BINDER
Best conditions for your success

KBF (E5.2)

Constant climate chambers with program control

Service Manual

valid for the following models of KBF

Model	order no.
KBF 115 (E5.2)	9020-0139, 9120-0139
KBF 115-UL (E5.2)	9020-0184, 9120-0184
KBF 240 (E5.2)	9020-0150, 9120-0150
KBF 240-UL (E5.2)	9020-0176, 9120-0176
KBF 720 (E5.2)	9020-0108, 9120-0108
KBF 720-UL (E5.2)	9020-0168, 9120-0168

Issue 04-2015

order no. 7001-0203

Imprint

Manufacturer:

BINDER GmbH

Address	Post office box 102
	D-78502 Tuttlingen
Tel.	+49 7462 2005 0
Fax	+49 7462 2005 100
Internet	http://www.binder-world.com
E-mail	info@binder-world.com
Service Hotline	+49 7462 2005 555
Service Fax	+49 7462 2005 93 555
Service E-Mail	service@binder-world.com
Service Hotline USA	+1 866 885 9794 or +1 631 224 4340 x3
Service Hotline Asia Pacific	+852 390 705 04 or +852 390 705 03
Service Hotline Russia and CIS	+7 495 988 15 16

The reproduction, distribution and utilization of this document as well as the communication of its content to others without explicit authorization are prohibited. Offenders will be held liable for the payment of damages.

All rights reserved in the event of the grant of a patent, utility model or design.

BINDER GmbH, 2015

Table of content

1 Preface 6
1.1 General guidelines 6
1.2 Syntax 6
1.3 Safety instructions structure 7
1.3.1 Safety instructions structure 7
1.3.2 Warning levels 7
1.3.3 Safety symbol 8
1.3.4 Warning symbols 8
1.3.5 Imperative symbols 8
1.3.6 Information symbol 8

2 General safety instructions 9
2.1 Qualification of service personnel 9
2.2 Dangers 10

3 Maintenance 12
3.1 Safety check acc. to DIN VDE 0701-0702 17

4 Troubleshooting 18
4.1 General electrical faults 19
4.2 Faults of the heating system 21
4.3 Faults of the cooling system 23
4.4 Functional check of the cooling system 25
4.5 Errors in the humidification module 27

5 Repair work at the housing 34
5.1 Replacing the housing cover at the lower front 34
5.2 Replacing the pen recorder (*-14P1*) 35
5.3 Replacing the rear panel 36
5.4 Replacing the silicone access port 37
5.5 Replacing the castors 39

6 Repair work at the outer door 41
6.1 Aligning the outer door 41
6.1.1 Aligning the door hinges 41
6.1.2 Aligning the adjustable door holder lug with pulley 42
6.2 Checking and replacing outer door components 43
6.2.1 Dismounting the interior side of the outer door 43
6.2.2 Replacing the door hinge cover 45
6.2.3 Checking and replacing the interior side of the outer door 46
6.2.4 Replacing the door 48
6.2.5 Replacing the door contact switch (*-3S1*) 49
6.2.6 Replacing the outer door gasket 50
6.3 Replacing the triangle instrument box 51
6.3.1 Dismantling the instrument box 51
6.3.2 Replacing of components of the triangle instrument box 52
6.4 Replacing the closing device of the outer door 54

7 Repair work at the inner and outer chamber 56
7.1 Replacing the glass door 56
7.2 Replacing the closing device of the glass door 57
7.3 Replacing the glass door gasket 58
7.4 Replacing the fan *(-4M1*) 59
7.5 Replacing the frame gasket 62
7.6 Checking and replacing the frame heating wire (*-4E3*) 63
7.7 Replacing the inner chamber and the gaskets between the inner and the outer chamber 64
7.8 Testing and replacing the heating element (*-4E1*) 66
7.9 Checking and replacing the inner chamber Pt 100 temperature sensor (*-3B1*) 69
7.10 Checking and replacing the humidity sensor and the sensor board (*-3B2*) 71
7.11 Replacing the temperature fuse 110°C / *230°F* (*-1F2*) 74

8 Repair work at electric and electronic components 75
8.1 Activating and replacing the miniature circuit breaker (*-1F1*) 76

8.2 Replacing the power cord with plug 77
8.3 Replacing the line filter (*-1Z1*) 78
8.4 Checking and replacing the main switch (*-1S1*) and the humidity switch (*-8S1*) 79
8.5 Removing the electric mounting plates from the machine room 80
8.6 Components of the electric mounting plate (standard) 82
8.7 Components of the electric mounting plate (optional plate) 83
8.8 Controller MB1 I/O Board (*-3N2*) 84
8.8.1 Replacing the controller MB1 I/O Board (*-3N2*) 85
8.9 Replacing the controller display *(-3N1)* 85
8.10 Replacing individual mTRON relay modules 86
8.11 Replacing the RS422 / Ethernet converter (*-2U1*) 88
8.12 Replacing the 24 V power supply unit (*-2T1*) 89

9 Humidifying and dehumidifying system 90
9.1 Variant A 93
9.2 Variant B 104

10 Repair work at the cooling system 114
10.1 General information 114
10.2 Required tools for repairing the cooling system 114
10.3 Replacing the condenser fan 115
10.4 Replacing the capillary tubes 116
10.5 Checking the step motor valve (*-7Y3*) 117
10.6 Interface board IB3 (*-7N1*) for step motor valve 118
10.7 Overview cooling cycle 119

11 Calibrating and adjusting the temperature and humidity control 120
11.1 General execution of the calibration 120
11.2 Calibrating and adjusting points 121
11.2.1 Calibrating and adjusting point of the temperature control 121
11.2.2 Calibrating and adjusting points of the humidity control 121
11.3 Calibrating and adjusting the temperature control 121
11.3.1 Resetting the temperature controller adjustment 122
11.3.2 Calibrating the temperature controller 125
11.3.3 Adjusting the temperature controller 127
11.4 Setting the door heating correction 129
11.5 Calibrating and adjusting the humidity controller 130
11.5.1 Resetting the humidity controller adjustment 130
11.5.2 Calibrating the humidity controller 131
11.5.3 Adjusting the humidity controller 133

12 Spare parts 134

13 Parts subject to wear 138

14 Revision history 138

1 Preface

1.1 General guidelines

This service manual describes the maintenance, the trouble shooting, the repair, the calibration and the adjustment of the KBF 115, 240 and 720 (E5.2). It is aimed at service personnel who should maintain, repair, calibrate and adjust the KBF

The repair of the cooling system must only be performed by service personnel having specialized training as cooling technician and special tools must be available.

References about the required qualification of the service personnel can be found in chap. 2.1.

Before starting the service work at a KBF, compare order and serial number of the unit with the validity note on the front page of this service manual.

The marking of electrical equipment and electric contacts refers to the circuit diagram of the KBF 240 (E5.2), 57121004.PRO.
The marking relates to the designation in the circuit diagram and the labeling of the components into the device. With other sizes of the device the marking can deviate. Therefore use always the appropriated circuit diagram of the device.

Additional options are indicated in the text.

The service manual of the KBF will be updated if necessary. Always use the latest version of the service manual. In case of doubt about the validity of this service manual, contact the BINDER Service Hotline (see Imprint).

All information about initial operation, normal operation, cleaning, alarm and error messages can be found in the relevant operating manual delivered with the KBF.

1.2 Syntax

Syntax	Meaning
(-1A1)	Marking of electrical equipment and electric contacts (Equipment code)
<button>	Button to be pushed
"text"	Displayed text or text to be keyed in

1.3 Safety instructions structure

This service manual employs the terms and symbols below to describe dangerous situations, in line with the harmonization of ISO 3864-2 and ANSI Z535.6.

1.3.1 Safety instructions structure

➢ Instruction how to avoid the hazard: mandatory action

∅ Instruction how to avoid the hazard: prohibition

1.3.2 Warning levels

Dangers are indicated, according to the severity and likelihood of their consequences, by a word to attract attention, with the associated warning color and any appropriate safety symbol:

DANGER!	
	Indicates an imminently hazardous situation that, if not avoided, will result in death or serious (irreversible) injury.

WARNING!	
	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious (irreversible) injury.

CAUTION!	
	Indicates a potentially hazardous situation which, if not avoided, may result in moderate or minor (reversible) injury.

CAUTION!
Indicates a potentially hazardous situation which, if not avoided, may result in damage of the product and/or its functions or of a property in its ambiance.

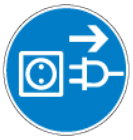
1.3.3 Safety symbol

	Danger of injury. Follow all the directions indicated by the safety symbol in order to avoid injury or death.

1.3.4 Warning symbols

	Danger of electric shock
	Danger of cutting injuries
	Danger of injuries by jumping off mechanical components
	Stability hazard
	Danger of scalding
	Danger of excessive humidity

1.3.5 Imperative symbols

	Pull out the power plug
	Wear protective goggles
	Wear protective gloves

1.3.6 Information symbol

	Important information

2 General safety instructions

2.1 Qualification of service personnel

WARNING!
 If the KBF is maintained or repaired incorrectly, there is a risk of malfunction which could cause harm to human beings and material damage to the equipment and samples.

CAUTION!
If the KBF is calibrated or adjusted incorrectly, there is a risk of malfunction which could cause material damage to the samples and false test results.

	The KBF should only be maintained, repaired, calibrated and adjusted by qualified persons.

To be able to carry out the service work the enforcing personnel must be qualified and familiar with the service and the operation of the KBF. Sufficient qualification is achieved by:

Electro technical training

Technical training by BINDER GmbH

Knowledge of the present service manual

Knowledge of the operating manual of the KBF to be serviced

Experience in servicing environmental simulation chambers for constant climates

Maintenance, repair and inspection of the cooling system must be performed by trained personnel, that has a certification in accordance with EC Regulation 303/2008 and expert knowledge in accordance with EN 13313:2010.

All work on the cooling system (repairs, inspections) must be recorded in the associated plant log book.

	The KBF units are operated with R 134a refrigerant. The amount of refrigerant may differ due to technical reasons. The amount of refrigerant for a unit is specified on its type plate and the flow chart of the refrigeration cycle.

	Refrigerant R 134a must not enter the environment. Before opening the cooling cycle, have the refrigerant sucked off in a professional way and disposed of according to the international regulations.

2.2 Dangers

DANGER!



Danger of electric shock.

Danger to life.

- ➢ The unit must be switched off and disconnected from the power supply prior to performing most of the described service tasks.
- ➢ Take all precautionary measures that a unit which is disconnected from the power supply will not be inadvertently connected to the power supply.
- ➢ The unit must be live to perform some of the service tasks.
  In this case, a second person must be present who is able to switch off the unit in case of emergency.

DANGER!



Danger of electric shock.

Danger to life.

The humidification module is supplied with electrical tension event if the humidity switch is switched off.

- ∅ Any service tasks at the humidification module must only be performed if the KBF is disconnected from the power supply.
- ➢ Disconnect the unit from the power supply, prior to performing repairs at the humidification module.

CAUTION!



Danger of cutting injuries by sharp edges.

- ➢ Wear protective gloves against cutting injuries during mounting and dismantling of inner chamber parts because the sheet metal components are sharp-edged.

CAUTION!



Danger of damaging the electronics.

Circuit boards might be damaged by handling malpractices and touching of its components.

- ➢ Prior to work at electronic components the technician must take appropriate protective measures against electrostatic discharge. Wearing ESD shoes and a grounding bracelet have shown to be useful.
- ➢ Before opening the triangle instrument box the technician should at least electrostatically discharge by touching grounded metallic objects.

CAUTION!

Danger of mechanical damages.

- ∅ Never let mechanical components hang at electric cables. Electric cables are not appropriate to hold bigger components and will be damaged if you do so.

CAUTION!

Danger of water running out.

- ➢ Disconnect the waste water hose from the unit only if the main switch is switched off.
- ∅ Never disconnect the waste water hose from the unit if only the humidity switch is switched off. Even if the humidity switch is switched off, water may be pumped off the unit.

CAUTION!

Danger of malfunction and damaging the electronics.

- ➢ Prior to work at the electrical equipment check identity of the components with the aid of the wiring diagram. The order of the electrical equipment may differ from the description in this service manual.

Electrical connection

The climatic test chamber has a fixed power connection cable 1800 mm in length.

	Power plug	Tension +/-10 %	Current type	Power frequency	Unit fuse
KMF 115; KMF 240, KMF 720	Shock-proof plug	200 V to 240 V	1N~	50/60 Hz	16 Amp
KMF 115-UL KMF 240-UL KMF 720-UL	NEMA 6-20P	200 V to 240 V	2~	50/60 Hz	16 Amp

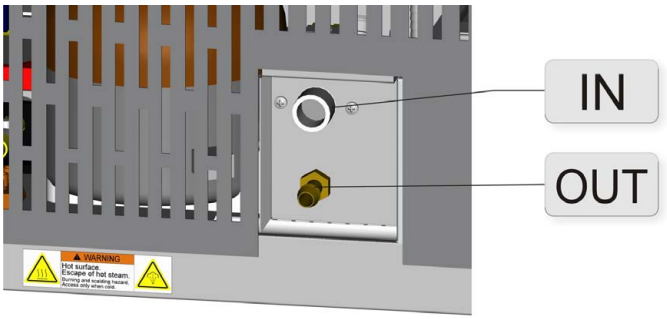
3 Maintenance

The mechanical and electronic components of the KBF must be checked and maintained at least once a year by a qualified service technician (chap. 2.1). When using tap water the maintenance interval according to amount of calcium deposit in the humidification module may be reduced to several times a year.

Maintenance schedule for the annual maintenance work

Component	Check step / Actions
Housing	
Sheet metal components	Check the housing and the inner chamber for mechanical damages and corrosion. If necessary, replace the damaged sheet metal components (chap. 7.7, page 64).
Silicone access port	Check the silicone access port for damages, tight fit in the housing wall and leakproofness. If necessary, replace the silicone access port (chap. 5.4, page 37).
Outer door	
Outer door, door hinges, lugs	Check the outer door for alignment and tight fit. Check the door hinges for well running. If necessary, align the adjustable door holder lug with pulley (chap. 6.1.2, page 42).
Instrument box	Check the triangle instrument box for tight fit and fractures. If necessary, fix or replace the instrument box (chap. 6.3, page 51).
Buttons on the instrument box	Check the function of the buttons on the instrument box by various entries (see operating manual). If necessary, replace the corresponding switch mat (chap. 6.3.2, page 52).
Outer door	Check the door for mechanical damages and corrosion. If necessary, replace the door (chap. 6.2.4 page 48).
Outer door gasket	Check the outer door gasket for wear, tight fit, and damages. If necessary, replace the outer door gasket or the frame gasket (chap. 6.2.6, page 50 and chap. 7.5, page 62).
Door contact switch (*-3S1*)	Check the door contact switch for tight fit and mechanical function. If necessary, replace the door contact switch (chap. 6.2.5, page 49).
Interior side of the outer door	Check the interior side of the door for damages by deformation and corrosion. If necessary, replace the interior side of the door (chap. 6.2.3, page 46).
Closure	Check the closure for function and well running. If necessary, replace the closure (chap. 6.4, page 54).

Component	Check step / Actions
Inner chamber and outer enclosure	
- Glass door - Closure of glass door - Glass door supports at the sides of the inner chamber	Check the glass door and the door hinges for damages. Check the door hinges for well running. Check the glass door for alignment and tight fit. If necessary, align the glass door. Check the glass door gasket. If necessary, replace the glass door gasket. Check the glass door closure. If necessary, replace the glass door closure (chap. 7.2, page 57). Check the solidity of the conglutination of the door handle and the glass door hinges. If necessary, replace the glass door (chap. 7.1, page 56).
Fan (*-4M1*)	Check the fan for damages, corrosion, function and bearing noises. If necessary, replace the entire fan (chap. 7.4, page 59).
Gaskets between the inner chamber and the outer enclosure	Check the gaskets between inner chamber and outer enclosure If necessary, replace the gaskets between the inner chamber and the outer enclosure (chap. 7.5, page 62).
Heating element (*-4E1*)	Check the resistance of the heating element. If necessary, replace the heating element (chap. 7.8, page 66).
Humidity sensor (*-3B2*)	If necessary with dirt load inside the KBF, replace the filter cap of the humidity sensor (chap. 7.10, page 71).
Machine room	
Machine room	Check the machine room for soiling, mechanical damages and corrosion. Clean the machine room from dust and similar dirt.
Electric and electronic components	
Mains plug power cord	Check the mains plug and power cord for damages. If necessary, replace the mains plug and power cord (chap. 8.2, page 77).
Main switch (*-1S1*) and Humidity switch (*-8S1*)	Check the main switch and humidity switch for mechanical damages and corrosion. If necessary, replace the main switch or the humidity switch (chap. 8.4, page 79).
RJ45 socket (*-2U1*) Interface RS 422	Check the RJ45 socket for mechanical damages and corrosion. If necessary, replace the RJ45 socket (chap. 8.11, page 88).
Electric mounting plate	Check the electric mounting plate and the components on it for soiling, damages and corrosion. If necessary, clean the electric mounting plate and the components. If necessary, replace the components on the electric mounting plate (chap. 8.6 ff, page 82). Check the components and the cables of the components on the electric mounting plate for sufficient fixing. Fix loose cables and components and replace any damaged cables.
Electronic components in the machine room	Check the electronic components in the machine room for sufficient fixing, soiling, damage, and corrosion. If necessary, replace the electronic components in the machine room (chap. 8ff, page 75). Check the cables of the electronic components in the machine room for sufficient fixing and for damages. Fix loose cables and replace any damaged cables.

