GALAXY S CO_2 INCUBATOR

MODEL No: 170-200

USER MANUAL

Issue 6, March 2002

Contents

Section 1

Product Description

The Galaxy S CO_2 Incubator is designed to ensure accurate and reliable operation. The unit incorporates a touch sensitive keypad and two three digit LED displays which allow easy setting and monitoring of the chamber condition.

The microprocessor control system ensures a rapid, controlled return to optimum chamber conditions after a door opening whilst also preventing any overshoot.

A thermal heating element completely surrounds the incubator providing an even temperature within the chamber. The independently heated outer door is designed to ensure an even distribution of heat thereby minimizing condensation on the inner door.

Incorporated into the unit is an over temperature safety system. This operates independently of the main control system.

A purpose designed condensation collection point at the rear of the chamber allows a high uniform relative humidity and prevents undesirable condensation in other parts of the chamber.

A solid-state infrared sensor is used to control the level of CO_2 giving excellent reliability and is unaffected by humidity. The CO_2 system has a programmable automatic zero system to re-reference the sensor to atmospheric CO_2 levels at regular intervals. A small pump supplies HEPA-filtered atmospheric gas to the sensor at about 0.3 litres / min. for 2 minutes. This displaces the chamber atmosphere completely and allows the control system to automatically zero reference. The pump is switched off and a dwell period of 3 minutes allows the chamber atmosphere to homogenize back into the sensor.

There is a two level alarm system. The chamber monitoring alarm is programmable and will alert you if temperature or CO_2 have not recovered within a preset time after the door has been opened. If not required, this system can be disarmed. System alarms occur only if a fault has developed which requires user intervention to rectify.

Air circulation is achieved without the use of a fan eliminating this potential source of contamination and reducing small sample evaporation within the chamber.

The 170-litre chamber and all internal components are manufactured from polished stainless steel. The shelves and shelf supports (which are non-tip and adjustable) are easily removed for thorough cleansing.

The outer shell of the incubator is manufactured from zinc plated stove enamelled steel to give a durable corrosion resistant finish.

The outer door is vacuum formed from ABS plastic and provides a high level of insulation. The keypad and display are incorporated into the door permitting maximum usable chamber volume.

Section 2

Guidance Notes and Routine Checks

2.1 To ensure that chamber conditions remain as stable as possible always minimize the length of time that the inner door is open. The magnetic door catch is specifically designed to make door openings and closing as easy as possible. When opening the inner door wipe off any small drops of condensate that may have formed on the inner seal. This will avoid any build up of condensation.

2.2 Always use copper sulphate (or a recognised biocide) in the humidity tray. Tests have shown that as well as inhibiting bacterial growth in the tray this also reduces contamination on the chamber walls (one teaspoonful of copper sulphate is recommended).

2.3 Daily

2.3.1 Check that the temperature and CO_2 levels are reading within specification.

2.4 Weekly

2.4.1 Check the reserve pressure in the CO_2 cylinder (normally 50 bar when full). The design of the incubator ensures very low consumption of CO_2 and during normal working conditions a type K cylinder should last approximately 12 months. If there is a significant drop at the cylinder 50 BAR pressure, it means that the cylinder is almost empty and should be replaced, ensuring that there are no leaks at any of the joints.

2.5 Monthly

2.5.1 Top up the humidity tray (to a maximum volume of 1.5 litres). The use of warm water (approx. 37.0^{o}C) will ensure rapid return to optimum chamber conditions. After topping up check that the humidity tray is situated directly beneath the deflector plate on the rear wall of the chamber. This ensures that any condensate collected is returned to the reservoir.

2.5.2 If required, a sample of the gas inside the chamber can be taken using the CO_2 sample port and checked using a CO_2 gas analyser. The CO_2 port is located inside the outer door at the front of the chamber. During sampling please ensure the following:-

a) The programmed value for CO_2 is lowered by 0.2% to prevent CO_2 from being injected into the chamber and giving a false reading.

b) A flow rate not in excess of 0.5 litres/minute is used to take a sample.

c) The outer door is kept closed to minimize heat loss through the glass door.

It is recommended that prior to sampling, a CO_2 auto zero be performed (see Section **4.1**).

ALWAYS PUSH THE HUMIDITY TRAY FULLY BACK AGAINST THE REAR WALL, SO THAT CONDENSATE FROM THE COLLECTION AREA GOES BACK INTO THE TRAY.

