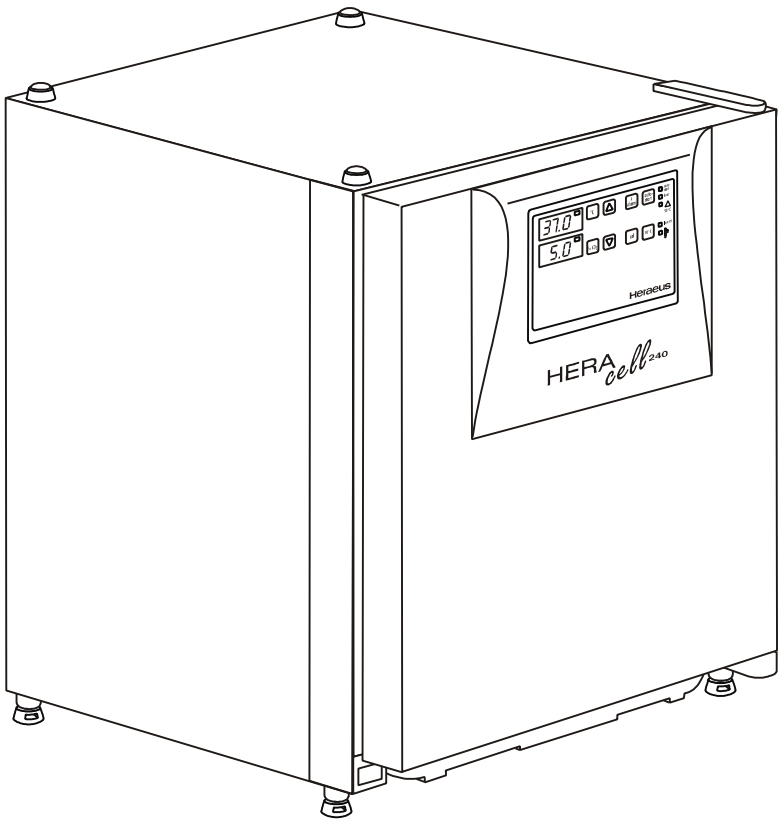
Kendro

Operating Instructions

HERAcell® 240 CO_2 Incubator with Decontamination Routine

HERAcell® 240



Version: 03.2001 / 50065640

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1.1 Operator Information

The HERAcell® 240 CO_2 Incubator has been manufactured according to the highest standards and is operationally safe. Nonetheless, this unit presents a source of potential hazard, particularly when used by individuals with inadequate instruction or if it is used in an improper manner or for work for which it is not intended.

- Using these operating instructions, the safety data sheets, hygienic guidelines, and in compliance with applicable technical regulations, the operator must prepare written instructions in an understandable form for the users of this unit.
- These instructions are to be provided in the language of the employees.
- Using these instructions, instruct the operating and cleaning personnel in the functions, the operation, and the required cleaning tasks for this unit.
- The content of these operating instructions is subject to change at any time without notification.
- The German version of these operating instructions remains binding for all translations.
- Carefully store these operating instructions near the unit so that operating personnel can refer to them with regard to the safety information and important operating information.

For your own safety, please contact Kendro Laboratory Products or your dealer should any questions arise which are not adequately covered by these operating instructions.

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1. Information regarding Safe Operation

Warranty:
Kendro Laboratory Products only warrants the safety and operability of the HERAcell® 240 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 operating 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 period begins at the time the unit is delivered to the ordering party.

Trademarks:
Heraeus, HERAcell® are registered trademarks of Kendro Laboratory Products GmbH. Any other trademarks cited in these operating instructions are the sole property of the associated manufacturers.

1.2 User Information

It is important for you to read these operating instructions carefully before using the unit for the first time. This will allow you to exploit all the advantages the unit offers and to protect individuals, samples, and the environment against possible harm:

- These operating instructions describe the HERAcell® 240 CO_2 Incubator.
- The CO_2 Incubator may only be operated by trained, authorized personnel.
- Maintenance work on the unit may only be performed by the Kendro Laboratory Products Service or trained, authorized agents.

1. Information regarding Safe Operation

1.3 Explanation of Symbols

Symbols Used in These Operating Instructions:

WARNING!
Failure to observe this instruction can result in severe or fatal injury.

CAUTION!
Failure to observe this instruction can result in slight to serious injury or property damage.

NOTE!
Indicates important information and application tips**.**

RECYCLING!
Valuable raw materials can be recovered.


Wear protective gloves!


Wear safety glasses!


Hazardous liquids!


Electrical shock hazard!


Hot surface!


Fire hazard!

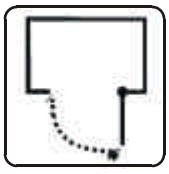
Symbols in the Short Instructions:

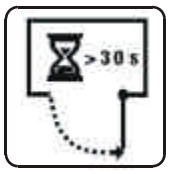

Operator steps to be carried out on the unit


Unit display status


Switch the unit on.


Switch the unit off.


Open the unit doors.



Leave the unit doors open for at least 30 seconds.

1. Information regarding Safe Operation

Symbols in the Short Instructions:

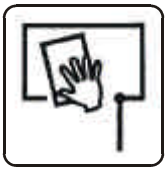
Check humidifying system water level and top up as required. Max. fill volume, 4.5 l; min. volume, 1.8 l

Fill 350 ml water reservoir for ContraCon disinfection routine

Initiate auto-start. Press and hold button for at least 5 seconds.

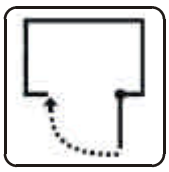
Initiate ContraCon disinfection routine. Press and hold button for at least 5 seconds.

Set desired temperature and CO_2 concentration.



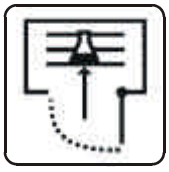
Clean sample chamber.

Symbols in the Short Instructions:



Close unit doors.

Remove samples and water reservoir from the unit.



Load unit.

Refer to note in the operating instructions, page ...

Symbols on the Unit:

CE symbol
Note the operating instructions!

Observe the operating instructions!

VDE-tested safety
(nameplate)

1. Information regarding Safe Operation

1.4 General Safety Information

Proper Use:
The HERAcell® 240 CO_2 Incubator is a laboratory unit used for the cultivation of cell and tissue cultures.
The unit permits the simulation of the special physiological environmental conditions for these cultures by means of the exact regulation of:

- Temperature;
- CO_2 content, and;
- The adjustment of an elevated relative humidity.

It is equipped with an automatic decontamination routine.
The HERAcell® 240 CO_2 Incubator is intended to provide an environment with controlled temperature, CO_2, elevated humidity and automatic decontamination mode for the development of ova or embryos at or near body temperature.

The HERAcell® 240 is suitable for installation and operation in the following areas:

- Laboratories performing cellular biology and biotechnology work and conforming to safety levels L1, L2, and L3.
- Medical/microbiological laboratories conforming to DIN 58 956.
- Laboratories in the central areas of clinics and hospitals.

The CO_2 Incubator is suitable for continuous operation.

The CO_2 used to supply the incubator is provided by a separate gas supply system, either from a CO_2 gas cylinder or a central compressed gas container. The gas supply equipment must be designed so that the operating pressure in the CO_2 supply line can be adjusted to a range of 0.8 bar min. to 1 bar max. and cannot be altered.

Improper Use:
Cell and tissue cultures which do not meet the requirements of safety levels L1, L2, and L3 may not be used in the unit.

Tissue, materials, or liquids:

- Which are highly flammable or potentially explosive;
- Whose vapors form flammable or explosive mixtures with air;
- Which release toxins;

may not be used.

1. Information regarding Safe Operation

Safety Regulations:
The following safety regulations apply to the operation of the unit in the Federal Republic of Germany:

- ZH 1/10
- ZH 1/119
- ZH 1/342
- ZH 1/343
- ZH 1/598
- TRG 280
- Safety data sheets from the gas suppliers with regard to the special properties of CO_2.
- "Basics of Good Microbiological Techniques", information sheet issued by the Federal Association of the Chemical Industry.

The corresponding national regulations are binding in other countries.

Safety Requirements:
The unit conforms to the following safety requirements:

- EN 61010
- Low-voltage Guideline, 73/23 EWG
- EMP Guideline, 89/336 EWG
- DIN 12880, Part 1/11.78

Protective Equipment:
The unit is equipped with several safety devices:

- An interlock switch in the door interrupts the CO_2 supply and the heater when the glass door is opened.
- An independent overtemperature protection protects the samples against damaging excess temperature in case of a fault.
- A pressure compensation opening provides pressure compensation for the sample chamber.
- Audible and optical warning indicators signal faults during operation.

Disposal

Old units or no longer serviceable components contain materials which can be recycled.

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.**

After proper decontamination, all components can be passed on to regular disposal/recycling channels.

For detailed information regarding employed materials, please refer to Chapter 14 "Employed Materials".

NOTE –Recycling-Service:

Kendro offers a proper recycling service for old equipment. For further information regarding this fee-based service, please contact the Kendro Service.

1. Information regarding Safe Operation

1.5 Safety Information Concerning CO_2

CO_2 is classified as a gas representing a potential health hazard. Special safety measures must therefore be observed when starting and using the CO_2 Incubator.

NOTE – Instruction:

Prior to beginning their work, all personnel involved with operating units with CO_2 supply must be instructed in the special requirements for handling CO_2:

- Proper operation of compressed air containers and gas supply equipment (e.g., TRG 280);
- Obligation to report damage and deficiencies in the CO_2 supply lines;
- Measures to be instituted in case of accidents and faults.

Instruction is to be repeated at suitable intervals. All special instructions provided by the gas supplier must be included in the instruction.

NOTE – Installation Work:

Only qualified personnel using suitable tools may work on supply lines and compressed gas container, bottles, or collective systems in which CO_2 is stored for use with the incubator.

CAUTION – Suffocation Hazard!

The release of larger amounts of CO_2 into the immediate environment will result in a suffocation hazard.
Immediately initiate the planned safety measures in case of a CO_2 leak!

- **Leave the room immediately and prevent the entry of other personnel!**
- **Immediately inform the local emergency services or fire department**!

2. Initial Inspection

2.1 Packaging

The HERAcell® 240 CO_2 Incubator is delivered in a rigid shipping crate. All packing materials can be separated for recycling:

Packing material

- Box — Recycled paper
- Plastic foam — Styrofoam (CFC free)
- Pallet — Untreated wood
- Wrapping — Polyethylene
- Straps — Polypropylene

2.2 Receipt Inspection

As soon as possible after receiving the unit check the unit components for any signs of shipping damage and make sure the delivery is complete.
Should damage be discovered or if components are missing, immediately inform the carrier, Kendro Laboratory Products, or your dealer.

2. Initial Inspection

2.3 Parts supplied

	CO_2 Incubator with full glass door		**CO_2 Incubator with 6-port gas diaphragm**	
Equipment level	Full glass door with continuous inserts (standard version)	Full glass door with divided inserts	6-port gas diaphragm with divided inserts	6-port gas diaphragm with continuous inserts
Insert tray	3	6	6	3
Insert tray support profiles	4	6	6	4
Insert tray support bracket	6	12	12	6
Drawer	1	1	1	1
Pressure compensation opening insert	1	1	1	1
Access port plug	1	1	1	1
Power cord	1	1	1	1
Connector, zero-potential contact	1	1	1	1
Spare cover flaps, set	1	1	1	1
CO_2 connecting hose set	1	1	1	1
Immersion water pump	1	1	1	1
Tools				
Open-end wrench, 24 mm	1	1	1	1
Allen wrench, 2 mm, for fan wheel	1	1	1	1
Allen wrench, 3 mm, for fan cover	1	1	1	1
Instructions				
Operating Instructions	1	1	1	1
Short Instructions	2	2	2	2

3. Location Requirements

3.1 Ambient Conditions

The unit may only be operated at setup locations which conform to the special ambient conditions listed below:

Requirements:

- The setup location must be dry and free of drafts.
- The minimum distances to adjacent surfaces must be maintained on all sides. Refer to Section 3.3.
- The room must be equipped with adequate ventilation. Refer to Section 3.2.
- The setup surface must be firm, level, and non-flammable.
- The support frame (base, laboratory workbench) must have adequate bearing strength and be vibration free to withstand the weight of the unit, both empty and loaded (particularly if units are to be stacked).
- In order to achieve a proper, constant incubation temperature of 37 °C, the ambient temperature must remain in the range between +18 °C to +33 °C.
- The relative humidity must not exceed 80 %.
- The unit must be set up where it will not be in direct sunlight.
- No unit capable of generating large amounts of heat should be placed near the HERAcell® 240.

3.2 Room Ventilation

When CO_2 is fed to the unit, there is a slight overpressure in the sample chamber. Excess gas exits the incubator through the pressure compensation opening and when the door is opened, thus equalizing the pressure inside and outside the unit.
The pressure compensation opening and opening the door during operation will release **very small amounts** of CO_2 into the surrounding atmosphere. The room ventilation must be able to vent this gas safely to the outside.
In addition, when used continuously, the heat generated by the unit may alter the ambient conditions.

- Therefore, always set the HERAcell® 240 up in an area with adequate ventilation.
- Do not set the unit up in corners or other inadequately ventilated areas.
- The room ventilation system should conform to the requirements of ZH 1/119 (laboratory guidelines).

3. Location Requirements

3.3 Space Requirements

When setting up the unit, make sure the installation and supply lines remain freely accessible.
The circuit cabinet on the rear of the unit can be used as a spacer with regard to adjacent objects.
The dimensions provided regarding space and clearances required are to be considered the minimum requirements.

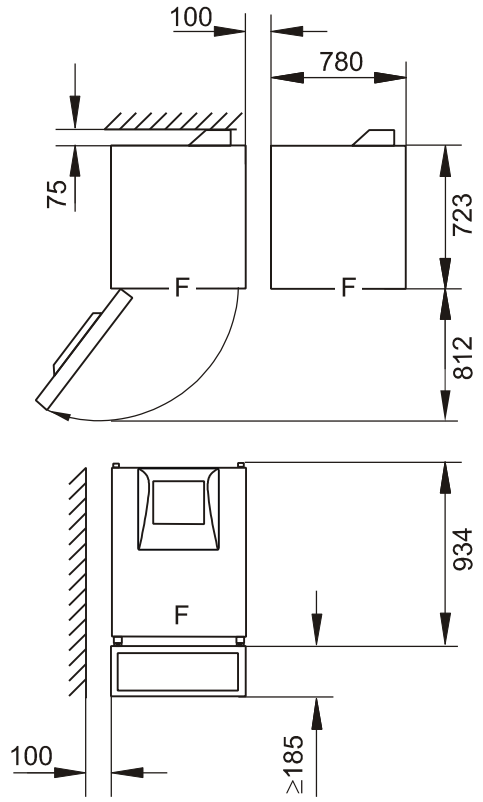
NOTE – Unit Accessibility:

We recommend maintaining larger than specified distances on the sides and rear of the unit to make access for care and maintenance tasks easier.

To avoid contamination of the CO_2 Incubator, a base or support should always be used, even when the unit is installed at floor level.
Kendro offers various stands as part of its line of accessory equipment (Refer to Chapter 12, “Spare Parts and Accessories” for the relevant order number).

