, reconnect the hose assembly to the socket again. To start, remove the mask connection from the socket again.

Attention!

If the red LED flashes, the Err display with the error code is shown alternately or an audible warning sounds, the system is not ready for use. After approx. 15 seconds the IC-Air switches off by itself. Connect hose assembly to socket again.

Carry out troubleshooting and re-establish readiness.

4.3. Donning the Full Face Mask

(1) Don 3 SR AirElite or Advantage AirElite full face mask (see operating manual for the full face mask).

(2) Check the fit of the full face mask during inhalation **and** exhalation using the palm test (see operating manual for the full face mask).

Attention!
The full face mask must be tightened carefully to safely avoid loss of breathing air.

4.4. Starting

(1) Remove breathing hose assembly by gently turning handwheel and pulling it entirely out of the socket on the left shoulder harness.
- Lead seal breaks.
- Apparatus starts automatically a function test and is ready for use after approx. 15 seconds (IC-Air indictes “100”).
- During the function test DO NOT engage breathing hose assembly into the full face mask.

(2) After the consumption indicator on the IC-Air indicates "100", engage the breathing hose assembly into the full face mask.

(3) Continue to breathe normally.

(4) Close socket on the left shoulder harness with the protection cap.

If the screen displays an „Err“ and the error code „20“ then reconnect the hose assembly to the socket on the shoulder harness and start the apparatus again. At the same time lightly press the breathing hose connection to the IC-Air side, to facilitate the function test.

After starting the apparatus first provides a function test of all electronic parts, the signals and a calibration. The IC-Air consumption indication starts a count down, followed by the indication of software version and canister type. During the function test an acoustic interval signal sounds, the LED flashes red. At the end an acoustic double signal sounds, the LED flashes green, the display indicates “go”, followed by “100” plus cylinder symbol.

If the breathing hose assembly is not pulled out of the socket entirely, the display indicates the warning “pull”. In this case remove the breathing hose assembly entirely and hold it in readiness in front of chest until function test is completed.

If „Err“ is indicated, the canisters are not started.

Attention!

In case of a malfunction in the electronics (red LED and warning signal) or a total failure immediately leave the hazardous area and return to fresh air. The apparatus continues to deliver breathing air so that an auxiliary apparatus is not required for the retreat.

4.5. Monitoring Unit and Consumption Indicator IC-Air

The IC-Air is used for the control and monitoring of the proper functioning of the apparatus, the indication of operational data as well as indicating and signalling hazardous conditions. It also warns when detecting motionlessness of the apparatus user and offers the possibility of activating the alarm manually.

Neues Bild

	Symbol "spanner" ▪ Calibration mode or error
	Symbol "running man" ▪ Evacuation required.
	Symbol "cylinder" ▪ Residual capacity in 8 stages
	"Battery" symbol ▪ Battery charging status
bAtt	Battery insufficiently charged
2h 4h 4htr	Symbol "canister Indication" ▪ 2 h or 4 h canister ▪ Training canister is installed
pull	Breathing hose assembly not pulled out of socket entirely
100	Symbol "Number display" *) ▪ Residual capacity or error code
tr	Symbol "tr" *) ▪ Training canister is in use

*) Both symbols are indicated alternately, if training canister is used.

Fig. 3 IC-Air and display symbols

1 Test button (green), display light
2 Display
3 LED button (red/green), manual alarm call
4 Reset button (yellow)

Monitoring and Display Functions

- Identification of the breathing canisters fitted (2 h, 4 h, training canister).
- Control of the battery charge level; warning when the battery is low.
- Digital capacity display in % (from 100 to 0 downwards).
- Residual capacity in 8 stages ("Cylinder" symbol).
- At 50 % residual capacity, a brief acoustic warning signal sounds.
- As from 20 % residual capacity, the LED flashes red-green alternately, an interval signal sounds and the retreat symbol ("Running Man") appears on the display.
- As from 5 % residual capacity the LED flashes red, the retreat symbol flashes and a warning sound (rapid beep) is emitted.

This warning sound repeatedly can be turned off for approx. 90 seconds by pressing the Reset button twice.

- At 0 % residual capacity, the warning function continues (LED is flashing red, the retreat symbol flashes and warning sound. The mission must be finished by then. The apparatus continues to operate utilising the residual capacity.

Function Control after Assembly and before Use

(1) Press the test button on IC-Air until the LED indicates green and the symbols on the display appear (→ Section 4.2 item (8).

Manual Alarm Call

It only functions if the apparatus is in operation.

(1) Push LED button until the alarm sounds.

Switching off the Motion Alarm

(1) If automatically released and in the pre-alarm stage (3 stages) move the IC-Air.

(2) If automatically released and in full alarm, press the reset button twice.

(3) If manually activated press the reset button twice.

