HOW TO ADJUST THE DIL-SWITCHES

During

INSTALLATION OF VARIOUS OPTIONS

Symbols used in this manual

	**WARNING ELECTRICAL SHOCK** Used in case of potential danger of electrical shocks.

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1. Instruction

During installation of options available for the SAFE 2000 / MAXI SAFE 2000 cabinet the DIL-switches positioned on the backside of the CPU circuit board, must be adjusted.

WARNING ELECTRICAL SHOCK
Before adjusting the DIL-switches, please note that the cabinet must be turned off from mains.

The figure below shows the position of the DIL-switches depending on the option:

[X] ~ DIL switch ON

DIL-SWITCH no. / OPTION	1	2	3	4	5	6	7	8
60 Hz	X							
DC Fan sensor		X						
UV, (active in all positions of sliding front window).			X					
Standard (UV timer off)				X				
AOS, 10 minute bypass.					X			
Holten logo off						X		
External relay							X	
Gas control, (DIL switch no. 2 must be turned off).								X

LEAK TEST OF FILTER AND CONSTRUCTION

USING A PHOTOMETER

Symbols used in this manual

	**WARNING** Used in case of danger of a serious accident or when documentation needs to be consulted.
☞	**NOTE** Used to direct attention to a special item.

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1. Introduction

1.1. Equipment required for leak test

- Photometer
- Aerosol
- Aerosol generator
- Diluent
- Dilution equipment (if available)
- Forms : "Key plan" and "Leak test of HEPA filter"

1.2. Requirements to the equipment

Photometer	Optical photometer with lower sensitivity 10^{-3} µg/l with 0,3µm particle, and possibility of measuring concentrations up to 10^{5} times lower sensitivity.
Test aerosol	EMERY
Aerosol generator	One or more nozzles of type Laskin.
Ratio of size of aerosol from generator	99 % smaller than 3,0 µm, 50 % smaller than 0,7 µm, 10 % smaller than 0.4 µm.

2. Test instruction

1. Start the unit, position the front window in working position and let the unit run for at least 15 minutes at 1/1 speed.

2. On the form "keyplan" make a drawing showing the location of:

- Inlet ports
- Control panel
- Shieldings
- Light fittings
- Location of the unit in the room
- Location of the remaining equipment in the room.

3. On the form "leak test of HEPA filter" make a key plan showing the filters in each module.

4. Connect the photometer to the module to be tested.

- Warm up the photometer.

- Connect the photometer to the service valve or close the suction side of the fan, in such a way that the measuring represents the mean concentration on the back side of the filter.

5. Start the aerosol generator

- Ensure that the aerosol is sucked into the opening of the filter to be tested.

6. Measure and make record the concentration of aerosol on the back side of the main filter.

7. Adjust the aerosol generator until a value of 5 µg/l is exceeded.

- Record the measured particle concentration on the form "Leak test of HEPA filter"

8. Adjust the photometer to indicate 100 %.

9. Adjust the aerosol generator until a value of 1×10^6 per ft^3 is exceeded.

- Record the measured concentration on the form "leak test of HEPA filter".

10. Set the photometer to :

- Scan with the Isokinetic sensor connected.

- Give acoustic signal if particle concentration exceeds 0,01 % or reads below 0,01 %.

11. Move the probe with a speed of maximum 30 mm/sec keeping it about 25 mm from the area to be tested.

12. Test the area around the filter packing.

13. Test the entire filter surface.

14. Test the entire filter area by moving the probe with overlapping movements.

15. Test the entire unit in side the clean area.

16. If relative permeability higher than 0,001 % is measured at a particular point, return to this point to measure the particle concentration.

17. Record the value.

18. Check that the value for maximum relative permeability is below the maximum permissible value.

19. Adjustments

- Too high permeability at a particular point or at filter packing.
- Contact customer to arrange replacement of filter and silicone sealant.
- Too high permeability in the construction.
- Make a silicone sealant, using the same colour of silicone as used during construction.

Maximum 5 % of the filter surface is allowed to be covered with silicone sealant.

Maximum area for one repair ~ 38 x 38 mm.

S/MS 2000 - Test of air velocity

Symbols used in this manual

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2. Test instruction 4
2.1. Air velocity 4
3. Air velocity in the work opening 5

1. Introduction

Procedure for testing the velocity in laminar flow and work opening.

Equipment for velocity test:

Anemometer (Flow Master)

Measuring pipe (PVC pipes with inside diameter Ø160 mm.)

2. Test instruction

☞	**NOTE** • Different ways of calibrating the measuring tools may cause discrepancies in the measuring results. - Ask for the previous calibration test results. • Inaccuracies of positioning the measuring points may cause minor changes of the values obtained. • The power supply will also influence the measuring results since the fan will give less air at lower voltage. • The measuring tool must compensate for the ambient temperature; otherwise the results must be corrected.

2.1. Air velocity

Air velocity in laminar flow:

Position the anemometer on top of a stand 250 mm above the table top.

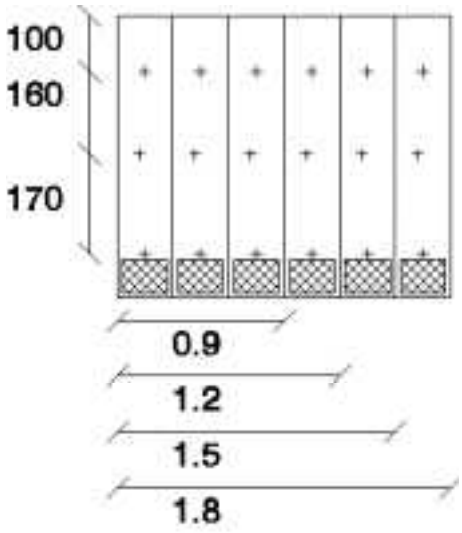
Measure the air velocity according to the indicated test point shown in figure 1.

Calculate the mean value

$$x_{av} = \frac{x_1 + x_2 ..... x_n}{n}$$

This value has to be 0.4 m/s (approximately). As there is hysteresis in the alarm system, the values x_1 ..... x_n should be between 0.34 m/s and 0.46 m/s in order to be able to adjust the alarm values which are 0.32 m/s for low alarm and 0.48 m/s for high alarm.

The airspeed below the main filter may be adjusted using the different settings on the auto transformer.



3. Air velocity in the work opening

1. Place the measuring pipe (ø160 mm) in the work opening.

2. To avoid false air in the work chamber, seal off all openings with tape.

3. Seal the "filter closing plate" with tape.

4. Place the anemometer at the end of the measuring pipe and measure in the 5 test points, see figure 2. The average velocity in the work opening must exceed 0,4 m/sec.

5. Calculate the mean value = $(x_1 + x_2 + ...+ x_n) / n$

Calculate the average velocity $V_{work\ opening} = F \times V_{pipe}$

- F= Conversion factor, see schedules below.
- V_{pipe} = Average velocity of the measurements in the measuring pipe.
- $V_{work\ opening}$ = Calculated mean value of velocity.
- Min. acceptable velocity in the work opening ~ $V_{min.} = 0,4 / F$
- Where V_{min} is the velocity in the measuring pipe corresponding to 0,4 m/sec. in the work opening.

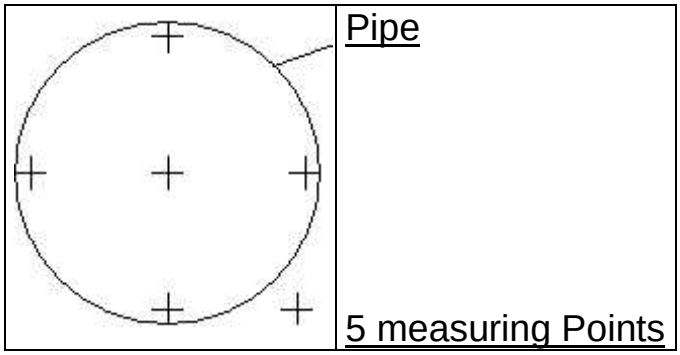


Figure 2

F at work opening height 200 mm				
Tube size [mm]	900	1200	1500	1800
ø125	0,0628	0,0471	0,0377	0,0314
ø160	0,1048	0,0786	0,0629	0,0524
ø200	0,1659	0,1244	0,0995	0,0830
ø250	0,2619	0,1964	0,1571	0,1310

Leak test of filter and construction using a particle counter

Symbols used in this manual

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1. Introduction

1.1. Equipment

Equipment required for leak test:

Optical particle counter

Aerosol

Aerosol generator

Diluent

Dilution equipment (if available)

Forms : "Key plan" and "Leak test of HEPA filter"

Isokinetic sensor

Requirements for equipment:

Particle analyser	Optical particle counter with lower sensitivity 0.3 Or 0.5 µm. Maximum 10 % double sequence of error.
Test aerosol	DEHS or similar, for example generated with atomiser.
Diluent	Dilution system for the particle analyser is advisable.

2. Test instruction

1. Start the unit, position the front window in working position and let it run for at least 15 minutes at 1/1 speed.

2. On the form "key plan" make a drawing showing the location of:

- Inlet ports
- Control panel
- Shielding
- Light fittings
- Location of unit in room
- Location of remaining equipment in room.

3. On the form "leak test of HEPA filter" make a key plan showing the filters in each module.

4. Measure the concentration on the suction side of each modulus.

- This indicates working load at normal run.

5. Start the aerosol generator.

- Ensure that the aerosol is sucked into the opening of the filter to be tested.

6. Connect the generator to the service valve.

7. Measure the concentration of aerosol on the back side of main filter.

8. Connect dilution equipment if available.

9. Adjust the aerosol generator until a constant value higher than $1x10^6$ per ft^3 is exceeded.

- Note the measured concentration on the form "leak test of HEPA filter".

10. Connect the particle counter to the Isokinetic sensor. Set the particle counter to:

- Measure total number of particles.

- Give acoustic signal for each particle measured.

11. Move the probe with a speed of maximum 30 mm/sec holding it about 25 mm from the area to be tested.

12. Test the area around the filter packing.

13. Test the entire filter surface.

14. Test the entire unit inside the clean area

15. If more than 1 particle is measured at a particular point, return to this point to measure the particle concentration.

- Note the value.

16. Determine highest concentration on the clean side of the filter.

17. This result is defined as maximum permeability.

18. Relative permeability is calculated as.

- Maximum permeability

- Concentration measured on the unclean side of the filter.

19. Check that the value for maximum relative permeability is below maximum permissible value.

20. Adjustments

- Too high permeability at a particular point or at filter packing.

  Contact customer to arrange replacement of filter and silicone sealant.

- Too high permeability in the construction.

  Make a silicone sealant, using the same colour of silicone as used during construction.

