

GB

USA

Gassed Incubator  
BB 6060, BB 6220

# Operating Instructions



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Thermo Electron LED GmbH, 63505 Langenselbold, Germany

If translated versions of this manual are used, the German version is the authoritative basis.

Subject to technical modifications.



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**The safety concerning the protection of persons, environment and material to be treated mainly depends on the behaviour of the operating personnel of these units.**

**Please read and observe the following instructions carefully before starting the unit in order to avoid faults and resulting damage, especially adverse health effects.**

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## Information according EN 61010

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### WARNING NOTES

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- Caution: General hazard area!



- Caution: Hot surface!



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### AMBIENT OPERATING CONDITIONS

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- For indoor use only
- For altitudes up to 2000 m above sea level
- Temperature range from 5 °C to 40 °C
- Maximum relative humidity: 80 %, for temperatures up to 31 °C, decreasing linearly to 50 % relative humidity at 40 °C
- Main power supply: Voltage fluctuations not to exceed +/- 10 % of the nominal value

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### ELEKTRICAL DATA

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- Overvoltage category: II
- Contamination level: 2

**WEEE Compliance:**

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC. It is marked with the following symbol:



Thermo Electron has contracted with one or more recycling/disposal companies in each EU Member State, and this product should be disposed of or recycled through them. Further information on Thermo Electron's compliance with these Directives, the recyclers in your country, and information on Thermo Electron products which may assist the detection of substances subject to the RoHS Directive are available at [www.thermo.com/WEEERoHS](http://www.thermo.com/WEEERoHS).

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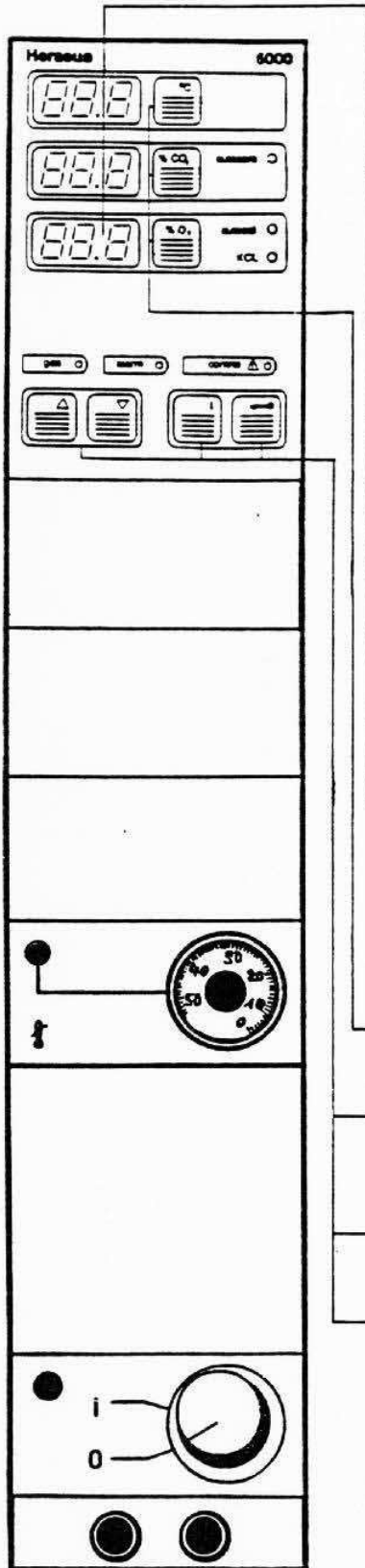
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## 1. CONTROL PANEL



### Displays and Keys

#### °C Display:

Displays actual value during normal operation  
Setpoint display is obtained with setpoint key

Temp.-related error codes are displayed with the [E]-key

Special functions are polled with the

[F0]-key

cf. Function Selection p.30

#### % CO<sub>2</sub> Display:

Displays actual value during normal operation  
Setpoint display is obtained with setpoint key

CO<sub>2</sub>-related error codes are displayed with the

[E]-key

Special functions are polled with the

[F0]-key

cf. Function Selection p.30

#### % O<sub>2</sub> Display\*:

Displays actual value during normal operation  
Setpoint display is obtained with setpoint key

O<sub>2</sub>-related error codes are displayed with the

[E]-key

#### Setpoint Keys:

Temperature, CO<sub>2</sub> and (O<sub>2</sub>)\*

#### [UP] and [DOWN] Keys:

To increase/decrease values

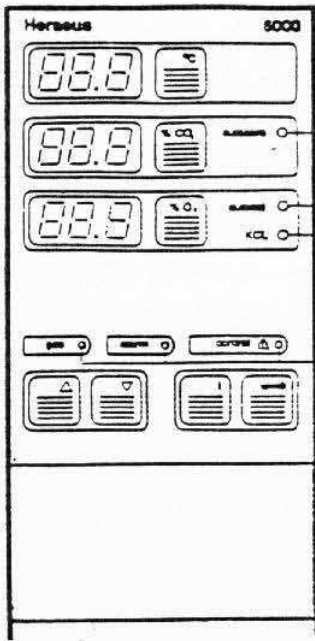
#### [E]-Key:

Error Code Display

#### [F0]-Key:

For special function enter a function selection

\* = Optional



**LED AUTO-ZERO:**  
flashing during the automatic calibration of the CO<sub>2</sub> measuring system

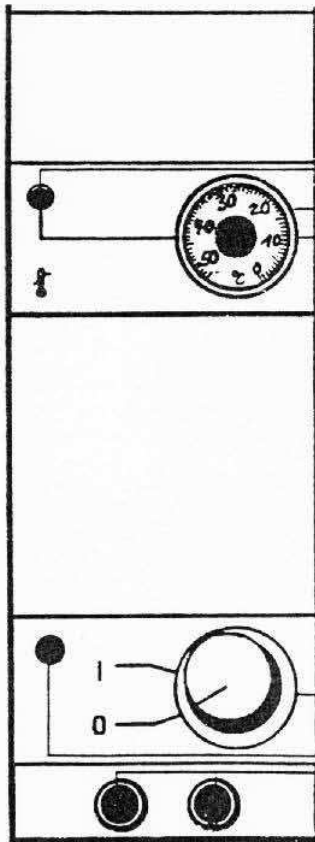
**LED AUTO-CAL\*:**  
flashing during the automatic calibration of the O<sub>2</sub> measuring system

**LED KCL\*:**  
flashing when the electrolyte in the oxygen electrode needs to be replenished

**LED Gas:**  
*shining* when gases are released

**LED Alarm:**  
flashing during an alarm

**LED Control:**  
flashing when a special function is selected



Temperature limit controller

Red lamp is on when the set temperature is exceeded

Dial to set the cut-off point

Master switch to turn the unit on/off

-Green pilot light is on when the unit is turned on


Fuses

\* = Optional

## 2. Introduction

Your new Gassed Incubator is characterized by outstanding quality and economic efficiency.

Prior to using it, read this manual carefully so that you can operate your unit without causing it damage.

Sections relating safety instructions are printed in fat characters and marked by a danger sign .

Sections which relate to proper operation or call for your special attention are highlighted by **FAT LETTERS**.

