

## Bioquell | L-3



- **Multi-purpose hydrogen peroxide vapour (HPV) generator delivering 6-log bio-decontamination**
- **Suitable for enclosures including pass-through chambers and isolators**
- **Optional room distribution head for rapid bio-decontamination of rooms/zones up to 100m<sup>3</sup>\***

The Bioquell L-3 is a versatile and robust hydrogen peroxide vapour (HPV) generator. Providing enhanced HPV delivery via a simple user interface with touch panel controls. Designed to safely bio-decontaminate a wide variety of enclosures including biological safety cabinets, laboratories, isolators and freeze driers.

The Bioquell L-3 utilises patented 'dual circuit' technology, minimising hydrogen peroxide usage whilst delivering the optimum amount of sterilant for a fast and reliable 6-log deactivation of viruses, fungi, bacteria and moulds.

A communications port allows integration to a building management system (BMS) or other related systems/equipment. The 'data logging' option allows data export into Excel and Yokogawa Data Logger format. The system comes with multiple language options.



**Image 1.** Optional room distribution head



**Image 2.** Simple menu driven touch panel controls



**Image 3.** Safe and secure bottle loading mechanism

## Technical specification

Physical and safety data	Operating data	Power data
<b>Dimensions (WxHxD)</b> 515 x 1135 x 705mm (19.1 x 44.7 x 27.8in)	<b>Temperature limits</b> Starting 15-30°C (59-86°F) Storage and operating 0-35°C (32-95°F)	<b>Requirements</b> 230V AC, single phase, 50/60Hz, 6A 120V AC, single phase, 50/60Hz, 12A 100C AC, single phase, 50/60Hz, 15A
<b>Weight</b> 74.5kg (164.2lbs)	<b>Relative humidity limits</b> Starting 80% max <sup>1</sup> Storage and operating 80% max non-condensing	<b>Consumption</b> 1.44kW (max)
<b>Locking brake</b> (2x) castor lock	<b>Hydrogen peroxide liquid</b> 30-35% w/w Bioquell approved supply only <sup>2</sup> (Fits approved 500ml and 1L bottles)	<b>Supply</b> Installation category II
<b>Vapour hoses and connectors</b> 1.5in nominal bore 1.5in male/female camlock couplings		

<sup>1</sup> If requiring to operate outside this range refer to Bioquell or its agents

<sup>2</sup> For a full hydrogen peroxide specification please contact Bioquell or its agents

## Key features

The Bioquell L-3 includes a colour touch panel, GAMP compliant software and an integral thermal paper printer. It is a compact and highly portable design with an easily cleanable external surface. There is a remote start/stop and volt-free contacts for external signals. Connection is simple with flexible supply/return hoses and pressure monitoring tube. There is also a cycle edit and store facility for new applications.

The Bioquell L-3 is effective against a wide range of microorganisms, utilising 30-35% w/w Bioquell hydrogen peroxide solution in 500ml or 1L sizes. This allows multiple cycles without intervention.

## Operation

Easy to operate with safe bottle loading, built-in drip tray and wipe clean mechanism. Touch sensitive panel provides an easy to use user interface. Software has built in warning alarms. Each stage of the cycle can be recorded. The thermal printer enables hard copy data recording.

## Optional accessories include:

- Remote control with room gassing distribution head
- Sensor pack - integrated hydrogen peroxide vapour sensor
- Data logging and archive with USB interface
- Hand-held HPV detector
- External aeration/catalyst unit to reduce cycle times further
- Supply/return hoses 0.5-3m long

\*Subject to room layout and configuration

## Validation and service

Fully validatable to comply with requirements of GMP using GAMP compliant software. Bioquell provides complete service including:

- Installation and integration
- Preventative maintenance plans
- Extensive field-based service engineer network
- IQ/OQ/PQ documentation and execution
- Bio-decontamination cycle development services

Your local distributor:

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## Remote Equipment Interfacing with the Clarus Range of Hydrogen Peroxide Gas Generators

