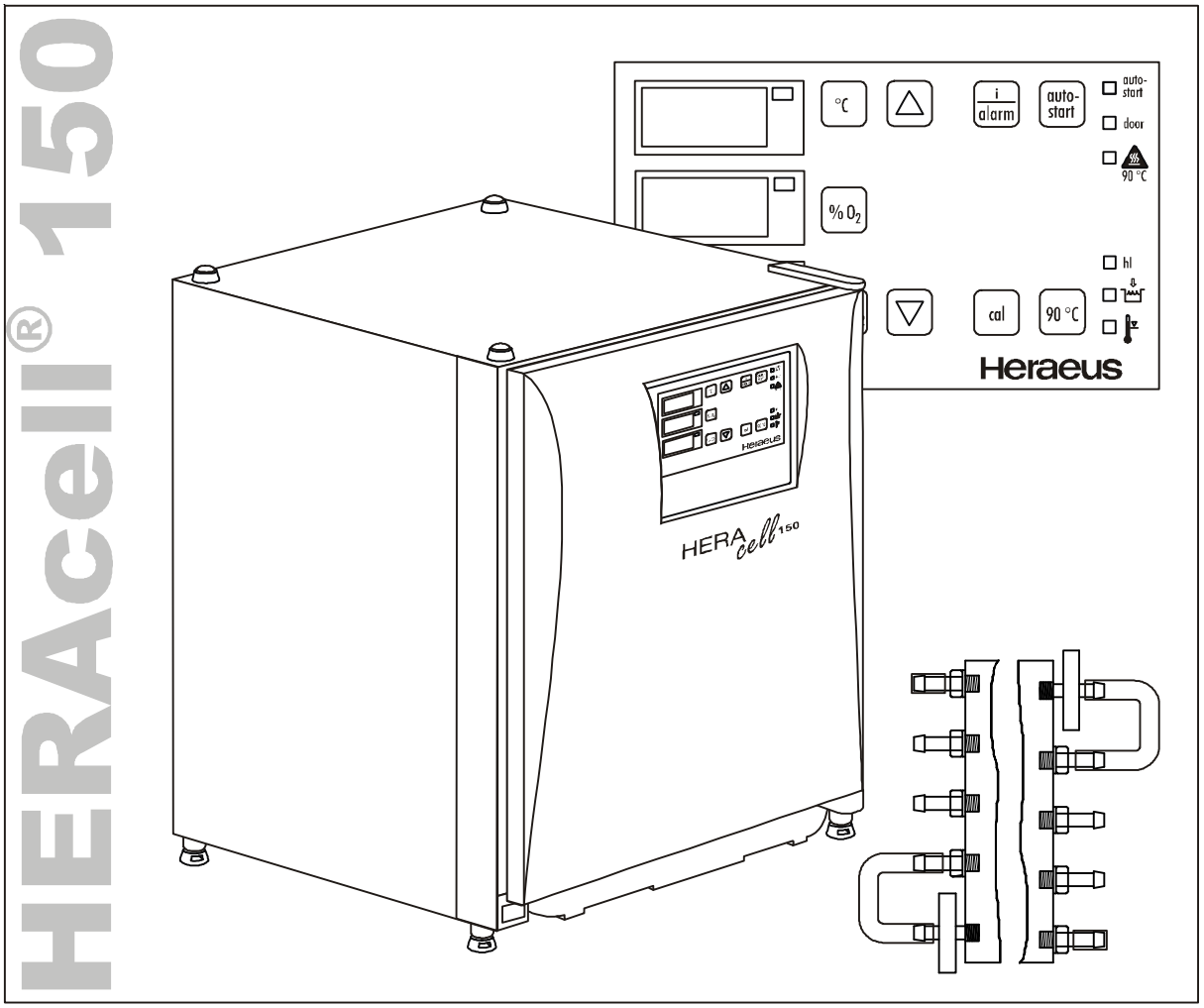
Kendro®

Operating Instructions

CO_2 incubator HERAcell® 150 with decontamination routine



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Kendro Laboratory Products GmbH
Robert-Bosch-Straße 1
D - 63505 Langenselbold
Germany

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Figures

1. General notes

The following are the addresses of the international Kendro Sales Organisations.

Postal address Germany
Kendro Laboratory Products GmbH
Robert-Bosch-Straße 1
D - 63505 Langenselbold

Anfragen aus Deutschland
Telefon
Vertrieb 0800 1 536376
Service 0800 1 112110
Fax
Vertrieb/Service 0800 1 112114
E-Mail info@kendro.de

Enquiries from Europe, Middle East and Africa
Tel. + 49 (0) 6184 / 90-6940
Fax + 49 (0) 6184 / 90-7474
E-Mail info@kendro.com

Postal address USA
Kendro Laboratory Products Inc.
275 Aiken Road
Asheville, NC 28804
USA

Enquiries from North America
Phone +1 800-879 7767
Fax +1 828-658 0363
E-Mail info@kendro.com

Enquiries from Latin America
Phone +1 828-658 2711
Fax +1 828-645 9466
E-Mail info@kendro.com

Enquiries from Asia Pacific
Phone +852-2711 3910
Fax +852-2711 3858
E-Mail info@kendro.com

1. General notes

1.1 General safety instructions

These operating instructions describe the CO_2 incubator HERAcell® 150.
The CO_2 incubator has been manufactured in keeping with the latest technological developments and is operationally safe. However, the device may present potential hazards, particularly if it is operated by inadequately trained personnel or if it is not used in accordance with the intended purpose. Therefore, the following must be observed to prevent accidents:

- The CO_2 incubator must only be operated by trained and authorized personnel.
- For personnel operating this device, the operator must prepare written instructions in a reasonable form based on these operating instructions, the safety data sheets, the hygiene regulations and the applicable Technical Guidelines, in particular:
  - which decontamination measures are to be taken for the device and for the accessories used,
  - which safety measures are to be taken when gases and pressurized gas containers are used,
  - which measures are to be taken in case of an accident.
- Any repairs to the device must only be performed by adequately trained and authorized expert personnel.
- The contents of the operating instructions are subject to change without further notice.
- Concerning translations into foreign languages, the German version of these operating instructions is binding.
- Keep these operating instructions in the vicinity of the device so that safety instructions and important information are always accessible.
- Should you encounter problems that are not mentioned in these operating instructions, please contact Kendro Laboratory Products GmbH immediately for your own safety.

1.2 Warranty

Kendro Laboratory Products warrant the operational safety and the operativeness of the CO_2 incubator HERAcell®150 only under the condition that:

- the device is operated and serviced exclusively in accordance with its intended purpose and as described in these operating instructions,
- the device is not modified,
- only original spare parts and accessories that have been approved by Kendro Laboratory Products are used,
- inspections and maintenance works are carried out at the specified intervals.

The warranty is valid from the date of delivery of the device to the operator.

1. General notes

1.3 Explanation of symbols

1.3.1 Symbols used in the operating instructions:

WARNING!

is used if non-observance may cause serious or even lethal injuries.

CAUTION!

is used if non-observance may cause medium to minor injuries or damage.

NOTE

is used for applicational hints and useful information.

Wear safety gloves!

Wear safety goggles!

Harmful liquids!

Electric shock!

Hot surfaces!

Fire hazard!

1. General notes

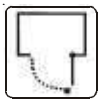
1.3.2 Symbols used in the quick referenc:

Operational steps to be performed at the device

Display state of device indicators

Turn device on

Turn device off



Open device doors

Leave device doors open for at least 30 seconds

Check humidification system water level, refill as necessary, level between 1.2 l (min.) and 3.0 l (max.)

Refill 300 ml water for ContraCon disinfection routine

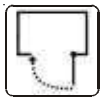
Initiate auto-start, keep key depressed for at least 5 seconds

Initiate ContraCon decontamination routine, keep key depressed for approx 5 seconds

Set nominal values for temperature, CO_2 and O_2.

1. General notes

Clean device work space



Close device doors

Remove samples and water from device

Charge device

Note in operating instructions, page ...

1.3.3 Symbols on the device:

CE symbol

VDE - safety-tested

Test certificate for USA/Canada

Observe operating instructions!

1. General notes

1.4 Intended purpose of the device

1.4.1 Correct use

The CO_2 incubator HERAcell® 150 is a laboratory device for preparing and cultivating cell and tissue cultures. The device allows the simulation of the special physiological ambient conditions for these cultures due to the exact control of:

- temperature,
- CO_2 content,
- O_2 content,
- and the setting of an increased relative humidity.

The HERAcell® 150 has been designed for installation and operation in the following fields of application:

- Laboratories for cytobiological and biotechnological experiments of safety levels L1, L2, and L3.
- Medical-microbiological laboratories in accordance with DIN 58 956.
- Laboratories in the central area of clinics and hospitals.

The gases required for the incubator (CO_2 and/or N_2 / O_2) are supplied to the device from a separate gas supply system, either from gas cylinders or from a central pressurized gas container.
The layout of the gas supply system must ensure that the operating pressure of the gas supply lines can be set to a range between 0.8 bar (min.) to 1 bar (max.) and that the pressure cannot be changed.
Depending on the capability of the gas supply system, several devices may be connected in series.
The CO_2 incubator is suited for continuous operation.

1.4.2 Incorrect use:

Do not use cell or tissue cultures in the device that are not in accordance with the regulations of safety levels L1, L2, and L3.

Do not use tissues, substances or liquids that:

- are easily ignitible or explosive,
- release vapors that form combustible or explosive mixtures when exposed to air,
- release poisons.

1. General notes

1.5 Standards and directives

The device is in accordance with the following standards and guidelines:
- DIN EN 61010
- Low Voltage Guideline 73/23 EWG
- EMC Guideline 89/336 EWG
- UVV VBG 20
- DIN 12880 Part 1/11.78

The following safety regulations must be observed if the device is operated within the territory of the Federal Republic of Germany:
- ZH 1/10
- ZH 1/119
- ZH 1/342
- ZH 1/343
- ZH 1/598
- TRG 280
- EC Official Gazette, L 374
- Safety data sheets of the gas supplier relevant to the particular characteristics of CO_2, O_2, and N_2.
- Principles of good microbiological proceedings, notice of the trade association of the German chemical industry.

For other countries, the applicable national regulations are binding.

1.6 Safety notes on gases

Carbon dioxide (CO_2):
As CO_2 is rated as a harmful gas, certain safety instructions must be observed when the CO_2 incubator is started up and when the device is operated.

NOTE – Personnel instruction

Personnel operating devices with CO_2 supply must be instructed about the particularities in the handling of CO_2 before starting their work:
- **Correct operation of pressurized gas containers and gas supply systems (e.g. TRG 280),**
- **Obligation to report damages and shortcomings in CO_2 supply lines,**
- **Measures to be taken in case of accidents or failures.**

These instructions must be repeated in appropriate intervals and must comprise the particular operating instructions of the gas supplier.

1. General notes

WARNING - Suffocation hazard!

CO_2 released in large amounts into the room atmosphere may cause suffocation.
If CO_2 is released, initiate safety measures immediately!

- **Leave the room immediately and do not allow others to enter the room!**
- **Inform security service or fire department!**

Oxygen (O_2):
O_2 is a gas that promotes combustion and may explode in combination with grease-containing materials.

WARNING – Oxygen explosion!

O_2 may explode in combination with oils, greases, and lubricants. If highly compressed oxygen comes in contact with grease- or oilcontaining substances, the mixture may explode!

- **For cleaning these device components, use only oil- and grease-free lubricants.**
- **Keep all connections and components of the oxygen system free from substances that contain oil, grease, or lubricant!**

CAUTION – Fire hazard!

Released oxygen promotes combustion. Do not use open flames in the vicinity of oxygen-operated systems!

- **Do not smoke in the vicinity of oxygen systems.**
- **Do not expose the components of an oxygen system to excessive heat.**

1. General notes

Nitrogen (N_2):
Nitrogen mixes easily with air. High concentrations of nitrogen reduce the oxygen content in the air.

CAUTION – Suffocation hazard!

N2 released in large amounts into the room atmosphere may cause suffocation due to oxygen deficiency.
If N_2 is released, initiate safety measures immediately!!

- **Leave the room immediately and do not allow others to enter the room!**
- **Inform security service or fire department!**

NOTE – Installation work

Any work to supply lines and pressurized gas containers, cylinders or containers used for storing N_2, CO_2 or O_2 must only be carried out by expert personnel using the appropriate tools.

2. Delivery

2.1 Packaging

The CO_2 incubator HERAcell® 150 is delivered in a stable packaging box. All packaging materials can be separated and are reusable:

Packaging materials

- Packaging carton — Recycled paper
- Foam elements — Styrofoam (CFC-free)
- Pallet — Untreated wood
- Packaging film — Polyethylene
- Packaging ribbons — Polypropylene

2.2 Components standard equipment

Quantity of the delivered components	CO2 or CO2/O2 incubator with solid glass door and with continuous shelves (standard version)	CO_2- or CO_2/O_2-Incubator with 3-door gas tight screen and with continuous shelves (optional)
Shelf	3	3
Support rail for shelf	4	4
Shelf supports for shelf	6	6
Tray	1	1
Insert for pressure compensation opening	1	1
Plug for pipe channel	1	1
Power supply cable	1	1
Connector, potential-free contact	1	1
Spare caps, set	1	1
CO_2 connecting hose set	1	1
Immersion water pump	1	1
Open-end wrench, 24 mm	1	1
Allen wrench 2 mm for blower wheel	1	1
Allen wrench 3 mm for blower wheel cover	1	1
Operating instructions	1	1
Quick reference	2	2
Additional equipment		
O_2 connecting hose set	1	1
O_2 sensor with set for gas humidification[1]	1	1

[1] The gas humidification set is packed in a separate carton and placed in the sample chamber during transport.

2. Delivery

2.3 Acceptance inspection

After the device has been delivered, check the delivery immediately for:
- completeness,
- possible damages.

If damages are detected or if components are missing, please contact the carrier and Kendro Laboratory Products immediately.

3. Installation of the device

3.1 Ambient conditions

The device must only be operated at locations that meet the particular ambient conditions listed below.

Requirements:
- Draft-free and dry location.
- The minimal distance to adjacent surfaces must be observed on all sides (see Section 3.3.).
- The operating room must be equipped with an appropriate room ventilation.
- Solid, level, fire-proof surface.
- Vibration-proof substructure (floor stand, lab table) capable of bearing the weight of the device and of accessories (particularly if several devices are stacked).
- To ensure a constant incubation temperature of 37° C, the ambient temperature must be within a range of +18° C to +33° C.
- Relative humidity up to 80 % (max.).
- No direct exposure to sunlight.
- Devices that produce excessive heat are not allowed near the location of the HERAcell® 150.

3.2 Room ventilation

When $CO_2/O_2/N_2$ is supplied, the work space of the incubator is slightly pressurized. The pressure is released through the pressure compensation opening into the operating room.
As the pressure compensation and any opening of the glass door/gas tight screen during the operation of the device will release **very small quantities of CO_2/ O_2/N_2** into the operating room, the room ventilation must be capable of carrying the released gas safely off into the open.
In addition, heat dissipating from the device during permanent operation may cause a change in the room climate.
- Therefore, the HERAcell® 150 must only be installed in rooms with sufficient ventilation.
- Do not install the device in room recesses without ventilation.
- The room ventilation should be a technical ventilation that is in accordance with the requirements of ZH 1/119 (Guidelines for laboritories) or some other suited ventilation system with appropriate capacity.

3. Installation of the device

3.3 Space requirements

Fig. 1: When installing the device, make sure that the installation and supply connections are freely accessible.
The control box at the rear panel of the device may serve as a spacer to adjacent objects. The side distances given are minimal distances.
To protect the CO_2 incubator against contamination, use a floor stand even if the device is installed near the floor. The height of the floor stand should not fall below 200 mm.
Several floor stands and carriers are available as options from Kendro (part numbers see Section 11.1, “Spare parts and accessories”).

NOTE – Accessibility of the devices

To ensure the accessibility for care and maintenance works, keep larger side and rear distances.

3.4 Transport

Fig. 2: For the transport do not lift the device using the doors or components attached to the device (e.g. control box on rear panel) as lift points.

NOTE – Lift points

Lift the device only using the lift points shown in Fig. 2.

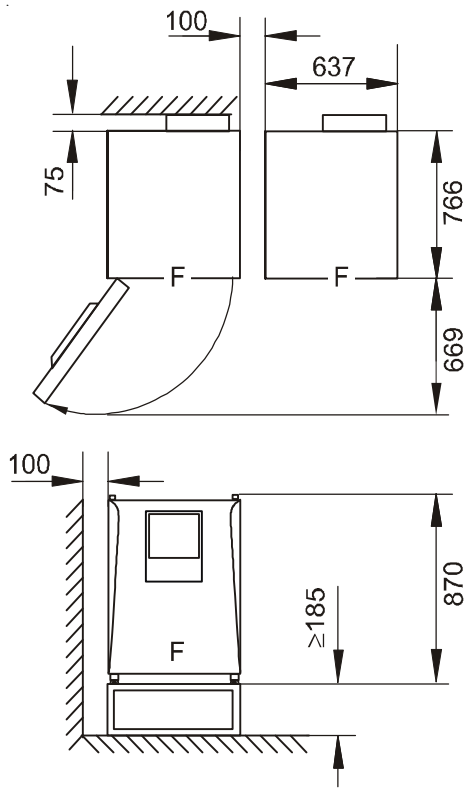


Fig. 1
Device dimensions and minimal distances in mm, F = Front

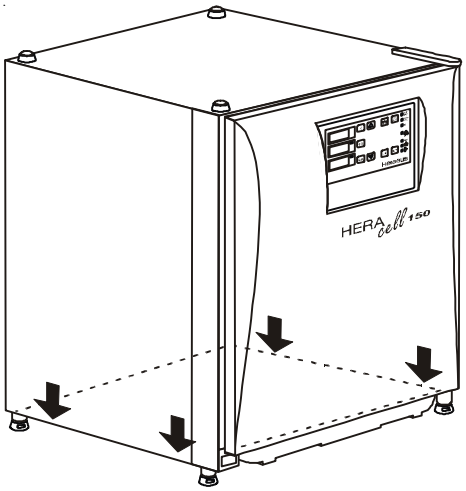


Fig. 2
Lift points

3. Installation of the device

3.5 Stacking

Fig. 3: Two HERAcell® 150 devices can be stacked on top of each other. The upper device is secured to the lower device by inserting the device stands [1] into the stacking elements [2] on the device ceiling.
If the devices are placed onto mobile racks, ensure that the rollers [3] are secured by an arresting device during operation. For reasons of stability, the rollers should be oriented to the front.

NOTE – Transporting stacked devices

The stacking elements are anot connecting elements. Therefore, the transport of stacked devices on sloped surfaces is not allowed.

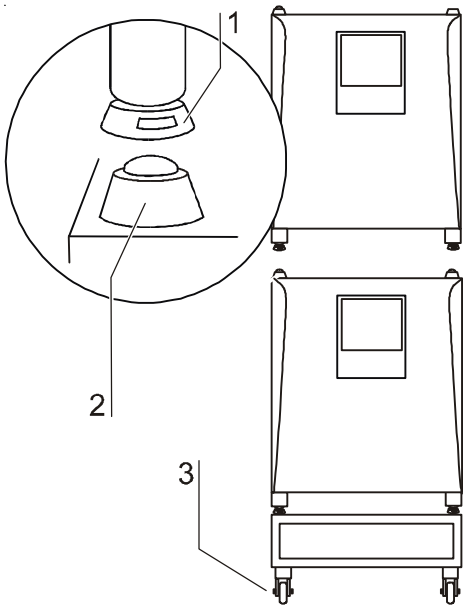


Fig. 3
Stacking

3.6 Retrofitting/Modifications

The outer door and the glass door can be equipped with left or right side fasteners. The door fastening can also be reversed later.
The standard version can also be retrofitted with a three-element split gas bezel by replacing the glass door with the gas bezel.

NOTE – Modifications

Retrofittings and modifications must only be performed by the Technical Service of Kendro Laboratory Products.

3.7 Tray

Fig. 4: After the device has been installed, the tray is inserted between the two guide straps below the bottom of the device.

1. Open the outer door of the device all the way to the stop.
2. Fold the guide straps [1] all the way down.
3. Position tray [4] with vertical edge [2] below cable guide [3]. The quick reference [5] faces the front of the device.
4. Lift tray slightly and tilt it downward.
5. Push tray in until resistance is observed, then push tray in all the way to the stop by pushing onto guide straps.

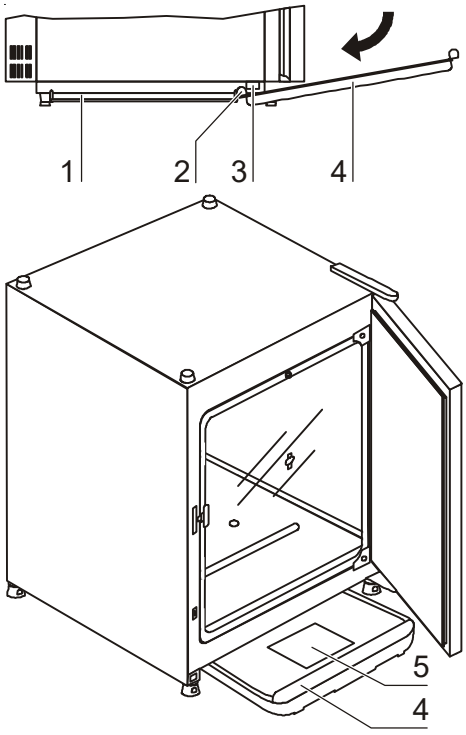


Fig. 4
Tray installation

4. Description of the device

4.1 Front view

[1] Stacking elements
[2] Plug caps
[3] Glass door
[4] Measuring cell with blower wheel and sensors
[5] Door switch
[6] Oxygen sensor (optional)
[7] Pressure compensation opening with insert
[8] Measuring opening
[9] Outer door
[10] Outer door seal, replaceable
[11] Foot, height-adjustable
[12] Gas humidification (optional)
[13] Water level sensor
[14] Nameplate
[15] Tray, extractable
[16] Power switch
[17] Support rail
[18] Shelf
[19] Latch, glass door
[20] Support hook for shelf
[21] Access port with plug
[22] Glass door seal, replaceable

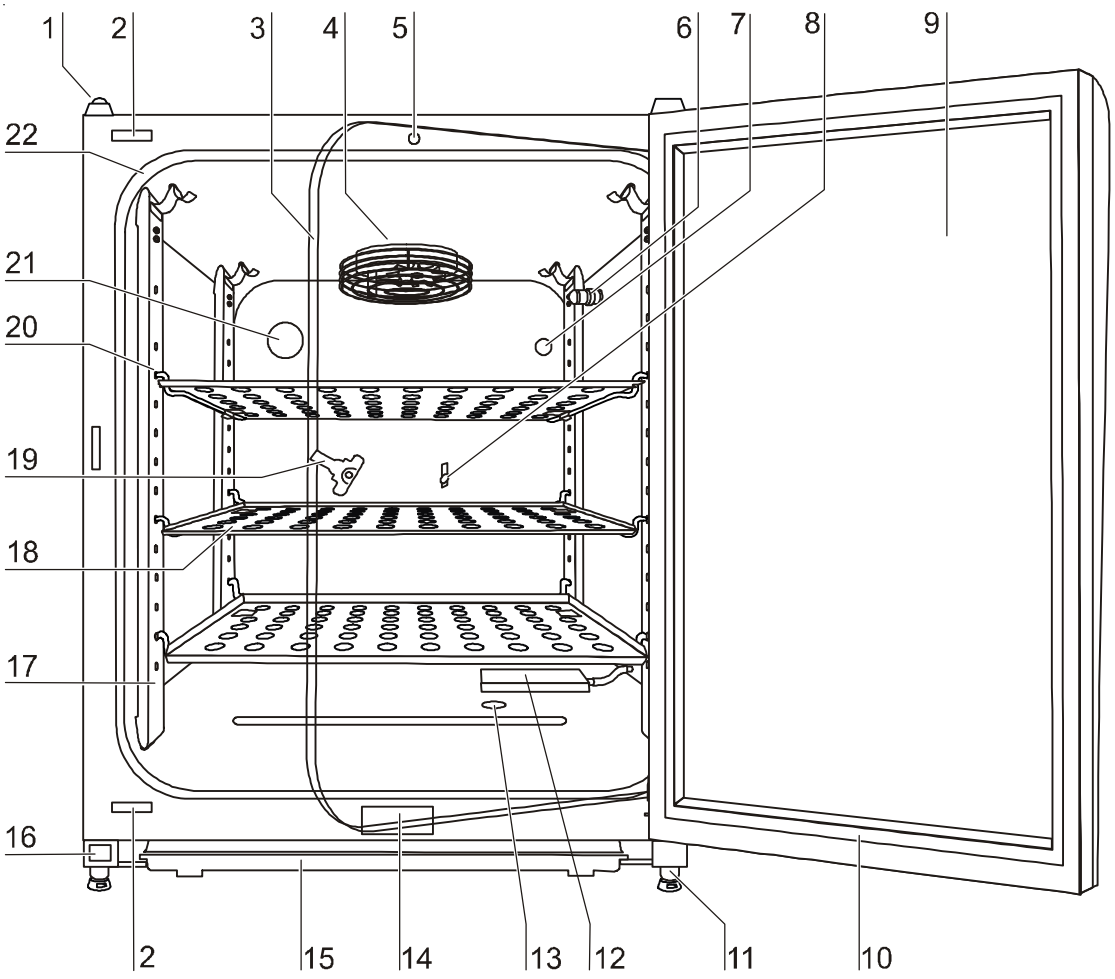


Fig. 5
Front view

4. Description of the device

4.2 Rear view

[1] Pressure compensation opening
[2] Access port, Ø 42 mm
[3] Stacking elements
[4] Switchbox with supply interfaces for combined gas connection CO_2 and O_2 /N_2 **with** gas guard
[5] Switchbox with supply interfaces for combined gas connection CO_2 and O_2 /N_2 **without** gas guard

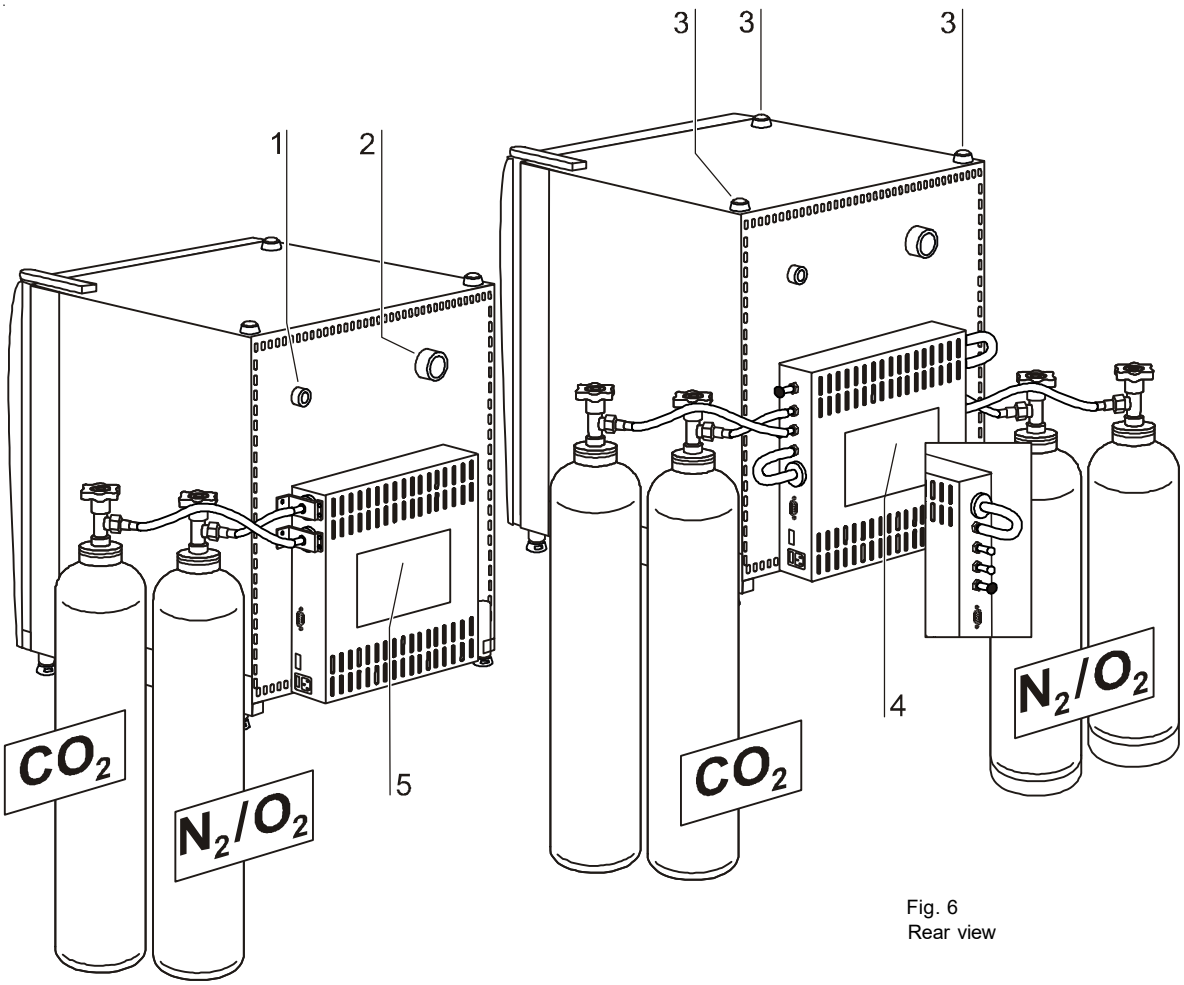


Fig. 6
Rear view

4. Description of the device

4.3 Safety devices

The device is equipped with the following safety devices:
- A door switch interrupts the CO_2 and O_2supply and the work space heating when the glass door is opened.
- The optional gas guard switches the gas supply over to a full gas cylinder.
- An independent thermal protection protects the samples from harmful overheating in case of failures.
- A pressure compensation opening ensures pressure compensation in the device work space.
- Audible and visual alarms indicate failures during operation.

4.4 Work space atmosphere

In the work space of the incubator, the particular physiological ambient conditions for the preparation and cultivation of cell and tissue cultures are simulated. The work space atmosphere is determined by the following factors:
- Temperature,
- Relative humidity,
- CO_2 concentration,
- O_2 concentration (option).

Temperature:
To ensure undisturbed operation, the temperature in the operating room must be at least 18° C and the incubation temperature must be at least 3° C higher than this temperature.
The heating system controls the incubation temperature from this temperature threshold up to 55° C. The principle of air jacket heating and the additional, separate heating of the outer door and glass door/gas tight screen minimize the risk of condensate formation at the side walls, at the ceiling of the work space, and at the glass door/gas tight screen.

Relative humidity:
The water tray of the work space can hold 3.0 liters of processed water. The heating of the work space supports the condensation of the water, thereby ensuring a constant humidity within the work space. Under normal operating conditions and at the usual incubation temperature of 37° C, a constant relative humidity of approx 95 % is achieved in the work space.
A high/low switch-over function allows the selection of two humidity settings:
- Select **setting 0 (High)** for a relative humidity of **approx 95 %** (standard setting).
- Select **setting I (Low)** for a relative humidity of **approx 90 %**.

If heated containers are removed and put back into the work space, the elevated humidity and the cooling may cause condensate to form on the outer sides of the container.
The low humidity regulation effectively prevents the formation of condensate on containers.

4. Description of the device

For humidification, processed water of the following quality is required:
- distilled,

or
- demineralized and destilled/autoclaved,

or
- deionized and destilled/autoclaved.

CO_2 supply:
To ensure the growth conditions for the cell and tissue cultures, the work space is supplied with CO_2.
The pH of the bicarbonate-buffered culture media largely depends on the CO_2 content of the work space atmosphere.
The CO_2 content of the work space atmosphere can be controlled within a range of 0-20 %.
The supplied CO_2 must have one of the following quality characteristics:
- Purity 99,5 % min.,
- medical gas quality.

O_2 supply:
If the O_2 incubator is to operated with more than 21 % oxygen, the work space is supplied with oxygen. The O_2 content of the work space atmosphere can be controlled within a range of 21-90 %.

N_2 supply:
If the oxygen content during operation is to be lowered to less than 21 % (air oxygen content), the work space is supplied with nitrogen. The O_2 content of the work space atmosphere can be controlled depending on the configuration of the sensor in a range of 1 % to 21 % or of 5 % to 21 %.

4.5 ContraCon decontamination routine

The ContraCon decontamination routine is used to decontaminate the complete work space including all installed components and sensors.
During this routine, a moist and wet atmosphere with highly decontaminating effect is created for 9 hours at a temperature of 90° C.
The effectiveness of the ContraCon decontamination routine has been tested and certified by independent institutes. Information about these tests is available at request from Kendro Laboratory Products.
The entire program run of the ContraCon decontamination routine will take approx 25 hours.
After the run has been completed, the device must be reactivated using the autostart routine.

NOTE – Thermal protection

If the thermal protection for the device responds, the ContraCon decontamination routine can only be be started after the cause of the failure has been repaired or reset (see Section 6.13).

4. Description of the device

4.6 Sensor system

Fig. 7: The blower wheel and two sensor modules are integral to the baseplate [1] of the measuring cell:

- Sensor [2] for the acquisition of the work space temperature and of the thermal protection,
- CO_2 sensor [3] for the acquisition of the CO_2 content in the work space atmosphere.

The O_2 sensor (optional) [4] for the acquisition of the O_2 content in the work space atmosphere is installed in the upper area of the right sidewall.

The sensor for the acquisition of the work space temperature as well as the CO_2 sensor and the O_2 sensor are integral to the control system of the device. Their measured values are compared to the set nominal values. Based on this data, the control system controls heating and CO_2/O_2 supply.
The blower intermixes the supplied gases and ensures an even temperature distribution within the work space.

The thermal protection has been preprogrammed at the factory and cannot be changed. It protects the stored cultures from overheating. If the temperature is exceeded by more than 1° C, the thermal protection responds and the work space temperature is automatically reduced to the set nominal value so that the incubation process can be continued even in case of a failure. Any response of the thermal protection will simultaneously trigger a visual alarm.

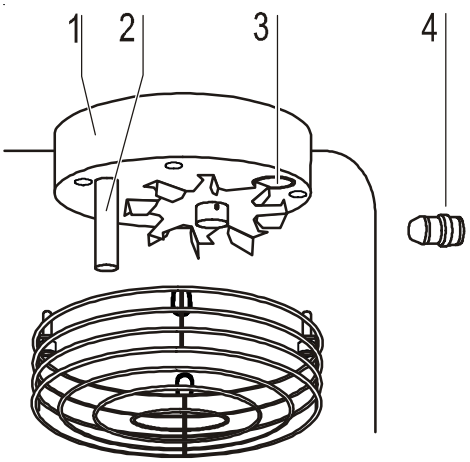


Fig. 7
CO_2 and O_2 sensors

4.7 Door switch

A door switch [1] is installed at the upper edge of the work space opening. If the door switch is activated by opening the glass door, the gas supply and the heating of the work space are interrupted and the display shows a corresponding message. If the door remains open for more than 30 seconds, a short acoustic alarm sounds. If the door remains open for more than 10 minutes, the acoustic alarm sounds continuously.
The outer door can only be closed after the glass door has been latched properly.

NOTE – Version with gas tight screen

For devices with the optional gas tight screen, the door switch function described above is triggered when the outer door is opened.

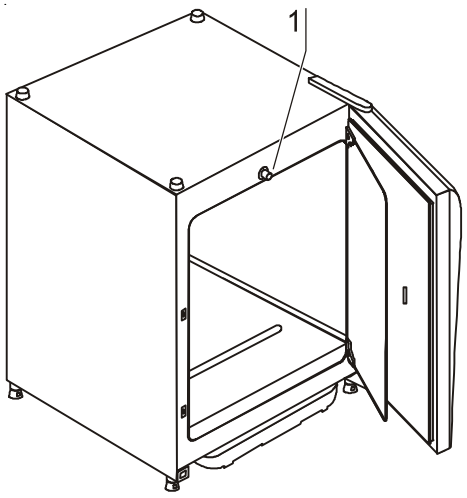


Fig. 8
Door switch

4. Description of the device

4.8 Switchbox with supply interface

All supply connections are installed in the switchbox at the rear of the device.

Gas connection:
The gas supply line between the device and the gas supply system is connected using the supplied connecting hoses. Fig. 9 shows the connection of a device with combined CO_2/O_2/N_2 connection. Further optional connections are described in Section 5.3.
O_2/N_2, and CO_2 are supplied to the device through separate connecting sleeves [1] and [2].
All process gases must be supplied to the device at a fixed pressure that has been preset within a range of 0.8-1.0 bar and must remain unchanged.
Befire the gases are fed into the work space, they flow through a sterile filter with a separation rate of 99.97 % for a particle size of 0.3 µm (HEPA filter quality).

Gas guard:
The devices can be equipped with an optional gas guard. The gas guard allows the connection of a secondary gas supply system and automatically controls the gas supply when the primary gas container becomes empty.
Devices with gas guard have an additional distributor for the connection of an additional CO_2 incubator so that several devices can be supplied by one central gas supply system.

Label:
Fig. 9: The label [3] contains information about gas supply, an alarm contact terminal legend, and notes about the electrical fusing of the device.

RS 232 interface:
Fig. 9: Via the RS 232 interface [4], the incubator can be connected to the serial interface of a PC. This connection allows the computer-aided acquisition and documentation of the major operating parameters (temperature, CO_2/O_2 concentration, failure codes, etc.).

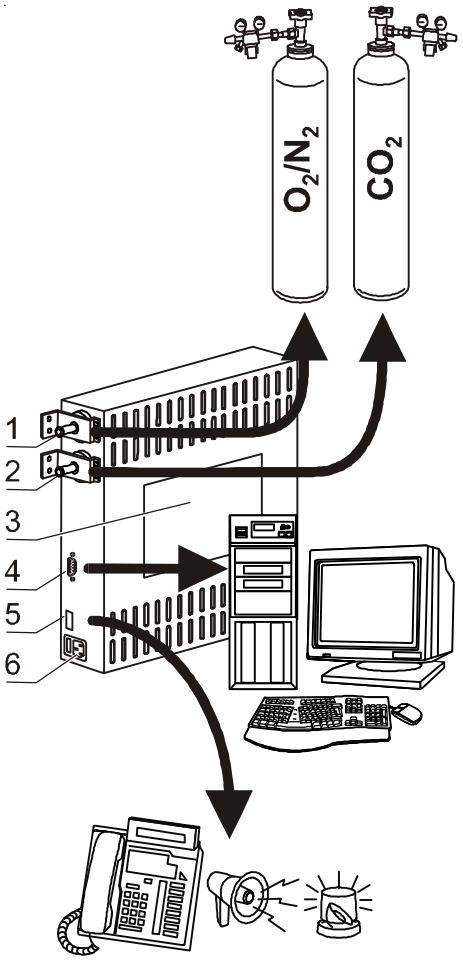


Fig. 9
Supply interfaces

4. Description of the device

Alarm contact:
Fig. 9: The device can be connected to an on-site, external alarm system (e.g. telephone system, building monitoring system, visual or acoustic alarm system). For this purpose, a potential-free alarm contact [5] is preinstalled in the device.

NOTE – Alarm contact

The alarm contact receives only messages caused by work space atmosphere conditions (temperature or gas).

Power supply connection:
Fig. 9: The power supply connection [6] of the device is established via a cable with a connector for non-heating appliances. The holder for the two device fuses is integral to the power supply socket for non-heating appliances of the supply interface.

4.9 Work space components

The work space of the incubator has only a minimum of surface, thereby supporting both the prevention of contamination and the easy, effective decontamination.

Interior container:
All components of the work space are made of stainless steel and have a burnished, absolutely smooth and easy-to-clean surface. Any embossings have a large radius.
As an option, the interior container, the shelf system, and the blower wheel with its cover can be made of copper material.

NOTE – Oxidation of copper components

When exposed to heat and humid air, the copper material of the interior container will oxidize. This results in a discoloration of the copper components during the test run for checking the device functions.
Do not remove the oxide layer during routine cleaning as the antimicrobial effect of the copper material is based on it.

Fig. 10: The components of the shelf system can be removed easily so that only the easily treatable, surface-reduced interior container [1] remains in the work space for cleaning and manual disinfection works.

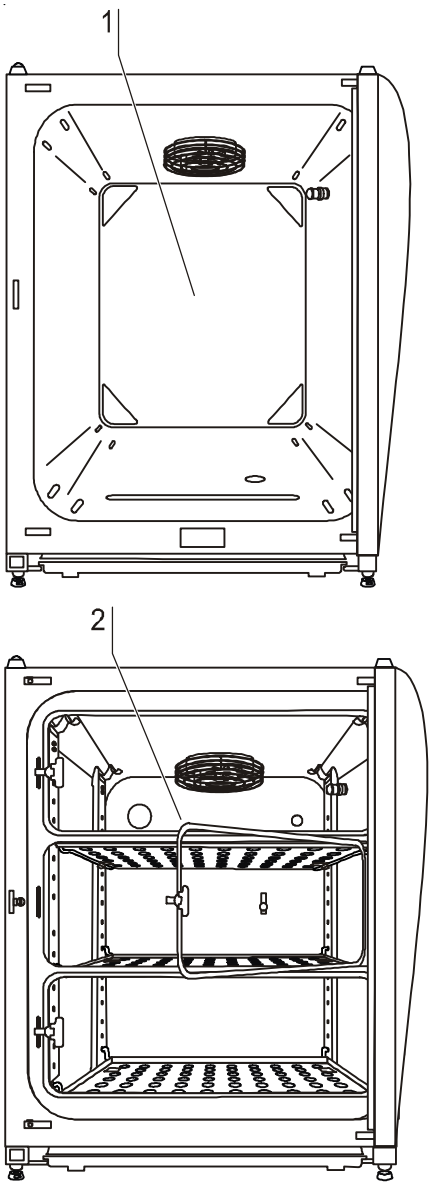


Fig. 10
Work space layout!

4. Description of the device

Optional 3-door gas tight screen:
Fig. 10: For devices that are equipped with the optional gas tight screen [2], the contamination hazard is considerably lower and the recovery times of the incubation parameters

- work space temperature,
- CO_2 concentration,
- O_2 concentration,
- relative humidity.

Water reservoir:
Fig. 11: The water reservoir [1] is integral to the interior container floor and inclines toward the rear. The water level is monitored by a water level sensor [2] that issues an alarm message at the display and an audible signal when the water falls below the minimal level. The embossings [3] in the water tray are used as indicators for the maximal level.

Heating system:
An air jacket heating is used for heating the work space. The arrangement of the heating elements ensures that condensate formation above the water reservoir is prevented as fast as possible.
The outer door of the device is also heated. The heat radiated onto the interior glass door/gas tight screen prevents condensate formation. The work space of the device always remains visible, despite high humidity.

Gas humidification (only for O_2 control):
A hose [5] connects the gas humidification [6] to the device-integral oxygen or nitrogen supply line [4]. The inflowing oxygen or nitrogen is fed to the heated water. This ensures humidification of the gases as they enter the work space and prevents an undesired drop of the work space humidity.

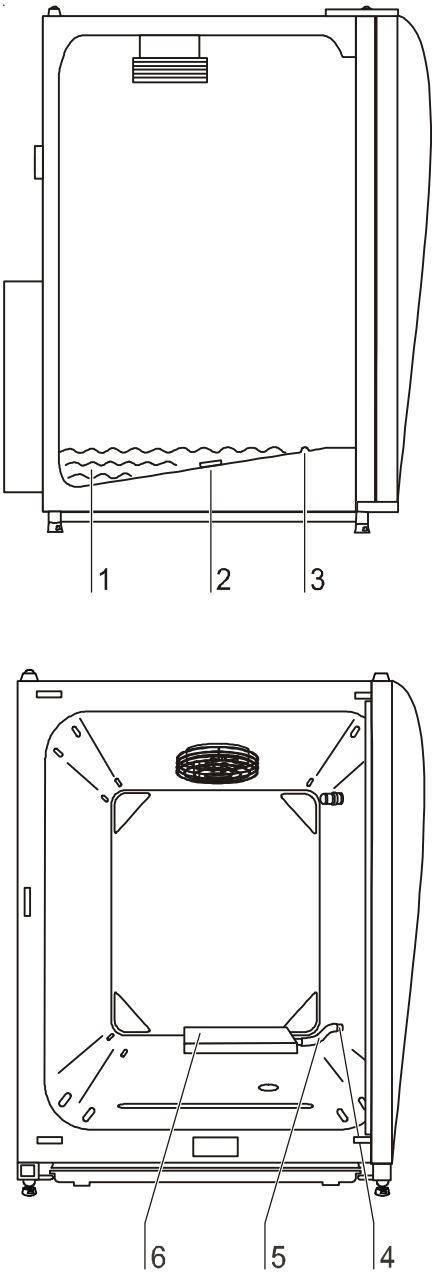


Fig. 11
Water reservoir,
gas humidification

4. Description of the device

Rear panel openings:
Fig. 12: A sealable access port [1] allows cables, hoses or additional sensors to be routed into the work space of the device. A pressure compensation opening with insert [2] at the rear panel of the device allows a compensation between the pressures in the work space and in the operating room.

NOTE – Operating conditions

When accessories are to be operated in the work space of the CO_2 incubator, the ambient condition requirements must be observed (see table below). The energy introduced into the work space affects the beginning of the temperature control range. When additional heating sources are introduced into the work space, condensation (e.g. at the glass door) may occur.

Introduced energy	Control range of the temperature	
	General	Example: RT* = 21° C
0 W	RT + 3° C	24° C
5 W	RT + 6,5° C	27,5° C
10 W	RT + 9,5° C	30,5° C
15 W	RT + 13° C	34° C
20 W	RT + 16° C	37° C
*RT = Ambient temperature		

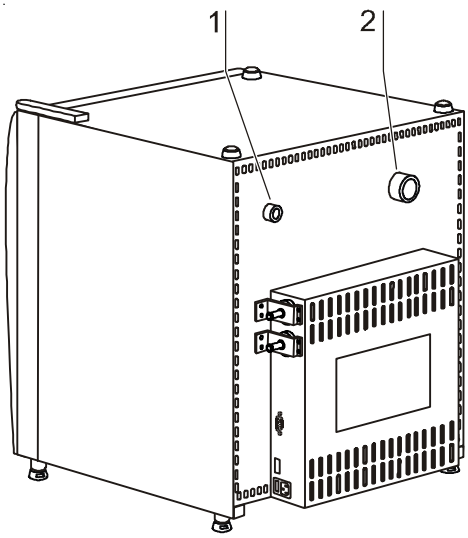


Fig. 12
Rear panel openings

5. Start-up

5.1 Preparing the work space

The incubator is not delivered in a sterile state. Before the initial start-up, the device must be decontaminated.
Before the decontamination is performed, the following work space components must be cleaned:

- Support rails,
- support hooks,
- shelves,
- gas humidification,
- work space surfaces,
- work space seals and gaskets,
- glass door

NOTE – Decontamination

For details about the cleaning and disinfection of the device, see Section 9.

5.2 Installing the shelf system

Tools are not required for the installation of the shelf system. The support rails are secured using spring pressure. After the support hooks have been inserted into the rail, the shelves are pushed onto the support hooks.

Support rail installation/removal:
Fig. 13: The support rails are held at the sides by the embossings [2] and [5] and secured by the embossings [1] and [6]. The support rails marked with (◊) are inserted at the rear panel of the device with the locksprings [3] facing upward.

1. Position support rail [4] onto lower embossing [6] and tilt toward the work space side wall so that the rail is positioned over the two embossings [5] and [2].
2. Clamp lockspring [3] behind upper embossing [1].
3. To remove the support rails, pull lockspring tab down out of the embossing and remove rail.

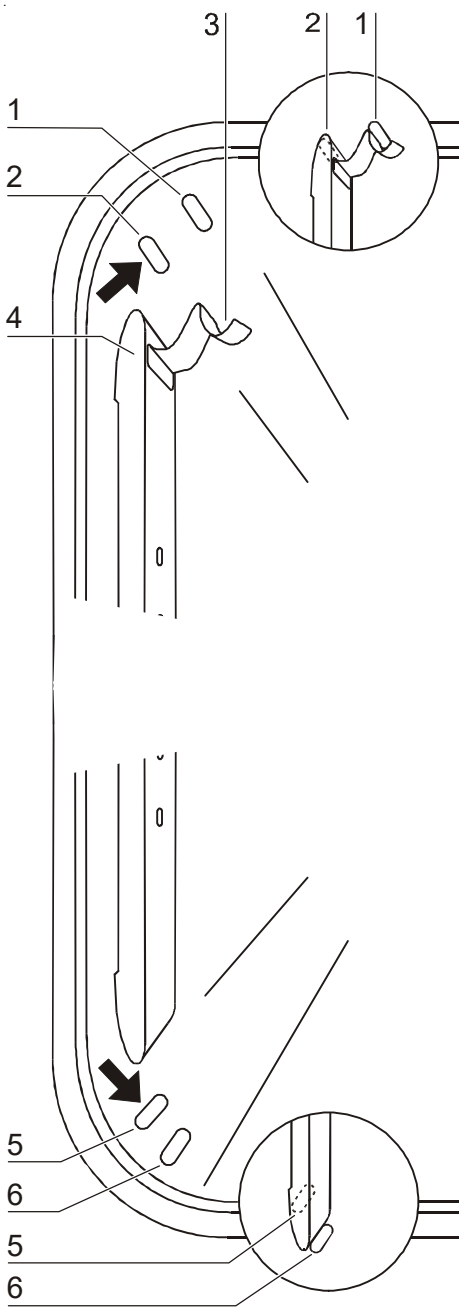


Fig. 13
Support rail installation/ removal

5. Start-up

Installing the shelf supports:
1. **Fig. 14:** Insert the shelf supports [3] into the perforations [1] of the support rail with the bar facing down.
2. Make sure that the two vertical elements [2] of the shelf support are flush with the support rail.

Installing the shelves:
1. **Fig. 14:** Push the shelf [4] onto the shelf supports with the tilt protection [5] facing the rear panel of the device. The tilt protection [5] is also used as a guide for the shelf.
2. Slightly raise shelf so that the withdrawal stop [6] can be routed over the shelf supports.
3. Make sure that the shelf supports is positioned in the two tilt protections in a way that it can move freely.

Levelling the device:
1. Position a bubble level onto the center shelf.
2. Rotate the adjustable device stands using the supplied 24 mm wrench until the shelf is positioned horizontally in all directions. Perform the adjustment of the device stands from left to right and from rear to front.

Installing the gas humidification (only for O_2 control):
Fig. 15: The gas humidification [10] is installed to the water tray parallel to the rear panel of the device. The position to the right side wall is predetermined by the hose length.
1. Install hose [8] to the sleeve [9] of the gas humidification and then to the sleeve [7] of the device-integral oxygen or nitrogen supply line.
2. Place gas humidification immediately to the rear panel of the device.

