



Operating Manual

MSA AirElite 4h

Breathing Apparatus



Order No.: 10067731/09



The Safety Company

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1 Safety Regulations

1.1 Correct Use

The AirElite 4h breathing apparatus - hereinafter referred to as device - 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.

In combination with a certified facepiece (full face mask) the device protects the wearer against inhalation of hazardous substances and mixtures, harmful biological agents and oxygen deficiency.

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 device. In particular, the safety instructions, as well as the information for the use and operation of the device, 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.



WARNING!

This device 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 device operability must be verified. The device must not be used if the function test is unsuccessful, it is damaged, a competent servicing/maintenance has not been carried out, genuine MSA spare parts have not been used.

Alternative use, or use outside this specification will be considered as non-compliance. This also applies especially to unauthorised alterations to the device 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 device has been used inappropriately or not as intended. The selection and use of the device are the exclusive responsibility of the individual operator.

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

2 Description

2.1 Apparatus Overview

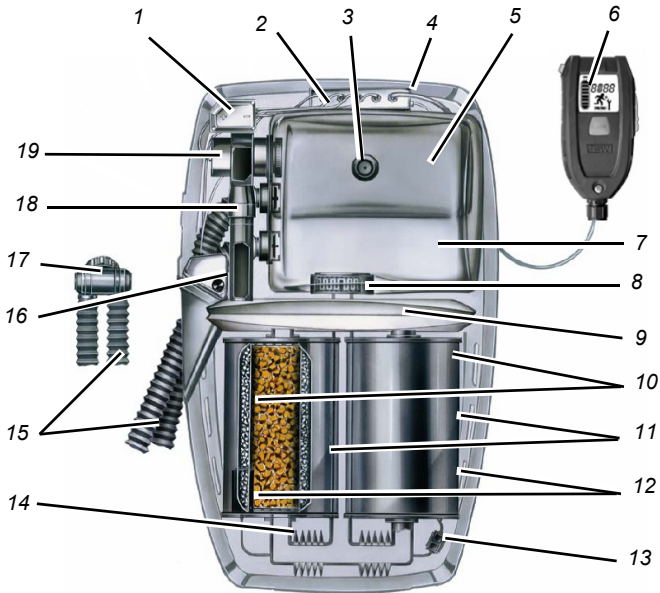


Fig. 1 Overview

1	Battery	11	Chemical canister (2x)
2	Electronic distributor	12	Quick starter in the chemical canister
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 unit
7	Inhalation bag	17	Mask connector with autostart (on left shoulder harness)
8	Particle filter	18	Valve control
9	Air distributor	19	Blower
10	Cooling jacket (2x)		

The device 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 device 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.**

Description

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 P2 particle filter (8) to EN 143 is fitted on the air inlet side of the inhalation bag.

The valve control (18) connects the breathing hose assembly (15) to the inhalation bag and exhalation bag. The blower (19) 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 automatic choke, 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). Alternatively, the use of non-rechargeable batteries is possible.

The breathing hose assembly is protected from damage by a flash-over protection. It is connected to the valve control of the device. 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 device into operation.

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



Fig. 2 Symbols at the distributor

The device 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). For training with the AirElite 4h are either ambient air dependent training canister (with non-interchangeable housing cover) or KO₂ training canister for ambient air independent exercises up to 2 hours (at a breathing minute volume of 40 l/min), also with a special non-interchangeable housing cover, available.

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, Advantage AirElite or Facepiece G1 AirElite are available as options (see the operating manuals for the full face masks).



CAUTION!

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

**WARNING!**

With the two training equipment versions only creating and ventilation of AirElite 4h must be practiced. The training devices are not respirators and may only be used for instruction and training.

2.2 Function

The device 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 device user, it automatically sounds an alarm. If required, the alarm can also be activated manually.

The device 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.

**CAUTION!**

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 device starts.