Illumination of the Display

(1) Press Test button.
   - The display is illuminated for about 6 seconds.

Error Display in Test Mode

Check the function of the apparatus after assembly and before use. To do so, press the test button until the IC-Air confirms readiness.

In case of a malfunction the following error codes are shown:

bAtt Battery defective or insufficiently charged.

1 - Autostart not connected to the distributor.

2 - Starter or canister not connected or canister already used.

4 - Blower motor defective, blocked or disconnected.

8 - Temperature sensor in the sensor assembly faulty.

20 - Pressure sensor in the sensor assembly faulty or calibration not successful.

28 - Complete sensor assembly faulty or not connected to the distributor (pressure sensor = 20 + temperature sensor = 8).

Several simultaneous errors are shown as a total, (e.g. Starter and blower = 6), except for the error bAtt. This is shown as a main error, always on its own.
In addition to the error code, there is also a visual (red LED) and acoustic (Beep) alarm indication.

The error codes 50, 70, 75, 80 and 90 indicate a defect in the IC-Air. Return the IC-Air to the MSA Customer Service for repair.

4.6. End of Use

(1) After use, disconnect the breathing hose assembly from the full face mask.

Attention!

After an interruption of use, subsequent use of the apparatus (without reconditioning) is possible within the timeframe of the capacity indication. During the interruption the breathing hose connection **must not be plugged** into the socket on the left shoulder harness, as then the apparatus is switched off irreversibly and cannot be reused.

If the usage of the apparatus is interrupted, the capacity reduces by 1%/min (2h-canisters) or 0.7%/min (4h-canisters).

(2) Plug the breathing hose assembly into the socket on the left shoulder harness.
- The apparatus switches off.
- An accoustic double signal sounds.

(3) Open the waist belt by pressing on the buckle (from the inside) and remove the apparatus.

(4) Return the used apparatus for reconditioning.

5. Maintenance and Service

The apparatus requires very little maintenance. Therefore it is particularly suitable for long periods of storage in readiness.

Attention!

This apparatus must be regularly checked and serviced by qualified specialists only. Inspection and service records must be maintained. Always use original parts from MSA.

Repairs and maintenance must be carried out only by authorised service centres or by MSA. Modifications of the apparatus or its components are not permissible and result in loss of approval.

MSA is liable only for maintenance and repairs carried out by MSA.

For cleaning do not use organic solvents like alcohol, white spirit, petrol, etc. Use exclusively the disinfectant AUER 90, tested and approved by MSA.

When drying/washing, do not exceed the maximum permissible temperature of 60°C.

See Section 7 for a list of spare parts. For questions regarding the apparatus, or any further information, please contact the MSA representative.

5.1. Inspection and Maintenance

MSA recommends the following maintenance intervals. If needed and by considering the usage, the activities may be required at shorter intervals than indicated. Observe national laws and regulations! If in doubt, ask the MSA representative.

6-Monthly

- Visual control of the lead-seal on the autostart and housing.
- Recharge the battery via the charging jack (→ Fig. 1 on page 5) for at least 24 h at an ambient temperature > 10°C.
  The red charging control light of the battery charger must light up during the entire charging process.

When the apparatus is continuously connected to the charger (trickle charge) via the charging jack, periodical recharging is not required.

- Control of the operational readiness with the test button on IC-Air.

Every year, if chemical canisters are fitted and the apparatus is not used

Attention!
If chemical canisters are fitted, we recommend to disconnect the battery from the electronic distributor during all maintenance and service activities.

- For breathing apparatus carried regularly on vehicles, a tightness test must be made (→ Section 5.11) and the operating readiness (→ Section 5.12) must be established.

Attention!
Tightness tests should not be made more than once a year to prevent performance reduction caused by entry of moisture.

Tightness tests must be made with dry air only.

Every 2 years if chemical canisters are fitted and the apparatus is not used

- Replacement of chemical canisters (→ Section 5.10) with subsequent tightness test in accordance with (→ Section 5.11) and establishment of operating readiness (→ Section 5.12).

If the apparatus has not been used within 2 years, we recommend to do a training before expiry of the canister storage period.

Attention!
Used chemical canisters can be identified by the discolouration of the thermo-markers on the canisters. When the chemical canisters are used, the thermo-marker indication segments turn black. The canisters cannot be used again.
Always replace both canisters at the same time.

Every 5 years

- Replace battery.
  Charge the new battery for 48 h at an ambient temperature above 10°C.
  Check the apparatus operational readiness after the battery change (test button on IC-Air).

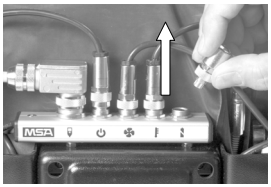
Separately stored factory sealed and airtight packed chemical canisters:

- Check the manufacturing date of the factory sealed and airtight packed chemical canisters. They must be used within 5 years. The packaging must only be removed immediately before fitting the chemical canisters in the apparatus.