Furthermore, make sure to observe the abridged operating instructions No. 50031065 which are to be attached to the unit (Appendix)

Operation of the Gassed Incubator and its conformity to the relevant safety standards will be guaranteed only if the required tests, maintenance and repairs are carried out by our Customer Service or by technical experts authorized by us.

We, therefore, recommend that you set up a Service Agreement.

When filing complaints or ordering spare parts, please state the data on the nameplate.

The unit should be operated only by trained personnel or expert technicians.

The unit is in compliance with safety standards:

- \* DIN 58 945
- \* DIN 12 880 Part 1
- \* DIN VDE 0700 Part 1; IEC 335-1



In addition, the unit bears the GS-label issued by the VDE Inspection Office.



The unit is radio interference-suppressed in acc.w. DIN VDE 0871, Class B and tested by the VDE Inspection Office.

**3. Application**

The Gassed Incubator can simulate the natural physiological parameters of cell and tissue cultures.

The unit should not be used for the treatment of flammable materials which could explode.

Please contact your nearest Thermo Service Agent if you plan on using your incubator for purposes other than those for which it has been designed.

#### 4. DESCRIPTION OF THE UNIT

##### Construction

The outer casing is made of electrolytically galvanized steel sheet and lacquered white (RAL 9002).

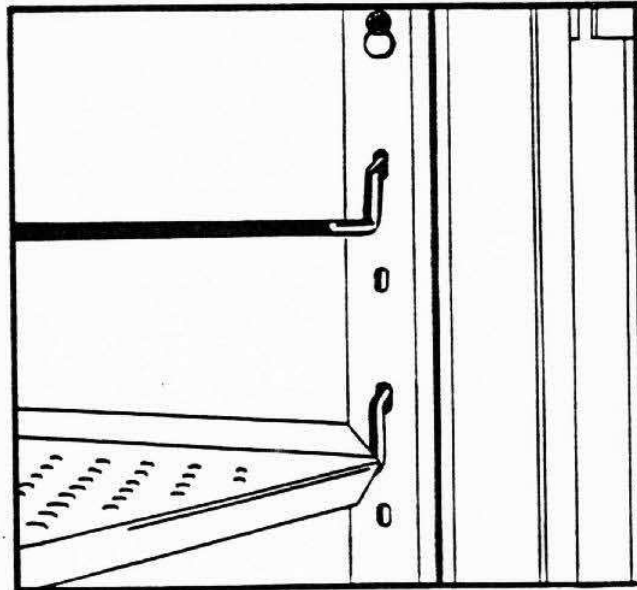
The control elements are made of temperature-resistant plastic.

The inner casing is of stainless steel or copper.

**Copper used for the inner casing and the fittings has a bactericidal and fungicidal effect. However, while the incubator passes through final inspection, the copper may oxidize and acquire a layer of patina. Although this may look stained and unsightly, it should not be removed.**

##### Internal Fittings

The pull-out shelves are tilt-proof and adjustable over a height of 40 mm. The support brackets are suspended in perforated carrier racks. Removal of shelves, support brackets and carrier racks requires no tools and they can be taken out one at a time. (cf. illustration below).



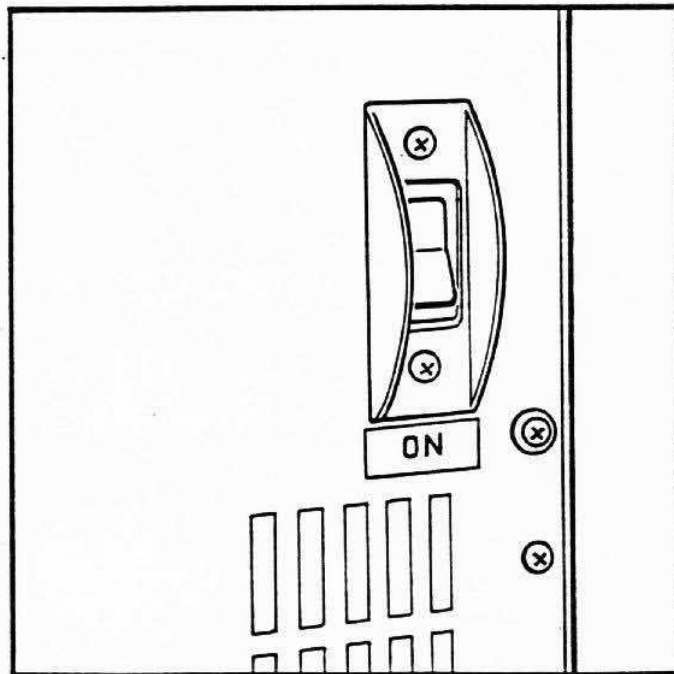
## Heating System

An air-jacket heating system heats the interior. The carefully chosen arrangement of the heating elements keeps the interior dry and free of condensation, except for a small rim right above the water reservoir.

Because the outer door is heated, condensation will not precipitate on the glass door. Therefore, the interior remains clearly visible in spite of the prevailing high humidity. Condensation could form, however, if the outer door is left open for some time.

**Because of the heating system array, efficient operation from 8 °C above ambient temperature is guaranteed. If the ambient temperature is higher than the working temperature, or if the unit is to be operated at low temperatures, you can use it at only 3 °C above ambient if you flip the switch on its rear wall. In this instance, you might experience a little condensation at the corners of the glass door.**

During normal operation, the switch is in the "ON" position (lit) and the auxiliary heater is turned on.



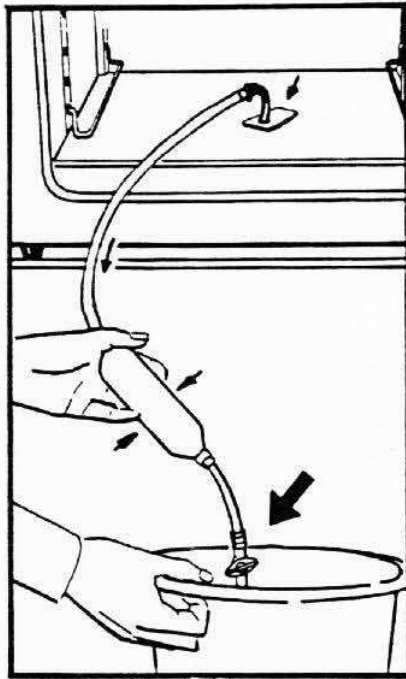
## Humidification

The distilled water kept in the reservoir of the unit evaporates and humidifies the chamber atmosphere. Under normal operating conditions, the relative humidity inside the chamber will be  $\geq 95\%$ . However, the air-jacket heating system is most effective in keeping the surfaces all but dry.



**Reservoir vol.:** BB 6060 4 l distilled water  
BB 6220 6 l distilled water

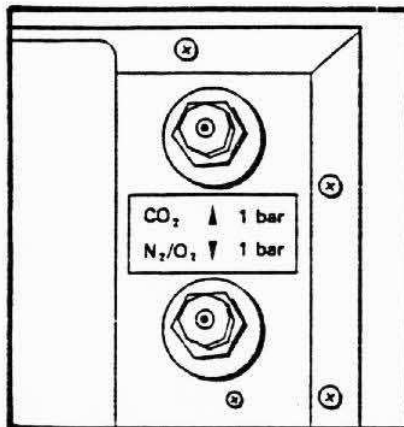
**Make sure the water used does not contain agents which could corrode the reservoir.**



Each unit includes a siphon to remove the water from the reservoir. This is done as follows:

- \* Remove the lower shelf
- \* Press the suction cup onto the recess in the water reservoir
- \* Shut the valve
- \* Firmly squeeze the pump
- \* Draw up the water
- \* Open the valve
- \* Drain the water
- \* Withdraw the suction cup
- \* Drain all the water from the pump
- \* Wipe the reservoir dry

## Gas Supply



Appropriately identified connections for the gas supplies ( $\text{CO}_2$ ,  $\text{O}_2$ ,  $\text{N}_2$ ) are located on the rear wall of the unit.

