Please read user's manual before operating equipment

Original Instructions

LABCONCO CORPORATION
8811 Prospect Avenue
Kansas City, MO 64132
(800) 821-5525 I +1 (816) 333-8811
labconco.com

User Manual

ReVo & ReVo Pro™ Class II, Type A2 Microbiological Safety Cabinets

Register this product

ReVo™ Type A2 Microbiological Safety Cabinets

2023—Present

3R231xxx1	3R241xxx1	3R251xxx1	3R261xxx1
3T231xxx1	3T241xxx1	3T251xxx1	3T261xxx1

Warranty

Labconco Corporation provides a warranty to the original buyer for the repair or replacement of parts and reasonable labor as a result of normal and proper use of the equipment with compatible chemicals. Broken glassware and maintenance items, such as filters, gaskets, light bulbs, finishes and lubrication are not warranted. Excluded from warranty are products with improper installation, erratic electrical or utility supply, unauthorized repair, use with incompatible chemicals, or non-factory modifications to the original product.

ReVo Microbiological Safety Cabinets carry a five-year warranty from date of installation or six years from date of shipment from Labconco, whichever is sooner. Warranty is non-transferable and only applies to the owner (organization) of record.

Buyer is exclusively responsible for the set-up, installation, verification, decontamination or calibration of equipment. This limited warranty covers parts and labor, but not transportation and insurance charges. If the failure is determined to be covered under this warranty, the dealer or Labconco Corporation will authorize repair or replacement of all defective parts to restore the unit to operation. Repairs may be completed by 3rd party service agents approved by Labconco Corporation. Labconco Corporation reserves the rights to limit this warranty based on a service agent's travel, working hours, the site's entry restrictions and unobstructed access to serviceable components of the product.

Under no circumstances shall Labconco Corporation be liable for indirect, consequential, or special damages of any kind. This warranty is exclusive and in lieu of all other warranties whether oral, or implied.

Returned or Damaged Goods

Do not return goods without the prior authorization from Labconco. Unauthorized returns will not be accepted. If your shipment was damaged in transit, you must file a claim directly with the freight carrier. Labconco Corporation and its dealers are not responsible for shipping damages.

The United States Interstate Commerce Commission rules require that claims be filed with the delivery carrier within **fifteen (15) days** of delivery.

Limitation of Liability

The disposal and/or emission of substances used in connection with this equipment may be governed by various federal, state, or local regulations. All users of this equipment are required to become familiar with any regulations that apply in the user's area concerning the dumping of waste materials in or upon water, land, or air and to comply with such regulations. Labconco Corporation is held harmless with respect to user's compliance with such regulations.

For additional questions or support:

Labconco Customer Care +1 (816) 333-8811

Labconco Technical Support (800) 821-5525

Hours 7:30 a.m.-5:30 p.m. CST

Symbols used in this manual

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

	**Warning**
	Used in case of danger of a serious accident or lethal injury.

	**Caution**
	Used in case of danger of medium or minor injuries or physical damage.

This document is the original instruction manual in accordance with the current Machinery Directive. This document is the reference for any translation of this instruction manual. In case of doubts or uncertainties the text in the original instruction manual is valid.

Table of contents

Table of contents

1 Introduction to this instruction manual

This instruction manual gives a detailed description of the standard ReVo and ReVo Pro cabinets: Functional description and principle, installation, start-up, operation, cleaning and decontamination, maintenance, specifications, testing and service log book.

2 Introduction

You are now in possession of a high quality microprocessor-controlled Class II cabinet, designed to provide protection of the operator, the environment, and the processed product against particle and microbiological contamination.

The functionality of class II safety cabinets is obtained by two carefully designed airflow mechanisms. The product protection is achieved by a downward laminar airflow (hereafter downflow) and an operator and environment protecting inward airflow through the front window opening (hereafter inflow). It is these two airflow rates and their interaction within the cabinet that dictates the product, operator and environmental protection levels. Without compromising the safety and the compliance with standards Labconco, at the same time, ensures minimum energy consumption and user-friendly working conditions with respect to emitted noise from the cabinets.

2.1 Operating conditions and factory settings

The EN 12469 standard require the inflow air velocity to be more than or equal to 0,40 m/s and the downflow air velocity must be in the interval 0,25 m/s – 0,50 m/s.

The Labconco default downflow setting is 0,28 m/s with a maximum variation of ± 10% on single measuring points, which is in accordance with annex G in EN 12469.

The Labconco default inflow setting is 0,45 m/s a maximum variation of ± 10% on single measuring points, which is in accordance with annex G in EN 12469.

2.2 Compliance and basic features

The cabinets comply with the requirements stipulated in EN 12469 and further DIN 12980 for ReVo Pro.

The ReVo and ReVo Pro Class II cabinets have:

- Microprocessor controller with:
    - LCD display indicating fan and alarm status.
    - Flow (Air velocity) sensors.
    - Clock (7 days) and hour-counter.
    - Pre-setting of automatic start-up, timer for delay start and timer for UV-light.
    - Alarm for any deviation from safety conditions.
    - Full programming of alarms and fans through pass word protection.
- Ergonomically correct sloping front for maximum operator comfort.
- Motor-driven front window, with both sliding and hinged modes.
- Side windows, for perfect light conditions and view to the surroundings.

- Negative pressure plenum for highest operator and product safety.
    - Three air velocity modes: Fan off or reduced air velocity or normal air velocity.
    - Divided table tops for easy cleaning and legs for increased stability.
    - Digital electrical direct adjustable Fan speeds.

2.3 Standard ReVo cabinet

A standard ReVo cabinet comprises:

The basic unit - four sizes 900, 1200, 1500 and 1800 including:

- 2 electrical outlets.
- Side windows (left and right) with three holes.

For each cabinet a support stand must be ordered.

2.4 Standard ReVo Pro cabinet

A standard ReVo Pro cabinet comprises:

The basic unit - four sizes 900, 1200, 1500 and 1800 including:

- 2 electrical outlets.
- Side windows (left and right) with three holes.
- Adjustable support stand 75-80 cm.

2.5 Safety precautions

To avoid unintended or improper operation of the cabinet, please carefully read this manual.

- Also, please pay attention to the short form operating instructions on the label stuck on the cabinet (Optional).
- If you have questions related to the function or control of the cabinet or wish to order spare parts, please always indicate the nameplate data. Use original spare parts only.

	**Caution**
	The proper function and safety of the cabinet is only secured if personnel authorized by us perform the required tests, maintenance and repair work.

Please also refer to sections “Testing” and “Maintenance”.

The following precautions must be taken for operation of the ReVo/ReVo Pro-series.

	**Caution**
	The safety cabinet must not be used for Group 4 pathogens.

Attention is drawn to the risk assessment requirements of the Control of Substances Hazardous to Health (COSHH) Regulations 1999. (UK).

	**Caution**
	The cabinet is not suitable for HIGH-RISK biological agents.

HIGH RISK biological agents include all etiologic agents designated Class 4 by CDC, and oncogenic viruses classed high risk by NCI. (USA).

	**Caution**
	Never operate the ReVo/ReVo Pro cabinets if the fan compartment cover is removed.

If this cover is removed, the cabinet will give no protection of the operator or of the environment and the fan will run with openly rotating blades.

	**Caution**
	The ReVo/ReVo Pro Class II cabinets will not provide any protection for operator or environment against harmful gases or vapours.

	**Caution**
	Always keep hands and arms away from the work chamber when activating the sliding window.

	**Caution**
	The airspeed monitoring system needs approximately 5 minutes to warm up and stabilise after the fan has been switched on.

3 Description

3.1 Safety systems

The ReVo/ReVo Pro class II cabinets have the following build-in safety systems:

Negative pressure air system

A negative pressure air system combines with HEPA filters in the downflow and exhaust airflow for personnel and product protection.

Personnel protection

Inflow air in the entire working opening at a constant high velocity prevents leakage from the work chamber to the surrounding room.

Exterior air pressure being higher than the internal air pressure creates negative pressure, ensuring containment in case of cabinet leakage.

Product protection

The steady airflow within the air system ensures constant downflow, allowing the HEPA filters to remove contaminants so that the product handled in the work chamber is always surrounded by near particle free air.

The laminarity of the downflow air ensures that harmful particles are not carried over the work chamber thus preventing cross-contamination.

HEPA Filters

On the ReVo/ReVo Pro cabinets the downflow air within the work chamber and the exhaust air are cleaned by HEPA H14 filters.

On the ReVo Pro a set of HEPA H14 prefilters further ensure that the cabinet is not contaminated internally.

UV Safety

To protect from UV radiation, the optional UV light will not turn on if the front window is open. While the UV light is on, the front window must remain closed. The closed window blocks out the UV rays.

Opening the window will cause the UV light to turn off. If the light is turned on in the cabinet, the UV light will turn of automatically.

Airflow monitoring

Independent monitoring of inflow and downflow air velocities guarantees that product and personnel protection remain uncompromised.

Airflow monitoring, using build-in flow sensors, determines the velocity of the airflow in the work chamber as well as the inflow velocity of air through the exhaust opening.

As soon as airflow velocities rise above or fall below a specified alarm value, an audible and a visual alarm is activated.

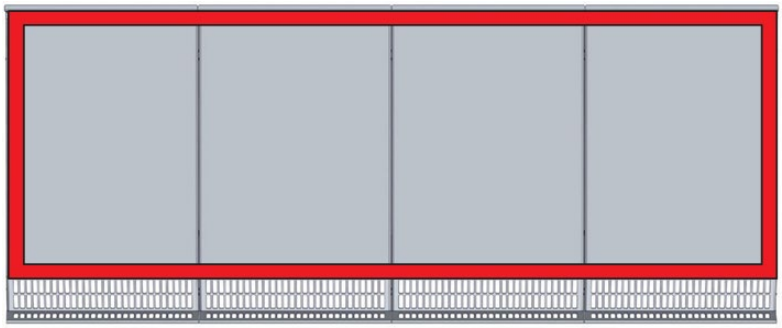
Window position monitoring

The ReVo/ReVo Pro cabinets use a 200 mm work opening for safe working conditions and completely closed window for safe use of the optional UV light.

Safe conditions are monitored by the control system. If the window is not in the correct position an alarm will be activated.

Work area

The outer 50 mm perimeter of the work area must be kept free of obstacles. This is to ensure that the airflow remains undisturbed.



Ergonomics

The Labconco ReVo and ReVo Pro cabinets are designed to accommodate sitting as well as standing working positions. With the electrically operated stand (optional) it is possible to easily change between sitting and standing while working in the cabinet.

The sloped front and ample legroom on the ReVo and the ReVo Pro enables the operator to change working positions while being able to see the operating status of the cabinet at all times.

For cabinets on fixed height stands, use a height adjustable chair and footrest to get the correct working position. With the electrically adjustable stand the adjustment can be done on the entire cabinet.

If a standing working position is needed, adjust the height of the cabinet to get the correct height for the operator.

When working for longer periods of time in the cabinet, change working position regularly. The design allows dynamic sitting and if fitted with electrical stand also standing position. This will prevent postural problems for the operator.

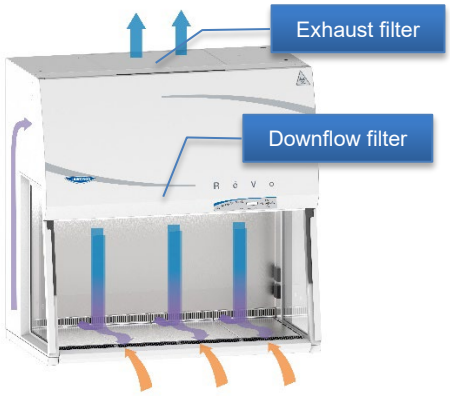
The legroom makes it possible to sit near the procedure and in easy reach of materials and utensils in the working chamber. In the larger models place all needed materials and utensils within reach of the operator.

For added comfort and ability to work ergonomically correct the armrest is at the same level as the work surface. Using the armrest during work will not interfere with the airflow in the cabinet to ensure safe working conditions for product, operator and environment.

For further details on ergonomics please refer to EN ISO 14738 “Safety of machinery — requirements for the design of workstations at machinery”.

3.2 HEPA filters – ReVo

The filter system consists of two HEPA H14 filters for downflow and exhaust air.



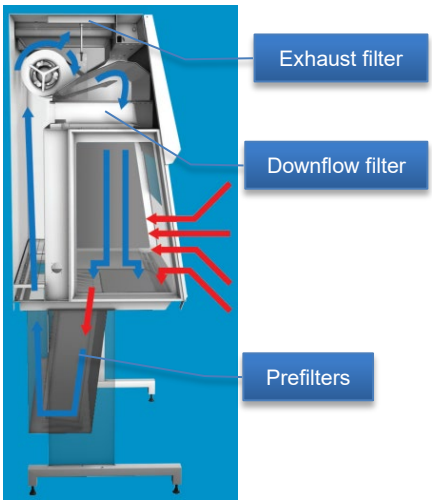
Air is drawn from the surrounding room into the work chamber through the window opening and through the working chamber under the table tops. The room air is drawn into the negative pressure trough air duct in the back wall, and then pulled into the air plenum in the top portion of the cabinet.

The room air is mixed with recirculating HEPA filtered air from the downflow in the work chamber, and filtered proportionally by the downflow and exhaust filters. The filtered air is then supplied as near particle free air into the work chamber of the cabinet, and exhausted as near particle free air into the surrounding environment, or into an external exhaust system.

Product name	Catalogue No.
ReVo 900 downflow filter	R3838400
ReVo 1200 downflow filter	R3838401
ReVo 1500 downflow filter	R3838402
ReVo 1800 downflow filter	R3838403
ReVo 900 exhaust filter	R3838500
ReVo 1200 exhaust filter	R3838500
ReVo 1500 exhaust filter	R3838502
ReVo 1800 exhaust filter	R3838502

3.3 HEPA filters – ReVo Pro

The filter system consists of three HEPA H14 filters for pre-filtering, downflow and exhaust air.



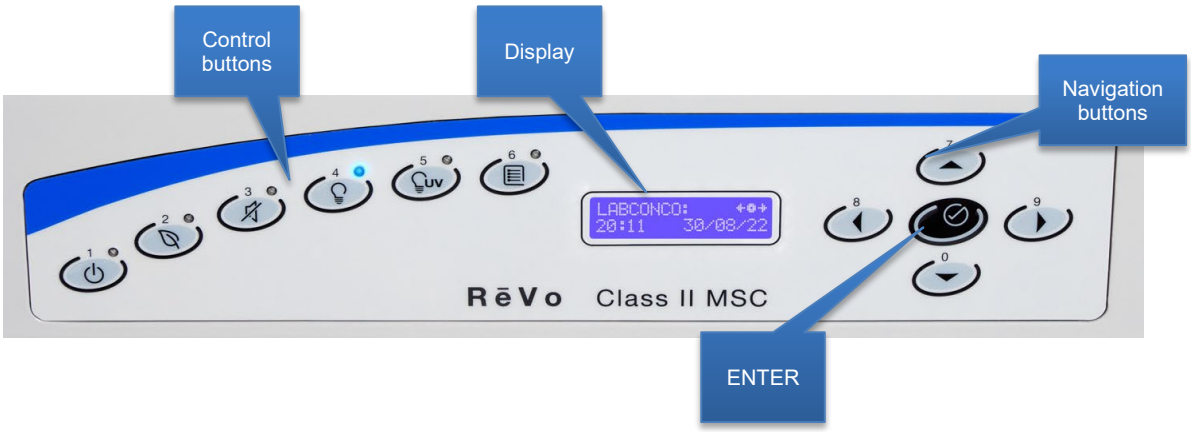
Air is drawn from the surrounding room into the work chamber through the window opening and through the working chamber under the table tops. The room air is drawn into the negative pressure trough, though the prefilters and into the air duct in the back wall, and then pulled into the air plenum in the top portion of the cabinet.

The room air is mixed with recirculating HEPA filtered air from the downflow in the work chamber and filtered proportionally by the downflow and exhaust filters. The filtered air is then supplied as near particle free air into the work chamber of the cabinet, and exhausted as near particle free air into the surrounding environment, or into an external exhaust system.

Product name	Catalogue No.
ReVo Pro 900 downflow filter	R3838400
ReVo Pro 1200 downflow filter	R3838401
ReVo Pro 1500 downflow filter	R3838402
ReVo Pro 1800 downflow filter	R3838403
ReVo Pro 900 exhaust filter	R3838500
ReVo Pro 1200 exhaust filter	R3838500
ReVo Pro 1500 exhaust filter	R3838502
ReVo Pro1800 exhaust filter	R3838502

3.4 Control Panel: Standard set up

All functions are controlled by an electronic card with microprocessor via the control panel with display shown below.