Figure 1

Fig. 1, Unit dimensions and minimum distances.
Information given in mm; F = Front



3. Location Requirements

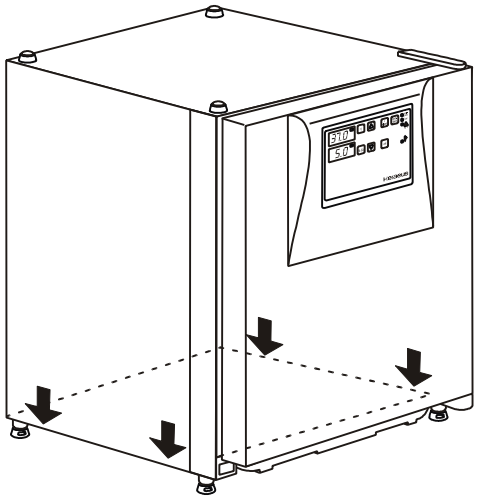
3.4 Moving

Figure 2 / 3

NOTE – Lift Points:

When moving the unit, do not lift it by its doors or other installed components such as the circuit cabinet on the rear.
Only lift the unit at the lift points indicated in the figure.

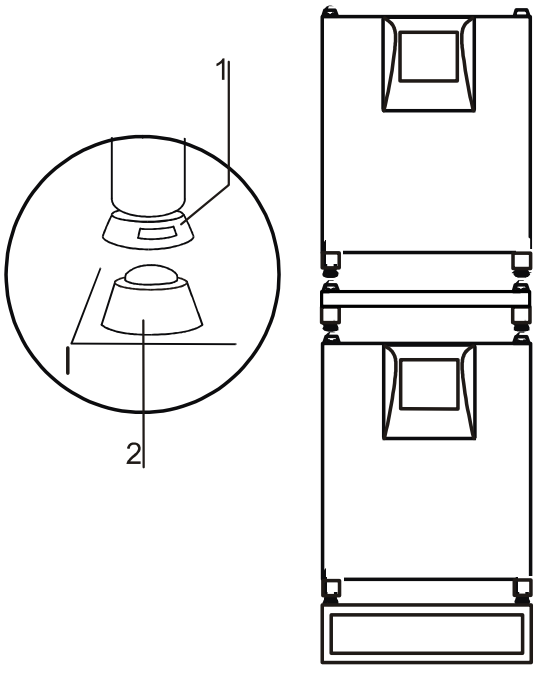
Fig. 2, Lift points



3.5 Stacking

A maximum of two HERAcell® 240 units can be stakked. For stacking, you will need the adapter panel (50068677) which provides a thermal barrier between the two units.
Stacking elements [2] are provided on the top of the unit and the top of the adapter panel. The unit feet [1] on the underside of the unit and the underside of the adapter panel mate with these elements to ensure a secure hold for the top unit.
When stacking units, a base stand with a minimum height of 185 mm should be employed to prevent contamination of the CO_2 Incubator.
If the units are mounted on a movable base or cart, make sure that the base or cart has locking castors so that they can be locked and pointed forward when the incubator is put in its operating position, as this offers the highest degree of safety.

Fig. 3, Stacking



NOTE – Moving Stacked Units:

The stacking elements **are not equipped so that they lock together.** Because of this care must be taken when moving the stacked incubators particularly. Ramps and uneven surfaces should be avoided.

3. Location Requirements

3.6 Door Modifications

Both the exterior door and the glass door can be installed so that they open to the left or right. The door stop can be retrofitted.
Standard versions of the incubator that have the full glass door can be modified to have a 6-port divided gas diaphragm. In this case, the gas diaphragm replaces the glass door.

NOTE – Modifications:

Door modifications may only be performed by the Kendro Laboratory Products Service.

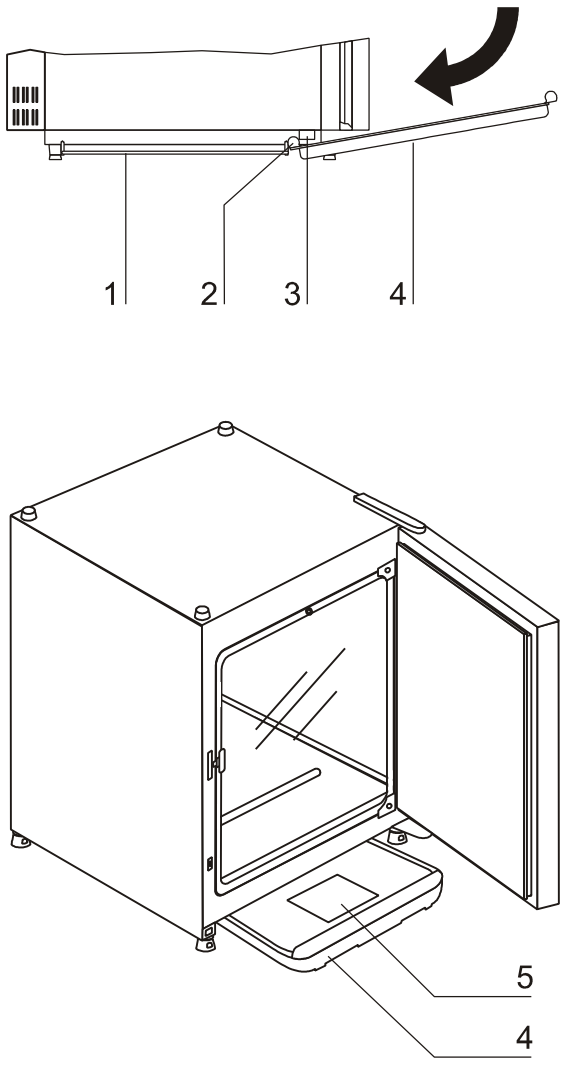
3.7 Drawer

Once the unit has been set up, the drawer is inserted between the two guide brackets under the unit body.

1. Completely open the exterior unit door to its stop.
2. Swing guide bracket [1] completely down.
3. Insert the drawer [4] with its raised edge [2] behind the cable conduit [3]. The short instructions [5] should face the front of the unit.
4. Slightly raise the front of the drawer and slide it downwards and into place.
5. Push the drawer in to its pressure point, then press down on the guide bracket and push it completely back to its stop.

Figure 4

Fig. 4, Drawer installation



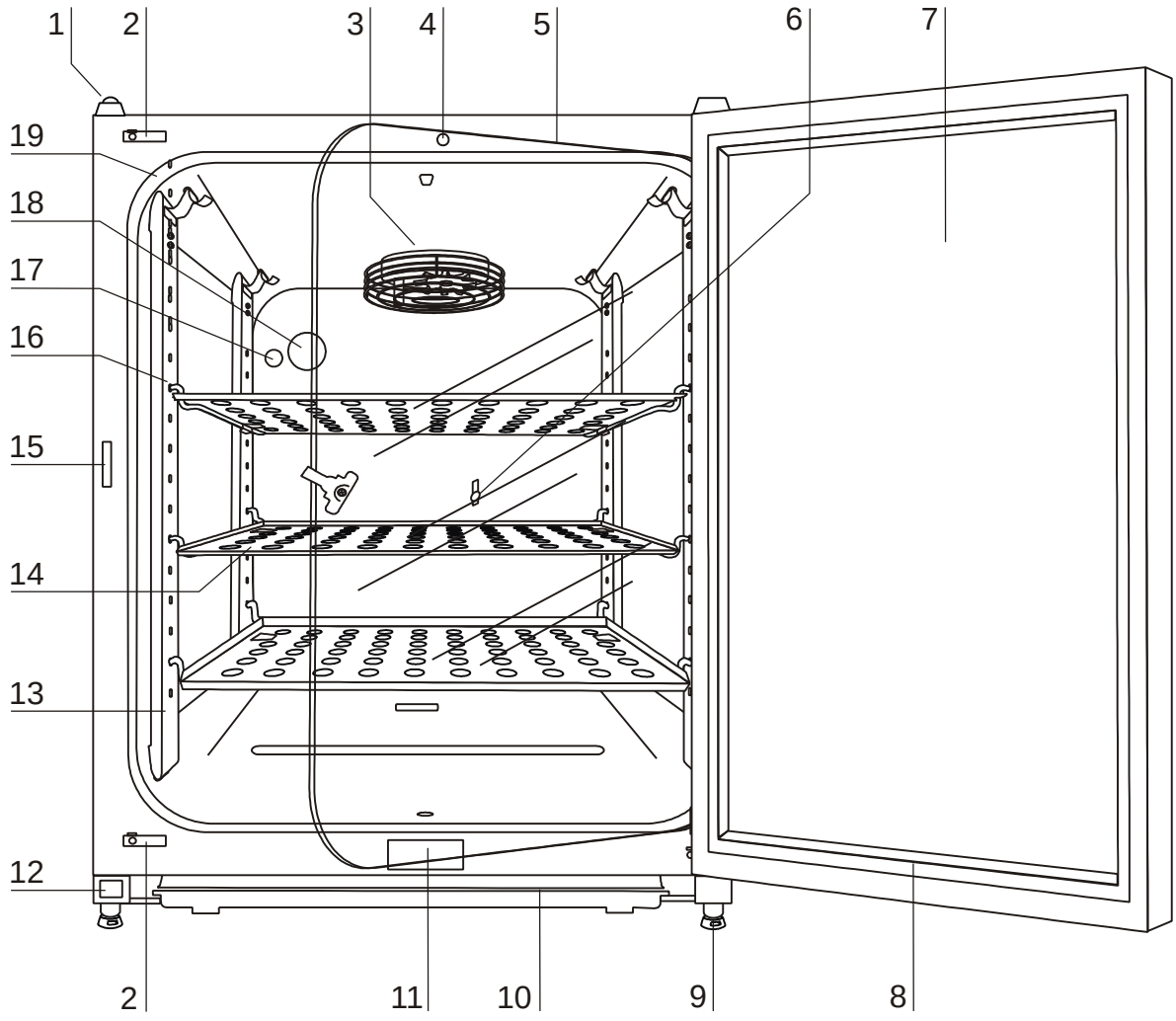
4. Parts Identification

4.1 Front View

Figure 5

[1] Stacking elements
[2] Cover flaps
[3] Measuring cell with fan wheel and sensors
[4] Door interlock
[5] Glass door
[6] Measurement opening
[7] Exterior door
[8] Exterior door seal, replaceable
[9] Foot, for height adjustment
[10] Drawer, pull-out
[11] Nameplate
[12] Main power switch
[13] Support profile
[14] Insert tray
[15] Door lock, glass door
[16] Support bracket
[17] Pressure compensation opening with insert
[18] Access port with plug
[19] Seal, glass door, replaceable

Fig. 5, Front view



4. Parts Identification

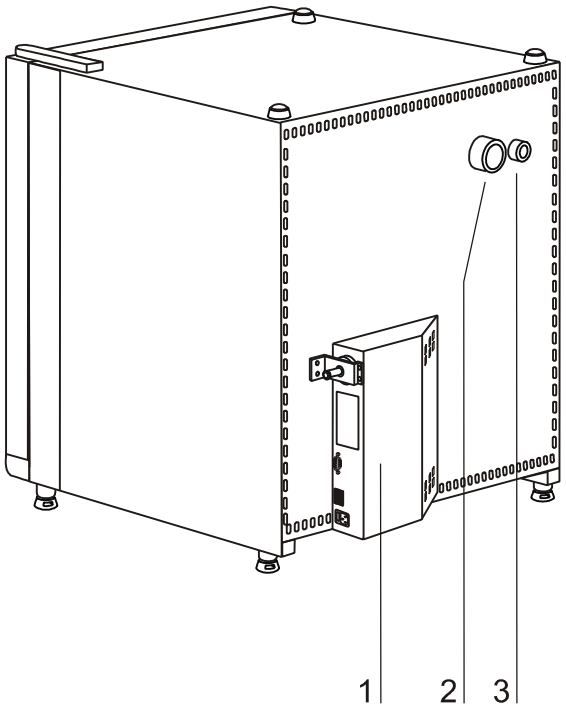
4.2 Rear View

Figure 6

[1] Circuit cabinet with supply connections:
- Gas connection
- RS 232 interface
- Zero-potential alarm contact
- Mains power connection

[2] Access port, 42 mm dia.
[3] Pressure compensation opening

Fig. 6, Rear view



5. System Description

5.1 Sample Chamber Atmosphere

The special physiological conditions for the preparation and cultivation of cell and tissue cultures are simulated in the incubator's sample chamber. In this, the sample chamber atmosphere is determined by three factors:

- Temperature;
- Relative humidity;
- CO_2 concentration.

Temperature:
For fault-free operation, the ambient temperature in the operating area should be at least 18 °C, while the incubation temperature should be at least 3 °C above the ambient room temperature.
The heating system regulates the incubation temperature from the minimum of 5 °C above ambient temperature up to 55 °C. The air jacket heating principle together with the separate exterior door heater ensure that condensation will not form on the sample chamber's side walls and ceiling.

Relative Humidity:
The floor pan in the sample chamber can hold 4.5 l of treated water. The sample chamber heater promotes the evaporation of this water thus providing a constant humidity level in the sample chamber. Under normal operating conditions at a standard incubation temperature of 37 °C, a constant relative humidity of approx. 95 % develops in the sample chamber.

A high/low switching function allows the unit to be switched between two modes to regulate the humidity:

- **Setting 0 (High)** creates a relative humidity of **approx. 95 %** in the sample chamber (standard setting),
- **Setting I (Low)** a relative humidity of **approx. 90 %** is created.

Only treated water which meets both of the following criteria is required for humidifying:

- Distilled;
- Autoclaved, sterile

CO_2 Supply:
CO_2 is supplied to the sample chamber to ensure the growth conditions for the cell and tissue cultures.
The pH value of the bicarbonate-buffered culture medium is significantly influenced by the CO_2 content of the sample chamber atmosphere.
The CO_2 content of the sample chamber atmosphere can be regulated through a range of 0 - 20 %.
The supplied CO_2 must exhibit one of the following properties:

- Minimum purity: 99.5 %;
- Medical gas quality.

5.2 ContraCon Decontamination Routine

The ContraCon decontamination routine decontaminates the entire sample chamber, together with all installed components and sensors.
During this routine, a hot/moist atmosphere is maintained at 90 °C providing a high decontamination effect.
The effectiveness of the ContraCon decontamination routine has been documented by independent institutions. Kendro can provide information concerning these tests upon request.
The ContraCon decontamination routine requires approx. 25 hours to run a complete cycle.
Once the routine has concluded, the unit must be restarted with the auto-start routine.

5. System Description

5.3 Sensors

The fan wheel and two sensor modules are installed in the base plate [2] of the metering cell:

- Sensor module [1] measures the sample chamber temperature and provides overtemperature protection;
- CO_2 sensor module [3] measures the CO_2 content of the sample chamber atmosphere.

The sensor to measure the sample chamber temperature and the CO_2 sensor form part of the unit's regulatory system. The measured values they provide are compared with the defined setpoints. Based on this data, the regulatory system controls the heater and the CO_2 supply.

The overtemperature protection has been preset at the factory. It protects the cultures against excess temperature. If the selected setpoint temperature is exceeded by more than 1 °C, the overtemperature protector is activated and the sample chamber temperature is automatically returned to the defined setpoint. Therefore, incubation can continue even in the case of a fault.
Activation of the overtemperature protector simultaneously generates an optical alarm.

