



# User Manual

# HypoxyLab™

Bench-top hypoxia workstation

# Product Documentation and User Manual

## Revision 1.7

(s/n HL9068 and later)

### **The HypoxyLab is Designed and Manufactured by:**

Oxford Optronix Ltd.  
19 & 21 East Central  
127 Olympic Avenue  
Milton Park  
Oxford OX14 4SA  
United Kingdom

t: +44 (0)1235 821 803

f: +44 (0)1235 821 678

Primary website: [www.oxford-optronix.com](http://www.oxford-optronix.com)

Sales email: [sales@oxford-optronix.com](mailto:sales@oxford-optronix.com)

Support website:

[http://www.oxford-optronix.com/support/supp\\_hypoxylab.htm](http://www.oxford-optronix.com/support/supp_hypoxylab.htm)

Support email:

[support@oxford-optronix.com](mailto:support@oxford-optronix.com)

# Thank you!

Thank you for purchasing our popular HypoxyLab™ hypoxia workstation. We genuinely value your commitment.

Here at Oxford Optronix Ltd. we pour our heart and soul into developing and manufacturing laboratory products that will meet or, ideally, exceed our customers' expectations.

For those rare but inevitable occasions where things go wrong please note that your HypoxyLab is covered by our comprehensive 2-year manufacturer's warranty. Any repair costs deemed necessary during this time, including shipping charges where required, will be borne entirely by ourselves.

As for all specialist laboratory equipment meanwhile, regular maintenance is an integral part of maximizing product performance, reliability and longevity.

Beyond the initial 2-year product warranty period we highly recommend annual preventative maintenance servicing where the system is in regular use.

We wish you every success with forthcoming studies involving the HypoxyLab and stand ready to provide any product support you require.

Please feel free to reach out to us via our support mailbox:  
[support@oxford-optronix.com](mailto:support@oxford-optronix.com)

Sincerely,



Michael Rau, PhD  
Sales Director

## Taking care of me

- Please keep me clean inside and out (you can safely spray me down with 70% ethanol)
- Please don't leave me in 'stand-by' for long periods (it hurts my various gas sensors)
- Please empty my water reservoir after use (so it doesn't go stagnant)
- Please don't leave me all wet and damp after use (I like to air-dry)
- Please disinfect my water reservoir regularly (there are instructions on the support site)
- Please release the catches on my enclosure cover when I'm not in use (it avoids deformation of the base seal)
- Please supply me with deionized or distilled water, rather than tap water (it avoids the build-up of scale)
- Please recalibrate my CO<sub>2</sub> sensor and replace my HEPA filter once per month



# Table of Contents

<b>1.</b>	<b>SAFETY INFORMATION</b>	<b>7</b>
1.1	Symbols used on HypoxyLab .....	7
1.2	Summary of Warnings .....	8
1.3	Summary of Cautions .....	9
<b>2.</b>	<b>INTRODUCTION</b>	<b>11</b>
2.1	Optimising Conditions for Cell-Based Research .....	11
2.2	User Benefits of the HypoxyLab .....	12
<b>3.</b>	<b>INSTALLATION REQUIREMENTS</b>	<b>15</b>
3.1	Gas Supply Requirements .....	15
3.2	Electrical Supply Requirements .....	16
3.3	Physical and Location Requirements .....	17
<b>4.</b>	<b>INSTALLING AND USING HYPOXYLAB</b>	<b>18</b>
4.1	Support Videos .....	18
4.2	List of Standard Components .....	18
4.3	Unpacking and Description .....	18
4.4	Connecting the Electrical Supply .....	20
4.5	Connecting the Gas Supplies .....	21
4.6	Water Supply / Waste Water .....	22
4.7	Fitting of Shelf Units .....	23
4.8	Using the Armport Sleeves .....	25
4.9	Fitting the Armport Plugs .....	25
4.10	Using the Easy-Entry Hatch .....	25
4.11	Fitting the Thermal Jacket .....	26
4.12	Fitting Insulated Armport Covers .....	26
4.13	Removing the Enclosure Cover .....	27
4.14	Changing the Armport Sleeves .....	28
4.15	Calibrating the CO <sub>2</sub> Sensor .....	28
4.16	The Touch-Screen User Interface .....	29
4.17	Saving Recorded Data to USB Flash Memory .....	30
4.18	Applying a Software Upgrade .....	30
4.19	Using OxyLite™ for in situ Oxygen Measurements .....	31
4.20	Setting up the optional CytoSMART™ add-on .....	31
<b>5.</b>	<b>CARE AND MAINTENANCE</b>	<b>33</b>
5.1	Cleaning and Sanitising .....	33
5.2	Routine Preventative Maintenance .....	33
5.3	Returning HypoxyLab for Repair, Service, or Upgrade .....	34
5.4	Storage Recommendations for HypoxyLab .....	35

## **HypoxyLab User Manual**





---

<b>6.</b>	<b>OBTAINING TECHNICAL ASSISTANCE</b>	<b>36</b>
6.1	Technical Support.....	36
6.2	Support Site and Support Videos.....	36
<b>7.</b>	<b>TECHNICAL SPECIFICATIONS</b>	<b>37</b>
<b>8.</b>	<b>WARRANTY</b>	<b>39</b>
<b>APPENDIX 1 - Converting between % oxygen and mmHg</b>		<b>40</b>

# 1. SAFETY INFORMATION












This section contains important safety information related to the general use of the HypoxyLab. Other important safety information appears throughout this manual in the form of warnings and cautions.

## 1.1 Symbols used on HypoxyLab

<b>SN</b>	Serial number	<b>REF</b>	Catalogue number (product code)
	Date of manufacture		Equipment should NOT be disposed of in the normal waste stream
	Warning – see user manual		Read user manual
<b>N2</b>	Nitrogen gas inlet	<b>CO<sub>2</sub></b>	Carbon dioxide gas inlet
<b>Air</b>	Air gas inlet		

## 1.2 Summary of Warnings

A Warning indicates a condition leading to the possibility of serious injury or even death.










	Like any incubator, ALWAYS use HypoxyLab in a well-ventilated room or laboratory.
	As for all tissue culture rooms or laboratories containing incubators, we strongly recommend the use of wall/ceiling mounted oxygen depletion warning sensors.
	While due care is taken to ensure gas hose connectors and regulator fittings supplied by Oxford Optronix are leak-free it is ESSENTIAL to check for gas leaks, both at the gas source end and at the HypoxyLab end of gas lines once they are connected and pressurized.
	DO NOT operate the HypoxyLab with the enclosure cover removed. To do so may cause uncontrolled CO2 venting.
	DO NOT attempt to remove the underside base plate. There is a risk of electrical shock.
	DO NOT supply gases to the HypoxyLab other than the ones specified.
	DO NOT exceed the maximum pressure ratings of the inlet gases supplying the HypoxyLab.
	DO NOT exceed the maximum voltage ratings of the inlet power supplying the HypoxyLab.
	ALWAYS replace fuses with the same type and rating. Failure to do so may present a fire hazard.
	The rear surface of the turret structure (see Fig 4.1) may become HOT TO THE TOUCH. Allow at least 5 minutes from powering down the HypoxyLab before touching the rear of the turret (e.g. to change the HEPA filter).
	Failure to pack the HypoxyLab adequately for repair or service may cause costly damage during transit.



No user-serviceable parts inside. HypoxyLab MUST be repaired or serviced by Oxford Optronix trained or approved personnel only.











### 1.3 Summary of Cautions

A Caution indicates a condition that may lead to a malfunction and/or permanent damage of the HypoxyLab.

