memmert

Experts in Thermostatics

INCO

HCP

SERVICE MANUAL

HCP
Humidity chambers

INCO
CO_2 incubators

Contents

1. About this manual

1.1 Purpose and target group

These instructions describe service and repair work on humidity chambers of the type HCP and CO_2 incubators of the type INCO. They are exclusively for use by electricians who are familiar with the safety regulations of electrical engineering.

1.2 Related documents

Apart from this service guide, the information and regulations in the user manual for the respective appliance must also be observed for all service and repair work.

Please refer to the circuit diagrams from page 44 of these instructions for all work on the electrical system.

1.3 Tools needed

The following tools and equipment are required to perform the work described in this guide:

- Torx screwdriver sizes 8 and 10
- Phillips screwdriver size 1
- Wire-cutting pliers
- Flat pliers to remove the connection cable
- Allen key 2 mm for door hinge,
  1.5 mm for humidity sensor
- Multimeter with voltage and resistance measuring range
- Cable straps
- Adhesive tape to label cables and components

1.4 Manufacturer address and customer service

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For service enquiries, please always specify the appliance number on the nameplate.

Date 01/2009

2. Safety regulations

Danger!
After removing covers, voltage-carrying parts may be exposed if the mains plug has not been disconnected. Any work that involves opening the appliance may only be performed by trained electricians who are familiar with the safety regulations for electrical engineering. If you want to change parts you must always first disconnect the mains plug.

Caution!
When dismantling the appliance you could be injured on sharp (unprocessed) metal edges. You should wear gloves.

Please also observe the safety regulations in the operating instructions for the respective appliance.

After all maintenance or repair work, the appliance must be subject to a function test. The appliance must not be left unattended until it has reached the steady state.

If the interference or malfunction cannot be eliminated: Contact the manufacturer.

3. Maintenance plan

Annually:

- Check and replace sterile filter if it is dirty (see page 24)

Every two years:

- Grease door hinge with silicone grease
- Replace all sterile filters (see page 24)
- Replace humidity restriction pump (see page 36)

4. Finding Errors and Error Messages

Error description	Cause of error	Rectifying errors	see
General faults			
Controller display does not light up	Miniature fuse 100 mA (200 mA) faulty	Check fuse, replace if necessary	page 13
	Appliance fuse 15 A faulty	Check fuse, replace if necessary	page 13
	Mainboard faulty	Replace mainboard	page 14
Temperature cannot be adjusted/ appliance can generally not be operated by the push/ turn control	Appliance "locked" by UserID card	Undo lock with UserID card	Instructions for use
	Push/turn control faulty	Replace main switch module with push/turn control	page 15
Chamber fan does not turn	Miniature fuse 50 mA on fan power supply unit faulty	Replace the fuse	page 19
	Fan power supply unit faulty	Replace fan power supply unit	page 19
Error messages in the monitoring display			
Caution icon ⚠ is permanently lit up	Mechanical temperature limiter has switched off heating	▶ Switch off appliance and leave to cool down ▶ Check temperature limiter The appliance is only operational again after it has cooled down and the error has been eliminated	page 23
Caution icon ⚠ flashes	Monitoring controller has switched off heating, since alarm limit has been reached	Increase temperature difference between monitoring and working temperature. Replace Pt100 temperature sensor of monitoring controller if necessary	page 22
Error message E-3	Pt100 temperature sensor of monitoring controller faulty	Replace Pt100 temperature sensor of the monitoring controller on slot J3	page 22

Error description	Cause of error	Rectifying errors	see
Error message E-3 alternates with display of temperature	Pt100 temperature sensor of monitoring controller faulty. Monitoring controller is working in emergency mode with the temperature value of the Pt100 temperature sensor from the operating controller	Replace Pt100 temperature sensor of the monitoring controller on plug J3	page 22
Error messages in timer display			
Error message E-0	Serious configuration error (e.g. incorrect chamber type or wrong temperature range)	Replace controller	page 16
Error message CONF (is only displayed for approximately 10 sec. after switching on)	Checksum error (error when saving setpoint values)	The error can be rectified by the controller after a setpoint parameter has again been saved. If the error should continue occurring, or cannot be rectified: Replace controller	page 16
Error message E-L1	Communication with mainboard 1 interrupted	Check connection lead; replace motherboard if necessary	page 14
Error messages in temperature display			
Error message E-1	Mainboard actuator Triac faulty	Replace mainboard	page 14
Error message E-2	Mainboard faulty	Replace mainboard	page 14
Error message E-3	Pt100 temperature sensor of operating controller faulty	Replace Pt100 temperature sensor of the operating controller on plug J4	page 22
Error message E-3 alternates with display of temperature	Pt100 temperature sensor of operating controller is faulty. Operating controller working in emergency mode with the temperature value of the Pt100 temperature sensor from the monitoring controller	Replace Pt100 temperature sensor of the operating controller on plug J4	page 22
Error messages in the CO_2 display (only for incubators of the INCO type)			
Error message E-5	CO_2 sensor faulty	Replace CO_2 measuring board and CO_2 sensor	page 39
Error message CONF in CO_2 display	Checksum error (error when saving setpoint values)	Replace CO_2 measuring board and CO_2 sensor	page 39
Error messages in humidity display (only for corresponding model)			
Error message E-6	Humidity sensor faulty	Replace humidity sensor	page 38

5. Overview/Appliance assembly

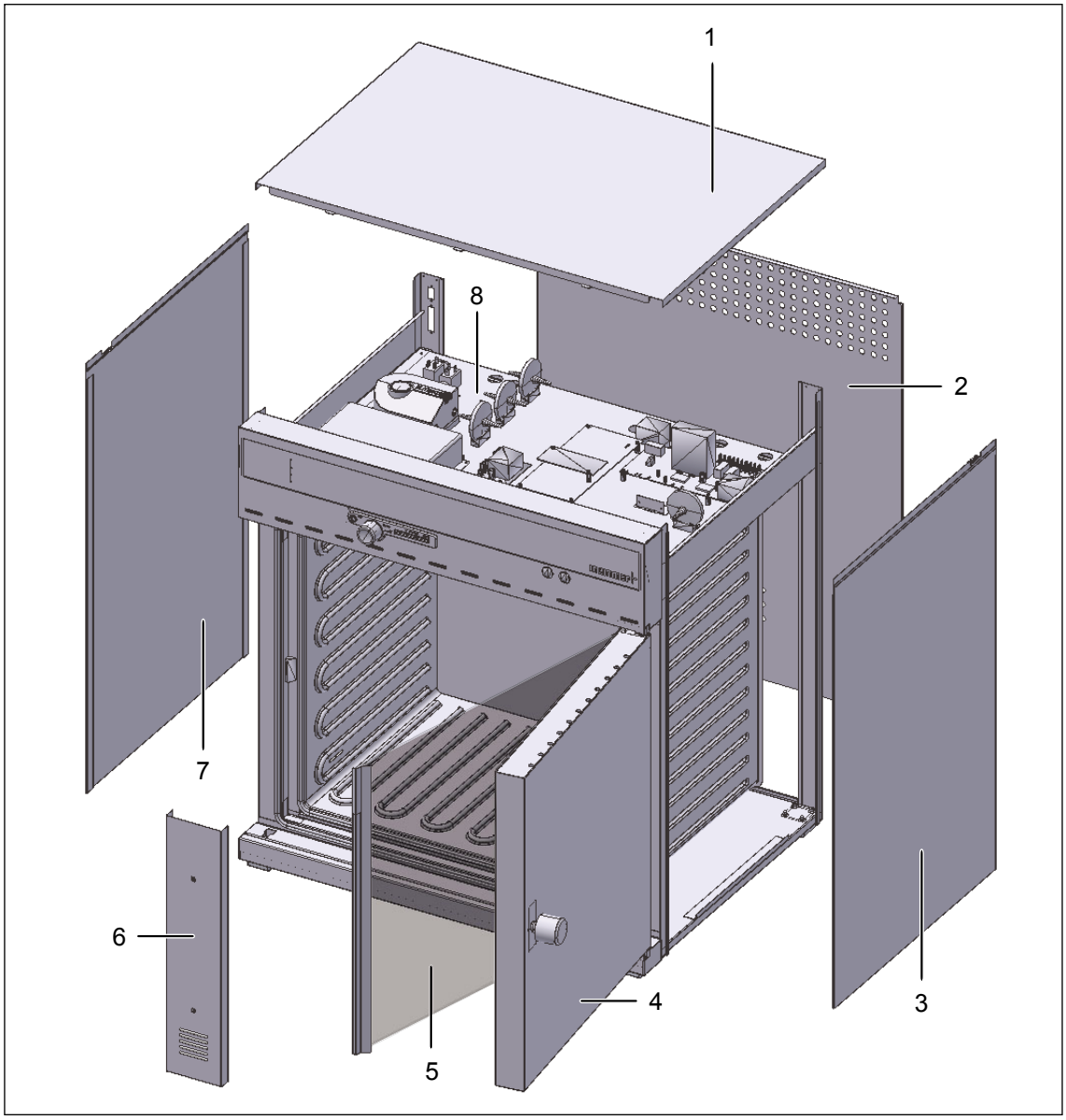


Fig. 1 Construction (shown in figure: Maximum fittings for INCO incubator; the actual fittings may vary, depending on the appliance type)

1 Top panel (see page 9).
2 Rear panel (see page 10)
3 Right-side panel
4 Door (see page 25)
5 Inner door (see page 31)
6 Fan shaft (see page 19)
7 Left-side panel
8 Control unit (see page 11)

6. Removing covers

For some service work it is necessary to remove case panels (top panel, rear panel). How these panels are removed is described below. What panel(s) need(s) to be removed for the respective service work is described in the relevant chapter.

6.1 Removing the top panel

Danger!
After removing the top panel, voltage-carrying parts in the control unit may be exposed if the mains plug has not been disconnected. Do not reach inside the control unit. If you want to examine or replace the components inside, disconnect the mains plug first.

1. Undo the 4 screws to the left and right on the rear side of the appliance holding down the top panel (1).
2. Slightly raise the panel and pull it out backwards (2).

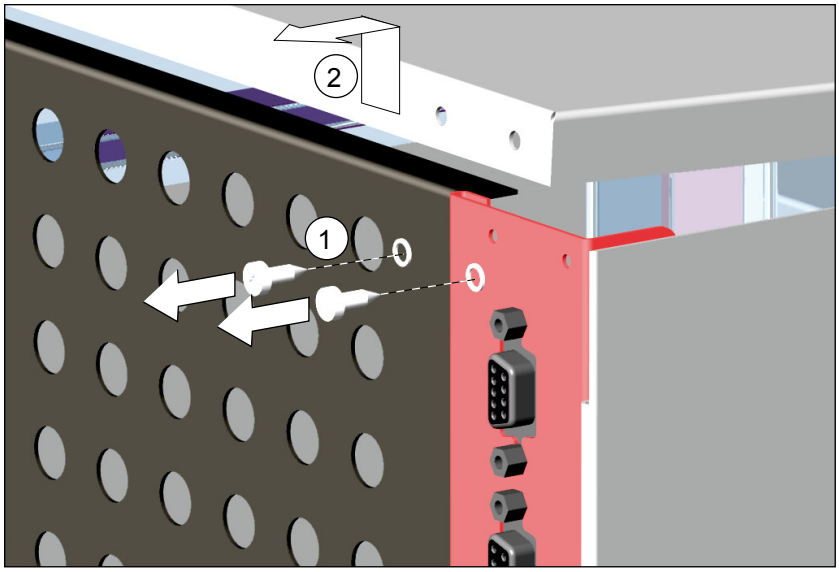


Fig. 2 Removing the top panel

Re-attach the top panel

Put on the top panel and push forwards into the slot. Insert the screws with retaining washers into the openings in the rear panel and screw down the top panel (1).

The retaining washers are necessary to create a safe PE conductor connection with the top panel.

6.2 Removing the rear panel

1. Disconnect the mains plug.
2. Remove the top panel (see previous page).
3. Undo connection to PE conductor (see page 11/12).
4. Pull rear panel upwards out of the appliance. For the INCO CO_2 incubator, pull away the rear panel slightly from the appliance so that it is not caught by the ventilation pipe (Fig. 3). Make sure that the rear panel does not jam when pulling out.

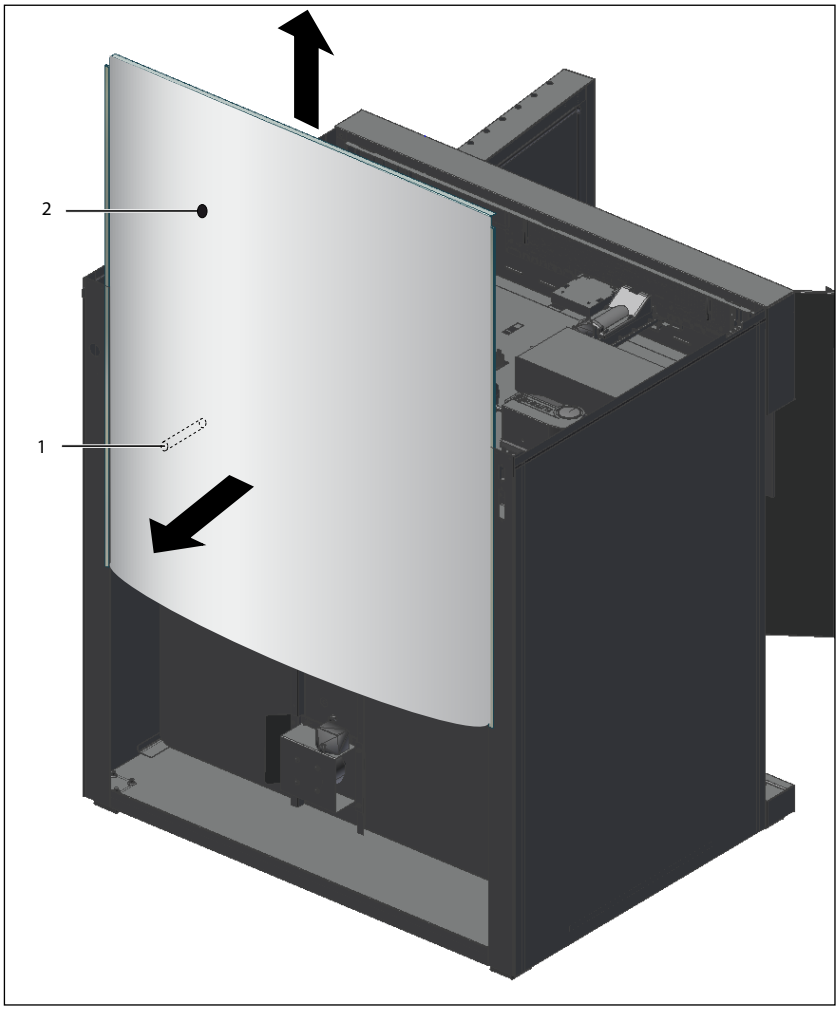


Fig. 3 Removing the rear panel
1 Ventilation pipe (only for CO_2 INCO incubators)
2 Opening for ventilation pipe in the rear panel

Put the rear panel back on

1. Insert rear panel carefully from above into the guide rails and push downwards until they slot into place. Make sure that the rear panel does not jam and is not scratched by the ventilation pipe that sticks out of the rear of the appliance (Fig. 3).
2. Reconnect the PE conductor.