Component	Check step / Actions
Humidification module variant A	
Freshwater hose, waste water hose	Check the freshwater and waste water hoses for wear, damage and leakproofness. ⇒ If necessary, replace the humidification module, chap. 9.1.6
Inlet tank and outlet tank	Check the inlet tank and outlet tank for soiling, damage and leakproofness. ⇒ If necessary, replace the humidification module, chap. 9.1.6
Steam hose, hoses of the ventilation, reflux valve	Check the steam hose and the hoses of the ventilation for wear, damages and leakproofness. Check the reflux valve for wear, damages and leakproofness. ⇒ If necessary, replace the humidification module, chap. 9.1.6
Evacuation pump (-8*M1*)	Check the evacuation pump for damages. Check the evacuation pump for function (float switch -*10S2*), Clean the evacuation pump and replace the gaskets if necessary. ⇒ If necessary, replace the humidification module, chap. 9.1.6
Water pump for steam boiler (-*9M10*)	Check the water pump for damage and soiling. ⇒ If necessary, replace the humidification module, chap. 9.1.6
Freshwater inlet valve (-*10Y1*)	Unscrew the freshwater hose and clean the connecting branch of the freshwater inlet valve. Check the freshwater inlet valve for damages. Check the freshwater inlet valve for function (float switch -*10S3*) ⇒ If necessary, replace the humidification module, chap. 9.1.6
Float switches (-*10S1*), (-*10S2*), (-*10S3*)	Check all float switches for smooth running. Check the float switches for function ⇒ If necessary, replace the humidification module, chap. 9.1.6
Steam boiler (-*9A10*)	Check the electrical connections for sufficient fixing, soiling, damage, and corrosion. Check the steam boiler from outside for leakages, wear, and damages. If necessary, replace the humidification module, chap. 9.1.6

Component	Check step / Actions
Humidification module variant B	
Freshwater hose, waste water hose	Check the freshwater and waste water hoses for wear, damage and leakproofness. ⇒ If necessary, replace the freshwater and waste water hoses.
Drain tank	Check the inlet tank and outlet tank for soiling, damage and leakproofness.
Steam hose	Check the steam hose and the hoses of the ventilation for wear, damages and leakproofness.
Freshwater inlet valve (-*Y1*)	Unscrew the freshwater hose and clean the connecting branch of the freshwater inlet valve. Check the freshwater inlet valve for damages.
Steam boiler	Check the electrical connections for sufficient fixing, soiling, damage, and corrosion. Check the steam boiler from outside for leakages, wear, and damages. ⇒ In case of lime decalcify the boiler following the instructions included in the cleaning kit.

Component	Check step / Actions
Cooling system	
Piping, dryer (*-J1, -J2*), step motor valve (*-7Y3*)	Check the tubes, especially the soldering joints, and the components of the cooling system for damages and corrosion. If necessary, have repaired the cooling system (chap. 10ff, page 114).
Insulation	Check the insulation of the cooling system for damages If necessary, seal damages of the insulation with appropriate insulating material
Compressor, condenser + fan	Check the condenser for soiling and damages. Check the compressor and the condenser and the fan for unusual noises. Clean the condenser and the fan If necessary, replace the condenser fan (chap. 10.3, page 115). If necessary, have replaced the compressor and/or condenser.
Solenoid valves (*-7Y1, -7Y2*)	Check the solenoid valves for damages and corrosion. If necessary, replace the solenoid valve coils. Check the electrical function of the solenoid valve coils according to the description in chap. 4.3, page 23.
Step motor valve (*-7Y3*)	Check the Step motor valve for function (chap. 4.4)
Safety check* (acc. to DIN VDE 0701-0702)	Check the unit for visible damages and defects. Check the protective conductor resistance and the insulation resistance as well as the protective conductor current (chap. 3.1, page 17).
Operating manual	Check if the operating manual is available (e. g. for safety instructions)
Controller	
Controller display	Check the function of the controller display by entering different menus (see operating manual). If necessary, replace the controller (chap. 8.9, page 85).
Set point setting	Key in several set points for temperature and humidity and check if the unit starts approaching this values (see operating manual). Execute a troubleshooting, if the unit does not start approaching the set points (chap. 4, page 18).
Temperature control	Calibrate the temperature controller (chap. 11, page 120). If necessary, adjust the temperature controller. If necessary, replace the Pt100 temperature sensor (chap. 7.9, page 69).
Humidity control	Calibrate the humidity controller (chap. 11, page 120). If necessary, adjust the humidity controller. If necessary, replace the humidity sensor incl. board (chap. 7.10, page 71).

* According to general technical rules, conduct a safety check acc. to DIN VDE 0701-0702 after every repair or modification of a unit.

Alternatively you can perform the safety check also with similar national standards if they contain the tests described in chap. 3.1, page 17. Independent of the standard used for the safety check, the measurement values indicated in chap. 3.1, page 17 must be reached.

3.1 Safety check acc. to DIN VDE 0701-0702

During the yearly maintenance and following repair we recommend an inspection acc. to DIN VDE 0701-0702. This inspection comprises the following points:

1. Visual inspection

   Check the unit and all electrical connecting lines visible damages and defects.

   Replace damaged parts and electrical connecting lines.

2. Measuring the protective conductor resistance

   The protective conductor resistance is measured between the grounding contacts of the mains plug and several different, electrically conductive spots of the housing.

   The measuring current for measuring the resistance must be at least 0.2 Amp.

   The protective conductor resistance must not exceed the value 0.3 Ω.

   Possible causes of error: corroded connections, no electrically conductive measuring spots due to lacquer or dirt.

   Cause removal: Clean connections or make the measuring spots metallically bare.

3. Measuring the insulation resistance

   The insulation resistance is measured between one conduct and several different, electrically conductive spots of the housing. All switches must be closed during the measurement. The resistance must not fall below the value 0.3 MΩ.

   When measuring, make sure that the unit is not dirty or wet. If the measured resistance value is too low, we recommend drying thoroughly the unit and repeating the measurement.

4. Measuring the protective conductor current

   The protective conductor current is the current that flows through the protective conductor when the unit is switched on. All switches must be closed during the measurement.

   Set the following set-point values:

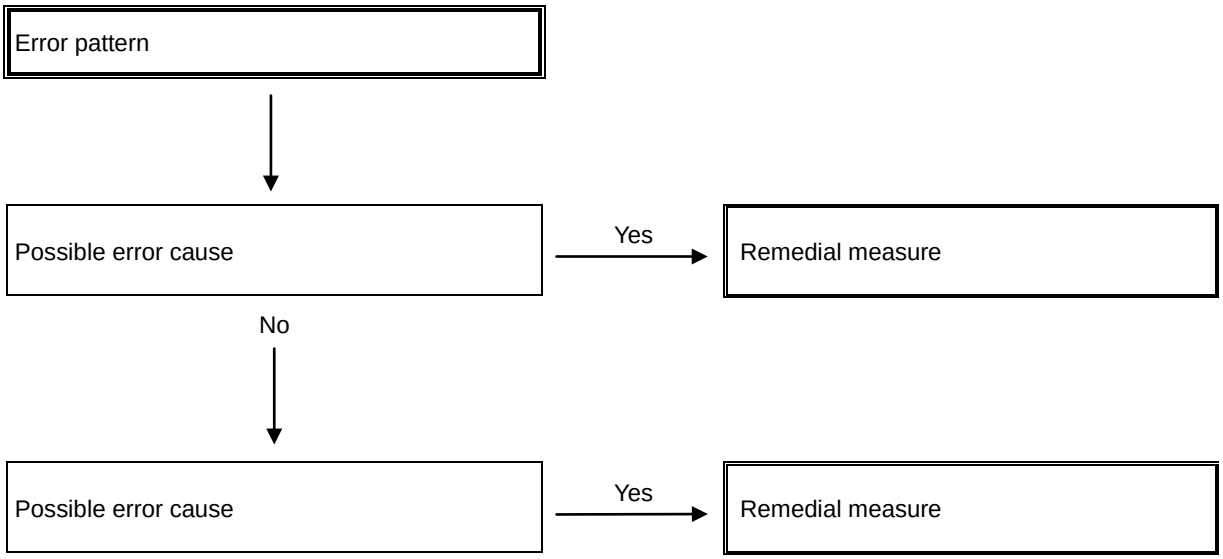
   - Temperature +90°C / *194°F*
   - Humidity 90% RH

   The measurement is effected at all possible plugging positions of the mains plug. The protective conductor current must not exceed 3.5 mAmp. If the current is exceeded, a possible cause may be bad insulation or short-circuit of a coil. Coils exist e.g. in fans, mains supply units, motors, solenoid valves, and relays. By temporary electrical uncoupling of the corresponding parts, you can identify and localize possible sources of error.

4 Troubleshooting

	Alarm and error messages as well as basic measures the operator himself may take to clear them are described in the KBF operating manual. Please make sure these measures have been tried before looking further for any other possible error causes.

The troubleshooting diagrams below are built up as follows:



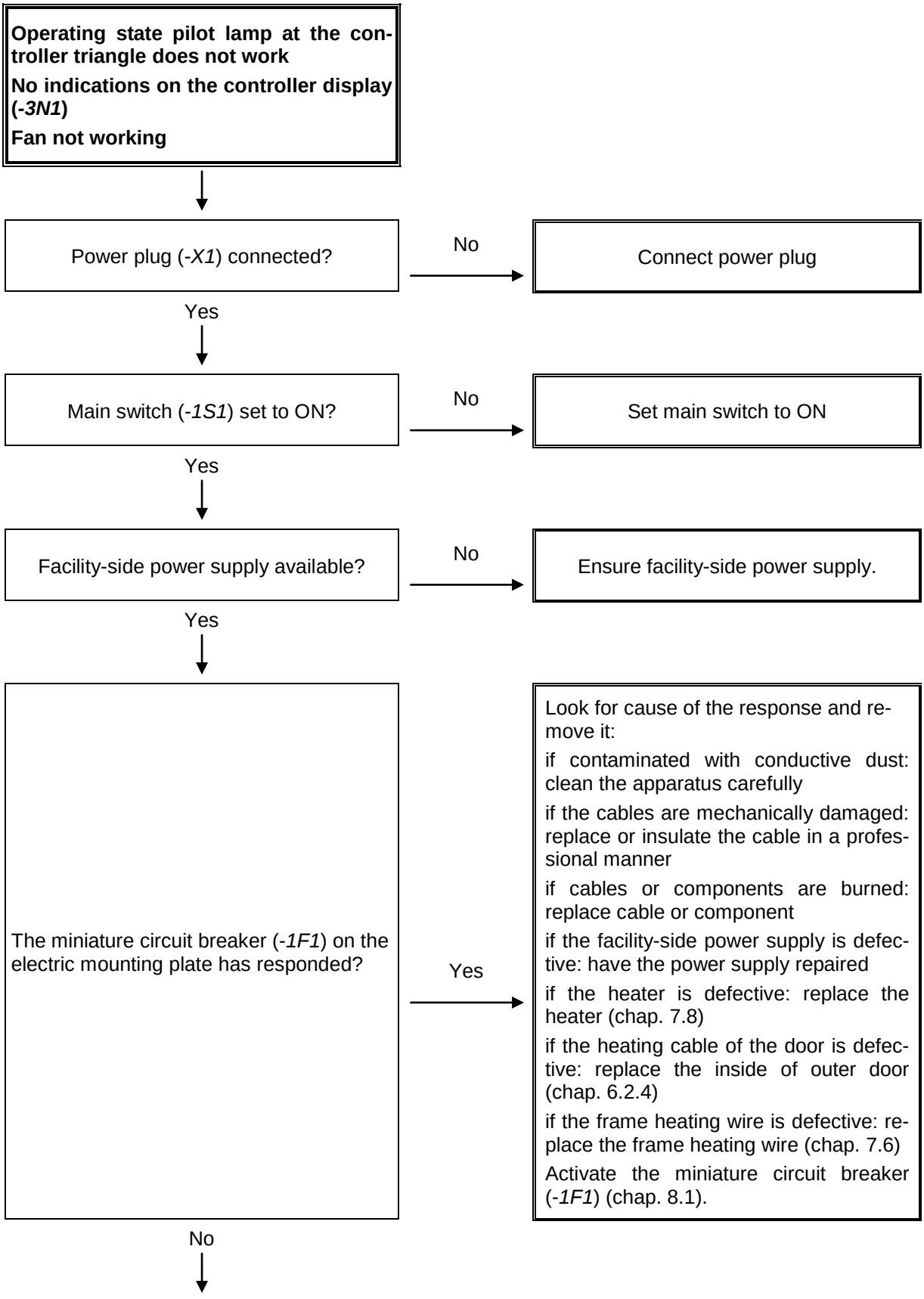
Faults should be found by replacing components of the unit. Usually that will be the fastest method of troubleshooting.

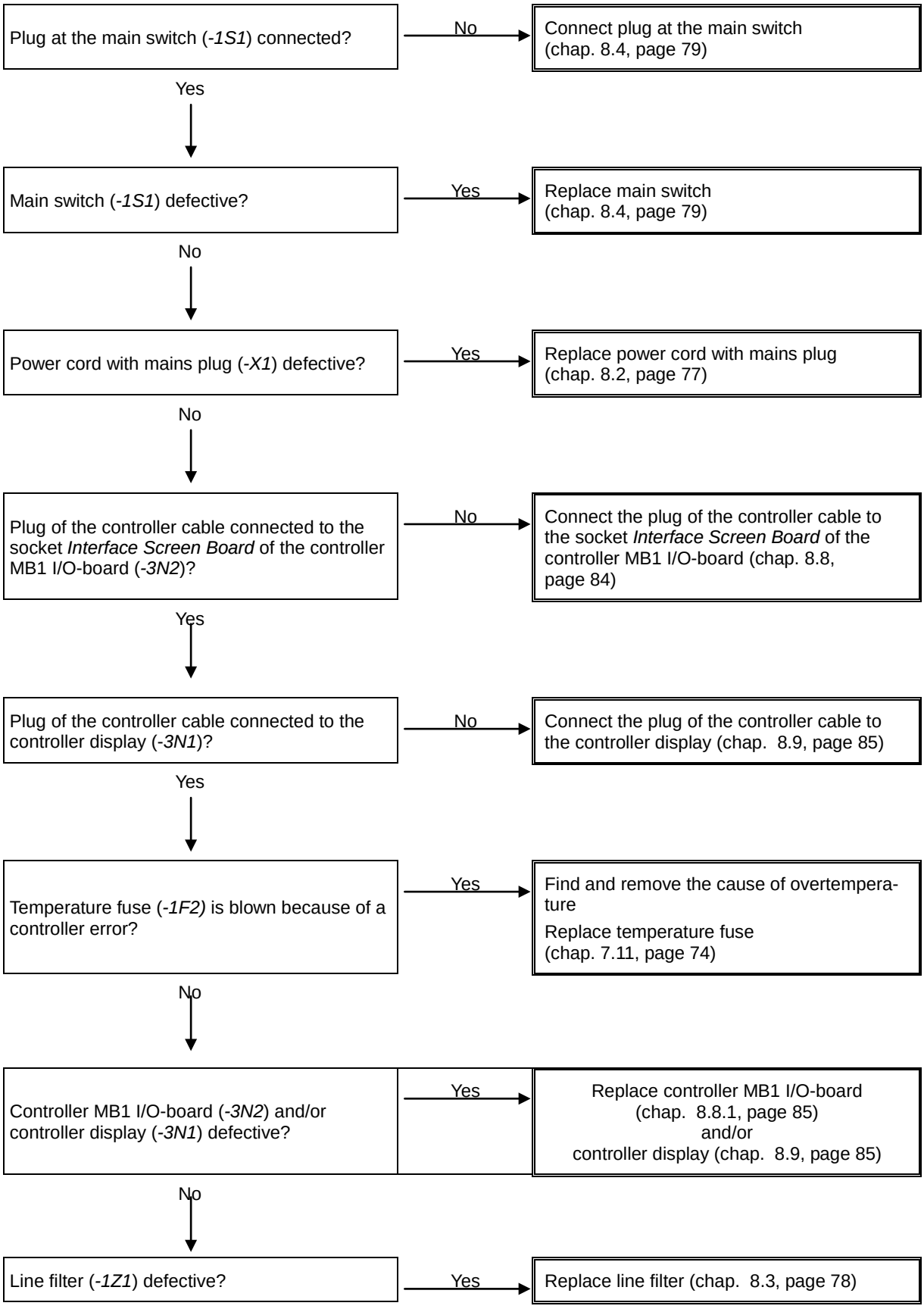
The sequence of the columns describing potential causes for errors, and the remedial actions to clear the described error patterns, is mainly intended to facilitate basic error diagnosis and clearance. So it is recommended to work your way from top to bottom of the diagrams.

Notations between brackets and in italics, e.g. (*-1S1*), behind a component refer to the respective equipment codes for this component, as specified in the wiring diagram, and in labels on some parts inside the apparatus.