For service and maintenance we recommend to use the AirElite tool kit (part no. 10068546)

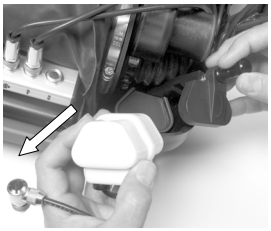
5.2. Disassembly of the Apparatus

(1) Unscrew housing with 4mm allen key and remove.
- Lead seal breaks.



(2) Unscrew battery cable plug on the distributor and pull plug out.

Symbol on the distributor

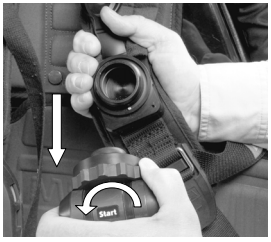


(3) Loosen battery grip screw until cover can be pushed aside.

(4) Remove battery

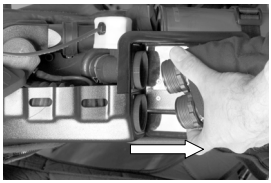
(5) Recharge battery for 24 h with charger and adapter cable (→ Section 7).

If adapter cable is not available, charge battery for 24 h in installed condition via the charging jack of the breathing apparatus (battery cable plug must then be connected to distributor). In this case disconnect autostart plug (symbol ⏻) from electronic distributor for the following described activities to avoid activation of the apparatus.



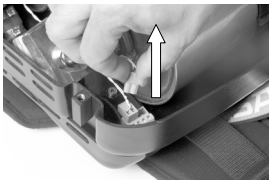
(6) Remove the breathing hose assembly from the socket on the left shoulder harness (autostart).

Gently turn and pull the hand wheel.

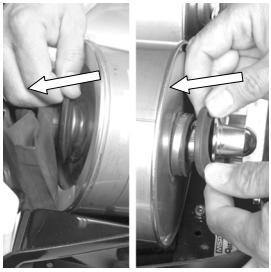


(7) Unscrew breathing hose assembly from apparatus (bottom side first).

(8) Open the zip of the flash-over protection.
(9) Open both push-button loops.
(10) Remove the flash-over protection from the hoses.

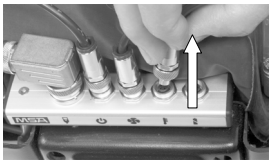


(11) Pull out starter cable plugs of both chemical canisters.



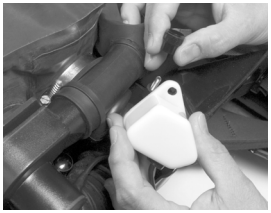
Attention!
Chemical canisters become hot when used. Let canisters cool down before removal or use protective gloves.

(12) Loosen chemical canister belts.
(13) Unbutton both canisters at the top and bottom from the rubber collar and pull them out upwards.
(14) Close the canisters at the bottom with plugs and at the top with caps, discard canisters.



(15) Unscrew and pull out the plug of the sensor assembly from the electronic distributor.

Symbol on the distributor

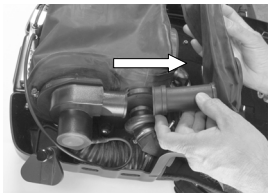


(16) Loosen fastening screw of sensor unit.

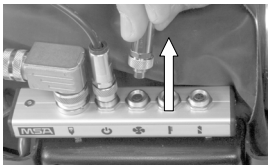
Attention!
Never pull the sensor unit out by the housing. Always support the unit from underneath.

(17) To avoid damage place your hand under the sensor unit, pull it out by the base plate and put it aside.

Protect the sensor assembly from damage, dust and moisture.

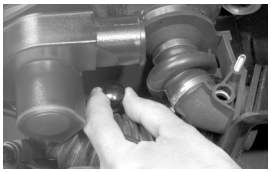


(18) Unbutton the air distributor from the blower.



(19) Loosen and pull out the blower plug from the electronic distributor.

Symbol on the distributor



(20) Loosen the grip screw on the valve control.

(21) Loosen the valve control from the housing by lightly pressing on the connections for the breathing hose assembly.

(22) Gently tilt the breathing bag and valve control to the right of the apparatus until the catch pin under the filter housing is free.

(23) Disconnect breathing bag from the pipe elbow with gentle pressure on the filter housing.

(24) Remove breathing bag and valve control from the apparatus housing.

5.3. Disassembly of the Breathing Bag Module

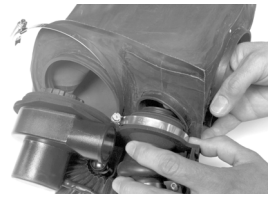
Attention!
To avoid damage, only use hexagonal socket spanner.