7. Control unit

7.1 Overview

(see also circuit diagrams from page 44).

The control unit can be reached after the top panel has been removed (see page 9).

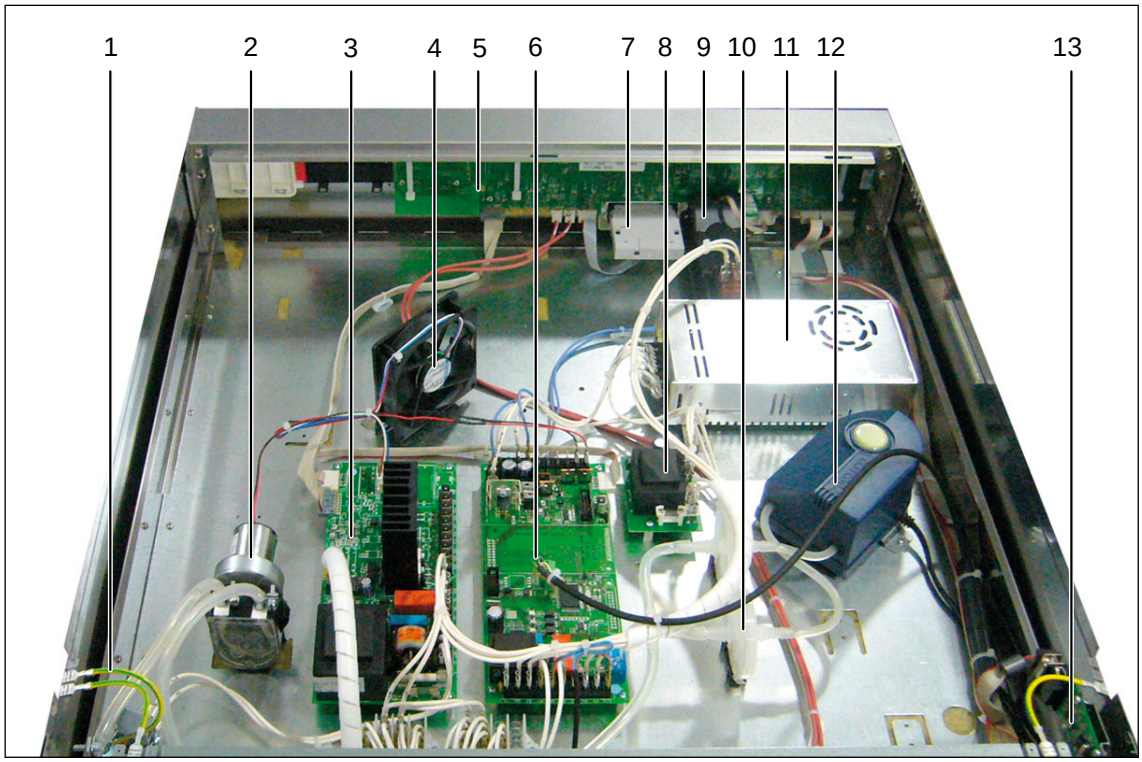


Fig. 4 Control unit humidity chamber HCP

1 Connection for PE conductor
2 Pump for humidification (see page 35)
3 Mainboard (see page 13)
4 Fan
5 Controller (see page 16)
6 Control module for humidity (see page 37)
7 Chipcard reader
8 Power supply unit for chamber fan (see page 19)
9 Main switch (see page 15)
10 Sterile filter (see page 24)
11 Switched mode power supply (see page 17)
12 Humidity restriction pump (see page 36)
13 Interface module (USB, Ethernet) (see page 18)

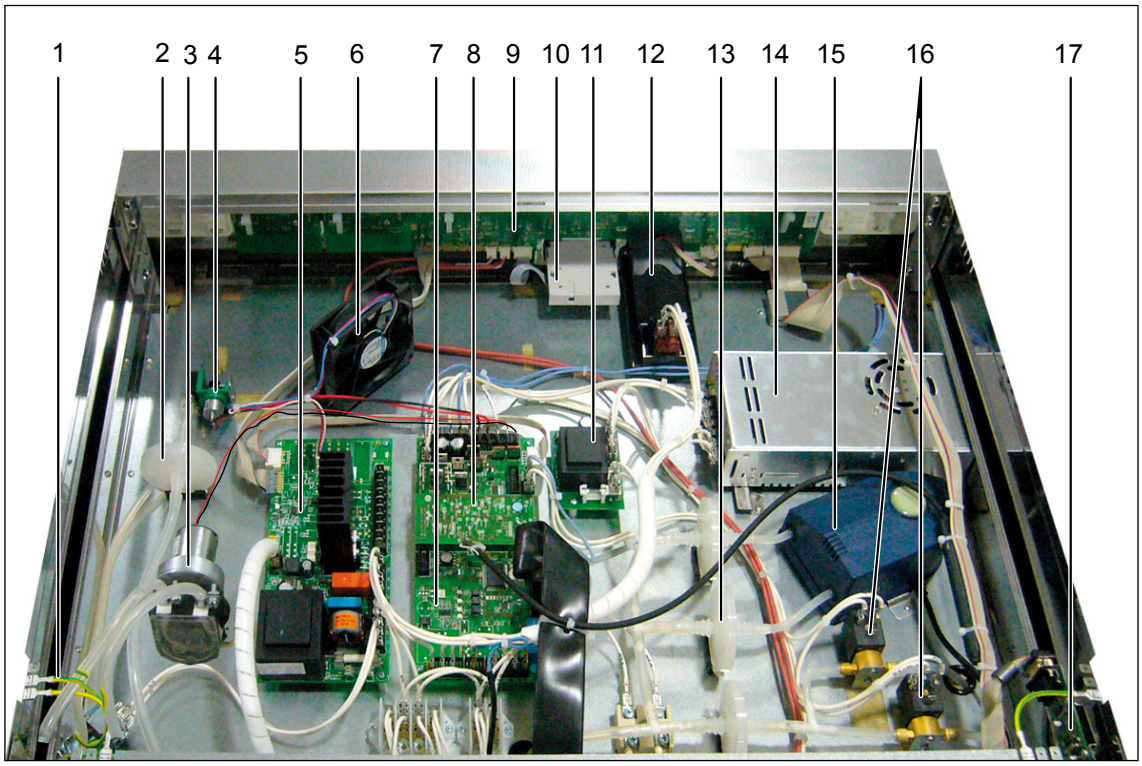


Fig. 5 Control unit CO_2 INCO incubator

1 Connection for PE conductor
2 Sterile filter for auto-zero measuring gas pump
3 Pump for humidification (only for incubators with humidification, see page 35)
4 Auto-zero measuring gas pump
5 Mainboard (see page 13)
6 Fan
7 Control module for humidity (see page 37)
8 PCB for CO_2 sensor (see page 39)
9 Controller (see page 16)
10 Chipcard reader
11 Power supply unit for chamber fan (see page 19)
12 Main switch (see page 15)
13 Sterile filter (see page 24)
14 Switched mode power supply (see page 17)
15 Humidity restriction pump (see page 36)
16 Solenoid valve (see page 42)
17 Interface module (USB, Ethernet) (see page 18)

7.2 Mainboard

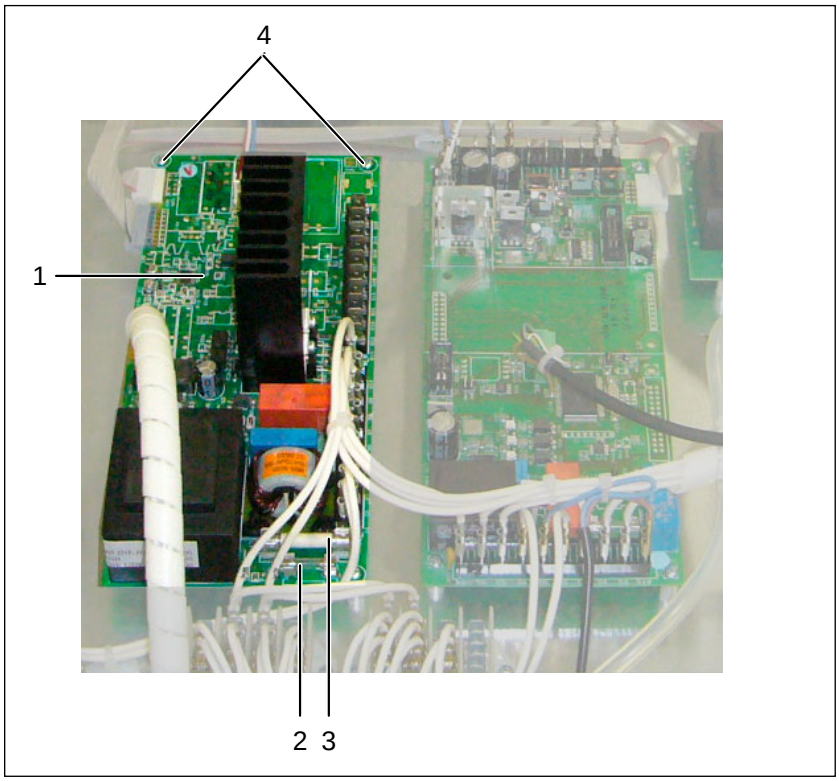


Fig. 6 Mainboard (see also control unit overview on pages 11 and 12)
1 Mainboard
2 Fuse for controller/display
3 Appliance fuse
4 Screws (4 units)

7.2.1 Check/replace fuses

The fuses for controller/display and appliance protection are located on the mainboard (Fig. 6).

1. Disconnect the mains plug.
2. Remove the top panel (see page 9).
3. Measure the fuse resistance with a continuity tester. If the fuse is in order the resistance should only be a few Ohms.
4. To replace the fuse, push an insulated flat screwdriver beneath the side of the fuse and lever it out of the mounting bracket. Press the new fuse from above into the mounting bracket.

- Appliance fuse: 15 A quick-blow 32 x 6.3 mm (American)
- Fuse for controller/display: 100 mA slow-blowing 20 x 5 mm
  200 mA slow-blowing 20 x 5 mm at 115V

Spare part	Variants	Spare part no.
Appliance fuse 15 A		E02387
Fuse for controller/display	100 mA/230 V	E02497
	200 mA/115 V	E01007

7.2.2 Replace mainboard

1. Disconnect the mains plug.
2. Remove the top panel (see page 9).
3. Pull off all cables from the mainboard (Fig. 6). Label unmarked cables with adhesive tape to avoid confusion when reconnecting.
4. Undo 4 screws from the mainboard. Make sure that the spacer bolts are not lost when doing this.
5. Remove the mainboard.
6. Insert a new mainboard and screw it tight with the spacer bolts.
7. Reconnect the cable.
8. Put the top panel back on; plug in the mains plug.
9. Check that the appliance is working. If the fault persists: Contact the manufacturer.

Spare part	Variants	Spare part number
Mainboard	230 V	B04093
	115 V	B04101

7.3 Replacing main switch module with the push/turn control

(See also overview pictures on pages 11, 12 and 16)

1. Disconnect the mains plug.
2. Remove the top panel (see page 9).
3. Pull off the push/turn control (1) on the operating side forwards.
4. Remove the plugs (4-pin) (4) in the control unit from the controller slot J2 (see Fig. 8).
5. Undo the mounting bolts on left and right (2).
6. Slightly raise the main switch module and pull backwards.
7. Place new main switch module into the control panel.
8. Attach the module with two screws (2).
9. Connect the plug (4) to the controller slot J2.
10. Attach the push/turn control (1) at the front.
11. Put the top panel back on; connect the mains plug.
12. Switch on appliance and check the function of the new main switch module and the push/turn control. If the error has not been rectified: Contact the manufacturer.

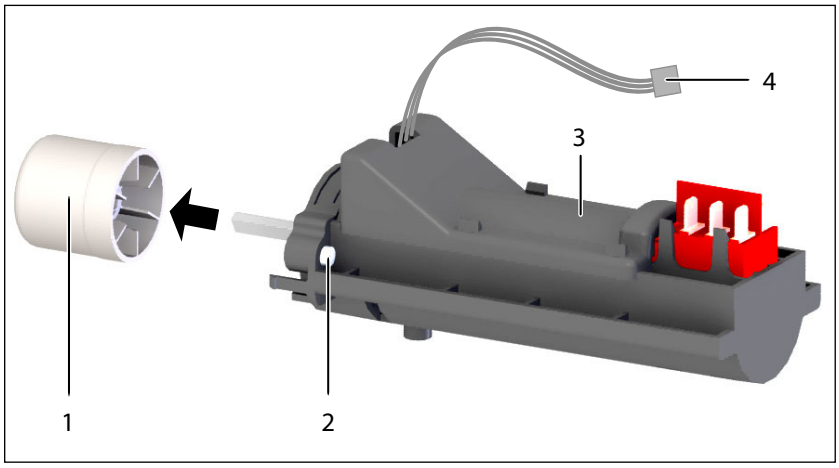


Fig. 7 Main switch module (see also control unit overview on pages 11 and 12)
1 Push/turn control
2 Mounting bolts (left and right)
3 Main switch
4 Plug (controller slot J2)

Spare part	Spare part number
Main switch module	B04425

7.4 Replacing the controller

1. Disconnect the mains plug.
2. Remove the top panel (see page 9).
3. Pull off the push/turn control to the front (see page 15).
4. Undo three screws (Fig. 8, 3) and remove the main switch module (4).
5. Cut through three (HCP) or four (INCO) cable ties (2) with wire-cutting pliers and discard.
6. Pull off and label the plugs of the respective controller slots (Jx).
7. Remove controller (1) to the rear.
8. Insert new controller and fasten controller and main switch module with three screws (3).
9. Reconnect plug to the respective controller slots.
10. Push the push/turn control back on.
11. Put the top panel back on; connect the mains plug.
12. Subject the appliance to a function test. If it should still work incorrectly, contact the manufacturer.

