MSA
The Safety Company

Operating Manual

Vautex Elite ET Dual LVS 600-D

Chemical Protective Suit with Automatic Switch Valve and Pressure Reducer

CE

Order No.: 10092992/03

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Thiemannstrasse 1,

Germany

Contents

1. Safety Regulations

1.1. Correct Use

The chemical protective suit Vautex Elite ET Dual LVS 600-D (hereinafter referred to as protective suit) is particularly intended to protect the wearer's skin from danger caused by liquid or gaseous toxic agents. As total encapsulating protective clothing it is worn over working clothes and the protective breathing apparatus. It offers excellent protection in emergencies, decontamination work, securing leaks or similar.

The Automatic Switch Valve with Pressure Reducer LVS 600-D (hereinafter referred to as Switch Valve) is used to connect a compressed air line system in combination with a compressed air breathing apparatus in a protective suit. For that reason, the limitation of the operating time of the protective suit can be extended.

The protective suit must be worn in combination with a compressed air breathing apparatus and/or compressed air line system. When using a compressed air breathing apparatus alone, the wearer of the suit has full freedom of movement. The combined use of a compressed air breathing apparatus and compressed air line system limits the wearer of the suit to a particular location. Local regulations about limitations on wearing time shall be observed.

The protective suit does not provide protection against heat or cold and is not itself a complete breathing protection apparatus.

It must be worn in conjunction with the following series of compressed air breathing apparatus:

Internal air supply with compressed air breathing apparatus models

- BD-N
- BD AE
- BD ESA
- BD AutoMaXX -AS
- AirGo
- DA 300-2

External air supply with LVS 600-D and aforementioned compressed air breathing apparatus

- DSL

Attention!

Only use compressed air breathing apparatus with a static medium pressure with more than 6 bar.

The protective suit described in this operating manual comply with the European Directives 89/686/EEC and 94/9/EC (→ Section 7.1).

The EC type examination was carried out by the DEKRA EXAM GmbH, (Dinnendahlstraße 9, D-44809 Bochum).

- Reference number of the organisation concerned: 0158

It is imperative that this operating manual be read and observed when using the product. In particular, the safety instructions, as well as the information for the use and operation of the product, 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 these specifications will be considered as non-compliance. This also applies especially to unauthorised alterations to the product 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. Design of the Protective Suit

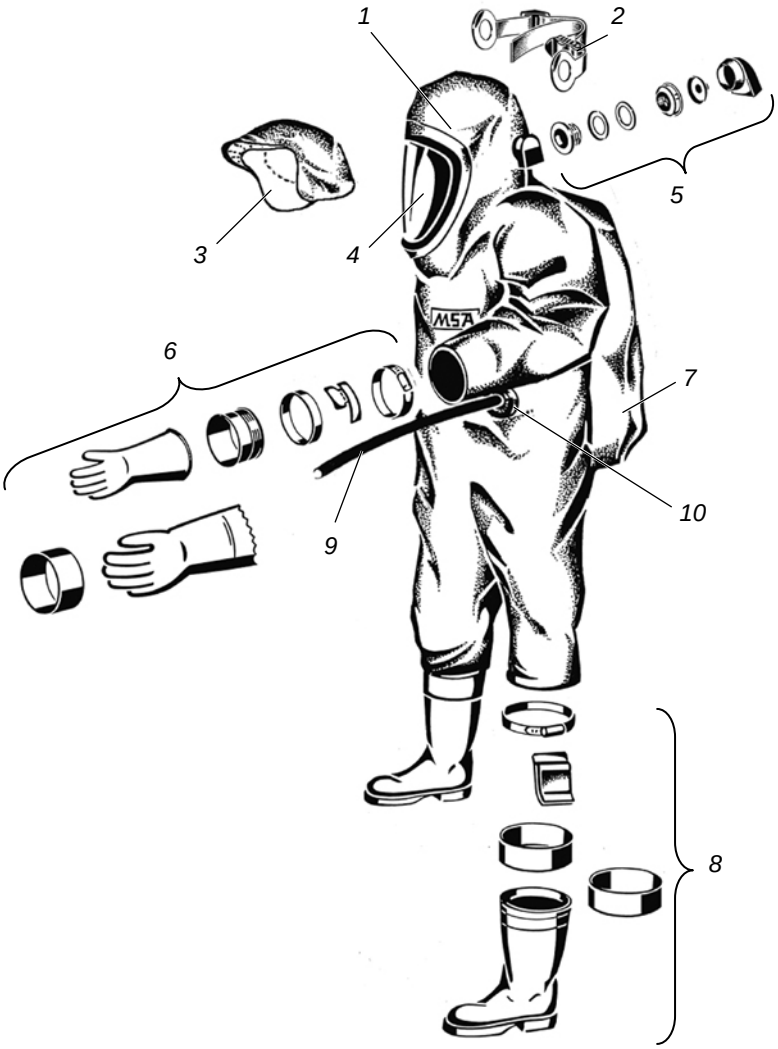


Fig. 1 Design of the Protective Suit

1	*Suit shell*	*6*	*Gloves*
2	*Head strap (on the inside of the suit)*	*7*	*Rucksack*
3	*Helmet cover as visor holder*	*8*	*Safety high boot*
4	*Lens and Lens-flushing with warning device*	*9*	*External compressed air supply*
5	*Suit valves (2 pieces)*	*10*	*Switch valve LVS 600-D*

The one-piece suit is made of a special compound material with a gas-tight zip protected by a zip cover. The zip runs vertically on the front from the right leg up to the head section. The lens is fitted gas and fluid-tight. The protective gloves and safety high boots can be changed and fitted as gas and liquid-tight.

The helmet cover as visor holder provides added comfort to the protective suit. It fixes the visor of the protective helmet (only MSA GALLET Helmets F1S, F1SA, F1E and F1SF).

Attention!

Wearing a protective suit and a compressed air breathing apparatus will put a physical strain on the wearer. Wearing the protective suit for extended periods can cause heat stress. The wearer must, therefore, be suited to wearing the protective suit (good health, possibly carry out a preventive medical examination first). Moreover, when in use, regional guidelines and accident prevention regulations must be observed.

The operating time must be limited in accordance with specific national regulations.

The back part is prepared for wearing a compressed air breathing apparatus under the protective suit.

The head part in the protective suit is spacious enough to allow a protective helmet (→ Section 3.1) to be worn under the protective suit. In order to adapt to different helmet sizes an adjustable head strap is fitted to the inside of the suit between both suit valves.

The inhalation air is supplied to the wearer from the compressed air breathing apparatus or air line system via the automatic lung mechanisms and the full face mask. The exhalation air passes through the exhalation valve of the full face mask to the inside of the protective suit and finally via the suit valves into the ambient atmosphere.

The protective suit is equipped with transponder technology for protective suits. The transponder is an electronic data carrier on which a code is saved. The code is read contactless with the AUER transponder reader (→ Section 8) and thus enables a clear identification of the chemical protective suit. In order to show, and to further process the code, a PC or MSA Proficheck and the corresponding MSA / TecBos software is required in conjunction with the AUER transponder reader.

The service life of the protective suit is at least 10 years when correctly serviced and stored and does not apply to use.