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

**CAUTION!**

Observe temperature limitations in use. The minimum temperature for starting must not be less than -6 °C

3 Technical Data

Dimensions H x W x D (housing)	:	approx. 600 mm x 360 mm x 190 mm
Weight ready for use	:	approx. 15 kg (less mask)
Maximum service life ¹⁾	:	<p>Depending on consumption</p> <p>With breathing canisters for 4 hours' operation:</p> <ul style="list-style-type: none"> • 4 hours at BMV 30 l/min • 6 hours maximum operational duration at reduced BMV < 20l/min <p>With breathing canisters for 2 hours' operation:</p> <ul style="list-style-type: none"> • 2 hours at BMV 40 l/min • 3 hours maximum operational duration at reduced BMV < 20l/min
Standby storage and starting temperature	:	<p>-6 °C to +60°C when using rechargeable batteries</p> <p>-6 °C to +54 °C when using non-rechargeable batteries</p>
Operational temperature (after starting)	:	<p>-15 °C to +60 °C when using rechargeable batteries</p> <p>-15 °C to +54 °C when using non-rechargeable batteries</p>
Breathing resistance with breathing canisters with a 4 hour operating time at BMV 30 l/min ²⁾	:	<p>Inhalation: -3 mbar</p> <p>Exhalation: +5 mbar</p>
Breathing resistance with breathing canisters with a 2 hour operating time at BMV 40 l/min ²⁾	:	<p>Inhalation: -4 mbar</p> <p>Exhalation: +6 mbar</p>
Inhalation Air	:	<p>Temperature +30 °C to +45 °C</p> <p>Humidity 20 % to 40 %</p> <p>Carbon dioxide < 1.0 vol. % (mask not considered)</p> <p>Oxygen > 80 vol. %</p>
Maximum surface temperature	:	<p>Temperature class T4 (with a 4 hour operation time according to EN 50014).</p> <p>EX ia IIC T4 Ga, Ex ia I Ma / ATEX 2014/34/EU, Group 1</p>
Electronic control	:	<p>dust and water protection tested acc. to IP 67</p> <p>EMC according to EN 61000-6-2 and EN 61000-6-3</p>
Housing	:	Plastic, self-extinguishing, impact-resistant, anti-statically treated
Facepiece	:	<p>3 SR AirElite, Advantage AirElite or</p> <p>Facepiece G1 AirElite full face masks</p>

¹⁾ BMV - Breathing minute volume according to DIN 58652-2

²⁾ Mask not taken into consideration

AirElite 4h was tested in accordance with DIN 58652-2 by DEKRA EXAM, Dinnendahlstr. 9, 44809 Bochum (reg. No. 0158) and meets the requirements of Directive 89/686 EEC or Regulation (EU) 2016/425, respectively. This is a device for the generation of chemical oxygen (KO₂) designed for work and rescue operations – a class K 240 S device.

The Declaration of Conformity can be found under the following link: <https://MSAsafety.com/DoC>

4 Operation

NOTICE

The device is delivered without chemical canisters. For storage in readiness, the device 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.

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

4.1 Donning the Device



- (1) Don AirElite as a backpack.
- (2) Tighten shoulder harnesses as required.



- (3) Don waist belt.
- (4) Tighten waist belt strongly.
- (5) Loosen shoulder harness slightly, the device 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 (chapter 4.4).
 - a) LED lights red and changes to green.
 - b) LCD symbols and software version appear on the display.
 - c) Brief acoustic signal sounds.
 - d) Background light in the display illuminates.
 - e) Indication of canisters fitted (2 h, 4 h, 2 htr or 4 htr) and indication "go". The device is ready for use.
 - f) Thereafter the IC-Air switches off.



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



During test, do not start the device. 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.

NOTICE

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 the socket again. Carry out troubleshooting and re-establish readiness.

4.2 Donning the Full Face Mask



- (1) Don 3 SR AirElite, Advantage AirElite or Facepiece G1 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).