## ATTACHMENT #1

## Revisions

Rev	Description	Date	C.R.No.	Orig.	Chkd.	Apprd.
10	Clarification of control interfaces; document re-branded.	19 <sup>th</sup> July 2011	1790	JL	<i>JL</i>	<i>CE</i>

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Remote Equipment Interfacing with the Clarus range of HPV Generators  
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## 1 Interfacing the Clarus with remote equipment / enclosures

The Clarus range of Gas Generators has been designed to work with remote equipment (e.g. Isolator) or enclosures. It is possible to establish communications between the Clarus and remote equipment or Building Management Systems (BMS), to enable the full benefits of an integrated system to be utilized. These control interfaces are defined below, along with the specification for the communications.

The Bioquell Z, Q-10 and other generators are not covered by this document; only the Clarus range.

The Clarus range have standard mechanical and control interfaces and logic. The Clarus C does have some additional functionality, and where this is the case the document makes it clear.

### 1.1 Mechanical Interfaces

#### 1.1.1 Hose Connections

The hoses carrying the gas into and out of the enclosure require the following interfaces:

	Connection for gas IN to remote equipment	Connection for gas OUT of remote equipment
Clarus C	1.5" Female Cam-lock	1.5" Male Cam-lock
Clarus L2	1.5" Female Cam-lock	1.5" Male Cam-lock

The mating Camlock on the Clarus hose is made of polypropylene.

#### 1.1.2 Pressure Sensor Connection

The Clarus range monitors and controls the pressure by means of a pressure line. To connect to this the remote enclosure/equipment requires a hose barb suitable for a 4.8mm (3/16") Internal Diameter flexible tube.

#### 1.1.3 Hydrogen Peroxide Sensor Mounting Assembly (Optional)

If the Hydrogen Peroxide sensor is to be mounted through the wall of the enclosure then a mounting assembly ought to be used. This can be supplied by Bioquell (Part No TD035-6100 for up to 5mm wall thickness and TD035-6200 for 10 to 12mm wall thickness). This assembly allows the sensor to be placed into the enclosure to monitor the levels of Hydrogen Peroxide directly, and then to be removed without breaking integrity. A 35.0 mm diameter hole is required, the position of which ought to be agreed with Bioquell.

### 1.2 Control Interface

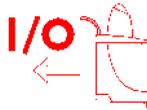
These are common to the Clarus L2 and Clarus C. There are two control sockets on the back of the unit which can be used for communication between the Clarus and a remote control system (PLC to PLC). These are the VOLT-FREE CONTACTS (VFC) and REMOTE START/STOP (RSS) connections.

The VFC connection allows an external system to interrogate the Clarus to determine its current cycle status, or alarm condition.

The connection at the back of the Clarus C is labelled XP182 (the 9 way socket).

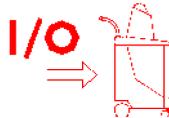
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The connection at the back of the Clarus L2 is labelled as:



The RSS connection permits an external system to start the Clarus from a Standby state, terminate a completed cycle or abort a running cycle, by completing or breaking a volt-free circuit.

The connection at the back of the Clarus C is labelled as XP231 (a 4 way socket). The connection at the back of the Clarus L2 is labelled as:



Plugs, sockets and pins to terminate cables to the Clarus from external equipment can be obtained from Bioquell (Included in Part No: CLARUS C CONN KIT or CLARUS L2 CONN KIT) as follows:

Connector Type:	Tyco AMP Series 1
Volt-Free Contact Output	5-Core Cable to 9-Way Pin Connector
Volt-Free Input Connector Part Nos.	182645-1 (9 way body) 66105-2 socket for 0.2 to 0.6 mm <sup>2</sup> wire OR 66101-2 for 0.8 to 1.4 mm <sup>2</sup> wire 182663-1 Outside shell
Remote Start / Stop Input	4-Core Cable to 4-Way Pin Connector
Remote Start / Stop Input Connector Part Nos.	182647-1 (4 way Body) 66105-2 socket for 0.2 to 0.6 mm <sup>2</sup> wire OR 66101-2 for 0.8 to 1.4 mm <sup>2</sup> wire 182658-1 Outside shell

Cables, 2 metres in length with suitable terminations at the Clarus end, and matching Tyco AMP female connectors at the other are available from Bioquell under part number SP72924-9001 (VFC) and SP72924-9002 (RSS).