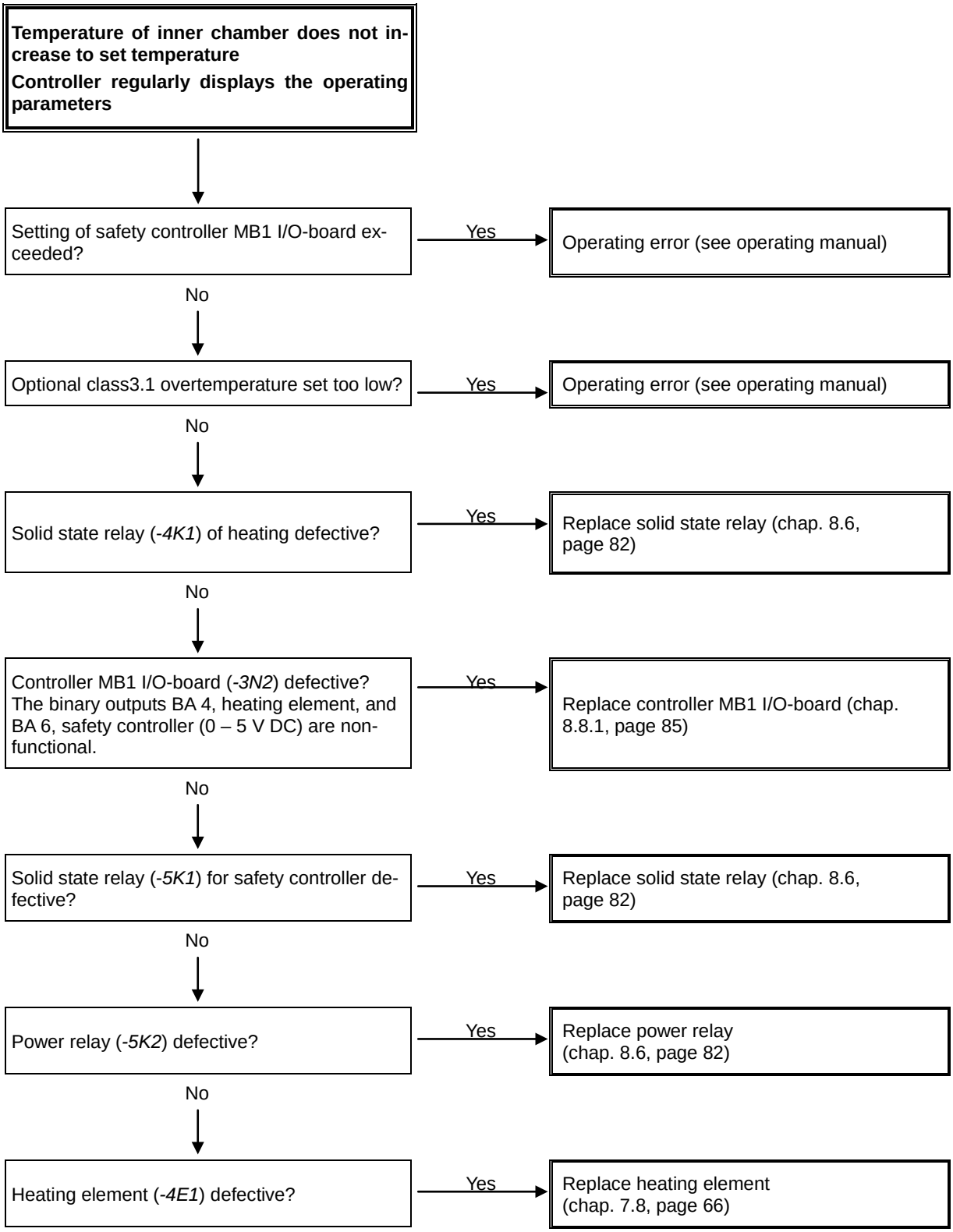
	Observe the safety instructions during service diagnosis! When repairing the unit, switch it off and disconnect it from the power supply.

4.1 General electrical faults




Plug at the main switch (-1S1) connected?
No
Connect plug at the main switch (chap. 8.4, page 79)
Yes
Main switch (-1S1) defective?
Yes
Replace main switch (chap. 8.4, page 79)
No
Power cord with mains plug (-X1) defective?
Yes
Replace power cord with mains plug (chap. 8.2, page 77)
No
Plug of the controller cable connected to the socket Interface Screen Board of the controller MB1 I/O-board (-3N2)?
No
Connect the plug of the controller cable to the socket Interface Screen Board of the controller MB1 I/O-board (chap. 8.8, page 84)
Yes
Plug of the controller cable connected to the controller display (-3N1)?
No
Connect the plug of the controller cable to the controller display (chap. 8.9, page 85)
Yes
Temperature fuse (-1F2) is blown because of a controller error?
Yes
Find and remove the cause of overtemperature
Replace temperature fuse (chap. 7.11, page 74)
No
Controller MB1 I/O-board (-3N2) and/or controller display (-3N1) defective?
Yes
Replace controller MB1 I/O-board (chap. 8.8.1, page 85) and/or controller display (chap. 8.9, page 85)
No
Line filter (-1Z1) defective?
Yes
Replace line filter (chap. 8.3, page 78)

4.2 Faults of the heating system



At the binary output BA 4 of the controller MB1 I/O-board (*-3N2*) there must be a voltage of +5 V DC. At the same time, the safety controller output BA 6 on the controller MB1 I/O-board must put out a voltage of +5 V DC. The solid state relays (*-4K2*) and (*-5K1*) and the power relay (*-5K2*) must have picked up.

Condensation on the glass door and / or the outer door

Does the outer door fit closely?
- No → Adjust the outer door (chap. 6.1, page 41)
- Yes ↓

Outer door gasket and / or glass door gasket defective?
- Yes → Replace outer door gasket and / or glass door gasket (chap. 6.2.4, page 49 and chap. 7.5, page 62)
- No ↓

Solid state relay (*-4K2*) defective?
⇨ Door heating and frame heating without function
- Yes → Replace solid state relay, (chap. 8.6, page 82)
- No ↓

Power relay (*-5K2*) defective?
⇨ Complete heating without function
- Yes → Replace power relay (chap. 8.6, page 82)
- No ↓

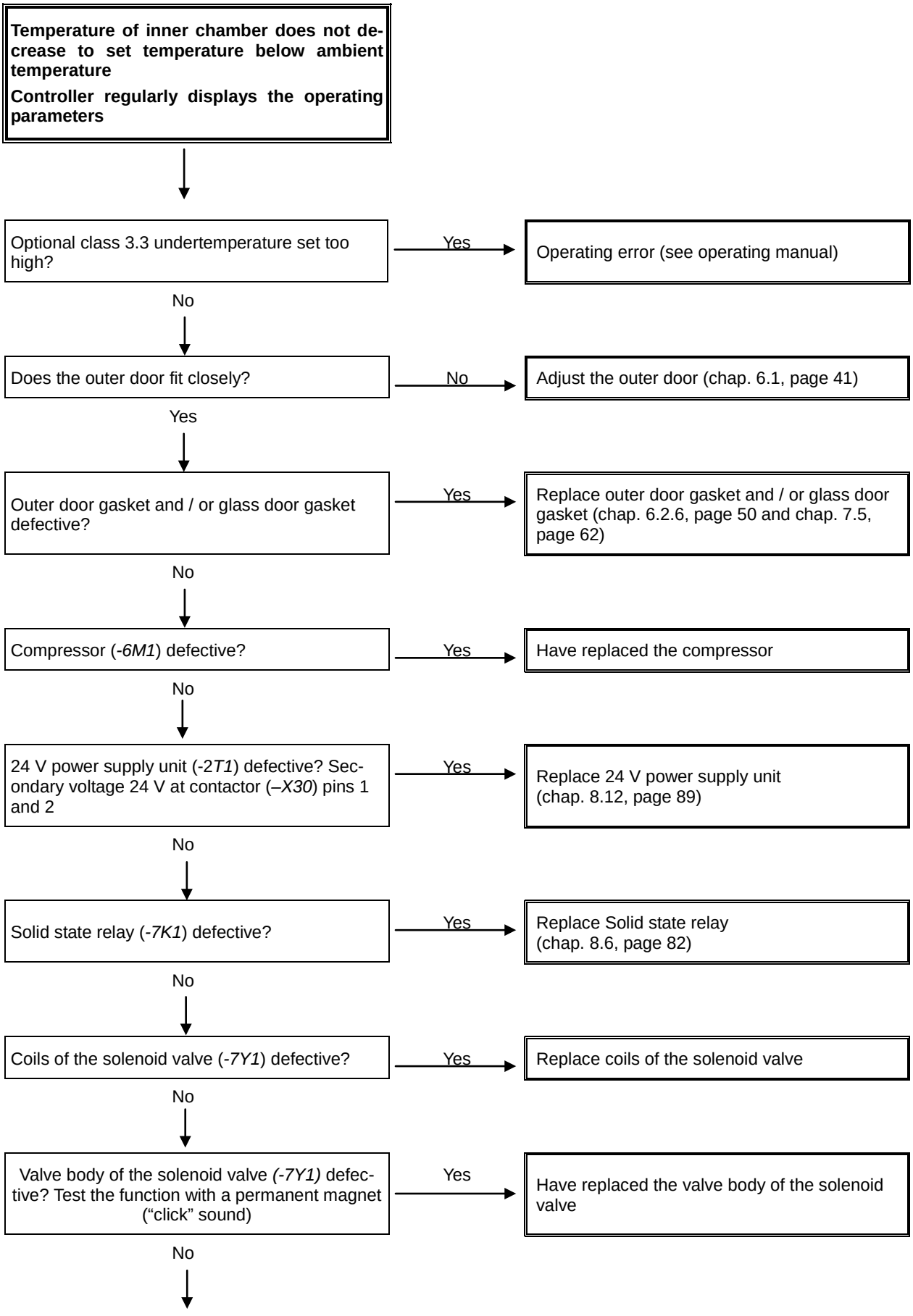
Door heating cable (*-4E2*) defective?
Measure resistance at contactor *(–X50*) pins 1 + 2.
- Yes → Replace interior side of outer door (chap. 6.2.3, page 46)
- No ↓

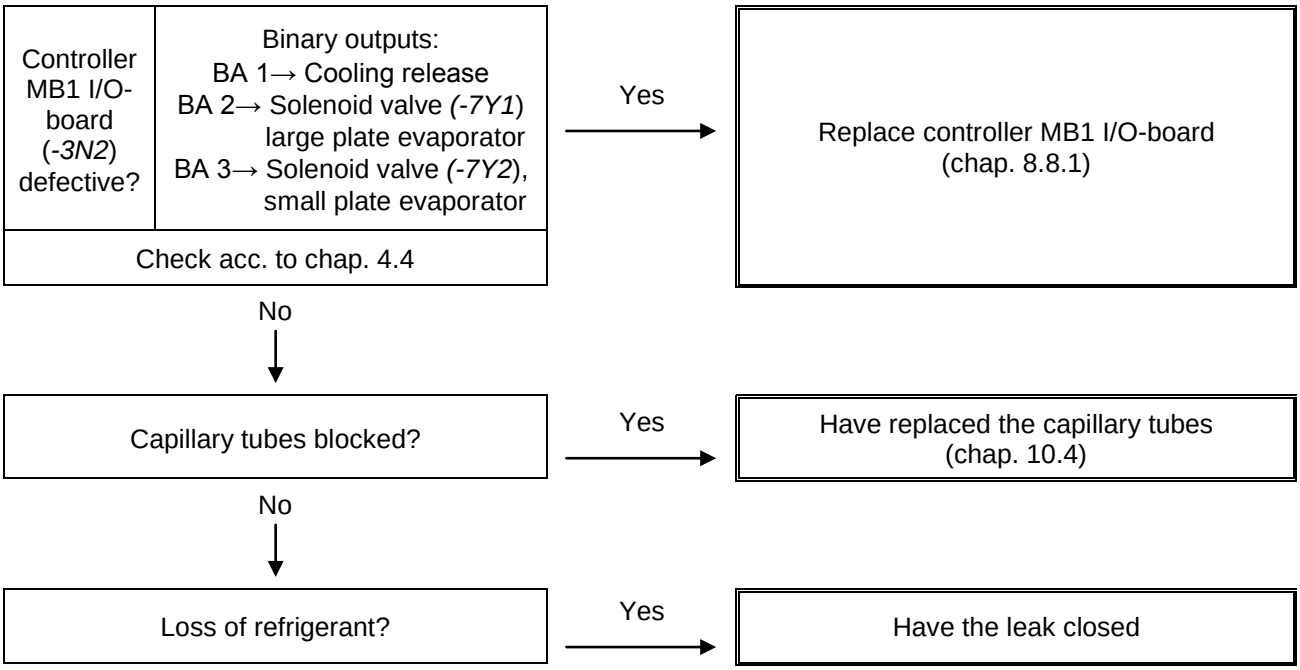
Frame heat conductor (*-4E3*) defective?
Measure resistance at contactor *(–X50*) pins 3 + 4
- Yes → Replace frame heat conductor (chap. 7.6, page 63)
- No ↓

Controller MB1 I/O-board (*-3N2*) defective?
The binary output BA 4 (0 - 5 V DC) is non-functional.
- Yes → Replace controller MB1 I/O-board
- No ↓

Temperature sensor Pt 100 (*-3B3*) in the interior side of the outer door defective? (Connection to E2 on controller MB1 I/O-board). Check the temperature sensor (chap. 6.2.3, page 46)
- Yes → Replace interior side of outer door (chap. 6.2.3, page 46)

4.3 Faults of the cooling system




Controller MB1 I/O-board (-3N2) defective?
Binary outputs:
BA 1→ Cooling release
BA 2→ Solenoid valve (-7Y1) large plate evaporator
BA 3→ Solenoid valve (-7Y2), small plate evaporator
Yes
Replace controller MB1 I/O-board (chap. 8.8.1)
Check acc. to chap. 4.4
No
Capillary tubes blocked?
Yes
Have replaced the capillary tubes (chap. 10.4)
No
Loss of refrigerant?
Yes
Have the leak closed

4.4 Functional check of the cooling system

To test the function of the cooling system you can use the following functions tables.

During program course use a multimeter to measure the output signal at the analog output **AA1** (pins 17 and 18) of the controller MB1 I/O-board (*-3N2*).

The clocking of the corresponding valves can be detected by the corresponding LED.

The values given under **X** indicate the start values. The values given under **W** indicate the target values to be triggered. The target values must not be reached for the test, it is sufficient to watch them during the first five minutes.

Humidity switch (*-8S1*) ON

Temperature / Humidity	Solenoid valve (***-7Y1***), Binary output **BA2** on controller MB1 I/O-board, **large** evaporator	Solenoid valve (***-7Y2***), Binary output **BA3** on controller MB1 I/O-board, **small** evaporator	Analog output **AA1** on controller MB1 I/O-board, controller cooling
X: Temperature: 20°C to 25°C *68°F to 75°F* Humidity: < 95 % r.H. **W:** Temperature: 10°C / *50°F* Humidity: 95 % r.H.	Clocking on / off 2 / 15 seconds	Clocking on / off 2 / 15 seconds	According to regulation ratio of temperature initially ≤ 5 V DC gradually decreasing if X=W then 0 V
X: Temperature: 20°C to 25°C *68°F to 75°F* Humidity: 50 % r.H. **W:** Temperature: 10°C / *50°F* Humidity: 0 % r.H.	Clocking at least 1 minute on / off 2 / 15 seconds then completely “OFF”	Clocking on / off 2 / 15 seconds	According to regulation ratio of temperature and humidity initially ≤ 5 V DC gradually decreasing if X=W then 0 V
X: Temperature: 20°C to 25°C *68°F to 122°F* Humidity: < 50 % r.H. **W:** Temperature: 50°C / *122°F* Humidity: 95 % r.H.	“OFF”	Clocking on / off 2 / 15 seconds	near 0 V

See also chap. 10.5, “checking the step motor valve”.

When cooling or dehumidifying, the compressor (*-6M1*) is operating continuously. So is the condenser. Please check the condenser at its fan wheel, which must continuously operate to carry off the heat. In standard case the injection points (a → cooling) and (b → dehumidification) (Figure 59) of the capillary tubes are cold. Otherwise, the flow of the refrigerant is disturbed.

Possible causes:

- Solenoid valve (*-7Y1*) for cooling closed
  Check the function of the valves by switching off the humidity switch (*-8S1*) (chap. 4.4).
- Solenoid valve (*-7Y2*) for dehumidification closed
  Check the valve by switching on the humidity switch (*-8S1*), heating the unit and dehumidifying at the same time. During regulation, the valve must be open.

If no deviation of the measured values was noted at the described tests, check the cooling cycle. If the injection points a, b) of the capillary tubes are not cold, possible reasons are:

- the capillary tubes are blocked (chap. 10.4)
- loss of refrigerant in the cooling cycle

	The repair of the cooling system must only be carried out by service personnel with specialized training as cooling technician. To avoid repair attempts by unqualified personnel, repair of the cooling system is not described in this service manual.

Qualified for service and maintenance work on the cooling system is only staff that has a certification in accordance with regulation 303/2008/EC and expert knowledge in accordance with EN 13313:2010.

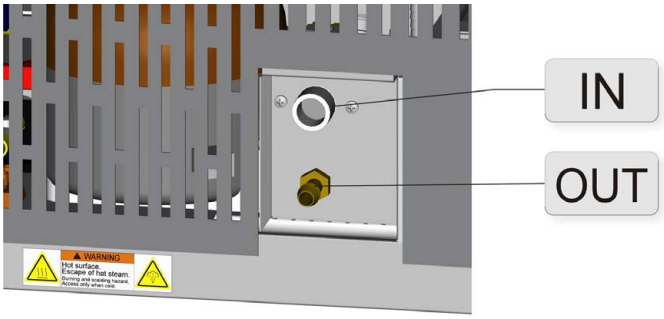
Personnel should be trained for the maintenance of the cooling system and be familiar with the content of the service manual and operating manual.

	R 134a is used as refrigerant in the KBF. The amount of refrigerant may differ due to technical reasons. The amount of refrigerant for a unit is specified on its type plate.

4.5 Errors in the humidification module

Fault localization

Humidification module variant A



- **Correct manipulation, but no steam enters the useable volume**

↓

Humidity switch (*-8S1*) defective? → Yes → Replace humidity switch (chap. 8.4)

↓ No

Steam boiler (*-9A10*) heats up? → No → See error description on next page "Steam boiler doesn't heat up"

↓ Yes

Water in the steam boiler?
Check the water level in the steam boiler by briefly opening the discharging screw (E) on the bottom side of the steam boiler.

Yes ↓

- Steam valve (*-9Y10*) does not open
  - Check the steam valve for its mechanical and electrical function, if necessary, replace the humidification module, chap. 9.1.6
- Solid state relay (*-9K1*) defective
  - Check the solid state relay (chap. 8.6) replace if necessary.
- Control of humidification module controller output BA5 on the controller MB1 I/O-board (*-3N2*) defective or controller MB1 I/O-board defective
  - Check controller output BA5 (chap. 8.8) and, if necessary, replace the controller MB1 I/O-board (chap. 8.8.1)

No ↓

- Water pump of humidification module (-9M10) defective
- - Check the electrical connection (230 V~), if necessary, replace the humidification module, chap. 9.1.6
- Calcification of boiler inlet, boiler sensor and / or of the back pressure valve
  - Decalcify as far as possible, if necessary replace components.
- Steam boiler inlet blocked
- Control board (-9N10) of the humidification module defective
- - Check the output (230 V~) to the water pump of the steam boiler (-9M10), if necessary, replace the humidification module, chap. 9.1.6.

