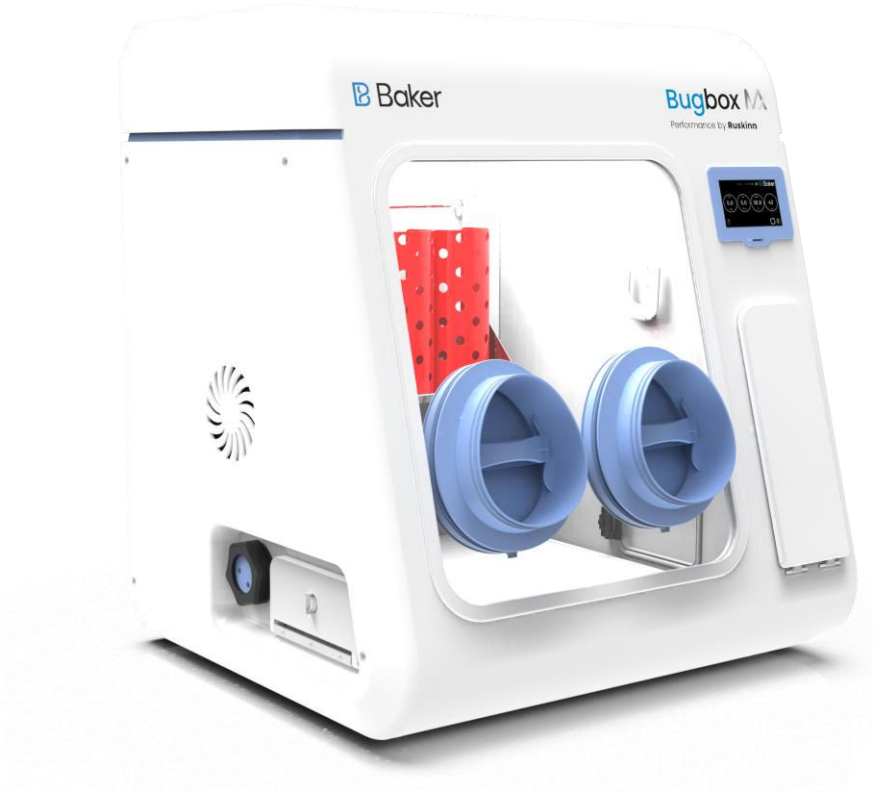
Bugbox Mx

Anaerobic & Microaerophilic Workstations



UM-054

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Product Summary

The Baker Bugbox Mx workstation allows you to isolate cells in a chamber that accurately maintains and controls temperature, humidity, oxygen and carbon dioxide. With the Bugbox Mx, you can study even the most complex cell interactions under perfect microaerophilic or anaerobic conditions.

Features and Benefits

- Compact size - Your personal workstation
- Quick and easy direct access with the gloveless, cuffed Ezee Sleeve system.
- Energy saving lighting. Read plates easily under perfect illumination without O_2 exposure.
- Petri dish holders for quick plate transfer included.
- Optimum cell environment
    - Accurate temperature control - from ambient + 5˚C to 45˚C.
    - Accurate and automated humidity control - no dry spots.
    - Accurate control over O2 (0.1% - 20.9% in 0.1% increments, can reach 23.0% using separate 25% O2 cylinder) and CO2 (0.1% - 30% in 0.1% increments).
    - Ezee Sleeve system allows access without disrupting atmosphere within the chamber.
- Economic and reliable long-term savings
- Standard dual gas operation - low gas consumption and running costs.
- Lower cost per plate compared to anaerobic jars.
- Minimal maintenance and downtime - with annual or biennial preventative maintenance kits available.

Note: The use of the word Interlock in this manual is medical terminology, and refers to the environmental working area between both chambers. It does not refer to the engineering safety interlock switch mechanism.

Table of Contents

Product Summary 2

Features and Benefits 2

1. Safety instructions 6

1. Regulatory compliance 7

1.1 North American Region 8

1.2 Precautions 8

1.3 Symbols 9

1.4 Weight and dimensions 10

2. Transport and storage 11

3. Location and handling of the Bugbox Mx workstation 11

4. Environmental Operating Conditions 11

5. Service Requirements 12

5.1 Electrical Supply Requirements 12

5.2 Gas Supply Requirements 13

6. Workstation overview 14

6.1 Workstation layout 14

6.2 Component layout 14

6.2.1 Front view 14

6.2.2 Rear view 15

6.2.3 Left side view – Standard humidifier 16

6.2.4 Right side view 17

6.3 Control system layout 18

6.3.1 Control panel 18

6.4 Temperature control 19

6.5 Interlock Purge 20

6.6 Humidity control 21

6.6.1 Aquasorb Sachets 21

6.7 Settings Menu 22

6.7.1 Gas Control Menu 23

6.7.2 Time & Date Settings 24

6.7.3 Offsets 25
6.7.4 Data Log 26
6.7.5 O2 Calibration 27
6.7.6 Micro SD Card 28
6.7.7 Hypoxic Cycling 29
6.7.8 Anoxic Mode 31
7. Environmental gas composition control 32
7.1 Environmental control overview 32
8. Using the workstation 33
8.1 Using the interlock 33
8.1.1 Interlock overview 33
8.1.2 Opening the interlock outer door 33
8.1.3 Opening the interlock inner door 33
8.1.4 Transferring material into the workstation chamber via the interlock 34
8.1.5 Removing material from the workstation chamber via the interlock 34
8.2 Hand access to the main chamber 35
8.3 Vacuum Operation 36
8.4 Workstation Entry 38
8.5 Workstation Exit 40
8.6 Rear shelf 41
8.7 Optional extras 41
8.7.1 Single Plate Entry System (SPES) 42
8.7.2 Internal power socket 43
8.7.3 Cable gland 43
8.7.4 Universal cable gland 43
8.7.5 Gas sample port 44
8.7.6 Vacuum port 44
9. Cleaning and maintenance 46
9.1 Cleaning the workstation 46

9.1.1 Cleaning agents 46
9.1.2 Cleaning procedure – during and after each use 46
9.1.3 Cleaning procedure – deep clean 47
9.2 Maintaining the workstation – End user maintenance 48
9.2.1 Replacing the mains plug fuse – UK users only 48
9.2.2 Replacing the mains fuses 49
9.3 Service requirements 50
9.4 Spare parts and accessories 50
9.4.1 Overview 50
9.4.2 Spare parts and cleaning agents 51
9.4.3 Accessories 51
9.5 Workstation malfunction 52
9.6 Common problems and solutions 53
9.6.1 Workstation general problems 53
9.6.2 Gas consumption/ environmental control problems 54
10. Warranty information 55
11. Contact details 56

Please read this manual carefully before using the Bugbox Mx and familiarise yourself with all aspects of using the workstation. The Baker Company (Baker) or Ruskinn Technology Ltd (Ruskinn) does not accept responsibility for accidents to personnel or damage to the Bugbox Mx workstation resulting from incorrect use.

The Bugbox Mx has been specifically designed and developed to meet the requirements of all laboratories. The unit is ergonomically laid out to ensure maximum operator comfort and optimization of space for media preparation, manipulation, and analysis.

A heater system maintains the temperature within the workstation between ambient +5°C to 45°C, which is set by the user.

Many unique features of the Bugbox Mx workstation are covered in detail in this manual. It is recommended that the user be fully conversant with the instruction and procedures, and that the operator familiarises themselves with all aspects and functions of the system before it is commissions to maintain optimum performance.

1. Safety instructions

The Baker Company do not take any responsibility for damages caused by using the equipment for other purposes than described in this user manual.

- The mains appliance coupler and plug are the AC mains supply isolation device and must be easily accessible when installed.
- In case of emergency disconnect the Bugbox Mx from the AC Mains Outlet.
- Ensure that the connecting cable is not squeezed or bent when the unit is being installed or moved.
- All installation work and adjustments to the unit must be carried out by qualified personnel. Work performed by persons with insufficient technical knowledge may adversely affect the performance of the unit or cause physical injury or damage to the equipment.
- All servicing and repairs must be carried out by a qualified customer service engineer. Only genuine spare parts must be used.
- In case of damage to the Bugbox Mx disconnect the workstation from the mains outlet and contact your local distributor.
- All covers and lids must only to be removed by a qualified service engineer.
- Nothing should be placed on the top of the workstation.
- A power cord supplied with the workstation and should be used to connect to the mains outlet. If a replacement is required it must be adequately rated for the application.
- All cables and pipes should be routed to ensure that they do not pose a trip hazard.
- Mains supply Voltage fluctuation must not exceed ±10% of the nominal Voltage.
- Gas regulators must be used for each gas supply. A 2 stage regulator is recommended with a maximum supply pressure of 5 Bar. Over pressure could damage the workstation.
- Only the gases specified in this user manual may be used.
- All gas bottles must be adequately secured before connection to the workstation.
- The maximum power rating of the internal sockets must not be exceeded.
- The end user is responsible for all materials and equipment places inside the workstation.
- Before connecting any equipment to the internal mains sockets ensure that the equipment has or is connected to a protective earth. If in doubt please contact the equipment manufacturer.
- The workstation must not be operated at an ambient temperature over 30°C.
- The cooling fan covers and cooling vents must not be covered or blocked.
- The weight limit for the workstation internal floor is 30kg and must be evenly distributed.
- The weight limit for the interlock is 5kg and must be evenly distributed.
- There should be no naked flames close to the workstation.
- The use of radioactive materials if strictly prohibited.

CAUTION: Asphyxiation Risk

The Bugbox Mx uses Nitrogen (N_2) and Hydrogen in Nitrogen (H_2N_2) as part of normal use with the volume released externally is inconsequential. In the event of a leak or malfunction this gas release may become excessive. DO NOT OPERATE this unit in a SMALL ENCLOSURE such as a small room or walk-in closet. An accidental release of Nitrogen or Carbon Dioxide could create an asphyxiating atmosphere in a small space.

If the equipment is not use in a manner specified by the manufacture, the protection provided by the equipment may be impaired.

Failure to adhere to these safety instructions could cause serious injury and will invalidate the workstation warranty. Ruskinn technology limited accepts no responsibility for any accident, injury or loss caused by unsafe operation of the workstation.

1. Regulatory compliance

CE Marking - for sales in the EU & NI

This product has been tested and complies with EU Directives 2014/35/EU (Low Voltage), 2014/30/EU (Electromagnetic Compatibility), and 2011/65/EU (RoHS as amended by EU 2015/863)

UKCA Marking – for Sales in GB

This product also complies with the following Statutory Instruments:

SI 2016 No. 1101	The Electrical Equipment (Safety) Regulations 2016
SI 2016 No. 1091	The Electromagnetic Compatibility Regulations 2016
SI 2012 No. 3032	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

WEEE:

This equipment must be disposed of in accordance with the Waste from Electrical and Electronic Equipment (WEEE) Directive

This product must not be treated as household waste. Instead, it shall be handed over to an appropriate collection point for the recycling of electrical and electronic equipment.

If in doubt, please return this equipment to Ruskinn Technology Ltd who will correctly dispose of it for you. We strongly recommend that this product is returned to RTL at the end of its useful life.

1.1 North American Region

This product is UL 61010-1 Listed, and CSA C22.2 No. 61010-1 under file number E113911.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

1.2 Precautions

The Bugbox Mx has been tested and approved to EN61010-1, 61326-1, and 61326-2-6. This means that the Bugbox Mx meets or exceeds the requirements for General and IVD electrical Laboratory equipment in terms of its levels of emitted electromagnetic (EM) radiation and its susceptibility to electromagnetic radiation from other devices. It should be noted that the Bugbox Mx may be affected by high levels of stray EM radiation from other electronic devices (even those which comply with relevant CISPR emission standards) that are being used in close proximity to it.

WARNING: This system may cause radio interference or may disrupt the operation of nearby equipment. It may be necessary to take mitigation measures, such as re-orienting or relocating the equipment or shielding the location.

1.3 Symbols

Before using the Bugbox Mx, please ensure that you are familiar with the symbols.