5.4 Door Interlock Switch

An interlock switch is installed in the upper edge of the sample chamber opening. If the interlock [1] is activated by the opening of the glass door, the gas supply and heater in the sample chamber are interrupted. A corresponding indication appears on the control panel. If the door remains open longer than 30 seconds, a short audible alarm sounds. If the door remains open longer than 10 minutes, this signal becomes continuous.
The exterior door can only be closed if the glass door is locked.

☞ **NOTE – 6-port gas diaphragm models:**
On units equipped with the optional 6-port gas diaphragm, the door interlock function described above occurs as soon as the exterior door is opened.

Figure 7 / 8

Fig. 7, Metering cell sensors

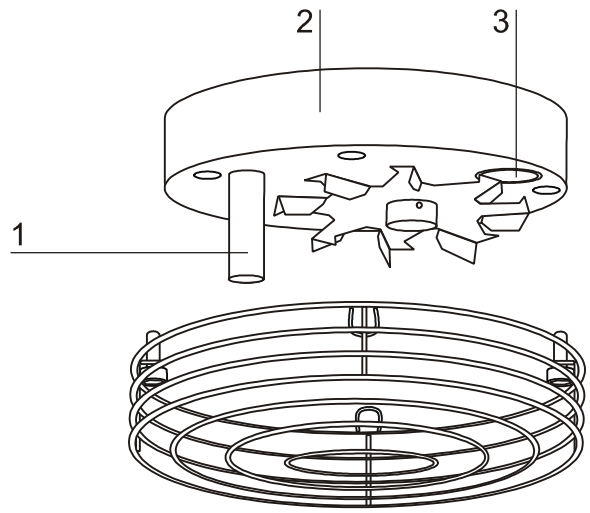
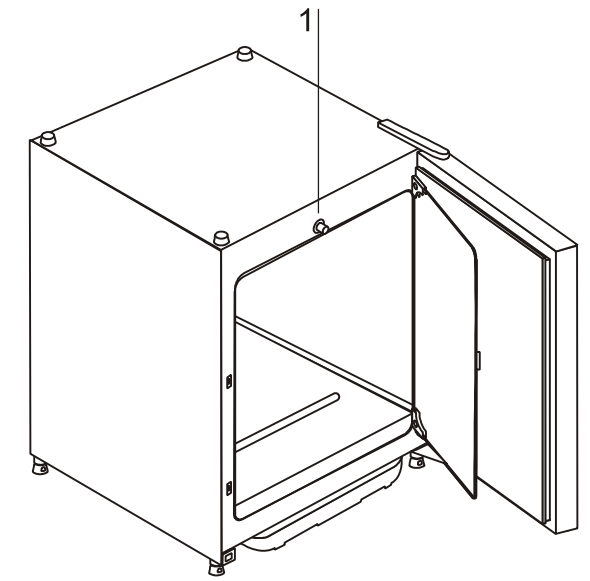


Fig. 8, Door interlock switch



5. System Description

5.5 Supply Connections

All supply connections are mounted on the circuit cabinet on the rear of the unit.

Gas Connection:
The gas supply between the unit and the gas supply system is established using the connecting hose provided. CO_2 is supplied to the unit via the connection piece [2] on the sterile filter [1] at a predefined, unalterable pressure set between 0.8 (min.) and 1.0 (max.) bar.
Before entering the sample chamber, the gas flows through the sterile filter [1] which provides a degree of separation of 99.998 % based on a particle size of 0.3 µm (HEPA filter quality).

Nameplate:
The nameplate [3] contains information concerning the supply connections.

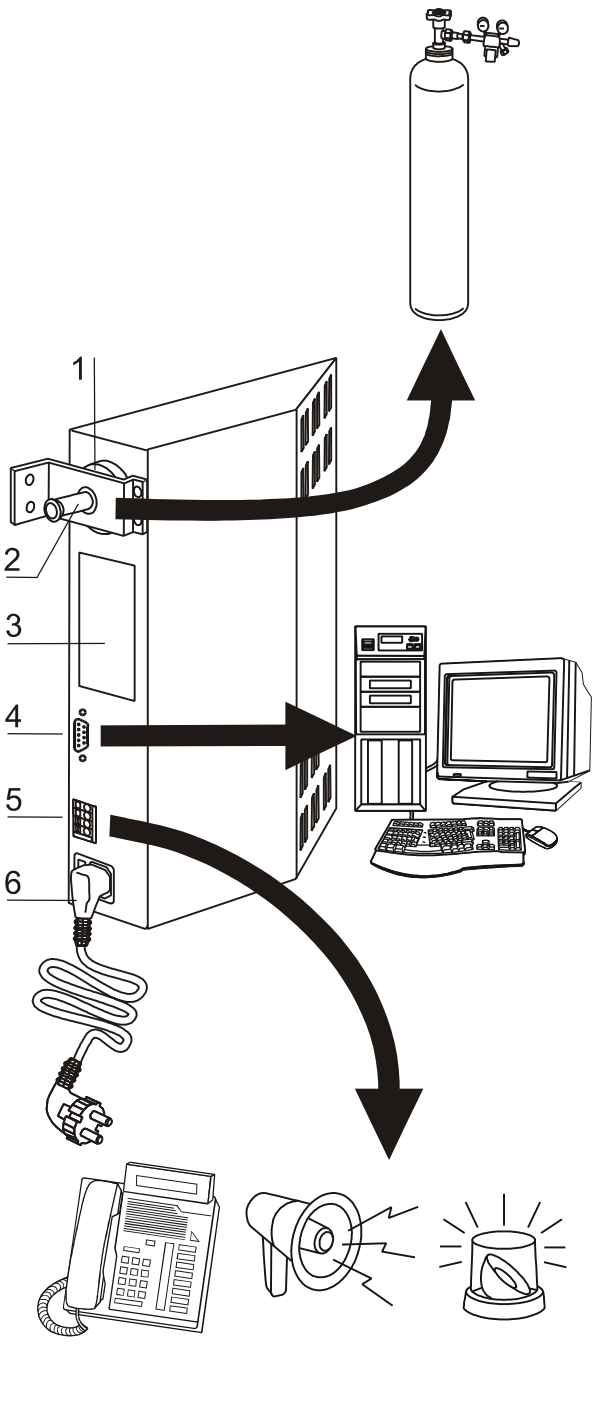
RS 232 Interface:
The RS 232 interface [4] can be used to connect the incubator to the serial port on a PC. This connection provides computer-aided acquisition and documentation of the most important operational parameters (temperature, CO_2 concentration, error codes, etc.). The interface protocol is detailed in Section 6.5.

Alarm Contact:
The unit can be connected to the customer's own, external reporting system (e.g., telephone system, facilities control system, optical or audible alarm). A zero-potential alarm contact [5] has been installed on the unit for this purpose and a connector is included in the accessories package.

Power Cord:
The power cord [6] uses a standard grounded plug. The power cord connector also contains a two-fuse holder.

Figure 9

Fig. 9, Supply connections



5. System Description

5.6 Sample Chamber Layout

The CO_2 Incubator's sample chamber has been designed to have a minimal surface area to minimise contamination and to allow efficient cleaning.

Interior Chamber:
All sample chamber components are made of stainless steel, having highly polished, totally smooth, easy-to-clean surfaces. Any protrusions have large, smooth shapes.
As an option, the interior chamber, the control system, and the fan wheel with its protective grid can be made of copper.

NOTE – Oxidation of the copper parts:

The effects of heat and humidity will oxidize the copper material in the interior chamber. Thus, the copper parts will already begin to discolor during the test run that is part of the initial unit inspection.
The oxidation layer should not be removed during routine cleaning as it provides the basis for copper's fungicidal and germicidal effect.

The components of the rack system are easily removed, leaving only the easy-to-treat interior chamber [1] to be cleaned.

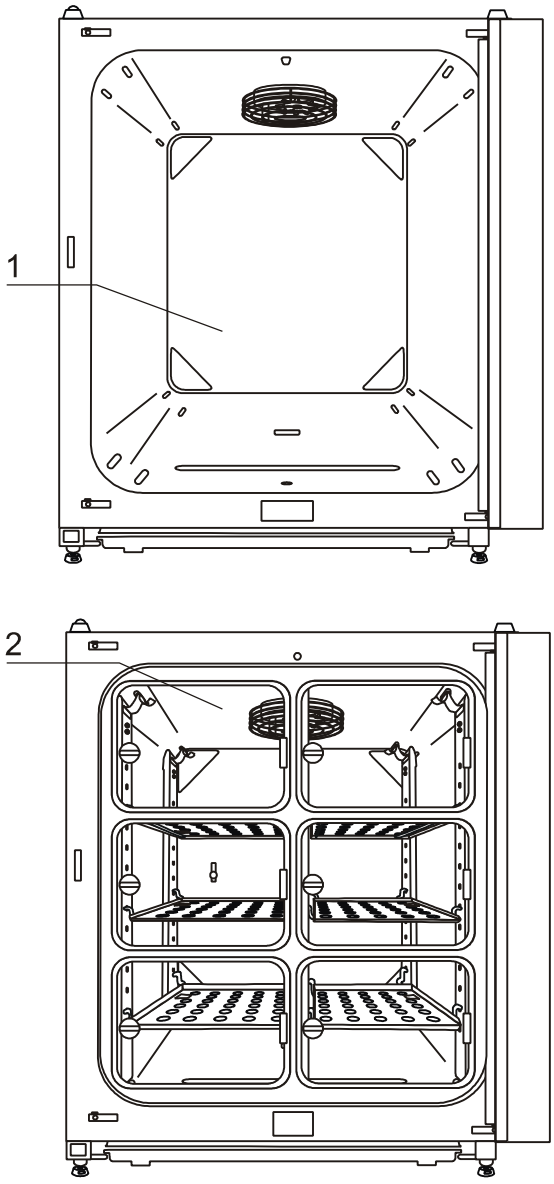
Optional 6-port Divided Gas Diaphragm:
Units equipped with the optional 6-port gas diaphragm [2] are subject to a greatly reduced risk of contamination and have shorter recovery times for the incubation parameters:

- Sample chamber temperature;
- CO_2 concentration;
- Relative humidity;

because the size of each opening is much smaller than the full glass door.

Figure 10

Fig. 10, Sample chamber layout



5. System Description

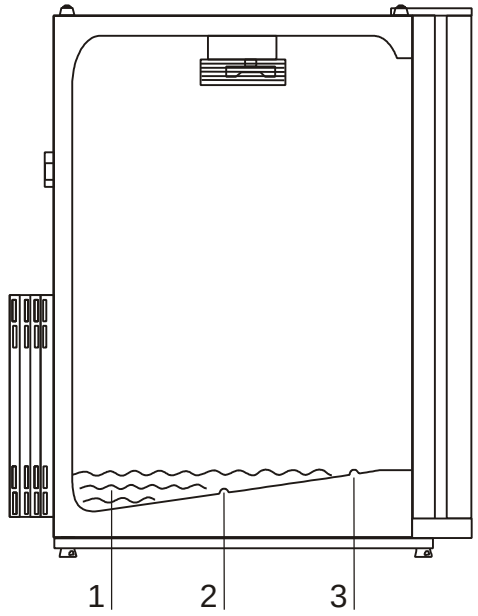
Figure 11 / 12

Water Reservoir, Fig. 11:
The water reservoir [1] is integrated into the base of the inner chamber and slopes towards the rear unit wall. Bulges in the base of the pan serve as indicators for the maximum fill level [3] and minimum fill level [2].

Rack System:
The support profiles for the rack systems have perforations every 42 mm. This allows the support brackets to be inserted in locations to accommodate any culture vessel size. The insert trays have integrated tip-protection and a stop to limit pull-out distance. Refer to Chapter 6, “Commissioning”, for a detailed description of the rack system.

Rear Unit Wall Openings, Fig. 12:
A pressure compensation opening [2] on the unit’s rear wall equalizes the pressure between the sample chamber and the ambient environment.
An access port [1] which can be sealed when not in use allows lines, tubes, or additional sensors to be added to the unit’s sample chamber.

Fig. 11, Water reservoir

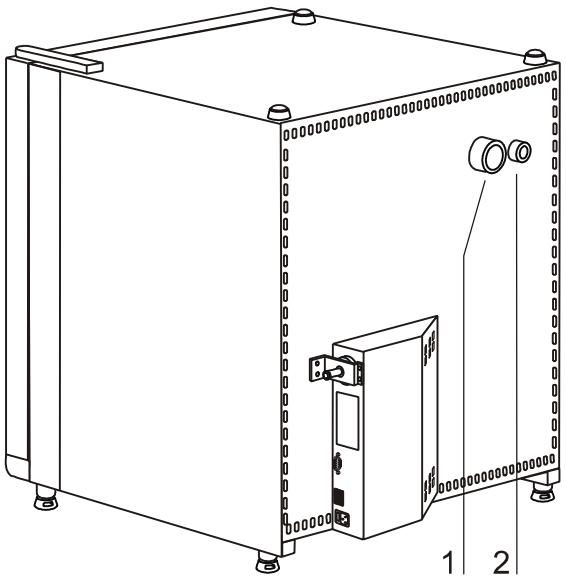


NOTE –Operating conditions:

When auxiliary units are operated in the CO_2 incubator’s sample chamber, the requirements of the ambient conditions must be observed (refer to the table). Energy brought into the sample chamber will influence the start of the temperature regulation range. The inclusion of additional heat sources in the sample chamber can result in the formation of condensation (e.g., on the glass door).

Added energy	Start of the temperature regulation range	
	General	Example: RT* = 21 °C
0 W	RT + 3 °C	24 °C
5 W	RT + 6 °C	27 °C
10 W	RT + 8.5 °C	29.5 °C
15 W	RT + 11.5 °C	32.5 °C
20 W	RT + 14 °C	35 °C
25 W	RT + 17 °C	38 °C
*RT = Room Temperature		

Fig. 12, Rear unit wall openings



6. Initial Setup

6.1 Sample Chamber Preparation

The CO_2 incubator is not sterile at delivery. The unit must be cleaned before beginning operation.
This applies to the following sample chamber components:

- Support profiles;
- Support brackets;
- Insert trays;
- Inner incubator chamber;
- Sample chamber seal;
- Glass door.

NOTE – Cleaning:

Refer to Chapter 10 for detailed information concerning cleaning and disinfecting the unit.

