CleanSpace®

RESPIRATORS

www.cleanspacetechnology.com

USER INSTRUCTIONS

CleanSpace HALO CS3021

with BIO-HOOD

USA - ENGLISH

CleanSpace Technology Pty Ltd
ABN 24 146 453 554
GF, 16-18 Carlotta St
Artarmon, NSW 2016, Australia

sales@cleanspacetechnology.com
1 888 804 0038

1. Contents

1. Contents 2
2. Foreword 3
3. System Description 3
4. List of Warnings within these User Instructions 3
5. NIOSH – Approval, Cautions and Limitations 4
6. S - Special or Critical User Instructions 5
7. Limitations of Use 5
8. Respirator Program Management 6
9. System Components 7
10. HALO BIO System 8
11. Controls and Indicators 9
12. Mask Fitting 10
13. Using CleanSpace HALO with HALF MASKS (including HALO BIO Half Masks) 12
14. Using CleanSpace HALO BIO with the Head Cover 20
15. Using CleanSpace HALO with Full Face Masks 22
16. Entering and Exiting the Contaminated Area 26
17. Working in Noisy Environments 27
18. Fitting & Changing the Filter 28
19. Battery Information 30
20. Cleaning 32
21. Periodic Maintenance & Checking 35
22. Performing a Quantitative Fit Test (Full Face Mask) 36
23. Converting Half Mask HALO into Half Mask HALO BIO 37
24. Specifications 38
25. Product and Accessory information 39
26. Product Warranty 41

Important: Before use, the wearer must read and understand these user instructions. Keep these user instructions for reference.

Read these instructions in conjunction with the appropriate CleanSpace™ filters and accessories instructions.

WARNING

This product is part of a system that helps protect against certain airborne contaminants. ***Misuse may result in sickness or death****. For proper use, see your Occupational Health Specialist, these user instructions or contact CleanSpace Technology Customer Service on 1 888 804 0038*

2. Foreword

Read all instructions and warnings before using this device. Keep these user instructions for reference. If you have questions regarding this system contact CleanSpace Customer Service on +612 8436 4000 or e-mail sales@cleanspacetechnology.com

3. System Description

CleanSpace HALO is a complete NIOSH-approved respiratory system. When used in accordance with its NIOSH approval, the respirator helps to provide respiratory protection against particulates. HALO does not provide protection against vapours or gasses and is not an intrinsically safe system. See the NIOSH Approval Section of these user instructions for additional information on approvals.

The components of the CleanSpace HALO system are shown in Section 9. The blower draws ambient air through the high efficiency filter and supplies filtered air to the wearer via the mask. HALO is a breath responsive respirator which means that it blows harder during inhalation and more softly during exhalation. The device continuously adjusts fan speed to maintain positive pressure in the mask. Should the filter become blocked, an audible alarm will sound and the “Filter” light on the keypad will be illuminated. If the battery voltage falls below the minimum required to sustain the designed flow rate, an audible alarm will sound.

The HALO BIO System includes a Head Cover which, in combination with the other HALO BIO components, helps protect the head and neck from splash contamination. The HALO BIO Head Cover is used with the HALO BIO Half Masks and HALO BIO filter. The HALO BIO System includes an exhalation filter.

WARNING

Properly selected, used and maintained respirators help to protect against certain airborne contaminants. It is essential to follow all instructions and government regulations on the use of this product, including wearing the complete respirator system during all times of exposure, in order for the product to help protect the wearer. ***Misuse of respirators may result in overexposure to contaminants and lead to sickness or death****. For proper use, see your Occupational Health Specialist, these user instructions or contact CleanSpace Technology Customer Service on* ***1 888 804 0038***

4. List of Warnings within these User Instructions

WARNING

This product is part of a system that helps protect against certain airborne contaminants. ***Misuse may result in sickness or death****. For proper use, see your Occupational Health Specialist, these user instructions or contact CleanSpace Technology Customer Service on 1 888 804 0038*

WARNING

Properly selected, used and maintained respirators help to protect against certain airborne contaminants. It is essential to follow all instructions and government regulations on the use of this product, including wearing the complete respirator system during all times of exposure, in order for the product to help protect the wearer. Misuse of respirators may result in overexposure to contaminants and lead to sickness or death. For proper use, see your Occupational Health Specialist, these user instructions or contact CleanSpace Technology Customer Service on 1 888 804 0038

WARNING: never dry the mask or exhalation valve with a cloth that may leave behind lint.

Lint contamination of the exhalation valve may cause it to leak, resulting in overexposure to contaminants and lead to sickness or death.

WARNING: The blower contains a battery, sensitive electronics and a motor. Never immerse it in water or use anything wetter than a damp cloth to clean it.

No PAPR can fully protect you if you are not clean shaven. CleanSpace HALO is not suitable for users with facial hair.

If a satisfactory fit factor cannot be achieved with any of the masks, CleanSpace halo must not be used

If you cannot adjust the mask to avoid your hairline, the mask is not suitable for you and must not be worn

Do not leave the seal check cap in place for more than 2 minutes

Do not use compressed air or a brush to clean the filter!

HEPA filters are very easily damaged by the use of compressed air or by brushing.

Misuse of CleanSpace HALO by cleaning the filter may result in overexposure to contaminants and lead to sickness or death.

Be sure to remove the Seal Check Cap (Half Mask variants) before entering the contaminated area. The Cap blocks the exhalation valve, making it more difficult for your exhaled air to be expelled from the mask. Failure to remove the cap will lead to build-up of Carbon Dioxide in the mask, and may result in headache or dizziness. Never leave the Cap in place for more than 2 minutes!

Do not remove the respirator until you have vacated the contaminated area unless you have pressing health reasons to do so (for instance you are experiencing dizziness and believe removing the respirator while you leave the contaminated area may help)

It is essential that the correct filter type is selected for the chosen application.

If the blocked filter alarm is triggered (2 beeps, repeated every second, red LED flashes), leave the contaminated area immediately and replace the filter. Operating the respirator after the blocked filter alarm has sounded can cause the flow to fall below the manufacturer's minimum designed flow, which may result in overexposure to contaminants and lead to sickness or death.

CleanSpace HALO is not intrinsically safe. Do not use in flammable or explosive atmospheres. Doing so may result in injury or death. Always correctly use and maintain the internal lithium ion battery packs. Failure to do so may result in fire or explosion or could adversely affect respirator performance and result in injury, sickness or death.

Do not charge the on-board battery with unapproved chargers, in enclosed cabinets without ventilation, near flammable liquids or gasses, or near sources of high heat. Do not immerse the device in water. Do not use, charge or store the device outside the recommended temperature limits

If the battery alarm sounds (3 beeps, repeated every second), leave the contaminated area immediately and re-charge the battery.

Operating the respirator after the low battery alarm has sounded can cause the flow to fall below the manufacturer's minimum designed flow, which may result in overexposure to contaminants and lead to sickness or death.

In the extremely rare circumstance that the battery is damaged and electrolyte comes in contact with eyes, flush with water immediately and seek urgent medical attention

You must recalibrate the internal pressure sensor any time that your CleanSpace HALO is exposed to changes in temperature of more than 20°C

When fitting a new filter, the blocked filter alarm shall be tested before the respirator is put back into service.

The Exhalation Filter CS3027 is an electrostatic filter and its performance will be degraded by exposure to certain organic solvents including isopropanol (IPA), xylene and toluene. Always remove the Exhalation Filter before cleaning the mask. If there is any possibility that the Exhalation Filter has become contaminated with solvent, replace it

5. NIOSH – Approval, Cautions and Limitations

NIOSH APPROVAL

CleanSpace HALO is a NIOSH-approved respirator system. Refer to these User Instructions and to the NIOSH approval label provided with each CleanSpace HALO for a listing of components that can be used to form a NIOSH-approved respirator.

NIOSH CAUTIONS AND LIMITATIONS

A - Not for use in atmospheres containing less than 19.5 percent oxygen.
B - Not for use in atmospheres immediately dangerous to life or health.
C - Do not exceed maximum use concentrations established by regulatory standards.
F - Do not use powered air-purifying respirators if airflow is less than four cfm (115 lpm) for tight fitting facepieces or six cfm (170 lpm) for hoods and/or helmets.
I – Contains electrical parts that may cause an ignition in flammable or explosive atmospheres
J - Failure to properly use and maintain this product could result in injury or death.
L - Follow the manufacturer's User's Instructions for changing cartridges, canister and/or filters.

M - All approved respirators shall be selected, fitted, used, and maintained in accordance with MSHA, OSHA, and other applicable regulations.
N - Never substitute, modify, add, or omit parts. Use only exact replacement parts in the configuration as specified by the manufacturer
O - Refer to User's Instructions, and/or maintenance manuals for information on use and maintenance of these respirators.
P - NIOSH does not evaluate respirators for use as surgical masks.
S - Special or critical User's Instructions and/or specific use limitations apply. Refer to User's Instructions before donning.

6. S - Special or Critical User Instructions

This respirator contains a system for synchronising with your breathing and regulating mask pressure. **This system requires re-calibration whenever it experiences a change in temperature of more than 36°F (20°C). It is best practice to also re-calibrate if the unit has been in storage, particularly if the storage temperature is not known.**

For the most accurate battery charge indication, the respirator must be plugged into its charger. To be sure it is fully charged, plug in the charger and wait for **all 3 LEDs to light solidly without flashing**. If the 3rd LED is flashing rapidly, the battery is 95% charged.

The CS3024 Head Cover shall only be used in combination with a HALO BIO Half Mask (CS3003H Small, CS3004H Medium or CS3005H Large); and with a CS3025 Filter HE – HALO BIO. No other combination of mask and filter is approved for use with the HALO BIO Head Cover. The HALO BIO Masks are approved and may be used without the Head Cover with either the HALO BIO HE Filter (CS03025) or the HALO Standard HE Filter (CS3022). The HALO BIO is a tight-fitting half mask PAPR. The head cover does not provide or contribute to the systems respiratory protection.

7. Limitations of Use

Use this Respirator strictly in accordance with all instructions in these user instructions. Never modify or alter this product.

- **Do not remove the Respirator until you have left the contaminated area**, unless you have pressing health reasons to do so (for instance you are experiencing dizziness and believe removing the respirator while you leave the contaminated area may help).
- Only suitable for use by clean-shaven personnel. Facial hair under the seal reduces protection and is not permitted.
- Note: Half Mask variants of CleanSpace do not protect your eyes. In conditions that may damage or irritate eyes, use protective eyewear or a full-face variant of CleanSpace.
- Only use your respirator with the parts and accessories listed on the Approval Label.
- Do not use the respirator unless it is powered and running normally.
- Do not use the respirator while it is being charged via the AC adaptor.
- Do not use in airborne contaminant concentrations above those specified in your national regulations
- Do not use for respiratory protection against unknown atmospheric contaminants or when concentrations of contaminants are unknown or immediately dangerous to life or health (IDLH).
- Do not use in oxygen deficient or oxygen enriched atmospheres. Do not use in flammable or explosive environments.
- Only for use by trained personnel.
- Filters need to be changed regularly. The frequency of change depends on use and the concentration of contaminants in the atmosphere.
- Do not use for escape purposes. National regulations may impose specific limitations on the use of filters depending on the filter class and the facemask used.

LEAVE THE CONTAMINATED AREA IMMEDIATELY IF:

- Respirator warning lights and/or sounds activate for low battery or blocked filter

- Any part of the respirator is damaged
- Air flow into the mask decreases or stops
- Breathing becomes difficult or increased resistance occurs
- You feel dizzy or your airway is irritated
- You can taste or smell contaminants

Your respirator is suitable for use in the following atmospheric conditions:

- Temperature: 14°F to 113°F (-10°C to 45°C)
- Relative humidity: 0 to 90% non-condensing

The respirator will stop functioning if its internal temperature rises above 140°F (60°C) or falls below 14°F (-10°C

If the respirator has been used in an area that has caused it to become contaminated with a substance requiring special decontamination procedures it should be placed in a suitable container and sealed until it can be decontaminated.

Do not disassemble the respirator case. There are no user serviceable parts inside.

Failure to follow all instructions on the use of this product, and/or failure to use the respirator during times of exposure, may lead to adverse effects on the wearer's health and may render the warranty void.