Symbol	Meaning
	Refer to user manual.
~	Alternating current
O	Off
I	On
	Functional Earth Connection
	Protective Earth Connection
CE	This product complies with the essential EEA requirements for Electrical Safety and Electromagnetic compatibility as set out in the EMC directive 2004/108/EC and the Low Voltage Directive 2006/95/EC
	Caution, do not remove covers. No end user serviceable parts behind covers. Please refer to this manual in all cases where this symbol appears, in order to find out the nature of the Potential Hazard and actions to be taken in order to avoid the Hazard.
	Warning, this equipment contains high voltage circuitry.
Warning Biohazard	Contains material or substances that may be hazardous to human health. Please refer to your local biohazardous material handling procedure for further advice on the handling and disposal of these items.
	Bugbox Mx contains hazardous components and must not be disposed of at a household waste site. Instead it should be taken to the appropriate collection point for the recycling of electrical and electronic equipment.
	USB socket
2015 01	Date of manufacture in format YYYY MM

Table 1: List of Symbols

1.4 Weight and dimensions

The Bugbox Mx workstation weighs approximately 60kg. Figure 1 lists the dimensions of the Bugbox Mx workstation;

Figure 1: Bugbox Mx workstation dimensions

External width	790 mm
External height	872 mm
External depth	679 mm
Workstation chamber internal width	540 mm
Workstation chamber internal height	535 mm
Workstation chamber internal depth	546 mm
Interlock internal width	149 mm
Interlock internal height	285 mm
Interlock internal depth	253 mm
Interlock outer door clear opening width	110 mm
Interlock inner door clear opening width	146 mm
Interlock inner door clear opening height	245 mm

2. Transport and storage

When not in use, the Bugbox Mx Workstation must only be stored within a temperature of between 0°C and 30°C

Storage outside of this range may damage the workstation.

3. Location and handling of the Bugbox Mx workstation

The Bugbox Mx should only be installed or relocated by a qualified engineer. To arrange installation or relocation please contact your local distributor.

The mains appliance coupler and plug are the AC mains supply isolation device and must be easily accessible.

For optimal performance, the Bugbox Mx should not be installed directly beneath Air Conditioning outlets. This can cause excessive humidity to collect on the inside surface of the front screen.

4. Environmental Operating Conditions

The Bugbox Mx Workstation should only be operated under the following environmental conditions:

- Temperature – Between 15°C and 30°C
- Humidity – Between ambient and 90% RH, Non-Condensing

The workstation must be located in a well-ventilated area.

5. Service Requirements

5.1 Electrical Supply Requirements

The workstation must be connected to a mains power supply. A power cord is supplied to connect the workstation to the mains supply. If an alternative power cord is used must be rated appropriately for the power requirements of the workstation, refer to Table 2. The workstation must be connected to a protective earth.

To ensure safe operation of the workstation, it must be connected to a supply of the correct voltage and frequency as stated on the rating label shown at the rear of the unit. The mains supply voltage fluctuations must not exceed +/- 10% of the nominal mains voltage. The input voltage and frequency for Bugbox Mx workstations are:

Voltage Range	Frequency	Nominal Power
220V to 240V AC	50/60Hz	560W
100V to 120 V AC	50/60Hz	430W

Table 2: Electrical Service Requirements

Please note that the applicable ratings for the Workstation configuration are detailed the labelling at the rear of the product as shown in Figure 3.

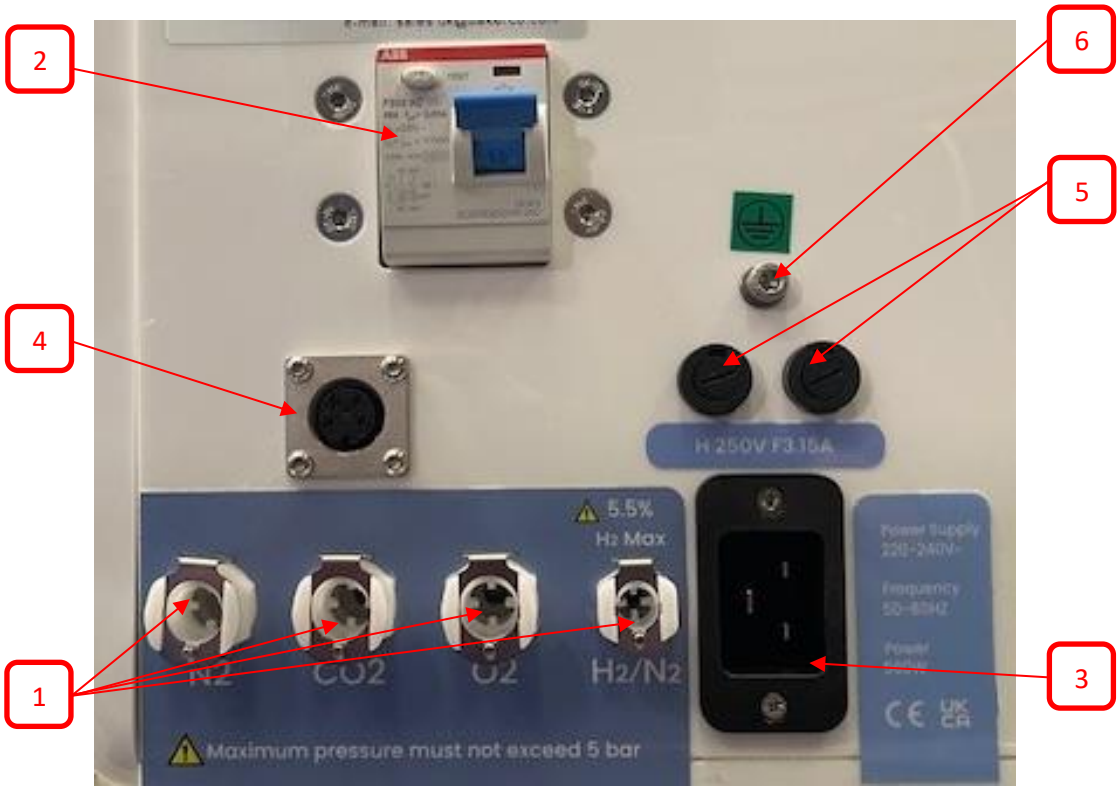


Figure 2 - Rear Connections

Figure 3: Bugbox Mx Rear Connections

1. Gas Supplies
2. Residual Current Circuit Breaker (RCCB)
3. Mains Input Connector (C19)
4. Footswitch Connector
5. Mains Input Fuses
6. Earth Stud

The Workstation is double pole fused (Live and Neutral) for protection against over current draw. The fuses fitted are based on the voltage range applicable, see Table 3 for details:

Voltage Range	**Mains Input Fusing**
220-240 Vac	T3.15A H250V
100 Vac, 110-120 Vac	T5A H250V

Table 3: Fuse Ratings

5.2 Gas Supply Requirements

The workstation gas supplies are located at the rear of the unit as shown in Figure 3.

For standard physiological environment operation of the workstation the input gas requirements are:

Gas	**Symbol**	**Specification**	**Regulator Output Pressure**
Nitrogen	N_2	Oxygen Free (Industrial or medical)	42 to 72.5psi (3 to 5 bar)
Carbon Dioxide	CO_2	100% (Industrial or medical)	42 to 49psi (3 to 3.5 bar)
Air	N/A	Compressed (Industrial or medical)	42 to 49psi (3 to 3.5 bar)
5% Hydrogen in Nitrogen*	H_2/N_2	Maximum of 5.5% Hydrogen in Nitrogen (Industrial or medical)	42 to 72.5psi (3 to 5 bar)

Table 4: Standard Gases

For the gas supply we recommend direct connections of the gas bottle regulator to ensure minimal pressure drops and flow rate restrictions.

The gas regulator should provide a minimum supply pressure of 3 bar gauge. The maximum supply pressure permissible is 5 bar gauge. A supply pressure greater than this will damage internal components of the Bugbox Mx and will invalidate the warranty.

Only the above stated gases are to be used with the workstation. Failure to comply with this may cause the product to become hazardous.

* - Recommended Hydrogen concentrations are compliant to BS EN ISO 10165:2010 (Classification of Flammable Gasses). The use of Hydrogen concentrations up to a maximum of 10% in Nitrogen (N_2) is the responsibility of the user and must be assessed by the user in accordance to local safety regulations at the installation location.

6. Workstation overview

6.1 Workstation layout

The Bugbox Mx workstation consists of 2 main areas; the workstation chamber and the interlock chamber. The workstation chamber is the main working area of the workstation. Access to the workstation chamber is provided by the glove ports and the interlock. The interlock consists of the interlock chamber, with an inner and an outer door. The Bugbox Mx workstation is controlled via the control panel.

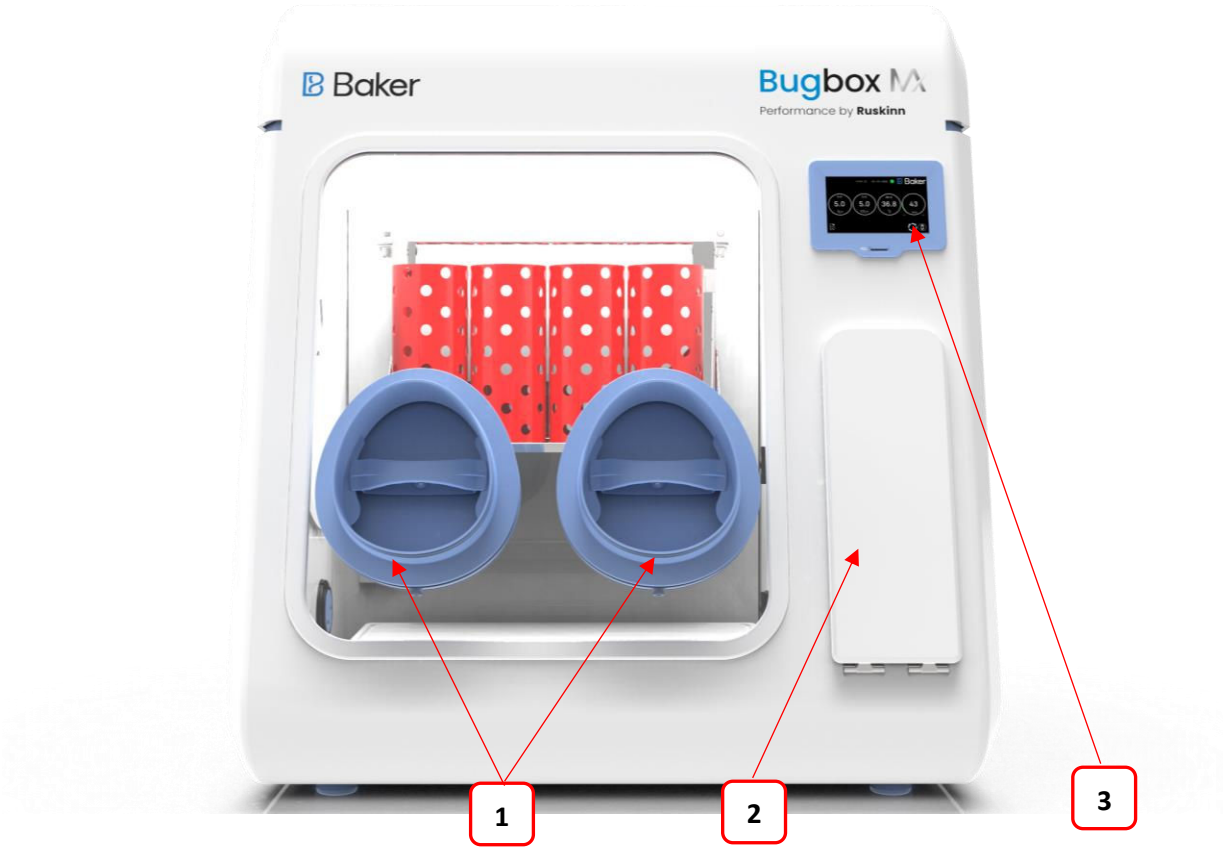
6.2 Component layout

Please familiarise yourself with the layout of your Bugbox Mx workstation.