(1) Open screw clamp on filter housing.

(2) Remove filter housing.
(3) Press spring outwards under the notches.
(4) Remove particle filter and discard.

Attention!
To avoid damage, only use hexagonal socket spanner.

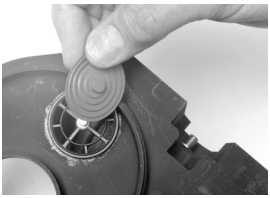
(5) Unscrew two screw clamps on the valve control, open the large 100 clamp entirely.



(6) Disconnect the breathing bag and valve control from each other.

(7) Unscrew the knurled nut on the blower.

(8) Disconnect blower from the valve control by gently pressing with the thumb outwards.



(9) Unbutton control valve disc on the exhalation side (under the blower).

(10) Remove the control valve on the inhalation side along with the valve seat.

(11) Unbutton control valve disc.

5.4. Cleaning, Disinfecting, Drying

Attention!
Use exclusively the disinfectant AUER 90 tested and approved by MSA (except for the blower). Use of other disinfection agents may cause subsequent damages.

(1) Clean and disinfect the following components:
- Full face mask (3 SR AirElite or Advantage AirElite full face mask)
- Breathing hose assembly
- Breathing bag
- Air distributor
- Valve control
- Control valves and discs (2)
- If dirty, clean the flame protection cover of breathing hose assembly with regular washing detergents.
- If required, clean housing components with a moist cloth.

The coolers and the sensor on the apparatus do not require disinfection. The heat generated by the exothermic chemical reaction results in a thorough thermic disinfection of the coolers and the sensor.

(Certified by the hygienic and microbiological survey of the "Institut für Krankenhaus- und Umwelthygiene", Berlin (Institute for Hospital and Environmental Hygiene, Berlin).

If necessary, we recommend that the convection coolers directly under the chemical canisters be cleaned and residues removed.

(2) Disinfect the blower (not its motor part) with Skinsept F (manufacturer: ECOLAB – see www.ECOLAB.com). Subsequently wipe out blower socket with a soft cloth.

Do not disinfect or flush the sensor. If needed, wipe off sensor housing with soft cloth.

(3) Rinse the disinfected parts thoroughly with water, except for the blower and valve control. Fill exhalation breathing bag with water, open the surplus valve by gently pulling on valve cap and the breathing bag opposite side, let the water drain through the surplus valve for several minutes to wash out disinfectant residues. Subsequently remove the remaining water from breathing bag.

(4) Dry the components thoroughly in a drying cabinet for 24 hours with clean air.

The drying of the components can be carried out in airflow of 60°C maximum.

If a washing machine is used for cleaning, hard components and elastomers must be treated separately.

Do not clean the blower, sensor assembly, valve control and filter housing in the washing machine or with water.

5.5. Assembly of the Valve Control

Carry out the assembly of the valve control in the reverse order of disassembly.

In view of this, photos are not shown for the most part of this task.
See (7) to (11) from Section 5.3.

(1) Fit both control valve discs.

(2) Press the valve seat with O-ring in on the inhalation side to the stop, check secure fit.

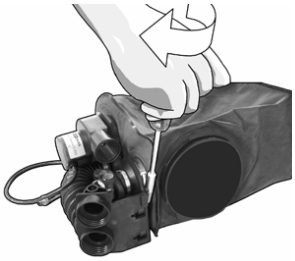
(3) Insert blower in the valve control and press in gently.

(4) Align blower on the valve control stop.

(5) Fix blower with knurled nut to the valve control.

5.6. Assembly of the Breathing Bag Module

Carry out the assembly of the breathing bag module in the reverse order of disassembly (→ Section 5.11).
Below we have refrained from showing the corresponding figures.



(1) Connect the breathing bag and valve control with each other.

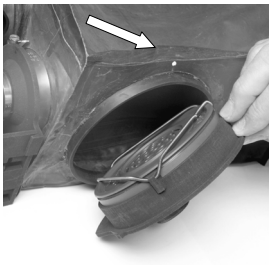
Place groove of large flange very accurately over beaded rim of valve control to the stop, to avoid leakages and/or damage.

(2) Check that the rubber flanges are perfectly seated on the valve control connections.

Attention!
To avoid damage, only use hexagonal socket spanner.

(3) Screw breathing bag and valve control with the corresponding screw clamps, first the clamp 60, then the clamp 100, both with screws outward.

(4) Double check that the rubber flanges are perfectly seated.



(5) Insert new particle filter with the open side down in the filter housing and secure with spring.

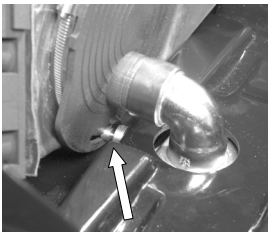
(6) Fit filter housing with filter in the proper position in the breathing bag.