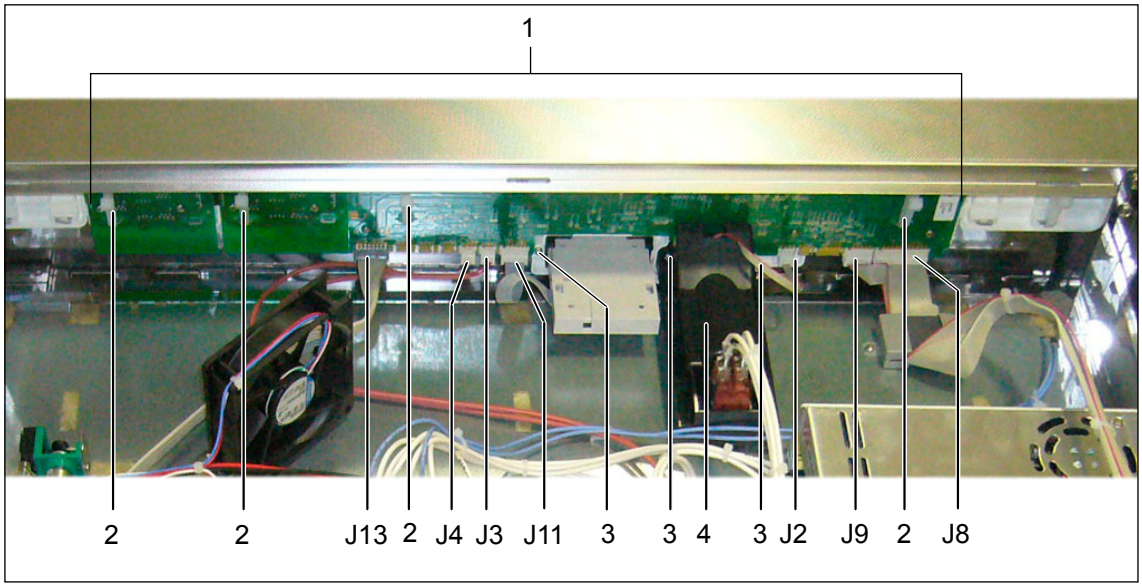


Fig. 8 Replace controller (the example shows the CO_2 INCO incubator controller, see also control unit overview on pages 11 and 12)
1 Controller
2 Cable straps
3 Screws
J(x) Controller slots

Spare part	Variants	Spare part number
Controller INCO	RS232/USB/Ethernet	B04373
	RS485	B04374
Controller HCP	RS232/USB/Ethernet	B04378
	RS485	B04379

7.5 Replacing the switched mode power supply

1. Disconnect the mains plug.
2. Remove the top panel (see page 9).
3. Disconnect all the plugs on the switched mode power supply and label them if necessary (1).
4. Undo the screws (4 screws) at the corners (2) and remove the switched mode power supply.
5. Insert a new switched mode power supply and screw tight.
6. Reconnect the plug to the switched mode power supply.
7. Re-attach the top panel.
8. Connect the mains plug and subject the appliance to a function test. If the fault should persist or if it works incorrectly, contact the manufacturer.

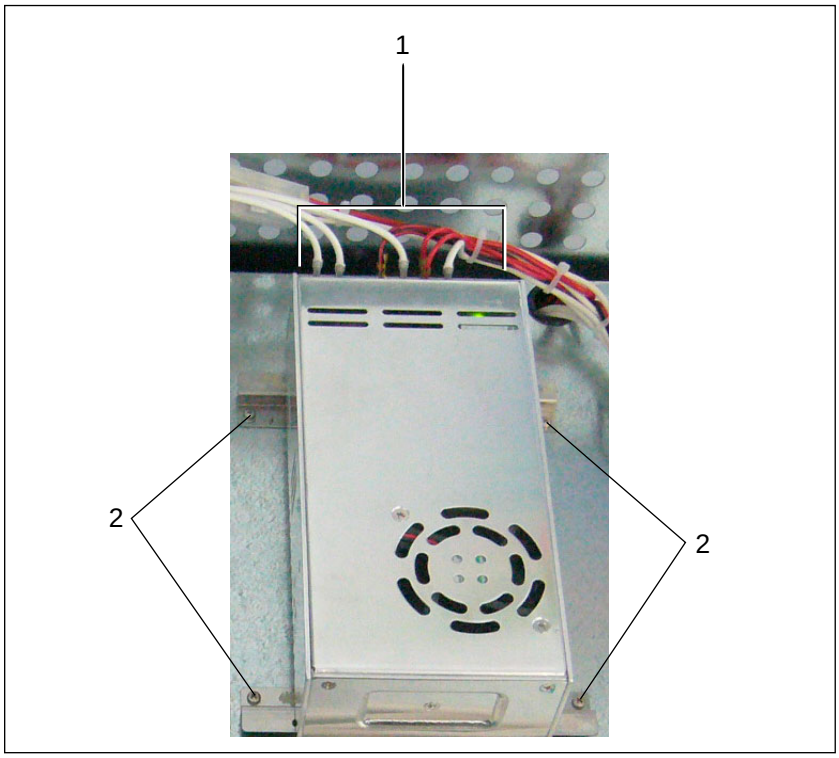


Fig. 9 Switched mode power supply
1 Connections
2 Screw connection

Spare part	Spare part number
Switched mode power supply	B04372

7.6 Replacing the interface module

1. Disconnect the mains plug.
2. Remove the top panel (see page 9).
3. Pull off the plug on the USB interface module or Ethernet module (depending on the appliance fittings) on the rear casing panel (1).
4. Undo 2 screws at top and bottom with which the module is attached to the rear wall (2); remove module.
5. Insert a new module and screw tight.
6. Connect the plug.
7. Re-attach the top panel.

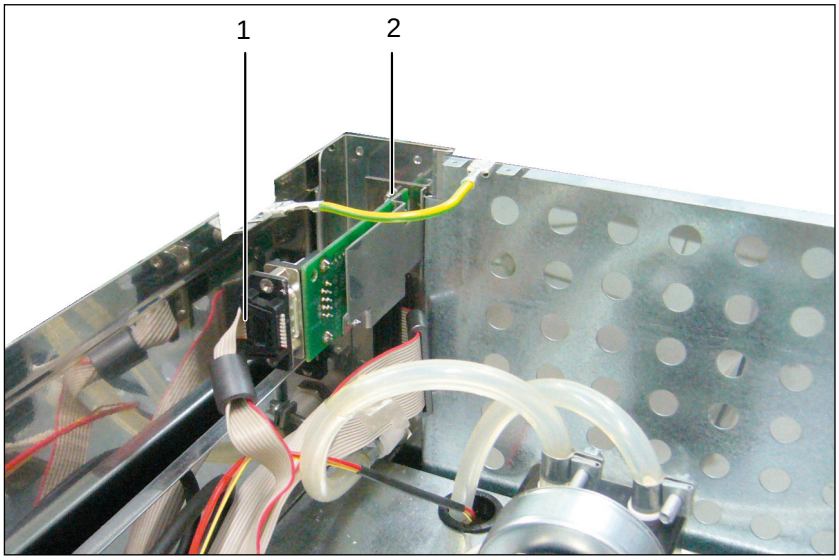


Fig. 10 Replacing the interface module
1 Plug
2 Screw connection

Spare part	Spare part number
USB interface module	B04118
Ethernet module	B04121

8. Chamber fan

8.1 Function test

Visual test to see if the fan wheel is turning. It is visible inside the chamber through the ventilation slits in the fan shaft on the rear (Fig. 12).

Check the fan power supply unit in the control unit (see also the control unit overviews from page 11):

1. Remove the top panel (see page 9).
2. Check the miniature fuse on the fan power supply unit (50 mA slow-burning) (Fig. 11).
3. Check the output voltages:
   terminal 1: L
   terminal 2: N
   terminal 3: N
   terminal 4: approx. 18 Volt/ DC
   terminal 5: GND

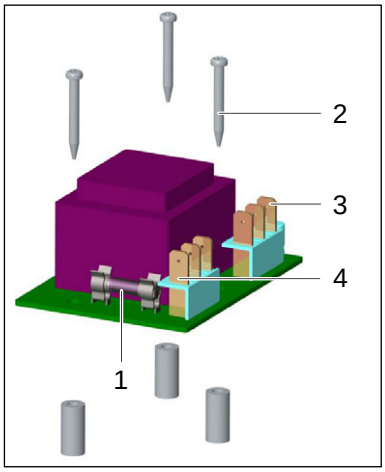


Fig. 11 Fan power supply unit in control unit
1 Miniature fuse
2 Screws
3 Terminal 6
4 Terminal 1

If one of the voltages is missing, the fan power supply unit must be replaced.

8.2 Replacing fan power supply unit

1. Disconnect the mains plug.
2. Pull off connection leads from the terminals on the fan power supply unit (Fig. 11).
3. Undo three mounting bolts (2) and remove the power supply unit.
4. Insert a new power supply unit and screw tight.
5. Connect connection leads to the power supply unit terminals.

Plug in mains plug and repeat voltage test (see above). In case this does not rectify the problem: Contact the manufacturer.

8.3 Replacing fan

The chamber fan unit is always replaced in full because of the shaft seal, i.e. with mounting plate, terminal and shaft feed-through.

1. Disconnect the mains plug.
2. Remove the top panel (see page 9) and pull out the rear panel (see page 10).
3. Inside the chamber (Fig. 12), undo the screws (2) of the fan shaft (1) and remove the fan shaft (3); the fan wheel is now accessible.

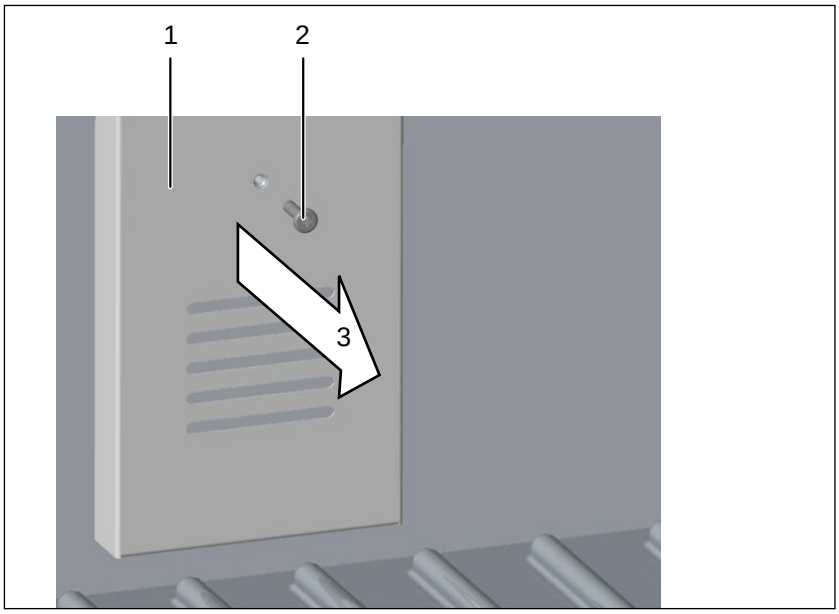


Fig. 12 Removing the fan shaft
1 Fan shaft
2 Screws
3 Taking off fan shaft

4. Undo the headless screw on the fan wheel (Fig. 13, 4) and remove the fan wheel towards the front (5).
5. On the rear of the appliance, unplug the two connection leads on the terminal block (10).
6. Undo four screws (9) with washer (7) and serrated washer (8) from the fan mounting plate (6) and pull out fan module to the rear (11).
7. Insert a new fan module and screw tight; connect leads.
8. Inside the chamber, attach the fan wheel to the shaft with the headless screw.
9. Screw the fan shaft back on.
10. Plug in mains plug and check fan function. In case this does not rectify the problem: Contact the manufacturer.

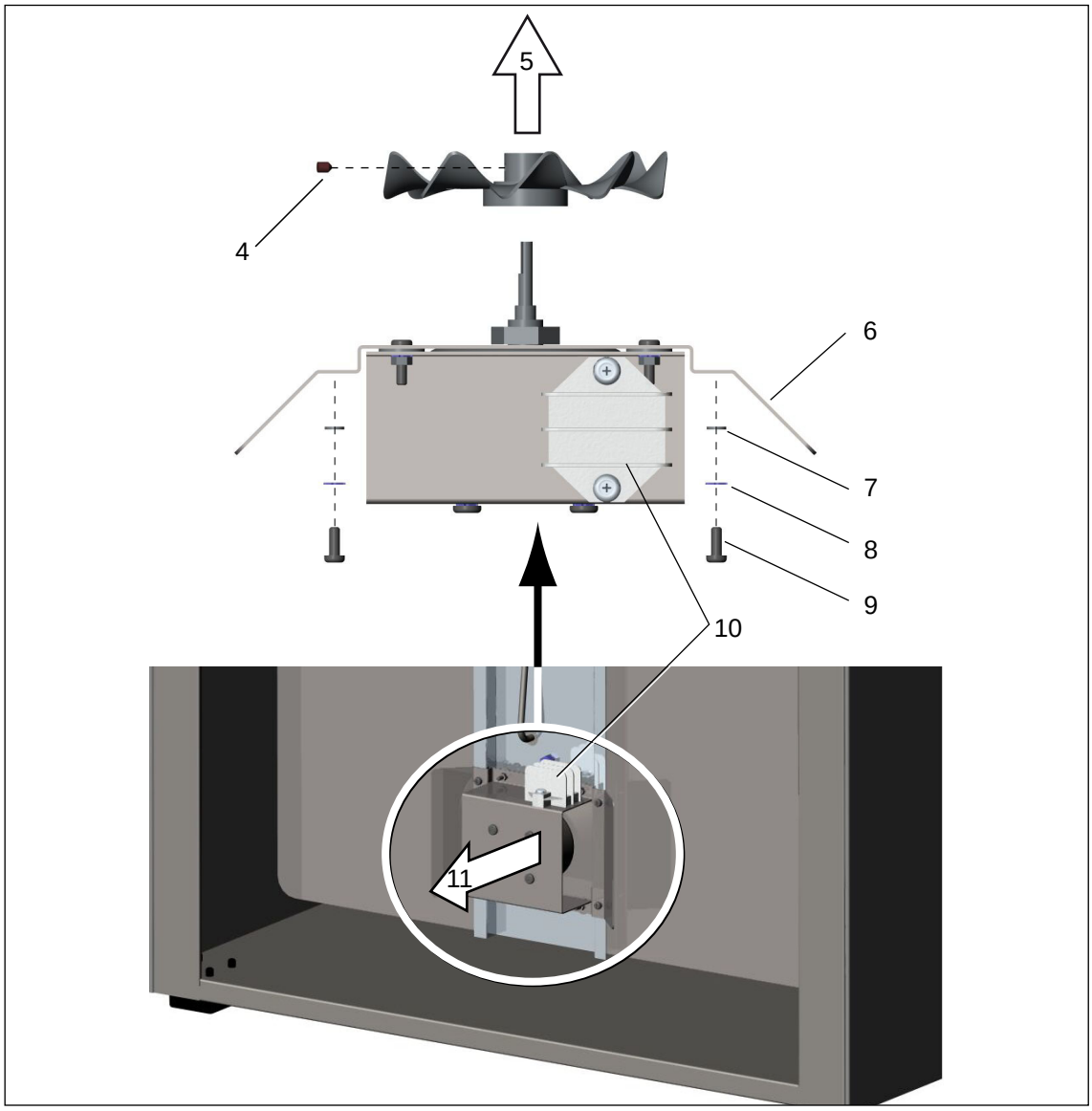


Fig. 13 Replacing the chamber fan
4 Headless screw
5 Remove fan wheel
6 Fan mounting plate
7 Disc
8 Toothed disc
9 Screw
10 Terminal block
11 Remove fan wheel

Spare part	Variants	Spare part number
Chamber fan IP54	24 V	B03283
Fan power supply unit	230 V	B03284
	115 V	B03286
Fan shaft	108	E03816
	153/246	E04364

9. Temperature control

9.1 Pt100 temperature sensor

The appliance is equipped with two temperature sensors which measure the temperature inside the chamber: one sensor for the working controller and one sensor for the monitoring controller (Fig. 14).