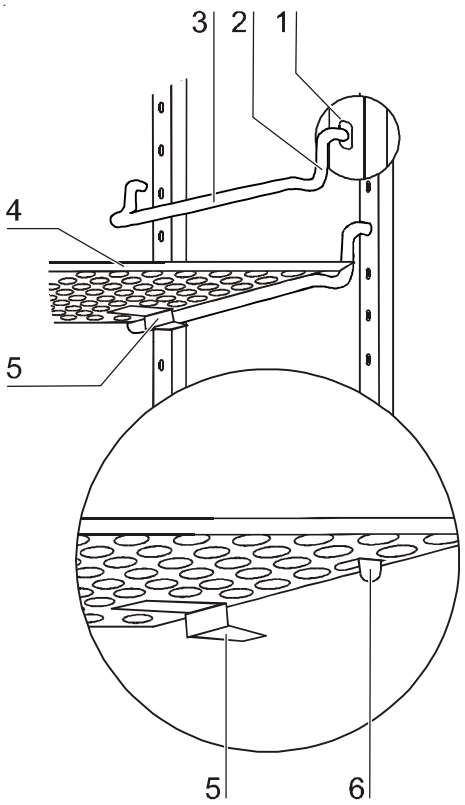


Fig. 14
Shelf support/
sheet/insert installation

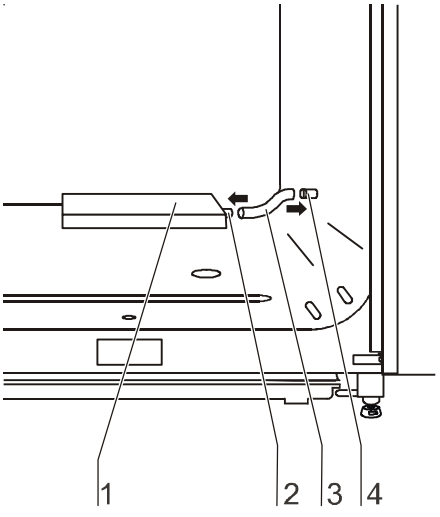


Fig. 15
Installing gas humidification

5. Start-up

5.3 Gas connection

NOTE – Gas quality

The gases must have one of the following qualities:
- **Purity 99.5 % min,**
- **medical gas quality.**

CAUTION – Overpressure!

The operating pressure of the gas applied to the device must not exceed 1 bar. If the gas is supplied at a higher pressure, the valves integral to the device may not close correctly and the gas supply control may be impaired.
Set the gas supply to a range between 0.8 bar min. and 1.0 bar max. and make sure that this pressure setting cannot be changed!

NOTE – Pressure compensation opening

To ensure permanent pressure compensation, the pressure compensation opening must not be connected to an exhaust air system. The pipe of the pressure compensation opening must not be extended or redirected.

NOTE – Pipe lead-through

If the pipe lead-through is not used, it must be capped during operation.

The device can be supplied with process gases from four different connections:
- CO_2 connection,
- combined CO_2 and O_2/N_2 connection,
- CO_2 connection with gas guard,
- combined CO_2 and O_2/N_2 connection with gas guard.

5. Start-up

5.3.1 Installing gas pressure hoses

Fig. 16: The gas supply from the gas supply system to the device is achieved using the supplied flexible gas pressure hoses:

1. Connect gas pressure hose [1] to the sleeve of the gas supply system.
2. Remove protective cap [3] from sterile filter.
3. Slide hose clamp [2] onto gas pressure hose and connect hose to the sleeve of the sterile filter.
4. Secure gas pressure hose to the sleeve of the sterile filter using the hose clamp.
5. Make sure that the access port is sealed when it is not used.

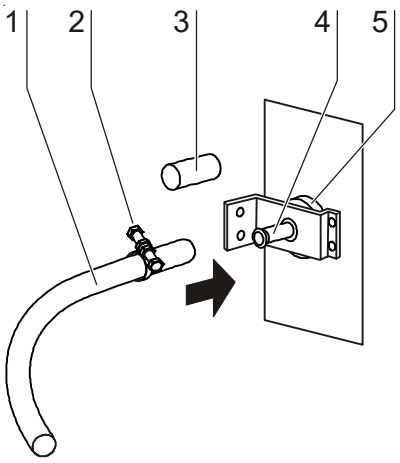


Fig. 16
Gas pressure hose installation

5.3.2 Installing devices without gas guard

CO_2 connection:

Fig. 17: For a device with CO_2 connection, connect the gas supply to the sterile filter [1].

Combined CO_2 and O_2/N_2 connection:

Fig. 17: For a combined $CO_2/O_2/N_2$ connection, proceed as follows:

- connect the O_2/N_2 supply line to the sterile upper filter [2],
- connect the CO_2 supply line to the lower sterile filter [3].

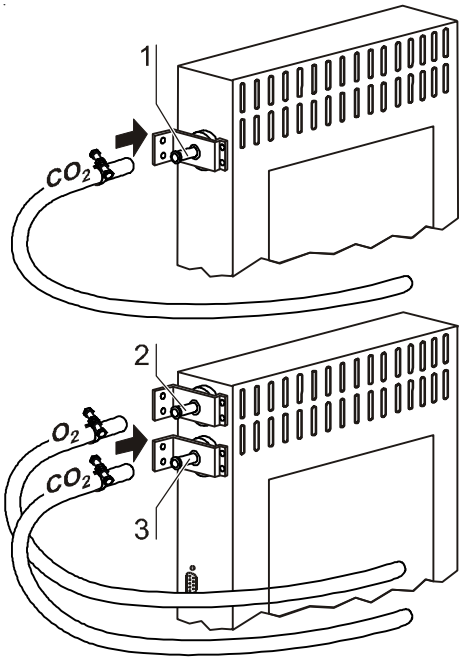


Fig. 17
CO_2 connection, combined $CO_2/O_2/N_2$ connection

5. Start-up

5.3.3 Connecting devices with gas guard

Fig. 18: Devices equipped with the optional gas guard have the following gas connections:
[1] Distributor connection for additional CO_2 incubator
[2] Primary connection for process gas
[3] Secondary connection for process gas
[4] Gas guard output
[5] Connecting hose
[6] Sterile filter (gas supply to device work space)

CO_2 connection with gas guard:
Fig. 19: For a device that is operated with process gas CO_2 and equipped with the optional gas guard, connect the gas supply lines as follows:

- The distributor connection [1] is capped.
- Connect the primary gas supply line [7] to the upper connection [2] of the gas guard,
- connect the secondary gas supply line [8] to the lower connection [3] of the gas guard.
- Upon delivery of the device, a short gas pressure hose [5] connects the output of the gas guard [4] to the sterile filter [6].

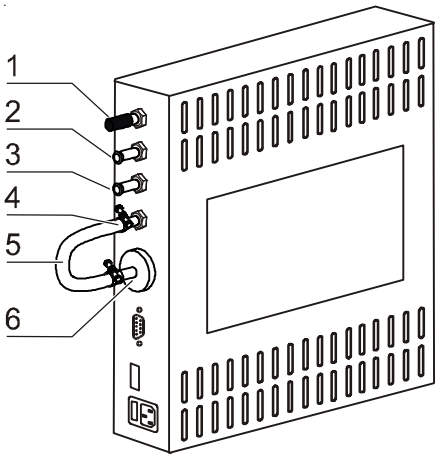


Fig. 18
Switchbox with gas guard

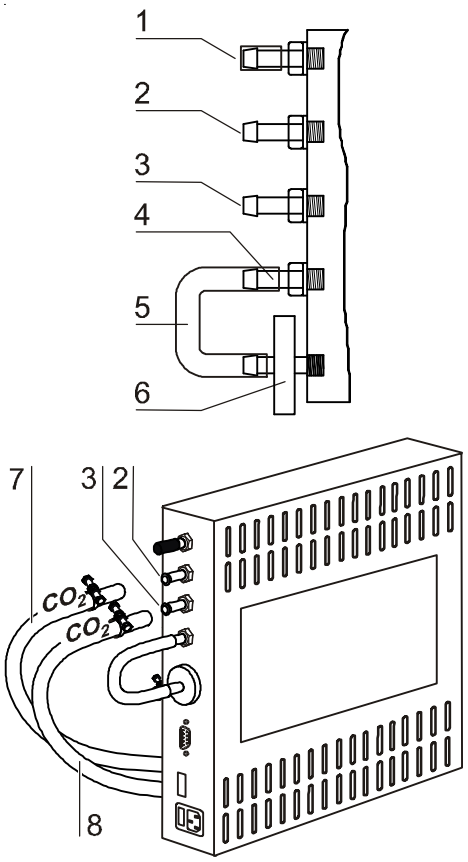


Fig. 19
CO_2 connection with gas guard

5. Start-up

Combined CO_2 and O_2/N_2 connection with gas guard:
Fig. 20: For a combined $CO_2/O_2/N_2$ connection, the gas connections are installed separately on both sides of the switchbox:
- the CO_2 supply connection is located on the left side,
- the O_2/N_2 supply connection is located on the right side.

CO_2 supply
- The distributor connection [1] is capped.
- The primary gas supply line [7] is connected to the **upper** connection [2] of the gas guard,
- the secondary gas supply line [8] is connected to the **lower** connection [3] of the gas guard.
- Upon delivery of the device, a short gas pressure hose [5] connects the output of the gas guard [4] to the sterile filter [6].

O_2/N_2 supply
- The distributor connection [11] is capped.
- The primary gas supply line [9] is connected to the **lower** connection [12] of the gas guard,
- the secondary gas supply line [10] is connected to the **upper** connection [13] of the gas guard.
- Upon delivery of the device, a short gas pressure hose [15] connects the output of the gas guard [14] to the sterile filter [16]

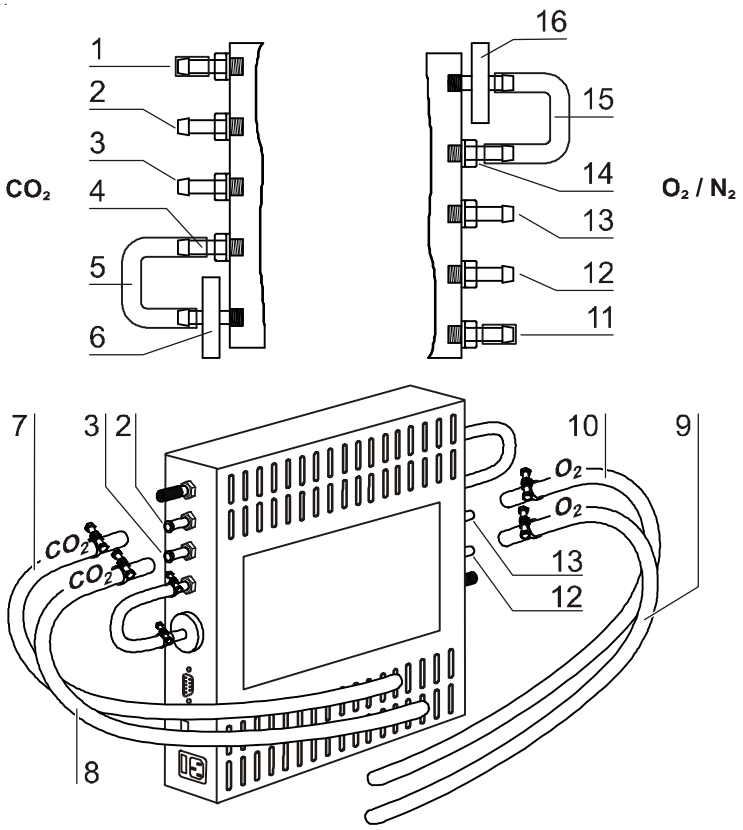


Fig. 20
Combined CO_2-/O_2-/N_2-connection gas guard

5. Start-up

5.4 Power supply connection

WARNING – Electric shock!

Contact with current-carrying components may cause a lethal electric shock.
Before connecting the device to the power supply, check plug and connection line for damage.
Do not use damaged components when connecting the device to the power supply!

The device must be connected only to a correctly installed and grounded power supply source:

- Fusing T 16 A
- Circuit breaker G 16

Connection to the power supply system:

1. Before connecting the device to the power supply, check to see if the voltage of the power supply corresponds with the specifications on the nameplate at the front of the device. If the ratings given for voltage (V) and current (A) are not correct, the device must not be connected to the power supply.
2. **Fig. 21:** Connect the connector for non-heating appliances [2] to the socket [1] at the control box of the device.
3. Connect the grounding plug [3] of the power supply cable to a correctly grounded and fused socket.
4. Make sure the power supply cable is not subjected to tensile or compressive force.

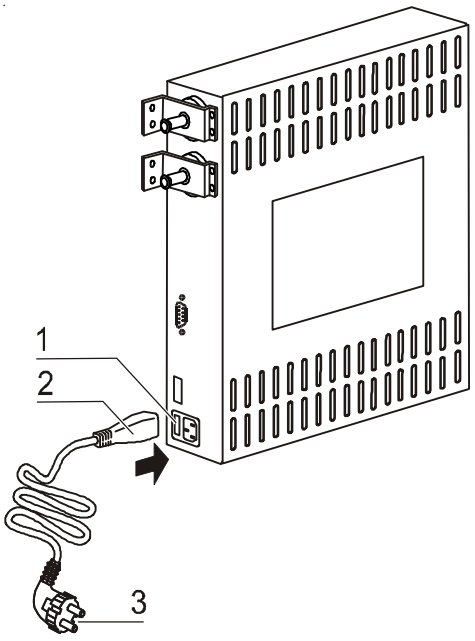


Fig. 21
Power supply connection

5. Start-up

5.5 RS 232 interface connection

The RS 232 interface has been designed for a cable connection with 9-pin connectors and a contact assignment of 1:1.

Connection of the device:
1. Turn PC off.
2. **Fig. 22:** Connect the connector [2] of the serial interface cable [3] (not comprised in the scope of delivery) to the socket [1] at the supply interface at the rear of the device.
3. Connect the remaining other connector [4] to an unassigned slot COM 1/COM 2 etc. at the PC.
4. Turn PC on.

Transfer protocol:
The interface must be configured as follows:
9600 baud, 8 data bits, 1 stop bit, no parity.

Command sequences:
Data communication is achieved with a defined structure of command sequences (frames).

Frame structure:
<STX | command | data | BCC | ETX>

Command:
Bit 0 - 3 = data field length in byte
Bit 4 - 7 = command

Check sum:
BCC = 1 - complement
(command XOR data XOR ... XOR dataN
XOR FF_H)

Command list - Reading control loop data
Command:
0110 0001 (61_H)
Data:
0001 0000 (10_H) for temperature during incubation operation
0001 0001 (11_H) for CO_2
0001 0011 (13_H) for O_2
0001 0010 (12_H) for temperature during decontamination

Device response for temperature, CO_2, O_2, and decontamination
Data:

Nominal value x 10	(2 bytes, integer)
Nominal value	(4 bytes, floating point number)
Internal use	(5 bytes for CO_2 and O_2, otherwise 7 Bytes)

(see example next side)

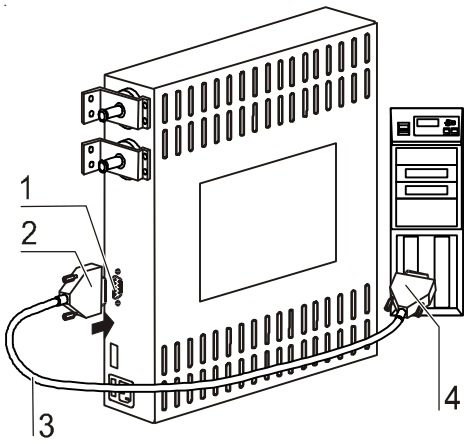


Fig. 22
RS 232 interface

5. Start-up

Command list - Requesting failure codes
Command:
1001 0000 (90_H)

Data:
none

Response - Reading failure codes
The microprocessor returns a total of 10 bytes (5 integer values). Each integer value represents a current failure code in the assigned control loop (incubation temperature, CO_2 content, decontamination temperature, general, O_2 content).
The failure code "General failure" belongs to a superior failure that is shown simultaneously in all displays (e.g. failure code 99).
The failure codes for incubation temperature and decontamination temperature are shown in the temperature display, the codes for CO_2 are shown in the CO_2 display, the codes for O_2 are shown in the O_2 display. Value "---" shows that there is no current failure.

Faulty response from control unit:
If a returned response is incomplete or faulty, the CPU responds with an NAK (15_H, only 1 byte, without frame). Otherwise, the command code (with pertaining length information) is regarded as a response and the data that may be required is transmitted.

Particularities during data communication:
For the data communication between PC and microcontroller, the following particularities must be observed:
The microprocessor stores an **int or unsigned int** value with the sequence <Highbyte>, <Lowbyte> in the memory. For the PC, this sequence is reversed. The microcontroller transmits these values in its format, i.e. the PC must reverse the sequence of the bytes. For floats, there is no difference.

Example: Temperature data request and response

Request
$O2_H$ 61_H 10_H $8E_H$ 03_H

Response:
$O2_H$ $6D_H$ $\underline{01}_H$ $\underline{72}_H$ 38_H 91_H $C7_H$ 41_H $\underline{F5}_H$ $\underline{6B}_H$ $\underline{F4}_H$ $\underline{43}_H$ $\underline{9E}_H$ $\underline{00}_H$ $\underline{32}_H$ $4B_H$ 03_H
integer *float* *intern*
(37.0) (24.946)

5. Start-up

5.6 Connecting the alarm contact

NOTE – Expert work

Kendro Laboratory Products warrants the operational safety and the operativeness of the device only if installation and repairs are performed properly.
The connection of the device to an external alarm system must only be carried out by adequately trained and authorized expert electrical/telecommunication personnel!

Function:
When failures occur in the temperature or gas control circuits, an alarm message is issued to the connected alarm/monitoring system. The potential-free contacts (1 changeover contact) have been laid out for the following circuits:

Circuit	Voltage	External fusing
Circuits with system voltage	max. 250 V ~	max. 6 A
SELV circuits (cf. VDE 0100, Part 410)	25 V ~	max. 2 A
	60 V =	max. 1 A
SELV-E circuits (cf. VDE 0100, Part 410)	50 V ~	max. 1 A
	120 V =	max. 0.5 A

HERAcell® alarm relay

Operating state	Contact 4 - 1	Contact 4 - 3
No failure, power off	X	O
No failure, power on	O	X
Failure	X	O
X: Contact closed / O: Contact open		

NOTE – Switching structure

For all failures reported by the device (sensor circuit open, deviation from the nominal value and door open for more than 10 minutes), the alarm relay drops.

5. Start-up

Connection example:
Fig. 23: The connector [5] for the connecting cable is comprised in the scope of delivery. The values for the operating voltage of the external circuits and of the fusing of the alarm system are given in the table below.

1. Connect the individual conductors [1] to [4] of the connecting cable as shown in the wiring diagram.
2. Connect the connector [5] of the alarm system connecting cable to the interface [6] at the control box at the rear panel of the device.

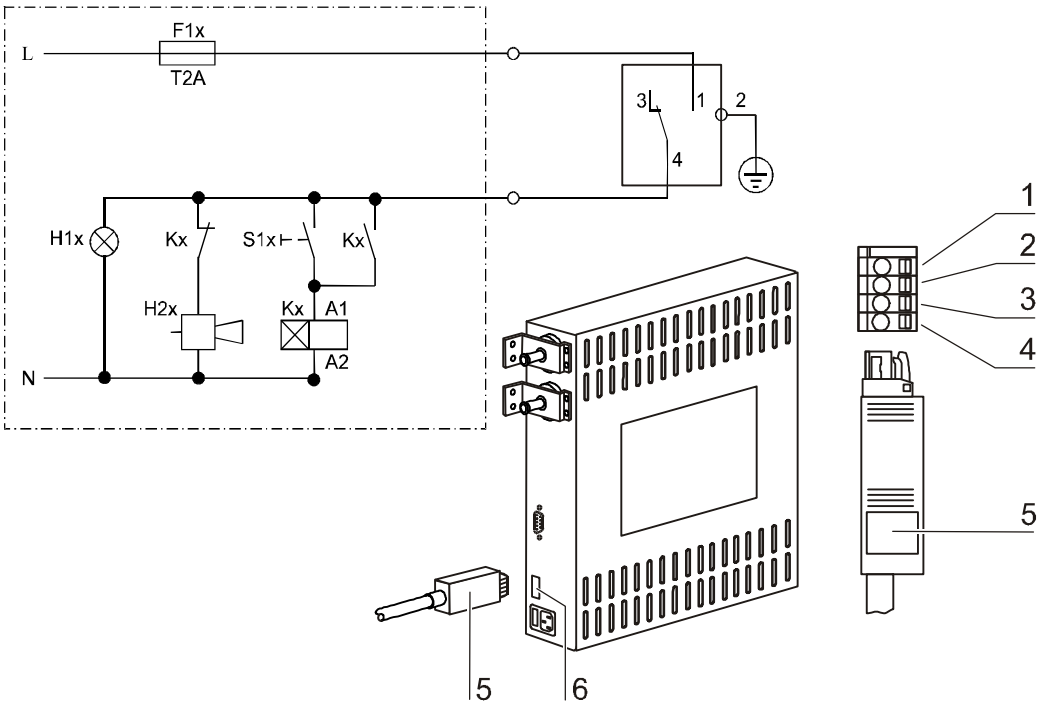


Fig. 23
Example of a connection scheme for an external alarm system (changeover contact: device off, no failure)

6. Handling and control

6.1 Power switch

Fig. 24: Depending on which side the door hinges are installed, the power switch [1] is integral to the front cover [2] of one of the front device stands.

- To turn the device on:
  Press the power switch [1]; the switch illumination comes on.
- To turn the device off:
  Press the power switch; the switch illumination goes off.

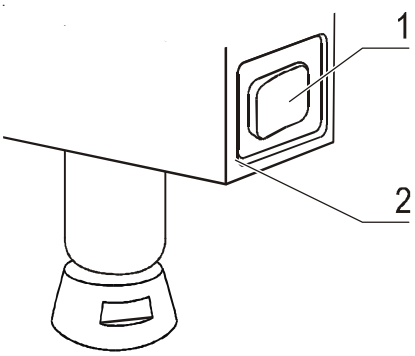


Fig. 24
Power switch

6.2 Operating panel

Fig. 25: The operating panel is divided into three functional areas:

- 3 displays that show numeric values for temperature, O_2 content, CO_2 content (fully equipped).
- 9 keys for selecting functions and for entering data (fully equipped).
- 9 LEDs that show functions or operating states.

For devices without O_2 supply, the key for setting the O_2 nominal value and the O_2 display are not installed on the operating panel.

[1] Temperature display
[2] Heating LED
[3] Key for setting temperature nominal value
[4] Key for setting O_2 nominal value
[5] Key for increasing value
[6] Key for reading failure codes/stopping acoustic alarm
[7] Key for activating auto-start
[8] LED for indicating active auto-start
[9] LED for indicating door (open door)
[10] LED for indicating active ContraCon decontamination routine
[11] LED for indicating active low humidity
[12] LED for indicating low water level
[13] LED for indicating active overtemperature protection
[14] Key for starting ContraCon decontamination routine
[15] Key for starting cal function
[16] Key for reducing value
[17] Key for setting CO_2 nominal value
[18] CO_2 display
[19] LED for indicating active CO_2 gas supply
[20] O_2 display
[21] LED for indicating active O_2 gas supply

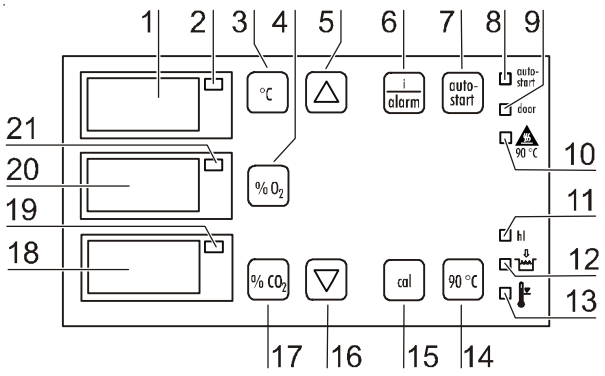


Fig. 25
Operating panel functions

6. Handling and control

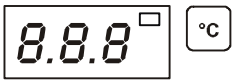
6.3 Control self-test

After the device has been turned on, the control goes through a test routine.

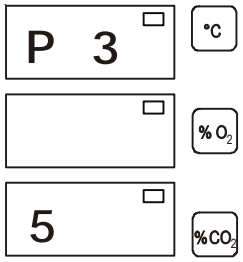
1. Turn the device on

▶ Press power switch.

○ All indicators on the operating panel come on, all displays show the numeric value 8 to indicate that the test routine is being run.

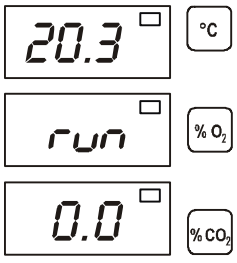


○ The temperature display shows a three-digit number for the corresponding assembly/parameter set:
P 1: Operating and display board
P 2: Measuring cell
P 3: Main board
P n: Parameter number
The CO_2 display shows the software version/device version.



2. Test routine completed

○ The temperature display shows the current temperature value, the CO_2 display shows the current CO_2 value. For devices with IR measuring cell, the CO_2 display shows "IR" during the heating-up period of approx 5 minutes. The O_2 display shows "run" to indicate the preheating cycle for the measuring process. After approx 5 minutes, the measured actual O_2 value is displayed.



6. Handling and control

NOTE – Factory presettings

Upon delivery of the device, the following nominal values have been set:
- **Temperature: 37° C**
- **CO_2 content: 0.0 %**
- **O_2 content: 21.0 % (optional)**

As the O_2 concentration of the air is 21 %, the control is deactivated for an O_2 nominal value setting of 21 %.

6.4 Setting the nominal temperature value

1. Display the nominal value:

▶ Press the [°C] key.

○ The temperature display shows the current **nominal value**.

2. Enter the nominal value:
The nominal value can be increased or reduced in increments; if you keep the key depressed, the UP/DOWN function switches to a rapid increase/reduction; after approx 3 seconds, another increase/reduction occurs.

To increase the nominal value:

▶ Press the [°C] + [△] keys.

To reduce the nominal value:

▶ Press the [°C] + [▽] keys.

3. Accept and store the nominal value:

▶ Release both keys.

○ The temperature display shows the **current actual value** measured in the work space.

6.5 Setting the O_2 nominal value

1. Display the nominal value:

▶ Press the [O_2] key.

○ The O_2 display shows the current **nominal value**.

6. Handling and control

2. Enter the nominal value:
Depending on the requirements for the working process, two different O_2 control ranges are preprogrammed at the factory.
Control range I: 1 % - 21 %
Control range II: 5 % - 90 %

NOTE – Using of process gases

For nominal values below 21 % O_2, the device must be connected to a nitrogen supply system. For nominal values above 21 % O_2, the device must be connected to an oxygen supply system.

The nominal value can be increased or reduced in increments; if you keep the key depressed, the UP/DOWN function switches to a rapid increase/reduction; after approx 3 seconds, another increase/reduction occurs.

To increase the nominal value:

▶ Press the [O_2] + [△] keys.

To reduce the nominal value:

▶ Press the [O_2] + [▽] keys.

3. Accept and store the nominal value:

▶ Release both keys.

○ The O_2 display shows the current **actual value** measured in the work space.

6.6 Disabling the O_2 control

If required by the application, the O_2 control can be disabled.

1. Set nominal value to the following minimal oxygen concentration:
- Control range I: < 1 % or > 21 %
- Control range II: < 5 % or > 90 %

▶ Press the [O_2] + [▽] keys or the [O_2] + [△] keys.

2. Disable the control:

▶ Press the [O_2] + [▽] keys or the [O_2] + [△] keys

The display shows that the control has been disabled.

6. Handling and control

3. Accept and store the new control state:

▶ Release both keys.

○ The „off“ message in the O_2 display disappears. The oxygen supply system is now disabled.

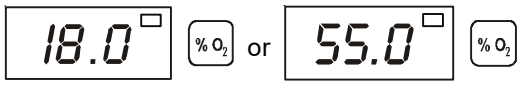
6.7 Enabling the O_2 control

The O_2 control can be reenabled at any time during the operation.

1. Enable the control function:

▶ Press the [O_2] + [△] keys or the [O_2] + [▽] keys.

○ Set the oxygen concentration on a value according to the control range:
Control range I: 1 % - 21 %
Control range II: 5 % - 90 %



2. Accept and store the new control state:

▶ Release both keys.

6. Handling and control

6.8 Setting the CO_2 nominal value

1. Indicate the nominal value:

▶ Press the [%CO2] key.

○ The CO_2 display shows the current **nominal value**.

2. Enter the nominal value:

The nominal value can be increased or reduced in increments; if you keep the key depressed, the UP/DOWN function switches to a rapid increase/reduction; after approx 3 seconds, another increase/reduction occurs.

▶ Press the [%CO2] + [△] keys.

To reduce the nominal value:

▶ Press the [%CO2] + [▽] keys.

3. Accept and store the nominal value:

▶ Release both keys.

○ The CO_2 display shows the current **nominal value** measured in the work space.

6.9 Setting the high/low humidity

If condensate forms at the culture containers due to high relative humidity, the humidity in the work space can be reduced to a lower value.

NOTE – Humidity presetting

The factory setting for the program control of the device is "high humidity".
- **Use setting 0 (high) for a relative humidity of approx 95 % in the work space,**
- **use detting l (low) for a relative humidity of approx 90 %.**

It takes some time for the change of relative humidity in the work space to be effected. Therefore, the setting "low humidity" should be used permanently to prevent condensate formation on containers.

6. Handling and control

1. Activate the configuration mode:

▶ Keep the [cal] key depressed for 5 seconds, then release key.

○ All indicators on the operating panel flash.

2. Display the mode:

▶ Press the [auto-start] key.

○ The temperature display shows the current mode (high humidity).

3. Change the mode:

Use the following key combinations to switch between the two modes:

▶ Press the [auto-start] + [△] keys.

or

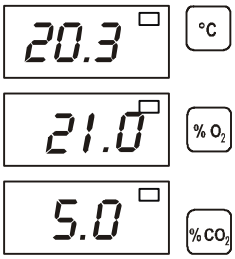
▶ Press the [auto-start] + [▽] keys.

○ The temperature display shows the new mode (low humidity).

4. Accept and store the desired mode:

▶ Press the [cal] key.

○ The temperature, O_2, and CO_2 displays show the actual values.



○ The new mode is accepted. The mode “low humidity” is indicated by the yellow LED “Low Humidity Active”.

6. Handling and control

6.10 Activating the auto-start routine

The auto-start function is an automated routine for the start and the subsequent adjustment of the CO_2 measuring system. After the start, the device control adjusts the temperature to the set nominal value while humidity is generated. When temperature and relative humidity have reached constant values, the CO_2 measuring system is automatically adjusted to these values, and the work space is supplied with the preset quantity of CO_2.

NOTE – Application of the routine

To ensure that the specified accuracy of the CO_2 measuring system is maintained, the device should always be started using the auto-start routine after the nominal temperature setting has been changed by more than 1° C or after extended interruptions of the operation of the device. The auto-start routine should be run at least every three months on the occasion of cleaning and maintenance works.

Running the routine usually takes 5 to 7 hours. At low room temperatures and when the device is cold, it may take up to 10 hours until the auto-start routine has been completed. If the glass door is opened or if the power supply of the device is interrupted while the routine is running, the routine is interrupted and rerun after the glass door has been closed and after the power supply has been reestablished.

At the start of the auto-start routine, the work space atmosphere must consist only of ambient air. The floorpan must be filled with a sufficient quantity of water!

1. Open both doors until the acoustic alarm sounds after 30 seconds:

- ○ All current **actual values** flash at the displays, the ”door” LED illuminates, after 30 seconds the acoustic alarm sounds.

2. Enter nominal values:

- ▶ See sections 6.4 / 6.8.

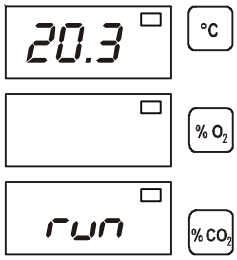
3. Activate the auto-start routine:

- ▶ Keep the [auto-start] key depressed for 5 seconds.
- ○ The ”auto-start” LED flashes.

6. Handling and control

4. Close all device doors:

- The temperature display shows the actual value, the CO_2 display shows ”run”, the ”door” LED goes off.



5. Cancel the auto-start routine:

- ▶ Keep the [auto-start] depressed for 5 seconds.
- The displays returns to normal operation (incubation operation).

NOTE – Cancelling the routine!

The auto-start routine can be cancelled any time.

NOTE – Failure code

The cancelling of the routine is indicated by a corresponding failure code. For a list and for a description of the codes, please refer to Section 6.12, "Failure code list".

6. Handling and control

6.11 Reading failure codes

The device is equipped with a failure diagnostic system. This system recognizes failures during the operation and allows the allocation of failure causes due to numeric codes. Failure recognition is displayed by an acoustic and a visual alarm at the operating panel. The diagnostic system stores the last 10 failures in the sequence of their occurence. The failure table can be requested and read. If the cause of a failure cannot be repaired, please have the fault code and the serial number of the device available when contacting Technical Service.

NOTE – Response delay

To prevent short-time changes of the operating conditions from resulting in repeated failure messages during the operation of the incubator, the diagnostic system has a response delay:

- **After changes to nominal values: max. 152 min**
- **After the glass door has been opened: max. 45 min**
- **Other failure causes: max. 1 min**

NOTE – Delay time reset

If the set nominal value is reached during the specified period, the delay time is reset to 1 min.

NOTE – Failure cause

When the temperature nominal value and/or the CO_2 nominal value is reduced, a failure message (code 101/201) may be set due to the inertia of the atmosphere within the work space. Therefore, the device doors should be opened for some time if the nominal values are reduced.

6. Handling and control

1. The audible alarm sounds.

2. Silence the audible alarm:

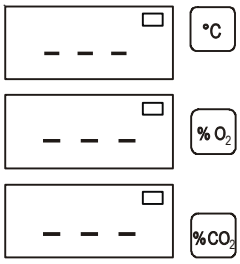
▶ Press any key.

○ The audible alarm is silenced.

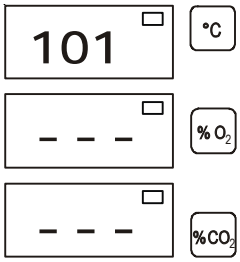
3. Read failure codes:

▶ Keep the [i alarm] key depressed.

○ If no failure is detected, each display shows three hyphens.



○ If the system detects a failure, the display that is assigned to the corresponding control circuit shows a failure code. Example: If the temperature display shows failure code 101, a failure in the temperature control circuit was detected.



NOTE – Failure codes

For a list and a description of the failure codes, please refer to Section 6.12, "Failure code list".

NOTE – Water level failure code

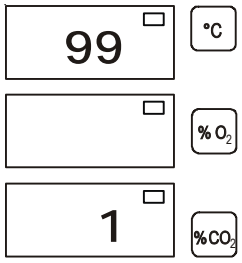
When the water level is low, the water level LED illuminates in addition to the failure code.

6. Handling and control

5. Scroll through the failure code table:

To read stored failure codes from the failure code table:

- ▶ Keep the [i alarm] key depressed.
- ▶ To scroll, keep the [▽] or [△] key depressed.
- ○ The temperature display shows the 10 failure codes that had been registered last. The CO_2 display shows the ranking of the individual failure codes within the table.



6. Exit the failure code table:

- ▶ Release the [i alarm] key.
- ○ The temperature, O_2, and CO_2 displays show the current actual values.

7. Erase the failure code table:

- ▶ Keep the [i alarm] + [cal] depressed for 5 seconds.
- ○ The temperature and CO_2 displays flash to indicate that the failure table has been erased.

6. Handling and control

6.12 Failure code list

Code	Description	Cause	Repair
???	No values displayed	Communication between display and CPU- main board faulty	Contact Service
42	NV RAM read failure	NV RAM faulty, default values loaded	Contact Service
43	NV RAM read failure	NV RAM faulty, mirrored values loaded	Contact Service
44	NV RAM faulty	CO_2 measuring cell values not overwritten, device works with default values	Contact Service
54	Manipulated variable failure	Calculation error, device performed RESET	Contact Service
55	I^2C bus failure	Data transfer faulty, measured value quality dropped below 50 %	Eliminate source of interference, e.g. cellular phone
66	Deviation of temperature sensors from one another	Temperature signal plausibility doubtful	Contact Service
77	CO_2 cal range exceeded	Max. adjustment value exceeded	Contact Service
88	Failure upon auto-start	Total time elapsed or max. adjustment value exceeded	Repeat auto-start
99	Device doors open	Doors open for more than 10 minutes, door switch	Close device doors, test door switch for correct function
100	Temperature below nominal value	Actual value < nominal value –1° C	Contact Service
101	Temperature above nominal value	Actual value > nominal value +1° C	Do not exceed ambient temperature limit
104	Temperature sensor faulty	Sensor circuit open/shorted	Contact Service
200	CO_2 below nominal value	Act. val. < nom. val. –1 % • No CO_2 • Prepressure low • Supply line blocked	Check gas supply: • Connect new gas cylinder • Raise prepressure to 1 bar • Check supply line to device
201	CO_2 above nominal value	Act. val. > nom. val. +1 % • Prepressure high	Check gas supply: • Reduce prepressure to 1 bar
204	CO_2 measuring cell faulty	Sensor circuit open/shorted	Contact Service
206	No CO_2 supply	Both CO_2 cylinders empty	Replace one or both CO_2 cylinders
207	CO_2 gas monitor failure	CO_2 gas monitor faulty or not connected	Check connection of CO_2 gas monitor at gas cylinders, contact Service as required

6. Handling and control

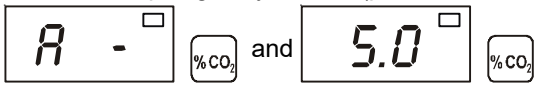
Code	Description	Cause	Repair
300	O_2 below nominal value	Act. val. < nom. val. –1 % • No O_2 • Prepressure low • Supply line blocked	Check gas supply: • Connect new gas cylinder • Raise prepressure to 1 bar max. • Check supply line to device
301	O_2 above nominal value	Act. Val. > nom. Val. +1 % • Prepressure high	Check gas supply: • Reduce prepressure to 1 bar
304	O_2 sensor faulty	Sensor circuit open/shorted	Contact Service
306	No O_2 supply	Both O_2 cylinders empty	Replace one or both O_2 cylinders
307	O_2 gas monitor failure	O_2 gas monitor faulty or not connected	Check connection of O_2 gas monitor at cylinders, contact Service as required
400	Water level low	Water level ³ 1 min below lower limit	Check water level and refill water as required
500	Temperature ContraCon routine below nom. val.	Actual value < 85 °C	Repeat decontamination routine; contact Service, as required
501	Temperature ContraCon routine above nom. val.	Actual value > 95 °C	Contact Service
502	Failure in ContraCon routine	Power failure during heating or holding phase	Silence alarm by pressing key "90 °C“ (2 times 5 sec), then restart routine

6.13 Gas guard failure display

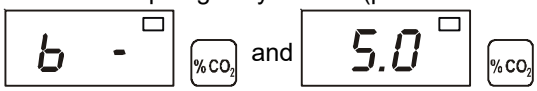
When the pressure in one of the two gas cylinders drops below the limit value of 0.6 bar for more than two minutes, the gas guard switches the gas supply over to the other cylinder (filling pressure > 0.6 bar).
The response time of two minutes prevents the gas minitor from switching over upon momentary pressure fluctuations (e.g. when opening device doors).
The failure appears alternatingly as „actual value“ and „error message“ (see below) on the display of the detected process gas.
If the filling pressure is below the limit value in both cylinders, the audible alarm is triggered, the potential-free contact is activated, and a visual alarm (flashing failure code) appears on the display of the detected process gas.

Error messages (Example: CO_2 supply):

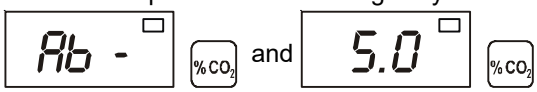
Pressure drop in gas cylinder A (pressure < 0.6 bar)



Pressure drop in gas cylinder B (pressure < 0.6 bar)



Pressure drop in both monitored gas cylinders A and B (pressure < 0.6 bar)



6. Handling and control

6.14 Resetting the thermal protection

1. The "Thermal Protection Active " LED illuminates.
2. Turn the device off:

▶ Press the power switch.

○ All indicators go off.

3. Turn the device back on:

▶ Press the power switch.

NOTE – Thermal protection

When the cause of the failure (e.g. excessive temperature in the operating room) has been repaired, the device is set to normal incubation operation after it has been turned on again. If the cause of the failure cannot be repaired with simple measures (e.g. by ventilating the room or by reducing the temperature in the operating room), the thermal protection will respond again immediately; in this case, contact Technical Service.

7. Operation

7.1 Preparing the device

The device must only be released for operation after all major measures for the start-up have been taken (Section 5.1–5.6).

Prior to starting operation, the following device components must be checked for their correct function:

- Gas hoses must be seated tight on the connecting filter and must be secured using a hose clamp.
- The access port must be capped.
- The pressure compensation opening must be permeable, its insert must be installed in the work space.
- The glass door seal must not be damaged.
- The glass door measurement opening must be capped.
- The shelf system components must be installed safely.
- The optional gas humidification must be connected to the device-integral gas supply and aligned parallel to the rear panel.

NOTE – Hygiene regulations

Prior to any operation, the user must clean and disinfect the work space in accordance with the hygiene regulations set forth by the operator to protect the cultures.
The ”Principles of good microbiological proceedings” at the end of these instructions are to be used as safety information for personnel operating the device.

NOTE – Water supply

The water tray of the work space can hold up to 3.0 l of processed water. For the running operation, always keep a sufficient quantity of processed water of the following quality available:

- **distilled,**

or

- **demineralized and destilled/autoclaved,**

or

- **deionized and destilled/autoclaved.**

When the water level falls below the lower limit, refill water.

7. Operation

7.2 Starting operation

Starting and loading the device:

1. Fill the water tray with up to max. 3.0 l of processed water. Do not exceed the upper level mark.
2. Make sure that the $CO_2/N_2/O_2$ supply system valves are open.
3. Turn the device on using the power switch.
4. Set nominal values for temperature and CO_2/ O_2 content at the operating panel.
5. Ventilate work space by leaving both device doors open until acoustic alarm sounds.
6. Start device using auto-start routine.
7. Close device doors.
8. The temperature control adjusts the temperature to the set nominal value, humidity rises.
9. When temperature and relative humidity are constant, the automatic adjustment of the CO_2/O_2 measuring system is performed.
10. The ”auto-start” indicator goes off.
11. The CO_2/O_2 control supplies the set amount of CO_2/O_2.
12. The device is ready for operation.
13. Load work space with cultures.

NOTE – Duration of the auto-start routine

When the device is cold and when the ambient temperature is low, the auto-start routine may take up to 10 hours.

NOTE – Charge

To ensure sufficient air circulation and even heating of the samples, the charge surface within the work space should be used up to 70 % max. Voluminous objects in the work space that dissipate heat may impair heat distribution.

8. Shut-down

8.1 Shutting the device down

CAUTION! – Contamination hazard!

If the work space surfaces are contaminated, germs my be transferred to the environment of the device.
In case of a shut-down, the device must be decontaminated!

1. Remove culture containers and all accessories from the work space.
2. Pump water off (see Section 9.2).
3. Fill in 350 ml of fresh processed water and start the ContraCon decontamination routine.

After the ContraCon decontamination routine has been run, disconnect the device from the power and gas supply:

4. Wipe device dry.
5. Turn device off using the power switch.
6. Unplug power connector and protect it against accidental reconnection.
7. Close the CO_2/ O_2 /N_2 supply system shut-off valves.
8. Disconnect gas pressure hoses from sleeve at the rear of the device.
9. Until the device is shut down, the work space must be continuously ventilated: Leave the glass door and the outer door open and secure them in this state.

9. Cleaning and disinfection

9.1 Decontamimation procedures

The operator must prepare hygiene regulations for the decontamination of the device in accordance with the application of the device.

ContraCon decontamination routine: is used to decontaminate the entire work space including all installed components and sensors in an automated program run. During this routine, a wet/hot atmosphere at a temperature of 90° C is created for a period of 9 hours.

Wipe/spray disinfection: is used as the standardized manual disinfection procedure for the device and for all accessories.

9.2 Wipe/Spray disinfection

The wipe/spray disinfection is carried out in three stages:
- Predisinfection,
- cleaning,
- final disinfection.

Recommended cleaning and disinfection agents:

CAUTION – Incompatible cleaning agents!

Some device components are made of plastic. Solvents may dissolve plastics. Powerful acids or lyes may cause embrittlement of the plastics.
For cleaning the plastic components and surfaces, do not use hydrocarbon-containing solvents, detergents with an alcohol content of more than 10 % or powerful acids and lyes!

CAUTION – Chloride-containing disinfectants!

Chloride-containing disinfectants may corrode stainless steel.
Use only disinfectants that do not affect stainless steel!

9. Cleaning and disinfection

CAUTION – Alcoholic disinfectants!

Disinfectants with an alcohol content of more than 10 % may form, in combination with air, easily combustible and explosive gas mixtures.
When using such disinfectants, avoid open flames or exposure to excessive heat during the entire disinfection process!

- **Use such disinfectants only in adequately ventilated rooms.**
- **After the disinfectant has been allowed to react, wipe the cleaned device components thoroughly dry.**
- **Observe safety regulations to avoid fire and/ or explosion hazard caused by alcohol-containing disinfectants (ZH 1/598).**

Kendro Laboratory Products recommend the disinfectant Barrycidal 36.
When applied properly, Barrycidal 36 is a highly effective broad-range disinfectant. The effectiveness of the product is the result of its ammonium compounds. The broad-range disinfectant is effective against viruses, bacteriae, yeasts, funguses and AIDS causatives (HIV). Barrycidal 36 is DGHM-listed.
Part no. for Barrycidal 36: 50 052 425 and 50 051 939

Restrictions:
In some European countries and in the U.S.A., Barrycidal 36 has not been approved as a disinfectant. In these areas, some other suited disinfectant that meets the aforementioned safety requirements must be used.
As an alternative for the U.S.A., Kendro Laboratory Products recommends Microcide SQ. Microcide SQ is EPA-listed.
Direct order: www.globalbio.com.

9. Cleaning and disinfection

Preparing the manual wipe/spray disinfection:

WARNING – Electric shock!

Contact with current-carrying components may cause a lethal electric shock.
Prior to cleaning and disinfection work, disconnect the device from the power supply!

- **Turn the device off using the power switch.**
- **Unplug power connector and protect it against accidental reconnection.**
- **Check to see if the device is deenergized.**

CAUTION! – Health hazard!

The surfaces of the work space may be contaminated. Contact with contaminated cleaning liquids may cause infections. Disinfectants may contain harmful substances.

When cleaning and disinfecting, always observe the safety instructions and hygiene regulations!

- **Wear safety gloves.**
- **Wear safety goggles.**
- **Wear mouth and respiratory system protection gear to protect the mucous membranes.**
- **Observe the safety instructions of the manufacturer of the disinfectant and of the hygiene experts.**

Pumping water out of the water tray:
The standard equipment of the device comprises an electrical suction pump for removing the water from the water tray.

1. Attach pump to work space rear panel using the three suction cups with the suction opening of the pump facing downward.
2. Insert pump drain hose into an appropriate reservoir.
3. Connect pump power cable connector to a properly grounded and fused socket.
4. Pump water out of water tray.
5. Disconnect connector from socket and remove pump from rear panel.
6. Wipe remaining water off using a cloth.

9. Cleaning and disinfection

Predisinfection:
1. Remove all samples from the work space and store them at a safe place.
2. Spray disinfectant onto the surfaces of the work space and of the accessories or wipe the surfaces clean using disinfectant.
3. Allow disinfectant to react as speciefied by manufacturer.

NOTE – CO_2 and O_2 sensors

Do not spray disinfectant onto the CO_2 sensor in the baseplate of the measuring cell and onto the O_2 sensor.

Removing accessories and shelf system:
1. Remove gas humidification and shelves, then remove the entire shelf system from the work space.
   For removal and installation of the shelf system, please refer to Section 5.2.
2. If required, remove the blower wheel and its cover from the baseplate of the measuring cell. The wheel and the cover can be autoclaved.

Removing blower wheel and cover:
1. **Fig. 26:** Remove the two retaining screws [3] of the cover using the supplied Allen wrench (3 mm) and remove the cover.
2. The blower wheel [1] is secured to the axle by a set screw [2]. Remove set screw using the Allen wrench (2 mm) and pull blower wheel off.

NOTE – Functional check

After the installation, check to see if the blower wheel is securely attached to the axle and if it can rotate freely, then secure cover using the screws.

Cleaning the work space and accessories:
1. Thoroughly remove dirt residues and deposits using a solution of tepid water and dishwashing agent.
2. Wipe surfaces clean using a clean cloth and plenty of clear water.
3. Remove cleaning liquid from water tray and wipe all surfaces of the work space thoroughly dry.
4. Wipe accessories thoroughly dry.

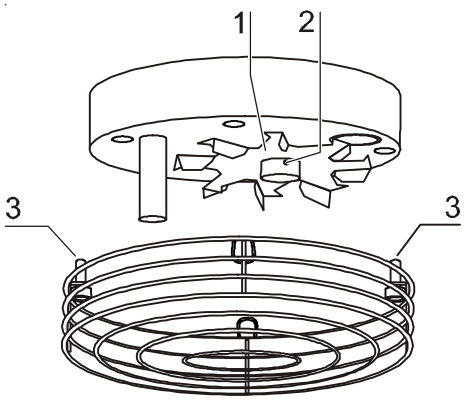


Fig. 26
Blower wheel/cover removal

9. Cleaning and disinfection

Final disinfection:
1 Install shelf system and accessories.
2. Again, spray disinfectant onto the surfaces of the work space and of the accessories or wipe the surfaces clean using disinfectant.
3. Allow disinfectant to react as speciefied by manufacturer.

9.3 ContraCon decontamination routine

CAUTION! – Hot surface!

The surfaces of the work space, particularly the glass door armatures and the interior sheet of the outer door, are heated during the decontamination routine.
During the routine run or immediately after completion of the run, always wear safety gloves when touching these surfaces; observe the warning indicator at the operating panel!

The entire program run of the decontamination routine takes approx 25 hours.
1. After the cleaning, reinstall the shelf system components into the work space.
2. Fill the water tray with 300 ml of processed water.
3. Turn the device on using the power switch.
4. Activate decontamination routine (see table in Section 9.4).
5. After the decontamination routine has been completed, remove the remaining water using a sterile cloth.
6. Turn the device off or restart the device operation using auto-start (see Section 7.2).

NOTE – Duration of the auto-start routine

When the device is cold and when the ambient temperature is low, the auto-start routine may take up to 10 hours.

9. Cleaning and disinfection

ContraCon decontamination routine procedure:
Fig. 27: The routine is divided into four phases. Each individual phase or several phases can be cancelled (i.e. skipped).
If the operating step ”Cancel ContraCon routine” is executed, the routine moves to the next program phase. To cancel the routine completely, the operating step must be executed repeatedly until the remaining run time display shows the value 0.
When the glass door is opened, this operating step cancels the routine completely.
The remaining run time of the ContraCon decontamination routine designates the period between the start or the current routine time state and the cooling down to the preset temperature nominal value (± 2° C).

Heating phase: Remaining run time approx 25 hours
The work space is heated to a temperature of 90° C while an elevated relative humidity is created. The current decontamination temperature is shown at the temperature display.

Decontamination phase: Remaining run time approx 23 hours
After the decontamination atmosphere has been created, the decontamination phase with a run time of 9 hours is started.

If the door is opened during this time, the decontamination routine is restarted automatically as soon as the door has been closed.

Cool-down phase: Remaining run time approx 14 hours
The device cools down until the originally set temperature nominal value is reached.

Postheating phase: Remaining run time approx 3 hours
During the postheating phase, condensate within the device is eliminated as far as possible; remaining condensate accumulates at the bottom of the work space.