The arrow on the filter housing points to the white dot on the breathing bag.

Attention!
To avoid damage, only use hexagonal socket spanner.

(7) Fix filter holder with screw clamp (120) and check for proper fit.

Before fitting into the apparatus the control valves and the breathing bag tightness may be tested (→ Section 5.11).



(8) Insert breathing bag module tilted slightly to the right into the housing.

(9) Engage catch pin (see arrow) in the slotted hole under the filter housing.

(10) Simultaneously press filter housing into pipe elbow to the stop.

(11) Turn breathing bag module towards apparatus left to the stop of the catch pin.

(12) Position screw connections for breathing hose assembly in the openings of the apparatus housing.

(13) Fix breathing bag module with valve control grip screw. To do so, press spring loaded screw down to the stop and bolt down.

(14) Push air distributor rubber hose on to blower socket and engage into groove. Do not turn blower upwards.

(15) Connect the blower cable plug to the electronic distributor.

Symbol on the distributor

Upon connecting the cable plugs observe the correct positioning of the **anti-twist markings** (notch on both male and female plugs) and its tight bolting.

5.7. Fitting the Sensor Assembly

Upon connecting the cable plugs observe the correct positioning of the **anti-twist markings** (notch on both male and female plugs) and its tight bolting.

(1) Push sensor assembly carefully in its seat and secure with cap screw.

(2) Connect and tighten the sensor plug to the electronic destributor.

Symbol on the distributor

5.8. Testing of the Control Valves

(1) Connect AirElite leak test kit with the adapter hose (for round thread).

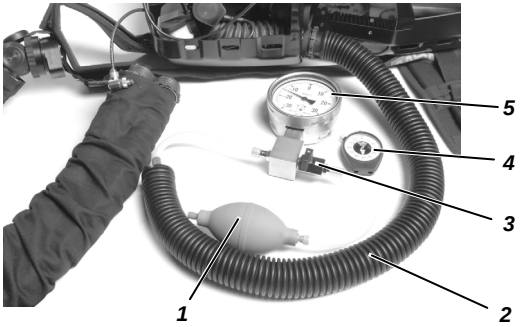


Fig. 4 Testing of the Control Valves

1 Hand pump
2 Adapter hose
3 Stopcock
4 Stop watch
5 Pressure gauge

Test of the Inhalation Valve

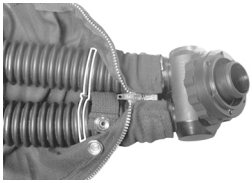
(1) Connect hand pump with pressure side to leak tester gauge stopcock.
(2) Screw adapter to the inhalation side (top, marked in white) of the apparatus.
(3) Using the hand pump, create a positive pressure of approx. 30 mbar.
(4) Close stopcock to hand pump.
(5) Measure the time required for a pressure drop from 20 mbar to 5 mbar.
- The time must be at least 10 secs.

Test of the Exhalation Valve

(1) Connect hand pump with suction side to leak tester gauge stopcock.
(2) Screw in adapter on exhalation side (bottom) of the breathing apparatus.
(3) Using the hand pump, create a negative pressure of approx. 30 mbar.
(4) Close stopcock to hand pump.
(5) Measure the time required for a pressure rise from - 20 mbar to - 5 mbar.
- The time must be at least 10 secs.
(6) Remove test kit.

5.9. Assembly of the Apparatus

For the assembly, put the apparatus with the harness downwards.
Carry out the assembly in the reverse order of the disassembly. Also refer to photos in Section 5.2.



Fitting of the flash-over protection for breathing hose assembly, the zip points toward the apparatus:

Observe
The zipper is closed from the mask connection in direction of the screw connections.

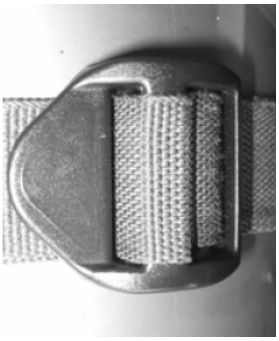
(1) Stretch breathing hoses to full length.
(2) Place both loops with push buttons in the direction towards the hose ends next to the hose holder (marked in white in the photo) around the hoses.
(3) Close push buttons.
(4) Pull hose assembly to full length and close zipper.
(5) Arrange the flash-over protection pleats evenly over the length of the breathing hoses.
(6) Snap the breathing hose assembly into the socket on the left shoulder harness (autostart).

(7) Connect breathing hose assembly to apparatus and screw tightly.

Connect the inhalation side first (top connection, marked in white).

5.10. Fitting the Breathing Canisters

(1) Remove upper caps from both canisters.
(2) Push canisters into the apparatus
(3) Button air distributor to both canisters, check proper fit.
(4) Remove lower plugs from both canisters.
(5) Insert connection tubes centrically into both canisters.