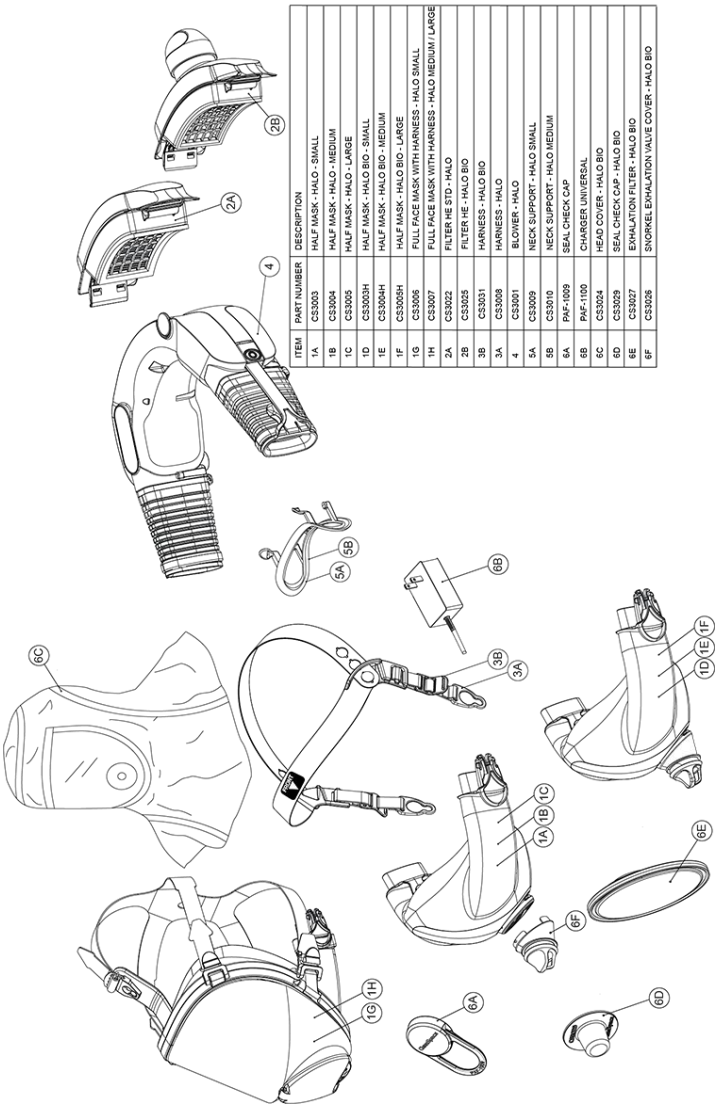
WARNING

This product is part of a system that helps protect against certain airborne contaminants. ***Misuse may result in sickness or death****. For proper use, see your Occupational Health Specialist, these user instructions or contact CleanSpace Customer Service on 1 888 804 0038*

8. Respirator Program Management

Occupational use of respirators must be in compliance with applicable health and safety standards. By United States regulation employers must establish a written respiratory protection program meeting the requirements of the Occupational Safety and Health Administration (OSHA) Respiratory Protection standard 29 CFR 1910.134 and any applicable OSHA substance specific standards. For additional information on this standard contact OSHA at www.OSHA.gov. In Canada, CSA standard Z94.4 requirements and/or the requirements of the applicable jurisdiction must be met. Contact an industrial hygienist or CleanSpace Technology Technical Service with questions concerning the applicability of the respirator to your job requirements.

9. System Components

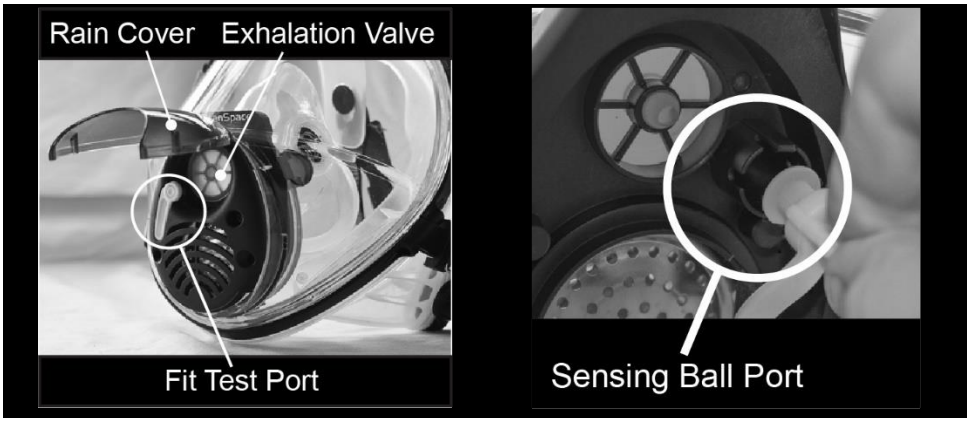


ITEM	PART NUMBER	DESCRIPTION
1A	CS3003	HALF MASK - HALO - SMALL
1B	CS3004	HALF MASK - HALO - MEDIUM
1C	CS3005	HALF MASK - HALO - LARGE
1D	CS3003H	HALF MASK - HALO BIO - SMALL
1E	CS3004H	HALF MASK - HALO BIO - MEDIUM
1F	CS3005H	HALF MASK - HALO BIO - LARGE
1G	CS3006	FULL FACE MASK WITH HARNESS - HALO SMALL
1H	CS3007	FULL FACE MASK WITH HARNESS - HALO MEDIUM / LARGE
2A	CS3022	FILTER HE STD - HALO
2B	CS3025	FILTER HE - HALO BIO
3B	CS3031	HARNESS - HALO BIO
3A	CS3008	HARNESS - HALO
4	CS3001	BLOWER - HALO
5A	CS3009	NECK SUPPORT - HALO SMALL
5B	CS3010	NECK SUPPORT - HALO MEDIUM
5A	PAF-1009	SEAL CHECK CAP
6B	PAF-1100	CHARGER UNIVERSAL
6C	CS3024	HEAD COVER - HALO BIO
6D	CS3029	SEAL CHECK CAP - HALO BIO
6E	CS3027	EXHALATION FILTER - HALO BIO
6F	CS3026	SNORKEL EXHALATION VALVE COVER - HALO BIO

Figure 1 - System Components

PARTS OF THE RESPIRATOR

Throughout this manual reference is made to various commonly-used components and features of the respirator. Familiarise yourself with these parts before reading the rest of the manual. See Figure 2.



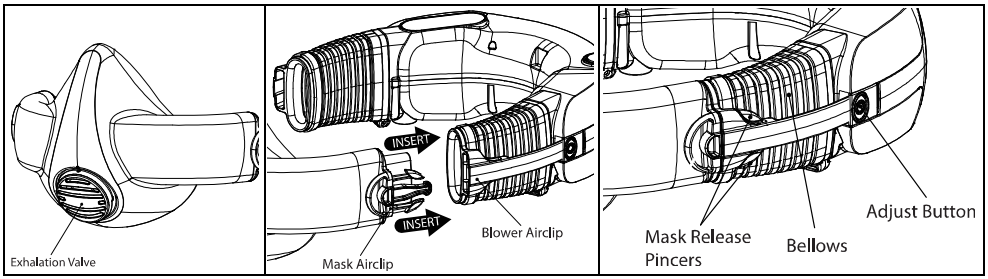


Figure 2 - Parts of the Respirator

10. HALO BIO System

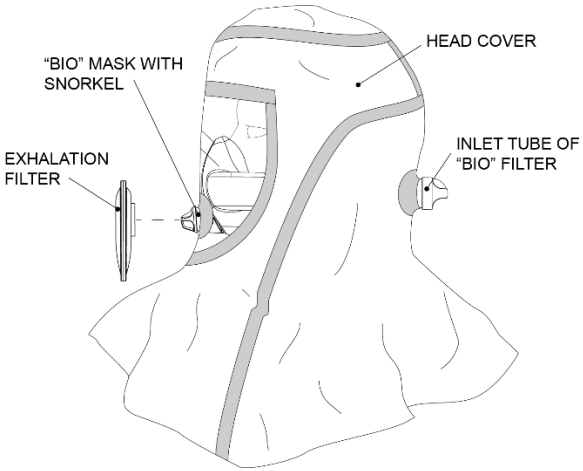
A fully configured HALO BIO system incorporates:

- CS3024 Head Cover – HALO BIO
- Half Mask – HALO BIO (CS3003H small, CS3004H medium or CS3005H large)
- CS3025 Filter HE – HALO BIO
- (optionally) CS3027 Exhalation Filter – HALO BIO

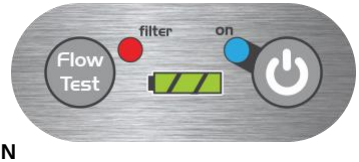
Notes:

- The HALO BIO is a tight-fitting half mask PAPR. The head cover does not provide or contribute to the system's respiratory protection.
- The CS3024 Head Cover shall only be used in combination with a HALO BIO Half Mask (CS3003H Small, CS3004H Medium and CS3005H Large) which is configured to adapt to the Head Cover; and with a CS3025 Filter HE – HALO BIO which is also configured to adapt to the Head Cover. No other combination of mask and filter is approved for use with the HALO BIO Head Cover.
- The HALO BIO Masks are approved and may be used without the Head Cover with either the HALO BIO HE Filter (CS03025) or the HALO Standard HE Filter (CS3022).

- The optional Exhalation Filter may be used with or without the HALO BIO Head Cover.
- The Snorkel Exhalation Valve Cover on BIO masks is a disposable component. For instructions on changing it see Section 19 Cleaning.



11. Controls and Indicators



POWER BUTTON

This button is used to switch between the three (3) operating Modes: "On", "Standby" and "Off" Mode.

i) ***Standby Mode*** is when the green battery indicator lights are on, the motor is not running and there is no airflow to the mask. The respirator will automatically switch to Standby Mode within ten (10) seconds of the user taking it off. If the respirator is in Off Mode it will switch to Standby Mode when the Power button is pressed.

ii) ***On Mode*** is when the respirator is being worn, the motor is running and there is air flow to the mask. The motor will start (called On Mode) when the respirator detects a change in pressure in the mask triggered by your breathing. In On Mode you should hear the motor running and feel the airflow on your face. You can also switch to On Mode (start the motor) from Standby Mode by pressing the Power button once.

iii) ***Off Mode*** is when the green battery indicator lights are off and the motor is not running and there is no air flow to the mask. The respirator automatically switches into Off Mode three (3) minutes after it has been removed from the user's face and the sensors detect that there is no breathing.

To conserve battery life, the respirator is designed to automatically switch from On Mode to Standby then to Off Mode when not being worn.

Important: CleanSpace HALO™ switches into On Mode when it is in Standby Mode and the wearer starts to breathe. The respirator can only switch into On Mode from Standby Mode.

FLOW TEST BUTTON

This button is used to check that the respirator is able to deliver its minimum designed flow. Pressing it once, when the CleanSpace HALO is in Standby Mode (not ON Mode), starts the flow test which lasts about 5 seconds. **See Section 0 for instructions on running the flow test.**

BATTERY INDICATOR LIGHTS

Your respirator is equipped with an indicator of battery charge. There are three (3) battery indicator lights. With the charger plugged in and three green lights lit, the battery is fully charged and typically has six (6) hours of operating time. The respirator should be fully charged before use.

If you need to be sure the battery is 100% charged plug in the charger. Even if the battery is fully charged, the 3rd LED will flash for at least three minutes while the respirator checks its condition. Once **all 3 LEDs light solidly without flashing the battery is at 100%**

For how to assess the level of charge, see Section 16.

When the battery approaches a level at which it would not be able to supply the Manufacturer's Minimum Design Flow, an alarm sounds (3 beeps, repeated once per second). All green battery lights are extinguished. **If the low battery alarm sounds you must leave the contaminated area immediately and recharge the battery.**

Operating time is strongly affected by work rate, altitude, and other factors. The operating times quoted above are average durations at moderate work rates at sea level. Actual operating times may vary widely from average durations.