Replacement

1. Disconnect the mains plug.
2. Remove the top panel (see page 9) and pull out the rear panel (see page 10).
3. Remove insulation material (1) at the top right of the rear panel.
4. Sensor for working controller: Disconnect connection lead (4) of the Pt100 sensor (2) in the control unit from the 4-pin controller slot J4.
   Sensor for monitoring controller:
   Disconnect connection lead (4) of the Pt100 sensor (3) in the control unit from the 4-pin controller slot J3.
5. Cut through cable tie (5) with wire-cutting pliers. Pull sensor back out of rear panel (6) and thread upwards through the floor of the control unit (7).
6. Thread new temperature sensor downwards from the control unit and push into rear panel. Connect connection lead to the corresponding controller slot (see above).
7. Re-attach the insulation material; push the rear panel back in and mount the top panel. Connect the mains plug.
8. Subject the appliance to a function test. If the fault should persist/if it works incorrectly, contact the manufacturer.

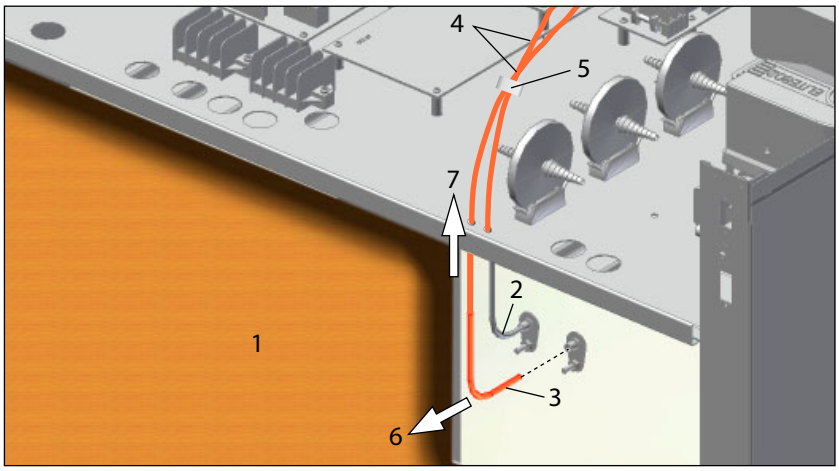


Fig. 14 Replacing a Pt100 temperature sensor
1 Insulation material
2 Sensor
3 Sensor
4 Cable connections to the controller in the control unit
5 Cable straps
6 Pull out Pt100 temperature sensor
7 Pull out Pt100 temperature sensor upwards into the control unit

Spare part	Spare part number
Pt100 temperature sensor	E04956

9.2 Temperature limiter

The temperature limiter in the rear panel switches the heating off automatically in case of overtemperature.

Replacement

1. Disconnect the mains plug.
2. Remove the top panel (see page 9) and pull out the rear panel (see page 10).
3. Remove insulation material in the vicinity of the temperature limiter (top left of the rear panel, see Fig. 15).
4. Pull off connection leads (1) of the temperature limiter from the mainboard (slots S25 and S26) in the control unit.
5. Pull out connection leads downwards through the raised floor (2).
6. Undo the mounting bolts (3) and remove the retaining bracket of the temperature limiter (4); remove temperature limiter.
7. Place on a new temperature limiter and attach with bracket.
8. Pull connection lead up through the control unit floor into the control unit and connect to the mainboard.
9. Re-attach the insulation material; push the rear panel back in and mount the top panel. Connect the mains plug.
10. Subject the appliance to a function test. If the fault should persist/if it works incorrectly, contact the manufacturer.

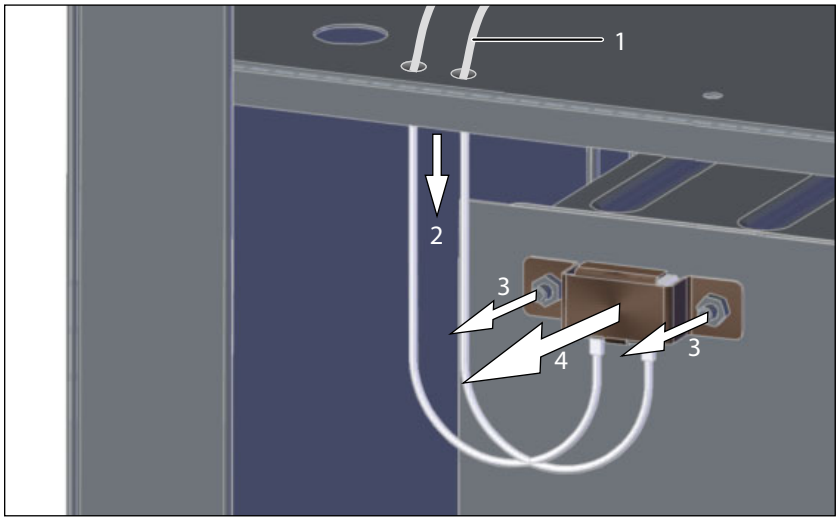


Fig. 15 Replacing the temperature limiter
1 Undo the connection leads in the control unit
2 Pull connection leads downwards and out through the control panel floor (2).
3 Remove screws
4 Remove mounting bracket and take out temperature limiter

Spare part	Spare part number
Temperature limiter	E05123

10. Sterile filter

Depending on the model (humidification and/or CO_2 fumigation), the appliance is fitted with up to four sterile filters which clean the CO_2 or the fresh air before it is brought into the chamber (Fig. 16):

Filter 1: CO_2 IN1 + IN2
Filter 2: Humidity limit control
Filter 3: Humidity limit control
Filter 4: Auto-zero measuring gas pump (see also page 41)

Replacement

1. Disconnect the mains plug.
2. Remove the top panel (see page 9).
3. Pull off tubes from both sides of the sterile filter (1).
4. Take sterile filter out of holder (3).
5. Place new sterile filter into holder.
6. Connect tubes to both sides of the new filter.
7. Re-attach the top panel.

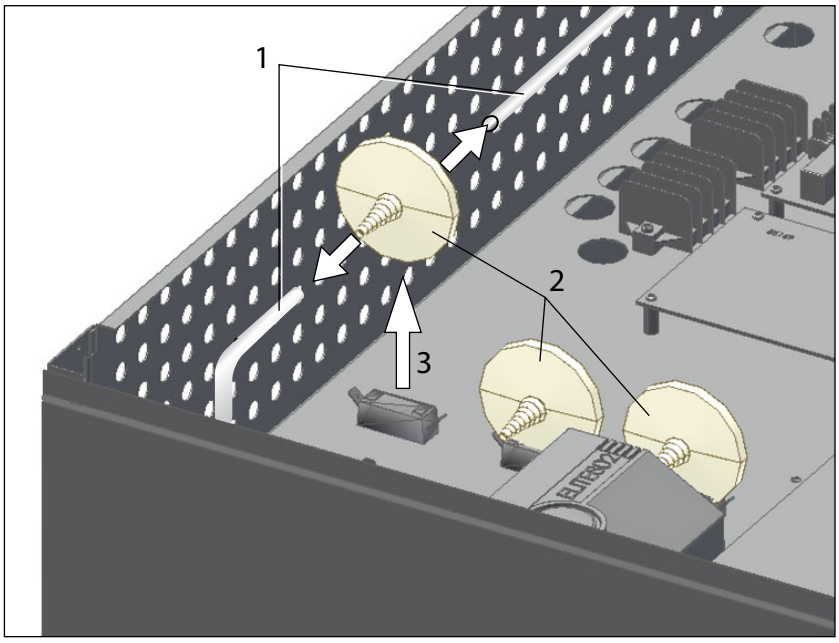


Fig. 16 Replace sterile filters
1 Pull off tubes from both sides of sterile filter
2 Sterile filter
3 Pull sterile filter upwards out of holder

Spare part	Spare part number
Sterile filter	E03401

11. Doors

11.1 Installing, removing and adjusting door

11.1.1 Removing the door

1. Swivel door by 180 degrees and undo screws (4) at the two eccentric sockets (1) at the top and bottom.
2. Pull out door (5) horizontally in the direction of the arrow.

11.1.2 Installing the door

1. Grease the moving parts of the door hinges with thin silicone grease (see also operating instructions "Maintenance").
2. Inset a hard paper disk on the lower door hinge between the eccentric tappet (3) and the door (5).
3. Insert the door. When doing this, make sure that the adjuster cam of the eccentric tappet (3) is pointing forwards (1a).
4. Put screws back in (4) and tighten up.

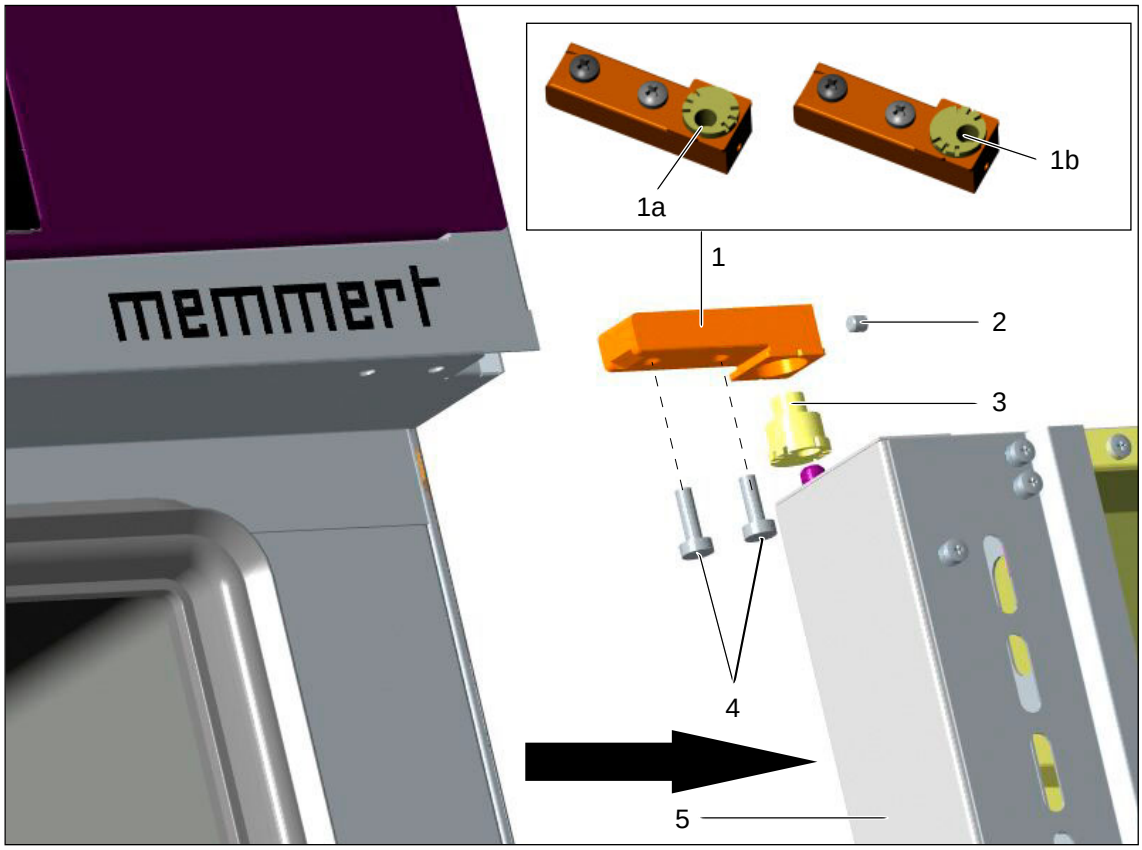


Fig. 17 Installing/removing door
1 Eccentric socket
1a Eccentric tappet moved forwards: factory settings for door
1b Eccentric tappet moved to the right: Doors are also adjusted to the right
2 Headless screw
3 Eccentric tappet
4 Screws
5 Door

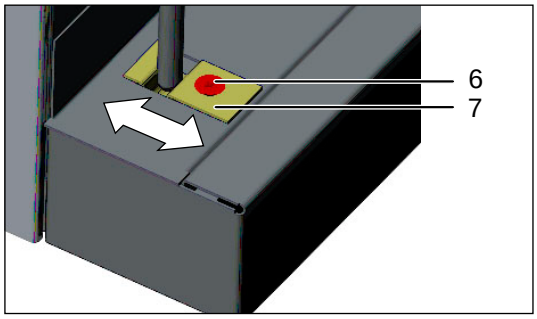
11.2 Adjusting the door

1. Undo mounting bolts (2) at the top and bottom of door.
2. The top section of the door hinge (1) can now be moved slightly in the direction of the arrow.
3. After undoing the headless screw (5), the door can be adjusted by turning the eccentric tappet (3) with a screwdriver.

The headless screw (5) is fixed with lock washer varnish. It can be undone with a jolting motion using a 2 mm Allen key.

4. Apply lock washer varnish to the headless screw (5) and screw the headless screw back tight.
5. Tighten the mounting bolts (2) again.

Fig. 18 Adjusting the door
1 Upper section of the door hinge
2 Mounting bolts
3 Eccentric tappet
4 Eccentric socket
5 Headless screw



The locking plate (7) can also be adjusted in the direction of the arrows after undoing the screws. Afterwards, screw the locking plate back firmly.

Fig. 19 Adjusting the locking plate
6 Screw
7 Locking plate

11.3 Removing and installing the door lock

1. Undo screws (6).
2. Remove the lock cover (5).
3. Screw off the door panel (2) and lift up.
4. Pull off the door-handle lid (1).
5. Pull off the circlip (2) sideways and remove the door-handle (3).
6. Undo the guide screw (4) remove the circlips (10) and coil springs (12).
7. Pull out the axles (11) sideways and push the locking pins (7) outwards.
8. Remove the door lock mechanism (6, 8, 9).