Section 3

Installation

3.1 Unpack the incubator by lifting it from the delivery pallet ensuring that the base supports it. At least two people at either side are required for lifting. In the unlikely event of any transit damage this must be reported within seven days.

3.2 The following items are supplied with your new incubator: -

4 Shelf Racks (in situ)

3 shelves with 6 shelving runners (in situ)

1 Humidity tray with runners (in situ)

1 Mains power cord

3m of PVC 6mm bore plastic tubing (in situ)

2 tubing clips (1 large, 1 small)

1 CO_2 hepa-vent filter (in situ)

4 Adjustable feet

4 Anti-slip pads for the adjustable feet

1 Black sensor cover (in situ)

1 Auto Zero HEPA Filter (in situ)

The shelves are adjustable and if required further shelves/runners can be purchased. The lower shelf position is reserved for the humidity tray.

3.3 In order to use the incubator you will require:-

a) A 220/240 V 50 HZ earthed electrical supply - minimum capacity 3 amps. (5 amps on High Temperature Decontamination Models)

b) CO_2 gas cylinder (100% CO_2 vapour withdrawal) together with a two-stage regulator for pressure control to 0.35 BAR. (5lbf / in^2).

c) Copper Sulphate or other biocide for the humidity reservoir.

3.4 The incubator is designed to operate at a chamber temperature of 1.0°C above ambient and at an absolute minimum of 15°C. Therefore care should be taken to avoid placing the incubator in draughts, direct sunlight or near a radiator.

3.5 To insert the adjustable feet, front pair first, tilt the incubator backwards, remove the protective tape and screw the feet into the required depth. Repeat the operation, tilting the incubator forward for the rear pair.

3.6 Place the incubator in the working position. The unit is designed to be sited on a level surface capable of bearing 80kg (approx – actual weight will depend on options fitted). It is recommended that a spirit level is used to position the incubator, the feet individually adjusted to compensate for uneven surfaces and the anti-slip pads fitted. Purpose designed stands and stacking assemblies are available.

3.7 Remove the black protective cover from sensor (keep for use when disinfecting). Ensure that the white porous sensor cover remains in place.

3.8 Connect the incubator to an earthed power supply using the power cord provided. Switch on the incubator using the on/off switch at the rear of the cabinet. The display will illuminate immediately.

3.9 Connect the CO_2 using the 6mm plastic tubing to the CO_2 HEPA filter at the rear of the chamber. Use the tubing clips provided to eliminate CO_2 leaks. Turn on the gas supply with the pressure to 0.35 BAR (5lbf/in^2) when the incubator is at the programmed temperature.

3.10 The chamber set points are factory pre-programmed at 37.0°C and 0% CO_2

3.11 Leave the incubator until the correct chamber conditions have been reached.

3.12 Fill the humidity tray with 1.5 litres of warm water (at approx. 37.0°C) and add one teaspoonful of copper sulphate.

3.13 Leave the incubator for at least two hours (preferably overnight) to allow conditions to stabilize.

3.14 Perform a CO_2 auto zero and program the CO_2 to the required level.

3.15 The incubator is now ready for use.

ALWAYS PUSH THE HUMIDITY TRAY FULLY BACK AGAINST THE REAR WALL, SO THAT CONDENSATE FROM THE COLLECTION AREA GOES BACK INTO THE TRAY.

Section 4

Operating instructions

4.1 Control Panel Description.

The control panel consists of 2, 3 segment LED displays, and 4 keys. The functions and descriptions of these are described below. ***bold, italicized text represents messages shown on the display***.

*	PROGRAMMING Key
+	UP Key
-	DOWN Key
↵	ACCEPT Key

The decimal points on the display for Temperature and CO_2 flash ON / OFF to signify that the Alarm System is not armed.

The picture on the previous page shows the screen in normal operation, this is how the screen should be illuminated when running normally.

1) The '*' Key allows temperature and $C0_2$ to be programmed within the following ranges:

Temperature Range:	10°C (must be 1°C above ambient) to 50°C.
CO_2 Range:	0.2% to 10.0%

2) Once the temperature has been programmed it must be entered with the '↵' Key and then the CO_2 can be programmed.

3) To carry out an **AUTO ZERO** press the '↵' & '*' Keys simultaneously. A prompt will appear ***Ent . Er StA . rtS CO2 Aut . O ZEr . O***. Press the '↵' Key to begin the cycle.