6.2.1 Front view

Figure 4 shows the front view of the Bugbox Mx workstation;

Figure 4: Bugbox Mx workstation front view

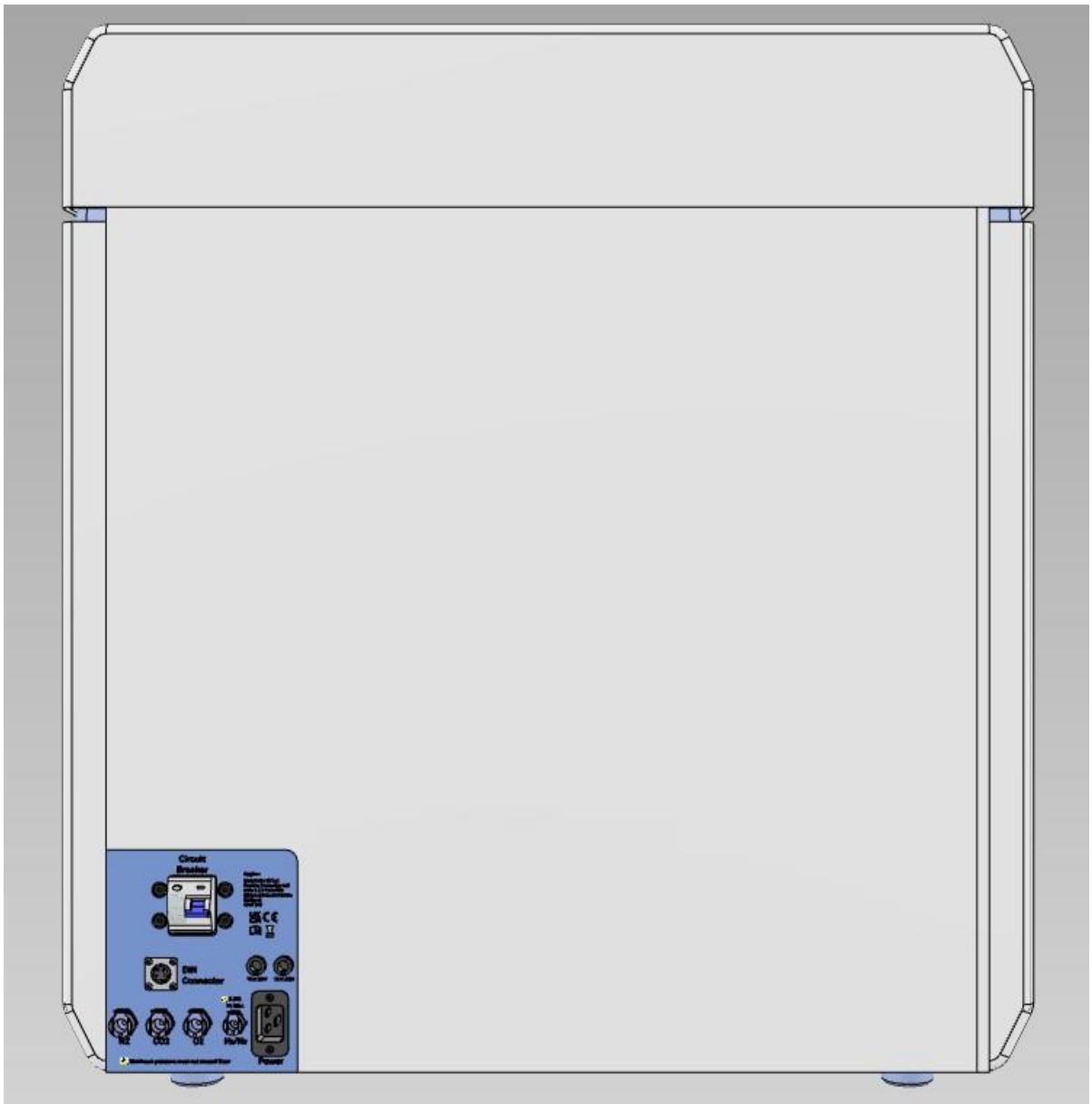


1. Glove ports (shown without Ezee Sleeves).
2. Interlock outer door.
3. Control panel.

6.2.2 Rear view

Figure 5 shows the rear view of the Bugbox Mx workstation;

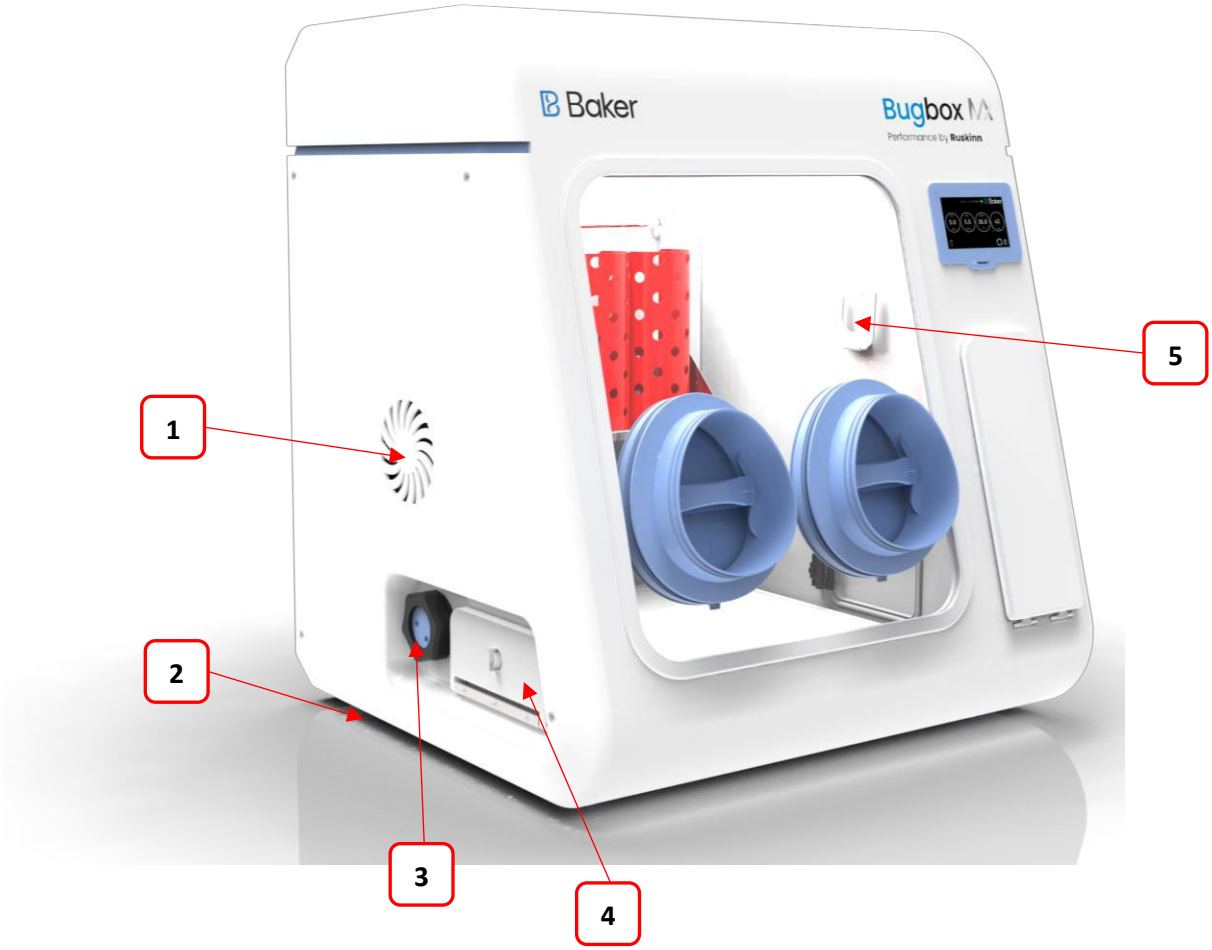
Figure 5: Bugbox Mx workstation rear view



6.2.3 Left side view – Standard humidifier

Figure 6 shows the left side view of the Bugbox Mx workstation with the standard humidifier;

Figure 6: Bugbox Mx workstation left side view



1. Condenser fan Intake – Do not obstruct
2. Condensate tank drain pipe.
3. Universal Cable Gland (optional extra)
4. Single Plate Entry System (optional extra)
5. Glove Port Stowage Bracket

Note: Place condensate trough (provided in the accessory kit) below the condensate tank drain pipe to collect any excess water from the overflow tube.

6.2.4 Right side view

Shows the right side view of the Bugbox Mx workstation;

Figure 7: Bugbox Mx workstation right side view

1. Interlock Fan Intake – Do not obstruct

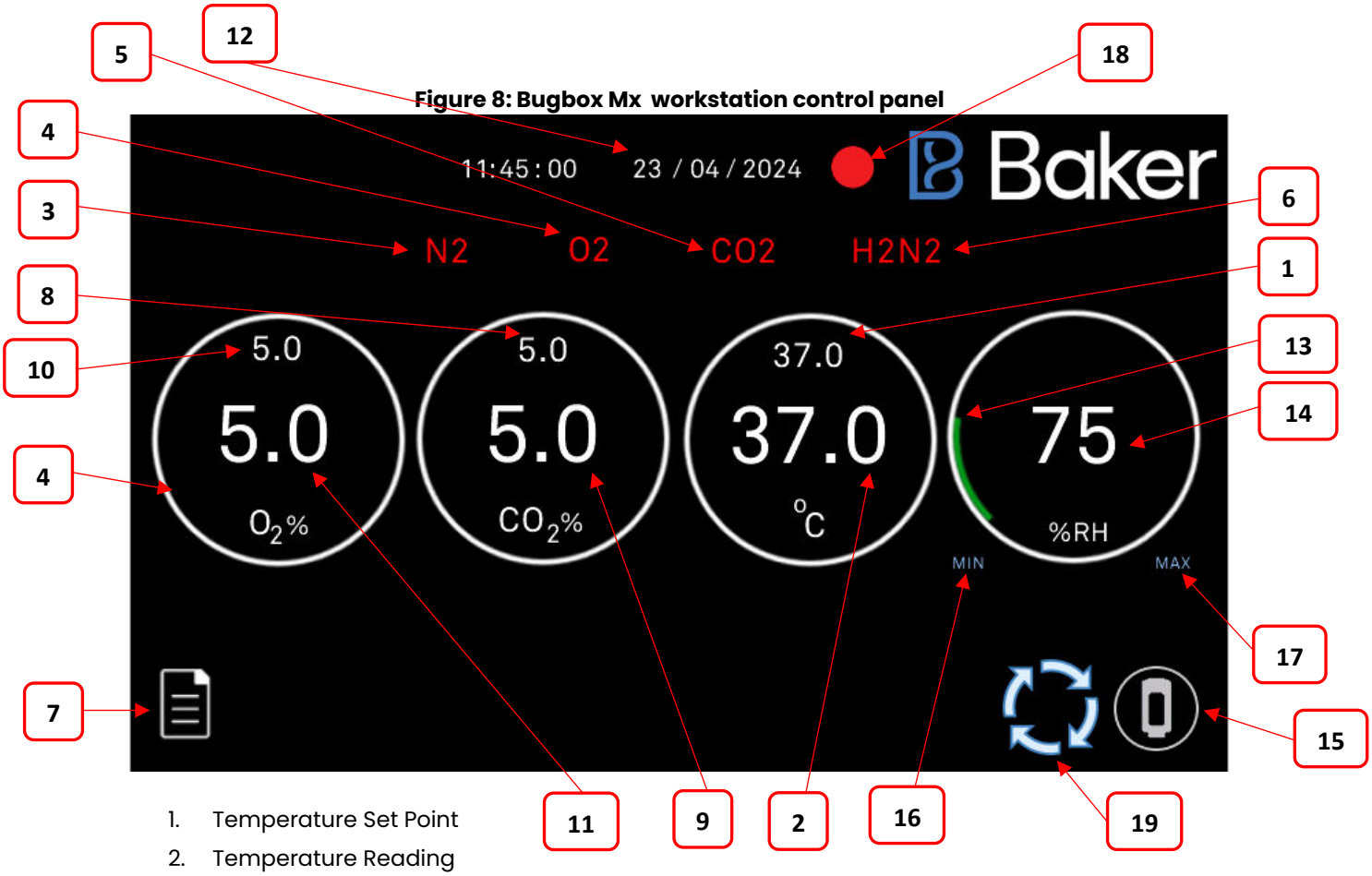
6.3 Control system layout

Please familiarise yourself with the control system layout of your Bugbox Mx workstation.