NOTICE

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

4.3 Starting



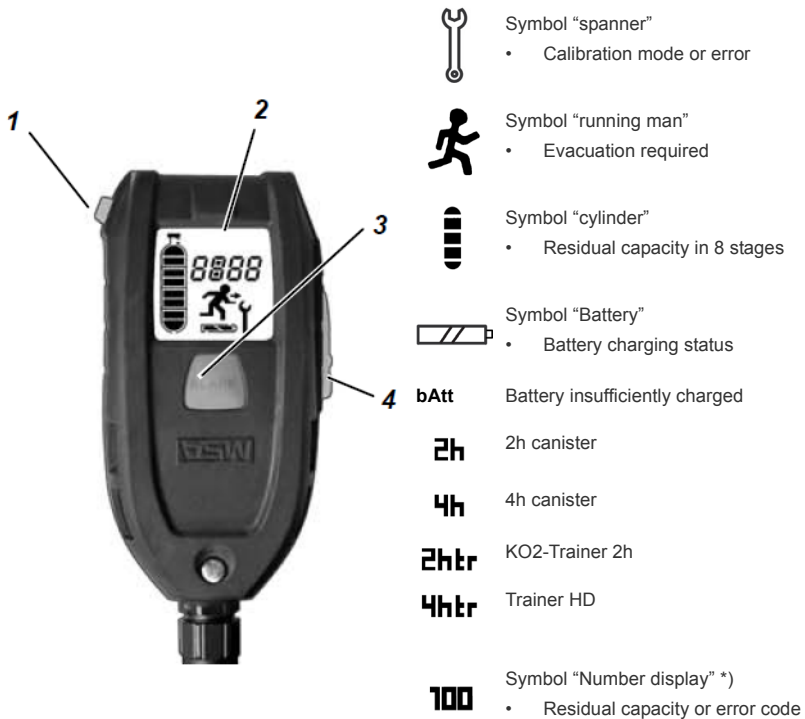
- (1) Remove breathing hose assembly by gently turning hand-wheel and pulling it entirely out of the socket on the left shoulder harness.
 - a) Lead seal breaks.
 - b) Device starts automatically a function test and is ready for use after approx. 15 seconds (IC-Air indicates "100").
 - c) Insert the facepiece of the breathing hose assembly in the respirator full face mask.

NOTE: During the function test, DO NOT connect breathing hose assembly into the full face mask.

The device is ready for use.

4.4 Monitoring Unit and Consumption Indicator IC-Air

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



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

Fig. 3 IC-Air and display symbols

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

After starting the AirElite 4h device, the IC-Air displays the residual in %.

During training with the training canisters, the IC-Air displays alternately the residual capacity in % and "2 htr" or "4 htr".

Monitoring and Display Functions

- Identification of the canisters fitted (2h, 4h, 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 can be turned off repeatedly 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 device 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 lights up green and the symbols on the display appear (Fig. 3, Pos. 1).

Error Display in Test Mode

Check the function of the device 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.

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Manual Alarm Call



The manual alarm call only functions if the device 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.

Illuminating the Display

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

4.5

End of Use

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



CAUTION!

After an interruption of use, subsequent use of the device (without reconditioning) is possible within the time frame 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 device is switched off irreversibly and cannot be reused.

If the usage of the training device 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 device switches off.
An acoustic double signal sounds.
- (3) Open hose support, open the waist belt by pressing on the buckle (from the inside), loose harness and remove the device.
- (4) Return the used device for reconditioning.

5 Maintenance and Service

This device 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 device or its components are not permissible and result in loss of approval.

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



CAUTION!

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

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



See chapter 6 for a list of accessories. For questions regarding the device, 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.

	Daily	Before use	After use	Every 3 months	Every 6 months	Every 1 year	Every 2 years	Every 5 years	Every 8 years
Visible inspection	AirElite 4h device, stored on trucks	AirElite 4h device	AirElite 4h device		AirElite 4h device, stored on stock				
Function Test		AirElite 4h device	after reconditioning		AirElite 4h device				
Cleaning and Disinfection			as described in the service manual						
Tightness check			tightness check of the device after reconditioning			tightness check of the device when canisters assembled			
Battery rechargeable			recharge battery	recharge battery				replacement of rechargeable batteries	
Battery non-rechargeable			replacement of non-rechargeable batteries		replacement of non-rechargeable batteries ¹⁾	replacement of non-rechargeable batteries ²⁾			
AirElite 4h canisters			replacement of canisters				replacement of canisters, when assembled in AirElite 4h device and device is stored on stock	replacement of canisters, when assembled in AirElite 4h device and device is stored in case (10071650)	replacement of canisters, when canisters are in original packages and stored on stock
AirElite K02-Trainer canisters			replacement of canisters	replacement of canisters, when assembled in AirElite 4h device and device is stored on stock			replacement of canisters, when canisters are in original packages and stored on stock		
Valve discs			replacement of valve discs when damaged					replacement of valve discs	

When using the battery holder AirElite the following must be observed:

- 1) For battery type DURACELL PLUS POWER MN1500 cells must be replaced after a service life of 6 months.
- 2) For battery type DURACELL INDUSTRIAL LR6 cells must be replaced after a service life of 12 months.