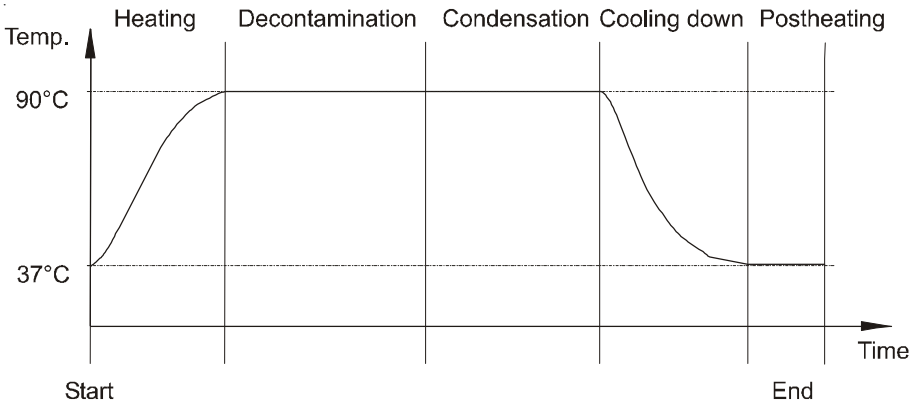


Fig. 27
ContraCon decontamination routine procedure

9. Cleaning and disinfection

End of the decontamination routine: Remaining run time 0 hours
When the remaining run time has elapsed to 0 hours, the device has reached the originally set working temperature again (e.g. 37° C). The ContraCon decontamination routine must then be ended by pressing the appropriate key.

NOTE – Overtemperature

If the maximum temperature of 95° C is exceeded during the ContraCon decontamination routine, the routine is interrupted and the device heating is switched off.

9. Cleaning and disinfection

9.4 Activating the ContraCon decontamination routine

Before running the decontamination routine, fill the water tray with 300 ml of water.

1. Turn the device on:

▶ Press the power switch.

○ All indicators at the control panel illuminate. The software version is shown at the temperature display and at the CO_2 display.

2. Ventilate work space: Open both doors until the acoustic alarm sounds after 30 seconds:

○ The current actual values flash at the displays, the ”door” LED illuminates, the acoustic alarm sounds after 30 seconds.

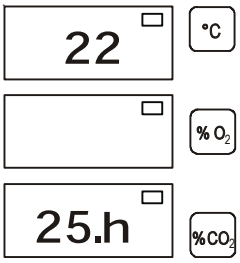
3. Start the ContraCon routine:

▶ Keep the 90 °C key depressed for 5 seconds.

○ The ” ContraCon routine” LED flashes.

4. Close the device doors:

○ The actual value is shown at the temperature display. The remaining run time is shown at the CO_2 display. The ”door” LED goes off.



5. Complete the ContraCon routine:

▶ Keep the 90 °C key depressed for 5 seconds.

○ The display returns to the normal operating state (incubation operation).

9.5 Cancelling the ContraCon decontamination routine

▶ Keep the 90 °C key depressed for 5 seconds.

○ The routine advances to the next phase. To completely cancel the routine, each phase must be skipped individually by pressing the key until a remaining run time of 0 hours is displayed as the routine cannot be completed earlier.

10. Maintenance

10.1 Inspections and checks

To ensure the operativeness and the operational safety of the device, the functions and device components listed below must be checked at different intervals.

Daily check:
- Gas supply of the CO_2 supply system.
- Gas supply of the O_2/N_2 supply system.

Annual inspection:
- Tightness of the glass door seal.
- Permeability of the pressure compensation opening with insert.
- Functional check of the operating panel and of the device control.
- Electrical safety check in accordance with the relevant national regulations (e.g. VBG 4).

NOTE – Functional check

If safety devices were removed or disabled for inspections, the device must not be operated before the safety devices have been reinstalled and checked for their correct function.

10.2 Service intervals

During running operation, the following service works must be performed:

Weekly service:
- Refill the work space water tray with fresh processed water.

3-month service:
- Run auto-start routine.
- Perform temperature and CO_2/O_2 calibration.

Annual service:
- Replace sterile filter.

NOTE – Service contract

Kendro Laboratory Products offer a device-specific service contact that comprises all test and service works required.

10. Maintenance

10.3 Preparing the temperature calibration

To determine the exact measured value of the device-integral temperature sensor, a temperature comparison measurement has to be performed every three months.
If a major temperature deviation is found during this check, a temperature calibration is required.
During this process, the temperature control of the device is set to the value measured during the temperature comparison measurement.
Use a calibrated measuring instrument with an accuracy of ≤ ± 0.1° C for this test. To minimize temporary temperature fluctuations during the measurement, the measuring instrument is placed into the work space in an isothermal container (e.g. a bowl filled with glycerol). The center of the work space is the reference location for the comparison measurement.

NOTE – Isothermal container

Do not use a container filled with water as an isothermal container as the evaporation of water will result in a lower temperature reading.

Comparison measurement procedure:
1. Turn device on using power switch.
2. Set temperature nominal value and allow device to be heated. This may take up to several hours.
3. **Fig. 28:** Place measuring instrument [3] onto the center area of the work space.
   Alternatively, a temperature sensor may be positioned in this location. Route the connecting cable either through the measurement opening [2] in the glass door or through the access port [1] at the rear panel of the device.
4. Close doors.
5. Wait until the temperature value displayed at the measuring instrument has stabilized.
6. Calibrate temperature control as described in Section 10.4.

Measurement example:
- Temperature nominal value: 37° C
- Reference temperature: 36.4° C

NOTE – Excessive work space temperature

Excessive work space temperature after the calibration can be reduced by leaving the doors open for approx 30 seconds.

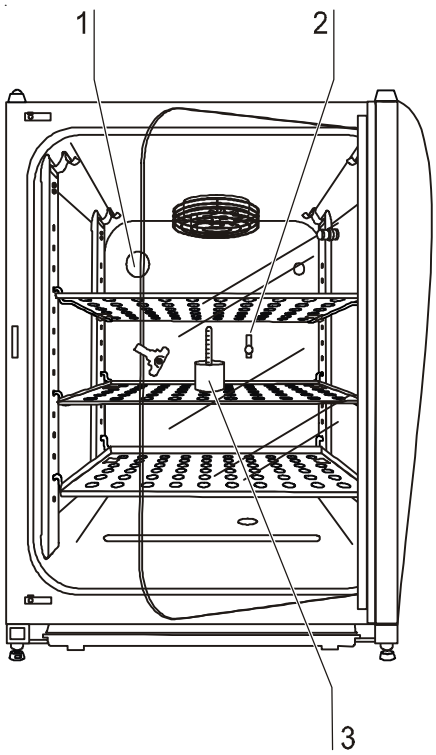


Fig. 28
Temperature calibration

10. Maintenance

10.4 Temperature calibration procedure

1. Activate calibration:

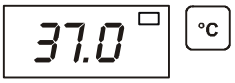
▶ Keep the [cal] key depressed for 5 seconds.

○ All operating panel indicators flash.

2. Display the nominal value:

▶ Press the [°C] key.

○ The preset value of 37° C is displayed.



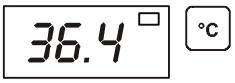
3. Enter the measured value (destination value):

▶ Press the [°C] + [△] keys.

or

▶ Press the [°C] + [▽] keys.

○ Destination value e.g. 36.4° C

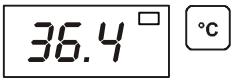


4. Accept the destination value:

▶ Press the [cal] key.

○ The temperature display momentarily shows “CAL”,

○ then the corrected actual value (measured destination value 36.4° C) is displayed.



5. Cancel the calibration process:

▶ Press any key.

○ The temperature display and the CO_2 display show the actual values.

10. Maintenance

10.5 Preparing the CO_2 calibration

To determine the exact measured value of the device-integral CO_2 sensor, a CO_2 comparison measurement has to be performed every three months.
If a major deviation is found during this check, a CO_2 calibration is required.
During this process, the CO_2 control of the device is set to the value measured during the comparison measurement.
Use a calibrated measuring instrument with an accuracy of ≤ ± 0.3 % CO_2 for this test.

Suited instrument:
- Portable IR readout instrument. (Part no. see Section 11, “Spare parts and accessories”)

The measuring sample is withdrawn through the sealable measurement opening of the glass door. The comparison measurement must be performed when the device is completely heated up.

Comparison measurement procedure:
1. Turn device on using power switch.
2. Set CO_2 nominal value and allow device to heat up completely and to create humidity. This process may take several hours.
3. **Fig. 29:** Insert the measuring instrument probe through the measurement opening [1] into the work space. Wait until the CO_2 value displayed by the instrument has stabilized.
4. Remove measuring probe, plug measurement opening and close doors.
5. Calibrate CO_2 control as described in Section 10.6.

Measurement example:
- CO_2 nominal value: 5 %
- Measured value: 5.6 %

NOTE – Excessive CO_2 content

Excessive CO_2 content after the calibration can be reduced by leaving the device doors open for approx 30 seconds.

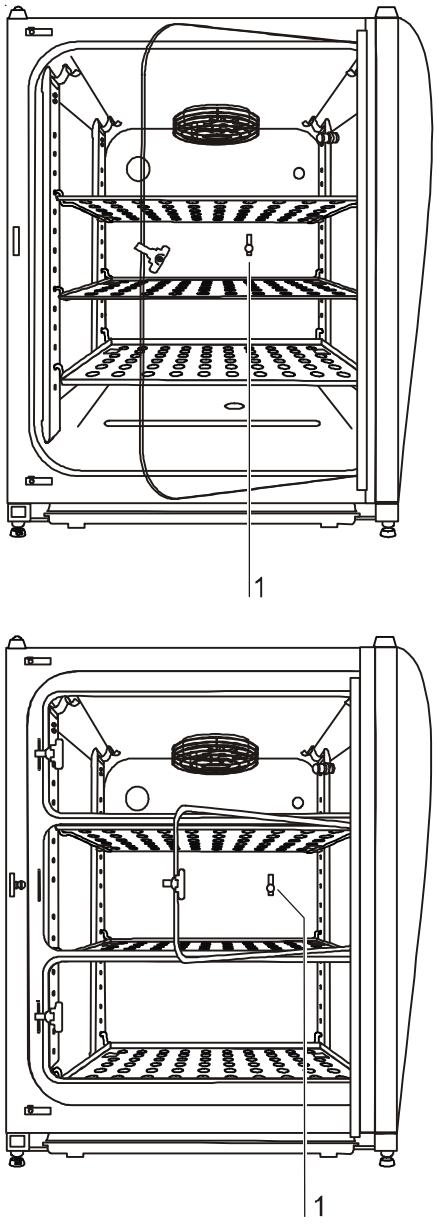


Fig. 29
CO_2 calibration

10. Maintenance

NOTE - IR measuring cell

For devices with infrared (IR) measuring cells, the CO_2 calibration can only be performed when the CO_s concentration has been set to 4.0 % or more. The maximal settable correction is restricted to the range of the CO_2 nominal value +/- 1.0 %. Should deviations of more than 1.0 % occur, the problem must be repaired by the Technical Service only.

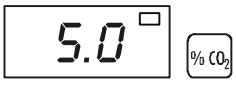
10.6 CO_2 calibration procedure

1. Activate the calibration:

- ▶ Keep the [cal] key depressed for 5 seconds.
- ○ All operating panel indicators flash.

2. Display the nominal value:

- ▶ Press the [%CO_2] key.
- ○ The set nominal value of 5 % is displayed.

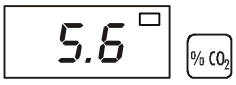


3. Enter the measured value (destination value):

- ▶ Press the [%CO_2] + [△] keys.

or

- ▶ Press the [%CO_2] + [▽] keys.
- ○ Destination value e.g. 5.6 %.

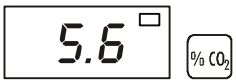


4. Accept the destination value:

- ▶ Press the [cal] key.
- ○ The CO_2 display momentarily shows “CAL”,

10. Maintenance

○ then the corrected actual value (measured destination value 5.6 %) is displayed.



5. Cancel the calibration process:

▶ Press any key.

○ The temperature display and the CO_2 display show the actual values.

10.7 Replacing the sterile filters

The sterile filters (CO_2/O_2/N_2 supply and auto-zero air inlet) have plastic threads and are screwed by hand into the threaded hole at the control box.

Procedure for gas supply sterile filter:
1. Make sure that the gas supply is shut off.
2. **Fig. 30:** Loosen hose clamp [4].
3. Remove gas hose [5] from sterile filter sleeve [2].

Procedure for all sterile filters:
4. Remove retainer [1].
5. Unscrew sterile filter [2] from the threaded hole [3].
6. When installing the new sterile filter, make sure that the plastic thread is not canted. Screw filter in carefully all the way to the stop.
7. Install retainer [1].

Procedure for gas supply sterile filter:
8. Connect gas hose to sterile filter sleeve and secure it using hose clamp. Check to see if the gas hose is securely seated on the sleeve.

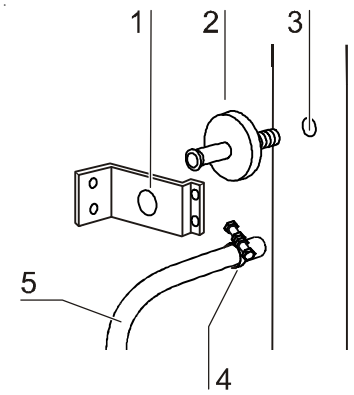


Fig. 30
Sterile filter replacement

10.8 Replacing the device fuses

Fig. 31: The two identical device fuses [4] are installed in the fuse compartment [1] next to the power plug receptacle of the device:

- Time delay fuses, 6.3 A (5x20 mm)

1. The fuse holder is secured to the fuse compartment [1] using two locking tabs [2].
2. To remove the fuse holder, squeeze the two locking tabs and pull holder [3] out of fuse compartment.
3. Remove faulty fuse from holder and install new fuse.
4. Slide fuse holder into fuse compartment and press holder on until locking tabs are fully engaged.

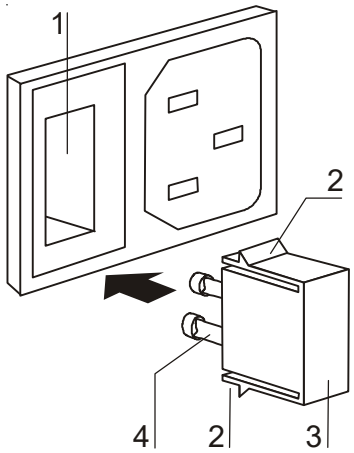


Fig. 31
Device fuse replacement

10. Maintenance

10.9 Replacing the door seal

The door seal (magnetic seal) of the outer door is located in the retaining slot. No tools are required to replace the seal.

1. **Fig. 32:** Pull magnetic seal [3] out of the guide slot [1].
2. Position new seal at a corner [2] and press seal retaining rail [4] into slot.
3. Make sure that the retaining rail taper is positioned correctly in the slot [1] and that the seal is flush with the door frame.

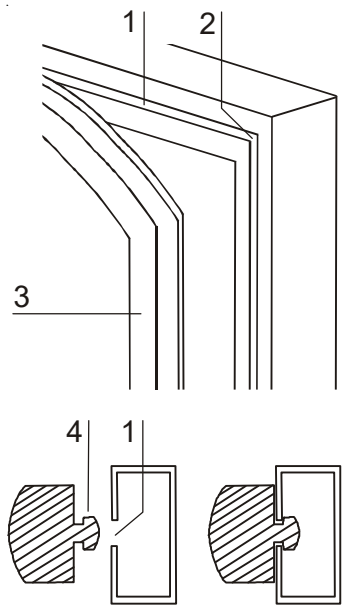


Fig. 32
Door seal replacement

11. Spare parts and accessories

11.1 List of spare parts and accessories

When ordering spare parts, please have the device specifications of the nameplate available.

NOTE – Repairs

Use only original spare parts that have been tested and approved by Kendro Laboratory Products. The use of other spare parts presents potential hazards and will make the warranty void.

Description	Type	Part No.
Operating instructions	Set	50075547
Quick reference	Single item	50049917
Stacking element	Ceiling, set of 3	50049238
Stand	Height-adjustable	50049939
Floor stand	Height 200 mm	50051376
Floor stand with rollers	Height 185 mm	50057161
Floor stand	Height 780 mm	50051436
Roller set for floor stand, set of 4	Guide rollers	50052528
Adapter plate HERAcell 150 in combination with BB 6220 or B 5060 / B 5061		50066094
Adapter plate HERAcell 240 in combination with HERAcell 150		50068677
Gas tight screen, split, 3 elements, retrofitting kit	Stainless steel and copper	50077587
Spare caps	Set	50052958
Outer door magnetic seal	637 x 858	50049711
Glass door silicone seal		50048705
Glass door	Complete	50050779
Glass door latch	Complete	50058542
Shelf, set with 2 shelf supports	Stainless steel	50051909
Split shelf, set with 2 shelf supports	Copper	50052454
Support rail, front	Stainless steel	50050923
Support rail, rear	Stainless steel	50050924
Support rail, front	Copper	50051420
Support rail, rear	Copper	50051421
Spring for support rail		50050922
Shelf, extractable	Plastic	50048409
HERAtray 1/3 width, set of 3	Stainless steel	50051913
HERAtray 1/3 width, set of 3	Copper	50051914
HERAtray, 1/2 width, set of 2	Stainless steel	50058672
HERAtray, 1/2 width, set of 2	Copper	50061050

11. Spare parts and accessories

Description	Type	Part No.
Electrical suction pump	230 V	50051461
Electrical suction pump	120 V	50051937
Blower wheel	Stainless steel	50049692
Blower wheel	Copper	50051184
Device fuse	T 6.3 A (set of 2)	3002641
Power supply cable	EU	50043143
Power supply cable	GB	50047100
Power supply cable	IT	50047101
Power supply cable	CH	50047099
Power supply cable	120 V, USA	50048111
Hose set for gas connection		50062701
Hose set for gas monitor		50077523
Sterile filter, gas inlet	With thread	50050737
Cylinder pressure reducer CO_2	Dual-stage	3429937
Cylinder pressure reducer O_2	Dual-stage	3429943
Cylinder pressure reducer N_2	Dual-stage	3429942
Measurement opening plug		26139262
Insert for pressure compensation opening		50070316
Plug for pipe channel		50063283
IR CO_2 gas tester (incl.charger)	100 V – 230 V	50060283
Spare filters, set of 5, for IR CO_2 gas tester		50060287
IrDa computer interface with connecting cable and PM COM software		50060289
CO_2 gas tester with 10 test tubes	Measurement kit	50051 435
CO_2 test tubes, set of 10	0 … 10 % vol.	50055124
Surface disinfectant, 250 ml, spray bottle	Barrycidal 36	50052425
Surface disinfectant, 500 ml, refill bottle	Barrycidal 36	50051939
HERALINE analogue interface (0...1 VDC), retrofit kit	EU	50055102
HERALINE analogue interface (0...1 VDC), retrofit kit	GB	50059353
HERALINE analogue interface (0...1 VDC), retrofit kit	USA	50055160
HERALINE analog interface (4...20 mA), retrofitting kit	EU	50077463
HERALINE analog interface (4...20 mA), retrofitting kit	USA	50076266
Gas cylinder monitor GM 2	EU	50046033
Gas cylinder monitor GM 2	GB	50054748
Gas cylinder monitor GM 2	USA	50059043
Gas humidification for O_2/N_2 devices	Stainless steel	50072122
Gas humidification for O_2/N_2 devices	Copper	50073523

12. Technical data

Description	Unit	Value
Mechanical		
External dimensions (W x H x T)	mm	637 x 870 x 766
Interior dimensions (W x H x T)	mm	470 x 607 x 530
Chamber volume	l	approx. 151
Shelves (W x T)	mm	423 x 455
Standard quantity	Piece	3
Maximal quantity	Piece	10
Maximal surface load	kg	10 / insertion shelf
Maximal device overall load	kg	30
Weight, without accessories	kg	60 (stainless steel)
Thermal		
Ambient temperature range	°C	+18...33
Temperature control range	°C	RT + 3 ... 55
Temperature deviation, time (DIN 12880, Part 2)	°C	± 0.1
Temperature deviation, spatial (DIN 12880, Part 2) at 37 °C	°C	± 0.5
Duration of the auto-start routine, to 37 °C ambient temperature 20 °C	h	5 ... 10
Temperature recovery time, at 37 °C, door open 30 seconds (to 98 % of initial value)	min	< 10
Heat transfer to environment: at 37 °C during ContraCon decontamination	 kWh/h kWh/h	 0.085 0.112
Humidity		
Water quality		demineralized / distilled or autoclaved or completely deionized / distilled or autoclaved.
Liquid quantity: Incubation operation ContraCon disinfection operation	 l ml	 max. 3. 0 / min 1.2 300
Constant humidity at 37 °C (high-humidity mode) Constant humidity at 37 °C (low-humidity mode)	% rH % rH	approx. 95 approx. 90
Humidity recovery time, at 95 % rH, door open 30 seconds (to 98 % of initial value)[1]	min min	approx. 30 (stainless steel) approx. 30 (copper)

[1] The specified technical data do not apply for devices w ith O_2 equipment

12. Technical data

Description	Unit	Value
CO_2 gas supply system		
Gas purity	%	min. 99.5 or medical quality
Prepressure	bar	min. 0.8 - max. 1
Measuring and control range	% vol.	0... 20
Control deviation, temporal	% vol.	± 0.1
Recovery time, at 5 %, door open 30 seconds (to 98 % of initial value)	min	< 8
CO_2 measuring cell		
Accuracy (absolute)	% CO_2	± 0.3
N_2/O_2 gas supply system		
Gas purity	%	min. 99.5 or medical quality
Prepressure	bar	min. 0.8 - max. 1
Measuring and control range	% vol.	1... 21 or 5... 90
Control deviation, temporal	% vol.	± 0.1
Retention time, door open 30 seconds (to 98 % of initial value) Option: 1.....21 % O_2 Option: 5.....90 % O_2	min	 ~ 0,5 % O_2/min ~ 1,0 % O_2/min
Retention time, door open 30 seconds (to 98 % of initial value) Option: 3 % O_2 Option: 70 % O_2	min 36 51	 ~ 0,5 % O_2/min ~ 1,0 % O_2/min
O_2 measuring cell		
Accuracy (absolute)	% O_2	± 0.5 (Option: 1.....21 % O_2) ± 2.0 (Option: 5.....90 % O_2)
Electrical system		
Rated voltage	V V V	1/N/PE 230 V, AC 1/N/PE 120 V, AC 1/N/PE 100 V, AC
Rated frequency	Hz	50/60
Interference suppression (DIN VDE 0875)		Interference level N
Type of protection (DIN 40 050)		IP 20
Protection class		I
Overvoltage category (IEC 1010, EN 61010)		II
Pollution severity (IEC 1010, EN 61010)		2
Rated current	A	2,6 (230 V, AC) 5,3 (120 V, AC) 6,2 (100 V, AC)
On-site fusing: Fuse Circuit breaker		 T 16 A G 16

12. Technical data

Description	Unit	Value
Rated input	kW kW kW	0.60 (230 VAC) 0.64 (120 VAC) 0.62 (100 VAC)
EMC class		B
Others		
Sound pressure level (DIN 45 635, Part 1)	dB(A)	< 50
Relative humidity of environment	% rH	max. 80
Location elevation	m NN	max. 2000

Fig. 33: Overview of gas consumption (CO_2)

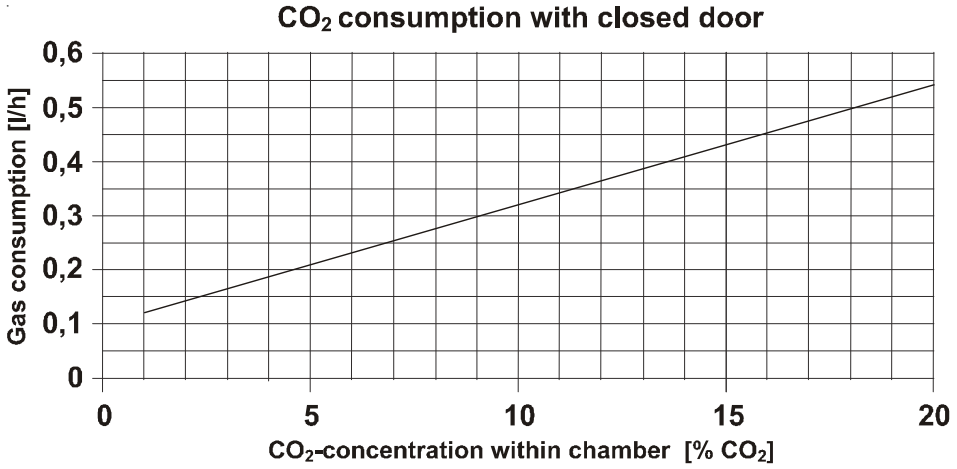


Fig. 33
Gas consumption

13. Disposal

CAUTION – Contamination hazard!

The device can be used for preparing and processing infectious substances so that the device or device components may become contaminated.
Before device components are discarded, they must be decontaminated!

- **The device components must be cleaned thoroughly; after the cleaning, they must be disinfected or sterilized, as required by the application.**
- **Discarded devices or device components must be provided with an appropriate certificate showing the decontamination measures performed.**

All device components can be discarded properly after they have been decontaminated properly.

NOTE – Recycling service

Kendro Laboratory Products offer, for a small fee, an environmentally compatible recycling service for discarded devices.

Component	Material
Thermal insulation components	Polystyrene foam EPS/PPS-Compound
Printed circuit boards	Enclosed electrical components coated with different plastics, equipped on epoxy resin-bound boards.
Plastic components, general	Note material labelling
Exterior housing	Galvanized steel sheet, painted
Device rear panel	Galvanized steel sheet
Outer door	Fiberglass reinforced epoxy resin
Door inner panel	Galvanized steel sheet, painted
Operating panel and indicator foil	Polyethylene
Magnetic door seal	Magnetic core sheathed with EMPP
Heating	Silicone-sheathed resistance-type wires
Interior containers, installed components and shelves	Stainless steel 1.4301 or copper
Plug for pipe channel	Silicone
Pressure compensation opening insert	POM with brass sinter filter
Glas screen	Soda-silicate glass
Glass door seal, measurement opening	Tempered silicone
Sensor block	Stainless steel 1.4301
Blower wheel	Stainless steel 1.4305 or copper
Measuring cell baseplate seal	Tempered silicone
Cables	Plastic-sheathed copper flexible
Packaging	Corrugated board, polyethylene film, and styrofoam

14. Principles of good microbiological proceedings[1]

General information:

- Keep windows and doors at the place of location closed while carrying out work.
- Do not eat, drink or smoke in the work area.
  Do not store food in the work area.
- Wear laboratory frocks or other protective clothing in the work area.
- Always use auxiliaries when pipetting.
- Do not use syringes and hollow needles unless absolutely necessary.
- For all manipulators, try to avoid aerosol formation.
- After completion of the work and prior to leaving the work area, wash your hands thoroughly and disinfect and regrease them, as required.
- Keep the work area tidy and clean. The work tables should contain only the required devices and materials. Store stocks only in the designated containers and cabinets.
- Check the identity of the used agents at regular intervals as required for assessing the potential hazard. The intervals depend on the potential hazard.
- When handling agents, employees are subject to a verbal, job-related instruction prior to starting work and subsequently at least once a year.
- Employees with no or little experience in microbiology, virology or cellular biology must be carefully instructed, guided, and looked after.
- Vermins must be exterminated at regular intervals, as required.

The following additional principles apply to the handling of causatives:

- Disinfect all workplaces every day. If required, the growth of resistent germs must be prevented by using a different disinfectant.
- Do not wear protective clothing outside the work area.
- Autoclave or disinfect contaminated devices prior to cleaning.
- Germ-contaminated waste must be collected safely and destroyed by autoclaving or disinfecting.
- If infectious material is spilled, the contaminated area must be immediately blocked and disinfected.
- When handling humanopathogenic germs for which an effective vaccine is available, all employees must be vaccinated and immunity has to be chekked at regular intervals using appropriate measures.
- The health conditions of the employees must be monitored using occupational medicine check-ups, i.e. initial examination prior to starting work and annual follow-ups. For the check-ups, particularly the guidelines G24, “Skin Diseases”, and G42, “Infection Diseases”, of the German trade associations apply; these guidelines are used as generally acknowledged occupational medicine guidelines by physicians to rate, evaluate, and acquire examination results based on identical criteria.
- For handling genetically manipulated organisms, viruses, and subviral agents with potential hazards, proceeding according to guideline G43, “Biotechnology”, of the German trade associations is required.
- First aid instructions for accidents with pathogenic microorganisms and viruses must always be freely accessible in the work area. All accidents must be reported immediately to the supervisor in charge.

Further safety measures in dependence of the potential hazard:

- Usage of safety cabinets (airflow directed away from the experimentator) according to Class I, Class II (type-tested)[2] or Class III.
- Restriction and monitoring of the access to certain areas.
- Usage of special protective clothing and breathing equipment.

14. Principles of good microbiological proceedings

- Disinfection of all germ-contaminated materials before they are removed from the worktable.
- Constant vacuum in the work area.
- Reduction of the germ quantity in the exhaust air by suited measures, e.g. HEPA filters.

The following general directives apply to the handling of humanopathogenic and livestock-pathogenic biological agents:

- For handling humanopathogenic biological agents, a permission according to the German Federal Epidemic Act is required.
- For the handling of livestock epidemic germs, a permission in accordance with the German Livestock Epidemic Act and Livestock Epidemic Germ Directive is required.
- Pregnant women and breast-feeding mothers must not handle infectious humanopathogenic biological agents or materials containing these agents.

[1]To be applied accordingly to cell cultures.

[2]Manufacturers' references are published in the information bulletins "Safe Chemical Working" of the German chemical industry's trade association and of the German trade association for health and welfare service and also on demand by the inspection office of the expert commission "Health and Welfare Service". The commission can be contacted at the trade association for health and welfare service, Pappelallee 35-37, D-2000 Hamburg

Reference: Notice B003, Issue 1/92 – ZH 1/343 of the trade association of the German chemical industry, published by Jedermann Verlag, Postfach 103140, D-69O21 Heidelberg.

15. Device log

NOTE – Device log!

Record nameplate information, work carried out, maintenance work, and repairs here.

Device type:		**Part number:**	
Serial number:		**Service number:**	
Location:		**Operator's note:**	

Work carried out	Notes	Date	Signature

16. Certificate of decontamination

Invoice recipient / Customer no.:			Location / Forwarding address:		
Year of manufacturer:	KC:	ST:	Name of technician:		Appointed date:
order date:	Ordered by:	Order no.:			
Type of device:			ID no. / Order no.:		Operating hours:
Equipment no.:	Factory no.:	Service device no.:	Date of delivery:	Date of start-up:	Customer inventory no.:

Certficate of decontamination

Dear customer,

when using biological and chemical agents within and ouside of devices, hazards to the health of the operating personnel may be present and contamination of the surroundings of the device may occur when service or repair works are carried out.
Within the scope of national and international legal regulations, such as
- responsibility of a company for the protection of its employees,
- responsibility of the operator for the operational safety of devices,

all possible hazards must absolutely be prevented. Prior to any calibration, service, and repair works, prior to any relocation of a device, and prior to the shut-down of a device, the device must be decontaminated, disinfected, and cleaned as required by the work to be carried out. Therefore, we ask you to fill in this certificate of decontamination before you start with the required work.

Yours sincerely

KENDRO Laboratory Products GmbH

Works to be carried out (please mark where applicable)

Service	☐	Filter replacement	☐
Repair	☐	Relocation	☐
Calibration	☐	Transport	☐

Declaration of possible contamination (please mark where applicable)

The device is clear of biological material	☐	The device is clear of dangerous chemical substances	☐
The device is clear of radioactivity	☐	The device is clear of other dangerous substances	☐
The device is clear of cytostatic agents	☐		

Certification:

Prior to carrying out the required work, we have decontaminated, disinfected, and cleaned the device as described in the operating instructions of the device and in accordance with nationally applicable regulations.
The device does not present any hazards.

Note:

Date, legally binding signature, stamp

16. Certificate of decontamination

Rechnungsempfänger / Kundennr.:			Aufstellungsort / Versandanschrift:		
Baujahr:	KC:	ST:	Technikername:		Termin:
Bestellung vom:	durch:	Bestellnr:			
Gerätetyp:			Identnr. / Bestellnr.:		Betriebsstunden:
Equipmentnr.:	Fabriknr.:	Servicegerätenr.:	Auslieferungsdatum:	Inbetriebnahmedatum:	Kunden-Inventarnr.:

Unbedenklichkeitserklärung

Sehr verehrte Kundin, sehr geehrter Kunde,

beim Einsatz von biologischen und chemischen Agenzien in und außerhalb von Geräten können bei Wartungs- und Instandsetzungsarbeiten gesundheitsschädliche Risiken für das durchführende Personal, sowie Kontamination der Umgebung auftreten.
Im Rahmen der national und international geltenden gesetzlichen Vorschriften, wie
- Schutzpflicht des Unternehmers gegenüber seinen Beschäftigten
- Verkehrsicherheitspflicht des Betreibers

ist es zwingend erforderlich etwaige Gefährdungen zu vermeiden. Vor Beginn von Kalibrier-, Wartungs- und Instandsetzungsarbeiten, vor Änderung des Aufstellungsortes sowie vor der Außerbetriebnahme von Geräten müssen diese in Abhängigkeit der durchgeführten Arbeiten gegebenenfalls dekontaminiert, desinfiziert und gereinigt werden.
Vor der Durchführung der erforderlichen Arbeiten bitten wir Sie daher um diese Bestätigung.

Mit freundlichen Grüßen
KENDRO Laboratory Products GmbH

Durchzuführende Arbeiten (Zutreffendes bitte ankreuzen)

Wartung	☐	Filterwechsel	☐
Instandsetzung	☐	Standortwechsel	☐
Kalibrierung	☐	Transport	☐

Erklärung über eventuelle Belastungen (Zutreffendes bitte ankreuzen)

Das Gerät ist frei von biologischem Material	☐	Das Gerät ist frei von chemischen Gefahrstoffen	☐
Das Gerät ist frei von Radioaktivität	☐	Das Gerät ist frei von sonstigen Gefahrstoffen	☐
Das Gerät ist frei von Zytostatika	☐		

Bestätigung:

Das Gerät wurde von uns vor der Durchführung der erforderlichen Arbeiten entsprechend den Angaben in der Betriebsanleitung des Gerätes und den bei uns geltenden Vorschriften dekontaminiert, desinfiziert und gereinigt. Eine Gefährdung besteht nicht.

Bemerkung:

Datum, rechtsverbindliche Unterschrift , Stempel

Internet: http://www.kendro.com

Rohrdurchführung CO_2-Inkubator HERAcell
Access port CO_2-Incubator HERAcell

Rohrdurchführung

Die Rohrdurchführung ermöglicht die Durchführung von zusätzlichen Sensoren, Leitungen oder Schläuchen in den Innenraum des HERAcell Inkubators.

Beim Betrieb von Geräten im Innenraum des Inkubators müssen die Sicherheitshinweise zu den Umgebungsbedingungen dieser Geräte beachtet werden.

Die in den Innenraum eingebrachte Energie hat Einfluss auf den Beginn des Regelbereichs der Temperatur (vgl. Tabelle 1).

Bei Einbringung zusätzlicher Wärmequellen kann es zur Bildung von Kondensat (z.B. im Bereich der Glastür) kommen.

Tabelle 1:

Eingebrachte Energie	Beginn des Regelbereichs der Temperatur	
	allgemein	Beispiel: RT* = 21 °C
0 W	RT + 3 °C	24 °C
5 W	RT + 6,5 °C	27,5 °C
10 W	RT + 9,5 °C	30,5 °C
15 W	RT + 13 °C	34 °C
20 W	RT + 16 °C	37 °C
*RT = Raumtemperatur		

Access port

The access port enables the lead-through of additional sensors, wires or flexible hoses into the interior of the HERAcell incubator.

When running electrical equipment in the interior of the HERAcell incubator the safety requirements concerning the environmental parameters of the equipment must be observed.

The load which is brought into the HERAcell incubator has an impact on the beginning of the temperature control range (see table 1).

The bringing-in of additional energy sources can lead to condensation formation (e.g. in the area of the glass door).

Table 1:

Brought-in energy	Beginning of the temperature control range	
	In general	Example: RT* = 21 °C
0 W	RT + 3 °C	24 °C
5 W	RT + 6,5 °C	27,5 °C
10 W	RT + 9,5 °C	30,5 °C
15 W	RT + 13 °C	34 °C
20 W	RT + 16 °C	37 °C
*RT = Room temperature		

Deutschland
Anschrift
Kendro Laboratory Products GmbH
Heraeusstraße 12-14
D – 63450 Hanau
Telefon
Vertrieb: + 49 (0) 1805 - 536376
Service: + 49 (0) 1805 - 112 110
Fax
Service
& Vertrieb: + 49 (0) 1805 - 112 114

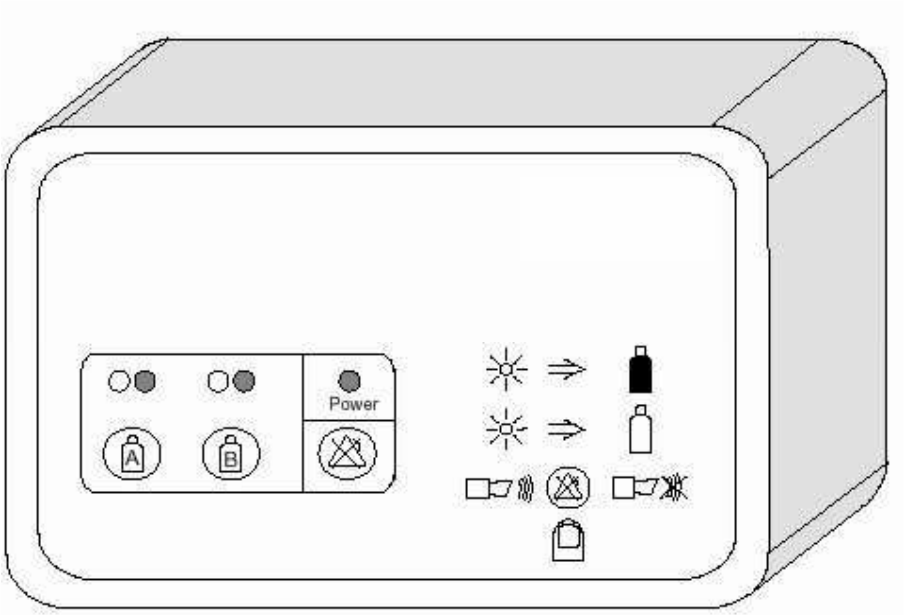
USA
Address
Kendro Laboratory Products
31 Pecks Lane
Newtown, CT 06470-2337

Telephone: 1-800-522-7746
Fax: 1-203-270-2210

GB

Gas Cylinder Change-Over Unit GM 2

Operating instructions



Thermo
ELECTRON CORPORATION

Valid: 10.2005 / 50047292 B

Below is a list of the international Thermo marketing organizations.

Postal address Germany
Thermo Electron LED GmbH
D – 63505 Langenselbold
Robert-Bosch-Strasse 1

Enquiries from Germany
Phone
Sales 0800 1 536376
Service 0800 1 112110
Fax
Sales/Service 0800 1 112114
E-Mail
info.labequipment.de@thermo.com

Enquiries from Europe, Middle East and Africa
Phone + 49(0) 6184 / 90-6940
Fax + 49(0) 6184 / 90-7474
E-Mail
info.labequipment.de@thermo.com

Postal address USA
Thermo Electron Corporation.
275 Aiken Road
Asheville, NC 28804
USA

Enquiries from North America
Phone + 1 800-879 7767
Fax + 1 828-658 0363
E-Mail
info.labequipment@thermo.com

Enquiries from Latin America
Phone + 1 828-658 2711
Fax + 1 828-645 9466
E-Mail
info.labequipment@thermo.com

Enquiries from Asia Pacific
Phone + 1 852-2711 3910
Fax + 1 852-2711 3858
E-Mail
info.labequipment@thermo.com

Internet: www.thermo.com

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 wich may assist the detection of substances subject to the RoHS Directive are available at **www.thermo.com/WEEERoHS**.

As regards foreign-language translations, the German version of this manual is binding.

Nominal charge

⚠ **This instruction manual information is important for your safety as well as the setup, installation, use and maintenance of the equipment.**

To avoid errors and causing damage, especially personal injury, read this manual carefully before using the equipment and follow all instructions.

1. INSTRUCTIONS FOR SAFE OPERATION

EXPLANATION FOR SAFE OPERATION

	In chapters of the instruction manual which have to do with safety, this icon appears under the title of the chapter. When displayed on the equipment, this icon denotes that special attention must be paid to the instruction manual.
	Indicates information in the instruction manual for using the equipment most effectively.
	Gas cylinder full (cylinder pressure > 0.6 bar)
	Gas cylinder empty (cylinder pressure < 0.6 bar)
	Manual selection, gas cylinder A
	Manual selection, gas cylinder B
	Acoustic alarm ON
	Acoustic alarm OFF
	Fault/alarm acknowledgement
	Yellow indicator lamp: Selected cylinder Red indicator lamp: Cylinder empty

1. INSTRUCTIONS FOR SAFE OPERATION

General

When setting up and operating the unit, make sure that you comply with the instructions contained in this manual as well as all applicable laws, regulations and directives in your country. (FRG: e.g. ZH 1/119, VBG 4, VBG 61, VBG 62)

The unit meets the following safety regulations:

- DIN VDE 0700 Part 1 (IEC 335-1; EN 60335-1/11.90)

If you have any queries or if you are ordering replacement parts, quote the data on the nameplate.

Areas of application

The gas cylinder change-over unit is a laboratory unit designed for **setup and operation** in the following **functions**:

- To change over the gas supply (e.g.: gas supply of a hot-air disinfectable gassed incubator) for laboratories, e.g. as used in commerce, industry, schools, universities, hospitals (safety classes L 1, L 2 and L 3).

Note: This unit is only designed for **non-aggressive and non-flammable gases,** e.g. CO_2, O_2 and N_2 . Maximum input pressure may **not** exceed 2 bar.

Safety instructions

Follow the instruction manual and keep it near the equipment for reference purposes.

Carefully read the instruction manual before starting up the units and follow the instructions contained therein to avoid errors and damage resulting therefrom (especially damage to health).

The unit may only be operated by personnel instructed in its use.

When setting up and operating the unit, make sure that you comply with the instructions contained in this manual as well as all applicable laws, regulations and directives in your country.

Check whether power connection line and connectors are not damaged before using them. If they are damaged, do not connect the unit to the mains.

The voltage specified on the nameplate (measuring voltage) must comply with the rated power voltage.

Work on electrotechnical equipment may only be performed in de-energized state by authorised electrotechnical personnel (voltage off, power plug removed from wall socket).

Only use authorised accessories and original replacement parts. Using other parts will cause unknown risks and should therefore be avoided in all cases.

Safe and reliable operation of the unit can only be guaranteed if the necessary checks, maintenance and repair work are carried out by Thermo Service personnel or by personnel authorised by us.

Thermo Electron LED GmbH shall accept no liability for damage resulting from incorrectly performed repair work which was not carried out by Thermo Service personnel or if components are replaced with non-original replacement parts or accessories. We can assume no liability for improper use.

Setup

Set up the gas cylinder change-over unit either as a standalone unit or mount it on the wall.

Free standing setup: The attached rubber feet must be stuck on the bottom of the unit.

Wall mounting: The attached fixing flaps must be mounted at the back. The unit should be used as a stencil for drilling, and bored accordingly. Use suitable mounting hardware such as dowels and screws.

Power connection

The unit is equipped with a flexible plug-in power cord. The **plug** disconnects **the unit from the power supply network**. Compare the power voltage and nameplate data (**note the position of voltage selection switch)** and plug in the power cord. At delivery, the unit is set up for **230 V**. If required, it can be switched to **115 V** operation. To change the input voltage, use a suitable tool to alter the setting of the red selector switch on the side of the unit. So that the indicated setting, **230**, changes to **115**.

Gas supply connection

The gas supply connections of the gas cylinder change-over unit are designed for pressure hoses with an inner diameter of 4 mm and a wall thickness of 1 mm. Attach the hose connections between the gas cylinder, GM 2 gas cylinder change-over unit and the consumer as specified in the connection drawing. Cut the supplied hose to appropriate lengths. Connect the supplied hose nozzles to the pressure reducer and secure the connected hoses with ties.

⚠ Only two-stage devices should be employed as cylinder pressure reducers, as these will maintain a constant output supply pressure.

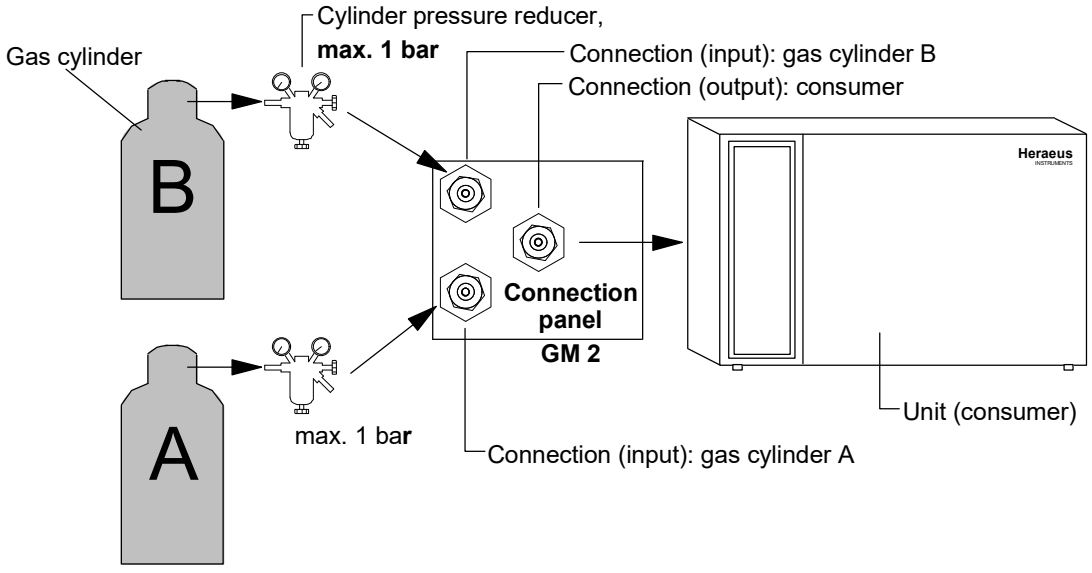


Fig. 1: Gas supply connections

2. SETUP AND INSTALLATION

"Floating contact" connection

The gas cylinder change-over unit is equipped with a floating contact for connection to external control and instrumentation systems. As soon as a fault occurs (cylinder empty), a contact is activated.
Reset the unit when a full cylinder is connected.

The floating contact (1 changeover contact) is rated for the following power circuits:

Circuit	Voltage	Fuse supplied by customer
Power-operated circuits	max. 250 V AC	max. 6 A
SELV / SELV - E circuits (cf. VDE 0100 Part 410)	25/50 V AC 60/120 V DC	max. 2/1 A max. 1/0.5 A

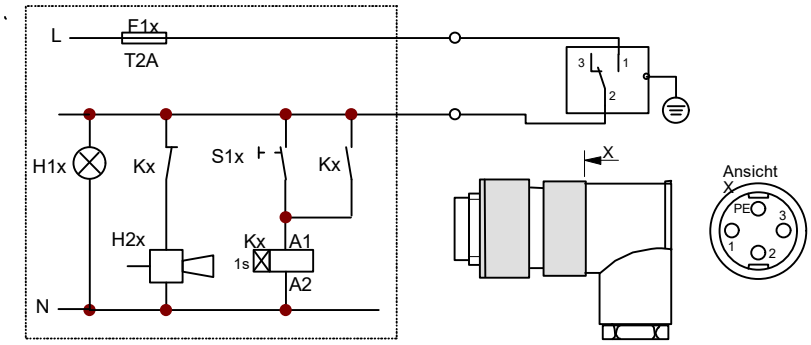


Fig. 2.: Application example of "floating contact" connection

Notice: WARNING EXTERNAL VOLTAGE

3. UNIT DESCRIPTION

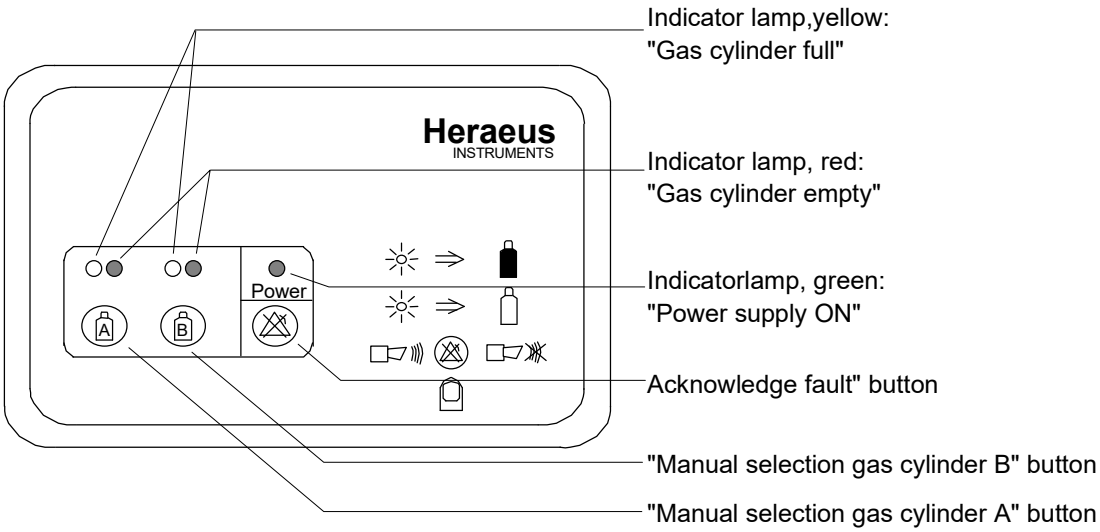


Fig. 3: Operator panel overview

5. SPECIFICATIONS

Operation

Plug in the power cord. The **green** signal lamp indicates that the unit is switched on. Until the input pressure from the connected cylinders, A and B, drops below **0,6 bar**, the **red** signal lamp remains on. The yellow signal lamp indicates the cylinder currently selected.

Open the valve on the gas cylinders and set the pressure regulator on the cylinders for an initial pressure between **0,9 to 1,1 bar**. The **red** signal lamps should go out. Press the **blue** buttons to select the desired cylinder (either A or B), and to switch it to the output. After a cylinder has been manually selected, selection of the remaining cylinder is prevented for approx. 5 seconds. When the connected device (i.e. a gassed incubator) begins draining gas from the selected cylinder, a pressure drop may occur at that cylinder's pressure reducer. For this reason, we recommend adjusting the output pressure at the pressure reducers to **0,9 to 1,1 bar** when gas is being removed. An increase in input pressure once gas has been removed has no negative effect on the operation of the unit as long as the maximum pressure of **2 bar** is not exceeded.

If the pressure in the selected cylinder drops below **0,6 bar** for more than 1 minute, the gas cylinder monitor automatically switches the supply to the second gas cylinder, and the **red** signal lamp of the empty cylinder comes on. Simultaneously, the acoustic alarm is switched on and the alarm output becomes active. Press the "Acknowledge Fault" button to turn the acoustic alarm off. Should the pressure in the empty cylinder again rise above **0,7 bar** after the unit has already switched over to the new cylinder, the unit will not automatically switch back to the previously empty cylinder. However, the empty cylinders **red** signal lamp will go out and its **yellow** signal lamp will begin flashing, so that the empty cylinder can be identified. After the empty cylinder has been replaced, the **red** or flashing **yellow** signal lamps will turn off and the alarm output will no longer be activated.

If, one the alarm has been acknowledged, the empty cylinder is not replaced with a full one, the acoustic alarm is again activated once the second, full cylinder becomes empty. Whenever the pressure in one or both cylinders drops below 0.6 bar for more than 1 minute, the alarm output will be continuously activated.