Operating temperatures: -30°C to +60°C

2.2. Air Line System

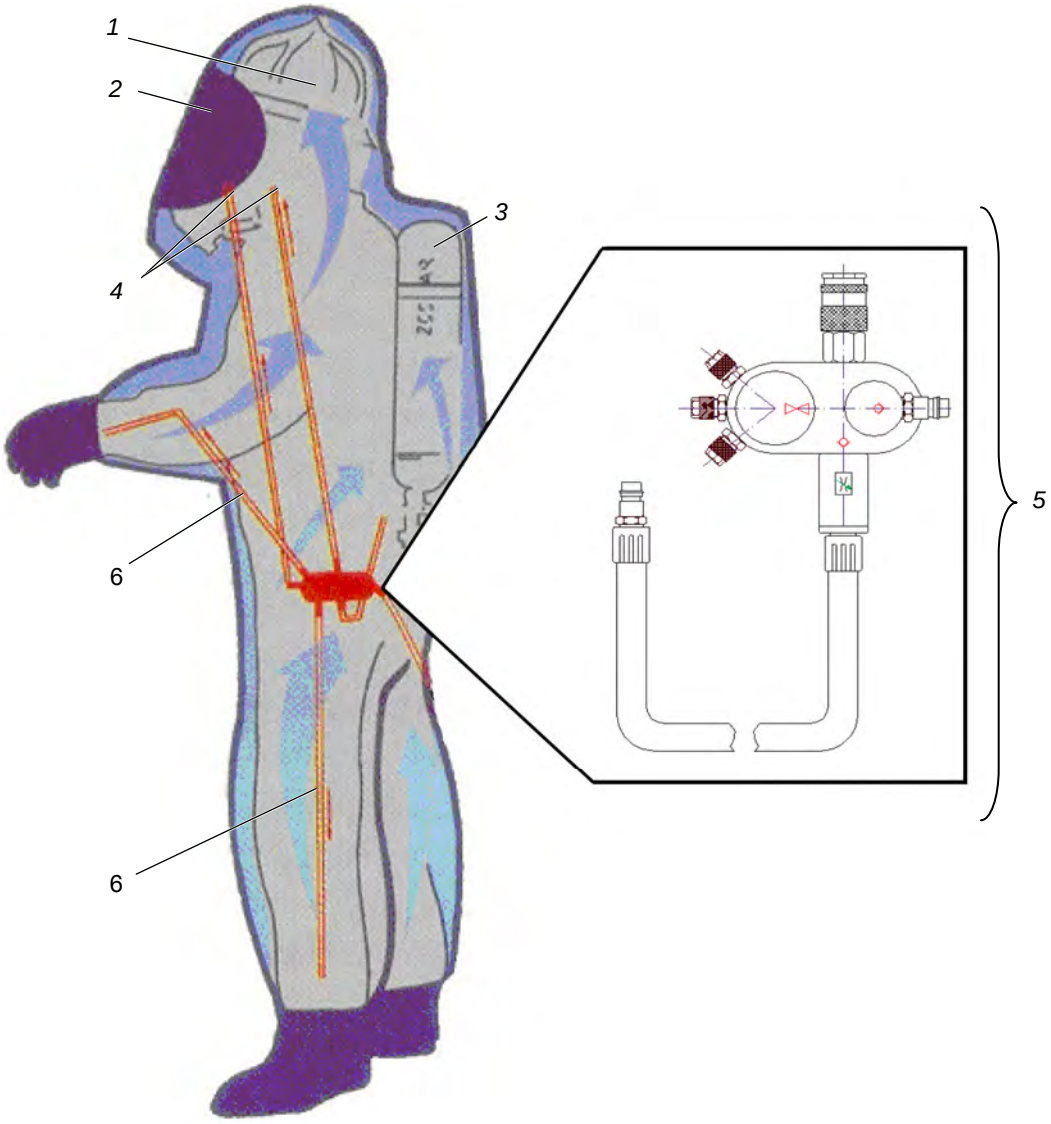


Fig. 2 Air Line System

1	*Suit shell*	*4*	*Lens-flushing with warning device*
2	*Lens*	*5*	*Switch valve LVS 600-D*
3	*Rucksack*	*6*	*Suit Ventilation System*

The switch valve supplies an optimal breathable air and a lens- and suit ventilation.

The wearer of the suit is supplied with breathable air via a compressed air line system. The compressed air breathing apparatus worn on the back supplies air when the air flow is interrupted, when the pressure drops or when the air feeding line of the unit is disconnected. In that case, the Switch Valve will switch to the compressed air breathing apparatus. If the external air supply fails it is automatically switched to emergency air supply provided by the compressed air breathing apparatus.

While air is supplied by a compressed air feeding line the Suit ventilation is automatically switched on and is continuously adjustable by a handwheel from outside.

The airflow into the suit via the Suit Ventilation System is max. 100 l/min at 10 bar adjustable only when the air line supply is active. The Suit Ventilation System provides a better climate inside the suit due to continuous air ventilation.

In order to secure the continuous supply of the user with breathable air in case of a pressure drop or deficiencies in the compressed air feeding line and to guarantee a retreat independent from the compressed air line breathing apparatus, a SCBA connected to the Switch Valve has to be used.

This SCBA is mounted to the Switch Valve (→ Fig. 3) such that the user is supplied with breathable air from the SCBA in case of interruption of the compressed air feeding line. The Switch Valve switches over automatically the breathable air supply from the compressed air feeding line to the SCBA or from the SCBA to the compressed air feeding line, dependent on pressure differences between the compressed air feeding line pressures and the SCBA.

The lens ventilation prevents fogging of the lens. The lens ventilation with the integrated emergency air supply warning device is fixed inside the protective suit to the inside of the lens with special glue.

After switching to emergency air supply (SCBA) the suit ventilation is switched off. The display of the warning device changes from silver to red to warn the wearer.