- **The set humidity above ambient humidity is not reached**
- **The steam boiler (-9A10) does not heat up**

Humidity switch off?
Yes → Switch on humidity switch
No

No water in the inlet tank, or with option external water cans there is no water in the freshwater can
Yes → Check water inlet (tap) and fill up water.
No

Inlet valve (*-10Y1*) defective?
Yes → Replace the humidification module, chap. 9.1.6)
No

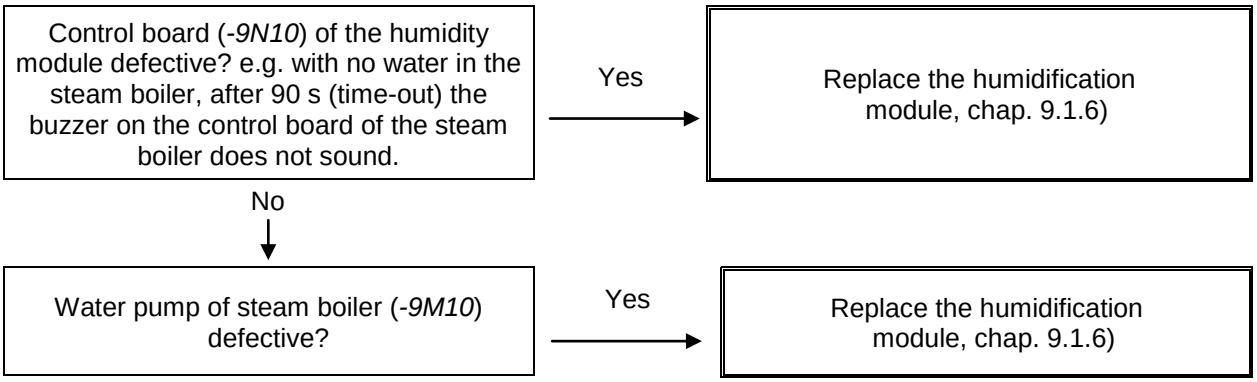
Filling level and overflow sensor (*-10S1)* in the outlet tank defective? With max. level down = switch is closed
Yes → Replace the humidification module, chap. 9.1.6)
No

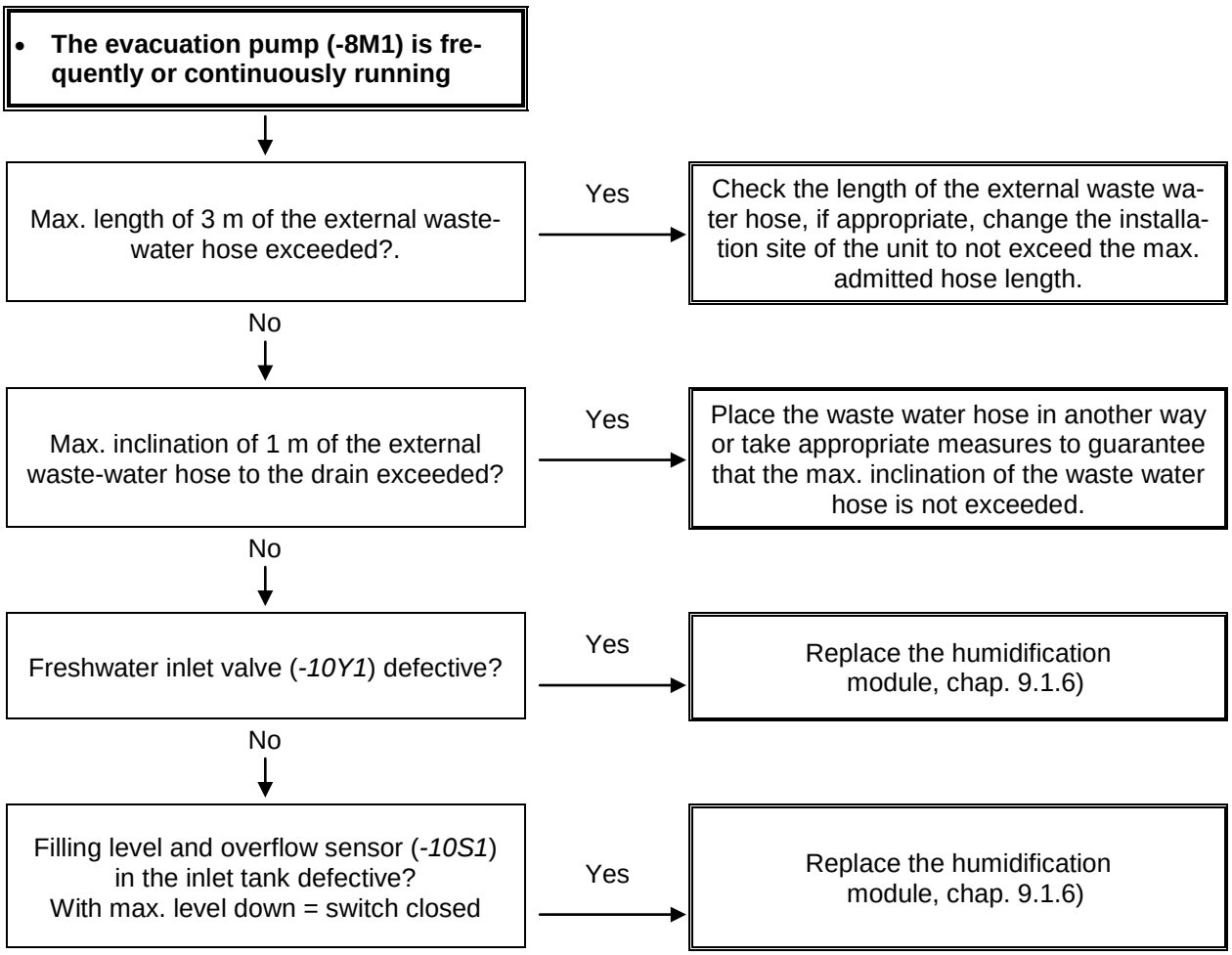
Side mounted float switch (*-10S3)* in the inlet tank defective? With enough water bent to top = switch is opened
Yes → Replace the humidification module, chap. 9.1.6)
No

Power supply to humidification module (*-9A10)* interrupted?
Yes → Check and restore power supply, connectors (*-X100, -X110*)
No

Temperature fuses defective?
Temperature fuse 160° (*-9F20*)
Temperature fuse 175° (*-9F10*)
Yes → Replace the humidification module, chap. 9.1.6)
No

Manometric switch (*-9F30*) defective?
Yes → Replace the humidification module, chap. 9.1.6)
No


Control board (-9N10) of the humidity module defective? e.g. with no water in the steam boiler, after 90 s (time-out) the buzzer on the control board of the steam boiler does not sound.
Yes
Replace the humidification module, chap. 9.1.6)
No
Water pump of steam boiler (-9M10) defective?
Yes
Replace the humidification module, chap. 9.1.6)


• The evacuation pump (-8M1) is frequently or continuously running
Max. length of 3 m of the external waste-water hose exceeded?.
Yes
Check the length of the external waste water hose, if appropriate, change the installation site of the unit to not exceed the max. admitted hose length.
No
Max. inclination of 1 m of the external waste-water hose to the drain exceeded?
Yes
Place the waste water hose in another way or take appropriate measures to guarantee that the max. inclination of the waste water hose is not exceeded.
No
Freshwater inlet valve (-10Y1) defective?
Yes
Replace the humidification module, chap. 9.1.6)
No
Filling level and overflow sensor (-10S1) in the inlet tank defective?
With max. level down = switch closed
Yes
Replace the humidification module, chap. 9.1.6)

- **The steam boiler releases steam via the safety valves through the silicon tubes into the outlet tank.**

↓

Double manometric switch (*-9F30*) defective?
Switch doesn't open even if pressure > 1.5 bar

Yes → Replace the humidification module, chap. 9.1.6)

- **The steam boiler lets off water via pressure hose with metal braiding**

↓

Union nuts of the steam boiler not tightened enough?

Yes → Tighten the union nuts of the steam boiler

No ↓

Gaskets of the union nuts of the steam boiler defective?

Yes → Replace gaskets

- **The steam boiler releases water via steam hose or via the 6 bar safety valve**

↓

Filling level electrode (*-9H10*) of the steam boiler calcified?

Yes → Replace the humidification module, chap. 9.1.6)

No ↓

Contactor of the filling level electrode (*-9H10*) of the steam boiler disconnected?

Yes → Connect the contactor

No ↓

Control board (*-9N10*) of the humidification module defective?

Yes → Replace the humidification module, chap. 9.1.6)

Error messages (chap. 9.1.8)

- **Buzzer on control board (-9N10) of the humidification module sounds**
- **Error message "HUMID ALARM" at the controller MB1 I/O-board (-3N1)**

⇨

- 90 sec time-out for filling the steam boiler exceeded
- during filling of the inlet tank more than 5 minutes have passed

↓

Water in the inlet tank?

Yes ↓

- The filling level electrode (-9H10) of the steam boiler (-9A10) is calcified
  - Replace the humidification module, (chap. 9.1.6)
- Water pump of steam boiler (-9M10) without function?
  - Check the voltage (230 V~) at the pump during rundown of the 90 sec. If voltage can be measured, the pump is defective and the humidification module must be replaced, chap. 9.1.6)
- Control board (-9N10) of the humidification module defective)?
  - If during rundown of the 90 sec no voltage (230 V~) can be measured at the water pump, the control board is defective and the humidification module must be replaced, chap. 9.1.6

No ↓

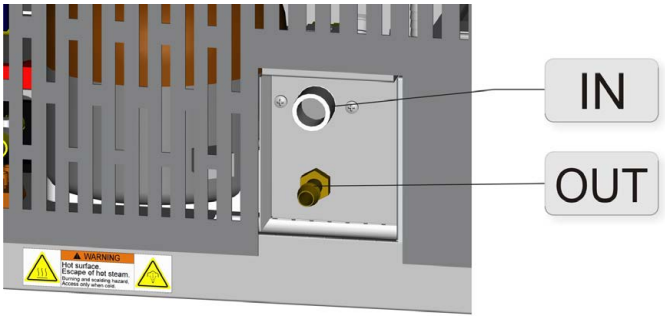
CAUTION!

The boiler heating may in case of error operate even without water in the steam boiler. There is danger of overheating. Therefore when executing longer checks, let the unit cool down in between.

- The water inlet (water tap) is closed, or with option external water can, there is no water in the freshwater can
- Solenoid valve (-10Y1) for freshwater inlet does not open?
  - Check the solenoid valve, if necessary replace the humidification module, (chap. 9.1.6)
- Side mounted float switches (-10S3) in the inlet tank defective?
  - Check the float switch for function (with no or not enough water horizontal position = switch is closed), if necessary replace the humidification module, (chap. 9.1.6)
- Filling level and overflow sensor (-10S1) in the outlet tank defective?
  - Check the sensor for function (in normal state or with not enough water the float is down = switch is closed), if necessary replace the humidification module, (chap. 9.1.6)
- Leak in the piping?
  - Check all hose clamps for tight fit. Check all hoses for perfect condition. if necessary replace the humidification module, (chap. 9.1.6)

Fault localization

Humidification module variant B



In spite of correct handling, no steam enters the inner chamber

↓

Humidity switch (*-8S1*) defective? → Yes → Replace humidity switch (chap. 8.4)

↓ No

The humidification module itself has extensive features for error detection. Please see the messages in the controller display and the LEDs on the control board of the humidification module.

On the controller display the error number can be derived from the indication “HUMID SYSTEM” following a first reset: number of flashes (1s ON / 1s OFF) with a pause of 5 seconds at the end.

The meaning of the error numbers is shown in the table below.

Number of flashes	Warning messages and error messages indicated by flashing of the “HUMID SYSTEM” indication in the controller display		
	Description		Cause / Action
1	Drain Reminder [1)]	Threshold for performing a purging is exceeded.	• Start purging by switching off/on the humidification module. → After successful purging the display is resetted automatically
2	Service Reminder [1)]	Threshold for performing a maintenance of the humidification module is exceeded.	• Perform maintenance
3	Initial Fill Timeout State10 [4)]	In the operating mode "refilling" the necessary level in the boiler cannot be achieved within 15 minutes. → Check the water supply.	• Inlet valve defective / no water • Upper float switch of the boiler defective • Steam valve defective / does not open • Leakage / water loss / drain valve does not close
4	Refill Timeout State 40 [4)]	In the operating mode "Normal Operation" the necessary level in the boiler could not be held. → Check the water supply.	• Inlet valve defective / no water • Upper float switch of the boiler defective • Leakage / water loss / drain valve does not close
5	Cylinder Level Void [4)]	Upper level float in the boiler shows ok although the lower float indicating low level. → Illegal switching combination of the float switch in the cylinder	• Upper float switch of the boiler defective • Lower float switch of the boiler defective

Continuation

6	Drain Valve Timeout State10 [3]	Functional test drain valve failed during system startup	• Upper float switch of the boiler defective • Lower float switch of the boiler defective • Steam valve defective / does not open • Drain defective / does not open
7	Thermostat [4]	Thermostat in the boiler has been tripped.	• Upper float switch of the boiler defective • Lower float switch of the boiler defective • Power controller for heater defective (Triac)
8	Drain Pump Timeout [4]	Drain tank could not be emptied within 2 minutes.	• Maximum allowable length and height of routing the drain hose exceeded. • The drain hose clogged • Drain pump defective • Lower float switch of the drain tank defective
9	Drain Short Cycle [4]	Average cycles between the drains of the drain tank too short.	• Maximum allowable length and height of routing the drain hose exceeded. • The drain hose clogged • Drain pump defective
10	Drain Level Void [4]	Upper level float in the drain tank shows ok although the lower float indicating low level. → Illegal switching combination of the float switch in the drain tank	• Upper float switch of the drain tank defective • Lower float switch of drain tank defective
11	Thermal Loss Cycle Fault [4]	In the operating state "Standby" the time-out "standby cycle" has been reached.	• Leakage / loss of steam • Defective heater • Power controller for heater defective (Triac)
12	Cylinder Level Low [1]	Security level in the cylinder falls below the short term.	— — —
13	Cylinder Level Low [4]	In the operating mode "Normal operation" the security level in the boiler has been exceeded for more than 10 minutes → Check the water supply	• Inlet valve defective / no water • Upper float switch of the boiler defective • Leakage / water loss / drain valve does not close
14	Diagnostic Steam Valve 4)	Cable break, short circuit or overheating of the coil at the steam valve	• Steam valve defective
15	Diagnostic Inlet Valve [3]	Cable break, short circuit or overheating of the coil at the inlet valve	• Inlet valve defective
16	Diagnostic Drain Valve [3]	Cable break, short circuit or overheating of the coil at the drain valve	• Drain valve defective
17	Diagnostic Drain Pump [4]	Cable break, short circuit or overheating of the coil at the drain pump	• Drain pump defective
18	Supply 24V Local [4]	24V= Voltage is outside the permissible value	— — —
19	Supply 5V Local [4]	5V= Voltage is outside the permissible value	— — —

[1] Warning without change in safety position

[2] Warning with change in safety position

[3] Error without change in safety position

[4] Error with change in safety position

CAUTION!



The boiler heating may in case of error operate even without water in the steam boiler. There is danger of overheating. Therefore when executing longer checks, let the unit cool down in between.

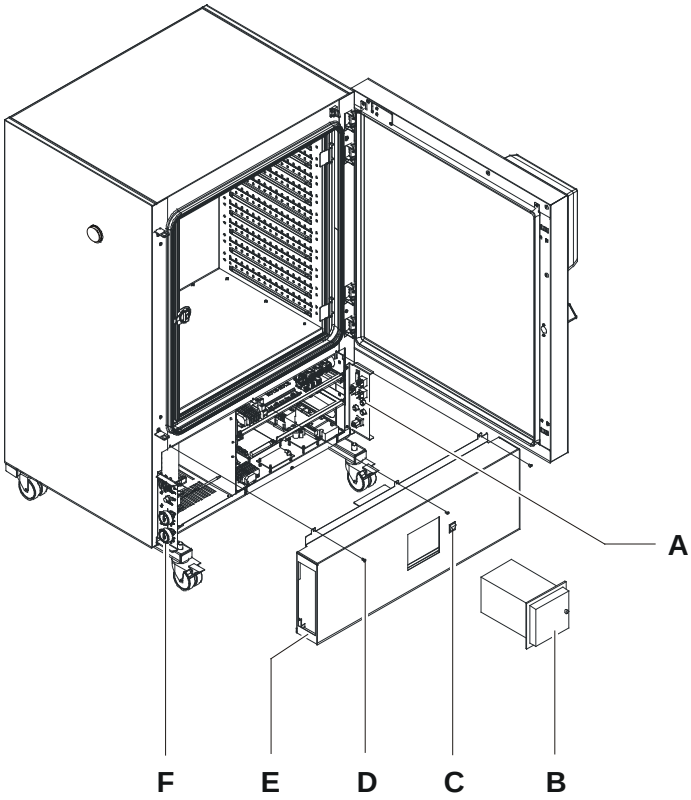
5 Repair work at the housing

5.1 Replacing the housing cover at the lower front

Spare parts:	**Housing cover** KBF standard (order no.4001-0611) KBF option temperature safety device class 3.3 (order no. 4001-0627) KBF with chart recorder (order no. 8001-0185) KBF with chart recorder with option temperature safety device class3.3 (order no. 8001-0188) **Lateral control panel right** KBF standard (order no. 8007-0279) KBF option temperature safety device class 3.3 (order no.8007-0279) **Lateral control panel left** KBF option temperature safety device class 3.3 (order no. 8007-0306)

Necessary tools:	Crosstip screwdriver, size 2

1. Disconnect the unit from the mains.
2. Unscrew the screws (D) of the housing cover (E).
3. Pull the housing cover towards the front over the lateral control panels (A, F).
   With additional option chart recorder:
   Remove the chart recorder (B) and rocker switch (C) from the housing cover (chap. 5.2, page 35).
4. Remove the housing cover from the unit.
5. Install the housing cover by following steps 1 to 4 in reverse order.