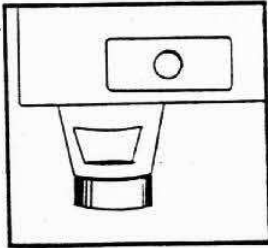
**Gas inlet pressure 1 bar**   
**Please observe the markings of the gas connections!**

Before entering the chamber, all gases pass sterile filters where particles larger than  $0.3\ \mu\text{m}$  are retained. Filter efficiency is 99.998%. A small fan incorporated in the gas analyzer, ensures that the gases and the incubator atmosphere are thoroughly mixed.

### Gas Analyzer

The gas analyzer is suspended from the ceiling of the chamber and incorporates the CO<sub>2</sub> detector. The gas analyzer and the electronic system are electrically connected by a gas and water-tight plug connector; the required hose connections between the plug-in board in the ceiling and the gas analyzer are tagged with colored identification rings. You can take the gas analyzer from the unit for cleaning and maintenance.

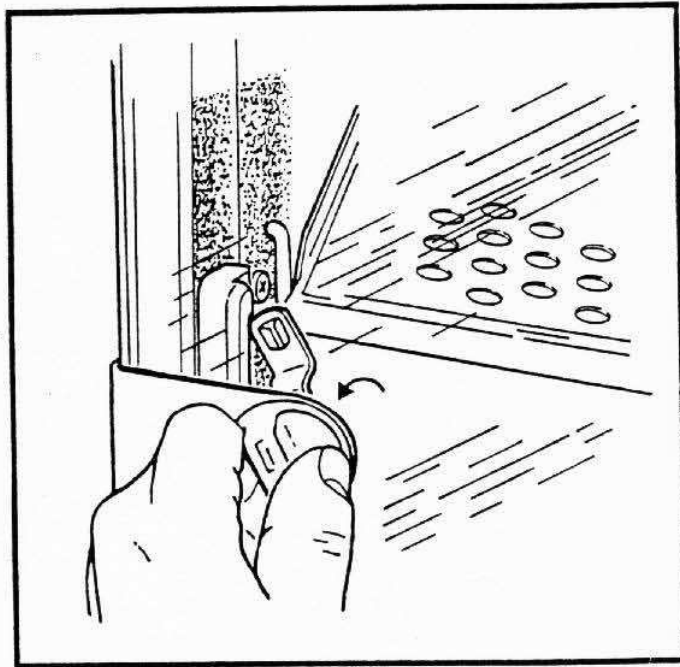
### Door Switch



There is a door switch located behind the outer door on the lower left side of the incubator. When the door is opened, this switch cuts off the gas supply and the heating system in order to avoid uncontrolled admission of gases or heating of the chamber.

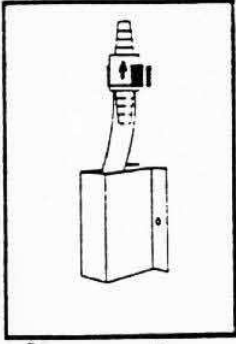
With the outer door opened, all displays will blink until the door is shut. An alarm will be triggered if the door remains open for more than 10 minutes.

You won't be able to close the outer door unless you've shut the glass door or all doors of the glass screen so that the unit is gas-tight.





### Pressure Compensation



A pressure compensation vent in the lower section of the chamber rear wall avoids undesirable pressure build-up during the admission of gases. This vent is connected with a check valve on the rear wall of the unit. The valve impedes unwanted aspiration of ambient air when the glass door is opened.

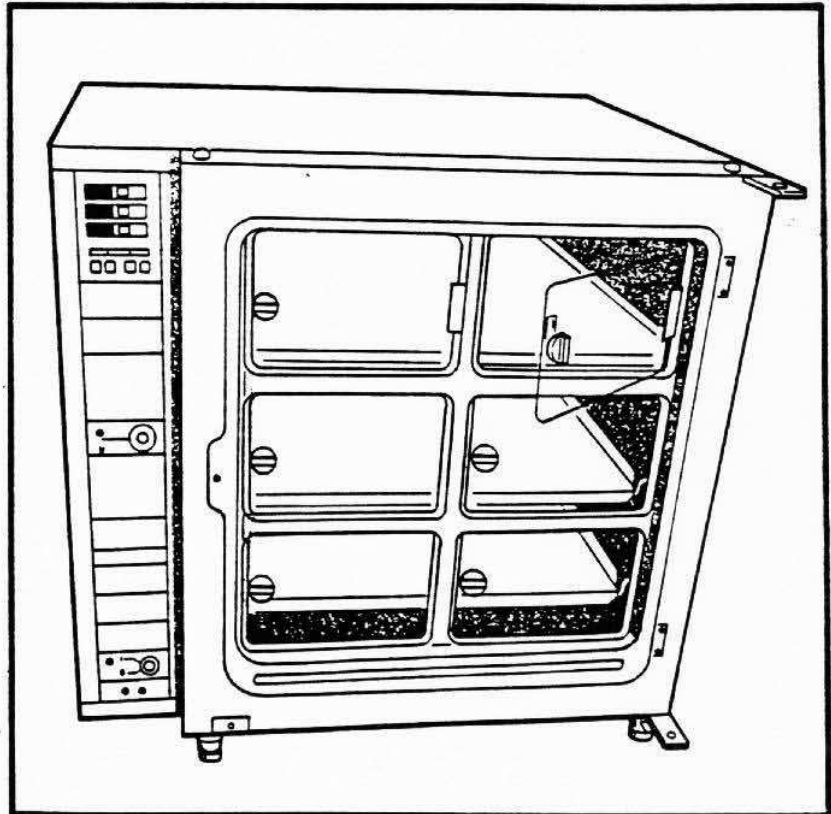


**The placement area must be thoroughly aired out in order to carry off the gases escaping around the check valve. Make sure to never shut this valve.**