3.4.1 Control panel

1. Button **1** with green LED light to select the fan ON/OFF at normal velocity. The green light indicates that the fan is running at normal velocity, and that conditions are safe. During start-up, the low flow alarm will be active, and the LED only switched on when the conditions are safe for working in the cabinet.

2. Button **2** with blue LED to select the fan ON/OFF at reduced velocity. Can be adjusted to any level desired for individual requirements (See Service menu). When switching to reduced velocity the low flow alarm is activated and the light in the cabinet is turned off to indicate not safe conditions.

3. Button **3** with red LED. Alarm indicator with blinking red light and acoustic alarm. Press the button to silence the acoustic alarm.

4. Button **4** with blue LED for normal light ON/OFF.

5. Button **5** with yellow LED to select ON/OFF for UV light (optional). The timer for the light is set in the user menu (See User menu).

6. Button **6** with blue LED can be connected to an internal plug in the chamber for remote on/off of the plug/gas resettable valve.

7. Button **7**: Window open (upwards movement).

8. Not active: Only for programming/navigation.

9. Not active: Only for programming/navigation.

10. Button **0**: Window close (downwards movement).

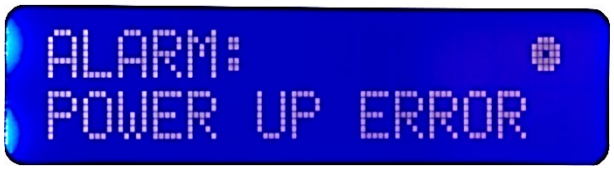
11. Blue button “ENTER”.

Display

The display is used for showing the current running conditions or the current alarm condition. The display is further used during setup of the cabinet in either user mode or service mode (password protected).

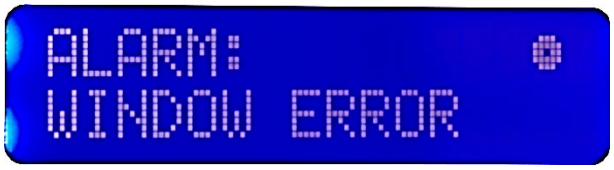
Some examples:

In the top right hand corner of the display, the navigation possibilities are shown. These are typically left arrow (button 8), ENTER and right arrow (button 9).



On start-up after power disconnect or after power failure the above alarm will be active. Press the blue ENTER button to clear the alarm.

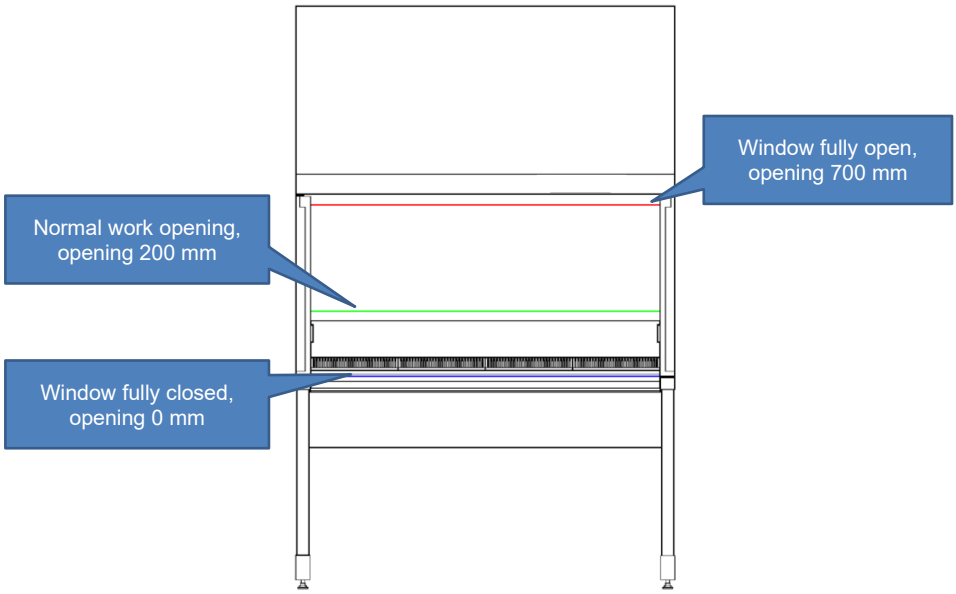
The main screen showing the time and date.



This alarm will be active if the window position differs from the correct working position (default 200 mm opening).

The display shows the current air velocity on flow 1, which is the downflow air velocity by default. Value in m/s.

3.5 Window positions



For easy loading and unloading of the cabinet, the window can be raised to create a 700 mm opening on front of the cabinet.

On the ReVo/ReVo Pro cabinets the default work opening is 200 mm

3.6 Lighting in working chamber

Product name	Catalogue No.
Light tube 900	R1297503
Light tube 1200	R1297504
Light tube 1500	R1297505
Light tube 1800	R1297506

All ReVo has built in light in the working chamber. All cabinets are fitted with two LED lights mounted at the top of the working chamber to avoid disturbances of the airflow. This position above the laminator gives a good and uniform light on the entire working area. The control system allows the user to adjust the intensity from 56% which is more than 800 Lux, to the reachable light level is about 2000 Lux equal to 100% in the standard cabinets, measured on the table tops.

3.7 UV light

UV disinfection of the ReVo is possible with an accessory, sold separately of the cabinet. The standard Labconco cabinet system is prepared for full control of safety and timing for the use of UV light – see section “UV light option” for operation and build in safety measures.

In the European standard EN 12469 - Biotechnology - Performance criteria for microbiological safety cabinets – concerning the requirements for class II cabinets, it is stated that “Ultraviolet (UV) radiation is not recommended for use in safety cabinets. However, if required, it should be installed in such a manner that is does not affect the airflow and the containment performance of the cabinet”. (Quote from informative annex A).

As this standard does not recommend the use of UV light in the safety cabinets, there are no recommendations as to the intensity of the UV light if used anyway.

UV light does not penetrate areas blocked from the direct light – for example under the table tops - and that it does not represent a substitute for good old fashion mechanical cleaning of the inner surfaces of the safety cabinet.

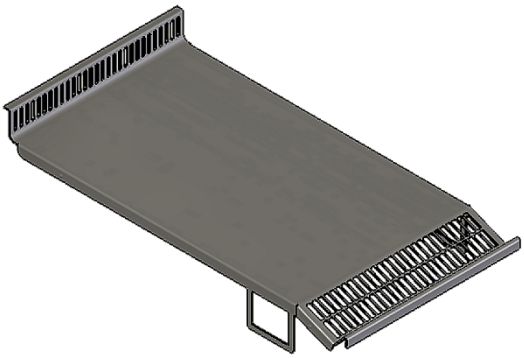
3.8 Working area

All ReVo and ReVo Pro cabinets are, as default, delivered with sectional table tops. They are designed for easy fitting and removal. Each 300 mm section of table top can be fitted randomly. As standard they are made of 2 mm stainless steel plate (AISI 304). One section in each cabinet it delivered with a handle for easy removal of the first table top section.

When working in the cabinet, keep a distance from the back and the front of the table tops, as air need to be able to pass freely or the function of the cabinet will be impaired. Leave approximately 50 mm open from the back as well as the front for maximum safety.

The sections are placed on a rail at the back of the cabinet and are supported on legs (integrated in the design) at the front of the cabinet. The sections can take a load of up to 100 kg. The size and easy handling makes it easy to autoclave them.

If UV is desired as a disinfectant, it must be used in careful combination with other cleaning and chemical disinfectant methods. Its use and hazards must be documented in the laboratory’s specific standard operating procedures (SOPs) and included in training for each lab worker. The method of cleaning the UV bulb and testing its effectiveness must be in the SOP. Appropriate personal protective equipment (PPE) must always be used. For needed dosage, please refer to relevant literature.



4 Installation of the ReVo and ReVo Pro cabinets

4.1 General considerations

A class II safety cabinet is a ventilated cabinet, which provides product, operator and environmental protection. It has an open front with inward airflow for operator and environment protection, downward HEPA filtered laminar airflow over the entire working area for product protection and HEPA filtered exhaust air environmental protection.

The air curtain at the front of the cabinet is fragile and can easily be disrupted by people walking parallel to it, by open windows, air supply registers or laboratory equipment that creates air movement (e.g. vacuum pumps, centrifuges).

Proper planning in the early stages of laboratory design, specification and layout is therefore essential for a trouble-free installation and uncompromised safe working conditions.

4.2 Specific considerations

To ensure that the build in safety features of the cabinets function properly, the location of installation must be selected carefully. The recommended ambient conditions, for safe and proper operation, are listed below.

- All cabinets are developed and produced for use in clean environments.
- Cabinets must not be operated outdoors or in environments with extreme air pollution. The safety cabinets are not intended to filter vapours containing acids or organic solvents. The safety cabinets must not be used as a fume hood.
- Up to 2000 m above sea level.
- The wall socket to which the cabinet is connected must be fused by a minimum 10 A fuse.
- The wall socket should be placed so accidental switch off is unlikely. A wall socket without a switch is recommended.
- The power cord is the mains disconnect.
- The location can support the weight of the device (Please refer to section 9).
- If the factory-approved stand is not purchased, the holding device must be rated for twice the cabinet weight.
- Adequate room height. For cabinets, which are not connected to an exhaust system, the distance between the exhaust air opening on the cabinet and the room ceiling must be at least 400 mm.

- There must be at least 100 mm clearance on the rear and non-utility side of the cabinet.
- For sides with external utility connections leave 150 mm clearance.
- The location must be equipped with an appropriate ventilation system.
- Room temperature between 10 °C and 35 °C.
- Relative humidity must not exceed 80%, up to 31 °C and is decreasing linearly to 50% at 40 °C.
- The cabinets are for indoor use only.

Room ventilation should preferably be a ventilation system that complies with the national requirements for the application.

The inlet air and exhaust air openings of the room ventilation must be located so that drafts do not impair the function of the biological safety cabinet air system.

4.3 Transport

The cabinet can be moved through a standard 2000 mm x 800 mm door.

Transport of the ReVo / ReVo Pro can be carried out by lifting the cabinet using a forklift either sideways under the support stand or directly under the trough. Furthermore, the cabinet can be moved manually by using hooks in the dedicated holes in the support stand.

	**Caution**
	Whenever transportation of the cabinet is needed, precautions should be taken to prevent it from overturning due to the high-located mass centre.

	**Caution**
	In order to prevent damage to the cabinet it must be handled as fragile goods.

Storage of the cabinet must be in an environment of maximum 80 % relative humidity and at temperatures between 5 °C to 50 °C.

4.4 Exhaust connection for the ReVo and ReVo Pro cabinets

All Labconco ReVo safety cabinets are designed to operate in ducted exhaust applications. An anti-blowback valve is mandatory (to be ordered separately) to prevent reverse airflow through the HEPA filter. The cabinet is equipped with an interlock system that prevents the cabinet fans from operating whenever the exhaust flow is insufficient. Labconco provides an optional potential free contact set (normally open or normally closed) for easy on/off control of exhaust system dampers. The associated control cable and control signal from the dampers to the cabinet must be provided and specified in the lab requirements and will be connected by authorized personnel during installation of the cabinet.

The signal and cable requirements are: 24 VAC/DC maximum 1A. Stranded cable gauge 2 x 0,25 mm^2 with at least 2,5 m free length from access point behind or over the cabinet.

The exhaust system can remove at least the air volume specified by Labconco (typically 300 – 1000 m^3/h) depending on the size of the cabinet. Labconco anti-blowback valves accommodate 200 mm

and 300 mm strait or elbowed duct diameters, either direct or by thimble, allowing simultaneous air extract from the room.

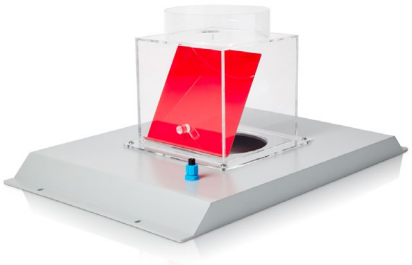
Continuous operation of the safety cabinet helps to control dust levels and other airborne particulates in the laboratory. If the safety cabinet is only operated when needed or put into reduced speed mode (NightSmart™) to conserve energy, the balancing of laboratory room air must be taken into account. If the room exhaust is balanced to include air exhausted through the ducted safety cabinet, this cabinet must not be turned off.

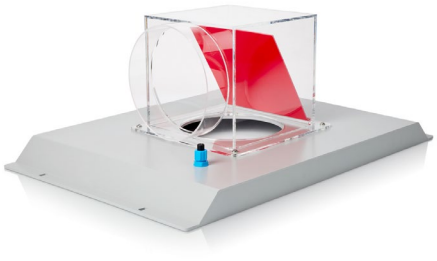
The ReVo and ReVo Pro cabinets can exhaust in three common ways:

1. Directly to the room in which they are installed.

2. Directly to the room in which they are installed through double exhaust filters. Normally used only on ReVo cabinets.

3. Through thimble with anti-blowback to an external ventilation system.





4.5 Cabinet exhaust system accessories

The safety cabinet can be equipped with a range of exhaust system accessories as listed below:

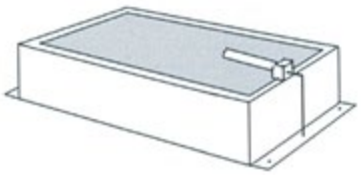
4.5.1 Double exhaust HEPA filter (Not GS)

Normally factory fitted but can be retro fitted if required. Required in UK for recirculating Class II cabinets when working with Cat 3 biohazard material. Available for all cabinet models with 2 sizes available. One for 900 and 1200 cabinets and one for 1500 and 1800 cabinets.

Product name	Catalogue No.
Double exhaust 900/1200	R2502500
Double exhaust 1500/1800	Contact Labconco

4.5.2 Double exhaust Carbon filter (Not GS)

Normally factory fitted but can be retro fitted if required. Required if working with organic / inorganic solvents that need to be removed from exhaust air. Available for all cabinet models with 2 sizes available. One for 900 and 1200 cabinets and one for 1500 and 1800 cabinets.



Product name	Catalogue No.
Carbon filter 900/1200	Contact Labconco
Carbon filter 1500/1800	Contact Labconco

☞	**Note**
	When fitting or removing the secondary filter take care to avoid damage to the air flow sensor.

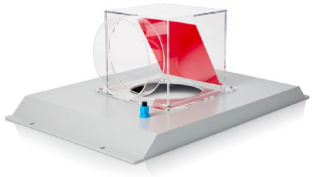
4.5.3 Direct duct kit for thimble extraction (Not GS)

This can be fitted to cabinets when the exhaust air is to be vented externally. It allows the room air to be vented via the same duct extract. Available for all cabinet models with 2 sizes available. One for 900 and 1200 cabinets and one for 1500 and 1800 cabinets. Not suitable for use in Germany and UK. For installation in Germany a bypass system must be fitted. Further a full test and verification of the proper function, in accordance with DIN 12980 must be performed on the finished installation. It consists of a ø 200 mm duct spigot on a housing and will fit over the exhaust filter. Care must be taken when fitting to avoid damaging the airflow sensor.

Product name	Catalogue No.
Direct duct 900/1200	Contact Labconco
Direct duct 1500/1800	Contact Labconco

4.5.4 Direct duct kit with horizontal venting anti-blowback (Not GS)

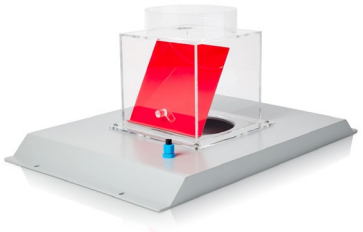
This kit is designed for use when the cabinet is to be hard ducted with all air vented externally. This system cannot be used in Germany. For installation in Germany a bypass system must be fitted. Further a full test and verification of the proper function, in accordance with DIN 12980 must be performed on the finished installation. An anti-blowback flap prevents the back flow of air to the cabinet should a remote fan fail. This design is mandatory for all hard-ducted systems. The horizontal vent outlet is ø 200 mm and allows it to be mounted with cabinets venting to the right or left by turning through 180º. Care must be taken when fitting it to avoid damage to the airflow sensor. Available for all cabinet models with 2 sizes available, one for 900 and 1200 cabinets and one for 1500 and 1800 cabinets.



