CO_2 incubator BB 150

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1. General notes

The following are Thermo Fisher Scientific service contact information.

For customers in China:
Tel. 800-810- 5118
Fax 010-51219151
Website: http://thermofisher.com

For customers outside of China: Please contact local distributors for technical support

1. General notes

1.1 General safety instructions

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

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

1.2 Warranty

Thermo Fisher Scientific Products warrant the operation and the operational safety of the CO_2 incubator BB 150 only under the condition that:

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

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

1. General notes

1.3 Explanation of symbols

1.3.1 Symbols used in the operating instructions

WARNING!

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

CAUTION!

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

NOTE

is used for applicational hints and useful information.

Wear safety gloves!

Wear safety goggles!

Harmful liquids!

Electric shock!

Hot surfaces!

Fire hazard!

1. General notes

1.3.2 Symbols on the device

CE symbol

VDE - safety-tested

Test certificate for USA/Canada

Observe operating instructions!

1. General notes

1.4 Intended purpose of the device

1.4.1 Correct use

The CO_2 incubator BB 150 is a laboratory device for preparing and cultivating cell and tissue cultures. The device allows the simulation of the special physiological ambient conditions for these cultures due to the exact control of:
- temperature,
- CO_2 content,
- an increased relative humidity.

The BB 150 has been designed for installation and operation in the following fields of application:
- Laboratories for cytobiological and biotechnological experiments of safety levels L1, L2, and L3.
- Medical-microbiological laboratories in accordance with DIN 58 956.
- Laboratories in the central area of clinics and hospitals.

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

1.4.2 Incorrect use

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

Do not use tissues, substances or liquids that:
- are easily ignitible or explosive,
- release vapors that form combustible or explosive mixtures when exposed to air,
- release poisons.

1.5 Standards and directives

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

1. General notes

The following safety regulations must be observed if the device is operated within the territory of the Federal Republic of Germany:

- ZH 1/10
- ZH 1/119
- ZH 1/342
- ZH 1/343
- ZH 1/598
- TRG 280
- EC Official Gazette, L 374
- Safety data sheets of the gas supplier relevant to the particular characteristics of CO_2.
- Principles of good microbiological proceedings, notice of the trade association of the German chemical industry.

For other countries, the applicable national regulations are binding.

1.6 Safety notes on gases

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

NOTE – Personnel instruction

Personnel operating devices with a CO_2 supply must be instructed about the requirements for the handling of CO_2 before starting their work:

- **Correct operation of pressurized gas containers and gas supply systems (e.g. TRG 280),**
- **Obligation to report damages and shortcomings in CO_2 supply lines,**
- **Measures to be taken in case of accidents or failures.**

These instructions must be repeated at appropriate intervals and must incorporate the particular operating instructions of the gas supplier.

WARNING - Suffocation hazard!

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

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

2. Delivery

2.1 Packaging

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

Packaging materials

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

2.2 Components standard equipment

Delivery	CO_2 incubator with single glass door and with continuous shelves (standard version)
Shelf	3
Shelf support post	4
Shelf support rail	6
Insert for pressure compensation opening	1
Plug for pipe channel	1
Power supply cable	1
Connector, potential-free contact	1
Spare caps, set	1
CO_2 connecting hose set	1
Immersion water pump	1
Open-end wrench, 24 mm	1
Allen wrench 2 mm for blower wheel	1
Allen wrench 3 mm for blower wheel cover	1
Operating instructions	1

2.3 Acceptance inspection

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

If damages are detected or if components are missing, please contact the carrier and Thermo Fisher Scientific Products immediately.

3. Installation of the device

3.1 Ambient conditions

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

Requirements:

- Draft-free and dry location.
- The minimal distance to adjacent surfaces must be observed on all sides (see Section 3.3.).
- The operating room must be equipped with appropriate room ventilation.
- Solid, level, fire-proof surface.
- Vibration-proof substructure (floor stand, lab table) capable of bearing the weight of the device and accessories (particularly if several devices are stakked).
- To ensure a constant incubation temperature of 37° C, the ambient temperature must be within a range of +18° C to +33° C.
- Relative humidity up to 80 % (max.).
- Avoid direct exposure to sunlight.
- Devices that produce excessive heat should not be used near the location of the CO_2 incubator BB 150.

3.2 Room ventilation

When CO_2 is supplied, the work space of the incubator is slightly pressurized. The pressure is released through the pressure compensation opening into the operating room.
As the pressure compensation and any opening of the glass door/gas tight screen during the operation of the device will release **very small quantities of CO_2** into the operating room, the room ventilation must be capable of carrying the released gas safely off into the open.
In addition, heat dissipating from the device during permanent operation may cause a change in the room climate.

- Therefore, the BB 150 must only be installed in rooms with sufficient ventilation.
- Do not install the device in room recesses without ventilation.
- The room ventilation should be a technical ventilation that is in accordance with the requirements of ZH 1/119 (Guidelines for laboratories) or some other suitable ventilation system with appropriate capacity.

3. Installation of the device

3.3 Space requirements

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

NOTE – Accessibility of the devices

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

3.4 Transport

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

NOTE – Lift points

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

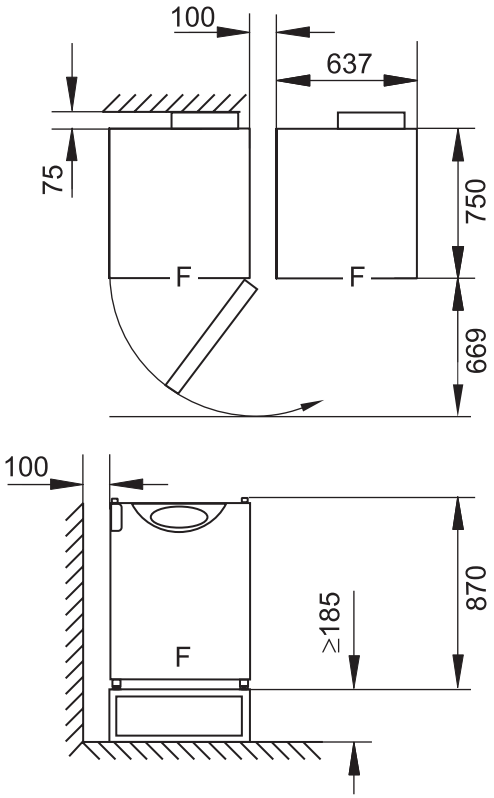


Fig. 1
Device dimensions and clearance in mm,
F = Front

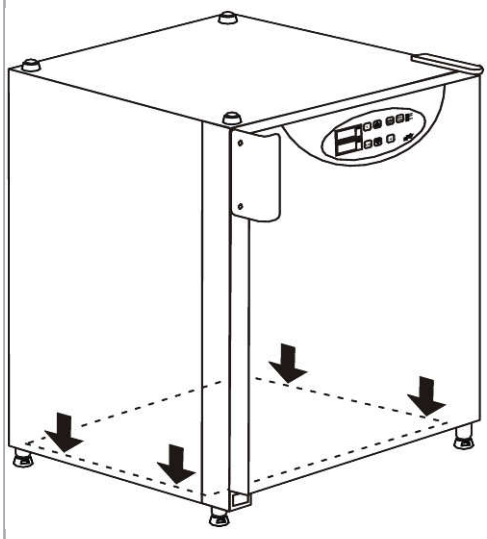


Fig. 2
Lift points

3. Installation of the device

3.5 Stacking

Fig. 3: Two BB 150 devices can be stacked on top of each other. The stacking elements [1] and [2] secure the devices on top of each other.
If the devices are placed onto mobile racks, ensure that the rollers [4] are secured by an arresting device during operation. For reasons of stability, the rollers should be oriented to the front.
When stacking the incubators, the stacked incubator function must be activated on the upper unit. This function adjusts the parameters of the uppper unit to compensate any heat transmission between the two units.

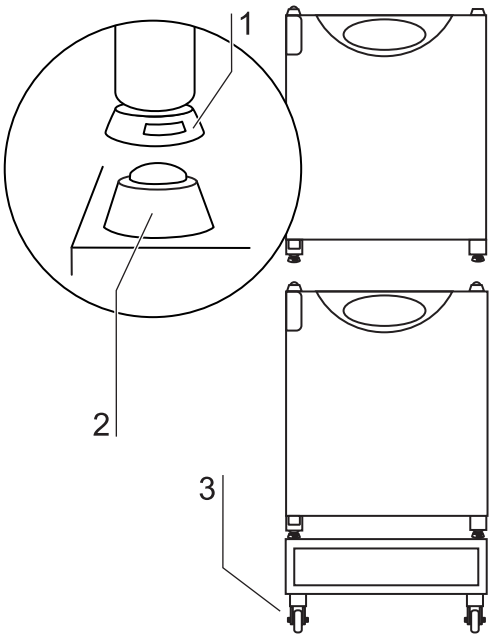


Fig. 3
Stacking

NOTE – Transporting stacked devices

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

3.6 Modifications

The outer door and the glass door can be equipped with left or right side fasteners. The door fastening can also be reversed later.

NOTE – Modifications

Retrofitts and modifications must only be performed by the Technical Service of Thermo Fisher Scientific Products.

4. Description of the device

4.1 Front view

[1] Stacking elements
[2] Plug caps
[3] Glass door
[4] Measuring cell with blower wheel and sensors
[5] Door switch
[6] Pressure compensation opening with insert
[7] Measuring opening
[8] Outer door
[9] Door handle
[10] Outer door seal, replaceable
[11] Stand, height-adjustable
[12] Nameplate
[13] Power switch
[14] Support rail
[15] Shelf
[16] Latch, glass door
[17] Support hook for shelf
[18] Access port with plug
[19] Glass door seal, replaceable

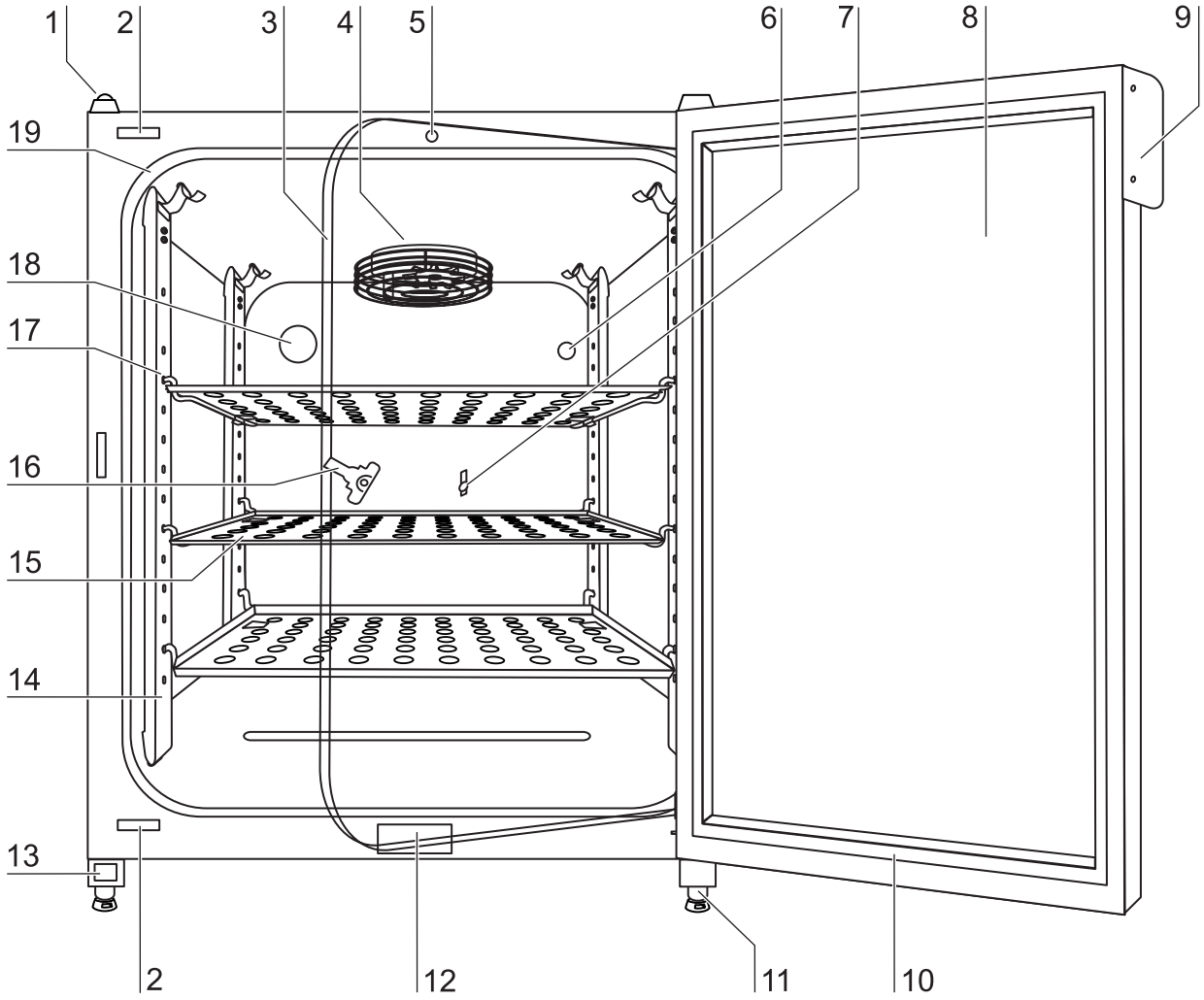


Fig. 4
Front view

4. Description of the device

4.2 Rear view

[1] Stacking elements
[2] Pressure compensation opening
[3] Access port, Ø 42 mm
[4] Switchbox with supply interfaces
[5] CO_2 gas container

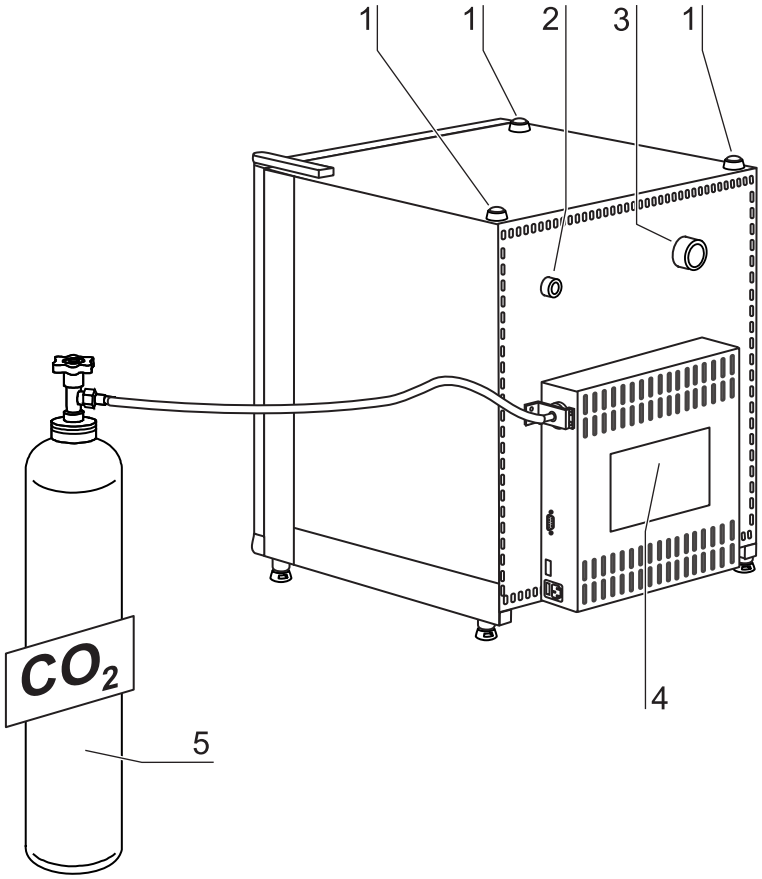


Fig. 5
Rear view

4. Description of the device

4.3 Safety devices

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

4.4 Work space atmosphere

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

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

Relative humidity:
The water tray of the work space can hold 3.0 liters of processed water. The heating of the work space causes evaporation of the water, thereby ensuring a constant humidity within the work space. Under normal operating conditions and at the usual incubation temperature of 37° C, a constant relative humidity of approx 95 % is achieved in the work space.
If heated containers are removed and put back into the work space, the elevated humidity and the cooling may cause condensate to form on the outer sides of the container.
For humidification, processed water of the following quality is required:
- demineralized and either distilled or autoclaved for sterilization,

or
- completely deionized and either distilled or autoclaved for sterilization.

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

or
- medical grade.

4. Description of the device

4.5 ContraCon decontamination routine

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

NOTE – Thermal protection

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

4.6 Sensor system

Fig. 6: The blower wheel and two sensor modules are integrated in the baseplate [1] of the measuring cell:
- Sensor [2] for the measurement of the work space temperature and of the thermal protection,
- CO_2 sensor [3] for the measurement of the CO_2 content in the work space atmosphere.

The sensor for the measurement of the work space temperature as well as the CO_2 sensor form part of the control system of the device. Their measured values are compared to the set nominal values. Based upon this data, the control system controls heating and CO_2 supply.
The blower intermixes the supplied gases and ensure uniform temperature distribution within the work space.

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

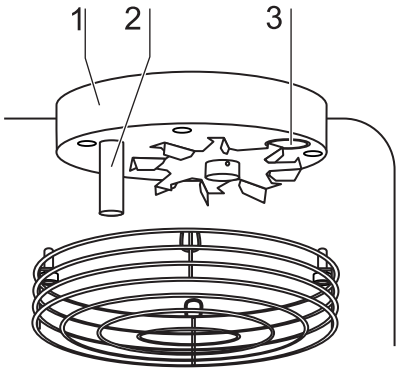


Fig. 6
Temperature and CO_2 sensor

4. Description of the device

4.7 Door switch

Fig. 7: A door switch [1] is installed in the upper edge of the work space opening. If the door switch is activated by opening the glass door, the gas supply and the heating of the work space are interrupted and the display shows will flash.
If the door remains open for more than 30 seconds, a short acoustic alarm sounds. If the door remains open for more than 10 minutes, the acoustic alarm sounds continuously.
The outer door can only be closed after the glass door has been latched properly.