Possible error messages

1. Green signal lamp flashing

Switching between gas cylinders is performed by a built-in magnetic valve (bi-stable magnetic valve). This prevents a switchover from occurring if there is a power failure. The unit's electronics determines and monitors the position of the magnetic valve. If the unit does **not** detect any response from the magnetic valve after switching over, the procedure is repeated up to 10 times. If the magnetic valve fails to switch over despite repeated attempts to do so, the green signal lamp will flash. A flashing **green** lamp can only be reset by unplugging the unit from the mains power supply.

2. A yellow signal lamp is flashing

Pressure dropped below **0,6 bar** for longer than one minute. However, after switching over to a full cylinder, the pressure climbed above **0,7 bar**. This condition can occur if the pressure at the cylinder ouptut drops below **0,6 bar** as gas is being removed. In this case, adjust the pressure at the pressure reducer so that it lies between **0.9 to 1.1 bar** when gas is drained from the cylinder.

3. Both yellow signal lamps are flashing

This is the same problem as described under 2. above. Here however, the pressure in the second cylinder has also dropped below 0.6 bar for more than one minute after the switchover. In this case, adjust the pressure at both pressure reducers so that it lies between **0,9 to 1,1 bar** when gas is drained from the cylinder.

5. SPECIFICATIONS

	Unit	Value
Mechanical		
Dimensions (W x H x D)	mm	201 x 120 x 95
Weight:	kg	approx. 2.0
Gas data		
Gas types		not suitable for non-aggressive, non-corrosive and non-flammable gases
Purity	%	99,5
Supply pressure	bar	0,9 to 1,1
Approval excessy pressure	bar	max. 2
Electrical		
Rated voltage	V	120 / 230 (switchable)
Rated frequency	Hz	50 / 60
Degree of protection		IP 20
Protection class		I
Rated power consumption	W	5
Fuse supplied by customer		
Fuse		T 16 A
Power contactor		G 16

6. MATERIALS USED

Component	Material
Outer housing	ABS
Controls and display panel	Polyethylene
Other components	Encapsulated electrical components coated with various plastics, some mounted on glass-fibre reinforced PCBs with epoxy resin

Safe and reliable operation of the unit can only be ensured if the following authorised original replacement parts are used.

Using other parts causes unknown risks and must be avoided in all cases.

7. AUTHORISED REPLACEMENT PARTS AND ACCESSORIES

Replacement part	Type	Order No.
Instruction manual		50 047 292
Hose set for gas supply connection		26 139 129
Supply main	230 VAC	50 043 143
Supply main	120 VAC	50 043 145
Plug for "floating contact"		50 034 772
Hose nozzle		26 137 409
Flexible pressure tubing		03 651 009

9. Description for HERAcell, HERAcell 150 and HERAcell 240 (no O2 – models)

The HERAline analog interface converts the digital values of temperature and CO2 from the RS 232 interface of the incubator in 4 analog signals, having 0....1 VDC, by using a 4 channel D/A converter together with a microprocessor. The resolution of the D/A conversation is 10 bit for each channel, which means totally 1024 steps.. Since the RS 232 will be used for the HERAline interface, it will not be possible to connect an additional computer to the RS 232 interface of the incubator.

The analog outputs are connected to a female 15 pole D-Sub connector, which is located at the rear of the incubator. External devices can be connected to the interface by using the standart RGB/S video cable which commes with the HERAline interface.

The analog output signals are:

Red	„R“	Actual temperature incubation mode	10 mV/°C	0...55 °C	= 0...0,55 VDC
		Actual temperature desinfection mode	10 mV/°C	0...90°C	= 0...0,9 VDC
Green	„G“	Actual CO2 – concentration	50 mV/%	0...20% CO2	= 0...1 VDC
Blue	„B“	Set temperature incubation mode	10 mV/°C	0...55 °C	= 0...0,55 VDC
		Set temperature desinfektions mode	10 mV/°C	0...90°C	= 0...0,9 VDC
Black	„S“	Set CO2 - concentration	50 mV/%	0...20% CO2	= 0...1 VDC

It will be possible to connect the external devices directly to a male 15 pole D-Sub connector which fits to the female output connector of the incubator.
The outputs are connected to:

Actual temperature	Pin 1	(+)
Actual CO2	Pin 2	(+)
Set temperature	Pin 3	(+)
Set CO2	Pin 13	(+)
Ground (-)	Pin 4,6,7,10 und 11	(-)

10. Mounting instruction for HERAline at HERAcell, HERAcell 150 and HERAcell 240 (no O2 – models)

1. Disconnect incubator.
2. Open the HERAline – interface with a cross tip srewdriver and stick the jumpers S1 according to drawing 50 053 075.
3. Close the analog interface.
4. Use interface cable to connect interface of the intubator and HERAline (digital input .
5. Connect RGB/S cable to HERAline (analog output).
6. Connect adapter (BNC – connector / banana plug) to RGB/S cable.
7. Connect power pack.
8. Connect incubator.
9. Now you can program the set value on the banana plugs.

11. Description for HERAcell 150 and HERAcell 240 (O2 – models)

The HERAline analog interface converts the digital values of temperature, CO2 and O2 from the RS 232 interface of the incubator in 3 analog signals, having 0....1 VDC, by using a 4 channel D/A converter together with a microprocessor. The resolution of the D/A conversation is 10 bit for each channel, which means totally 1024 steps.. Since the RS 232 will be used for the HERAline interface, it will not be possible to connect an additional computer to the RS 232 interface of the incubator.

The analog outputs are connected to a female 15 pole D-Sub connector, which is located at the rear of the incubator. External devices can be connected to the interface by using the standart RGB/S video cable which commes with the HERAline interface.

The analog output signals are:

Red	„R“	Actual temperature incubation mode	10 mV/°C	0...55 °C	= 0...0,55 VDC
		Actual temperature desinfection mode	10 mV/°C	0...90°C	= 0...0,9 VDC
Green	„G“	Actual CO2 – concentration	50 mV/%	0...20% CO2	= 0...1 VDC
Blue	„B“	Actual O2 – concentration	10 mV/%	1...21 %O2	= 0,01...0,21 VDC
			10 mV/%	5...90 %O2	= 0,05...0,9 VDC
Black	„S“	Not occupied			

It will be possible to connect the external devices directly to a male 15 pole D-Sub connector which fits to the female output connector of the incubator.

The outputs are connected to:

Actual temperature	Pin 1	(+)
Actual CO2	Pin 2	(+)
Actual O2	Pin 3	(+)
Not occupied	Pin 13	(+)
Ground (-)	Pin 4,6,7,10 und 11	(-)

12. Mounting instruction for HERAline at HERAcell 150 and HERAcell 240 (O2 – models)

2. Disconnect incubator.

2. Open the HERAline – interface with a cross tip srewdriver and stick the jumpers S1 according to drawing 50 053 075.

3. Close the analog interface.

4. Use interface cable to connect interface of the intubator and HERAline (digital input .

5. Connect RGB/S cable to HERAline (analog output).

6. Connect adapter (BNC – connector / banana plug) to RGB/S cable.

7. Connect power pack.

8. Connect incubator.

9. Now you can program the set value on the banana plugs.

9. Description for HERAcell, HERAcell 150 and HERAcell 240 (no O2 – models)

The HERAline analog interface converts the digital values of temperature and CO2 from the RS 232 interface of the incubator in 4 analog signals, having 4....20 mA, by using a 4 channel D/A converter together with a microprocessor. The resolution of the D/A conversation is 10 bit for each channel, which means totally 1024 steps. Since the RS 232 will be used for the HERAline interface, it will not be possible to connect an additional computer to the RS 232 interface of the incubator.

The analog outputs are connected to a female 15 pole D-Sub connector, which is located on the analog interface. External devices can be connected to the interface by using the standart RGB/S video cable which commands with the HERAline interface.

The analog output signals are:

Red	„R“	Actual temperature incubation mode	0,16 mA/°C	0...55 °C	= 4...12,8 mA
		Actual temperature desinfection mode	0,16 mA/°C	0...90°C	= 4...18,4 mA
Green	„G“	Actual CO2 – concentration	0,8 mA/%	0...20% CO2	= 4...20 mA
Blue	„B“	Set temperature incubation mode	0,16 mA/°C	0...55 °C	= 4...18,4 mA
		Set temperature desinfektions mode	0,16 mA/°C	0...90°C	= 4...12,8 mA
Black	„S“	Set CO2 - concentration	0,8 mA/%	0...20% CO2	= 4...20 mA

It will be possible to connect the external devices directly to a male 15 pole D-Sub connector which fits to the female output connector of the incubator.
The outputs are connected to:

Actual temperature	Pin 1	(+)
Actual CO2	Pin 2	(+)
Set temperature	Pin 3	(+)
Set CO2	Pin 13	(+)
Ground (-)	Pin 4,6,7,10 und 11	(-)

10. Mounting instruction for HERAline at HERAcell, HERAcell 150 and HERAcell 240 (no O2 – models)

1. Disconnect incubator.
2. Open the HERAline – interface with a cross tip srewdriver and stick the jumpers S1 according to drawing 50 053 075.
3. Close the analog interface.
4. Use interface cable to connect interface of the intubator and HERAline (digital input .
5. Connect RGB/S cable to HERAline (analog output).
6. Connect adapter (BNC – connector / banana sockets) to RGB/S cable.
7. Connect power pack.
8. Connect incubator.
9. The analog output signals are now avaiable on the banana sockets.

11. Description for HERAcell 150 and HERAcell 240 (O2 – models)

The HERAline analog interface converts the digital values of temperature and CO2 from the RS 232 interface of the incubator in 4 analog signals, having 4....20 mA, by using a 4 channel D/A converter together with a microprocessor. The resolution of the D/A conversation is 10 bit for each channel, which means totally 1024 steps. Since the RS 232 will be used for the HERAline interface, it will not be possible to connect an additional computer to the RS 232 interface of the incubator.

The analog outputs are connected to a female 15 pole D-Sub connector, which is located on the analog interface. External devices can be connected to the interface by using the standart RGB/S video cable which commands with the HERAline interface.

The analog output signals are:

Red	„R“	Actual temperature incubation mode	0,16 mA/°C	0...55 °C	= 4...12,8 mA
		Actual temperature desinfection mode	0,16 mA/°C	0...90°C	= 4...18,4 mA
Green	„G“	Actual CO2 – concentration	0,8 mA/%	0...20% CO2	= 4...20 mA
Blue	„B“	Actual O2 – concentra	0,16 mA/%	1...21 % O2	= 4,16...7,36 mA
			0,16 mA/%	5...90 % O2	= 4,8...18,4 mA
Black	„S“	Not connected			

It will be possible to connect the external devices directly to a male 15 pole D-Sub connector which fits to the female output connector of the incubator.
The outputs are connected to:

Actual temperature	Pin 1	(+)
Actual CO2	Pin 2	(+)
Set temperature	Pin 3	(+)
Set CO2	Pin 13	(+)
Ground (-)	Pin 4,6,7,10 und 11	(-)

12. Mounting instruction for HERAline at HERAcell 150 and HERAcell 240 (O2 – models)

2. Disconnect incubator.

2. Open the HERAline – interface with a cross tip srewdriver and stick the jumpers S1 according to drawing 50 053 075.

3. Close the analog interface.

4. Use interface cable to connect interface of the intubator and HERAline (digital input .

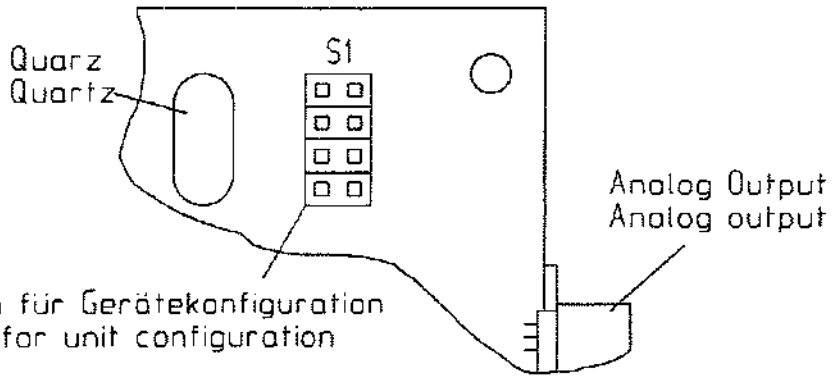
5. Connect RGB/S cable to HERAline (analog output).

6. Connect adapter (BNC – connector / banana sockets) to RGB/S cable.

7. Connect power pack.

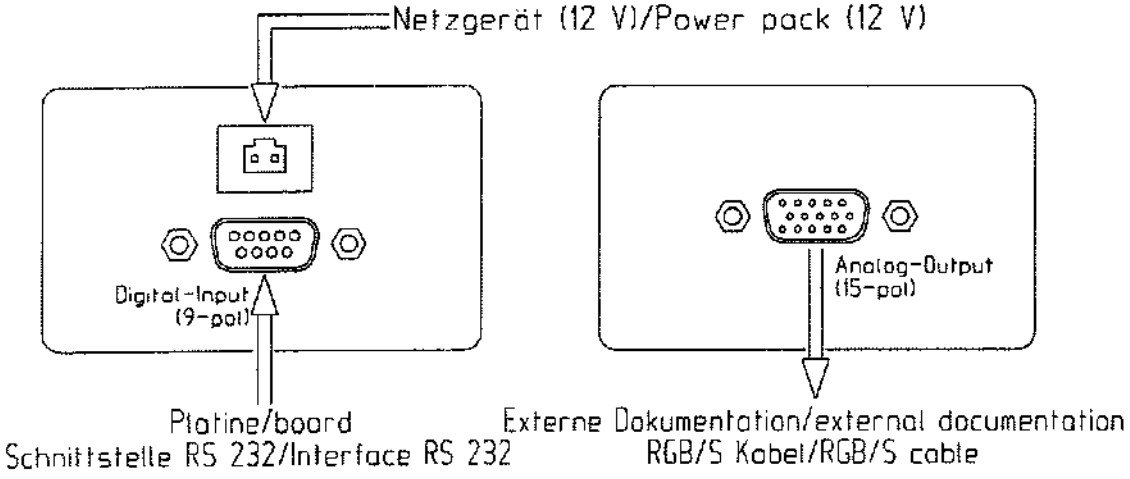
8. Connect incubator.

9. The analog output signals are now avaiable on the banana sockets.



Gerätekonfiguration / Unit configuration

BR 6000 Kelvitron B	BR 6000 Kelvitron T, UT	Function line B	Function line T, UT	BK 6160	BB 16	cytoperm 2 & BBD 6220	HERAcell	HERAcell mit O_2
								



Ind	Änderung	Datum	Name	Mikro
B	202203	18 11 02	Dar	
A	101192	18 01 00	Dar	

Ind	Änderung	Datum	Name	Mikro	Verteiler
					PS2
				Q	PS3

	Datum	Name
Bearb	29 06 99	Dornseiff
Gepr		
Norm		
Mikro		

Maßstab: ---

Werkstoff, Halbzeug:

Benennung: Anschlußplan HERAline

DIN-34-1-D

Heraeus

Zeichnungsnummer	Format	Index	Blatt
50053075	A4	B	Bl

Urspr | Ers f | Ers d

4 CONTROL AND REGULATING SYSTEM

HERAcell 150 with water level sensor(WLS), O_2 addition(O2), and gas guard

Contents ..... Page

GENERAL NOTE:

AN UNDERSTANDING OFT HE OPERATING INSTRUCTIONS IS AN ESSENTIAL REQUIREMENT FOR OPERATING THIS DEVICE!

4.1 DESCRIPTION OF CONTROL AND REGULATING SYSTEM

HERAcell unit is equipped with the following measurement, control, and regulating circuits:

- **Temperature measurement / Temperature regulation**
  * Incubation
  * Decontamination routine
  * Sample protection function

- **Plausibility test**
  of the temperature signal with a second, digital temperature sensor

- **CO_2 measurement / regulation**
  (thermal conductivity sensor or, optionally, infrared sensor)

- **Fan control**

- **Door recognition**
  (door switch)

- **Error diagnostics system**

- **RS 232 interface**

- **Alarm contact,** zero potential

- **Acoustic alarm signal** (horn)

- **Power supply**

- **O2 measurement / regulation**

- **Water level sensor**

- **Gas guard**

4.2 DESCRIPTION OF ELECTRONIC CONCEPT

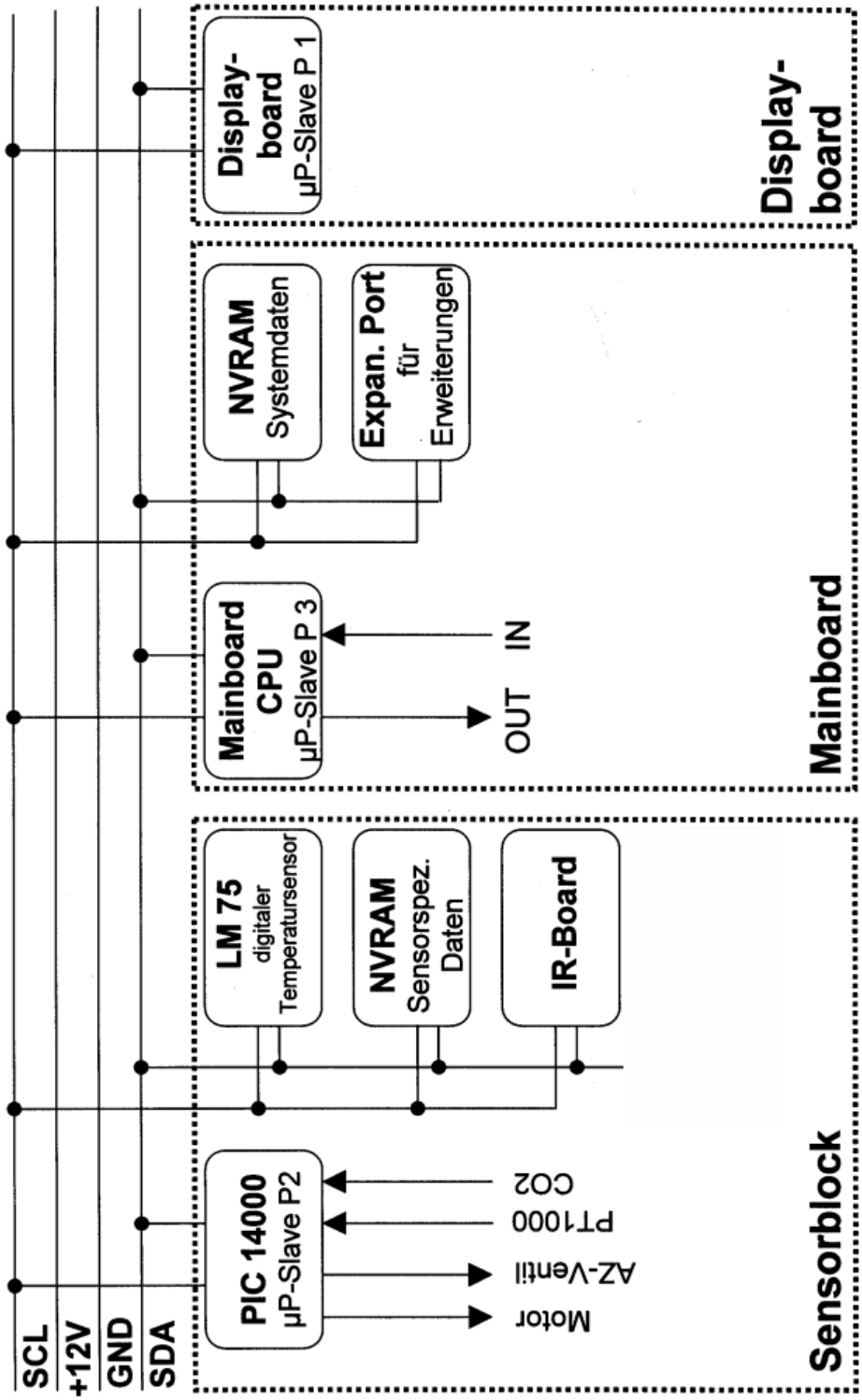
The system in question is a PC-bus-driven measurement and control system, operating in the "single master" mode.

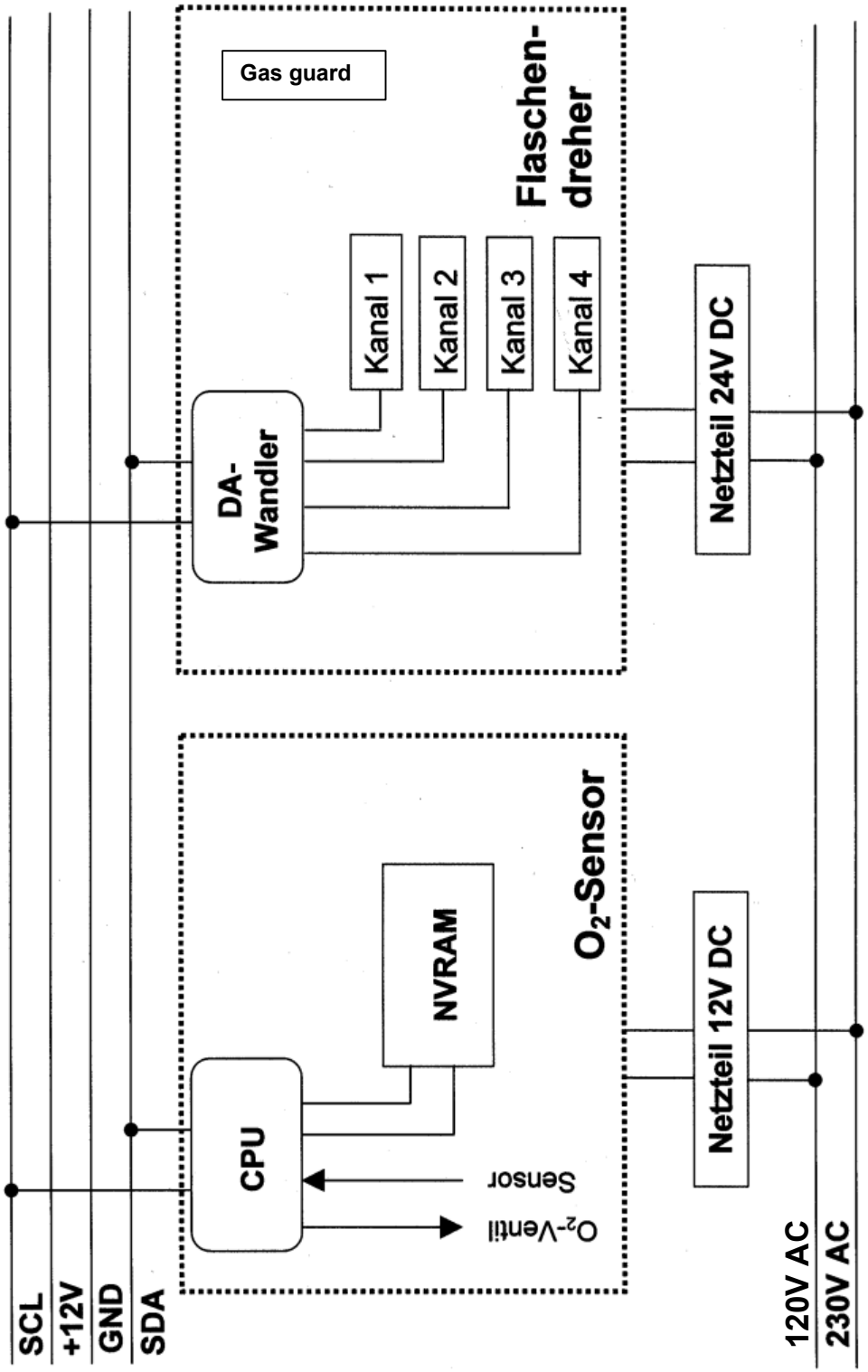
In other words, the total system is made up of a number of components with separate μP′s, with one of these (the master on the main board) assuming management and control of the entire PC bus system, as well as performing the actual evaluation of the signals and regulatory functions.
The so-called "slaves" perform the input/output and measurement tasks "on site". Thus, one μP controls the display on the unit door, while another one, on the sensor board, controls the fan and generates measured values for temperature and CO_2 (only if the thermal conductivity detector is installed).

Ann additional μP in the O_2 sensor's separate electronics performs the calculation of the O_2 value and switches the O_2 valve based on the specifications of the processor on the main board. Both the O_2 sensor's electronics as well as the electronics board of the flask rotation equipment on which the power drivers for the DC motors are mounted, have a separate mains power supply.

If the unit is equipped with an infrared metering cell, this cell also has its own slave μP.

There are also other bus subscribers aside from the "slaves", e.g., the digital temperature sensor, LM 75, and the NVRAM`s (memory building blocks) on the sensor and main boards, all of which send their values directly to the master via the bus system, and receive instructions from it.
This system offers the advantage of having a self-configurable design (e.g., when switching from a CO_2 thermal conductivity detector to an infrared detector), and that it is "open" for the addition of optional equipment in the future.
Power to the electronic boards is provided by a combinational circuit component.





4.3 DESCRIPTION OF FUNCTIONAL GROUPS

Display board P001:
This is used to input and display the operating parameters, to initiate the various routines, and to provide access to the adjustment levels.
If necessary, FL 9 can be used to adjust the display brightness.

Sensor block P002:

This is a multifunctional assembly that provides the following functions:

- Sample chamber temperature measurement, Sensor PT 1000.
  This is the actual lead sensor for temperature measurement and regulation.

- Sample chamber temperature monitor, digital temperature sensor, type LM 75. National Semiconductor.
  Sends a temperature signal via the PC bus directly to the master processor. The signal is compared with the PT1000 value to serve as a "plausibility check" of the measured temperatures.
  If the difference between the two measured temperatures exceeds a range that can be separately defined for the incubation and decontamination modes, the entire system is completely shut down.
  In such cases, the user can assume that the problem is either sensor drift or an incorrect measurement. This function also represents an overtemperature protection. Both sensors have been preadjusted to one another at the factory (the PT1000 value is used as the reference value for the digital temperature sensor).

- Sample chamber refresh, electronic commutated DC fan motor.
  The air exchange rate for the fan is automatically switched between incubation mode (low rate of 32%) and decontamination mode (high rate of 100%) by means of pulse packet control. Control is performed directly on the sensor board by the PIC 14000 slave µP. Supply voltage: 12 V.

- CO_2 concentration measurement, thermal conductivity detector (TCD).
  The thermal conductivity of the sample chamber atmosphere is measured with he aid of an NTC thermistor bridge.

- CO_2 concentration measurement, infrared detector (NDIR), OPTIONAL.
  The CO_2 absorption band is measured at definite wavelength in the infrared range. Compensation of drift and grow old with a beam with CO2 independent wavelength. Compensation of the barometric influence by means of an internal pressure sensor.

- Sensor-specific data storage, NVRAM.
  All sensor-block-specific data are stored in the NVRAM on the sensor board. The master processor reads/writes this information via the PC bus.

Main board P003 (also main board or main PCB)

Provides the following functions:

- **Mains power connection:**
  Device power socket with integrated fuse holder

- Power supply creation:
  The combinational circuit component (input voltage range ~ 80 - 270 V) generates the 12 V DC low power voltage for the electronic components. Voltage is displayed by an LED. Power for the auto-zero air pump is derived from the main PCB's power supply.
-
- **Signal processing, water level sensor**
-
- **Temperature and CO_2 calculation and regulation, O_2 regulation:**
  The measured values from the sensor board are adjusted by the offset and amplification, and corresponding set values are generated. Control of all software routines. The O_2 concentration is calculated by a separate O_2 board, described in more detail below. O_2 regulation is also a function of the main board.

- **Actuator controls:**
  All heating system actuators are located on the main PCB.
-
- **CO_2 solenoid activation:**
  The 12 VDC CO_2 solenoid is connected directly to the board.
-
- **Sample protection:**
  In case of overtemperature, a special software routine linked to a universally switching relay assumes the temperature regulating function. This upper temperature limit band (set value +1 °C) acts as the trigger band for this controller. The software attempts to readjust the unit to the specified desired temperature value.

- **Temperature limiting during the decontamination routine:**
  If the upper temperature limit band (set value + 5 °C) is exceeded during the decontamination routine, a universal relay shuts the unit's heating system down permanently.

- **Fault detection and display (software):**
  The error diagnostics system detects faulty functions and passes corresponding information to the display board.

- **RS 232 interface:**
  An RS 232 interface is part of the standard unit equipment.

- **Control of the zero-potential alarm contact:**
  In case of a fault, the standard alarm contact (center-zero relay) is activated.

- **Door switch connection:**
  The glass door state is determined by the door switch (contact closed when the glass door is open!).

- **Acoustic signal generator:**
  A short acoustic signal sounds if the door remains open for longer than 30 sec. to indicate that the various "time-locked" routines can be selected (auto-start; 90 °C decontamination routine).
  In addition, the horn on the main PCB is activated when a fault is detected.
  The horn signal can be separately turned off for error reporting and the door open state, using FL 6.

- **Expansion port / 3rd I²C bus connector**
  This is designed to be used to connect future bus subscriber components.

  O_2 board
  Comprises the following functions:
  - Measured value acquisition
  - O_2 valve activation.

  Gas guard
  For change-over from one gas cylinder to the other.

In addition to the information provided in the operating instructions, the following information may also be helpful:

- The unit is equipped with a programmed, electronic, compact control and regulator unit (refer to the device description).
- The basic device configuration parameters are stored on functional levels (refer to the control and regulating system configuration description).
- All essential adjustment routines are performed automatically.
- Should the customer enter incorrect adjustments via the "cal" key, the unit can be reset (refer to the adjustment description).
- Faults and errors that arise and are detected during operation are stored in the form of error messages with an associated error code. Steps to correct the problem can be initiated after reading the error code (**i** key) (refer to the section on reading error codes).
- The "sample protection" unit function is a special software routine that is activated if the upper temperature limit band (set value: +1 °C) is exceeded. Because the routine switches all heaters in parallel without any special weighting (refer to the heating system information) condensation may form in the unit and on the glass door.
- Mains interruptions of up to 1 sec. in duration can be bridged by the power supply buffer.

4.4 SWITCHING THE UNIT ON

The following actions are initiated when the unit is switched on:

- The green toggle switch on the main power control indicates that power to the unit has been turned on.
- Both displays perform an 8-digit test, and all LEDs come on.

When high/low humidity, O_2, and/or flask rotation equipment are configured their LEDs also light up during the 8-digit check.
Options that are not configured do no light.

- The version information of the various software versions is then displayed:

  P 1 (operator and display PCB): e.g., 010 = Version 10
  P 2 (sensor PCB): e.g., 026 = Version 26
  P 3 (main board): e.g., 204 = Version 204

  The unit then displays the current actual values.

- **The selected unit version is shown after the three version numbers during initialization. If the unit version comprises more than three figures, the full number appears in two areas on the display.**

  Example:
  Pr (unit version) = 1000 → First, “1” is displayed,
  followed by “000” on the display.

Please provide the program version when making inquiries, particularly with regard to avoidable software problems.

4.5 CONTROL AND REGULATING SYSTEMS CONFIGURATION

NOTE:
Function levels FL 1 - FL 4 described below are only used to monitor the values entered here. Normally, these values should only be changed by the factory adjustment.
Any required device calibrations can be performed with the aid of the adjustment routine, initiated by the "cal" key (refer to the operating instructions)!

1) To access the function levels described below, simultaneously press the **cal** key, the **i** key, and the **auto-start** key, and hold them down for at least 5 seconds. The program enters function level 0.

2) To move between various function levels, press and hold down the **cal** key and use the ▲ / ▼ keys.

3) To access a particular sublevel, press and release the **cal** key until you reach the desired sublevel.

4) To modify a sublevel, press and hold down the **cal** key on the desired item, then change its value with the ▲ / ▼ keys.

5) To exit a function level:
- **Press the °C or the % CO_2 key.**
- **Wait 30 sec. Without pressing another key.**

Table 3/1: Function levels (FL)

CAUTION!
Function levels are for factory settings only, or are automatically determined. The settings may only be modified after consultation with the factory.

Levels			
1	**Adjustments for regulating range 1 (incubation mode, 0 - 55 °C)**		
	Sublevel [CO_2 display]	Sublevel value range [temperature display]	Description
	1	0 = (+) / -0 = (-)	Temperature offset value sign
	2	0.0 ..... 99.9	Offset value temperature, in °C
	3	0. 1	Temperature amplification, pre-decimal places
	4	000 999	Temperature amplification, decimal places
	5	0. 1	cal factor, pre-decimal places
	6	800.....999 / 000.....200	cal factor, decimal places
	7	0 = (+) / -0 = (-)	auto-start offset value sign (NV RAM on the sensor board)
	8	0.0 ..... 99.9	auto-start offset, in % CO_2 (measuring cell, NV RAM)
	9	0. 1	CO_2 amplification, pre-decimal places (measuring cell, NV RAM)
	10	000 999	CO_2 amplification, decimal places (measuring cell, NV RAM)
	11	0 = (+) / -0 = (-)	cal value sign
	12	0.0 ..... 99.9	cal value, in % CO_2

The items identified by "-cal-" are automatically modified by the adjustment routine initiated with the **cal** key.

2	Adjustments for regulating range 2 (decontamination mode, 0 - 100 °C) CAUTION: Specified set value = 90 °C		
	FL position	FL value range	Description
	1	0 = (+) / -0 = (-)	Temperature offset value sign
	2	0 99	Decontamination temperature offset value, in °C
	3	0. 1	Decontamination temperature amplification, pre-decimal places
	4	000 999	Decontamination temperature amplification, decimal places
	5	55 90	Decontamination temperature set value (90°C)
	6	30 999	Decontamination hold time, in min. (total time = equilibrium time + time at 90°C *)
* This holding time begins when the unit reaches the lower limit band value for the 90°C routine, that is, 85°C. The specified set value of 540 min. may not be changed!			

3	Outputs, manual control (main PCB)		
	FL position	FL value range	Description
	1	0 / 1	Heater actuator, unit body: X5...X8
	2	0 / 1	Heater actuator, unit door: X3
	3	0 / 1	Heater actuator, base: X10
	4	0 / 1	Actuator, CO_2 valve: JP5
	5	0 / 1	Actuator, common alarm: X11
	6	0 / 1	Actuator, horn
	7	0 / 1	Actuator, fan
	8	0 / 1	Actuators remain active as long as the **cal** key is pressed.
	9	0 / 1	O_2 valve switch
The output actuators can be manually activated on this function level. The switch state (1) can be reset by: - Manually returning it to 0, or; - Performing a mains reset.			

4	Adjustment LM 75 / PT 1000 and CO_2 countervoltage (TCD)		
	FL position	FL value range	Description
	1	0 / 1	Adjust LM 75 value to PT 1000 value
	2	0 / 1	Determine the CO_2 metering bridge countervoltage
	3	0 / 1	Activation of the IR sensor zero point calibration
	4	0 / 1	Manual auto-zero activation
	5	0 ... 99.9	Display of LM 75, without correction
	6	-19.9 ... 19.9	Display LM 75 correction offset
The CO_2 metering bridge countervoltage is automatically adjusted during the -auto-start- routine.			

5	CO_2 countervoltage values		
	FL position	FL value range	Description
	1	0 255	Countervoltage value A (NV RAM on the sensor board)
	2	0 255	Countervoltage value B (NV RAM on the sensor board)
	2	0 255	Countervoltage value C (NV RAM on the sensor board)
The values are automatically determined during the -auto-start- routine.			

6	Horn, on/off		
	FL position	FL value range	Description
	1	A 0 A 1	Horn OFF Horn ON
	2	0 .... 1.0	Door signal, in sec.
	3	Ar 2 Ar 1	Alarm relay inverted Alarm relay normal
Factory setting: Horn ON; door signal, 0.3 sec.			

7	Set value locking, on/off		
	FL position	FL value range	Description
	1	S 0 S 1	Set values locked Set values released
Factory setting: Set values released			

As of software version 200, the set value interlock can also be activated via a key combination (refer to the operating instructions).

8	Door heating factor, on/off		
	FL position	FL value range	Description
	1	PH0 PH1	Door heating factor OFF Door heating factor ON
	2	0.0 .... 3.0	Door heating factor
Factory setting: Door factor ON = PH1. May not be changed!			

When replacing the main board, the door heating factor for the model in question must be checked in function level 8, position 2. Readjust if necessary:
Units with stainless steel interior fittings: 1.4
Units with copper interior fittings: 2.2

9	Display brightness		
	FL position	FL value range	Description
	1	1 15	Display brightness
Factory setting: Brightness stage 8			

10	Auto-zero settings		
	FL position	FL value range	Description
	1	0 / 1	auto-zero not configured/configured
	2	0 ... 100	Interval between two auto-zeros, or Interval between door closure and next auto-zero, in hr.
	3	0 ... 10.0	Flush time (auto-zero valve on), in min.
	4	0 ... 20.0	Compensation time after valve closure, in min.
	5		Display auto-zero value
Factory setting: 1; 6hr.; 1,5 min.; 11 min.			

11	O_2 settings		
	FL position	FL value range	Description
	1	0 = Bo O_2 1 = 5 ... 90% O_2 2 = 1 ... 21% O_2	O_2 sensor configuration
	2	000 ... 999	O_2 ->CO_2 correction value (NV RAM on the sensor board). The decimal places are displayed.
	3	000 ... 999	N_2 ->CO_2 correction value (NV RAM on the sensor board). The decimal places are displayed.
	4	0 / 1	1 = Starts the determination of the individual correction value.
For new units, the compensation is preset at the factory. Replacement measuring cells are programmed with default values and should be checked after installation.			

12	Water level sensing settings		
	FL position	FL value range	Description
	1	0 / 1	Monitoring activated/deactivated
	2	0 ... 240	High/low switch time, in sec.
	3	0 ... 240	High/low switch time, in sec.
	4	0 / 1	Alarm active
Factory setting: 1; 60 sec.; 10 sec; 1			

13	Flask rotator settings		
	FL position	FL value range	Description
	1	0 / 1	Level 1 deactivated/activated
	2	0 / 1	Level 2 deactivated/activated
	3	0 / 1	Level 3 deactivated/activated
	4	0 / 1	Level 4 deactivated/activated
	5	0 ... 100	Speed during the ContraCon routine
	6	0 ... 100	Maximum AD value
Factory setting: Position 5=0; position 6=100			

14	Gas guard CO2 settings		
	FL position	FL value range	Description
	1	0 / 1	Gas guard not configured / configured
	2	0 / 1	Display bottle 1 pressure low / o.K.
	3	0 / 1	Display bottle 2 pressure low / o.K.
	4	0 / 1	Display valve position: bottle 1 / bottle 2

15	Gas guard O2 settings		
	FL position	FL value range	Description
	1	0 / 1	Gas guard not configured / configured
	2	0 / 1	Display Bottle 1 pressure low / o.K.
	3	0 ... 240	Display Bottle 2 pressure low / o.K.
	4	0 / 1	Display valve position: bottle 1 / bottle 2

20	Memory management		
	FL position	FL value range	Description
	1	0 / 1	Mirror NV RAM on the main PCB.
	2	0 / 1	Write default values to measuring cell.
	3	0 / 1	Write default values to $IRCO_2$ measuring cell.
	4	0 / 1	Upgrade measuring cell NV RAM to software version 204

These values may only be readjusted after consultation with the factory test facilities!

21	Unit configuration		
	FL position	FL value range	Description
	1	0 = Heracell 150 1 = Heracell 240	Configure unit size.
	2	0 = VA 1 = CU	Configure interior fittings.
	3	0 = 230 Volt 1 = 120 Volt	Configure mains voltage.
	4	0 = Not installed 1 = Installed	Configure gas diaphragm.
	5	0 = No O_2 1 = 5 ... 90% O_2 2 = 1 ... 21% O_2	Configure O_2.
	6	0 = Not installed 1 = Installed	Configure flask rotator.
	7	0 = Standard TCD or IR 1 = Auto-zero measuring cell	Configure installed measuring cell.
	8	0 = Not installed 1 = Installed	Configure water level monitor.
	9	0 = Inactive 1 = Active	Configure low humidity option.
	10	0 = Not installed 1 = Installed	Gas guard CO2.
	11	0 = Inactive 1 = Active	Gas guard O2/N2.
	12	0	- without function -
	13	0	- without function -
	14	0	- without function -
	15	0	- without function -
	16	0	- without function -
	17	0	- without function -
	18	0	- without function -
	19	0	- without function -
	20	0 / 1	Start write process.
	21	0 / 1	Security bit for position 1-10

For initial configuration only!
Using this function will overwrite all unit adjustments on the main board!

When FL 601 is called up, the system jumps to FL 21.

Determining the unit version

The following table can be used to determine the unit version:

Values determining the unit version	Version
0 = Heracell 150 1 = Heracell 240	Unit size
0 = VA 2 = CU	Interior fittings material
0 = 230 Volt 4 = 120 Volt	Mains voltage
0 = Not installed 8 = Installed	Gas tight screen
0 = No O_2 16 = 5 ... 90% O_2 32 = 1 ... 21% O_2	O_2
0 = Not installed 64 = Installed	Flask rotator
0 = Standard TCD or IR 128 = Auto-zero measuring cell	Installed measuring cell
0 = Not installed 256 = Installed	Water level monitoring
0 = Inactive 512 = Active	Low humidity function
0 = Inactive 1024 = Active	Gas guard CO2
0 = Inactive 2048 = Active	Gas guard O2/N2
The unit version is represented by the sum of the values.	

If low humidity is not configured, the unit always operates with high humidity. No selection is possible for the customer.

4.6 ERROR TABLE

Aside from the current error, outputting the unit's error history may be helpful in correcting a problem.
To output the last 10 errors, press the **i** and the ▲ / ▼ keys. The most recent error is displayed in position 1, the oldest in position 10 (refer to the section on error storage in the operating instructions).

Error table		
Code	**Cause**	**Fault condition**
≡≡≡	Communications between display mP and main board interrupted.	The display is not receiving display values from the master processor.
42	Main board NVRAM read error	Default values were loaded.
43	Main board NVRAM read error	The mirrored values were loaded.
44	NVRAM defect	Values of the measuring cell are not overwritten, unit runs using default values
54	Set value error	Error in the calculation of the ser values. The processor performs a “reset”.
55	I²C bus error	Data transfer to the I^2 bus interrupted.
66	Deviation between temperature probe PT1000 and LM 75 is too large. (No longer plausible.)	The validity of the temperature signals is no longer assured because the permissible deviation between the measured values for: The incubation mode are > ± 2 °C, or; The decontamination mode are > ± 5 °C.
77	CO_2 calculation range exceeded.	• The offset value for the CO_2 adjustment made by the cal function exceeds the maximum permissible adjustment range of ± 10.0 % CO_2 • The calculated temperature adjustment factor exceeds the maximum permissible adjustment range of 0.8 ... 1.2.
88	auto-start error	The total running time (1080 min.) has passed without the routine concluding, or the maximum CO_2 countervoltage adjustment value has been exceeded.
99	Glass door open or door switch defective.	The door or door switch have remained in the "open" state for more than 10 min. (The door switch contact is closed when the glass door is open!!)
100	Temperature below set value	Actual value < set value - 1.0 °C
101	Temperature above set value	Actual value > set value + 1.0 °C (Sample protection function active.)

104	Temperature probe PT1000 or digital temperature sensor LM 75 defective.	Probe break or sensor short-circuit
200	CO_2 below set value	Actual value < set value - 1.0 % CO_2
201	CO_2 above set value	Actual value > set value + 1.0 % CO_2
204	CO_2 measuring cell defective	Sensor break or short-circuit, or infrared measuring cell defective.
205	Humidity sensor probe break	Humidity sensor in the sensor block defective.
206	CO_2 gas cylinders empty	Booth gas cylinders are empty
207	CO_2 gas guard defective	CO_2 gas guard defective or not connected
300	O_2 below set value	Actual value < set value - 1.0 % CO_2 (1.0 adjustable and halved for values < 2%)
301	O_2 above set value	Actual value > set value + 1.0 % CO_2
304	O_2 measuring cell defective	Sensor break or sensor short-circuit
305	O_2/N_2 gas cylinders empty	Booth gas cylinders are empty
306	O_2/N_2 gas guard defective	O_2/NO_2 gas guard defective or not connected
400	Water level alarm	Water level in the base pan too low.
500	90°C temperature below set value	Actual value < set value - 5 °C
501	90°C temperature above set value	Actual value > set value + 5 °C (Unit will be completely shut down.)
502	Error in the 90 °C decontamination routine	Mains interrupt during the decontamination routine.

4.7 ERROR EXAMINATION AND REGULATING CIRCUIT SCHEMATICS

4.7.1 GENERAL ERRORS:

General errors are those that cannot be assigned to a specific regulating circuit.

Error code	Test equipment / Test at the unit	Inspections and tests	Possible corrective actions
≡≡≡	Multimeter	▪ Check the power supply to the O2 board and flask rotating equipment.	• Replace the mains power supply unit.
	Bus cable and display PCB both in working order.	▪ Switch the unit off. ▪ Disconnect the bus cable to the display PCB at the main board. ▪ Attach the test set (cable/display PCB). ▪ Switch the unit on. ▪ Perform the functional test.	Test set operational: • Repeat the functional test of the individual installed components. Replace the cable or display PCB. Test set not operational: • Replace the main board.
44		▪ Switch unit off then on. ▪ Check if error reoccurs.	▪ Replace the measuring cell.
42			Replace the main board.
43		Switch the unit off, then on. Check if the error reoccurs.	Replace the main board.
54		Check the error list.	If the error reoccurs, inform the factory (Q).

55	Multimeter	▪ Check the power supply to the O2 board and flask rotating equipment.	• Replace the mains power supply unit.
	Bus cable and sensor block both in working order.	▪ Switch the unit off. ▪ Disconnect the bus cable to the sensor block at the main board. ▪ Attach the test set (cable/sensor block). ▪ Switch the unit on. ▪ Perform the functional test.	Test set operational: • Repeat the functional test of the individual installed components. Replace the cable or sensor block. Test set not operational: • Replace the main board.
99	Ohmmeter	▪ The door switch contact is closed when the glass door is open! ▪ Perform the functional test at the main bard input.	▪ If defective: Replace the door switch. • If defective: Replace the main board.
77		Error in the CO_2 cal range: ▪ Initiate an auto-start. Temperature adjustment error:	▪ If the error reoccurs, replace the measuring cell. ▪ Replace the measuring cell.
88		▪ Check the setup location (drafty, direct sunlight, etc.)	▪ If necessary, change the setup location/conditions. ▪ Replace the measuring cell.

4.7.2 TEMPERATURE MEASUREMENT/REGULATING CIRCUIT – INCUBATION MODE

Short description:

- Sample chamber with controlled, directly mounted heating lines. The unit's air jacket supports the temperature equilibrium.
- Exterior door with mounted heating lines to prevent condensation from forming on the glass.
- μP-based temperature regulator with PT1000 as the temperature sensor (integrated in the sensor block).
- μP-based sample protection function with an upper limit band value that serves as the trigger threshold to activate the software module.
- Plausibility check of the temperature sensor signals (PT1000 and digital sensor, LM 75, in the sensor block).
- The individual heating circuits are activated separately, and for varying lengths of time.

Circuit diagram:

- See circuit diagrams in Chapter 3.

Technical specifications – incubation mode:

- Nominal voltage: 230 VAC or 120 VAC
- Power consumption: **0.63** kW (HERAcell 240, 230 VAC)
  0.64 kW (HERAcell 240, 120 VAC)
- Heater resistors Chapter 6: Metering and Test List

4.7.3 ERROR IN THE TEMPERATURE MEASUREMENT/REGULATING CIRCUIT - INCUBATION MODE

Error code	Test equipment / Test at the unit	Inspections and tests	Possible corrective actions
66	Bus cable and sensor block both in working order.	▪ Switch the unit off. ▪ Attach the test set (cable/sensor block). ▪ Switch the unit on. ▪ Perform the functional test	Test set operational: • Replace the sensor block. Test set not operational: • Replace the main board.
100	Heater on LED continuously lit. Wattmeter	▪ Perform the functional test of relay K1 on the main board. (Switch the unit off and on.) ▪ Check the heater actuators (FL 3). Check the power consumption.	▪ Replace the main board.
101	Sample protection LED active.	▪ The unit's set value is lower than the ambient room temperature or countermands the regulating system. ▪ Room temperature is too high. ▪ Check the unit's setup location (exposure to direct sunlight). ▪ Check the heater actuators (FL 3).	▪ Select a higher set value. ▪ Lower the room temperature. ▪ Change the setup location. ▪ Replace the main board.
104	The temperature display reads 99.9.		▪ Replace sensor block.

4.7.4 TEMPERATURE MEASUREMENT/REGULATING CIRCUIT - DECONTAMINATION MODE AT 90°C

Short description of the decontamination routine:

With 300 ml of water in the sample chamber, the decontamination heaters raise the unit temperature to 90 °C. The exterior door is also heated in order to prevent condensation from forming.
Press the -90 °C- key to start the decontamination routine.

Warm-up phase:
The unit heats up to the decontamination temperature.

Decontamination phase:
Duration: 9 hours. Once the unit reaches the lower limit band value (85 °C), the decontamination time holding counter starts.

Condensation phase:
Duration: 6 hours. The unit's base heater is turned off during this phase (water will condense on the floor of the sample chamber as it cools).

Cool-down phase:
The unit cools down naturally to the specified set incubation temperature. During this phase, the exterior door is heated with a base load factor to reduce the amount of condensation that forms on the glass door.

Reheat phase:
Duration: 3 hours. In this phase, the unit operates at, for example, 37 °C. The base heater remains off. Heat applied to the interior sample chamber surfaces and the glass door removes as much condensation as possible.

To reactivate the base heater and switch to the incubation mode, either perform a mains reset, or press the -90°C- key to exit the decontamination routine.

Remaining time table:
The remaining decontamination routine time shown in the CO_2 display only indicates the holding value until the end of the decontamination routine!
The total time is calculated from the values of the time-controlled phases and the values from a temperature/reset table for the set-value-controlled phases.

Decontamination status:
You can also output the precise phase of the decontamination routine that the unit is currently going through. The phase is shown on the CO_2 display.

Simultaneously press and hold down the –90°C- and -i- keys for approx. 5 seconds:

[S - -] Warm-up phase
[- S -] Decontamination phase
[- H -] Condensation phase
[- - S] Cool-down phase
[- - H] Reheat phase

- Circuit diagram:

See circuit diagrams in Chapter 3.

Technical specifications - same as for the incubation mode:

- Nominal voltage: 230 VAC or 120 VAC
- Power consumption: **0.63** kW (HERAcell 240, 230 VAC)
  0.64 kW (HERAcell 240, 120 VAC)
- Heater resistors Chapter 6: Metering and Test List

4.7.5 ERROR IN THE TEMPERATURE MEASUREMENT/REGULATING CIRCUIT - DECONTAMINATION MODE AT 90°C

Error code	(Unit display) Test equipment / Test at the unit	Inspections and tests	Possible corrective actions
500	Heater on LED continuously lit. Wattmeter	▪ Perform the functional test for relay K1 on the main board. (Switch the unit off and on.) ▪ Check the heater actuators (FL 3).	▪ Replace the main board.
501	Sample protection LED active.	▪ Check the heater actuators (FL 3).	▪ Replace the main board.
502	Determine any mains interrupt.		▪ Repeat the de-contamination routine.

4.7.6 CO_2 METERING AND REGULATION CIRCUIT

Short description:

- The replaceable, connector-compatible, thermal conductivity detector (TCD with auto-zero or infrared (IR) sensor) is integrated in the sensor block. CO_2 regulation is µP-based .
- CO_2 gas input is metered by a solenoid. The gas flowrate is also restricted by a capillary opening with a diameter of 0.7 mm, integrated in the valve block. Before entering the unit, the gas passes through a sterile filter that can be accessed from outside the unit for replacement.