Product name	Catalogue No.
Direct duct, side 900/1200	R3889210
Canopy Connection Kit, Side Exhaust 1500/1800 mm	R3889212

4.5.5 Direct duct kit with vertical venting – anti-blowback (Not GS)

This kit is designed for use when the cabinet is to be hard ducted with all air vented externally. This system cannot be used in Germany. For installation in Germany a bypass system must be fitted. Further a full test and verification of the proper function, in accordance with DIN 12980 must be performed on the finished installation. An anti-blowback flap prevents the back flow of air to the cabinet should a remote fan fail. This design is mandatory for all hard-ducted systems. The vertical vent outlet is ø 200 mm and allows it to be mounted with cabinets venting directly upwards. Care must be taken when fitting it to avoid damage to the airflow sensor. Available for all cabinet models with 2 sizes available, one for 900 and 1200 cabinets and one for 1500 and 1800 cabinets.



Product name	Catalogue No.
Direct duct 900/1200	R3889200
Direct duct 1500/1800	R3889202

4.6 Safety cabinets and open flames

The provision of natural gas to safety cabinets is not recommended. Open flames in the safety cabinet create turbulences, disrupt airflow patterns and can damage the laminator and the HEPA filter.

4.7 Moving the ReVo and ReVo Pro cabinets

It is not recommended to move the ReVo or the ReVo Pro cabinets after installation. The moving of a cabinet can result in safety issues, which can only be detected by re-testing of critical functions and properties.

If moving is warranted both the ReVo and ReVo Pro can be lifted and moved using a low lifter (on 1500 and 1800 models use one from each side). Be aware that the cabinets are top heavy. Stabilize cabinet during the moving process. On the ReVo the stand can be removed and moved separately.

	**Caution**
	Whenever transportation of the cabinet is needed, precautions should be taken to prevent it from overturning due to the high-located mass centre.

	**Caution**
	To prevent damage to the cabinet it must be handled as fragile goods.

4.8 Connecting utilities to the ReVo and ReVo Pro cabinets

If optional valves for utilities are delivered, make sure that local rules and regulations are complied with during installation and use. It is generally recommended, to use an authorized technician for this kind of work. Make sure that local rules and regulations regarding such installations are strictly complied to.

Valves suited for any utility medium can be delivered. As default they are mounted in the holes in the side windows. Optionally they can be mounted in the back wall.

Product name	Catalogue No.
Valve, vacuum	R3747500
Valve, other gasses	Contact Labconco

5 Start-up of the ReVo and ReVo Pro cabinets

	**Caution**
	Correct assembly and installation is essential for proper start-up and operation of the ReVo and ReVo Pro cabinets.

5.1 Preparation

	**Caution**
	The installations site for the unit must be draft-free and should be selected so that frequent passing of people in front of the work opening is avoided.

1. The table tops of stainless steel are mounted over the trough.

2. Adjust the levelling screws to assure that the table top is in horizontal position and levelled.

3. Valves for gases or vacuum are installed in the side windows. A qualified technician must make the connections for the supply.

4. For connection of the exhaust air to the exhaust air systems, special precautions which must be discussed with the cabinet supplier must be taken.

When the cabinet has been installed:

1. Check that the front window is in the correct position, i.e. parallel to the front shield.

2. Never lift the front window manually - this will cause window to mall function.

3. Check that the window slides from top to bottom without any irregular sound.

4. If the window does not move when the UP or DOWN button is pressed, authorized service personnel must be called to correct the fault.

5. Always keep hands and arms away from the working chamber when activating the front window.

5.2 Connections

The wall socket to which the cabinet is connected must be fused by a minimum 10 A fuse. The wall socket should be placed so accidental switch off is unlikely. A wall socket without a switch is recommended. Wires must be live, neutral and earth.

Required fusing: Circuit breaker 10 A (13 A) or fuse T 10 A (T 13 A).

In addition, the applicable safety requirements of the local power Supply Company shall apply.

	**Caution**
	If an automatic relay for disconnection of power in case of electric fault is needed, it must be installed in the supply, as it is not built-in.

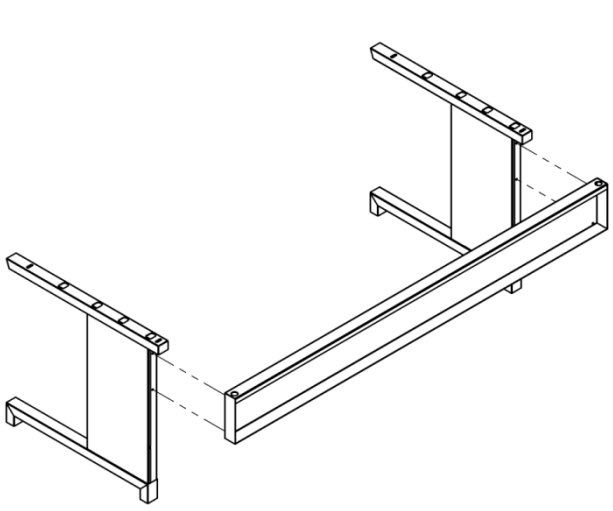
	**Caution**
	Before connecting the power supply, it must be checked that the mains specifications correspond to those stated on the type plate.

	**Caution**
	The safety cabinet is provided with a flexible power cord. The connection may be installed hard-wired or by means of a wall outlet with protective ground.

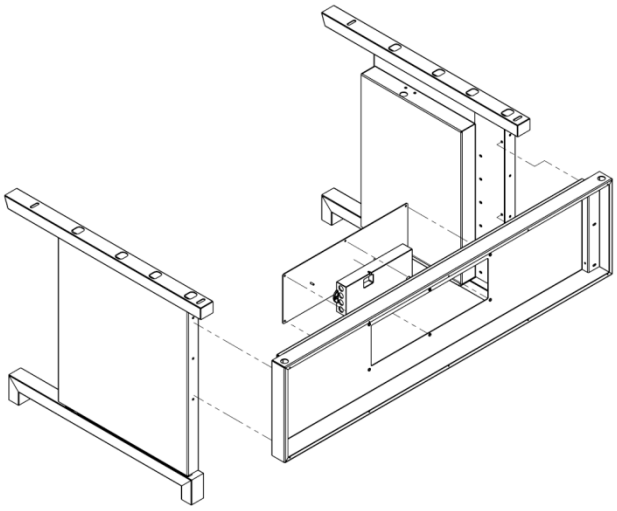
If a hard-wired connection is used, a main switch, which will cut off all poles to the unit, must be used. This switch must be lockable both in the ON and OFF positions.

5.3 Assemble the stand for the ReVo cabinets

As default the ReVo is delivered without the stand mounted. ReVo Pro is always delivered with the stand mounted.



Stand



Electrical stand

All nuts and bolts for assembly of the stand and for mounting the stand to the cabinet are delivered with the stands.

Start by assembling the stand and then place the cabinet on top and fasten with four bolts – one in each corner.

To minimize the risk of pinching, the electrical stands has an electrical set at 52 mm from the bottom position. As a backup, a 50 mm mechanical stop is placed on each leg of the stand, physically stopping the stand going below this point. Further a warning label is placed on each leg to warn against the minimal remaining risk of pinching.

5.4 Levelling of the ReVo and ReVo Pro cabinets

To ensure the best working conditions possible the cabinet must be levelled off before getting released for normal operation.

Place a levelling device directly on the table tops and adjust the feet on the stand until the cabinet is perfectly in horizontal level. Make sure that the cabinet is in horizontal level from side to side and from front to back.

5.5 Power connection of the ReVo and ReVo Pro cabinets

The ReVo and ReVo Pro are connected to power through the delivered power cable. It is mounted in the power inlet placed on top of the cabinet and to a standard power socket. All that is required is 230 VAC / 50 Hz connected to a 10 A or 13 A fused socket in the general electrical installation.

Product name	Catalogue No.
Power cable, GB	Delivered with the product.
Power cable, EU	Contact Labconco if a spare is needed.

5.6 Installation test on the ReVo and ReVo Pro cabinets

The ReVo and ReVo Pro must go through a series of test after installation has been finalized before being released for normal operation.

As a minimum the following tests must be performed with satisfactory results:

- Leak test of downflow and exhaust filters and HEPA prefilters on ReVo Pro cabinets
- Downflow air velocity
- Inflow air velocity
- Alarm settings (downflow, inflow and window alarms)
- Smoke pattern test

The above-mentioned tests are all associated with the safe operation of the cabinet. General functionality is checked ad Hoc.

To ensure optimal function and performance of the cabinet, the parameter values found in the Factory test report must be used as close as possible. An installation test report covering all necessary tests exists and can be acquired on demand from Labconco.

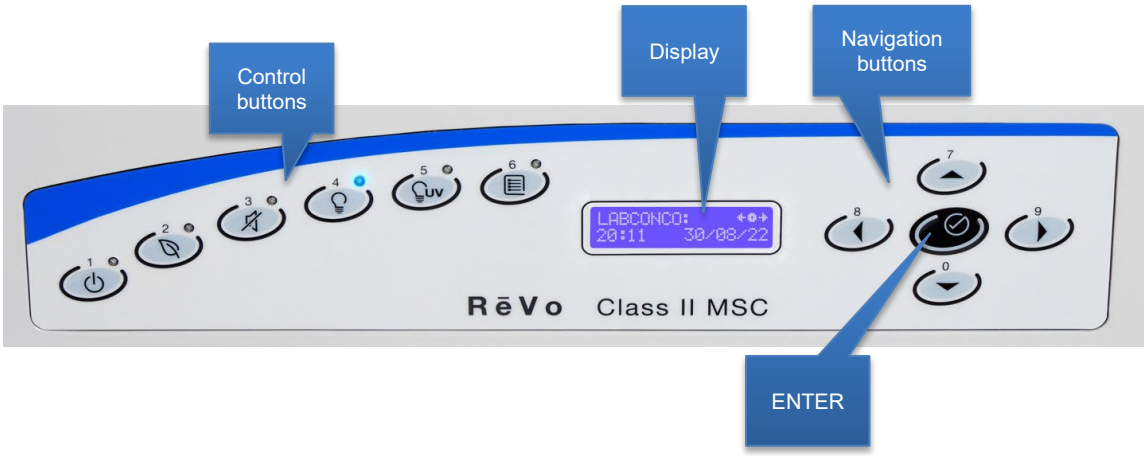
	Warning
	The operational safety of the cabinet, particularly the personnel and product protection, are guaranteed only if all safety functions of the cabinet have been tested and approved.

	Caution
	Labconco will not warrant the operational safety if the cabinet is operated without the required installation tests, or if these tests and are not performed by adequately trained personnel.

	Caution
	The initial operation with subsequent installation test does not include any decontamination measures. The working chamber and any accessories required must be disinfected and cleaned in accordance with the hygiene guidelines set forth for the desired application.

6 Operating the ReVo and ReVo Pro cabinets

All functions are controlled via the control panel shown below and by an electronic microprocessor bases control system.



The control panel contains 6 buttons with LED for operating the basic functions in the cabinet, a text display, that will show current running conditions and error messages and 5 buttons for navigational purposes.

- Button **1** with green LED light to select the fan ON/OFF at normal velocity. The green light indicates that the fan is running at normal velocity, and that conditions are safe.
- Button **2** with blue LED to select the fan ON/OFF at reduced velocity. Can be adjusted to any level desired for individual requirements (See Service menu).
- Button **3** with red light to silence the acoustic alarm.
- Button **4** with blue light for normal light ON/OFF.

- Button **5** with yellow light is if UV-light is required for decontamination or activation of the table top. The time for the light is set in the user menu (See User menu). The UV-light can only be turned on when the front window is closed completely. When the UV-light is turned on, the normal lighting in the cabinet is turned off. If the window is raised or the normal light is turned on, the UV-light will be turned off.

- Button **6** can be connected to an internal plug in the chamber for remote on/off of the plug/gas resettable valve.

- Button 7: Window open (upwards movement).

- Button 8: Only for programming/navigation.

- Button 9: Only for programming/navigation.

- Button 0: Window close (downwards movement).

- Blue button: ENTER.

The user can by pressing enter see following **User menu´s**

- **Light intensity** – in this menu the user can choose between 56-100 % light intensity to get best light conditions. Please choose desired level and press enter.

- By pressing 8 or 9 the user can move to **Display mode** – where there is a possibility for constant read out of velocity speeds – both inflow and down – flow – showed in m/s or in counts from 0-255.

- By pressing 8 or 9 again the user can see **UV-light** (if this is installed) and choose the time for how long the UV–light should be activated.

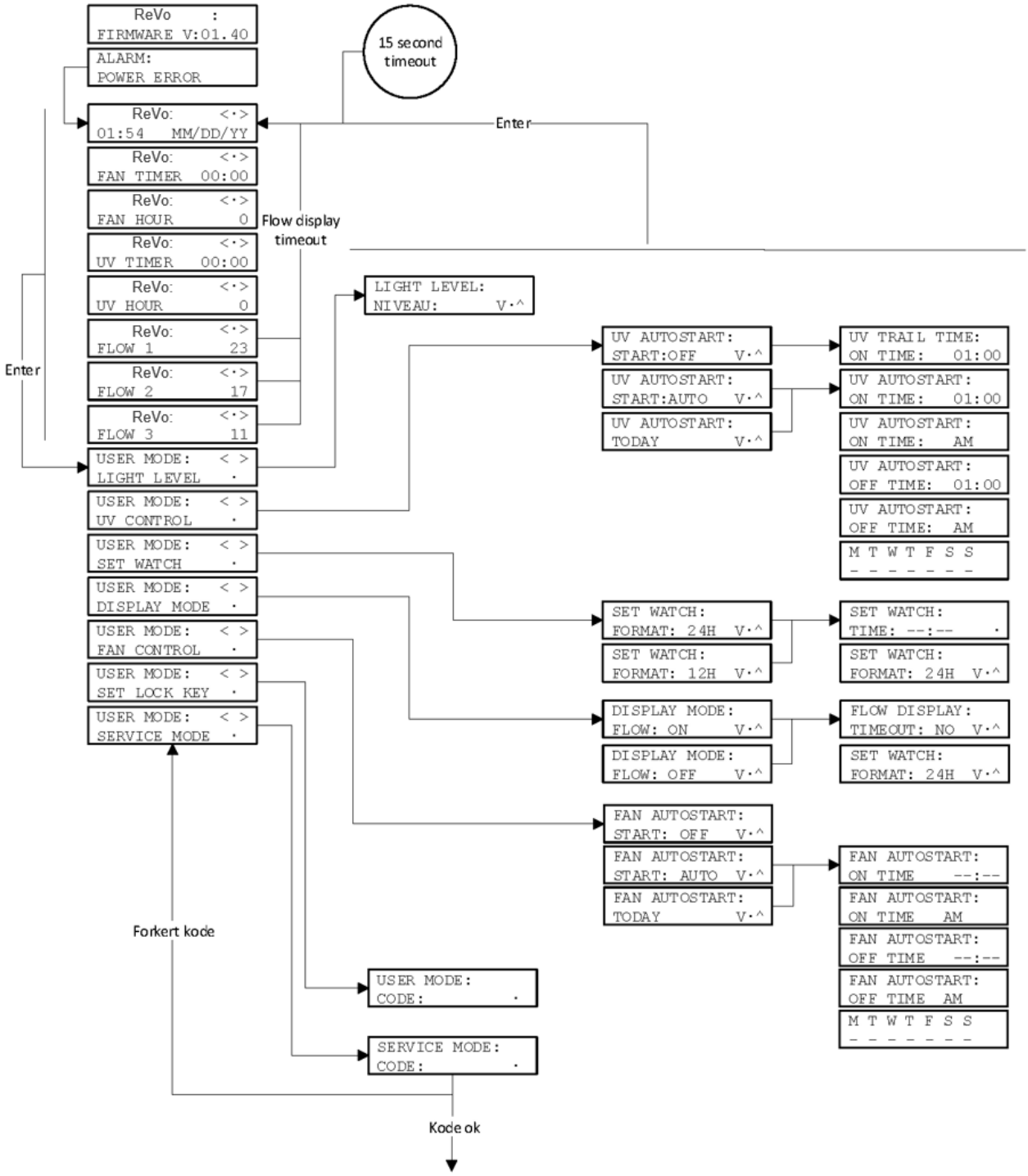
- By pressing 8 or 9 again the user can choose **Auto start** – auto stop. Here it is possible to select Monday to Friday – whole week or only a single day when the cabinet should start up in full speed and after how long it should wait until it switches off again.

- By pressing 8 or 9 the **Time setting** on the cabinet can be set by the end user – date, month, and year, clock 24 hours or AM/PM.

- By pressing 8 or 9 **Password** shows up – this means the user can select a Password so the keys cannot be activated – without the entered Password. It can always be overruled by the Service access code.

- By pressing 8 or 9 **Service mode** can be reached. To enter this, you need to be trained personnel and to have got the Service access code.

6.1 Overview of the user menu



6.2 Programming

Password protected access for trained personnel only!

Service mode: This menu is only operated by authorised service people from Labconco, distributors and trained technical people for safety reasons – who have got the Service access code.