6.3.1 Control panel

Figure 8 shows the control panel of the Bugbox Mx workstation;

Figure 8: Bugbox Mx workstation control panel



1. Temperature Set Point
2. Temperature Reading
3. N_2 Low Alarm Icon
4. O_2 Low Alarm Icon
5. CO_2 Low Alarm Icon
6. H_2N_2 Low Alarm Icon
7. Trend Log Button
8. CO_2 Set Point
9. CO_2 Reading
10. O_2 Set Point
11. O_2 Reading
12. Time / Date / Settings Button
13. Humidity Set Point
14. Humidity Reading
15. Interlock Purge Button
16. Humidity Decrease Button
17. Humidity Increase Button
18. Gas Control status- Green =Active. Red =Deactivated
19. Hypoxic Cycle Settings

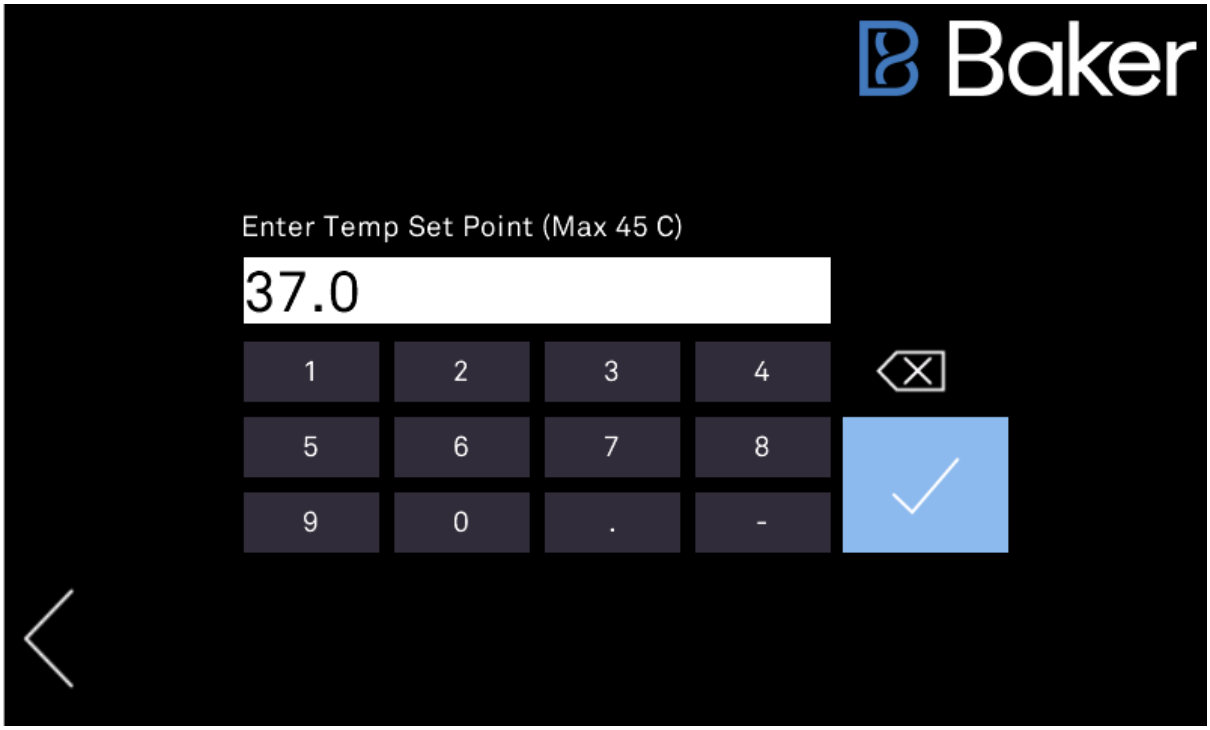
6.4 Temperature control

The Bugbox Mx workstation can control the workstation chamber temperature between ambient plus 5°C and 45°C.

The temperature in the main chamber can be set using the temperature controller settings on the touchscreen.

Setting the temperature;

1. Press the temperature controller dialog on the touchscreen.
2. The Temperature Control Input Keypad will appear. Enter the desired temperature in intervals of 0.1°C:



3. Press the ENTER button, the keypad will close and the temperature control system will make the necessary adjustments

6.5 Interlock Purge

The Bugbox Mx workstation has a 9.8 litre interlock that is used for transferring materials and samples into and out of the workstation main chamber. The interlock can be purged of oxygen by pressing the interlock purge button. This pre-conditions the interlock atmosphere to not affect the internal workstation atmosphere.

To run an interlock purge first ensure that both the inner and outer door are closed.

Then press the interlock purge button which will begin a 30 second purge.

A countdown timer displays the remaining amount of seconds before completion.

Once the cycle is complete the outer door can be then be opened.

Figure 9: Interlock purge countdown timer

6.6 Humidity control

The Bugbox Mx workstations control the humidity of the workstation chamber from ambient to 85% relative humidity.

The humidity level can be increased and decreased by pressing the 'Min' & 'Max' buttons shown on figure 7.

Note: Any equipment installed in the workstation chamber must be suitable for the humidity level inside the workstation chamber. If in doubt, consult the manufacturers' datasheet or manual for any equipment that is installed in the workstation chamber. Ruskinn Technology Limited accepts no responsibility for damage to any equipment installed in the workstation chamber that is not suitable for the conditions inside the workstation chamber.

6.6.1 Aquasorb Sachets

These sachets contain a small amount of a super absorbent polymer that has the ability to absorb 500 times its weight in water that is then evaporated into the workstation atmosphere. The workstation allows the humidity to rise to a user defined maximum at which point it will start to strip the excess humidity away at a control accuracy of +/-6%. One sachet should deliver a humidity level of at least 70% for more than 3 days.

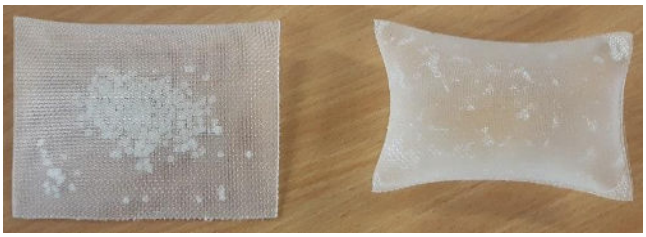


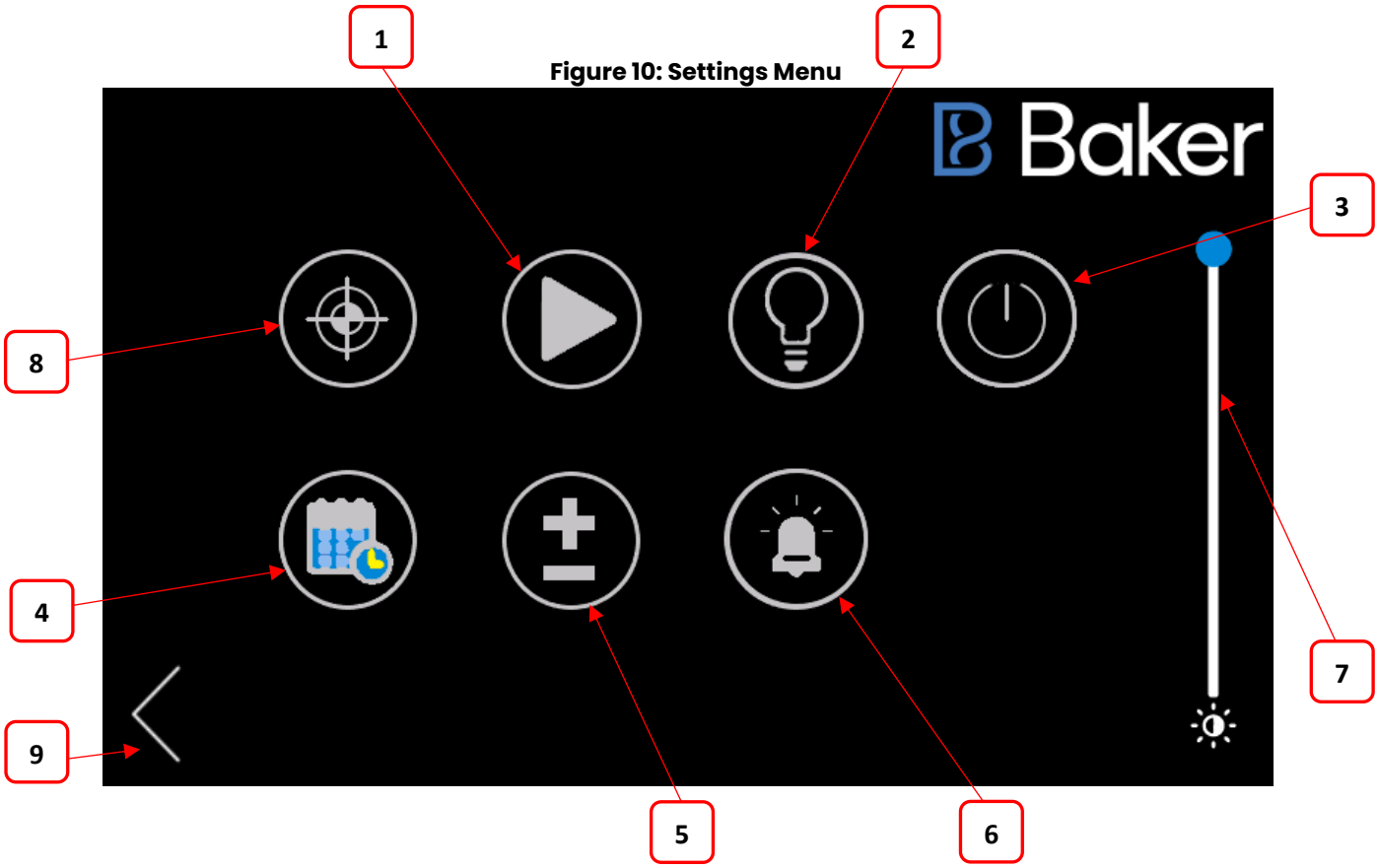
Figure 14: Aquasorb Sachets - Empty and Charged

The sachets are supplied 'dry' and require charging before use by placing the sachet in the tray provided with them and filling with deionised water. The sachet will expand as it absorbs the water to fill the volume of the sachet. Once complete, lightly shake and/or wipe off any excess water droplets and then place in the workstation on the metal tray. The sachets can be 'recharged' multiple times and are capable of continuous use for a number of months if kept clean. It is up to the end user to decide on the frequency of replacement but we recommend every month or two to change the sachet. Additional sachets can be purchased from The Baker Company or your local distributor.

6.7 Settings Menu

The setting menu can be accessed by pressing the 'Time & Date' section on the home screen.

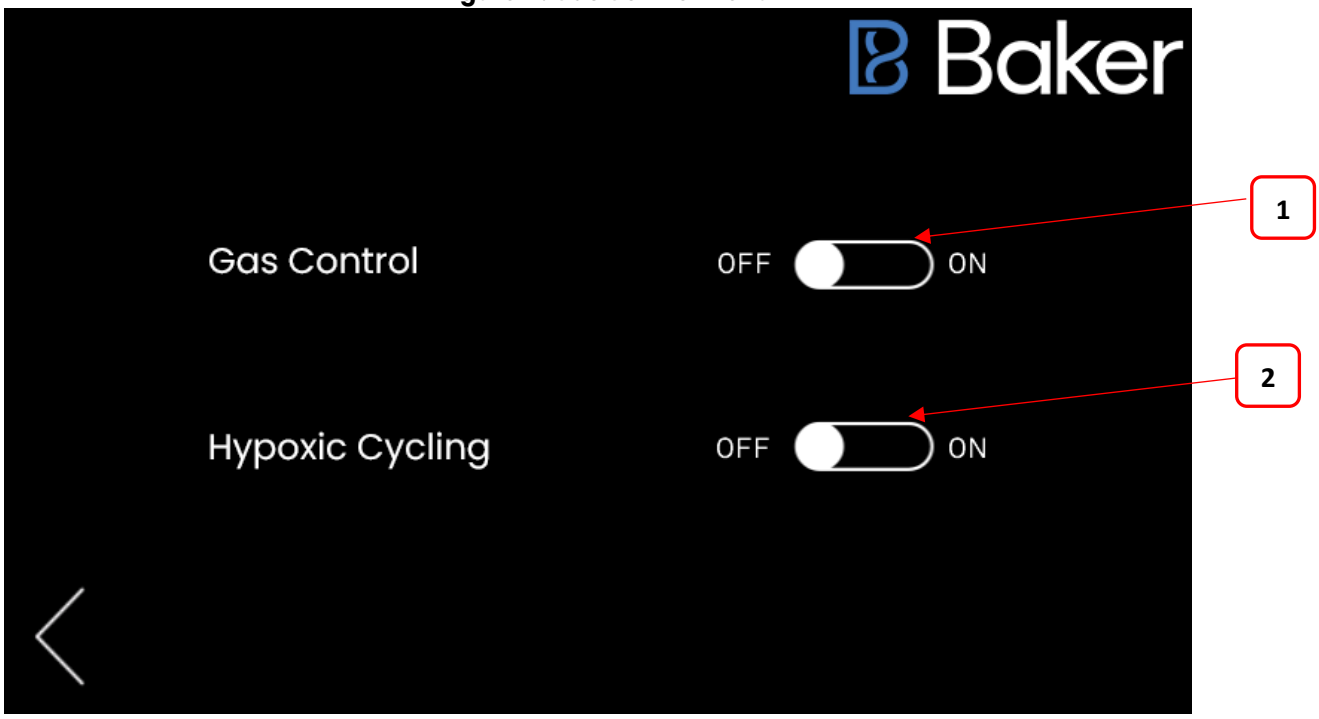
Figure 10: Settings Menu



1. **Gas Control Menu**
2. **Internal Light On/Off –** Press to switch on or off internal light
3. **Internal Socket On/Off (Option) -** Press to switch the power to the internal socket on or off
4. **Time & Date Settings**
5. **Offsets**
6. **Alarm mute –** Press to mute or unmute the audible alarms
7. **Touchscreen brightness slider –** Slide from 0-100 to adjust the touch screen brightness
8. **Calibration Menu**
9. **Back button**