TCD:

- In units equipped with the O_2 option, a cross-sensitivity of the O_2 concentration in the sample chamber to the CO_2 measured value must be taken into account. The compensation has been factory preset for new units. The steps required to check this setting or when replacing the measuring cell are described in Section 4.14.3.

IR Sensor:

- IR-absoption-sensor with auto-zero function for automatic zero-point correction of drift and grow old.
- Selection of the wavelenght with two different filters.
- Compensation of the barometric influence with an internal pressure sensor.
- Finding of the CO2 value in the microcontroller of the sensor.

Circuit diagram:

See circuit diagrams in Chapter 3.

Technical specifications:

Gas flowrate:	~ 5 l/min
Gas input pressure:	1 bar

4.7.7 ERROR IN CO_2 METERING AND REGULATION CIRCUIT

Error code	(Unit display) Test equipment / Test at the unit	Inspections and tests	Possible corrective actions
200	CO_2 Gas: on LED continuously lit.	▪ Check the initial gas pressure. ▪ Check the flow through the sterile filter. ▪ Perform the solenoid functional test (FL 3). ▪ Check the flow through the solenoid. ▪ Check the tubing to the detector. ▪ Check the air pump. ▪ Check the auto-zero valve.	▪ Adjust the correct initial gas pressure. ▪ Replace any defective parts. ▪ Replace the main board as required.
201	CO_2 Gas: off LED always off.	▪ Initial gas pressure far too high. ▪ Perform the solenoid functional test (FL 3). ▪ Check the air pump. ▪ Check the auto-zero valve. ▪ Check the set value (against the direction of regulation).	▪ Adjust the correct initial gas pressure. ▪ Replace any defective parts. ▪ Replace the main board as required. ▪ Remove excess gas.
204	CO_2 display reads 99.9.	▪ Check the O_2 sensor. For TCD ▪ Check the cross-compensation (see Sec. 4.14.3) ▪ Measure voltage P1/P2 or P3/P4: U=0 V or U=VCC (~5V), detector defective. U=2.0 - 2.5 V, thermistors are OK.	▪ Reinsert/replace the sensor head. ▪ Adjust the cross-compensation. ▪ Replace the measuring cell, as required.
205	Humidity sensor in the sensor block defective.	▪ No test possible.	▪ Replace the sensor block.

4.7.8 O_2 METERING AND REGULATION CIRCUIT

Short description:

- Zink oxide sensor located in the sample chamber and with replaceable, plugged-in sensor head.
- auto–cal routine for automatic adjustment is integrated into the auto-start routine.
- µP-based O_2 regulator.
- O_2 or N_2 input via the same connection spout.
- After entering the sample chamber, the gas is dispersed across the surface of the water to increase the rate of humidity regeneration.
- The O_2 or N_2 gas input is metered by a valve. The gas flowrate is also restricted by a capillary opening in the connection spout.
- Prior to entering the unit, the O_2 or N_2 passes through a sterile filter.
- The O_2 metering and regulation circuit can be manually switched off by adjusting the set value to < 5 % (for the O_2 range of 5 ... 90 %) or adjusting the set value >21 % (for the O_2 range of 1 ... 21 %).
- The initial startup ‘‘run‘‘ phase of the O_2 sensor is approx. 5 min. During this time, CO_2 gas addition is suppressed.

Circuit diagram:

See circuit diagrams in Chapter 3.

Technical specifications:

Gas flowrate:	O_2 ~ 11 l/min
	N_2 ~ 13 l/min
Gas input pressure:	1 bar

4.7.9 ERROR IN O_2 METERING AND REGULATION CIRCUIT

Error code	(Unit display) Test equipment / Test at the unit	Inspections and tests	Possible corrective actions
300	O_2 Gas: on LED continuously lit.	▪ Check the initial gas pressure. ▪ Check the flow through the sterile filter. ▪ Perform an O_2 valve functional test (FL3) ▪ Check the flow through the O_2 valve. ▪ Check the tubing.	▪ Adjust the correct initial gas pressure. ▪ Replace any defective parts. ▪ Replace the main board as required.
301	O_2 Gas: off LED always off.	▪ Initial gas pressure far too high. ▪ Perform an O_2 valve functional test (FL3) ▪ Check the set value (against the direction of regulation).	▪ Adjust the correct initial gas pressure. ▪ Replace any defective parts. ▪ Remove excess gas. ▪ Replace the main board as required.
304	O_2 display reads 99.9.	▪ Check the O_2 sensor (plugged in / operational?) For TCD ▪ Check the cross-compensation (see Sec. 4.14.3)	▪ Plug sensor head in, if required; replace if defective. ▪ Adjust the cross-compensation.

4.7.10 Faults without Error Messages

Error code	Faulty function	Inspections and tests	Possible corrective actions
-	Heavy condensation in the sample chamber	▪ Check the sample chamber heater actuators (heaters E2-E8). ▪ Check the unit version.	▪ Replace the main board. ▪ Return to factory for repairs. ▪ Set correct set of parameters (FL 601)
-	Heavy condensation on the glass	▪ Check the door heater actuator (heater E1). ▪ Check temperature switch N2 in the exterior door. ▪ For software version <200: check door factor (FL 8) ▪ Check set of parameters (since software version 200)	▪ Replace the main board. ▪ Replace the entire exterior door. ▪ Set correct door factor ▪ Set correct set of parameters (since software version 200, FL 601)
-	Incorrect CO_2 concentration in the unit (see also Sec. 4.14.3).	▪ Check the air pump. ▪ For WLD: Check the O_2 cross-compensation ▪ Check the O_2 sensor function. ▪ Check the auto-zero valve.	▪ Replace any defective parts. ▪ Adjust the cross-compensation.
-	Water level sensor fails to activate when water level is too low.	▪ Check the power supply. ▪ Check the voltage at JP1 See circuit diagram in Sec. 4.13.	▪ Replace the main board. ▪ Contact the factory.

4.8 FAN SYSTEM AND ERRORS

Short description:

- DC motor (nominal voltage: 24 V; operating voltage: 12 V) mounted on the sensor block. Located outside the sample chamber.
- The fan speed is adjusted to the various operating modes by pulse package control:
  Incubation mode: Low speed
  Decontamination mode: Maximum speed
- The fan runs continuously.
- After a mains reset or when the door is closed, the fan runs at maximum speed for 2 sec., even in the incubation mode.
- In units with the O_2 option, the fan always runs at maximum speed outside the CO_2 limit band.
- Fan control

Errors in the fan system

Error code	Faulty function	Inspections and tests	Possible corrective actions
-	Fan not rotating.	▪ LED LD1 on the sensor board must be flashing or lit. ▪ Check the solder connections.	▪ Replace the sensor block.

4.9 GAS GUARD AND ERRORS

Short description:

- When the pressure in one of the gas guards falls below 0.6 bar for 2 minutes, the gas supply is automatically switched to the other gas cylinder.
- The reaction time of two minutes avoids the possibility of the gas guard switching the brief pressure changes.
- In the event of an error the appropriate display (CO_2 or O_2) will alternate between the actual value and the error info.
- If the pressure in both cylinders is below 0.6 bar an alarm will sound, the potential free contact will switch and an error info on the display (CO_2 or O_2) will flash.

Errors ot the gaws guard:

Error info	Faulty function	Inspections and tests	Possible corrective actions
A -	Gas cylinder A is empx.	▪ Check the bottle pressure. ▪ Check hose connection.	▪ Change gas cylinder. ▪ Recover hose connection.
B -	Gas cylinder B is empx.	▪ Check the bottle pressure. ▪ Check hose connection.	▪ Change gas cylinder. ▪ Recover hose connection.
A b -	Booth gas cylinders are empty.	▪ Check the bottle pressure. ▪ Check hose connection.	▪ Change gas cylinder. ▪ Recover hose connection.
Error code	**Faulty function**	**Inspections and tests**	**Possible corrective actions**
206	Booth CO_2 gas cylinders are empty.	▪ Check the bottle pressure. ▪ Check hose connection.	▪ Change gas cylinder. ▪ Recover hose connection.
207	CO_2 gas guard is defective.	▪ Check hose connection and electical connectors.	▪ Recover connectors ▪ Change gas guard
306	Booth O_2/NO_2 gas cylinders are empty.	▪ Check the bottle pressure. ▪ Check hose connection.	▪ Change gas cylinder. ▪ Recover hose connection.
307	CO2 gas guard is defective.	Check hose connection and electical connectors.	▪ Recover connectors ▪ Change gas guard.

4.10 DISPLAY PCB OR I²C BUS CABLE REPLACEMENT

- In order to change the I^2C bus cable the exterior door must be removed and disassembled.
- In order to change the display board of the operating panel must be removed. For this, remove the caps, loosen the screws, and remove the front panel upwards.

4.11 SENSOR BLOCK REPLACEMENT

After completing the service tasks:
After the sensor block has been replaced and all functional tests and control measurements have been performed, the unit MUST be restarted with the auto-start routine.

Units without O_2:
The replacement sensor block has been fully preadjusted and calibrated.

Units with O_2:
The replacement sensor block has been preset with the O_2 compensation default values.
Refer to Section 4.14.3 regarding the method to check the compensation values.

In either case, the following steps are designed as a functional check.

- The unit must be disconnected from the mains power.
- The I²C bus system is self-configuring, that is, no adjustments are required.
- Switch the unit on, close the glass door, prevent the unit from heating up, check the operation of the fan.

Units equipped with thermal conductivity detectors:

- Initiate the countervoltage adjustment by activating the -auto-start- routine and closing the glass door.
- The fan will stop for several seconds. The adjustment process is automatic. Once the countervoltage adjustment is complete, the fan will switch on again.
- Manually interrupt the -auto-start- routine (the same procedure as starting the routine).
- Auto-zero starts automatically. Wait for the adjustment to be completed (auto-zero LED goes out).
- Trigger a mains reset since software version 200.

- Use the "cal" key to perform the zero-point adjustment of the CO_2 metering circuit.

- Run a test gas addition to check the metering and regulating functions with CO_2.

- **For O_2/N_2 units:**
  - Remove the CO_2 from the unit.
  - Run a test gas addition with 70% O_2 or 10% N_2.
  - Observe the CO_2 zero point.
  - If required, start the O_2 compensation (see Sec. 14.4.3).

- Remove the gas from the unit and restart the unit with the -auto-start- routine.

Unit with IR measuring cell: Se Section 4.14.5.

4.12 MAIN BOARD REPLACEMENT

After completing the service tasks:
After the main board has been replaced and all functional tests and control measurements have been performed, the unit MUST be restarted with the auto-start routine.

- The unit must be disconnected from the mains power.

- Replace the PCB.

- The PC bus lines can be connected to the sockets in any desired order.

- After installation, switch the unit on.

- Press and hold down the -cal- key.
  This will reset any -cal- adjustments that may have been performed.
  The unit is now operating with its original specified adjustment values.

- In units equipped with copper interior fittings, set the door factor in FL 8. Refer to Section 4.5, Control and Regulating System Configuration.
  The replacement PCB is set up for units with stainless steel interior fittings. (Door factor for copper interior fittings 2.2).

- Test the unit's control and regulating functions:
  - Allow the unit to heat up to, for example, 37.0°C.
  - Once the unit reaches the specified temperature, use the -cal- key to perform

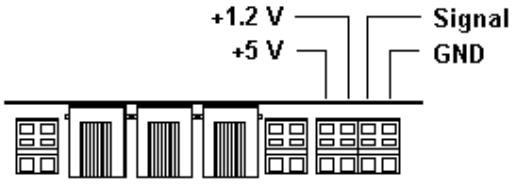
the zero-point adjustment of the CO_2 metering circuit.
- Run a test gas addition to check the metering and regulating functions.

- Remove the gas from the unit and restart the unit with the -auto-start- routine.

4.13 CHECKING / REPLACING THE WATER LEVEL SENSOR

To check the water level sensor, check the voltage at JP1.
The voltage tolerance range is ± 0.1 Volt.

Water below: High level between signal and GND at JP1: ~ 5 V
Water over: Low level between signal and GND at JP1: ~ 0 V



If possible, the water level sensor should be replaced at the factory.

4.14 PERFORMING ADJUSTMENTS

In general, a comparative measurement should be made. Refer to the chapter, "Comparative Measurements and Adjustments" in the operating instructions.

An adjustment routine can be initiated for each adjustable regulation circuit by using the -cal- key.

4.14.1 TEMPERATURE ADJUSTMENT INCUBATION MODE

Comparative measurement:	**Incubation temperature**

Perform the comparative measurement at the user's normal operating temperature, e.g., 37.0°C. Make sure the unit has adequate time to reach equilibrium before taking a reading:

- For cold units: No sooner than 5 hours after the temperature has reached equilibrium or the end of a complete -auto-start- procedure.
- For units at operating temp.: No sooner than 45 min. after probe placement.

Comparative measurement procedure: (Calibrated thermometer: 37.0 °C ± 0.1°C)

- Place the probe in the center of the sample chamber, 15 mm above the insert tray. Open the doors as briefly as possible for this step.
- Allow the unit to reach equilibrium or the -auto-start- routine to finish.
- Read the probe value and compare it with the displayed value.
- Deviation: < ± 0.2°C No adjustment necessary.

  ≥ ± 0.2°C Refer to Section 9.1 of the operating instructions (p. 42 onwards).

4.14.2 TEMPERATURE ADJUSTMENTS DECONTAMINATION MODE

Comparative measurement:

Perform the comparative measurement during the decontamination phase of the decontamination routine. Allow the unit to reach equilibrium before taking the reading:

- For cold units: No sooner than 3 hours after reaching equilibrium at 90°C.
- For units at operating temp.: No sooner than 45 min. after probe placement.

Comparative measurement procedure: (Calibrated thermometer: 90.0°C ± 1°C)

- Place the probe in the center of the sample chamber, 15 mm above the insert tray. Open the doors as briefly as possible for this step.
- Allow the unit to reach equilibrium.
- Read the probe value and compare it with the displayed value.
- Deviation: < ± 1°C No adjustment necessary.

  ≥ ± 2°C Perform the adjustment:

- Press and hold down the -cal- and –90°C- keys for 5 seconds.
- Enter the target temperature.
- Initiate the adjustment procedure by pressing the -cal- key.

The unit displays the correct actual value.

4.14.3 PERFORMING ADJUSTMENTS CO_2 METERING AND REGULATION CIRCUIT

Performing adjustments:

The following steps can be performed for units equipped with either a thermal conductivity or an infrared detector.

In general, a comparative measurement should be made, unless the actual value is known, e.g., CO_2 display deviation at 0.0 % CO_2.

Adjustment routine activation: Refer to the example in the operating instructions (Chapter 6: Switch Function, Manual Zero-point Adjustment of the CO_2 Metering System)

Comparative measurement:	**CO_2 regulating circuit**

Perform the comparative measurement at the user's normal CO_2 concentration, e.g., 5.0 %. Make sure the unit has adequate time to reach equilibrium before taking a reading:

- For test addition: No sooner than 45 min. after all regulating circuits have reached equilibrium.
- For units at operating temp., with gas, stable humidity: The measurement can be made immediately.

Comparative measurement procedure: (Portable IR meter or hand pump w. sample tube 0..10 % CO_2)

- Extract three gas samples through the metering opening in the gas diaphragm/glass door.
- Read and average the values, then compare with the displayed value.
- Deviation: $< \pm 0.5$ % CO_2 No adjustment necessary.

  $\geq \pm 0.5$ % CO_2 Refer to Section 10.6 of the operating instructions.

Checking and Adjusting the O_2 Compensation at the TCD Measuring Cell

Preparation:

- Remove the CO_2 from the unit
- Adjust the O_2 set value to 10% O_2 (sensor 1..21% O_2) or 70% O_2 (sensor 5..90% O_2).
- What for the conditions to stabilize (humidity, O_2).

To check a previously set compensation, observe the CO_2- zero point. If, after O_2 gas addition, the zero point does not lie in the range of $\pm$ 0,1 % CO_2, you must perform a new compensation.

Compensation procedure:

- On function level 11, item 4, set a value of 1.
- The compensation is then automatically calculated.

For sensor 5...90% O_2, the compensation should then be repeated at 10% O_2. If no N_2 is present, this step can be omitted.

4.14.4 ADJUSTMENTS - O_2 METERING AND REGULATION CIRCUIT

In general, a comparative measurement with O_2 gas addition to the recommended values for the individual sensor should be performed.

Comparative measurement: O_2 regulation circuit

Perform the comparative measurements at the following O_2 concentrations:

Sensor measurement range 1...21% O_2: approx. 5% O_2
Sensor measurement range 5...90% O_2: approx. 90% O_2

Give the unit sufficient time to stabilize before reading the measured values:

- For test gas addition: No sooner than 45 min. after all regulating circuits have reached equilibrium
- For units at operating temp., with gas, stable humidity: The comparative measurement can be made immediately.

Performing the comparative measurement: (O_2 reference measuring instrument)

- Extract three gas samples through the metering opening in the gas diaphragm/glass door.
- Read and average the values, then compare with the displayed value.

Sensor measurement range 1...21% O_2

- Deviation: $< \pm 0.5$ % O_2 No adjustment necessary.

  $\geq \pm 0.5$ % O_2 Perform the adjustment (see below)

Sensor measurement range 5...90% O_2

- Deviation: $< \pm 2$ % O_2 No adjustment necessary.

  $\geq \pm 2$ % O_2 Perform the adjustment (see below)

O_2 adjustment procedure:

- Press and hold down the -cal- , -i- , and -O_2- keys simultaneously until the O_2 display flashes.
- Set the reference measured value.
- Press any key to return to the normal operating mode.

4.14.5 ADJUSTMENTS - IR SENSOR

Calibrating the sensor:

The IR – absorption – sensor is a high precision measurement instrument, therefore, extreme care must be taken when performing any work on the measurement system. Due to the non-linear nature of the sensor signal characteristic curve, the effects of an incorrect zero-point calibration are far greater than is the case with the TCD measuring cell, which has a linear characteristic curve.
The sensor should be recalibrated whenever the zero-point deviates by more than ± 0,3 % CO_2.

All water must be completly removed from the incubator before attempting to calibrate the sensor, as CO_2 dissolved in water will falsify the measurement result.
Prior to calibrating the sensor, a reference device must be employed to ensure that the device setup area is not being artificially enriched with CO_2 as a result of inadequate ventilation.

Zero-point calibration: CO_2 -- controller

1. Remove all water from the device.
2. Select the function level:
   Simultaneously press the i; cal and auto-start keys and hold them for 5 sec.
   The programm shifts to function level 0.
3. Continue pressing the cal – key and use the arrow keys to select function level 4.
4. Repeatedly press cal – key to select sublevel 3.
   Display 0 (on the temperature display)
   Display 3 (on the CO_2 – display)
5. Activate the sublevel: Using the arrow keys, set the upper display, 0.
6. Release the keys.
7. The device rests the CO_2 display to 0.
8. Press any key to return to the normal display.

Operating point calibration: CO_2 – controller

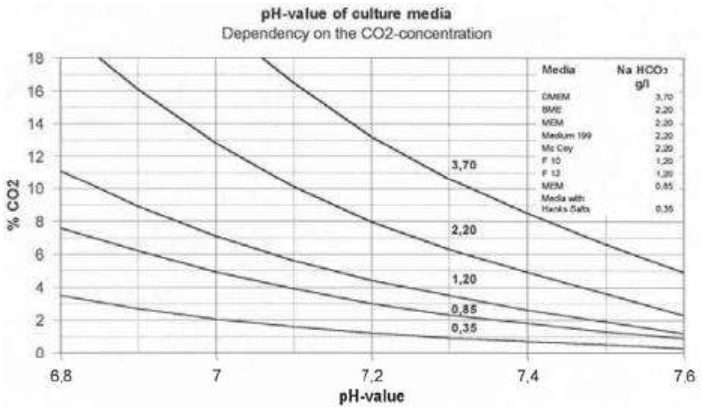
After recalibrating the zero-point, you must calibrate the operating point. This procedure is similar to the customer adjustment of the TCD measuring cell.

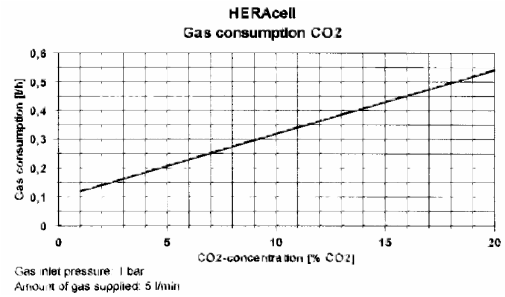
1. Add CO“ until the gas concentration in the device reches the operating point (e.g. 5%). The actual value must remain stable at 0,1 %. Since the IR sensor does not indicate the influence of moisture, you need not wait until the humidity in the chamber has built up.
2. Press the cal – key for 5 sec. All displays flash.
3. Press the % CO_2 key (e.g. 5.0 %)
4. Use the arrow keys to adjust the measured value. (e.g. 5.4)
5. Press the cal – key to acknowledge the value. The display briefly shows cal, followed by the correct actual value.
6. Press any key to exit the adjustment routine.

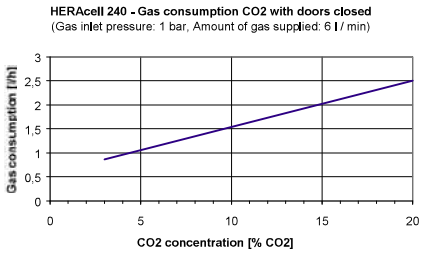
2. TECNICAL DATA

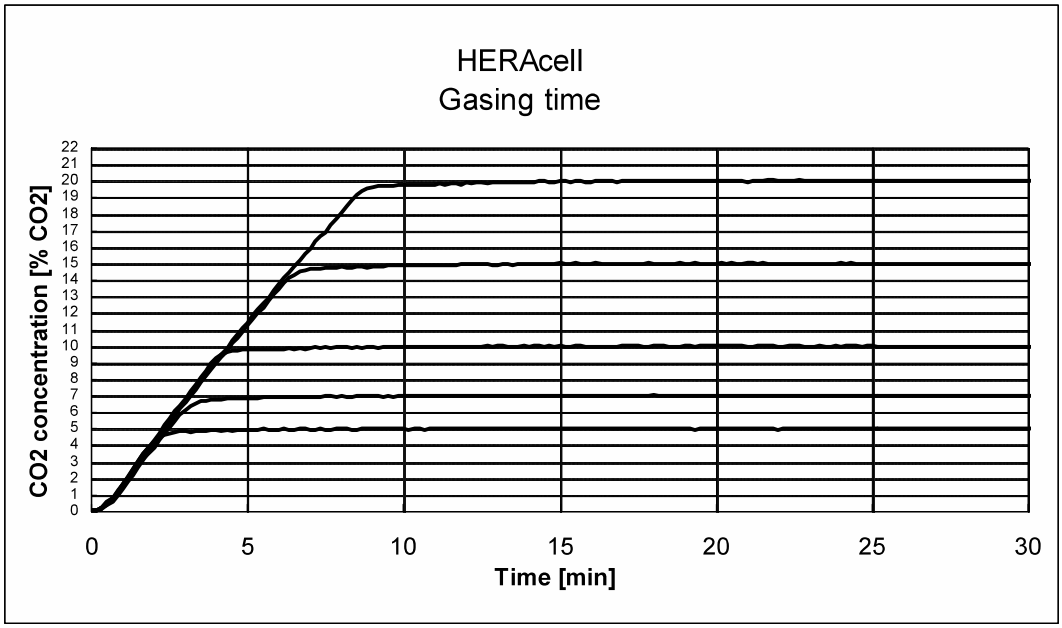
Description	Unit	Value	
		HERAcell & 150	*HERAcell 240*
Mechanical			
Exterior dimensions (W x H x D)	mm	637 x 870 x 766	780 x 934 x 834
Interior dimensions (W x H x D)	mm	470 x 607x 530	607 x 670 x 583
Chamber volume	l	approx. 151	approx. 238
Insertion shelfs (W x D)	mm	423 x 445	560 x 500
Standard quantity	each	3	3
Maximum quantity	each	10	12
Maximum surface load	kg	10 / per shelf	10 per shelf
Maximum device overall load	kg	30	30
Weight, without accessories	kg kg	70 (stainless steel) 75 (copper)	85 (stainless steel) 90 (copper)
Thermal			
Ambient temperature range	°C	+ 18... + 33	+18... + 33
Temperature control range	°C	RT + 3... + 55	RT + 3... + 55
Decontamination temperature (ContraCon- routine)	°C	90	90
Temperature deviation, temporal (DIN 12880, Part 2)	°C	± 0.1	± 0.1
Temperature deviation, local (DIN 12880, Part 2) at 37 °C at 55 °C	 °C °C	 ± 0.5 ± 0.6	 ± 0.5 ± 1.0
auto-start routine duration, to 37 °C Ambient temperature 20 °C	h	approx. 6	5 ... 10
Temperature recovery time, at 37 °C, door open 30 s (to 98 % of initial value)	min	≤ 10	< 5
Cool-down time, from 37° C to 25 °C Ambient temperature 20 °C	h	approx. 6	approx. 5
Heat dissipation to environment: at 37 °C at 50 °C during ContraCon decontamination (90 °C)	 kWh/h kWh/h kWh/h	 approx. 0.085 approx. 0.095 approx. 0.112	 0.1 0.2 0.25
Humidity			
Water quality	demineralized / distilled or autoclaved or completely deionized / destilled or autoclaved		
Liquid quantity: Incubation operation ContraCon disinfection operation	 l ml	 max. 3 300	 4.5 max, / 1.8 min 350 max.
Constant humidity at 37 °C (high humidity mode) Constant humidity at 37 °C (low humidity mode)	% rH % rH	approx. 95 approx. 90	approx. 95 approx. 90
Humidity recovery time, at 95 % rH, door open 30 s (to 98 % of initial value)	min min	≤ 17 (stainless steel) ≤ 10 (copper)	approx 18 (stainless steel) approx 18 (copper)

Description	Unit	Value	
		HERAcell & 150	*HERAcell 240*
CO_2 gas supply system			
Gas purity	%	99.5 min. or medical quality	99.5 min. or medical quality
Prepressure	bar	0.8 min. – 1 max.	0.8 min. – 1 max.
Measuring and control range	vol - %	0... 20	0... 20
Control deviation, temporal	vol - %	± 0.1	± 0.1
Recovery time, at 5 %, door open 30s (to 98 % of initial value)	min	≤ 5	< 8
CO_2 measuring cell			
Accuracy after auto-start routine	% CO_2	± 0.3	± 0.3
Drift	% CO_2/month	typically ± 0.2 (± 0.5 max.)	typically ± 0.2 (± 0.5 max.)
O_2 gas supply system			
Gas purity	%	99.5 min. or medical quality	99.5 min. or medical quality
Prepressure	bar	0.8 min. – 1 max.	0.8 min. – 1 max.
Measuring and control range	vol - %	1... 20 or 5....90	1... 20 or 5....90
Control deviation, temporal	vol - %	± 0.1	± 0.1
Recovery time, at 5 %, door open 30s (to 98 % of initial value)	min	range 1.....21 % range 5.....90%	< 0,5 % O2/min. < 1,0 % O2/min.
O_2 measuring cell			
Accuracy (totally)	% O_2	range 1.....21 % range 21...90%	± 0.5 ± 1.0
Drift	% O_2/month		
Electrical system			
Rated voltage	V V V	1/N/PE 230 V, AC 1/N/PE 120 V, AC 1/N/PE 100 V, AC	1/N/PE 230 V, AC 1/N/PE 120 V, AC 1/N/PE 100 V, AC
Rated frequency	Hz	50/60	50/60
Interference suppression (DIN VDE 0875)		Interference level N	Interference level N
Type of protection (DIN 40 050)		IP 20	IP 20
Protection class		I	I
Overvoltage category (IEC 1010, EN 61010)		II	II
Pollution severity (IEC 1010, EN 61010)		2	2
Rated current	A A A	2.4 (230 VAC) 5.3 (120 VAC) 6.2 (100 VAC)	2.7 (230 VAC) 5.2 (120 VAC) 6.2 (100 VAC)
On-site fusing: Fuse Circuit breaker		 T 16 A G 16	 T 16 A G 16
Rated input	kW kW kW	0.60 (230 VAC) 0.64 (120 VAC) 0.62 (100 VAC)	0.61 (230 VAC) 0.62 (120 VAC) 0.62 (100 VAC)
EMC class		B	B
Others			
Sound pressure level (DIN 45 635, Part 1)	dB(A)	< 50	< 50
Relative humidity of environment	% rH	80 max.	80 max.
Location elevation	m NN	2000	2000 max.

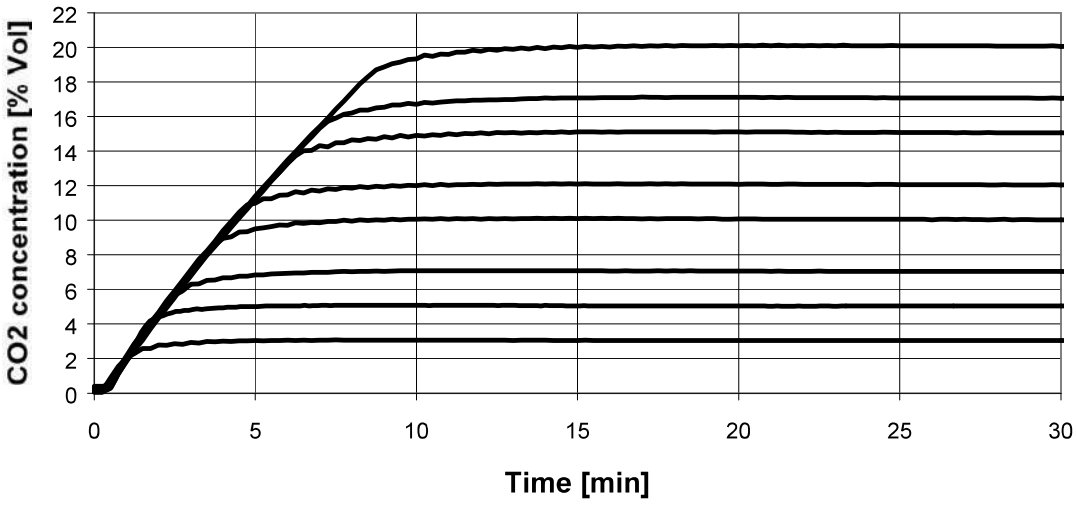








HERAcell 240
Gasing time
(Gas inlet pressure: 1 bar, amount of gas supplied: 360 l / h)



Alarm Table

Error Code	Description	Time to Alarm
42, 43, 44	NV RAM failure	Immediate
55	BUS failure	Immediate
66	Temperature sensor mis-match	1 minute
77	CO2 Cal error	Immediate
88	Auto Start Error	Up to 24 hours
99	Door Open too long	10 minutes
100	Temperature more than 1 degree below set point	a) 152 minutes from switch on or change of set point. b) 45 minutes after the door is closed c) 1 minute continuously below.
101	Temperature more that 1-degree above set point.	a) 152 minutes from switch on or change of set point. b) 45 minutes after the door is closed c) 1 minute continuously above.
104	Temperature sensor faulty	1 minute
200/201	CO2 more than – or + 1% from set point.	a) 152 minutes from switch on or change of set point. b) 45 minutes after the door is closed c) 1 minute continuous.
204	CO2 Measuring cell faulty	1 minute
205	Compensation board faulty	1 minute
300/301	N2/O2 more that – or + 2% from set point.	a) 152 minutes from switch on or change of set point. b) 45 minutes after the door is closed c) 1 minute continuous.

304	O2 sensor faulty	1 minute
400	RH more than 5% below set point.	a) 152 minutes from switch on or change of set point. b) 45 minutes after the door is closed c) 1 minute continuously below.
500/501	Temperature more than – or + 10 degrees from the set point	a) 152 minutes from switch on or change of set point. d) 45 minutes after the door is closed e) 1 minute continuous.
502	Error during Contracon cycle.	1 minute

5. INITIAL SETUP

Instruction	Input / key(s) / comments	Display / comment /status
Open all doors.		
Remove shipping restraints and fixed equipment from sample chamber.		
Clean the unit.		
Water reservoir	Add water.	Do not exceed max. level, use only distilled and sterile water.
Switching on the unit	Set the main power switch to its "I" position.	All indicators on the control panel go on for approx. 15 sec. (8-digit test). Software versions and parameter set are shown.
Setpoint specification		
Temperature setpoint adjustment		
Display temperature setpoint.	Press °C	Current setpoint is displayed, digit to the right of decimal flashes.
Enter new temperature set-point.	Press °C & △	Increase the setpoint.
	Press °C & ▽	Decrease the setpoint.
Save NEW temperature set-point.	Release °C	Sample chamber temperature is displayed.
O_2 setpoint adjustment (option)		
Display O_2 setpoint.	Press % O_2	Current setpoint is displayed, digit to the right of decimal flashes.
Enter new O_2 setpoint.	Press % O_2 & △	Increase the setpoint.
	Press % O_2 & ▽	Decrease the setpoint.

Save NEW O_2 setpoint	Release [% O_2]	O_2 concentration in the sample chamber is displayed.
CO_2 setpoint adjustment		
Display CO_2 setpoint.	Press [% CO_2]	Current setpoint is displayed, digit to the right of decimal flashes.
Enter new CO_2 setpoint.	Press [% CO_2] & [△]	Increase the setpoint.
	Press [% CO_2] & [▽]	Decrease the setpoint.
Save NEW CO_2 setpoint.	Release [% CO_2]	CO_2 concentration in the sample chamber is displayed.
Flask rotating equipment speed adjustment (option)		
Display speed of the driven roller, in %.	Press [FLD]	Current setpoint is displayed..
Enter new speed for the driven roller, in %.	Press [FLD] & [△]	Increase the setpoint.
	Press [FLD] & [▽]	Decrease the setpoint.
Save NEW speed setpoint.	Release [FLD]	Speed of the driven roller is displayed.

Instruction	**Input / key(s) / comments**	**Display / comment /status**
High/low humidity adjustment		
Display the mode.	Press (5 sec.) [cal] Press [auto-start]	Current mode is displayed; rH0 = High, rH1 = Low
Change the mode.	Press [△] or [▽]	New mode is displayed.
Save the NEW mode.	Press [cal]	"hi" indicator light flashes in the low humidity mode.
Query the error code (max. 10 errors stored).	Press [i alarm] & [△]	Scroll forward in the error table.
	Press [i alarm] & [▽]	Scroll backwards in the error table.

Activate auto-start.	auto-start / See operating instructions.	"auto-start" indicator light flashes. **Please note the duration!**
Activate equalization function.	cal / See operating instructions.	
Activate 90 °C ContraCon decontamination routine.	90 °C / See operating instructions.	"90 °C" indicator light flashes.
Activate other functions.	Go to the associated function levels via the control panel (see Chapter 4).	
Close all doors.	Temperature display: "actual value" O_2 display: "21.0" CO_2 display: "0.0" TCD display: "actual value" auto-start routine performed automatically. ► Controller regulates the defined temperature setpoint. ► Relative humidity is built up. ► Once the temperature remains constant, the CO_2 measurement system is equalized. ► "auto-start" indicator light goes out. ► Unit adds gas up to the adjusted CO_2 / O_2 setpoint.	

6. MEASUREMENT- / TEST LIST

HERAcell / HERAcell 150 / HERAcell 240

Contents ..... page

RESISTOR TESTS (refer to the circuit diagram, disconnect the unit from the mains power supply) **HERAcell**

Item	Comment	Procedure	Equipment	Result for 230 VAC	Result for 120 VAC
E1; Door heater		Disconnect the plug and measure the resistance	Meter	198 Ω – 229 Ω	47,1 Ω – 55,6 Ω
E3; Sample chamber, left side		Disconnect the plug and measure the resistance	Meter	2458 Ω – 2846 Ω	570 Ω – 660 Ω
E4; Sample chamber, right side		Disconnect the plug and measure the resistance	Meter	2458 Ω – 2846 Ω	570 Ω – 660 Ω
E5; Sample chamber, rear wall	230 V – Units, Cu and VA	Disconnect the plug and measure the resistance	Meter	2294 Ω – 2656 Ω	/
E5; Sample chamber, rear wall	120 V – Gerät in Cu	Disconnect the plug and measure the resistance	Meter	/	532 Ω – 616 Ω
E5; Sample chamber, rear wall and top	120 V – Gerät in VA	Disconnect the plug and measure the resistance	Meter	/	333 Ω – 386 Ω
E6; Sample chamber, front side	230 V – Gerät in Cu	Disconnect the plug and measure the resistance	Meter	382 Ω – 443 Ω	/
E6; Sample chamber, front side and top	230 V – Gerät in VA	Disconnect the plug and measure the resistance	Meter	331 Ω – 383 Ω	/
E6; Sample chamber, front side	120 V - Gerät in Cu und VA	Disconnect the plug and measure the resistance	Meter	/	87 Ω – 101 Ω
E8; Sample chamber, base		Disconnect the plug and measure the resistance	Meter	594 Ω – 688 Ω	134 Ω – 155 Ω
Y1; Magnetic valve	Cold resistor	Loosen the connection and measure the resistance	Meter	~126 Ω	~126 Ω
S2; Door switch		Loosen the connection and check the operation. Glass door open Glass door closed	Meter Switch closed Switch open	 0 Ω ∞ Ω	 0 Ω ∞ Ω

RESISTOR TESTS (refer to the circuit diagram, disconnect the unit from the mains power supply) **HERAcell 150**

Item	Comment	Procedure	Equipment	Result for 230 VAC	Result for 120 VAC
E1; Door heater		Disconnect the plug and measure the resistance	Meter	198 Ω – 229 Ω	47,1 Ω – 55,6 Ω
E3; Sample chamber, left side		Disconnect the plug and measure the resistance	Meter	2458 Ω – 2846 Ω	570 Ω – 660 Ω
E4; Sample chamber, right side		Disconnect the plug and measure the resistance	Meter	2458 Ω – 2846 Ω	570 Ω – 660 Ω
E5; Sample chamber, rear wall	230 V – Units, Cu and VA	Disconnect the plug and measure the resistance	Meter	2294 Ω – 2656 Ω	/
E5; Sample chamber, rear wall	120 V – Gerät in Cu	Disconnect the plug and measure the resistance	Meter	/	532 Ω – 616 Ω
E5; Sample chamber, rear wall and top	120 V – Gerät in VA	Disconnect the plug and measure the resistance	Meter	/	333 Ω – 386 Ω
E6; Sample chamber, front side	230 V – Gerät in Cu	Disconnect the plug and measure the resistance	Meter	382 Ω – 443 Ω	/
E6; Sample chamber, front side and top	230 V – Gerät in VA	Disconnect the plug and measure the resistance	Meter	331 Ω – 383 Ω	/
E6; Sample chamber, front side	120 V - Gerät in Cu und VA	Disconnect the plug and measure the resistance	Meter	/	87 Ω – 101 Ω
E8; Sample chamber, base		Disconnect the plug and measure the resistance	Meter	594 Ω – 688 Ω	134 Ω – 155 Ω
Y1; Magnetic valve	Cold resistor	Loosen the connection and measure the resistance	Meter	~126 Ω	~126 Ω
S2; Door switch		Loosen the connection and check the operation. Glass door open Glass door closed	Meter Switch closed Switch open	 0 Ω ∞ Ω	 0 Ω ∞ Ω

RESISTOR TESTS (refer to the circuit diagram, disconnect the unit from the mains power supply) **HERAcell 240**

Item	Comment	Procedure	Equipment	Result for 230 VAC	Result for 120 VAC
E1; Door heater		Disconnect the plug and measure the resistance	Meter	207 Ω – 240 Ω	59 Ω – 69 Ω
E3; Sample chamber, left side		Disconnect the plug and measure the resistance	Meter	2325 Ω – 2693 Ω	646 Ω – 748 Ω
E4; Sample chamber, right side		Disconnect the plug and measure the resistance	Meter	2325 Ω – 2693 Ω	646 Ω – 748 Ω
E5; Sample chamber, rear wall		Disconnect the plug and measure the resistance	Meter	1539 Ω – 1782 Ω	427 Ω – 495 Ω
E6; Sample chamber, front side		Disconnect the plug and measure the resistance	Meter	311 Ω – 361 Ω	87 Ω – 101 Ω
E8; Sample chamber, base		Disconnect the plug and measure the resistance	Meter	399 Ω – 462 Ω	91 Ω – 106 Ω
Y1; Magnetic valve; CO2	Cold resistor	Loosen the connection and measure the resistance	Meter	~126 Ω	~126 Ω
Y2; Magnetic valve; O2	Cold resistor	Loosen the connection and measure the resistance	Meter	~71,5 Ω	~71,5 Ω
S2; Door switch		Loosen the connection and check the operation. Glass door open Glass door closed	Meter Switch closed Switch open	 0 Ω ∞ Ω	 0 Ω ∞ Ω

VOLTAGE TESTS (refer to the circuit diagram, connection diagram)

Item	Location	Procedure	Instrument	Result
Mains / unit voltage	X2:2 / X2:3	Disconnection the plug and measure the voltage	Meter	230 VAC or 120 VAC
Value voltage	JP5:1 / JP5:2	Loosen the connection and measure the voltage	Meter	12 VDC
Power supply O2 controller	A5 connectors	Connectors main Connectors low tension	Meter	230 VAC or 120 VAC 12 VDC
Power supply bottle turning device	A7 connectors	Connectors main Connectors low tension	Meter	230 VAC or 120 VAC 24 VDC

SAFETY TESTS (refer to the circuit diagram, connection diagram)

Item	Location	Procedure	Instrument	Result
Electrical safety test	On the unit	[1)]	Safety test instrument	
Labels, signs, nameplate			Visual inspection	Present and undamaged

[1)] Applicable documents:
Procedure instruction DA 000 001

Ausgangsspannung des Fujikura O2-Sensors bei unterschiedlichen Sauerstoff-Konzentrationen.

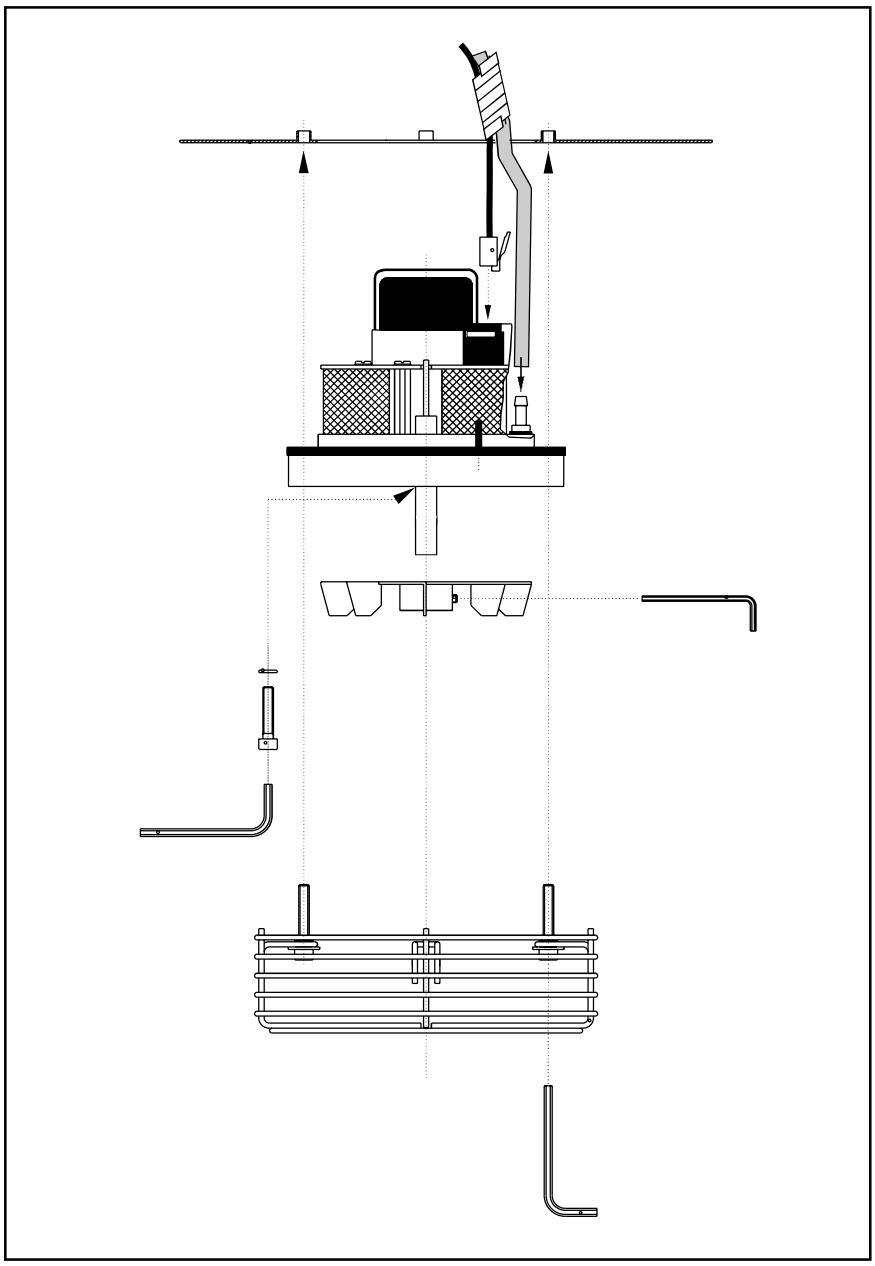
0 % O2	0,0 mV	51 % O2	835,6 mV
1 % O2	9,0 mV	52 % O2	854,0 mV
2 % O2	18,0 mV	53 % O2	872,7 mV
3 % O2	27,1 mV	54 % O2	891,9 mV
4 % O2	36,4 mV	55 % O2	711,5 mV
5 % O2	45,7 mV	56 % O2	731,5 mV
6 % O2	55,1 mV	57 % O2	752,0 mV
7 % O2	64,7 mV	58 % O2	772,9 mV
8 % O2	74,3 mV	59 % O2	794,4 mV
9 % O2	84,0 mV	60 % O2	816,4 mV
10 % O2	93,9 mV	61 % O2	839,0 mV
11 % O2	103,8 mV	62 % O2	862,1 mV
12 % O2	113,9 mV	63 % O2	885,9 mV
13 % O2	124,1 mV	64 % O2	910,3 mV
14 % O2	134,4 mV	65 % O2	935,4 mV
15 % O2	144,8 mV	66 % O2	961,2 mV
16 % O2	155,3 mV	67 % O2	987,8 mV
17 % O2	166,0 mV	68 % O2	1015,2 mV
18 % O2	176,8 mV	69 % O2	1043,5 mV
19 % O2	187,8 mV	70 % O2	1072,7 mV
20 % O2	198,8 mV	71 % O2	1102,9 mV
21 % O2	210,0 mV	72 % O2	1134,2 mV
22 % O2	221,4 mV	73 % O2	1166,6 mV
23 % O2	232,9 mV	74 % O2	1200,2 mV
24 % O2	244,5 mV	75 % O2	1235,2 mV
25 % O2	256,3 mV	76 % O2	1271,6 mV
26 % O2	268,3 mV	77 % O2	1309,5 mV
27 % O2	280,4 mV	78 % O2	1349,1 mV
28 % O2	292,7 mV	79 % O2	1390,5 mV
29 % O2	305,2 mV	80 % O2	1434,0 mV
30 % O2	317,8 mV	81 % O2	1479,7 mV
31 % O2	330,6 mV	82 % O2	1527,9 mV
32 % O2	343,6 mV	83 % O2	1578,8 mV
33 % O2	356,8 mV	84 % O2	1632,8 mV
34 % O2	370,2 mV	85 % O2	1690,3 mV
35 % O2	383,8 mV	86 % O2	1751,8 mV
36 % O2	397,6 mV	87 % O2	1817,8 mV
37 % O2	411,7 mV	88 % O2	1889,2 mV
38 % O2	425,9 mV	89 % O2	1966,7 mV
39 % O2	440,4 mV	90 % O2	2051,6 mV
40 % O2	455,1 mV	91 % O2	2145,5 mV
41 % O2	470,1 mV	92 % O2	2250,4 mV
42 % O2	485,4 mV	93 % O2	2369,4 mV
43 % O2	500,8 mV	94 % O2	2506,7 mV
44 % O2	516,6 mV	95 % O2	2669,2 mV
45 % O2	532,7 mV		
46 % O2	549,0 mV		
47 % O2	565,7 mV		
48 % O2	582,6 mV		
49 % O2	599,9 mV		
50 % O2	617,6 mV		

$$\text{Ausgangsspannung (mV)} = -891 \times \ln\left[1\left(\frac{O_2}{100}\right)\right]$$

Kendro®

Assembly instructions

Replacement of CO_2 Measuring Cell
For units equipped with thermal conductivity or infrared measuring cells



Edition: 11.2002 / 50 052 629 C

1. General

1.1 Copyright

Trademarks

Kendro Laboratory Products GmbH
Heraeusstr. 12-14
D - 63450 Hanau
Germany

1. General

1.2 Warranty

Kendro Laboratory Products only warrants the safety and operability of the HERAcell® CO_2 Incubator under the condition that:

- The unit is employed solely for its intended purpose and is operated and maintained in accordance with the information in these assembly instructions;
- No structural alterations are made to the unit;
- Only original spare parts and accessories approved by Kendro Laboratory Products are used;
- All inspection and maintenance tasks are performed at the specified intervals.

The warranty begins at the time the unit is deliverd to the ordering party.

Address:
Kendro Laboratory Products GmbH
Heraeusstr. 12-14
D - 63450 Hanau
Germany

Telephone:
Sales + 49 (0) 1805-536376
Service + 49 (0) 1805-112110

Fax:
Sales / Service + 49 (0) 1805-112114

1. General

1.3 General safety instructions

CAUTION – Contamination hazard!

The unit may be used to process infectious substances. Therefore, the unit or its individual components may be contaminated.
All unit components must be decontaminated prior to disposal!

- **Clean all unit components thoroughly then, depending of the application, either disinfect or sterilize them.**
- **A declaration of freedom from hazards, including information regarding the decontamination measures performed, must accompany the goods destined for disposal.**

NOTE – Configuration of the CO_2 measuring cell!

The HERAcell incubator has been factory-configurated to allow the thermal conductivity measuring cell to be replaced with an infrared cell or vice versa to meet your CO_2 measurement technique needs.
Both types of cells are plug-in compatible, i.e. no additional installation work or major unit adjustments are required.
The HERAcell incubator automatically recognizes the type of CO_2 measuring cell installed and is autoconfigured accordingly for version 205 and higher.

NOTE – Installation!

Assembly is only to be performed by the Technical Service of Kendro Laboratory Products or by adequately trained and authorized expert personnel.