5.2 Safety Advice for handling KO₂ Canisters

When installing KO₂ canisters (AirElite 4h canisters and KO₂ training canisters), the following safety regulations must be observed (see MSA safety data sheet on chemical oxygen devices and corresponding spare canisters):



CAUTION!

Wear appropriate eye protection and protective gloves (no cloth gloves).

NOTE: When handling KO₂ canisters, KO₂ grains or dust can escape from the canisters. Carefully dispose of released KO₂ according to the safety instructions below.

AirElite 4h

- (1) Remove the sealed chemical canisters from the packaging.
- (2) Cut open the foil bag and remove the canisters.
- (3) Slowly and carefully unbutton the black cap while pointing the side of the canister with the cap away from the body.

NOTE: If a pressure builds up in the canister during storage, removing the cap can lead to a pressure release causing KO₂ dust to escape from the canister.



CAUTION!

Do not inhale dust! Do not allow dust to come in contact with the eyes!

Absorb dust dry or with high amounts of water. When exposed to water, KO₂ produces oxygen and potash (danger of chemical burn).

When in contact with skin, thoroughly wash affected areas with water!

- (4) After removing the cap, unbutton the white sealing plug.
- (5) Fit the canister into the device.

AirElite 4h KO₂-Trainer 2h

- (1) Remove the sealed chemical canisters from the packaging.
- (2) Cut open the foil bag and remove the canisters.
- (3) Slowly and carefully pull out the large yellow plug while pointing the side of the canister with the plug away from the body.

NOTE: If a pressure builds up in the canister during storage, removing the cap can lead to a pressure release causing KO₂ dust to escape from the canister.



CAUTION!

Do not inhale dust! Do not allow dust to come in contact with the eyes!

Absorb dust dry or with high amounts of water. When exposed to water, KO₂ produces oxygen and potash (danger of chemical burn).

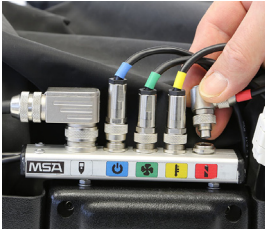
When in contact with skin, thoroughly wash affected areas with water!

- (4) After removing the large yellow plug, pull out the small yellow plug.
- (5) Fit the canister into the training device.

5.3 Disassembly of the Device



- (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) Open the hook-and-loop-tape of the battery pack on the top side.
- (4) Remove battery.
- (5) Recharge battery with charger and adapter cable until the charge level indicator glows green.

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



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

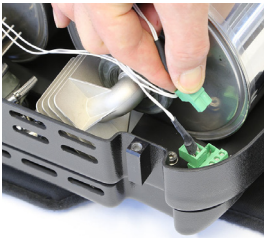
NOTE: Gently turn and pull the hand wheel.



- (7) Unscrew breathing hose assembly from the device (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.



CAUTION!

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

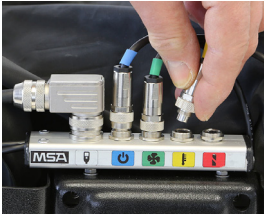


- (12) Loosen chemical canister belts.
- (13) Unbutton both canisters at the top and bottom from the rubber collar and pull them out upwards.
- (14) Close the canisters at the bottom with plugs and at the top with caps, discard canisters.




- (15) Dispose used chemical canisters in accordance with local regulations (chapter 5.16).

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

Symbol on the distributor: 



- (17) Loosen fastening screw of sensor unit.



CAUTION!

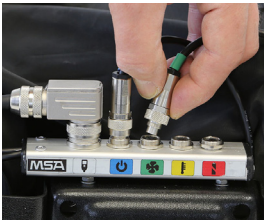
Never pull the sensor unit out by the housing. Always support the unit from underneath.

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

NOTE: Protect the sensor assembly from damage, dust and moisture.



- (19) Unbutton the air distributor from the blower.



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

Symbol on the distributor: 



- (21) Loosen the grip screw on the valve control.