	BEFORE UNPACKING carefully inspect the outer shipping carton for signs of damage. Please take photographs as evidence and IMMEDIATELY report any packaging damage to Oxford Optronix Ltd or your authorised distributor.
	HEAVY ITEM. The HypoxyLab weighs approximately 30 Kg (70 lbs). TWO PERSONS are required to safely lift and move the HypoxyLab.
	FRAGILE TURRET. Never handle the turret structure to lift or move the HypoxyLab. Move the HypoxyLab by gripping the underside of the base only.
	Gas inlet lines and their integrity are the responsibility of the user and should be constructed, tested and maintained in accordance with local Code of Practice standards.
	It is the responsibility of the user to fit multi-stage regulators to all gas cylinders supplying gasses to the HypoxyLab.
	It is the responsibility of the user to fit the correct multi-stage regulator according to the <u>type</u> of gas used.
	DO NOT site the HypoxyLab near draughts caused by doors, windows or air conditioning/ventilation ducts.
	DO NOT site the HypoxyLab on paper towels, tablecloths or any other materials that might obstruct the air vents on the underside of the HypoxyLab.
	DO NOT operate the HypoxyLab outside the specified operating temperature range of 15 – 30 °C.

## HypoxyLab User Manual

---

 <p>CAUTION</p>	ONLY use DIONIZED / DISTILLED WATER to supply the HypoxyLab. Oxford Optronix shall not be held responsible for damage caused by the build-up of scale in the reservoir.
 <p>CAUTION</p>	DO NOT leave the HypoxyLab in Stand-by mode for extended periods. Sensor accuracy may be adversely affected.
 <p>CAUTION</p>	It is ESSENTIAL to empty the reservoir during periods when HypoxyLab is not in use. Oxford Optronix will not be held responsible for damage caused by the build-up of microbial contamination in the reservoir due to stagnant water.
 <p>CAUTION</p>	Regular (monthly) decontamination of the reservoir is ESSENTIAL to prevent the build-up of microbial contamination over time. Refer to Section 5.2.
 <p>CAUTION</p>	It is recommended to maintain the armport sleeves INSIDE the HypoxyLab or within the insulated armport covers during extended (e.g. overnight) incubation periods. Allowing the armport sleeves to 'dangle' outside the HypoxyLab can result in the accumulation of water condensation.
 <p>CAUTION</p>	DO NOT use sharp objects to operate the touch screen display.
 <p>CAUTION</p>	DO NOT spray, pour or spill any liquid on the touch screen display.
 <p>CAUTION</p>	DO NOT attempt to operate the HypoxyLab in the vicinity of equipment that emits ionising radiation or produces a strong magnetic field as the performance of the device may be adversely affected.
 <p>CAUTION</p>	Gases supplied to the HypoxyLab must be equal to or better than 99.998% pure 'zero' grade (N4.8) nitrogen.
 <p>CAUTION</p>	Use ONLY the HEPA filters supplied by Oxford Optronix.

# 2. INTRODUCTION

## 2.1 Optimising Conditions for Cell-Based Research

HypoxyLab™ offers researchers a new toolkit to accurately reproduce real-life physiological conditions for a wide variety of cell-based research fields, including cancer biology, radiation cell biology, cardiovascular research, apoptosis, neurology, stem cell research, multidisciplinary drug development, and proteomics.

Interest in the role of hypoxia in cell development has gained momentum as researchers learn more about the biology of physiological oxygen concentration and how it affects cells at the molecular level. While in the past the focus in the laboratory was on maintaining cells alive and genetically stable while avoiding contamination, in recent decades researchers have demonstrated that cells react in different ways, both metabolically and morphologically, depending on the environmental factors that maintain and interact with them.

Today's life scientists require the ability to reproduce *in vivo* environments in which cells can be cultured in their natural state, at oxygen concentrations in the range of 0.5 - 10%. To date all hypoxia workstations present the user with a method for controlling oxygen as a percentage concentration (% O<sub>2</sub>) only. However, this approach does not take account of barometric pressure and therefore fails to deliver compensation for altitude of the research location or prevailing climatic conditions.

HypoxyLab is a second-generation hypoxia workstation that uses the absolute partial pressure of oxygen, expressed in units of mmHg or kPa, to deliver authentic hypoxia replication with the highest possible accuracy. Since the partial pressure of oxygen is what cells actually “see” when exposed to oxygen, this scientifically superior approach enhances hypoxia accuracy, particularly when culturing cells at extremely low oxygen set-points. Regardless therefore, of whether a research laboratory is located in Amsterdam or in Denver, hypoxia conditions generated within the HypoxyLab in one location can be reliably compared with those generated in another.

HypoxyLab delivers precise control of the partial pressure of oxygen and carbon dioxide content, alongside chamber temperature and humidity, using optimised PID algorithms alongside advanced digital gas flow controllers, low maintenance or maintenance-free sensors, and built-in nebulizer-based humidifier technology. Using its touchscreen display, researchers also have the ability to set HypoxyLab to automatically cycle through up to eight fully programmable oxygen profiles.

HypoxyLab is also engineered to support our “gold standard” OxyLite™ dissolved oxygen monitors. Positioning an OxyLite sensor within a cell culture provides a direct measure of the partial pressure of oxygen that cells are actually exposed to and can optionally be recorded alongside the values of chamber pO<sub>2</sub>, CO<sub>2</sub>, temperature, and humidity.

For research teams undertaking studies at the cellular and molecular level, HypoxyLab provides a way to maintain cells at true physiological oxygen, an essential prerequisite to refining the processes they are using to probe gene expression changes, signal transduction pathways, enzyme activities, and the molecular mechanisms that underlie these phenomena.

### 2.2 *User Benefits of the HypoxyLab*

#### **True hypoxia**

As every scientist knows, it's the partial pressure of oxygen that reflects the oxygen that cells actually 'see'. The partial pressure of oxygen varies not only with oxygen concentration in the atmosphere, but also with altitude and prevailing weather conditions. We believe it is implausible to express hypoxia in terms of a (barometrically uncompensated) percent oxygen concentration value alone. HypoxyLab is the world's first and only hypoxia chamber that directly regulates its environment using the partial pressure of oxygen, expressed in units of mmHg or kPa, and is thereby insensitive to changing climatic and altitude conditions. This scientifically rigorous approach enhances HypoxyLab's accuracy over other devices that rely simply on % oxygen measurements.

#### ***In situ* oxygen measurements from cell culture media**

For those that require *in situ* oxygen measurements from the precise location or layer where cells are actually growing (or simply from a bottle of media), HypoxyLab provides a dedicated, sealable side-gland via which to insert an OxyLite™ fibre-optic oxygen sensor. The OxyLite sensor is a miniature, highly accurate, non-consuming optical based oxygen sensor that can be easily positioned precisely within the cell culture to obtain continuous, real-time dissolved oxygen measurements at the sensor tip. By taking into account the oxygen gradient generated between the chamber environment and cellular oxygen consumption processes occurring within the media, the OxyLite sensor delivers the 'holy grail' for hypoxia researchers - the ability to measure oxygen availability in the microenvironment where cells are actually growing.

#### **Contamination controlled environment**

HypoxyLab includes a replaceable HEPA filter that continuously scrubs the chamber atmosphere. This ensures that cultures and media are protected from the risk of contamination.

#### **Live cell imaging**

We have teamed with the manufacturers of the CytoSMART™ system, an extremely compact digital microscope solution that can be deployed within the HypoxyLab and is built to withstand long-term exposure to tissue culture environments. The system is supplied with an accompanying tablet PC, which is kept outside the HypoxyLab and on which live cell culture images are displayed. The CytoSMART™ system

## HypoxyLab User Manual

---

supports time-lapse recording and cloud-based access to images and time-lapse data from any browser-capable computer, smartphone, or tablet device.