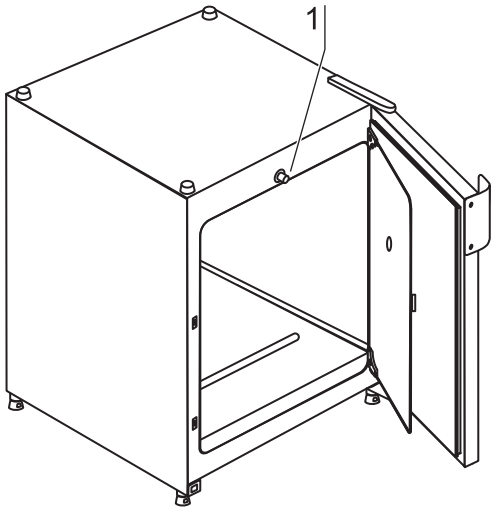


Fig. 7
Door switch

4.8 Switchbox with supply interface

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

Gas connection:
Fig. 8: The gas supply line between the device and the gas supply system is connected using the supplied connecting hoses. CO_2 is supplied to the device through a separate connecting sleeve [1].
The process gas must be supplied to the device at a fixed pressure that has been preset within a range of 0.8-1.0 bar, this must remain unchanged.
Before the gas is fed into the work space, it flows through a sterile filter with a separation rate of 99.97 % for a particle size of 0.3 µm (HEPA filter quality).

Label:
Fig. 8: The label [2] contains information about gas supply, an alarm contact terminal legend, and notes about the electrical fusing of the device.

RS 232 interface:
Fig. 8: Via the RS 232 interface [3], the incubator can be connected to the serial interface of a PC. This connection allows the computer-aided acquisition and documentation of the major operating parameters (temperature, CO_2 concentration, failure codes, etc.).

Alarm contact:
Fig. 8: The device can be connected to an on-site, external alarm system (e.g. telephone system, building monitoring system, visual or acoustic alarm system). For this purpose, a potential-free alarm contact [4] is preinstalled in the device.

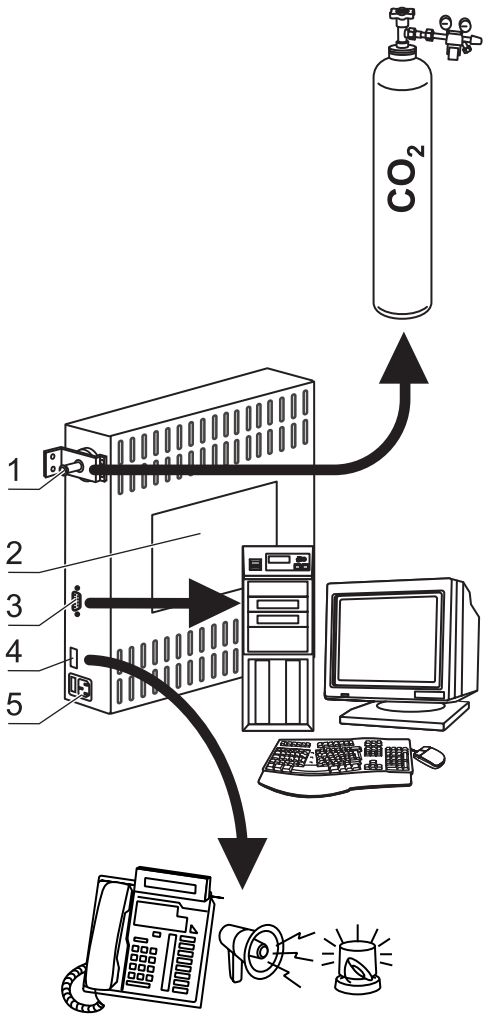


Fig. 8
Supply interfaces

4. Description of the device

NOTE – Alarm contact

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

Power supply connection:
Fig. 9: The power supply connection [5] of the device is established via a cable with a connector for non-heating appliances. The holder for the two device fuses is integral to the power supply socket.

4.9 Work space components

The working surface of the incubator has been designed to minimize the surface area. This helps to reduce condamination and promotes easy of cleaning.

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

NOTE – Oxidation of copper components

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

Fig. 9: The components of the shelf system can be removed easily so that only the easily treatable, surface-reduced internal chamber [1] remains in the work space for cleaning and manual disinfection works.

Water reservoir:
Fig. 9: The water reservoir [2] is integral to the internal chamber floor and inclines toward the rear. The embossing in the water tray is used to indicate minimum level [3] and the maximum level [4].

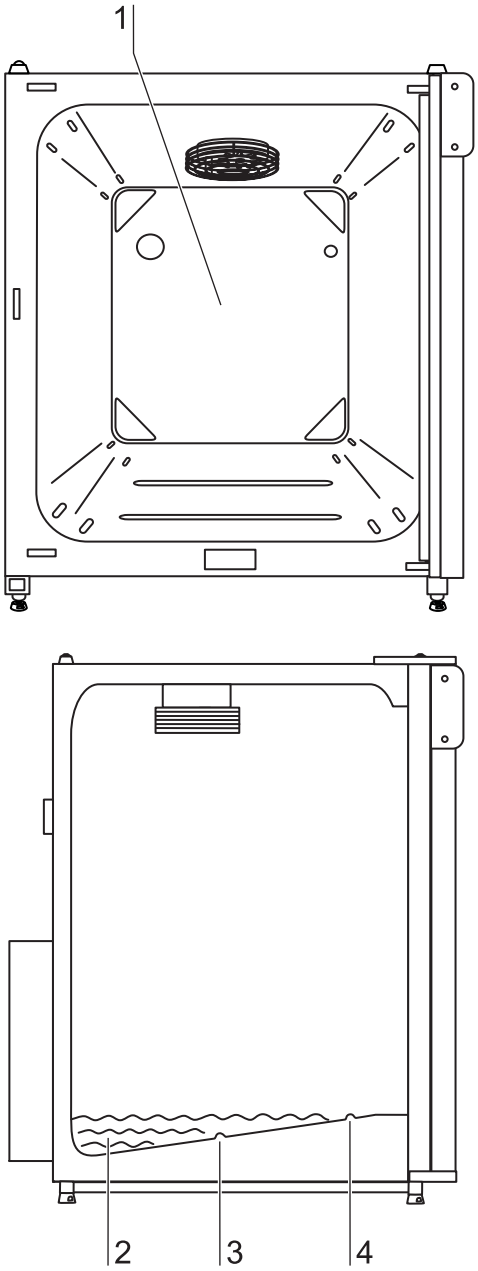


Fig. 9
Work space layout,
Water reservoir

4. Description of the device

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

Rear panel openings:
Fig. 10: A sealable access port [1] allows cables, hoses or additional sensors to be routed into the work space of the device. A pressure compensation opening with insert [2] at the rear panel of the device allows a compensation between the pressures in the work space and in the operating room.

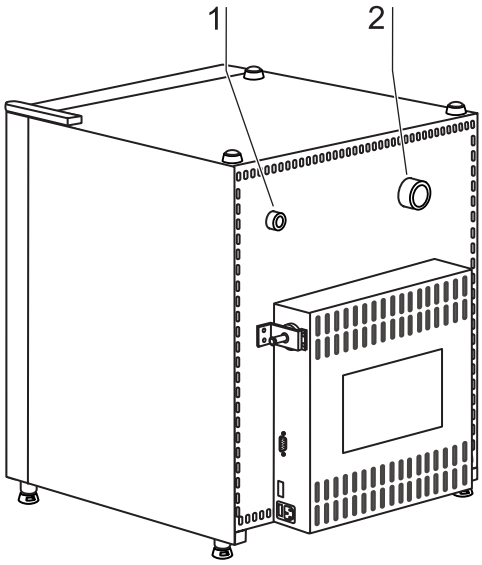


Fig. 10
Rear panel openings

NOTE – Operating conditions

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

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

5. Start-up

5.1 Preparing the work space

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

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

NOTE – Decontamination

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

5.2 Mounting the door handle

Fig. 11: The door handle [4] can be installed to the face of the outer door [2] either at the upper position [1] or at the lower position [3]. Two holes are drilled in each position.

1. Install the door handle by using the 2 self tapping srews [5] provided.
2. Cap the unused holes with the protective caps.

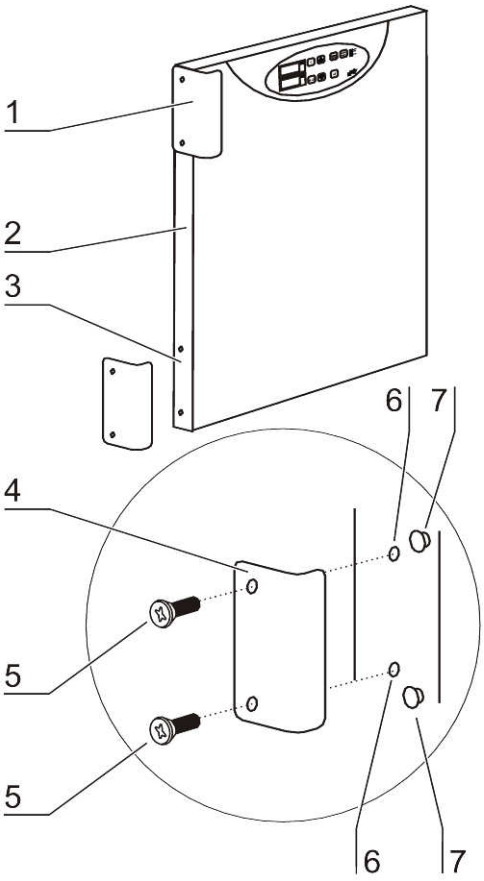


Fig. 11
Door handle

5.3 Installing the shelf system

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

Support rail installation/removal:
Fig. 12: The support rails are held at the sides by embossing [2] and [5] and secured by the embossing [1] and [6]. The support rails marked with (◊) are inserted at the rear panel of the device with the locksprings [3] facing upward.

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

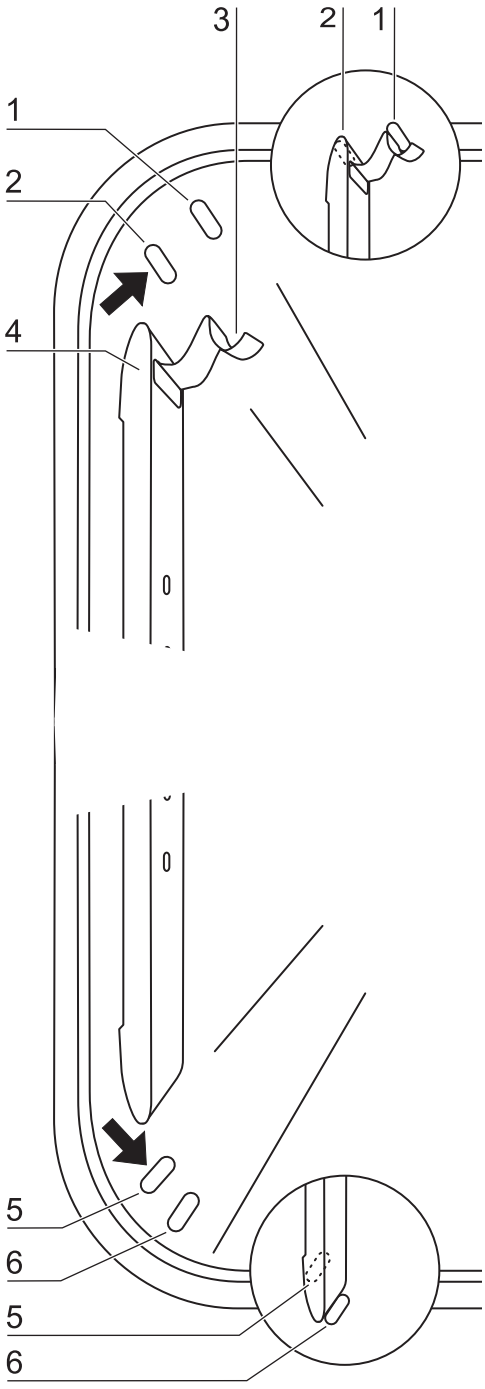


Fig. 12
Support rail installation/ removal

5. Start-up

Installing the shelf supports:

1. **Fig. 13:** Insert the shelf supports [3] into the perforations [1] of the support rail with the bar facing down.
2. Make sure that the two vertical elements [2] of the shelf support are flush with the support rail.

Installing the shelves:

1. **Fig. 13:** Push the shelf [4] onto the shelf supports with the tilt protection [5] facing the rear panel of the device. The tilt protection [5] is also used as a guide for the shelf.
2. Slightly raise shelf so that the withdrawal stop [6] can be routed over the shelf supports.
3. Make sure that the shelf supports are positioned in the two tilt protectors in a way that it can move freely.

Levelling the device:

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

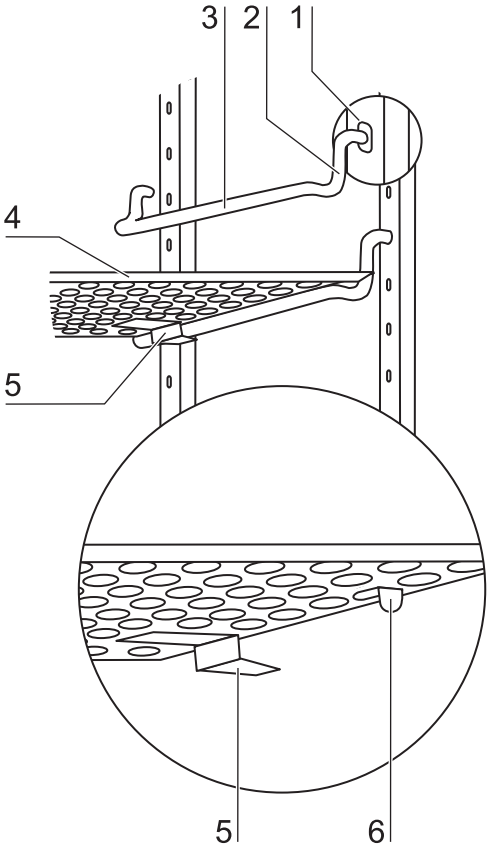


Fig. 13
Shelf support/sheet/
insert installation

5. Start-up

5.4 Gas connection

NOTE – Gas quality

CO_2 must be of the following qualities:
- **Purity 99.5 % min,**
- **medical grade.**

CAUTION – Overpressure!

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

NOTE – Pressure compensation opening

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

NOTE – Access port

If the access port is not used, it must be capped during operation.

CO_2 connection
Fig. 14: The gas supply from the gas supply system to the device is achieved using the supplied flexible gas pressure hoses:
1. Connect gas pressure hose [1] to the sleeve of the gas supply system.
2. Remove protective cap [3] from sterile filter.
3. Slide hose clamp [2] onto gas pressure hose and connect hose to the sleeve of the sterile filter.
4. Secure gas pressure hose to the sleeve of the sterile filter using the hose clamp.

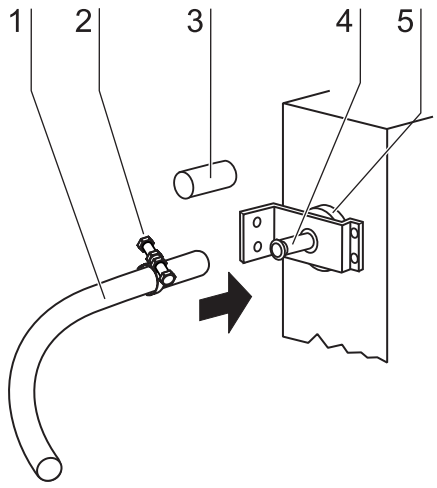


Fig. 14
Gas pressure hose installation, CO_2 connection

5. Start-up

5.5 Power supply connection

WARNING – Electric shock!

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

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

- Fusing T 16 A
- Circuit breaker G 16

Connection to the power supply system:

1. Before connecting the device to the power supply, check to see if the voltage of the power supply corresponds with the specifications on the nameplate at the front of the device. If the ratings given for voltage (V) and current (A) are not correct, the device must not be connected to the power supply.
2. **Fig. 15:** Connect the connector for non-heating appliances [2] to the socket [1] at the control box of the device.
3. Connect the grounding plug [3] of the power supply cable to a correctly grounded and fused socket.
4. Make sure the power supply cable is not subjected to tensile or compressive force.

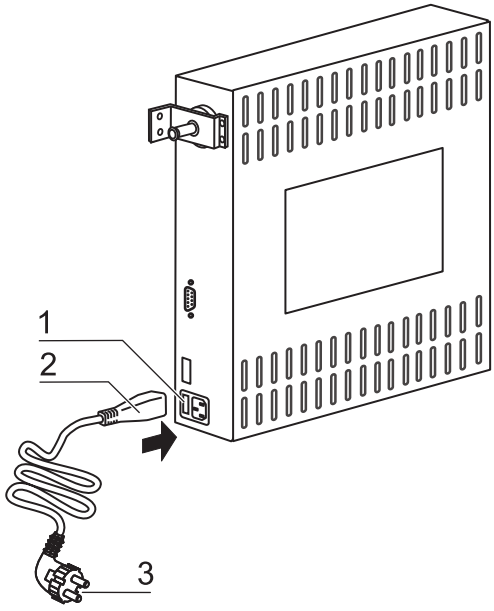


Fig. 15
Power supply connection

5. Start-up

5.6 RS 232 interface connection

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

Connection of the device:
1. Turn PC off.
2. **Fig. 16:** Connect the connector [2] of the serial interface cable [3] (not comprised in the scope of delivery) to the socket [1] at the supply interface at the rear of the device.
3. Connect the remaining other connector [4] to an unassigned slot COM 1/COM 2 etc. at the PC.
4. Turn PC on.

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

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

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

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

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

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

Device response for temperature and CO_2
Data:

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

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

Data:
none

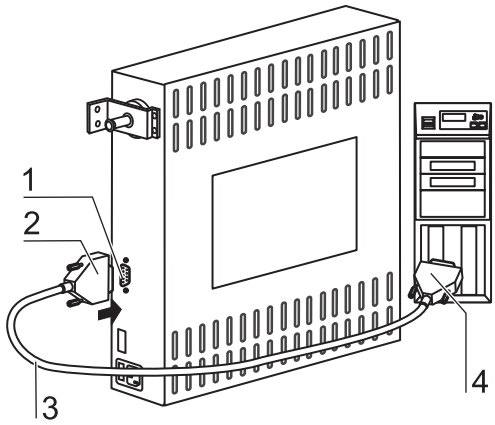


Fig. 16
RS 232 interface

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

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

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

Example: Temperature data request and response

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

Response:
$O2_H\ 6D_H\ \underline{01_H}\ \underline{72_H}\ 38_H\ 91_H\ C7_H\ 41_H\ \underline{F5_H}\ \underline{6B_H}\ \underline{F4_H}\ \underline{43_H}\ \underline{9E_H}\ \underline{00_H}\ \underline{32_H}\ 4B_H\ 03_H$
integer (37.0) *float* (24.946) *intern*

5. Start-up

5.7 Connecting the alarm contact

NOTE – Expert work

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

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

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

Alarm relay

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

NOTE – Switching structure

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

5. Start-up

Connection example:
Fig. 17: The connector [5] for the connecting cable is comprised in the scope of delivery. The values for the operating voltage of the external circuits and of the fusing of the alarm system are given in the table above.