- (22) Loosen the valve control from the housing by lightly pressing on the connections for the breathing hose assembly.
- (23) Gently tilt the breathing bag and valve control to the right of the device until the catch pin under the filter housing is free.



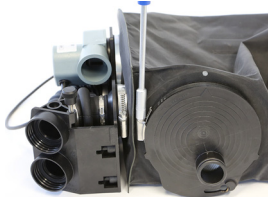
- (24) Disconnect breathing bag from the pipe elbow with gentle pressure on the filter housing.
- (25) Remove breathing bag and valve control from the device housing.

5.4 Disassembly of the Breathing Bag Module



CAUTION!

To avoid damage, only use hexagonal socket spanner (7 mm).



- (1) Open screw clamp on filter housing.



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



- (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.

5.5 Cleaning, Disinfecting, Drying



CAUTION!

Use exclusively the disinfectant Incidin Rapid 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:
 - a) Face piece (Full face mask)
 - b) Breathing hose assembly
 - c) Breathing bag
 - d) Air distributor
 - e) Valve control
 - f) Control valves and discs (2)
 - g) If dirty, clean the flame protection cover of breathing hose assembly with regular washing detergents.
 - h) If required, clean housing components with a moist cloth.

The coolers and the sensor on the device 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 blower and sensor assembly in the washing machine or with water.

5.6 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 chapter 5.4.



- (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 with O-ring 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.

5.7 Function Control of the Valve Control

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



Fig. 4 Testing of the Control Valves

- 1 Pressure gauge
- 2 Stopcock
- 3 Hand pump
- 4 Adapter hose

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 device.
- (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 device.
- (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.

Control Valve Test of the Breathing Bag Assembly before Fitting into the Device

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

5.8 Assembly of the Breathing Bag Module



Carry out the assembly of the breathing bag module in the reverse order of disassembly (chapter 5.14).

Below we have refrained from showing the corresponding figures.



CAUTION!

To avoid damage, only use hexagonal socket spanner.



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

NOTE: 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.
- (3) Screw breathing bag and valve control with the corresponding screw clamps, first the small screw clamp, then the medium screw clamp, 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.

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

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



Before fitting into the device, the control valves and the breathing bag tightness may be tested (chapter 5.14).



- (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 device left to the stop of the catch pin.
- (12) Position screw connections for breathing hose assembly in the openings of the device 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.

5.9 Tightness Test of the Breathing Bag Module

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



- (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 (steps (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.

5.10 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 distributor.

Symbol on the distributor:



5.11 Assembly of the Device



For the assembly, put the device with the harness downwards.

Carry out the assembly in the reverse order of the disassembly. Also refer to photos in chapter 5.3.



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

NOTE: 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).

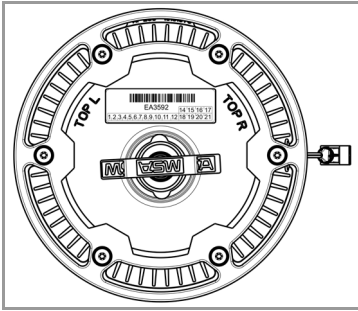


- (7) Connect breathing hose assembly to device and screw tightly.

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

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5.13 Installing the AirElite 4h KO2-Trainer Canisters



Canister bottom

- (1) Adjust canister holding straps of MSA AirElite 4h to full length.
- (2) Mark the installation date (month, year) on label on the canister bottom.

The canister adjustment position is also shown on the bottom (Top L for installation on the left side, Top R for installation on the right).

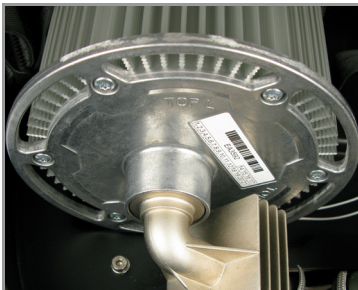
- (3) Start the installation with the left canister:
Remove both plugs before installation: Pull out with a slight turn.

Important: Always pull on both ears of the plug. Keep the plugs for canister disposal.



Installation of canister

- (4) Push the left canister through the canister holding strap from below.
- (5) Adjust the canister roughly so that for the left canister Top L is in the top position.