2.3. Switch Valve

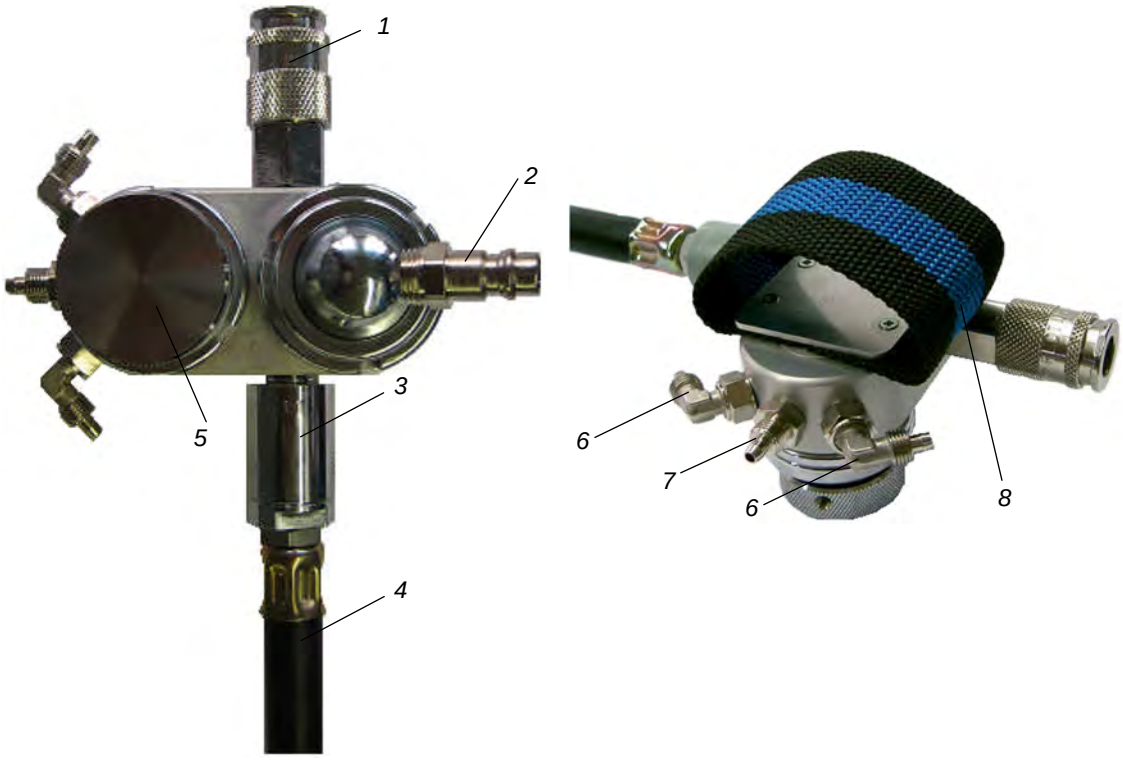
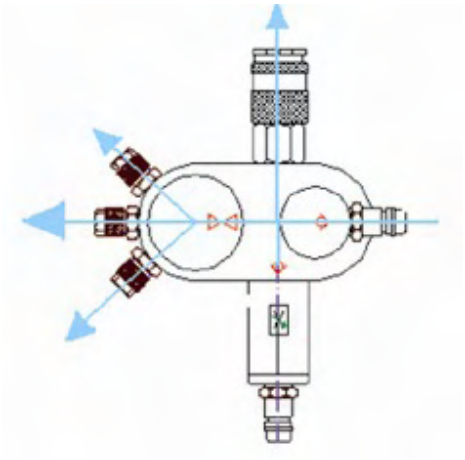


Fig. 3 Switch Valve

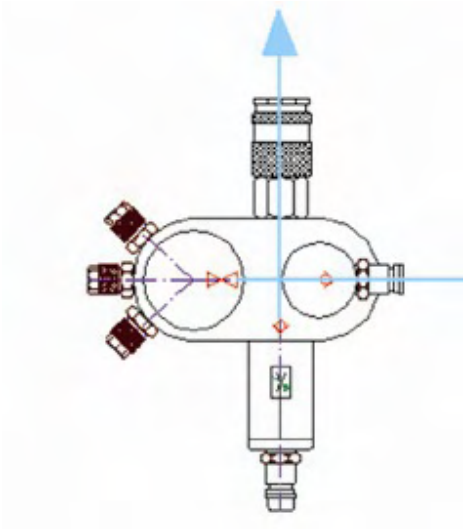
1	*Lock coupling for lung governed demand valve*	*5*	*Handwheel for regulating the Suit Ventilation*
2	*Plug nipple for compressed air feeding line*	*6*	*Suit Ventilation*
3	*Pressure reducer with 60 cm airline*	*7*	*Lens ventilation*
4	*Plug nipple for SCBA*	*8*	*Strap for SCBA-belt*

2.4. Operation modes



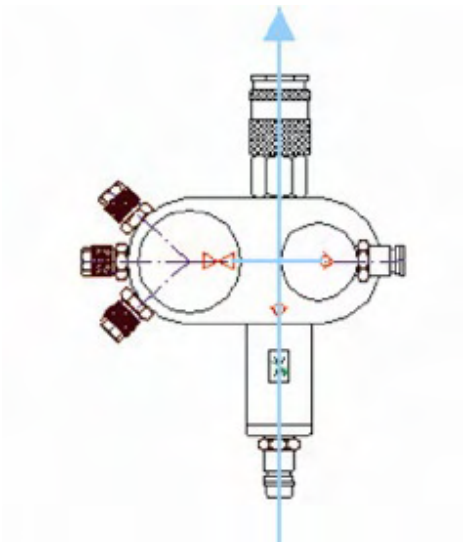
Normal mode with Suit Ventilation

While air is supplied by a compressed air feeding line the suit ventilation is automatically switched on and is continuously adjustable by a handwheel from outside.



Normal mode without Suit Ventilation

Suit ventilation is switched off.



Emergency air supply

The Switch Valve switches over automatically the breathable air supply from the compressed air feeding line to the SCBA or from the SCBA to the compressed air feeding line, dependent on pressure differences between the compressed air feeding line pressures and the SCBA.

Suit ventilation is switched off. The display colour at the lens ventilation changes from silver to red to warn the wearer.

Warning device

At the lens ventilation is a warning device whose spool displays the colour "SILVER" in case of operation with external compressed air supply.

Change of pressure in the external compressed air supply

If the pressure of the compressed air feeding line at the inlet of the switch valve drops below a pressure of 5,5 bar ±1 bar the switch valve automatically switches to "emergency air supply". Thus the breathing air is supplied by the connected compressed air breathing apparatus. When the emergency air supply is switched on, the suit ventilation is switched off and the spool of the warning device displays the colour "RED". The switch-over of the warning device happens slowly, not abruptly. If the pressure inside the compressed air feeding line is readjusted, the switch valve switches back to compressed air feeding line operation.

If the spool is in a horizontal position the function of the warning device is limited.

If a protective suit equipped with a Switch Valve without a compressed air feeding line is to be used, the plug nipple 2 (→ Fig. 3) located on the outside has to be sealed with the enclosed cap.

Attention!

In the dark the colour perception of the spool of the warning device is limited.

The warning device can only be perceived unambiguously if it is in a vertical position, the function of warning device is not completely independent of position.

2.5. Surfaces for Customer-Specific Marking

The following surfaces are provided on the protective suit for customer-specific marking.