### Option

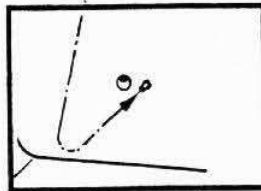
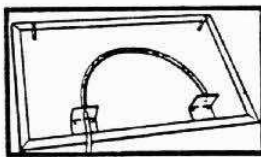
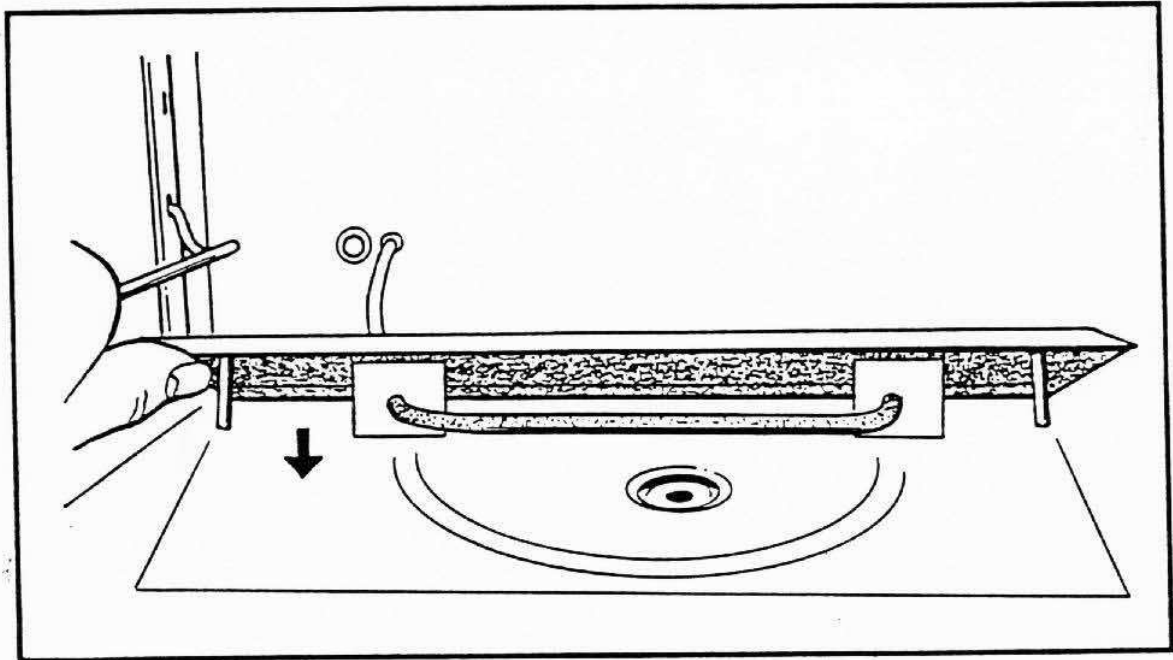
#### Gas-tight Glass Screen (BB 6220 only) (O<sub>2</sub> Version)

The glass screen effectively cuts down on gas consumption. It is included in the scope of delivery for the O<sub>2</sub> version of Model BB 6220. The glass screen is subdivided into six little gas-tight doors. With this arrangement, you can open just one small door and keep the chamber atmosphere nearly constant. You can close the outer door only after you've shut all the doors of the glass screen.



Option  
Microperlator  
(O<sub>2</sub> Version)

The microperlator (micro-porous hose) on the bottom of the water reservoir (cf. ill. below) admits O<sub>2</sub> or N<sub>2</sub>. With this arrangement, gases are humidified at the time they enter the chamber, thus preventing an undesirable drop in the prevailing relative humidity.



#### 4. DESCRIPTION OF THE UNIT

##### MICROPROCESSOR-BASED CONTROL SYSTEM

This system comprises the following separate control functions:

a) Physiol.Parameter Control

Setting ranges:

- \* Temperature: 7.0 ... 50.0 °C
- \* CO<sub>2</sub> content: 0.0 ... 20.0 %
- \* O<sub>2</sub> content: 3.0 ... 80.0 % (Optional)

b) Automatic Calibration of the Meas.Systems

- \* AUTO-START routine
- CO<sub>2</sub> AUTO-ZERO system
- O<sub>2</sub> AUTO-CAL system (Optional)

c) Monitoring Functions

- \* Door Control
- \* Error Messages
- \* Error Storage
- \* External Alarm System (Optional)
- \* Error Code Table

d) Special Functions

- \* Buzzer: ON/OFF
- \* Gas Supplies: ON/OFF
- \* Setpoint Key: Lock-in
- \* Operat.Modes: with or w/o water

a) Physiol. Parameter Control

- Temperature:** The chamber temperature is precision-regulated by a microprocessor-based control circuit. A platinum Pt 100 resistance serves as temperature sensor. A broken temperature sensor will automatically cut off the heating system and trigger an alarm.
- CO<sub>2</sub>:** To keep the pH value of the culture media constant at a preset value, you need to control the CO<sub>2</sub> concentration of the chamber atmosphere. The relevant CO<sub>2</sub> concentration depends on the desired pH value and the content of sodium bicarbonate buffer in the culture medium. You will find a graph illustrating this dependence in the Appendix.
- CO<sub>2</sub> measurement is based on the continuous measurement of the thermal conductivity of the chamber atmosphere. The lower thermal conductivity of the entering CO<sub>2</sub> alters the thermal conductivity level of the chamber atmosphere. This generates an electric signal which is directly proportional to the CO<sub>2</sub> concentration.
- O<sub>2</sub>:**  
**Optional** Organs from which cells cultivated in vitro are taken have different pO<sub>2</sub> values. In order to create optimum physiological conditions for these cell cultures, you can vary the oxygen concentration of the chamber atmosphere by admitting controlled amounts of nitrogen (3.0 .. 21.0 %) or oxygen (21.0 .. 80.0 %). The oxygen content is measured with a so-called CLARK electrode. The electrode proper consists of a platinum cathode and a chlorinated silver anode. A 0.3-mol KCL solution serves as electrolyte.
- If you have no need for O<sub>2</sub> control, you should remove the electrode from the chamber. Be sure to cap the socket (cf. Maintenance Instructions, page 35).**
- Gas Mixtures:** The microprocessor limits the overall concentration setting of CO<sub>2</sub> and O<sub>2</sub> to 95 % in order to keep gas consumption down. (O<sub>2</sub> - Konzentration max. 80 %)

b) Autom. Calibration of the Meas. Systems

**AUTO-START Routine**

Start-up of the unit or changing of the temperature setpoint requires calibration of the various measuring systems. Your incubator performs this task automatically during the AUTO-START routine.

The microprocessor recognizes when both temperature and humidity have reached the steady state and performs a fully automatic calibration of the measuring system. When the unit is cold, this process requires approx. 15 hours. Prior to AUTO-START, make sure that the chamber is void of all gases, except air.

To initiate the AUTO-START routine, refer to page 28.

**CO<sub>2</sub> AUTO-ZERO System**

Thermal conductivity detectors require periodic calibration. This is performed automatically every 3 1/2 hours. The entire process requires approx. 7 minutes. LED AUTO-ZERO will be flashing as long as the AUTO-ZERO adjust is in progress. During this time, gas supplies are interrupted.

**O<sub>2</sub> AUTO-CAL System (Optional)**

Subsequent to the AUTO-ZERO routine, units equipped with the oxygen electrode will go through the calibration of the O<sub>2</sub> sensor. An air pump integrated in the unit will admit sterile ambient air to the electrode. The resulting correction signal is transmitted to the microprocessor which then takes it into account when adjusting the O<sub>2</sub> content to 21 %. LED AUTO-CAL will be flashing as long as the AUTO-CAL routine is in progress.

c) Monitoring Functions

Door Control

All actual value displays will blink as soon as the outer door of the unit is opened and continue to do so until the door is closed again. Should the door remain open for more than 10 minutes, an error message will ensue and the appropriate code can be read.

Error Recognition

A microprocessor reliably monitors all chamber atmosphere parameters and detects any malfunctions which might occur. All set values have been assigned defined tolerance ranges and if these are exceeded or not reached, an error message will be triggered.