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

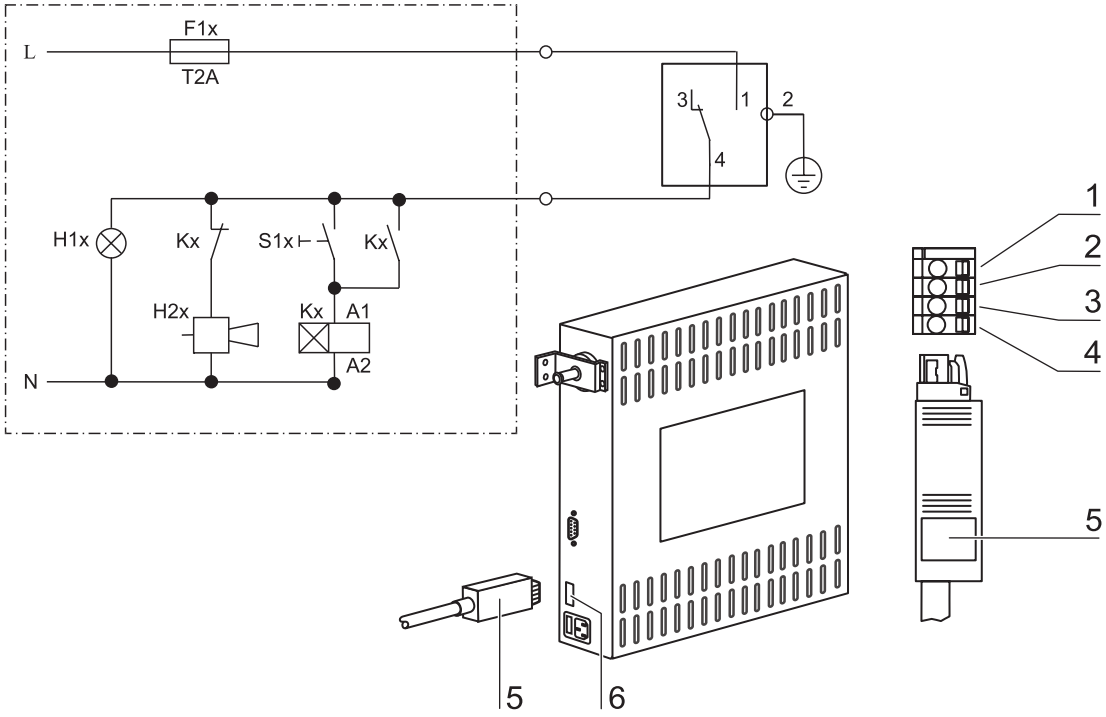


Fig. 17
Example of a connection scheme for an external alarm system (changeover contact: device off, no failure)

6. Handling and control

6.1 Power switch

Fig. 18: Depending on which side the door hinges are installed, the power switch [1] is integral to the front cover [2] of one of the front device stands.

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

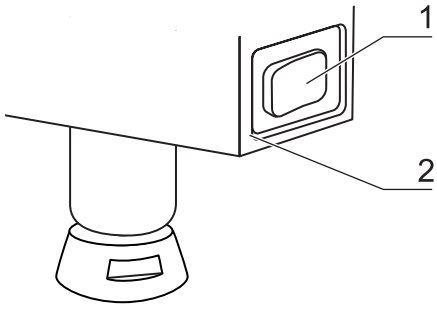


Fig. 18
Power switch

6.2 Operating panel

Fig. 19: The operating panel is divided into three functional areas:

- 2 displays that show numeric values for temperature and CO_2 content.
- 7 keys for selecting functions and for entering data.
- 4 LEDs that show functions or operating states.

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

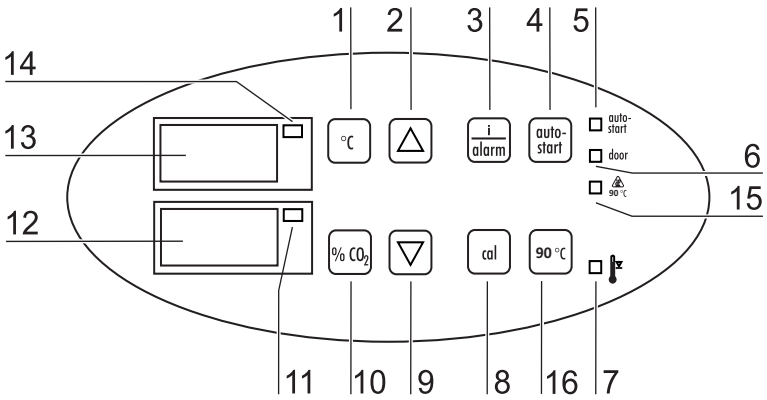


Fig. 19
Operating panel functions

6. Handling and control

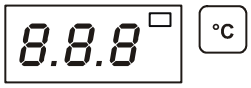
6.3 Control self-test

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

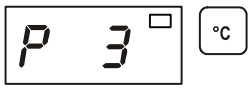
1. Turn the device on

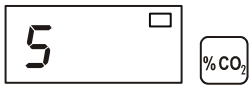
▶ Press power switch.

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



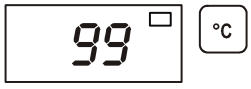
○ The temperature display shows a three-digit number for the corresponding assembly/parameter set:
P 1: Operating and display board
P 2: Measuring cell
P 3: Main board
P n: Parameter number
The CO_2 display shows the software version/device version.

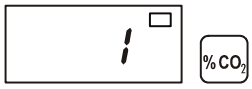




2. Test routine completed

○ The temperature display shows the current temperature value, the CO_2 display shows the current CO_2 value.





NOTE – Factory presettings

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

6. Handling and control

6.4 Setting the nominal temperature value

1. Display the nominal value:

▶ Press the [°C] key.

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

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

To increase the nominal value:

▶ Press the [°C] + [△] keys.

To reduce the nominal value:

▶ Press the [°C] + [▽] keys.

3. Accept and store the nominal value:

▶ Release both keys.

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

6.5 Setting the CO_2 nominal value

1. Indicate the nominal value:

▶ Press the [%CO_2] key.

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

2. Enter the nominal value:

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

▶ Press the [%CO_2] + [△] keys.

To reduce the nominal value:

▶ Press the [%CO_2] + [▽] keys.

3. Accept and store the nominal value:

▶ Release both keys.

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

6.6 Activating the stacked incubator mode

When stacking the incubators, the stacked incubator mode must be activated on the upper unit. This function adjusts the parameters of the uppper unit to compensate any heat transmission between the two units.

1. Activate the stacked incubator mode:

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

○ All indicators on the operating panel flash.

2. Display the mode:

▶ Press the [auto-start] key.

○ The temperature display shows the current mode (disabled).

3. Change the mode:

Use the following key combinations to switch between the two modes (enabled and disabled):

▶ Press the [auto-start] + [△] keys.

or

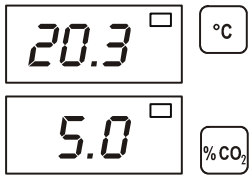
▶ Press the [auto-start] + [▽] keys.

○ The temperature display shows the new mode (enabled).

4. Accept and store the desired mode:

▶ Press the cal key.

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



○ The new mode is accepted.

6.7 Activating the auto-start routine

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

NOTE – Application of the routine

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

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

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

6. Handling and control

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

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

2. Enter nominal values:

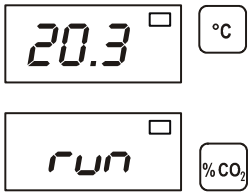
- ▶ See sections 6.4 / 6.5.

3. Activate the auto-start routine:

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

4. Close all device doors:

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



5. Cancel the auto-start routine:

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

NOTE – Cancelling the routine!

The auto-start routine can be cancelled any time.

NOTE – Failure code

The cancelling of the routine is indicated by a corresponding failure code. For a list and for a description of the codes, please refer to Section 6.8, "Failure code list".

6. Handling and control

6.8 Reading failure codes

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

NOTE – Response delay

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

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

NOTE – Delay time reset

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

NOTE – Failure cause

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

6. Handling and control

1. The audible alarm sounds.

2. Silence the audible alarm:

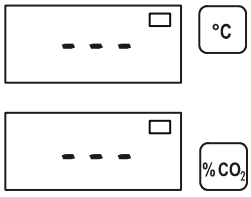
▶ Press any key.

○ The audible alarm is silenced.

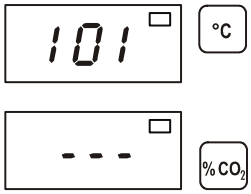
3. Read failure codes:

▶ Keep the alarm key depressed.

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



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



NOTE – Failure codes

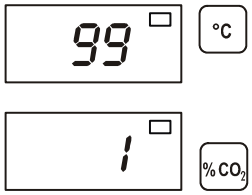
For a list and a description of the failure codes, please refer to Section 6.8, "Failure code list".

6. Handling and control

5. Scroll through the failure code table:

To read stored failure codes from the failure code table:

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



6. Exit the failure code table:

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

7. Erase the failure code table:

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

6. Handling and control

6.9 Failure code list

Code	Description	Cause	Repair
--- ---	No values displayed	Communication between display and CPU- main board faulty	Contact Service
42	NV RAM read failure	NV RAM faulty, default values loaded	Contact Service
43	NV RAM read failure	NV RAM faulty, mirrored values loaded	Contact Service
44	NV RAM faulty	CO_2 measuring cell values not overwritten, device works with default values	Contact Service
54	Manipulated variable failure	Calculation error, device performed RESET	Contact Service
55	I^2C bus failure	Data transfer faulty, measured value quality dropped below 50 %	Eliminate source of interference, e.g. cellular phone
66	Deviation of temperature sensors from one another	Temperature signal plausibility doubtful	Contact Service
77	CO_2 cal range exceeded	Max. adjustment value exceeded	Contact Service
88	Failure upon auto-start	Total time elapsed or max. adjustment value exceeded	Repeat auto-start
99	Device doors open	Doors open for more than 10 minutes, door switch	Close device doors, test door switch for correct function
100	Temperature below nominal value	Actual value < nominal value –1 ° C	Contact Service
101	Temperature above nominal value	Actual value > nominal value +1 ° C	Do not exceed ambient temperature limit
104	Temperature sensor faulty	Sensor circuit open/shorted	Contact Service
200	CO_2 below nominal value	Act. val. < nom. val. –1 % • No CO_2 • Prepressure low • Supply line blocked	Check gas supply: • Connect new gas cylinder • Raise prepressure to 1 bar • Check supply line to device
201	CO_2 above nominal value	Act. val. > nom. val. +1 % • Prepressure high	Check gas supply: • Reduce prepressure to 1 bar
204	CO_2 measuring cell faulty	Sensor circuit open/shorted	Contact Service
500	Temperature 90° C routine below nominal value	Actual value < 85° C	Repeat decontamination routine, contact service as required
501	Temperature 90° C routine above nominal value	Actual value > 85° C	Contact Service
502	Failure in 90° C routine	Power failure during heating or holding phase	Silence alarm by pressing key 90 ° C" (2 times 5 sec.), then restart routine

6. Handling and control

6.10 Resetting the thermal protection

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

▶ Press the power switch.

○ All indicators come off.

3. Turn the device back on:

▶ Press the power switch.

NOTE – Thermal protection

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

7. Operation

7.1 Preparing the device

The device must only be released for operation after all major measures for the start-up have been taken (Section 5.1–5.7).

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

- Gas hoses must be seated tight on the connecting filter and must be secured using a hose clamp.
- The access port must be capped.
- The pressure compensation opening must be permeable, its insert must be installed in the work space.
- The glass door seal must not be damaged.
- The glass door measurement opening must be capped.
- The shelf system components must be installed safely.

NOTE – Hygiene regulations

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

NOTE – Water supply

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

Water quality recommendation:
For trouble-free operation of the equipment, fill the water reservoir with sterilized destilled water or equivalent. The acceptable conductivity should be within the range of 1 to 20 µS (resistivity within the range of 50 kΩ to 1 MΩ).

7. Operation

Termination of warranty!
Using chlorinated tap water or additives that contain chlorine will void the manufacture warranty. Similarly, the use of ultrapure water whose conductivity is out of the range of 1 to 20 µS (and whose resistivity is out of the range of 50 kΩ to 1 MΩ) will void the manufacture warranty.
If you should have any questions, please contact Technical Support of Thermo Fisher Scientific.

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

7.2 Starting operation

Starting and loading the device:

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

NOTE – Duration of the auto-start routine

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

NOTE – Loading

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

8. Shut-down

8.1 Shutting the device down

CAUTION! – Contamination hazard!

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

1. Remove culture containers and all accessories from the work space.
2. Pump water out off the water reservoir.
3. Clean and decontaminate the work space and wipe device dry.
4. Turn device off using the power switch.
5. Unplug power connector and protect it against accidental reconnection.
6. Close the CO_2 supply system shut-off valves.
7. Disconnect gas pressure hoses from sleeve at the rear of the device.
8. Until the device is shut down, the work space must be continuously ventilated: Leave the glass door and the outer door open and secure them in this state.

9. Cleaning and disinfection

9.1 Decontamination procedures

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

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

9.2 Wipe/Spray disinfection

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

Recommended cleaning and disinfection agents:

CAUTION – Incompatible cleaning agents!

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

CAUTION – Chloride-containing disinfectants!

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

9. Cleaning and disinfection

CAUTION – Alcoholic disinfectants!

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

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

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

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

9. Cleaning and disinfection

Preparing the manual wipe/spray disinfection:

WARNING – Electric shock!

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

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

CAUTION! – Health hazard!

The surfaces of the work space may be contaminated. Contact with contaminated cleaning liquids may cause infections. Disinfectants may contain harmful substances.
When cleaning and disinfecting, always observe the safety instructions and hygiene regulations!

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

Pumping water out of the water tray:
Fig. 20: The water pump serves for suction cleaning of the remainig water in the water reservoir. The water drain works through gravity.

1. Place the water pump [1] on lowest shelf [5].
2. Feed the inlet hose [4] through a whole [7] of the lowest the shelf to the water reservoir [8].
3. Prepare a bucket [2].
4. Suck the water, therefore pump the water pump using the hand grip [6] about four times until water flows in the outlet hose.
5. Let the water run into the bucket [2] through gravity.
6. Wipe out the rests of the water at the floor plate of the water reservoir.

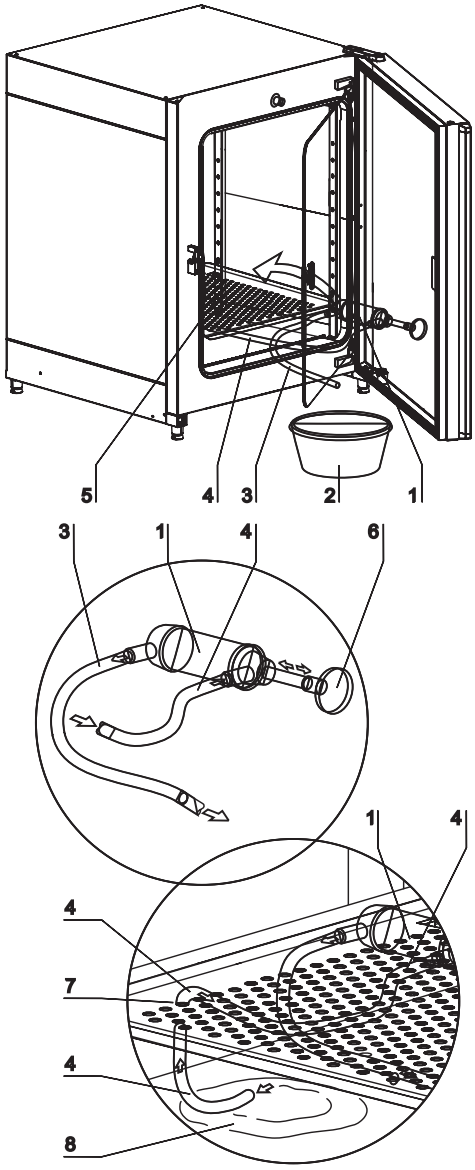


Fig. 20
Water pump

9. Cleaning and disinfection

Predisinfection:

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

NOTE – CO_2 sensor

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

Removing accessories and shelf system:

1. Remove all shelves, then remove the entire shelf system from the work space.
   For removal and installation of the shelf system, please refer to Section 5.3.
2. If required, remove the blower wheel and its cover from the baseplate of the measuring cell. The wheel and the cover can be autoclaved.

Removing blower wheel and cover:

1. **Fig. 21:** Remove the two retaining screws [3] of the cover using the supplied Allen wrench (3 mm) and remove the cover.
2. The blower wheel [1] is secured to the axle by a set screw [2]. Remove set screw using the Allen wrench (2 mm) and pull blower wheel off.

NOTE – Functional check

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

Cleaning the work space and accessories:

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

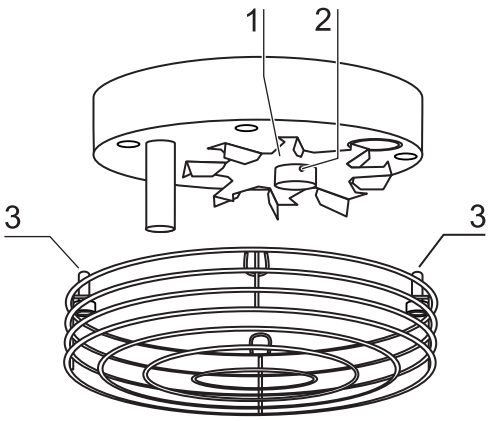


Fig. 21
Removing blower wheel and cover

9. Cleaning and disinfection

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

9.3 ContraCon decontamination routine

CAUTION! – Hot surface!