(6) Draw rubber collars of both canisters circumferential over the connection flanges, check tight and proper fit.
(7) Lash fixing belts of both canisters well and secure with Velcro fasteners.

Thread fixing belt around bridge of buckle through both slots (see photo).

(8) Save canister plugs and caps for reuse on spent canisters.
(9) Fit and tighten fully charged battery, do not connect it to the electronic distributor.
(10) Stow away safely all cables

5.11. Tightness Test

Attention!

For the tightness test the battery must be disconnected from the electronic distributor. Otherwise the chemical canisters are started.

Tightness tests must be made with dry air only.

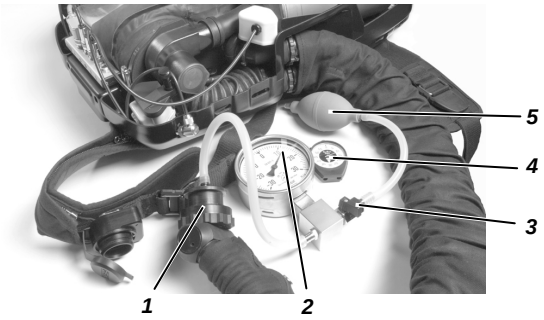


Fig. 5 Tightness Test

1 Adapter
2 Pressure gauge
3 Stopcock
4 Stop watch
5 Hand pump

(1) Remove the breathing hose assembly from the socket on the left-hand shoulder harness.

(2) Connect the AirElite leak test kit with the full face mask adapter to the breathing hose assembly.

(3) Block surplus valve on exhalation bag (→ Fig. 1 on page 5) laterally with metal bracket to stop air from being blown off the valve.

(4) Connect hand pump with pressure side to leak tester gauge stopcock.

(5) Using the hand pump, create a positive pressure of 11 - 12 mbar.

(6) Close stopcock to the hand pump.

(7) Then wait for approx. 1 min (stabilisation period), do not move apparatus.

- The pressure must not fall below 10 mbar.

(8) Determine pressure drop over 1 min.

- The pressure drop must not exceed 1.0 mbar/min.

(9) Remove metal bracket from the surplus valve and breathing bag.

(10) Check surplus valve funtion by gently pressing the exhalation bag laterally until ventilation valve opens and remove as far as possible air from exhalation bag.

- The pressure gauge should indicate between 1 mbar and 4 mbar as the air is slowly discharged.

(11) Remove tester.

(12) Snap in breathing hose assembly immediately into the socket (autostart) on the left shoulder harness to seal the apparatus from the ambient air.

For storage of the apparatus, the tightness test can also be made without canisters.

(1) Seal both canister connections of air distributor with the white sealing plugs (large flange inside to air distributor).
(2) Seal both lower cooler connections with the medium size grey plugs (white and grey plugs contained in test kit).
(3) Tightness test as described above.
(4) Remove all 4 plugs.

This tightness test does not replace the tightness test after fitting the canisters.

Tightness test of breathing bag assembly before fitting into the apparatus:

(1) Seal filter connection with large grey plug (contained in test kit).
(2) Seal sensor connection with small plug.
(3) Seal both canister connections of air distributor with white sealing plugs.
(4) Push air distributor hose on the blower socket, engage into groove.
(5) Connect breathing hose assembly directly to valve control.
(6) Tightness test as described above (points (2) to (11)
(7) Remove the 2 grey and 2 white plugs.
(8) Disconnect the breathing hose assembly again.

This tightness test does not replace the tightness test after fitting the canisters.

Control valve test of breathing bag assembly before fitting into the apparatus:

(1) Seal sensor connection with small plug.
(2) Connect adapter hose for round thread directly to valve control.
(3) Test control valves as described (→ Section 5.8)
(4) Remove test kit and plug.

5.12. Establishing and check Readiness

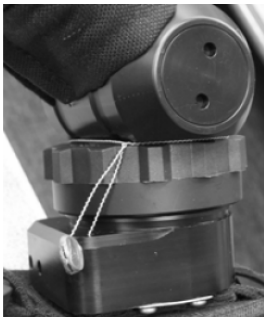
Attention!
Make sure that the breathing hose assembly is safely engaged into the socket on the left shoulder harness (autostart). Otherwise the apparatus and the canisters are started.

(1) If applicable, connect and tighten autostart plug to electronic distributor (symbol ⏻).
(2) Connect chemical canister starter cables (→ Section 1, Page 5).
(3) Connect the battery connection cable to the distributor and screw down (Symbol ▮).

Attention!
Do not take the breathing hose assembly out of the socket of the shoulder harness. Otherwise the apparatus and the chemical canisters are started and cannot be used!