The Auto Zero System automatically re-references the CO_2 Sensor to atmospheric CO_2 in the following way: -

a. A small pump switches on for 2 minutes pumping HEPA-filtered atmosphere at 0.3 litres / min into the measuring chamber of the sensor. This displaces the chamber atmosphere completely from the sensor.
b. At the end of the countdown, the Control System adjusts the A/Z Factor to reference the sensor to 0.05% CO_2 which is the approximate atmospheric level.
c. The pump switches off and chamber atmosphere moves back into the measuring chamber of the sensor. This takes 3 minutes after which the normal CO_2 control takes over.
d. On completion of the **AUTO ZERO** a prompt will appear ***CO2 Aut . O ZEr . O In rAn . gE*** NB:- *Press the '*' Key to finish the cycle and return to the main display.*
e. If the CO_2 Auto Zero *cannot* reference the signal to atmosphere at the end of the Auto Zero the following message will appear ***CO2 Aut . O ZEr . O FAI . LEd .*** This means that the CO_2 Sensor is defective and requires replacement. If this occurs please contact your local distributor immediately.

4) Do not press the '+' and '-' keys simultaneously as this enters the Engineering Mode. If this is inadvertently done, press the '*' key to exit.

4.2 Setting the Humidity Conditions

4.2.1 If humidification is required, the humidity tray, which is located on the lower shelf runners, should be pulled forward and filled with 1.5 litres of warm water (add one teaspoonful of copper sulphate or other recognised biocide). When replacing the humidity tray it is important that it is directly beneath the deflector plate on the rear wall of the chamber. This ensures that any condensation is returned to the reservoir.

4.2.2 The incubator is designed to achieve 95% relative humidity when using the standard humidity tray. If a higher relative humidity is required a larger tray is available as an optional extra. This will achieve a relative humidity in the region of 97 - 98%. When using the larger tray some condensation may occur on the interior glass door. Increasing the outer door temperature can eliminate this. Should you wish to do this please contact your distributor.

DO *NOT* LEAVE WATER IN THE HUMIDITY TRAY IF THE INCUBATOR IS SWITCHED OFF, AS THIS MAY RESULT IN DAMAGE TO THE CO_2 SENSOR.

Section 5

Programming the CO_2 Auto zero System

5.1 The default setting for the Auto zero System is 28 days of running time for the incubator. After the unit has been switched on for a total of 28 x 24 = 672 hours the Auto zero as is described in Section 4 will take place to reference the CO_2 sensor automatically to atmospheric CO_2.

5.2 To alter the frequency of the auto zero press the '**+**' and '↵' simultaneously and the following message will be displayed

PrG AZ

Press '↵' and display changes to ***28 dAY***.

By pressing the '**+**' and '**-**' keys this value can be changed in steps from **28** to **14, 7, 1** or OFF.

Press '↵' to confirm the new setting.

5.3 If a CO_2 Alarm occurs, the Auto zero will automatically take place after 1 minute. This is to confirm that the CO_2 sensor is correctly referenced.
If after a 15-minute delay, the CO_2 is still in an alarm condition and re-alarms it will again Auto zero.

5.4 In the event of high CO_2 alarms, open the inner door for a few seconds to ensure that the CO_2 level drops below set point. Also check that the CO_2 pressure is set correctly to 0.35bar (5lbf/in^2).

5.5 In the event of low CO_2 alarms check that the CO_2 supply is present and set to the correct pressure.

Section 6

Programming The Alarm System

Press the '↵' & '-' Keys simultaneously to enter Alarm Program Mode.

7.1 Setting the High and Low Temperature Alarms.

The LED display shows ***°C . AL . .*** Press the '↵' Key to display the High Temperature Alarm, ***HI 37.5***. The factory setting is the programmed value +0.5°C. This value can be adjusted using the '+' & '-' Keys, the minimum setting is 0.5°C from set point. Press the '↵' Key to accept the setting and the Low Temperature Alarm is displayed ***LO 36.5***. Press the '↵' Key to accept the setting.

7.2 Setting the CO_2 High and Low Alarms.

Press the '+' Key, the display will show ***CO2 . AL . .*** Press the '↵' Key to display ***HI . 5.5*** Adjustment and the Low Alarm Setpoint are as described in 1) above.

7.3 Door Open Alarm.

To adjust the time delay after opening the door before the alarm sounds, Press the '+' Key, the display will show ***doo . rAL*** Press the '↵' Key and the '+' & '-' Keys to adjust the time in the following steps – 15, 30, 45, 60, 75 & 90 seconds, then OFF. Press '↵' to select the preferred value.