Tolerance ranges:

- Temperature :  $\pm 0.5$  °C
- CO<sub>2</sub> content :  $\pm 1.0$  % CO<sub>2</sub>
- O<sub>2</sub> content :  $\pm 2.0$  % O<sub>2</sub> (option)

In addition to the errors when a set value is exceeded or not met, the system recognizes the following malfunctions:

Temperature Control Circuit:

- Broken sensor

CO<sub>2</sub> Control Circuit:

- Defective CO<sub>2</sub> analyzer
- Gas analyzer not connected  
(cf. Error Code Table, page 33)

Models with O<sub>2</sub> Control:

O<sub>2</sub> Control Circuit:

- Spent electrolyte (replenish KCL solution)
- Defective O<sub>2</sub> electrode  
(cf. Error Code Table, page 33)

c) Monitoring Functions

Door Control

All actual value displays will blink as soon as the outer door of the unit is opened and continue to do so until the door is closed again. Should the door remain open for more than 10 minutes, an error message will ensue and the appropriate code can be read.

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Tolerance ranges:

- Temperature :  $\pm 0.5$  °C
- CO<sub>2</sub> content :  $\pm 1.0$  % CO<sub>2</sub>
- O<sub>2</sub> content :  $\pm 2.0$  % O<sub>2</sub> (option)

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Temperature Control Circuit:

- Broken sensor

CO<sub>2</sub> Control Circuit:

- Defective CO<sub>2</sub> analyzer
- Gas analyzer not connected  
(cf. Error Code Table, page 33)

Models with O<sub>2</sub> Control:

O<sub>2</sub> Control Circuit:

- Spent electrolyte (replenish KCL solution)
- Defective O<sub>2</sub> electrode  
(cf. Error Code Table, page 33)

### Error Code Table:

Error Code	Possible Cause	Remedy
<b>99</b> Door is open	Doors are not closed	Shut doors
<b>100</b> Temperature too low (SP)	Temp.limit controller set too low; observe pilot light	Check temp.limit controller adjustment, cf. page 29
<b>101</b> Temperature too high (SP)	Ambient temperature too high	Flip switch on rear wall of the unit
<b>104</b> Broken sensor	Temperature sensor	Request Service Technician
<b>200</b> CO <sub>2</sub> too low (SP)	CO <sub>2</sub> not connected Empty CO <sub>2</sub> cylinder CO <sub>2</sub> inlet pressure too low	Connect gas supply cf. Installation Replace CO <sub>2</sub> cylinder Adjust inlet pressure; 1 bar
<b>201</b> CO <sub>2</sub> too high (SP)	CO <sub>2</sub> inlet pressure too high	Adjust inlet pressure; 1 bar
<b>202</b> Gas analyzer calibr.error	Hose connections switched or plugged up-  Defective gas analyzer fan	Check hose connections, observe colored identification rings Replace fan Request Service Technician
<b>203</b> Gas analyzer	Gas analyzer not connected	Connect gas analyzer Insert plug several times
<b>300</b> N <sub>2</sub> too low (SP)	N <sub>2</sub> not connected  Empty N <sub>2</sub> cylinder N <sub>2</sub> inlet press. too low	Connect gas supply cf. Installation Replace N <sub>2</sub> cylinder Adjust inlet pressure; 1 bar
<b>301</b> N <sub>2</sub> too high (SP)	N <sub>2</sub> inlet pressure too high	Adjust inlet pressure; 1 bar
<b>302</b> O <sub>2</sub> too low (SP)	O <sub>2</sub> not connected  Empty O <sub>2</sub> cylinder O <sub>2</sub> inlet pressure too low	Connect gas supply cf. Installation Replace O <sub>2</sub> cylinder Adjust inlet pressure; 1 bar
<b>303</b> O <sub>2</sub> too high (SP)	O <sub>2</sub> inlet pressure too high	Adjust inlet pressure; 1 bar
<b>304</b> Electrolyte error	Spent electrolyte KCl level too low Torn foil membrane	Replenish electrolyte cf. Appendix Remount electrode cf. Appendix
<b>305</b> O <sub>2</sub> electrode	Spent electrolyte Filling level too low Torn foil membrane  Electrode installed wrong	Replenish electrolyte cf. Appendix Remount electrode cf. Appendix Assy.Instruct.,cf. Appendix

SP = Setpoint



d) Special Functions

For adjustment, cf. page 30.  
Use the Function Key, identified by a [F0] symbol to select the special functions below:

**Buzzer ON/OFF**

Function 1:

If the buzzer is turned on, you will get an acoustic signal together with the error message.  
Buzzer OFF: "Silent" alarm.

Factory Setting:  
Buzzer ON

**Gas ON/OFF**

Function 2:

With the selection "Gas OFF", the gas supplies are cut off permanently; the green LED "Gas" is extinguished

Factory Setting:  
Gas ON; the green LED "Gas" is lit

**Setpoint Lock-in**

Function 4:

This function permits you to lock in the setpoints you've entered for temperature, CO<sub>2</sub> and O<sub>2</sub> so that these values cannot be changed inadvertently.

Factory Setting:  
Setpoints are not locked in

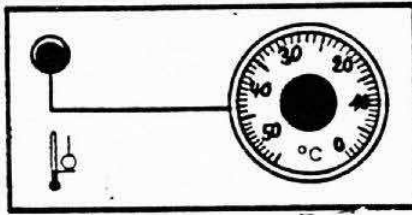
**Operating Modes**

Function 7:

If you want to run your unit without water in the reservoir, you need to select this mode prior to the AUTO-START routine.

Factory Setting:  
To be run with water in the reservoir

## 5. OVERTEMPERATURE PROTECTION



### Temperature Limit Controller - (responds to temperature)

The unit features a separate electronic temperature limit controller to protect the incubator, its surroundings and the load against inadmissible excess temperatures. (It is in compliance with Thermal Safety Class 3.1 in acc.w. DIN 12 880).

In case of a temperature control circuit malfunction, i.e. if the set temperature is exceeded, the temperature limit controller will assume the control function.

Setting it requires a tool (a coin or screwdriver, for example); cf. Start-up, page 29.

### Protection of the Unit

If you set the control knob to 55 °C (limit stop), the temperature limit controller will protect the incubator.

### Load Protection

The temperature limit controller will protect the load if you set it approx. 1 - 2 °C higher than the temperature selected at the microprocessor.

The red pilot lamp will be on as soon as the temperature limit controller responds.

In case the temperature limit controller has assumed the control function, refer to the Error Code Table to investigate and define the cause of the malfunction

### Operational Test

**At reasonable intervals have your temperature limit controller tested for proper operation. To run this test, turn the dial to where it shows approx. 2 °C less than the temperature indicated by the display. The red pilot lamp must come on. We recommend that your authorized operators run this test routinely, e.g. prior to the start of a longer work process.**

External Alarm System

Provision is made for the connection of external alarm systems (cf. page 45).

## 6. Placement and Installation

### Location:

Unpack your unit and remove the accessories from the interior. Don't lift it by the door in order to move it.

The incubator must be placed in a draft-free location.

The placement area must be dry and the ambient temperature should not exceed 30 °C.

Set the unit on a level, non-combustible surface which does not vibrate. Make sure the unit itself is level (adjustable feet).