### Unrivalled performance

Partial pressure of oxygen ( $pO_2$ ) as well as chamber  $CO_2$ , temperature and humidity are controlled via HypoxyLab's touchscreen display and delivered using digital gas flow controllers and state-of-the-art sensors. HypoxyLab is the most faithfully accurate system available today.

### Lightweight cover

HypoxyLab's lightweight and durable cover means that it can be easily removed by just one person. This not only allows for easy loading of media, consumables but makes routine cleaning/sterilisation of the workstation a practical reality.

### Oxygen profiling

The touch screen user interface provides an oxygen profiling function to automatically cycle through up to eight oxygen levels. The fact that HypoxyLab can adjust the hypoxia equilibrium in a matter of minutes (rather than hours) adds real value to the concept of 'oxygen profiling' whilst maintaining minimal levels of gas consumption.

### Integrated touchscreen

HypoxyLab's integrated full colour touchscreen conveniently allows the user to control all aspects of the HypoxyLab whilst simultaneously displaying real-time data in both digital and graphical format. The display updates the user with vital information such as actual and set-point values for gas composition, humidity and temperature and provides access to useful features such as the oxygen profiling feature.

### Easy-Entry system

HypoxyLab's Easy-Entry hatch affords the quick and convenient transfer of cells, culture-ware and media into the chamber. As soon as items are passed through the hatch, HypoxyLab immediately applies the precise gas composition necessary to maintain steady-state conditions. This immediate response effectively eliminates fluctuations in the  $pO_2$  of cell media during operation of the Easy-Entry system. An internal 'letterbox' style flap acts as an additional barrier against gas displacement when the hatch is opened.

### Data logging

All HypoxyLab parameters are continuously recorded onto internal flash memory and can be copied onto a USB flash drive via a port at the rear of the HypoxyLab. Data files can be analyzed and played back retrospectively using the free LabChart Reader® by ADInstruments.

### **Ergonomic design**







HypoxyLab's patented ergonomic design ensures natural, relaxed operation. The angled vision panel combined with touch-screen dimmable LED illumination provide excellent visibility. Choose between bare-hand or gloved operation using HypoxyLab's easy-to-use cuff and sleeve system. HypoxyLab also includes height-adjustable shelves and a 5V USB power socket within the chamber.

### **Cost of ownership advantage**

HypoxyLab's highly considered design minimises dead space, ensures rapid equilibration to set points and frugal gas consumption. Service-free sensors and a user changeable HEPA filter simplify routine maintenance and minimize HypoxyLab's true cost of ownership.

## 3. INSTALLATION REQUIREMENTS

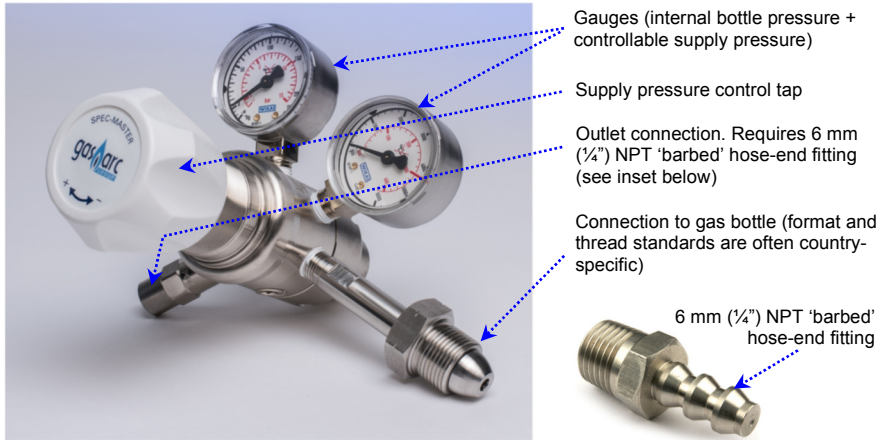
### 3.1 Gas Supply Requirements

 WARNING	DO NOT attempt to supply gasses to the HypoxyLab other than the ones specified. To do so may cause death or injury.
 WARNING	DO NOT exceed the maximum pressure ratings of the inlet gasses supplying the HypoxyLab. To do so may cause death or injury.
 CAUTION	Gas inlet lines and their integrity are the responsibility of the user and should be constructed, tested and maintained in accordance with local Code of Practice standards.
 CAUTION	It is the responsibility of the user to fit multi-stage regulators to all gas cylinders supplying gasses to the HypoxyLab.
 CAUTION	It is the responsibility of the user to fit the correct multi-stage regulator according to the <u>type</u> of gas used.
 CAUTION	Gases supplied to the HypoxyLab must be equal to or better than 99.998% pure 'zero' grade (N4.8) nitrogen.

Only laboratory-grade (ideally 99.998% pure 'zero' grade (N4.8) purity) gases must be used with the HypoxyLab. Where cylinders are used, it is vital that high quality, multi-stage regulators are fitted to each gas cylinder and that each regulator is correctly specified for the particular type of gas used. Each regulator requires a 6 mm (¼ inch) NPT fitting to allow the hoses supplied with the HypoxyLab to be connected (see Fig. 3.1 below).

**It is the responsibility of the user to ensure that supplied gases are free of particulate contamination. Unfiltered gases entering the HypoxyLab may damage the delicate electronic flow controllers within. Oxford Optronix shall not be held responsible for damage caused by particulates entering the HypoxyLab. We recommend the use of 30 µm or finer upstream in-line filters for any building-wide 'plumbed-in' gases.**

High quality, multi-stage regulators pre-fitted with NPT hose fittings can be purchased from Oxford Optronix Ltd.



*Figure 3.1 Multi-stage regulator and barbed NPT fitting*

The HypoxyLab requires CO<sub>2</sub>, synthetic air and nitrogen gases to be supplied at pressures summarized below:

Gas type Recommended purity 'N4.8' or better	Outlet	Regulator	Nominal outlet pressure
CO <sub>2</sub>	6 mm (1/4") NPT	Two Stage	1 – 4 bar (15 - 60 psi)
Synthetic air	6 mm (1/4") NPT	Two Stage	1 – 4 bar (15 - 60 psi)
Nitrogen	6 mm (1/4") NPT	Two Stage	3 – 5 bar (45 - 75 psi)

### 3.2 Electrical Supply Requirements

 <b>WARNING</b>	DO NOT exceed the maximum voltage ratings of the inlet power supplying the HypoxyLab.
 <b>WARNING</b>	ALWAYS replace fuses with the same type and rating. Failure to do so may present a fire hazard.

The input voltage requirements for the HypoxyLab are as follows:

Input Voltage: 110 – 240 VAC 50/60 Hz Single phase

Max Operating Current: 5A

## HypoxyLab User Manual




---

Max Operating Power: 550W

Fuses: 2 x 5A 20mm AS

A dedicated, country-specific IEC mains inlet cable is supplied with your HypoxyLab.

### 3.3 Physical and Location Requirements

	DO NOT site the HypoxyLab near draughts caused by doors, windows or air conditioning/ventilation ducts.
	DO NOT site the HypoxyLab on paper towels or tablecloths or any other materials that might obstruct the vents on the underside of the HypoxyLab.
	DO NOT operate the HypoxyLab outside the operating temperature range of 15 – 30 °C

HypoxyLab must be operated in a clean laboratory environment free from corrosive gases, flammable gases, and dust.

Instructions for assembling the (optional) electrically height-adjustable mobile worktable (product code 'WORKTABLE') are provided separately.