## 2 Communication from the Clarus output to remote equipment input

In order for external equipment to establish the operating status of the Clarus, voltfree outputs VF1, VF2 and VF3 are sequenced in tandem with the Clarus decontamination process phases. The table below defines the default logic sequence.

Note with exception to the Clarus L2 when connected to a Clarus Port the Gassing phase encompasses the Pregassing, Gassing and Gassing Dwell stages of the cycle. The voltfree outputs are set as configured at the start of Pregassing and remain static until the Aeration phase.



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The voltfree outputs are rated 5 to 30V DC or 5 to 250V AC, at a maximum current of 2 Amps.

Warning: All outputs are relay contacts switching delay time maximum 10ms. PLC inputs with faster scan times will require program time delays to prevent false operation at phase transitions.

### 3 Communication to the Clarus inputs from remote equipment outputs

The Clarus is provided with two digital inputs for interfacing to external equipment by way of external voltfree contacts. For this specification the input is present when the external voltfree contact is closed.

Digital input 1 is used in conjunction with the remote start/stop enable/disable cycle parameter, such that if the function is enabled the Clarus process phase will not advance beyond the standby phase until an external start signal is present.

Digital input 2 (Clarus C only) is used to flag the end of the cycle remotely to the Clarus, allowing the Clarus time to shut down before removal of the remote start signal.

When a Clarus is being controlled by a remote device such as an isolator, the Clarus is first prepared ready to start by the operator, and then waits in Stand-by mode for a start signal.

For the remote device to generate the start signal it must connect Pin 1 to Pin 2, breaking the connection at any time other than specified, will cause the Clarus cycle to abort. The Clarus will display a message that the remote device has stopped it, and it will alarm. On the Clarus C connecting Pin 3 to Pin 4 is the way a remote device signals to finish the cycle. This is required when the Clarus is in the cycle complete phase (once Aeration has ended), otherwise the Clarus will just continue to run. Note the start signal should be removed a minimum of 10 seconds after issuing the finish cycle signal.

On the Clarus L2, breaking the connection between Pin 1 and Pin 2 when the unit is in cycle complete phase will end the cycle, breaking the connection at any other point in the cycle will cause the Clarus L2 to abort.

The switch in the remote device to make and break the two connections must be a volt free contact rated at 7 mA minimum.

Pin No.	
1	GRD
2	Remote Stop/Start
3	GRD – Clarus C only
4	Cycle Stop (Aeration Ended) – Clarus C only

### 4 Monitoring only from Remote Equipment

In applications where there is a requirement to only monitor the Clarus, it is only necessary for the remote equipment to be linked to the Clarus's output. A typical example of an application for this is when the remote equipment such as a BMS or Isolator can vent during the aeration stage of the cycle, thus reducing its duration.

Below are some guidelines of the configuration of the system, however each case is going to be different and thus specific requirements will be needed. It is recommended that these are discussed with Bioquell.

The remote equipment needs to be set to a mode for gassing prior to starting the Clarus. This may involve closing valves/dampers, checking doors are shut etc. Once this has been successfully achieved the Clarus can then be started by the operator.

When the remote equipment detects that the Clarus is in Aeration the remote equipment can go into Aeration phase and exhaust the gas. It ought to continue this configuration during the cycle complete stage, and only return back to its normal operating stage when the Clarus is indicating Off Mode.

If the Clarus should alarm the remote equipment ought to remain in its configuration but stop any fans from running.