In Service mode the following can be adjusted:

- **Airflow speeds** downflow and exhaust through 2 air flow sensors.
- The setting and calibration of the **Alarms**: Analogue air flow sensors or pressostats.
- The configuration of the cabinet options: UV–light, light mode setting, electrical outlets, gas resettable valves, PIR sensor.
- External control setting: Output 0-10 VDC to volume gauge, external blower dampers or CTS, input from external blower or CTS or pressure gauge mounted in the exhaust channel.
- Decontamination through H_2O_2, Chlorine Dioxide, or Formalin.

6.3 Supervision – Alarm

The cabinet safety is constantly supervised so that any deviation from safe conditions or any fault in the supervision system will be indicated immediately.

Safe conditions are indicated by a green LED light in the button for fan at normal velocity. Unsafe conditions will be indicated both acoustically and visually by red flashing LED light.

The alarm will be initiated if:

- The vertical air velocity inside the work area is outside the limits.
- The air volume exhausted is below the limits.
- The fan is running at reduced velocity.
- After a power failure AND on normal start-up.
- Optional 3rd sensor: A sensor mounted in the exhaust channel.

By activating the alarm (button 3) when the cabinet runs at reduced speed the red LED will change from flashing to constant light.

The alarm will be deactivated when the fan is running at normal velocity, all conditions are safe, or the cabinet is switched off.

(The whole display can be flashing if there is an alarm – this setting is done as a default in alarm setting).

6.4 PIR sensor

If the operation of the cabinet must be automatic – i.e. the cabinets is ready to work when the operator sticks an arm in the work chamber.
The purpose of the application of the PIR sensor is to save energy when the cabinet is not in active use, either during the working day or overnight. It has to be made very clear, that the cabinet does not offer protection for product or operator while running in NightSmart. If the NightSmart option is activated, the cabinet will not comply with GMP. The NightSmart is ideal for keeping the cabinet clean during downtime. The cabinet should not run in NightSmart with product in the chamber.

One of the risks while running in NightSmart is that the air barrier is easily broken by external influences like doors opening and movement in front of the cabinet. To minimize this risk, the following sequence has been implemented in the control system:

When there has been no activity in the cabinet for more than 5 minutes (no PIR signal), the following sequence will be executed:

a. Alarm in 10 secs (LED flash + buzzer) + the text in the display is changed to “Window closing in xx sec” where xx is counting down.
b. The window is moving down (in approximately 6 sec) + alarm (LED flash + buzzer) + the text in the display is changed to “Window closing entering ecomode”.
c. When the window is down the cabinet enters NightSmart, the light is switched off, and the window alarm is muted.

The above sequence is aborted anytime the PIR sensor is activated or the “window up” button is pushed.

If the PIR sensor is activated while the window is closing, the following sequence will be executed:

a. The fans are set to normal operating speed - until the airflows are correct, a flow alarm will sound.
b. The light is set to same level as before entering NightSmart.
c. The window will return to position 200 mm automatically.

If window up button is pushed while the window is closing by the PIR sensor, the following sequence will be executed:

a. The fans are set to normal operating speed - as long as flows are not correct, flow alarm will sound.
b. The light is set to same level as before NightSmart.
c. The window will move upwards when the button is pressed.
d. If the button up is released before window reaching 200 mm the window alarm will continue until the correct position is reached.

If the window up button is pushed with the cabinet in NightSmart, the following sequence will be executed:

a. The fan is set to normal operating speed – until the airflows are correct, a flow alarm will sound.
b. The light is set to same level as before NightSmart.
c. The window will move upwards when the button is pressed.
d. If the button up is released before window reaching 200 mm the window alarm will continue until the correct position is reached.

When the cabinet is running normal it can be switched off by pressing full power bottom for 10 seconds (alarm will flash + buzzer the last 3 seconds).

When the cabinet is running in NightSmart it can be switched off by pressing full power bottom in 10 sec.

6.5 Setting of light

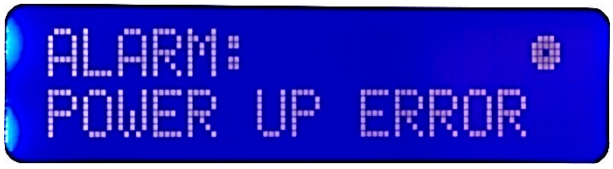
The light setting of the cabinet upon alarm can be set in 3 different alternatives:

- Light always on when blue light button is activated.
- Light always on when blue light button is activated and in full speed mode – if reduced speed is pressed the light turns out.

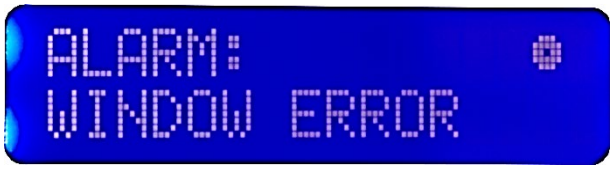
- Light is always on when blue light button is activated and in full speed mode – if there is an alarm the light will turn off automatically and will only be turned on again when all alarms have been deactivated.

6.6 Start-up of the ReVo and ReVo Pro cabinets

Turn on the cabinet by pressing the green button (1). The fans will start and the visible alarm in the red button (3) will flash and audible alarm will be running until safe air velocity in downflow and inflow has been reached. When the safe condition is reached the LED in the green button (1) will turn on. The display will show the message below. Press the blue ENTER button to clear this message.



Turn on the light on in the cabinet by pressing the blue button (4). Move the window to working position using the arrow UP (7) or DOWN (0) buttons. If the window is not it that position the display will show the message below, audible alarm will sound and the red alarm button (4) will be flashing:



Alarm will cancel automatically when the window is in the correct position.

The cabinet is ready for use with protection of product, operator and environment.

6.7 Operating modes of the ReVo and ReVo Pro cabinets

The following are the operating modes for ReVo and ReVo Pro cabinets:

- OFF mode
- Window open mode
- Working mode
- Standby mode
- UV mode

6.7.1 Off mode

Off mode means the cabinet is in an idle state. The cabinet is turned off (light and fans are off). The cabinet is connected to a power source.

6.7.2 Window mode

The cabinet is running at full speed and the window is opened or closed - positioned outside of the working position of 200 mm opening. To install or remove accessories, the front window can be moved to the maximum open position.

The fans are switched on with the alarm active and the red LED flashing. The display will show the alarm text:

6.7.3 Working mode (Operating mode)

In normal operation mode or working mode no alarms can be active. I this case it is safe to work in the cabinet, product, operator and environment is protected. The green LED in button (1) is on and the blue LED in button (4) is on. The display is showing the message below:

Or the screen, shown below, depending on the setup of the cabinet control system:

6.7.4 Standby mode

To enter standby mode press the blue button (2). The fans will go to reduced speed – approximately 50% of the normal operating speed, the light will turn off and the audible and visible alarm (red button (3)) will activate. The audible alarm can be muted by pressing the red button (3).

It is not safe to work in the cabinet in this mode.

To return to working mode press the green button (1).

6.7.5 UV mode

To enter UV mode press the yellow button (5). UV mode can only be activated when the window is completely closed. The light is switched off in the cabinet during the UV disinfection period. The UV period is controlled by a timer integrated in the control system.

The user can enter a time for the UV light to be switched on and the duration of the UV disinfection period.

The ReVo and ReVo Pro Class II Safety Cabinets are designed, build and tested in accordance with the current European standard EN 12469:2000 - Biotechnology - Performance criteria for microbiological safety cabinets, which is the standard dealing with class II safety cabinets.

In EN 12469:2000 it is stated that “Ultraviolet (UV) radiation is not recommended for use in safety cabinets. However, if required, it should be installed in such a manner that is does not affect the airflow and the containment performance of the cabinet”. (Quote from informative annex A).

As this standard does not recommend the use of UV light in the safety cabinets, there are no recommendations as to the intensity of the UV light if used anyway.

Please remember that UV light does not penetrate areas blocked from the direct light – for example under the table tops - and that it does not represent a substitute for good old fashion mechanical cleaning of the inner surfaces of the safety cabinet.

If UV is desired as a disinfectant, it must be used in careful combination with other cleaning and chemical disinfectant methods. Its use and hazards must be documented in the laboratory's specific standard operating procedures (SOPs) and included in training for each lab worker. The method of cleaning the UV bulb and testing its effectiveness must be in the SOP. Appropriate personal protective equipment (PPE) must always be used. For needed dosage, please refer to relevant literature.

6.8 Loading the working chamber

1. Turn on the cabinet. Move the front window to the maximum opening position.

2. Install needed work materials within the working chamber work area. Avoid blocking the inflow air intake.

3. Move the front window to the work position and wait for the airflow to stabilize. Safe working conditions are reached when the alarm is deactivated and the green LED in button 1 is on.

4. Load the work tray with samples and place them inside the working chamber.

5. For work breaks or for extended experimental phases without manual intervention, switch the device to standby mode by pressing button 2.

6.9 Working safely - Recommendations

6.9.1 Before start-up

- The cabinets may only be operated at temperatures between 15 °C and 35 °C, at maximum 80% relative humidity, and at normal air pressure.
- Approximately 15 minutes before any work in the cabinet, the fan of the unit must be switched on at normal velocity.
- The work chamber and the front- and side windows are to be carefully cleaned and disinfected. Use an ethanol solution or similar. It is recommended to use special lint-free material. Do not use explosive disinfectants. See also section 10.
- Objects and appliances must be carefully cleaned or disinfected before being introduced into the work chamber. Do not bring in writing utensils, packing material, etc.
- The front window is positioned in working position and kept in that position during the entire work process.
- Necessary appliances for use during work must be placed within easy reach.
- Secure the appropriate protection of the operator as well as the product (e.g. clothes, gloves, etc.).

6.10 While working

	**Caution**
	Important for work with environmentally harmful substances!

- Do not perform work while the fan is running at reduced speed.
- The front window must be in work position.
- Place the product behind the perforated area of the work surface.
- Work with calm, smooth movements.
- Never overload the work chamber.
- Reduce the number of transfers into and out of the work chamber.
- Avoid equipment with high heat emission.
- Avoid a cabinet location where personnel frequently pass avoid draughts.

	**Caution**
	The efficiency of the laminar airflow in the work chamber is essential for personnel and product protection. Negative influences of the flow conditions must therefore be avoided.

They are primarily raised due to:

- Rapid movements of the operator's hand, arm, or body both in and in front of the work chamber.
- Covered perforations in the table top, both at the front and the back of the work chamber.
- Large objects and apparatus.
- Devices making rapid movements, e.g. agitators, centrifuges.

	**Caution**
	Do not damage the laminator, the prefilters (ReVo Pro) or the main filter in the ceiling of the work chamber by mechanical objects or heat sources, otherwise the microbiological safety is no longer ensured.

The acoustic and optical monitoring devices of the fan and front window must not be deactivated.

Devices developing strong heat e.g. burners which can disrupt airflows.

Operate heat sources only with the cabinet fan activated.

6.10.1 After work

Remove objects and appliances from the work chamber.

Clean the work chamber, remove fluids, if any, from the trough and dry it. Disinfect if required. Leave the cabinet fan in operation for about another 10 minutes.

Close the front window to its lowest position.

6.11 Interrupting an ongoing procedure

To interrupt a work process:

1. Remove all samples from the working chamber and store them properly.
2. Remove any accessories from the chamber, and clean and disinfect them.
3. Clean and disinfect the working chamber surfaces, work tray, and the trough.
4. Turn the cabinet either to standby mode or off mode.

6.12 Shut down of the ReVo and ReVo Pro cabinets

If the cabinet is not to be used or is to be stored for an extended period of time, it must be completely decontaminated.

Warning

To shut the cabinet down, the sample chamber must be disinfected completely and the plenum, including the filters, must be decontaminated using the appropriate and authorized procedures.

1. After the device has been decontaminated, close the window completely.
2. Disconnect the unit from the power source.

6.13 Disposal of cabinets

All components except for the HEPA filters can be discarded after having been thoroughly cleaned and decontaminated. The HEPA filters must be discarded in accordance with the applicable international, national and local regulations for chemical or biological waste.

Warning

As this cabinet, can be used for processing and treating infectious substances, it must be decontaminated prior to disposal, in accordance with acceptable standards and procedures.

6.14 Trouble shooting

Item	Fault message	Fault reaction	Action
Cabinet	Ventilators does not start	No reaction when trying to start cabinet	Check: • Power supply to cabinet • Mains cable is in place • Call service technician
Light	Light does not turn on with cabinet running in normal mode	Cabinet running without light in the working chamber.	Check: • Change light tubes • Change ballast • Call service technician
Front window	No movement	No movement	Check: • Blockage of window • Call service technician
System alarms	Power up error	“Power up error” in display is show to show that the cabinet has been without power.	Press the ENTER button.
	Low flow alarm Flow 1 = downflow	Visible “Low flow X” and audible alarm on control panel	Check:

Item	Fault message	Fault reaction	Action
	Flow 2 = inflow		• For blockage of inflow and/or exhaust air from the cabinet • If ducted, that the external ventilation system is working properly • Call service technician
	High flow alarms	Visible “High flow X” and audible alarm on control panel	Call service technician
	Window alarm	Visible “Window error” and audible alarm on control panel	Place window in normal work opening position.
Electrical stand	No movement	No movement	Check: • Power supply to electrical stand • Call service technician
All operations requiring the use of tools must be performed by a trained service technician			

7 Cleaning/Decontamination of cabinets

Several procedures can be used for decontaminating the biological safety cabinet. Which procedure is selected, depends on the potential risk imminent in the products handled, and/or the degree of cleanliness required by an experiment or work process.

One possible decontamination procedure is to clean, rinse and dry with a disinfection liquid or spray, followed by sterile distilled water or isopropyl alcohol (IPA).

UV disinfection can also be used as a secondary decontamination method after the above described chemical disinfection procedure.

Autoclaving (sterilization with steam) can be used for treating the removable stainless steel components. The table tops autoclavable components.

Decontamination using hydrogen peroxide H_2O_2 can be performed if a sterile working chamber is required for the work procedure. This decontamination procedure or a similar one is required before filters are replaced, or before the cabinet is discarded. The control system incorporates a procedure for this process.

Decontamination using formaldehyde can be performed if a sterile working chamber is required for the work procedure. This decontamination procedure or a similar one is required before filters are replaced, or before the cabinet is discarded. The control system incorporates a procedure for this process.

7.1 Caring for and cleaning of stainless steel

Stainless steel is a combination of many different metals including iron and chromium. Iron, the primary element in stainless steel, tends to corrode (rust) when in its natural state. The chromium content in stainless steel prevents corrosion.

Stainless steel is not corrosion or rust proof, but resistant to stains. The chromium, in the presence of oxygen, forms a tough, invisible, passive layer of chromium oxide film on the steel surface. If damaged mechanically or chemically, this film is self-healing as long as it has enough oxygen. The presence of any liquid or solid that remains in contact with the stainless steel for a prolonged time can prevent oxygen contact and promote corrosion, as can prolonged contact with cleaners or disinfectants containing chlorine, ammonia, iodine or other caustic agents.

1. To properly care for stainless steel, use cleaners and disinfectants free of caustic agents such as chlorine, iodine and ammonia.

2. Always follow the application of any cleaner or disinfectant with a minimum of two clean distilled water rinses, then a thorough drying with a clean soft cloth. By rinsing with distilled water and drying, any remaining residue is removed from contact with the stainless steel.

	**Caution**
	Never use abrasive cleaners, scouring pads or steel wool when caring for stainless steel.

If the stainless steel does become stained, corroded or rusted, the iron deposits left on the surface can be removed by neutralizing them with the passivation process. This process uses an acid to neutralize the “free iron” deposits left on the steel where there has been deprivation of oxygen. This stops the spread of the corrosion or rust. It will not return the stainless steel to its original finish.

7.2 Caring for and cleaning of coated surfaces

All the coated surfaces of these cabinets are powder coated. Powder coating is a method of applying a dry powder to electro-statically charged metal, then baked in an oven where the dry powder molecules are melted and fused together. This is by far the most durable finish available today and, if cared for properly, will last for many years. The coated surfaces should be cleaned with a neutral detergent and rinsed twice with clean distilled water, then dried thoroughly with a clean soft cloth. Cleaning or disinfecting coated surfaces without rinsing with clean distilled water and drying thoroughly will result in smearing, streaking and dulling of the coated surfaces. Never use abrasive cleaners, scouring pads or steel wool. If the coated surfaces do become dull, streaked, smeared or marred in some other way, there is no known method to restore the finish.

7.3 Disinfection of working chamber

1. Remove all samples from the working chamber and store them properly.

2. Remove accessories from the cabinet and disinfect them using the disinfection procedure recommended by the manufacturer of the accessory.