6.2 Rack System Installation

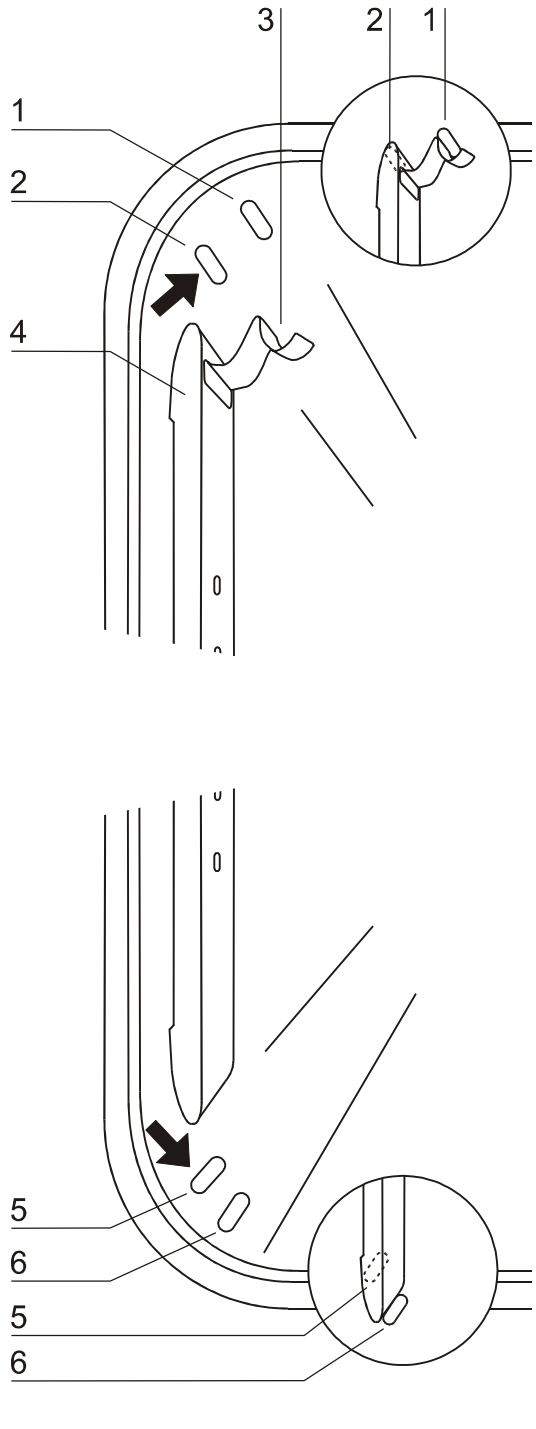
No tools are required to install the rack system. The support profiles are held in place by spring pressure. The support brackets are hung into the support profiles and the insert trays slide onto the support brakkets.

Support Profile Installation/Removal:
The sides of the support profiles are guided along protrusions [2] and [5] and held in place by protrusions [1] and [6]. The support profiles identified by the diamond-shape (◆) are installed against the rear unit wall. The retainer spring clips [3] must face up.

1. Place the support profile [4] on the lower protrusion [6] and swing it against the side sample chamber wall so that it sits on protrusions [5] and [2].
2. Clip the spring clip [3] behind the upper protrusion [1].
3. To remove the support profiles, pull the spring clip down and out of the protrusion by its tab, then remove the support profile.

Figure 13

Fig. 13, Support profile installation/removal



6. Initial Setup

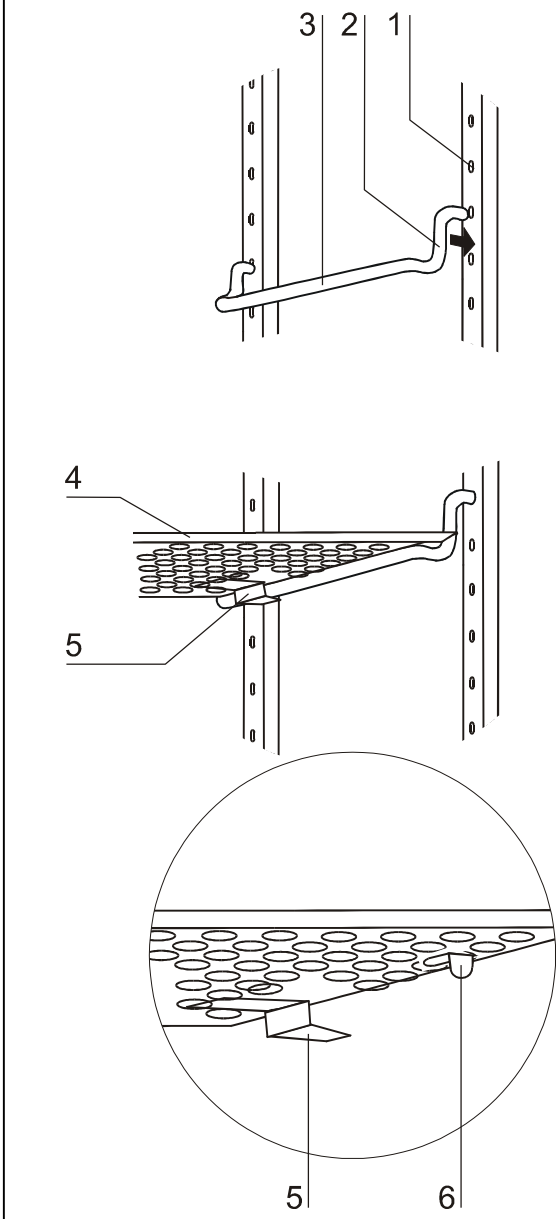
Figure 14

Support Bracket Installation:
1. Insert the support brackets [3] into the perforations [1] on the support profiles with the support bar facing down.
2. Make sure the two vertical sections [2] of the support bracket lie against the support profile.

Inserting Trays:
1. Slide the insert trays [4] with their tip-protection [5] towards the rear unit wall onto the support brakkets. The tip-protection [5] simultaneously serves as the guide for the insert tray.
2. Slightly raise the insert tray so that the stop [6] can be pushed over the support bracket.
3. Make sure the support bracket moves freely in the two tip-protections.

Leveling the CO_2 Incubator:
1. Place a level on the middle insert tray.
2. Using the open-end wrench provided (24 mm), turn the adjustable unit feet until the insert tray is horizontal in all directions. Adjusting the height with the feet should be performed from left to right and from the rear to the front.

Fig.. 14, Support bracket / insert tray installation



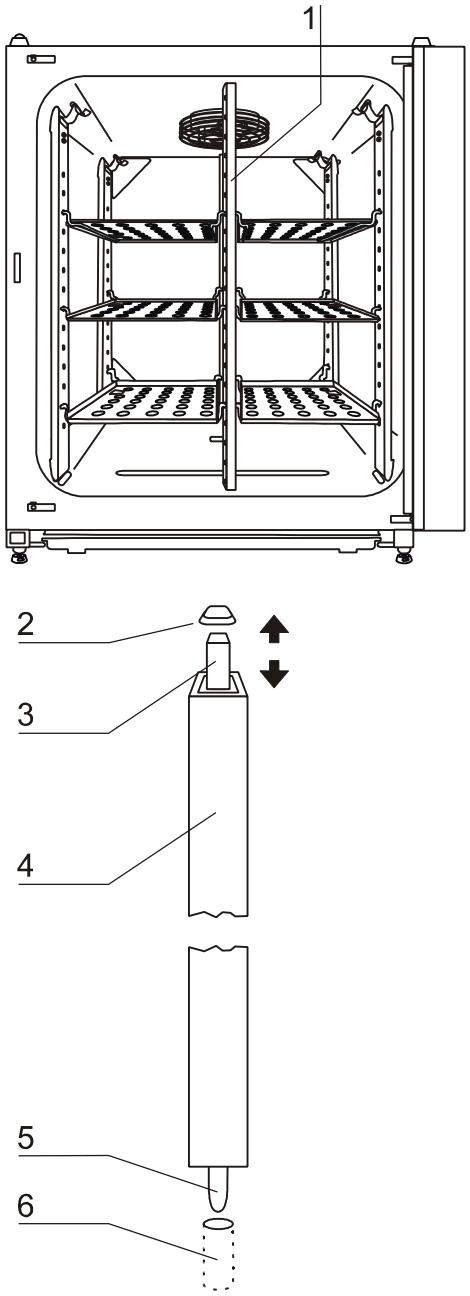
6. Initial Setup

Figure 15

Center Support Installation:
If the CO_2 incubator is equipped with the optional divided insert trays, tow center supports [1] with perforations are installed in addition to the support profiles on the sides.
In this case, the support brackets are inserted in the side support profiles and the perforations on the left and right sides of the center supports.

1. The upper rectangular guide [3] of the center support is under spring force. First insert this rectangular guide into the retainer on the sample chamber ceiling [2], then press down gently so that the rectangular guide pushes itself into the center support.
2. Then insert the lower round peg guide [5] of the center support into the opening [6] on the sample chamber floor and release the spring pressure.
3. The spring pressure stabilizes the center support.

Fig. 15, Center support installation



6. Initial Setup

6.3 Gas Connection

NOTE – Gas quality:

The supplied CO_2 must exhibit one of the following properties:

- Minimum purity: 99.5 %;
- Medical gas quality.

CAUTION - Overpressure:

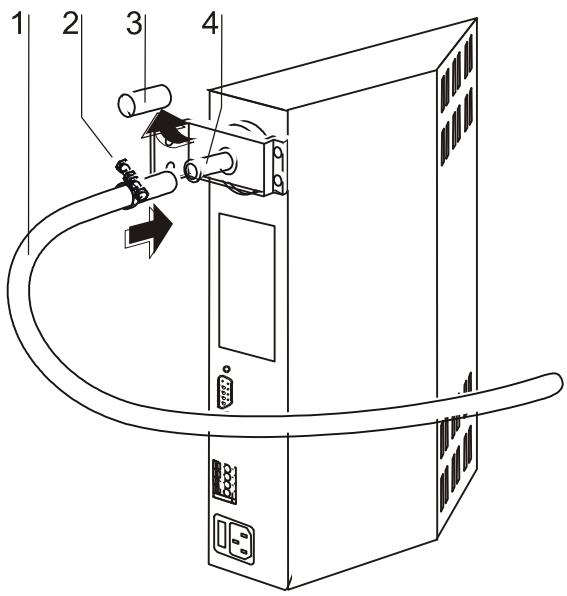
The maximum pressure of the CO_2 supplied to the unit may not exceed 1 bar. If gas is supplied at a higher pressure, there is a risk that the valves in the unit interior will not close properly resulting in improper regulation of the gas supply. Adjust the gas supply pressure in a range between a minimum of 0.8 bar and a maximum of 1.0 bar and make sure this pressure cannot be altered!

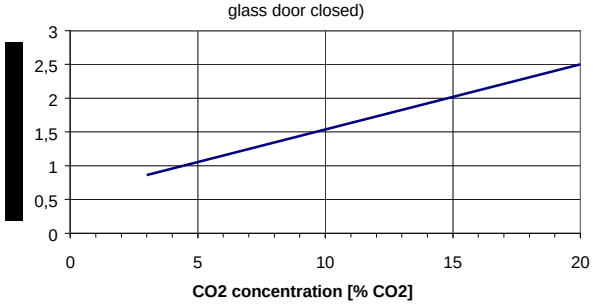
The gas supply is connected to the gas connection piece on the sterile filter, using the included, flexible gas pressure hose which is secured by a hose clamp.

1. Push the gas pressure tube [1] onto the gas supply connection piece.
2. Remove the protective cap [3] on the sterile filter.
3. Push the hose clamp [2] onto the gas pressure hose [1] and push the hose onto the connecting piece [4] on the sterile filter.
4. Secure the gas pressure hose to the connecting piece with the hose clamp.
5. If the access port is not being used, make sure it is sealed with its plug.

Abbildung 16

Fig. 16, Gas supply line connection





6. Initial Setup

6.4 Power Connection

WARNING – Electrical shock hazard:

Contact with components under electrical power can result in a life-threatening electrical shock.
Inspect the plug and power cord for damage before connecting the unit to the mains power supply.
Never use damaged components for establishing the mains power connection!

Connect the unit to a properly installed and grounded power supply with the following connection values:

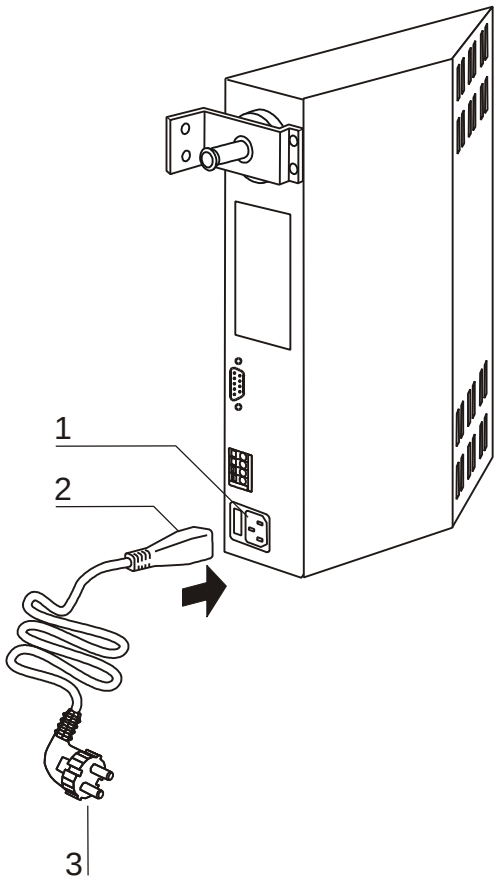
- Fuse T 16 A
- Power overload cut-out G 16

Establishing the mains power connection:

1. Before connecting the unit to the mains power supply, make sure the supply outlets electrical rating matches the information on the nameplate on the front of the unit. If the values for voltage (V) and maximum current (A) do not agree, do not connect the unit.
2. Insert the grounded unit connector [2] into the socket [1] on the unit circuit cabinet.
3. Insert the grounded connector on [3] the power cord into a properly grounded and protected wall outlet.
4. Make sure there is no tension or pressure on the power cord.

Figure 17

Fig.. 17, Power connection



6. Initial Setup

6.5 RS 232 Interface Connection

The RS 232 interface is designed to accept a cable with a 9-pin plug and 1:1 contacts.

Unit connection:
1. Switch the PC off.
2. Insert the plug of the serial interface cable [2] (not supplied) into the port [1] on the CO_2 incubator's circuit cabinet on the rear of the unit.
3. Insert the plug [3] at the other end of the cable into an open serial port on the PC, COM 1/COM 2, etc..
4. Switch the PC on.

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

Command Sequence
Data is exchanged by means of a defined structure of command sequences (frames).

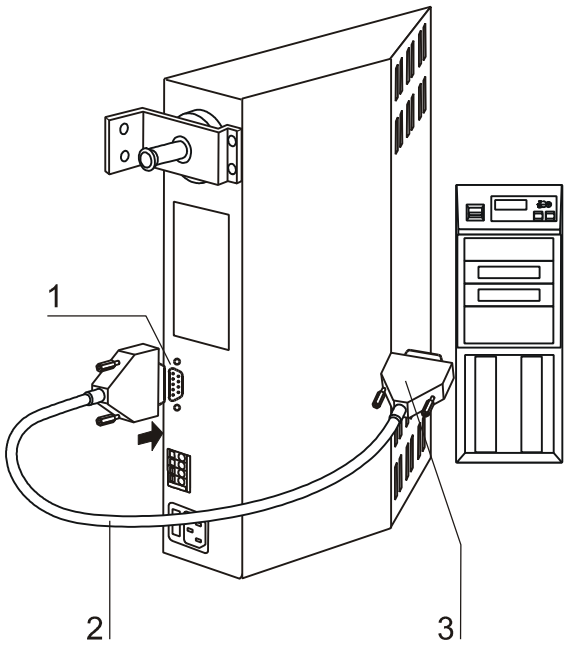
Frame structure:
<STX | command | data | BCC | ETX>

Command:
Bit 0 - 3 = Data field length, in bytes
Bit 4 - 7 = Command

Checksum:
BCC = 1 - complement
(command XOR data1 XOR ... XOR dataN XOR FF_H)

Figure 18

Fig. 18, RS 232 interface



6. Initial Setup

Command list – Read Regulatory Circuit Data
Command:
0110 0001 (61_H)
Data:
0001 0000 (10_H) for temperature in the incubation mode
0001 0001 (11_H) for CO_2
0001 0010 (12_H) for temperature during ContraCon decontamination

Unit response for Temperature, CO_2, and Decontamination
Data:
Setpoint x 10 (2 bytes, as integer)
Actual value (4 bytes, as floating point number)
Internal use (5 bytes for CO_2, otherwise 7 bytes)
(Refer to the example below)

Command List – Query Error Codes
Command:
1001 0000 (90_H)

Data:
None

Response – Query Error Codes
The microprocessor returns a total of 14 bytes (7 integer values). Each integer value represents one current error code in the associated regulatory circuit (0 = incubation temperature, 1 = CO_2 content, 2 = decontamination temperature, 6 = general).