S/MS 2000 Start up Procedure for Cabinets with Software Version 05.09

Symbols used in this manual

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1. Supplement to Instruction Manual for SAFE 2000 cabinet

Start up procedure for cabinets with software version 05.09

1. Insert the plug and connect the cabinet to mains.

2. Place the front window in work position by pressing the ∆ or ∇ button.

3. Turn the lock switch to position 1.

4. Start the fan by pressing the button once.

5. Wait for approx. 1 min. and observe the flow graph illuminate in min. 6 segments.

6. Turn the lock switch to position 0, and the acoustic/visual alarm stops.

- *By turning the key switch to position 1 it is now possible to choose fan speed.*
- *During restart the above mentioned procedure must be repeated.*

REPLACEMENT OF PREFILTER

MAXI SAFE ONLY

Symbols used in this manual

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2. Replacement of Pre-filter 4

1. Introduction

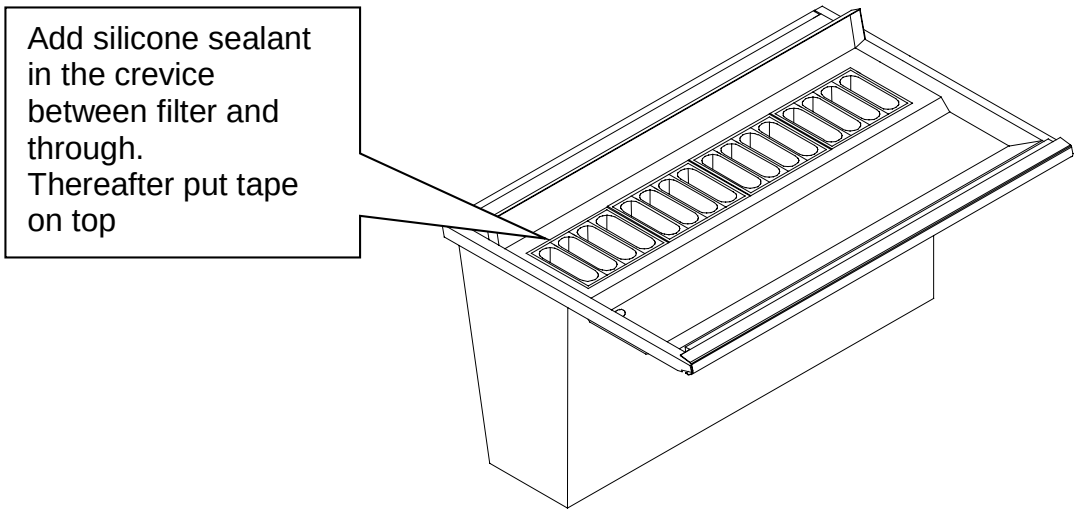
- Prior to performing any work on the chamber, always remember to ensure that the cabinet is disinfected and/or neutralised.
- The HEPA filter is very delicate, a slight touch on the material may damage the filter.
- In order to avoid any possible harm, we recommend that while changing the filters the service technician should wear a safety mask with filters.

The used filters must immediately after removal be placed in special bags for biohazard waste.

2. Replacement of Pre-filter

1. Position the front window in top position.
2. Turn the fan on at reduced speed.
3. Remove the tabletops. *See fig. 1*
4. Remove the drip-catchers. *See fig.1*
5. Seal the intake openings in the filters by tape
6. Cut the tape and silicone sealant found between filters and frame.
7. Carefully remove the filters and place them in a bag for biohazard waste.
8. Insert the new filters.
9. Seal the crevice between filter and through with a silicone sealant, then tape the top of the sealant between the filters.
10. Reposition the drip-catchers and tabletops.
11. Test the cabinet according to recommended test procedures.

Remove drip-catchers Remove table-tops



Prior to performing any work on the chamber, always remember to ensure that the cabinet is disinfected and / or neutralised !

The HEPA filter is very delicate a slight touch on the material may damage the filter. In order to avoid any possible harm, we recommend that while changing the filters the service technician should wear a mask with filter of HEPA quality. (EU 12 or better).

S/MS 2000 - Installation of UV-kit

Symbols used in this manual

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1.1. Introduction 4
1.2. Instructions for cabinets produced after the middle of June 1997: 5

1. How to connect the UV-Kit

1.1. Introduction

The germicidal effect of UV-light is used in the work chamber of Class II safety cabinets to destroy or inactivate micro-organisms in the air and on the surfaces.

Instructions for cabinets produced before the middle of June 1997:

1. Bring the front window in top position.
2. Turn off the cabinet and disconnect from the mains.
3. Remove the cover unit for UV light by unscrewing the screws.

☞	**NOTE** The UV lamp must be cleaned frequently by use of spirit of household type, to maintain the property of the UV-light.

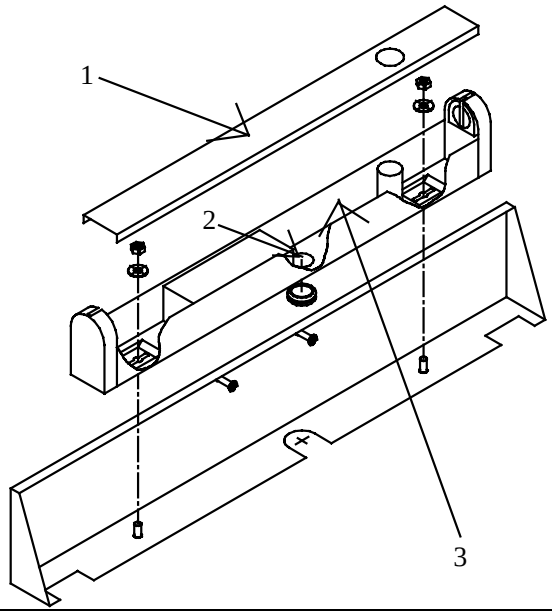
4. Preparation of the UV kit:

Remove the cover on the UV light fixture

see fig. 1, pos. 1

Cut out a 10 mm hole in the nipple,
see fig. 1, pos. 2.

Put in the nipple in the central hole on the UV light fixture *see fig 1, pos. 2. see fig. 1, pos. 3.*



5. Mount the UV light fixture on the cover unit, using the enclosed screws.

6. The electrical cord is led through the nipple placed on the UV-light fixture.

7. Remount the cover with the UV light fixture in the cabinet.

8. Connect the wires:

N : Neutral ~ blue

L : Phase ~ brown-black

⏚ : Earth ~ Yellow-green

9. Mount the UV light tubing.

10. Adjust the DIL-switches positioned on the backside of the CPU-circuit board, as described in document no. 00350470 section 23, - " How to adjust the DIL-switches"

11. Reconnect to mains.

	**WARNING** Newer allow direct exposure of persons to UV light. Exposure to UV radiation may cause reddening of the skin and inflammation of the mucous membranes of the eye.

1.2. Instructions for cabinets produced after the middle of June 1997:

1. Bring the front window in top position.

2. Turn off the cabinet and disconnect from the mains.

3. Remove the cover unit with magnets, including the 2 brackets.

4. Remove the cover on the UV-light fixture, *(see fig.1, pos.1.)* and mount the UV-light fixture using the enclosed nuts and sprockets.

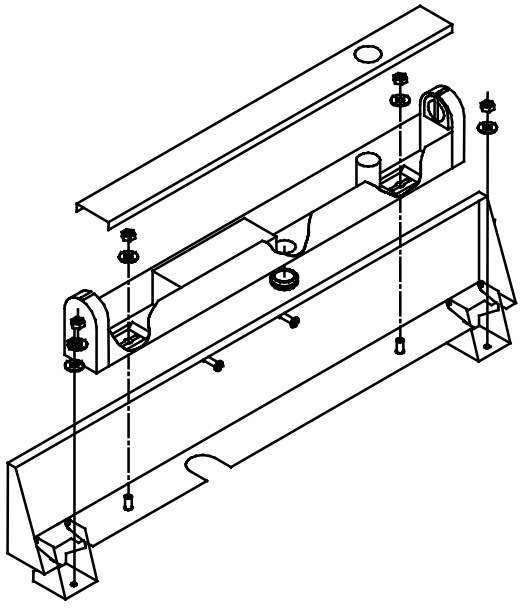
5. Connect the wires:

N : Neutral ~ blue

L : Phase ~ brown-black

⏚ : Earth Yellow-green

6. Reconnect to mains.



☞	**NOTE** The sprockets must be mounted in order to connect the cabinet to earth.

SERVICE MANUAL

Replacement of front and side windows

Symbols used in this manual

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2. Replacement of side windows.....4

1. Replacement of front window

1. Lower the front window, stop immediately prior to reaching the lowest position to avoid the window from sealing to the frame.

	**WARNING** Turn off the cabinet and disconnect from the mains.

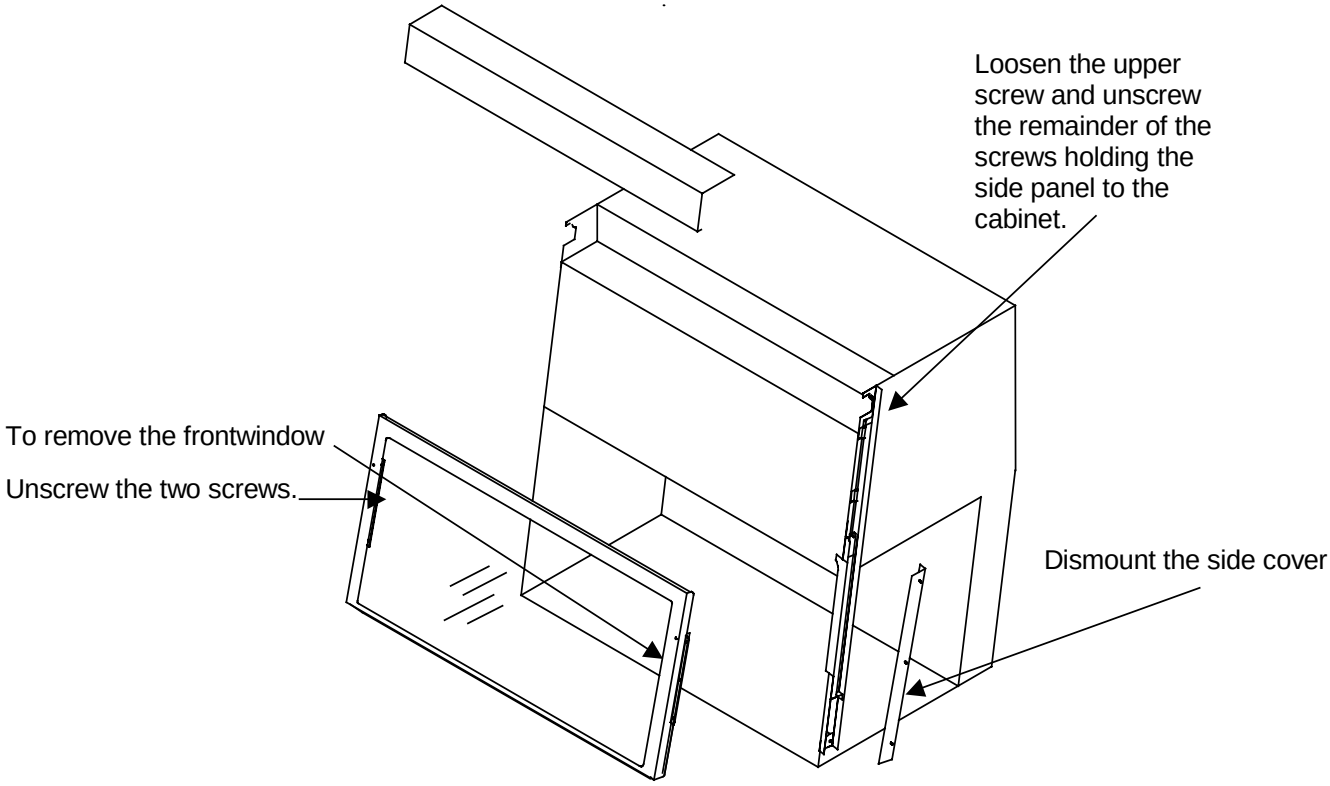
2. Dismantle the front shield. - see section concerning installation, document 00346561.
3. Dismantle the protective cover for electric/mechanical installations.
4. Pull the front window up the sliding rails and position it on a support next to the cabinet.
5. Unscrew the screws holding the wires to the window frame in the front. *See fig. 1, page 3.*
6. Mount the new window.
7. Remount in reverse order

2. Replacement of side windows

Instruction for replacement of side window in SAFE/MAXI SAFE produced in 1996

Follow step 1 to 4 in previous description.