The gassed incubator is run with CO<sub>2</sub>, O<sub>2</sub> or N<sub>2</sub>. CO<sub>2</sub> is a health risk whereas O<sub>2</sub> is a fire hazard. Therefore, make sure the placement area has adequate ventilation. The gases which escape on the back wall must be carried off without risk (evacuated into the open or carried off via an exhaust).

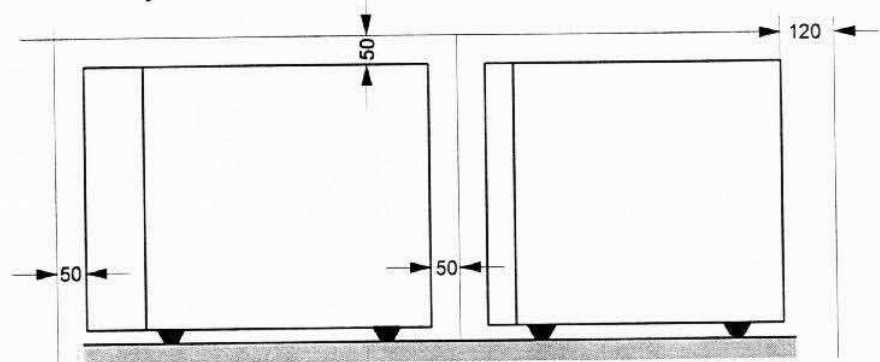
The unit should not be placed and operated in recesses which cannot be ventilated.

If several units are placed in the same room or if a unit is installed underneath a laboratory bench, additional ventilation equipment could be required.

For information on gases which are released during operation or a malfunction, consult the Appendix.

### Clearances

Required clearances between the incubator and adjacent walls/objects:



Do not shut the check valve on the rear wall of the unit. Don't connect a hose to the valve outlet (condensation could form).

Installation under  
Lab. Benches

Model BB 6060 can be fitted into a laboratory bench. This bench must be of non-combustible materials as specified by DIN 4102.

Installation is carried out as follows:

- \* Connect the gas supplies
- \* Connect the unit to the power supply
- \* Push it into position underneath the bench, taking care not to damage the power supply cable and the gas supply lines.

Stacking of Gassed  
Incubators

cf. page 42.

Installation, Connection  
to the Gas Supply

The appropriate connections are located on the back of the unit. The pertinent hoses are delivered with the unit:

The gases required for operation of the unit are to be connected via a pressure relief valve, set at 1 bar. This is to be provided by the customer.

For technical safety reasons, the 1 bar setting must not be changed.

CO<sub>2</sub>

Connect the gas cylinder with the gas nozzle on the unit.

O<sub>2</sub> (Optional)

If you intend to run the unit with the oxygen content above 21 %, you'll need to connect an oxygen cylinder.

N<sub>2</sub> (Optional)

If you intend to run the unit with the oxygen content of less than 21 %, you'll need to connect a nitrogen cylinder.

Reminder:

The gases must be at least 99.5 % pure.  
Do not use a CO<sub>2</sub> cylinder with a riser.

Since erroneous connections could be made, it is imperative that all hoses be checked again so that the connected gas is delivered to the appropriately identified nozzle on the unit.

Connection to the Mains

Prior to connecting the unit to the mains, make sure that the power supply ratings match those stated on the nameplate.

Your Gassed Incubator is equipped with a power supply cable with an earthing contact-type plug.

A 16 A delay-action type fuse is required for mains fusing.

Gas Analyzer

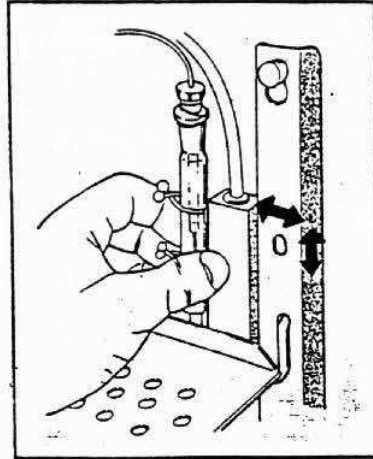
Check the electrical connections as well as the hose connections on the plug-in board located on the chamber ceiling. (Refer to the illustration; observe the color-coded nozzles!)

Mikro-porous Hose Connection (O<sub>2</sub> Version)  
(Option)

Remove the microperlator from inside the unit and unpack it.

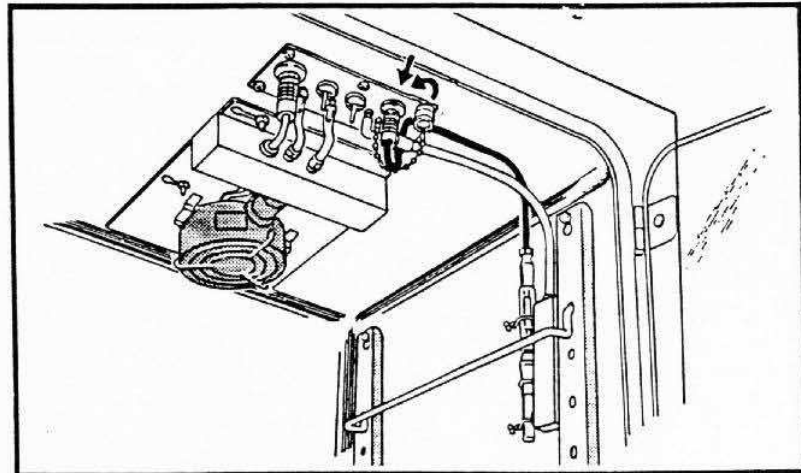
Place it on the bottom of the water reservoir and push the hose onto the gas inlet nozzle. (Refer to the illustration on page 15)

Oxygen electrode



Remove the oxygen electrode support (suspended from the right carrier rack in front). Insert the prepared O<sub>2</sub> electrode (for assembly instructions, consult the Appendix, page 47). Make sure the electrode is properly secured! Reinstall the complete electrode assembly. Establish electrical and hose connections to the plug-in board on the chamber ceiling in accordance with the illustration below.

If the oxygen electrode is not used, be sure to cap the jack in the ceiling!



## 7. START-UP

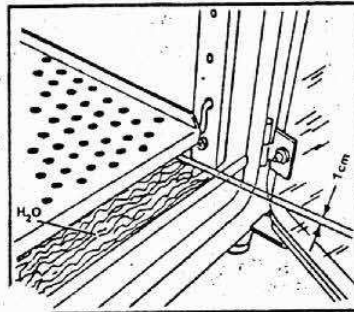
The ambient temperature of the placement area must be at least 8 °C lower than that which has been preselected on the controller.

\* **Open the outer door and the glass door all the way (this includes, of course, all doors of the glass-screen equipped Model BB 6220).**

### Operation with Distilled Water

\* **Fill the reservoir with distilled water** (at approx. room temperature)

**Filling level:** BB 6060 4 l  
BB 6220 6 l



Make sure not to spill any of the water when filling the reservoir.

### Operation w/o Distilled Water

\* Consult the Special Function Table (page 30) and select Function Code 7, "Operat.Mode w/o water" and enter [U.O].

Make sure that the relative humidity inside the chamber does not change.

Only use closed culture dishes!