7.4 Alarm Duration.

To adjust the length of time which all Alarms are on for. Press the '+' Key, the display shows ***Per . Iod.*** Press the '↵' Key and the '+' & '-' Keys to adjust the Alarm on time in the following steps - OFF, 10 sec, 30 sec, 60 sec, 600 sec, 1 Hr , then ON. Press '↵' to select the preferred value.

7.5 Alarm Arm Time.

This is the length of time that is allowed for the Temperature and CO_2 to recover before the Alarm System is armed. Press the '+' Key, the display will show ***dr . dEL*** Press the '↵' Key and the '+' & '-' Keys to adjust the Alarm Arm time in the following steps – 0.15 Hr (15mins), 0.20, 0.30, 1.00, then OFF. Press '↵' to select the preferred value.
NB – When set to OFF the Alarm will arm only when programmed set point is reached.

Section 7

The Alarm System

Refer to the Flow Chart on the following page.

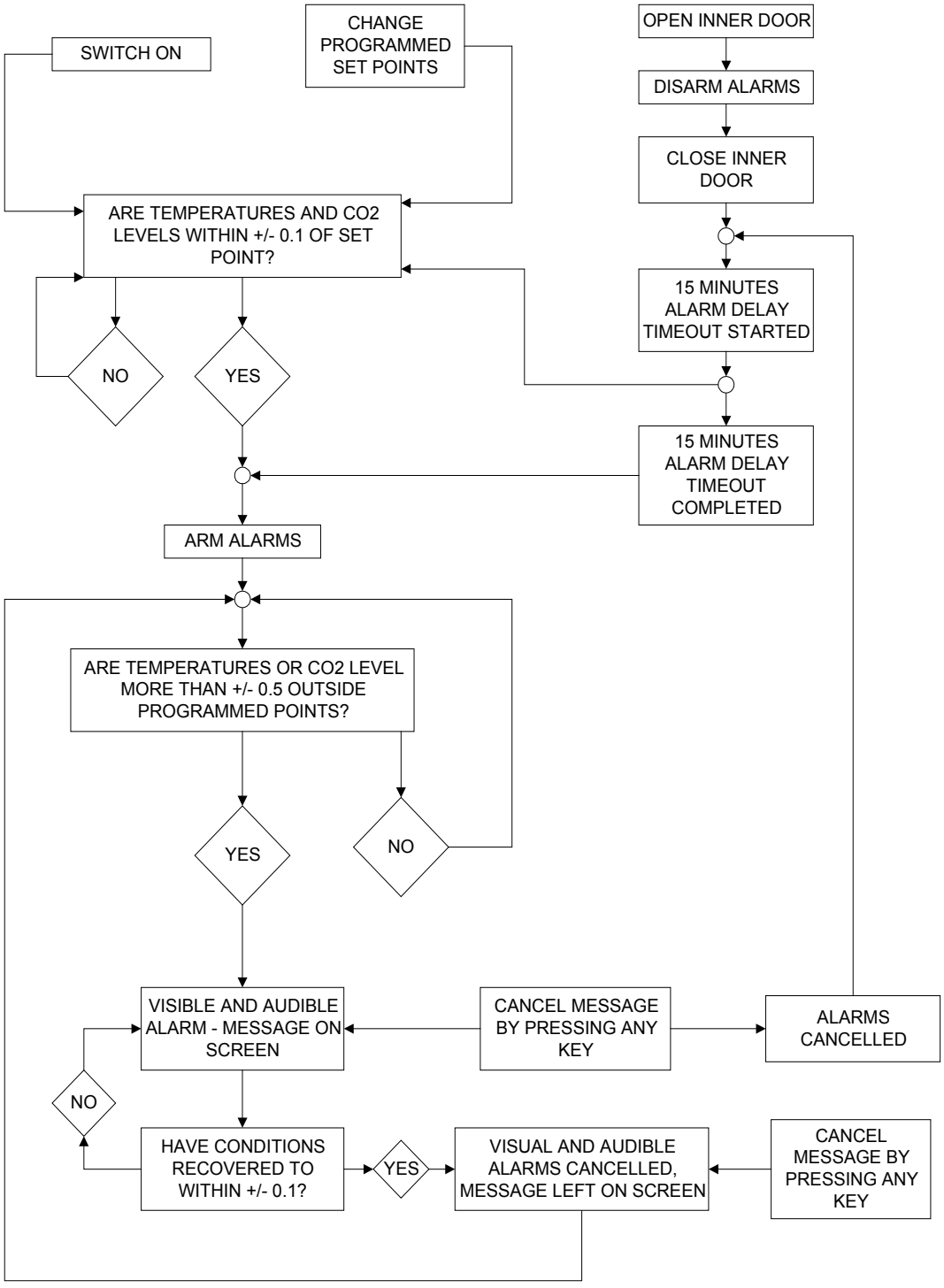
8.1 At switch on or after the programmed values have been reprogrammed, the Alarm System is inactive until the programmed values ± 0.1 are achieved, after which the Alarm System is armed. If Temperature and / or CO_2 levels deviate more than ± 0.5°C / % CO_2, the display flashes, the buzzer sounds and a message appears on the screen. This can be cancelled by pressing any key.