2. Assembly overview

2. CO_2 measuring cell overview

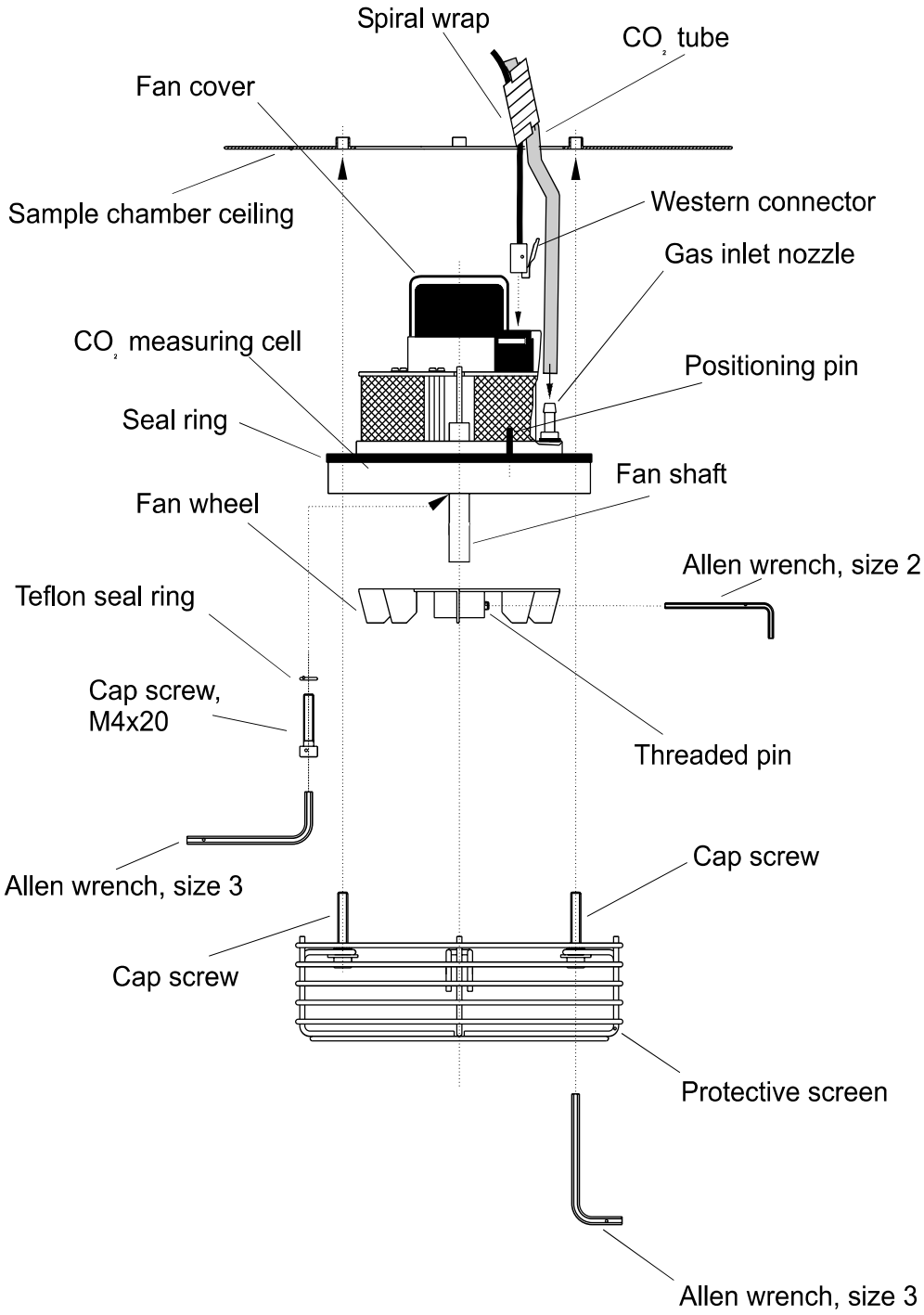


Fig.
Portrayal example: TCD measuring cell

3. Dissembly

3. CO_2 measuring cell removal

- Disconnect the CO_2 incubator from the power supply to prevent the rotating fan from accidentally causing injury or damage.
- Open the doors of the unit.
- Disassemble the protective screen: Using a size 3 Allen wrench, remove the left and right cap screws. NOTE: The seal rings help to prevent losing the screws.
- Using a size 2 Allen wrench, loosen the threaded pin on the fan wheel and pull the wheel off its shaft.
- Unscrew the cap screws at the front and rear of the measuring cell flange. It is absolutely necessary to hold the measuring cell to prevent it from dropping. Take care not to damage or lose the Teflon seal rings on the screws.
- Carefully pull out the measuring cell approx 20 cm. Note the location of the positioning pin.

CAUTION - connecting lines!

Do not let the measuring cell hang from its connecting lines.

- Unplug the Western connector that serves as the measuring cell power connection. Press down on the connector's release tab.
- Remove the CO_2 tube (Color transparent).
- Remove the air hoses (Color yellow and black).
  Only for auto-zero measuring cell.

4. Assembly

4. CO_2 measuring cell installation

- Prior to the installation, note the measuring cell alignment. The positioning pin must be positioned at the right front side (towards the unit doors).
- Install the seal ring around the stainless steel disk.

CAUTION - alignment!

The measuring cell cannot be installed if not properly aligned.

- Install the transparent CO_2 tube and secure it in the guiding groove of the electronics PCB.
- Install the air hoses (yellow and black). Note the color markings at the hose grommets. Only for auto-zero measuring cell.
- Plug the Western connector into its socket. The connector must engage audibly.
- Check the positioning of the seal ring on the measuring cell flange.
- Carefully raise the measuring cell into the ceiling opening of the inner casing. Note the location of the positioning pin.
- Make sure the connecting lines are not pinched or kinked.
- While holding the measuring cell with one hand, insert the front and rear cap screws, then tighten both screws using the size 3 Allen wrench.
- Push the fan wheel onto its shaft up to the stop, then use the size 2 Allen wrench to tighten the threaded pin.

NOTE – Blower wheel replacement

When installing the infrared measuring cell upgrade kit, the blower wheel of the device must be replaced with the blower wheel of the upgrade kit.

- Install and tighten the cap screws on the left and right of the protective screen until it is flush with the measuring cell flange. The seal rings of the screws must disappear completely into the flange.

5/6/7 Conversion / Check / Troubleshooting

5. Converting the main board

- After installing the new sensor, the resistor R37 on the main board must be removed. The resistor R37 is located at the upper right corner of the board, next to the orange 3-pole connector X10.
- For units with auto-zero measuring cell, the power supply of the air pump must be interrupted by disconnecting the connector JP 11 (center of the main board).
- Disconnect the air pump connector (only for IR measuring cell upgrade).

6. CO_2 measuring cell operational check

- Connect the CO_2 incubator to the mains power supply and switch it on.
- Note the processor version shown on the unit display. Version P002 with ³ 15 must be indicated.
- For units with IR measuring cell, the display shows "IR" for 5 minutes.
- After the initialization phase has been completed, the fan wheel must rotate smoothly.
- To restart the unit, initiate the auto-start routine.
- Adjust the temperature as described in the operating instructions.

7. Troubleshooting

Problem:	Possible cause:	Corrective action:
Processor version P002 is shown as 000.	Western connector not properly engaged.	Unplug the connector, then plug it in again.Engagement must be audible.
Unit beeps after it is switched on.		
The unit display shows [= = =] after 1 minute.		
Fan wheel not turning or turning very slowly.	CO_2 tube and/or metering cable wires are lying against the fan motor.	Disassemble the measuring cell. Check the position of the CO_2 tube in the guide groove. When reinstalling the cell, make sure the cell's wiring is not obstructed in the sample chamber ceiling opening.

4.14.5 ADJUSTMENTS - IR SENSOR

Calibrating the sensor:

The IR – absorption – sensor is a high precision measurement instrument, therefore, extreme care must be taken when performing any work on the measurement system. Due to the non-linear nature of the sensor signal characteristic curve, the effects of an incorrect zero-point calibration are far greater than is the case with the TCD measuring cell, which has a linear characteristic curve.
The sensor should be recalibrated whenever the zero-point deviates by more than ± 0,3 % CO_2.

All water must be completly removed from the incubator before attempting to calibrate the sensor, as CO_2 dissolved in water will falsify the measurement result.
Prior to calibrating the sensor, a reference device must be employed to ensure that the device setup area is not being artificially enriched with CO_2 as a result of inadequate ventilation.

Zero-point calibration: CO_2 -- controller

1. Remove all water from the device.
2. Select the function level:
   Simultaneously press the i; cal and auto-start keys and hold them for 5 sec.
   The programm shifts to function level 0.
3. Continue pressing the cal – key and use the arrow keys to select function level 4.
4. Repeatedly press cal – key to select sublevel 3.
   Display 0 (on the temperature display)
   Display 3 (on the CO_2 – display)
5. Activate the sublevel: Using the arrow keys, set the upper display, 0.
6. Release the keys.
7. The device rests the CO_2 display to 0.
8. Press any key to return to the normal display.

Operating point calibration: CO_2 – controller

After recalibrating the zero-point, you must calibrate the operating point. This procedure is similar to the customer adjustment of the TCD measuring cell.

1. Add CO“ until the gas concentration in the device reches the operating point (e.g. 5%). The actual value must remain stable at 0,1 %. Since the IR sensor does not indicate the influence of moisture, you need not wait until the humidity in the chamber has built up.
2. Press the cal – key for 5 sec. All displays flash.
3. Press the % CO_2 key (e.g. 5.0 %)
4. Use the arrow keys to adjust the measured value. (e.g. 5.4)
5. Press the cal – key to acknowledge the value. The display briefly shows cal, followed by the correct actual value.
6. Press any key to exit the adjustment routine.

4.6 ERROR TABLE

Aside from the current error, outputting the unit's error history may be helpful in correcting a problem.
To output the last 10 errors, press the i and the ▲ / ▼ keys. The most recent error is displayed in position 1, the oldest in position 10 (refer to the section on error storage in the operating instructions).

Error table		
Code	**Cause**	**Fault condition**
═══	Communications between display mP and main board interrupted.	The display is not receiving display values from the master processor.
42	Main board NVRAM read error	Default values were loaded.
43	Main board NVRAM read error	The mirrored values were loaded.
44	NVRAM defect	Values of the measuring cell are not overwritten, unit runs using default values
54	Set value error	Error in the calculation of the ser values. The processor performs a "reset".
55	I²C bus error	Data transfer to the I²C bus interrupted.
66	Deviation between temperature probe PT1000 and LM 75 is too large. (No longer plausible.)	The validity of the temperature signals is no longer assured because the permissible deviation between the measured values for: The incubation mode are >± 2 °C, or; The decontamination mode are >± 5 °C.
77	CO_2 calculation range exceeded.	• The offset value for the CO_2 adjustment made by the cal function exceeds the maximum permissible adjustment range of ± 10.0 % CO_2 • The calculated temperature adjustment factor exceeds the maximum permissible adjustment range of 0.8 ... 1.2.
88	auto-start error	The total running time (1080 min.) has passed without the routine concluding, or the maximum CO_2 countervoltage adjustment value has been exceeded.
99	Glass door open or door switch defective.	The door or door switch have remained in the "open" state for more than 10 min. (The door switch contact is closed when the glass door is open!!)
100	Temperature below set value	Actual value < set value - 1.0 °C
101	Temperature above set value	Actual value > set value + 1.0 °C (Sample protection function active.)

104	Temperature probe PT1000 or digital temperature sensor LM 75 defective.	Probe break or sensor short-circuit
200	CO_2 below set value	Actual value < set value - 1.0 % CO_2
201	CO_2 above set value	Actual value > set value + 1.0 % CO_2
204	CO_2 measuring cell defective	Sensor break or short-circuit, or infrared measuring cell defective.
205	Humidity sensor probe break	Humidity sensor in the sensor block defective.
300	O_2 below set value	Actual value < set value - 1.0 % CO_2 (1.0 adjustable and halved for values < 2%)
301	O_2 above set value	Actual value > set value + 1.0 % CO_2
304	O_2 measuring cell defective	Sensor break or sensor short-circuit
400	Water level alarm	Water level in the base pan too low.
500	90°C temperature below set value	Actual value < set value - 5 °C
501	90°C temperature above set value	Actual value > set value + 5 °C (Unit will be completely shut down.)
502	Error in the 90 °C decontamination routine	Mains interrupt during the decontamination routine.

4.7 ERROR EXAMINATION AND REGULATING CIRCUIT SCHEMATICS

4.7.1 GENERAL ERRORS:

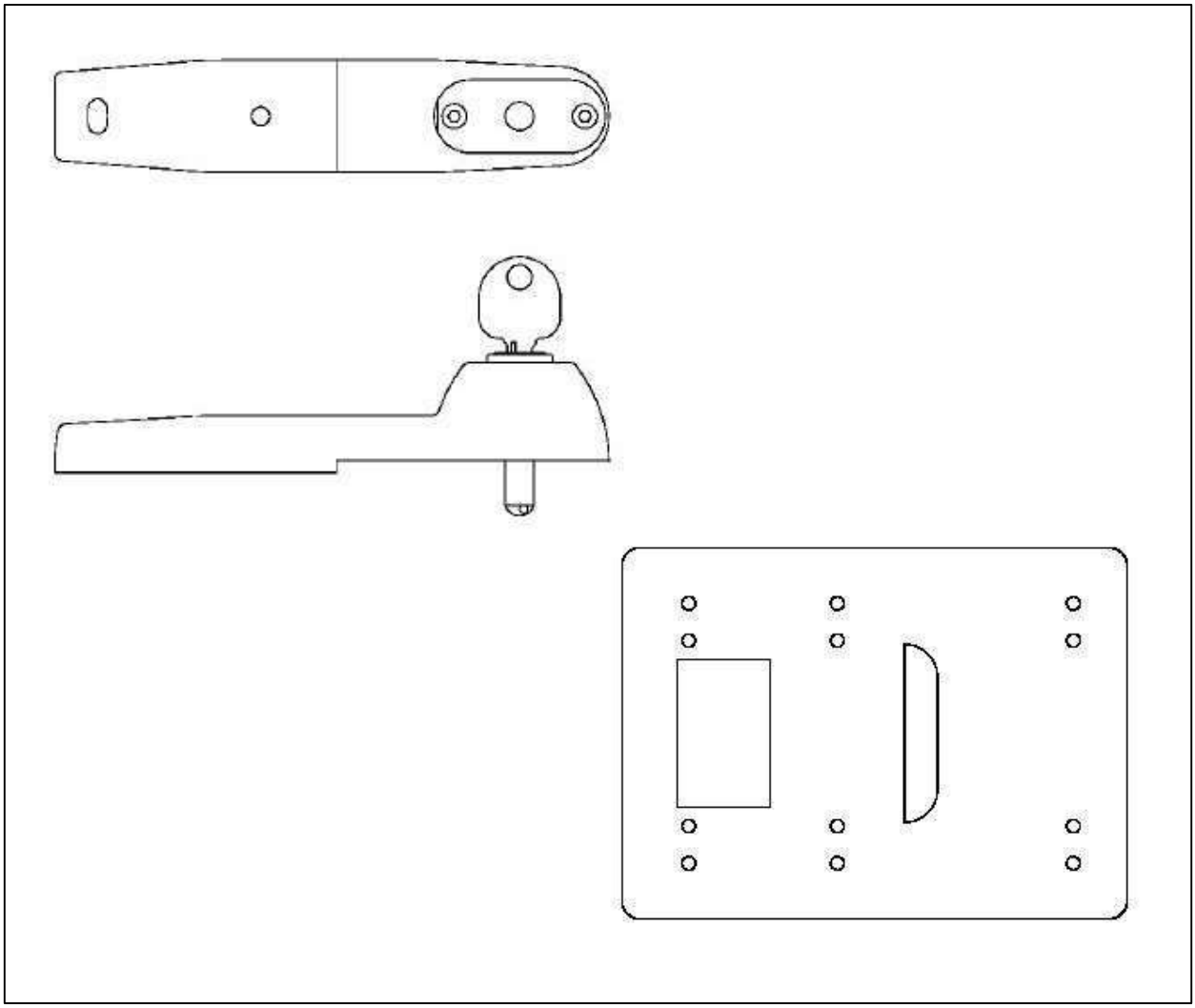
General errors are those that cannot be assigned to a specific regulating circuit.

Error code	Test equipment / Test at the unit	Inspections and tests	Possible corrective actions
⩵	Multimeter	▪ Check the power supply to the O2 board and flask rotating equipment.	• Replace the mains power supply unit.
	Bus cable and display PCB both in working order.	▪ Switch the unit off. ▪ Disconnect the bus cable to the display PCB at the main board. ▪ Attach the test set (cable/display PCB). ▪ Switch the unit on. ▪ Perform the functional test.	Test set operational: • Repeat the functional test of the individual installed components. Replace the cable or display PCB. Test set not operational: • Replace the main board.
44		▪ Switch unit off then on. ▪ Check if error reoccurs.	▪ Replace the measuring cell.
42			Replace the main board.
43		Switch the unit off, then on. Check if the error reoccurs.	Replace the main board.
54		Check the error list.	If the error reoccurs, inform the factory (Q).

55	Multimeter	▪ Check the power supply to the O2 board and flask rotating equipment.	• Replace the mains power supply unit.
	Bus cable and sensor block both in working order.	▪ Switch the unit off. ▪ Disconnect the bus cable to the sensor block at the main board. ▪ Attach the test set (cable/sensor block). ▪ Switch the unit on. ▪ Perform the functional test.	Test set operational: • Repeat the functional test of the individual installed components. Replace the cable or sensor block. Test set not operational: • Replace the main board.
99	Ohmmeter	▪ The door switch contact is closed when the glass door is open! ▪ Perform the functional test at the main bard input.	▪ If defective: Replace the door switch. • If defective: Replace the main board.
77		Error in the CO_2 cal range: ▪ Initiate an auto-start. Temperature adjustment error:	▪ If the error reoccurs, replace the measuring cell. ▪ Replace the measuring cell.
88		▪ Check the setup location (drafty, direct sunlight, etc.)	▪ If necessary, change the setup location/conditions. ▪ Replace the measuring cell.

Assembly Instruction

Lockable door for HERAcell®, HERAcell® 150 and HERAcell 240



Edition: 09.2003 50072431 A

Index

1. General Information

This assembly instruction describes the process for retrofitting the CO_2 incubators HERAcell®, HERAcell® 150 and HERAcell® 240.

This door lock can be retrofitted to all CO_2 incubators HERAcell, HERAcell 150 and HERAcell 240.

The device must be removed from service to perform the retrofit work.

The device should be standing on a firm base.

2. Scope of supply

- Pos. 10 Door lock 1 pc.
- Pos. 20 Drilling jig 1 pc.
- Pos. 30 Screw M4 x 20 2 pc.
- Pos. 40 Screw B3, 9 x 19 2 pc.
- Pos. 50 Washer A4, 3 2 pc.
- Pos. 60 Assembly instruction 1 pc.

3. List of tools required

- Screwdriver for slotted head screws
- Screwdriver for positive head screws
- Hammer
- Center punch
- Waterproofed pen
- Power drill
- Drill, 3 mm diameter
- Drill, 6 mm diameter
- Drill, 8 mm diameter
- Counter sink

4. Retrofit door lock

4.1 HERAcell, HERAcell 150 and HERAcell 240; non stacked devices

1. Unscrew the front stacking element of the unit.

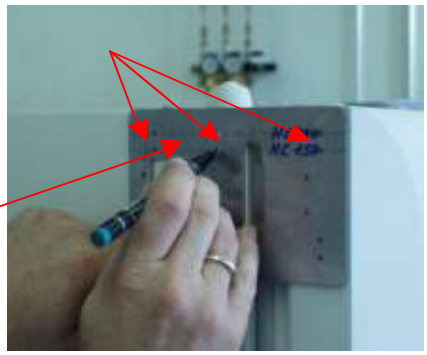
2. Remove the adjacent cap of the outer door.

3. Mount the door lock using the screws and washers supplied.

4.2 HERAcell and HERAcell 150; door lock above

1. Place the drilling jig flush with the top of the outer casing.

2. Mark the position of the three holes with the marker pen.

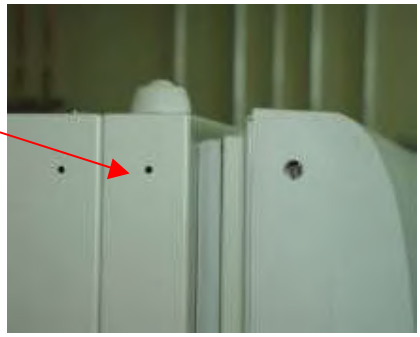


3. Before drilling the holes use a centre punch to mark the position.

4. Drill the marked positions with a 3 mm drill.

5. Open up the hole in the door, first with a 6 mm drill and then with an 8 mm.

6. Holes for the door lock.

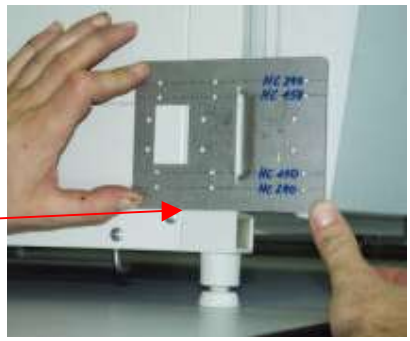


7. Mount the door lock with the screws and washers provided.

4.3 HERAcell and HERAcell 150, door lock below

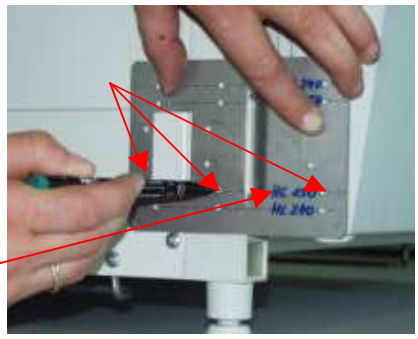
1. Place the drilling jig on the upper edge of the power switch housing.

Flush with the housing



2. Mark the position of the three holes with the marker pen.

For HERAcell / HERAcell 150 second row from the bottom.



3. Before drilling the holes use a centre punch to mark the position.

4. Drill the marked positions with a 3 mm drill.

5. Open up the hole in the door, first with a 6 mm drill and then with an 8 mm.

6. Holes for the door lock.

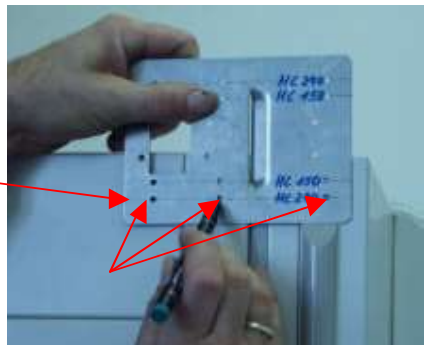
7. Mount the door lock with the screws and washers provided.

4.4 HERAcell 240, door lock above

1. Place the drilling jig flush with the top of the door handle.

Flush with the top of the door handle

2. Mark the position of the three holes with the marker pen.



For HERAcell 240 use the bottom row.

3. Before drilling the holes use a centre punch to mark the position.

4. Drill the marked positions with a 3 mm drill.

5. Open up the hole in the door, first with a 6 mm drill and then with an 8 mm.

6. Counter sink the hole.

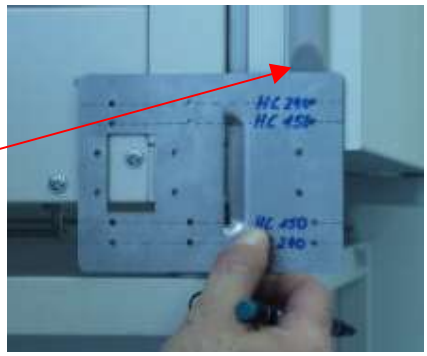
7. Holes for the door lock.

8. Mount the door lock with the screws and washers provided.

4.5 HERAcell 240, door lock below

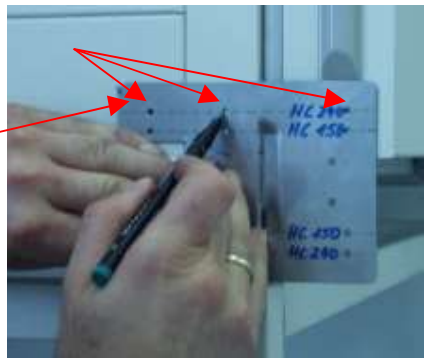
1. Place the drilling jig flush with the bottom of the door handle.

Flush with the bottom of the door handle



2. Mark the position of the three holes with the marker pen.

For HERAcell 240 use the top row.



3. Before drilling the holes use a centre punch to mark the position.

4. Drill the marked positions with a 3 mm drill.

5. Open up the hole in the door, first with a 6 mm drill and then with an 8 mm.

6. Counter sink the hole.

7. Holes for the door lock.

8. Mount the door lock with the screws and washers provided.

Address
Kendro Laboratory Products GmbH
Robert-Bosch-Strasse 1
D – 63505 Langenselbold
Telefone
Sales & Service: + 49 (0) 6184 / 90-6940
Fax
Sales & Service: + 49 (0) 6184 / 90-7474

http://www.kendro.com

Address
Kendro Laboratory Products Inc.
275 Aiken Road
Asheville, NC 2884 USA
Telephone
Sales & Service: + 1 800 / 879-7767
Fax
Sales & Service: + 1 828 / 658-0363

http://www.kendro.com

SAUERSTOFFSENSOR UND GASBEFEUCHTUNGSEINRICHTUNG

OXYGEN SENSOR AND GAS HUMIDIFIER

Beschreibung:

Vor Inbetriebnahme des Geräts müssen der Sauerstoffsensor und die O_2 Befeuchtungseinrichtung installiert werden.

Sauerstoffsensor

1. Stecken Sie den Sauerstoffsensor in die Steckverbindung (verpolungssicher) im hinteren Bereich der Decke des Gerätes. (Bild 1)

Gasbefeuchtungseinrichtung

2. Ziehen Sie zuerst den Schlauch über die Tülle der Gasbefeuchtungseinrichtung.
3. Stellen Sie dann die Gasbefeuchtungseinrichtung in das Gerät (hinten rechts, parallel zur Geräterück-wand) und stecken jetzt den Schlauch auf die Tülle der Gaszuführung. (Bild 2)

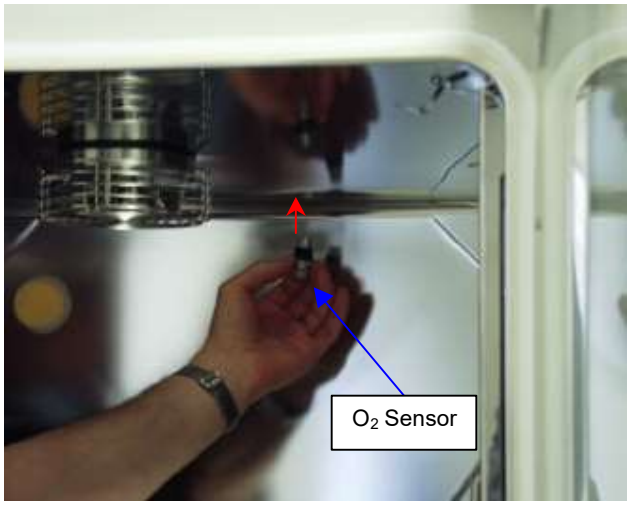


Abb. 1 / Picture 1

Achtung:
Der Sauerstoffsensor ist nur in den HERAcell 240 einzusetzen und darf nicht in einen anderen CO_2 Inkubator Typen eingebaut werden. Eine eindeutige Zuordnung des Sensorkopfs zum Gerät ist durch die Typennummer auf dem Sensorkopf und dem Typenschild des Gerätes gewährleistet.

Deutschland
Anschrift
Kendro Laboratory Products GmbH
Heraeusstr. 12 – 14
D – 63450 Hanau
Telefon
Vertrieb: + 49 (0) 1805 – 536 376
Service: + 49 (0) 1805 – 112 110
Fax
Service & Vertrieb: + 49 (0) 1805 – 112 114

Description:

Before initial operation the oxygen sensor and O_2 humidifier must be installed.

Oxygen sensor

1. Plug the oxygen sensor into the socket located at the back of the top of the inner housing. (Picture 1)

Gas humidifier

2. First assemble the gas humidifier by pushing the tube over the nozzle.

3. Then place the gas humidifier assembly in the chamber (rear right, parallel to the rear wall) and connect the tube to the gas supply nozzle. (Picture 2)

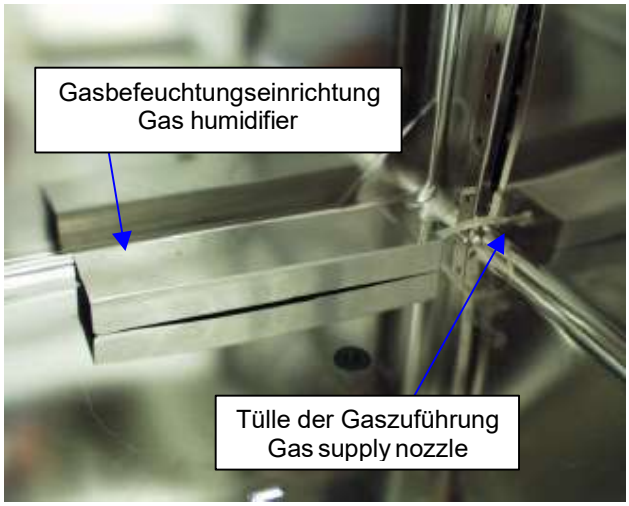


Abb. 2 / Picture 2

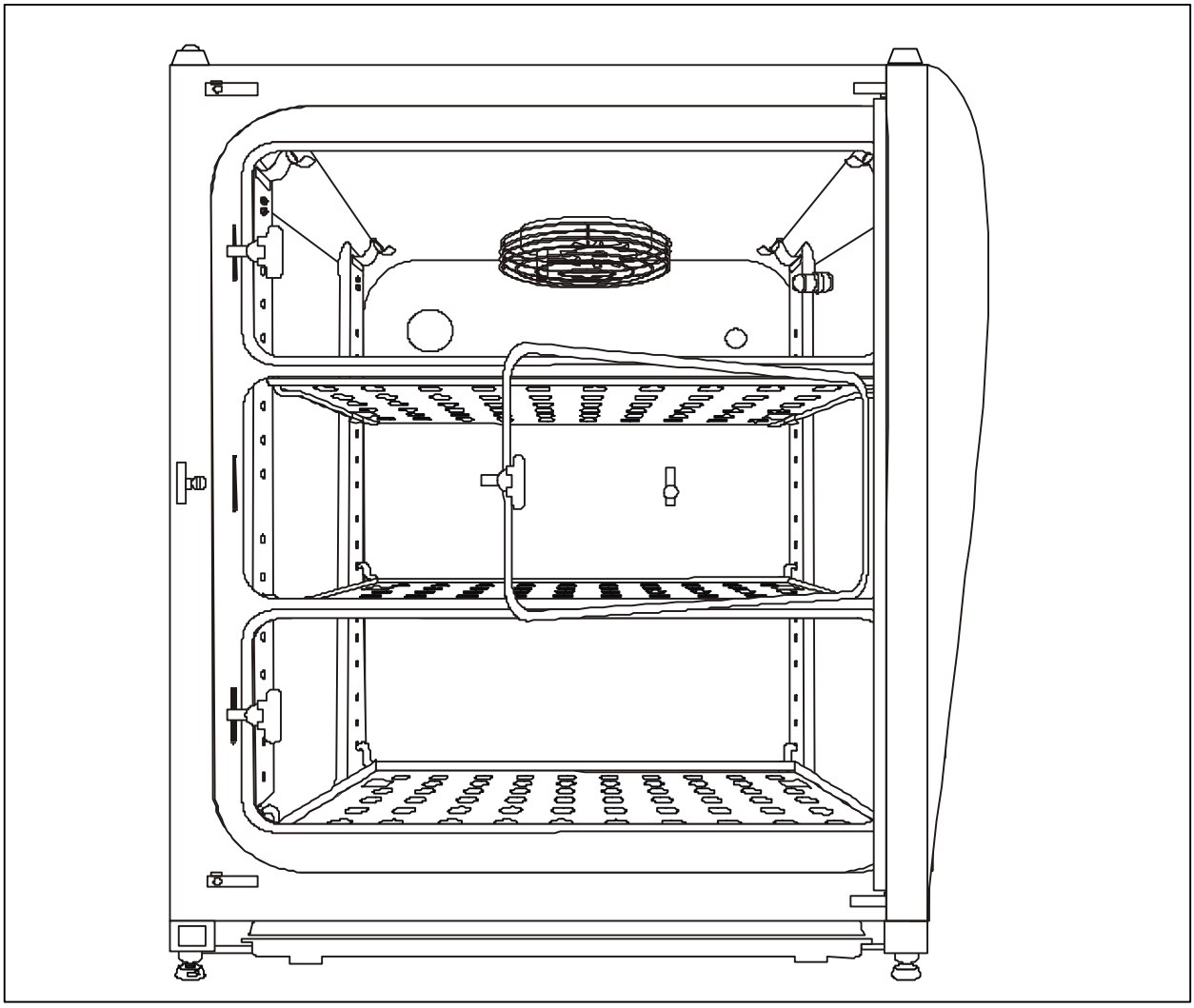
Attention:
The oxygen sensor is designed specifically for HERAcell 240, and is not to be used in other CO_2 incubators. For clear identification the sensor and the unit are serialized together.

USA
Address
Kendro Laboratory Products; Inc.
31 Pecks Lane
Newton, CT 06470

Telephone: 1 – 800 – 522 - 7746
Fax: 1 – 203 – 270 - 2210

Installation Instructions

Gas Tight Screen for the HERAcell® and HERAcell® 150, Retrofit



Version: 07.2003 / 50078424

1. General Information

These installation instructions describe the prozess for retrofitting the HERAcell® and HERAcell® 150 CO_2 incubators with a gas tight screen.

List of Required Tools

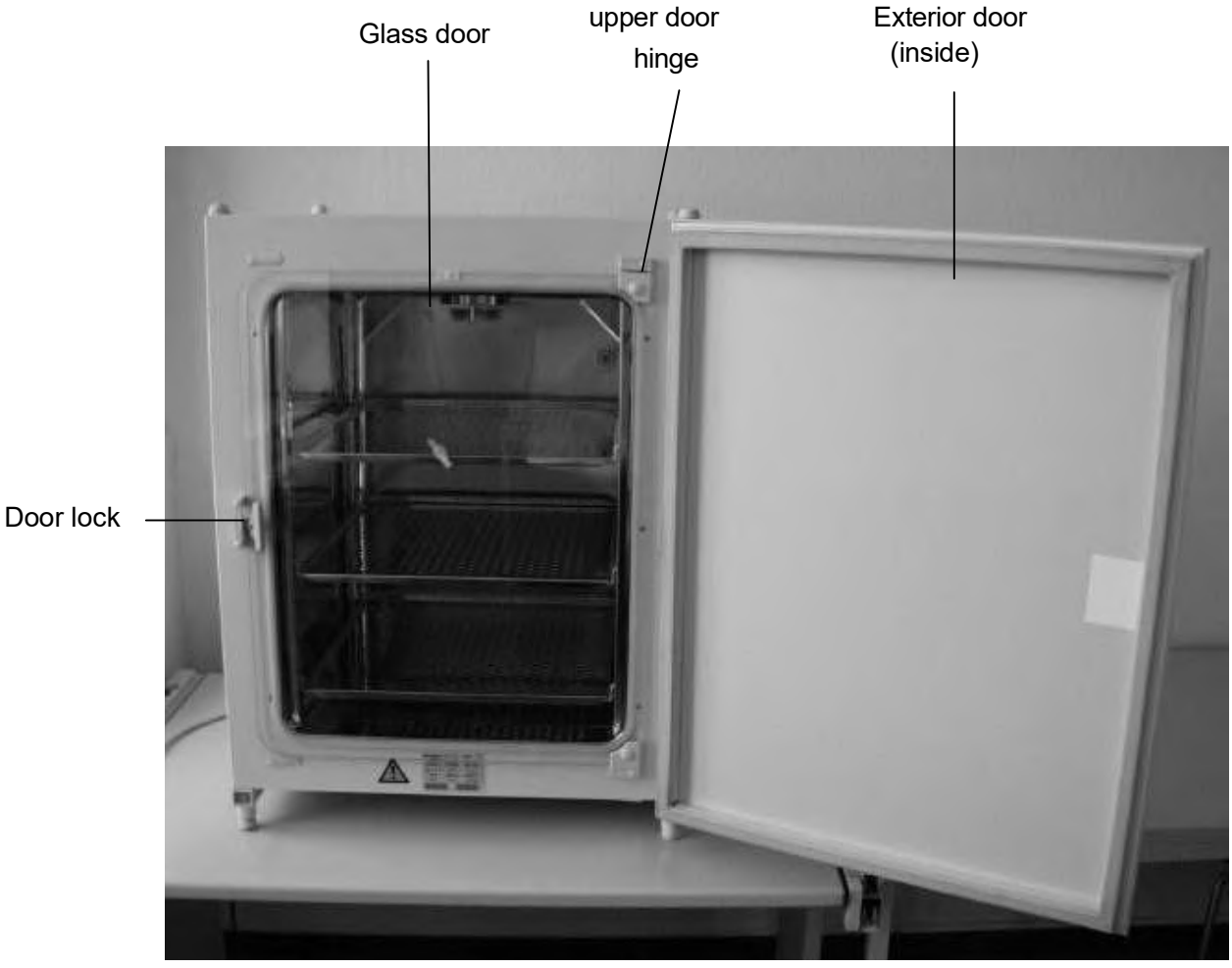
- Knife
- Allen key (Größe 3 mm)
- Phillip´s Head screwdriver
- DThin nail ∅ 1 mm

- Drilling machine (for HERAcell)
- Drill with 3 mm diameter (for HERAcell)

2. Device Preparation

1. The device must be taken out of action to perform the retrofit work.

2. The device should be standing on a firm base.



3. HERAcell® and HERAcell® 150 Gas Tight Screen Retrofit

3.1 Remove the Glass Door

1. Open the exterior device door.

2. Using the knife, CAREFULLY pry off the cover panels on the upper and lower door hinges.

3. Remove the Allen screw (3 mm) on the upper door hinge. The glass door shouls still be closed during this step.

4. Open the glass door and remove it. To do this, push the door hing to the right ? and pull it forward ? towards yourself.

5. Remove the door hinge from the shaft.

6. Carefully place the glass door in a safe location
Please take care that the washers do not get lost.

3.2 Gas Tight Screen Installation

1. Insert the gas tight screen with the **2 washers** into the door hinge. Close the gas tight screen.

2. Now insert the upper door hinge onto the gas tight screen shaft. Secure the door hinge with the Allen screw.

3. Clip the cover panels back onto the door hinges. If the panels broke during removal, install new ones.

3.3 Angel Bracket and Switch Activator Installation for HERAcell 150

1. Remove the plastic rivets from the inside of the door.

1.1 Using a thin nail, puncture the center of the rivets inwards.

1.2 Using the kife, CARREFULLY pull the rivets out.

2. Using the Phillip´s head screwdriver, mount the angle bracket on the inside of the exterior door.

Fig. 1 – For doors with stops on the right. The edge must face left.

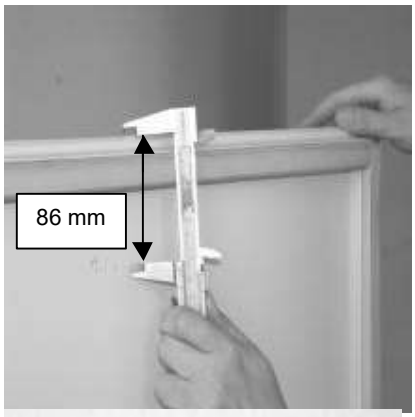
Fig. 2 – For doors with stops on the left. The edge must face right.

3. Using Phillip´s head scres, mount the shackle (serves as switch activator) on the inside of the exterior door.

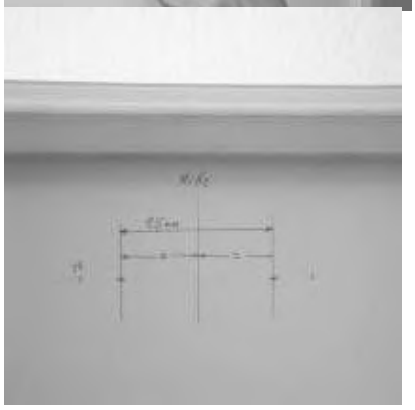
4. Clip the cover panels into the shackle.

3.4 Angel Bracket and Switch Activator Installation for HERAcell

1. For drilling the holes of the switch activator, the exactly position of the holes must be observed.



For that purpose in a distance of **86 mm** to the upper door edge a horizontal mark must be sketched.



Please measure the middle of the door.
On each site of the middle (left and right) in a distance of **42,5 mm** a mark must be sketched.

On this marks two holes with **D=3 mm** muts be drilled.
Pleas look that the drill penetrates **max. 10 mm**. (when the drill penetrates deeper, the board could be damaged)

4. Using Phillip´s head scres, mount the shackle (serves as switch activator) on the inside of the exterior door.

3.5 Configuration control- and rule system (softwareversion ≤ 202)

Beside the installation of the gas tight screen you have to configure the appropiate set of parameters.
Enter **funktion level 601** and choose the right set of the parameters.

Information:
After switching on the incubator, the actual set of the parameters is indicated during the start routine.
Upper display: Pr
Lower display: Parameter

General description	Input
1. To access the function levels simultaneously press the **cal** – key, the **i** – key, and the **auto-start** – key, and hold them down for at least 5 seconds. The programm enters function level 0.	
2. To move to the various function levels, press and hold down the **cal** – key and use the ▲ - key.	Go to function level 601.
3. To access a particular sublevel, press and release the **cal** – key until you rech the desired sublevel.	1. Enter sublevel 2. See chart 1 function level 601. Press the **cal** and ▲ - key. Set value 1. (Set of parameters unlocked) 2. Enter sublevel 1. See chart 1 function level 601. Enter the appropiate set of parameters for the incubator, press **cal** and ▲-key see chart 2. See example.
4. After changing the set of parameters the unit restarts. If nothing has been changed continue with 4.1. 4.1 To exit the function level: - Press the **°C** – key or the . **% CO_2** – key or – wait 5 seconds without pressing . a key.	

Chart 1: function level 601

601	Configuration of the unit		
	FE position	FE value range	Description
	1	1 ... 20	Set of parameters, No.
	2	0 1	Set of parameters interlocked Set of parameters unlocked
	3	0 1	Low humidity not configured Low-humidity configured

Chart 2: Set of parameters

Assignments of sets of parameters to the unit types		
Set of parameters, No.	Unit	Description
1	HERAcell 150, 230 V, VA	
2	HERAcell 150, 230 V, Cu	
3	HERAcell 150, 120 V, VA	
4	HERAcell 150, 120 V, Cu	
5	HERAcell 240, 230 V, VA	
6	HERAcell 240, 230 V, Cu	
7	HERAcell 240, 120 V, VA	
8	HERAcell 240, 120 V, Cu	
9 10 11 12	HERAcell 240, 230 V, VA HERAcell 240, 230 V, Cu HERAcell 240, 120 V, VA HERAcell 240, 120 V, Cu	Set of parameters for gas tight screen (booster switched off)

Example

FE = function level

without gas tight screen: HERAcell® 240, 230 V, VA
function level 601 configuration of the unit
lower level FE position 1 => **FE value range: 5**

with gas tight screen: HERAcell® 240, 230 V, VA
function level 601 configuration of the unit
lower level FE position 1 => **FE value range: 9**

without gas tight screen: HERAcell® 240, 120 V, Cu
function level 601 configuration of the unit
lower level FE position 1 => **FE value range: 8**

with gas tight screen: HERAcell® 240, 120 V, Cu
function level 601 configuration of the unit
lower level FE position 1 => **FE value range: 12**

3.6 Configuration control- and rule system (softwareversion 210)

Beside the installation of the gas tight screen you have to configure the appropiate set of parameters.
Enter **funktion level 21** and choose the right set of the parameters.

Information:
After switching on the incubator, tha actual set of the parameters is indicated during the start routine.
Upper display: Pr
Lower display: Parameter

General description	**Input**
1. To access the function levels simultaneously press the **cal** – key, the **i** – key, and the **auto-start** – key, and hold them down for at least 5 seconds. The programm enters function level 0.	
2. To move to the various function levels, press and hold down the **cal** – key and use the ▲ - key.	Go to function level 21.
3. To access a particular sublevel, press and release the **cal** – key until you rech the desired sublevel.	1. Enter sublevel 2. See chart 1 function level 21. Press the **cal** and ▲ - key, set value 1. (Set of parameters unlocked) 2. Enter sublevel 4. Press the **cal** and ▲ - key, set value 1. 3. Enter sublevel 10. Press the **cal** and ▲ - key, set value 1. (writing EPROM)
4. After changing the set of parameters the unit restarts. If nothing has been changed continue with 4.1. 4.1 To exit the function level: - Press the **°C** – key or the . **% CO_2** – key or – wait 5 seconds without pressing . a key.	

Chart 1: function level 21

21	Configuration of the unit		
	FE position	FE value range	Description
	1	0 = Heracell 150 1 = Heracell 240	Configure unit size
	2	0 = Stainless steel 1 = Copper	Configure innercasing material
	3	0 = 230 Volt 1 = 120 Volt	Configure mains voltage
	4	0 = not installed 1 = installed	Configure gas tight screen
	5	0 = no O_2 1 = 5 ... 90% O_2 2 = 1 ... 21% O_2	Configure O_2
	6	0 = not installed 1 = installed	Configure bottle turning device
	7	0 = standart TCD or IR 1 = Auto-Zero-measuring cell	Configure installed measuring cell
	8	0 = not installed 1 = installed	Configure water level sensor
	9	0 = inactive 1 = active	Configure low humidity option
	10	0 = not installed 1 = installed	Gas guard CO_2
	11	0 = not installed 1 = installed	Gas guard O_2/N_2
	12	0	- without function -
	13	0	- without function -
	14	0	- without function -
	15	0	- without function -
	16	0	- without function -
	17	0	- without function -
	18	0	- without function -
	19	0	- without function -
	20	0 / 1	Start write pocess
	21	0 / 1	Security bit for position 1-10
For initial configuration only ! Using this function will overwrite all unit adjustments on the main board!			

When FE 601 is called up, the system jumps to FE 21

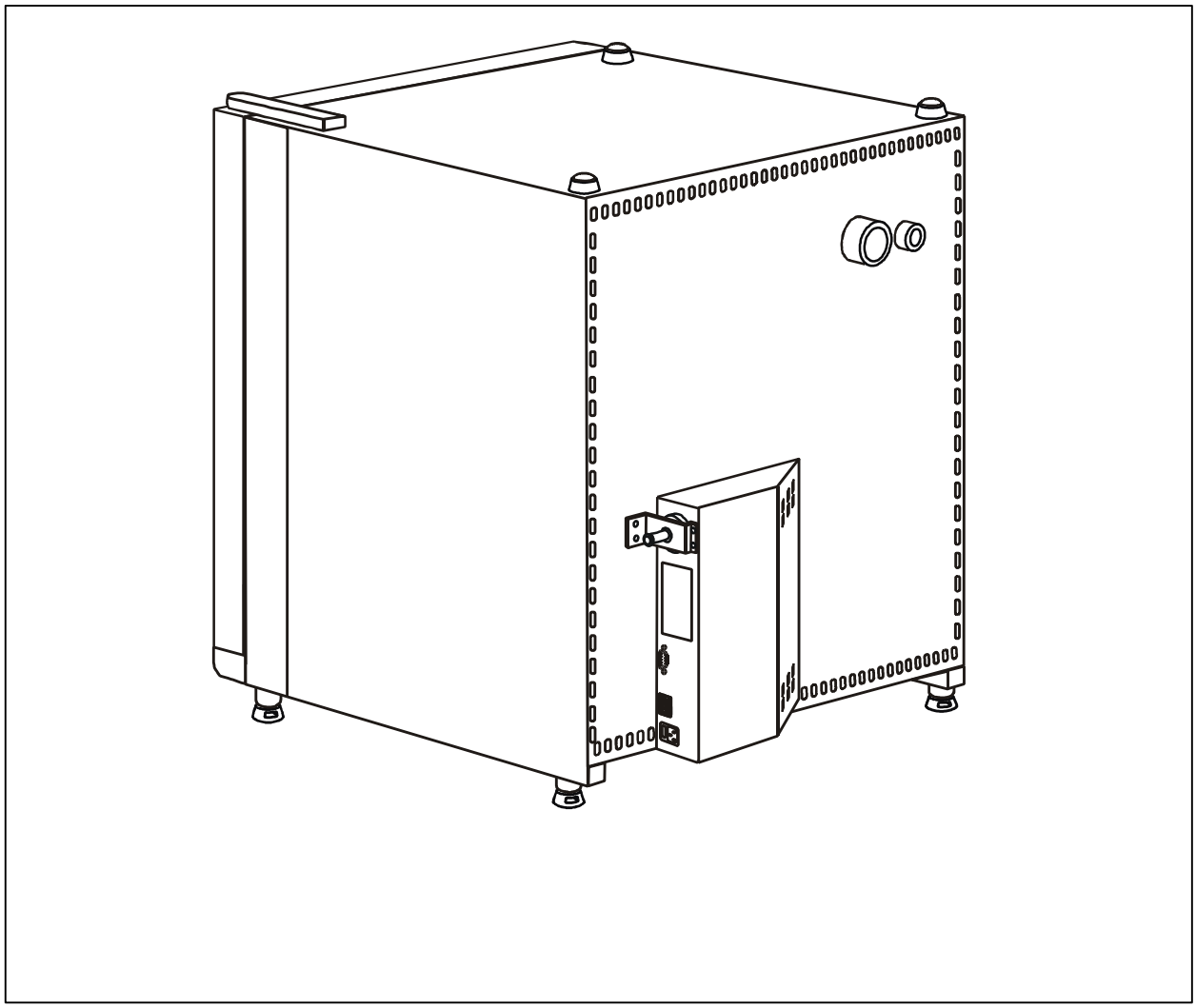
Anschrift:
Kendro Laboratory Products GmbH
Robert – Bosch - Straße 1
D - 63505 Langenselbold
Deutschland

Telefon:
Vertrieb + 49 (0) 1805-536376
Service + 49 (0) 1805-112110

Fax:
Vertrieb/
Service + 49 (0) 1805-112114

Assembly Instructions

HERAcell®, HERAcell® 150 and HERAcell® 240, Main PCB Replacement



Version: 12.2003 / 50073246 / D

Contents

1. General Information

These Installation Instructions describe the procedure for replacing the main PCB for the HERAcell®, HERAcell® 150 and HERAcell® 240 CO_2 incubators with decontamination routine.

Device retooling tasks may only be performed by Kendro Service or specialist personnel authorized by Kendro.
Should retooling be performed by anyone other than authorized service personnel, all warranties provided by Kendro Laboratory Products GmbH will become void.

At the end of the replacement procedure, an electrical safety test in accordance with DIN VDE 0701, Part 1, must be performed.