- \* Open the manual gas supply shut-off valves.
- \* Turn on the master switch
  - green pilot lamp lights up
  - Digital displays will indicate [ 8 8.8 ] for approx. 40 sec.
  - Auto-test routine
  - after the unit has gone through the auto-test routine, the displays will indicate the actual values.

## Setpoint Adjustment

Setpoint Keys      [°C]  
                          [CO<sub>2</sub>] [UP] [DOWN] keys  
                          [O<sub>2</sub>]

\* Setpoint adjustment requires that the respective setpoint keys [°C], [CO<sub>2</sub>] or [O<sub>2</sub>] are pressed down:

- the adjusted setpoint is displayed
- the last digit in the display is flashing
- use the [UP] or [DOWN] key to adjust the desired setpoint

If you release the setpoint key, the new setpoint will be stored and the actual values are displayed once again.

## Factory-Settings

Temperature: 37.0 °C  
CO<sub>2</sub>:           0.0 %  
O<sub>2</sub>:            21.0 %

## Adjustment of the Temp.Limit Controller

Set it approx. 1 - 2 °C higher than the selected temperature, cf. page 23 "Overtemperature Protection"

**Attention! The chamber must be void of all gases, except air.**

## AUTO-START

- \* Press both the [UP] and [DOWN] keys for approx. 5 sec.
  - The AUTO-START routine is activated and the CO<sub>2</sub> display will reflect **[0.0] after closing the door.**
  - LED Gas will go dark.
  - In units with built-in oxygen electrode, the O<sub>2</sub> display will reflect **[21.0]** (option).

\* **Shut the doors.**

## Reminder:

**You can shut the outer door only after you've closed the glass door or all individual doors of the glass screen.**

The unit proceeds to heat to the adjusted temperature setpoint and builds up the relative humidity. At the end of the AUTO-START routine (after approx. 15 h), the system will execute the CO<sub>2</sub>/O<sub>2</sub> AUTO-ZERO/AUTO-CAL routines.

- LED's AUTO-ZERO, AUTO-CAL are flashing
- Actual values are displayed
- LED Gas is on
- If you've entered setpoints for CO<sub>2</sub> and O<sub>2</sub>, gas will be admitted until the preset values are reached
- **If you've set the unit for [21.0] % O<sub>2</sub>, no oxygen will be admitted since this setting corresponds to the O<sub>2</sub> content of air.**
- The unit is now ready to admit the load.



## Special Functions

[F0] key and [UP]/[DOWN] keys

If you keep pressing the [F0] key, you can select and set special functions with the [UP]/[DOWN] keys.

The [ °C ] display will reflect the function code, e.g. [.1]. If you release the [F0] key and then press it again, you'll get the status report in the CO<sub>2</sub> display:

Function Code [F0]	Temperature Display [ °C ]	Display [CO <sub>2</sub> ]	Function	Factory Setting
1 Buzzer	[ .1]	[A .1] [A .0]	Buzzer ON Buzzer OFF	Buzzer ON
2 Gas	[ .2]	[G .1] [G .0]	Gases ON Gases OFF	Gases ON
4 Setpoint Release	[ .4]	[S .0]  [S .1]	Not released  Released	Released
7 Operat.Mode	[ .7]	[U .1] [U .0]	w. water w/o water	w. water

For more info., please consult page 22

Notes:

Temperature:

If you change the temperature setpoint by more than 1 °C, you'll have to restart the unit as described in the chapter for start-up so that the gas detectors will operate with the utmost precision.

CO<sub>2</sub> Comparison

If a precise CO<sub>2</sub> comparison measurement should reveal a concentration which differs a lot from the actual value, you can manually correct the CO<sub>2</sub> measuring system while it is running. In this way it won't be necessary to start the unit all over again!

Reference example:

CO<sub>2</sub> display: 7.0 % CO<sub>2</sub>  
CO<sub>2</sub> measured: 6.2 % CO<sub>2</sub>

- \* Use the [←0] and the [UP] keys to select function code 3
- \* Release the [←0] key
- \* Then, press the [←0] key again and keep it pressed down
  - The temperature display indicates  
[ .0], flashing
  - the CO<sub>2</sub> display reflects [ .1]
- \* Use the [UP] key to set the measured concentration in the temperature display. For example: [ 6.2 ],
- \* Release the [←0] key
- \* Press the [I] key briefly (to start computation by the microprocessor)

The CO<sub>2</sub> display will indicate the corrected concentration after the computation is complete. If you now find that the actual value displayed exceeds the setpoint, you'll have to open the doors for approx. 15 sec. in order to evacuate the excess gas.

## Admittance of O<sub>2</sub>:

The electrolyte (0.3 molar KCl solution) contained in the oxygen electrode is altered over time as the electrode is operated, resulting in a reduction in the oxygen electrode's sensitivity. This reduction in sensitivity is automatically compensated for by the "Auto Cal" function. Once the limit value of the "Auto Cal" function is reached, the "KCl" LED on the unit's front panel begins flashing. When this occurs, the oxygen electrode must be fitted with a new foil membrane within 3 days, and must be filled with fresh KCl (refer to page 47). Failure to respond to the flashing "KCl" LED will result in an alarm after several days. The O<sub>2</sub> display and the "alarm" LED will flash and the acoustic alarm will sound. Pressing the [i] key displays error message 305.

When "regenerating" the electrode by replacing the foil membrane and adding fresh KCl, the electrode plug should be pulled out of the socket with the unit **switched on**, and the electrode should then be pulled out of the incubator. During this work, we recommend sealing the oxygen electrode socket on the top of the sample chamber with the closure cap located next to the socket. The O<sub>2</sub> display on the operator panel will go out, but the temperature regulator and CO<sub>2</sub> regulator will continue to operate.

After "regenerating" the oxygen electrode, the electrode should be reinserted in the socket on the top of the unit with the unit still **switched on**. Plugging the electrode in while the unit is switched on will automatically block the oxygen regulation for a period of approximately 70 minutes during the electrode's warm-up phase, after which an "Auto Cal" will be initiated. The flashing "KCl" LED or flashing O<sub>2</sub> display and flashing "alarm" LED will only go out after the automatic calibration has been completed, at which time error message 305 will also be deleted.

If the electrode is plugged in with the unit turned off, an automatic calibration (Auto Cal) will only take place after 4 hours. The exterior unit door must not be opened, otherwise the timer will be zeroed and the process will begin again. Only after this 4 hour wait period has passed will the CO<sub>2</sub> metering cell auto-zero function be performed, followed by an automatic calibration of the oxygen electrode. The "KCl" LED will continue to flash until this time. If error message 305 has already been generated, it will not be deleted until the "Auto Cal" function has been completed.

The display will turn dark if you remove the O<sub>2</sub> electrode from the unit.

It is vital that you cap the jack.

In order to achieve a measurement as accurate as possible, the system will automatically make an allowance for the rise phase of the electrode if you insert it into the switched-on, heated unit. After 1,5 hours, the system will execute an AUTO-CAL routine and admit oxygen until the adjusted setpoint is reached.

General remarks:

If you don't operate your unit for a while, you must drain the water from the reservoir and wipe the chamber surface dry.

Remove the O<sub>2</sub> electrode, disassemble it and rinse it in distilled water (see Appendix)

Make sure not to turn the unit on and off several times in a row.

In order to keep recovery times as short as possible and to create optimum chamber conditions, don't open the unit needlessly or leave it open for some time.