(4) Set harness to full length.
(5) Place housing cover of breathing apparatus in position.
(6) Screw housing cover down using Allen key (4 mm).
(7) Press the test button on IC-Air until the green LED, canister display and symbols on the display appear.
- Brief acoustic signal confirms readiness.
- Thereafter the apparatus switches off again.

(8) Lead seal housing and mask connecting piece.



(9) Document the reconditioning with apparatus number, date and serial numbers of the canisters fitted.

Observe battery recharging time of 24 hours, if battery is charged in the apparatus during the activities.

6. Training

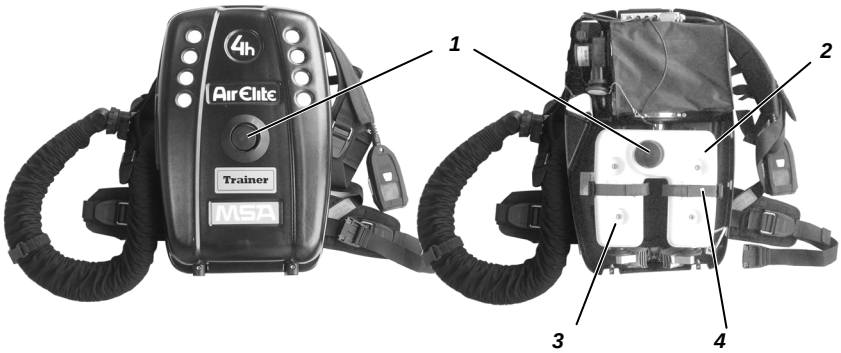


Fig. 6 Breathing apparatus with training canister

1 Air inlet
2 Training canister
3 Allen screw (4x)
4 Canister fixing belts

By using the Training Conversion Kit and its training canister (→ Section 7) practice exercises with the breathing apparatus can be carried out without consuming the chemical canisters. The inhaled air is taken from the ambient air via the apparatus particle filter. Therefore training can be carried out also in dust or mist.

The exhalation air is discharged via the apparatus blower to the ambient air.

The Training canister can be reused as often as desired.

The breathing apparatus with training canister must be used only in non-toxic environments.
The oxygen content must be ≥ 21 vol.-%.

The handling of the apparatus corresponds, except for the heat build-up, to the use in real conditions. The consumption indicator shows the remaining capacity of the apparatus alternating with the display "tr".

The training canister is designed such that a special housing cover must be fitted. It has a blue label "Trainer" and an opening for the protruding air inlet. This avoids confusing equipment for hazardous conditions with that for training purposes.

For practice exercises, the TR conversion kit is available as accessory (→ Section 7). It consists of:

- a canister set TR and
- the TR housing cover.

6.1. Disassembly of the Apparatus and conversion for training

(1) Unscrew and remove housing.
- Lead seal breaks.

(2) Remove starter cable plugs of both chemical canisters.

(3) Loosen both canister fixing belts.

(4) Unbutton both canisters at the top and bottom from the rubber collar and remove them.

(5) Close both canisters immediately at the bottom with the white plugs and at the top with the caps, protect and store in a dry place (preferably in the original packaging).

(6) Release and pull out the blower plug from the electronic distributor and stow away.

(7) Unbutton and dismount air distributor from blower socket.

(8) Button in the training canister at the bottom only.

(9) Connect the blower cable plug of the training canister to the electronic distributor.

(10) Connect quick start simulator cable plug.

The leak test is not carried out.
The training canister takes breathing air from the ambient air, as such the training apparatus is not tight.

(11) Fasten the training canister on both sides with the fixing belts.

(12) Button the throttle screen hanging on the chain onto the blower socket.

(13) Fit housing cover TR.

(14) Screw housing using hexagon Allen key (4 mm).

(15) Set harness to full length.

(16) Press the test button on IC-Air for about 1 second.
- LED lights red and then switches to green indicating readiness for start.
- Software version and symbols are displayed.
- Canister version (4htr) and "go“ are displayed.
- A brief acoustic signal sounds.
- Thereafter the apparatus switches off again.

(17) Lead seal housing and mask connecting piece.

For donning and starting the apparatus → Section 4.2 to 4.4.

6.2. After Training

Disassembly of the training apparatus

The training apparatus is disassembled in reverse sequence

Replacement of the particle filter (→ Section 5.3) is only necessary if training has been carried out in misty or dusty conditions.

Cleaning, Disinfecting, Drying after training use

The training canister does not come into contact with the exhalation air. It need only be cleaned if the training was in a dusty environment.

Clean and disinfect hose assembly, breathing bag, valve control and blower (→ Section 5.4).

In addition, clean throttle screen with spray disinfectant (→ Section 5.4)

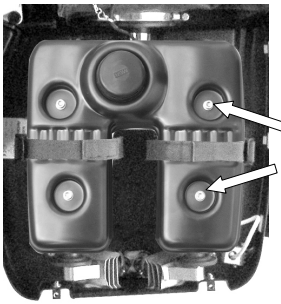
Breathing apparatus retrofitting

For breathing apparatus retrofitting → Section 5.5 to 5.12.