The entry in index 6 belongs to a higher-level error which appears on all displays (e.g., error code 99). The error codes for incubation temperature and decontamination temperature appear on the temperature display, while those for CO_2 appear on the CO_2 display. A value of 0 indicates that there is currently no error.

Incorrect Response by the Regulatory Unit:
If a message is incomplete or incorrect, the CPU responds with an NAK (15_H, 1 byte only, no frame). Otherwise, the response will be the command code (with its own length information) and any required data.

Particular Data Exchange Features:
The following special features of the exchange of data between the PC and the regulatory unit's microcontroller must be noted:
The microprocessor stores a type size of **int or unsigned int** in the sequence: <high byte>, <low byte>. The reverse is true for the PC. The microcontroller transmits these values in its own format, that is, the PC must reverse the byte sequence. There are no differences for floating decimals (float).

Example: Temperature data query and response

Query
02_H 61_H 10_H $8E_H$ 03_H

Response:
02_H $6D_H$ 01_H 72_H 38_H 91_H $C7_H$ 41_H $F5_H$ $6B_H$ $F4_H$ 43_H $9E_H$ 00_H 32_H $4B_H$ 03_H
integer *float* *internal*
(37.0) (24.946)

6. Initial Setup

6.6 Alarm Contact Connection

NOTE – Specialized tasks:

Kendro Laboratory Products only warrants the safety and proper operability if the installation and repair tasks are performed professionally.
Only an authorized electrotechnical/ telecommunications specialist may connect the unit to an external alarm system!

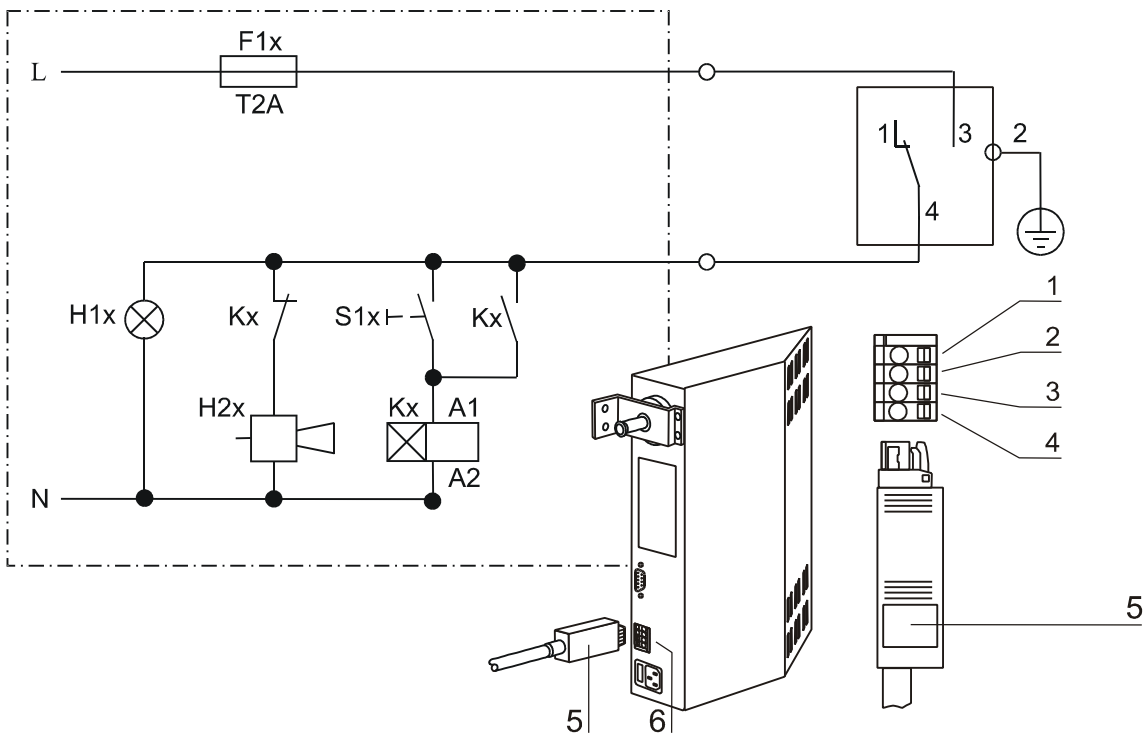
Figure 19

A connector [5] is supplied to allow connection to an alarm system (cable is not supplied). The table lists the values for the operating voltage and fuses on the external circuits of the alarm system.

1. Connect the individual connecting cable strands [1] to [4] according to the circuit diagram.
2. Plug connector [5] on the connecting cable to the external alarm system into the circuit box interface [6] of the rear of the unit.

Circuit	Voltage	External fuse
Circuit with mains voltage	250 V ~, max.	6 A, max.
SELV circuits (refer to VDE 0100, Part 410)	25 V ~	2 A, max.
	60 V =	1 A, max.
SELV-E circuits (refer to VDE 0100, Part 410)	50 V ~	1 A, max.
	120 V =	0.5 A, max.

Fig.. 19, Example of a connection diagram for an external alarm system



6. Initial Setup

HERAcell® Alarm Relay .

Operating mode	Contact 4 - 1	Contact 4 - 3
No error, mains off	X	O
No error, mains on	O	X
Error	X	O
X: contact closed / O: contact open		

☞ **Note – Circuit structure:**

The alarm relay is activated by all errors reported by the unit (probe break, setpoint exceeded/not reached, and door open longer than 10 minutes).

6. Initial Setup

6.7 Cleaning

The unit must be cleaned before it can be operated. We recommend performing the ContraCon decontamination routine after cleaning the sample chamber. The ContraCon decontamination routine decontaminates the entire sample chamber including all installed components ands sensors in a single, automatic program run.

1. Check that the insert trays in the sample chamber are empty and that no tools or materials have been left in the unit,.
2. Add 350 ml of treated water to the floor pan.
3. Switch the unit on at the main power switch.
4. Start the ContraCon decontamination routine from the control panel (refer to Section 10.5 for detailed instructions).

The ContraCon decontamination routine requires approx. 25 hours to run a complete cycle.

☞ **Note – Cleaning:**

Chapter 10 contains detailed instructions regarding cleaning and disinfecting the unit.

7. Control, Displays, Indicators

7.1 Main Power Switch

Depending on the location of the door stop, the main power switch is integrated into one of the two front feet on the front cover [1].

- Switching the unit on:
  Press the main power switch [2]. The button indicator light goes on.
- Switching the unit off:
  Press the main power switch. The button indicator light goes out.

7.2 Control Panel

The control panel is divided into three functional areas:

- 2 displays to indicate numeric values for temperature and CO_2 content;
- 8 keys to call up functions and input data;
- 7 LED indicators showing a function or state.

[1] Temperature display
[2] LED indicator, heating
[3] Key, specify temperature setpoint
[4] Key, increase value
[5] Key, query errors / shut off audible alarm
[6] Key, activate auto-start
[7] LED indicator, auto-start active
[8] LED indicator, (door open)
[9] LED indicator, ContraCon decontamination routine active
[10] LED indicator, overtemperature protection active
[11] LED indicator, low humidity active
[12] Key, start ContraCon decontamination routine
[13] Key, start calibration function
[14] Key, decrease value
[15] Key, define CO_2 setpoint
[16] LED indicator, gas flowing
[17] CO_2 display

Figure 20 / 21

Fig. 20, Switch the unit on/off

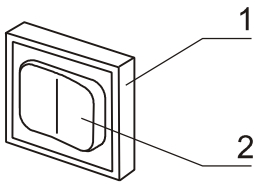
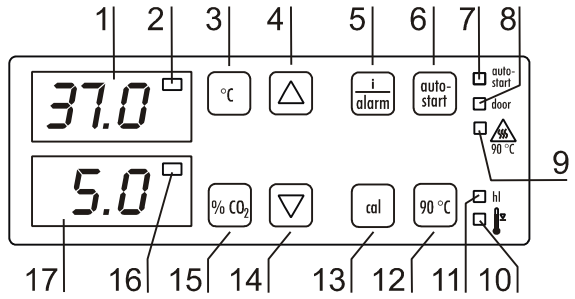


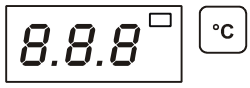
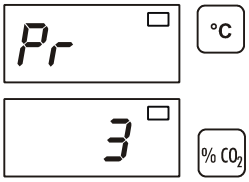
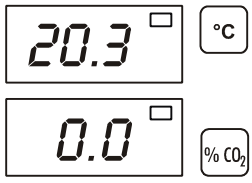
Fig. 21, Control panel functions



7. Control, Displays, Indicators

7.3 Microprocessor Self-test

After the unit has been switched on at the main power switch, the microprocessor performs a self-test routine.

No	Instruction	Operator action	Display / explanation
1.	Switch the unit on.	Press the main power switch.	All indicators on the control panel go on.  The software version designation is shown on the temperature display and the CO_2 display. Example: 
2.	Test routine complete.		The temperature display shows the actual temperature and the CO_2 display the actual CO_2 value. Example: 

NOTE – Factory presets:

The following setpoints have been preset at the factory:

- Temperature: 37 °C
- CO_2 content: 0.0 %

7. Control, Displays, Indicators

7.4 Temperature Setpoint Specification

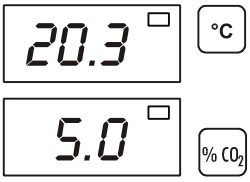
No	Instruction	Operator action	Display / explanation
1.	Display setpoint.	Press the [°C] key.	The current setpoint is shown on the temperature display.
2.	Enter new setpoint.	Press the [°C] + [△] keys, or Press the [°C] + [▽] keys.	Increase the setpoint. Decrease the setpoint.
3.	Save setpoint.	Release the [°C] key.	The current actual value in the sample chamber is shown on the temperature display.

7.5 CO_2 Setpoint Specification

No	Instruction	Operator action	Display / explanation
1.	Display setpoint.	Press the [%CO2] key.	The current setpoint is shown on the CO_2 display
2.	Enter new setpoint.	Press the [%CO2] + [△] keys, or Press the [%CO2] + [▽] keys.	Increase the setpoint. Decrease the setpoint.
3.	Save setpoint.	Release the [%CO2] key.	The current actual value in the sample chamber is shown on the CO_2 display.

7. Control, Displays, Indicators

7.6 Setting the High/Low Humidity

No	Instruction	Operator action	Display / explanation
1.	Activate the configuration mode.	Press the [cal] key for 5 sec.	All indicators on the control panel flash.
2.	Display the mode.	Press the [auto-start] key.	The current mode (High humidity) is shown on the temperature display. Example: 
3.	Change the mode.	Press the [△] key, or Press the [▽] key.	The new mode (Low humidity) is shown on the temperature display. Example: 
4.	Save the target mode.	Press the [cal] key.	The actual values are shown on the temperature and CO_2 displays. Example:  The new mode is saved. The “low humidity” mode is indicated by the yellow “Low Moisture active” LED.

NOTE – Humidity presets:

The program controller has been factory-set to “high humidity”.

- **Setting 0 (High)** creates a relative humidity of **approx. 95 %** in the sample chamber.
- **Setting I (Low)** a relative humidity of **approx. 90 %** is created.

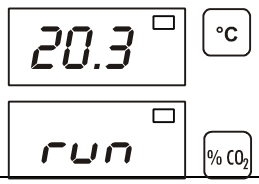
7. Control, Displays, Indicators

7.7 Auto-start Activation

The auto-start function is an automated routine to start the unit and subsequently equalize the CO_2 measurement system. After starting, the system controller regulates the defined temperature setpoint. Simultaneously, the humidity is built up. Once temperature and humidity have reached a constant value, the CO_2 measurement system is automatically equalized to these values and CO_2 is supplied to the sample chamber until the predefined value is reached.

☞ **NOTE – Using the routine:**

In order for the specified accuracy of the CO_2 measurement to be maintained, the auto-start routine should always be used to start the unit if the adjustment of the temperature setpoint involves a change of more than 1 °C or if the unit is being restarted after having been shut down for a longer period of time. In any case, the auto-start routine should be run at least quarterly as part of normal cleaning and maintenance work.
As a rule, the routine requires 5 to 7 hours. Where the ambient temperature is low or the unit is cold, the routine may take up to 10 hours. If the glass door is opened while the routine is running or if the unit is separated from the mains power, the routine is interrupted. It will restart once either the door is closed or the mains power supply is reestablished.
There must be no CO_2 in the sample chamber atmosphere at the start of the auto-start routine.

No	Instruction	Operator action	Display / explanation
1.	Open both doors and wait for the alarm signal to start after 30 sec.		The current actual values flash on the displays, the “Door” LED goes on, the time alarm sounds after 30 sec.
2.	Enter the setpoint	Sec. 7.4 – 7.5	
3.	Activate auto-start.	Press the auto-start key for 5 sec.	The “auto-start” LED flashes.
4.	Close both unit doors.		The actual value appears on the temperature display. “run” appears on the CO_2 display. The “door” LED goes out. Example: 
5.	Abort auto-start.	Press the auto-start key for 5 sec.	The display switches back to the normal mode (incubation mode).

☞ **NOTE – Aborting the routine:**

The auto-start routine can be interrupted prematurely.

7. Control, Displays, Indicators

7.8 Error Codes

The unit is equipped with an error diagnostics system. This diagnostics system detects errors during the unit operation and indicates their cause using numeric codes. When an error is detected, an alarm will sound and a warning light will appear on the control panel. The diagnostics system saves the 10 most recent errors detected in the sequence in which they occurred. This error table can be recalled for viewing.
If you are unable to rectify the cause of the error yourself, contact the Kendro Service and have the error code in question together with your unit's ID no. ready

☞ **NOTE – Activation delay:**

In order to prevent brief fluctuations in the operating conditions from leading to error codes being constantly generated during the incubation mode, the diagnostics system operates with an activation delay:

- After setpoint changes 152 min, max.
- After opening the glass door 45 min, max.
- For other error sources 1 min, max.

☞ **NOTE – Resetting the delay time:**

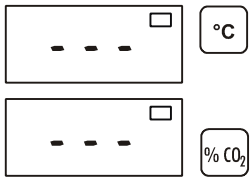
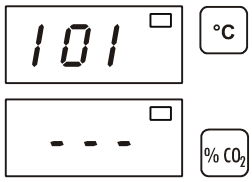
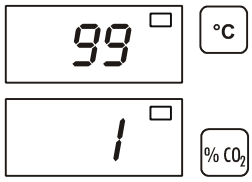
If the specified setpoint is reached within the indicated time, the delay time is reset to 1 minute.

☞ **NOTE – Error source:**

When reducing the temperature setpoint and/or the CO_2 setpoint, the inertia of the sample chamber atmosphere may result in the generation of an error message (Code 101/201). Therefore, if the setpoints are being lowered, the doors on the unit should be opened briefly.