FILTER WARNING ALARM

CleanSpace HALO™ has a Filter Warning Alarm, which is triggered when the filter is blocked**. If the Filter Warning Alarm sounds** (two beeps, repeated once per second) or the Filter Warning Alarm light comes on, **you must move out of the contaminated area**, **and change the filter**.

12. Mask Fitting

Before using your respirator you must determine the right mask for your face and know how to adjust the machine to achieve a good fit.

It is vital that your mask is the right size for your face and fits properly. **Mask fitting must be carried out by a specialist / designated mask fitter**. The fit must be confirmed by a **quantitative fit test** performed according to OSHA regulations 1910.134.

Full Face masks and Half Masks require different equipment and instructions to carry out a quantitative fit test.

Half Masks: To carry out a quantitative fit test your specialist mask fitter will require **PAF-0025 PortaCount Adaptor** and the accompanying **S005-7174 Quantitative Fit Test Instructions.** The PortaCount Adaptor is an accessory that fits between the mask and the exhalation valve and allows the air in the mask to be sampled. It comes with detailed instructions on how to carry out a quantitative fit test.

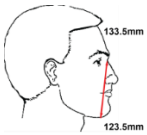
Full Face Masks: See Appendix - Performing a Quantitative Fit Test (Full Face Mask).

No PAPR can fully protect you if you are not clean shaven. CleanSpace HALO is not suitable for users with facial hair.

MASK SELECTION GUIDELINES

No set of guidelines can ensure that you have the right size mask for your face. You must confirm the fit with a quantitative fit test. But the tables below will help your mask fitting specialist to select the mask most likely to fit you and may therefore save time.

Half Masks:

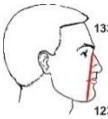


FACE LENGTH	34.5mm	43.5mm	52.5mm	61.5mm
133.5mm	First Try: **MEDIUM*** Then Try: **LARGE**	First Try: **LARGE** Then Try: **MEDIUM***	First Try: **LARGE** Then Try: **MEDIUM**	
123.5mm	First Try: **MEDIUM** Then Try: **SMALL***	First Try: **MEDIUM** Then Try: **LARGE**	First Try: **LARGE** Then Try: **MEDIUM**	
113.5mm	First Try: **SMALL** Then Try: **MEDIUM**	First Try: **MEDIUM** Then Try: **SMALL**	First Try: **MEDIUM** Then Try: **SMALL**	
103.5mm	First Try: **SMALL** Then Try: **MEDIUM**	First Try: **SMALL** Then Try: **MEDIUM**	First Try: **SMALL** Then Try: **MEDIUM**	
93.5mm				

LIP LENGTH

* On narrow faces, the action of pulling on the arms of the mask to tighten it causes the height of the mask to increase. The narrower the face, the more likely a smaller mask will be a better fit.

Full Face Masks:



FACE LENGTH	117.5mm	126.5mm	135.5mm	144.5mm	153.5mm
133.5mm	**M/L**	**M/L**	**M/L**	**M/L**	
123.5mm	First Try: M/L Then Try: S	First Try: M/L Then Try: S	First Try: M/L Then Try: S	**M/L**	
113.5mm	First Try: S Then Try: M/L	First Try: S Then Try: M/L	First Try: M/L Then Try: S	First Try: M/L Then Try: S	
103.5mm	**S**	**S**	First Try: S Then Try: M/L	First Try: S Then Try: M/L	
93.5mm					

FACE WIDTH

SELECTING A NECK SUPPORT

Your CleanSpace HALO respirator is supplied with two sizes of neck support, “S”, “M”. “S” (Small) is for people with smaller necks and heads while “M” (Medium) is for those with medium sized heads and necks. Users for whom the “Medium” neck support does not provide enough room (both bellows are fully extended but mask is still too tight on face) should use HALO without a neck support. This configuration provides extra room and is comfortable due to the curved design of the case.

Once you have achieved an acceptable mask fit and confirmed it with a quantitative fit test, record your information in the table below.

Name			
Half Mask:	**Small**	**Medium**	**Large**
Neck Support Size Fitted	**Small**	**Medium**	**None**
Date of Quantitative Fit Test			
Fit Factor on Test			
Full Face Mask:	**Small**		**Medium/Large**
Neck Support Size Fitted	**Small**	**Medium**	**None**
Date of Quantitative Fit Test			
Fit Factor on Test			

IF A SATISFACTORY FIT FACTOR CANNOT BE ACHIEVED WITH ANY OF THE MASKS, CLEANSPACE HALO MUST NOT BE USED

13. Using CleanSpace HALO with HALF MASKS (including HALO BIO Half Masks)

Complete the following five steps each time you use your respirator with a Half Mask.

STEP 1 - INSPECT

Before each entry into a contaminated area, the following inspections must be performed:

- Visually check the entire respirator system including the blower, mask, harness and filter. If parts are missing or damaged replace them only with approved parts before proceeding. Check the top and bottom case of the blower for cracks or other damage. Do not use the device if there is any damage.
- Remove the HE filter and check it carefully. The seal must be clean and free from damage of any kind. If necessary it can be cleaned with a cloth dampened with water. Examine the visible internal surfaces for any sign that dust has leaked past a damaged seal. If found, replace the filter. The body of the filter must not be cracked or show any sign of damage. Examine the filter carefully for any sign that it has sustained an impact or been scratched. If any sign of impact or scratching is found, discard the filter. Refit the HE filter (see Changing the Filter, page 28)

DO NOT USE COMPRESSED AIR OR A BRUSH TO CLEAN THE FILTER!
HEPA FILTERS ARE VERY EASILY DAMAGED BY THE USE OF COMPRESSED AIR OR BY BRUSHING.
Misuse of CleanSpace HALO by cleaning the filter may result in overexposure to contaminants and lead to sickness or death.

- Check that the battery is fully charged by pressing the power button. All three battery LEDs must light. See Section 14.
- Check both bellows for splits or holes. Check that the bellows have not become distorted so as to partially or fully close the air path to the mask.
- Check the mask to ensure that there are no cracks, tears or dirt; check the mask is not distorted.
- Check the exhalation valve for damage or dirt. If it is dirty, remove the exhalation Valve Cover. Remove any dirt, hairs or anything that could affect the seal of the valve against its seat. Check that the valve seat is clean. Reinstall the Valve Cover. If the valve is damaged, replace the mask. A dirty or poorly sealing valve will reduce protection and shorten battery life.
- Check the harness is intact and the elastic is not frayed or damaged. It must be adjusted to support some of the weight of the respirator.

STEP 2 – CALIBRATE

This respirator contains a system for synchronising with your breathing and regulating mask pressure. **This system requires re-calibration whenever it experiences a change in temperature of more than 36°F (20°C). It is best practice to also re-calibrate if the unit has been in storage, particularly if the storage temperature is not known. To re-calibrate:**

1. Remove the mask if fitted.
2. Remove the filter from the respirator.
3. Place the respirator on a stable surface such as a table.
4. With the respirator in standby mode (one or more green LEDs lit), press the Power button and the Flow Test button at the same time.
   If no LEDs are lit. press the Power button once to enter standby mode
5. When both the blue and red LEDs light, release both buttons. Leave the respirator sitting still.
6. After 5 – 10 seconds the motor will start and will run for 5 – 10 seconds.
7. When the motor stops, calibration is complete.
8. Re-fit the filter.

Important Note: Failure to remove the filter prior to calibration will result in poor battery life. In order to restore the performance of the respirator, calibration must be performed again with the filter removed.

STEP 3 – TEST FLOW RATE

This test checks that the machine is able to deliver the Manufacturer's Minimum Design Flow of 120 litres/minute.

1. Remove the mask from the respirator. **Leave the filter in place**. Place the respirator flat on a table or other support.
2. Press and release the button marked "Flow Test"
3. The respirator automatically runs the Flow Test. The motor will run fast and air will be discharged from the left hand bellows.
4. After 2 seconds the respirator reports the result of the test using the LEDs on the keypad. Use the table below to interpret the LEDs.

LIGHTS	Meaning
3 LEDs:	PASS (Excellent: flow >180 l/min)**
2 LEDs:	**PASS (Good)****
1 LED:	**PASS (Acceptable)**
ALL LEDs FLASH	**FAIL (Flow <120 l/min)** **Do not use the respirator until a new filter has been fitted and / or battery charged and the test has been repeated with a PASS result.** *Reset the respirator by pressing the Power button. Fully charge the battery and / or replace the filter. Repeat the flow test. If filter is new and battery fully charged but the respirator fails the test, contact CleanSpace Technology and do not use until it has been evaluated*

***** This test is not a battery charge test. Three LEDs means that, as of the moment it is tested, the unit can deliver high flow. <u>It does not mean the battery is full</u>. You must check the battery condition separately. See Section 16.***

STEP 4 - DON THE RESPIRATOR

NOTE – please read STEP 4 <u>all the way through</u> before beginning to don the respirator

Locate your blower, mask, neck support and harness. **Make sure the mask is the size that you used for your last successful quantitative fit test.** This size should be recorded in this manual (see Section 11 above).

- **Fit a mask to CleanSpace HALO**

With the peak of the mask upright locate the right-hand mask AirClip. Locate the right-hand blower AirClip. It is on the same side of the blower as the Keypad.

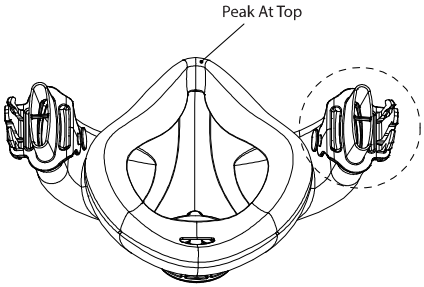


Figure 5 - Right hand mask AirClip

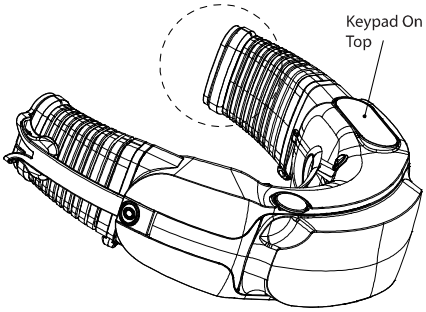


Figure 6 - Right hand blower AirClip

Join the AirClips, so that the mask is attached to the blower. See Figure 7.

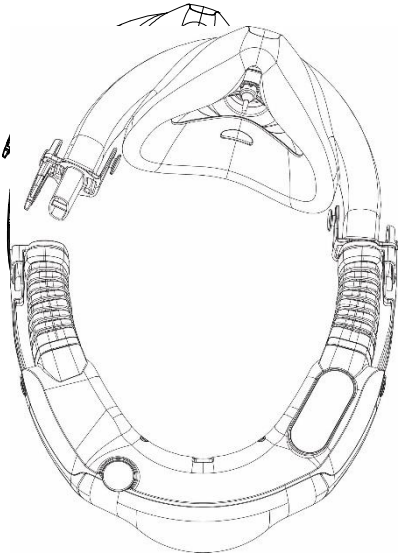


Figure 7 - Mask on Blower (Note - connection is on right hand side)

Check that the mask is the right way up! *The nose region of the mask must face in the same direction as the keypad. See Figure 8.*

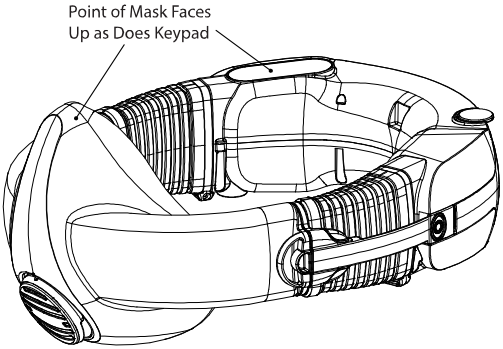


Figure 8 - Nose section of mask and keypad must both face up

Leave the other mask arm and bellow free until you are fitting the Respirator.

Familiarise yourself with the Adjust Buttons and the Mask Release Buttons. See Figure 9

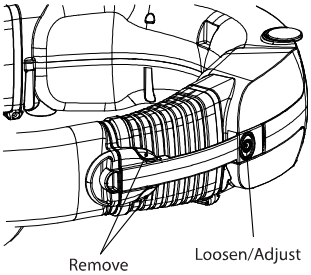


Figure 9 - Mask Release Button and Adjust Button

- **Fit the Harness**

  Holding the harness find the two keyhole clips at the end of each elastic strap, fit these to the buttons on the inside of each Airclip. Check that the "Front" printing on the main head strap is pointing to the mask and that there are no twists in the straps.