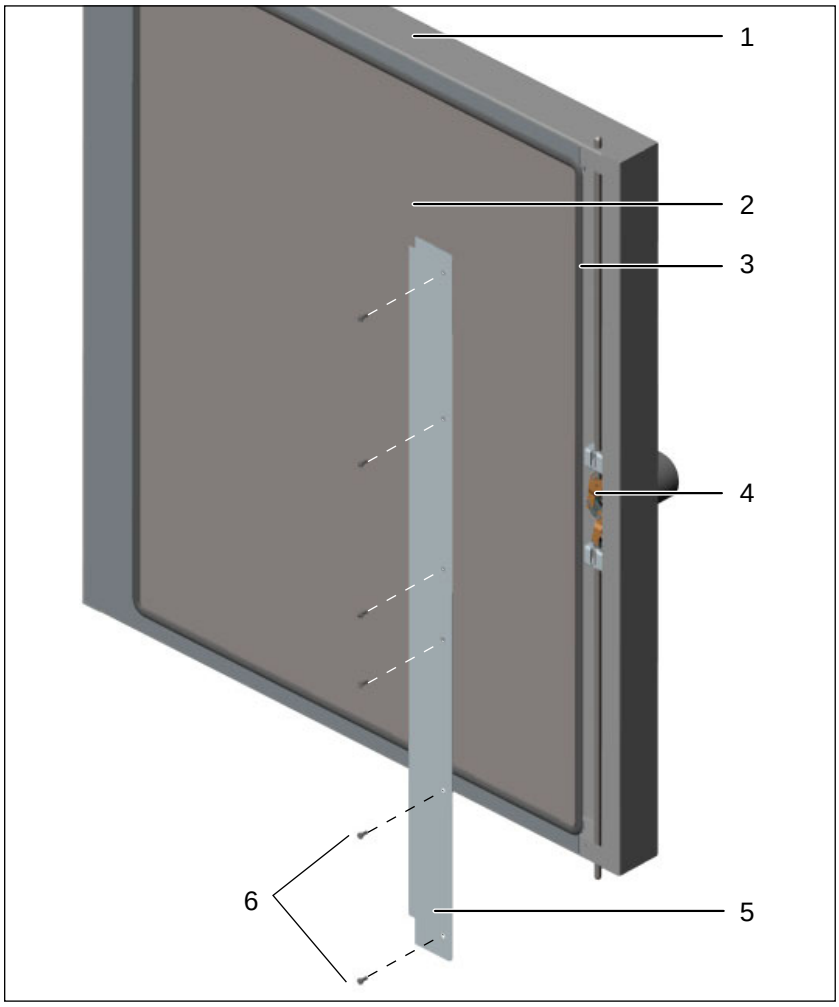


Fig. 20 Door lock
1 Door
2 Door panel
3 Door seal
4 Locking mechanism
5 Lock cover
6 Screws

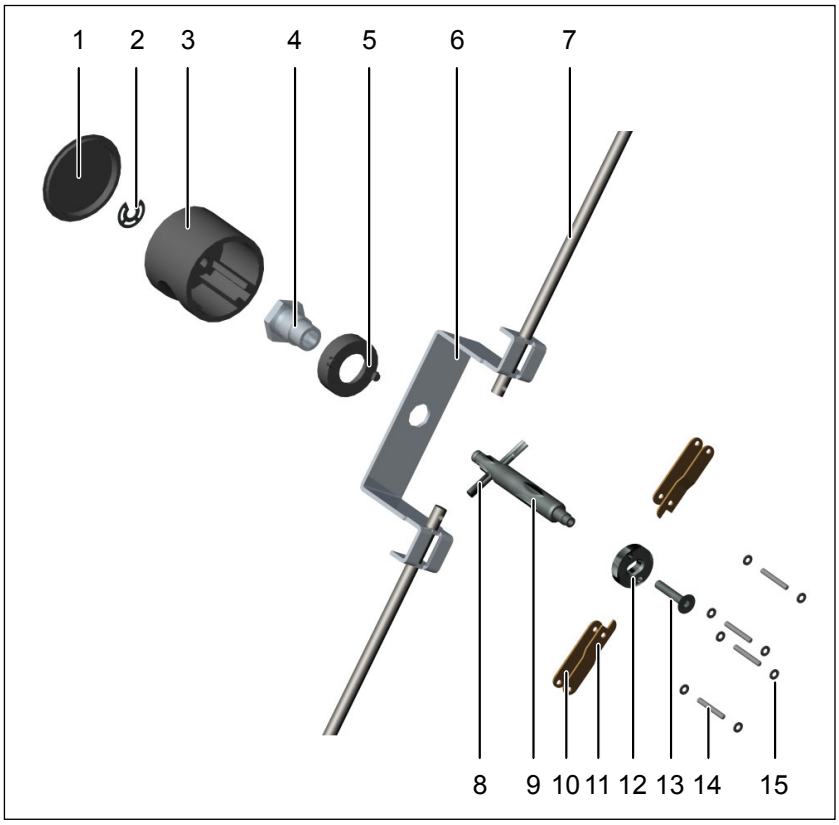


Fig. 21 Locking mechanism

1 Door-handle cover
2 Circlip
3 Door-handle
4 Guide screw
5 Sleeve
6 Locking bracket
7 Locking pins
8 Locking bolt
9 Transmission pin
10 Disc for door handle
11 Flat-head screw
12 Locking arm (straight)
13 Locking arm (angled)
14 Axles
15 Circlips (small)

Spare part	Model	Spare part number
Door	108	B03299
	153	B04052
	246	B03643
Door eccentric tappet	all	B03749
Door lock, complete, without locking pins	all	B04037
Locking pins	108	E02993
	153/246	E03287
Locking plate	all	B02720

11.4 Replacing seals

11.4.1 Replacing door seal

1. Remove the locking cover (2) (see page 27).
2. Lift up door panel (4) and remove old seal (3). On no account should the screw mounting of the door panel be undone, since parts inside the door are held together by this.
3. Cut out the new door seal at the ends using the old one as a template and push onto the door panel.
4. Insert the door panel and press on.
5. Re-attach the lock cover.

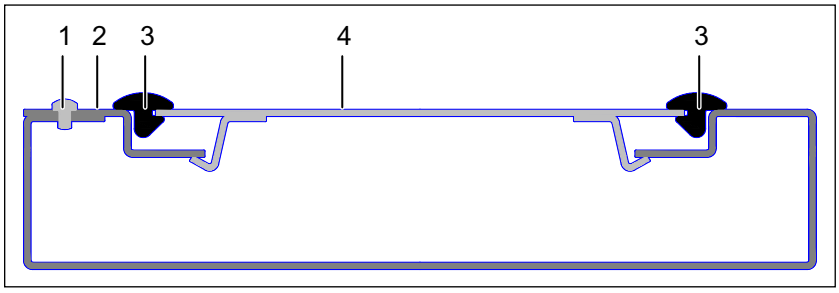


Fig. 22 Replacing the door seal (cross-section)
1 Screw
2 Lock cover
3 Door seal
4 Door panel

11.4.2 Replacing the chamber seal and the cage seal

The appliance has two seals:

- Chamber seal
- Cage seal

The seal can be pulled out after the door is opened and the new seal be pushed into place.

Push in the pre-cut length of seal into the space, without stretching it, and cut off the end if necessary.

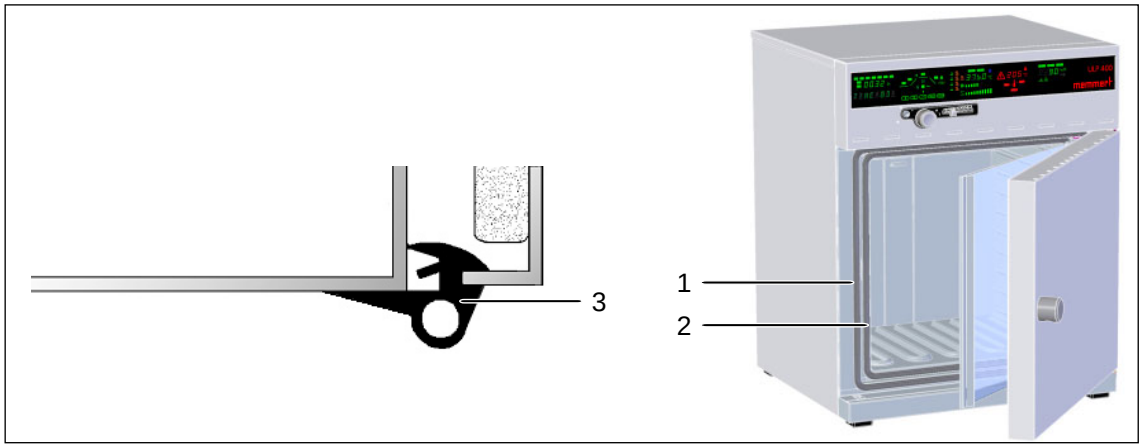


Fig. 23 Replacing the chamber and cage seals
1 Chamber seal
2 Cage seal
3 Seal cross-section

Spare part	Model	Spare part number
Chamber seal	108	Z00702
	153	Z00722
	246	Z00723
Cage seal	108	Z00716
	153	Z00800
	246	Z00801
Door seal	108	Z00707
	153	Z00721
	246	Z00708

11.5 Door heating

The door heating is operated with safety extra-low voltage.

11.5.1 Function test through resistance measurement

The correct function of the door heating can be tested with a resistance measurement. The measurement should be taken at the upper and lower spring contact (Fig. 24). The resistance must be approx. 12 Ω.

11.5.2 Contact

Adjust door (see page 26), in case the spring contact (Fig. 24) in the door does not touch the door contact surface (Fig. 25) when the door is closed.

The spring contacts can be pulled out of the mounting with flat pliers and replaced.

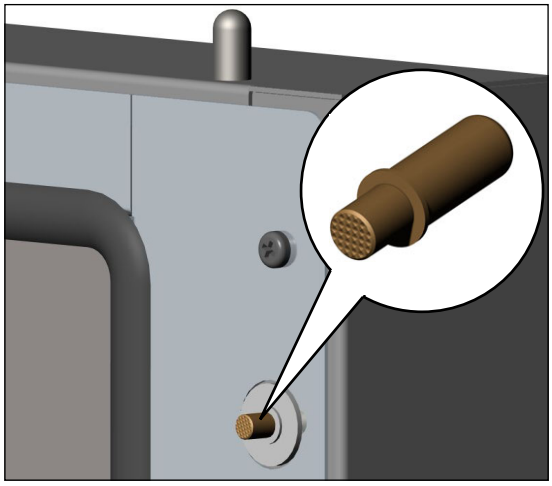


Fig. 24 Spring contact in door

Fig. 25 Door contact surface

Spare part	Spare part number
Spring contact	E02743

11.6 Adjusting and removing inner door

11.6.1 Adjusting inner door

1. Loosen screws (1); do not remove screws completely, as otherwise the mounting block (inside) will fall out.
2. Check the screw (2) in the hinge and tighten if necessary.
3. Adjust the inner door (4) and tighten screws (1) again.

If a mounting block has fallen out, you can reach it by pulling out the side section and then mount it again.

11.6.2 Removing the inner door

Undo the screw (2) (counter with open-end wrench), tilt glass door forwards and lift out from lower hinge.

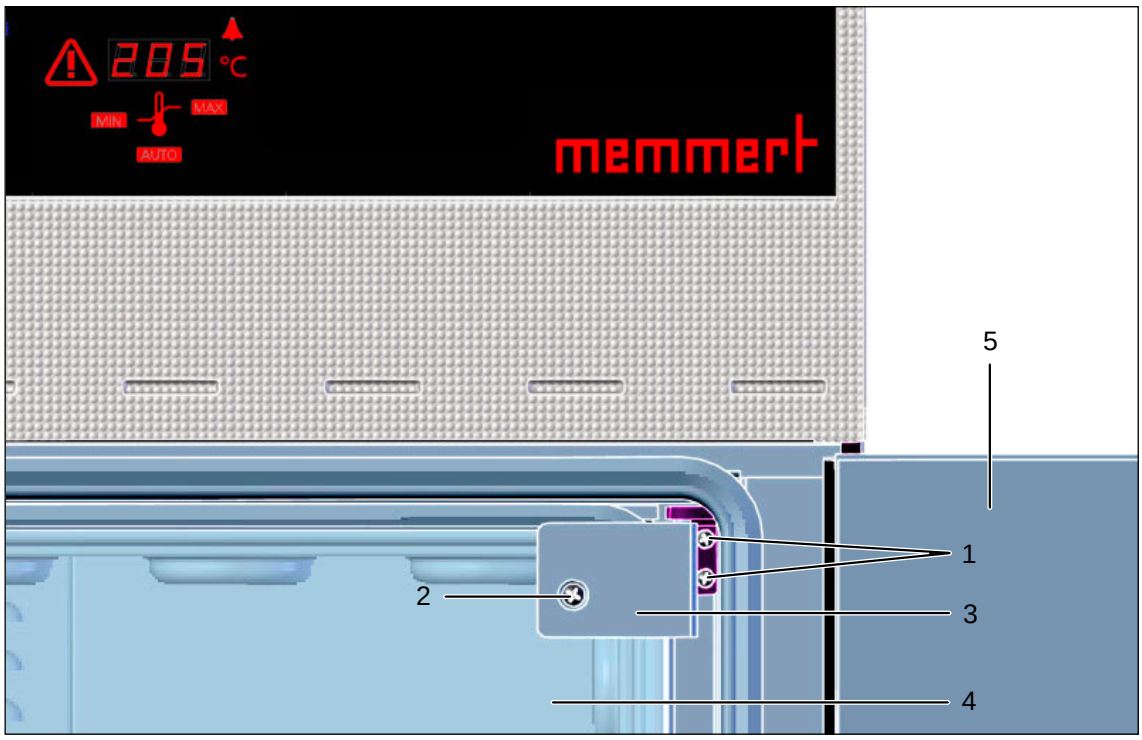


Fig. 26 Adjusting/removing inner door
1 Screws
2 Screw
3 Inner door hinge
4 Inner door
5 Outer door (open)

Spare part	Variants	Spare part number
Glass inner door (incl. hinge)	108	B03300
	153	B03670
	246	B03644
Hinge	top	B02902
	bottom	B02903

12. Humidity control

(only for corresponding model)

If the humidity control of the chamber does not work properly (see also operating instructions), this may have several different causes. It is described below how the fault can be determined and what needs to be done to remedy this.

First check whether an error message of the control module for humidification is displayed at the front of the appliance (see operating instructions). If this is the case, the control module must be replaced (see page 37).

If this is not the case, check whether an error message from the humidity sensor is displayed. In this case the humidity sensor must be replaced (see page 38).

If no error message is displayed, proceed as follows:

12.1 Humidity cannot be increased

If humidification (increase of humidity in the chamber) is not working properly, this can be seen by the fact that the humidity setpoint display on the control panel does not change if a higher humidity is set (see operating instructions). Reducing the humidity works, however.

Proceed as follows to determine the cause:

1. Check whether there is water in the external tank/canister (1); if not, fill up with distilled water.
2. Disconnect the mains plug.
3. Remove the top panel (see page 9) and rear panel (see page 10).
4. Check whether the water tubes on the appliance and on the steam generator (3) on the rear side of the appliance are connected properly (2). If not, make sure that they are fastened tight.