- Undo the screws holding the wires positioned on the frame for the front window
- Dismount the side cover positioned as shown in fig. 1 below.
- Unscrew the screws holding the side profile, except the one positioned above the pulley.
- Slacken the last screw.
- Turn the side profile a few centimetres outwards, and cut away the silicone sealant around the side window.
- Pull out the side window.
- Remove as much silicone from the cabinet as possible.
- Mount the new side window.
- *Remember to add silicone between cabinet and side window.*
- Remount in reverse order.


Loosen the upper screw and unscrew the remainder of the screws holding the side panel to the cabinet.
To remove the frontwindow
Unscrew the two screws.
Dismount the side cover

SERVICE MANUAL

Replacement of Fan/Fans

Symbols used in this manual

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1. Replacement of fan 4

1. Replacement of fan

1. Lower the front window. Stop immediately before it reaches the lowest position to prevent the window from sealing to the frame, and disconnect from mains.

2. Dismantle the front shield...

Undo the screw for the gas spring, pos.1 -fig.1.

Pull out the plug for the control panel, pos.2 -fig.1.

Undo the screw for the front shield, pos.3 -fig.1.

Remove the front shield.

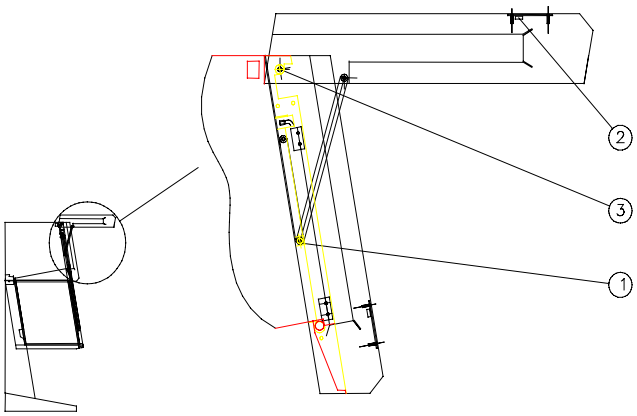

Figure 1

3. Pull the front window up the sliding rails and position it in a safe way next to the cabinet.

4. Dismantle the protective cover for the electric board.

5. Undo the screws holding the wires placed on the frame for front the window.

6. Dismantle the tension rods by unscrewing the screws positioned as shown in fig. 2.

Figure 2

☞	**NOTE** Remount the screws after you have dismounted the tension rods. The screw on the left is larger.

7. Disconnect the electrical connection of the fan, light, and mains supply by removing the electrical cords from the terminals and rubber tubing for the flow sensor *Please consult the enclosed wiring diagram.*

8. Dismantle the protective cover and the electric board.

9. Using a scalpel cut the silicone sealant applied between the cabinet and the electric board.

10. Remove the filters according to the description in the section concerning filter change. Document no. 00346621.

11. Dismount the "Royco" tubing for measuring of filter efficiency.

12. Remove the filter frame with the mounted fan from the cabinet.

13. Undo the screws which secure the fan to the frame.

14. Remove the fan.

15. Mount the new fan and remount in reverse order *remember to add silicone between the cabinet and the electric board.*

	0.9	1.2	1.5	1.8
SAFE 2000	EBM 822458	EBM 822459	EBM 2 x 822458	EBM 2 x 822458
MAXI SAFE 2000	PLTC 822451	PLTC DC 822451	PLTC 2 x 822451	PLTC 2 x 822451

Project	Written date/sign.	Item no.	Replace doc.	Doc.no
SERVICE	961107/MK			00346670

REPLACEMENT OF ACTIVATED CARBON FILTERS...

REPLACEMENT OF ACTIVATED CARBON FILTERS...

Ensure that the substances in the activated carbon have been neutralized before changing the carbon filters.
In order to avoid possible damage we recommend the service technician wears a mask with activated carbon filter, protective garment and surgical type gloves.
After the activated carbon filters are removed they should be placed in toxic bags.

1. Turn off the cabinet and disconnect from mains.

2. Using a scalpel cut the silicone sealant between the cabinet and box with carbon filters.

3. Remove the cover containing the carbon filters.

4. Dismount the lid from the cover.

5. The cylinders are fastened with bayonet sockets. Place the special bag over one of the cylinders. Turn the cylindre clockwise and remove it from the frame. See fig.2

6. Proceed as above until all activated carbon filters have been removed.

7. Mount the new carbon filter cylinders in the cover.

8. Remount the lid.

9. Remove as much old silicone sealant from cover and opening as possible.

10. Remount the cover, seal the cover with silicone around all edges.

11. Rinse all tools used. Protective cloth and filter for filter masks i to be placed in a special bag of the same type as the one which are used for the filters.

12. The special bags should be handled as toxic material and sent for destruction in the same fashion as the material from the lab is handled.

Cover for carbon filters...
...Lid dismounted...

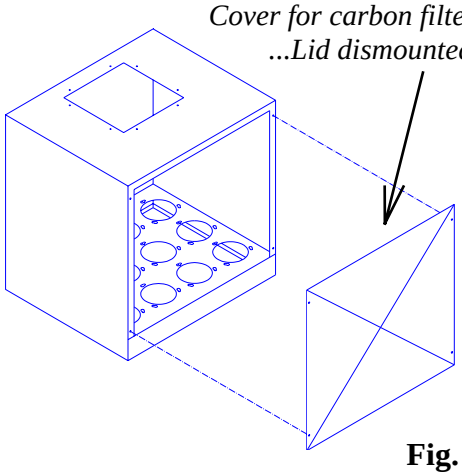

Fig. 1

Turn clockwise and pull out the cylindre...

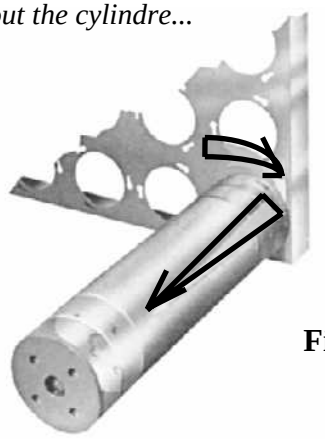

Fig. 2

SERVICE MANUAL

Relacement of activatede charcoal filters

Symbols used in this manual

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1. Replacement of activated charcoal filters 4

1. Replacement of activated charcoal filters

Ensure that the substances in the activated charcoal have been neutralised prior to change of the charcoal filters.

☞	**NOTE** In order to avoid possible damage we recommend the service technician wears a safety mask with filters, protective garment and surgical type gloves.

⚠	**WARNING** After the activated charcoal filters are removed they should be placed in bags for toxic waste.

1. Turn off the cabinet and disconnect it from the mains.
2. Dismount the lid from the filter box.
3. The charcoal cylinders are fastened with bayonet sockets.

- Place the special bag over one of the cylinders.
- Turn the cylinder clockwise and remove it from the frame.
- See the figure.

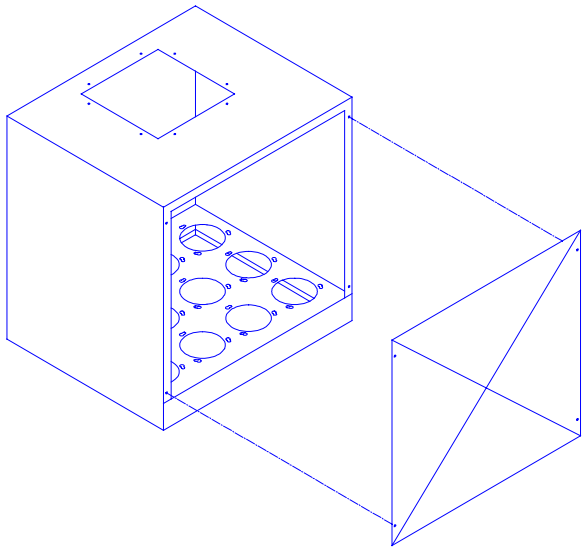

Figure: 1 Filter box with lid dismounted.

4. Proceed as above until all activated charcoal filters have been removed.
5. Mount the new charcoal filter cylinders in the filter box.
6. Remount the lid.
7. Rinse all tools used. Protective cloth and filter for filter masks is to be placed in a bag for toxic waste.
8. The special bags should be handled as toxic material and sent for destruction as the normal toxic waste from the lab.

1. Turn clockwise.
2. Pull out the cylinder.

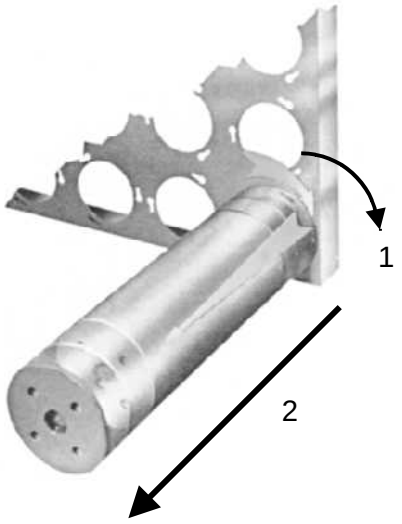

Figure: 2

SERVICE MANUAL

DECONTAMINATION OF SAFE/ MAXI SAFE

BY USE OF FORMALDEHYDE

Symbols used in this manual

☞	**NOTE** Used to direct attention to a special item.

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1. Introduction 4
1.1. Procedure 4
2. Disinfecting and neutralisation agent 5

1. Introduction

The purpose of this document is to state guidelines regarding decontamination using formaldehyde.

HOLTEN is unable to guarantee a successful decontamination using this method and it must be regarded as a general method.

Important: This method is not applicable for units with activated carbon installed.

☞	**NOTE** In certain countries certification is required for decontamination by the use of formaldehyde.

1.1. Procedure

A sufficient amount of formaldehyde is evaporated inside a closed class II cabinet. The formaldehyde will condense on all surfaces. The formaldehyde is left to work for at least 5 hours.

To neutralise, the formaldehyde ammonia is then evaporated inside the closed cabinet. Residual parts of either ammonia or formaldehyde are removed from the cabinet through ventilation or by means of activated charcoal filters.

Action...	**Time**
Prepare the formaldehyde and ammonia inside the work chamber. Seal off the work opening, around the front window and exhaust by means of e.g. cardboard and tape.	
Start the unit's fan, and start the boiling / evaporation of the formaldehyde.	10 mins.
After all formaldehyde has evaporated, leave the fan on for about	20 mins.
Turn off the fan and leave the unit for at least	5 hours
Start the fan of the unit, start the boiling/evaporation of ammonia.	10 mins.
Leave the fan on for about	20 mins.
Exhaust the air from the cabinet, or filtrate it through activated carbon.	
Remove the sealing from the work opening around the front window and from the exhaust.	

2. Disinfecting and neutralisation agent

Unit	Formaldehyde 37 %	Water	Ammonia 25 %
SAFE 2000/MAXI SAFE 2000 0.9	30 ml	30 ml	20 ml
SAFE 2000/MAXI SAFE 2000 1.2	40 ml	40 ml	27 ml
SAFE 2000/MAXI SAFE 2000 1.5	50 ml	50 ml	33 ml
SAFE 2000/MAXI SAFE 2000 1.8	60 ml	60 ml	40 ml

☞	**NOTE** The formaldehyde is diluted with water.

Hints concerning exhaust of internal air.

1. Connect the unit via a flexible duct to the fume hood.
2. Mount activated charcoal filter installed on exhaust grill on the cabinet.