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

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

NOTE – Duration of the auto-start routine

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

ContraCon decontamination routine procedure:
Fig. 22: The routine is divided into four phases. Each individual phase or several phases can be cancelled (i.e. skipped).
If the operating step ”Cancel ContraCon routine” is executed, the routine moves to the next program phase. To cancel the routine completely, the operating step must be executed repeatedly until the remaining run time display shows the value 0.
When the glass door is opened, this operating step cancels the routine completely.
The remaining run time of the ContraCon decontamination routine designates the period between the start or the current routine time state and the cooling down to the preset temperature nominal value (± 2° C).

9. Cleaning and disinfection

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

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

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

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

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

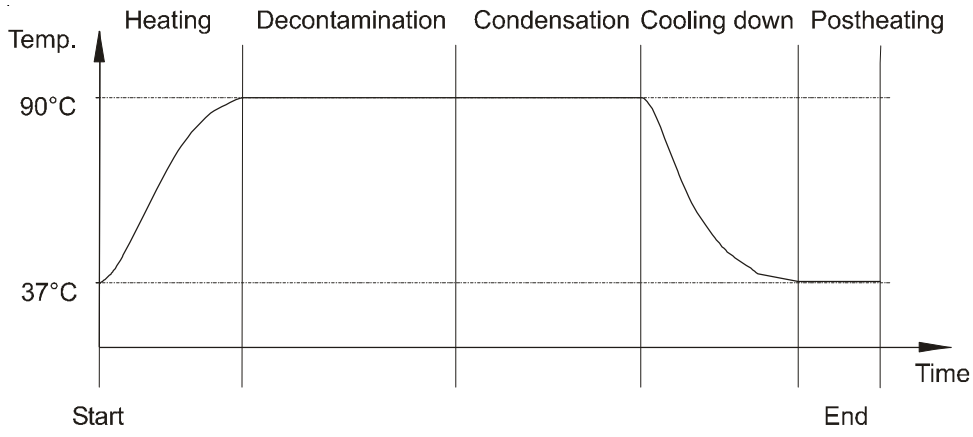


Fig. 22
ContraCon decontamination routine procedure

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

NOTE – Overtemperature

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

9. Cleaning and disinfection

9.4 Activating the ContraCon decontamination routine

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

1. Turn the device on:

▶ Press the power switch.

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

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

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

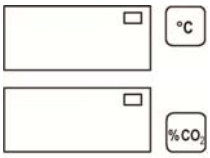
3. Start the ContraCon routine:

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

○ The ” ContraCon routine” LED flashes.

4. Close the device doors:

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



5. Complete the ContraCon routine:

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

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

9.5 Cancelling the ContraCon decontamination routine

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

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

10. Maintenance

10.1 Inspections and checks

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

Daily check:
- Gas supply of the CO_2 supply system.

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

NOTE – Functional check

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

10.2 Service intervals

During normal operation, the following service routine must be performed:

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

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

Annual service:
- Replace sterile filter.

NOTE – Service contract

Thermo Electron LED GmbH offers a device-specific service contact that comprises all test and service works required.

10. Maintenance

10.3 Preparing the temperature calibration

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

NOTE – Isothermal container

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

Comparison measurement procedure:

1. Turn device on using power switch.
2. Set temperature nominal value and allow device to be heated. This may take up to several hours.
3. **Fig. 23:** Place measuring instrument [3] onto the center area of the work space.
   Alternatively, a temperature sensor may be positioned in this location. Route the connecting cable either through the measurement opening [2] in the glass door or through the access port [1] at the rear panel of the device.
4. Close doors.
5. Wait until the temperature value displayed on the measuring instrument has stabilized.
6. Calibrate temperature control as described in Section 10.4.

Measurement example:

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

NOTE – Excessive work space temperature

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

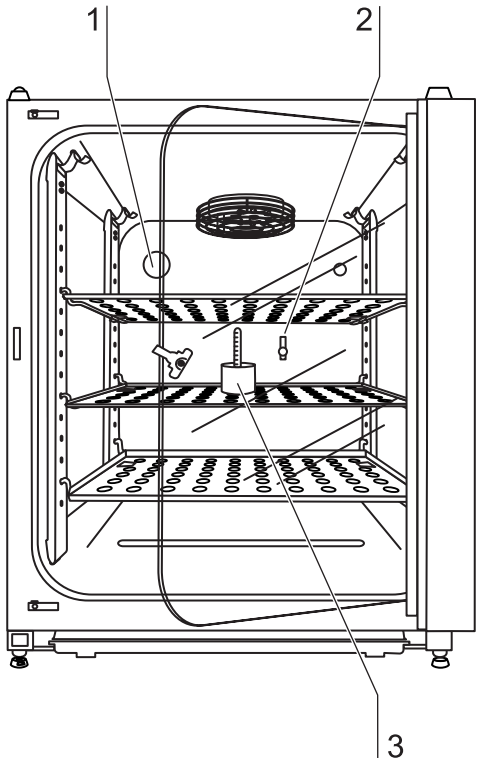


Fig. 23
Temperature calibration

10. Maintenance

10.4 Temperature calibration procedure

1. Activate calibration:

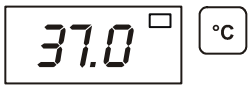
▶ Keep the [cal] key depressed for 5 seconds.

○ All operating panel indicators flash.

2. Display the nominal value:

▶ Press the [°C] key.

○ The preset value of 37° C is displayed.



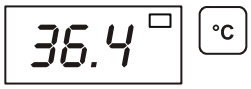
3. Enter the measured value (destination value):

▶ Press the [°C] + [△] keys.

or

▶ Press the [°C] + [▽] keys.

○ Destination value e.g. 36.4° C

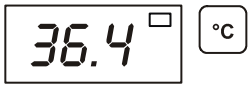


4. Accept the destination value:

▶ Press the [cal] key.

○ The temperature display momentarily shows “CAL”,

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



5. Cancel the calibration process:

▶ Press any key.

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

10. Maintenance

10.5 Preparing the CO_2 calibration

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

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

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

Comparison measurement procedure:
1. Turn device on using power switch.
2. Set CO_2 nominal value and allow device to heat up completely and to create humidity. This process may take several hours.
3. **Fig. 24:** Insert the measuring instrument probe through the measurement opening [1] into the work space. Wait until the CO_2 value displayed by the instrument has stabilized.
4. Remove measuring probe, plug measurement opening and close doors.
5. Calibrate CO_2 control as described in Section 10.6.

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

NOTE – Excessive CO_2 content

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

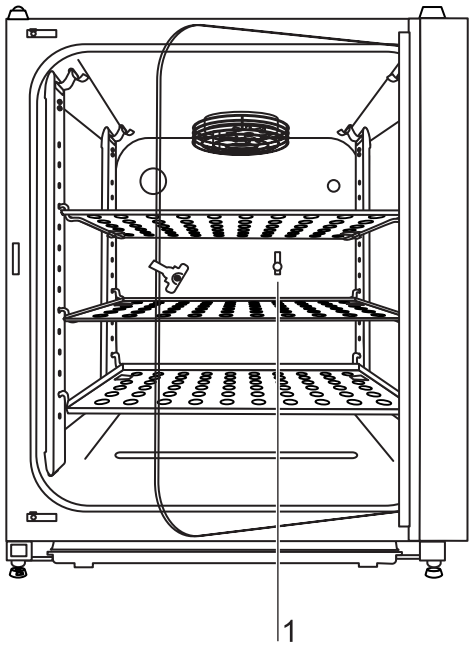


Fig. 24
CO_2 calibration

10. Maintenance

10.6 CO_2 calibration procedure

1. Activate the calibration:

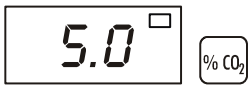
▶ Keep the [cal] key depressed for 5 seconds.

○ All operating panel indicators flash.

2. Display the nominal value:

▶ Press the [%CO2] key.

○ The set nominal value of 5 % is displayed.



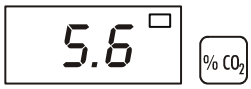
3. Enter the measured value (destination value):

▶ Press the [%CO2] + [△] keys.

or

▶ Press the [%CO2] + [▽] keys.

○ Destination value e.g. 5.6 %.

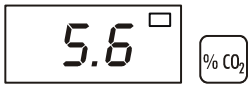


4. Accept the destination value:

▶ Press the [cal] key.

○ The CO_2 display momentarily shows “CAL”,

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



5. Cancel the calibration process:

▶ Press any key.

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

10.7 Replacing the sterile filters

The sterile filters have plastic threads and are screwed by hand into the threaded hole on the control box.

Procedure for gas supply sterile filter:
1. Make sure that the gas supply is shut off.
2. **Fig. 25:** Loosen hose clamp [4].
3. Remove gas hose [5] from sterile filter sleeve [2].

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

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

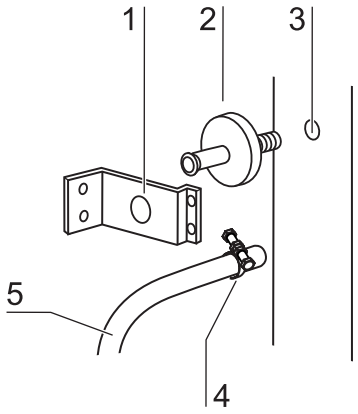


Fig. 25
Sterile filter replacement

10.8 Replacing the device fuses

Fig. 26: The two identical device fuses [4] are installed in the fuse compartment [1] next to the power plug receptacle of the device:

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

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

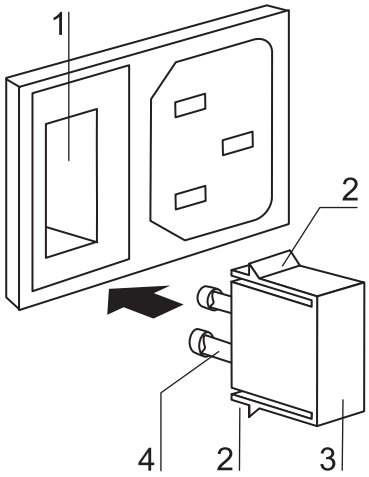


Fig. 26
Device fuse replacement

10. Maintenance

10.9 Replacing the door seal

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

1. **Fig. 27:** Pull magnetic seal [3] out of the guide slot [1].
2. Position new seal at a corner [2] and press seal retaining rail [4] into slot.
3. Make sure that the retaining rail taper is positioned correctly in the slot [1] and that the seal is flush with the door frame.

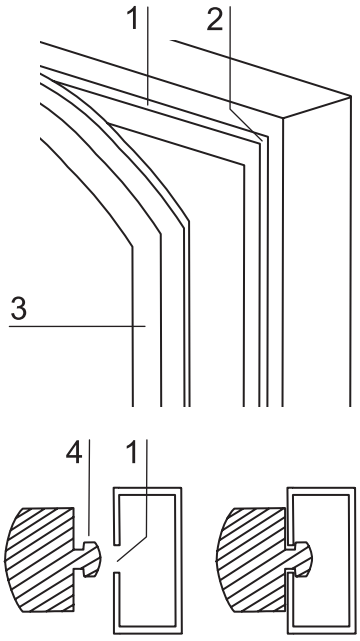


Fig. 27
Door seal replacement

11. Spare parts and accessories

11.1 List of spare parts and accessories

When ordering spare parts, please have the device specifications on the name-plate available.

NOTE – Repairs

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

Description	Type	Part No.
Operating instructions, BB150	Set	CSP-50078936CN
Stacking element,	Ceiling, set of 3	CSP-50049238
Stand	Height-adjustable	CSP-50049939
Floor stand,	Height 200 mm	CSP-50051376
Floor stand with rollers,	Height 185 mm	CSP-50057161
Floor stand,	Height 780 mm	CSP-50051436
Roller set for floor stand, set of 4,	Guide rollers	CSP-50052528
Spare caps,	Set	CSP-50052958
Outer door magnetic seal	637 x 858	CSP-50078769
Glass door silicone seal,		CSP-50048705
Glass door	Complete	CSP-50050779
PLUG F. HOSE PASS-THROUGH D 40 MM	Complete	CSP-50105899
Shelf, set with 2 shelf supports,	Stainless steel	CSP-50051909
Support rail, front	Stainless steel	CSP-50050923
Support rail, rear	Stainless steel	CSP-50050924
Spring for support rail		CSP-50050922
HERAtray 1/3 width, set of 3,	Stainless steel	CSP-50051913
HERAtray, 1/2 width, set of 2,	Stainless steel	CSP-50058672
Blower wheel	Stainless steel	CSP-50049692
Device fuse,	T 6.3 A (set of 2)	CSP-3002641-
Power supply cable,	EU	CSP-50043143
Power supply cable,	GB	CSP-50047100
Power supply cable,	IT	CSP-50047101
Power supply cable,	CH	CSP-50047099

11. Spare parts and accessories

Description	Type	Part No.
Hose set for gas connection,3m		CSP-50062701
Sterile filter, gas inlet,	With thread	CSP-50050737
Measurement opening plug,		CSP-26139262
Insert for pressure compensation opening,		CSP-50070316
Surface disinfectant, 250 ml, spray bottle,	Barrycidal 36	CSP-50052425
Surface disinfectant, 500 ml, refill bottle,	Barrycidal 36	CSP-50051939
Gas cylinder monitor GM 2,	EU	50046033
Gas cylinder monitor GM 2,	GB	50054748
Gas cylinder monitor GM 2,	USA	50059043
Adapter plate for stacking 2 BB 150,		CSP-50079816
DOOR HANDLE BB 15		CSP-50079139
IR CO2 Tester (100-240Vac)		50121515
Pump for water drain,complete		CSP-50120606

12. Technical data

Description	Unit	Value
Mechanical		
External dimensions (W x H x T)	mm	637 x 870 x 766
Interior dimensions (W x H x T)	mm	470 x 607 x 530
Chamber volume	l	approx. 151
Shelves (W x T)	mm	423 x 455
Standard quantity	Piece	3
Maximum quantity	Piece	10
Maximum surface load	kg	10 / insertion shelf
Maximum device overall load	kg	30
Weight, without accessories	kg	60 (stainless steel)
Thermal		
Ambient temperature range	°C	+18...33
Temperature control range	°C	RT + 3 ... 55
Temperature deviation, time (DIN 12880, Part 2)	°C	± 0.2
Temperature deviation, spatial (DIN 12880, Part 2) at 37 °C	°C	± 0.5
Duration of the auto-start routine, to 37 °C ambient temperature 20 °C	h	5 ... 10
Temperature recovery time, at 37 °C, door open 30 seconds (to 98 % of initial value)	min	< 10
Heat transfer to environment at 37 °C	kWh/h	0.085
Humidity		
Water quality		Refer to "NOTE-Water supply" in Page 43
Liquid quantity incubation operation	l	max. 3. 0 / min 1.2
Constant humidity at 37 °C	% rH	>90
Humidity recovery time, at 95 % rH, door open 30 s (to 95 % of initial value)	min	≤30

12. Technical data

Description	Unit	Value
CO_2 gas supply system		
Gas purity	%	min. 99.5 or medical quality
Prepressure	bar	min. 0.8 - max. 1
Measuring and control range	% vol.	0... 20
Control deviation, temporal@middle of inner chamber	% vol.	± 0.1
Recovery time, at 5 %, door open 30 seconds (to 95 % of initial value)	min	≤12
CO_2 measuring cell		
Accuracy (absolute)	% CO_2	± 0.3
Electrical system		
Rated voltage	V	1/N/PE 230 V, AC
Rated frequency	Hz	50/60
Interference suppression (DIN VDE 0875)		Interference level N
Type of protection (DIN 40 050)		IP 20
Protection class		I
Overvoltage category (IEC 1010, EN 61010)		II
Pollution severity (IEC 1010, EN 61010)		2
Rated current	A	2,6 (230 V, AC)
On-site fusing: Fuse Circuit breaker		 T 16 A G 16
Rated input	kW kW kW	0.60 (230 VAC)
EMC class		B
Others		
Sound pressure level (DIN 45 635, Part 1)	dB(A)	< 50
Relative humidity of environment	% rH	max. 80
Location elevation	m NN	max. 2000

12. Technical data

Fig. 28: Overview of gas consumption (CO_2)

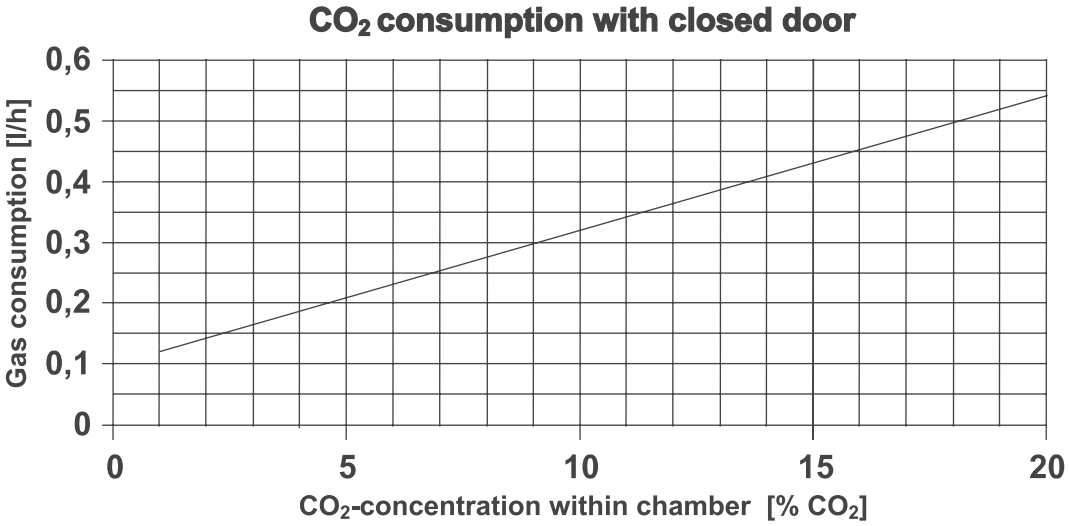


Fig. 28
Overview of gas consumption (CO_2)

13. Disposal

CAUTION – Contamination hazard!

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

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

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

NOTE – Recycling service

Thermo Fisher Scientific Products offer, for a small fee, an environmentally compatible recycling service for discarded devices.

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

13. Disposal

WEEE Compliance:

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

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

14. Principles of good microbiological practice[1]

General information:

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

The following additional principles apply to the handling of causatives:

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

Further safety measures in dependence of the potential hazard:

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

14. Principles of good microbiological practice

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

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

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

[1]To be applied accordingly to cell cultures.