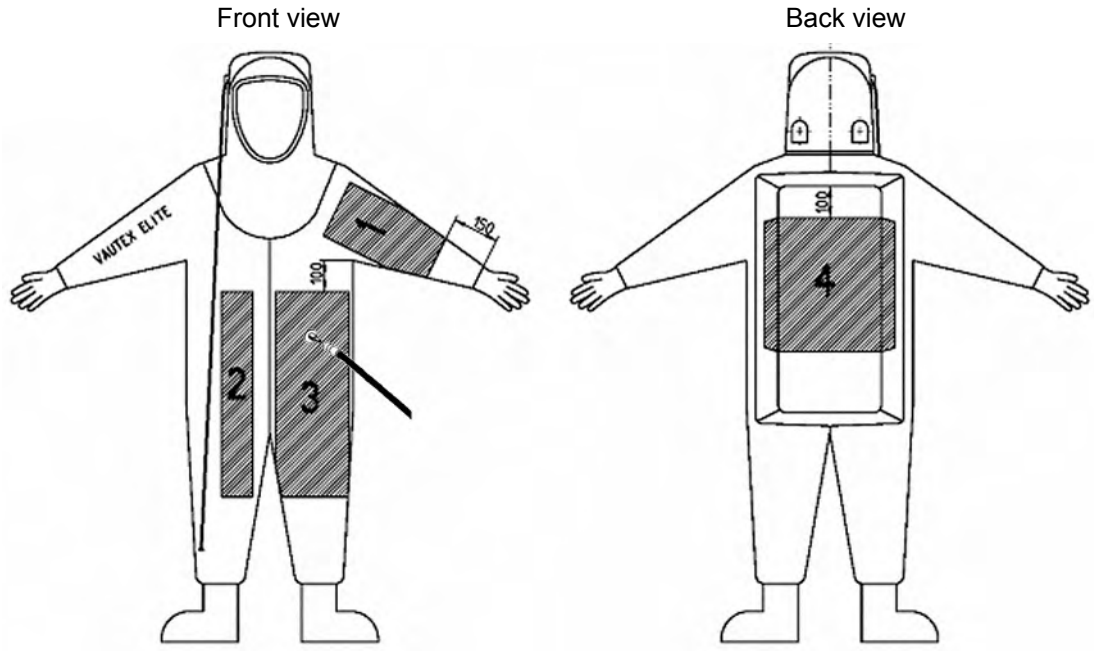


Fig. 4 ***Marking Surfaces on the Protective Suit***

Surfaces for Marking	
Field	Max. sticker size
1	B 200 mm x H 400 mm
2	B 100 mm x H 700 mm
3	B 250 mm x H 700 mm
4	B 450 mm x H 550 mm

This adhesive bonding work shall be carried out only by MSA, qualified service engineers or technicians. The corresponding seminars can be ordered at MSA.

3. Use

3.1. Safety Instructions

Attention!

In order to prevent electrostatic load when entering explosive atmospheres the protective suit must be moistened with water on the outside and kept moistened whilst in the explosive area.

Attention!

The protective suit is not suitable for firefighting.

Attention!

During use a compressed air breathing apparatus is worn to ensure the breathing air supply in case the compressed air feeding line fails.

Attention!

If a malfunction of the Switch Valve is suspected, the suit ventilation has to be switched off and the site must be left.

The appropriate measures will be stated by the supervising personnel.

The breathing behaviour of the device wearer during use has to be moitored by a trained person using the manometer of the compressed air feeding line. If necessary preventive measures or pressure corrections have to be carried out.

Before donning the suit, the wearer must check that there are no missing parts (e.g. suit valves, gloves and boots).

When using in the colder environments heat insulating clothing is recommended.

As clothing under the protective suit the following is recommended:

- cotton underwear and socks,
- cotton gloves,
- e.g. one-piece overall with legs and sleeves that can be closed tightly or a firefighting protective suit,
- protective helmet (e.g. DIN firefighting helmet MSA Linesman, MSA GALLET: F1S, F1SA, F2 or F2 XTREM,
- protective helmets with helmet cover as visor holder (MSA GALLET F1S, F1SA, F1E, F1SF) (→ Section 3.2).

3.2. Helmet cover as visor holder

The helmet cover as visor holder is available for the helmets MSA GALLET F1S, F1SA, F1E, F1SF.

Pulling on the helmet cover as visor holder

(1) Pull the helmet cover as visor holder over the visor.

(2) Pull the helmet cover as visor holder completely over the bottom edge of the helmet.

3.3. Preparation

Before donning the protective suit the following instructions must be followed:

(1) Spread the protective suit on the floor.

(2) Align the sleeves and legs of the protective suit ensuring there are no twists.

(3) Open the zip fully and carefully in stages.

(4) Treat the suit lens on the inside and the lens of the respiratory protective mask on the inside and outside with the anti-misting agent MSA klar-pilot.

(5) Place the safety high boots upright and expose the boot openings.

(6) Align the suspenders if available.

(7) Switch on the radio, adjust and test.

(8) Switch on the compressed air feeding line and pressurise in accordance with the corresponding operating manual.

(9) Check the compressed air breathing apparatus and full face mask in accordance with the corresponding operating manual and check the sealing.

Checking the Switch Valve (→ Fig. 3)

(10) Connect the lung governed demand valve to the lock coupling 1.

(11) Connect the medium pressure line of the compressed air breathing apparatus to the plug nipple.

(12) Disperse air three times fast and intensely by activating the lung governed demand valve.

(13) Connect the compressed air feeding line to the plug nipple 2.

(14) Disconnect the medium pressure line (SCBA) from plug nipple 3.

(15) Open the suit ventilation with handwheel 5, use the lung governed demand valve to disperse air three times, switch off suit ventilation afterwards.

(16) Reconnect the medium pressure line (SCBA) to plug nipple 3.

(17) Open the suit ventilation completely and use the lung governed demand valve to disperse air three times fast.

It has to be made sure that the emergency air supply (SCBA) is not switched on while dispersing air by the lung governed demand valve.

If the emergency air supply system is switched on during use of the lung governed demand valve the pressure of the compressed air feeding line has to be increased accordingly.

3.4. Donning the Protective Suit

When donning the protective suit a second person (assistant) is required to help.

Suspenders can be supplied by MSA as an option including a supplementary sheet for donning. They keep the suit held in position better.
The suspenders do not form part of the supply of the EC prototype test!

Donning respiratory protection

(1) Put the compressed air breathing apparatus and full face mask on in accordance with the corresponding operating manual.
(2) Open cylinder valves fully.
(3) Don the protective helmet and put on the cotton gloves.

Attention!

Ensure that the mask is properly tightened since it could slip as a result of the wearer's increased sweat when wearing the protective suit.

Adjusting the head strap

(4) The assistant adjusts the head strap so that the head section is set to the optimum size for the size of the helmet.

Donning the boots

(5) Stand next to the protective suit, remove footwear.
(6) Step into the suit.
(7) Step into the right, followed by the left, boot.

Donning suspenders (if available) and support belt

(8) Adjust the length of the support belt from the crotch of the protective suit.
(9) Pull the protective suit up to crotch.
(10) Lay the straps of the suspenders over the shoulders.
(11) Roughly adjust the length of the suspender straps.
(12) Engage the suspenders strap in the ring.
(13) Engage the support belt in the ring.
(14) Adjust the length of the suspenders strap exactly.
- The strap must be attached tightly whilst ensuring freedom of movement.

(15) Adjust the length of the support belt exactly.
- The belt must be attached tightly whilst ensuring freedom of movement.

Attaching the support belt (without suspenders)

(16) Roughly adjust the length of the support belt from the crotch of the protective suit.

(17) Pull the protective suit up to crotch.

(18) Attach the support belt to the waist belt of the compressed air breathing apparatus.

(19) Adjust the length of the support belt.
The belt must be attached tightly whilst ensuring freedom of movement.

Pulling the left glove over fully

(20) The assistant holds on to the loose hanging sleeves of the protective suit at the support ring of the left glove system and pulls the sleeve without creases to the side.

(21) Pull the left sleeve on fully whilst ensuring that the glove system fits properly.

Pulling the protective suit on

(22) The assistant raises the protective suit over the compressed air cylinders.

(23) Hold the lens up by the bottom edge using your left hand.

(24) The assistant places the head part over the helmet.

Switch Valve (→ Fig. 3)

(25) Connect the lung governed demand valve to the lock coupling 1.

(26) Connect the medium pressure line of the compressed air breathing apparatus to the plug nipple 4.

(27) Connect the compressed air feeding line to the plug nipple 2.

(28) The Switch Valve has to be secured by the attached flexible strap at the SCBA-belt.