3. Stainless steel components – table tops - can be removed from the working chamber and disinfected separately.

4. Clean all of the working chambers surfaces with disinfectant. Do not use sharp objects or fluid on the laminator.

7.4 Rinsing of working chamber

After disinfection of the working chamber, the working chamber must be rinsed properly:

1. Rinse all surfaces of the working chamber twice with clean distilled water.

2. Discard any liquid from the trough. Rinse the trough.

3. Dry all working chamber surfaces completely.

7.5 UV Disinfection after cleaning the working chamber

UV disinfection can be performed by using the optional factory installed UV light.

To start the UV disinfection procedure:

1. Close the front window.

2. Press the yellow button (5). The pre-programmed UV settings will be performed.

To interrupt or cancel the UV disinfection procedure, just press the yellow button (5) again.

7.6 Microbiological decontamination

Microbiological decontamination is required before accessing any area of the cabinet, which can potentially be contaminated. Typically, it is required before maintenance work and change of HEPA filters. The control system can handle decontamination using hydrogen peroxide and formalin. All national and local rules and regulations must be strictly observed during this process.

7.7 Cleaning of external surfaces

Clean the exterior surfaces of the cabinet using a solution of tepid water and commercially available mild dishwashing agent. Then, dry all surfaces well, using a soft, clean cloth.

7.8 Cleaning the windows

For cleaning the front and side windows, use a commercially available window cleaner.

7.9 Cleaning the trough

Clean the trough, using a solution of tepid water and commercially available mild dishwashing agent.

1. Remove the table tops from the working chamber.

2. Clean thoroughly to remove any residues and/or deposits.

3. Wipe the trough, using a clean cloth and plenty of clean water.

4. Discard any liquid in the trough. Rinse and dry thoroughly.

5. Re-install the table tops.

	**Note**
	After cleaning, make sure that all cleaning product has been removed completely from the trough.

8 Service and maintenance of ReVo and ReVo Pro cabinets

These cabinets are only safe as long as they are working properly. All components must be in full working order to ensure safety for product, operator and environment.

	**Caution**
	Every 5000 operating hours or at least once every year the cabinet has to be inspected and tested by a trained technician.

To ensure this, at least a yearly service and maintenance inspection is highly recommended. This activity must be carried out by trained technicians and all appropriate safety measures must be taken during this work.

	**Caution**
	Before repair work is carried out inside the contaminated and/or infected cabinet and prior to filter replacement and upon change of location, proper cleaning and disinfecting by the operator is required. The lab Manager/Safety Manager must confirm this in writing to the service personnel.

	**Warning**
	Always disconnect the mains supply before doing any work on the electrical parts of the cabinet. Failing this may cause electrical shock and damage to the electrical components.

Before starting any service and maintenance work on the cabinet, conduct a general inspection to evaluate the state of the cabinet.

After completion of the service and maintenance work, tests are required according to the standard.

- Leakage test of pre-, downflow and exhaust filters.
- Test and adjustment of air velocities in downflow and inflow and alarm settings in the vertical downflow inside the working chamber and the horizontal inflow in through the work opening.
- Test of air flow patterns.

The general function and safety tests must be performed in accordance with local requirements. For this purpose, we recommend a service and maintenance agreement.

All maintenance and repair work performed, as well as filter replacements and required tests, must be documented in a test book.

8.1 Service on ReVo and ReVo Pro cabinets

Service comprises the following activities:

- General evaluation of the state of the cabinet.
- Check and if necessary replacement of light tubes (normal and UV if mounted).
- Leak test of all HEPA filters (downflow and exhaust – and prefilters on ReVo Pro only).

- Check and adjustment of downflow air velocity and downflow alarms.
- Check and adjustment of inflow air velocity and inflow alarms.
- Check of window alarm.
- Check of airflow pattern using smoke.

A service test report should be issued documenting the “as left” conditions of the cabinet.

Optional test can be performed on request:

- Particle test in the working chamber to determine the air quality.
- KI Discus test to determine the retention in the work opening.
- Sound level test.
- Light intensity test – normal light.
- Light intensity test – UV light.

8.2 Working chamber lights, replacement

The general light for the working chamber consists of two LED lights placed between the downflow filter and the laminator at the top of the working chamber.

To remove the laminator, the two fixing screws, shown on the picture below, must be removed.

Remove the laminator located in top of the work chamber (handle with care). Release the two lamps from the fixtures by rotating them 90º. Install the new lamps performing the inverse operation.

Product name	Catalogue No.
Light tube ReVo and ReVo Pro 900	R1297503
Light tube ReVo and ReVo Pro 1200	R1297504
Light tube ReVo and ReVo Pro 1500	R1297505
Light tube ReVo and ReVo Pro 1800	R1297506

8.3 Optional UV lights

The UV light accessory mounts to the back wall of the working chamber. Release the lamp from the fixtures by rotating it 90º. Install the new UV-lamp performing the inverse operation.

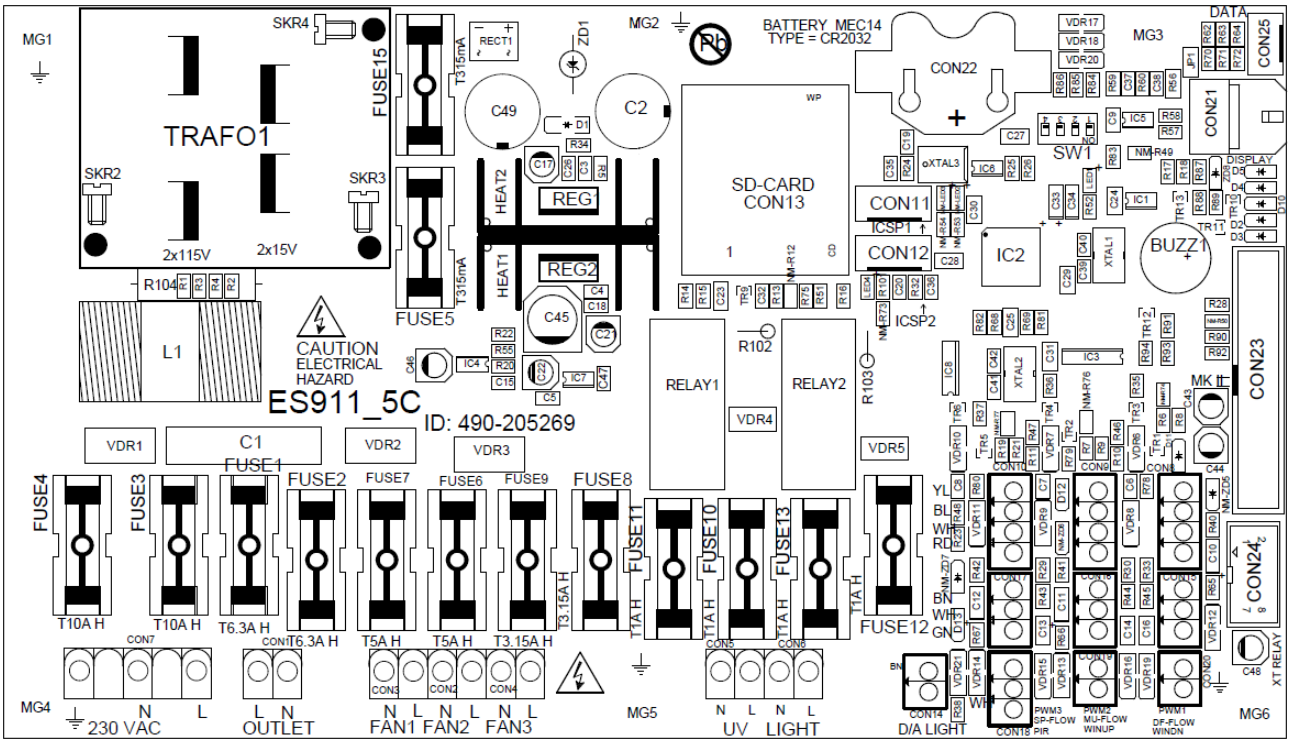
☞	**Note**
	Use gloves when manipulating a germicidal UV lamp, to prevent leaving hand prints that reduce the effects of the ultraviolet radiation.

Replace UV lamp every 2000 or 3000 hours of life.

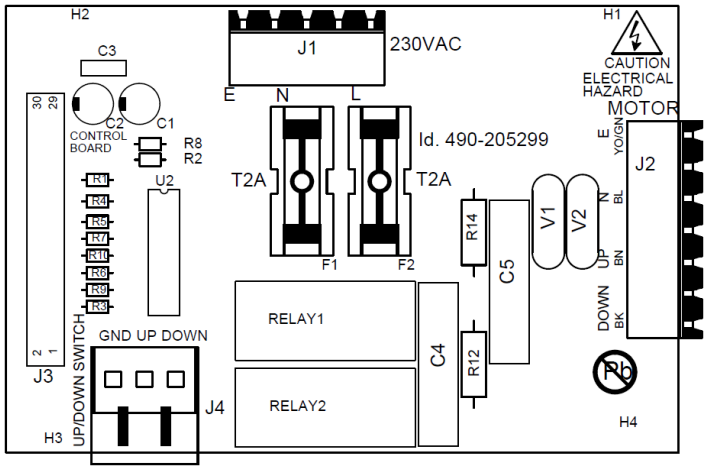
Product name	Catalogue No.
UV light tube, all models	Contact Labconco

8.4 Replacement of fuses

All fuses are located on PCB's accessed through the top plate located on the front top of the cabinet. Make sure that power is cut before removing the protective top plate.



Main board



Window motor board

8.5 Replacement of laminator

The laminator is placed at the top of the working chamber just below the main downflow filter. To remove the laminator, the two fixing screws, shown on the picture below, must be removed.

Pull on the two flaps located at the back edge of the laminator and pull downwards. Be careful not to damage the main downflow filter located just above the laminator.

Install the replacement laminator and mount the fixing screws again.

Product name	Catalogue No.
Laminator ReVo and ReVo Pro 900	R3832500
Laminator ReVo and ReVo Pro 1200	R3832501
Laminator ReVo and ReVo Pro 1500	R3832502
Laminator ReVo and ReVo Pro 1800	R3832503

8.6 Replacements and repairs

All replacement and repairs – other than the two described above – must be performed by a trained service technician.

8.7 Disposal of cabinet

The entire cabinet except for the HEPA filters can be discarded after having been thoroughly cleaned and decontaminated. The HEPA filters must be discarded in accordance with the applicable national and local regulations for chemical and biological waste.

	**Warning**
	As this cabinet can be used for processing and treating infectious substances, it may become contaminated. Prior to disposal, the entire cabinet with filters must be decontaminated in accordance with acceptable standards and procedures.

9 Specifications

The sound level stated in this manual has been measured in accordance with EN/ISO 11201:2010 ”Acoustics - Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections”.

Measurements performed in accordance with accuracy grade 1 (precision) paragraph 5.2.1.2 “Outdoors”.

For further details please refer to the standard.

ReVo 900	Unit	Part no: 3x2310xx1
General Specifications		
Certificates		None
Compliance with		EN 12469, EN 61010-1, EN 61000-6, EN 11201
Sound Pressure Level at factory settings and standard configuration	dB(A)	43
Sound Pressure Level in NightSmart mode	dB(A)	36
Down flow, Air velocity	m/s	0,28 ±0,01
Inflow, Air velocity	m/s	0,45
Exhaust, Air flow rate	m3/h	292
Light illuminance (LED)	Lux	> 1000
Front Opening (height)	mm	200
Number of table top segments		3
Filter construction in accordance with EN 1822-1		2-filter system, HEPA, at least Class H14
Table top and trough material		AISI 304 stainless steel
Table top max. total load	kg	100
Side glass material		5 mm hardened glass w. 3 x ø22 mm holes
Front glass material		6mm laminated safety glass
Cabinet and back wall material/colour		AISI 304 stainless steel
Dimensions		
External dimensions with adjustable Stand (Standard) (DxWxH)	mm	797 x 1010 x 2033
Table top height with adjustable Stand (Standard)	mm	750 (Range 745-780)
External dimensions with Elec. Elevation Stand (DxWxH)	mm	797 x 1010 X 2025-2325
Table top height with Elec. Elevation Stand	mm	750-1050
Work chamber dimensions (DxWxH)	mm	650x900x700
Net weight	kg	225
Shipping Volume	m3	Approx. 2,2
Electrical Data		
Rated AC Voltage/frequency	V/Hz	220-240/50-60
Rated max. current (fuse)	A	Max 9
Power outlet(s) max. total current (fuse)	A	6,3
Type of power outlet socket, pair left & pair right side		Cabinet-dependent (IP44)
Typical power consumption excl. power outlets	VA	85/45
Typical power consumption in NightSmart mode	VA	50/20
Type of mains connection		3 pin male AC power socket

ReVo 1200	Unit	Part no: 3x2410xx1
General Specifications		
Certificates		None
Compliance with		EN 12469, EN 61010-1, EN 61000-6, EN 11201
Sound Pressure Level at factory settings and standard configuration	dB(A)	45
Sound Pressure Level in NightSmart mode	dB(A)	37
Down flow, Air velocity	m/s	0,28 ±0,01
Inflow, Air velocity	m/s	0,45
Exhaust, Air flow rate	m3/h	389
Light illuminance (LED)	Lux	> 2000
Front Opening (height)	mm	200
Number of table top segments		4
Filter construction in accordance with EN 1822-1		2-filter system, HEPA, at least Class H14
Table top and trough material		AISI 304 stainless steel
Table top max. total load	kg	100
Side glass material		5 mm hardened glass w. 3 x ø22 mm holes
Front glass material		6mm laminated safety glass
Cabinet and back wall material/colour		AISI 304 stainless steel
Dimensions		
External dimensions with adjustable Stand (Standard) (DxWxH)	mm	797 x 1303 x 2033
Table top height with adjustable Stand (Standard)	mm	750 (Range 745-780)
External dimensions with Elec. Elevation Stand (DxWxH)	mm	797 x 1303 X 2025-2325
Table top height with Elec. Elevation Stand	mm	750-1050
Work chamber dimensions (DxWxH)	mm	650x1200x700
Net weight	kg	250
Shipping Volume	m3	Approx. 2,9
Electrical Data		
Rated AC Voltage/frequency	V/Hz	220-240/50-60
Rated max. current (fuse)	A	Max 9
Power outlet(s) max. total current (fuse)	A	6,3
Type of power outlet socket, pair left & pair right side		Cabinet-dependent (IP44)
Typical power consumption excl. power outlets	VA	150/80
Typical power consumption in NightSmart mode	VA	65/30
Type of mains connection		3 pin male AC power socket

ReVo 1500	Unit	Part no: 3x2510xx1
General Specifications		
Certificates		None
Compliance with		EN 12469, EN 61010-1, EN 61000-6, EN 11201
Sound Pressure Level at factory settings and standard configuration	dB(A)	49
Sound Pressure Level in NightSmart mode	dB(A)	37
Down flow, Air velocity	m/s	0,28 ±0,01
Inflow, Air velocity	m/s	0,45
Exhaust, Air flow rate	m3/h	486
Light illuminance (LED)	Lux	> 2000
Front Opening (height)	mm	200
Number of table top segments		5
Filter construction in accordance with EN 1822-1		2-filter system, HEPA, at least Class H14
Table top and trough material		AISI 304 stainless steel
Table top max. total load	kg	100
Side glass material		5 mm hardened glass w. 3 x ø22 mm holes
Front glass material		6mm laminated safety glass
Cabinet and back wall material/colour		AISI 304 stainless steel
Dimensions		
External dimensions with adjustable Stand (Standard) (DxWxH)	mm	797 x 1610 x 2033
Table top height with adjustable Stand (Standard)	mm	750 (Range 745-780)
External dimensions with Elec. Elevation Stand (DxWxH)	mm	797 x 1610 X 2025-2325
Table top height with Elec. Elevation Stand	mm	750-1050
Work chamber dimensions (DxWxH)	mm	650x1500x700
Net weight	kg	275
Shipping Volume	m3	Approx. 3,2
Electrical Data		
Rated AC Voltage/frequency	V/Hz	220-240/50-60
Rated max. current (fuse)	A	Max 9
Power outlet(s) max. total current (fuse)	A	6,3
Type of power outlet socket, pair left & a pair right side		Cabinet-dependent (IP44)
Typical power consumption excl. power outlets	VA	195/115
Typical power consumption in NightSmart mode	VA	85/35
Type of mains connection		3 pin male AC power socket