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

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

15. Device log

NOTE – Device log!

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

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

Work carried out	Notes	Date	Signature

16. Certificate of decontamination

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

Certficate of decontamination

Dear customer,

when using biological and chemical agents within and ouside of devices, hazards to the health of the operating personnel may be present and contamination of the surroundings of the device may occur when service or repair works are carried out.
Within the scope of national and international legal regulations, such as
- responsibility of a company for the protection of its employees,
- responsibility of the operator for the operational safety of devices,
all possible hazards must absolutely be prevented. Prior to any calibration, service, and repair works, prior to any relocation of a device, and prior to the shut-down of a device, the device must be decontaminated, disinfected, and cleaned as required by the work to be carried out.
Therefore, we ask you to fill in this certificate of decontamination before you start with the required work.

Yours sincerely

KENDRO Laboratory Products GmbH

Works to be carried out (please mark where applicable)

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

Declaration of possible contamination (please mark where applicable)

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

Certification:

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

Note:

Date, legally binding signature, stamp

Thermo Fisher Scientific,
San Jose, CA USA is ISO Certified.

thermoscientific.com

Thermo Fisher Scientific
81 Wyman Street
Waltham, MA 02451

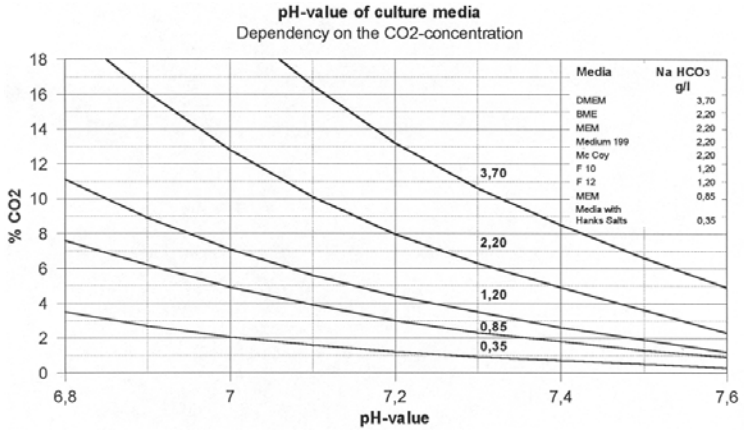
Thermo SCIENTIFIC

Part of Thermo Fisher Scientific

2. TECNICAL DATA

Description	Unit	Value	
		BB 150	
Mechanical			
Exterior dimensions (W x H x D)	mm	637 x 870 x 766	
Interior dimensions (W x H x D)	mm	470 x 607x 530	
Chamber volume	l	approx. 151	
Insertion shelfs (W x D)	mm	423 x 445	
Standard quantity	each	3	
Maximum quantity	each	10	
Maximum surface load	kg	10 / per shelf	
Maximum device overall load	kg	30	
Weight, without accessories	kg kg	70 (stainless steel) 75 (copper)	
Thermal			
Ambient temperature range	°C	+ 18... + 33	
Temperature control range	°C	RT + 3... + 55	
Temperature deviation, temporal (DIN 12880, Part 2)	°C	± 0.2	
Temperature deviation, local (DIN 12880, Part 2) at 37 °C at 55 °C	 °C °C	 ± 0.5 ± 0.6	
Temperature recovery time, at 37 °C, door open 30 s (to 98 % of initial value)	min	≤ 10	
Cool-down time, from 37° C to 25 °C Ambient temperature 20 °C	h	approx. 6	
Heat dissipation to environment: at 37 °C at 50 °C 90 °C decontamination routine	 kWh/h kWh/h kWh/h	 approx. 0.085 approx. 0.095 approx. 0.112	
Humidity			
Water quality	demineralized / distilled or autoclaved or completely deionized / destilled or autoclaved		
Liquid quantity: Incubation operation 90 °C decontamination routine	 L ml	 max. 3 350	
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, door open 30 s (to 95 % of initial value)	min min	≤ 30	

Description	Unit	Value	
		BB 150	
CO_2 gas supply system			
Gas purity	%	99.5 min. or medical quality	
Prepressure	bar	0.8 min. – 1 max.	
Measuring and control range	vol - %	0... 20	
Control deviation, temporal@middle of inner	vol - %	± 0.1	
Recovery time, at 5 %, door open 30s (to 95% of initial value)	min	≤ 12	
CO_2 measuring cell			
Accuracy after auto-start routine	% CO_2	± 0.3	
Electrical system			
Rated voltage	V	1/N/PE 230 V, AC	
Rated frequency	Hz	50/60	
Interference suppression (DIN VDE 0875)		Interference level N	
Type of protection (DIN 40 050)		IP 20	
Protection class		I	
Overvoltage category (IEC 1010, EN 61010)		II	
Pollution severity (IEC 1010, EN 61010)		2	
Rated current	A	2.4 (230 VAC)	
On-site fusing: Fuse Circuit breaker		 T 16 A G 16	
Rated input	kW	0.60 (230 VAC)	
EMC class		B	
Others			
Sound pressure level (DIN 45 635, Part 1)	dB(A)	< 50	
Relative humidity of environment	% rH	80 max.	
Location elevation	m NN	2000	



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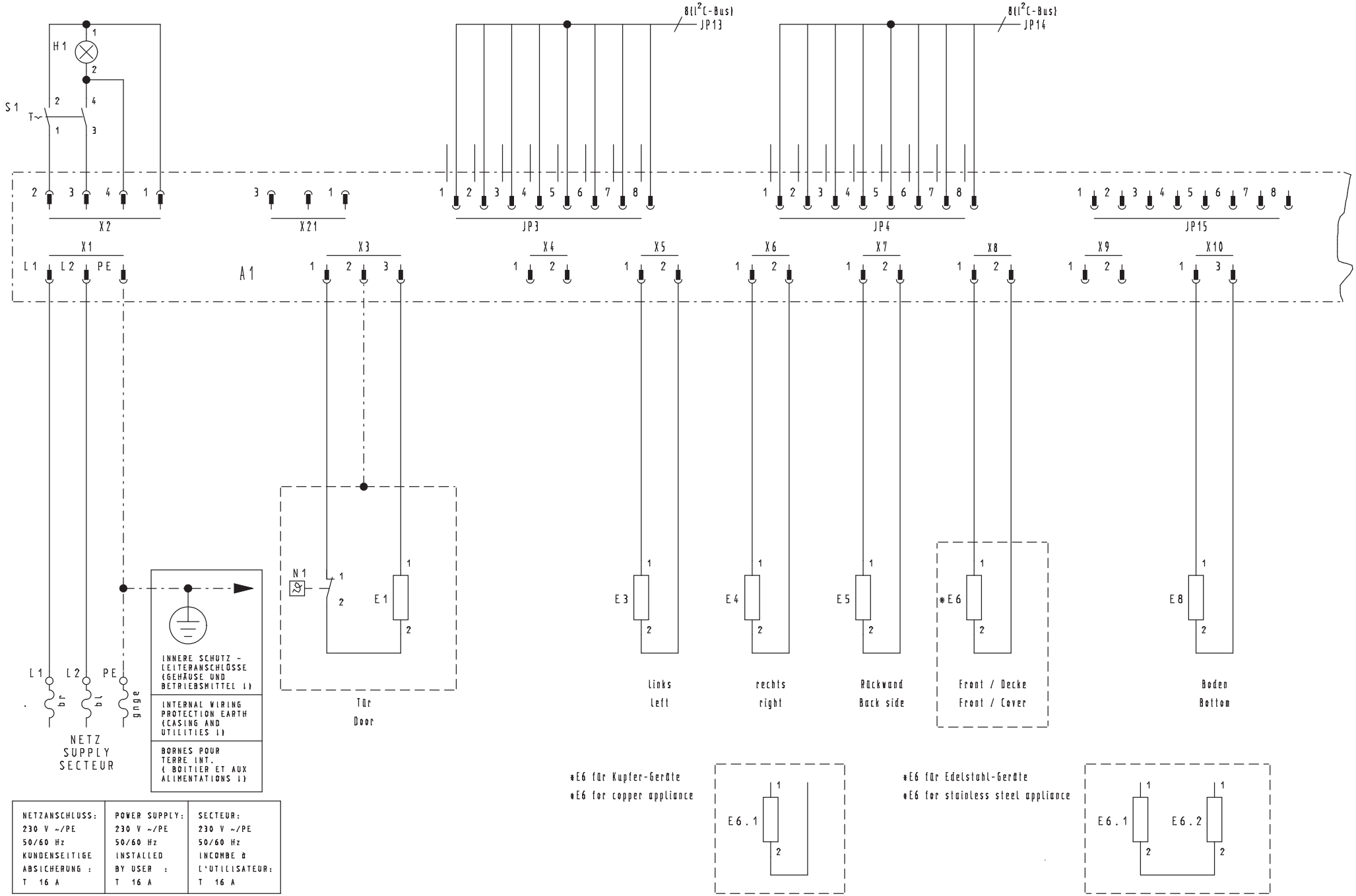
Prepared		JF	05.07.13	*Service Manual BB 150*
Index		Name	Date	
File		50079823_02_CN		Thermo SCIENTIFIC

Dokumentnr./Document No.	Seite/Page
50 079 823	2 / 2



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50/60 Hz	50/60 Hz	50/60 Hz
KUNDENSEITIGE ABSICHERUNG :	INSTALLED BY USER :	INCOMBE à L'UTILISATEUR:
T 16 A	T 16 A	T 16 A

Bearb.	28.10.03	Mirsu	
Gepr.	28.10.03	Mirsu	
Norm			

Ind.	Änderung	Datum	Name		Datum	Name

PROJEKT: 50078932

SP BB 150 / RB 150, 230 VAC

Thermo SCIENTIFIC

Id.-Nr. 50 078 932

A4

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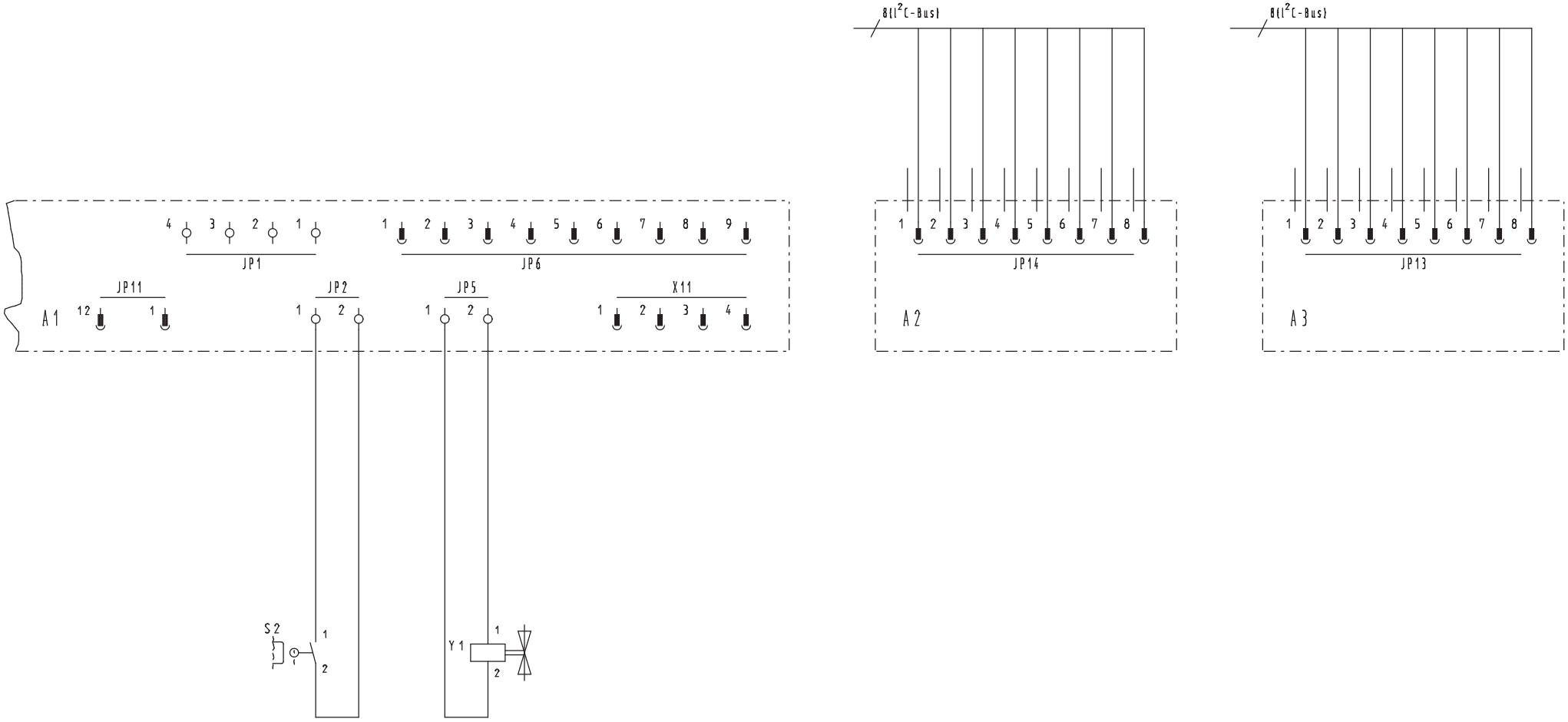
Blatt 3



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					Norm		
Ind.	Änderung	Datum	Name			Datum	Name

PROJEKT: 50078932

SP BB 150 / RB 150, 230 VAC

Thermo SCIENTIFIC

Id.-Nr. 50 078 932

A4

Ind.

Bl. 2
Blatt 3

LEGENDE ZU : SP BB 15 / RB 150, 230 VAC

NAME	BETRIEBSMITTEL
A1	Platine, Steuer- und Regeleinheit
A2	Platine, Messzelle
A3	Platine, Bedien- und Anzeigeeinheit
E1	Türheizung
E3	Innenbehälter Seite links
E4	Innenbehälter Seite rechts
E5	Innenbehälter Rückwand
*E6	Matrix Innenbehälter Front
E6.1	Innenbehälter Front
E6.2	Innenbehälter Decke (nur Edelstahl-Geräte)
E8	Innenbehälter Boden
H1	Netzmeldeleuchte
JP1	Klemmenleiste, Wasserstand
JP2	Klemmenleiste, Türschalter
JP3	Steckverbindung, I_2C-Bus, Hauptplatine
JP4	Steckverbindung, I_2C-Bus, Hauptplatine
JP5	Klemmenleiste, Ventil
JP6	Steckverbindung, Schnittstelle RS 232
JP13	Steckverbindung, I_2C-Bus, Türe
JP14	Steckverbindung, I_2C-Bus, Messzelle
JP15	Steckverbindung, I_2C-Bus
N1	Regler, Türheizung
S1	Netzschalter
S2	Türschalter
X1	Netzanschluß
X2	Steckverbindung, Netzschalter
X3	Steckverbindung, Türheizung
X4	Steckverbindung, Hzg. Innenbehälter Boden
X5	Steckverbindung, Hzg. Innenbehälter Seite links
X6	Steckverbindung, Hzg. Innenbehälter Seite rechts
X7	Steckverbindung, Hzg. Innenbehälter Rückwand
X8	Steckverbindung, Hzg. Innenbehälter Front
X9	Steckverbindung, Hzg. Außengehäuse Front (n.eingebaut)
X10	Steckverbindung, Hzg. Sterilisation (nicht eingebaut)
X11	Steckverbindung, Potentialfreier Kontakt
Y1	Magnetventil

NOMENCLATURE TO : SP BB 15 / RB 150, 230 VAC

NAME	EQUIPMENT
A1	PCB, control and regulator
A2	PCB, metering cell
A3	PCB, operator and display panel
E1	Door heater
E3	Inner casing, left side
E4	Inner casing, right side
E5	Inner casing, rear wall
*E6	Matrix inner casing, front
E6.1	Inner casing, front
E6.2	Inner casing, cover (stainless steel units only)
E8	Inner casing, base
H1	Mains power supply indicator lamp
JP1	Terminal strip, water level
JP2	Terminal strip, door switch
JP3	Plug in connector, I_2C-bus, main PCB
JP4	Plug in connector, I_2C-bus, main PCB
JP5	Terminal strip, valve
JP6	Plug in connector, RS 232 interface
JP13	Plug in connector, I_2C-bus, door
JP14	Plug in connector, I_2C-bus, metering cell
JP15	Plug in connector, I_2C-bus
N1	Regulator, door heater
S1	Mains power switch
S2	Door switch
X1	Mains power connection
X2	Plug in connector, mains power switch
X3	Plug in connector, door heater
X4	Plug in connector, heater, inner casing, base
X5	Plug in connector, heater, inner casing, left side
X6	Plug in connector, heater, inner casing, right side
X7	Plug in connector, heater, inner casing, rear wall
X8	Plug in connector, heater, inner casing, front
X9	Plug in connector, heater, exterior housing (not inst)
X10	Plug in connector, heater, sterilization (not install)
X11	Plug in connector, potential free contact
Y1	Magnetic valve