SERVICE MANUAL

Replacement of main and exhaust filters

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2. Replacement of main and exhaust filters 4
2.1. How to change exhaust filter 5
2.2. Main filter: 8
2.3. Exhaust filter: 8

1. Introduction

- Prior to performing any work on the chamber, always remember to ensure that the cabinet is disinfected and/or neutralised.
- The HEPA filter is very delicate a slight touch on the material may damage the filter.
- In order to avoid any possible harm, we recommend that while changing the filters the service technician should wear a safety mask with filters.

☞	**NOTE** The used filter must immediately after removal be placed in special Bags for biohazard waste.

2. Replacement of main and exhaust filters

Cabinets with plenum made from a PVC hose. (SAFE 2000/MAXI SAFE 2000 0.9, 1.2, and SAFE 2000 1.8).

Special equipment: wire with hooks, item no. 903855 shown in figure 2.

The main and exhaust filters are positioned behind the cover right above the upper part of the window.

How to change the main filter:

1. Position the front window in the lowest position.
2. Turn off the cabinet and disconnect it from mains.
3. Open the front-shield.
4. Dismantle the front cover.
5. Locate the 4 latches, which hold the main filter frame. Remove the two front latches and loosen the other two positioned at the back of the cabinet, see fig. 1.

Remove the latches

Figure:1

6. Lift up the front of the filter frame.

A set of hooks may be obtained through the Holten service department, item no. 903855

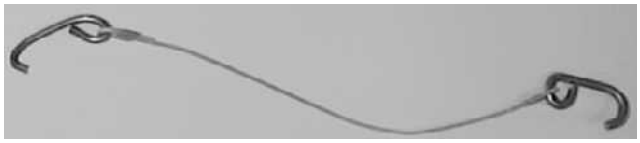

Figure: 2

7. Carefully remove the filter from the cabinet, and place it in a bag for biohazard waste.

8. Insert the new filter.

9. Reassemble in reverse order.

10. Test the cabinet according to the recommended test procedures.

11. Decontaminate all tools used. Protective clothing and filter for filter masks is to be placed in a bag for biohazard waste.

Suspend the down-flow filter frame as shown in figure 3.

Figure: 3

2.1. How to change exhaust filter

Follow step 1 - 4 in previous description.

On models with 3 fittings for installation of the exhaust filter continue:

5a 3 latches supports the exhaust filter frame, remove the latches in the order shown in fig.2

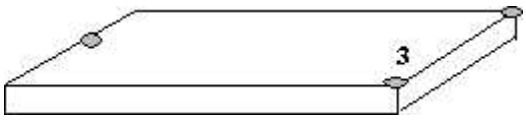

Figure: 4

6a Carefully remove the filter from the cabinet, and place it in a bag for biohazard waste.

7a Insert the new filter.

8a Reassemble in reverse order.

9a Test the cabinet according to our recommended test procedures.

10a Rinse all tools used. Protective clothing and filter for filter masks is to be placed in a bag for biohazard waste.

- On later models on which the filter is mounted with a beam and two retainer irons in front continue:

5b Slacken the two screws on top of the cabinet and dismount the two retainer irons in front of the filter.

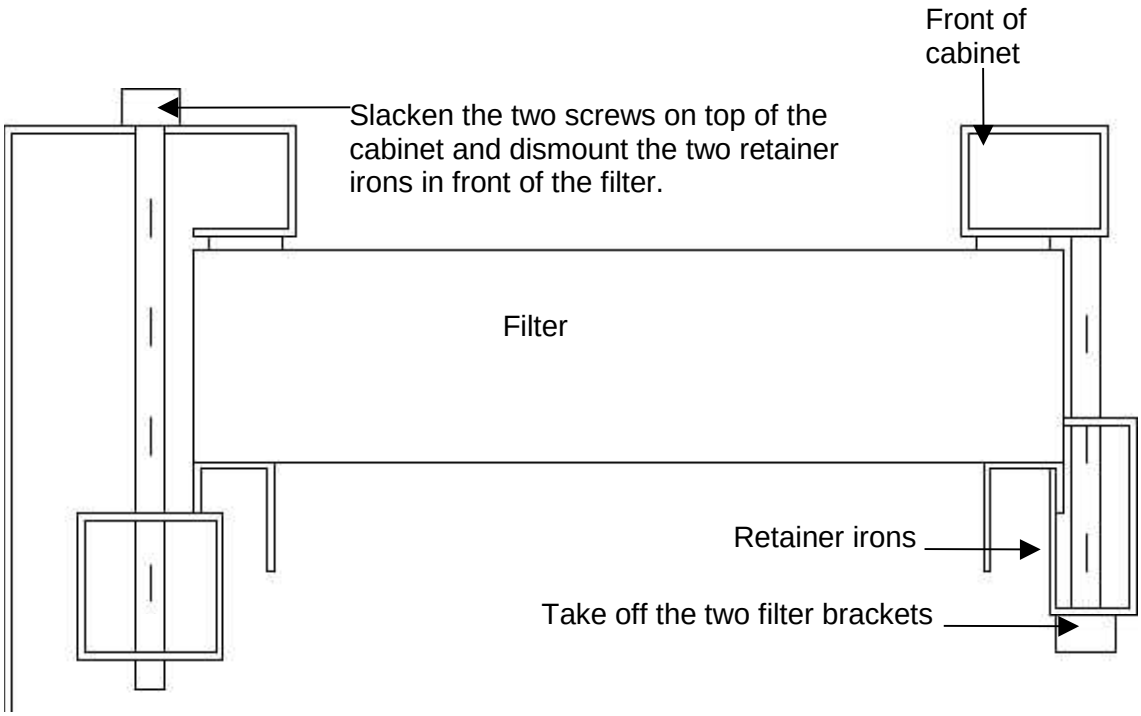

Figure: 5

6b Carefully remove the filter from the cabinet, and place it in a bag for biohazard waste.

7b Insert the new filter.

8b Reassemble in reverse order.

9b Test the cabinet according to our recommended test procedures.

10b Rinse all tools used. Protective clothing and filter for filter masks is to be placed in a bag for biohazard waste.

- Replacement of main and exhaust filter on cabinets with plenum made from sheet steel (SAFE 2000/MAXI SAFE 2000 1.5 and MAXISAFE 2000 1.8)

2.2. Main filter:

5c Slacken the two levelling screws on top of the cabinet.

Seen from the front:

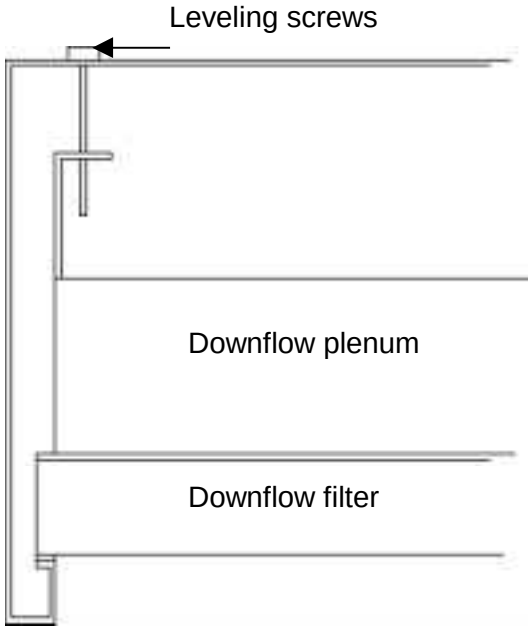

Figure: 6

6c Take out the two screws on each latch positioned on the cable ends. Mount them in the thread on top of the latches from the top of the cabinet through the holes covered by plastic plugs. Lift up the plenum by turning the screws

7c Carefully remove the filter from the cabinet, and place it in a bag for biohazard waste.

8c Insert the new filter.

9c Reassemble in reverse order.

10c Test the cabinet according to our recommended test procedures.

11c Rinse all tools used. Protective clothing and filter for filter masks is to be placed in a bag for biohazard waste.

2.3. Exhaust filter:

Is mounted like on the later model with hoses.

SERVICE MANUAL

Trouble shooting

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1. Introduction 4

1. Introduction

If new trouble shooting ideas are encountered while performing service on HOLTEN LAMINAIR safety cabinets, please contact us in order to share this information with your colleagues.

Problem:

The window alarm keeps going on even though the window is in its proper position.

Cause and possible remedy:

The micro switch arm is bend, try bending it back so the alarm will go off.
or
The micro-switch has become unserviceable, try replacing the switch.

Problem:

The alarm indicating incorrect flow doesn't turn off automatically.

Cause and possible remedy:

Too little exhaust air. Measure the air velocity in the work opening using the recommended test procedures.

Problem:

The air velocity is too low.

Cause and possible remedy:

Fan performance is to low. Caused either by low mains voltage, low setting on transformer, or damaged fan (will be indicated by grinding noise) Try adjusting fan performance.

Blocked filter	Try changing filters.
Blocked suction holes in table top	Remove all blocking objects.

Problem:

The control buttons on the control panel will not respond.

Cause and possible remedy:

The control panel is damaged. Replace the control panel.

SERVICE MANUAL
Maintenance

Symbols used in this manual

	**WARNING** Used in case of danger of a serious accident or when documentation needs to be consulted.
☞	**NOTE** Used to direct attention to a special item.

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1. General 4
2. Testing 4
3. Control panel functions 4
4. Change of filters 4

1. General

Please contact the person responsible for safety in the laboratory to get his/hers absolute guarantee that the cabinet is ready for service.

Otherwise suggest the means of disinfecting and neutralising as described in appendix.

For the service technician maintenance consists of four major parts:

1. Testing of cabinets performance.

2. Adjustments of alarm setting.

2. Testing of control panel functions.

3. Replacement of filters.

2. Testing

See appendix for instruction on recommended test procedures. The test procedures are only given as guide lines, special rules in different countries might require some specific procedures.

To ensure safe operation the setting of the alarm of SAFE 2000 should be adjusted with regular intervals. See appendix for detailed instruction concerning adjustment of the alarm system.

3. Control panel functions

Use the instruction manual to verify that the control panel functions are as per stated specifications.

4. Change of filters

See the specific point in appendix concerning change of HEPA- and activated carbon filters.

	**WARNING** Prior to starting any service on a class II cabinet, make absolutely sure that the cabinet has been disinfected and/or neutralised so there is no possible danger to the service technicians.

See relevant appendix: “Decontamination”.

SERVICE MANUAL

General dismounting

Electrical

Symbols used in this manual

☞	**NOTE** Used to direct attention to a special item.

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2. How to dismount the front shield 4
3. How to tilt the cabinet 5
3.1. GS version 5
3.2. Gas valves 6

1. Installation

General guide lines: Check that the dimensions of the unit assures free access to the wanted site of installation possible. The cabinet may be tilted 10° over an axle so that the sloping front is in vertical position. Furthermore you can dismount the front shield with the control panel.

The cabinet may then be transported through a standard 800 mm wide door.

2. How to dismount the front shield

1. Dismount the screw for the gas spring, pos.1-fig.1
2. Pull out the plug for the control panel, pos.2-fig.1.
3. Dismount the screw for the lamp-shield, pos.3-fig.1.