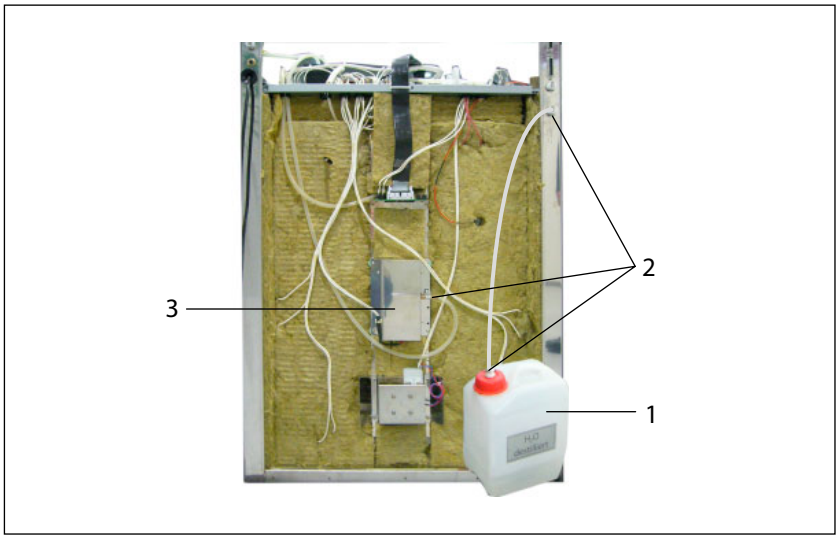


Fig. 27 Checking the tube connections
1 Water tank/canister
2 Tube connections
3 Steam generator

If the fault is not down to the water supply, continue as follows:

1. Check that all plugs in the control unit are connected to the control module for humidification (1) and for the pump (2).
2. Check that the fuse for the control module is in order. If not: Remove the mains plug and replace the fuse.
3. Check that the pump is running. If not: Remove the mains plug and replace the pump (see page 35).
4. If the error has still not been found, then the steam generator at the back of the appliance is faulty. In this case it must be replaced (see next chapter).

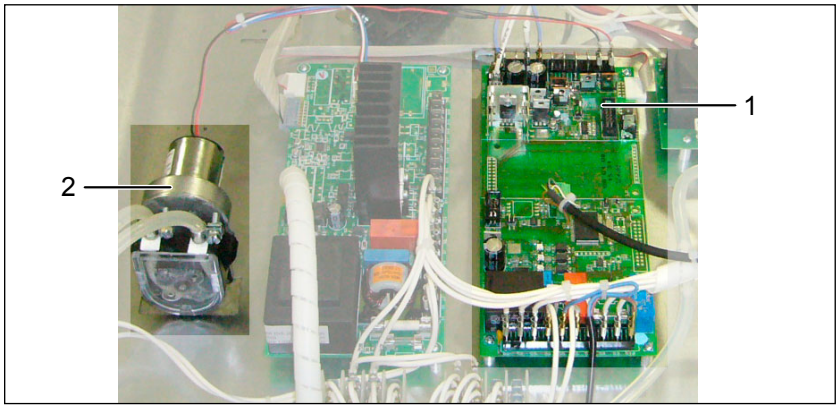


Fig. 28 Control unit
1 Control module for humidification
2 Pump

12.1.1 Replacing steam generator

1. Disconnect the mains plug.
2. Remove the top panel (see page 9) and pull out the rear panel (see page 10).
3. Remove the fan shaft in the chamber of the appliance (see page 20).
4. Loosen tube (1) on the steam generator (2) (Fig. 29).
5. Undo the plug connector of the steam generator (3) in the control unit on the top of the appliance.
6. Unscrew the steam generator (4 screws) (4).
7. Remove the steam generator.
8. Put a new steam generator into place. When doing this, make sure that the copper pipe with the attached tube on the rear of the steam generator fits through the opening into the interior of the appliance (7). Screw the steam generator tight.
9. In the interior of the appliance, cut back the tube of the steam generator coming out of the rear to about 3 mm in length (7). Re-attach the fan shaft.
10. Connect the plug connector of the steam generator in the control unit on the top of the appliance.
11. Connect the water tube on the right of the steam generator (1).
12. Reinsert the rear panel and attach the top panel.
13. Reconnect the mains plug.
14. Check that the humidification is now working properly. If this is not the case, contact the manufacturer.

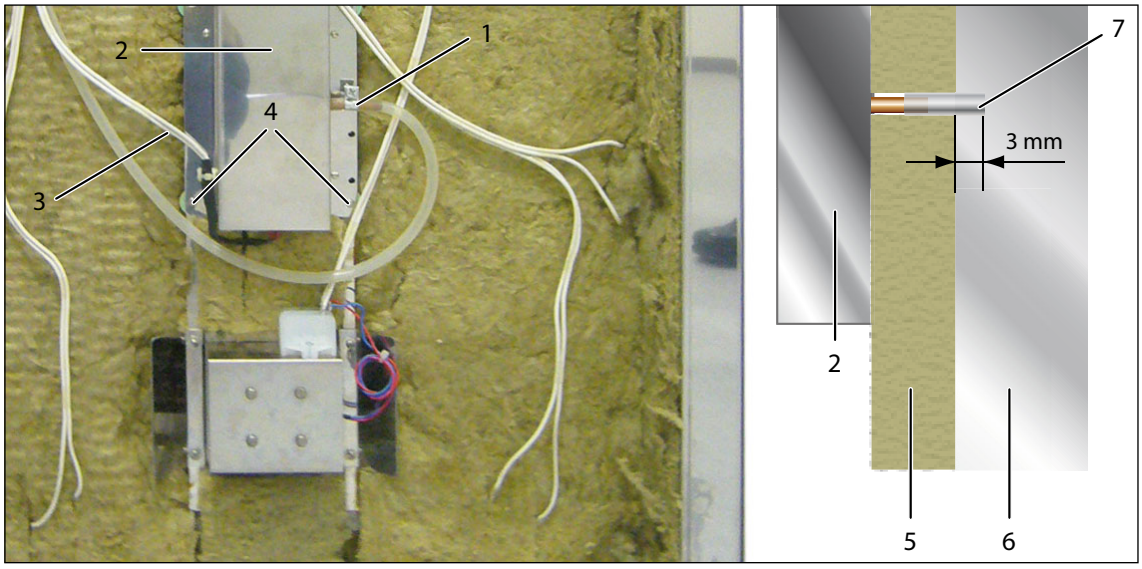


Fig. 29 Replacing steam generator

1 Tube connection
2 Steam generator
3 Connection cable to the control unit
4 Screw connections (four screws)
5 Insulation material/rear panel
6 Interior of appliance
7 Tube on steam generator

Spare part	Model	Spare part number
Steam generator	108/153	B04436
	246	B04437

12.1.2 Replacing the pump

1. Disconnect the mains plug.
2. Remove the top panel (see page 9).
3. Release the two tube connections on the pump (Fig. 30, 1).
4. Pull off the plug connector from the control module (2).
5. Undo the screw connection of the pump (3) to the ground plate (2 screws) and remove the pump.
6. Insert a new pump and screw it tight with 2 screws.
7. Connect the plug connector.
8. Connect both tube connections.
9. Re-attach the top panel.
10. Reconnect the mains plug.
11. Check that the humidification is now working properly. If this is not the case, contact the manufacturer.

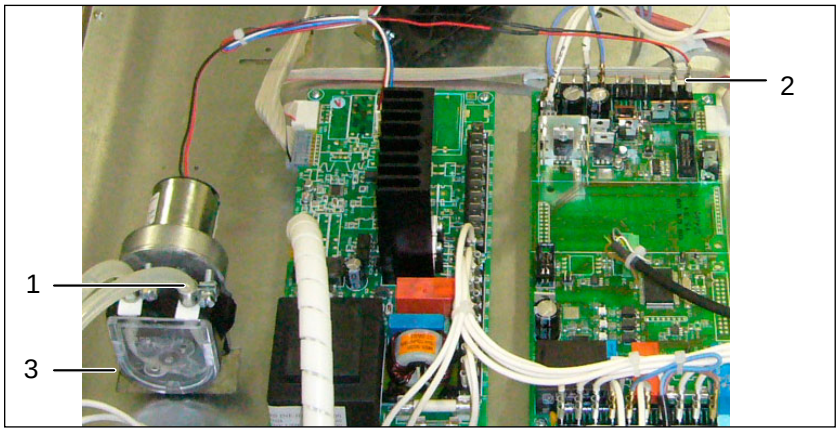


Fig. 30 Replacing the pump
1 Remove hoses
2 Undo the plug connector on the control module
3 Undo the mounting bolts

Spare part	Spare part number
Pump	E04504

12.2 Humidity cannot be reduced

12.2.1 Finding errors

If the decrease of humidity in the chamber is not working properly, this can be seen by the fact that the humidity setpoint display on the control panel does not change, even if a lower humidity is set (see operating instructions). Increasing the humidity (humidification) works, however.

Proceed as follows to determine the cause:

1. Remove the top panel (see page 9).
2. Check that all tubes are connected to the humidity restriction pump and the two accompanying sterile filters, and that they are undamaged (Fig. 31).
3. Check the two sterile filters (2) for contamination (permeability). If they are dirty, replace the sterile filters (see also page 24).
4. Check that the connection lead for the humidity restriction pump (4) is connected properly.

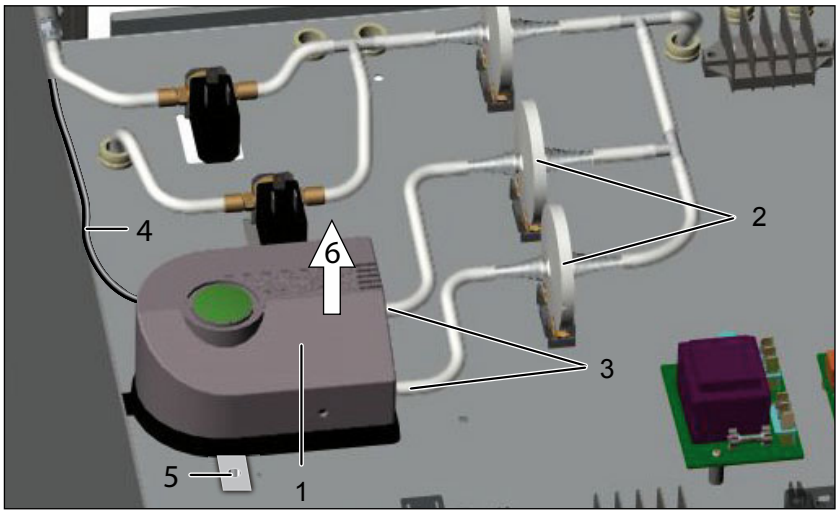


Fig. 31 Humidity restriction in the control unit
1 Humidity restriction pump
2 Sterile filter
3 Tube connections
4 Connection lead
5 Screw connection
6 Removing the humidity restriction pump

If this does not result in the cause of the error being found, the humidity restriction pump must be replaced:

12.2.2 Replacing the humidity restriction pump

1. Disconnect the mains plug.
2. Pull of the tubes from the pump (Fig. 31, 3).
3. Pull off the flat connector of the connection lead (4) on the humidity/CO_2 module.
4. Undo both screws on the mounting bracket (5) and remove the pump (6).
5. Insert a new pump and screw it tight to the mounting brackets.
6. Connect the flat connector of the pump to the humidity/CO_2 module.
7. Push on the tube connections on the pump.
8. Check that the humidity restriction is now working properly. If this is not the case, contact the manufacturer.

Spare part	Spare part number
Humidity restriction pump	E03660

12.3 Replacing the control module

1. Disconnect the mains plug.
2. Remove the top panel (see page 9).
3. Undo all plug connectors on the control module in the control unit (1).
4. Undo the screws of the control module (2) (4 screws) and remove the control module (see also control unit overview on page 11).
5. Screw in a new control module.
6. Reconnect the plug connections. The number of the respective slot is marked on the cables.
7. Re-attach the top panel.
8. Reconnect the mains plug.
9. Check that the humidification is now working properly. If this is not the case, contact the manufacturer.

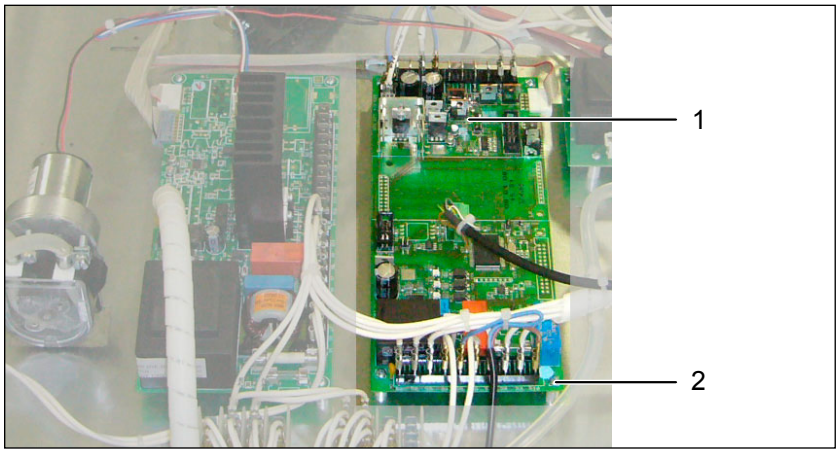


Fig. 32 Replacing control module for humidification
1 Control module
2 Screw connection (four screws)

Spare part	Design	Spare part number
Control unit humidification	active humidification	B04376
	passive humidification (INCO only)	B04375

12.4 Replacing the humidity sensor

1. Disconnect the mains plug.
2. Remove the top panel (see page 9) and pull out the rear panel (see page 10).
3. Remove the insulation material surrounding the humidity sensor on the rear side of the appliance (3).
4. Undo the connection cable (2) of the humidity sensor (4) on the control module in the control unit.
5. Undo the set screw on the humidity sensor (5) and pull out the humidity sensor (6).
6. Pull the humidity sensor out and upwards through the opening in the floor of the control unit (1).
7. Push the new humidity sensor down through the opening in the floor of the control unit and insert into the rear of the appliance.
8. Screw tight the humidity sensor with the set screw and put the insulation material back in.
9. Connect the plug connection of the humidity sensor to the control module in the control unit.
10. Re-attach the rear and top panels.
11. Reconnect the mains plug.
12. Check that the humidification and dehumidification is now working properly. If this is not the case, contact the manufacturer.