8.2 When the inner door is opened the Alarm System is disabled and on closing the door the preset Alarm Arm timeout starts. If chamber conditions recover within the Alarm Arm Time, the Alarm System is rearmed. At the timeout the Alarm System is armed and if the Temperature and CO_2 are outside the ± 0.5 alarm point, the alarm will be activated.

8.3 If the alarm is not acknowledged and chamber conditions subsequently recover, the Audio alarm is cancelled but the alarm message is left on the screen to alert the user to the fact that an alarm has occurred. The message can be cancelled by pressing any key.

8.4 The duration of the Audio Alarm can be adjusted from inactive to continuous. See Programming the Alarm System, Section 6.

Alarm System Flow Chart



Section 8

System Alarms

9.1 Temperature Sensor Alarms.

9.1.1 In the event of any one of the four temperature sensor failing (there are two in the door and two for the chamber), the following message will appear ***°C FAIL***

Because the incubator can no longer control temperature properly the heating will switch off and the incubator will cool down to room temperature.

If a sensor fails but subsequently corrects itself, the temperature control will restart and an alarm message as follows will be remain on the temperature side of the display ***SAL ...***

This message can be cancelled by pressing any key.

9.2 CO_2 Alarms.

9.2.1 This alarm only occurs if the CO_2 Auto Zero cannot adjust to reference the signal to atmosphere at the end of the Auto Zero the following message will appear ***AUTO ZERO FAI LED***

This means that the CO_2 Sensor is defective and requires replacement.

If any of these alarms occur then contact your distributor immediately.

Section 9. Cleaning and Disinfecting

Cleaning

9.1 The exterior of the incubator should be kept clean by wiping over with a soft cloth and soapy water.

Disinfecting

9.2 The recommended disinfecting agent for use with the incubator is a solution of 70% Isopropanol (alcohol) and 30% distilled water. Appropriate safety regulations should be followed when using this solution. Gloves should be worn as a routine precaution. Alcohol can form an explosive vapour in confined spaces – ensure adequate ventilation during cleaning. There will be no adverse effects to the incubator if the following procedures are carried out:-

9.3 Program 0.0% CO2 and switch off the incubator. Disconnect from the mains supply.

9.4 Dampen a clean cloth with the 70 / 30% solution and wipe down all external surfaces. Take care not to let any of the liquid come into contact with any electrical outlets or assemblies.

9.5 Remove all shelves, the humidity reservoir, shelf runners and shelf racks.

9.6 Place the black protective cover over the CO2 sensor, also protect any additional sensors such as Oxygen or humidity with the cover(s) supplied.

9.7 **NOTE:** It is very important to ensure that no disinfectant solution is spilled onto the white porous CO_2 sensor cover at the rear of the chamber. Failure to use the protective cover(s) could result in damage to the sensor(s) and may affect your warranty.

9.8 The humidity reservoir can be cleaned by rinsing in sterile water, wiping down with the alcohol solution, and rinsing with sterile water.

9.9 Wipe down the inside of the chamber with alcohol / water solution, and leave to dry completely.

9.10 Wipe the internal components of the chamber with alcohol / water solution twice. Wipe off excess liquid and leave to dry completely. Re-assemble in reverse order before switching the incubator on. NB:- Check the shelf racks are the correct way round – ie: the small hole in the keyhole slot should be uppermost. Ensure the protective cover(s) are removed from the sensor(s) and replaced in the holder for safe keeping (protective covers must also be removed from any additional sensors fitted such as Oxygen or humidity).

9.11 Refill the humidity tray with 1.5 litres of warm distilled water (approx. 37.0°C) It is recommended that one teaspoonful of copper sulphate or a small quantity of other biocide is added to the water to prevent growth. NB – ensure that the Humidity Tray is pushed fully back against the rear wall.