Fitting the radio (if available)

(29) Connect the radio with the headset and place in the radio holder.

(30) Carry out a communication test and adjust the channel and volume if required

The radio pocket does not form part of the supply of the EC prototype test!

Pulling the right glove over fully

(31) The assistant holds on to the support ring of the right glove system and pulls the sleeve without creases to the side.

(32) Pull the right sleeve on fully whilst ensuring that the glove system fits properly.

Attention!

Carefully close the zip by gently pulling. As the zip slider moves downwards, hold on to the suit material at the same level.

Pulling with excessive force can lead to irreparable damage and to the zip opening when in use or losing its sealing.

Make sure that both halves of the chain are located parallel to each other without lateral load.

Closing the protective suit

(33) Stretch your right arm gently backwards and downwards and use your left hand to hold the lens upwards by the bottom edge to ensure that the zip is freely accessible and tight for closing.

(34) The assistant gently closes the zip in stages until reaching chest height.

(35) The assistant connects the automatic lung mechanism.

(36) The assistant gently fully closes the zip in stages.

Attention!

In order to prevent the penetration of toxic agents the zip must be fully closed. In order to verify this, the assistant must look through the lens from the outside to the zip end. If any light can be seen the zip must be closed up to the end chamber.

(37) Close the push buttons on the zip cover.

Check readiness for use

(38) Check the freedom of movement of the head, arms and legs.

(39) Test the radio

(40) Indicate readiness for use.

(41) Adjust ventilation to your needs via handwheel on the outside.

3.5. Removing the Protective Suit

Attention!

If the protective suit is heavily soiled a preliminary cleaning should be carried out by an assistant before removing to ensure that toxic agents are removed from the protective suit. Whilst doing so the protective suit remains fully donned and closed. The assistant must wear the appropriate personal protection equipment when doing this e.g. protective gloves, respiratory protection, protective suit.

The preliminary cleaning is, if possible, performed using water with suitable detergent additives with the zip cover open.

When removing the protective suit, avoid any contact with the soiled outside of the suit. To avoid any impurities from reaching the inside the assistant must ensure that he does not come into contact with them.

The removal of the protective suit is performed in reverse order from the donning procedure:

Attention!

Carefully open the zip by pulling gently.
As the zip slider moves downwards, hold on to the suit material at the same level.

Opening with excessive force can cause long-lasting damage.

(1) Open the zip cover.

(2) Pull your arms from the sleeves and hold on to the lens from the inside.

(3) Open the protective suit carefully.

(4) Disconnect from the Switch Valve in the following order:
- Compressed air feeding line
- Lung governed demand valve
- Medium pressure line (SCBA)

(5) Remove the Switch Valve from SCBA-belt.

(6) Pull the protective suit off.

(7) Drop off helmet.

(8) Remove the compressed air breathing apparatus.

(9) In order to protect the inside of the suit from contamination fully close the zip of the removed protective suit.

(10) For transport of the protective suit, e.g. loosely fold the suit and pack into a polyethylene bag or similar.

3.6. Disposal

The protective clothing itself does not require any special handling with regard to disposal. However, the disposal of contaminated protective suits is carried out in accordance with local legislation depending on the extent of the contamination through toxic waste.

4. Cleaning, Disinfection

4.1. Cleaning

The protective suit must be cleaned after each use. To do this remove the valve discs of the suit (→ Section 5.3) and unbutton the rucksack reinforcement. These parts must be cleaned separately and fitted back only after they have been dried.

Attention!

The use of cleaning and disinfection materials, or the use of cleaning and disinfection processes, which are not permitted by MSA, can damage the protective suit and can destroy its protective properties (e.g. the use of a washing machine and drier).

Do not clean the protective suit using hard, sharp or pointed instruments.

Do not use organic solvents for cleaning such as nitro thinner, alcohol, spirit, petrol.

The protective suit is to be cleaned as follows:

(1) If the protective suit is not too badly soiled wash it once by hand at 30°C using a mild detergent. If badly soiled repeat the washing procedure.

(2) Then rinse twice in clear water.

Attention!

To ensure full tightness the zip links must be free from foreign bodies such as bristles, hairs, threads and other impurities.

(3) Thoroughly clean the zip separately with water and a soft brush.

(4) Then hang the protective suit by the boots to dry.

Attention!

The protective suit and the removed parts must not be dried in radiant heat (e.g. sunlight, radiators) to prevent destroying the structure of the protective suit.

When using a drying cabinet, the temperature may not exceed 40°C.

(5) After cleaning the protective suit disinfect it e.g. with the disinfectant AUER 90 (→ Section 4.2).

(6) Then rinse thoroughly with water!

(7) After each use and cleaning/ disinfection, a tightness test of the protective suit and its valves is performed (→ Section 5.2).

(8) Grease the zip (→ Section 5.5).

4.2. Cleaning the Switch Valve

Components of the breathing apparatus and the Switch Valve that have been soiled should be thoroughly cleaned after usage, if required, with tepid water.

To do this, seal the connection nipple, leave all pressure hoses attached and pressure-clean the Switch Valve. Any remaining moisture should be dried at a maximum temperature of 40°C. Make sure that no water gets inside the Switch Valve. For drying i.e. air-dry the switch valve 1-2 days unpressurised.

Attention!

The use of cleaning and disinfection materials, or the use of cleaning and disinfection processes, which are not permitted by MSA, can damage the Switch Valve.

Do not use organic solvents for cleaning such as nitro thinner, alcohol, spirit, petrol.

After the valve is completely dry a function test of the Switch Valve has to be carried out.

4.3. Disinfection

Disinfection should only be carried out as follows using disinfectant AUER 90 only:

(1) Dilute the disinfectant AUER 90 with water (water temperature max. 30°C).

(2) Immerse the parts to be disinfected directly in the disinfectant solution or apply the solution with a rag and allow it to work.

(3) Then rinse all parts thoroughly with water.

Concentration and working times of the disinfectant AUER 90:

	Concentration	Working Time
Normal disinfection	2.0%	15 Minutes

Attention!

The safety instructions on the bottle or container of the disinfectant AUER 90 must be observed.

5. Maintenance

5.1. Maintenance Intervals

The maintenance work shall be carried out by qualified service engineers or technicians. The corresponding seminars can be ordered at MSA.

All maintenance work carried out must be noted on the appropriate inspection plate. The maintenance periods specified below refer only to protective suits.

Task to be Performed	Before Use	After Use	6-Monthly	Every 2 Years	Every 9 Years
Cleaning, Disinfection		X			
Maintenance		X	X		
Function test and tightness test		X	X		
Function test of the Switch Valve	X	X	X		
Overhaul of the Switch Valve					X
Valve disc replacement		X		X	
Sealing ring replacement				X	
Control by wearer	X				
Service zip		X	X		

5.2. Tightness Test of the Protective Suit

After each use, after each cleaning / disinfection, after each maintenance / repair or on a half-yearly basis, a tightness test of the protective suit must be performed. In order to do so use the MSA suit tightness tester kit with the valve leak test adapter.
The valves can be tested using a mask testing instrument in conjunction with the valve leak test adapter and the compensation container.

The test instruments can be ordered separately at MSA (→ Section 8).

Only inflate the protective suit with clean oil-free compressed air (breathable air quality in accordance with EN 12021) to ensure that after the tightness test there are no residues left in the suit.