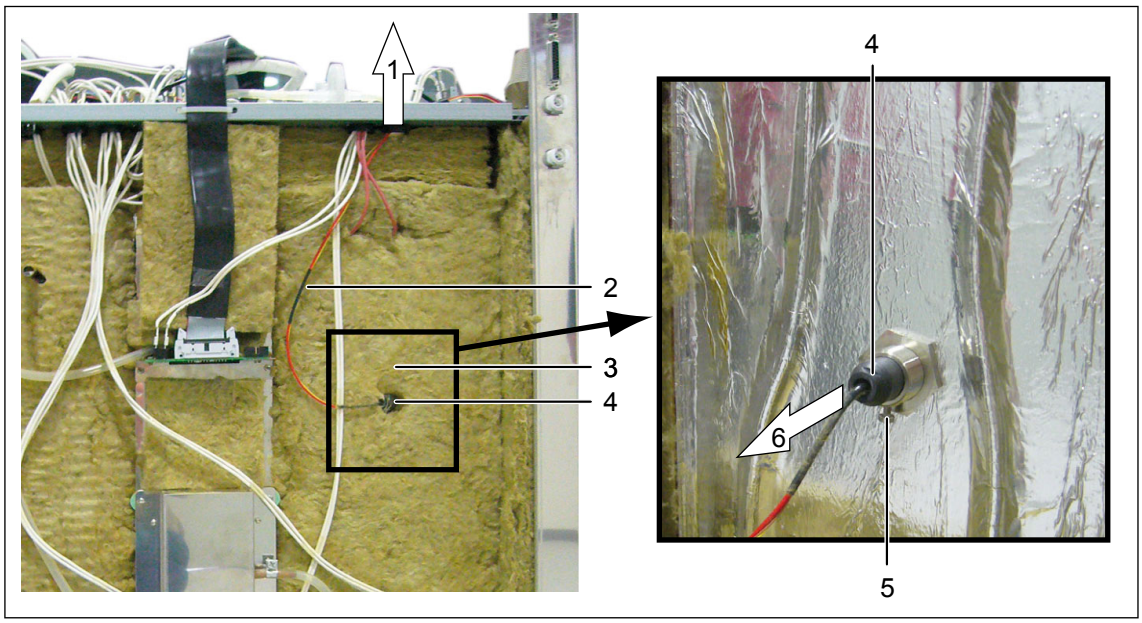


Fig. 33 Replacing the humidity sensor
1 Pull out the humidity sensor upwards
2 Connection lead of humidity sensor
3 Remove insulation material
4 Humidity sensor
5 Set screw
6 Pull humidity sensor out of rear panel of appliance

Spare part	Spare part number
Humidity sensor	E05249

13. CO2-supply

(only for incubators of the INCO type)

13.1 CO2 sensor

When replacing the CO_2 sensor in the rear panel of the appliance the accompanying PCB in the control unit must always be replaced as well, as the two components are tuned to each other (see control unit overview on page 12, Fig. 5, item 8).

1. Disconnect the mains plug.
2. Remove the top panel (see page 9) and pull out the rear panel (see page 10).
3. Replace the PCB of the CO_2 sensor (Fig. 34, 1) in the control unit, which is screwed to the control module of the humidity unit (2). To do this, undo the two plastic screws (3 and 4) and pull the PCB upwards (5). Carefully insert the new PCB (included in the spare parts delivery) and attach with the two plastic screws.

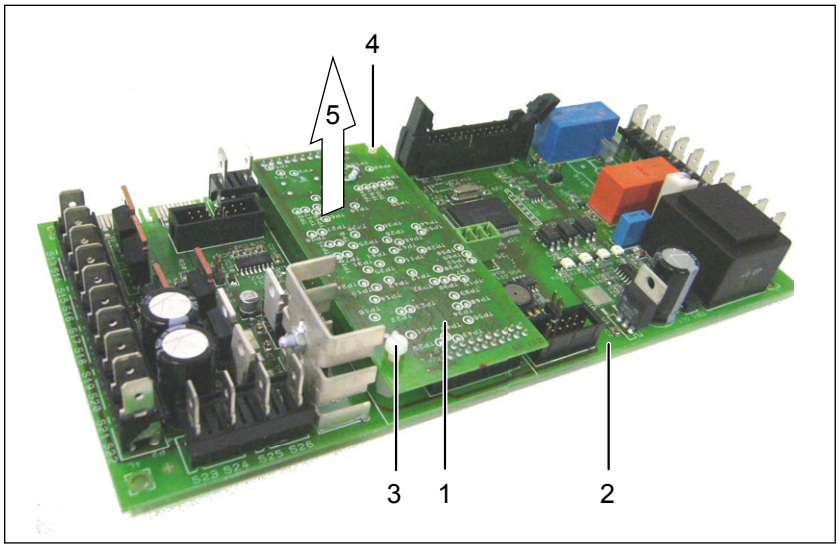


Fig. 34 Replacing the PCB of the CO_2 sensor

1 PCB of the CO_2 sensor
2 Control module for humidification
3 Plastic screw
4 Plastic screw
5 Remove PCB

4. Remove insulation material on the CO_2 sensor in the rear panel of appliance (Fig. 35).
5. Pull off 25-pin signal lead (2) and both control cables (3).
6. Pull off silicone tubes at the top and left on the CO_2 sensor (Fig. 36).
7. Undo both screws (4) of the mainboard.
8. Carefully undo sensor from the silicone tube on the rear panel (Fig. 37). Hold the silicone tube tightly so that it remains positioned on the connecting piece on the rear panel.
9. Connect the new sensor first to the silicone tube.
10. Attach the sensor with both screws.
11. Put the silicone tubes on the sensor on the top and to the left.
12. Re-attach the insulation material.
13. Connect the 25-pin signal lead and the two control cables.
14. Push the rear panel back in and mount the top panel.

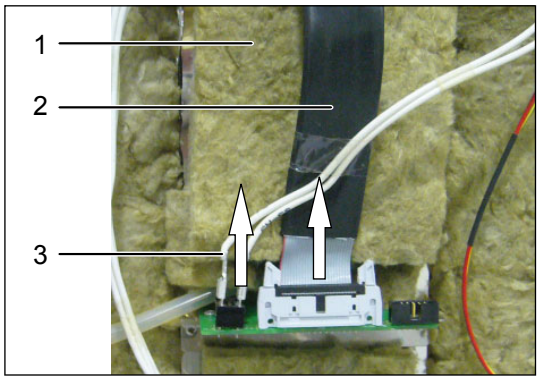


Fig. 35
1 Remove insulation material
2 Remove 25-pin signal lead
3 Remove control cable

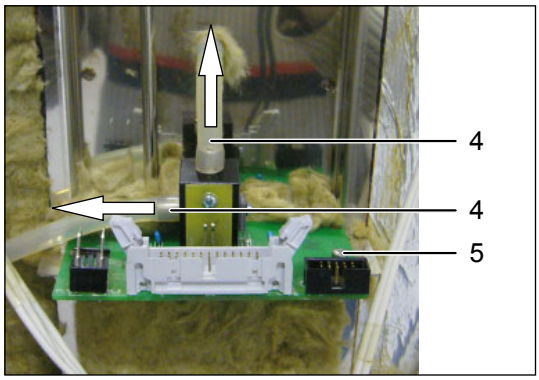


Fig. 36
4 Pull off tubes at the top and on the left of the sensor
5 Undo the screws on the left and right of the PCB (2 screws)

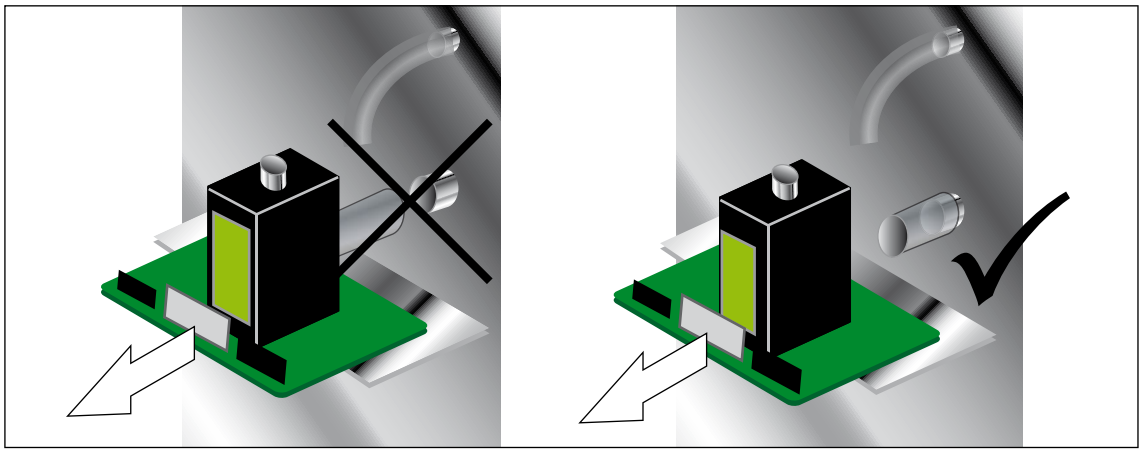


Fig. 37 Pull off the sensor with the PCB from the tube coming out the rear. Pull the tube from the sensor, and not from the appliance, when doing this.

13.2 Auto-zero measuring gas pump

The auto-zero measuring gas pump is used to calibrate the CO_2 sensor to zero. It briefly sprays the sensor with fresh air to do this.

Function test

1. Remove the top panel (see page 9).
2. Switch on appliance; the auto-zero measuring gas pump must run for about 1 second. Then the pump must run for the duration of the zero point calibration. In this period, AUTO ZERO can be seen in the display.

In case the pump does not run, it is defective and must be replaced:

Replacement

1. Disconnect the mains plug.
2. Undo the tube fuse (1) and pull off tube from the measuring gas pump between the measuring gas pump and the sterile filter (2).
3. Pull off the connection leads of the auto-zero measuring gas pump (3) from the humidity/CO_2module (mainboard).
4. Undo the side mounting bolts (4) and remove the pump (5).
5. Screw tight new pump to the mounting bracket.
6. Connect the connection leads of the auto-zero measuring gas pump to the humidity/CO_2 module.
7. Push on the tubes.
8. Connect the mains plug and subject the pump to a function test; switch on the appliance for this purpose (see above). If the error has not been rectified: Contact the manufacturer.

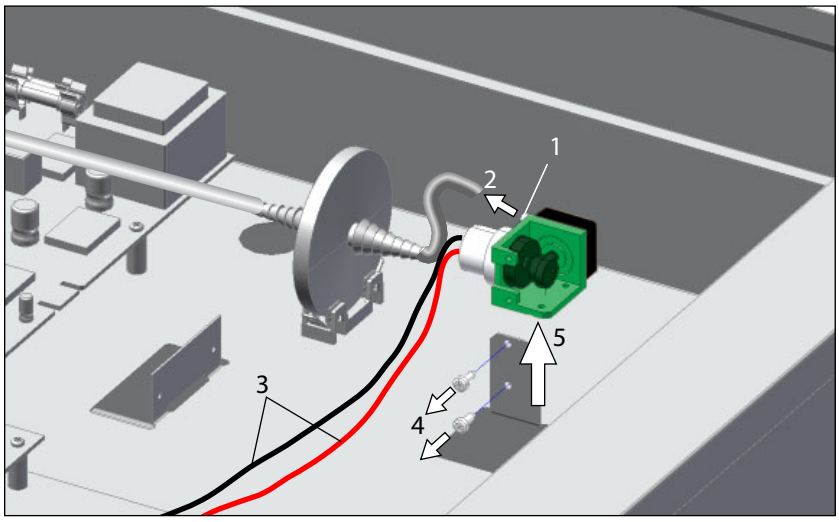


Fig. 38 Replacing the auto-zero measuring gas pump
1 Undo the tube safety catch
2 Pull off tube
3 Pull off connection leads from the humidity/CO_2 module
4 Undo the mounting bolts on the mounting bracket
5 Remove the auto-zero measuring pump upwawrds

Spare part	Spare part number
Auto-zero measuring gas pump	E03604

13.3 Replacing solenoid valve

The two solenoid valves (2) regulate the CO_2 supply via the two external connections.

1. Disconnect the mains plug.
2. Interrupt CO_2 supply at the gas bottle.
3. Remove the top panel (see page 9).
4. Undo the tube connections (1) on the solenoid valve (2) and pull off tubes (3).
5. Unplug the connection leads (4).
6. Undo the two side screws (5) on the mounting bracket and remove the pump (6).
7. Screw a new solenoid valve onto the mounting bracket.
8. Connect the leads.
9. Push on the tubes and screw tight.
10. Re-assemble the top panel; connect the mains plug and turn on the CO_2 supply with primary pressure of approx.1 bar.

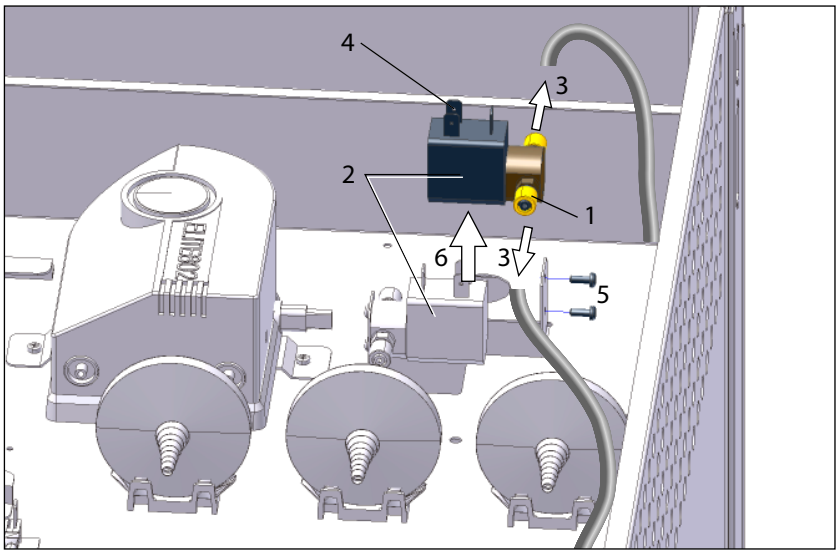


Fig. 39 Replacing solenoid valve
1 Undo the tube connections
2 Solenoid valves
3 Pull off tubes
4 Unplug connection leads
5 Undo the screws on the mounting bracket
6 Remove the solenoid valve upwards

Spare part	Spare part number
Solenoid valve 24 V	E05232

13.4 CO_2 tube connections

Caution:
The tubes (4) between the gas bottle connections on the rear of the appliance (3) and the solenoid valves (1) must withstand the maximum CO_2 gas pressure. Only a special pressure tube may be used here. All tube connections must be secured with a safety catch.

Replacement

1. Disconnect the mains plug.
2. Switch off the gas supply.
3. Remove the top panel (see page 9).
4. Undo the tube connections (2) and remove the CO_2 tube.
5. Put on a new tube and screw it tight.
6. Re-attach the top panel.