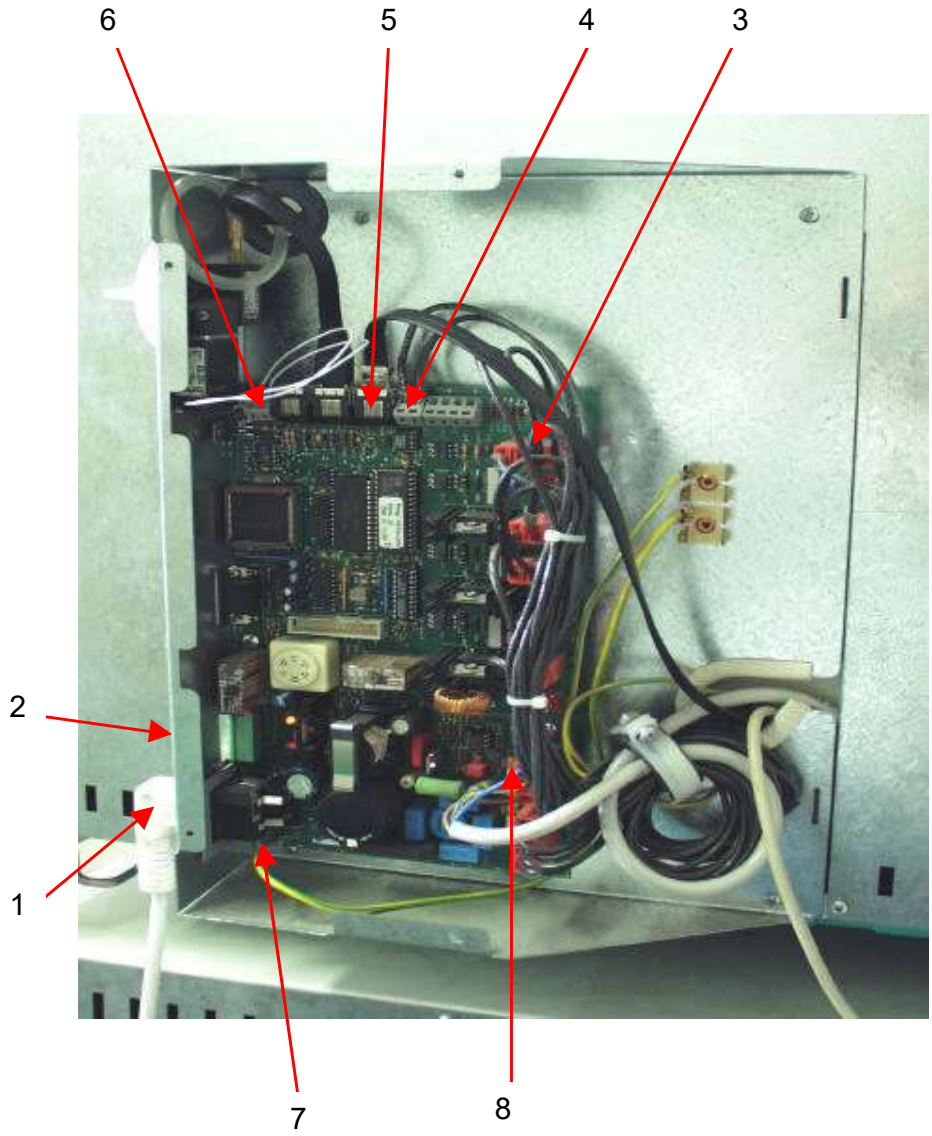
List of Required Tools and Aids

- Screwdriver, Philips-head, size: 1+2, Philips Recess system
- Socket wrench (5 mm)
- Narrow screwdriver

2. Preparation

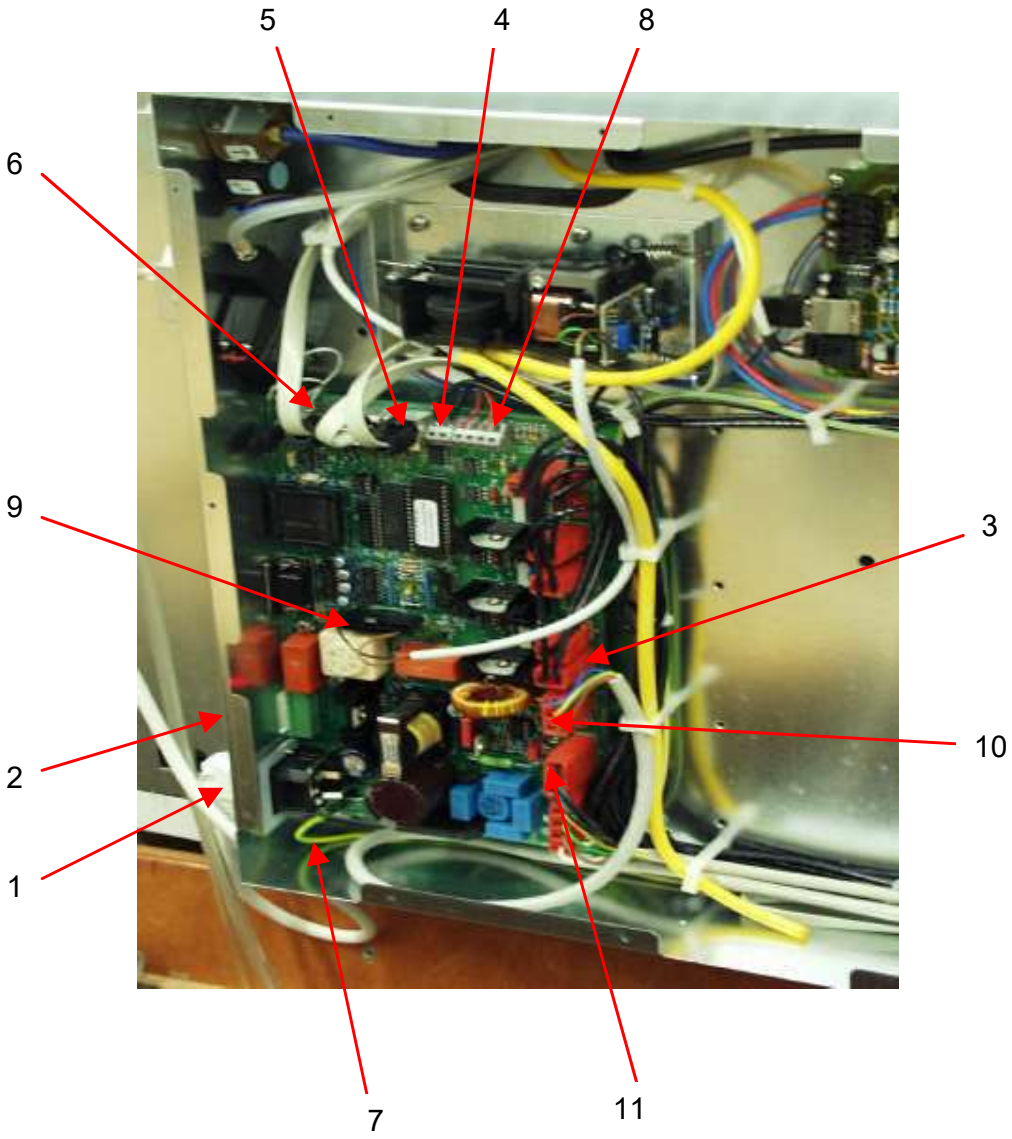
The device should be positioned on a stable base (table, bench).

2.1 Rear View (units without any options, small control box)



1 Mains power plug
2 Alarm output
3 Mains power circuit (orange connector)
4 Terminal, door switch
5 Bus cable
6 Terminal, CO_2 solenoid valve
7 Ground connection
8 Connector for door heater

2.2 Rear View (units with options or with large control box)



1	Mains power plug
2	Alarm output
3	Mains power circuit (orange connector)
4	Terminal for door switch
5	Bus cables (max. 3 pcs.)
6	Terminal for CO_2 solenoid valve
7	Ground connection
8	Terminal for water level sensor
9	Connector for „auto-zero“ air pump
10	Connector for door heater
11	Connector for additional power supplies.

3. Main PCB Replacement

3.1 Disconnecting the Device from the Mains Power Supply

1. Switch the device off at the main power switch.
2. Unplug the mains power cord and secure it to prevent accidental reconnection.

3.2 Removing the Main PCB

1. Remove the circuit box cover.
2. Remove the interface retainer screws.
3. Remove the Philips head screw on mains inlet connector.
4. Unplug the orange plug-in connector (X2 – X10) for the mains power circuit on the PCB.
5. Disconnect the two door switch leads from terminal block JP2. To do this, press on the spring terminals with a small screwdriver.
6. If installed, disconnect the four water level sensor leads from terminal block JP1. To do this, press on the spring terminals with a small screwdriver.
7. Unplug the bus cables at the plug-in connections (JP3 / JP4 / JP 15). Press the lockinng hook on the connectors to release.
8. Disconnect the two CO_2 solenoid leads from terminal block JP5. To do this, press on the spring terminal with a small screwdriver.
9. If installed, unplug the air pump leads at connector JP 11. Press the lockinng hook on the connectors to release.
10. Unplug the green/yellow ground wire at the PCB.
11. Using a Philips head screwdriver, remove the PCB retainer screws (7 screws).
12. Remove the main PCB from the circuit box.

3.3 Installing the New PCB

1. Install the new PCB in the reverse order to the removal instructions given in Section 3.2.
2. An electrical safety check must be performed after electrical components have been removed / installed.

3.4 Restarting the Device

1. Plug the mains power cord into the mains inlet connector.
2. Switch the device on at the mains power switch.
3. Resume normal operations.

3.5 Configuration Settings (units without any options, small control box)

The following appear when the device is switched on:

- The green lamp incorporated the mains power switch lights up.
- 8-digit check of both displays, and all LEDs are on.

If High/Low humidity has been configured, the associated LED will also light up during the 8-digit check.

- The version of the current software will be displayed:

P 1 (display PCB):	e.g., 004, that is, Version 4
P 2 (sensor PCB):	e.g., 015, that is, Version 15
P 3 (main PCB):	e.g., 202, that is, Version 202
Pr (parameter set)	e.g.. 004, that is HERAcell, 120V, Cu

The device then displays the current actual values of temperature and CO_2.

- Next, select the appropriate parameter set for your unit from the table below:

Device assignment to the control parameter sets		
Parameter set no.	Device	Note
1	HERAcell, 230 V, SS	SS = stainless steel
2	HERAcell, 230 V, Cu	
3	HERAcell, 120 V, SS	SS = stainless steel
4	HERAcell, 120 V, Cu	
5	HERAcell 240, 230 V, SS	SS = stainless steel
6	HERAcell 240, 230 V, Cu	
7	HERAcell 240, 120 V, SS	SS = stainless steel
8	HERAcell 240, 120 V, Cu	
9 10 11 12	HERAcell 240, 230 V, SS HERAcell 240, 230 V, Cu HERAcell 240, 120 V, SS HERAcell 240, 120 V, Cu	Parameter sets 9 -12, booster switched off for 6 door screen

- Inputting the selected parameter set in function level 601, sublevel 1:

1) The function levels are accessed by simultaneously pressing and holding the **cal** - key, the **i** - key, and the **auto start** - key for at least 5 sec. The program then jumps to function level 0.

2) Holding down the **cal** - key and pressing the ? key will take you to function level 601.

3) Release the **cal** - key, then press it twice and hold it (you will be in function level 601, sublevel 2).

4) Using the ? - key, select “1” and release the **cal** - key.

5) Press the **cal** key three times, then hold it (you will be in function code 601, sublevel 1.)

6) Using the ? - key until the selected parameter set will be displayed. Releasing the **cal** - key will store the settings and initiate a device reset.

- 8-digit check of both displays, and all LEDs are on.

If High/Low moisture has been configured, the associated LED will also light up during the 8-digit check.

- The version of the current software versions are displayed:

P 1 (display PCB):	e.g., 004, that is, Version 4
P 2 (sensor PCB):	e.g., 015, that is, Version 15
P 3 (main PCB):	e.g., 202, that is, Version 202
Pr (parameter set)	the new selected parameter set

The device then displays the current actual values.

- The program versions P1, P2 and P3 must be provided for all questions, particularly those concerning software problems.

3.6 Configuration Settings (units with options or with large control box)

The following appear when the device is switched on:

- The green lamp incorporated the mains power switch lights up.
- 8-digit check of both displays, and all LEDs are on.

If High/Low humidity has been configured, the associated LED will also light up during the 8-digit check.

- The version of the current software will be displayed:

P 1 (display PCB):	e.g., 010, that is, Version 10
P 2 (sensor PCB):	e.g., 027, that is, Version 27
P 3 (main PCB):	e.g., 210, that is, Version 210
Pn (parameter number)	e.g.. 256

The device then displays the current actual values of temperature and CO_2.

- The parameter number will displayed during initialization after displaying the software version P1, P2, P3. The display will show Pn. If the parameter number has more than 3 digits the parameter number will be shown in to steps.

Example:

Pn (parameter number) = 1024	first step: 1 will be displayed second step: 024 will be displayed

- The program versions P1, P2 and P3 must be provided for all questions, particularly those concerning software problems.

- Inputting the correct parameters in function level 21:

1) The function levels are accessed by simultaneously pressing and holding the **cal** - key, the **i** - key, and the **auto start** - key for at least 5 sec. The program then jumps to function level 0.

2) Holding down the cal - key and pressing the ? key will take you to function level 21.

21	Parameter settings		
	Sublevel of FC 21	Possible settings	Meaning
	1	0 = Heracell 150 1 = Heracell 240	Model size
	2	0 = SS 1 = CU	Material Inner casing SS = Stainless Steel
	3	0 = 230 Volt 1 = 120 Volt	Mains voltage
	4	0 = not installed 1 = installed	Gastight screen
	5	0 = no O_2 control 1 = 5 ... 90% O_2 2 = 1 ... 21% O_2	Oxygen control / control range
	6	0 = not installed 1 = installed	Bottle turners
	7	0 = standard TCD or IR 1 = Auto-Zero-detector	CO_2 detector
	8	0 = not installed 1 = installed	Water Level Sensor
	9	0 = inactive 1 = active	High/Low Humidity
	10	0 = not installed 1 = installed	Gas guard CO_2
	11	0 = not installed 1 = installed	Gas guard O_2/N_2
	12	0	- without function
	13	0	- without function
	14	0	- without function
	15	0	- without function
	16	0	- without function
	17	0	- without function
	18	0	- without function
	19	0	- without function
	20	0 = do not store 1 = store to memory	Store to memory (NVRAM)
	21	0 / 1	Security bit for position 1-20
Only for initial configuration ! Using this function will override all calibration settings			

3) Release **cal** – key and press **cal** - key 21 times and hold it (you are at function code 21, sublevel 21).

4) Use ? - key and select „1“ and release **cal** – key. This will enable the access to sublevels 1 to 20 of function code 21. The actual settings in all sublevels will start to flash and can be changed.

5) Press the **cal** - key several times in order to select one of the sublevels1 to 19 of function code 21 (see table above). For changing the setting press and hold the **cal** - key and select the correct value by using the? - key.

6) After the settings in sublevel 1 to 19 have been changed the values must be stored to the memory as follows:

   Press the **cal** – key several times an keep it pressed after reaching sublevel 20. During pressing the **cal** – key use the ? key and select „1“. Releasing the **cal** - key will store the settings and initiate a device reset.

- 8-digit check of both displays, and all LEDs are on.

If High/Low moisture has been configured, the associated LED will also light up during the 8-digit check.

- The version of the current software versions are displayed:

P 1 (display PCB):	e.g., 010, that is, Version 10
P 2 (sensor PCB):	e.g., 027, that is, Version 27
P 3 (main PCB):	e.g., 204, that is, Version 204
Pn (parameter number)	the new calculated parameter number

The device then displays the current actual values.

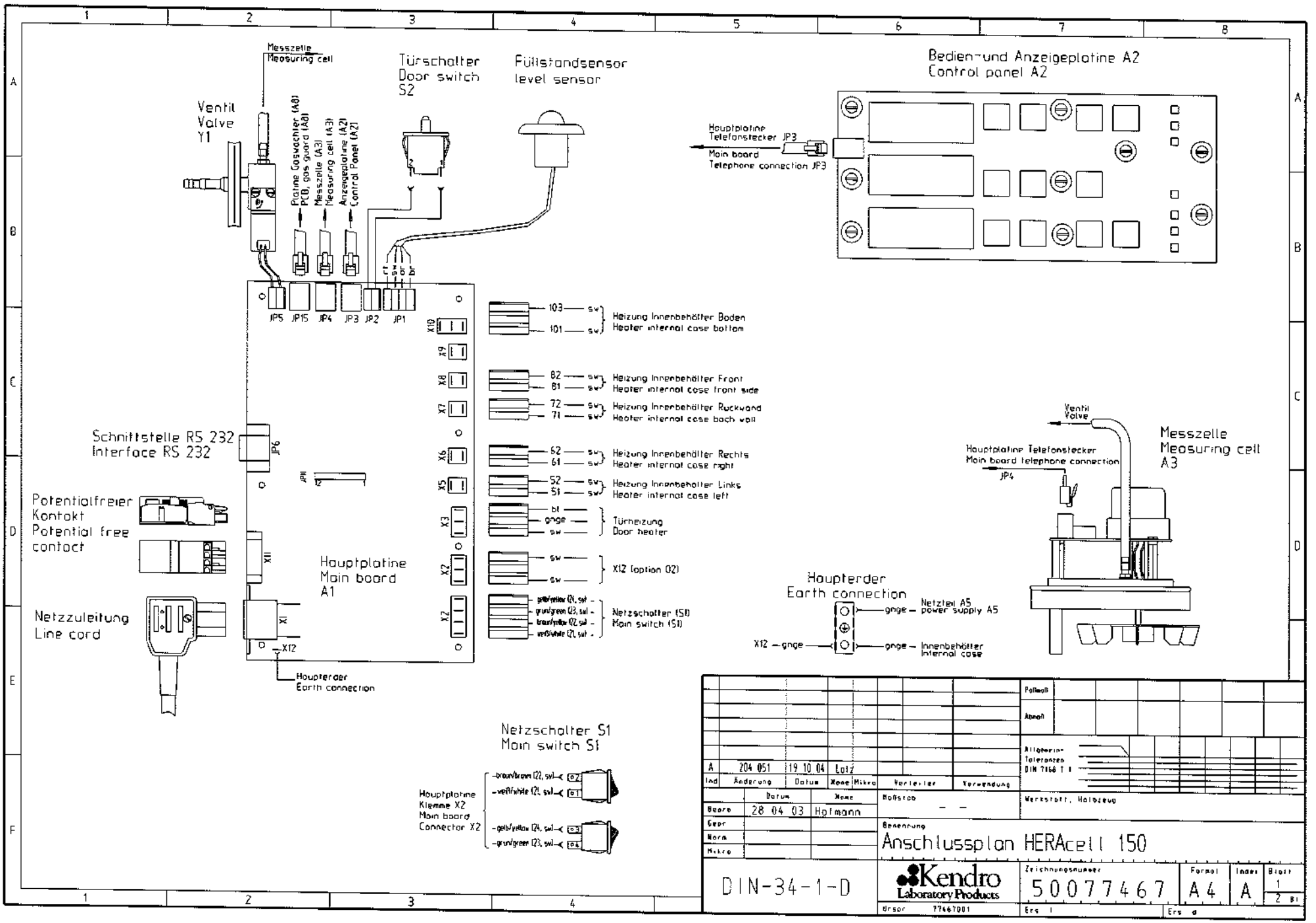
- The program versions P1, P2 and P3 must be provided for all questions, particularly those concerning software problems.

Address:
Kendro Laboratory Products GmbH
Robert – Bosch – Str. 1
D - 63505 Langenselbold
Germany

Telephone:
Sales / Service + 49 (0) 6184 / 90-6940

Fax:
Sales/Service + 49 (0) 6184 / 90-7474

Fax:
Info@kendro.com



Ind	Änderung	Datum	Name	Verteiler	Verwendung
A	204 051	19 10 04	Lotz		

	Datum	Name
Bearb	28 04 03	Hofmann
Gepr		
Norm		
Mikro		

Maßstab – –

Werkstoff, Halbzeug

Benennung
Anschlussplan HERAcell 150

DIN-34-1-D

Kendro Laboratory Products

Zeichnungsnummer 50077467

Format A4

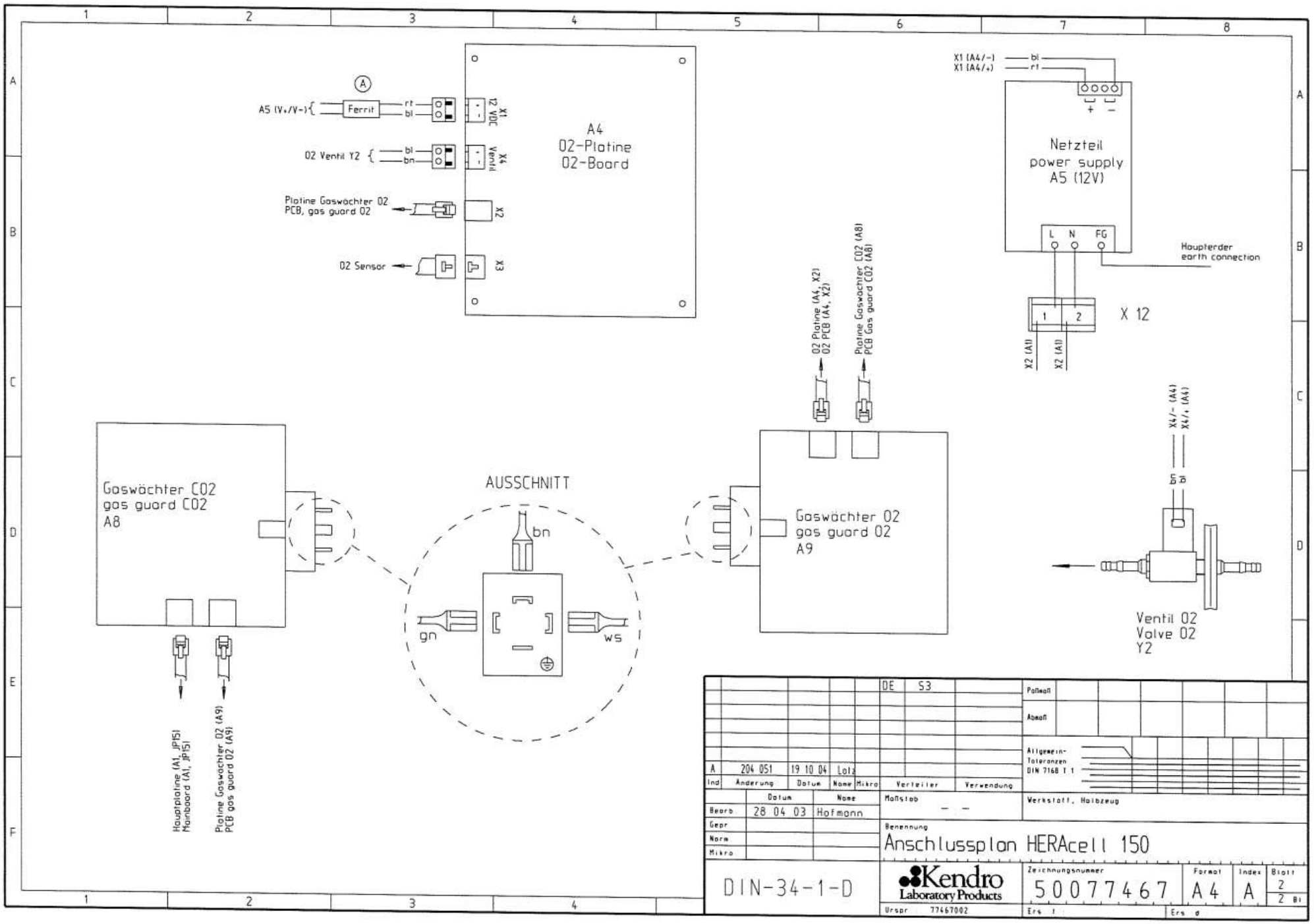
Index A

Blatt 1 2 Bl

Ursor 77467001

Ers i

Ers d



						DE	S3		
A	204 051	19 10 04	Lotz						
Ind	Änderung	Datum	Name	Mikro	Verteiler	Verwendung			
		Datum	Name		Maßstab				
Bearb		28 04 03	Hofmann		– –				
Gepr									
Norm									
Mikro									

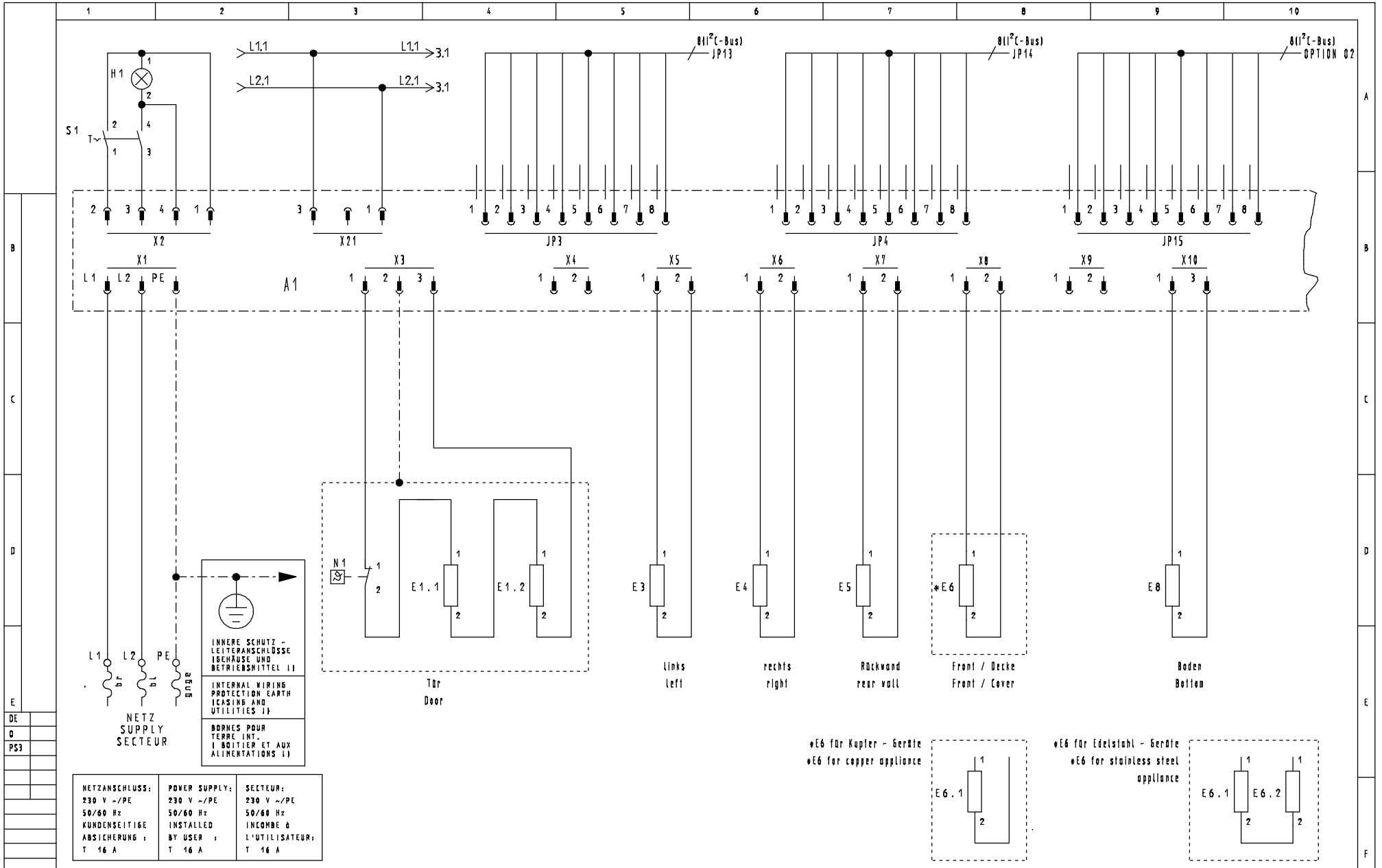
Benennung: Anschlussplan HERAcell 150

DIN-34-1-D

Kendro Laboratory Products

Zeichnungsnummer	Format	Index	Blatt
50077467	A4	A	2 / 2 Bl

Ursprung: 77467002



NETZANSCHLUSS:	POWER SUPPLY:	SECTEUR:
230 V ~/PE	230 V ~/PE	230 V ~/PE
50/60 Hz	50/60 Hz	50/60 Hz
KUNDENSEITIGE	INSTALLED	INCOMBE À
ABSICHERUNG :	BY USER :	L'UTILISATEUR:
T 16 A	T 16 A	T 16 A

Ind.	Änderung	Datum	Name
A	203991	24.09.2004	Mirsu

Bearb.	05.03.2002	Hofmann
Gepr.	24.09.2004	Mirsu
Norm		
Datum		Name

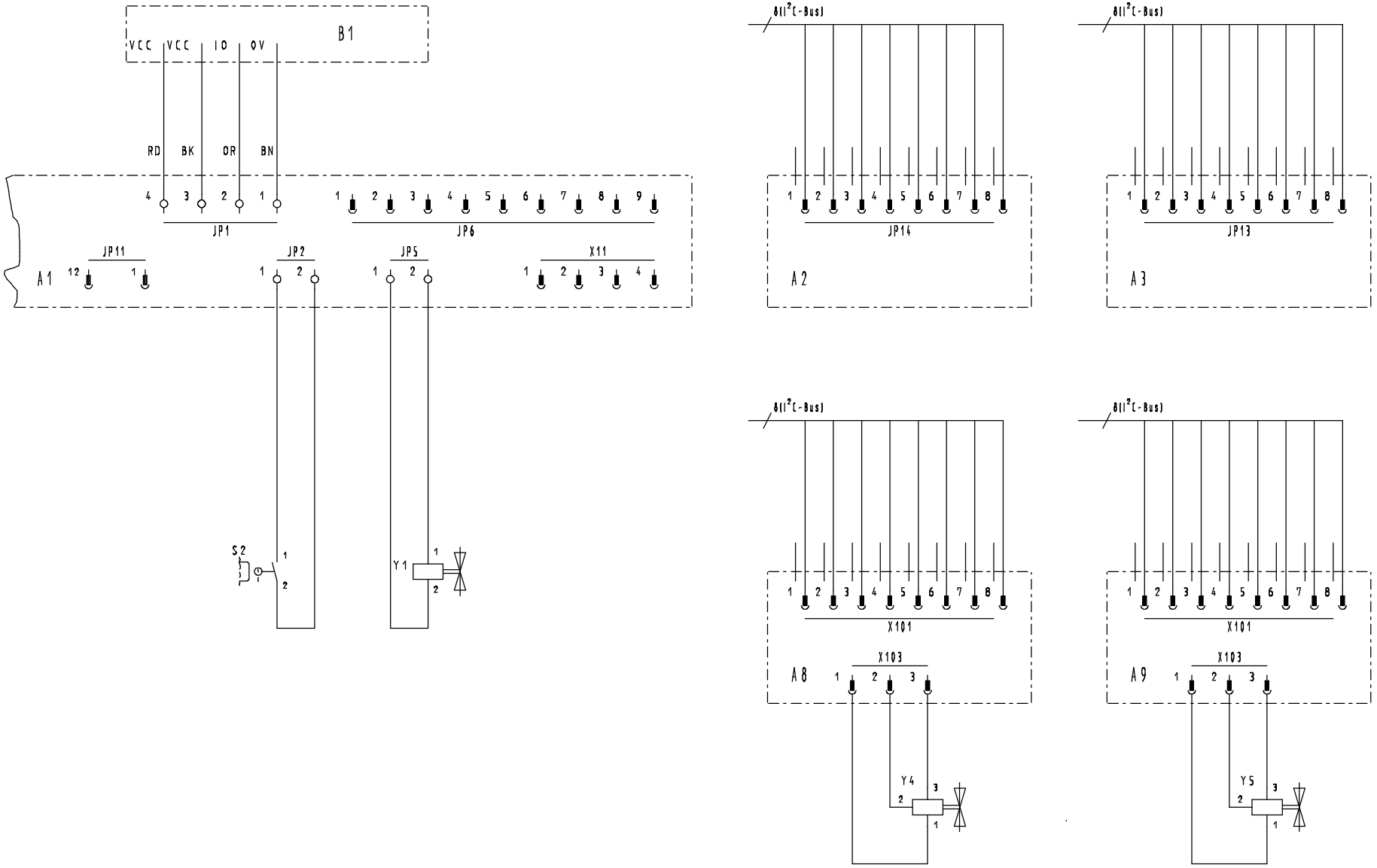
PROJEKT: 50073744-A

Sp HERAcell 150 (230 VAC-Gerät)

Kendro

Id.-Nr. 50 073 744

A4 | A | Bl. 1 | Blatt 5



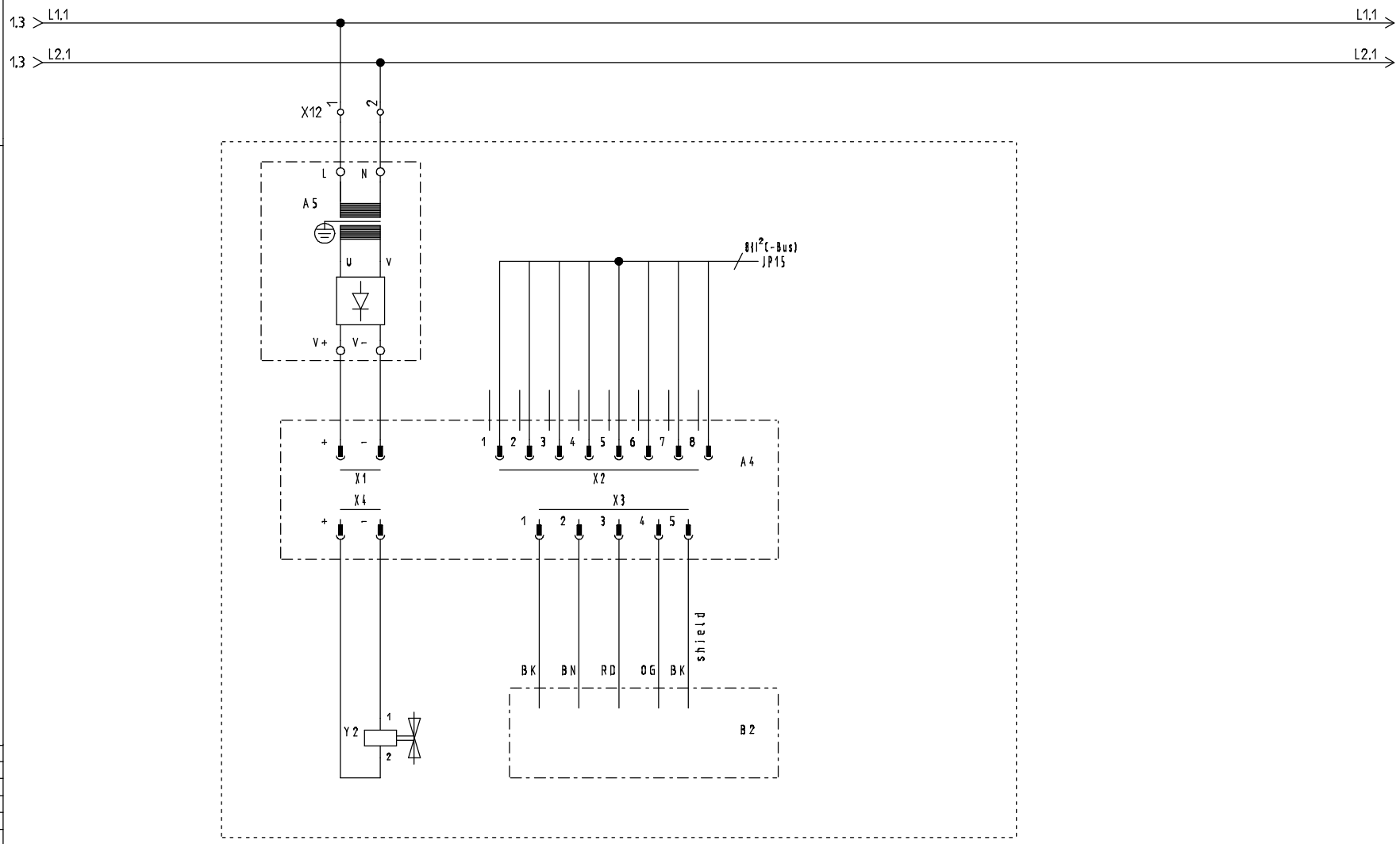
					Bearb.	05.03.2002	Hofmann	
					Gepr.	24.09.2004	Mirsu	
	A	203991	24.09.2004	Mirsu	Norm			
	Ind.	Änderung	Datum	Name		Datum	Name	

PROJEKT: 50073744-A

Sp HERAcell 150 (230 VAC-Gerät)

Kendro

Id.-Nr. 50 073 744 | A4 | A Ind. | Bl. 2 Blatt 5



OPTION 02

					Bearb.	05.03.2002	Hofmann				
					Gepr.	24.09.2004	Mirsu				
	A	203991	24.09.2004	Mirsu	Norm						
	Ind.	Änderung	Datum	Name		Datum	Name				

PROJEKT: 50073744-A

Sp HERAcell 150 (230 VAC-Gerät)

Kendro

Id.-Nr. 50 073 744

A4 | A (Ind.) | Bl. 3 / Blatt 5

LEGENDE ZU : SP HERAcell 150 (230 VAC)

NAME	BETRIEBSMITTEL
A1	Platine, Steuer- und Regeleinheit
A2	Platine, Messzelle
A3	Platine, Bedien- und Anzeigeeinheit
A4	Platine, O2 Sensor
A5	Netzteil O2 Sensor
A8	Platine, Gaswächter CO2
A9	Platine, Gaswächter O2
B1	Füllstandsensor
B2	O2 Sensor
E1.1-E1.2	Türheizung
E3	Innenbehälter Seite links
E4	Innenbehälter Seite rechts
E5	Innenbehälter Rückwand
*E6	Matrix Innenbehälter Front
E6.1	Innenbehälter Front
E6.2	Innenbehälter Decke (nur Edelstahlgeräte)
E8	Innenbehälter Boden
H1	Netzmeldeleuchte
JP1	Klemmenleiste, Wasserstand
JP2	Klemmenleiste, Türschalter
JP3	Steckverbindung, I_2C-Bus, Hauptplatine
JP4	Steckverbindung, I_2C-Bus, Hauptplatine
JP5	Klemmenleiste, Ventil
JP6	Steckverbindung, Schnittstelle RS 232
JP13	Steckverbindung, I_2C-Bus, Türe
JP14	Steckverbindung, I_2C-Bus, Messzelle
JP15	Steckverbindung, I_2C-Bus, Option O2
N1	Regler, Türheizung
S1	Netzschalter
S2	Türschalter

LEGENDE ZU : SP HERAcell 150 (230 VAC)

NAME	BETRIEBSMITTEL
X1	Netzanschluß
X2	Steckverbindung, Netzschalter
X3	Steckverbindung, Türheizung
X4	Steckverbindung, Hzg. Innenbehälter Boden
X5	Steckverbindung, Hzg. Innenbehälter Seite links
X6	Steckverbindung, Hzg. Innenbehälter Seite rechts
X7	Steckverbindung, Hzg. Innenbehälter Rückwand
X8	Steckverbindung, Hzg. Innenbehälter Front
X9	Steckverbindung, Hzg. Außengehäuse Front (n.eingebaut)
X10	Steckverbindung, Hzg. Sterilisation (nicht eingebaut)
X11	Steckverbindung, Potentialfreier Kontakt
Y1	Magnetventil
Y2	Magnetventil, O2
Y4	Magnetventil, Gaswächter CO2
Y5	Magnetventil; Gaswächter O2

LEGENDE ZU : SP HERAcell 150 (230 VAC)

NAME	BETRIEBSMITTEL

DE
0
PS3

Ind.	Änderung	Datum	Name
		Bearb. 05.03.2002	Hofmann
		Gepr. 24.09.2004	Mirsu
A	203991	24.09.2004	Mirsu
		Norm	

PROJEKT: 50073744-A

SP HERAcell 150 (230 VAC-Gerät)

Kendro

Id.-Nr. 50 073 744 | A4 | Ind. A | Bl. 4 | Blgt. 5

NOMENCLATURE TO : SP HERAcell 150 (230 VAC)	
NAME	EQUIPMENT
A1	PCB, control and regulator
A2	PCB, metering cell
A3	PCB, operator and display panel
A4	PCB, O2 Sensor
A5	power supply O2-sensor
A8	PCB, gas guard CO2
A9	PCB, gas guard O2
B1	level sensor
B2	O2 sensor
E1.1-E1.2	Door heater
E3	Inner casing, left side
E4	Inner casing, right side
E5	Inner casing, rear wall
*E6	Matrix inner casind, front
E6.1	Inner casind, front
E6.2	Inner casind, cover (stainless steel units only)
E8	Inner casind, base
H1	Mains power supply indicator lamp
JP1	Terminal strip, water level
JP2	Terminal strip, door switch
JP3	Plug in connector, I_2C-bus, main PCB
JP4	Plug in connector, I_2C-bus, main PCB
JP5	Terminal strip, valve
JP6	Plug in connector, RS 232 interface
JP13	Plug in connector, I_2C-bus, door
JP14	Plug in connector, I_2C-bus, metering cell
JP15	Plug in connector, I_2C-bus, option O2
N1	Regulator, door heater
S1	Mains power switch
S2	Door switch

NOMENCLATURE TO : SP HERAcell 150 (230 VAC)	
NAME	EQUIPMENT
X1	Mains power connection
X2	Plug in connector, mains power switch
X3	Plug in connector, door heater
X4	Plug in connector, heater, inner casing, base
X5	Plug in connector, heater, inner casing, left side
X6	Plug in connector, heater, inner casing, right side
X7	Plug in connector, heater, inner casing, rear wall
X8	Plug in connector, heater, inner casing, front
X9	Plug in connector, heater, exterior housing (not inst)
X10	Plug in connector, heater, sterilization (not install)
X11	Plug in connector, potential free contact
Y1	Magnetic valve
Y2	Magnetic valve, O2
Y4	Magnetic valve, gas guard CO2
Y5	Magnetic valve, gas guard O2

NOMENCLATURE TO : SP HERAcell 150 (230 VAC)	
NAME	EQUIPMENT

DE
0
PS3

Ind.	Änderung	Datum	Name
A	203991	24.09.2004	Mirsu

Bearb.	05.03.2002	Hofmann
Gepr.	24.09.2004	Mirsu
Norm		
	Datum	Name

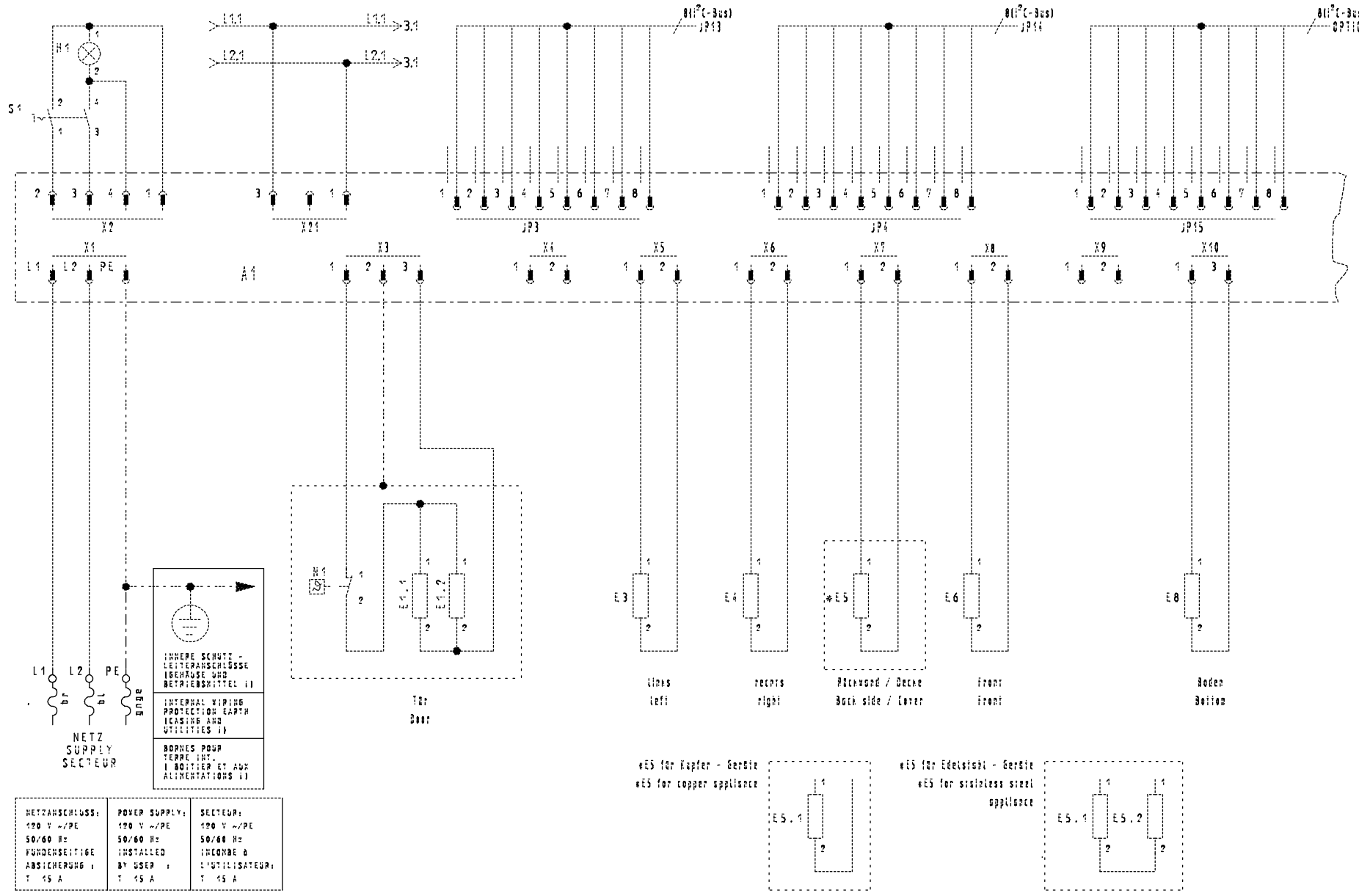
PROJEKT: 50073744-A

SP HERAcell 150 (230 VAC-Gerät)

Kendro

Id.-Nr. 50 073 744

A4 | A | Bl. 5 | Ind. | Blatt 5



NETZANSCHLUSS:	POWER SUPPLY:	SECTEUR:
120 V ~/PE	120 V ~/PE	120 V ~/PE
50/60 Hz	50/60 Hz	50/60 Hz
KUNDENSEITIGE ABSICHERUNG :	INSTALLED BY USER :	INCOMBE A L'UTILISATEUR:
T 15 A	T 15 A	T 15 A

Ind.	Änderung	Datum	Name
A	203991	23.09.2004	Mirsu

Bearb.	17.05.2002	Hofmann
Gepr.	23.09.2004	Mirsu
Norm		
	Datum	Name

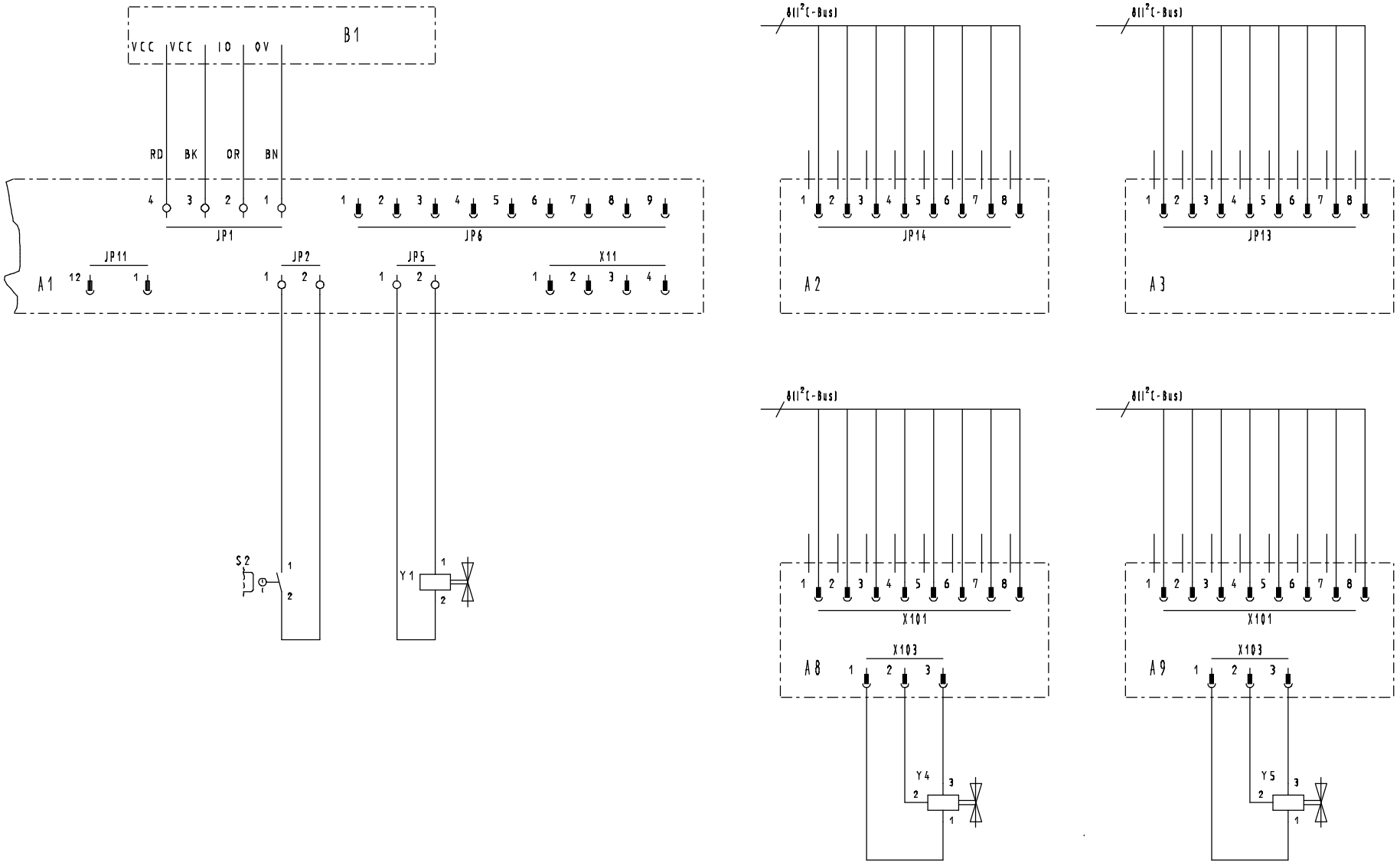
PROJEKT: 50074611-A

SP HERAcell 150 (120 VAC-Gerät)

Kendro

Id.-Nr. 50 074 611

A4 | A | Bl. 1 | Blatt 5



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						Gepr.	23.09.2004	Mirsu
	A	203991	23.09.2004	Mirsu		Norm		
	Ind.	Änderung	Datum	Name			Datum	Name