7. Control, Displays, Indicators

7.8 Error Codes

No	Instruction	Operator action	Display / explanation
1.			The audible alarm sounds.
2.	Shut off the audible alarm.	Press any key.	The audible alarm stops.
3.	Query the error code.	Press and hold the i alarm key.	The display remains empty if no error is recognized. Example: 
4.	View the error code.	Press the i alarm key.	The error code appears on the temperature display. The CO_2 display remains blank (---) Example: 
5.	Call up the error table	Press the i alarm + △ keys.	The most recently registered error appears on the temperature display. The sequence in which error codes were saved appears on the CO_2 display. Example: 
6.	Exit the error table.	Release the i alarm key.	The temperature and CO_2 displays return to a display of their respective actual values.
7.	Delete the error table.	Press the i alarm + cal keys for 5 seconds	The error table is deleted.

7. Control, Displays, Indicators

7.9 Error Code Overview

Code	Designation	Possible cause	Corrective action
44	CO_2 metering cell faulty.	NV RAM faulty	Contact the Kendro Service.
55	I^2C bus error	Measured value quality below 50 %.	Remove the source of the interference, e.g., cell phone.
66	Differences between the individual temperature probes.	The temperature signal is no longer plausible.	Contact the Kendro Service.
77	CO_2 calibration range exceeded.	Maximum compensation value exceeded.	Contact the Kendro Service.
88	Error during auto-start	Total time has passed or the max. compensation value has been exceeded.	Repeat auto-start.
99	Unit door(s) open.	Door(s) open for longer than 10 minutes.net	Close unit door(s).
100	Temperature below set-point	Actual value < setpoint –1° C	Contact the Kendro Service.
101	Temperature above set-point.	Actual value > setpoint +1° C	Make sure ambient temperature is below permissible maximum. Contact the Kendro Service.
104	Temperature probe faulty	Probe break / short circuit	Contact the Kendro Service.
200	CO_2 below setpoint	Actual value < setpoint –1 % • No CO_2; • Insufficient pressure; • Supply line blockage.	Check the gas supply: • Change gas bottles. • Increase pressure to 1 bar, max. • Check the supply lines to the unit.
201	CO_2 above setpoint	Actual value > setpoint +1 % • Pressure too high.	Check the gas supply: • Reduce pressure to 1 bar.
204	CO_2 metering cell faulty.	Sensor break/short circuit	Contact the Kendro Service.
500	ContraCon routine temperature below setpoint	Actual value < 85° C	Repeat the decontamination routine. Contact the Kendro Service as required.
501	ContraCon routine temperature above setpoint.	Actual value > 95° C	Contact the Kendro Service.
502	ContraCon routine error	Power failure during the pre-heat or hold phase.	Acknowledge the error by pressing the "ContraCon Routine“ key (twice for 5 seconds), then restart the routine.

7. Control, Displays, Indicators

7.10 Resetting the Overtemperature Protector

No	Instruction	Operator action	Display / explanation
1.			"Overtemperature protection" LED on.
2.	Switch the unit off.	Press the main power switch.	All displays go out.
3.	Switch the unit on again	Press the main power switch.	All displays on the control panel go on.

☞ **NOTE – Overtemperature protection:**

Once the cause of the problem has been corrected (e.g., ambient temperature too high), the unit returns to the normal incubation mode after being switched on again. If the cause cannot be corrected by simple measures such as increasing the room ventilation or reducing the ambient temperature, the overtemperature protector will immediately activate again. In this case, contact the Kendro Service.

8. Operation

8.1 Preparing the Unit

The unit may only be released for actual operation if all the measures for initial setup (Sec. 6.1 – 6.7) have been properly carried out.

Before beginning operation, a unit check must be performed to determine the condition of the following components:

- The gas hose must be mounted on the connecting filter, must not leak, and must be secured with the hose clamp.
- The access port must be plugged.
- The pressure compensation opening must be open.
- The glass door seal must not be damaged.
- The measurement opening in the glass door must be plugged.
- The rack system components must be securely installed.

☞ **NOTE:**

The attachments to these operating instructions include a section, “Principles of Good Microbiological Techniques” as safety information for individuals who work with this unit.

☞ **NOTE – Water supply:**

The water reservoir in the sample chamber can hold a maximum of 4.5 l of treated water. For continuous operation, an adequate supply of treated water which meets both of the following criteria is required for humidifying:

- Distilled;
- Autoclaved, sterile.

The water reservoir must be topped up when the level drops below the minimum mark.

8.2 Beginning Operation

Starting and loading the unit:

1. Add a maximum of 4.5 l of treated water to the water reservoir in the sample chamber. Do not exceed the maximum level indicated by the upper fill mark.
2. Make sure the CO_2 supply system valve is open.
3. Switch the unit on at the main power switch.
4. Define the temperature and CO_2 content setpoints at the control panel.
5. Open both unit doors until the audible alarm sounds.
6. Start the unit with the auto-start routine (refer to Section 7.7).
7. Close the unit doors.
8. The temperature regulator adjusts to the temperature setpoint and the humidity builds up.
9. Once temperature and humidity have reached a constant value, the CO_2 measurement system is automatically equalized.
10. The “auto-start” indicator goes out.
11. The CO_2 regulator supplies gas until the specified CO_2 setpoint is reached.
12. **The unit is now operational.**
13. Place the cultures in the sample chamber.

☞ **NOTE – Duration of the auto-start routine:**

As a rule, the routine requires 5 to 7 hours. Where the ambient temperature is low or the unit is cold, the routine may take up to 10 hours.

☞ **NOTE – Loading:**

To provide adequate air circulation and uniform heating of the samples, the available area in the sample chamber should only be filled to approx. 70 %. Objects with large surface areas or equipment which generates heat in the sample chamber can inhibit heat distribution.

9. Decommissioning

9.1 Taking the Unit Out of Service

CAUTION – Contamination Hazard!

The sample chamber surfaces may be contaminated. There is a risk that bacteria can be released into the ambient environment.
Decontaminate the unit when taking it out of service!

1. Remove culture vessels and all other items from the sample chamber.
2. Pump out the water reservoir (refer to Chapter 10).
3. Add 350 ml of fresh, treated water and start the ContraCon decontamination routine.

Once the ContraCon decontamination routine has been completed, disconnect the unit from the power and gas supplies:

4. Switch the unit off at the main power switch.
5. Disconnect the power cord and prevent it from being accidentally reconnected.
6. Close the CO_2 supply system shutoff valve.
7. Disconnect the gas supply hose from the connection valve on the back of the unit.

NOTE – Recycling-Service:

Kendro Laboratory Products offers a proper recycling service for old equipment. For further information regarding this fee-based service, please contact the Kendro Service

10. Cleaning and Disinfection

10.1 Preparation

Users must be aware of all characteristics of materials used and the hazards associated with them.

The operator must provide hygienic guidelines for cleaning and disinfecting the unit. Measures must be appropriate for the unit's specific application.

WARNING - Electrical shock hazard:

Contact with components under electrical power can result in a life-threatening electrical shock.
Disconnect the unit from the mains power supply before beginning any cleaning or disinfecting tasks!

- **Switch the unit off at the main power switch.**
- **Disconnect the power cord and prevent it from being accidentally reconnected.**
- **Make sure there is no power to the unit.**

CAUTION! – Health hazard!

The sample chamber surfaces may be contaminated. Contact with contaminated cleaning fluids can result in infections. Disinfecting agents may contain hazardous materials.
Comply with all safety and hygienic rules when cleaning and disinfecting the unit!

- **Wear protective gloves.**
- **Wear safety glasses.**
- **Wear a mask that covers your nose and mouth to protect their mucus membranes.**
- **Observe all requirements of the disinfecting agent manufacturer and the hygienic specialist.**

Perform the following preparatory tasks for a general cleaning:

- Remove culture vessels and all other items from the sample chamber.
- Remove all water from the water reservoir.
- If necessary, remove the entire rack system from the sample chamber.
- If necessary, disassemble the protective screen and the fan wheel from the metering cell base plate.

Pumping the Water Out:
The standard incubator includes an electric submersible pump so that the water in the reservoir can be pumped out.

1. Mount the pump on the rear sample chamber wall with the three suction cups. Make sure the pump intake opening faces down.
2. Place the pump's outlet hose into a catch container.
3. Plug the pump into a properly grounded and fused outlet.
4. Pump the water out of the reservoir.
5. Unplug the pump from the mains outlet and remove it from the rear wall.
6. Use a cloth to wipe up any residual water.

Rack System Removal:
Refer to Section 6.2 for a description of the rack system installation and removal.

10. Cleaning and Disinfection

Figure 22

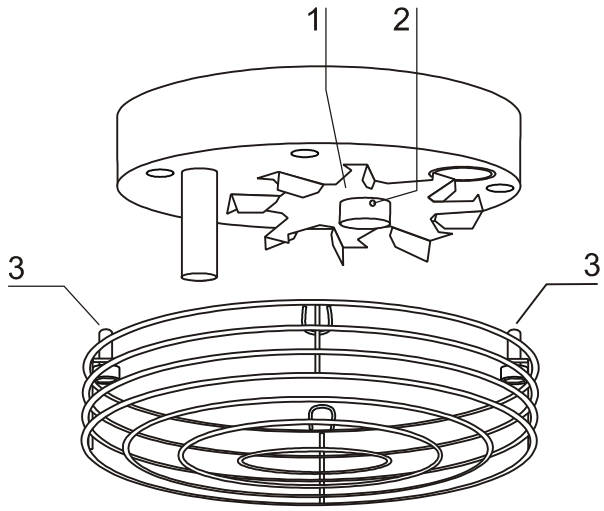
Protective Screen and Fan Wheel Removal:
The fan wheel and its protective screen can be disassembled if required.

1. Using the provided Allen wrench (3 mm), remove the two fastening screws [3] on the protective screen, then remove the screen.
2. The fan wheel [1] is secured to the shaft by the stud screw [2]. Loosen the stud screw with the Allan wrench (2 mm) and pull the fan wheel off the shaft.

NOTE – Functional check:

After reinstallation, check the fan wheel to make sure it is properly secured on the shaft and turns freely. Reinstall the protective screen after this check.

Fig. 22, Protective screen/fan wheel disassembly



10. Cleaning and Disinfection

10.2 Cleaning

CAUTION – Hazardous fluids:

Certain unit components are made of plastics. Solvents can dissolve plastics. Strong acids and bases can make plastics brittle.
Do not use solvents containing hydrocarbons, agents with an alcohol content greater than 10 %, or strong acids and bases to clean plastic components!

Cleaning the Sample Chamber Prior to Disinfection:

1. Wipe down the sample chamber surfaces with lukewarm water containing a household dishwashing liquid.
2. Remove any stubborn residue with lukewarm water and dishwashing liquid.
3. Use a soft, clean cloth to wipe the surfaces dry.

Cleaning the Unit Exterior:

1. Wipe down the exterior surfaces with lukewarm water containing a household dishwashing liquid.
2. Use a soft, clean cloth to wipe the surfaces dry.

10.3 Manual Disinfection

The unit can be disinfected by hand using a disinfecting rinse/spray.
The rack system components as well as the fan wheel and its protective screen can be autoclaved.

CAUTION – Disinfecting agents containing alcohol:

When mixed with air, disinfecting agents containing more than 10 % alcohol form highly flammable and explosive gas mixtures.
When using such agents, avoid open flames or high temperatures during the disinfection process!

- **Only use such disinfecting agents in well ventilated rooms.**
- **Dry all treated components thoroughly after the disinfecting agent has been used.**
- **Observe all regulations governing the prevention of fires and explosions by disinfecting agents containing alcohol (ZH 1/598) .**

CAUTION – Disinfecting agents containing chlorides:

Disinfecting agents containing chlorides can result in corrosion to stainless steel components.
Only employ disinfecting agents which are not harmful to stainless steel!

10. Cleaning and Disinfection

Sample Chamber Disinfection:

1. Wipe or spray down all surfaces with a disinfecting agent.
2. Allow the agent to work according to the manufacturer's instructions.
3. Rinse all surfaces with sterile water. Make sure all disinfecting agent residue is completely removed.
4. Use a sterile cloth to wipe the surfaces dry.

Recommended Disinfecting Agents:

Kendro Laboratory Products recommends using Barrycidal 36 for disinfection.
Properly employed, Barrycidal 36 represents a highly effective, broad-band disinfecting agent. Its effect is based on quartenary ammonia compounds. The broad-band disinfecting agent works effectively against viruses, bacteria, yeasts molds, as well as the AIDS virus (HIV). Barrycidal 36 is DGHM listed.
Order no.: Barrycidal 36: 50 052 425

Limitation:
Barrycidal 36 is not approved as a disinfecting agent in some countries. In these areas, a suitable alternative disinfecting agent whose effects are equivalent to those described above must be employed.

10. Cleaning and Disinfection

10.4 ContraCon Decontamination Routine

The ContraCon decontamination routine decontaminates the entire sample chamber including all installed components ands sensors in a single, automatic program run.
During this routine, a hot/moist atmosphere at 90 °C is maintained in the sample chamber for 9 hours.

CAUTION! – Hot surface!

During the decontamination routine, the sample chamber surfaces, in particular the glass door hinges and the inside of the exterior door become extremely hot.
Always wear protective gloves if you need to touch these surfaces immediately after the routine has been completed or is aborted. Observe the warning indicators on the control panel!

The ContraCon decontamination routine requires approx. 25 hours to run a complete cycle.

1. Add 350 ml of treated water to the floor pan.
2. Switch the unit on at the main power switch.
3. Start the ContraCon decontamination routine from the control panel (refer to the table in Sec. 10.5).
4. Remove any residual water at the conclusion of the decontamination routine.
5. Quit the ContraCon decontamination routine and restart the unit with the auto-start routine (refer to the table in Sec. 7.7).

NOTE – Duration of the auto-start routine:
As a rule, the routine requires 5 to 7 hours. Where the ambient temperature is low or the unit is cold, the routine may take up to 10 hours.

10. Cleaning and Disinfection

Figure 23

The ContraCon Decontamination Routine:
The routine is subdivided into four phases. Each of these phases can be interrupted individually and thus be skipped.
Initiating the “Quit ContraCon Routine” command switches the routine to the next phase in the sequence. To completely cancel the routine, issue this command until the display indicates a remaining running time of “0”.
Opening the glass door cancels the routine completely after this command.

The remaining time indicated for the ContraCon decontamination routine designates the time from the start or the routine’s current time status until the unit has cooled down to the specified temperature setpoint.

Heating phase: Remaining time, ca. 25 h
The sample chamber is heated to 90 °C. Simultaneously, a high relative humidity is built up. The temperature display indicates the current decontamination temperature.

Decontamination phase: Remaining time, approx. 23 h
Once the decontamination atmosphere has been established, the 9-hour-long decontamination phase begins.

If the door is opened during this phase, the decontamination routine will automatically restart once the door is closed again.

Cooling phase: Remaining time, approx. 14 h
The unit cools down to the specified temperature setpoint.