9.12 Leave the incubator for at least two hours (preferably overnight) to allow conditions to stabilize.

9.13 When the incubator has stabilized, carry out an Auto Zero and re-program the desired CO2 level.

9.14 *Never* use the following substances to clean the stainless steel as damage will result:

Sodium Azide, Aqua Regia, Iodine, Ferric Chloride or Sulphuric Acid.

Section 10

Galaxy S Technical Specification

Temperature Management

Digital programming via microprocessor control on 0.1°C increments. Measurement of chamber and outer door temperature via 4 RT matched thermistors with sensitivity < 0.1°C.

"Out of Limits" temperature protection system independent of microprocessor control.

Range	1°C above ambient temperature to 50°C
Control	± 0.1°C
Stability	± 0.1°C
Uniformity	± 0.2°C

Relative Humidity

Achieved using standard stainless steel humidity reservoir

Reservoir capacity	1.5 litres
Relative humidity	95% at 37°C

Large humidity reservoir

Reservoir capacity	2.5 litres
Relative humidity	98% at 37°C

Shelves

Polished stainless steel - perforated.

Capacity	0.25m^2 / shelf
Standard No	3 (positions for 14)

CO_2 Control

Solid state infra-red CO_2 sensor which operates independent of humidity. Auto zeroing facility.

Range	0.2 - 10%
	0.2 – 20% (Order No: 170. 215)
Control	0.1%
Stability	± 0.2%
Uniformity	± 0.1%
Recovery rate	Better than 0.7% minute
Gas connections	6mm tubing
Required gas pressure	0.35 bar / 5psi

Alarm Systems

Two-level alarm system giving programmable audiovisual warnings with options for remote communication. Level 1 signals system failures, level 2 is programmable and monitors chamber conditions.

Dimensions

	(Height x width x depth)
Chamber	570 x 525 x 570mm
External	745 x 600 x 650mm
Crated	1000 x 720 x 790mm (Including pallet)
Weight (uncrated)	80kg (approx – actual weight will depend on options fitted).
Weight (crated)	100kg
Chamber volume	170 litres

Electrical Supply

Voltage	100 - 120v 50/60Hz or 220 - 240v 50/60Hz
Power	500 watts – Standard Models 1000 watts – High Temperature Decontamination Models

Energy required maintaining chamber at 37°C - under 0.1kwh.

Storage Temperature

10 - 50°C

Section 11

Ordering Information Galaxy S

Galaxy S 220 / 240v 50 / 60 Hz	170 - 200
Galaxy S 100 / 120v 50 / 60 HZ	170 - 201

No Charge Options:-

CO_2 Control 0.2 - 20%*	170 - 215
Left Hand Door	170 - 216

Model Options - (factory fitted)

Seamless Chamber	170 - 210
Copper interior	170 - 211
Three Inner Door	170 - 212
Access Port	170 - 213
BMS Relay Contact Alarm*	170 - 214
Seamless Copper Chamber	170 - 217
6 Inner Door Option	170 - 218
High Temperature Decontamination	170 - 219
Internal IP66 Mains Socket	170 - 224
Split Shelf System	170 - 229
Key Lock on Outer Door	170 - 231

* Can be retrofitted by a Service Technician

Some option combinations are not possible, others may incur extra cost. Please enquire before ordering.

Accessories

Automatic CO_2 Cylinder Change Over Unit	170 - 101
CO_2 Two-stage Regulator	170 - 102
CO_2 Filter (supplied in pairs)	170 - 103
Extra Shelf (Perforated) - supplied with 2 runners	170 - 104
Extra Shelf (Non-Perforated) - supplied with 2 runners	170 - 105
Stand with Castors for Stacking 1 – 2 units	170 - 106
Large Humidity Tray (50% credit if replacing standard tray)	170 - 107
Extra Shelf (Copper & Perforated) - supplied with 2 runners	170 - 108
Stand with castors for 1 Incubator (below bench)	170 - 109
In-line Pressure Regulator	170 - 110
Reinforced Shelf (No Runners)	170 - 111
CO_2 Gas Analyser complete with 10 Testing Tubes	170 - 113
10 Spare Gas Analyser Testing Tubes	170 - 114
Air Zero Filters (supplied in pairs)	170 - 115
Stand with Feet for Stacking 1 – 2 units	170 - 116

For other Accessories see Price List.