If HypoxyLab is to be bench mounted, the bench must be stable, flat, level and of sufficient size and strength to fully support the HypoxyLab.

## **4. INSTALLING AND USING HYPOXYLAB**

### **4.1 Support Videos**

A collection of video tutorials covering many of the sections below is maintained on the HypoxyLab support website:

[http://www.oxford-optronix.com/support/supp\\_hypoxylab.htm](http://www.oxford-optronix.com/support/supp_hypoxylab.htm)

### **4.2 List of Standard Components**

- 1 pair of armport sleeves, pre-fitted
- 1 base seal, pre-fitted
- 1 HEPA filter, pre-fitted
- 2 spare HEPA filter
- 2 shelf units (compatible with 50 ml and 15 ml Falcon tubes)
- 1 stainless steel elevated floor unit
- 1 neoprene thermal jacket
- 1 Oxford Optronix branded USB flash drive
- 3 gas inlet hoses, 3.5 m (1 each for Nitrogen, CO2 and synthetic air)
- 1 pair of wrist seal plugs
- 1 pair of spare latex wrist seals
- 1 pair of water fill/drain hoses
- 1 pair of insulated arm port covers
- 1 100 ml starter bottle of Klercide Amine concentrate (water reservoir sterilizer)
- 1 printed user manual
- 1 country-specific IEC mains power cable

### **4.3 Unpacking and Description**

Before unpacking the HypoxyLab, ensure the physical, electrical and gas supply installation requirements listed in the previous section have been followed.

When unpacking the HypoxyLab, inspect the packaging thoroughly for any signs of damage that may have occurred during transit. Report any damage immediately to Oxford Optronix Ltd. or your local authorised distributor.

# HypoxyLab User Manual



**HEAVY ITEM.** The HypoxyLab weighs approximately 30 Kg (70 lbs). TWO PERSONS are required to safely lift and move the HypoxyLab.



**FRAGILE TURRET.** Never handle the turret to lift or move the HypoxyLab. Move the HypoxyLab by gripping the underside of the base only.

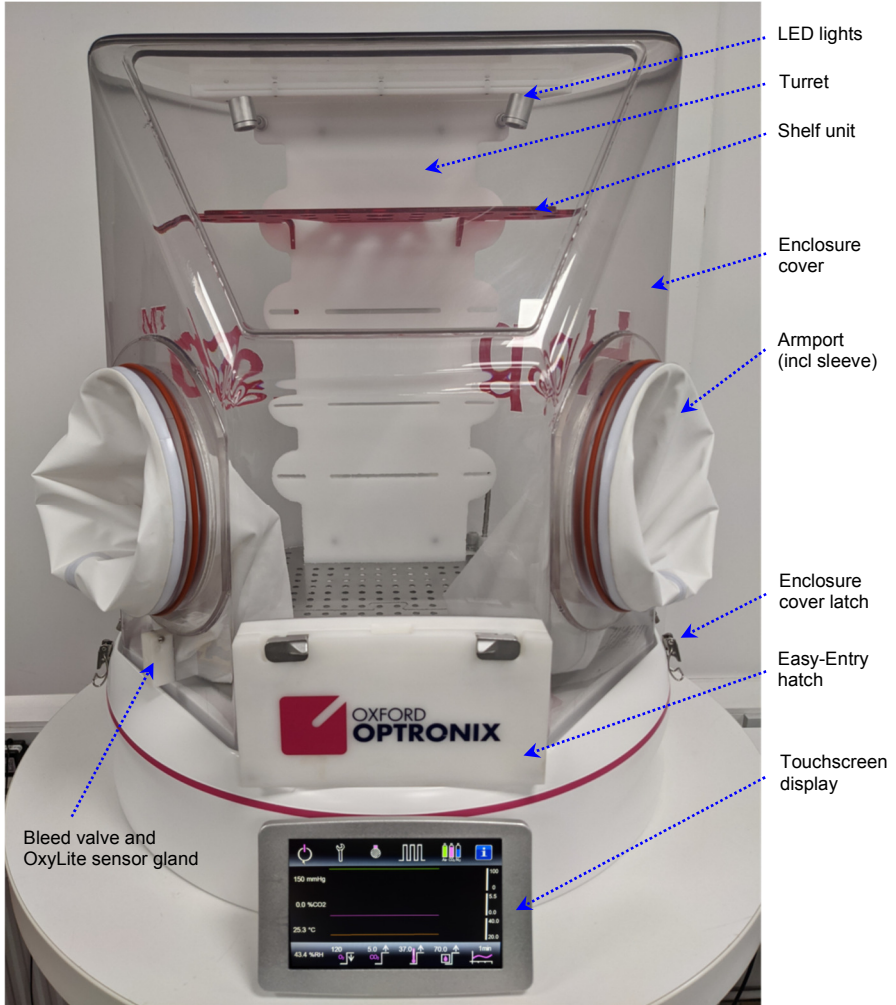


Figure 4.1 A frontal view of the HypoxyLab



Figure 4.2 HypoxyLab rear connector panel

To unpack the HypoxyLab, remove the retaining straps that surround the shipping carton and that run under the wooden pallet, remove all protective cellophane wrapping, open the top of the carton and remove the foam insert protecting the top of the HypoxyLab.

Remove any packing tape connecting the base carton to the upper carton then carefully lift the upper carton 'up and over' to reveal the HypoxyLab secured within its base foam insert.

The HypoxyLab weighs approximately 30 kg (70 lbs). It should be lifted out of the base foam insert by TWO PERSONS by locating the gripping points in the foam insert either side of the HypoxyLab.

Carefully position the HypoxyLab on a worktable or previously prepared laboratory bench.

## 4.4 Connecting the Electrical Supply

Locate the IEC mains power cable (supplied in the accessories box) and plug it into the mains inlet connector on the HypoxyLab back panel (Fig. 4.2). Switch on the HypoxyLab, when ready to do so, by operating the rocker switch. The HypoxyLab will boot up to 'Stand-by' mode.



DO NOT leave the HypoxyLab in Stand-by mode for extended periods. Sensor accuracy may be adversely affected.

## 4.5 Connecting the Gas Supplies



As for all tissue culture rooms or laboratories containing incubators, we strongly recommend the use of wall/ceiling mounted oxygen depletion warning sensors.



While due care is taken to ensure gas hose connectors and regulator fittings supplied by Oxford Optronix are leak-free it is **ESSENTIAL** to check for gas leaks, both at the gas source end and at the HypoxyLab end of gas lines once they are connected and pressurized.

The incoming gas supplies are the sole responsibility of the user. It is essential that the user has read and fully understood Section 3.1 'Gas Supply Requirements' before connecting the gas supply hoses.



Three 'Quick Connect' style gas connection hoses, pre-fitted with high quality Swagelok® fittings are supplied with your HypoxyLab. These hoses are for supplying CO<sub>2</sub>, air and nitrogen and are labelled accordingly. The connector assemblies are supplied 'clean'. The hoses should be attached to the outlet stage of each regulated cylinder according to the table below.

Take a moment to double-check that each labelled hose is securely connected to the correct gas (cylinder). Also, double-check that the regulator output pressures are correctly set according to the table below.

## HypoxyLab User Manual

---

Locate and identify the individual male inlet gas connectors on the back of the HypoxyLab. Push the brass SwageLok® fitting end of each labelled gas hose firmly onto the corresponding gas inlet connector, gripping the fitting by the body rather than by the front flare (as shown above). An audible 'click' confirms that the SwageLok® fitting is secured and that gas will flow. This action releases the automatic shut-off valve built into each SwageLok® fitting and will allow gas to flow. Please retain and use the dust caps whenever the hoses are detached from the HypoxyLab.