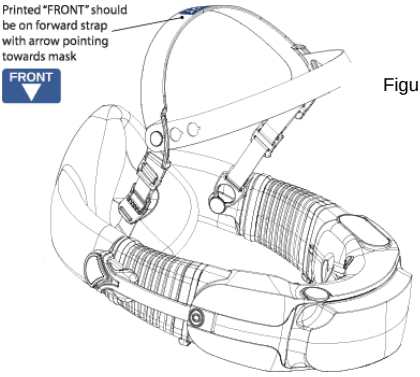


Figure 10 - Harness Fitting

The two straps of the harness fit to the inside of the AirClips on the mask

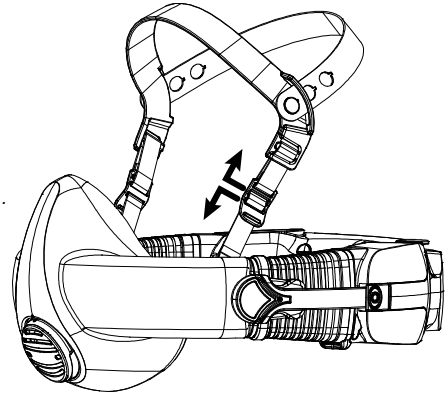


Figure 11 – Adjust Harness Length by Moving Cleat Up or Down Strap

Adjust the harness as follows:

- *To move the mask up, tighten the elastic straps by sliding the cleat down the strap*
- *To adjust for a smaller head size, shorten the rear strap by using a hole further along the strap, as shown below.*

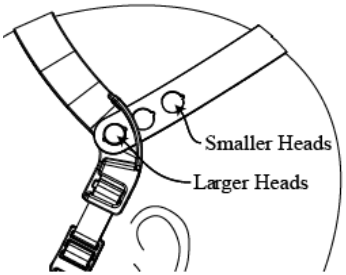


Figure 12 - Adjusting the harness rear strap

- **Fit a Neck Support**

  Align the neck support with the blower, the two arms with the rounded heads should be at the top. Locate the bottom arms of the neck support in the grooves at the bottom of the unit and slide neck support upwards until you hear a 'click'.

  NOTE – Users for whom the "Medium" neck support does not provide enough room (both bellows are fully extended but mask is still too tight on face) may use HALO without a neck support. ***Note that this configuration (like all others) must be confirmed by a quantitative fit test performed according to OSHA regulations 1910.134***

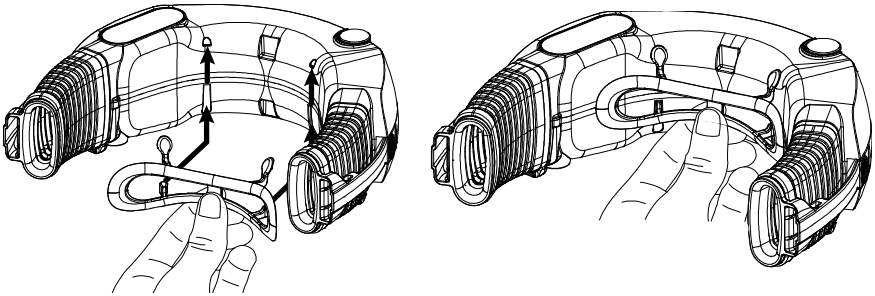


Figure 13 - Fitting neck support

- **Loosen both bellows to their widest opening**

  Press the adjust button on the blower and pull on the bellows to extend them. See Figure 14.

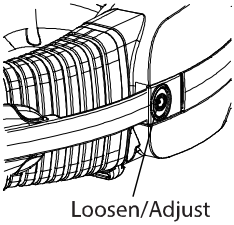


Figure 14 - Adjust Button

- **Place the machine in Standby Mode**

  Press the Power button once

- **Don the respirator and start to breathe. (The motor should start)**

  Place the blower behind your neck with the bellows and mask hanging down one side, harness should be hanging in front of mask. Fasten the AirClip on your left-hand side. Pull the mask up and around onto your face. Pull the harness back and onto your head.

  Adjust harness and settle it on your head, move cleats up or down to adjust.

Figure 15 - Blower behind neck

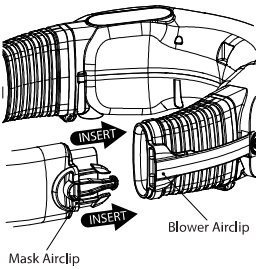


Figure 16 – Fasten AirClip

Figure 17 – Device fastened around neck

Figure 18 – Pull mask up and onto face

Figure 19 – Pull harness back and onto head

Figure 20 - Settle harness and adjust

Breathe normally. The motor should start and you should feel fresh air on your face.

If the motor does not start, it was not in Standby Mode. Take the respirator off, press the Power button to activate Standby Mode and don it again as described above.

- **Check the Harness**

  The Harness should take a little of the weight of the mask and support the blower so that the respirator system sits level on your head. If necessary adjust the harness. This is done by shortening or lengthening the front straps of the harness, by sliding the cleats up or down the straps. Remember to shorten or lengthen each side by the same amount. If necessary the rear strap can also be adjusted – see above.

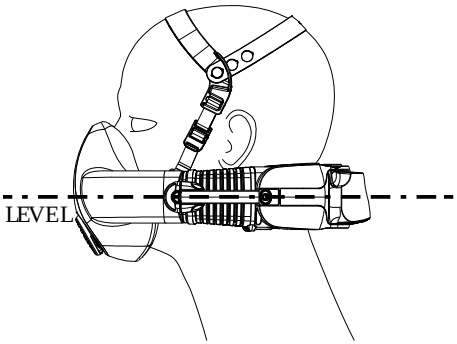


Figure 21 - Correct CleanSpace HALO Position

- **Tighten the mask on your face**

  Tighten the mask until you do not feel any leaks between the mask cushion and your face.

  To tighten the mask, place one hand against the back of the blower and the other over the front of the mask. Push the blower forwards and the mask back, tightening the fit. You will hear a series of clicks as the mask is tightened.

  Be careful to tighten each side by the same amount

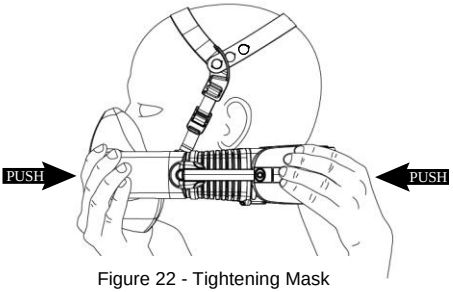


Figure 22 - Tightening Mask

STEP 5 – CHECK MASK SEAL (STANDARD MASK)

If using the HALO BIO system CS3024 Head Cover, skip to Section 14

It is essential to do a fit check every time you wear a CleanSpace HALO

Locate PAF-1009, the red Seal Check Cap. Fit Seal Check Cap over the exhalation valve in the mask. The Cap should snap into place. See Figure 23**.**

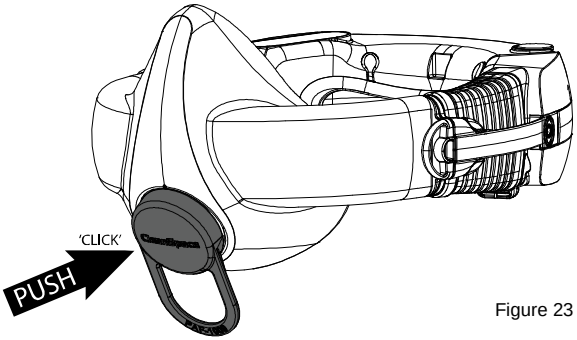


Figure 23 - Fitting Seal Check Cap

Check that no air is flowing from the exhalation valve. Breathe normally.

Using your fingers, feel around the perimeter of the mask for leaks. You will feel any leak as a cool flow of air over your finger. For greater sensitivity breathe out firmly to raise the mask pressure. Wetting your fingers will make it easier to feel tiny leaks.

If necessary tighten the mask. To tighten the mask, place one hand against the back of the blower and the other over the front of the mask. Push the blower forwards and the mask back, tightening the fit. You will hear a series of clicks as the mask is tightened.

Be careful to tighten each side by the same amount.

After each tightening, feel for leaks again

Tilt your head down (look at the ground) and up (look at the sky). Check that there are still no leaks. Look right and left, checking for leaks. Adjust if necessary.

Once you can feel no leaks from the mask, the seal check is complete.

IF A SATISFACTORY FIT CANNOT BE ACHIEVED, DO NOT ENTER THE CONTAMINATED ZONE

Remove the Seal Check Cap by gently **twisting** the handle so that one side of the cap comes loose from the exhalation valve. Be careful not to dislodge the exhalation Valve Cover. See Figure 24.

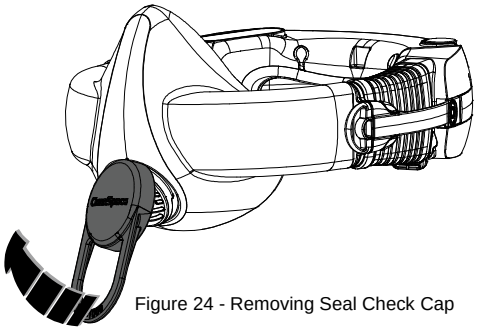


Figure 24 - Removing Seal Check Cap

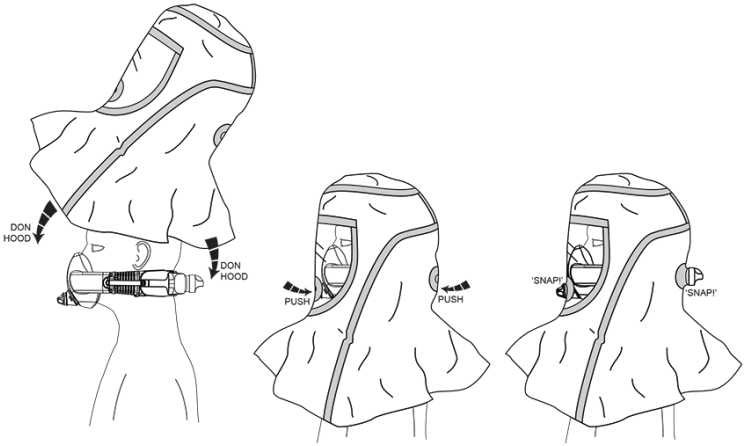
Be sure to remove the Seal Check Cap (Half Mask variants) before entering the contaminated area. The Cap blocks the exhalation valve, making it more difficult for your exhaled air to be expelled from the mask. Failure to remove the cap will lead to build-up of Carbon Dioxide in the mask and may result in headache or dizziness.
Never leave the Cap in place for more than 2 minutes!

14. Using CleanSpace HALO BIO with the Head Cover

If you are using the HALO BIO Head Cover, carry out the following additional steps

STEP 1 – CHECK MASK SEAL

- Check that you are using a HALO BIO mask (CS3003H, CS3004H or CS3005H) with the blue Snorkel Exhalation Valve Cover on the front
- Check that you are using CS3025 Filter HE – HALO BIO, with the blue inlet tube
- Don the Head Cover
- Reach behind your head and pull the rear grommet (rubber patch) over the filter inlet tube until you hear a “snap” and the grommet is sealed around the inlet tube
- Press the front grommet (rubber patch) over the mask Snorkel Exhalation Valve Cover until you hear a “snap” and the grommet seals around the Snorkel Cover. If necessary, support the Snorkel Cover with your other hand, reaching up inside the Head Cover.



Have your buddy check that the air vent in the Snorkel Cover is fully through the front grommet and the rear grommet is sealing neatly around the filter inlet tube.