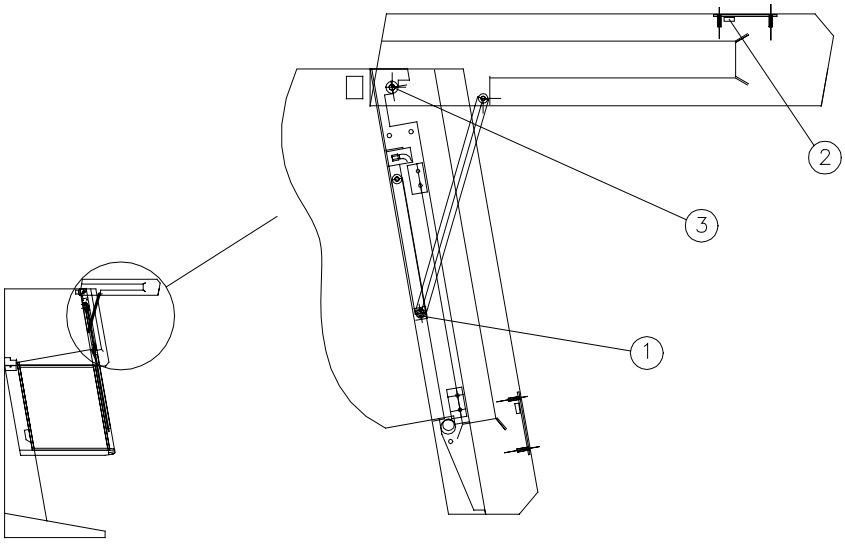

Figure: 1

3. How to tilt the cabinet

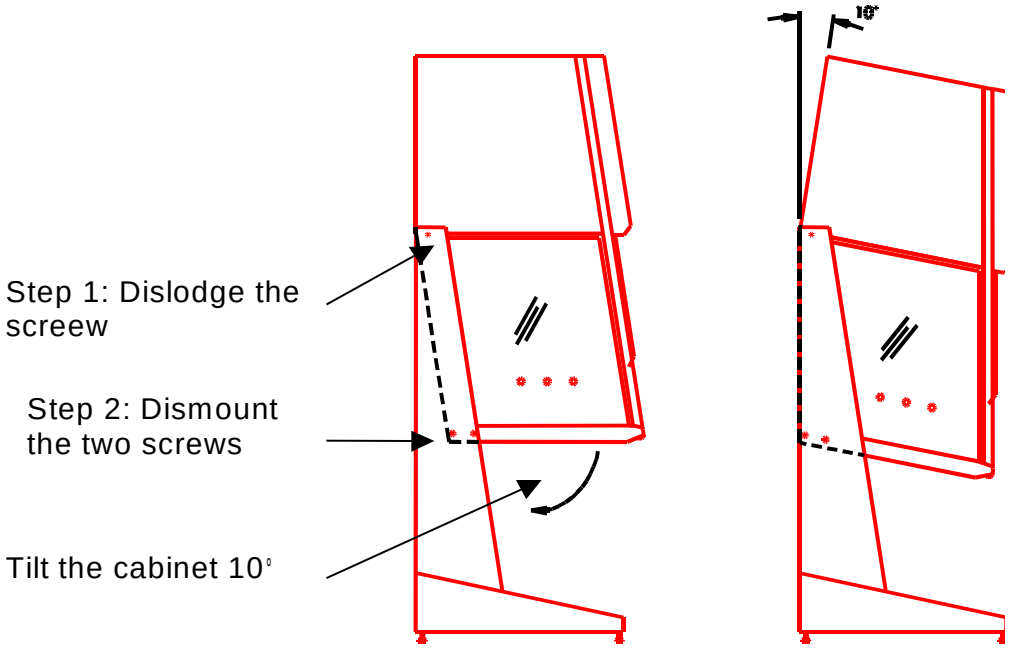

Figure: 2

If this is impossible the access openings must be made larger, by removing doors, door frames etc.

If this is unobtainable the cabinets must be assembled at the desired site of installation. This must be performed by the special trained service personnel of the manufacturer. Contact the technical department of HOLTEN for details.

The assembly place for the unit should be draught free and passing-by of persons in front of the work opening should be avoided.

☞	**NOTE** Prior to electricity connection it must be checked that the mains supply corresponds to the type plate data.

3.1. GS version

By fixed electrical connection, a bipolar mains switch lockable in both engaged and disengaged position should be installed between the main power supply and the cabinet.

If electrical connection is via an earthen plug socket, this socket takes over the function of the bipolar mains switch.

The socket is to be positioned outside the operators' reach and must only be accessible to authorised persons (service personnel).

3.2. Gas valves

☞	**NOTE** connection of vales for fluids, gasses, pressurised air and vacuum should always be carried out by an authorised technician.

SERVICE MANUAL
Technical Description

Symbols used in this manual

☞	**NOTE** Used to direct attention to a special item.

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2. Fluid dynamics 4
2.1. Protection factor 4
3. Fan 4
4. Filters 5
4.1. HEPA filter 5
4.2. Activated charcoal filters (optional equipment) 5
5. Electrical system description 5

1. General

SAFE 2000/MAXI SAFE 2000 are class II micro-biological safety cabinets tested and constructed according to the existing international standards for this type of cabinet.

The standards are BS 5726, DIN 12950, NSF no 49, AFNOR X 44-201.

2. Fluid dynamics

In a class II safety cabinet the protection of the handled product is obtained by use of laminar flow (unidirectional flow). This unique flow pattern acts as an air piston inside the work chamber. The removal of emitted particles is very efficient and sideways transport of material in the air stream is practically impossible. Protection against cross contamination, is one of the advantages of class II cabinets.

The laminar flow is created as a combination of the air stream leaving the filter and the front- back- and side coverage of the work chamber.

One of the advantages of Holten class II safety cabinets is that the sides-, the back-, and the front coverage flush with the outlet edges of the installed filter.

The filters used by HOLTEN LAMINAR are pleated filters with protective grid on the inlet side and a laminator sheet on the exhaust side.

Testing the air velocity of a filter with a tolerance of ± 20 % can be achieved at a distance of 150 mm from the filter surface. According to the standard the correct test distance is 50 mm above the lower edge of the front window in its normal work position.

2.1. Protection factor

The protection factor is a factor indicating how many times better the personal protection in a cabinet is, compared to the open tabletop work situation. This protection factor may be measured using special equipment.

Under normal service testing conditions the protection can only be tested in an indirect way. The protection factor is directly related to inward coming air velocity in the work opening. Ensuring a minimum air velocity, thus ensures a certain minimum protection factor.

An air velocity in the work opening of more than 0,65 m/s is not recommended. Higher speed, will enable creation of eddies in the work opening and eventually reduce the personal protection capability of the cabinet.

3. Fan

The fans installed in SAFE 2000 / MAXI SAFE 2000 units are directly driven AC models, where performance may be adjusted by changing voltage on a transformer. MAXISAFE 2000 1.2 is equipped with a DC fan (due to higher internal pressure drop). The performance of this fan is controlled by jumper settings at a separate print.

4. Filters

4.1. HEPA filter

The HEPA filters which is used in SAFE 2000 / MAXI SAFE 2000 are always of the best quality available. In standard cabinets the normal efficiency of the filter is 99,999% when tested with mono disperse DOP aerosol of 0.3 μm in diameter.

The filter gasket is made of one piece ensuring no leakage. All materials used are inorganic and non-corrosive.

The HEPA filter will only remove particles, whilst gasses, and vapours will pass through without filtration. See the appendix on data sheets for details concerning HEPA filters.

4.2. Activated charcoal filters (optional equipment).

Activated charcoal filters are taken into use whenever removals of fumes, vapours, or gasses states are required. For details concerning working principle and efficiency, see appendix for data sheets covering this subject.

There is no general way of testing the remaining capacity of an activated charcoal filter. It is therefore impossible to state a specific lifetime for such a filter.

5. Electrical system description

All relays, contacts, transformers, main fuses etc. are placed on an electric mounting plate behind the front-shield.

There should be made no attempts to repair the electric mounting plate. Please replace if damaged.

Special optional equipment for communication with external devices is also located in this compartment.

SERVICE MANUAL

Rewiring of the motor for opening/closing
Due to change from 24V to 14VProduct name

Symbols used in this manual

☞	**NOTE** Used to direct attention to a special item.

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1. Rewiring of the motor for opening/closing