LEGENDE ZU : SP BB 15 / RB 150, 230 VAC

NAME	BETRIEBSMITTEL

DE
PS3
TSC

Ind.	Änderung	Datum	Name
	Bearb.	28.10.03	Mirsu
	Gepr.	28.10.03	Mirsu
	Norm		

PROJEKT: 50078932

SP BB 150 / RB 150, 230 VAC

Thermo SCIENTIFIC

Id.-Nr. 50 078 932

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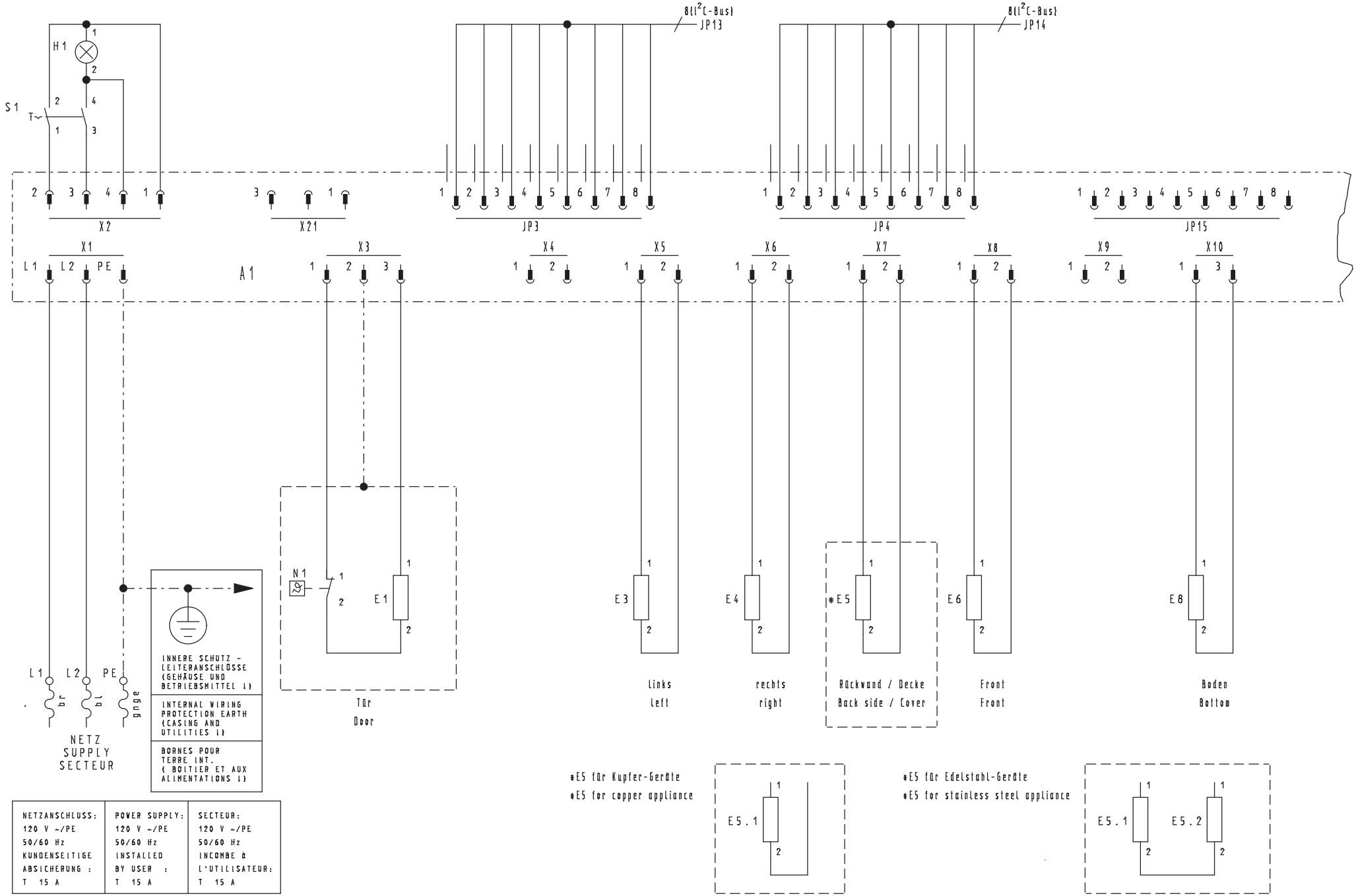

NETZANSCHLUSS:	POWER SUPPLY:	SECTEUR:
120 V ~/PE	120 V ~/PE	120 V ~/PE
50/60 Hz	50/60 Hz	50/60 Hz
KUNDENSEITIGE ABSICHERUNG :	INSTALLED BY USER :	INCOMBE À L'UTILISATEUR:
T 15 A	T 15 A	T 15 A

Bearb.	28.10.03	Mirsu	
Gepr.	28.10.03	Mirsu	
Norm			

Ind.	Änderung	Datum	Name		Datum	Name

PROJEKT: 50078933

SP BB 150 / RB 150, 120 VAC

Thermo SCIENTIFIC

Id.-Nr. 50 078 933

A4

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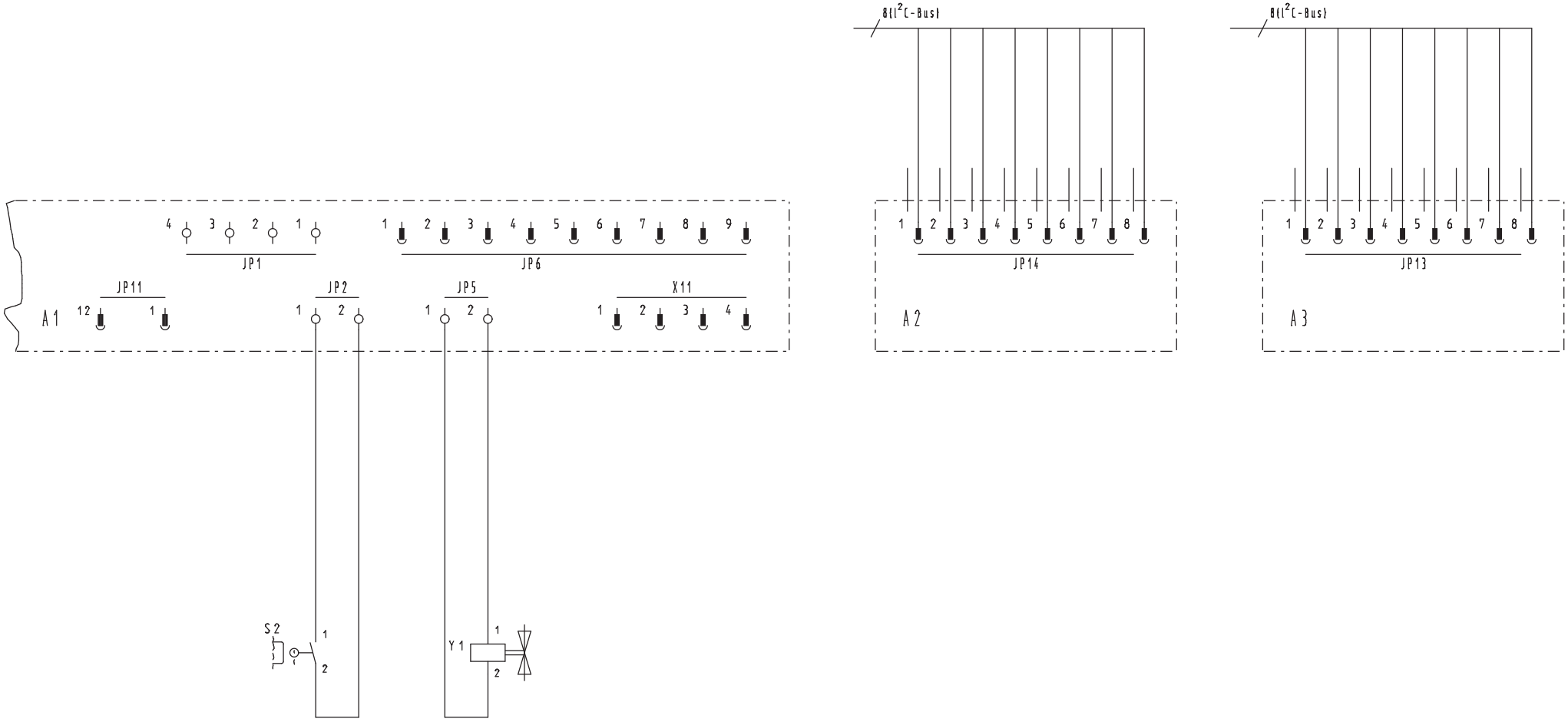

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Ind.	Änderung	Datum	Name			Datum	Name

PROJEKT: 50078933

SP BB 150 / RB 150, 120 VAC

Thermo SCIENTIFIC

Id.-Nr. 50 078 933

A4

Ind.

Bl. 2
Blatt 3

LEGENDE ZU : SP BB 15 / RB 150, 120 VAC

NAME	BETRIEBSMITTEL
A1	Platine, Steuer- und Regeleinheit
A2	Platine, Messzelle
A3	Platine, Bedien- und Anzeigeeinheit
E1	Türheizung
E3	Innenbehälter Seite links
E4	Innenbehälter Seite rechts
*E5	Matrix Innenbehälter Rückwand
E5.1	Innenbehälter Rückwand
E5.2	Innenbehälter Decke (nur Edelstahl-Geräte)
E6	Innenbehälter Front
E8	Innenbehälter Boden
H1	Netzmeldeleuchte
JP1	Klemmenleiste, Wasserstand
JP2	Klemmenleiste, Türschalter
JP3	Steckverbindung, I_2C-Bus, Hauptplatine
JP4	Steckverbindung, I_2C-Bus, Hauptplatine
JP5	Klemmenleiste, Ventil
JP6	Steckverbindung, Schnittstelle RS 232
JP13	Steckverbindung, I_2C-Bus, Türe
JP14	Steckverbindung, I_2C-Bus, Messzelle
JP15	Steckverbindung, I_2C-Bus
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S1	Netzschalter
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X2	Steckverbindung, Netzschalter
X3	Steckverbindung, Türheizung
X4	Steckverbindung, Hzg. Innenbehälter Boden
X5	Steckverbindung, Hzg. Innenbehälter Seite links
X6	Steckverbindung, Hzg. Innenbehälter Seite rechts
X7	Steckverbindung, Hzg. Innenbehälter Rückwand
X8	Steckverbindung, Hzg. Innenbehälter Front
X9	Steckverbindung, Hzg. Außengehäuse Front (n.eingebaut)
X10	Steckverbindung, Hzg. Sterilisation (nicht eingebaut)
X11	Steckverbindung, Potentialfreier Kontakt
Y1	Magnetventil

NOMENCLATURE TO : SP BB 15 / RB 150, 120 VAC

NAME	EQUIPMENT
A1	PCB, control and regulator
A2	PCB, metering cell
A3	PCB, operator and display panel
E1	Door heater
E3	Inner casing, left side
E4	Inner casing, right side
*E5	Matrix inner casing, rear wall
E5.1	Inner casing, rear wall
E5.2	Inner casing, cover (stainless steel units only)
E6	Inner casing, front
E8	Inner casing, base
H1	Mains power supply indicator lamp
JP1	Terminal strip, water level
JP2	Terminal strip, door switch
JP3	Plug in connector, I_2C-bus, main PCB
JP4	Plug in connector, I_2C-bus, main PCB
JP5	Terminal strip, valve
JP6	Plug in connector, RS 232 interface
JP13	Plug in connector, I_2C-bus, door
JP14	Plug in connector, I_2C-bus, metering cell
JP15	Plug in connector, I_2C-bus
N1	Regulator, door heater
S1	Mains power switch
S2	Door switch
X1	Mains power connection
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X4	Plug in connector, heater, inner casing, base
X5	Plug in connector, heater, inner casing, left side
X6	Plug in connector, heater, inner casing, right side
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X8	Plug in connector, heater, inner casing, front
X9	Plug in connector, heater, exterior housing (not inst)
X10	Plug in connector, heater, sterilization (not install)
X11	Plug in connector, potential free contact
Y1	Magnetic valve

LEGENDE ZU : SP BB 15 / RB 150, 120 VAC

NAME	BETRIEBSMITTEL

DE
PS3
TSC

Ind.	Änderung	Datum	Name
	Bearb.	28.10.03	Mirsu
	Gepr.	28.10.03	Mirsu
	Norm		

PROJEKT: 50078933

SP BB 150 / RB 150, 120 VAC

Thermo SCIENTIFIC

Id.-Nr. 50 078 933

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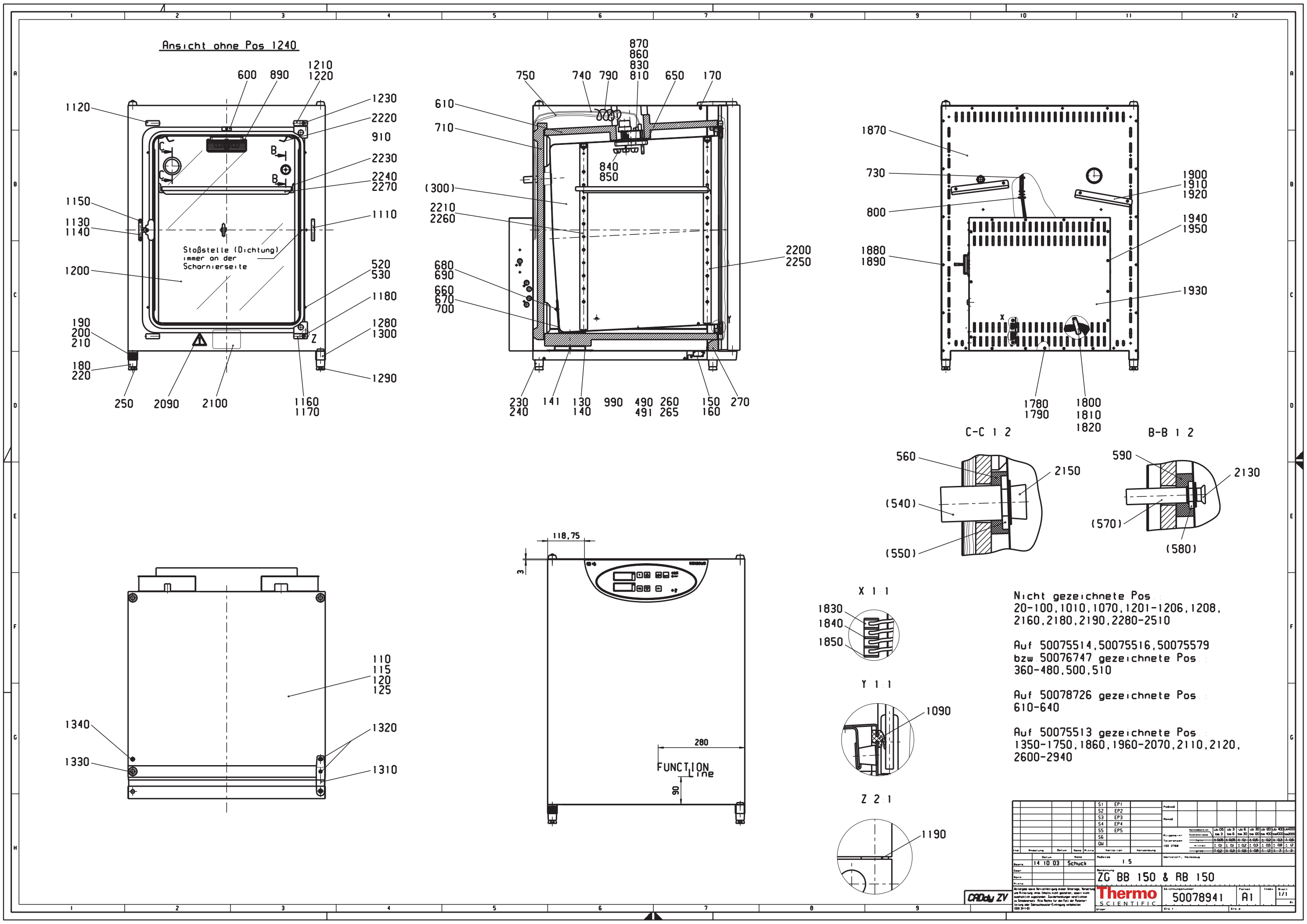
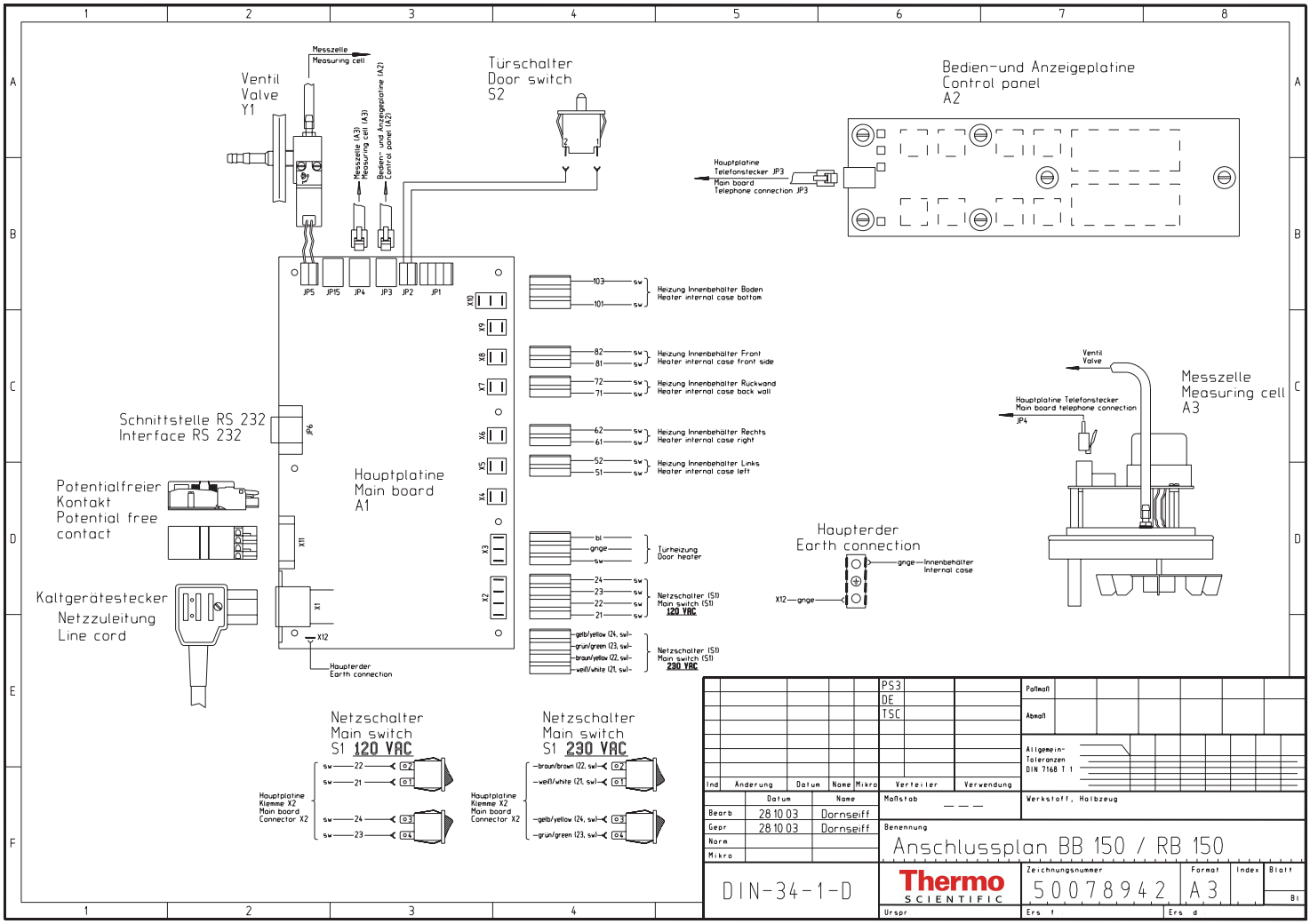