## 5 Integrated Remote Equipment and Clarus Systems

If the requirement is for an integrated system, then the following is a guideline on how the system could work. However, each system is going to be different and thus specific requirements will be needed. It is recommended that these are discussed with Bioquell.

It is assumed that the remote equipment has one volt free contact if used with a Clarus L2 and two if used with a Clarus C, designated by RE VF1 and RE VF2 (Clarus C only). RE VF1 is connected to the Clarus's remote start/stop (Pins 1 and 2) and RE VF2 to Clarus's Cycle stop (Pins 3 and 4) – Clarus C only.

### 5.1 Normal Gassing Cycle

Before anything happens the Clarus is in its 'OFF MODE' the volt free outputs from the Clarus are VF3=0, VF2=0, VF1=0, and the remote equipment outputs are RE VF1=0 and RE VF2=0

The operator will load the H2O2 bottle into the Clarus and run through the start-up procedure. At the end of which the Clarus will go into Standby mode (VF3=0, VF2=0, VF1=1).

The operator will then go to the remote equipment, get it ready for gassing, and then start the gassing cycle from the remote equipment. This will result in the remote equipment volt free contact closing (RE VF=1) which will start the Clarus automatically. The remote equipment must not try to start the Clarus (RE VF=1) UNLESS the Clarus is in Standby (VF3=0, VF2=0, VF1=1).

The Clarus will then signal to the remote equipment that it is going through its cycle stages:

Pressure test (VF3=0, VF2=1, VF1=0) Conditioning (VF3=0, VF2=1, VF1=1) Gassing (VF3=1, VF2=0, VF1=0)

During the cycle stages above the remote equipment stays in its configuration for Gassing.

Then the Clarus will move into Aeration (VF3=1, VF2=0, VF1=1). The remote equipment prepares itself for Aeration and takes the actions it has to.

At the end of Aeration the Clarus goes into Cycle Complete stage (VF3=1, VF2=1, VF1=0). The Clarus will continue to Aerate but a message appears on the Clarus screen "H2O2 Concentration OK?" This message is reproduced on the remote equipment screen if installed.

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The operator must then acknowledge at the remote equipment that the cycle has ended. This will then end the cycle (RE VF2=1 on the Clarus C and VF1=0 on the Clarus L2). The Clarus will then go to "Off Mode" VF3=0, VF2=0, VF1=0. The remote equipment can then disconnect its volt free contacts a minimum of 10 seconds after issuance of the cycle end signal (RE VF1=0 and RE VF2=0).

This is the end of the cycle.

### 5.2 Alarms

If the Clarus has a critical alarm then it will signal this to the remote equipment by VF4 = 0. The Clarus will always Abort, and will go to "OFF MODE". When aborting the volt free contacts will be VF4=0, VF3=0, VF2=0, VF1=0.

If the remote equipment alarms, the remote equipment signals by RE VF=0. The Clarus will then abort the cycle.

If there is a power cut, when the power is restored the Clarus will be in "OFF MODE" but with an alarm stating that there has been a power cut.

## 6 Auto Recovery

It is often perceived that in an alarm situation the equipment ought to go into auto-recovery. However this is not advisable. For example, if the return hose was disconnected, and an alarm occurred "Pressure High" (if running in negative pressure). If the Clarus then started aerating it would blow air from the chamber with high levels of Hydrogen Peroxide into the room from the disconnected hose. This would be very dangerous.

It is advisable for all equipment to stop working fans etc in an alarm mode and leave the configuration the same. If there is a leak then the Hydrogen Peroxide can only diffuse out which is unlikely to cause a dangerous situation. The operator can take the most appropriate action to rectify the alarm condition.

There is a special cycle in the Clarus called "Aeration Only". This runs the Clarus through Aeration and cycle complete stages only. The operator can choose to run this cycle if appropriate, to make the remote equipment safe. However the remote equipment must be able to allow an "Aeration Only" cycle to be run.