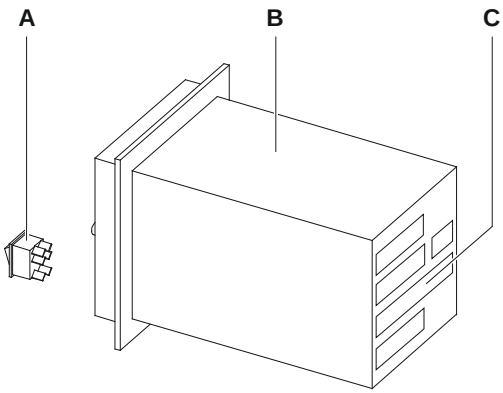
A Lateral control panel right
B Chart recorder (*-14P1*)
C Switch of chart recorder (*-14S1*)
D Screws
E Housing cover
F Lateral control panel left

Figure 1: Replacing the housing cover at the lower front

5.2 Replacing the pen recorder (*-14P1*)

Spare parts:	• 2-channel pen recorder 500d (order no. 5016-0003) • Rocker switch (2W) 230V AC (order no. 5019-0010)
Necessary tools:	• Crosstip screwdriver, size 2

1. Disconnect the unit from the mains.
2. Remove the lower housing cover at the front (chap. 5.1, page 34).
3. Remove the electrical connections of the pen recorder (C) and of the rocker switch (A).
4. Remove the holding devices and pull the pen recorder towards the front out of the housing cover.
5. Mount the pen recorder by following steps 1 to 4 in reverse order.



A Rocker switch
B Pen writer
C Electrical connections

Figure 2: Replacing the pen recorder

5.3 Replacing the rear panel

Spare parts:	Rear panel (order no. 4001-0616)
Necessary tools:	Torx screwdriver, size *T20*

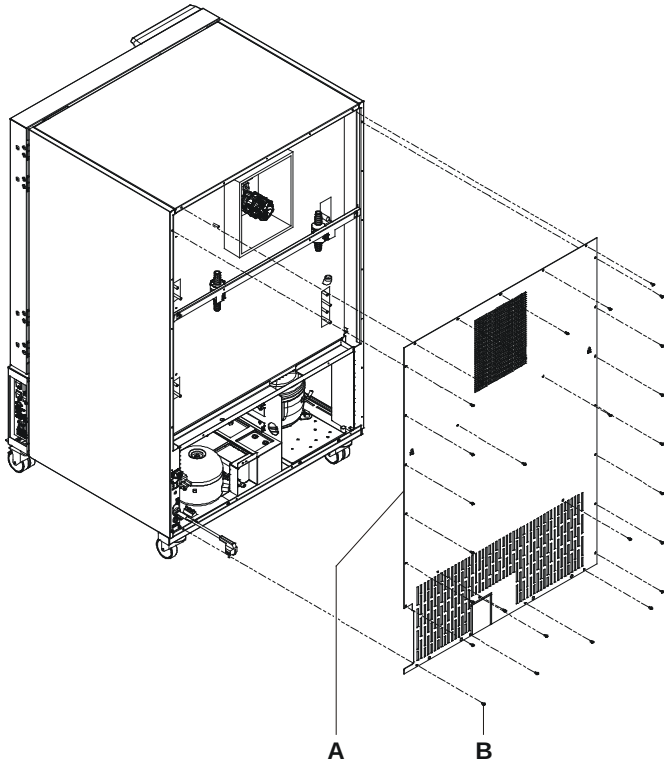
CAUTION!



Danger of cutting injuries by sharp edges!

- Wear protective gloves against cutting injuries during mounting and dismantling of inner chamber parts because the sheet metal components are sharp-edged.

1. Disconnect the unit from the mains.
2. Remove the screws (B) of the rear panel (A).
3. Hint: Remove the screws crosswise to avoid jamming of the rear panel.
4. Mount the rear panel by following steps 1 to 2 in reverse order.



A Rear panel
B Screws

Figure 3: Replacing the rear panel

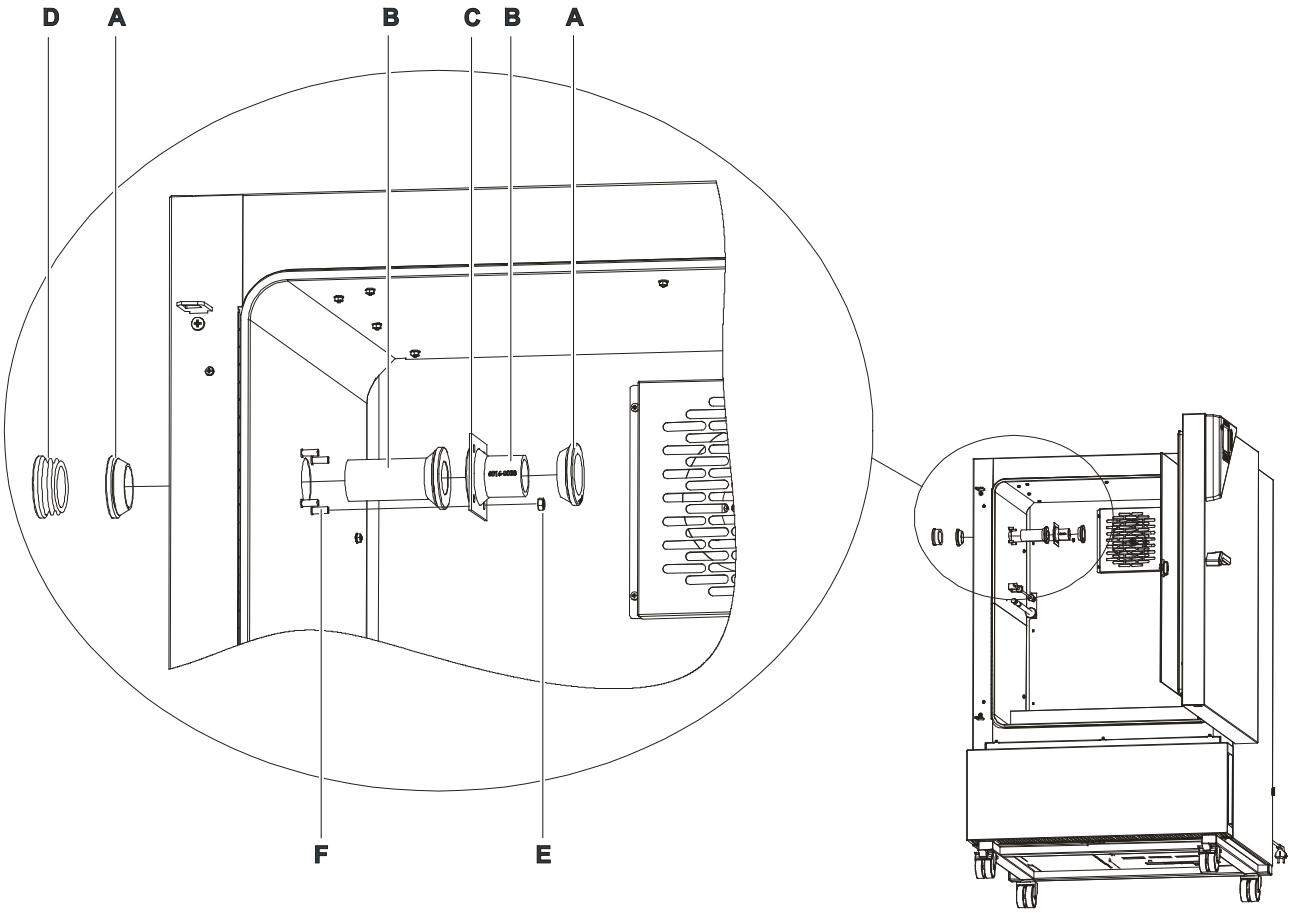
5.4 Replacing the silicone access port

Spare parts:	2 x silicone access port (order no. 6016-0033) Plug for silicone access port (order no. 6016-0035) 2 x conical nipple (inside / outside; order no. 6016-0034) Fixing disk (order no. 4020-0509) 4 x nut M6 A2 / stainless steel (order no. 3002-0052)
Necessary tools:	Crosstip screwdriver, size 2

1. Disconnect the unit from the mains.
2. Remove the conical nipple (A) from the outer housing side.
3. Remove the conical nipple (A) from the inner chamber side plate.
4. Remove the bottom of the inner chamber and the left inner chamber side plate (chap. 7.7, page 64).
5. Remove the fixing disk (C) and pull the silicone access port (B) to the inside from the side plate.
6. Mount the new silicone access port.

Hint:
Slightly grease over the silicone access port (B), e.g. with Vaseline or silicone oil.
Fold the hose lengthwise to make it narrower, and fix the end, which is pushed through the side plate, e.g. with a cable tie.

	In order to have the inner chamber closed steam-tight, the silicone access port must be completely pushed through the side plate. The groove of the outer conical nipple must be enclosed by the outer housing panel and the groove of the inner conical nipple must be enclosed by the inner chamber side plate. The silicone access port must be cut in a way that they end even with the inner and outer conical nipples, but not protrude.



A Conical nipples
B Silicone access ports
C Fixing disk
D Plug for silicone access port
E Nuts M6 A2 / stainless steel
F Stud bolt

Figure 4: Replacing the silicone access port

5.5 Replacing the castors

Spare parts:	2 x castors 16x50 (order no. 6006-0028) 2 x castors 16x50 with lock (order no. 6006-0029)
Necessary tools:	Fork lifter or elevating truck Drift punch 6-8 mm / *0.24 x 0.31 in* Rubber mallet If appropriate, crosstip screwdriver, size 2

CAUTION!



Sliding or tilting of the unit.

Danger of mechanical damages.

- ➢ Only use a fork lifter or lifting truck with sufficient carrying force to lift the unit.
- ⊘ Do NOT lift the unit laterally.
- ⊘ Do NOT continue lifting the unit if it inclines to the side.
- ➢ Correct the balance, if necessary, by differently positioning the fork lifter or lifting truck.
- ➢ All lateral supports at the bottom of the unit must be completely supported on the fork.
- ➢ Make sure that the unit is placed stable during the service work to be performed and will not tilt or slip.
  Secure the unit if necessary against falling.

CAUTION!

Danger of mechanical damages.

- ⊘ Do NOT lift or transport the unit using the door handle or the door
- ➢ When lifting the unit, mind not to squeeze the electrical wiring.

1. Disconnect the unit from the mains.
2. Remove the lower housing cover at the front (chap. 5.1, page 34)
3. Remove the rear panel (chap. 5.3, page 36)
4. Lift the unit from the front or the rear with a fork lifter or lifting truck as much as necessary to replace the castors.
5. Drive the axles (D) with a drift punch and a rubber mallet through the fixing disk (C) and remove the castors from the bottom.
6. Install the new castors from the bottom and let down the unit with the fork lifter or lifting truck. Mind that the unit is standing on all its four castors.
7. Secure the axles from the top with new fixing disk (C)

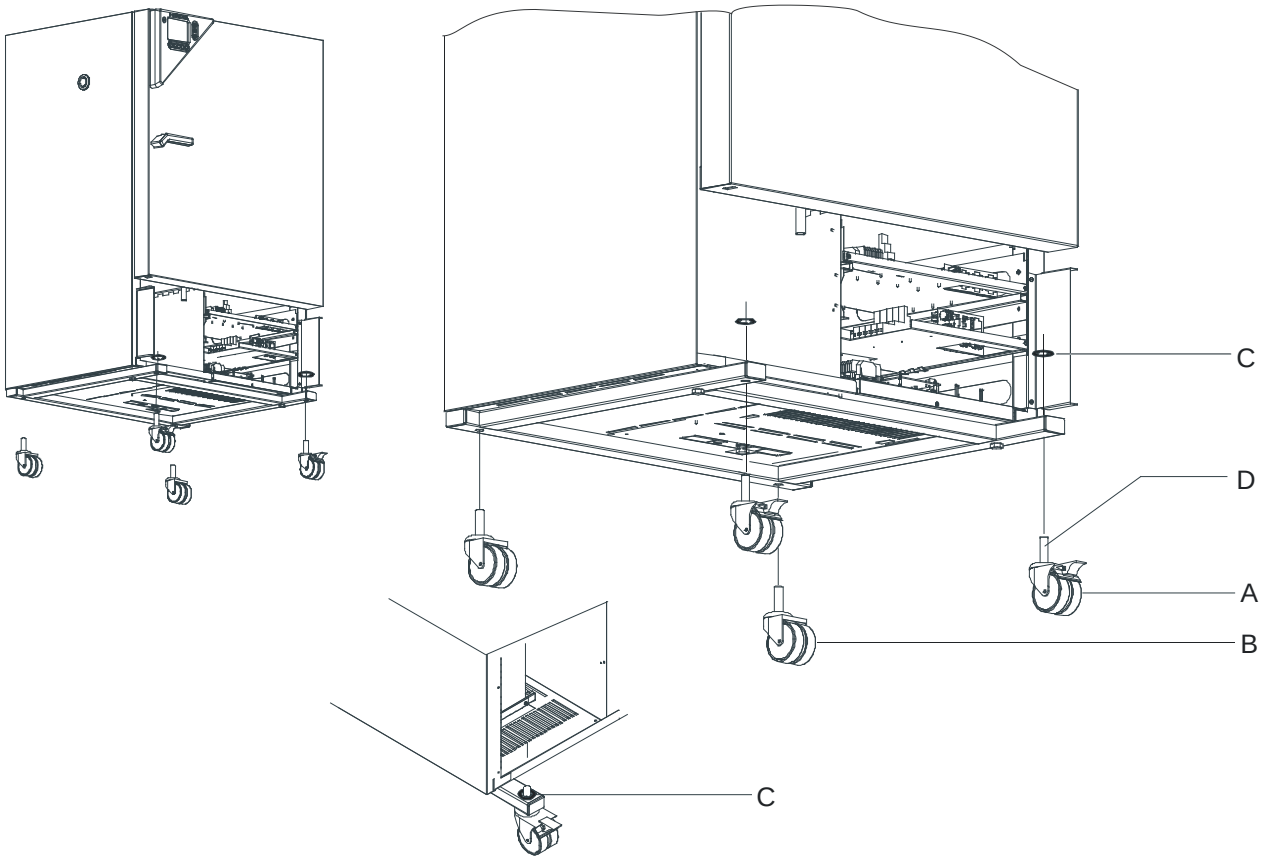


Figure 5: Replacing the castors

A	Castors with lock	**C**	Fixing disk
B	Castors	**D**	Axles

6 Repair work at the outer door

6.1 Aligning the outer door

6.1.1 Aligning the door hinges

Spare parts:	12 x cover (order no. 6002-0008)
Necessary tools:	Allen wrench size 4

1. Disconnect the unit from the power supply.
2. Remove the outer door gasket (chap. 6.2.6).
3. Remove the covers (C).
4. Close the door (A).
5. Loosen the screws (B) and align the door along the frame gasket (chap. 7.5).
6. Tighten the screws (B) and place the covers (C) on them.
7. Hint: We recommend aligning the door with the aid of two persons. One person will loosen the screws and then tighten them again, while the second person aligns the door.
8. Install the outer door gasket (chap. 6.2.6) and check if the door closes tightly.

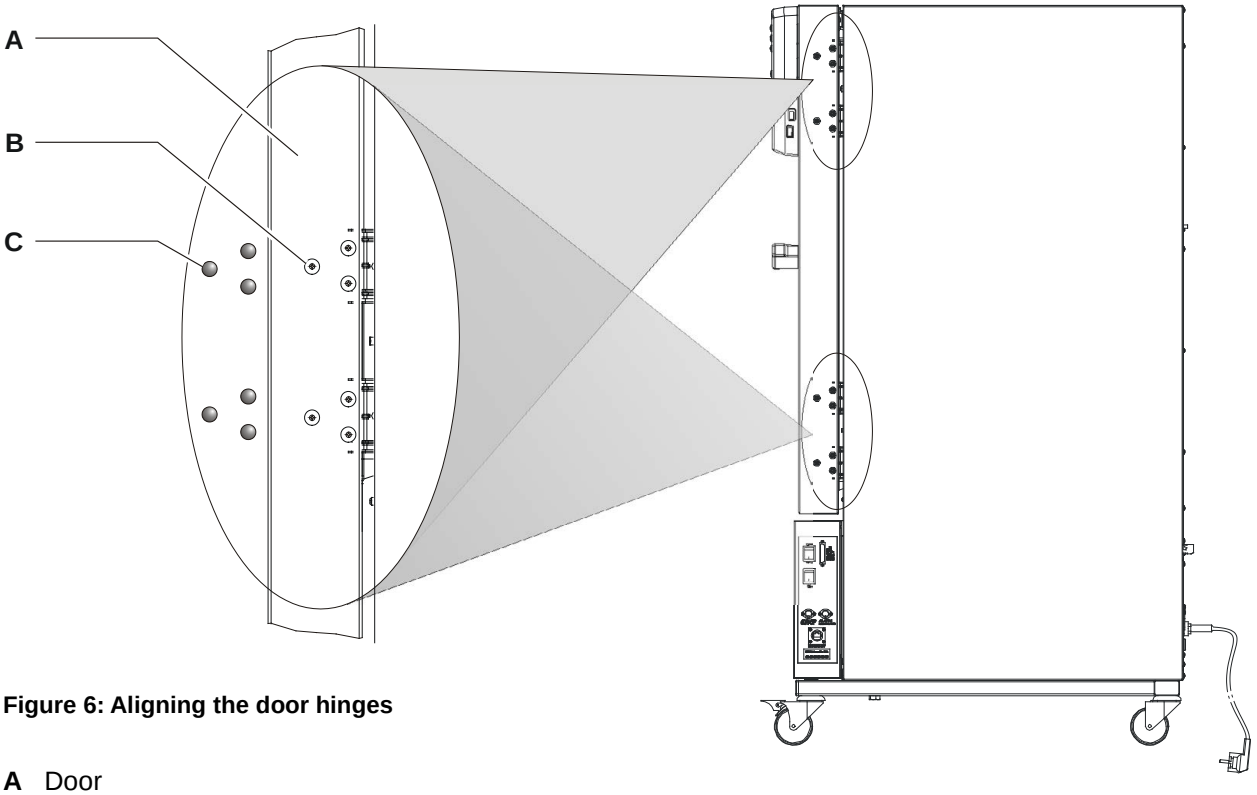


Figure 6: Aligning the door hinges

A Door

B Screws

C Covers

To check if the door closes tightly it has proved useful to place a lamp inside the chamber and then check along the gasket if any light is visible. If there is light, the door is not well adjusted, or the gasket has not been mounted precisely.