Ansicht ohne Pos 1240
Stoßstelle (Dichtung) immer an der Scharnierseite
C-C 1:2
B-B 1:2
X 1:1
Y 1:1
Z 2:1
118,75
280
FUNCTION Line
90
Nicht gezeichnete Pos.:
20-100,1010,1070,1201-1206,1208,
2160,2180,2190,2280-2510
Auf 50075514,50075516,50075579
bzw 50076747 gezeichnete Pos.:
360-480,500,510
Auf 50078726 gezeichnete Pos.:
610-640
Auf 50075513 gezeichnete Pos.:
1350-1750,1860,1960-2070,2110,2120,
2600-2940
Datum 14.10.03 Schuck
Maßstab 1:5
Benennung ZG BB 150 & RB 150
Thermo SCIENTIFIC
Zeichnungsnummer 50078941
Format A1
Blatt 1/1
CADdy ZV



					PS3		
					DE		
					TSC		

Ind	Änderung	Datum	Name	Mikro	Verteiler	Verwendung

	Datum	Name
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Gepr	28.10.03	Dornseiff
Norm		
Mikro		

Maßstab – – –

Paßmaß

Abmaß

Allgemein-Toleranzen DIN 7168 T 1

Werkstoff, Halbzeug

Benennung

Anschlussplan BB 150 / RB 150

DIN-34-1-D

Thermo SCIENTIFIC

Zeichnungsnummer	Format	Index	Blatt
50078942	A3		Bl

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Ers f

Ers d

4 CONTROL AND REGULATING SYSTEM

Contents ..... Page

GENERAL NOTE:

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

4.1 DESCRIPTION OF CONTROL AND REGULATING SYSTEM

BB 150 unit is equipped with the following measurement, control, and regulating circuits:

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

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

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

- **Fan control**

- **Door recognition**
  (door switch)

- **Error diagnostics system**

- **RS 232 interface**

- **Alarm contact,** zero potential

- **Acoustic alarm signal** (horn)

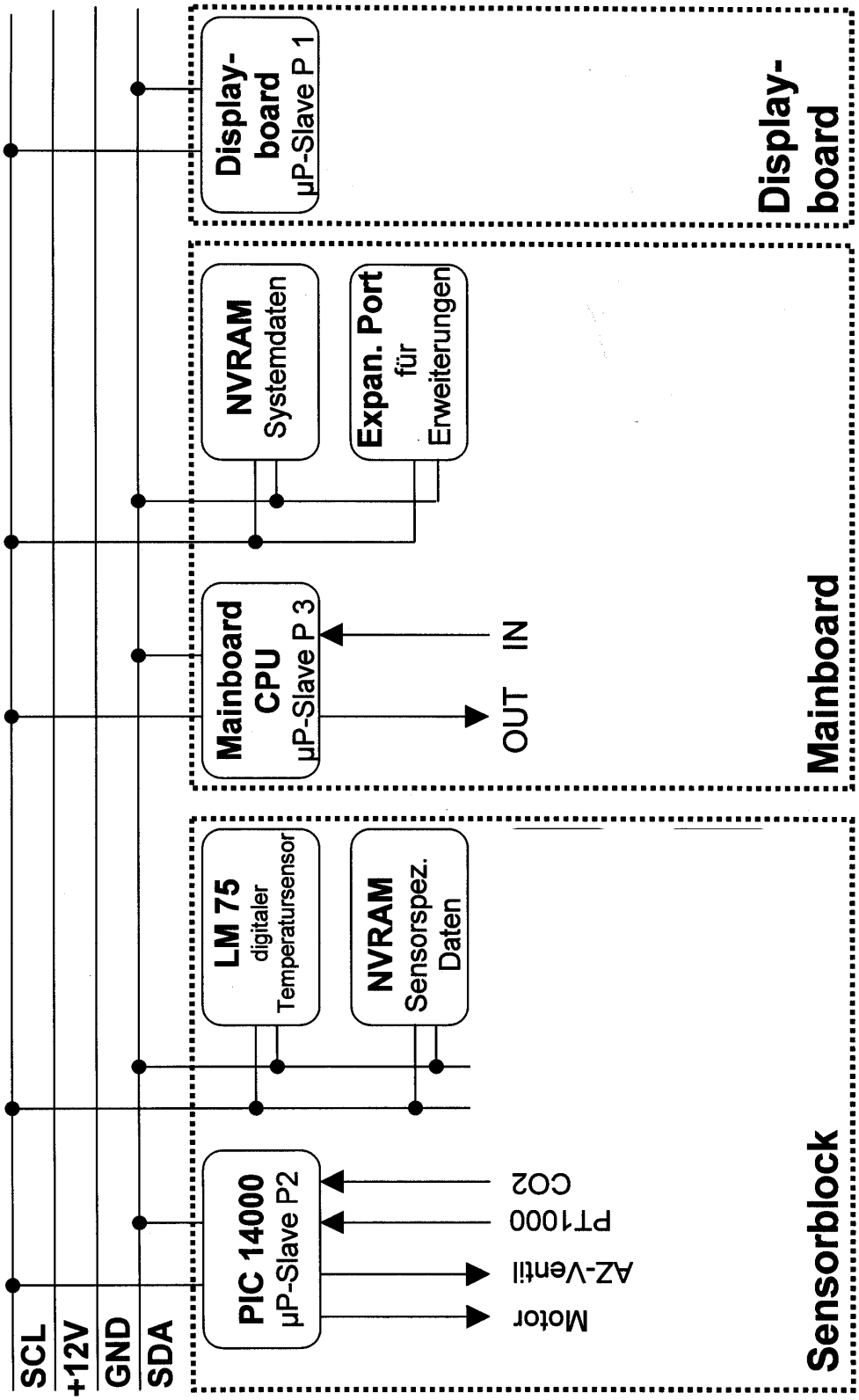
- **Power supply**

4.2 DESCRIPTION OF ELECTRONIC CONCEPT

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

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

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



		Name	Date	Designation
Prepared		JF	05.07.13	*Service Manual BB 150*
Index		Name	Date	
				Thermo SCIENTIFIC
File		50078923_04_CN		Document No. 50 079 823
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4.3 DESCRIPTION OF FUNCTIONAL GROUPS

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

Sensor block P002:

This is a multifunctional assembly that provides the following functions:

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

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

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

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

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

Main board P003 (also main board or main PCB)

Provides the following functions:

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

- **Power supply creation:**
  The combinational circuit component (input voltage range ~ 80 - 270 V) generates the 12 V DC low power voltage for the electronic components. Voltage is displayed by an LED.

- **Temperature and CO_2 calculation and regulation:**
  The measured values from the sensor board are adjusted by the offset and amplification, and corresponding set values are generated. Control of all software routines.

- **Actuator controls:**
  All heating system actuators are located on the main PCB. .

- **CO_2 solenoid activation:**
  The 12 VDC CO_2 solenoid is connected directly to the board. .

- **Sample protection:**
  In case of overtemperature, a special software routine linked to a universally switching relay assumes the temperature regulating function. This upper temperature limit band (set value +1 °C) acts as the trigger band for this controller. The software attempts to readjust the unit to the specified desired temperature value. .

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

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

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

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

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

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

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

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

4.4 SWITCHING THE UNIT ON

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

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

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

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

  P 1 (operator and display PCB): e.g., 010 = Version 3
  P 2 (sensor PCB): e.g., 026 = Version 27
  P 3 (main board): e.g., 204 = Version 300

  The unit then displays the current actual values.

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

  Example:
  Pr (unit version) = 4608 → First, “004” is displayed, followed by “608” on the display.

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

4.5 CONTROL AND REGULATING SYSTEMS CONFIGURATION

NOTE:
Function levels FL 1 - FL 21 described below are only used to monitor the values entered here. Normally, these values should only be changed by the factory adjustment.
Any required device calibrations can be performed with the aid of the adjustment routine, initiated by the "cal" key (refer to the operating instructions)!

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

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

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

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

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

Table 3/1: Function levels (FL)			
CAUTION! **Function levels are for factory settings only, or are automatically determined.** **The settings may only be modified after consultation with the factory.**			
Levels			
1	**Adjustments for regulating range 1 (incubation mode, 0 - 55 °C)**		
	Sublevel [CO_2 display]	Sublevel value range [temperature display]	Description
	1	0 = (+) / -0 = (-)	Temperature offset value sign
	2	0.0 ..... 99.9	Offset value temperature, in °C
	3	0. 1	Temperature amplification, pre-decimal places
	4	000 999	Temperature amplification, decimal places
	5	0. 1	cal factor, pre-decimal places
	6	800.....999 / 000.....200	cal factor, decimal places
	7	0 = (+) / -0 = (-)	auto-start offset value sign (NV RAM on the sensor board)
	8	0.0 ..... 99.9	auto-start offset, in % CO_2 (measuring cell, NV RAM)
	9	0. 1	CO_2 amplification, pre-decimal places (measuring cell, NV RAM)
	10	000 999	CO_2 amplification, decimal places (measuring cell, NV RAM)
	11	0 = (+) / -0 = (-)	cal value sign
	12	0.0 ..... 99.9	cal value, in % CO_2

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

2	Not reserved		
	FL position	FL value range	Description
*			

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

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

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

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

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

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

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

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

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

10	Not reserved		
	FL position	FL value range	Description

11	Not reserved		
	FL position	FL value range	Description

12	Not reserved		
	FL position	FL value range	Description

13	Not reserved		
	FL position	FL value range	Description

20	Memory management		
	FL position	FL value range	Description
	1	0 / 1	Mirror NV RAM on the main PCB.
	2	0 / 1	Write default values to measuring cell.
	3	0 / 1	Write default values to $IRCO_2$ measuring cell.
	4	0 / 1	Upgrade measuring cell NV RAM to software version 204
These values may only be readjusted after consultation with the factory test facilities!			

21	Unit configuration		
	FL position	FL value range	Description
	1	0 = BB 150 / RB 150/ BB 15 1 = BB 24 / RB 240	Configure unit size.
	2	0 = VA 1 = CU	Configure interior fittings.
	3	0 = 230 Volt 1 = 120 Volt	Configure mains voltage.
	4	0 = Not installed 1 = Installed	Configure gas diaphragm.
	5	0 = No O_2	Configure O_2.
	6	0 = Not installed	Configure flask rotator.
	7	0 = Standard TCD	Configure installed measuring cell.
	8	0 = Not installed	Configure water level monitor.
	9	1 = Not installed	Configure low humidity option.
	10	0 = Not installed	Gas guard CO2.
	11	0 = Not installed	Gas guard O2/N2.
	12	1 = not active	Contra Con Routine
	13	0	- without function -
	14	0	- without function -
	15	0	- without function -
	16	0	- without function -
	17	0	- without function -
	18	0	- without function -
	19	0	- without function -
	20	0 / 1	Start write process.
	21	0 / 1	Security bit for position 1-10

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

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

Determining the unit version

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

Values determining the unit version	Version
0 = BB 150 / RB 150/BB 15 1 = BB 24 / RB 240	Unit size
0 = VA 2 = CU	Interior fittings material
0 = 230 Volt 4 = 120 Volt	Mains voltage
0 = Not installed 8 = Installed	Gas tight screen
0 = No O_2	O_2
0 = Not installed	Flask rotator
0 = Standard	Installed measuring cell
0 = Not installed	Water level monitoring
512 = Not installed	Low humidity function
0 = Inactive	Gas guard CO2
0 = Inactive 2048 = Active	Gas guard O2/N2
4096 = inactive	Contra Con Routine
The unit version is represented by the sum of the values.	

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

4.6 ERROR TABLE

Aside from the current error, outputting the unit's error history may be helpful in correcting a problem.

To output the last 10 errors, press the **i** and the ↵ / ↵ keys. The most recent error is displayed in position 1, the oldest in position 10 (refer to the section on error storage in the operating instructions).

Error table		
Code	**Cause**	**Fault condition**
====	Communications between display mP and main board interrupted.	The display is not receiving display values from the master processor.
42	Main board NVRAM read error	Default values were loaded.
43	Main board NVRAM read error	The mirrored values were loaded.
44	NVRAM defect	Values of the measuring cell are not overwritten, unit runs using default values
54	Set value error	Error in the calculation of the ser values. The processor performs a “reset”.
55	I²C bus error	Data transfer to the I^2 bus interrupted.
66	Deviation between temperature probe PT1000 and LM 75 is too large. (No longer plausible.)	The validity of the temperature signals is no longer assured because the permissible deviation between the measured values for: The incubation mode are > ± 2 °C, or; The decontamination mode are > ± 5 °C.
77	CO_2 calculation range exceeded.	• The offset value for the CO_2 adjustment made by the cal function exceeds the maximum permissible adjustment range of ± 10.0 % CO_2 • The calculated temperature adjustment factor exceeds the maximum permissible adjustment range of 0.8 ... 1.2.
99	Glass door open or door switch defective.	The door or door switch have remained in the "open" state for more than 10 min. (The door switch contact is closed when the glass door is open!!)
100	Temperature below set value	Actual value < set value - 1.0 °C
101	Temperature above set value	Actual value > set value + 1.0 °C (Sample protection function active.)
104	Temperature probe PT1000 or digital temperature sensor LM 75 defective.	Probe break or sensor short-circuit
200	CO_2 below set value	Actual value < set value - 1.0 % CO_2
201	CO_2 above set value	Actual value > set value + 1.0 % CO_2
204	CO_2 measuring cell defective	Sensor break or short-circuit, or infrared

		measuring cell defective.

4.7 ERROR EXAMINATION AND REGULATING CIRCUIT SCHEMATICS

4.7.1 GENERAL ERRORS:

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

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

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

4.7.2 TEMPERATURE MEASUREMENT/REGULATING CIRCUIT – INCUBATION MODE

Short description:

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

Circuit diagram:

- See circuit diagrams in Chapter 3.

Technical specifications – incubation mode:

- Nominal voltage: 230 VAC
- Power consumption: **0.60** kW (BB 150, 230 VAC)
- Heater resistors Chapter 6: Metering and Test List

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

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

4.7.4 CO_2 METERING AND REGULATION CIRCUIT

Short description:

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

Circuit diagram:

See circuit diagrams in Chapter 3.

Technical specifications:

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

4.7.5 ERROR IN CO_2 METERING AND REGULATION CIRCUIT

Error code	(Unit display) Test equipment / Test at the unit	Inspections and tests	Possible corrective actions
200	CO_2 Gas: on LED continuously lit.	▪ Check the initial gas pressure. ▪ Check the flow through the sterile filter. ▪ Perform the solenoid functional test (FL 3). ▪ Check the flow through the solenoid. ▪ Check the tubing to the detector.	▪ Adjust the correct initial gas pressure. ▪ Replace any defective parts. ▪ Replace the main board as required.
201	CO_2 Gas: off LED always off.	▪ Initial gas pressure far too high. ▪ Perform the solenoid functional test (FL 3). ▪ Check the set value (against the direction of regulation).	▪ Adjust the correct initial gas pressure. ▪ Replace any defective parts. ▪ Replace the main board as required. ▪ Remove excess gas.
204	CO_2 display reads 99.9.	For TCD ▪ Check the cross-compensation (see Sec. 4.14.3) ▪ Measure voltage P1/P2 or P3/P4: U=0 V or U=VCC (~5V), detector defective. U=2.0 - 2.5 V, thermistors are OK.	▪ Replace the measuring cell, as required.

4.7.6 TEMPERATURE MEASUREMENT/REGULATING CIRCUIT – DECONTAMINATION MODE AT 90°C

Short description of the decontamination routine:

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

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

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

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

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

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

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

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

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

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

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

- Circuit diagram:

See circuit diagrams in Chapter 3.

Technical specifications - same as for the incubation mode:

- Nominal voltage: 230 VAC
- Power consumption: **0.63** kW

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

Error code	(Unit display) Test equipment / Test at the unit	Inspections and tests	Possible corrective actions
	Heater on LED continuously lit. Watt meter	■ Perform the functional test forrelay K1 on the main board.(Switch the unit off and on.) ■ Check the heater actuators (FL3)	■ Replace the main board.
	Sample protection LED active.	■ Check the heater actuators (FL3).	■ Replace the main board.
	Determine any mains interrupt.		■ Repeat the decontamination routine.

4.7.8 Faults without Error Messages

Error code	Faulty function	Inspections and tests	Possible corrective actions
-	Heavy condensation in the sample chamber	▪ Check the sample chamber heater actuators (heaters E2-E8). ▪ Check the unit version.	▪ Replace the main board. ▪ Return to factory for repairs. ▪ Set correct set of parameters (FL 21)
-	Heavy condensation on the glass	▪ Check the door heater actuator (heater E1). ▪ Check temperature switch N2 in the exterior door. ▪ For software version <200: check door factor (FL 8) ▪ Check set of parameters (since software version 200)	▪ Replace the main board. ▪ Replace the entire exterior door. ▪ Set correct door factor ▪ Set correct set of parameters (since software version 200, FL 21)

4.8 FAN SYSTEM AND ERRORS

Short description:

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

Errors in the fan system

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

4.9 DISPLAY PCB OR I²C BUS CABLE REPLACEMENT

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

4.10 SENSOR BLOCK REPLACEMENT

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

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

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

Units equipped with thermal conductivity detectors:

- Initiate the countervoltage adjustment by activating the -auto-start- routine and closing the glass door.
- The fan will stop for several seconds. The adjustment process is automatic. Once the countervoltage adjustment is complete, the fan will switch on again.
- Manually interrupt the -auto-start- routine (the same procedure as starting the routine).
- Auto-zero starts automatically. Wait for the adjustment to be completed (auto-zero LED goes out).
- Trigger a mains reset since software version 200.
- Use the "cal" key to perform the zero-point adjustment of the CO_2 metering circuit.
- Run a test gas addition to check the metering and regulating functions with CO_2.
- Remove the gas from the unit and restart the unit with the -auto-start- routine.

4.11 MAIN BOARD REPLACEMENT

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

- The unit must be disconnected from the mains power.
- Replace the PCB.
- The PC bus lines can be connected to the sockets in any desired order.
- After installation, switch the unit on.
- Press and hold down the -cal- key.
  This will reset any -cal- adjustments that may have been performed.
  The unit is now operating with its original specified adjustment values.