PCB Relay Print 88859027

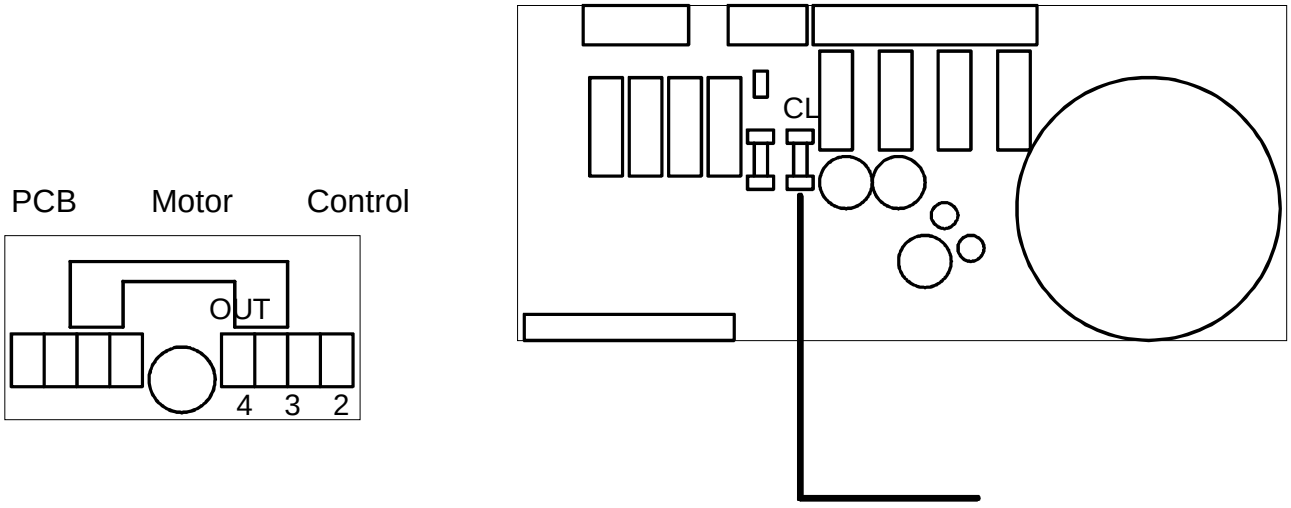

Fig. 1

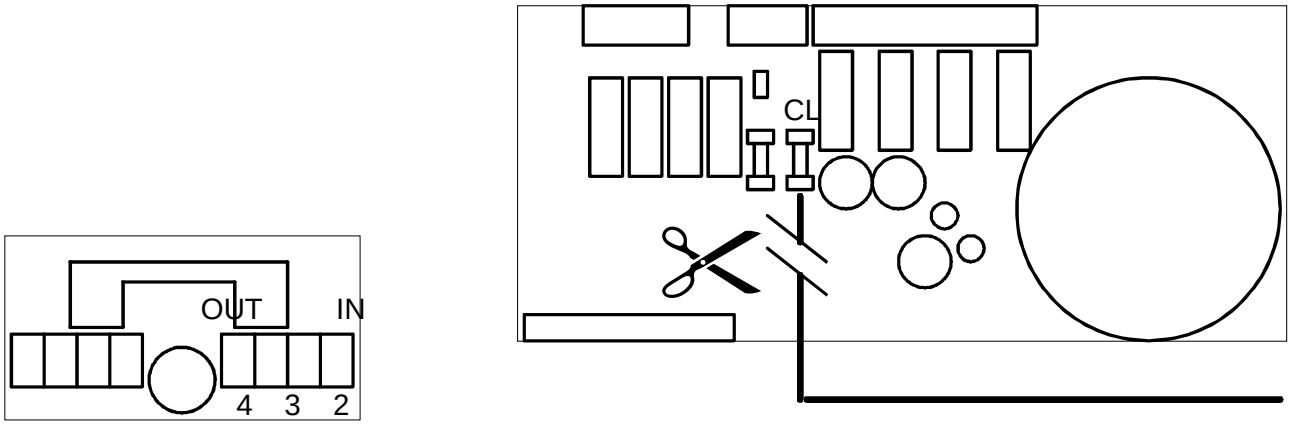

Fig. 2

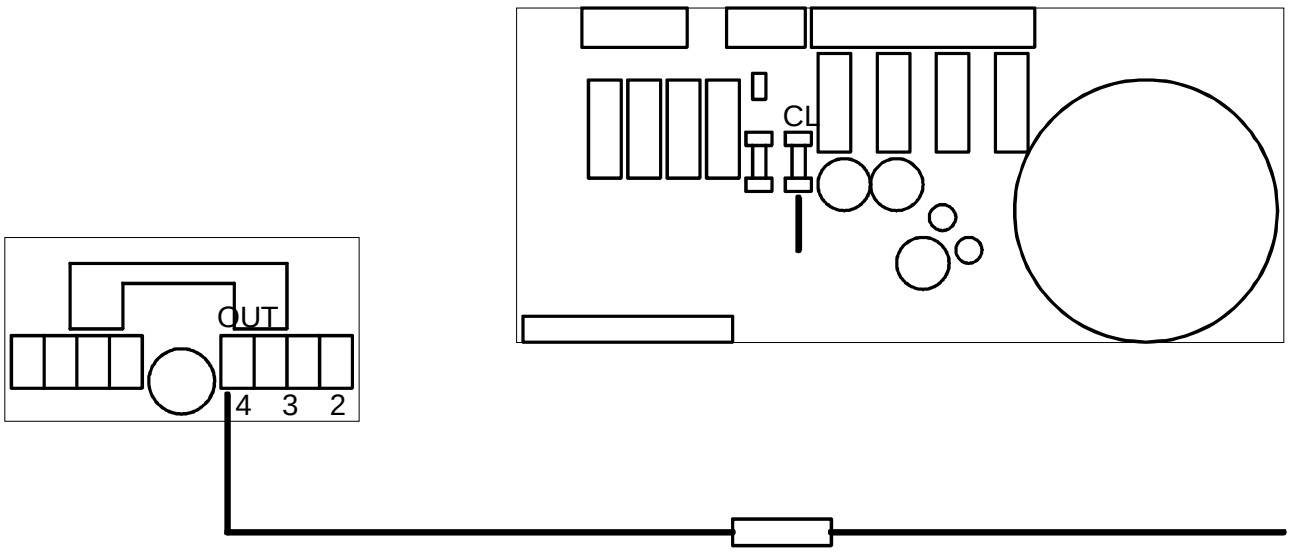

Fig. 3

The old push-on blade is pulled out and the wire is cut as indicated through figs. 1 and 2.

The wire is then reconnected through a parallel and the 25-cm wire as indicated in fig. 3.

☞	**NOTE** The rewiring will lead to increase opening/closing times for the window mechanism.

20. Diagrams Safe 2000

INSTALLATION OF EXHAUST TO THE OUTSIDE

INSTALLATION INSTRUCTION
Safe 2000 / Maxi Safe 2000
Installation of exhaust to the outside

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2. Installation of exhaust to the outside systems 5
3. Typical exhaust air systems 5

1. Introduction

Some important factors should be taken into consideration when connecting exhaust from safety cabinets to the outside via ducting. Some of these are mentioned below.

VERY IMPORTANT:

- The exhaust fan must only be turned on when the internal fan is also running.
- In order to withstand back pressures of 250 Pa in the ducting, HOLTEN recommends that the SAFE 2000 / MAXI SAFE 2000 with exhaust ducting should be equipped with separate exhaust fan.

EXHAUST TO THE OUTSIDE SYSTEM:

- The exhaust system should minimise the effect on the safety cabinet of outdoor wind pressures up to 250 Pa at the end of the duct.
- The discharge opening must be located so that the exhaust air volume is not influenced by air movements around the building.
- There is a risk that exhaust air could be drawn back into the building or that the exhausted air reaches other buildings either through windows or air intakes.
- The exhaust ducting should be clearly marked with biohazard signs, and it must be possible to identify ducting leading to a specific cabinet i.e. one exhaust ducting per cabinet.
- Sharing of ducts is not recommended.
- Ducts should follow the most direct route to the discharge point. Bends should be kept at a minimum.
- The exhaust fan should be installed away from the cabinet and close to the discharge end of the duct in order to keep the duct under negative pressure.

MAKE-UP AIR SYSTEMS:

- Safety cabinets with exhaust to the outside should only be installed after having considered the type of make-up air system necessary to replace all of the air leaving the room through the cabinet. The air supply system must not compromise performance of the safety cabinet.
- For make-up air by passive air inflow, openings or transfer grilles should be provided in walls and doors for make-up air to be introduced into the room from the surroundings preferably from the adjacent heated corridors.

2. Installation of exhaust to the outside systems

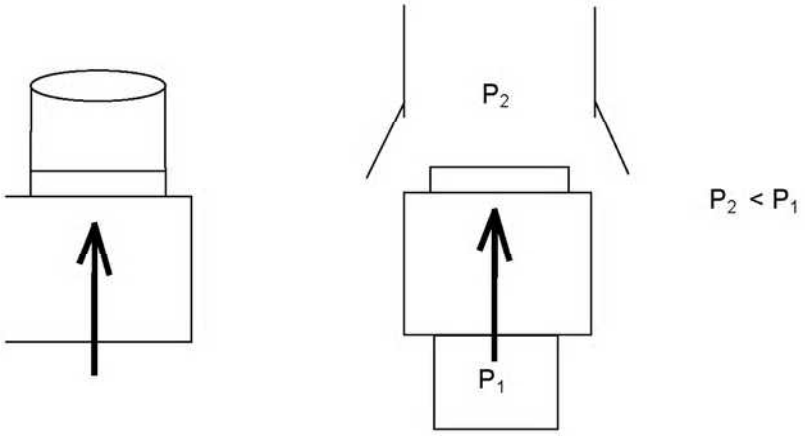
The size of the exhaust stub on SAFE 2000 / MAXI SAFE 2000 and the nominal exhaust air volume are indicated in the table below:

Item \ Model	SAFE & MAXI SAFE 0.9	SAFE & MAXI SAFE 1.2	SAFE & MAXI SAFE 1.5	SAFE & MAXI SAFE 1.8
Diameter of stub	Ø 200	Ø 200	Ø 200	Ø 200
Exhaust air, nominal volume	300 m^3/h	400 m^3/h	500 m^3/h	600 m^3/h

3. Typical exhaust air systems

	☺ Advantages	☹ Disadvantages
Dedicated ducting systems, directly connected. ***See figure C page 6.***	Prevents escape of contaminants from the ducting inside the building. No need of control device to keep the flow within the limit.	Sensitive to outside wind pressures.
Centralised ducting system, directly connected. ***See figure B page 6.***	Cost effective.	Sensitive to outside wind pressures. Control device needed to keep flow within limits. Possibility of spreading contaminants to surrounding rooms through ducting system.