Pre-cooler completely inserted in the canister

- (6) Push the canister while slightly rotating it all the way to the stop onto the pre-cooler.
- (7) Adjust the canister so that Top L is in the top position for the left canister.

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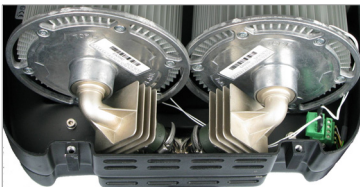
Connecting the upper canister connection

- (8) Button in the air distributor connection on the upper canister connection, ensure tight fit.
- (9) Pull canister holding strap tight.
- (10) Repeat these installation steps for the right canister, with Top R in the top position when adjusting the canister.
- (11) Check device for tightness (see chapter 5.14)



CAUTION!

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



Both canisters installed with connected cable plugs

- (12) Connect trainer canister starter cable plugs.



Symbol for battery connection (on electrical distributor)

- (13) Connect the battery connection cable to the distributor and screw down.
- (14) Press the test button on IC-Air until LED illuminates red/green, canister display shows 2htr and symbols on the display appear.
Brief acoustic signal confirms readiness.
Afterwards the device switches off again.
- (15) Install housing cover and fix with screws.
- (16) Adjust harness to full length.
- (17) If applicable, lead seal housing cover and mask connector.
- (18) Record overhaul.

5.14 Tightness Test



CAUTION!

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	4	Hand pump
2	Stop watch	5	Pressure gauge
3	Stopcock		

- (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 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 device.
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 function 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 device from the ambient air.

For storage of the device, 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.



SmartCHECK test benches can also be used for performing a tightness test. See SmartCHECK operating manual.



Fig. 6 SmartCHECK

5.15 Establishing and check Readiness



CAUTION!

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

- (1) If applicable, connect and tighten autostart plug to electronic distributor.

Symbol:



- (2) Connect chemical canister starter cables (Fig. 1, pos. 13).
- (3) Connect the battery connection cable to the distributor and screw down.

Symbol:



CAUTION!

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

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- (4) Set harness to full length.
- (5) Place housing cover of device 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.
 - a) Brief acoustic signal confirms readiness.
 - b) Thereafter the device switches off again.
- (8) Lead seal housing and mask connecting piece.



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

5.16 Disposal of used KO₂ Canisters

For disposal local regulations are to be observed.

Used canisters contain unused potassium hyperoxide and potassium peroxide. Therefore used canisters are considered hazardous waste, the recommended EU waste code is 160507.

Contact a local disposal company to correctly dispose of used trainer canisters. Notes concerning the handling of the chemicals can be taken from the EU safety data sheets.

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6 Ordering Information

Description	Part No.
Basic apparatus	
AirElite 4h (without canister, without mask)	10065152
AirElite 4h canister set	10065373
AirElite KO2 - trainer housing cover	10151861
AirElite KO2 - trainer canister set 2h	10151860
AirElite 4h training-converting set HD	10100126
AirElite 4h (Battery Version)	10165441
3S-R full face mask (AirElite 4h)	10065153
Advantage full face mask (AirElite 4h)	10065154
Facepiece G1 AirElite	ATO code
Operating manual	
CD operating manual AirElite 4h	10100459
Quick start guide AirElite 4h	10100458
AirElite KO2-TR & TR HD, trainer operating manual	10151572
AirElite 4h, operating manual	10067731
AirElite 4h, service and maintenance manual	10175141
Accessories	
AirElite 4h leak test kit, complete	10068544
Adapter Rd 40 bayonet TR-HD AirElite 4h	10147183
Special grease Krytox GPL 206 AirElite	10160425
Charging jack set AirElite case spare	10150400
Case, AirElite 4h, wheeled	10071650
AirElite 4h adapter cable (in combination with the battery charger for charging battery separately from the device)	10068543
AirElite 4h tool kit	10068546
AirElite 4h battery charger	10068542
Particle filter (10 piece)	10068499
FLEXIfilter P2 / pack of 5 pair	10027699
ADVANTAGE TabTec A1 - pack 2	10030510
Particle filter P3 PlexTec (Pg 10)	10094376
Klar-pilot Fluid Super Plus	10032164
Battery holder AirElite	10165410

For local MSA contacts, please visit us at [**MSAsafety.com**](http://MSAsafety.com)

*Because every life has a **purpose...***