[i] – Key:

The relevant displays are going to flash if you are experiencing malfunctions during the operation of your unit. If the buzzer is connected, you will get an acoustic signal at the same time. Acknowledge the signal with [i]-key. The affected display will reflect the malfunction in the form of a code number (cf. Error code Table, page 33). On the other hand, if no malfunction is present and you press the [i]-key, the relevant display will reflect the symbol [--.].

**Error Code Table:**

Error Code	Possible Cause	Remedy*
99 Door is open	Doors are not closed	Shut doors
100 Temperature too low (SP)	Temp.limit controller set too low; observe pilot light	Check temp.limit controller adjustment, cf. page 29
101 Temperature too high (SP)	Ambient temperature too high	Flip switch on rear wall of the unit
104 Broken sensor	Temperature sensor	Request Service Technician
200 CO <sub>2</sub> too low (SP)	CO <sub>2</sub> not connected Empty CO <sub>2</sub> cylinder CO <sub>2</sub> inlet pressure too low	Connect gas supply cf. Installation Replace CO <sub>2</sub> cylinder Adjust inlet pressure; 1 bar
201 CO <sub>2</sub> too high (SP)	CO <sub>2</sub> inlet pressure too high	Adjust inlet pressure; 1 bar
202 Gas analyzer calibr.error	Hose connections switched or plugged up-  Defective gas analyzer fan	Check hose connections, observe colored identification rings Replace fan Request Service Technician
203 Gas analyzer	Gas analyzer not connected	Connect gas analyzer Insert plug several times
300 N <sub>2</sub> too low (SP)	N <sub>2</sub> not connected  Empty N <sub>2</sub> cylinder N <sub>2</sub> inlet press. too low	Connect gas supply cf. Installation Replace N <sub>2</sub> cylinder Adjust inlet pressure; 1 bar
301 N <sub>2</sub> too high (SP)	N <sub>2</sub> inlet pressure too high	Adjust inlet pressure; 1 bar
302 O <sub>2</sub> too low (SP)	O <sub>2</sub> not connected  Empty O <sub>2</sub> cylinder O <sub>2</sub> inlet pressure too low	Connect gas supply cf. Installation Replace O <sub>2</sub> cylinder Adjust inlet pressure; 1 bar
303 O <sub>2</sub> too high (SP)	O <sub>2</sub> inlet pressure too high	Adjust inlet pressure; 1 bar
304 Electrolyte error	Spent electrolyte KCl level too low Torn foil membrane	Replenish electrolyte cf. Appendix Remount electrode cf. Appendix
305 O <sub>2</sub> electrode	Spent electrolyte Filling level too low Torn foil membrane  Electrode installed wrong	Replenish electrolyte cf. Appendix Remount electrode cf. Appendix Assy.Instruct.,cf. Appendix

\* if this does not work, request a service technician (cf.p.37).

SP = Setpoint

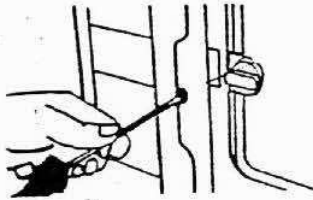
Malfunctions which are not displayed:

Malfunction	Remedy, Checkout
* Unit does not heat	- Check setpoint
* Unit does not admit gas	- Observe LED gas: * Check whether gases are released - Check setpoint
* Buzzer does not sound if a malfunction occurs	- Check to make sure buzzer is turned on, cf. Special Functions, p.30
* Setpoints cannot be changed	- Setpoints are locked in, cf. Special Functions, p.30
* A lot of condensation on the glass pane	- Check switch position on the rear wall of the unit. cf. remark on p. 11

Shutdown of the Unit

- \* Turn off master switch
- \* Shut the manual gas valves

## 8. Disinfection, Cleaning, Checks



### O<sub>2</sub> Electrode Removal (Optional)

### Removal of the Shelf Supports

#### Weekly checks to be performed by the user:

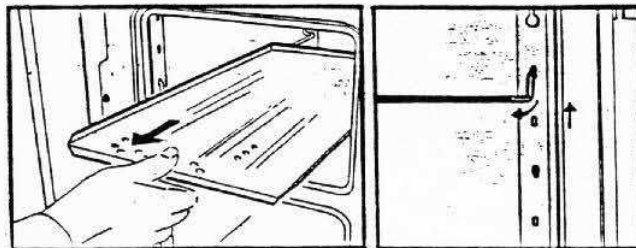
- \* Check level of distilled water in the reservoir (cf. ill., page 28).
- \* Check that gas supply pressure is set at: 1 bar
- \* Check electrolyte filling level of the O<sub>2</sub> electrode: it should be 15 mm below the vent hole (cf. Appendix).

#### Disinfection and cleaning of the chamber by the user:

- \* Turn the unit off
- \* Open the glass door or use a screwdriver to release the rotary lock of the glass screen (Model 6220)
- \* Drain the water (cf. ill., page 12)
- \* Remove the O<sub>2</sub> electrode, the gas analyzer, the shelves and supports
- \* Pull the plug on the chamber ceiling
- \* Remove the cap from the support and cap the O<sub>2</sub> socket
- \* Pull the hose connection to the nozzle in the chamber ceiling
- \* Pull the electrode with its support upward and remove it from the unit
- \* Disassemble the O<sub>2</sub> electrode and rinse it in distilled water

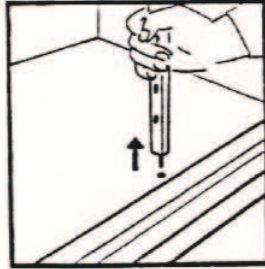
#### Unit with full-width shelves

- \* Remove shelves toward the front
- \* Unhook support brackets
- \* Push the carrier racks on both sides in front upward and remove them from the unit
- \* To remove the carrier racks on both sides in the rear, push back first and then up



Unit with divided shelves:

- \* Remove the shelves, supports and carrier racks as described above
- \* Unhook the support brackets from the carrier racks in the center
- \* Push the center carrier racks up (spring) and remove them from the unit



Removal of the Gas Analyzer

- \* Pull the plug from the socket
- \* Pull the hose connection to the ceiling
- \* Release the thumb screw
- \* Support the gas analyzer with one hand, pull it toward the right and remove it.

Reminder

The gas analyzer should be treated only with disinfectants recommended by Thermo.

Removal of the Glass Screen, Model BB 6220 Only, (cf. page 38):

- \* Use a screwdriver to release the rotary lock of the glass screen
- \* Use a pair of pliers to remove the guard rings from the door hinges
- \* Carefully push the glass screen up and lift it off the hinges

Recommended Disinfectant

Disinfect the surfaces with:

A surface disinfectant recommended by Thermo can be ordered under part number 50052425 (250 ml spray bottle) and 50051939 (500 ml refill bottle).

Details for efficiency and approvals are available on request.

Don't use disinfectants containing alcohol\*!

Prior to calling Service for maintenance and repair work, it might be necessary to clean or disinfect the unit.

\*)

Alcoholic disinfectants as termed by the German ZH 1/598 are those which contain more than 10% alcohol when diluted for use.





ERROR: undefinedresource  
OFFENDING COMMAND: findresource

STACK:

/N1961  
/ColorSpace  
/N1961  
-savelevel-