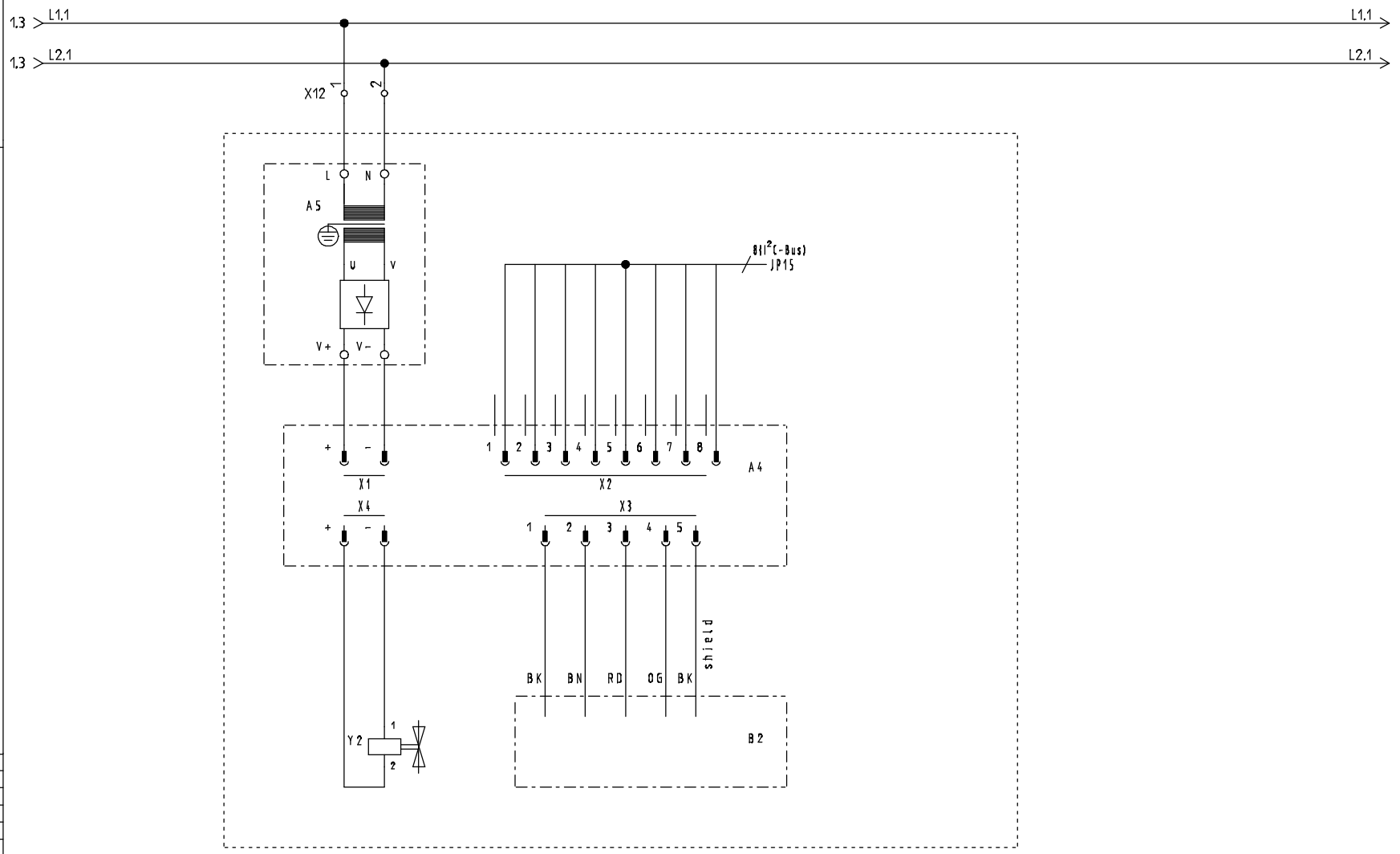
PROJEKT: 50074611-A

Sp HERAcell 150 (120 VAC-Gerät)

Kendro

Id.-Nr. 50 074 611

A4 | A Ind. | Bl. 2 Blatt 5



OPTION 02

DE
Q
PS3

Ind.	Änderung	Datum	Name
A	203991	23.09.2004	Mirsu

Bearb.	17.05.2002	Hofmann
Gepr.	23.09.2004	Mirsu
Norm		
	Datum	Name

PROJEKT: 50074611-A

SP HERAcell 150 (120 VAC-Gerät)

Kendro

Id.-Nr. 50 074 611

A4 | A | Bl. 3 | Blatt 5

LEGENDE ZU : SP HERAcell 150 (120 VAC)

NAME	BETRIEBSMITTEL
A1	Platine, Steuer- und Regeleinheit
A2	Platine, Messzelle
A3	Platine, Bedien- und Anzeigeeinheit
A4	Platine, O2 Sensor
A5	Netzteil O2 Sensor
A8	Platine, Gaswächter CO2
A9	Platine, Gaswächter O2
B1	Füllstandsensor
B2	O2 Sensor
E1.1-E1.2	Türheizung
E3	Innenbehälter Seite links
E4	Innenbehälter Seite rechts
*E5	Matrix Innenbehälter Rückwand
E5.1	Innenbehälter Rückwand
E5.2	Innenbehälter Decke (nur Edelstahlgeräte)
E6	Innenbehälter Front
E8	Innenbehälter Boden
H1	Netzmeldeleuchte
JP1	Klemmenleiste, Wasserstand
JP2	Klemmenleiste, Türschalter
JP3	Steckverbindung, I_2C-Bus, Hauptplatine
JP4	Steckverbindung, I_2C-Bus, Hauptplatine
JP5	Klemmenleiste, Ventil
JP6	Steckverbindung, Schnittstelle RS 232
JP13	Steckverbindung, I_2C-Bus, Türe
JP14	Steckverbindung, I_2C-Bus, Messzelle
JP15	Steckverbindung, I_2C-Bus, Optionen
N1	Regler, Türheizung
S1	Netzschalter
S2	Türschalter
X1	Netzanschluß
X2	Steckverbindung, Netzschalter
X3	Steckverbindung, Türheizung
X4	Steckverbindung, Hzg. Innenbehälter Boden
X5	Steckverbindung, Hzg. Innenbehälter Seite links
X6	Steckverbindung, Hzg. Innenbehälter Seite rechts
X7	Steckverbindung, Hzg. Innenbehälter Rückwand
X8	Steckverbindung, Hzg. Innenbehälter Front
X9	Steckverbindung, Hzg. Außengehäuse Front (n.eingebaut)

LEGENDE ZU : SP HERAcell 150 (120 VAC)

NAME	BETRIEBSMITTEL
X10	Steckverbindung, Hzg. Sterilisation (nicht eingebaut)
X11	Steckverbindung, Potentialfreier Kontakt
Y1	Magnetventil
Y2	Magnetventil, O2
Y4	Magnetventil, Gaswächter CO2
Y5	Magnetventil, Gaswächter O2

LEGENDE ZU : SP HERAcell 150 (120 VAC)

NAME	BETRIEBSMITTEL

DE
0
PS3

Ind.	Änderung	Datum	Name
A	203991	23.09.2004	Mirsu

Bearb.	17.05.2002	Hofmann
Gepr.	23.09.2004	Mirsu
Norm		
	Datum	Name

PROJEKT: 50074611-A

SP HERAcell 150 (120 VAC-Gerät)

Kendro

Id.-Nr. 50 074 611 | A4 | Ind. A | Bl. 4 | Blgt. 5

NOMENCLATURE TO : SP HERAcell 150 (120 VAC)

NAME	EQUIPMENT
A1	PCB, control and regulator
A2	PCB, metering cell
A3	PCB, operator and display panel
A4	PCB, O2 Sensor
A5	power supply O2-sensor
A8	PCB, gas guard CO2
A9	PCB, gas guard O2
B1	level sensor
B2	O2 sensor
E1.1-E1.2	Door heater
E3	Inner casing, left side
E4	Inner casing, right side
*E5	Matrix, Inner casing, rear wall
E5.1	Inner casing, rear wall
E5.2	Inner casing, cover (stainless steel units only)
E6	Inner casind, front
E8	Inner casind, base
H1	Mains power supply indicator lamp
JP1	Terminal strip, water level
JP2	Terminal strip, door switch
JP3	Plug in connector, I_2C-bus, main PCB
JP4	Plug in connector, I_2C-bus, main PCB
JP5	Terminal strip, valve
JP6	Plug in connector, RS 232 interface
JP13	Plug in connector, I_2C-bus, door
JP14	Plug in connector, I_2C-bus, metering cell
JP15	Plug in connector, I_2C-bus, options
N1	Regulator, door heater
S1	Mains power switch
S2	Door switch
X1	Mains power connection
X2	Plug in connector, mains power switch
X3	Plug in connector, door heater
X4	Plug in connector, heater, inner casing, base
X5	Plug in connector, heater, inner casing, left side
X6	Plug in connector, heater, inner casing, right side
X7	Plug in connector, heater, inner casing, rear wall
X8	Plug in connector, heater, inner casing, front
X9	Plug in connector, heater, exterior housing (not inst)

NOMENCLATURE TO : SP HERAcell 150 (120 VAC)

NAME	EQUIPMENT
X10	Plug in connector, heater, sterilization (not install)
X11	Plug in connector, potential free contact
Y1	Magnetic valve
Y2	Magnetic valve, O2
Y4	Magnetic valve, gas guard CO2
Y5	Magnetic valve, gas guard O2

NOMENCLATURE TO : SP HERAcell 150 (120 VAC)

NAME	EQUIPMENT

DE
0
PS3

Ind.	Änderung	Datum	Name
A	203991	23.09.2004	Mirsu

Bearb.	17.05.2002	Hofmann
Gepr.	23.09.2004	Mirsu
Norm		
	Datum	Name

PROJEKT: 50074611-A

SP HERAcell 150 (120 VAC-Gerät)

Kendro

Id.-Nr. 50 074 611 | A4 | Ind. A | Bl. 5 | Blatt 5

Component	Description	Beschreibung	Used On			
			HC	HC 240	HC 150	240 Adv
	Inner Chamber	Innengehäuse				
50011380	Support rail for drawer	Auflagebügel für Schublade	X	X	X	X
50072122	Humidifier SS	Gasbefeuchtung VA			X	X
50073523	Humidifier Copper	Gasbefeuchtung CU			X	X
50071935	Roller (bottle turner)	Rolle FLD				X
50048350	Roller Support (bottle turner)	Leiste FLD				X
50076386	Shelf 2 thick mm copper	Einlageblech 2mm dick 560X500 CU		X		X
50074093	Shelf 2 mm thick stainless steel	Einlageblech 2mm dick 560X500 VA		X		X
50106263	Powered Roller (bottle turner)	Rolle mit antrieb FLD				X
50074739	Plug with sinter metal filter	Stopfen mit sintermetallfilter	X	X	X	X
50063193	Shelf support rail	Auflagebügel HC240 für Einlegeblech		X		X
50052858	Shelf support rail	Auflagebügel HERAcell/BB16 für Einlegeblech	X		X	
50050923	Shelf support, front SS	Tragprofil, vorne VA	X	X	X	X
50050924	Shelf support, rear SS	Tragprofil, hinten VA	X	X	X	X
50051420	Shelf support, front CU	Tragprofil, vorne CU	X	X	X	X
50051421	Shelf support rear, CU	Tragprofil, hinten CU	X	X	X	X
	Outer Door	Aussentür				
50052958	Set covers for door reversal	Abdeckung für frontrahmen	X	X	X	X
03672305	Main door 230 V	Gerätetür HERAcell 230 V	X			
03672304	Main door for 120 V	Gerätetür HERAcell 120 V	X			
50077893	Main door HERA 150 for 230 V (right)	Gerätetür HERAcell 150 230 V (right)			X	
50077894	Main door HERA 150 for 230 V (left)	Gerätetür HERAcell 150 230 V (links)			X	
50077895	Main door HERA 150 for 120 V (right)	Gerätetür HERAcell 150 120 V (rechts)			X	
50077896	Main door HERA 150 for 120 V (left)	Gerätetür HERAcell 150 120 V (links)			X	
50069296	Main door HERA 240 for 230 V (left)	Gerätetür HERAcell 240 230 V (links)		X		
50069297	Main door HERA 240 for 230 V (right)	Gerätetür HERAcell 240 230 V (rechts)		X		
50069299	Main door HERA 240 for 120 V (left)	Gerätetür HERAcell 240 120 V (links)		X		
50069300	Main door HERA 240 for 120 V (right)	Gerätetür HERAcell 240 120 V (rechts)		X		
50074893	Main door HERA 240 Adv for 230 V (left)	Gerätetür HERAcell 240 Adv 230 V (links)				X
50074894	Main door HERA 240 Adv for 230 V (right)	Gerätetür HERAcell 240 Adv 120 V (rechts)				X
50074895	Main door HERA 240 Adv for 120 V (left)	Gerätetür HERAcell 240 Adv 230 V (links)				X
50074896	Main door HERA 240 Adv for 120 V (right)	Gerätetür HERAcell 240 Adv 120 V (rechts)				X
50063111	Display housing HERAcell 240	Bedienpanel HERAcell 240		X		X
50058545	Guide set for unit door HERAcell	Leistensatz gerätetür HERAcell	X			
50062721	Guide set for unit door HERAcell 240	Leistensatz gerätetür HERAcell 240		X		X
50083928	GUIDE SET, OUTER DOOR HERACELL 150	LEISTENSATZ GERAETETUER HERACELL 150			X	
50049711	Magnetic door seal, HERAcell	Türdichtung, magnetisch HERAcell	X		X	
50063335	Magnetic door seal, HERAcell 240	Türdichtung, magnetisch HERAcell 240		X		X
50051418	Cover plug, unit door, bottom	Blindstopfen gerätetür unten HERAcell	X		X	

Component	Description	Beschreibung	Used On			
			HC	HC 240	HC 150	240 Adv
50051419	Cover plug, unit door, top	Blindstopfen gerätetür oben HERAcell	X		X	
50050459	Cover plug, unit door HERAcell 240, bottom	Blindstopfen gerätetür unten HERAcell 240		X		X
50068686	Cover plug, unit door HERAcell 240, top	Blindstopfen gerätetür oben HERAcell 240		X		X
50049683	Front foil, HERAcell CO2	Frontfolie HERAcell, CO2	X			
50075656	Front foil, HERAcell 150 CO2	Frontfolie HERAcell 150, CO2			X	
50075657	Front foil, HERAcell 150 O2	Frontfolie HERAcell 150, O2			X	
50078212	Panel with Front foil, HERAcell 240 CO2	Panel mit Frontfolie HERAcell 240, CO2		X		
50078213	Panel with Front foil, HERAcell 240 Adv CO2	Panel mitFrontfolie HERAcell 240 Adv CO2				X
50078214	Panel with Front foil, HERAcell 240 Adv CO2 + O2	Panel mit Frontfolie HERAcell 240 Adv CO2 + O2				X
50078215	Panel with Front foil, HERAcell 240 Adv CO2 + bottle turner	Panel mit Frontfolie HERAcell 240 Adv CO2 + FLD				X
50078216	Panel with Front foil, HERAcell 240 Adv CO2 + O2 + bottle turner	Panel mit Frontfolie HERAcell 240 Adv CO2 + O2 + FLD				X
50049233	Door bearing and foot, bottom	Türlagen unten	X	X	X	X
50049234	Door bearing, top	Türlagen oben	X	X	X	X
50084100	Outer Door Handle	Griffleiste (halbrund) HERAcell 240		X		X
50051345	Door panel, heated, for 230 VAC units	Türblech beheizt HERAcell 230 V	X			
50077196	Door panel, heated, for 230 VAC units	Türblech beheizt HERAcell 230 V			X	
50051690	Door panel, heated, for 120 VAC units	Türblech beheizt HERAcell 120 V	X			
50077197	Door panel, heated, for 120 VAC units	Türblech beheizt HERAcell 120 V			X	
50069358	Door panel HERA 240, heated, 230 VAC units	Türblech beheizt HERAcell 240 230 V		X		X
50069359	Door panel HERA 240, heated, 120 VAC units	Türblech beheizt HERAcell 240 120 V		X		X
50052323	Bi-metall regulator on the heated door panel	Temperaturregler türblech HERAcell	X		X	
50067106	Bi-metall regulator on the heated door panel	Temperaturregler türblech HERAcell 240		X		X
50072430	Door lock upgrade kit	NRS Türverschluss	X	X	X	X
50084100	Door Reversal Kit	Umbausatz Tür		X		X
	Electrical	Elektrische				
50049363	Mains power switch	Netzschalter	X	X	X	X
50050735	BUS CableTCD (1.5M)	BUS Kable WLD (1.5M)	X		X	
50062943	BUS Cable TCD (1.7M)	BUS Kable WLD (1.7M)		X		X
50049713	BUS Cable Display (3.1M)	BUS Kable Anzeige (3.1M)	X		X	
50065580	BUS Cable Display (3.6M)	BUS Kable Anzeige (3.6M)		X		X
03672281	Operator and display PCB HERAcell	Bedien & anzeigeplatine für HERAcell	X	X		
50077892	Operator and display PCB HERAcell 150 Adv	Bedien & anzeigeplatine für HERAcell 150 Adv			X	
50074892	Operator and display PCB HERAcell 240 Adv	Bedien & anzeigeplatine für HERAcell 240 Adv				X
50072902	Main PCB HERAcell	Hauptplatine HERAcell	X	X		
50074891	Main PCB HERAcell Adv	Hauptplatine HERAcell Adv			X	X
03002641	Main fuse (T 6.3 A)	G - Sicherung einsatz 6,3 A 250v T	X	X	X	X
50053397	Mains fuse holder	Sicherungs halter für netzsicherungen	X	X		
50050738	CO2 Solenoid Valve	Magnetventil	X	X	X	X
50050736	Connector, orange, for zero-potential contact	Stecker, orange mit zugenlastung	X	X	X	X
50051461	Draining pump, 230 VAC	Elektr wasserpumpe 230 V	X	X	X	X
50051937	Draining pump, 120 VAC	Elektr wasserpumpe 120 V	X	X	X	X

Component	Description	Beschreibung	Used On			
			HC	HC 240	HC 150	240 Adv
50050438	Door switch	Türschalter	X	X	X	X
50071363	PCB for Bottle Turner (serialnumber below 40518421)	LP flaschendrehvor. (Fabriknummer kleiner 40518421)				X
50106128	PCB Bottle Turuning Device HERAcell 240 (s/n 40518421 and higher)	LP HERAcell 240 Flaschendrehvor. 2 BEST. (s/n 402518421 und größer)				
50071933	O2 Solenoid Valve	Magnetventil O2 HERAcell 240 Adv			X	X
50071776	Air Pump	Membranpumpe HERAcell 240 Adv				X
50072121	Power Supply 24v, 25w	Netzteil 25 W 24 V				X
50066588	Cable Assy, Data BUS (0.320M)	Drahsatz daten BUS L = 0.320M				X
50074804	Power Supply 12v, 25w	Netzteil 25 W 12 V				X
50075864	Gas Guard PCB	LP Gaswaechter			X	
	Glass Door	Glastür				
50070610	Silicon seal for glass door	Türdichtung	X	X	X	X
50051620	Glass door for 3 door screen (old)	Glastür VST gasblende	X			
50067225	6 Door gas screen	Gasblende HERAcell 240		X		X
50030020	Glass Door for 6 Door Screen, Left	Glastuer VST, Links HERAcell 240 (OL)				
50030021	Glass Door for 6 Door Screen, Left with hole	Glastuer VST, Links HERAcell 240 ML)				
50030022	Glass door for 6 Door Screen, Right	Glastuer VST, Rechts HERAcell 240		X		X
50077587	Glass gas screen	Gasblende HERAcell 150			X	
50077912	Glass door for Gas screen HERAcell 150 without hole	GLASTUER VST GASBLENDE HERACELL 150 (OL)			X	
50077913	Glass door for Gas screen HERAcell 150 with hole	GLASTUER VST GASBLENDE HERACELL 150 (ML)			X	
50077046	Seal 3 Door screen	Türdichtung gasblendetür			X	
50050077	Threaded cap for glass door	Hohlschraube M4 für glastürscharn.	X	X	X	X
50050067	Glass door bearing, bottom	Gegenlager unten (glastür)	X	X	X	X
50050066	Glass door bearing, top	Gegenlager oben (glastür)	X	X	X	X
50050779	Glass door HERAcell	Glastür HERAcell	X		X	
50062577	Glass door HERAcell 240	Glastür HERAcell 240		X		X
50060281	Hinge, complete glass door	Scharnier für glastür	X	X	X	X
50058542	Glass door lock, complete	Verschluss für glastür	X	X	X	X
50071261	Glass door lock, 6 door screen	Verschluss für gasblende		X		
26139262	Silicon CO2 aspiration port for glass door	Silikondurchführung	X	X	X	X
50041536	Silicone Seal 6 Door	Profildichtung für gasblende		X		X
50077805	Door lock glass door, green (3 door screen)	Verschluss für gasblende (3 türig grün)			X	
50077914	Door lock for frame, gray (3 door screen)	Verschluss für gasblende (3 türig grau)			X	
	Sensors	Sensoren				
50084764	Water Level Sensor	Wasserstandsensor			X	X
03672279	TCD detector	Messzelle WLD HERAcell	X	X		
50077891	TCD Detector HERAcell 150 Adv	Messzelle WLD HERAcell 150 Adv			X	
50049690	TCD motor	Lüftermotor 12 VDC für messzelle	X	X	X	X
50049692	Fan wheel for TCD, stainless steel	Lüfterrad für messzelle VA	X	X	X	X
50051184	Fan wheel for TCD, copper	Lüfterrad für messzelle CU	X	X	X	X

Component	Description	Beschreibung	Used On			
			HC	HC 240	HC 150	240 Adv
50051728	Fan cover, stainless steel	Drahtkorb für lüfter VA	X	X	X	X
50051725	Fan cover, copper	Drahtkorb für lüfter CU	X	X	X	X
50066022	Fan motor cover	Abdeckung für motor	X	X	X	X
50054735	IR CO2 Sensor & Retrofit	Messzelle IR HERAcell & NRS			X	X
50074890	TCD CO2 Detector (auto zero)	Messzelle WLD auto zero HERAcell				X
50053406	Gasket for TCD	Dichtungsring WLD HERAcell	X	X	X	X
50071138	O2 Sensor Complete 1 - 21%	O2 sensor VST (1 - 21% O2)			X	X
50072105	O2 Sensor Complete 5 - 90%	O2 sensor VST (5 - 90% O2)			X	X
	Filters and Tubing	Filter und Schlauch				
50050737	Filter for gas inlet	Filter für Gaseinlass	X	X	X	X
50062701	Hose set	Anschlussschlauchsatz	X	X		X
50077523	Hose set HERAcell 150 Adv	Anschlussschlauchsatz HERAcell 150 Adv			X	
50052933	Tube 4 x 3 mm	Schlauch 4 x 3	X	X	X	X
03719098	Y - connector for tube distribution Di=4 mm	Y verbinder - YS 4. Di = 4 mm	X	X	X	X
50062978	Straight tube connector für Di=4 mm	Schlauchverbinder GS 4. di = 4 mm	X	X	X	X
	Outer Casing	Aussengehäuse				
50049232	Power switch housing with foot	Netzschalter modul mit fuss, ohne schalter	X	X	X	X
50049237	Rear foot	Gerätefuss hinten	X		X	
50067195	Rear foot 240	Gerätefuss hinten 240		X		X
50052444	Securing clip for rear foot	Kunststoffspange für gerätefuss	X	X	X	X
50049939	Height adjusting foot	Fuss hoehenverstellbar	X	X	X	X
50049238	Stacking foot on housing top	Stapelfuss decke	X	X	X	X
50063283	Plug in the hose pass-through Di=42 mm	Stopfen für rohrdurchf. Di = 42 mm	X	X	X	X
50062694	Access Tube 41 x 90	Rohrdurchfuerung 41 x 90	X	X	X	X
50050216	Access Tube 16 x 90	Rohrdurchfuerung 16 x 90	X	X	X	X
50074739	Cap for Pressure Relief Tube	Einsatz für Druckausgleichsöffnung	X	X	X	X
50077186	Cover for water sensor access hole	Schild Abdeckung ausbruch bodenteil			X	X

Ersatzteil / Spare part
Glastürdichtung für CO_2 - Inkubatoren
Glass door seal for CO_2 Incubators

Glastürdichtung

Die beiliegende Türdichtung kann in allen CO_2 – Inkubatoren, die in der Tabelle aufgeführt sind, verwendet werden.

1. Schneiden Sie die Türdichtung auf die richtige Länge für Ihren Inkubator zurecht. Entnehmen Sie die Länge aus der Tabelle. Achten Sie darauf, dass der Schnitt gerade ausgeführt wird.
2. Nehmen Sie die alte Türdichtung heraus.
3. Setzen Sie die neue Türdichtung ein.

Glass door seal

The enclosed door seal can be used on all CO_2 incubators shown in the table below.

1. Using the table below, cut the seal to the correct length. Make sure that the seal is cut at right angles.
2. Remove the old seal.
3. Fit the new seal.

Gerät / Unit	Länge / Lenght
B 5060 / B 5061	2,47 m
cytoperm 8080 / cytoperm 8088	2,47 m
BB 6060	1,75 m
BB 6220 / cytoperm 2 / BBD 6220	2,56 m
BK 6160	2,16 m
BB 16	2,16 m
HERAcell	2,50 m
HERAcell 240	3,00 m
Cytomat 6000 / Cytomat 6001	2,56 m
Cytomat 2	2,20 m

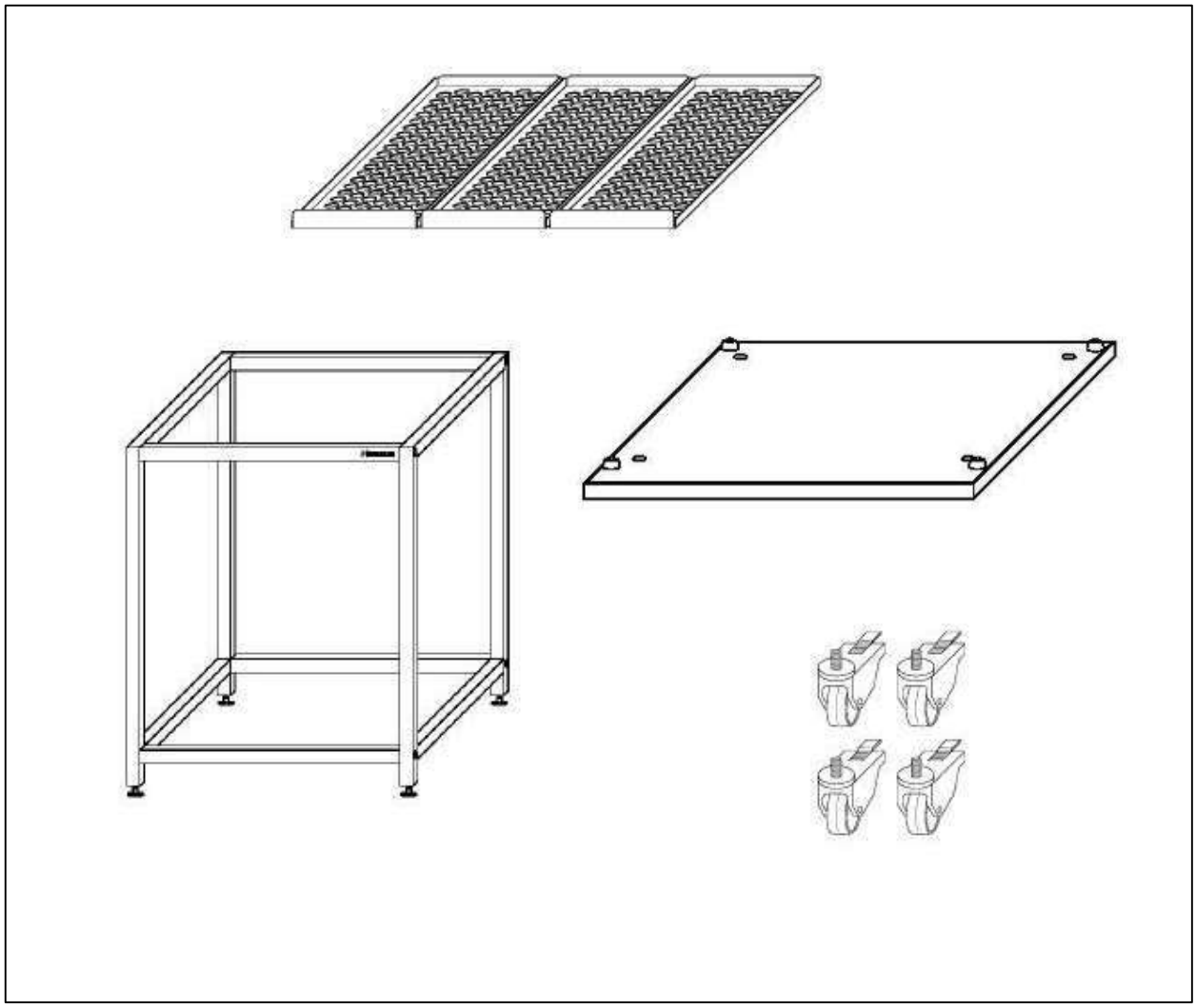
Deutschland
Anschrift
Kendro Laboratory Products GmbH
Heraeusstraße 12-14
D – 63450 Hanau
Telefon
Vertrieb: + 49 (0) 1805 - 536376
Service: + 49 (0) 1805 - 112 110
Fax
Service
& Vertrieb: + 49 (0) 1805 - 112 114

USA
Address
Kendro Laboratory Products
31 Pecks Lane
Newtown, CT 06470-2337

Telephone: 1-800-522-7746
Fax: 1-203-270-2210

Accessories for CO_2 - incubators

Illustrations and describtion



Version: 04.2004 / 50078754

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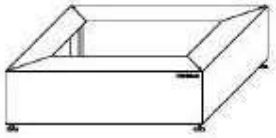
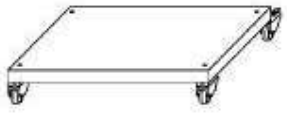
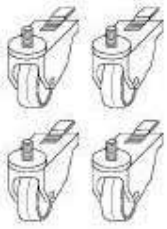
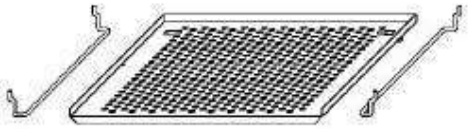
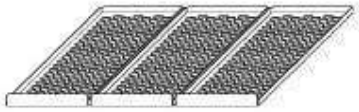
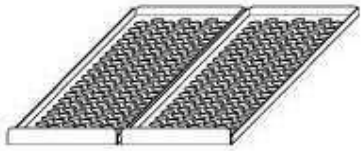
1 Accessories for HERAcell / HERAcell 150

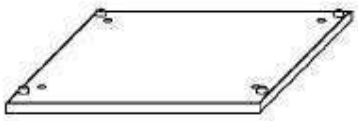
1.1 Support frames

1.	Support frame 200 mm Width: 637 mm Height: 200 mm Depth: 600 mm	50 051 376		
2.	Support frame 780 mm Width: 637 mm Height: 780 mm Depth: 600 mm	50 051 436		
3.	Support frame 185 mm (with castors) Width: 637 mm Height: 185 mm Depth: 600 mm	50 057 161		
4.	Support cart with drawers and castors Width: 637 mm Height: 890 mm Depth: 600 mm	50 056 459		
5.	Castors set for 1 & 2 above (Set of 4) Information: When fitting the castors will increase the height of the support frame by 90 mm.	50 052 528		

1.2 Shelves / HERAtrays

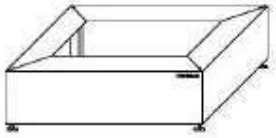
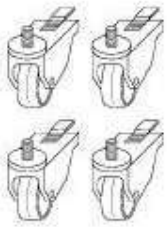
1.	Standart Shelf Full width inc. support rails, SS Full width inc. support rails, Cu Width: 423 mm (Overall) Depth: 465 mm (Overall) Thickness: 1 mm	50 051 909 50 051 910		
2	HERAtray 1/3 width SS (3 pcs.) HERAtray 1/3 width Cu (3 pcs) Width: 135 mm (Overall) Depth: 440 mm (Overall) Thickness: 1 mm	50 051 913 50 051 914		
3.	HERAtray 1/2 width SS (2 pcs.) HERAtray 1/2 width Cu (2 pcs.) Width: 205 mm (Overall) Depth: 440 mm (Overall) Thickness: 1 mm	50 058 672 50 061 050		

1.3 Stack adapters

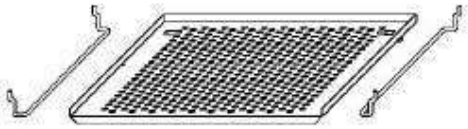
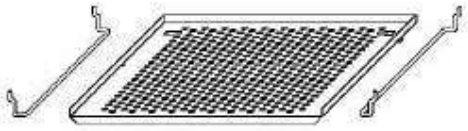
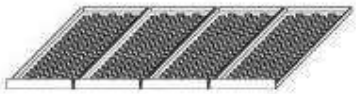
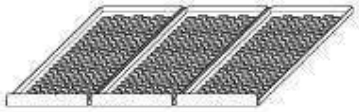
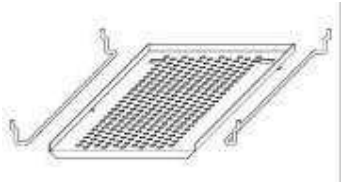
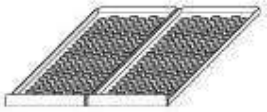
1.	Plate for stacking a HERAcell or HERAcell 150 on aHERAcell 240 Width: 780 mm Depth: 772 mm	50 068 677		
2.	Plate for stacking a HERAcell or HERAcell 150 on a BB 16 Width: 647mm Depth: 660 mm	50 051 938		
3.	Plate for stacking a HERAcell or HERAcell 150 on a BB 6220 Width: 920 mm Depth: 670 mm	50 060 612		
3.	Plate for stacking a HERAcell or HERAcell 150 on a B 5060 or B 5061 Width: 890 mm Depth: 665 mm	50 060 736		

2 Accessories for HERAcell 240

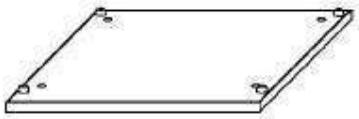
2.1 Support frames

1.	Support frame 200 mm Width: 780 mm Height: 200 mm Depth: 652 mm	50 065 754		
2.	Support frame 780 mm Width: 780 mm Height: 780 mm Depth: 652 mm	50 065 753		
3.	Support frame 185 mm (with castors) Width: 780 mm Height: 185 mm Depth: 652 mm	50 067 224		
4.	Castors set for 1 & 2 above (Set of 4) Information: When fitting the castors will increase the hight of the support frame by 90 mm.	50 052 528		

2.2 Shelves / HERAtrays

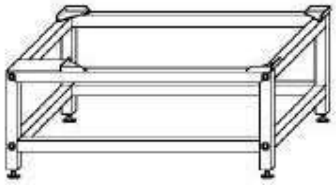
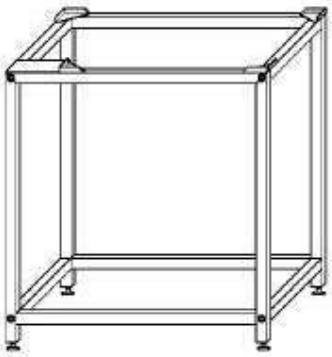
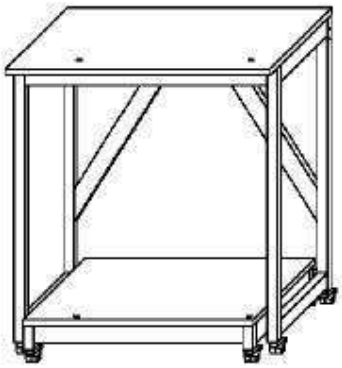
1.	Standart Shelf Full width inc. support rails, SS Full width inc. support rails, Cu Width: 560 mm (Overall) Depth: 500 mm (Overall) Thickness: 1 mm	50 065 793 50 065 794		
2.	Reinforced shelf (Strengthen shelf) Full width inc. support rails, SS Full width inc. support rails, Cu Width: 560 mm (Overall) Depth: 500 mm (Overall) Thickness: 2 mm	50 077 367 50 077 365		
3.	HERAtray 1/4 width, SS (3 pcs.) HERAtray 1/4 Width; Cu (3 pcs.) Width: 135 mm (Overall) Depth: 485 mm (Overall) Thickness: 1 mm	50 065 807 50 065 808		
4.	HERAtray 1/3 width, SS (3 pcs.) HERAtray 1/3 Width; Cu (3 pcs.) Width: 180 mm (Overall size) Depth: 485 mm (Overall size) Thickness: 1 mm	50 065 805 50 065 806		
5.	Shelf for units with gas screen Half width incl. support rails, SS Half width incl. support rails, Cu Width: 260 mm (Overall size) Depth: 500 mm (Overall size) Thickness: 1 mm	50 065 795 50 065 796		
6.	Shelf for units with gas screen HERAtray 1/2 width, SS (2 pcs.) HERAtray 1/2 width, Cu (2 pcs.) Width: 125 mm Depth: 485 mm Thickness: 1 mm	50 065 809 50 065 810		

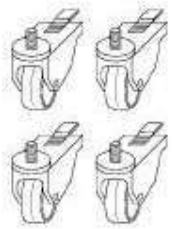
2.3 Stack adapters

1.	Plate for stacking 2 x HERAcell 240 or for stacking a HERAcell or HERAcell 150 with a HERAcell 240 Width: 780 mm Depth: 772 mm	50 068 677		
2.	Plate for stacking a HERAcell 240 with a BB 6220 or BBD 6220 or cytoperm 2 or B 5060 or B 5061 Width: 895 mm Depth: 721 mm Information: The BBD 6220 or cytoperm 2 should stand on the adapterplate.	50 066 094		

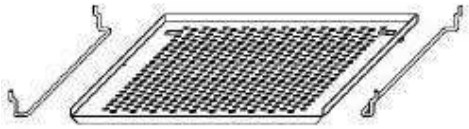
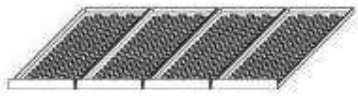
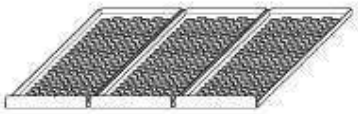
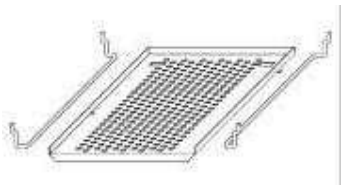
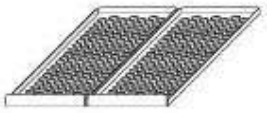
3 Accessories for cytoperm 2 / BBD 6220

3.1 Support frames

1.	Support frame 300 mm Width: 885 mm Heidht: 300 mm Depth: 645 mm	50 031 348		
2.	Support frame 780 mm Width: 885 mm Height: 780 mm Depth: 645 mm	50 029 597		
3.	Stacking frame with castors for stacking 2 x BBD 6220 or cytoperm 2 Support frame for lower unit: Width: 920 mm Height: 200 mm Depth: 670 mm Support frame for upper unit: Width: 1080 mm Height: 1215 mm Depth: 770 mm Information: Alternatively another unit can bestacked in upper position, e.g. BB 6220 oder HERAcell 240.	50 053 628		

4.	Castors set for 1 & 2 above (Set of 4) Information: When fitting the castors will increase the hight of the support frame by 90 mm.	50 052 528		

3.2 Shelves / HERAtrays

1.	Standart Shelf Full width inc. support rails, SS Full width inc. support rails, Cu Width: 560 mm (Overall) Depth: 500 mm (Overall) Thickness: 1 mm	50 029 945		
3.	HERAtray 1/4 width, SS (3 pcs.) Width: 135 mm (Overall) Depth: 485 mm (Overall) Thickness: 1 mm	50 065 807		
4.	HERAtray 1/3 width, Cu (3 pcs.) Width: 180 mm (Overall) Depth: 485 mm (Overall) Thickness: 1 mm	50 065 805		
5.	Shelf for units with gas screen Half width incl. support rails, SS Width: 260 mm (Overall size) Depth: 500 mm (Overall size) Thickness: 1 mm	50 029 943		
6.	Shelf for units with gas screen HERAtray 1/2 width, SS (2 pcs.) Width: 125 mm Depth: 485 mm Thickness: 1 mm	50 065 809		

3.3 Stack adapter

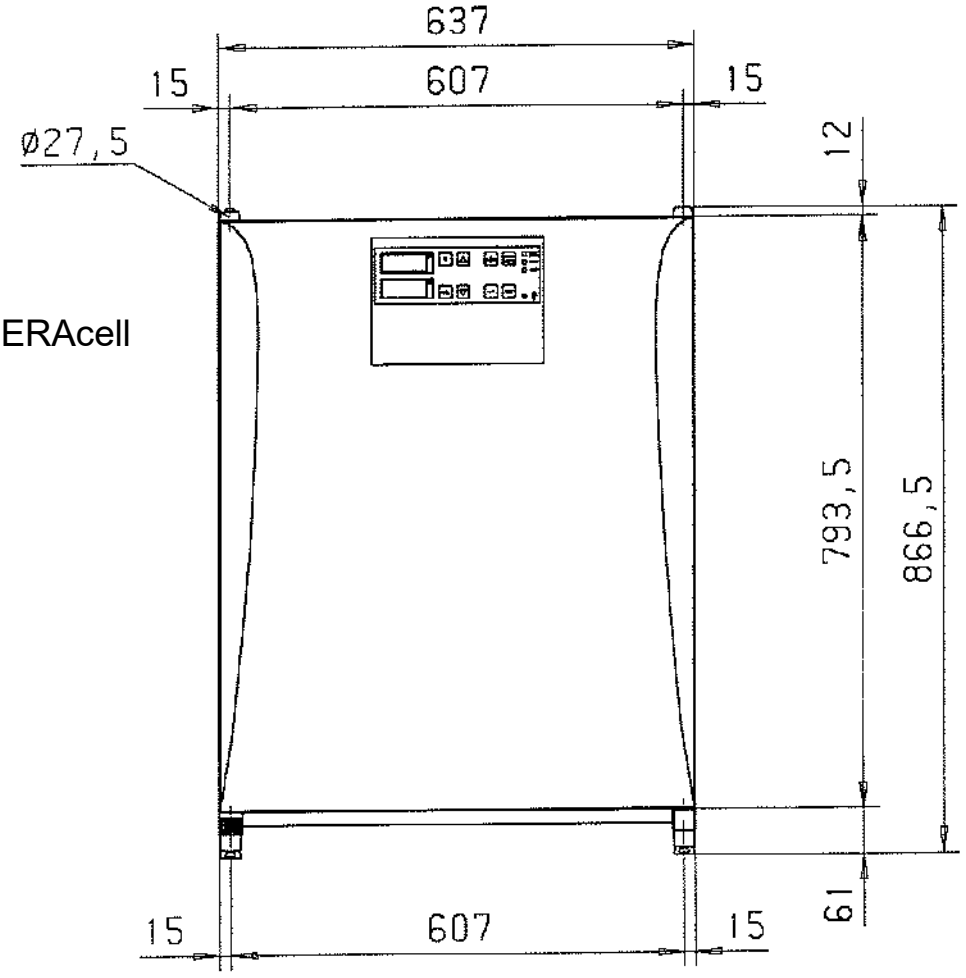
1.	Plate for stacking a HERAcell 240 with a BB 6220 or BBD 6220 or cytoperm 2 or B 5060 or B 5061 Width: 895 mm Depth: 721 mm Information: The BBD 6220 or cytoperm 2 should stand on the adapterplate.	50 066 094		

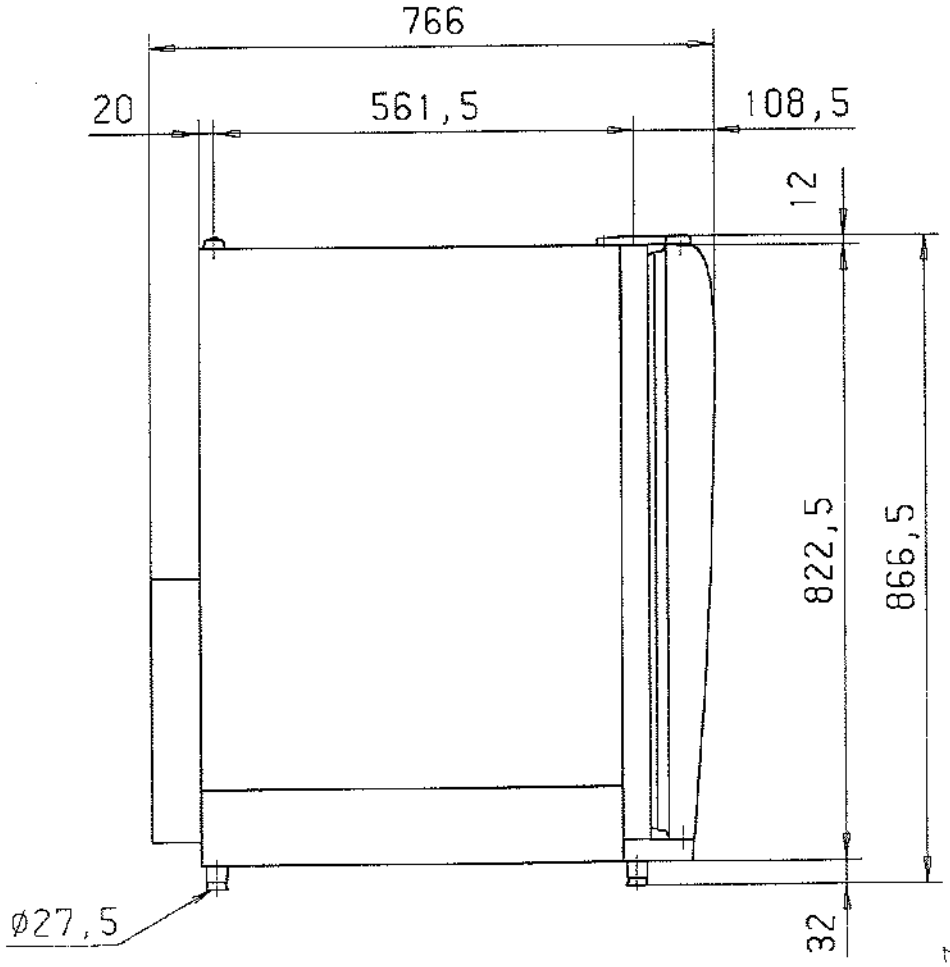
Anschrift:
Kendro Laboratory Products GmbH
Robert – Bosch – Straße 1
D - 63505 Langenselbold
Deutschland

Telefon:
Vertrieb/
Service + 49 (0) 6184 / 906940

Fax:
Vertrieb/
Service + 49 (0) 6184 / 907474

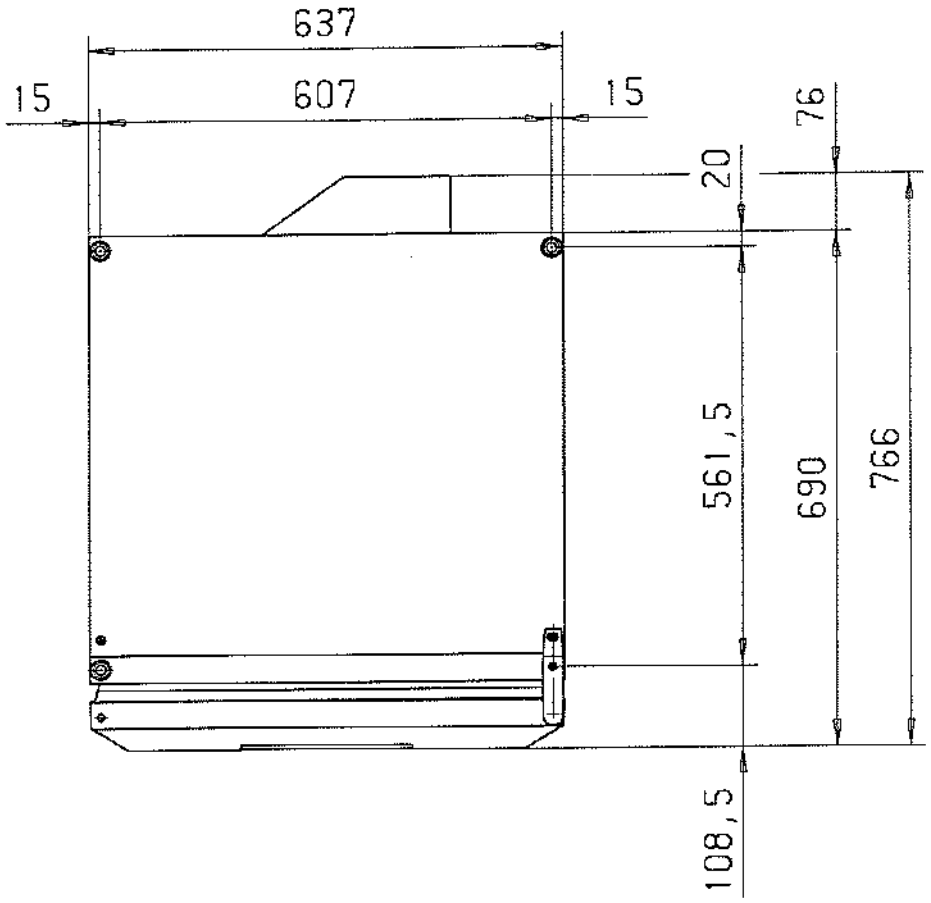
Footprint HERAcell

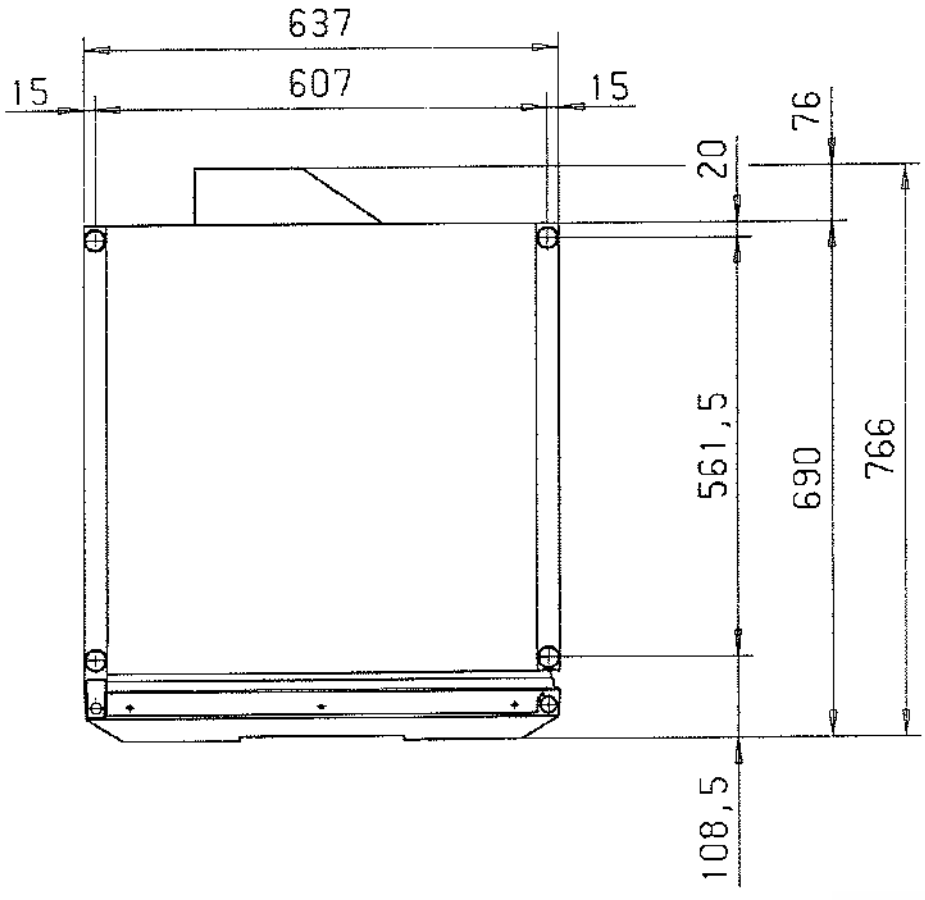




JAPAN

Footprint HERAcell





Thermo Service & Support
Service Bulletin

Product Line	Equipment	Bulletin	Issue Date
Incubator - Heraeus	HERAcell 150/240	0504-LSB-INC-007	21. April 2005

New Water Level Sensor

PURPOSE:

To inform the field of a new water level sensor for HERAcell 150/240.

EQUIPMENT AFFECTED:

All HERAcell 150/240 Advance

DESCRIPTION / INFORMATION:

Due to poor reliability 50075590 water level sensor for HERAcell has been replaced with a new more robust device.

The spare part number for the new sensor is 50084764 and is available immediately.

ADDITIONAL INFORMATION:

The new sensor is a direct replacement for the old and should be wired as follows:

Sensor Wire	JP1 Pin
Red (+5v)	4
Orange (signal)	2
Brown (0v)	1

Note – Pin 3 is no longer used.

Existing stocks of 50075590 should be scrapped.

The new sensor has been used in the production of all HERAcell with a serial number of **40481146** and higher.

Author	Reviewed By	
R Bloomfield	S Czwak	Thermo ELECTRON CORPORATION