Figure A: *Comparison of directly vs. indirectly connected.*



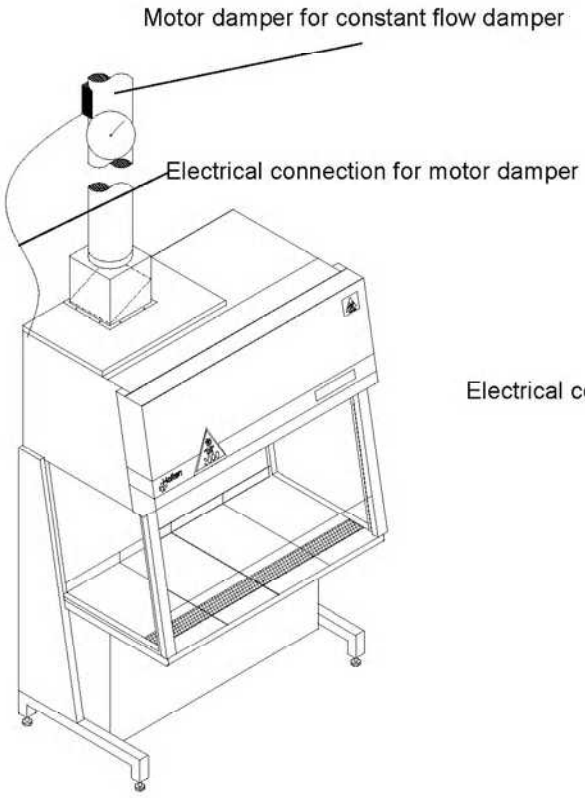


Figure B. *Example of a connection to a centralised ducting system.*

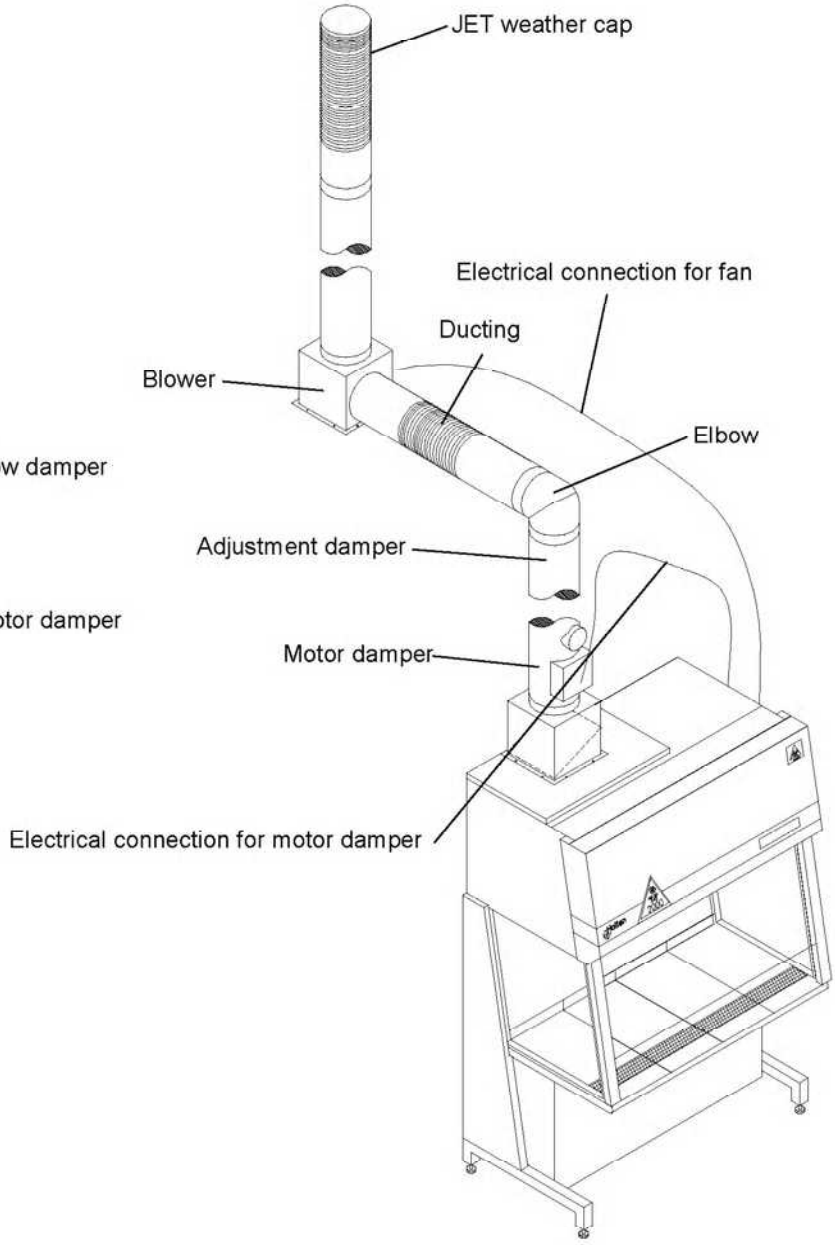


Figure C. *Example of a dedicated ducting system.*

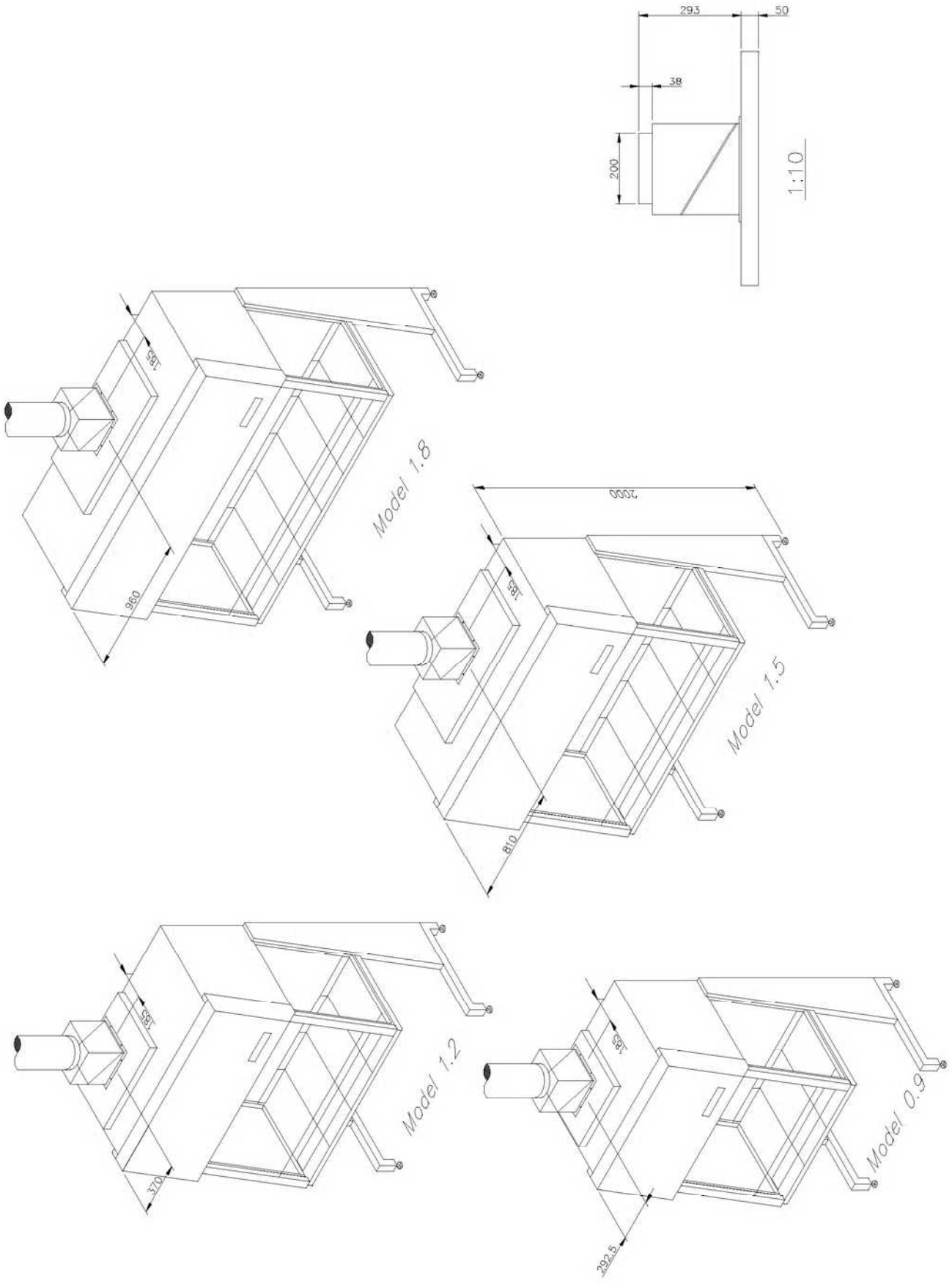

293
50
38
200
1:10
185
960
Model 1.8
2000
185
810
Model 1.5
185
570
Model 1.2
185
292.5
Model 0.9

Figure D.

Project	Written date/sign	Item no.	Replace doc.	Doc.no.
SERVICE	961107/MK			00346661

INSTALLATION OF...

- ACTIVATED CARBON FILTER .

- ANTI BLOW BACK VALVE.

CARBON FILTERS

INTRODUCTION:

When handling harmful vapours or gases carbon filters will reduce the possibility of harmful emission to the breathing zone of the operator or to the surroundings.
In the SAFE 2000 / MAXI SAFE 2000 the carbon filter is placed on the top of the cabinet, connected to the exhaust air outlet.

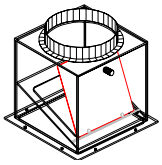
INSTALLATION

Please check with the local authorities wheter exhaust to the outside is required or not. Heto Holten A/S do not recommend that installation of cabinets with carbon filters is done with exhaust to the outside.

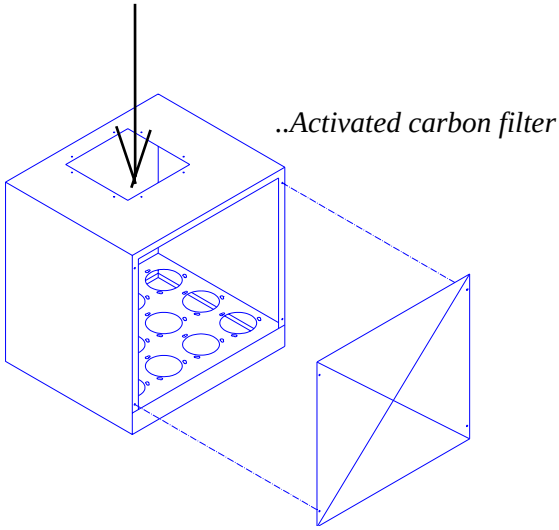
Mounting the activated carbon filter.

1. Mount the activated carbon filter using the enclosed screws.

2. The cover must be sealed on all four sides by means of the enclosed silicone.



..Anti blow back valve

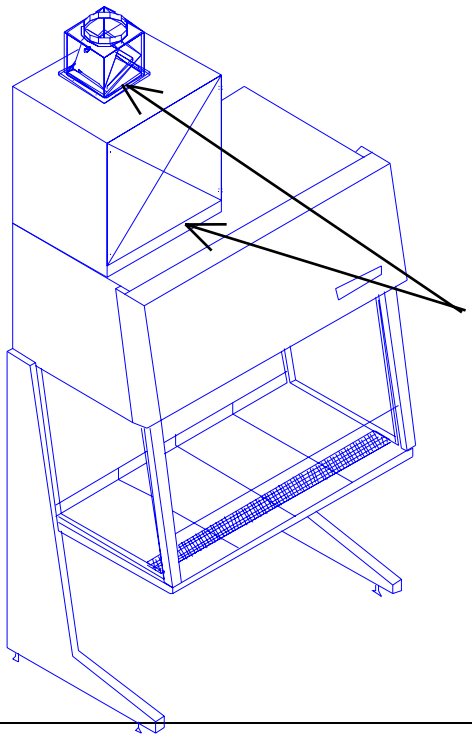


..Activated carbon filter

Mounting the anti blow back valve.

1. Mount the exhaust system using the enclosed screws.

2. The cover must be sealed on all four sides by means of the enclosed silicone.



Remember to seal on all sides between the build-up sections...

PLEASE READ THIS BEFORE TAKING THE CABINET INTO USE !

The enclosed instruction manual must be read and understood prior to the cabinet being taken into use to avoid misuse.
Erroneous use may result in personal injury.
HETO-HOLTEN does not assume any responsibility for injuries caused by misuse.

Power supply.

Prior to use, please check that the Mains voltage corresponds to that indicated on the type plate. Fixed installation should be used when connection is established in order to avoid unintentional disconnection. Furthermore, check that the power supply is connected to an installation which is protected by a HFI relay.

Connection to earth.

This product has been developed as a class I product.
To ensure continuous protection against electric chock the cabinet must be connected to earth when installed.

Disconnection from the Mains.

If the cabinet has been disconnected from the Mains, the microprocessor in the operator panel will automatically be updated when reconnecting the cabinet. Depending on how long the disconnection has lasted, updating may last up to 15 mins. During updating it is impossible to use the operator panel, and the fan will be working.

Opening of the front window.

After having opened the front window to its cleaning position, it is important to close it back into the correct position, i.e. the window must be closed against the stop. Please observe that the window moves evenly when it is lowered. If the front window is not closed correctly, the hoisting mechanism of the window cannot work, which may lead to damage.

Project	Date/sign	Replace doc.	Doc. no.
SAFE 2000/MAXI SAFE 2000	980430/or	00346680	00346682

REPLACEMENT OF FAN/FANS

Replacement of Fan

1. Lower the front window. Stop immediately before it reaches the lowest position to prevent the window from sealing to the frame....*and disconnect from the mains !*

2. Dismantle the front shield...
   Undo the screw for the gas spring, pos.1 -fig.1
   Pull out the plug for the control panel, pos.2 -fig.1
   Undo the screw for the front shield, pos.3 -fig.1
   Remove the front shield.

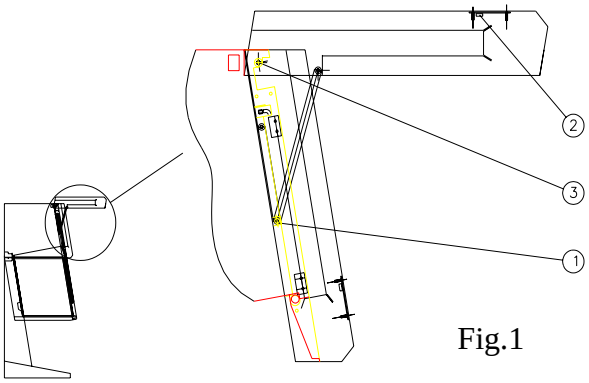


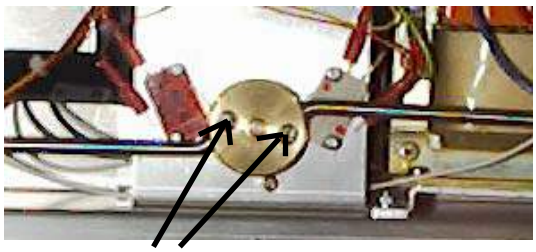
Fig.1

3. Pull the front window up the sliding rails and position it in a safe way next to the cabinet.

4. Dismantle the protective cover for the electric board.

5. Undo the screws holding the wires placed on the frame for front the window.

6. Dismantle the tension rods by unscrewing the screws positioned as shown in fig. 2
   - *Note! Remount the screws after you have dismounted the tension rods. The screw on the left is larger.*



Unscrew the 2 screws

Fig. 2

7. Disconnect the electrical connection of the fan, light, and mains supply by removing the electrical cords from the terminals and rubber tubing for the flow sensor.
   - *Please consult the enclosed wiring diagram*

8. Dismantle the protective cover and the electric board.

9. Using a scalpel cut the silicone sealant applied between the cabinet and the electric board.

10. Remove the filters according to the description in the section concerning filter change. Document no. 00346621.

11. Dismount the "Royco" tubing for measuring of filter efficiency.

12. Remove the filter frame with the mounted fan from the cabinet

13. Undo the screws which secure the fan to the frame.

14. Remove the fan.

15. Mount the new fan and remount in reverse order.
    - *remember to add silicone between the cabinet and the electric board*

	0.9	1.2	1.5	1.8
SAFE 2000	EBM 822458	EBM 822459	EBM 2 x 822458	EBM 2 x 822458
MAXI SAFE 2000	PLTC 822451	PLTC DC 822451	PLTC 2 x 822451	PLTC 2 x 822451

HOW TO ADJUST ALARM FOR FLOW SENSOR

How to Adjust Alarm for Flow Sensor.