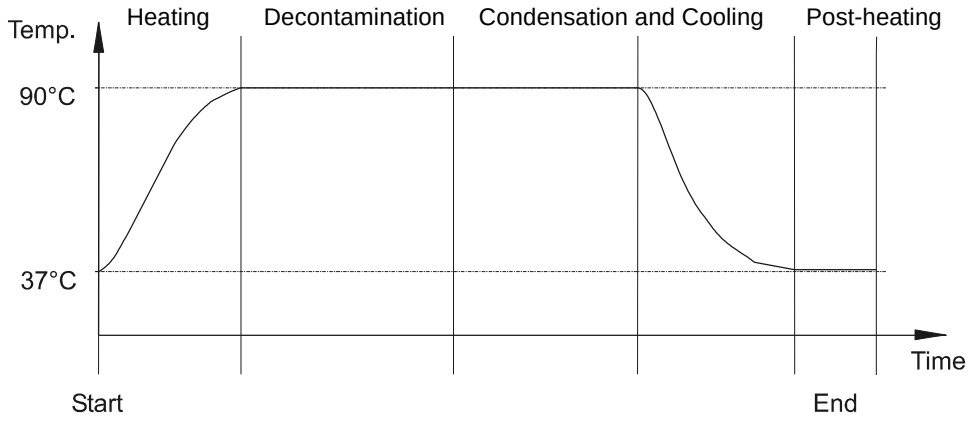
Post-heating phase: Remaining time, approx. 3 h
During this phase the residual moisture is condensed.

End of the decontamination routine: Remaining time, 0 h
Once the remaining time displayed is 0 h, the unit has returned to the originally specified operating temperature (e.g., 37 °C). The ContraCon decontamination routine must then be ended by pressing the appropriate key.

☞ **NOTE - Overtemperature:**

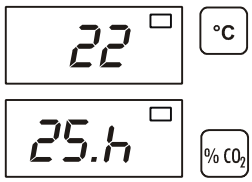
If the maximum temperature of 95 °C is exceeded during the ContraCon decontamination routine, the routine is aborted and the unit heater is switched off.

Fig. 23, Schematic diagram of the decontamination routine process



10. Cleaning and Disinfection

10.5 ContraCon Decontamination Routine Activation

No	Instruction	Operator action	Display / explanation
1.	Switch the unit on.	Press the main power switch.	All displays on the control panel go on, the software version is shown on the temperature display and on the am CO_2 display.
2.	Open both doors and wait for the alarm signal to start after 30 sec.		The current actual values flash on the displays, the “Door” LED goes on, the time alarm sounds after 30 sec.
3.	Start the ContraCon routine.	Press the 90 °C key for 5 sec.	The “ContraCon Routine” LED flashes.
4.	Close both unit doors.		The actual value appears on the temperature display. The CO_2 display indicates the remaining time. The “door” LED goes out. Example: 
5.	End the ContraCon routine.	Press the 90 °C key for 5 sec.	The display switches back to the normal mode (incubation mode).

10.6 Interrupting the ContraCon Decontamination Routine

No	Instruction	Operator action	Display / explanation
1.	Interrupt the ContraCon routine.	Press the 90 °C key for 5 sec.	The routine jumps to the next phase in the sequence. To completely abort the routine, you must skip each phase individually by repeatedly pressing the key until the remaining time shown is 0 h. You can then end the routine.

11. Maintenance

11.1 Inspections and Checks

In order to maintain the operational efficiency and safety of the unit, we recommend performing an inspection of the functions listed below at varying intervals.

Daily Check:
- Gas supply in the CO_2 supply system;
- Water level in the sample chamber reservoir.

Annual Inspection:
- Integrity of the door seal;
- Permeability of the pressure compensation opening;
- Functional test of the control panel and unit controller;
- Electrical safety inspection in accordance with the applicable regulations (e.g., VBG 4).

☞ **NOTE – Functional test:**

If protective or safety equipment was removed or disabled for the inspections, the unit may only be returned to normal operation once these have all been reinstalled and checked for their proper function.

11.2 Maintenance Intervals

We recommend performing the following maintenance tasks if the unit is in continuous use:

Weekly Maintenance:
- Refill the sample chamber reservoir with fresh, treated water.

Quarterly Maintenance:
- Run the auto-start routine;
- Check temperature and CO_2 concentration (see chapter 11.3 and chapter 11.5).

Annual Maintenance:
Replace the sterile filter on the CO_2 gas supply.

☞ **NOTE – Maintenance agreement:**

Kendro Laboratory Products offers a maintenance agreement tailored to your specific unit and covering all required inspection and maintenance tasks.

11. Maintenance

11.3 Checking the Temperature

In order to determine the precise value being measured by the internal temperature sensor, a comparative temperature measurement should be performed quarterly.
If the result indicates a measured value deviation of > 0.2 °C, a temperature equalization should be performed.
For this, the unit's temperature control is adjusted to the measured value obtained in the comparative measurement.
A calibrated instrument with an accuracy of ≤ ± 0.1 °C should be employed for the comparison. To minimize temperature fluctuations during the course of the measurement, immerse the temperature probe in an isothermal container (e.g., a beaker filled with glycerin).

NOTE – Isothermal container:

A container filled with water must not be used as an isothermal container as the water's evaporation will cause the instrument to indicate a temperature that is below the actual temperature.

Performing a Comparative Measurement:

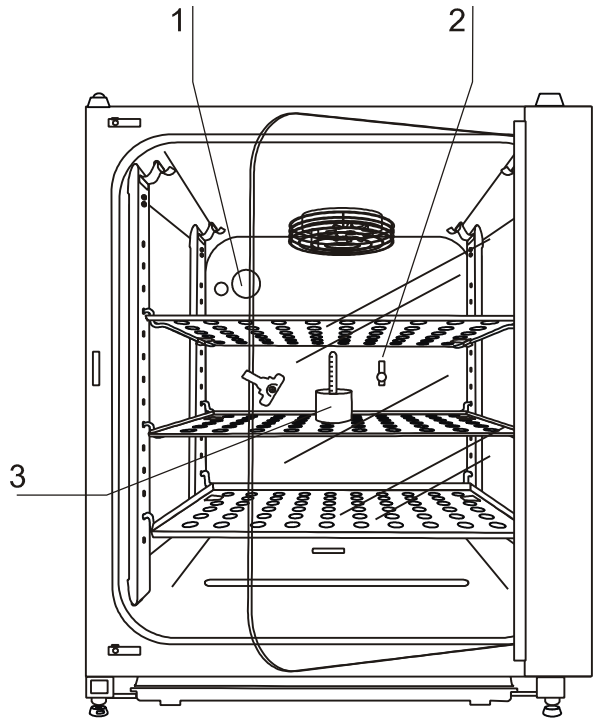
1. Switch the incubator on at the main power switch.
2. Define the temperature setpoint, then wait until the unit temperature has stabilized. This may take several hours.
3. Place the isothermal container with the instrument [3] on the center of the insert tray located in the middle of the sample chamber.
   Alternatively, a temperature sensor can be positioned in the same location. The sensor line can either be passed through the measurement opening [2] in the glass door or through the access port [1] on the back of the unit.
4. Close the doors.
5. Wait until the instrument temperature reading is constant.
6. If the temperature deviation is > 0.2 °C, calibrate the temperature control accordingly. Refer to the steps in Table 11.4.

Measurement Example:

- Temperature setpoint: 37° C
- Comparison temperature: 36.4° C

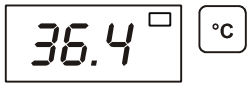
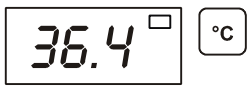
Figure 24

Fig. 24, Temperature equalization



11. Maintenance

11.4 Equalizing the Temperature

No	Instruction	Operator action	Display / explanation
1.	Activate the equalization function.	Press the [cal] key for 5 seconds.	All indicators on the control panel flash.
2.	Display the setpoint.	Press the [°C] key.	Preset value of 37 °C Example: 
3.	Enter the measured value (target value).	Press the [△] key. or Press the [▽] key.	Target value, e.g.: 36.4 °C Example: 
4.	Save the target value.	Press the [cal] key.	"CAL" will appear briefly on the temperature display.  After this, the corrected actual value (measured target value: 36.4 °C) is displayed. 
5.	Quit the equalization process.	Press any key.	The actual values are shown on the temperature and the CO_2 displays.

11. Maintenance

11.5 Checking the CO_2 Concentration

To determine the precise value being measured by the internal CO_2 sensor, a comparative CO_2 measurement should be performed quarterly.
If the result indicates a measured value deviation of > 0.5 % CO_2, a CO_2 equalization should be performed. For this, the unit's CO_2 regulation is adjusted to the measured value obtained in the comparative measurement.
A calibrated instrument offering an accuracy of ≤ ± 0.3 % CO_2 should be employed for the comparison. A suitable Infrared (IR) meter is available from Kendro:

- Portable IR meter. (Refer to Chapter 12, "Spare Parts and Accessories" for the order number.)

The sample is taken via the measurement opening in the glass door. The comparative measurement must be made when the unit temperature has stabilized.

Performing a Comparative Measurement:

1. Switch the unit on at the main power switch.
2. Define the CO_2 setpoint, then wait until the unit temperature has stabilized. The humidity must build up. This may take several hours.
3. Insert the IR meter's probe through the measurement opening [1] and into the sample chamber. Wait until the instrument CO_2 reading is constant.
4. Remove the probe, close the measurement opening, and close the doors.
5. Calibrate the CO_2 regulator accordingly. Refer to the steps in Table 11.6.

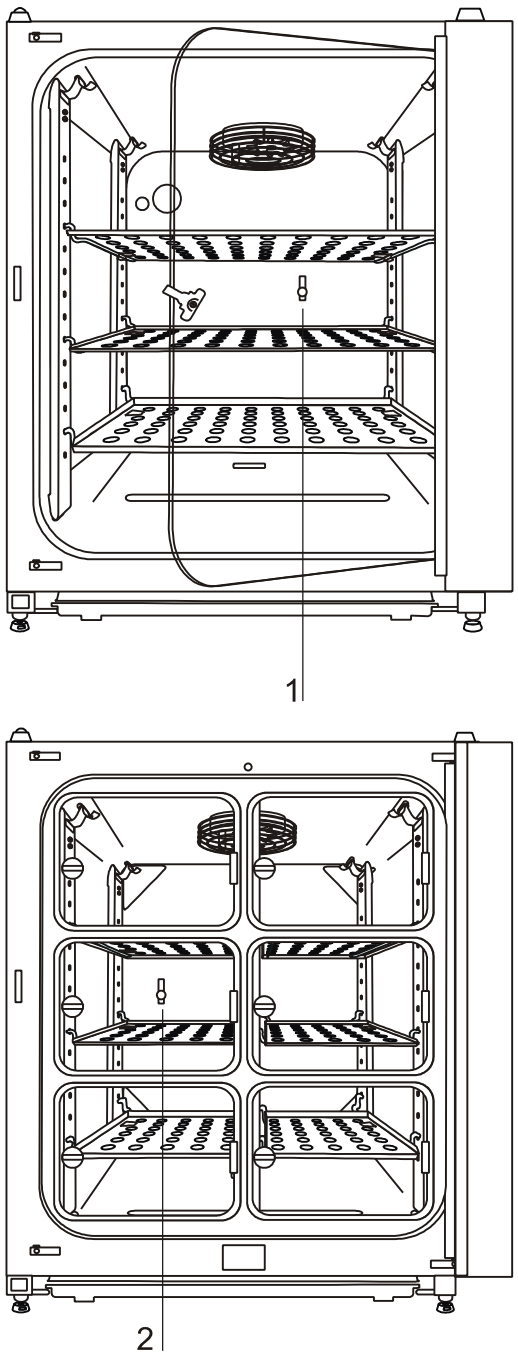
Measurement Example:

- CO_2 setpoint: 5 %
- Sample measurement: 5.6 %

NOTE – 6-port gas diaphragm models:
On units equipped with the optional 6-port gas diaphragm, the measurement opening [2] is located in one of the middle glass doors.

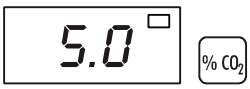
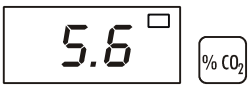
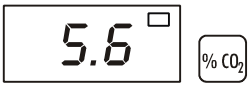
Figure 25

Fig. 25, CO_2 equalization



11. Maintenance

11.6 Equalizing the CO_2 Concentration

No	Instruction	Operator action	Display / explanation
1.	Activate the equalization function.	Press the [cal] key for 5 seconds	All indicators on the control panel flash.
2.	Display the setpoint.	Press the [°C] key.	Preset value of 5 % Example: 
3.	Enter the measured value (target value).	Press the [△] key. or Press the [▽] key.	Target value, e.g.: 5.6 % Example: 
4.	Save the target value.	Press the [cal] key.	"CAL" will appear briefly on the CO_2 display.  After this, the corrected actual value (measured target value: 5.6 %) is displayed. 
5.	Quit the equalization process.	Press any key.	The actual values are shown on the temperature and the CO_2 displays.

NOTE – Excess CO_2 content after a CO_2 equalization:

An excessively high CO_2 content after equalization can be reduced by opening the doors for approx. 30 seconds.

11. Maintenance

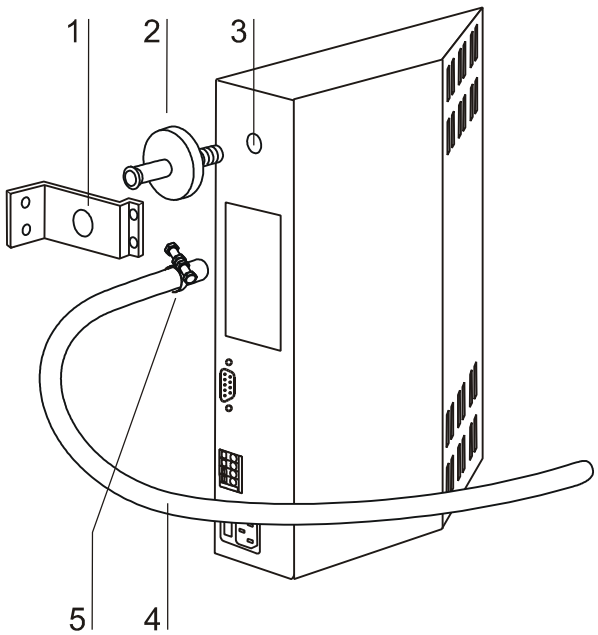
11.7 Sterile Filter Replacement for the CO_2 Gas Supply

The sterile filter has plastic threads and is screwed into the socket on the circuit cabinet.

1. Make sure the gas supply is shut off.
2. Loosen the hose clamp [5].
3. Pull the gas hose [4] off the connecting piece on the sterile filter [2].
4. Unscrew the retaining panel [1].
5. Unscrew the sterile filter [2] from its threaded sokket [3].
6. Taking care not to cross-thread the new sterile filter screw it into the socket ans hand-tighten.
7. Reinstall the retaining panel [1].
8. Insert the gas hose onto the sterile filter connecting piece and secure it with the hose clamp. Check to make sure the gas hose/filter connection does not leak.

Figure 26

Fig. 26, Sterile filter replacement



11. Maintenance

11.8 Unit Fuse Replacement

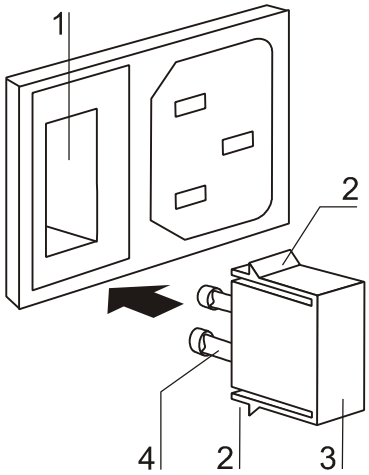
The two identical unit fuses [4] are located in the fuse box [1] next to the unit socket. The fuse characteristics are:

- Slo-blo fuse, 6.3 A (5 x 20 mm)

1. The fuse holder is secured in the fuse box [1] by two clamp tabs [2].
2. To open, push the two tabs together and pull the fuse holder [3] out of the fuse box.
3. Remove the blown fuse(s) from the fuse socket and replace it/them with a new one.
4. Slide the fuse holder back into the fuse box and gently press down on it until the clamp tabs lock in place.