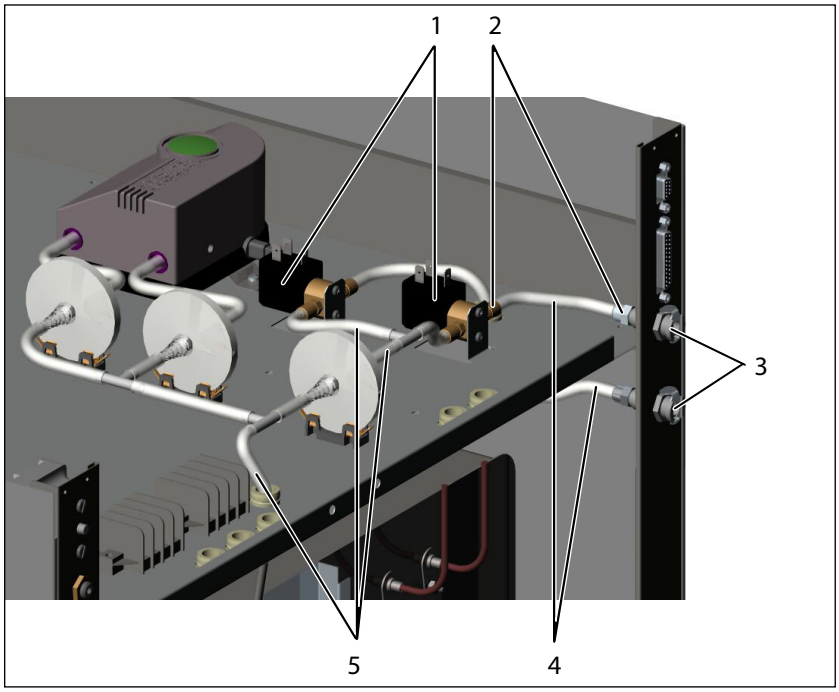


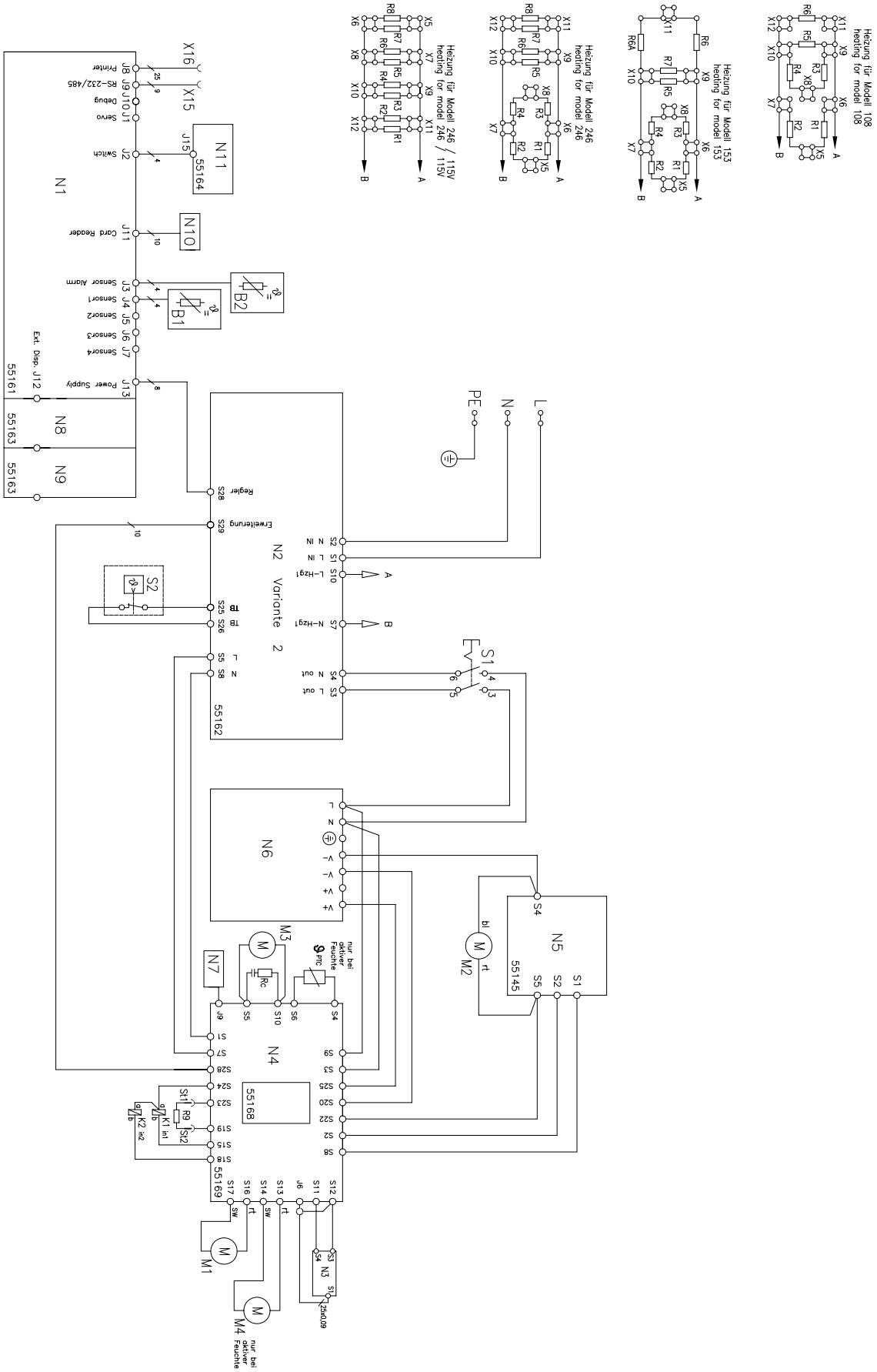
Fig. 40
1 Solenoid valves
2 Tube connections
3 Connections for gas supply
4 Pressure tube (not temperature resistant but pressure resistant)
5 Silicon tube (max. 200 °C temperature resistant)

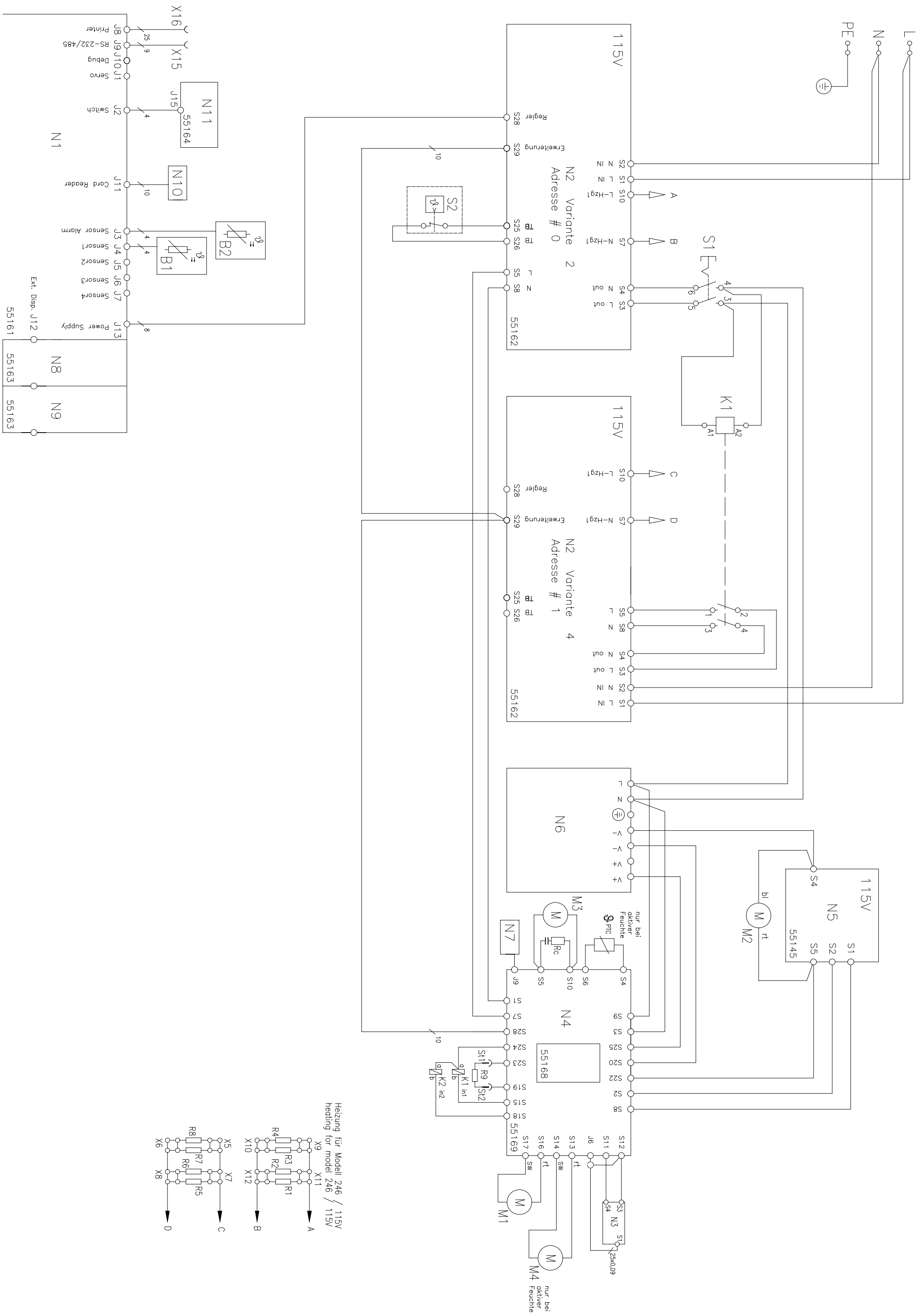
Spare part	Spare part number
Pressure tube (4)	R00258
CO_2 gas tube	R00201

13.5 Replacing CO_2 sterile filter

See page 24.

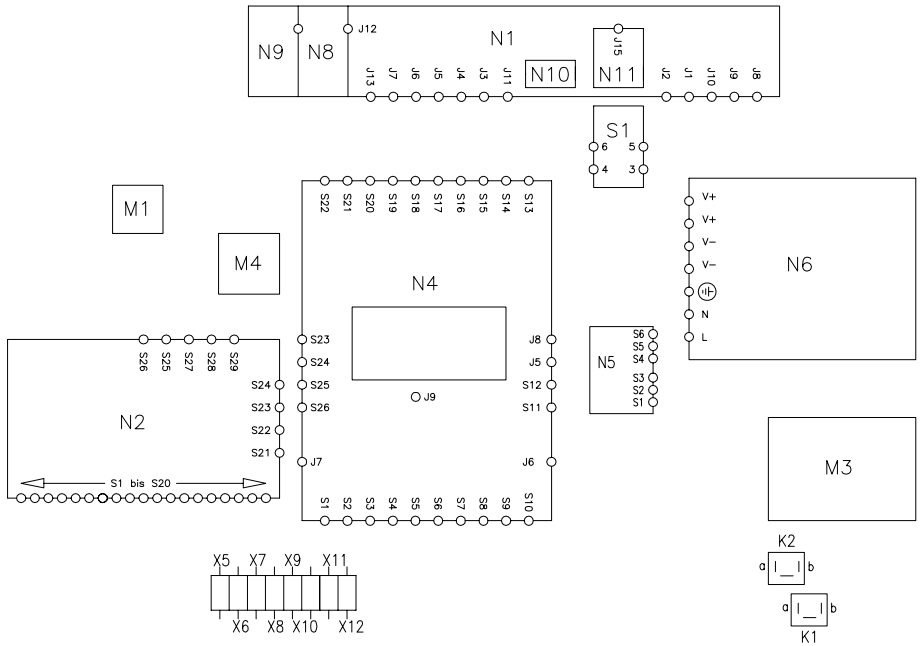
14. Circuit diagrams




L
N
PE
115V
N2 Variante 2
Adresse # 0
55162
N2 Variante 4
Adresse # 1
N1
N4
N5
N6
N7
N8
N9
N10
N11
55164
55161
55163
55168
55169
55145
K1
S1
S2
B1
B2
M1
M2
M3
M4
N3
Heizung für Modell 246 / 115V
heating for model 246 / 115V

GERÄTELISTE		INSTRUMENTATION		Nummer/ number
B1	Temperaturfühler Pt100 (Glas, Teflon)	B1	temp.–sensor Pt100 (glass, Teflon)	E04956
B2	Temperaturfühler Pt100 (Glas, Teflon)	B2	temp.–sensor Pt100 (glass, Teflon)	E04956
K1	Magnetventil, Kuhnke 65.111/24 V	K1	magnet valve, Kuhnke 65.111/24 V	B03486
K2	Magnetventil, Kuhnke 65.111/24 V	K2	magnet valve, Kuhnke 65.111/24 V	B03486
M1	Membranpumpe	M1	diaphragm pump	E03604
M2	Lüfter M2G045–BA17–XA	M2	fan M2G045–BA17–XA	E02845
M3	Pumpe Elite 802	M3	pump Elite 802	E03660
M4	Schlauchpumpe	M4	hose pump	E00234
N1	Elektron. Temp.–Regler 55161	N1	electronic controller 55161	–
N2	Leistungsteil 55162	N2	power pack 55162	–
N3	CO2–Sensor 55148	N3	sensor for CO2 55148	–
N4	CO2–Regler 55168, 55169	N4	CO2–controller 55168, 55169	–
N5	Lüfternetzteil 55145	N5	fan power pack 55145	–
N6	Schaltnetzteil SP200	N6	power pack SP200	E04016
N7	Feuchtesensor	N7	sensor for humidity	–
N8	Erweiterungskarte 55163	N8	55163	
N9	Erweiterungskarte 55163	N9	55163	
N10	Kartenleser	N10	cardreader	
N11	Sensorleiterplatte 55164	N11	sensor for main switch 55164	
S1	Hauptschalter	S1	main switch	–
S2	Temperaturbegrenzer	S2	overtemperature limiter (TB)	E05123
RC	RC–Glied	RC	RC–module	–
St1	Kontaktstecker Türheizung	St1	contact connector doorheating	–
St2	Kontaktstecker Türheizung	St2	contact connector doorheating	–
X1–X12	Klemmen für Verdrahtung	X1–X12	conector for wiring	–
X15	SUB–D Buchse 9–polig	X15	9 channel socket connector	E02381
X16	SUB–D Buchse 25–polig	X16	25 channel socket connector	E02777
PTC	PTC–Heizelement	PTC	heating element	–

Heizung heating	Modell / model 108 l	Modell / model 153 l	Modell / model 246 l
R1 Ohm	200	270	270
R2 Ohm	200	270	270
R3 Ohm	140	120	120
R4 Ohm	140	120	120
R5 Ohm	140 Front/front	290	120
R6 Ohm	150 Rückwand/back wall	60 Front/front	80 Front/front
R6A Ohm		40 Front/front	
R7 Ohm		120 Rückwand/back wall	200 Rückwand rechts/back wall right
R8 Ohm			200 Rückwand links/back wall left
R9 Ohm	12 (2x24) Tür/door	12 (2x24) Tür/door	12 (2x24) Tür/door



Schaltraum Anordnung
Ansicht von rückwärts, oben

PCB, wiring
back side, view from the top

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