6.7.1 Gas Control Menu

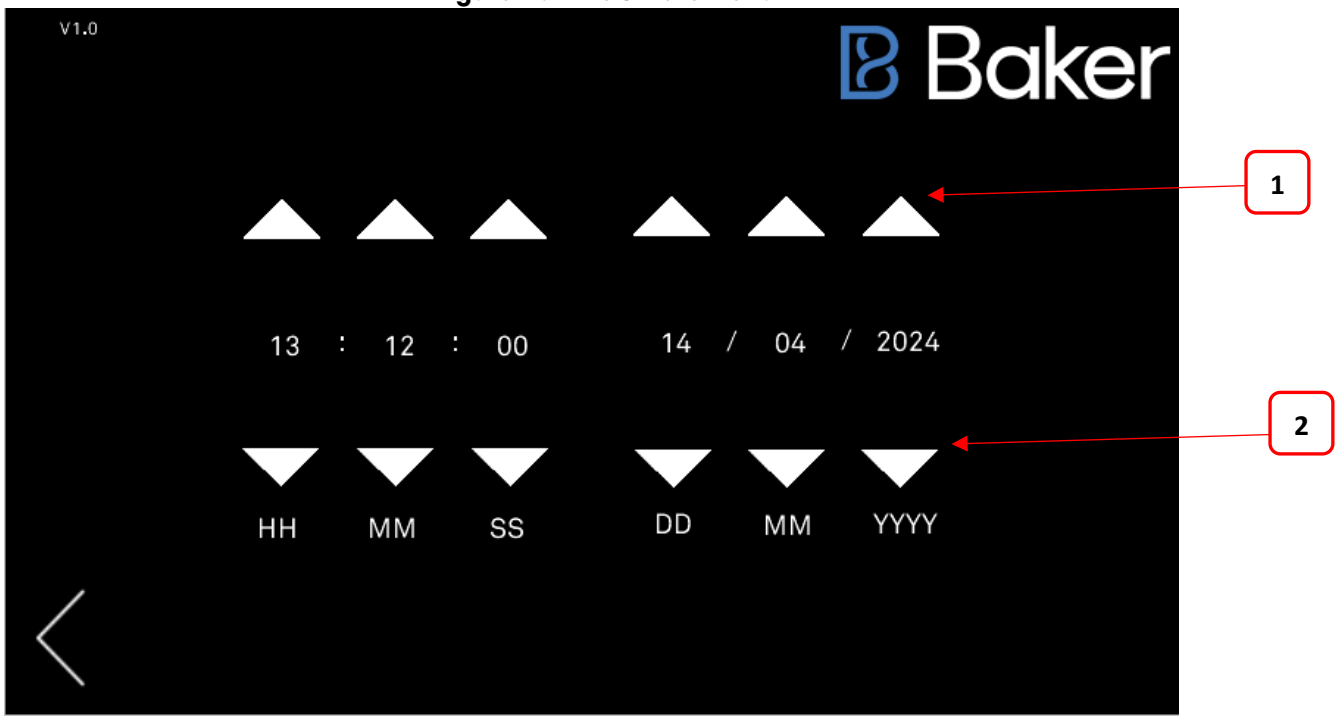
Figure 11: Gas Control Menu



1. **Gas Control –** Used to control to a single set point of Oxygen and Carbon Dioxide. This is also used to start anaerobic control when O2 is set to 0%
2. **Hypoxic cycling –** Allows for dynamic changing of the Oxygen and Carbon Dioxide levels over fixed time periods. The initial setting to for continuous cycling for up to 5 set-points.

6.7.2 Time & Date Settings

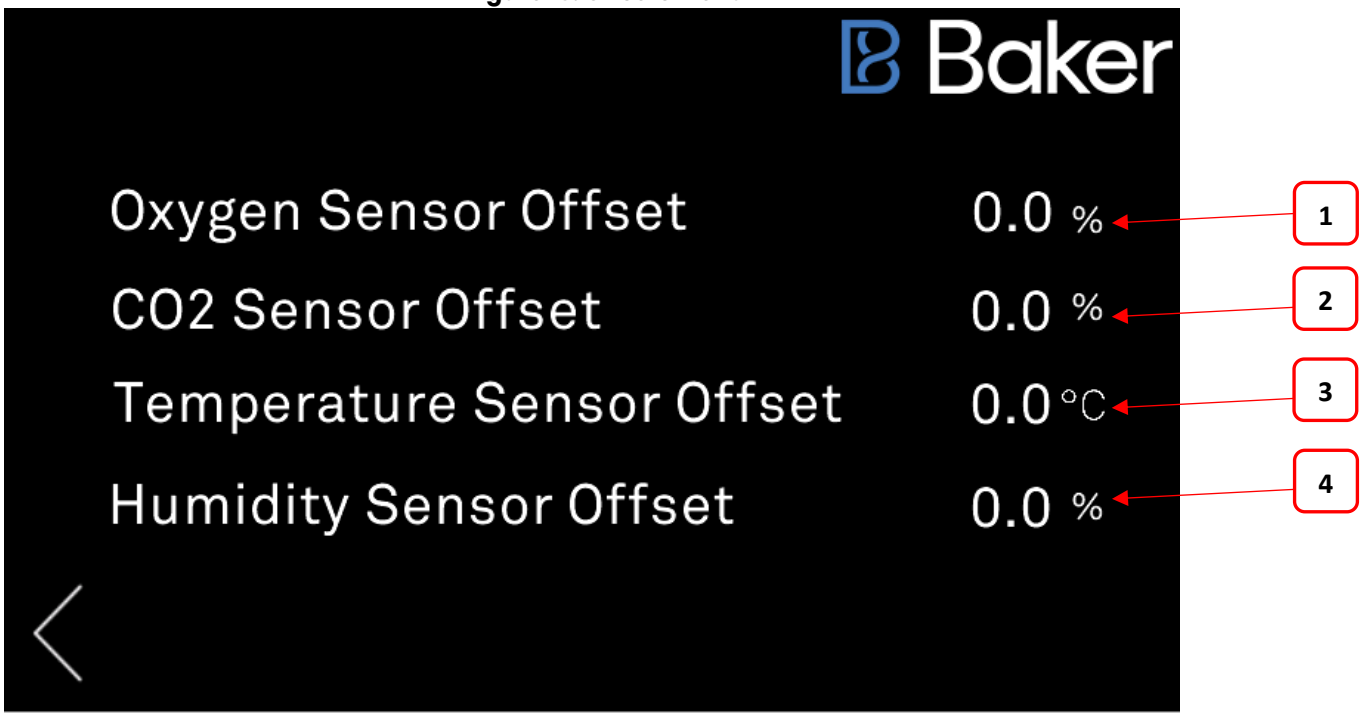
Figure 12: Time & Date Menu



1. **Increase button –** Press to increase the value of the time/date
2. **Decrease button –** Press to decrease the value of the time/date

6.7.3 Offsets

Figure 13: Offsets Menu



1. **Oxygen Sensor Offset –** The O_2 reading on the main menu can be offset to match a preferred external sensor if required. Press the value and enter the desired offset value.
2. **CO2 Sensor Offset –** The CO_2 reading on the main menu can be offset to match a preferred external sensor if required. Press the value and enter the desired offset value.
3. **Temperature Sensor Offset –** The temperature reading on the main menu can be offset to match a preferred external sensor if required. Press the value and enter the desired offset value.
4. **Humidity Sensor Offset –** The humidity reading on the main menu can be offset to match a preferred external sensor if required. Press the value and enter the desired offset value.

6.7.4 Data Log

Figure 14: Datalog Screen

Date	Time	O2 Value	CO2 Value	Temperature	Humidity
0/0/0	0:00:00	0.0	0.0	0.0	0
0/0/0	0:00:00	0.0	0.0	0.0	0
0/0/0	0:00:00	0.0	0.0	0.0	0
14/4/2024	13:12:00	5.0	5.0	37.0	75
14/4/2024	13:12:00	5.0	5.0	37.0	75
14/4/2024	13:12:00	5.0	5.0	37.0	75
14/4/2024	13:12:00	5.0	5.0	37.0	75
14/4/2024	13:12:00	5.0	5.0	37.0	75
14/4/2024	13:12:00	5.0	5.0	37.0	75
14/4/2024	13:12:00	5.0	5.0	37.0	75
14/4/2024	13:12:00	5.0	5.0	37.0	75

The data log screen is accessed from the Home screen by pressing the Data Log button.

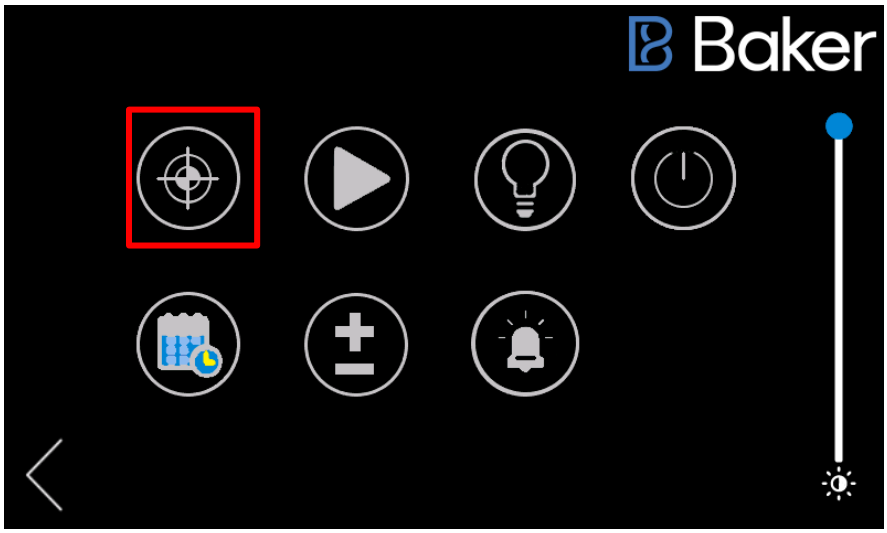
The screen displays Date, Time, O2, CO2, Temperature and Humidity readings logged every minute. A Micro SD card must be installed for logging to take place.