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

- Test the unit's control and regulating functions:
  - Allow the unit to heat up to, for example, 37.0°C.
  - Once the unit reaches the specified temperature, use the -cal- key to perform the zero-point adjustment of the CO_2 metering circuit.
  - Run a test gas addition to check the metering and regulating functions.

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

4.12 PERFORMING ADJUSTMENTS

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

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

4.12.1 TEMPERATURE ADJUSTMENT INCUBATION MODE

Comparative measurement:	**Incubation temperature**

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

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

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

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

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

4.12.2 PERFORMING ADJUSTMENTS CO_2 METERING AND REGULATION CIRCUIT

Performing adjustments:

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

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

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

Comparative measurement:	**CO_2 regulating circuit**

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

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

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

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

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

4.13 TEMPERATURE ADJUSTMENTS DECONTAMINATION MODE

Comparative measurement:

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

- For cold units: No sooner than 3 hours after reaching equilibrium at 90°C.

- For units at operating temp.: No sooner than 45 min. after probe placement.

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

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

  ≥± 2°C Perform the adjustment:

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

The unit displays the correct actual value.

5. INITIAL SETUP

Instruction	Input / key(s) / comments	Display / comment /status
Open all doors.		
Remove shipping restraints and fixed equipment from sample chamber.		
Clean the unit.		
Water reservoir	Add water.	Do not exceed max. level, use only distilled sterile water.
Switching on the unit	Set the main power switch to its "I" position.	All indicators on the control panel go on for approx. 15 sec. (8-digit test). Software versions and parameter set are shown.
Setpoint specification		
Temperature setpoint adjustment		
Display temperature setpoint.	Press °C	Current setpoint is displayed, digit to the right of decimal flashes.
Enter new temperature setpoint.	Press °C & △	Increase the setpoint.
	Press °C & ▽	Decrease the setpoint.
Save NEW temperature setpoint.	Release °C	Sample chamber temperature is displayed.
CO_2 setpoint adjustment		
Display CO_2 setpoint.	Press % CO_2	Current setpoint is displayed, digit to the right of decimal flashes.
Enter new CO_2 setpoint.	Press % CO_2 & △	Increase the setpoint.
	Press % CO_2 & ▽	Decrease the setpoint.
Save NEW CO_2 setpoint.	Release % CO_2	CO_2 concentration in the sample chamber is displayed.

Instruction	Input / key(s) / comments	Display / comment /status
Query the error code (max. 10 errors stored).	Press i alarm & △	Scroll forward in the error table.
	Press i alarm & ▽	Scroll backwards in the error table.
Activate auto-start.	auto-start / See operating instructions.	"auto-start" indicator light flashes. **Please note the duration!**
Activate equalization function.	cal / See operating instructions.	
Activate other functions.	Go to the associated function levels via the control panel (see Chapter 4).	
Close all doors.	Temperature display: "actual value" O_2 display: "21.0" CO_2 display: "0.0" TCD display: "actual value" auto-start routine performed automatically. ► Controller regulates the defined temperature setpoint. ► Relative humidity is built up. ► Once the temperature remains constant, the CO_2 measurement system is equalized. ► "auto-start" indicator light goes out. ► Unit adds gas up to the adjusted CO_2 / O_2 setpoint.	

6. MEASUREMENT- / TEST LIST

BB 150

Contents ..... page

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

Item	Comment	Procedure	Equipment	Result for 230 VAC	
E1; Door heater		Disconnect the plug and measure the resistance	Meter	167 Ω – 185 Ω	
E3; Sample chamber, left side		Disconnect the plug and measure the resistance	Meter	2458 Ω – 2846 Ω	
E4; Sample chamber, right side		Disconnect the plug and measure the resistance	Meter	2458 Ω – 2846 Ω	
E5; Sample chamber, rear wall	230 V – Units, Cu and VA	Disconnect the plug and measure the resistance	Meter	2294 Ω – 2656 Ω	
E6; Sample chamber, front side and top	230 V – Gerät in VA	Disconnect the plug and measure the resistance	Meter	331 Ω – 383 Ω	
E8; Sample chamber, base		Disconnect the plug and measure the resistance	Meter	594 Ω – 688 Ω	
Y1; Magnetic valve	Cold resistor	Loosen the connection and measure the resistance	Meter	~126 Ω	
S2; Door switch		Loosen the connection and check the operation. Glass door open Glass door closed	Meter Switch closed Switch open	0 Ω ∞ Ω	0 Ω ∞ Ω

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

Item	Location	Procedure	Instrument	Result

Mains / unit voltage	X2:2 / X2:3	Disconnection the plug and measure the voltage	Meter	230 VAC
Value voltage	JP5:1 / JP5:2	Loosen the connection and measure the voltage	Meter	12 VDC

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

Item	Location	Procedure	Instrument	Result
Electrical safety test	On the unit	[1)]	Safety test instrument	

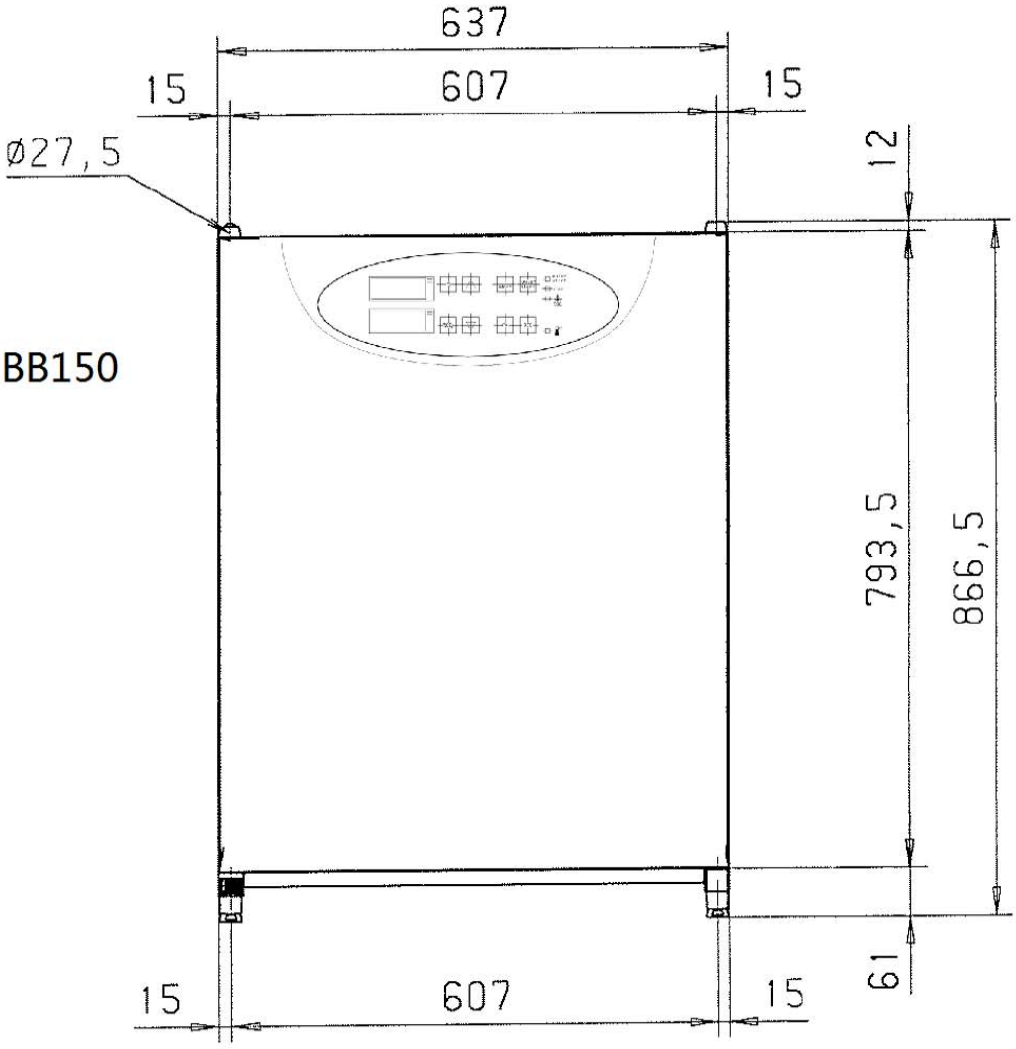
Labels, signs, nameplate			Visual inspection	Present and undamaged

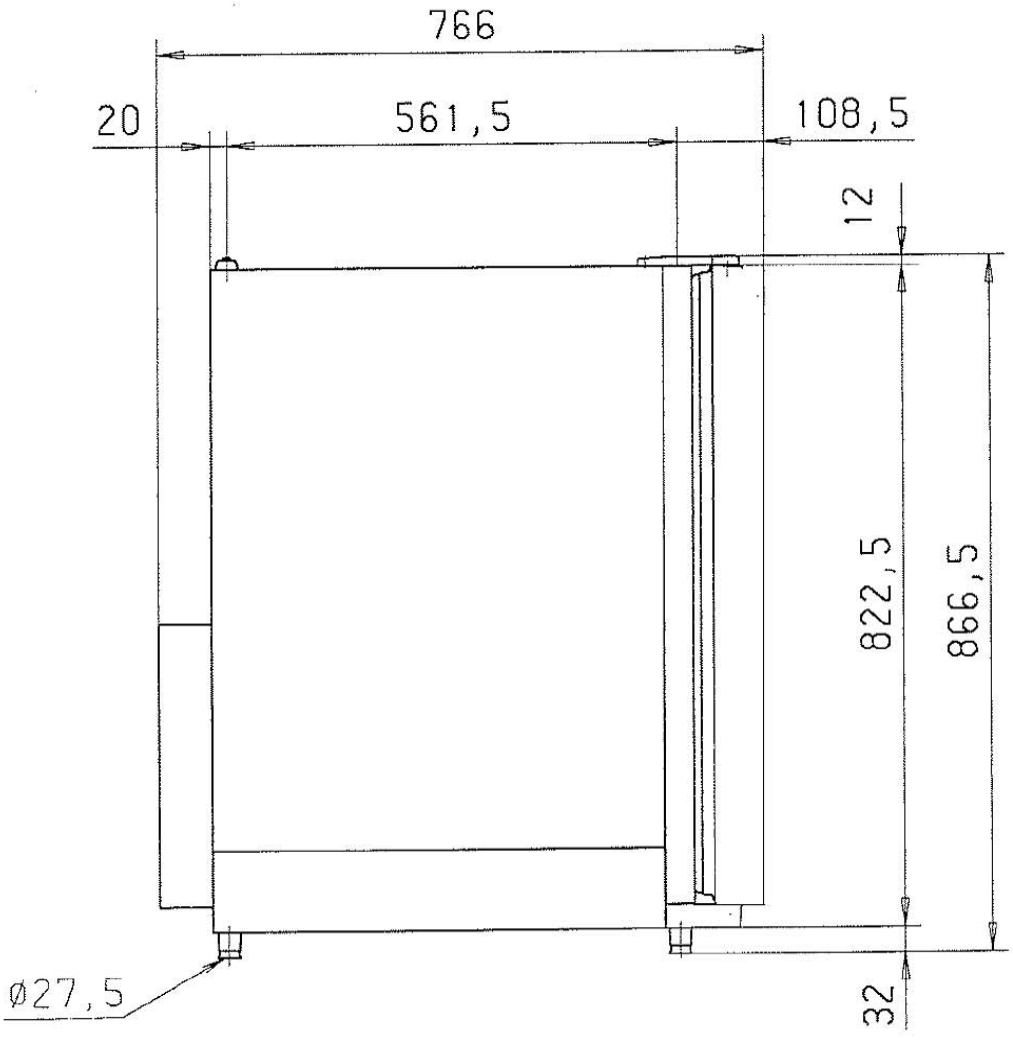
[1)] Applicable documents:
Procedure instruction DA 000 001

Component	Description	Beschreibung	Used On			
			BB 150			
CSP-3002641	Main fuse (T 6.3 A)	G - Sicherungseinsatz 6,3 A 250v T	X			
CSP-3672281	Operator and display PCB HERAcell	Bedien & Anzeigeplatine für HERAcell	X			
CSP-3710384	NUT PG16 FOR PASS-THROUGH	MUTTER L PG 16 FUER ROHRDURCHF. HDL	X			
CSP-3719098	Y - connector for tube distribution Di=4 mm	Y verbinder - YS 4. Di = 4 mm	X			
CSP-26139262	Silicon CO2 aspiration port for glass door	Silikondurchführung	X			
CSP-50011380	Shelf support rail	Auflagebügel	X			
CSP-50049232	Power switch housing with foot	Netzschaltermodul mit Fuss, ohne Schalter	X			
CSP-50118512	DOOR HINGE, BOTTOM HERACELL i	Türlagen unten	X			
CSP-50049234	Door bearing, top	Türlagen oben	X			
CSP-50049237	Rear foot	Gerätefuss hinten	X			
CSP-50049238	Stacking foot on housing top	Stapelfuss Decke	X			
CSP-50049363	Mains power switch	Netzschalter	X			
CSP-50049692	Fan wheel for TCD, stainless steel	Lüfterrad für Messzelle VA	X			
CSP-50049713	Wiring set, display PCB (HERAcell)	Drahtsatz Anzeigeplatine HERAcell	X			
CSP-50049939	Height adjusting foot	Fuss hoehenverstellbar	X			
CSP-50050066	Glass door bearing, top	Gegenlager oben (Glastür)	X			
CSP-50050067	Glass door bearing, bottom	Gegenlager unten (Glastür)	X			
CSP-50084634	HOLLOW-CORE SCREW (GLASS DOOR HERACELL)	Hohlschraube M4 für Glastürscharn.	X			
CSP-50050216	HOSE PASS-THROUGH WITH SEAL ID=16X90	ROHRDURCHFUEHRUNG ID=16X90 MIT DICHTUNG	X			
CSP-50050438	Door switch	Türschalter	X			
CSP-50050735	Cable harness TCD	Drahtsatzmesszelle HERAcell	X			
CSP-50050736	Connector, orange, for zero-potential contact	Stecker, orange mit Zugenlastung	X			
CSP-50050737	Filter for gas inlet	Filter für Gaseinlass	X			
CSP-50050738	Magnetic valve	Magnetventil	X			
CSP-50050779	Glass door HERAcell	Glastür HERAcell	X			
CSP-50050922	SPRING FOR SUPPORT	FEDER FUER TRAGPROFIL 0,8	X			
CSP-50050923	SUPPORT FRONT, STAINLESS STEEL	TRAGPROFIL VORNE RECHTS/LINKS VA	X			
CSP-50050924	SUPPORT REAR, STAINLESS STEEL	TRAGPROFIL HINTEN RECHTS/LINKS VA	X			
CSP-50051728	Fan cover, stainless steel	Drahtkorb für Lüfter VA	X			
CSP-50120606	PUMP FOR WATER DRAIN COMPLETE	PUMPE ZUM ENTLEEREN WASSERVORRAT VST.	X			
CSP-50112263	TEMP. CONTROLLER, NC 125°C	TEMPERATURREGLER, OEFFNER 125°C	X			
CSP-50052444	Securing clip for rear foot	Kunststoffspange für gerätefuss	X			
CSP-50052858	Shelf support rail	Auflagebügel	X			
CSP-50052933	Tube 4 x 3 mm	Schlauch 4 x 3,	X			
CSP-50052958	Set covers for door reversal	Abdeckung für Frontrahmen	X			
CSP-50053406	Gasket for TCD	Dichtungsring WLD HERAcell	X			
CSP-5010589	PLUG F. HOSE PASS-THROUGH D 40 MM	Verschluss für Glastür	X			
CSP-50060281	Hinge, complete glass door	Scharnier für Glastür	X			

Component	Description	Beschreibung	Used On			
			BB 150			
CSP-50062694	HOSE PASS-THROUGH WITH SEAL ID=41X90	ROHRDURCHFUERUNG ID=41X90 MIT DICHTUNG	**X**			
CSP-50062701	Hose set,length=3m	Anschlussschlauchsatz	**X**			
CSP-50062978	Straight tube connector für Di=4 mm	Schlauchverbinder GS 4. di = 4 mm	**X**			
CSP-50063283	Plug in the hose pass-through Di=42 mm	Stopfen für Rohrdurchf. Di = 42 mm	**X**			
CSP-50065249	NUT PG 36 FOR PASS-THROUGH	MUTTER L PG 36 FUER ROHRDURCHF.	**X**			
CSP-50066022	Fan motor cover	Abdeckung für Motor	**X**			
CSP-50068686	Cover plug, unit door HERAcell 240, top	Blindstopfen Gerätetür oben HERAcell 240	**X**			
CSP-50070610	Silicon seal for glass door	Türdichtung	**X**			
CSP-50074739	Plug with sinter metal filter	Stopfen mit Sintermetallfilter	**X**			
CSP-50077891	TCD detector	Messzelle WLD HERAcell	**X**			
CSP-50078768	Guide set for unit door BB 15	Leistensatz Gerätetür BB 15	**X**			
CSP-50078769	Magnetic door seal, BB 15	Türdichtung, magnetisch BB 15	**X**			
CSP-50079265CN	Front foil, BB 150	Frontfolie BB 150	**X**			
CSP-50079636	MAIN PCB BB 15 REPLACEM.	ERSATZ HAUPTPLATINE BB 15	**X**			
CSP-50079637	DOOR GRIP BB 15 REPLACEMENT	ERSATZ GRIFF BB 15	**X**			
CSP-50076021	Service Kit, BB15/HERAcell 150/240/I Preventive Maintenance		**X**			

Footprint BB150





9 ERROR TABLE

Aside from the current error, outputting the unit's error history may be helpful in correcting a problem.

To output the last 10 errors, press the **i** and the ← / → keys. The most recent error is displayed in position 1, the oldest in position 10 (refer to the section on error storage in the operating instructions).

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

100	Temperature below set value	Actual value < set value - 1.0 °C
101	Temperature above set value	Actual value > set value + 1.0 °C (Sample protection function active.)
104	Temperature probe PT1000 or digital temperature sensor LM 75 defective.	Probe break or sensor short-circuit
200	CO_2 below set value	Actual value < set value - 1.0 % CO_2
201	CO_2 above set value	Actual value > set value + 1.0 % CO_2
204	CO_2 measuring cell defective	Sensor break or short-circuit, or infrared measuring cell defective.