Equipment:

Anemometer (Flow Master)
Vario transformer
Stand
Screwdriver made from plastics
External relay print

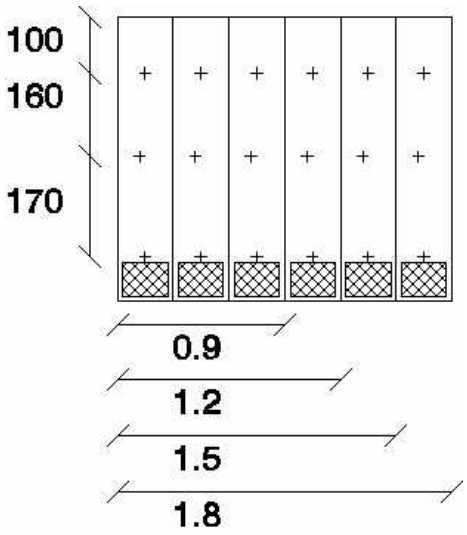


Fig. 1: Showing the relationship between the distance from the rear in mm (Y-axis) and the different models (X-axis).

Procedure for low alarm using a vario transformer:

Place the front window in work position and:

1. Place the anemometer upon a stand 250 mm above the table top

2. Measure the air velocity in the test points shown in fig. 1.

3. Find the minimum air velocity.

4. Place the anemometer where the min. air velocity is measured.

5. Adjust the vario transformer. Turn down the air velocity until the air speed indicator reaches 0,32 m/sec.

6. Position the window in the lowest position, open the front-shield, remove the lid for electrical installations, and you have access to the PCB low alarm.

7. Adjust the segments on the bar graph by turning the potentiometer indicated with ► on figure 2. The first 6 segments on the bar graph should be activated. Use a screwdriver made from to plastics in order not damage the potentiometer.

8. When the bar graph has been adjusted properly the alarm point has to be set by turning the potentiometer indicated with ► on figure 2. The LED next to the potentiometer should just turn on for correct adjustment.
   Note: there is a time delay of 5 to 6 seconds prior to alarm start.

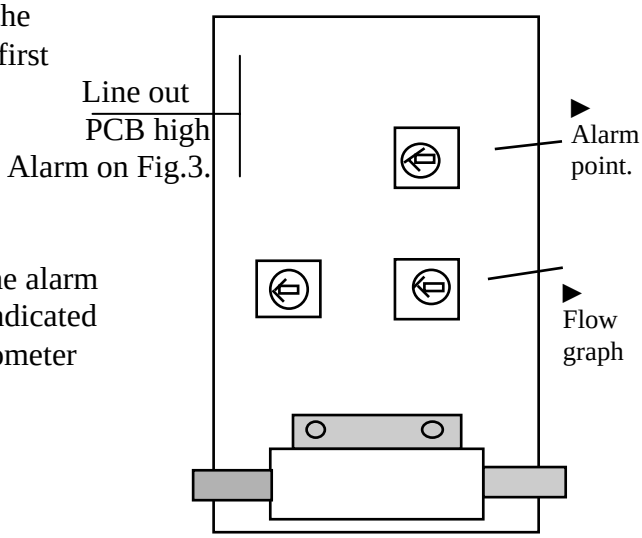


Fig. 2: PCB low alarm

9. Now let the fan run at 1/1 speed (230V).

10. Observe that the flow segments turns off and that the visual/acoustic alarms stop.

11. Repeat 5 and observe the visual/acoustic alarms starts. Let the fan run at 1/1 speed (230 V).

Alternative procedure valid when no vario transformer is available:

Equipment:

Anemometer (flow master)
Stand
Paper (A4)
Screwdriver made from plastics

Procedure:

Follow steps 1 to 4 in the previous description.

5. Cover the perforation in the tabletop with paper, until the anemometer reaches 0,32 m/sec.
   Note! The perforated area must be evenly covered, in order not to interrupt the airflow profile.

6. Now let the fan run at 1/1 speed (230 V)

7. Observe that the flow segments turns off and the visual/acoustic alarms stop.

8. Repeat 5 and observe the visual/acoustic alarms start. Now let the fan run at 1/1 speed (230 V).

High alarm procedure for SAFE 2000 and MAXI SAFE 2000 0.9 1.5, and 1.8

1. Locate the position with the highest down-flow.

2. By increasing the voltage, increase the down-flow to 0.48 m/s.

3. Adjust the potentiometer ❸ on the PCB high alarm to turn off the red light.

4. Decrease the voltage to, the high alarm should then go off.

5. Readjust the voltage to achieve 0.48 M/S and note the voltage.

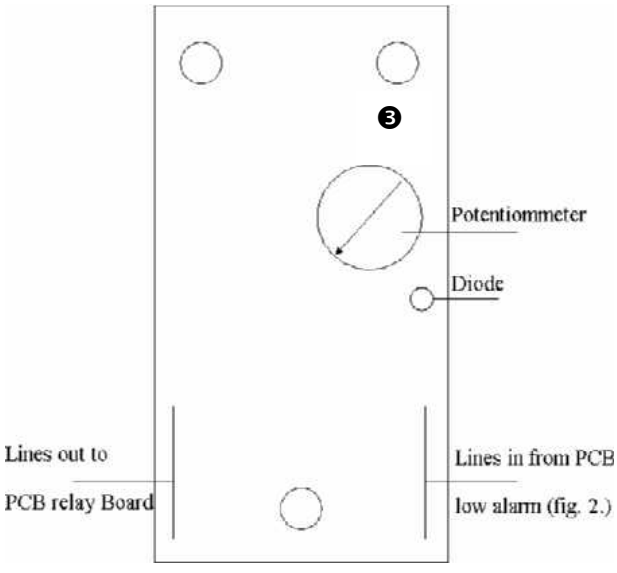
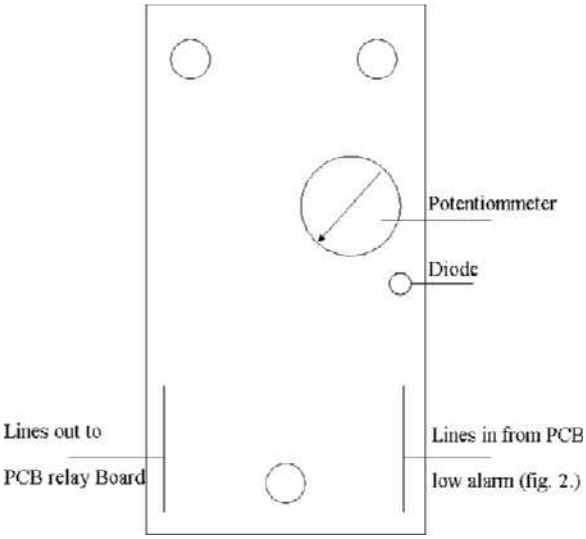


Fig. 3 PCB High alarm

High alarm procedure for MAXI SAFE 2000 1.2

1. Locate the position with the highest down-flow.
2. Set both switches to “D”.
3. Adjust the potentiometer on the PCB high alarm to turn off the red light.
4. Reset both switches to normal value and the lamp to go off.
5. Reset both switches, which triggers the alarm.



Manual replacing 00350561 981204.

Spare Parts

Spare parts dependent on cabinet model and size:

Item \ Model	SAFE 0.9	SAFE 1.2	SAFE 1.5	SAFE 1.8	MAXI SAFE 0.9	MAXI SAFE 1.2	MAXI SAFE 1.5	MAXI SAFE 1.8
Autotransformer Before Feb. 99	00847221	00847221	00847222	00847222	00847221	00847221	00847222	00847222
After Feb. 99	847225	847225	847226	847226	847225	847225	847226	847226
Bag for pressure chamber	00970088	00970061		00970090	00970088	00970061		
Choke coil	00844050	00844050	00844060	00844060	00844050	00844050	00844060	00844060
Condenser	00847002	00847002	00847003	00847003	00847002	00847002	00847003	00847003
Exhaust filter MDA-2GW	95200519	95200520	95200520	95200519*	95200519	95200520	95200520	95200521
Fan	EBM 822458	EBM 822458	EBM 2 x 822458	EBM 2 x 822458	PLTC 822451	PLTC 822451	PLTC 2 x 822451	PLTC 2 x 822451*
Flock filter	00970013	00970014	00970015	00970016	-	-	-	-
Front window	00903707	00903705	00903708	00903706	00903707	00903705	00903708	00903706
Flourrescent lamp	00844035	00844027	00844028	00844028	00844035	00844027	00844028	00844028
Gas spring	00822221	00822221	00822205	00822226	00822221	00822221	00822205	00822226
Main filter MDLA-GW	95200003	95200004	95200005	95200006	95200003	95200004	95200520	95200521
PCB/CPU cable	00903322	00903319	00903323	00903320	00903322	000903319	00903323	00903320
SWF engine	00903765	00903765	00903766	00903766	00903765	00903765	00903766	00903766
Valve 1/1" Ballofix	-	-	-	-	88823746	88823746	88823746	88823746
Pre- filter R2L-3326	-	-	-	-	(9) 95200029	(12) 95200029	(15) 95200029	(18) 95200029
Wire, sliding window	00970113	00970114	00970115	00970116	00970113	00970114	00970115	00970116

* 2 pcs.

MOUNTING KITS	
Item \ Model	SAFE / MAXI SAFE
Gas, resettable solenoid valve	80100001
Gas	80100022
Carbon-dioxide	80100023
Vacuum	80100024
Nitrogen	80100025
Oxygen	80100026

Spare parts common for all models:

Item	SAFE/MAXI SAFE
DC engine with gear	88847439
Divided tabletop	00970047
Distance piece for print	00970106
Drip catcher	00970050
Flow sensor ES 324	00849017
Fork	88822942
Fixture for flat cable	00841418
Glas fuse T 0,2 A	88851095
Glas fuse T 6,3 A	88851096
Glas fuse T 1,0 A	88851097
Glas fuse T 2,0 A	88851156
Glas fuse T 10 A	00841274
Ground fault circuit interrupter,10 A	88856008
Hum eliminator, 10 A	88856001
Key switch	00841004
Micro switch (window)	00845581
PCB relay print	88859027
Pulley fittings	00903309
RC-LED 100µF/ 100R	88856036
Rubber packing ,4 pcs.	00832408
Safety strap	00845451
Safety switch, wire	00903325
Side window	00970048
Silicone tube	88831212
Slide rail	00970102
Wheel for fastening	00970060
Wheel, sliding window	00970087
PCB CPU, class II	88859029
PCB motor control (sliding front window)	88859092
Thread bush	00970177
Transparent cover plug	00833012
Sheet coupling for tube	00833025

Fan Configuration				
	0.9	1.2	1.5	1.8
SAFE 2000	EBM 822458	EBM 822458	2 x EBM 822458	2 x EBM 822458
MAXI SAFE 2000	PLTC 822451	PLTC DC 822454	PLTC 2 x 822451	PLTC 2 x 822451