In order to avoid erroneous measurement perform the test in a draught-free room.

Test according to EN 464:

(1) Remove the valve discs and angled prechambers, close the valve bodies with the valve closing cap (this can act simultaneously as a test and/or filling connection).

(2) Inflate the suit to 18 mbar positive pressure. Whilst doing so the pressure must be held for 10 minutes at 17.0 ±0.5 mbar.

(3) Reduce positive pressure to 16.5 ±0.3 mbar (test pressure). The maximum permitted pressure drop in 6 min: 3 mbar.

(4) At the end of the test, reassemble the valve discs and the angled prechambers.

(5) Then perform a valve tightness test (→ Section 5.3).

In practice the following maintenance test has divergently been tried and tested:

(1) Remove the valve discs and angled prechambers, close the valve bodies with the valve closing cap (this can act simultaneously as a test and/or filling connection).

(2) Inflate protective suit 18 ±0.5 mbar positive pressure.

(3) Stabilising time approx. 3 min.

(4) Reduce positive pressure to 16 ±0.5 mbar (test pressure). The maximum permitted pressure drop is in 3 min: 2 mbar.

(5) At the end of the test reassemble the valve discs and angled prechambers.

(6) Then perform a valve tightness test (→ Section 5.3).

In the event of doubt, check in accordance with EN 464 (see above).

Checks in case of leaks

If leaks are detected during the tightness test it must be checked whether

- the test instrument is tightly connected to the valve,
- the zip is fully closed and tight,
- the valves are properly assembled.

Test the Switch Valve:

(1) Seal the plug nipple 2 (→ Fig. 3) located on the outside of the Protective Suit.

(2) Connect a compressed air supply to plug nipple 3.

(3) Connect a pressure gauge to the lock coupling 1 for lung governed demand valve.

(4) Pressurise Switch Valve with a medium pressure (test pressure) of 10 bar to check the tightness.

- The maximum permitted pressure drop is in 1 min: < 1 bar.

5.3. Replacing the Suit Valves

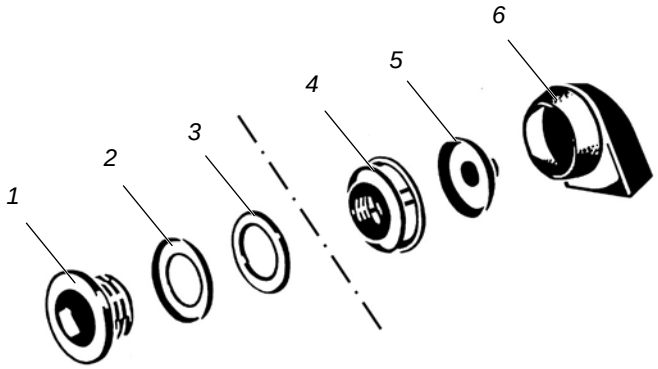


Fig. 5 Suit Valve

1	*Ring nut*	*4*	*Valve housing*
2	*Slip ring*	*5*	*Valve disc*
3	*Gasket*	*6*	*Prechamber*

Removing the suit valves

(1) Pull off the angled prechamber of the valve to be removed.

(2) Open the suit and lay out the inside to allow access to the valve.

(3) Use one hand to grip the valve housing from the outside and the other to unscrew the ring nut from the valve housing inwards using a valve spanner.

Reassembling the suit valves

(1) Insert the ring nut with the slip ring correctly fitted from inside through the head strap hole, the gasket opening and the valve hole on the suit shell.

(2) Screw the valve housing onto the ring nut from the outside.

(3) Use one hand to grip the valve housing from the outside and the other to screw on the ring nut from the inside to the valve housing using a valve spanner.

The torque must be 250 Ncm.

(4) Fit the valve disc.

(5) Mount the prechamber by overstretching whereby the angled part is pointing in the direction of the boot.

5.4. Tightness Test of the Valves

After each use and cleaning / disinfection and after each maintenance / repair task or every half-year, a tightness test of the suit valves must be carried out. The tightness of the suit valves is to be checked using e.g. the MSA valve leak test adapter in connection with the compensation container and the mask tightness test instrument (→ Section 5.1):

- create a negative pressure of 10 mbar.
- max. pressure change within one minute must not exceed 1 mbar.

If a leak is detected, either the valve disc or the entire suit valve assembly must be replaced. To do this, the threaded ring is unscrewed from the inside of the suit using an assembly spanner.

The valve discs and gaskets must be replaced every two years (→ Section 5.1).

5.5. Zip

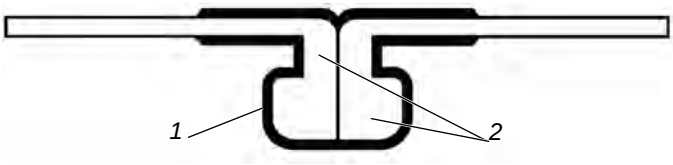


Fig. 6 Zip Area to be treated with Grease

1 Grease film *2 Zip links*

After each use, after each cleaning or disinfection or every half year (→ Section 5.1) the zip should be lubricated using a grease pencil or it should be sprayed using a zip grease spray. This applies a thin film of grease to the zip links.

5.6. Visual Control of the Protective Suit

The protective suit must be checked for irregularities. These include:

- scratches or abrasion points,
- breaks in the suit material
- swollen or brittle material
- and damaged seams.

Visible changes to the outside of the suit material such as slight abrasion and / or slight discolouration do not impair its protective effectiveness against chemicals.

The discharge of ageing inhibition agents during storage does not impair the quality of the safety high boots.

5.7. Repair

The repair of suit material, seams or the replacement of zips may only be carried out by MSA or MSA authorised customer service.

Before submitting the protective suit for maintenance and/or repair purposes, it must be fully decontaminated, cleaned and disinfected. Confirmation of this is given on the maintenance and repair form (→ Section 8).

Only MSA original spare parts can be used for repairs.

5.8. Replacing the Lens

The replacement of the lens is solely to be carried out by authorised workshops or by MSA customer service.

5.9. Replacing the Gloves

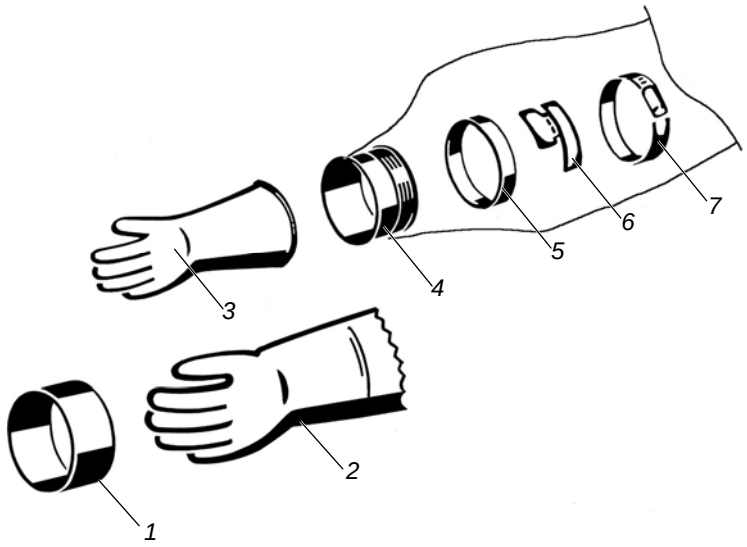


Fig. 7 Gloves

1	*Cuff tube (protective rubber) for outer glove*	*5*	*Rubber ring*
2	*Outer glove*	*6*	*Clamp protection*
3	*Inner glove*	*7*	*Screw and nut clamp*
4	*Tube piece*		

Disassembling the outer gloves

(1) Pull off cuff tube.