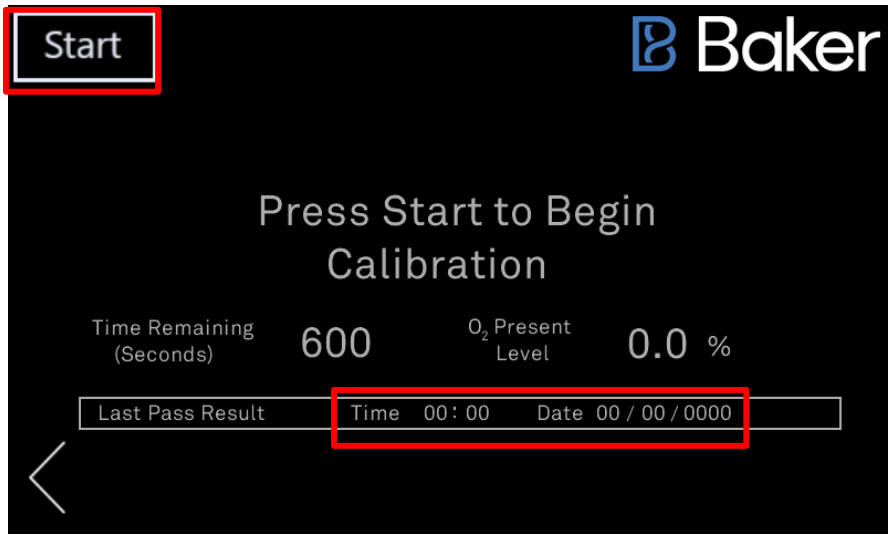
The on screen log displays the values from the last 10 minutes recorded at 1 minute increments.

The data can be scrolled back on screen over a one week period. To return to the Home Screen, press the back arrow button at the bottom left.

6.7.5 O2 Calibration

The O2 sensor should be calibrated at least once a month and on installation. To access the calibration menu, press the settings, O2 calibration icon and then press start. When the O2 calibration has passed the time and date will be stored next to last pass result. If the gas bottle levels are low before the calibration it will not start.





6.7.6 Micro SD Card

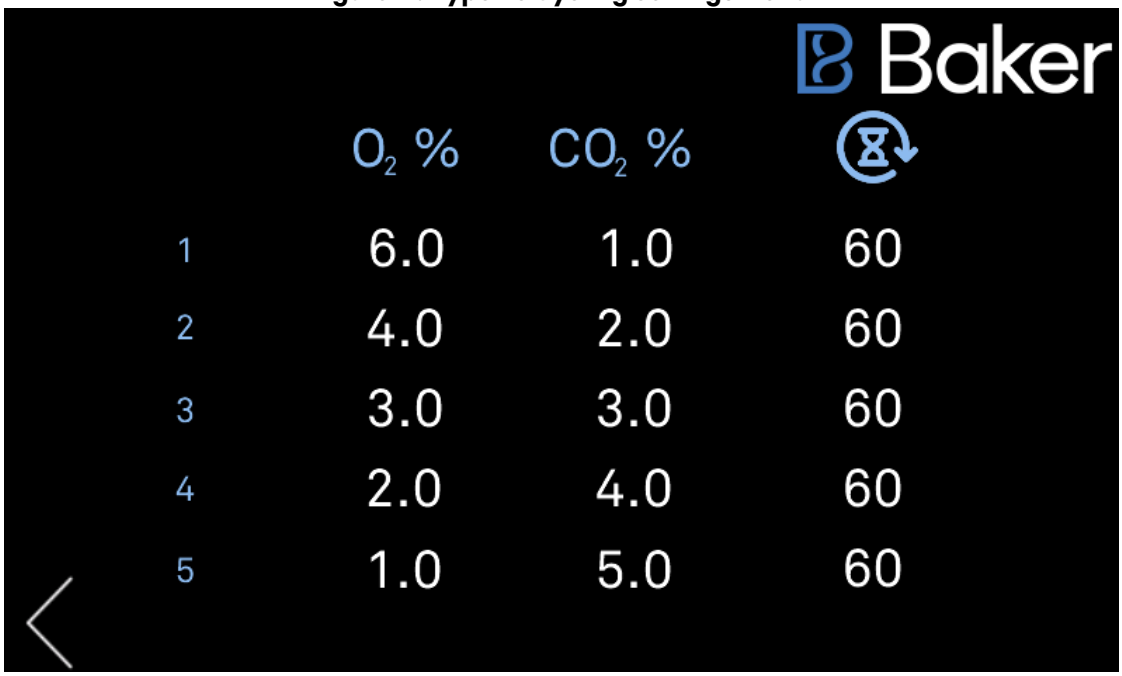
Figure 15: Micro SD Card Slot

1. **Micro SD Card Slot –** To enable data logging insert the Micro SD card that was supplied with the workstation. To remove the Micro SD card push gently on the it's edge to release.
   Note – Data logging will not take place with the Micro SD card removed.
   When removed the home screen will display a red 'SD' warning as shown in figure 16.

Figure 16: Micro SD Card Slot

6.7.7 Hypoxic Cycling

Figure 17: Hypoxic Cycling Settings Menu



Hypoxic Cycling Settings Menu – Hypoxic cycling must be switched on from the gas control menu. The hypoxic cycle settings menu is accessed from the home screen.

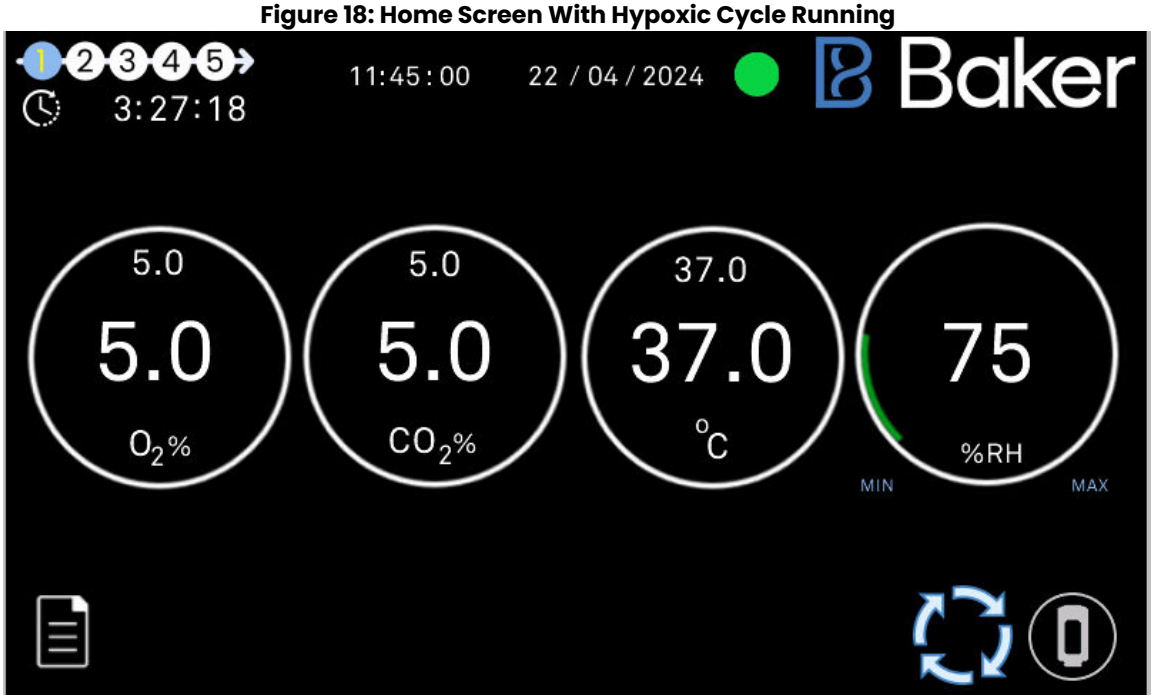
The settings allow for continuous cycling of up to 5 set points.

The timing values defines (in minutes) how long the Oxygen and Carbon Dioxide levels are maintained for once they have been achieved.
This means that there is a time period between the steps that is not able to be set as it is dependent on the difference between the set-points within the gas control software.

Pressing on any of the values will bring up a dialogue box to enter in the required setting. If less than 5 values are required for the cycling then set the number of required steps as required, then set the subsequent steps time period to 0 minutes with the O2 and CO2 set-points the same as the previous step.

Once desired settings are entered press the back button on the bottom left of the screen to exit the menu and return to the home screen.

Figure 18: Home Screen With Hypoxic Cycle Running



Hypoxic Cycling Menu – With the Hypoxic cycle option switched on the additional information is displayed in the top left hand side of the home screen.

The 5 cycle steps are displayed with the current step the workstation is controlling to illuminated with a blue background.

The time counter below displays the remaining time at the specified step.
Note – This only begins counting down once both O2 and CO2 setpoints have been reached.

After step 5 the cycle continues to loop indefinitely until hypoxic cycling is switched off in the gas control menu.

6.7.8 Anoxic Mode

Figure 19: Anoxic Mode Settings Menu

Anoxic Mode Menu – To enable anoxic mode gas control must be switched to the on position from the gas control menu.

Switching Gas Control to the on position disables the hypoxic cycling option and is replaced with a Forced Demand option.

Forced Demand – Press to toggle forced demand option on or off. When forced demand is on a 2 second shot of Hydrogen will be injected every 20 minutes regardless of workstation low pressure.

0% O2 can then be selected from the main menu control panel.
The O2 level is now locked at 0% and will be unable to be changed until gas control is switched to off within the gas control menu.

Note – Catalyst sachets must be installed into the workstation in order to achieve 0% Oxygen.

Figure 20: Catalyst Sachet in place

7. Environmental gas composition control

The Bugbox Mx workstation provides a Hypoxic environment for the incubation of samples and cultures.

7.1 Environmental control overview

To provide the desired environment, a combination of N2, CO2 and O2 gasses are injected into the workstation chamber. Any excess water is then removed by the humidity control system.

8. Using the workstation

8.1 Using the interlock

The Bugbox Mx workstation interlock is designed for transferring material into and out of the workstation chamber.

8.1.1 Interlock overview

The interlock consists of 2 main components;

- Interlock outer door
- Interlock inner door

The interlock is accessed by opening either the outer or inner door. **Note** Both doors should not be opened at the same time.

8.1.2 Opening the interlock outer door

To open the interlock outer door, push the interlock door towards the workstation. The interlock outer door will release. The interlock outer door can then be opened.

To close the interlock outer door, push the interlock outer door towards the workstation. The door latch will click to indicate that the door is closed.

Note: Do not open the interlock outer door if the interlock inner door is open. Do not place object(s) on the interlock outer door, as this may damage the workstation. Do not pull the interlock outer door to open it, as this may damage the workstation

8.1.3 Opening the interlock inner door

To open the interlock inner door;

- Access the workstation chamber via the Ezee Sleeves See section 8.2 for details.
- Undo the inner door catch by turning the latch anti-clockwise (counter-clockwise).
- Pull the inner door backwards to open the inner door.

To close the interlock inner door;

- Push the interlock inner door closed.
- Tighten the inner door latch by turning it clockwise. Do not over tighten the inner door latch.

Note: The interlock inner door should only be open when transferring materials from the interlock chamber to the workstation chamber and vice versa. The interlock inner door should not be opened if the interlock outer door is open.

8.1.4 Transferring material into the workstation chamber via the interlock

To transfer material into the workstation chamber via the interlock;

- Open the interlock outer door (see section 8.1.2 for more details).
- Place the material inside the interlock.
- Close the interlock outer door (see section 8.1.2 for more details).
- Start the interlock purge cycle by pressing the interlock purge button on the touchscreen
- Access the workstation chamber via the Ezee Sleeves (see section 8.2 for more details).
- Open the interlock inner door (see section 8.1.3 for more details).
- Remove the material from the interlock.
- Close the interlock inner door (see section 8.1.3 for more details).

8.1.5 Removing material from the workstation chamber via the interlock

To remove material from the workstation chamber via the interlock;

- Open the interlock inner door (see section 8.1.3 for more details).
- Place the material into the interlock.
- Close the interlock inner door (see section 8.1.3 for more details).
- Exit the workstation chamber via the Ezee Sleeves.
- Open the interlock outer door (see section 8.1.2 for more details).
- Remove the material from the interlock.
- Close the interlock outer door (see section 8.1.2 for more details).

8.2 Hand access to the main chamber

Direct hand access to the workstation chamber is provided via the Ezeeyin glove ports and

Ezee-Sleeve

The Ezee-Sleeve consists of a gloveless gas tight sleeve and a cuff.

- The Ezee-Sleeve attaches to the glove port via two O-rings.

Note: The workstation should not be used without the Ezee-Sleeve or EzeeCuff attached.