Cleaning the training canister

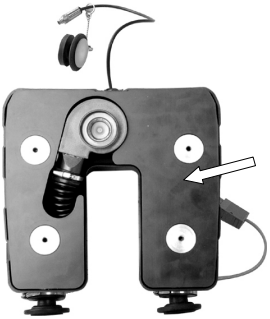
(1) Unscrew air inlet (→ Fig. 6) and check integrated blower for contamination.

(2) If necessary, blow out blower with compressed air.
If this fails, clean training canister inside as described.

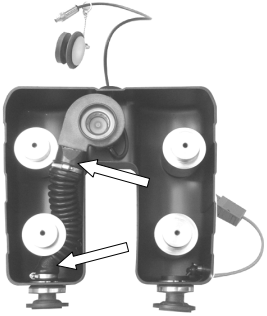


(3) Loosen and remove four Allen screws on training canister

(4) Remove housing cover.



(5) Remove insert plate.



(6) Loosen hose clamps at both ends of the hose and remove the hose.

(7) Wipe hose nozzle on blower and if needed, spray-disinfectant, flush with water and dry.

(8) Wash and dry hose and air inlet.

(9) Wipe rubber collar and spray-disinfectant, flush with water and dry.

(10) Blow out blower and wipe if needed.

(11) Reassemble device in reverse order.

7. Ordering Information

Description	Part No.
Basic apparatus, training apparatus	
AirElite 4h Apparatus (without chemical canister, without mask)	10065152
3 SR AirElite Full Face Mask	10065153
Advantage AirElite Full Face Mask	10065154
Breathing Canister Set 4 h, new, without return of used canisters	10065373
Exchange Canister Set 4 h, when returning used canisters	10065374
Breathing Canister Set 2 h, new, without return of used canisters	D1129861
Exchange Canister Set 2 h, when returning used canisters	D1129801
AirElite 4h-TR Training Conversion Kit	10065375
Spare Parts	
Lead seals (pack. 25)	D1129859
Housing labels, set (complete)	10068284
Housing cover, complete with labels	10068285
Catch pins with screws (housing cover) (pack. 2)	10068286
Shoulder harness left and right, assembly (less autostart)	10068287
Waist belt, complete	10068288
Back padding	10068289
Breathing hose assembly, complete with flash-over protection and mask connector	10068290
Breathing hose gaskets / valve control (pack. 10)	10068491
Flash-over protection (breathing hose assembly)	10068492
AirElite 4h autostart, complete	10068493
Rubber cap Autostart (pack. 5)	10068494
Sensor assembly, complete (incl. attachment screw)	10068496
Fixing screw for sensor assembly (pack. 10)	10068497
Breathing bag AirElite 4h, assembly, incl. surplus valve (less P-Filter, filter housing, screw clamps)	10068498
Particle filter (pack. 10)	10068499

Description	Part No.
Filter housing, complete	10068500
Gaskets, filter housing (pack. 5)	10068501
Screw clamps for breathing bag (set with 3 clamps; 5 Sets)	10068502
Valve control, complete with valves and connection hoses	10068503
Valve seat, complete (pack. 5)	10068504
O-Ring, valve seat (pack. 10)	10068505
Control valve discs (pack. 10)	D1118947
AirElite 4h Blower assembly, complete	10068507
O-Ring, blower (pack. 10))	10068511
Knurled nut, blower	10068512
AirElite 4h Air distributor	10068515
Canister fixing belt (pack. 2)	10068516
Connection bush, convection cooler, complete with clamps (2 units)	10068517
Battery (Replacement)	10068520
Padding, battery holder (pack. 10)	10068518
Cover, charging jack (pack. 10)	10068519
IC-Air, assembly, with cable and plug, ready for fitting	10068328
Electronic distributor, complete	10068541
Instruction and service manual, multilingual	10067731

Accessories

Disinfectant AUER 90, 2 l	D2055765
Disinfectant AUER 90, 6 l	D2055766
Skinsept F (manufacturer: ECOLAB – see www.ECOLAB.com)	commercially available
Antimist agent klar pilot Super Plus	10032164
AirElite 4h battery charger (for battery in apparatus)	10068542
AirElite 4h adapter cable (in combination with the battery charger for charging battery separately from the device)	10068543
AirElite 4h leak test kit, complete	10068544
AirElite 4h metal bracket (as spare part, contained in leak test set)	D1129138
AirElite 4h leak test adapter (as spare part, contained in leak test set)	10068545
AirElite tool kit: : 1 socket wrench 7 mm, 1 Allen key 4 mm, 1 lead seal pliers (neutral)	10068546

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