6.1.2 Aligning the adjustable door holder lug with pulley

1. Disconnect the unit from the power supply.
2. Remove the outer door gasket (chap. 6.2.6).
3. By turning the adjusting screw (A) you can change the horizontal position of the door holder lug (B).
   ➞ left-hand rotation = inwards
   ➞ right-hand rotation = outwards
4. Align the door holder lug (B) in a way that the closing of the door (chap. 6.4) can seal easy-running in the openings of the door holder lug and the door closes tightly all around.

	Absolutely avoid screwing in the door holder lug unnecessarily far (left-hand rotation), because this would cause the adjusting screw to work loose from the thread of the door holder lug, and the internal spring may fall into the housing. It is not possible to easily mount or replace the door holder lug or parts of it.

5. Mount the outer door gasket (chap. 6.2.6) and check if the door it is well aligned and closes tightly (chap. 6.1.1).

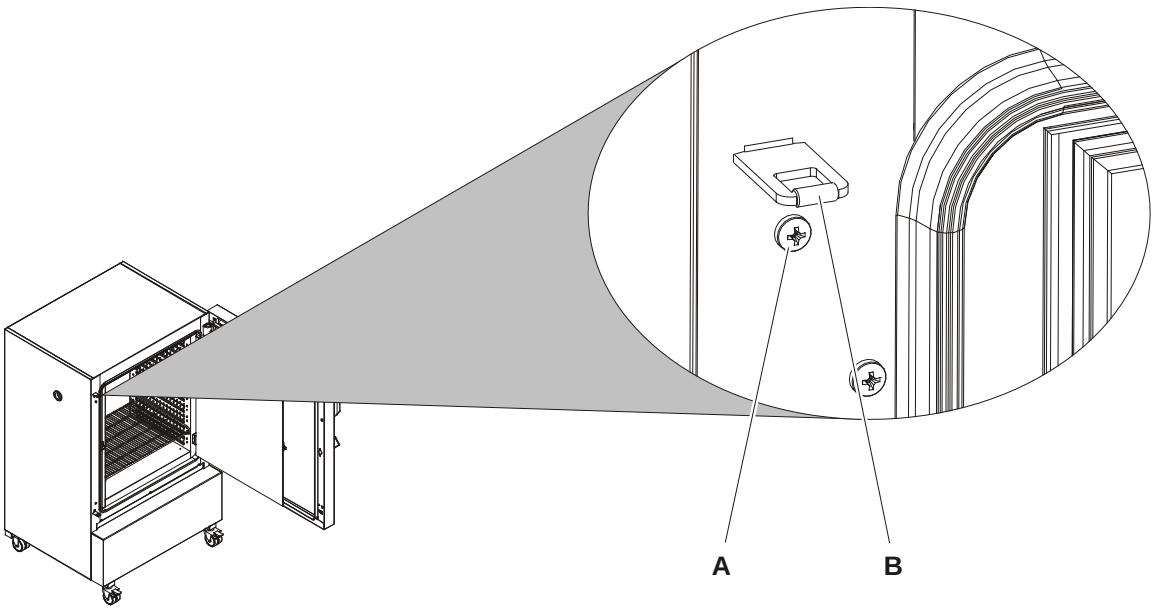


Figure 7: Aligning the adjustable door holder lug with pulley

A Adjusting screw

B Door holder lug with pulley

6.2 Checking and replacing outer door components

6.2.1 Dismounting the interior side of the outer door

Necessary tools:	Crosstip screwdriver, size 2

1. Disconnect the unit from the power supply.
2. Remove the door gasket (chap. 6.2.6,).
3. Remove the screws (F) of the holders (E) of the interior side of the door.
4. Lift the holders (E) over the fastening spigot (G), so that you can remove the holders.
5. Slightly incline the interior side of the door (C) on the top at the frame and pull the plug of the grounding cable (D) from the connection on the top right-hand at the interior side of the door.
6. Lift the interior side of the door (C) to lift its fastening spigots at the bottom side out of the bore holes in the door frame (A).
7. The interior side of the door (C) is still connected to the unit by the cables (B) of the door heat conductor and of the door temperature sensor.
8. Carefully place the interior side of the door (C) on the floor in front of the door frame (A) and lean it against the unit.
9. Mount the interior side of the outer door by following steps 1 to 8 in reverse order

CAUTION!

Danger of damage.

Electric cables are not made for holding larger components and are damaged by doing this.

∅ Do not let the interior side of the outer door (C) hang at the cables of the door heat conductor or of the door temperature sensors.

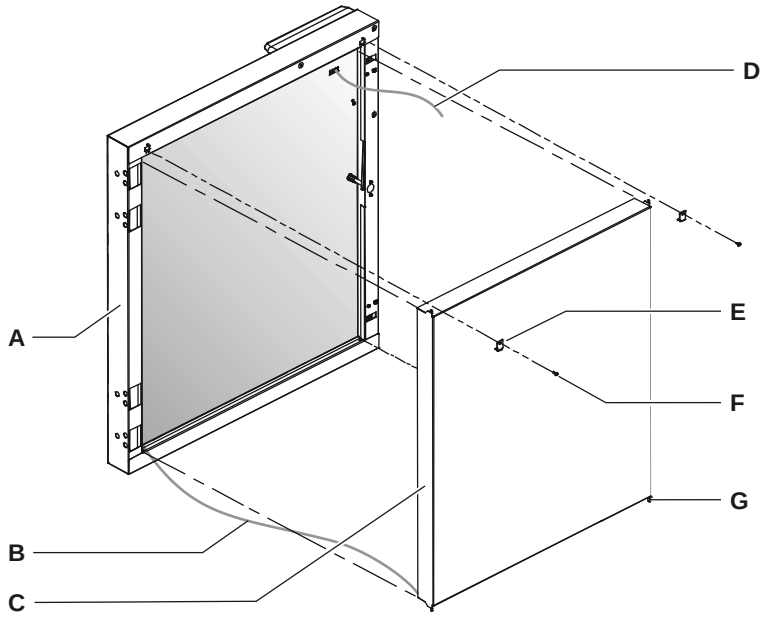


Figure 8: Dismounting the interior side of the outer door

A Door frame

B Cable of door heating and temperature sensor

C Interior side of the outer door

D Grounding cable

E Holder of interior side of the outer door

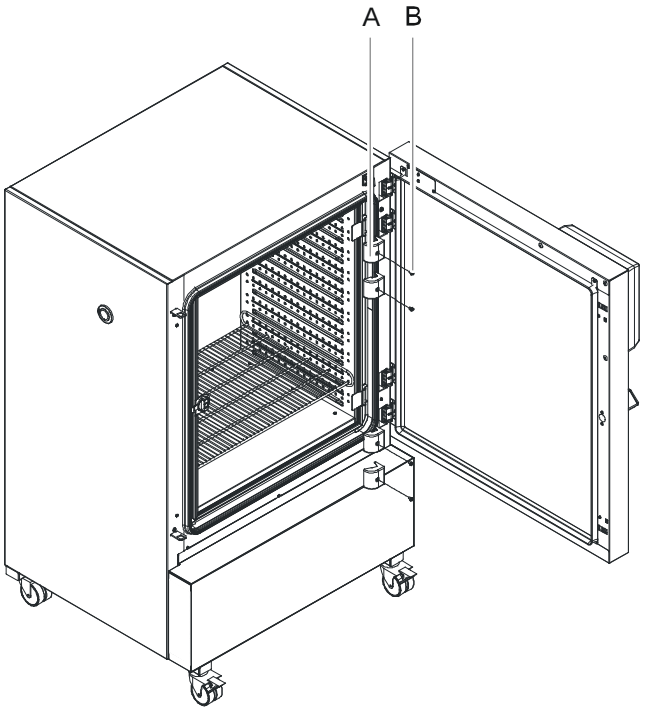
F Screws

G Fastening spigot

6.2.2 Replacing the door hinge cover

Spare parts:	Door hinge cover (order no. 6002-0007)
Necessary tools:	Crosstip screwdriver, size 2

1. Remove the screws (B) of the door hinge covers (A).
2. Remove the door hinge cover.
3. Install the (new) door hinge cover by following steps 1 to 2 in reverse order.



A Door hinge cover

B Screw

Figure 9: Replacing the door hinge cover

6.2.3 Checking and replacing the interior side of the outer door

Spare parts:	Inner door (interior side of the outer door) KBF 115	order no. 8003-0181
	Inner door (interior side of the outer door) KBF 240	order no. 8003-0181
	Inner door (interior side of the outer door) KBF 720, right	order no. 8003-0184
	Inner door (interior side of the outer door) KBF 720, left	order no. 8003-0183
Necessary tools:	Crosstip screwdriver, size 2	

1. Disconnect the unit from the power supply.
2. Remove the housing cover at the lower front (chap. 5.1).
3. Pull the electric mounting plate (A) towards the front out of the unit (chap. 5.1).

Checking the door heat conductor (*-4E2*):

4. Disconnect the contactor (*-X50*), which is located behind the electric mounting plate. Use a multimeter to measure the resistance of the door heat conductor between pins 1 and 4 of the contactor (*-X70*). If $R_{measured}$ = 240 Ω ± 10 %, the door heat conductor is OK. If $R_{measured}$ ≠ 240 Ω ± 10 %, the door heat conductor is defective and the interior side of the outer door must be replaced (chap. 6.2.1).

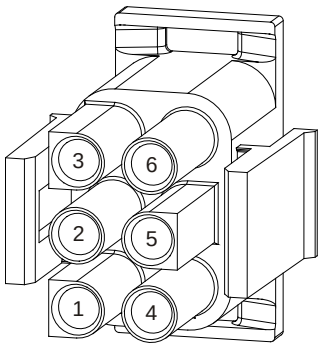


Figure 10: Pin configuration (*-X70*)

Checking the temperature sensor (*-3B3*):

5. Pull the wires of the door Pt100 temperature sensor out of the terminal strips (*E2- Pt100*) of the controller MB1 I/O-board (*-3N2*) (see wiring diagram and chap. 8.8). To test the temperature sensor, use a multimeter to measure the resistance between one of the red wires and the white wire.
6. Use the following table to determine the temperature value corresponding to the measured resistance. Compare this temperature value with the temperature measured with a reference thermometer, which measures the temperature on the interior side of the outer door. If the temperature values vary by more than 5°C, the temperature sensor is defective. In this case the interior side of the outer door must be replaced. If the temperature deviation is < 5°C, perform an adjustment (chap. 11).
7. Remove the connecting cable of the door heat conductor (*-4E2*) and of the temperature sensor (*-3B3*) on the electric mounting plate.
8. Demount the interior side of the outer door (chap. 6.2.1).
9. Remove the door hinge cover (chap. 6.2.2).
10. Pull all cables of the interior side of the door carefully through the hinge ports of the door frame out of the machine room.
11. Mount the interior side of the outer door by following steps 1 to 8 in reverse order.

T (°C)	0	1	2	3	4	5	6	7	8	9	10
-10	96.086	96.478	96.870	97.262	97.653	98.045	98.436	98.827	99.218	99.609	100.000
0	100.000	100.391	100.781	101.172	101.562	101.953	102.343	102.733	103.123	103.513	103.902
10	103.902	104.292	104.681	105.071	105.460	105.849	106.238	106.627	107.016	107.404	107.793
20	107.793	108.181	108.570	108.958	109.346	109.734	110.122	110.509	110.897	111.284	111.672
30	111.672	112.059	112.446	112.833	113.220	113.607	113.994	114.380	114.767	115.153	115.539
40	115.539	115.925	116.311	116.697	117.083	117.469	117.854	118.240	118.625	119.010	119.395
50	119.395	119.780	120.165	120.550	120.934	121.319	121.703	122.087	122.471	122.855	123.239
60	123.239	123.623	124.007	124.390	124.774	125.157	125.540	125.923	126.306	126.689	127.072
70	127.072	127.454	127.837	128.219	128.602	128.984	129.366	129.748	130.130	130.511	130.893
80	130.893	131.274	131.656	132.037	132.418	132.799	133.180	133.561	133.941	134.322	134.702
90	134.702	135.083	135.463	135.843	136.223	136.603	136.982	137.362	137.741	138.121	138.500
100	138.500	138.879	139.258	139.637	140.016	140.395	140.773	141.152	141.530	141.908	142.286

Table 1: Temperature – resistances table of temperature sensor Pt100

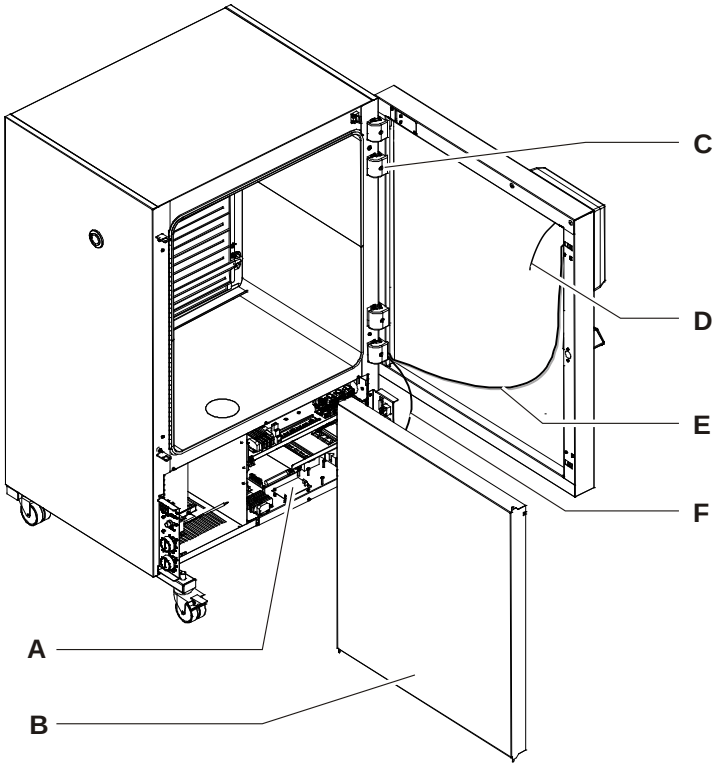


Figure 11: Checking and replacing the interior side of the outer door

A Electric mounting plate

B Interior side of the outer door

C Door hinge with cover

D Grounding cable

E Wires of triangle instrument box

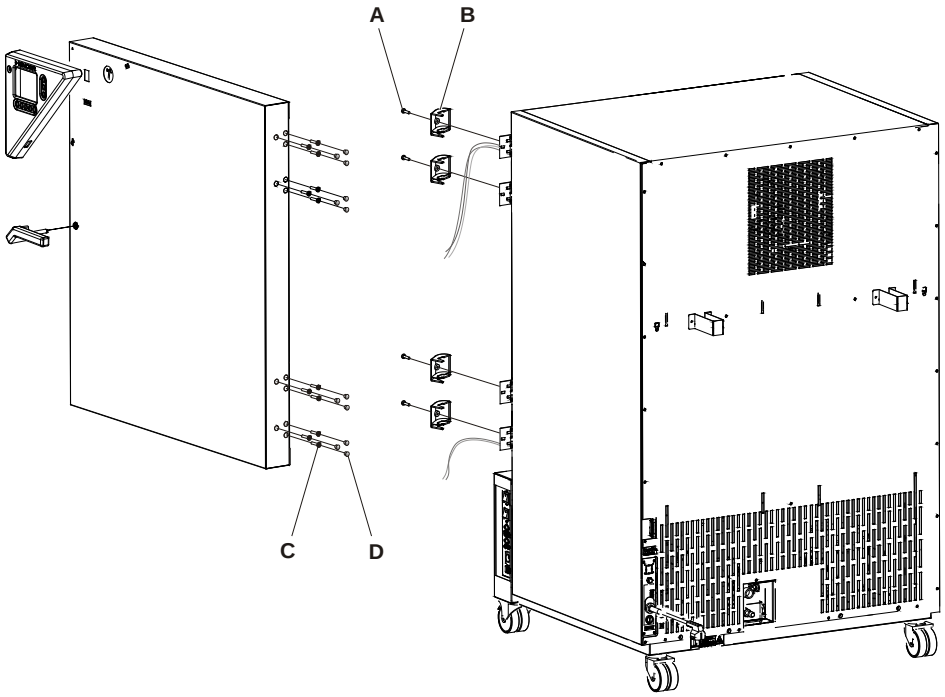
F Cable for door heat conductor and temperature sensor

6.2.4 Replacing the door

Spare parts:	Door 240 KBF/E5 (order no. 8002-0594) (complete door) Door 240 KBF/E5 (order no. 8002-0595) (door housing) Interior side of outer door 240 KB/E5 (order no. 8003-0182), complete, incl. heat conductor (order no. 5005-0169) and temperature sensor (order no. 5002-0021) Covers (order no. 6002-0008)
Necessary tools:	Crosstip screwdriver, size 2 Allen wrench, size 4

Due to the relatively high door weight, demounting and mounting should be performed only if a second person is available for lifting and holding.

1. Disconnect the unit from the power supply.
2. Remove the interior side of the door (chap. 6.2.3).
3. Remove the complete triangle instrument box (chap. 6.3)
4. Remove the door hinge covers (chap. 6.2.2).
5. Remove the covers (D), hold on to the outer door and remove the screws (C) situated below.
6. Install the door by following steps 1 to 4 in reverse order.
7. Afterwards check the correct fit of the frame gasket against the interior side of the door. For this temporarily remove the outer door gasket (chap. 6.2.6).



A Door hinge cover screws
B Door hinge cover
C Door hinge screws
D Covers

Figure 12: Replacing the door

When replacing only the door housing, you need to dismount the closing device (chap. 6.4) and the door contact switch (chap. 6.2.5) from the old door and use it again with the new door.

6.2.5 Replacing the door contact switch (*-3S1*)

Spare parts:	Door contact switch	order no. 5019-0061
Necessary tools:	Small slotted screwdriver	

1. Disconnect the unit from the power supply.
2. Open the door and remove the interior side of the door (chap. 6.2.1)
3. Prize up the clips of the door contact switch (A) and push them from inside out of the door frame (C).
4. Remove the electrical connections (B).
5. Install the new switch by following steps 1 to 4 in reverse order.