To remove the hoses, grasp the brass flare at the end of the SwageLok® connector and push it towards the HypoxyLab. Another audible 'click' confirms disconnection and activation of the automatic shut-off valve built into the fitting. The automatic shut-off valve prevents gas leakage even when the hoses remain pressurized and the hose can now be removed if need be.

See also our dedicated video tutorial:

[http://www.oxford-optronix.com/support/supp\\_hypoxylab.htm](http://www.oxford-optronix.com/support/supp_hypoxylab.htm)

Gas type Recommended purity 'N4.8' or better	Outlet	Regulator	Nominal outlet pressure
CO <sub>2</sub>	6 mm (¼") NPT	Two Stage	1 – 4 bar (15 - 60 psi)
Synthetic air	6 mm (¼") NPT	Two Stage	1 – 4 bar (15 - 60 psi)
Nitrogen	6 mm (¼") NPT	Two Stage	3 – 5 bar (45 - 75 psi)

NOTE: The SwageLok® 'Quick Connect' fitting on each gas hose has a convenient auto shut-off valve system built-in to the body of the fitting such that the flow of gas is stopped as soon as the connector is detached from the 'male' inlet on the HypoxyLab back panel. This allows hoses to be disconnected from the rear of the HypoxyLab while still under pressure (i.e. there is no need to turn off the gas supply at source), without the risk of gas leakage.

### 4.6 Water Supply / Waste Water

The HypoxyLab utilizes a nebulizer-based, active humidification system to maintain the high humidity that is required during cell culture to minimize evaporation. This requires both a supply of water and a wastewater receptacle or sink.



ONLY use DIONIZED / DISTILLED WATER to supply the HypoxyLab. Oxford Optronix shall not be held responsible for damage caused by the build-up of scale in the reservoir.

## HypoxyLab User Manual

---

Locate the supplied water fill/drain pipes (2 m flexible tubes). Identify the blue, barbed fill and drain connectors at the rear of the HypoxyLab, next to the gas inlets (see Fig. 4.2 above) and push one end of each tube over each barbed connector.

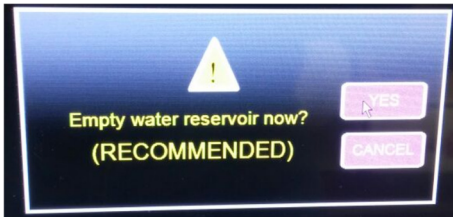
Place the free end of the hose fitted to the fill connector into your laboratory source of de-ionised water (e.g. a bottle) and place the free end of the hose fitted to the drain/waste connector into your waste receptacle (bottle or beaker) or dangle it into a nearby sink.

**Supply the HypoxyLab ONLY with de-ionized or distilled water. Use of any other type of water may permanently damage the nebulizer unit.**

The HypoxyLab will automatically fill the reservoir on power-up.

In use the humidifier reservoir is automatically emptied and re-filled ('flushed') every 8 hours. While no humidification is possible during the flush procedure, the process takes only 2-3 minutes. This 'flush' cycle is intended to prevent the water in the reservoir becoming stagnant.

On shutdown, the HypoxyLab will prompt the user to empty the humidifier reservoir:



**It is ESSENTIAL that the humidifier reservoir be left empty if the HypoxyLab will be out of use for more than 24 hours.**

NOTE: For manual drainage of the water reservoir, please use the dedicated 'Drain Res' function in the control panel (Standby mode only).



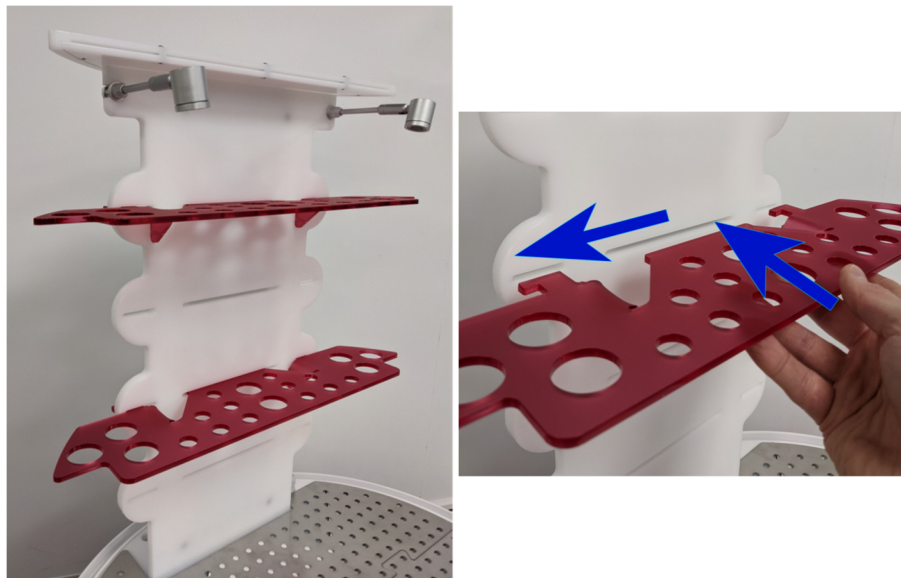
It is ESSENTIAL to empty the reservoir during periods when HypoxyLab is not in use. Oxford Optronix will not be held responsible for damage caused by the build-up of microbial contamination in the reservoir due to stagnant water.

### 4.7 Fitting of Shelf Units

The HypoxyLab is supplied with 2 shelf units. Each shelf unit features a pair of lugs that fit locator slots in the turret wall. The turret wall can accommodate up to 4 shelf units.

A shelf unit is secured by sliding the lugs into the locator slots and pushing the shelf to the LEFT, into its locked position (see arrows).

To remove a shelf, simply reverse the above steps.



Each shelf features cut-outs intended to fit standard 50 ml and 15 ml Falcon® tubes. Shelves can also be used to hang micropipettes.



*Figure 4.3 Fitting and use of the shelf unit*

### 4.8 Using the Armport Sleeves

Place your gloved or bare hands through the wrist seals and ensure the cuff is sealed comfortably, yet tightly around your wrist. A light powdering with the specialized talc supplied will assist if the sleeve feels particularly tight. Hold your hands flat and fully extend the armport sleeves without pulling on them.

See also our dedicated video tutorial:

[http://www.oxford-optronix.com/support/supp\\_hypoxylab.htm](http://www.oxford-optronix.com/support/supp_hypoxylab.htm)



The armport sleeves should be maintained WITHIN the armport covers during extended incubation periods (e.g. overnight). Allowing the armport sleeves to 'dangle' outside the HypoxyLab may result in the accumulation of significant water condensation.

### 4.9 Fitting the Armport Plugs

The armport plugs seal the armport sleeves when they are not being used. To use the armport plugs, hold each armport plug by the black handle and push the cylinder through each wrist seal in turn.



The armport plugs are designed to be fitted from either inside the chamber or outside the chamber. If you wish to fit them from inside the chamber (black handle facing inwards), make sure the armport plugs have been previously placed/stored inside the chamber before use.

See also our dedicated video tutorial:

[http://www.oxford-optronix.com/support/supp\\_hypoxylab.htm](http://www.oxford-optronix.com/support/supp_hypoxylab.htm)

### 4.10 Using the Easy-Entry Hatch

HypoxyLab's easy-entry hatch affords the quick and convenient transfer of cells, culture-ware and media into the chamber. As items are passed through the easy-entry hatch, a sensor detects when the internal letterbox style flap is opened and the

HypoxyLab injects nitrogen at a high rate to generate a temporary overpressure and thus minimize the ingress of external oxygen.