(2) Pull off outer glove.

Disassembling the inner gloves

(1) Open zip fully.

(2) Turn the sleeves of the protective suit inside out.

(3) Loosen screw and nut clamp (SW7).

(4) Pull out tube piece with glove.

(5) Pull glove off tube piece.

Reassembling the inner gloves

Attention!

In order to guarantee full tightness, check the tightness of the suit after each glove replacement before fitting the outer gloves (→ Section 5.2).

(1) Insert tube piece into glove cuff.

(2) Insert tube piece and glove into the sleeve.

(3) Align glove.

(4) Fit the screw and nut clamp on.

(5) Fit clamp protector under clamp.

(6) Turn clamp lock on the screw clamp on the seam.

(7) Tighten screw and nut clamp with SW7, tightening torque: 400 ±30 Ncm.

(8) Push inner glove to the outside.

Ensure that the clamp lock is on the seam and that the clamp protector covers the clamp lock.

Reassembling the outer gloves

(1) Takes place only after successful tightness test of protective suit.

(2) Pull the outer glove over the inner glove.

(3) The inner roll of the outer glove must be fitted into the groove of the tube piece.

(4) Then assemble the cuff tube.

5.10. Replacing the Safety High Boots

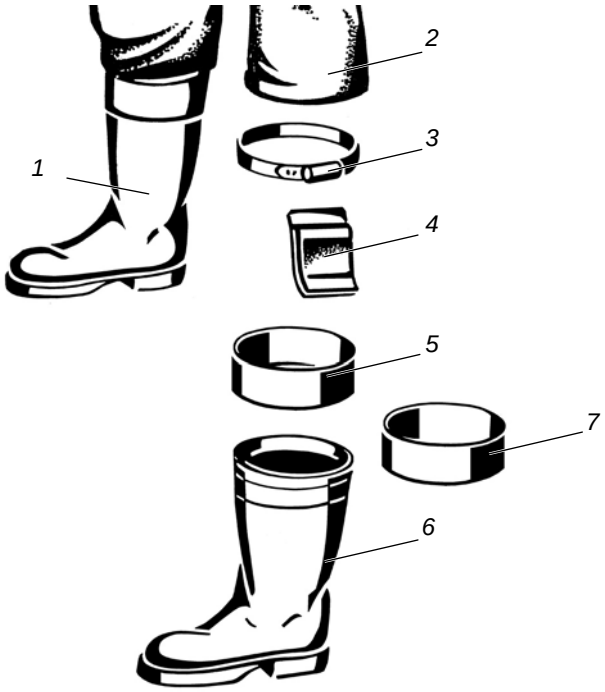


Fig. 8 Safety high boots

1	*Safety high boot complete*	*5*	*Tube piece*
2	*Protective suit leg*	*6*	*Safety high boot*
3	*Screw and nut clamp*	*7*	*Cap tube (protective rubber) for safety high boot*
4	*Clamp protection*		

Removing the safety high boots

(1) Remove cap tube from the boot shaft.

(2) Open protective suit zip fully.

(3) Turn protective suit legs inside out.

(4) Loosen and remove screw and nut clamp (SW7).

(5) Pull out tube piece.

(6) Remove safety high boot from the protective suit leg.

Reassembling the safety high boots

Attention!

In order to guarantee full tightness, check the tightness of the suit (→ Section 5.2) after each replacement of the safety high boots before the cap tube is fitted over the shaft of the boot.

(1) Push safety high boot into the suit leg that was turned inside out.

(2) Align suit leg and boot.

(3) Insert tube piece in the boot shaft.

(4) Fit the screw and nut clamp on.

(5) Turn clamp lock towards the rear.

(6) Fit clamp protector under clamp.

(7) Tighten screw and nut clamp with SW7, tightening torque: 500 ±30 Ncm.

(8) Clamp protection must cover the clamp lock.

(9) Push safety high boot to the outside.

(10) After tightness test, fit cap tube over shaft of boot.

6. Transport and Storage

Attention!

When storing the protective suit on vehicles or containers abrasion through permanent friction with the contact surface has to be avoided.

Attention!

In order to prevent damage to the protective suit, the material, seams, and zip must not be forcibly kinked or folded!

The zip should remain closed during storage.

The suit can, for example, be loosely folded as a large package.

The protective suit is supplied folded and pressure-free. Storage must be in a loosely folded pack in clean and dry conditions in a normal atmosphere free from toxic substances, protected from direct sunlight and temperature changes (according to DIN 7716 and ISO 2230).

The operational life can change as a result of environmental influences, such as UV light, heat, humidity. The storage room must be cool, dry, dust-free and well ventilated.

The storage temperature is between -5 °C and +25 °C. The optimum storage temperature is between +15°C and +25°C, since in the long-term there could otherwise be a change in the physical properties or a shortening of the service life.

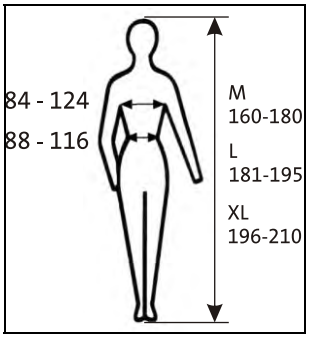
The relative air humidity is best at under 65%.

7. Technical Data / Approvals

7.1. Approvals

PPE Directive	**89/686/EEC**
	EN 943-1:2002 EN 943-2:2002 - Type 1a (Internal compressed air breathing apparatus) Gas-tight (Type 1) chemical protective suits for emergency teams (ET)
	EN 14126:2003 - Type 1B Protective clothing for infective agents
	EN 533:1997 - Type 3 Limited flame spread
	EN 1073-2:2002 Radioactive contamination by solid particles
EC type examination:	DEKRA EXAM GmbH, Zertifizierungsstelle, Dinnendahlstr. 9, 44809 Bochum
Surveillance acc. Article 11B	DEKRA EXAM GmbH, Zertifizierungsstelle, Dinnendahlstr. 9, 44809 Bochum
	CE 0158

7.2. General Characteristics of the Protective Suit

Weight of the complete protective suit, excluding breathing apparatus and full face mask.	approx. 8.5 kg
	Size M Size L Size XL
Inner gloves	Size 9, 10 and 11
Safety high boot	Size 9 (43/44)
	Size 10 (45)
	Size 11½ (46/47)
Operating temperature	-30°C to +60 °C
Storage temperature	-5 °C to +25 °C, optimal +15 °C to +25 °C
Suit ventilation	max. 100 l/min at 10 bar
Automatically switch-over of Switch Valve to SCBA	< 5.5 bar ±1 bar
Automatically switch-over of Switch Valve to compressed air line system	> 6 bar ±1 bar
Life span (with appropriate maintenance and storage and without emergency use)	at least 10 years

7.3. Mechanical Characteristics of the Suit Material

Mechanical Characteristics	**Class**
Abrasion according to EN 530	6
Blocking behaviour according to ISO 5978	2
Flexural crack resistance according to ISO 7854	5
Flexural crack resistance at low temperatures (-30 °C) according to ISO 7854	2
Flexural crack resistance at low temperatures (-60 °C) according to prEN 943-2	2
Further crack resistance (Trapezoid process) according to ISO 9073-4	5
Bursting strength according to ISO 13938	6
Tensile strength to EN ISO 13934-1	6
Cutting resistance according to EN 863	3
Resistance to ignition according to EN 13274-4	3
Seam resistance to EN ISO 13935-2	6

7.4. Chemical Characteristics of the Suit Material

Resistance to permeation of chemicals.