- Locate CS3029 Seal Check Cap Snorkel, which is a red rubber cap. Fit the cap over the mask Snorkel Cover and push until it snaps into place.
- Check that no air is flowing from the exhalation valve. Breathe normally.
- Using your fingers (and reaching up inside the Head Cover) feel around the perimeter of the mask for leaks. You will feel any leak as a cool flow of air over your finger. For greater sensitivity breathe out firmly to raise the mask pressure. Wetting your fingers will make it easier to feel tiny leaks.
- If necessary, tighten the mask. To tighten the mask, place one hand against the back of the blower and the other over the front of the mask. Push the blower forwards and the mask back, tightening the fit. You will hear a series of clicks as the mask is tightened.
- Be careful to tighten each side by the same amount.
- After each tightening, feel for leaks again
- Tilt your head down (look at the ground) and up (look at the sky). Check that there are still no leaks. Look right and left, checking for leaks. Adjust if necessary.
- Once you can feel no leaks from the mask, the seal check is complete.

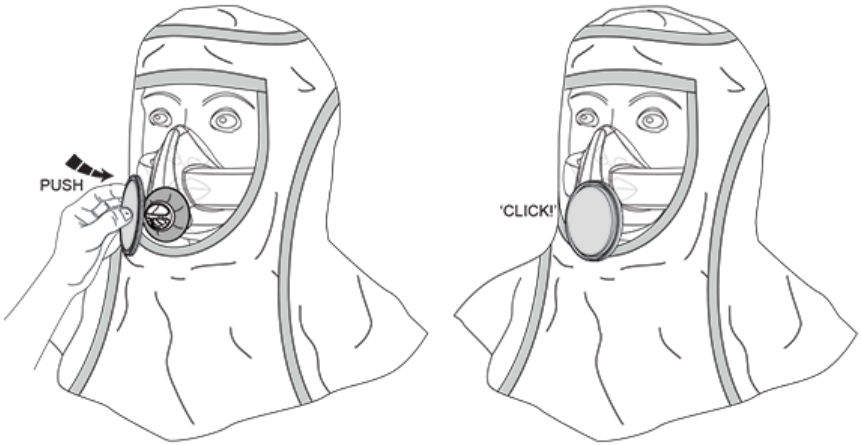
IF A SATISFACTORY FIT CANNOT BE ACHIEVED, DO NOT ENTER THE CONTAMINATED ZONE

- Remove the Seal Check Cap by pulling on the flange around its base.

DO NOT LEAVE THE SEAL CHECK CAP IN PLACE FOR MORE THAN 2 MINUTES

STEP 2 – FIT THE EXHALATION FILTER

- If you are using CS3027 Exhalation Filter, fit it now by pressing it onto the Snorkel Exhalation Valve Cover until you hear a “click”. If necessary, support the Snorkel Cover by reaching up inside the Head Cover.



15. Using CleanSpace HALO with Full Face Masks

Complete the following six steps each time you use your respirator with a full face mask.

STEP 1 - INSPECT

Before each entry into a contaminated area, the following inspections must be performed:

- Visually check the entire respirator system including the blower, mask, harness and filter. If parts are missing or damaged replace them only with approved parts before proceeding. Check the top and bottom case of the blower for cracks or other damage. Do not use the device if there is any damage.
- Remove the HE filter and check it carefully. The seal must be clean and free from damage of any kind. If necessary it can be cleaned with a cloth dampened with water. Examine the visible internal surfaces for any sign that dust has leaked past a damaged seal. If found, replace the filter. The body of the filter must not be cracked or show any sign of damage. Examine the filter carefully for any sign that it has sustained an impact or been scratched. If any sign of impact or scratching is found, discard the filter. Refit the HE filter (see Changing the Filter, page 28)

DO NOT USE COMPRESSED AIR OR A BRUSH TO CLEAN THE FILTER!
HEPA FILTERS ARE VERY EASILY DAMAGED BY THE USE OF COMPRESSED AIR OR BY BRUSHING.
Misuse of CleanSpace HALO by cleaning the filter may result in overexposure to contaminants and lead to sickness or death.

- Check that the battery is fully charged by pressing the power button. All three battery LEDs must light. See Section 14.
- Check both bellows for splits or holes. Check that the bellows have not become distorted so as to partially or fully close the air path to the mask.
- Check the mask to ensure that there are no cracks, tears or dirt; check the mask is not distorted.
- Check the exhalation valve for damage or dirt. If it is dirty, flip up the rain cover. Remove any dirt, hairs or anything that could affect the seal of the valve against its seat. Check that the valve seat is clean. Reinstall the Valve Cover. If the valve is damaged, replace the mask. A dirty or poorly sealing valve will reduce protection and shorten battery life.
- Check the harness is intact and the elastic is not frayed or damaged. For Half Mask use it must be adjusted to support some of the weight of the respirator.

STEP 2 – CALIBRATE

This respirator contains a system for synchronising with your breathing and regulating mask pressure. **This system requires re-calibration whenever it experiences a change in temperature of more than 36°F (20°C). It is best practice to also re-calibrate if the unit has been in storage, particularly if the storage temperature is not known. To re-calibrate:**

9. With CleanSpace HALO in standby mode (one or more green LEDs lit), press the Power button and the Flow Test button at the same time.
10. The red and blue LEDs will both light, and the green battery LEDs will cycle.
11. Hold the respirator still until the red and blue LEDs turn off (10 – 15 seconds)
12. Calibration is complete. At the end of the calibration process the green LEDs return to indicating battery charge status.

STEP 3 – TEST FLOW RATE

This test checks that the machine is able to deliver the Manufacturer's Minimum Design Flow of 120 litres/minute.

5. Remove the mask from the respirator. **Leave the filter in place**. Place the respirator flat on a table or other support.
6. Press and release the button marked "Flow Test"
7. The respirator automatically runs the Flow Test. The motor will run fast and air will be discharged from the left hand bellows.
8. After 2 seconds the respirator reports the result of the test using the LEDs on the keypad. Use the table below to interpret the LEDs.

9. LIGHTS	Meaning
3 LEDs:	PASS (Excellent: flow >180 l/min)**
2 LEDs:	**PASS (Good)****

1 LED:	**PASS (Acceptable)**
ALL LEDs FLASH	**FAIL (Flow <120 l/min)** **Do not use the respirator until a new filter has been fitted and / or battery charged and the test has been repeated with a PASS result.** *Reset the respirator by pressing the Power button. Fully charge the battery and / or replace the filter. Repeat the flow test. If filter is new and battery fully charged but the respirator fails the test, contact CleanSpace Technology and do not use until it has been evaluated*

***** This test is not a battery charge test. Three LEDs means that, as of the moment it is tested, the unit can deliver high flow. It does not mean the battery is full. You must check the battery condition separately. See Section 16.***

STEP 4 - DON THE MASK

Donning is best done with a buddy to help you check adjustments and fit!

If you have long hair, it is recommended you tie the hair back so that it does not interfere with the seal between the mask and your face. When you are fitting the mask, check that the seal does not cross your hairline.

DO NOT USE COMPRESSED AIR OR A BRUSH TO CLEAN THE FILTER!
HEPA FILTERS ARE VERY EASILY DAMAGED BY THE USE OF COMPRESSED AIR OR BY BRUSHING.
Misuse of CleanSpace HALO by cleaning the filter may result in overexposure to contaminants and lead to sickness or death.

Loosen all five straps on the mask harness to their fullest extent *Hold the mask in one hand while you use the other hand to pull the harness back and away from the mask*	
Place your chin in the cup of the mask face seal *And* *Pull the harness over your head*	

Adjust the top strap to a comfortable height. *Note – if you have a ponytail, bun or hair accessories, make sure they are not trapped between the harness and your head.*	
Settle your face into the mask face seal. Gently tighten each harness strap in turn, starting with the bottom straps. As you pull each strap, use your other hand to steady the mask on your face. *Continue to adjust the straps, loosening and tightening as necessary, until the mask face seal presses evenly on your face around its entire length.* *If necessary, adjust the mask up or down (using the top strap) so that the inner mask sits comfortably around your nose*	 

CHECK THAT THE MASK SEAL DOES NOT CROSS YOUR HAIRLINE

Check all the way around the mask seal, paying particular attention to your forehead and temples. ***The seal must not cross your hairline****.*

IF YOU CANNOT ADJUST THE MASK TO AVOID YOUR HAIRLINE, THE MASK IS NOT SUITABLE FOR YOU AND MUST NOT BE WORN

STEP 5 – SEAL CHECK

Carry out a negative pressure seal check *Using your index fingers or thumbs, cover the air inlets on both air clips.* *Breathe in sharply. You should not be able to draw any air into the mask. The mask should be sucked in towards your face as you inhale. Listen for squeaking or whistling noises which indicate air is leaking past the seal.* *Hold your breath for 10 seconds. The mask should stay collapsed against your face. If the mask seal slowly recovers (mask moves away from your face) there is a leak. Readjust the mask fit and repeat the negative pressure seal check.* *Resume normal breathing and proceed to the next step.*	

IF A SATISFACTORY FIT CANNOT BE ACHIEVED, DO NOT ENTER THE CONTAMINATED ZONE

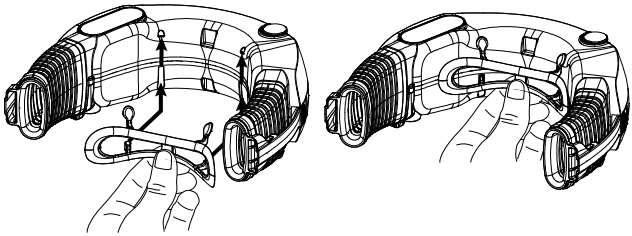
STEP 6 – DON THE RESPIRATOR

NOTE: Please read STEP 4 all the way through before beginning to don CleanSpace PAPR

Locate your blower and neck support. **Make sure neck support is of the size that you used for your last successful quantitative fit test.** This size should be recorded in this manual.

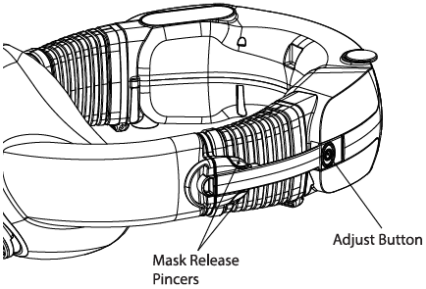
Fit a neck support to the respirator

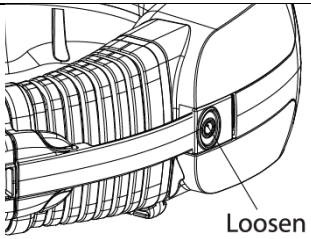
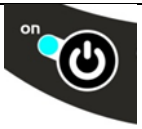
Align the neck support with the blower, the two arms with the rounded heads should be at the top. Locate the bottom arms of the neck support in the grooves at the bottom of the unit and slide neck support upwards until you hear a 'click'.



Familiarise yourself with the Adjust Buttons and the Mask Release Buttons.

Mask Release Button and Adjust Button

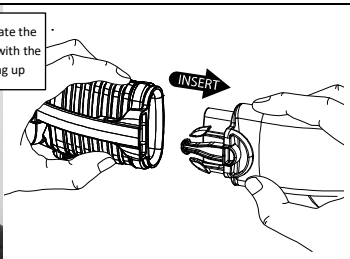


Loosen both bellows to their widest opening *Press the adjust button on the blower and pull on the bellows to extend them*	
Place the machine in Standby Mode *Press the Power button once*	

Don the respirator and start to breathe.

Place the respirator behind your head, resting on your shoulders. ***Note that the keypad must be facing upwards.***

Grasp the left-hand mask AirClip in one hand and the left-hand respirator AirClip in the other. Join them. Pulling down on the mask AirClip to move it away from the harness makes this process easier.



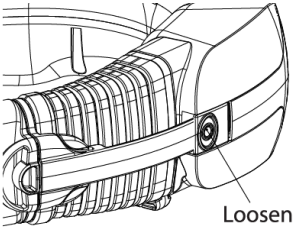
Join the AirClips on the right-hand side

Breathe normally. CleanSpace Respirator should start.

If the motor does not start, it was not in Standby Mode. Take the respirator off, press the Power button to activate Standby Mode and don it again as described above.

Finally, you can set how close CleanSpace Respirator sits to your neck by adjusting the bellows on either side of the respirator. If your job involves a lot of rapid movement (for instance running up stairs) you may wish the respirator to sit snugly against your neck. If you will be looking up a lot, you may find it more comfortable with the respirator set well back from your neck.