To open the easy-entry hatch turn the two catches into the 'open' (vertical) position and lower the door downwards. After use, close the door as quickly as possible and ensure the hatch is properly sealed by turning the catches to the 'closed' position.

The O-ring surrounding the hatch is user-replacable.

See also our dedicated video tutorial:

[http://www.oxford-optronix.com/support/supp\\_hypoxylab.htm](http://www.oxford-optronix.com/support/supp_hypoxylab.htm)

### **4.11 Fitting the Thermal Jacket**

A purpose-designed, stretchy thermal jacket is now supplied with HypoxyLab, which allows the maintenance of higher humidity set points for reduced evaporation from cell cultures, while benefiting overall power consumption too.

The jacket can be pulled over the enclosure cover from above and features holes for the armports and a cut-out for the Easy-Entry hatch. A Velcro-lined slit on the right-hand side allows the user to ensure a 'snug' overall fit.

Ensure that the elastic strap runs underneath the Easy-Entry hatch.

### **4.12 Fitting Insulated Armport Covers**

The HypoxyLab is supplied with two insulated armport covers that are intended for periods of steady-state, e.g. overnight runs or periods when the armports are not in use. The covers improve HypoxyLab temperature stability, reduce power consumption, and help reduce the accumulation of water condensation.



The armport covers are designed to accommodate the folded armport sleeves and attached armport plugs and are secured to the enclosure cover using the integral drawstring.



It is recommended to maintain the armport sleeves **INSIDE** the HypoxyLab or within the insulated armport covers during extended (e.g. overnight) incubation periods. Allowing the armport sleeves to 'dangle' outside the HypoxyLab can result in the accumulation of water condensation.

### **4.13 Removing the Enclosure Cover**

Removing HypoxyLab's clear enclosure cover enables users to introduce or remove items of equipment or bulk quantities of samples quickly and easily from the chamber – providing of course that a temporary loss of environmental conditions within the chamber is acceptable.

Removal of the enclosure cover also permits easy cleaning and sanitising of all the internal surfaces. Removing the enclosure cover can be accomplished by one person. Unlatch the two side latches and very carefully lift the enclosure cover so as not to scrape it against the internal turret structure. If the armport sleeves are removed, the cover can be conveniently gripped via the armport holes.

See also our dedicated video tutorial:

[http://www.oxford-optronix.com/support/supp\\_hypoxylab.htm](http://www.oxford-optronix.com/support/supp_hypoxylab.htm)

**NOTE:** Under **NO** circumstances should you attempt to lift or move the HypoxyLab by direct handling of the turret structure. Move the HypoxyLab by gripping the underside of the base only.

### 4.14 Changing the Armport Sleeves

The armport sleeves are consumable items and must be changed if they are worn, torn or a gas leak is suspected. Replacement armport sleeves are available from Oxford Optronix or your authorised Oxford Optronix Distributor.

To change the armport sleeve, firstly remove the orange O-ring located in the second groove (nearest you) on the armport sleeve flange. Loosen and remove the armport sleeve from the first groove (nearest the enclosure) of the armport sleeve flange. Take the new armport sleeve and mount the sleeve's internal 'O' ring over first groove on the armport mounting flange.

Ensure the internal armport sleeve O-ring sits evenly and uniformly within the groove around the entire circumference of the armport sleeve flange.

Take the new O-ring from the kit and stretch it OVER the new armport sleeve such that it locates on the shoulder of the armport sleeve flange.

This should be a very snug fit and may take a little effort and practice to get it right. With the O-ring positioned on the shoulder, carefully roll it forward until it neatly locates into the second groove. Double-check that both O-rings are sitting correctly and uniformly in their respective grooves. Finally, ensure the armport sleeve is both secure and gas tight.

See also our dedicated video tutorial:

[http://www.oxford-optronix.com/support/supp\\_hypoxylab.htm](http://www.oxford-optronix.com/support/supp_hypoxylab.htm)

### 4.15 Calibrating the CO<sub>2</sub> Sensor

We recommend calibrating the CO<sub>2</sub> sensor within the HypoxyLab approximately once a month. Please follow the instructions below to carry out a recalibration. The calibration takes place in room air, i.e. at what is assumed to be essentially a zero CO<sub>2</sub> concentration.

1. Disconnect all 3 gases at the rear of the HypoxyLab by releasing the Swagelok® connectors
2. Remove the enclosure cover and place it somewhere secure
3. Power on the HypoxyLab at the rear and launch the user interface via the touchscreen
4. Adjust the humidity set point to its minimum of 20% via the touchscreen
5. Wait 5-10 minutes
6. Launch the control panel from the 'spanner' icon and press the 'Cal CO<sub>2</sub>' function, following on-screen instructions.
7. Confirm that the display is showing a CO<sub>2</sub> of zero, or almost zero.

8. Replace the enclosure cover and either turn off the HypoxyLab or reconnect gases to continue your experiments, adjusting the humidity set point back to the desired level.

## 4.16 The Touch-Screen User Interface

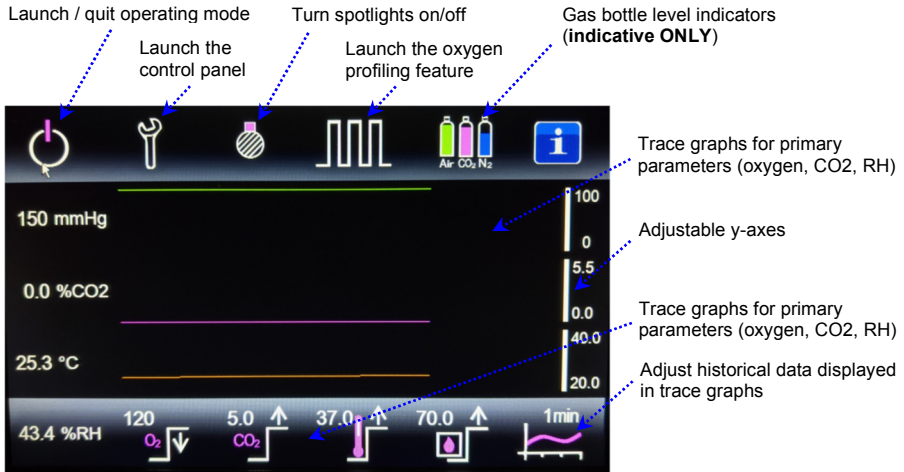


Figure 4.4 The primary user interface

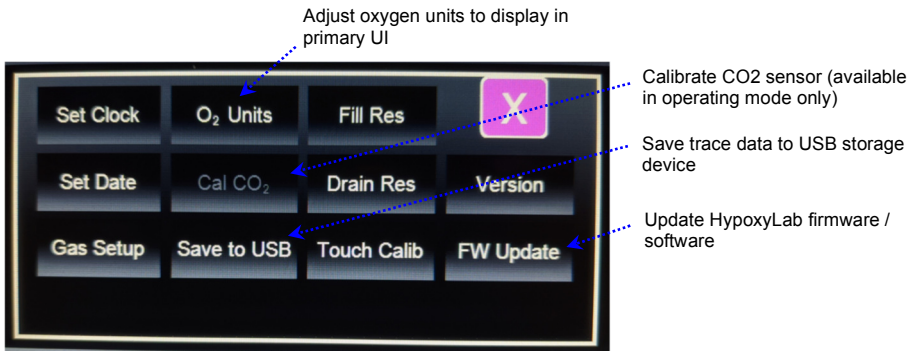


Figure 4.5 The control panel

Please also refer to video tutorials on our support website:  
[http://www.oxford-optronix.com/support/supp\\_hypoxylab.htm](http://www.oxford-optronix.com/support/supp_hypoxylab.htm)

### 4.17 Saving Recorded Data to USB Flash Memory

HypoxyLab parameters are continuously stored on internal flash memory and can be transferred to a USB flash drive (such as the branded one provided) for offline playback and analysis. The USB port is located at the rear of the HypoxyLab (Fig. 4.2).