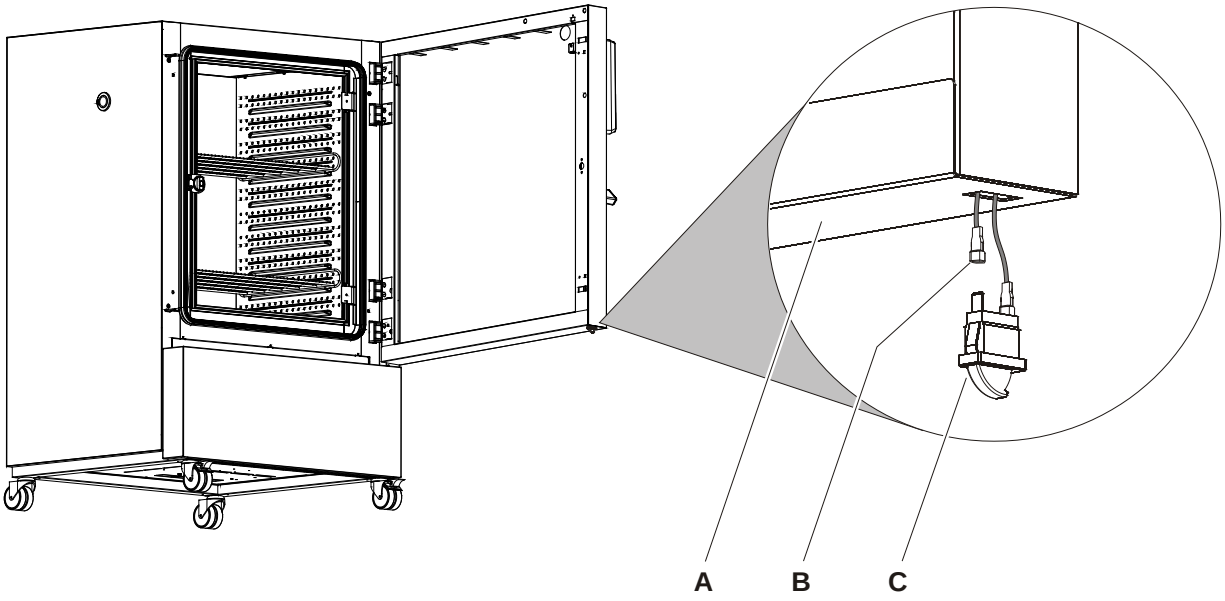


Figure 13: Replacing the door contact switch

A Door frame

B Electrical connections

C Door contact switch

6.2.6 Replacing the outer door gasket

Spare parts:	Outer door gasket 240 KB/E5 (order no. 6005-0161)

1. Carefully pull the outer door gasket (A) out of the slot between the interior side of the outer door (D) and the door frame (B).
2. The gasket must be put in that way, that the cutout (F) of the door gasket is in the region of the door handle. The outer edge of the sealing lip (E) must point outward.
3. Push the new door gasket all around evenly into the gap between the interior side of the door (D) and the door frame (B). Mind that the incisions (C) enclose the fastening spigots of the interior side of the door.
4. After mounting, the door gasket must fit as close as possible to the door.

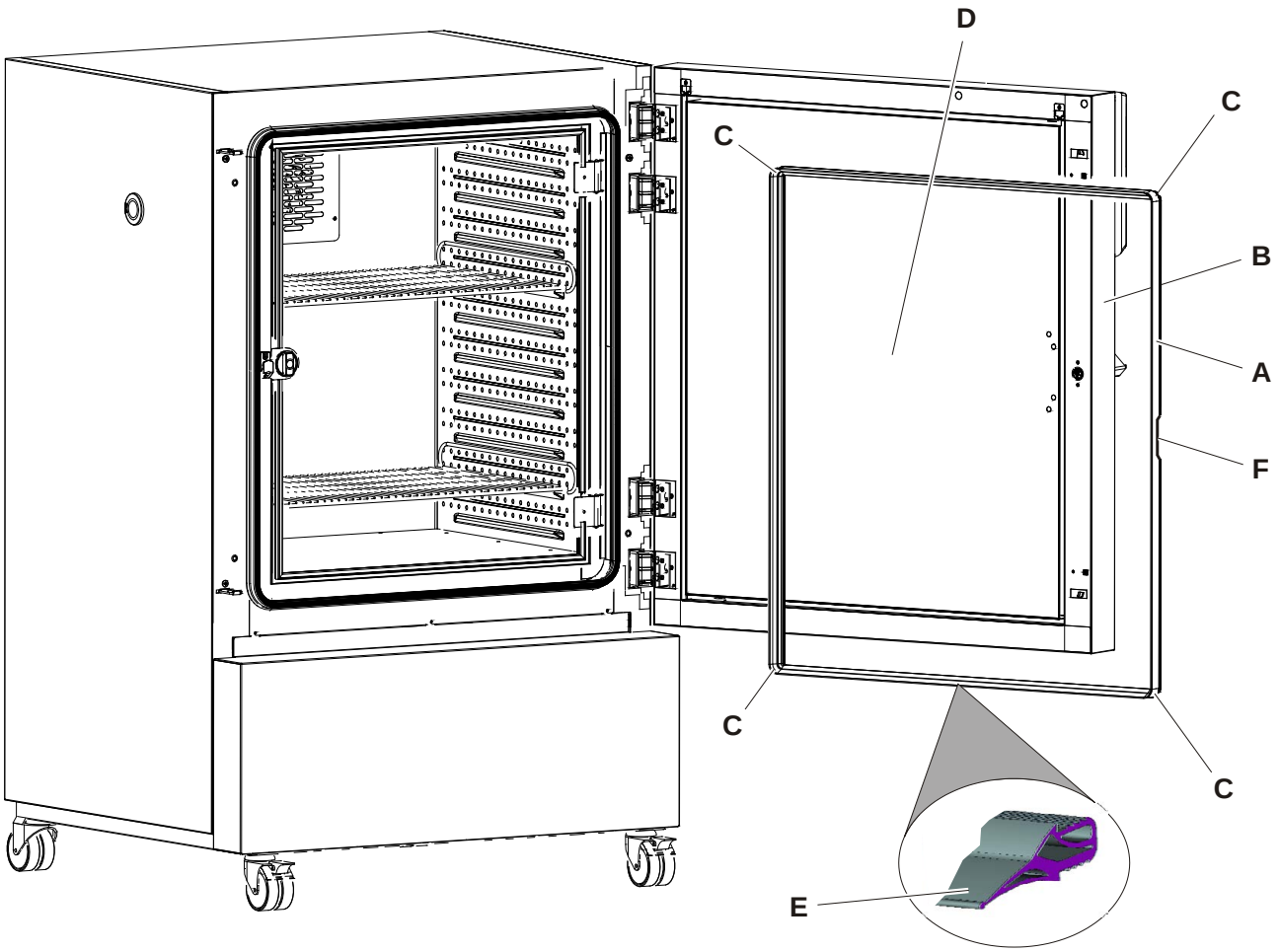


Figure 14: Replacing the outer door gasket

A	Outer door gasket	**D**	Interior side of outer door
B	Door frame	**E**	Sealing lip
C	Incisions	**F**	Cutout

6.3 Replacing the triangle instrument box

CAUTION!	
	**Danger of damaging the electronic.** Circuit boards might be damaged by handling malpractices and touching of its components. ➢ Prior to work at electronic components the technician must take appropriate protective measures against electrostatic discharge. Wearing ESD shoes and a grounding bracelet have shown to be useful.

CAUTION!
Danger of mechanical damages. ∅ Never let mechanical components hang at electric cables. Electric cables are not appropriate to hold bigger components and will be damaged if you do so.

6.3.1 Dismantling the instrument box

Necessary tools	Crosstip screwdriver (magnetic), size 2

1. Disconnect the unit from the power supply.
2. Remove the covers (C) of the screws (D).
3. Hold on to the instrument box at its housing (K) and unscrew the screws (D) with a magnetic screwdriver. Take care that the three screws will not fall into the door frame!*

   Hint: To prevent the screws from falling into the door frame, you can apply some bonding agent etc. on the top of the screwdriver.
4. Disconnect the plug of the controller cable (G) from the socket on the controller display (F). Disconnect the grounding cable and the connection from the controller display (F).
5. Remove the complete instrument box (K).
6. Install the instrument box by following steps 1 to 5 in reverse order.
7. If necessary fix the insulating material in the door frame with aluminum tape.

* In spite of all care it may happen that the fixing screws (D) fall into the door frame.
To access them, you need to demount the interior side of the door (chap. 6.2.3).

6.3.2 Replacing of components of the triangle instrument box

Spare parts:	Triangle instrument box complete (order no. 8008-0246) or Housing instrument box (order no. 6002-0180) Switch mat 3-fold (order no. 6002-0196) Switch mat 5-fold (order no. 6002-0184) Filter pane of instrument box (order no. 6002-0160) Controller display (order no. 5014-0059)
Necessary tools	Crosstip screwdriver, size 2

1. Dismantle the triangle instrument box (chap. 6.3.1).
2. Remove the controller display (F) (chap. 8.9).
3. Remove the component to be replaced:
   - 3-fold switch mat (H)
   - 5-fold switch mat (I)
   - Filter pane (J)
4. Install the component by following steps 1 to 3 in reverse order.

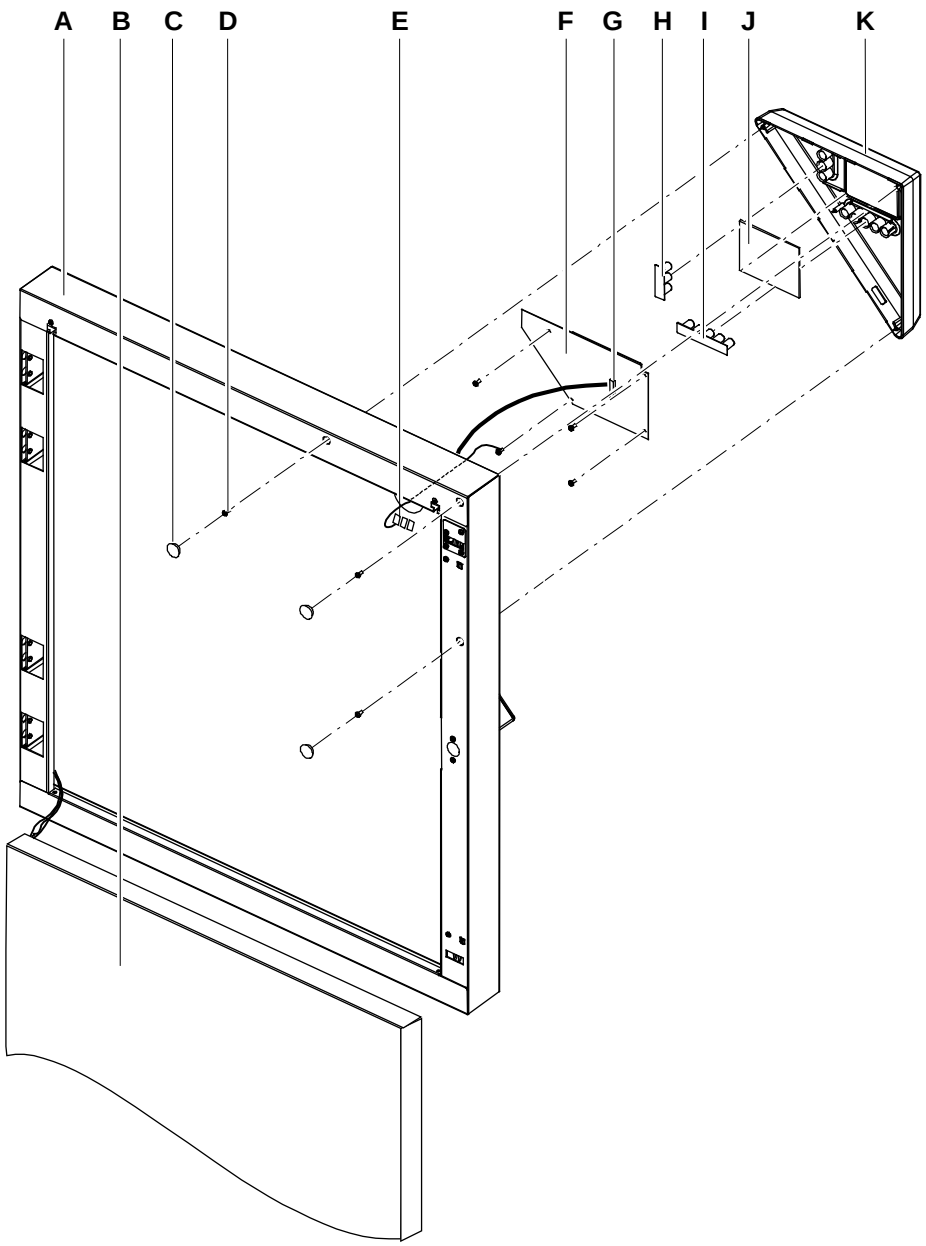


Figure 15: Replacing the triangle instrument box

A	Door frame	**G**	Plug of controller cable
B	Interior side of the outer door	**H**	Switch mat 3-fold
C	Covers	**I**	Switch mat 5-fold
D	Screws	**J**	Filter pane
E	Connection of the grounding cable	**K**	Housing of instrument box
F	Controller display		

Please note that demounting the interior side of the outer door is necessary only if, while demounting the triangle instrument box, the fixing screws have fallen into the door frame!

6.4 Replacing the closing device of the outer door

Spare parts:	Door handle 104 mm / *4.09 in* right (order no. 6002-0104) Push rod guide (order no. 6002-0018) Screw (order no. 3001-0003) Push rod (order no. 4021-0365) O-ring (order no. 3004-0002) Axle guide (order no. 6002-0119) Push rod lever (order no. 6006-0009) Axle bearing (order no. 4020-0018) Screws (order no. 3001-0012) Washer (order no. 3003-0003) Screw (order no. 3001-0002) Cover d 13.5 (order no. 6002-0008)
Necessary tools	Crosstip screwdriver, size 2

1. Disconnect the unit from the power supply.
2. Remove the interior side of the door (chap. 6.2.3).
3. Remove the screws (B) of the push rod guides (A).
4. Lift the push rod guides (A) out of the openings in the door frame.
5. Remove the cover (M) of the screw (K).
6. Remove the screw (K) and the washer (J).



The screw (K) is secured by lacquer in its thread. Therefore it is possible that the screw cannot be loosened or that its head breaks away. In this case, replace the door handle.

7. The door handle (D) with O-ring (E) and push rod lever (G) are stuck on each other.
8. Pull the door handle (D) carefully out of the door in order to loosen it from the push rod lever (G) and to remove it.
9. Pull the axle guide (F) from the door front out of the door plate.
10. Remove the push rod lever (G) together with the push rods (C) out of the door frame.
11. Remove the push rods (C) from the hooks of the push rod lever (G).
12. Unscrew the screws (I) of the axle bearing (H).
13. Remove the axle bearing (H).
14. Install the new closing device by following steps 1 to 13 in reverse order.

When installing the push rods, the open side of the profile must point in direction of the unit. During assembling push rod lever (G) and axle bearing (H), pay attention that the guiding hooks of the push rod lever are within the guiding nuts of the axle bearing and that the door handle (D) can be turned into door closed position (I) and door open position (II).