To move the respirator forward: steady the mask with one hand and press on the back of the respirator with the other. You will hear clicking as the adjust mechanism moves to the new position. Be careful to adjust each side by the same amount. To move the respirator backwards, press the adjust buttons on each side and if necessary pull backwards on the respirator.



16. Entering and Exiting the Contaminated Area

Prior to entering the contaminated area, complete the inspections and checks listed in these user instructions.

1. Ensure Seal Check has been done and motor is responding to your breathing
2. Check that none of the alarms are sounding.
3. Remember that if your workplace is very noisy you may not be able to hear the device alarms**. In this case you must follow the special precautions set out in Section 15.**
4. Enter the work area

5. Do not remove the respirator until you have left the contaminated area, unless you have pressing health reasons to do so (for instance you are experiencing dizziness and believe removing the respirator while you leave the contaminated area may help).
6. Leave the contaminated area immediately if any of the following conditions occur:
    a. Any part of the system is damaged
    b. Airflow into the mask decreases or stops
    c. The battery of filter alarms are triggered (even if only the audible or only the visible alarm triggers)
    d. Breathing becomes difficult
    e. You feel dizzy or your vision is impaired
    f. You smell or taste contaminants
    g. Your face, eyes, nose or mouth become irritated
    h. You suspect the concentration of contaminants may have reached levels at which this respirator may no longer provide adequate protection.
7. You should have specific exiting and decontamination procedures as part of your workplace respiratory protection program. Follow those procedures, together with the instructions below when removing the respirator.

To remove the respirator, find the Mask Release Pincer (see Section 9) and pinch to release the mask from the blower. See Figure 28.

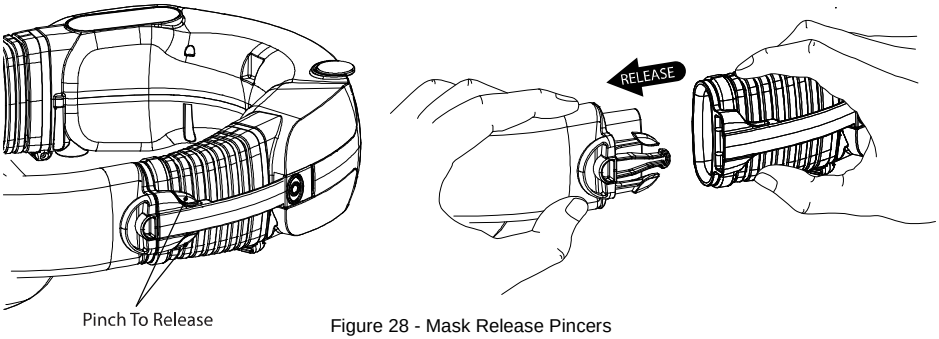


Figure 28 - Mask Release Pincers

Note: The respirator motor will automatically switch off and go into Standby Mode in approximately 10 seconds when no breath is detected. In Standby Mode, if after three (3) minutes no breath is detected, the Respirator will automatically go into Off Mode. In Off Mode, all the battery indicator lights will be off and the motor will not be triggered by the wearer's breathing.

DO NOT REMOVE THE RESPIRATOR UNTIL YOU HAVE VACATED THE CONTAMINATED AREA unless you have pressing health reasons to do so (for instance you are experiencing dizziness and believe removing the respirator while you leave the contaminated area may help)

17. Working in Noisy Environments

In most noisy environments the CleanSpace HALO alarms are still clearly audible to the wearer. But if there is a chance that you will not hear the alarms, you must take the following extra precautions

- Never enter the contaminated zone unless all three green battery indicator lights are illuminated
- Never work in the high noise area for more than four (4) hours. At the end of four hours, leave the contaminated zone and check that
    - The filter blocked light is not illuminated; AND
    - All three green battery indicator lights are still illuminated
- If two or fewer green battery indicator lights are illuminated, recharge CleanSpace HALO until 3 lights are showing again (and the 3rd one has stopped flashing)
- If the filter blocked light is illuminated, change the filter

- Be particularly aware of difficulty breathing or of the air flow stopping. If these things happen, exit the contaminated zone immediately.

18. Fitting & Changing the Filter

Before using the respirator you must ensure that you are using the correct filter type for the environment you are working in.

IT IS ESSENTIAL THAT THE CORRECT FILTER TYPE IS SELECTED FOR THE CHOSEN APPLICATION.

Before changing the filter, move out of the contaminated area and remove the respirator. Used filters should be disposed of responsibly and treated as non-recyclable hazardous* waste (* dependent on the contaminant being filtered). Filters need to be regularly changed. The frequency of change depends on use and concentration of contaminants in the atmosphere.

BLOCKED FILTER ALARM

All CleanSpace respirators have a Filter Blocked alarm, which is triggered when the filter requires replacement (2 beeps, repeated every second).

If the blocked filter alarm is triggered (2 beeps, repeated every second, red LED flashes), leave the contaminated area immediately and replace the filter.
Operating the respirator after the blocked filter alarm has sounded can cause the flow to fall below the manufacturer's minimum designed flow, which may result in overexposure to contaminants and lead to sickness or death.

(Pressing the Power button once will mute the Filter Blocked alarm, allowing you to concentrate while you exit the contaminated zone. After 15 minutes, if the filter has not been changed, the alarm will resume).

WHEN TO CHANGE THE FILTER

Change the filter

- When the Blocked Filter Alarm sounds
- If the Flow Test indicates that the respirator is not able to produce the Minimum Design Flow.
- If there is any sign of damage to the filter
- When the filter reaches its expiry date (marked on the filter label)
- When the outside of the filter is soiled, particularly if the contaminant is blood or other potentially infectious material.
- When the filter has been exposed to water or other liquids
- If there is any sign of dust or contaminants on the inside surface of the filter.

A respirator with a clean filter will run for much longer than one with a filter that is dirty. To maximise your work time between battery charges, it is best to change the filter more often.

CS3027 Exhalation Filter should be changed every time the Head Cover is changed and also

- If there is a possibility that it has been splashed with contaminant (for instance blood)
- If there is a possibility that it has been exposed to organic solvents (for instance isopropanol, xylene or toluene) as organic solvents will degrade its performance.

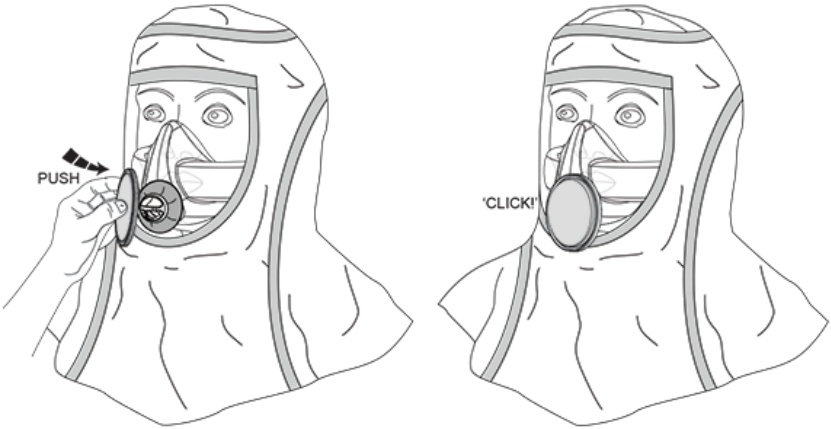
Do not fit a filter if its expiry date (which is marked on the filter) has passed.

CleanSpace filters are NOT reusable and must NOT be cleaned.

DO NOT USE COMPRESSED AIR OR A BRUSH TO CLEAN THE FILTER!
HEPA FILTERS ARE VERY EASILY DAMAGED BY THE USE OF COMPRESSED AIR OR BY BRUSHING.
Misuse of CleanSpace HALO by cleaning the filter may result in overexposure to contaminants and lead to sickness or death.

CHANGING THE EXHALATION FILTER CS3027

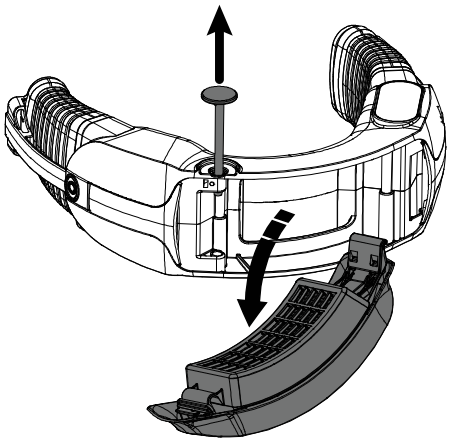
To remove the filter, simply pull if off the Snorkel Exhalation Valve Cover using a twisting motion. To fit a new Exhalation Filter, press it onto the Snorkel Cover until you hear a "click" and it snaps into place.

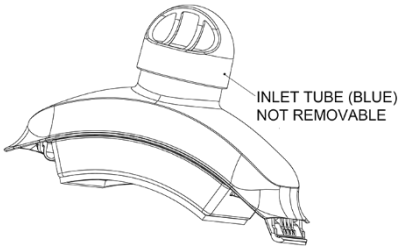


CHANGING THE HE FILTER (CS3022 AND CS3025)

To unlock the filter cover, lift the pin located on the left side of the filter cover. The filter cover will become loose and fall out. Remove the filter. Check that the area where the filter sits is clean. If necessary, wipe it with a clean cloth or CleanSpace Cleaning Wipe. Fit a new filter, locating the tongue on the right-hand side of the filter inside the locating pin on the right of the blower. Swing the filter shut into closed position and hold it firmly against the body of the respirator with one hand. Press the pin down until back in place.

NOTE: Inlet Tube (Blue cover) on the filter cover of CS3025 is not removable from the filter. Remove the HALO BIO filter in its entirety and replace with a new one.





WHEN FITTING A NEW FILTER, THE BLOCKED FILTER ALARM SHALL BE TESTED BEFORE THE RESPIRATOR IS PUT BACK INTO SERVICE. SEE "TESTING THE BLOCKED FILTER ALARM" AT THE END OF THIS SECTION

TESTING THE BLOCKED FILTER ALARM

After changing the filter, check that the Blocked Filter Alarm is audible and the Filter LED is working.

1. Remove the mask from the respirator.. Using your hand, completely cover the air outlet (see picture below).
2. With the respirator in Standby mode (one or more green LEDs lit), press and release the Power button. The blue LED will light and the respirator starts blowing.

   If no LEDs are lit, press the Power button once to enter Standby mode.
3. After 5 - 10 seconds, the red Filter LED will light and the blocked filter alarm will sound (2 beeps, repeated every second).
4. Reset the machine by pressing the Power button.

   If the red Filter LED does not light or the alarm does not sound, check that the outlet is ***completely*** *blocked. The outlet is on the left side as you wear the device (see illustration below).* ***If the Filter LED and/or audible alarm are still not working, do not enter the contaminated zone****. Contact CleanSpace for assistance.*

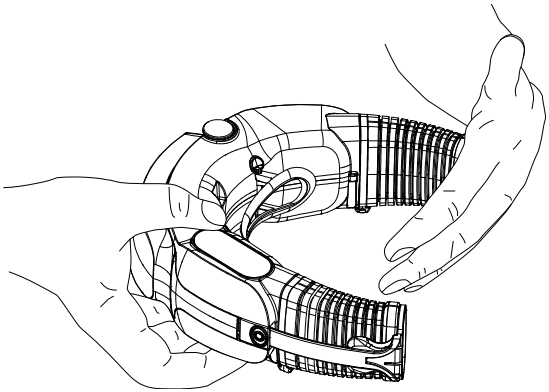


Figure 29 – Blocking the air outlet for a blocked filter alarm test

19. Battery Information

CleanSpace HALO is not intrinsically safe. Do not use in flammable or explosive atmospheres. Doing so may result in injury or death.

Always correctly use and maintain the internal lithium ion battery packs. Failure to do so may result in fire or explosion or could adversely affect respirator performance and result in injury, sickness or death.