Figure 21: Ezee-Sleeves

8.3 Vacuum Operation

To ensure that no external atmosphere contaminates the workstation, a single vacuum operation is required before Glove Port access. To minimise the time, it is recommended to eliminate as much external atmosphere from the Ezee-Sleeve as possible prior to arm entry. This can be achieved by compressing the Ezee-Sleeve before inserting the hand and arm as shown in Figure 22

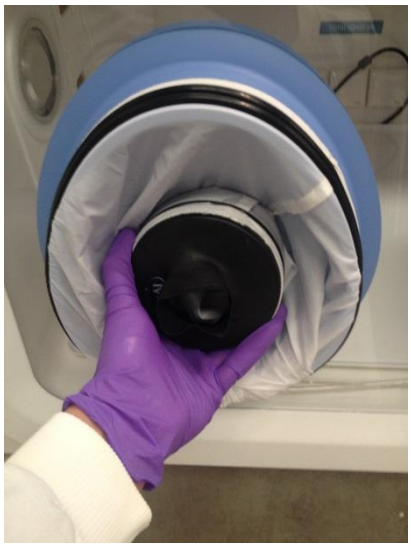


Figure 22: Compressed Ezee-Sleeve for Entry

- Hold the desired Ezee-Sleeve cuff with the opposite hand.
- Support the Ezee Cuff, push the hand through the cuff of the Ezee -Sleeve.
- Insert the arm and grasp the Glove Port handle in preparation for the vacuum stage, using the foot pedals.

Note: Failure to grasp the Handle at this stage will make grasping it after the vacuum operation much more difficult.

Figure 23: Arm inserted into Ezee-Sleeve (Shown with and without Ezee-Sleeve)

While the arm is grasping the handle, generate a vacuum by operating the foot pedal for the corresponding glove port.

Figure 24: Foot pedals for right and left glove ports

The vacuum operation should be continued until the maximum amount of external atmosphere has been removed from the Ezee-Sleeve and the Ezee-Sleeve exerts some pressure on the arm/hand.

Figure 25: Ezee-Sleeve before vacuum

Figure 26: Ezee-Sleeve after vacuum

The Ezee-Sleeve should pull forcefully against both the inner surface of the Glove Port interior and the users arm and hand when adequate vacuum has been achieved.

Once the pedal has been released a 3 second Nitrogen shot is injected into the port. This acts to relieve the pressure exerted by the vacuum as well as further purge the sleeve of Oxygen.

8.4 Workstation Entry

Once the vacuum has been achieved, the Glove Port Handle can now be rotated in either direction to unlock the Glove Port Cap.

As there is a strong vacuum within the Ezee-Sleeve, removal of the Cap can require a reasonable amount of force. This can be made easier by pushing the uppermost part of the Handle to first break the vacuum at the upper edge of the Cap seal.

Figure 27: Glove port cap

The Glove port Cap can now be stored inside the workstation using the locator feature on the rear of the Cap. These slot into the storage brackets mounted within the workstation.

Figure 28: Glove port cap storage location inside workstation

Repeat the procedure for the other hand (if both hands are entering the workstation chamber).

8.5 Workstation Exit

Remove Cap from storage brackets, and ensure the handle is oriented in a vertical position on the Cap. The Handle is designed with “indexing” detent features to help locate the Handle relative to the Cap.

Drawing the handle into the Glove Port, replace the cap, using the location posts and graphic to orient the Cap correctly on the Glove Port.

Note: Care should be taken to ensure that the Ezee-Sleeve material does not become caught between the Cap and the Glove Port seal.

Figure 29: Glove port cap

Figure 30: Glove Port Locator

Rotating the Handle by 90 degrees to the horizontal position will now lock the Cap to the Glove Port, allowing withdrawal of the users arm from the Ezee-Sleeve.

8.6 Rear shelf

The Bugbox Mx workstation has a shelf for additional storage within the workstation chamber. The weight limit for the shelf is 5.5kg. The weight on the shelf must be evenly distributed.

8.7 Optional extras

Your Bugbox Mx workstation may be fitted with optional extra parts to provide added functionality. The available optional extra parts for Bugbox Mx workstations are;

- Cable gland port
- Universal cable gland
- Gas sample port
- Vacuum port

Note: These parts are not available as aftermarket upgrades; they must be fitted during the manufacture of the workstation.

8.7.1 Single Plate Entry System (SPES)

A SPES is provided for quick and easy direct access to the workstation chamber, for loading materials. The SPES is also known as the mailbox.

1. To open the SPES turn the knob half a turn anti clockwise until the knob stops and lower the plate
2. Load plate through the opening.
3. To close the SPES lift the flap into position and turn the knob a quarter of a turn to engage the lock. Once engaged turn the knob another quarter of a turn to engage the seal, the knob will stop when fully closed. When operating the SPES it is good practice to ensure the seal is clean and clear of any debris

8.7.2 Internal power socket

An internal power socket is provided within the workstation chamber. The socket is located on the left hand side, underneath the rear shelf.

The maximum permissible power rating of equipment connected to the internal socket is shown in Figure 31.

The internal power socket is controlled in the settings menu:

Figure 31: Internal socket power ratings

Supply voltage	Power rating
120V AC, 60Hz	2 Amp
240V AC, 50 Hz	2 Amp

8.7.3 Cable gland

The cable gland is used to allow cables to enter the workstation chamber without affecting the internal environment of the workstation chamber. The cable gland is suitable for cables of diameter 3.5mm to 7mm. The cable gland port is located on the left hand side and is shown below.

Figure 32: Cable gland

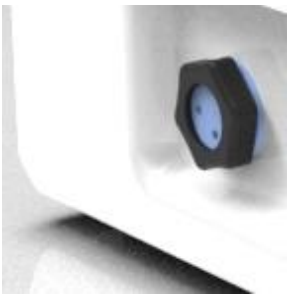
To use the cable gland;

- Turn the grey collar anti-clockwise (counter-clockwise) to loosen the cable gland.
- Remove the red plug.
- Push the cable through the cable gland.
- Tighten the grey collar by turning clockwise until tight. Do not over tighten the cable gland

8.7.4 Universal cable gland

The Universal cable gland is used to allow cables to enter the workstation chamber without affecting the internal environment of the workstation chamber. The Universal cable gland provides a diameter of 50mm for passing through larger cables and connectors. The Universal cable gland is located on the left hand side of the workstation.

Figure 33: Universal Cable Gland



8.7.5 Gas sample port

The gas sample port can be used to collect a gas sample from the workstation chamber. To use the gas sample port;

- Remove the outer cap.
- Push a needle connected to a syringe through the internal sponge of the gas sample port.
- Pull back the syringe to withdraw a sample of gas.
- Remove the needle from the internal sponge of the gas sample port.
- Replace the outer cap.

Figure 34: Gas Sample Port

8.7.6 Vacuum port

The vacuum port is used to remove liquids from the workstation chamber, for example excess media from Petri dishes. The vacuum port is located on the left hand side of the workstation.

To use the vacuum port;

- Connect the vacuum source to the external part of the vacuum port by pushing a tube from the vacuum source onto the vacuum port hose connection.
- Insert the internal vacuum hose into the internal section of the vacuum port. Figure 35 shows the internal part of the vacuum port;

Figure 35: Internal part of vacuum port

- When the vacuum is no longer required, remove the internal vacuum hose from the vacuum port by pressing the top of the metal part of the internal section of the vacuum port and pulling the vacuum hose. The hose should release from the vacuum port, sealing the vacuum port.
- Remove the vacuum source from the outside of the vacuum port.

9. Cleaning and maintenance

9.1 Cleaning the workstation

To ensure that the Bugbox Mx workstation remains at optimum working conditions, it must be cleaned on a regular basis. A basic clean is required after each use. Deep cleaning is required at regular intervals, dependent upon the nature of the materials used in the workstation. As a guide, a deep clean should be performed at between 3-6 month intervals.

9.1.1 Cleaning agents

The correct cleaning agents must be used to clean the workstation. The use of incorrect cleaning agents will damage the workstation and invalidate the warranty. The following cleaning agents are permitted;

- Ethanol, laboratory grade at a maximum concentration of 70% by volume ethanol in distilled water.
- Propanol, laboratory grade at a maximum concentration of 70% by volume propanol in distilled water.
- Tristel Fuse Sachet (available in the starter pack), 1 sachet diluted in 3 litres of distilled water, or Tristel Duo Foamer. Tristel Fuse Sachets and Duo Foamer are available from Ruskinn Technology Limited, see section 9.4.2 for details.
- Ruskinn Technology Limited anti-static cleaner.
- Distilled water.

No other cleaning agents are permitted. Cleaning agents should be applied to a clean paper towel and then to the workstation, then removed using a clean paper towel. Cleaning agents should not be sprayed directly onto the workstation, as this may damage the shell of the workstation. The use of UV light is not permitted in the workstation, as it will damage the acrylic shell.

Note: Where 3rd party instruments or apparatus are used within the workstation, please refer to the applicable manufacturers for guidance on approved cleaning agents. If these cleaning agents are not listed above, please remove the instrument or apparatus from the workstation to undertake cleaning to prevent damage to the workstation or 3rd party instrument / apparatus

9.1.2 Cleaning procedure – during and after each use

During use, clean any spills immediately using paper towels soaked in an appropriate cleaning agent. Wipe dry using a dry paper towel.

After each use;

- Remove all waste materials from the workstation chamber.
- Wipe the workstation chamber floor tray using paper towels soaked an appropriate cleaning agent.
- Wipe the workstation chamber floor tray clean using paper towels to dry.
- Wipe the interlock inner door using paper towels soaked in an appropriate cleaning agent.
- Wipe the interlock inner door using paper towels to dry.

9.1.3 Cleaning procedure – deep clean

To deep clean the workstation;

Preparing the workstation

- Remove all cells/ samples to an alternative storage facility.
- Switch the workstation off at the mains and remove the plug from the mains.
- Remove the Ezee Sleeves.
- Remove any other equipment installed in the workstation chamber.

Cleaning the workstation chamber

- The items inside the workstation chamber that require cleaning are;
    - The floor tray.
    - The ceiling panel.
    - The shelf panel.
    - The left hand wall.
    - The right hand wall.
    - The interlock inner door.
    - The glove port covers.
    - If fitted, the inside of the SPES.
- For all workstation components, wipe with a paper towel soaked in an appropriate cleaning agent. Take care not to get cleaning agents on the fans (below the shelf panel) and if fitted, the plug socket
- Wipe dry using paper towels.

Cleaning the interlock chamber;

- The items inside the interlock chamber that require cleaning are;
    - The floor.
    - The interlock outer door
    - The Petri dish holder
    - The inside wall
    - The interlock inner door.
- For all interlock components, wipe with a paper towel soaked in an appropriate cleaning agent.
- Wipe dry using paper towels.

Reinstalling workstation components

- Reinstall any equipment removed from the workstation chamber.
- Reinstall the Ezee Sleeves.

9.2 Maintaining the workstation – End user maintenance

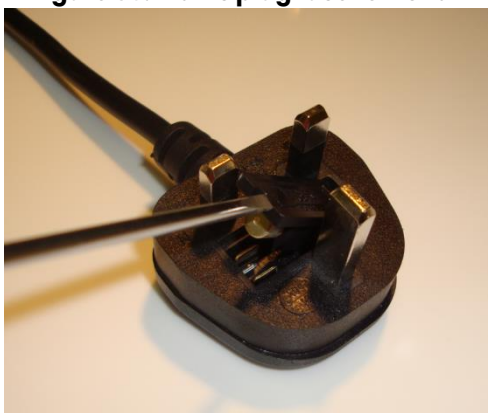
To ensure that your Bugbox Mx workstation remains at optimum working conditions, it must be maintained on a regular basis. Many basic tasks can be performed by the end user.

9.2.1 Replacing the mains plug fuse – UK users only

To replace the mains plug fuse;

- Switch off Bugbox Mx and disconnect from the mains power supply.
- Remove the plug from the mains socket.
- Using a small flat bladed screw driver, remove the fuse cover from the mains plug. Figure 36 shows the fuse removal;

Figure 36: Mains plug fuse removal



- Replace the fuse with a BS 1362 13A fuse.
- Replace the plug in the mains socket.
- Reconnect Bugbox Mx to the mains power supply and switch on the Bugbox Mx .