To transfer data files onto a USB flash drive, simply select the 'Save to USB' function in the Control Panel.

Data files can be viewed using LabChart® Reader available as a free download from AD Instruments:

<http://www.adinstruments.com/products/labchart-reader>

### 4.18 Applying a Software Upgrade

Updates to the HypoxyLab operating software may be made available from time to time to address system bugs or to introduce improvements.

Updates will be made available via an emailed attachment or download link and will require the use of a USB flash drive (e.g. the branded USB flash drive originally supplied) in the correct format.

1. To begin Format a USB stick using the Quick Format option in Windows (select FAT 32 file system) then copy the 'Update' folder and its contents (extracted from the attached or downloaded zip archive) onto the root of the newly formatted USB stick.
2. Insert the USB flash drive into the USB port at the rear of the HypoxyLab and shut down the HypoxyLab to 'stand-by' (if it isn't already).
3. From the control panel select 'FW Update'. HypoxyLab will search for suitable data on the flash drive and automatically proceed with the update, reporting progress on the touch screen. Note that display will show some error messages, which can be safely ignored! After a short delay HypoxyLab will automatically re-boot and re-enter 'stand-by' mode.

4. Please check, by selecting 'Version' from the control panel, that the version number matches that just installed/provided.

### 4.19 Using OxyLite™ for *in situ* Oxygen Measurements

The optional OxyLite™ monitor (also manufactured by Oxford Optronix) provides highly accurate measurements of dissolved oxygen, directly from cell cultures or culture media within the HypoxyLab. It does so using a sensor inserted through the enclosure cover via a dedicated, sealable side-gland positioned next to the pressure release valve below the left-hand armport.

The OxyLite sensor is a miniature optode that can be used to rapidly sample oxygen in media or directly from cell cultures. Measurements are made within seconds from the sensor tip.



Oxygen readings in absolute units of mmHg are displayed on the OxyLite monitor itself, or, optionally, can also be displayed and recorded by the HypoxyLab (requires UI reconfiguration and optional serial data cable – contact Oxford Optronix).

For further instructions, please refer to the “Setting up the OxyLite Oxygen Monitor” video tutorial on our support website:

[http://www.oxford-optronix.com/support/supp\\_hypoxylab.htm](http://www.oxford-optronix.com/support/supp_hypoxylab.htm)

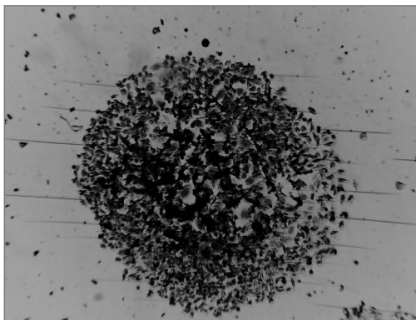
### 4.20 Setting up the optional CytoSMART™ add-on

The CytoSMART is a compact inverted microscope for bright-field live cell imaging *in situ*, inside the HypoxyLab.

The system operates at low voltage and is safe to use within the HypoxyLab (as well as in regular CO<sub>2</sub> incubators).

Power comes from a USB port conveniently positioned *within* the HypoxyLab. There is no need to run any cables in from outside the HypoxyLab.

The CytoSMART supports single images (jpg files), time-lapse videos (avi files) and confluency data (csv files), with optional cloud storage for access from any PC or mobile device.





For further instructions, please refer to the “Setting up the CytoSMART Digital Microscope” video tutorial on our support website:

[http://www.oxford-optronix.com/support/supp\\_hypoxylab.htm](http://www.oxford-optronix.com/support/supp_hypoxylab.htm)

## 5. CARE AND MAINTENANCE

Regular checks and routine maintenance will ensure your HypoxyLab operates both reliably and safely.

### 5.1 *Cleaning and Sanitising*

	NEVER use ammonia based cleaning agents, Methanol, Toluene or Acetone to clean HypoxyLab. To do so will degrade and damage the plastic surfaces.
	Regular (monthly) decontamination of the internal water reservoir is ESSENTIAL to prevent the build-up of microbial contamination over time. Refer to Section 5.2.




The HypoxyLab base and enclosure cover should be cleaned using lukewarm water and lint-free cloths. You may sanitise the base, enclosure cover and HypoxyLab's internal surfaces using 70% IPA or 70% ethanol spray (wiping down with lint-free cloths as desired).

For active disinfection (virucidal, bactericidal, sporicidal and fungicidal action) we recommend the use of commercially available hydrogen peroxide hard surface cleaners, such as Incidin™ OxyFoam™ S spray.

### 5.2 *Routine Preventative Maintenance*

#### Daily

Ensure the HypoxyLab chamber is free from any spillages and wipe/clean surfaces accordingly (see above).

	DO NOT leave the HypoxyLab in Stand-by mode for extended periods. Sensor accuracy may be adversely affected.
	It is ESSENTIAL to empty the reservoir during periods when HypoxyLab is not in use. Oxford Optronix will not be held responsible for damage caused by the build-up of microbial contamination in the reservoir due to stagnant water.
	Regular (monthly) decontamination of the reservoir is ESSENTIAL to prevent the build-up of microbial contamination over time. Refer to Section 5.2.

### Weekly

Replace the external water supply for the humidifier reservoir with fresh de-ionised or distilled water.

### Monthly

Carry out a CO<sub>2</sub> sensor calibration (see section 4.15).

Carry out Klercide decontamination or a physical decontamination of the internal water reservoir to ensure the humidification system remains contamination free.

Please refer to the dedicated instructions on our Support website:

[http://www.oxford-optronix.com/support/supp\\_hypoxylab.htm](http://www.oxford-optronix.com/support/supp_hypoxylab.htm)

Examine the condition of the armpit sleeves, wrist seals and associated O-rings. Replace as necessary.

Examine the condition of the enclosure-to-base main seal and the O-ring seal around the Easy-Entry hatch for signs of wear. Replace as necessary.

### 5.3 *Returning HypoxyLab for Repair, Service, or Upgrade*

While we offer an on-site preventative maintenance service, we reserve the right to require return-to-base of the HypoxyLab where on-site maintenance is not available due to geographic location.

In the above instance or the rare circumstance where your HypoxyLab must be returned to Oxford Optronix for a repair that cannot be offered on-site, the HypoxyLab must be prepared for shipment and packed in strict accordance to Oxford Optronix issued instructions and RMA (Returned Materials Authorization) procedures.

**A Returned Materials Authorisation (RMA) number and completed Decontamination Declaration Form MUST be obtained prior to shipping the equipment.**

**It is essential to carefully follow the packing instructions provided.**

**It is essential to ensure that the humidifier reservoir is entirely drained** before shipping (i.e. select 'Yes' when prompted to do so at shutdown).

HypoxyLab **MUST be packed in its original shipping carton, which must be attached to a wooden pallet as originally delivered.** If the original carton/pallet are not available, please contact Oxford Optronix (or your local Oxford Optronix representative) to request original packing materials that will ensure safe transportation.

Use a reputable courier company for the return of product to Oxford Optronix (UPS, FedEx etc).



Failure to pack the HypoxyLab appropriately for repair or service is likely to cause costly damage during transit.