- ***Do not charge the on-board battery with unapproved chargers, in enclosed cabinets without ventilation, near flammable liquids or gasses, or near sources of high heat***
- ***Do not immerse the device in water***
- ***Do not use, charge or store the device outside the recommended temperature limits***

ASSESSING STATE OF CHARGE

The three LEDs on the control panel indicate the level of charge. When the unit is in use (not on charge) they work like a fuel gauge allowing you to estimate your remaining work time. When the unit is on charge, the 3rd LED turns on solidly (no flashing) only when the battery is fully charged (100%), making it easy for you to tell when the unit is 100% charged.

If you need to be sure the battery is 100% charged plug in the charger. Even if the battery is fully charged, the 3rd LED will flash for at least three minutes while the respirator checks its condition. Once **all 3 LEDs light solidly without flashing the battery is at 100%**

With the unit NOT on charge

Green LEDs	Charge	Approximate Run Time*
●●●	85 - 100%	4 – 8 hours
●●	15 – 85%	1 – 4 hours
●	5 – 15%	Recharge! (20min to 1 hour)

* ***Operating time is strongly affected by work rate, altitude, and other factors. The operating times quoted above are average durations at moderate work rates at sea level. Actual operating times may vary widely from average durations.***

CHARGING THE INTERNAL BATTERY

The internal battery must only be charged with a CleanSpace charger.

- To charge the internal battery, turn the respirator upside down, and locate the charging port. See Figure 30 - Charging Port
- Slide the charger cable connector into the charging port. Ensure the charger is plugged into a power socket.

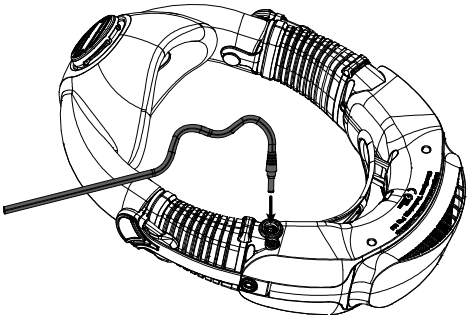


Figure 30 - Charging Port

Turn the respirator over and **check that one of the green LEDs on the keypad is flashing**. If none of the LEDs is flashing, the unit is not charging. Check that the charger is plugged into the wall socket and the charger cable is plugged securely into the socket on the underside of the respirator. If the respirator is still not charging, contact CleanSpace Customer Service on +612 8436 4000

- **Charging is complete when the blower shows three (3) green solid lights.** If the third green LED is flashing rapidly, charging is 95% complete.
- When the respirator is fully charged, disconnect the charger cable from the blower charging port.
- Note: The battery can only be charged at temperatures between 32°F and 95°F (0°C and 35°C). Outside this temperature range no charging will occur.

Do not charge the battery in electro-magnetically noisy environments, such as near welding machines. Doing so may damage the CleanSpace HALO electronics.

Do not leave the respirator plugged into its charger for more than one week at a time. Doing so may shorten the battery life.

LOW BATTERY ALARM

Your respirator has a low battery alarm, which is triggered when the battery has approximately 5 minutes life remaining (3 beeps, repeated every second). You cannot mute the low battery alarm except by connecting the respirator to its charger or by stopping the motor (doff the respirator and either press the Power Button once or allow the respirator to detect that there is no breathing and stop)

When the battery voltage becomes extremely low, the motor will stop.

If the battery alarm sounds (3 beeps, repeated every second), leave the contaminated area immediately and re-charge the battery.
Operating the respirator after the low battery alarm has sounded can cause the flow to fall below the manufacturer's minimum designed flow, which may result in overexposure to contaminants and lead to sickness or death.

GENERAL BATTERY INFORMATION

Your respirator has an internal lithium ion (Li-ion) polymer battery. Lithium ion (Li-ion) batteries have the highest energy density of all battery types and are widely used today in portable electronic devices across many different industries. The commonly available Li-ion polymer batteries are similar to Li-ion batteries, except they are packaged in a soft polymer film as opposed to the metal case commonly used for Li-ion cells. The soft packaging allows the cells to expand slightly under extreme heat, making them safer in fault conditions. CleanSpace respirators use quality Li-ion polymer batteries and are designed to be viable over a minimum of 500 complete charge and discharge cycles while still maintaining at least 70% of their specified full capacity.

RESPIRATOR STORAGE

To maintain the integrity of the internal battery, the respirator must be stored under the following conditions when not being used:

Long term storage (> 30 days)	30% - 50% RH, 65°F to 82°F (18°C to 28°C)
Short term storage (< 30 days)	30% - 50% RH, 14°F to 95°F (-10°C to 35°C)

The following precautions must be followed during use:

- Avoid mechanical shocks or impacts from any sharp or hard objects
- Do not use or place the respirator in extreme heat, such as in direct sunlight, near heat sources, etc. The battery will be damaged if its temperature rises above 212°F (100°C). Note: The respirator will stop functioning if its internal temperature rises above 140°F (+60°C) or falls below 14°F (-10°C)
- Do not dispose of the respirator in a fire
- Do not use the respirator in heavy rain, or allow it to get wet or immersed in liquid
- Do not disassemble the blower case, there are no user serviceable parts inside
- Do not use the respirator if there are any signs of severe mechanical damage

IN THE EXTREMELY RARE CIRCUMSTANCE THAT THE BATTERY IS DAMAGED AND ELECTROLYTE COMES IN CONTACT WITH EYES, FLUSH WITH WATER IMMEDIATELY AND SEEK URGENT MEDICAL ATTENTION

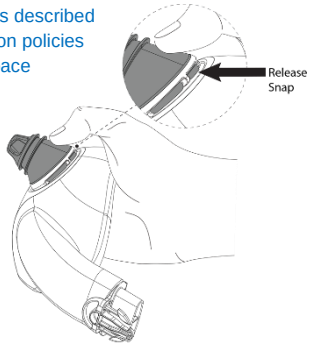
20. Cleaning

We recommended that you clean your respirator after every use. The mask, blower, neck support and harness need to be cleaned separately. Disassemble the mask, neck support and harness from the blower before cleaning. CleanSpace Cleaning Wipes are recommended as a simple and effective method of cleaning the blower and masks.

CLEANING THE HALF MASK

There are two methods for cleaning the mask. Before washing the mask, remove the Valve Cover or Snorkel Exhalation Valve Cover (on the HALO BIO mask) covering the exhalation valve leaf.

The Valve Cover or Snorkel Exhalation Valve Cover can be cleaned using the methods described for the mask; or disposed of and replaced with a new one, depending on the disinfection policies of the user. New Snorkel Exhalation Valve Covers may be ordered from your CleanSpace distributor and are part number CS3026. The exhalation Valve Cover is PAF-1111.



To remove either Valve Cover, locate the snap feature on the cover that secures it to the valve seat. This feature is located on the bottom edge of the valve seat. Using your thumb nail or a small blunt object such as a pen, press on the snap until the cover springs free of the valve seat.

To fit either Valve Cover, locate the small prong on the Valve Cover into the matching hole in the valve seat. Rotate the Valve Cover towards the mask until the snap on the Valve Cover engages the matching opening in the valve seat

1. CleanSpace Non-Alcohol Wipes for face piece

- CleanSpace Cleaning Wipes are impregnated with benzalkonium chloride, a bactericidal solution ideally suited for silicone face pieces.
- To clean the exhalation valve, remove the Valve Cover (using the instructions above), gently wipe the leaf edge. Replace the Valve Cover before use.
- Note that CleanSpace Cleaning Wipes are compatible with the Exhalation Filter.

2. Hand wash in warm soapy water

- Wash the mask thoroughly with a mild detergent in warm water (less than 122°F (50°C)).
- A soft brush or sponge can be used to remove any stubborn dirt or grit
- To clean the exhalation valve, gently wash the warm water solution through the valve and use a sponge to gently clean the valve surface
- Rinse the mask and valve well in warm running water. IMPORTANT: If the mask is not rinsed thoroughly, residue from cleaning solution may irritate the wearer's skin or cause the valve to stick. Replace the Valve Cover before use.

Drying the mask

After cleaning, allow the mask to air dry in a clean environment, valve up to prevent water pooling. Note: Do not dry the mask by exposing directly to heat i.e. hair dryers or heaters. The mask can also be hand-dried with a clean, lint-free cloth. IMPORTANT: Cleaning can cause the exhalation valve leaf to stick. Before use, check that the exhalation valve leaf operates freely by gently lifting the valve. Replace the Valve Cover before use.

The Exhalation Filter CS3027 is an electrostatic filter and its performance will be degraded by exposure to certain organic solvents including isopropanol (IPA), xylene and toluene. Always remove the Exhalation Filter before cleaning the mask. If there is any possibility that the Exhalation Filter has become contaminated with solvent, replace it

WARNING: NEVER DRY THE MASK OR EXHALATION VALVE WITH A CLOTH THAT MAY LEAVE BEHIND LINT. Lint contamination of the exhalation valve may cause it to leak, resulting in overexposure to contaminants and lead to sickness or death.

DISPOSING OF CS3024 HEAD COVER & CS3027 EXHALATION FILTER

Neither the Head Cover nor the Exhalation filter can be cleaned. Dispose of both after use.

CLEANING THE HALF MASK HARNESS

Both CS3008 Harness – HALO and CS3031 Harness – HALO BIO can be cleaned with CleanSpace Wipes or with warm soapy water. Because the straps are silicone, not fabric, CS3031 is more suitable for environments (for instance hospital use) in which it is essential to ensure that all contaminants have been removed.

CLEANING THE FULL FACE MASK

The full face mask harness can be left attached to the mask.

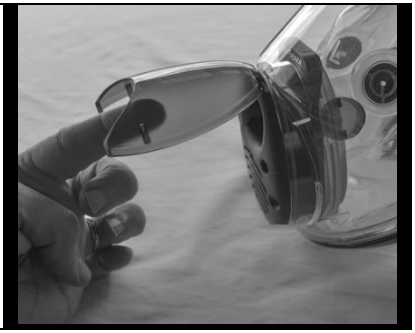
Carrying out the following steps prior to cleaning the mask improves access

Remove the inner mask

Pinch the two inner mask snaps together and pull the top of the inner mask back.

Withdraw the inner mask from the main mask.

Raise the rain cover



There are two methods for cleaning the mask.

1. CleanSpace Non-Alcohol Wipes

- CleanSpace Cleaning Wipes are impregnated with benzalkonium chloride, a bactericidal solution ideally suited for silicone face pieces.
- Clean all surfaces of the mask with a wipe.
- To clean the exhalation valve, lift the rain cover, clean the valve leaf and seat and lower the rain cover again.

2. Hand wash in warm soapy water

- Wash the mask thoroughly with a mild detergent in warm water (less than 122°F (50°C)).
- A soft brush or sponge can be used to remove any stubborn dirt or grit
- To clean the exhalation valve, lift the rain cover, gently wash the warm water solution through the valve from the inside and use a sponge to gently clean the valve surfaces. Remember to lower the rain cover again when done.
- Rinse the mask and valve well in warm running water. IMPORTANT: If the mask is not rinsed thoroughly, residue from cleaning solution may irritate the wearer's skin or cause the valve to stick.

Drying the mask

After cleaning, allow the mask to air dry in a clean environment, valve up to prevent water pooling. Note: Do not dry the mask by exposing directly to heat i.e. hair dryers or heaters. The mask can also be hand-dried with a clean, lint-free cloth. IMPORTANT: Cleaning can cause the exhalation valve leaf to stick. Before use, check that the exhalation valve leaf operates freely by gently lifting the valve.

WARNING: NEVER DRY THE MASK OR EXHALATION VALVE WITH A CLOTH THAT MAY LEAVE BEHIND LINT. Lint contamination of the exhalation valve may cause it to leak, resulting in overexposure to contaminants and lead to sickness or death.

Reassembling the Mask

Refit the inner mask

The frame of the inner mask has two ribs on the bottom. Fit these into the slots in the bottom of the main valve block

Push the top of the inner mask firmly forwards until both snaps engage, holding it in place against the main valve block

Lower the rain cover

Using a full face mask with the rain cover raised can cause the exhalation valve to vibrate, which you may notice as a buzzing noise. Lower the rain cover for correct operation.

CLEANING THE BLOWER

WARNING: The blower contains a battery, sensitive electronics and a motor. NEVER immerse it in water or use anything wetter than a damp cloth to clean it.