Figure 27

Fig. 27, Unit fuse replacement

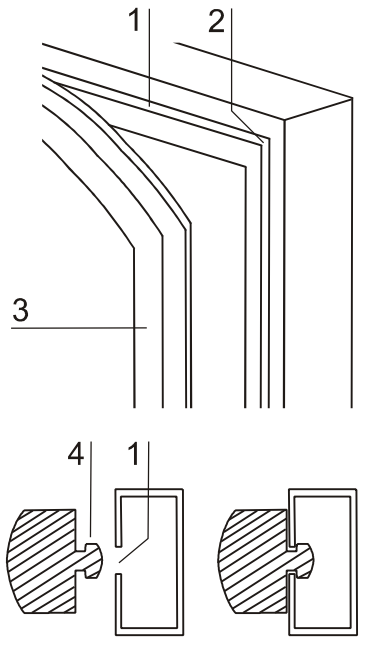


11.9 Door Seal Replacement

The door seal (magnetic seal) on the outer door rests in a retainer groove. No tools are required to replace the seal.

1. Pull the magnetic seal [3] out of the guide groove [1].
2. Starting at one corner [2] insert the new seal into the groove, then press the seal retainer strip [4] into the retainer groove.
3. Make sure the tapered side of the retainer strip sits properly in the retainer groove [1] and that the seal is flush against the door frame.

Fig. 28, Door seal replacement



12. Spare Parts and Accessories

12.1 List of Spare Parts and Accessories

NOTE – Maintenance:

Only original spare parts and accessories approved by Kendro Laboratory Products may be used. Use of other parts may present unknown risks and will result in the warranty being voided.
When ordering spare parts or accessories, please have the unit data listed on the nameplate ready.

Designation	Type	Order no.
Operating Instructions	Set	50062938
Short Instructions	One	50049917
Stacking element	Top, 3 pieces	50049238
Foot	Height-adjustable	50049939
Base frame	Height, 200 mm	50065754
Base frame, with rollers	Height, 185 mm	50067224
Base frame	Height, 780 mm	50065753
Rollers for base frame	Guide rollers (4)	50052528
Adapter panel		50068677
Stack adapter for BB 6220 and B 5060 / B 5061		50066094
Gas diaphragm, 6-port, divided, retrofit kit		50067225
Divided inserts, retrofit kit	Stainless steel	50067226
Divided inserts, retrofit kit	Copper	50067227
Replacement cover panels for front hinges	Set	50052958
Magnetic door seal, exterior door	778 x 858	50063335
Glass door seal	3 m	50048705
Glass door	Complete	50062577
Glass door lock	Complete	50058542
Continuous insert, set, w. 2 support brackets	Stainless steel	50065793
Divided insert, set, w. 2 support brackets	Stainless steel	50065795
Continuous insert, set, w. 2 support brackets	Copper	50065794
Divided insert, set, w. 2 support brackets	Copper	50065796
Support profile, front	Stainless steel	50057282
Support profile, rear	Stainless steel	50057283
Support profile, front	Copper	50062679
Support profile, rear	Copper	50062680
Support profile spring	Spring steel	50050922
Drawer, pull-out	Plastic	50048409
HERAtray, 1/3 width, 3	Stainless steel	50065805
HERAtray, ¼ width, 4	Stainless steel	50065807
HERAtray, 1/2 width, for 2 divided inserts, 4	Stainless steel	50065809
HERAtray, 1/3 width, 3	Copper	50065806
HERAtray, ¼ width, 4	Copper	50065808
HERAtray, 1/2 width, for 2 divided inserts, 4	Copper	50065810
Electric submersable pump	230 V	50051461
Electric submersable pump	120 V	50051937

12. Spare Parts and Accessories

Designation	Type	Order no.
Fan wheel	Stainless steel	50049692
Fan wheel	Copper	50051184
Unit fuse	T 6.3 A (2)	03002641
Power cord	EU	50043143
Power cord	GB	50047100
Power cord	IT	50047101
Power cord	CH	50047099
Power cord	120 V, USA	50048111
Hose set for gas connection		50062701
Sterile filter, gas inlet	Threaded	50050737
Bottle pressure regulator, CO_2	2-stage	03429937
Plug, measurement opening, glass door		26139262
Insert for pressure compensation opening		50056464
Plug for access port		50063283
IR $C0_2$ gas tester, hand-held unit (incl. charger)	100 V – 230 V	50060283
Replacement filters, 5, for IR-CO_2 gas tester		50060287
IrDa computer interface with connecting cable, incl. PM-COM software		50060289
CO_2 gas tester w. 10 sample tubes	Messkit	50051435
CO_2 sample tubes, package of 10	0 … 10 Vol. %	50055124
Surface disinfectant, 250 ml, spray bottle	Barrycidal 36	50052425
Surface disinfectant, 500 ml, refill	Barrycidal 36	50051939
HERALINE-Analog-Interface, retrofit kit	EU	50055102
HERALINE-Analog-Interface, retrofit kit	GB	50059353
HERALINE-Analog-Interface, retrofit kit	USA	50055160
Gas bottle monitor, GM 2	EU	50046033
Gas bottle monitor, GM 2	GB	50054748
Gas bottle monitor, GM 2	USA	50059043

13. Technical Specifications[1]

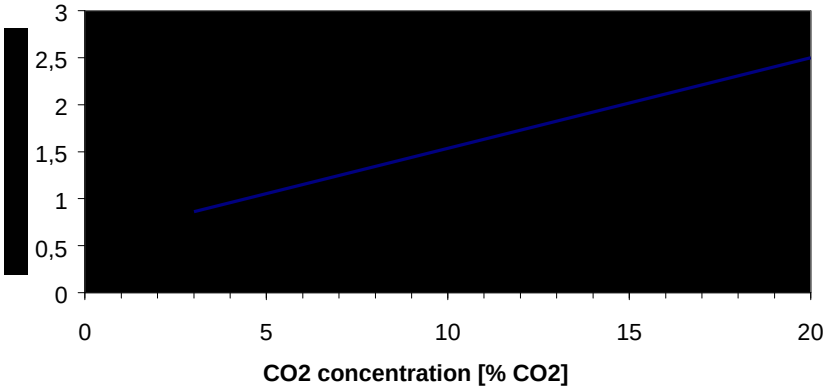
Designation	Unit of measure	Value
Mechanical		
Exterior dimensions (W x H x D)	mm	780 x 934 x 834
Internal dimensions (W x H x D)	mm	607 x 670 x 583
Sample chamber volume	l	approx. 238
Insert tray (W x D)	mm	560 x 500
Number, standard delivery	units	3
Number, maximum	units	12
Surface load capacity, maximum	kg	10 / insert tray
Total unit load, maximum	kg	30
Weight, w./o. accessories	kg kg	approx. 85 (stainless steel) approx. 90 (copper)
Thermal		
Ambient temperature range	°C	+18 ... 33
Temperature regulation range	°C	RT + 3 ... 55
Temperature deviation over time (DIN 12880, Part 2)	°C	± 0.1
Decontamination temperature (ContraCon routine)	°C	90
Temperature deviation, spatial (DIN 12880, part 2) At 37 °C	°C	± 0.5
auto-start routine duration, to 37 °C, Ambient temperature: 20 °C	hr.	5 ... 10
Temperature recovery time at 37 °C with door open for 30 seconds (to 98 % of the initial value)	min	< 10
Thermal loss to the environment: At 37 °C During ContraCon decontamination	 kWh/h kWh/h	 0.08 0.25
Humidity		
Water quality		Distilled and sterile
Fill volumes: Incubation mode ContraCon decontamination mode	 l ml	 4.5, max. / 1.8, min 350
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, with door open for 30 seconds (to 98 % of the initial value)	min min	approx. 18 (stainless steel) approx. 18 (copper)

[1] The technical specifications cited above apply to units with a glass door.

13. Technical Specifications

Designation	Unit of measure	Value
CO_2 gas		
Gas purity	%	At least 99.5 or medical quality
Input pressure	bar	0.8, min. to 1, max.
Measurement and regulation range	Vol. %	0... 20
Regulation deviation over time	Vol. %	± 0.1
Recovery time at 5 %, with door open for 30 seconds (to 98 % of the initial value)	min	< 8
CO_2 metering cell		
Accuracy	% CO_2	± 0.3
Electrical		
Nominal voltage	V V V	1/N/PE 230 V, AC 1/N/PE 120 V, AC 1/N/PE 100 V, AC
Nominal frequency	Hz	50/60
Interference suppression (DIN VDE 0875)		Interference level N
Protection method (DIN 40 050)		IP 20
Protection class		I
Overvoltage category (IEC 1010, EN 61010)		II
Contamination degree (IEC 1010, EN 61010)		2
Nominal current	A A A	2.7 (230 VAC) 5.2 (120 VAC) 6.2 (100 VAC)
Fuses, on-site: Fuse Circuit breaker		 T 16 A G 16
Nominal consumption	kW kW kW	0.61 (230 VAC) 0.62 (120 VAC) 0.62 (100 VAC)
EMI class		B
Miscellaneous		
Noise level (DIN 45 635, Part 1)	dB(A)	< 50
Ambient relative humidity	% rH	80, max.
Setup elevation	m above sea level	2000, max.

HERAcell 240 - Gas consumption CO2
(Gas inlet pressure: 1 bar, Amount of gas supplied: 6 l / min, glass door closed)



14. Materials Employed

Component	Material
Thermal insulation elements	Polystyrene foam, EPS/PPS compound
Electronics PCBs	Jacketed electronic components with various plastics mounted on epoxy resin bonded circuit boards
Plastic components, general	Note material identification marks
Exterior housing	Galvanized sheet steel, painted
Rear unit wall	Galvanized sheet steel
Exterior door	Galvanized sheet steel, painted
Inner door panel	Galvanized sheet steel, painted
Operator and display panels	Polyethylene
Magnetic door seal	Magnetic core covered in EMPP
Heaters	Silicon-jacketed resistance heater coil
Inner chamber, built-in parts, and insert trays	Stainless steel 1.4301 or copper
Plug for access port	Silicon
Pressure compensation opening insert	Teflon with metal insert
Glass panel	Sodium silicate glass
Glass door seal, measurement opening	Degassified silicon
Sensor block	Stainless steel 1.4301
Fan wheel	Stainless steel 1.4305 or copper
Seal on metering cell base	Degassified silicon
Wiring	Plastic-jacketed copper braids
Packaging	Corrugated cardboard, polyethylene sheeting, and molded Styrofoam parts

Attachment A: Principles of Good Microbiology Techniques[1]

General Rules**:**

- All doors and windows in the work area should be closed while work is in progress.
- Food and beverages are not permitted in the work area.
  No food should be stored in the work area.
- Lab coats or other protective clothing must be worn in the work area.
- Pipetting by mouth is prohibited. Pipetting aids must be used.
- Syringes and needles may only be used if absolutely necessary.
- The formation of aerosols must be avoided during any manipulations.
- At the conclusion of work and prior to leaving the work area, personnel must wash their hands and, if necessary, disinfect, and moisturize them.
- The work area should be kept clean and tidy. Only equipment and materials actually required should be stored on lab benches. Supplies should be stored in the areas or cabinets provided.
- If required for an assessment of the hazard risk, the identity of the employed biological agents must be regularly checked. Inspection intervals depend on the degree of potential hazard.
- When working with biological agents, all personnel are to be trained regarding safety at the workplace prior to starting their activities, and at least annually thereafter.
- Any individuals unfamiliar with microbiology, virology, or cellular biology must receive special, in-depth instructions and must be carefully supervised.
- If necessary, regular pest control measures must be carried out.

The following additional basic rules apply when working with pathogens:

- All work areas are to be disinfected daily. If necessary, disinfectants are to be changed regularly to prevent a buildup of resistant germs.
- Protective clothing may not be worn outside the work area.
- Contaminated equipment must be autoclaved or disinfected before being cleaned.
- Waste containing pathogenic material must be safely collected and be autoclaved or disinfected to make it inactive.
- If infectious material is spilled, the contaminated area must be immediately sealed off and disinfected.
- When working with human pathogens against which vaccines exist, all personnel that are not already immune to the pathogen in question must be vaccinated. An appropriate method must be in place to regularly monitor the immunity of the personnel.
- The health of all personnel is to be monitored by appropriate medical procedures. In other words, a preliminary examination prior to starting work, followed by annual examinations. FRG: With respect to these examinations, professional regulations G 24 "Skin Diseases" and G 42 "Infectious Diseases", are available to physicians. These are recognized principles of occupational medicine and serve as guidelines for the evaluation, assessment, and acquisition of examination results.
- Professional guidelines are to be observed when handling genetically altered organisms, viruses, and subviral agents with a potential hazard risk, FRG: G 43 "Biotechnology".
- Information concerning first aid in cases of accidental exposure to pathogenic microorganisms and viruses must be immediately available in the work area. All accidents must be immediately reported to the responsible supervisor.

[1] To be appropriately applied to cell cultures.

Attachment A: Principles of Good Microbiology Techniques[1]

Depending on the potential risk involved, other safety measures may include:

- The use of safety workbenches (with the air flow directed away from the individual working at the bench), Class I, Class II (type certified)[2], or Class III.
- Limiting and monitoring access to certain areas.
- The use of special protective clothing and breathing equipment.
- Disinfecting all materials containing pathogens before they are removed from the workbench.
- Maintaining negative pressure in the work area.
- A reduction in the germ volume in the exhaust air by the employment of suitable measures such as the use of HEPA filters.

The following additional rules apply when handling human or animal pathogens:

- A permit in accordance with the Federal Epidemic Law is required to handle human pathogenic biological agents.
- A permit in accordance with the Animal Epidemic Pathogen Law and the Animal Epidemic Pathogen Regulation is required to handle animal epidemic pathogens.
- Pregnant women and nursing mothers may not handle infectious and human pathogenic agents or materials containing such agents.

[2]Manufacturers' certificates are outlined in the information sheets provided by the Professional Chemists Association (BG Chemie) Safe Chemical Practices" and the Professional Association for Health Services and Welfare (BG for Gesundheitsdienst und Wohlfahrtspflege), as well as on request from the testing department of the professional committee "Health Services and Welfare". The committee can be reached at the BG for Gesundheitsdienst und Wohfahrtspflege, Pappelallee 35-37, 22089 Hamburg.

Source: Fact sheet B003, version 1/92 - ZH 1/343, from the Professional Association of the Chemical Industry, Jedermann Verlag, Dr. Otto Pfeffer OHG; Postfach 103140. 69021 Heidelberg.

Attachment B: Unit Log

NOTE – Unit log:

Enter the nameplate information, and any work, maintenance, and repairs carried out here.

Unit type:		Order number	
Manufacturer's number:		Service number:	
Setup location:		Operator's comment:	

Work performed	Comments	Date	Signature

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