**Oxford Optronix will not accept responsibility for any loss or damage to goods shipped to us howsoever caused.**

### **5.4 Storage Recommendations for HypoxyLab**

If the HypoxyLab is not required for a period of time please carry out the following actions:

- Select 'Yes' to drain the humidifier reservoir fully when prompted to do so at shutdown (see section 4.6 above).
- Turn off the HypoxyLab via the on/off rocker switch at the rear.
- Unclip the enclosure cover. This will help prevent irreversible compression of the main base seal.
- Remove the armport plugs, open the Easy-Entry hatch and prop open the internal flap to allow humidity inside the HypoxyLab to escape and the system to dry out fully.

Store out of direct sunlight in an indoor, dry environment within normal temperature ranges.

## 6. OBTAINING TECHNICAL ASSISTANCE

### 6.1 *Technical Support*

Please contact Oxford Optronix Technical Support (or your local Oxford Optronix representative) for product support or to report a technical fault.

When reporting a technical fault please provide the serial number of your HypoxyLab (printed on the back panel) and full details of the problem experienced, supported by photographs where possible.

Please provide as much detail as possible.

Technical Support email: [support@oxford-optronix.com](mailto:support@oxford-optronix.com)

Technical Support telephone: +44 (0)1235 821 803 (UK time zone)

### 6.2 *Support Site and Support Videos*

Our dedicated HypoxyLab support website offers usage tips, support documentation and links to an expanding list of video tutorials:

[http://www.oxford-optronix.com/support/supp\\_hypoxylab.htm](http://www.oxford-optronix.com/support/supp_hypoxylab.htm)

## 7. TECHNICAL SPECIFICATIONS

<b>General</b>	
Gas control	Microprocessor controlled, 3 channel Digital Electronic Flow Controller (DEFC)
Gases	Air, Nitrogen, CO <sub>2</sub> (1-4 bar inlet pressure)
Contamination control	Integrated HEPA filtration
Chamber volume	approx. 130L
Chamber working area	approx. 500 cm x 390 cm
Chamber storage capacity	up to 40 multi-well plates or 10 cm Petri dishes (assumes 2 shelf units; excludes storage on working area)
Maximum gas flow rate	15L / minute / gas
Transfer hatch	'Easy-Entry' letterbox with internal flap (usable dimensions 204 mm (W) x 88 mm (H))
Power	Auto-switching 110 – 240V AC 50/60 Hz, 500W max
Enclosure	PET-G. Lightweight and removable
Colour touchscreen	Integrated
External USB ports	1 x Type A (data recording and firmware upgrades) 1 x Type mini-B (pass-thru port for internal digital devices)
Internal, powered USB port	Integrated
Physical dimensions	800 mm (H) x 590 mm (W) x 690 mm (D)
Weight	25 Kg / 55 lbs
Operating temperature range (external)	15 – 30 °C
<b>Oxygen</b>	
Oxygen control method	Feedback algorithm with auto PID – using DEFC and optical O <sub>2</sub> sensor
Oxygen control range	1 – 140 mmHg; user programmable via touchscreen
Oxygen calibration	None required
Oxygen accuracy	± 0.5 mmHg (1-20 mmHg) ± 1 mmHg (21-40 mmHg) ± 2 mmHg (41-80 mmHg) ± 3 mmHg (81-140 mmHg)
Oxygen resolution	1 mmHg

## HypoxyLab User Manual

---

### Carbon Dioxide

CO2 control method	Feedback algorithm with auto PID – using DEFC and IR CO2 sensor
CO2 control range	0.1 – 10.0%; user programmable via touchscreen
CO2 calibration	Auto
CO2 accuracy	$\pm 0.25\%$
CO2 resolution	0.1%

### Temperature

Temp control method	Feedback auto PID – using Class A Pt sensor
Temp control range	Ambient +5°C (min 20°C) – 45 °C; user programmable via touchscreen
Temp calibration	Auto
Temp accuracy at point of sense	$\pm 0.5\text{ }^{\circ}\text{C}$
Temp resolution	0.1 °C
Temp gradient across chamber	$\pm 0.5\text{ }^{\circ}\text{C}$

### Relative Humidity

Humidity control method	Nebuliser with auto PID using pre-calibrated capacitive sensor
Humidity calibration	Pre-calibrated
Humidity control range	Ambient – 85% RH; user programmable via touchscreen
Humidity accuracy	$\pm 2.5\%$ RH
Humidity resolution	1% RH

## **8. WARRANTY**

Oxford Optronix Ltd. warrants its Products against defects in material or in workmanship, when used under appropriate conditions and in accordance with the appropriate Operating or User Instructions for a period of 24 months from the date of purchase. Oxford Optronix' sole obligation shall be to repair or to replace at Oxford Optronix' option, F.O.B. its factory, without charge, any part(s) that prove defective within the warranty period.

Software programs are supplied on the strict understanding that we do not warrant their functions to be free from defects, errors or bugs.

Any claim under the warranty must be made in writing. The Products to which the claim refers must be returned to us within 2 months from the date the claim was made, suitably packaged, using our Returned Materials Authorisation (RMA) procedure and our courier (e.g. FedEx) account reference. No returned Products will be accepted without prior written authorisation and an RMA number.

Oxford Optronix Ltd. is not liable under this warranty:

- for any defect arising from fair wear and tear, wilful damage, negligence, misuse, repair of the Products without our written approval; or
- any use of or dealing with the Products in conjunction with any other item where such item causes or gives rise to the alleged defect; or
- any use of the Products which is not in accordance with the Operating or User Instructions or from any failure to service or maintain the Products in accordance with such instructions.

Oxford Optronix Ltd. specifically disclaims any other express or implied warranty, including warranties of merchantability and of fitness for use. To the full extent permitted by law, we shall not be liable in any way whatsoever whether in contract, in tort, in misrepresentation or under statute or common law or otherwise (whether caused by our negligence or otherwise) in respect of defects in the Products or failure to correspond to specification or for any injury, damage or loss resulting from such defects or failure. In no event shall any breach of contract on our part or tort (including negligence) or failure of any kind on our part give rise to any liability for loss of revenue or loss of profits or any other consequential or indirect loss or damage arising from any cause whatsoever.

## APPENDIX 1

### Converting between % oxygen and mmHg

The HypoxyLab characterizes its internal oxygen environment in units of oxygen partial pressure (mmHg). This is because oxygen availability to cells in culture is better described as a function of oxygen partial pressure ('pO<sub>2</sub>') than merely as the proportion (%) of oxygen in the atmosphere.

At any constant atmospheric pressure, there is a direct relationship between the % oxygen composition of air and oxygen partial pressure. For example, at sea level, assuming mean atmospheric pressure of 760 mmHg (1 atmosphere):

- 1 % oxygen ⇔ 7.6 mmHg;
- 2% oxygen ⇔ 15.2 mmHg;
- 3% oxygen ⇔ 22.8 mmHg;
- 5% oxygen ⇔ 38 mmHg, etc..

Note that converting a partial pressure value in mmHg into a value for % oxygen requires knowledge of the current atmospheric pressure, i.e.,

$$\% \text{ oxygen} = [\text{mmHg oxygen}] / [\text{atmospheric pressure in mmHg} / 100]$$

The reality of course is that not all laboratories are situated at sea level and that atmospheric pressure is everything but constant, being highly dependent on weather patterns and therefore rarely at a nominal 760 mmHg.

Which is precisely why using the partial pressure of oxygen to control the oxygen environment within HypoxyLab represents the most scientifically robust approach, as it allows the scientist to be certain that the oxygen availability experienced by cells within the HypoxyLab is independent of altitude or atmospheric pressure (weather) fluctuations.