- After removing the mask, remove the neck support. Leave the filter in place to prevent any dust or liquids from getting into the blower.

DO NOT USE COMPRESSED AIR OR A BRUSH TO CLEAN THE FILTER!
HEPA FILTERS ARE VERY EASILY DAMAGED BY THE USE OF COMPRESSED AIR OR BY BRUSHING.
Misuse of CleanSpace HALO by cleaning the filter may result in overexposure to contaminants and lead to sickness or death.

- Using CleanSpace Cleaning Wipes, wipe down the outside of the blower. The blower can also be cleaned with a damp cloth.
- Allow the blower to air dry in a clean environment. The blower can also be hand-dried with a clean lint-free cloth. Note: **Do not dry the blower by exposing to heat (i.e. hair dryers or heaters) or compressed air**.

CLEANING THE HARNESS AND NECK SUPPORT

The harness and neck pads can be washed in warm soapy water or machine washed. After cleaning, allow the harness and neck pads to air dry in a clean environment.

Note: Do not dry the harness or neck support by exposing directly to heat i.e. hair dryers or heaters

21. Periodic Maintenance & Checking

Recalibration

You must recalibrate the internal pressure sensor any time that your CleanSpace HALO is exposed to changes in temperature of more than 36°F (20°C). *). It is best practice to also re-calibrate if the unit has been in storage, particularly if the storage temperature is not known.*

See Section 12 for how to calibrate your respirator.

22. Performing a Quantitative Fit Test (Full Face Mask)

Half Masks: *To carry out a quantitative fit test with a Half Mask your specialist mask fitter will require* ***PAF-0025 PortaCount Adaptor*** *and the accompanying* ***S005-7174 Quantitative Fit Test Instructions.*** *The PortaCount Adaptor is an accessory that fits between the mask and the exhalation valve and allows the air in the mask to be sampled. It comes with detailed instructions on how to carry out a quantitative fit test.*

PERFORMING A QUANTITATIVE FIT TEST WITH A FULL FACE MASK

Mask fitting must be carried out by a specialist / designated mask fitter. A quantitative fit test must be performed during initial selection of a respirator, whenever the user's face changes shape (for instance due to weight gain or loss) and at least annually. The test is performed using a machine that compares the concentration of particles in the mask with that in the surrounding atmosphere. One example is the PortaCount Respiratory Fit Tester, made by TSI Incorporated.

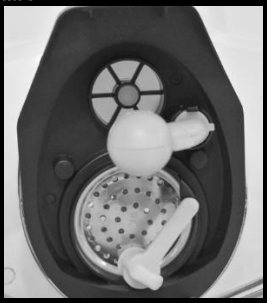
CleanSpace Full Face Masks come with a built-in sampling port and a sampling ball accessory which make it quick and easy to carry out a fit test.

To set up for the test, do the following. **Firstly, we recommend you remove the inner mask as that makes access easier.**

With the mask off your face, pull the orange plug from the Sensing Ball socket.

Locate the Sensing Ball which was supplied with your mask

Fit the Sensing Ball. Push it all the way in. Note that there are small fins on the stem of the ball to ensure the correct orientation.



Raise the rain cover

Remove the sealing plug from the fit test port

Fit the mask sensing tube to the fit test port (on a TSI PortaCount it is the clear tube)

Re-fit the inner mask! The inner mask is an essential part of the device and you will need it to complete the fit test.

Don the mask and begin the test, following the protocol provided with the fit testing machine**. A CleanSpace respirator with a clean filter and full battery should achieve a fit factor above 1000**. If your result is below 1000 adjust the mask and try again.

If a fit factor above 1000 cannot be achieved, CleanSpace must not be used

At the end of the fit test, do the following to prepare you mask for use

Remove the Sensing Ball from the Sensing Ball socket. **Refit the orange plug to the Sensing Ball Socket. Push it all the way in**

Remove the sensing tube from the fit test port. **Refit the plug to the fit test port.**

Lower the rain cover

After using the on-board fit test ports:
To check that the test port plug is fitted correctly, a negative pressure seal test shall be performed – see page 22

Using the mask with the rain cover raised can cause the exhalation valve to vibrate, which you may notice as a buzzing noise. Lower the rain cover for correct operation.

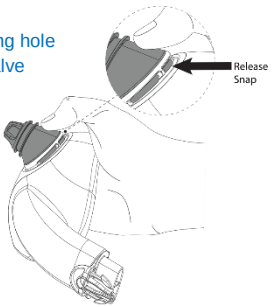
23. Converting Half Mask HALO into Half Mask HALO BIO

It is possible to convert a Half Mask – HALO into a Half Mask – HALO BIO by replacing the Valve Cover - Standard (PAF-1111) with the BIO system Snorkel Exhalation Valve Cover (CS3026). For NIOSH approval to be maintained, the mask part number shown on the inside of the exhalation valve seat must be updated. This can be done by the user by simply adding an "H" to the end of the part number with a pen or marker. The table below shows the part numbers that shall appear on the finished Half Mask.

	Half Mask – HALO		Half Mask – HALO BIO	
Mask Size	Mask Part No.	Valve Cover	Mask Part No.	Valve Cover
Small	CS3003	Standard PAF-1111	CS3003H	Snorkel (CS3026)
Medium	CS3004		CS3004H	
Large	CS3005		CS3005H	

To remove either Valve Cover, locate the snap feature on the cover that secures it to the valve seat. This feature is located on the bottom edge of the valve seat. Using your thumb nail or a small blunt object such as a pen, press on the snap until the cover springs free of the valve seat.

To fit either Valve Cover, locate the small prong on the Valve Cover into the matching hole in the valve seat. Rotate the Valve Cover towards the mask until the snap on the Valve Cover engages the matching opening in the valve seat.



24. Specifications

Air Flow	Greater than 115 litre/minute *Breath-responsive, with max inflow to mask 115 – 220 litre per minute, dependant on altitude, filter and battery condition.*
Operating Temperature Range	14°F to 113°F (-10°C to 45°C) *The motor will shut down while the temperature of the battery pack is above 140°F (60°C) or below 14*°F (-10°C)
Operating Humidity Range	Zero to 90%, non-condensing
Operating Altitude Range	Approximately sea level to 10,000 feet (3000m)
Charging Temperature Range	32°F to 95°F (0°C to 35°C) *Below 32°F (0°C) and above 95°F (35°C) the battery will not accept charge*
Storage Conditions	**Short term storage under 30 days:** Out of direct sunlight, in a clean, dry environment (30% - 50% RH), 14°F to 95°F (-10°C to 35°C). *To maintain the integrity of the internal battery, the respirator must be stored under the following conditions when it will not be used for longer than 3 months* **Long term storage (> 30 days):** Out of direct sunlight, in a clean, dry environment (30% - 50% RH), 65°F to 82°F (18°C to 28°C).
Shelf Life (when stored as specified)	Blower (limited by internal battery): 6 months *We recommend you charge the battery every 3 months if the device is not in use.* HE Filter: 3 years
Battery Type	Lithium Ion Polymer
Run Time	Approximately 4.5 – 8 hours. *Run time is strongly influenced by work rate, filter condition, altitude and other factors. The run time specified above assumes moderate work rates at sea level with a clean filter. Different conditions will produce widely varying run times.*
Recharge Time	2 hours (to 95%)
Low Battery Voltage Alarm	Triggers when the remaining run time is around 5 to 10 minutes. *Audible alarm, 3 beeps, repeated every second, 75dB(A) at ear.*
Filter Blocked Alarm	Triggers when the filter requires replacement. *Audible alarm sounds until a key is pressed, 2 beeps repeated every second, 75dB(A) at ear plus red filter LED flashes. When the alarm first sounds, and if the battery is almost completely run flat, the maximum flow that can be delivered has been reduced to about 140 litre/minute.*

Charger	Input: 100 – 240VAC, 50 – 60 Hz
Weights	HALO blower CS3001 with Filter, Medium Neck Support, Harness and CS3004 Medium Half Mask – 18.8oz (533g) HALO blower CS3001 with CS3025 Filter, Medium Neck Support, CS3031 Harness, CS3024 Head Cover, CS3004H Half Mask and CS3027 Exhalation Filter - 25oz (709g) HALO blower CS3001 with Filter, Medium Neck Support, CS3007 FFM mask and harness – 39.7oz (1,126g)
Intrinsic Safety	CleanSpace HALO is not an intrinsically safe system
FCC Compliance	Contains FCC ID: A8TBM71S2 *This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.*

25. Product and Accessory information

Blower

Product Code	Description
CS3001	Blower - HALO

Filters

Product Code	Description
CS3022	Filter HE Standard - HALO
CS3025	Filter HE – HALO BIO

Masks

Product Code	Description
CS3003	Half Mask – HALO Small
CS3004	Half Mask – HALO Medium
CS3005	Half Mask – HALO Large
CS3003H	Half Mask – HALO BIO - Small
CS3004H	Half Mask – HALO BIO - Medium
CS3005H	Half Mask – HALO BIO - Large
CS3006	Full Face Mask with Harness – HALO Small
CS3007	Full Face Mask with Harness – HALO Medium / Large

Harness, Neck Supports

Product Code	Description
CS3008	Harness - HALO
CS3031	Harness – HALO BIO
CS3009	Neck Support – HALO Small
CS3010	Neck Support – HALO Medium

Charger, Accessories

Product Code	Description
PAF-1100	Charger Universal

PAF-1009	Seal Check Cap
PAF-1111	Exhalation Valve Cover - Standard
CS3024	Head Cover – HALO BIO
CS3026	Snorkel Exhalation Valve Cover – HALO BIO
CS3027	Exhalation Filter – HALO BIO
CS3029	Seal Check Cap – HALO BIO

26. Product Warranty

This product has been manufactured using quality parts and processes.

CleanSpace Technology Pty Ltd warrants that the product is free from defective workmanship and parts for a period of one (1) year from the date of original purchase provided the product has been used, cleaned and maintained in accordance with these instructions and CleanSpace's recommendations. This warranty does not include consumable parts, such as filters and face masks, which must be replaced regularly by the user. Consumable parts are warranted up to the point of use, provided they have been stored correctly and are within their expiry date.

This warranty does not cover:

- Where the product has been used for industrial purposes outside the recommendations of CleanSpace Technology Pty Ltd;
- Where damage has been caused by misuse, neglect, accident, or excessive wear and tear.

Any claim under this warranty must be made within one (1) year of the date of purchase of the product. All warranty claims must be made by returning the defective product to your supplier together with the proof of purchase. The purchaser is responsible for all freight. In the event that any part of the product is found by CleanSpace to be defective, CleanSpace will either repair or at its discretion replace the faulty part.

This warranty is given by:

CleanSpace Technology Pty Ltd
(ABN 24 146 453 554),
Ground Floor, 16-18 Carlotta Street
Artarmon NSW 2064 Australia;
T. +61 2 8436 4000
E. sales@cleanspacetechnology.com

This warranty is provided in addition to other rights and remedies you have under law. You are entitled to replacement or refund for a major failure. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

Disclaimer:

Whilst CleanSpace Technology has made every effort to ensure that the details and information given in both our printed and online publications are accurate at the time of issue, full technical specifications are not necessarily included. Furthermore CleanSpace Technology has a policy of continuous improvement and the right is reserved to alter details and information as the need arises. Accordingly the Customer should check any details and information they wish to rely on with CleanSpace Technology at the time of purchase. CleanSpace Technology cannot accept liability in respect of any errors or omissions herein contained or for any loss or damage malfunction or consequential loss arising from reliance upon our publication.

The Customer will be responsible for any risk to health or safety from goods in the Customer's possession and/or control. The Customer's attention is drawn to the fact that statutory regulations and recognised codes of practice exist covering the use and handling of some goods (including safety products). The Customer must ensure that persons who use the goods receive adequate training and safety literature.

CleanSpace Technology Pty Ltd
ABN 24 146 453 554
Ground Floor, 16-18 Carlotta Street, Artarmon NSW 2064 Australia
T: +612 8436 4000 |E: sales@cleanspacetechnology.com

S005-7319 Rev 4, 11 NOV 2019
Released on Change Note ECN1224