ReVo 1800	Unit	Part no: 3x2610xx1
General Specifications		
Certificates		None
Compliance with		EN 12469, EN 61010-1, EN 61000-6, EN 11201
Sound Pressure Level at factory settings and standard configuration	dB(A)	52
Sound Pressure Level in NightSmart mode	dB(A)	39
Down flow, Air velocity	m/s	0,28 ±0,01
Inflow, Air velocity	m/s	0,45
Exhaust, Air flow rate	m3/h	583
Light illuminance (LED)	Lux	> 2000
Front Opening (height)	mm	200
Number of table top segments		6
Filter construction in accordance with EN 1822-1		2-filter system, HEPA, at least Class H14
Table top and trough material		AISI 304 stainless steel
Table top max. total load	kg	100
Side glass material		5 mm hardened glass w. 3 x ø22 mm holes
Front glass material		6mm laminated safety glass
Cabinet and back wall material/colour		AISI 304 stainless steel
Dimensions		
External dimensions with adjustable Stand (Standard) (DxWxH)	mm	797 x 1910 x 2033
Table top height with adjustable Stand (Standard)	mm	750 (Range 745-780)
External dimensions with Elec. Elevation Stand (DxWxH)	mm	797 x 1910 X 2025-2325
Table top height with Elec. Elevation Stand	mm	750-1050
Work chamber dimensions (DxWxH)	mm	650x1800x700
Net weight	kg	318
Shipping Volume	m3	Approx. 4,1
Electrical Data		
Rated AC Voltage/frequency	V/Hz	220-240/50-60
Rated max. current (fuse)	A	Max 9
Power outlet(s) max. total current (fuse)	A	6,3
Type of power outlet socket, pair left & pair right side		Cabinet-dependent (IP44)
Typical power consumption excl. power outlets	VA	240/140
Typical power consumption in NightSmart mode	VA	100/40
Type of mains connection		3pin male AC power socket

ReVo Pro 900	Unit	Part no: 3x2315xx1
General Specifications		
Certificates		None
Compliance with		EN 12469, DIN 12980, EN 61010-1, EN 61000-6, EN 11201
Sound Pressure Level at factory settings and standard configuration	dB(A)	46
Sound Pressure Level in NightSmart mode	dB(A)	37
Down flow, Air velocity	m/s	0,28 ±0,01
Inflow, Air velocity	m/s	0,45
Exhaust, Air flow rate	m3/h	292
Light illuminance (flourescent tube)	Lux	> 1000
Front Opening (height)	mm	200
Number of table top segments		3
Filter construction in accordance with EN 1822-1		3-filter system, HEPA, at least Class U17
Table top and trough material		AISI 304 stainless steel
Table top max. total load	kg	100
Side glass material		5 mm hardened glass w. 3 x ø22 mm holes
Front glass material		6mm laminated safety glass
Cabinet and back wall material/colour		AISI 304 stainless steel
Dimensions		
External dimensions with adjustable Stand (Standard) (DxWxH)	mm	797 x 1010 x 2033
Table top height with adjustable Stand (Standard)	mm	750 (Range 745-780)
External dimensions with Elec. Elevation Stand (DxWxH)	mm	797 x 1114 X 2025-2325
Table top height with Elec. Elevation Stand	mm	750-1050
Work chamber dimensions (DxWxH)	mm	650x900x700
Net weight	kg	275
Shipping Volume	m3	ca. 2,2
Electrical Data		
Rated AC Voltage/frequency	V/Hz	220-240/50-60
Rated max. current (fuse)	A	Max 9
Power outlet(s) max. total current (fuse)	A	6,3
Type of power outlet socket, pair left & pair right side		Cabinet-dependent (IP44)
Typical power consumption excl. power outlets	VA	150/75
Typical power consumption in NightSmart mode	VA	95/32
Type of mains connection		3 pin male AC power socket

ReVo Pro 1200	Unit	Part no: 3x2415xx1
General Specifications		
Certificates		None
Compliance with		EN 12469, DIN 12980, EN 61010-1, EN 61000-6, EN 11201
Sound Pressure Level at factory settings and standard configuration	dB(A)	48
Sound Pressure Level in NightSmart mode	dB(A)	38
Down flow, Air velocity	m/s	0,28 ±0,01
Inflow, Air velocity	m/s	0,45
Exhaust, Air flow rate	m3/h	389
Light illuminance (LED)	Lux	> 2000
Front Opening (height)	mm	200
Number of table top segments		4
Filter construction in accordance with EN 1822-1		3-filter system, HEPA, at least Class U17
Table top and trough material		AISI 304 stainless steel
Table top max. total load	kg	100
Side glass material		5 mm hardened glass w. 3 x ø22 mm holes
Front glass material		6mm laminated safety glass
Cabinet and back wall material/colour		AISI 304 stainless steel
Dimensions		
External dimensions with adjustable Stand (Standard) (DxWxH)	mm	797 x 1303 x 2033
Table top height with adjustable Stand (Standard)	mm	750 (Range 745-780)
External dimensions with Elec. Elevation Stand (DxWxH)	mm	797 x 1407 X 2025-2325
Table top height with Elec. Elevation Stand	mm	750-1050
Work chamber dimensions (DxWxH)	mm	650x1200x700
Net weight	kg	308
Shipping Volume	m3	ca. 3,0
Electrical Data		
Rated AC Voltage/frequency	V/Hz	220-240/50-60
Rated max. current (fuse)	A	Max 9
Power outlet(s) max. total current (fuse)	A	6,3
Type of power outlet socket, pair left & pair right side		Cabinet-dependent (IP44)
Typical power consumption excl. power outlets	VA	265/140
Typical power consumption in NightSmart mode	VA	115/38
Type of mains connection		3 pin male AC power socket

ReVo Pro 1500	Unit	Part no: 3x2515xx1
General Specifications		
Certificates		None
Compliance with		EN 12469, DIN 12980, EN 61010-1, EN 61000-6, EN 11201
Sound Pressure Level at factory settings and standard configuration	dB(A)	50
Sound Pressure Level in NightSmart mode	dB(A)	38
Down flow, Air velocity	m/s	0,28 ±0,01
Inflow, Air velocity	m/s	0,45
Exhaust, Air flow rate	m3/h	486
Light illuminance (flourescent tube)	Lux	> 2000
Front Opening (height)	mm	200
Number of table top segments		5
Filter construction in accordance with EN 1822-1		3-filter system, HEPA, at least Class U17
Table top and trough material		AISI 304 stainless steel
Table top max. total load	kg	100
Side glass material		5 mm hardened glass w. 3 x ø22 mm holes
Front glass material		6mm laminated safety glass
Cabinet and back wall material/colour		AISI 304 stainless steel
Dimensions		
External dimensions with adjustable Stand (Standard) (DxWxH)	mm	797 x 1610 x 2033
Table top height with adjustable Stand (Standard)	mm	750 (Range 745-780)
External dimensions with Elec. Elevation Stand (DxWxH)	mm	797 x 1714 X 2025-2325
Table top height with Elec. Elevation Stand	mm	750-1050
Work chamber dimensions (DxWxH)	mm	650x1500x700
Net weight	kg	324
Shipping Volume	m3	Approx. 3,2
Electrical Data		
Rated AC Voltage/frequency	V/Hz	220-240/50-60
Rated max. current (fuse)	A	Max 9
Power outlet(s) max. total current (fuse)	A	6,3
Type of power outlet socket, pair left & pair right side		Cabinet-dependent (IP44)
Typical power consumption excl. power outlets	VA	345/180
Typical power consumption in NightSmart mode	VA	140/53
Type of mains connection		3 pin male AC power socket

ReVo Pro 1800	Unit	Part no: 3x2615xx1
General Specifications		
Certificates		None
Compliance with		EN 12469, DIN 12980, EN 61010-1, EN 61000-6, EN 11201
Sound Pressure Level at factory settings and standard configuration	dB(A)	53
Sound Pressure Level in NightSmart mode	dB(A)	40
Down flow, Air velocity	m/s	0,28 ± 0,01
Inflow, Air velocity	m/s	0,45
Exhaust, Air flow rate	m3/h	583
Light illuminance (flourescent tube)	Lux	> 2000
Front Opening (height)	mm	200
Number of table top segments		6
Filter construction in accordance with EN 1822-1		3-filter system, HEPA, at least Class U17
Table top and trough material		AISI 304 stainless steel
Table top max. total load	kg	100
Side glass material		5 mm hardened glass w. 3 x ø22 mm holes
Front glass material		6mm laminated safety glass
Cabinet and back wall material/colour		AISI 304 stainless steel
Dimensions		
External dimensions with adjustable Stand (Standard) (DxWxH)	mm	797 x 1910 x 2033
Table top height with adjustable Stand (Standard)	mm	750 (Range 745-780)
External dimensions with Elec. Elevation Stand (DxWxH)	mm	797 x 2014 X 2025-2325
Table top height with Elec. Elevation Stand	mm	750-1050
Work chamber dimensions (DxWxH)	mm	650x1800x700
Net weight	kg	350
Shipping Volume	m3	Approx. 4,1
Electrical Data		
Rated AC Voltage/frequency	V/Hz	220-240/50-60
Rated max. current (fuse)	A	Max 9
Power outlet(s) max. total current (fuse)	A	6,3
Type of power outlet socket, pair left & pair right side		Cabinet-dependent (IP44)
Typical power consumption excl. power outlets	VA	425/220
Typical power consumption in NightSmart mode	VA	165/60
Type of mains connection		3 pin male AC power socket

9.1 Spare parts

Cat. No.	Item
Contact Labconco	UV-light tube for ReVo/ReVo Pro 900-1800
R1297503	Light tube for ReVo/ReVo Pro 900
R1297504	Light tube for ReVo/ReVo Pro 1200
R1297505	Light tube for ReVo/ReVo Pro 1500
R1297506	Light tube for ReVo/ReVo Pro 1800
R3838400	Main HEPA filter for ReVo/ReVo Pro 900 - 915x457x115 mm
R3838401	Main HEPA filter for ReVo/ReVo Pro 1200 - 1220x457x115 mm
R3838402	Main HEPA filter ReVo/ReVo Pro 1500 - 1525x457x115 mm
R3838403	Main HEPA filter ReVo/ReVo Pro 1800 - 1830x457x115 mm
R3328600	Main circuit board for ReVo/ReVo Pro
R3405500	Flow sensor
R3448710	Light ballast for ReVo/ReVo Pro 900 and 1200
R3448711	Light ballast for ReVo/ReVo Pro 1500 and 1800
R2501500	Window motor for ReVo/ReVo Pro
R3328610	Display board ReVo/ReVo Pro
R3328620	Motor board ReVo/ReVo Pro
R3448700	UV-light ballast ReVo/ReVo Pro
Contact Labconco	V-shaped H-14 prefilters for ReVo Pro
R3434900	Fan for ReVo
R3434910	Flow grid for ReVo fan
R3838500	Exhaust HEPA filter for ReVo/ReVo Pro 900, 1200 - 610x457x69 mm
R3838502	Exhaust HEPA filter for ReVo/ReVo Pro 1500, 1800 - 915x457x69 mm
R2502500	Second exhaust ReVo/ReVo Pro 900 & ReVo/ReVo Pro 1200 UK cabinets - 610x457x115 mm
R3832500	Laminator for ReVo/ReVo Pro 900
R3832501	Laminator for ReVo/ReVo Pro 1200
R3832502	Laminator for ReVo/ReVo Pro 1500
R3832503	Laminator for ReVo/ReVo Pro 1800
R3832400	Micro switch for ReVo/ReVo Pro window
R3403400	Front window ReVo/ReVo Pro 900
R3403401	Front window ReVo/ReVo Pro 1200
R3403402	Front window ReVo/ReVo Pro 1500
R3403403	Front window ReVo/ReVo Pro 1800
R3843201	Complete front cover for ReVo/ReVo Pro 1200
R3843203	Complete front cover for ReVo/ReVo Pro 1800
R3327200	Gas damper for the front cover for ReVo/ReVo Pro, all models
R2503500	DOP valve

10 Quality testing of the ReVo and ReVo Pro cabinets

All ReVo and ReVo Pro cabinets are adjusted and tested before leaving the factory. A factory check list and a factory test report is issued for each cabinet and is, together with the HEPA filter test certificates and an instruction manual, shipped with the cabinet.

10.1 Classification of the ReVo and ReVo Pro cabinets

The ReVo and Labconco Mar Pro cabinets are rated as Class II type A2 in accordance with the standards EN 12469 and DIN 12980 (ReVo Pro only).

10.2 Test terms and definitions

Nominal value	Default value as specified by Labconco.
Measured value	Value measured at the location of the safety cabinet.
Tolerance	Acceptable deviation from the nominal value.
Average value	The sum of the measuring values divided by the number of tests. The average value is compared to the nominal value.
Set point	Acceptable operating value for the inflow and downflow air velocities.
Inflow air velocity	Velocity of the air entering the working chamber opening.
Downflow air velocity	Velocity of the displacement airflow circulating through the working chamber.
Exhaust airflow volume	Amount of air discharged at the exhaust filter.

10.3 What is required by EN 12469 and DIN 12980 to be tested

Test	**Factory**	**Installation**	**Service**
Leak test of HEPA filters	Yes	Yes	Yes
Downflow air velocity and setting of alarms	Yes	Yes	Yes
Inflow air velocity and setting of alarms	Yes	Yes	Yes
Test of alarms	Yes	Yes	Yes
Light test	Yes	Yes	
Airflow pattern test	Yes	Yes	Yes
Electrical test	Yes		*)
Special tests not included as default			
Particle counting in working chamber		Yes	
KI-Discus test		Yes	
UV light intensity		Yes	
Sound test		Yes	
*) A yearly electrical inspection is mandatory in most locations (national regulations to be observed)			

10.4 The factory quality test of the ReVo and ReVo Pro cabinets

The factory quality test of the cabinets is designed to ensure that the cabinet is functioning in accordance with requirements and specification before being shipped to the customer.

10.5 The factory check list and factory test report

The factory check list and factory test report is designed for the ReVo and ReVo Pro cabinets specifically. They document all quality related activities performed during the production through testing and cleaning when the cabinet is ready for packing and shipment.

A filled in and reviewed check list and test report is shipped with each cabinet.

10.6 Test equipment needed to perform installation tests and service tests

The test equipment needed to perform installation and service test are:

Test	Equipment
Leak test of HEPA filters	Smoke generator and aerosol photometer or particle counter and diluter
Downflow air velocity and setting of alarms	Thermo-anemometer
Inflow air velocity and setting of alarms	Thermo-anemometer
Test of alarms	No equipment needed
Light test	Light meter
Airflow pattern test	Smoke stick or similar

All equipment used should be of a suitable quality and should be calibrated where deemed necessary in compliance with EN 12469.

10.7 Test information

For more detailed information on the individual tests please refer to the factory test report delivered with the cabinet.

During installation and service testing, the values measured during the factory test are the target values to be reached as close as possible.

From the factory, all parameters and functions has been set to ensure that all requirements are meet and that the cabinet will protect the samples handled, the operator doing the work and the environment in the surrounding room.

All tests should be done by authorized test technician approved by Labconco.

11 Options for ReVo and ReVo Pro cabinets

A number of optional components can be fitted to the ReVo and ReVo Pro cabinets.

The cabinets can be ordered with these options or the options can be retro-fitted by trained service technicians.

The most common options are listed below. Contact your distributor or Labconco for availability of other options.

11.1 LED light

LED lighting is standard. LED lighting provided with the cabinet is dimmable.

The use of LED light saves on energy versus traditional fluorescent light tubes.

The control system allows the user to adjust the intensity from 56% which is more than 800 Lux, to the reachable light level is about 2000 Lux equal to 100% in the standard cabinets, measured on the table tops.

11.2 Table tops

The ReVo and ReVo Pro cabinets are, as default, delivered with V-shaped divided table tops in AISI 304 stainless steel.

A number of alternatives can be delivered to suit different types of working processes. Contact Labconco for more information.

11.3 PIR sensor

PIR sensor can be delivered or retro-fitted by a qualified technician.

Product name	Catalogue No.
PIR sensor - turns automatically to full speed and light upon any movement	Contact Labconco

11.4 Utility valves

Utility valves are mounted in the side windows as default. The connection to the utility supplies cannot be done by Labconco.

If optional valves for utilities are delivered, make sure that local rules and regulations are complied with during installation and use. It is generally recommended, to use an authorized technician for this kind of work. Make sure that local rules and regulations regarding such installations are strictly complied to.

Valves suited for any utility medium can be delivered.
Optionally they can be mounted in the back wall.

Product name	Catalogue No.
Valve, gas	Contact Labconco
Valve, vacuum	R3747500
Valve, carbon dioxide	Contact Labconco
Valve, nitrogen	Contact Labconco
Valve, compressed air	Contact Labconco
Valve, oxygen	Contact Labconco
Valve, water	Contact Labconco

12 TÜV/GS marking

A selection of ReVo and ReVo Pro cabinets have been certified and granted the GS mark.