Test Chemical	Suit Material	Suit seams	Inner Gloves	Lens	Boot	Zip	Pass-Thru
	Class	Class	Class	Class	Class	Class	Class
Acetone	5	5	4	5	3	2	5
Acetonitrile	6	6	6	6	4	3	6
Ammonia (Gas)	6	6	6	6	6	6	6
Chlorine (Gas)	6	6	6	6	6	6	6
Hydrogen chloride (Gas)	6	6	6	6	6	6	6
1.2 Methylene chloride	3	3	2	4	2	1*	6
Diethylamin	6	5	1*	6	5	2	3
Ethyl acetate	6	4	2	6	4	1*	6
n - Heptane	6	6	6	6	6	6	6
Carbon disulphide	6	3	6	6	3	4	6
Methanol	6	6	6	6	6	6	6
Caustic soda 40%	6	6	6	6	6	6	6
Sulphuric acid 96%	6	6	6	6	6	6	6
Tetrahydrofuran	6	5	1*	5	4	2	6
Toluol	6	3	6	6	5	1*	6

* Note: Not suitable for use with these chemicals under continuous exposure.

Manufacturer recommendation: using in accordance with the scope of delivery with over glove results in class 2 of the glove components for both chemicals after tests. Without impairing the tightness with regard to the tested chemicals it can lead to material changes depending on the operating conditions.

The evaluation of the retention behaviour is classified as follows in accordance with the European standard EN 369:

Class	Breakthrough Time
6	> 480 min
5	> 240 min
4	> 120 min
3	> 60 min
2	> 30 min
1	> 10 min

8. Ordering Information

Order Code for Protective Suit

The order no. for the protective suit consists of A_Vautex Elite ET and an 8-digit code from A-H.

	A	B	C	D	E	F	G	H
Code	Protective suit torso size	Lens	Safety high boots size	Inner glove size	Radio holder size	Suspenders	Marking Numbers size	External air feed
0	-	-	none	none	none	none	none	none
1	M	Standard	UK 9 D 43/44	9	70x35x95	equipped	100 mm	Dual Airline
2	L		UK 10 D 45	10	80x50x190		150 mm	Dual LVS600-D
3	XL		UK11 ½ D 46/47	11	90x65x220		200 mm	Dual SCBA
4					90x40x300		300 mm	

The marking of the protective suit can be attached to the suit. A specific surface is to be provided for this, see Fig. 4 (not possible in connection with the trainer suit).

MSA offers in its product portfolio a training version of the protective suit. The material and the treatment of the seams of these training suit are not designed for protection against chemicals, but solely for training purposes. The fabric of the training suit is designed to resist abrasion and tearing also at frequent use in training galleries.

Please contact the MSA Customer Service for detailed information.

Example for the Order No. of a Protective Suit:

- with torso size L (Code: 2)
- with standard lens (Code: 1)
- with safety high boot size D 45 (Code: 2)
- with inner glove size 9 (Code: 1)
- without radio holder (Code: 0)
- with suspenders (Code: 1)
- without marking on the protective suit (Code: 0)
- with external air feed and LVS 600-D (Code: 2)

The above would result in the following article number:

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**
A_Vautex Elite ET	2	1	2	1	0	1	0	2

The complete article number is: **A_Vautex Elite ET 21 21 0102.**

Article Numbers Protective Suit Parts and Accessories

Description	Part-No.
Gloves	
Replacement gloves, inner size 9	10068292
Replacement gloves, inner size 10	10068293
Replacement gloves, inner size 11	D3022721
Replacement gloves, outer size 9	10092112
Replacement gloves, outer size 10	10092113
Replacement gloves, outer size 11	10144803
Replacement gloves, outer size 14 (K-MEX Gigant N)	10092116
Textile gloves (Packet with 5 pairs)	D3022719
Cuff tube glove (unit)	D0008866-SP
Safety high boots	
Boot size 11½ (46/47)	D3022705
Boot size 10 (45)	10053172
Boot size 9 (43/44)	10053171
Cap tube boot (pair)	D3020063
Spare Parts	
Suit valve for all CSA	D5135924
O-ring for suit valve 40 x 30 x 1 (4 pieces)	D3022076-SP
Accessories	
Helmet as visor holder - MSA GALLET F1S, F1SA cover	GA1108A
Helmet as visor holder - MSA GALLET F1E cover	GA1108B
Helmet as visor holder - MSA GALLET F1SF cover	GA1108C
Maintenance and repair form	D3022085
Grease pencil for zip	D3022050
Syntheso W zip lubricant spray	D3022180
AUER 90 disinfectant, 2l.	D2055765
AUER 90 disinfectant, 6l.	D2055766
Antimist agent klar-pilot spray	10032164
Hanger for chemical protective suit	D3022908
Transport case for chemical protective suit	D0120831
Storage bag PE 2300 x 750 mm with slide lock	D3022213
Valve spanner suit valves	D2055038
CD-ROM Instructions for use Vautex Elite ET	10065898
Transponder reader	upon request
Apparatus management software	upon request

Compressed Air Supply	
Automatic Switch Valve (LVS 600-D)	10080956
Manual Compressed Air Line Breathing Apparatus	D4066091
Pressure reducer	D4066830
Compressed air filter housing	D3043986
Adapters for compressed air filter housing with pressure gauge and coupling	D3043994
Compressed air filter cartridge CO	D3043987
Compressed air filter cartridge AB/St	D3043989
Compressed air filter housing A (oil vapour filter)	D3043993
Y-manifold	D4066804
Air supply line antistatic, 5 m	D4066847
Air supply line antistatic, 10 m	D4066848
Air supply line antistatic, 20 m	D4066849
Air supply line antistatic, 50 m	10012120
Compressed air line filter unit	D4066851
1st Stage high effiency filter element replacement	D4066852
2nd Stage Activated carbon filter element replacement	D4066853
Lock coupling	D4066113
Gas hose nozzle adapter G 1/2"	D4066199
Pressure regulator	D4066854
Pressure gauge	D4066855
Kit of couplings for Airline Filter Unit	10041367
Diaphragm compressor V-Meko 400	D4066843
Diaphragm compressor R-Meko 720	10014875

Accessories Tightening Test, Testers	
Tightness tester kit for chemical protective suits	D3022800
Valve lock cap	D5135039-SP
Valve lock cap	D5135047-SP
Mask tightness tester	D6063705
Valve leak test adapter	D5065989
Compensation container	D3022717
Multitest Plus test case	D5175743
Multitest Plus test console	D5175744
CPS test line for Multitest	D5175532
CPS valve test mechanism for Multitest	D5175533
Computer-supported testers	upon request

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