9.2.2 Replacing the mains fuses

To replace the mains fuses;

- Switch off the Bugbox Mx.
- Remove the plug from the mains socket.
- Remove the mains fuse drawer by using a small flat bladed screwdriver. Depress and rotate anti clockwise to release.
- Replace the mains fuses. The fuse ratings are;
    - 240V 50Hz – F3.15A H250V
    - 220V 60Hz - F3.15A H250V
    - 110V 60Hz – F5A H250V
    - 100V 50/60Hz – F5A H250V

Fuses should be fast blow, for example Cooper Bussmann S501. For more information, contact your local distributor.

- Replace the mains fuse drawer by again using a small flat bladed screwdriver. Depress and rotate clockwise to secure.
- Replace the plug in the mains socket.
- Switch the Bugbox Mx on.

9.3 Service requirements

To maintain the best performance from your Bugbox Mx workstation, it must be serviced at regular intervals. Figure 37 lists the servicing requirements, intervals and persons capable of performing the service;

Figure 37: Bugbox Mx servicing requirements

Action	Frequency	By
Clean workstation	After each use	End User
Deep clean workstation	3-6 months depending on usage	End User
Replace detox sachet	Annually	End User
Replace catalyst sachet	Annually	End User
Annual service	Annually	Qualified service engineer
Biennial service	Biennially (every 2 years)	Qualified service engineer

To arrange an annual or biennial service, contact your local distributor.

Note: The biennial service includes an annual service.

Note: The annual service includes the replacement of the detox and the catalyst sachet.

Service contracts are available for all Baker Company workstations. Please contact your local distributor for more information.

9.4 Spare parts and accessories

A range of spare parts and accessories are available for your Bugbox Mx workstation.

Note: Only Baker Company spare parts should be used. The use of unapproved spare parts will invalidate the warranty of your workstation and may cause damage to your workstation.

9.4.1 Overview

To order spare parts and accessories, please contact your local distributor for the latest pricing and availability.

9.4.2 Spare parts and cleaning agents

Figure 38 lists the spare parts and cleaning agents available for your Bugbox Mx workstation. To order spare parts, please contact your local distributor for the latest pricing and availability. All items are sold individually except where stated.

Figure 38: Bugbox Mx end user spare parts and cleaning agents list

Part	Where used
Small Ezee Sleeve (Pair)	Ezee Sleeve
Medium Ezee Sleeve (Pair)	Ezee Sleeve
Large Ezee Sleeve (Pair)	Ezee Sleeve
Glove port seal plate assembly	Glove ports
Sleeve to port O-ring	Ezee Sleeve
Port Lube Talc	Ezee Sleeve
Mains lead	Mains lead
Anti-static cleaner (600ml)	Cleaning
Tristel Fuse Sachet	Cleaning
Small Detox Sachet	VOC filtration
Small Catalyst Sachet	Anaerobic operation
Anaerobic Indicator Strips	Anaerobic operation

9.4.3 Accessories

A range of accessories are available to enhance the functionality of your Bugbox Mx workstation. Figure 39 is the list of accessories for the Bugbox Mx workstation. Please contact your local distributor for the latest pricing and availability.

Figure 39: Bugbox Mx accessories

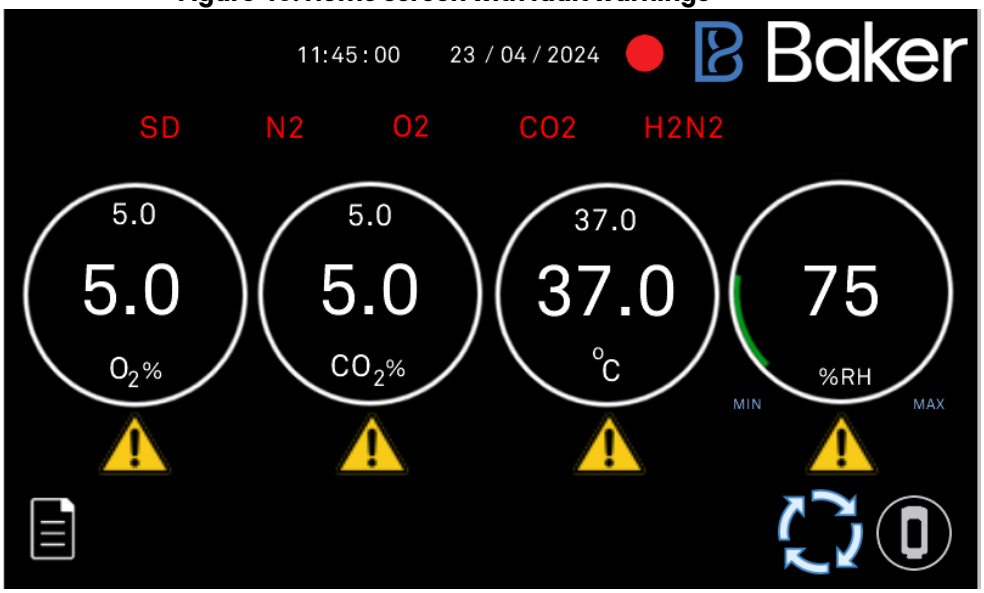
Item	Description
Large Petri dish holder	Holds up to 15 9cm Petri dishes for easier storage inside the workstation chamber. 3 colours available; **White** **Yellow** **Blue**
Small stand	The workstation can be located on the stand where bench space is not available. 2 models are available, either with fixed feet or mounted on castors. Stand height approximately 800mm **Stand with fixed feet** **Stand with castors**

9.5 Workstation malfunction

In the event of a workstation malfunction, please check section 9.6 for a list of common problems and solutions.

The touch screen will display a yellow warning triangle below the settings circle if the workstation detects a fault with the relevant sensor.

Figure 40: Home screen with fault warnings



An illuminated warning triangle display beneath a particular setting indicates a sensor fault within the system.

If you cannot find a solution to your problem, please contact your local distributor, quoting the serial number of your workstation.

9.6 Common problems and solutions

9.6.1 Workstation general problems

Please consult the list shown below as a reference in the event of a malfunction of your workstation.

Figure 41: Common problems and solutions

Problem	Cause	Solution
The workstation will not switch on	The workstation is not plugged in The mains socket is not switched on The mains plug fuse has blown The mains fuse has blown	Plug the workstation into the mains Switch the mains power on UK users: Replace the mains plug fuse (see section 9.2.1, for more details) Replace the mains fuses. See section 9.2.2 for more details.
The workstation temperature will not go above ambient plus 5°C	The heater mat thermal protection switch has activated The heater mat fuse has blown	Wait for the heater mat thermal protection switch to reset. Contact your local distributor
Devices plugged into the internal socket (if fitted) are not powering up	The power switch on the device is not switched on The plug for the device is not fully inserted into the socket The fuse in the device has blown and/ or the device has failed The internal socket fuse has blown	Turn the power switch on the device on Check that the plug is correctly inserted into the socket Plug the device into another socket. If the device fails to power up, the fuse has blown and/ or the device has failed. Refer to the owner's manual for the device. Contact your local distributor
The internal light does not illuminate when switched on	The bulb has blown The fuse has blown	Contact your local distributor to arrange replacement
Plates are drying out	Too little humidity inside workstation	Place a tray of water inside the workstation as a water source.

9.6.2 Gas consumption/ environmental control problems

Bugbox Mx is fitted with a gas demand indicator (item 7 in Figure 8). The indicator illuminates when gas is injected into the workstation chamber. When the workstation is at rest, the gas demand indicator should illuminate once every 20 minutes. At rest is defined as the workstation chamber is in an anaerobic condition with no access to the interlock chamber, i.e. the glove ports are closed, the interlock is closed and, if fitted, the SPES is closed. Figure 42 gives some common gas consumption and environmental control problems and solutions;

Figure 42: Gas consumption/ environmental control problems and solutions

Problem	Cause	Solution
High gas consumption when at rest.	The glove port cover has been left open. The SPES has been left open. The interlock inner and outer doors are both open.	Close the glove port cover. Close the SPES. See section 8.7.1 for more details. Close the interlock inner and/ or outer door.
High gas consumption when in use.	The Ezee Sleeves have not been correctly fitted. The Ezee Sleeves are not sealing around the users wrists.	Refit the Ezee Sleeves. Ensure that the Ezee Sleeves are the correct size for the user. Ensure that any clothing and/ or jewellery that may foul the Ezee Sleeves is removed/ rolled back. Ensure that the Ezee Sleeves are pulled tight around the user's wrists.
The N_2 low indicator is illuminated.	Low pressure in the nitrogen supply caused by an empty nitrogen cylinder.	Replace the nitrogen cylinder, check connections between canister and canister head for leaks.
The O_2 low indicator is illuminated.	Low pressure in the O_2 gas supply caused by an empty nitrogen cylinder.	Replace the O_2 cylinder.
The CO_2 low indicator is illuminated.	Low pressure in the CO_2 gas supply caused by an empty nitrogen cylinder.	Replace the CO_2 cylinder.
An audible alarm can be heard.	Low pressure in the gas supply, caused by an empty gas cylinder.	Replace the empty gas cylinder. The alarm can be muted by pressing the gas alarm switch (item 3 in Figure 8)

10. Warranty information

Ruskinn Technology Limited warrants for the applicable time period that the Bugbox Mx will substantially perform in accordance with the user documentation. The terms of this Agreement do not affect or prejudice the statutory rights of a consumer acquiring the Ruskinn Technology Limited Bugbox Mx otherwise than in the normal course of a business.

THIS WARRANTY DOES NOT APPLY IN THE FOLLOWING CIRCUMSTANCES:

(A) IF THE Ruskinn Technology Limited Bugbox Mx HAS BEEN REPAIRED BY PERSONS NOT AUTHORIZED BY Ruskinn Technology Limited; OR

(B) THE Ruskinn Technology Limited Bugbox Mx and associated accessories/peripherals HAVE BEEN ALTERED, MODIFIED, OR MISUSED; OR

(C) THE Ruskinn Technology Limited Bugbox Mx IS USED WITH NON- Ruskinn Technology Limited COMPONENTS; OR

(D) THE Ruskinn Technology Limited Bugbox Mx OR A COMPONENT IS USED FOR OTHER

USES (FOR EXAMPLE USE WITH OTHER CIRCUIT BOARDS OR SOFTWARE) OR

(E) THE Ruskinn Technology Limited Bugbox Mx HAS NOT BEEN MAINTAINED OR USED IN ACCORDANCE WITH THE INSTALLATION AND USER GUIDE. UNLESS PROHIBITED BY LAW, THIS WARRANTY IS MADE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, THE IMPLIED WARRANTY OF MERCHANTABILITY, OR ANY IMPLIED WARRANTY ARISING OUT OF A COURSE OF DEALING OR OF PERFORMANCE, CUSTOM OR USAGE OF TRADE. Ruskinn Technology Limited DOES NOT WARRANT THAT THE Ruskinn Technology Limited Bugbox Mx WILL FUNCTION ERROR FREE.

If within the Warranty Period, the Ruskinn Technology Limited Gas Mixing Station does not conform to the express warranty set forth above, Ruskinn Technology Limited's sole obligation and User's sole remedy shall be, at Ruskinn Technology Limited's option: 1. to repair or replace the non-conforming component; or, 2. refund the purchase price.

LIMITATION OF LIABLITY.

UNLESS PROHIBITED BY LAW, Ruskinn Technology Limited WILL NOT BE LIABLE TO USER OR OTHERS

FOR ANY OTHER DIRECT, INDIRECT, CONSEQUENTIAL, INCIDENTAL OR SPECIAL DAMAGES INCLUDING, FOR EXAMPLE, LOST PROFITS, BUSINESS, INVESENTS, OR OPPORTUNITIES EVEN IF Ruskinn Technology Limited HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

The parties agree that Ruskinn Technology Limited total cumulative liability to User for direct damages for all causes under this Agreement shall not exceed £5,000,000 (FIVE MILLION UK STERLING POUNDS), or the price paid for the Ruskinn Technology Limited Bugbox Mx, whichever is higher. Some states or countries may have laws which require liability rights different from those stated above. In such states or countries, the minimum required liability terms shall apply.

11. Contact details

Ruskinn Technology Limited

Address:		8 York Park,
		Bridgend Industrial Estate
		Bridgend CF31 3TB
		United Kingdom
Phone:		+44 (0)1656 645988
Email:	Sales:	sales.uk@bakerco.com
	Technical support	support.uk@ bakerco.com
	General enquiries	sales.uk@ bakerco.com
Website:		www.bakerco.com

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