Below the models and the equipment certified are listed:

Model	GS	Power outlets	Side windows with three holes (plugged)	Utility valves	PIR sensor	Non-default table tops	Weighing stone
ReVo 900							
ReVo 1200	Y	Y	Y	Y	Y		
ReVo 1500							
ReVo 1800	Y	Y	Y	Y	Y		
ReVo Pro 900							
ReVo Pro 1200	Y	Y	Y	Y	Y		
ReVo Pro 1500							
ReVo Pro 1800	Y	Y	Y	Y	Y		

13 Annex 1 - Factory check list and factory test report

Class II Microbiological Safety Cabinet	Factory Check List ReVo/ReVo Pro 900,1200,1500,1800	LABCONCO

ReVo:		ReVo Pro:		Serial no:	
Size:					
Made by:					
Order number:					
Customer:					
Cabinet voltage and frequency:					

Factory checklist and test report reviewed by:	
Date of review:	
Check list and report - all accepted:	Yes ☐ No ☐

Class II Microbiological Safety Cabinet	Factory Check List ReVo/ReVo Pro 900,1200,1500,1800	LABCONCO

Test Technician			
	Pass	Fail	N/A
Check all window functions:			
Check light functions always set in safe mode:			
Check UV-light in safe mode:			
Check electrical sockets phase/neutral/earth:			
Smooth start-up of fans:			
Check cable bushings:			
Check PIR-sensor function, fan and lights in safe mode:			
Check solenoid gas valve function:			
UK fuses and labels:			
Check that cabinet is according to the order:			
Checked by date/signature:			

Class II Microbiological Safety Cabinet	Factory Check List ReVo/ReVo Pro 900,1200,1500,1800	LABCONCO

Cleaning			
	Pass	Fail	N/A
Check windows for defects:			
Check all silicone seal:			
Check damper for lamp shade:			
Check plastic plugs inside windows:			
Check that the laminator is correctly mounted and with locking screw:			
Check retaining clamp on power inlet:			
Cleaning of surfaces, window, and trough:			
Check name plate and test label:			
Check order:			
Check factory test report is correctly filled and signed:			
Checked by date/signature:			

Class II Microbiological Safety Cabinet	Factory Check List ReVo/ReVo Pro 900,1200,1500,1800	LABCONCO

Builder			
	Pass	Fail	N/A
Check of internal checklist:			
Checked by Date / Signature:			

Builder			
	Pass	Fail	N/A
Check for sharp edges on tabletop/tabletops:			
Check top plate is mounted:			
Checked by date /signature:			

Shipment			
	Pass	Fail	N/A
For GS (TÜV) cabinets make sure that the cabinet is in "TÜV" mode before packing and shipping:			
Checked by date /signature:			

Class II Microbiological Safety Cabinet	Factory Test Report EN 12469 ReVo/ReVo Pro 900,1200,1500,1800	LABCONCO

ReVo		ReVo Pro		Serial No.	
Model / Size:					
Order No.					
Customer:					

Important:

Let the cabinet run for 30 minutes with light on, before measurement,
all measurements, listed in this report, must be carried out for factory testing.

Main fans:	Serial no:	Date/signature:
	Serial no:	
	Serial no:	
Exhaust fan:	Serial no:	Date/signature:
Controller board PCB:	Serial no:	Date/signature:
	Software version no.:	Date/signature:
Display board:	Software version no.:	

Class II Microbiological Safety Cabinet	Factory Test Report EN 12469 ReVo/ReVo Pro 900,1200,1500,1800	LABCONCO

Leak test
Main filter, exhaust filter 1, pre-filter*, exhaust filter 2 **if installed.
Instrument used: Aerosol photometer.
According to Annex D in EN 12469.
Filter certificates according to EN 1822 must be present and attached to this report.

Main filter			
Make:	Size:	x457x115/ H14	
Serial no.			
Aerosol concentration ≥ 10 µg/l		☐ Pass	☐ Fail
Leakage scanning < 0,01%		☐ Pass	☐ Fail
Date/signature:			

Exhaust filter			
Make:	Size:	x457x69/ H14	
Serial no.			
Aerosol concentration ≥ 10 µg/l		☐ Pass	☐ Fail
Leakage scanning < 0,01%		☐ Pass	☐ Fail
Date/signature:			

Exhaust filter 2 - If installed			
Make:	Size:	x457x115/ H14	
Serial no.			
Aerosol concentration ≥ 10 µg/l		☐ Pass	☐ Fail
Leakage scanning < 0,01%		☐ Pass	☐ Fail
Date/signature:			

Pre-filter - If installed					
Make:		Size:	600X86,5X202/ H14 (9/12/15/18)		
Serial no:					
Aerosol concentration ≥ 10 µg/l				☐ Pass	☐ Fail
Leakage scanning < 0,01%				☐ Pass	☐ Fail
Date/signature:					

Aerosol Photometer ID-no:	
Calibration date:	

Class II Microbiological Safety Cabinet	Factory Test Report EN 12469 ReVo/ReVo Pro 900,1200,1500,1800	LABCONCO

Air velocity in laminar flow According to Annex G EN 12469							
Down flow is measured in at least 8 positions in horizontal plane 50 - 100 mm over top edge of the window opening. minimum 4 positions 125 mm from the back wall and 4 positions 200 mm from the front window. With spacing from left side according to the matrix below:							
150 mm	450 mm	750 mm	1050 mm	1350 mm	1650 mm	ReVo/ ReVo Pro 1800	
150 mm	450 mm	750 mm	1050 mm	1350 mm		ReVo/ ReVo Pro 1500	
150 mm	450 mm	750 mm	1050 mm			ReVo/ ReVo Pro 1200	
112,5 mm	337,5 mm	562,5 mm	785,5 mm			ReVo/ ReVo Pro 900	
m/s	m/s	m/s	m/s	m/s	m/s		
m/s	m/s	m/s	m/s	m/s	m/s		
Highest:		m/s	Lowest:		m/s		
Average:		m/s	Accept: 0,28 m/s ± 0,01 m/s			☐ Pass	☐ Fail
Average + 20%:		m/s	Average - 20%:			m/s	
Temperature outside cabinet:		°C	Temperature inside cabinet:			°C	
Fan speed setting H:			Fan speed setting L:				
Alarms setting H:			Alarms setting L:				
Date/signature:							
Thermo Anemometer ID-no:							
Calibration date:							

Class II Microbiological Safety Cabinet	Factory Test Report EN 12469 ReVo/ReVo Pro 900,1200,1500,1800	LABCONCO

Test of inflow
According to Annex G EN 12469

The air velocities are measured with a thermo anemometer in the 50 mm opening of the front window and divided by 4 to have the mean inflow.

To ensure good repeatability the custom fixture for the anemometer probe must be used.

Thermo Anemometer equation:

Calculated value = mean velocity x area front aperture x 3600.

Example: 0,45 m/s x 1,2 m x 0,2 m x 3600 s/h = 389 m^3/h for ReVo/ReVo Pro 1200.

Test airflow speed at window work opening 50 mm up to 6 positions.						
150 mm	450 mm	750 mm	1050 mm	1350 mm	1650 mm	ReVo/ ReVo Pro 1800
150 mm	450 mm	750 mm	1050 mm	1350 mm		ReVo/ ReVo Pro 1500
150 mm	450 mm	750 mm	1050 mm			ReVo/ ReVo Pro 1200
112,5 mm	337,5 mm	562,5 mm	785,5 mm			ReVo/ ReVo Pro 900
m/s	m/s	m/s	m/s	m/s	m/s	Accept ≥ 1,80 m/s
Calculated airflow speed up to 6 positions. (Measured / 4) m/s.						
m/s	m/s	m/s	m/s	m/s	m/s	Accept ≥ 0,45 m/s

Calculated mean velocity:	m/s	☐ Pass	☐ Fail
Calculated volume:	m^3/h		
Fan speed setting H:		Fan speed setting L:	
Inflow alarm settings: High = Average + 20%, Low = Average – 20 % MINIMUM 0,40 m/s			
Alarms setting H:		Alarms setting L:	

Measured inflow volume						
Model	ReVo 900	ReVo 1200	ReVo 1500	ReVo 1800		
Accept ≥	292 m^3/h	389 m^3/h	486 m^3/h	583 m^3/h	☐ Pass	☐ Fail

Date/signature:	
Thermo Anemometer ID-no:	
Calibration date:	

Class II Microbiological Safety Cabinet	Factory Test Report EN 12469 ReVo/ReVo Pro 900,1200,1500,1800	LABCONCO

Test of alarms Low flow and incorrect window position			
Procedure for activate alarms: T1 = Disconnect, T2 = Activate component, T3 = Other. Check that cabinet returns to running mode after removal of cause of alarm. Check also that the correct message is displayed on control panel.			
Alarm	Procedure		
Window higher than work opening:	T2 Window.	☐ Pass	☐ Fail
Window lower than work opening:	T2 Window.	☐ Pass	☐ Fail
Alarm for low flow:	T3 Let cabinet run reduced speed.	☐ Pass	☐ Fail
Alarm for power failure:	T1 Disconnect.	☐ Pass	☐ Fail
Date/signature:			

Light test			
Adjust light to 100% on the control panel and wait 10 minutes before measuring. Measure the background light, and then place the light sensor on the table top and measure the light inside the cabinet. Accept: 800 Lux on the table top.			
Background light:	Lux		
Light inside cabinet > 800 Lux:	Lux	☐ Pass	☐ Fail
Date/signature:			
Lux-meter ID-no:			

Air flow pattern test		
Demonstrate by use of smoke that the airflow is laminar, downwards without turbulences over the work surface, and that the smoke inside the cabinet does not leave through the work opening.		
	☐ Pass	☐ Fail
Date/signature:		

High voltage test				
Test instruction: According to high voltage test instrument manual.				
Test	Acceptance	Result		
High voltage test:	2000 V	V	☐ Pass	☐ Fail
Date/signature:				
Test instrument ID-no:				
Calibration date:				

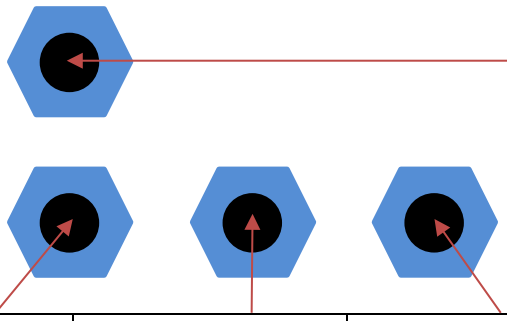
Electrical test				
Test instruction: According to Fulltest instrument manual.				
Test	Acceptance	Result		
Consumption with light on:		A		
Consumption with light off:		A		
Minimum leak resistance to earth:	2 MΩ	MΩ	☐ Pass	☐ Fail
Maximum resistance to Earth:	0,1 Ω	Ω	☐ Pass	☐ Fail
Maximum leak current:	3,5 mA	mA	☐ Pass	☐ Fail
Date/signature:				
Fulltest instrument ID-no:				
Calibration date:				

13.1 DOP challenge and measuring valves

The number of DOP valves on the different sizes and models vary. Below a description of the positions and functions are described for all models.

13.1.1 ReVo cabinets

ReVo cabinets have up to 4 DOP valves, placed under the top plate, which needs to be removed to gain access to the DOP valves.



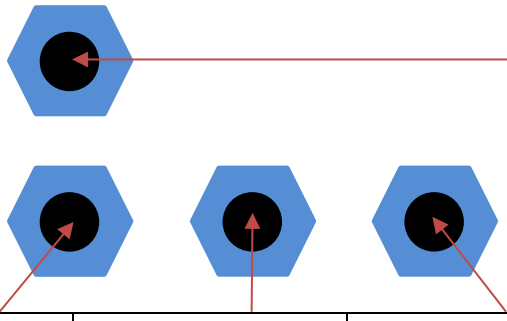
	Downflow 1	Downflow 2	Downflow 3	Exhaust
ReVo 900	Upstream measurement	Upstream measurement	N/A	Upstream measurement
ReVo 1200	Upstream measurement	Upstream measurement	N/A	Upstream measurement
ReVo 1500	Upstream measurement	Upstream measurement	Upstream measurement	Upstream measurement
ReVo 1800	Upstream measurement	Upstream measurement	Upstream measurement	Upstream measurement

Warning - Positive pressure in DOP valves

Must be closed and tightened before normal operation. Refer to manual for details.

13.1.2 ReVo Pro cabinets

The ReVo Pro cabinets has up to 7 DOP valves, 4 placed under the top plate, that needs to be removed to gain access to these DOP valves, and up to 3 under the working table on the front of the prefilter box.



	Downflow 1	Downflow 2	Downflow 3	Exhaust
ReVo 900	Upstream measurement	Upstream measurement	N/A	Upstream measurement Exhaust filter and downstream prefilters
ReVo 1200	Upstream measurement	Upstream measurement	N/A	Upstream measurement
ReVo 1500	Upstream measurement	Upstream measurement	Upstream measurement	Upstream measurement
ReVo 1800	Upstream measurement	Upstream measurement	Upstream measurement	Upstream measurement

Challenge of main downflow and exhaust filters is done through 1, 2 or 3 DOP valves placed under the working table on the front of the prefilter box.

	**Warning**
	Must be closed and tightened before normal operation. Refer to manual for details.

14 Annex 3 - Service log book

Type:	Product name:	Serial no.:	Supplier:

Service interval _____ **Location** _____

Service /repair	Fault occurred on	Notified/date	Repaired/date	Remark/fault	Caused by/action	Service vendor	Carried out by

15 Annex 4 - Decontamination statement

Statement regarding personal safety for repair/inspection

Labconco is legally obliged to protect its employees from all dangers. We therefore kindly ask you to copy and complete this statement before work is commenced.

Subject: Service report no. _____ Service agreement no. _____

The undersigned hereby declares that the above repair/inspection will not expose the service technician to hazardous biological, chemical or radioactive agents. Reservations, if any, may be indicated here (e.g., use of gloves, respiratory gear, etc.).

Date	Name in block letters	Signature

16 Annex 5 – Declaration of comformity – ReVo

Declaration of conformity

We: Labconco Corporation
8811 Prospect Avenue
Kansas City, MO 64132USA
Ph. +1 816-333-8811 Fax. 816-363-0130
www.labconco.com

being the representative party solely responsible for this certification, hereby declare that the following products:

Equipment: ReVo Class II Microbiological Safety Cabinet
Type, Models: 3R2xxxxxx and 3T2xxxxxx
Manufacturer: LaboGene A/S
Bjarkesvej 5, 3450 Allerød, Denmark
Ph. +45 39 40 25 66
Mail info@labogene.com

are in accordance with the following directives:

2006/42/EC - Machinery Directive, as amended
2006/95/EC - Low Voltage Directive, as amended
2004/108/EC - EMC Directive, as amended
2011/65/EU - RoHS Directive
2012/19/EU - WEEE Directive

are in conformity with the standards listed below:

EN 12469 - Biotechnology - Performance criteria for microbiological safety cabinets
EN ISO 14644 - Cleanrooms and associated controlled environments
EN 61010-1 - Safety requirements for electrical equipment for measurement, control and laboratory use - General requirements
EN 61000-6-3, EN 61000-6-1 - Electromagnetic compatibility - Generic immunity/emission standard
EN ISO 11201 – Acoustics – Noise emitted by machinery and equipment

when installed and operated in accordance with the manufacturer's installation and operating instructions.

Allerød, September 2022

Rasmus Sørensen
QA Manager
LaboGene A/S, Bjarkesvej 5, 3450 Allerød, Denmark

27092022QA

CE

17 Annex 6 – Declaration of conformity – ReVo Pro

18 Annex 7 – Shortform manual ReVo

Basic Functions

Turn cabinet on/off.
When light in this button - it is safe to work in the cabinet.

Reduced fan speed - Standby.
It is not allowed to work in the cabinet. Alarm is on.

Alarm – when alarm is on it is unsafe to work in the cabinet.
Press for turning alarm off. Call for technical assistance.

Light on/off.

UV-Light on/off

Turn external unit on/off (if the unit is installed)

Alarms

POWER UP ERROR
This alarm shows that the cabinet has been turned off. It is activated by a restart of the cabinet or when a power failure has occurred.
Press ENTER to turn this alarm off.

FLOW ALARM HIGH / LOW
Flow-Alarm can be activated by the 2 airflow sensors.
HIGH alarm when airflow is too high and LOW alarm when air flow is too low.
These alarms are cancelled when the reason is eliminated.

WINDOW ERROR
This alarm shows when the window position is incorrect according to the correct working requirements.
When window is repositioned to correct position, alarm will turn off.

Working principle

- Read the manual
- Turn on the cabinet 15 minutes before start using
- Use slow movements when working in the cabinet
- Do not work in the cabinet while having reduced fan speed
- Avoid transportation in and out of the working area while working
- Do not store equipment in the working area

SAFE WORKING AREA
To obtain maximal security during working in the cabinet – an area of 50 mm to be free of equipment at the rear edges, side edges and front edges of the working area inside the cabinet.

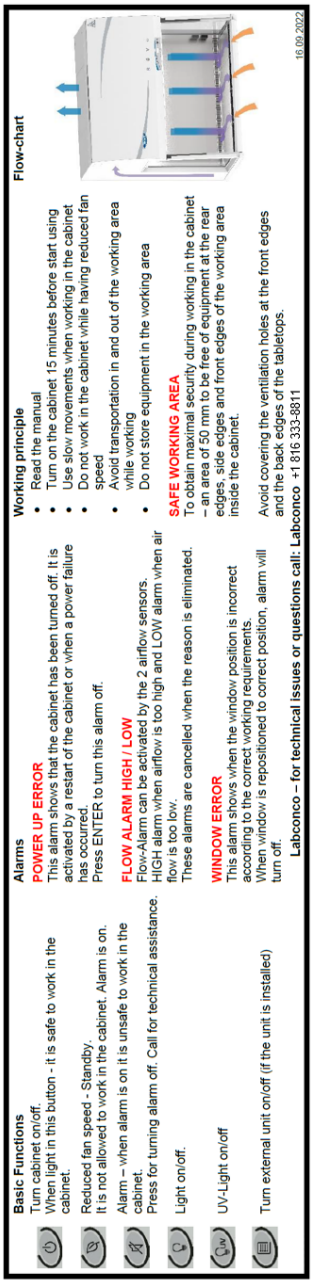
Avoid covering the ventilation holes at the front edges and the back edges of the tabletops.

Flow-chart

Labconco – for technical issues or questions call: Labconco +1 816 333-8811

16.09.2022

19 Annex 8 - Shortform manual ReVo Pro



Basic Functions

Turn cabinet on/off.
When light in this button - it is safe to work in the cabinet.

Reduced fan speed - Standby.
It is not allowed to work in the cabinet. Alarm is on.

Alarm – when alarm is on it is unsafe to work in the cabinet.
Press for turning alarm off. Call for technical assistance.

Light on/off.

UV-Light on/off

Turn external unit on/off (if the unit is installed)

Alarms

POWER UP ERROR
This alarm shows that the cabinet has been turned off. It is activated by a restart of the cabinet or when a power failure has occurred.
Press ENTER to turn this alarm off.

FLOW ALARM HIGH / LOW
Flow-Alarm can be activated by the 2 airflow sensors.
HIGH alarm when airflow is too high and LOW alarm when air flow is too low.
These alarms are cancelled when the reason is eliminated.

WINDOW ERROR
This alarm shows when the window position is incorrect according to the correct working requirements.
When window is repositioned to correct position, alarm will turn off.

Labconco – for technical issues or questions call: Labconco +1 816 333-8811

Working principle

- Read the manual
- Turn on the cabinet 15 minutes before start using
- Use slow movements when working in the cabinet
- Do not work in the cabinet while having reduced fan speed
- Avoid transportation in and out of the working area while working
- Do not store equipment in the working area

SAFE WORKING AREA
To obtain maximal security during working in the cabinet – an area of 50 mm to be free of equipment at the rear edges, side edges and front edges of the working area inside the cabinet.

Avoid covering the ventilation holes at the front edges and the back edges of the tabletops.

Flow-chart

16.09.2022

20 Annex 9 – Decontamination procedure for ReVo and ReVo Pro cabinets

Decontamination is a very important issue regarding all service and maintenance work to be done on the cabinets.

Before any work can be done in the potentially contaminated parts of the cabinet, a decontamination must be performed, and a statement regarding safe conditions for working in the cabinet must be issued and presented to the technician who will be working on the cabinet.

Labconco has chosen to recommend one method for decontamination of the ReVo and ReVo Pro cabinets, and have this method validated to ensure, that it is efficient and will create the safe

conditions, that is needed, for the service technician to work in the cabinets otherwise contaminated areas. The same procedure is used on ReVo (two-filter model) and ReVo Pro (three-filter model), which means that it is designed and designed to cope with the “worst case” cabinet, the ReVo Pro 1800. The validation of the decontamination process has been performed using chemical and biological indicators from BIOQUELL. Labconco cannot guaranty the same high efficiency of the decontamination process for any other biological agents. Therefore, it is recommended that the user performs a validation of the decontamination process using the actual biological agent handled in the cabinet.

As decontamination using formaldehyde is getting banned in more and more countries, Labconco recommends using hydrogen peroxide (VHP). Several different manufacturers produce equipment, that will perform this process. Each has some requirements, that needs to be fulfilled by the cabinet during the decontamination process.

Labconco can supply VHP connection points to fit all existing decontamination systems. Labconco has chosen to recommend the BIOQUELL Clarus S system, as no permanent changes to the Labconco ReVo and ReVo Pro cabinets are needed for the decontamination process to be performed. Further this system runs the decontamination process under negative pressure inside the cabinet, which ensures, that no hydrogen peroxide escapes to the surroundings during the process. This equipment is designed for use in biological safety cabinets and other small enclosures, which offers several advantages regarding setup, operation and safety without compromising on the effectiveness of the decontamination process.

Operating principle for the BIOQUELL Clarus S system

The BIOQUELL Clarus S system consists of 3 units:

- The generator
- The internal catalyst
- The external catalyst

The hydrogen peroxide generator and internal catalyst are placed on the work tray. Both are connected via cable to the control panel located outside the cabinet, placed on top of the external catalyst. One cable passes under the nearly closed front window of the cabinet. Also, through this opening is the test tube for the pressure gauge that continuously monitors the air pressure in the taped-up cabinet during the decontamination process.

During the decontamination (gassing) cycle, the generator evaporates the liquid hydrogen peroxide inside the working chamber, while the internal catalyst is turned off. The external catalyst extracts the air and vapor from the top of cabinet through the 3” hose to create negative pressure inside the cabinet, bypasses the carbon filter inside the catalyst, then injects it back into the work zone via a 1” hose connected to the inlet port mounted in one of the standard holes in the side window of the cabinet.

This loop re-circulates the hydrogen peroxide vapor while maintaining negative pressure of – 15-20 Pa inside the cabinet. To reach this level of under pressure inside the cabinet, the cabinet is sealed using tape on the top, the front and side windows. An opening of about 20 mm is left in the opening where the cable and the pressure test tube is passing out and into the cabinet. During the entire process, the cabinet is set to run at reduced speed to create the maximum circulation of the vaporized hydrogen peroxide. This is critical for the successful decontamination of the “clean” side of the exhaust filter on the three-filter ReVo Pro cabinets.

During the aeration (neutralization) cycle, the internal catalyst is turned on, to absorb the hydrogen peroxide vapor. This process is expedited by passing the re-circulating air and vapor through the

carbon filter inside the external catalyst, that was bypassed during the decontamination cycle. Cabinet fan is kept running at reduced velocity during this cycle.

Setup and process parameters

The setup of the decontamination process is dimensioned after the “worst case” cabinet, i.e. the ReVo Pro 1800. To keep it simple Labconco recommends using the same procedure for all types and sizes of cabinets.

155 ml of the 35% hydrogen peroxide (as supplied by BIOQUELL) is used for the decontamination. The Clarus S is set to 155 ml giving a gassing period of 80 minutes and an aeration period of 4 hours 10 minutes. Experience show that the aeration on the ReVo Pro cabinets will take longer, as the hydrogen peroxide in the prefilters is hard to remove. Check the concentration using a gas detection probe.

Ambient conditions during the decontamination process are not critical. As a guideline the values below are mentioned:

Ambient temperature in the range 15-35 °C and relative humidity under 85 %.

After the aeration process is finished, check the hydrogen peroxide concentration in the working chamber through the opening in the sealing of the front window using a gas detection probe. Make sure the cabinet is still running at reduced velocity. Once the concentration is below 1ppm, the sash window can be opened, and the concentration in the prefilters can be measured. As long as the cabinet is running no hydrogen peroxide will escape to the room.

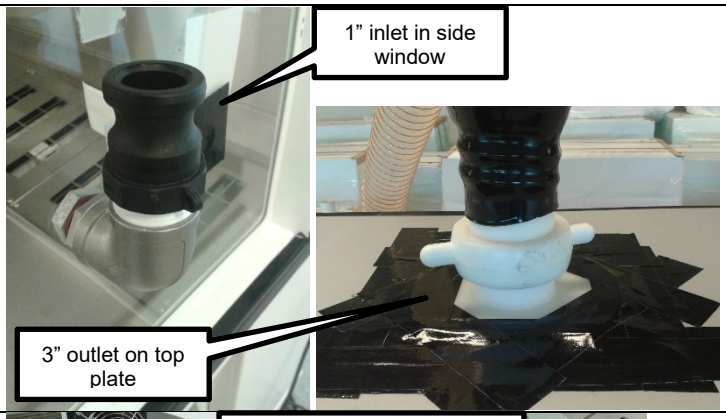
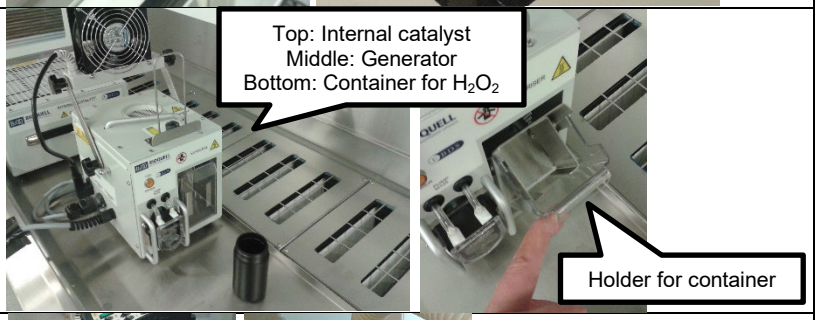
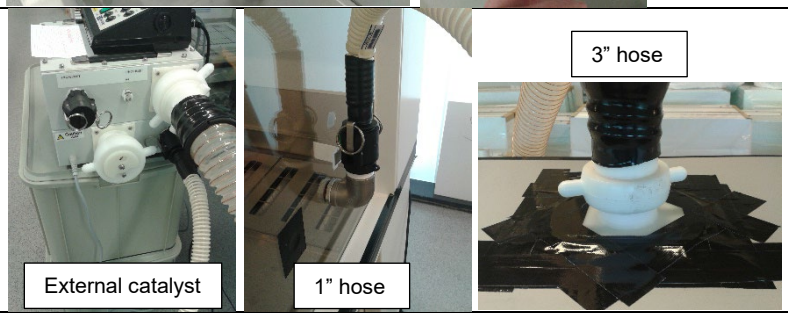
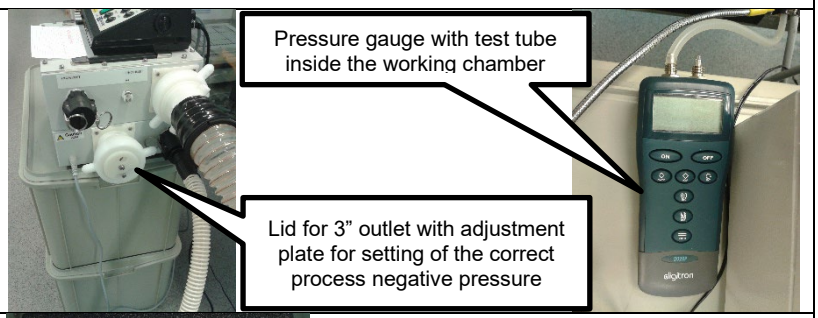
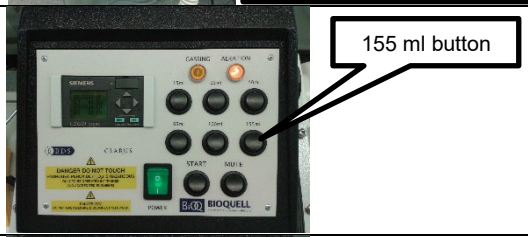
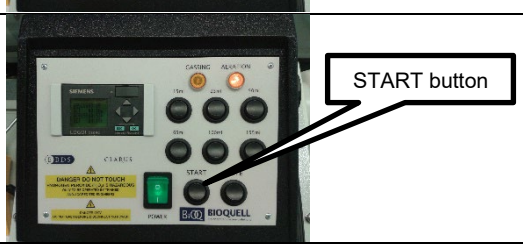
The decontamination process as described above has been validated using biological indicators. The process has been performed 3 times, with a kill-rate of at least 6-log in every part of the cabinet and even on the clean side of the exhaust filter. This means, that it is enough to use a few chemical indicators during the normal decontamination process. This will give the user a quick and reliable check of the efficiency of the process.

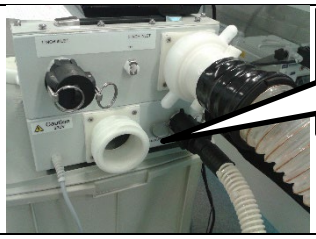
Step by step procedure – decontamination of ReVo and ReVo Pro cabinets

1	**Prepare the cabinet**	Empty the cabinet. Remove all equipment that are not necessary for the decontamination process. It is recommended to remove the table tops on the ReVo Pro cabinets and place the decontamination equipment directly in the trough. Mount the 1” inlet in one of the standard holes in the side window. Mount the cover plate with the 3” outlet over the exhaust opening on the cabinet and seal using adhesive tape. Be careful not to damage the exhaust flow sensor during the installation process.
2	**Place the BIOQUELL equipment in the cabinet**	The generator and the internal catalyst is placed either on the table tops or directly in the trough. Make sure all connections are in place. Fill the bottle with 155 ml hydrogen peroxide and place it in the generator. The fan on the generator must point downwards.
3	**Connect the hoses to the Clarus S equipment and the cabinet.**	The 3” hose is connected to the adaptor on the cover on the top of the cabinet and to the external catalyst. The 1” hose is connected to the adaptor on the side-window and the outlet on the external catalyst.
4	**Tape up the cabinet**	Close the front window until the cable from the generator is lightly touched. Place the test tube for the pressure gauge beside the above-mentioned cable and secure them both to the armrest using adhesive tape. Turn on the cabinet at reduced velocity and turn on the Clarus S equipment. Precede to tape joints and openings starting from the top of the cabinet. Working your way downwards make sure the side windows, the front lid and the front window gets sealed. Leave an opening of about 20 mm around the cable and the test tube. Keep sealing until a negative pressure of about 100 Pa is reached.
5	**Adjust the pressure in the cabinet**	Using the slider on the lid on the 3“outlet on the external catalyst, the operating pressure of between -15 and -20 Pa is set.
6	**Setting up the Clarus controller**	Press the “155 ml” button and check that the display shows the correct process setup.
7	**Start the decontamination process**	Press the “start” button and check that the control light on the generator is turned on. After warming up the pump on the generator will start rotating. Using the gas detector probe check for any leaks when the gassing process is running.
8	**Transition from gassing to aeration**	When the gassing is complete, an audible signal will be activated. Mute this by pressing the “mute” button on the control panel. Remove the cover on the 3” outlet on thee external catalyst to let as much air through as possible. The negative pressure in the cabinet will increase to more than 2000 Pa (the pressure gauge is overloaded).
9	**During aeration**	Check regularly that there is no leak of hydrogen peroxide.

10	**After aeration**	Check the concentration inside the working chamber. If it is 1 ppm or less, the cabinet is safe and can be opened completely. On ReVo Pro cabinets the concentration must be measured inside the prefilters, where some hydrogen peroxide will probably be found even with the working chamber clean. Keep the cabinet running – the front window can be set at normal work opening during the period as long as the cabinet is still running at reduced velocity.
11	**Ending the decontamination process**	When concentration is under 1 ppm, the Clarus S can be turned off and removed from the cabinet. Clean the cabinet and restore it to normal operating conditions, ready for use.

Pictures for step by step decontamination procedure

1	**Prepare the cabinet**	
2	**Place the BIOQUELL equipment in the cabinet**	
3	**Connect the hoses to the Clarus S equipment and the cabinet.**	
4	**Tape up the cabinet**	
5	**Adjust the pressure in the cabinet**	
6	**Setting up the Clarus controller**	
7	**Start the decontamination process**	

8	**Transition from gassing to aeration**	 During aeration the lid for the 3” outlet is removed to increase the airflow – the negative pressure in the cabinet will increase significantly.
9	**During aeration**	 Cabinet is running at reduced velocity during the entire decontamination process