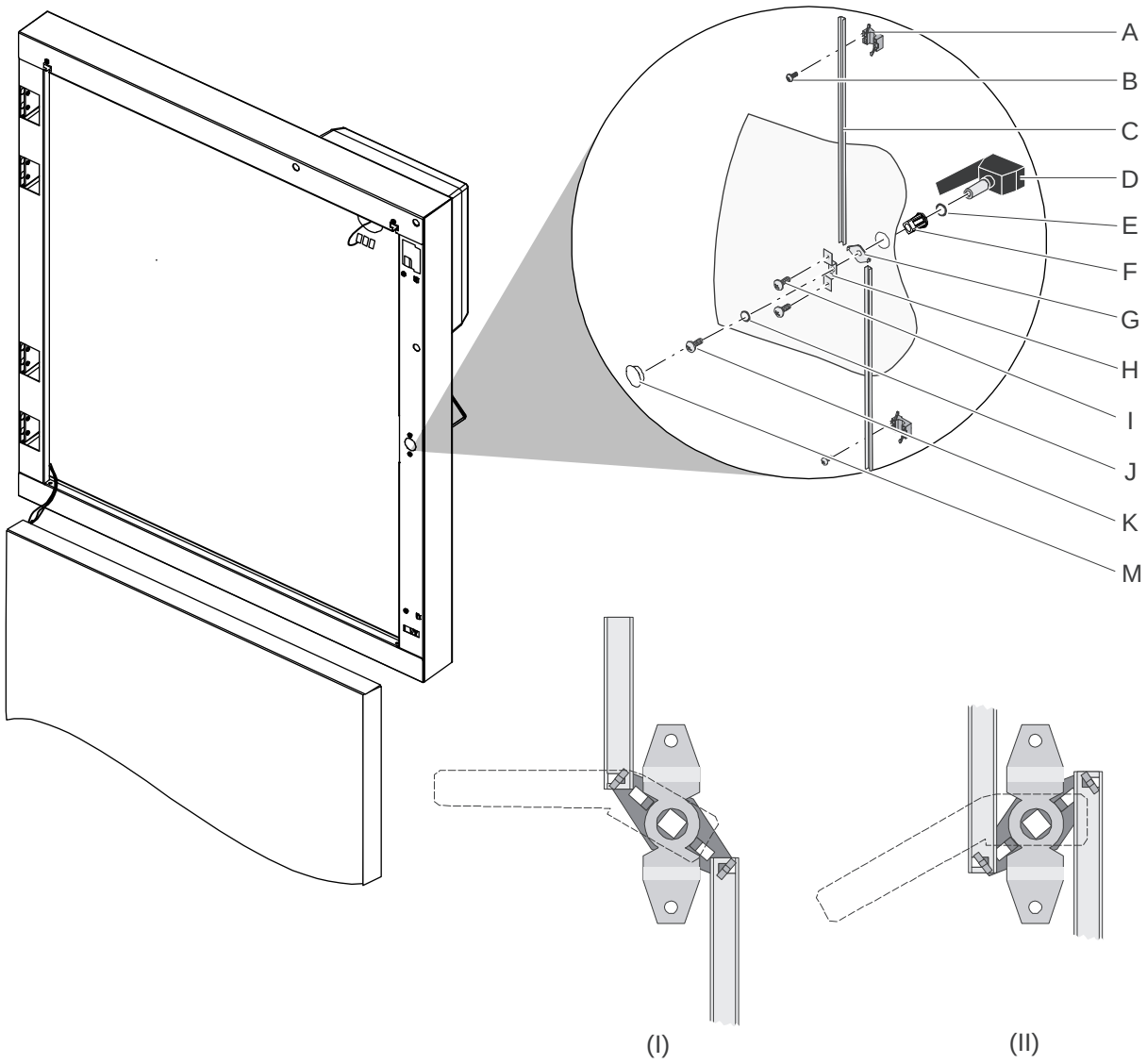


Figure 16: Replacing the closing device of the outer door

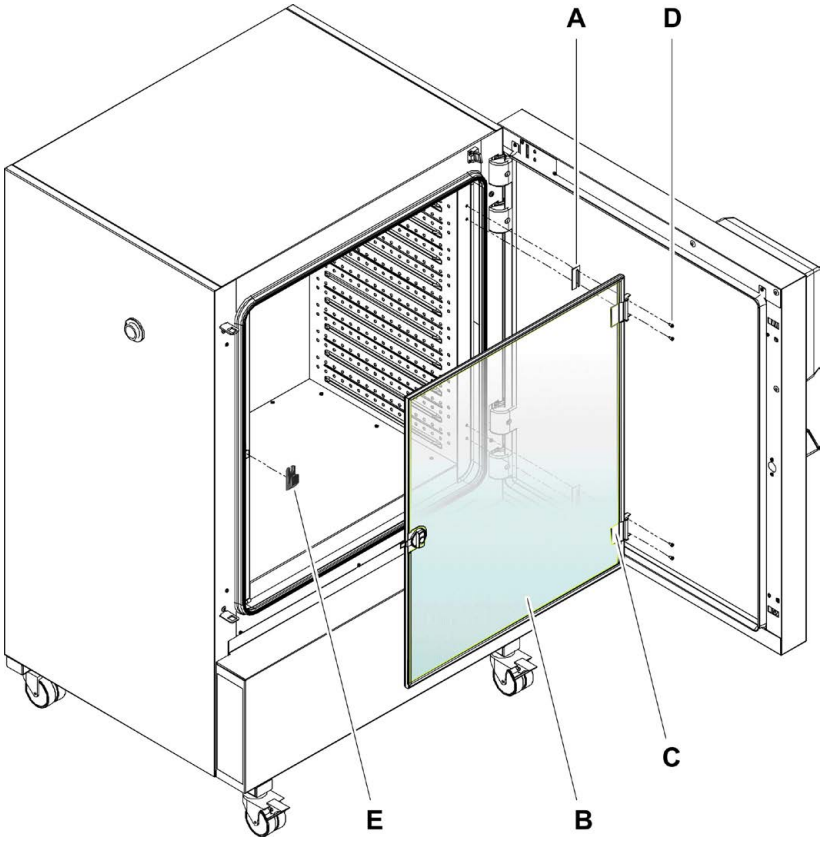
A Push rod guide
B Screw
C Push rod
D Door handle
E O-ring
F Axle guide
G Push rod lever
H Axle bearing
I Screws
J Washer
K Screw
M Cover
(I) Door closed position
(II) Door opened position

7 Repair work at the inner and outer chamber

7.1 Replacing the glass door

Spare parts:	Glass door 115 complete, (order no. 8010-0088) Glass door 240 complete, (order no. 8010-0143) Glass door 720 complete, (2x), (order no. 8010-0086) Distance plate (order no. 4020-0483) Fastener block (order no. 6002-0124)
Necessary tools	Crosstip screwdriver, size 2

1. Hold on to the glass door (B).
2. Remove the screws (D) of the hinges (C).
3. Remove the glass door after unscrewing the screws.
4. Install the glass door by following steps 1 to 3 in reverse order. Align the glass door before tightening the screws.
5. Check whether the glass door gasket sits close to the inner chamber. Otherwise you need to adjust the door. Use for this purpose the distance plates, which you can place below the hinges or the glass door lock.



A Distance plate (when required)

B Glass door

C Hinge

D Screws

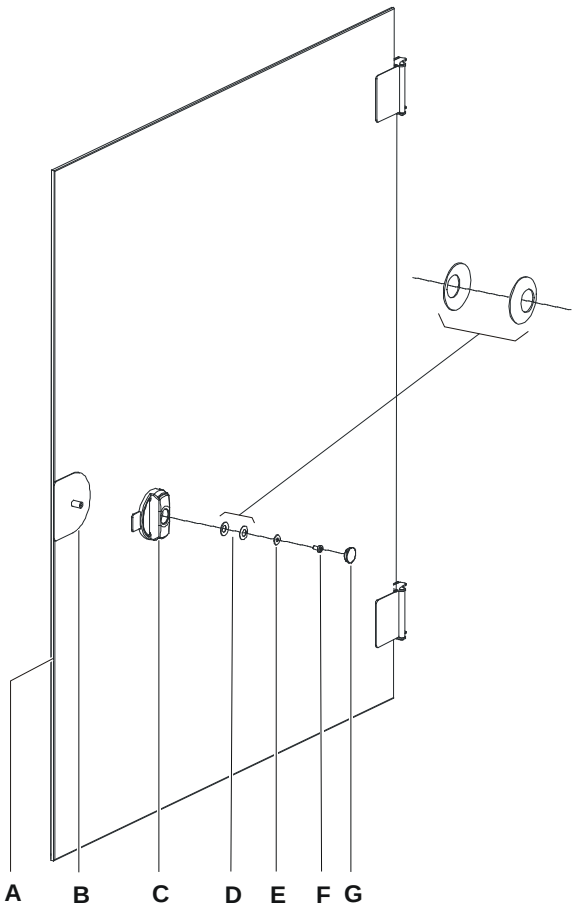
E Fastener block

Figure 17: Replacing the glass door

7.2 Replacing the closing device of the glass door

Spare parts:	Turn-lock fastener KB/E5 complete (order no. 6002-0316) Disk spring DIN2093-C 12.5 x 6.2 x 0.35 (order no. 3003-0034) Washer DIN9021-A 3.2 A2 140 (order no. 3003-0025) Screw DIN7985-A M3x6-4.8 zinc coated (order no. 3001-0029)
Necessary tools:	Crosstip screwdriver, size 2

1. Remove the cap (G) and the screw (F) below with its washer (E).
2. Remove the turn-lock fastener (C) from the press-fit bush (B).
3. Mount the new closing device by following steps 1 to 2 in reverse order.



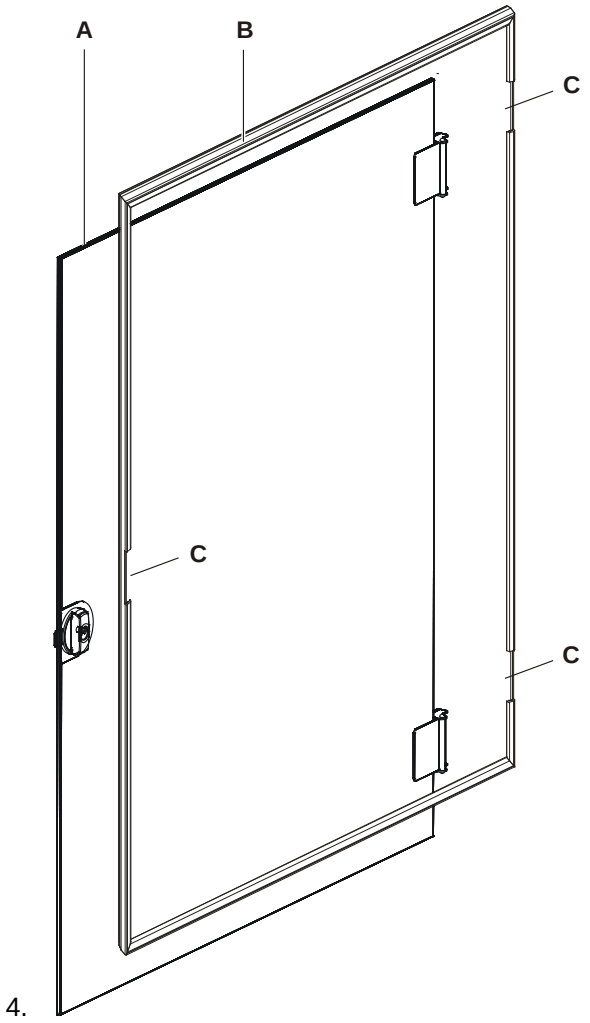
A Glass
B Locking plate with press-fit bush
C Turn-lock fastener
D Disk spring 2x
E Washer
F Screw
G Cap

Figure 18: Replacing the closing device of the glass door

7.3 Replacing the glass door gasket

Spare parts:	Glass door gasket KBF 115, (order no. 6005-0204) Glass door gasket KBF 240, (order no. 6005-0149) Glass door gasket KBF 720, (2x),(order no. 6005-0198) Intermediate door gasket KBF 720, (order no. 6005-0192)

1. Remove the gasket (B) from the glass door (A).
2. Mount the new gasket on the glass door. Mind the recesses (C) for the hinges and the turn-lock fastener.
3. Check whether the glass door gasket sits close to the inner chamber. Otherwise you need to adjust the door (see chap. 7.1).



4.

5. A 6. Glass door
B Glass door gasket
C Recesses

Figure **19**: Replacing the glass door gasket

7.4 Replacing the fan *(-4M1)*

Spare parts:	Radial fan complete with motor and fan wheel	order no. 5013-0088
	Fan sheet KBF 115	order no. 4020-0576
	Fan sheet KBF 240, 720	order no. 4020-0597
	Fan cover KBF 115	order no. 4020-0949
	Fan cover KBF 240, 720	order no. 4020-0918
	Fan drive shaft gasket	order no. 6005-0160
	Fan drive shaft ring	order no. 6006-0310
Necessary tools:	Crosstip screwdriver, size 2 Universal pliers or water pump pliers Dynamometric key (min 5 Nm) 10 mm / *0.39 in* socket spanner 24 mm / *0.94 in* open-end wrench	

Danger of damage. Replace the fan only completely, because the fan wheel is exactly balanced. When mounting the fan, do not hold it at its blades but only at the outer ring.

1. Disconnect the unit from the power supply.
2. Unscrew the screws (P) and remove the fan cover (O) and the fan panel (N) in the inner chamber.

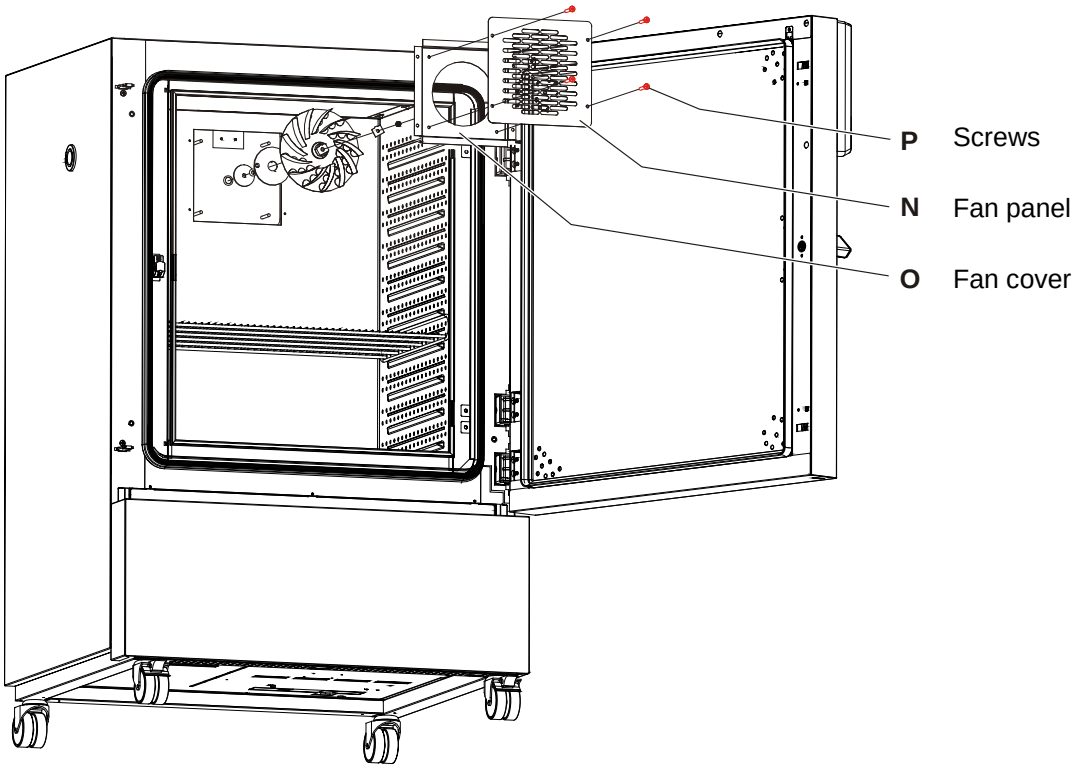


Figure 20: View of the inner chamber

3. Hold on to the fan wheel (L) at the driving sheet (I) with a 24 mm / *0.94 in* fork wrench.
With a 10 mm / *0.39 in* wrench loosen the nut (M) by turning it anti-clockwise and remove it.

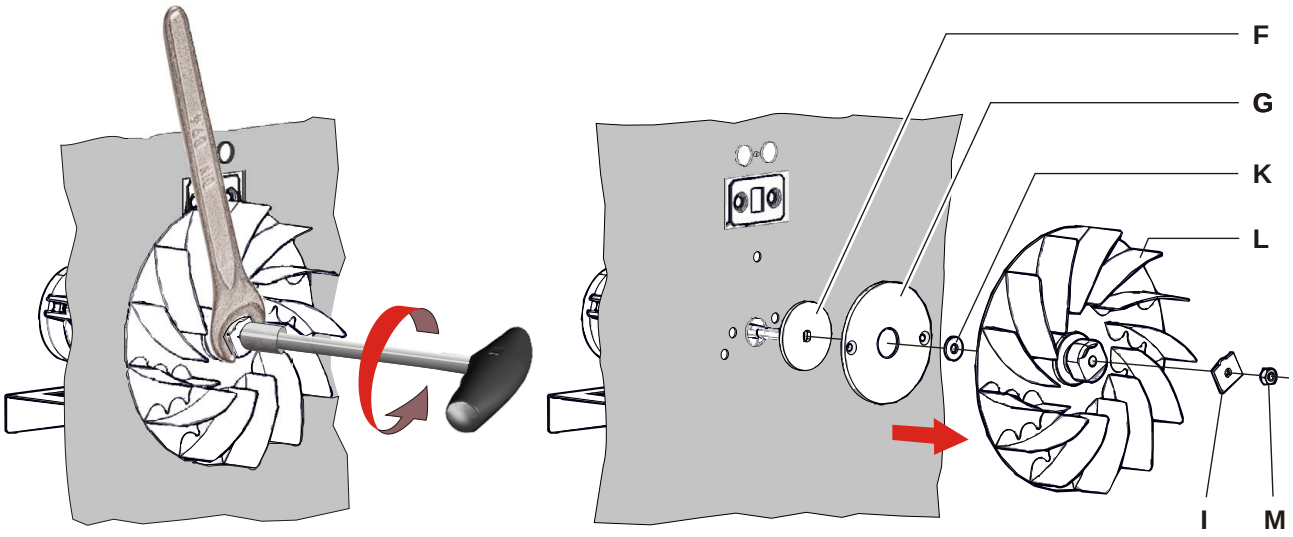


Figure 21: Removing the fan wheel

F Fan drive shaft gasket
G Seal ring for fan drive shaft
K Disk
L Fan wheel
I Driving sheet
M Nut M6

4. Remove the driving sheet (I) and then the fan wheel (L) from the fan drive shaft.
5. Remove the screws (H) at the seal ring for fan drive shaft (G) and remove the disk (K).
6. Pull the fan drive shaft gasket (F) from the fan drive shaft.
7. Remove the rear housing panel (chap. 5.3).

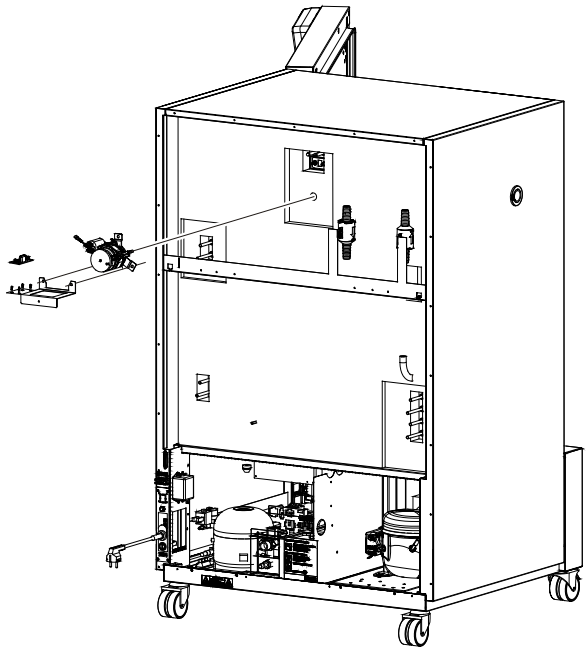


Figure 22: Rear view

8. Pull the power plug and the grounding cable from the connections of the fan motor (E).
9. Remove the screws (D) and the carrier (B) together with the overvoltage cutout board (C).
10. You can now remove the fan motor (E) to the rear.
11. Install the fan by following steps 1 to 10 in reverse order.

	When replacing the fan, we recommend also replacing the fan drive shaft gasket (F). During installation place first the fan with the fan drive shaft through the base plate of the fan attachment, and only then the carrier of the overvoltage cutout board. Push the fan wheel in a way that the arrow on the fan wheel fits the arrow on the fan drive shaft. Tighten the screws (H) at the seal ring for fan drive shaft (G) with 1.5 Nm. Tighten the nut (M) with a dynamometric key with 5 Nm. To tighten the fan wheel (clockwise), do not hold it on its lamella, but use a 24 mm / *0.94 in* fork wrench instead (see point 3).

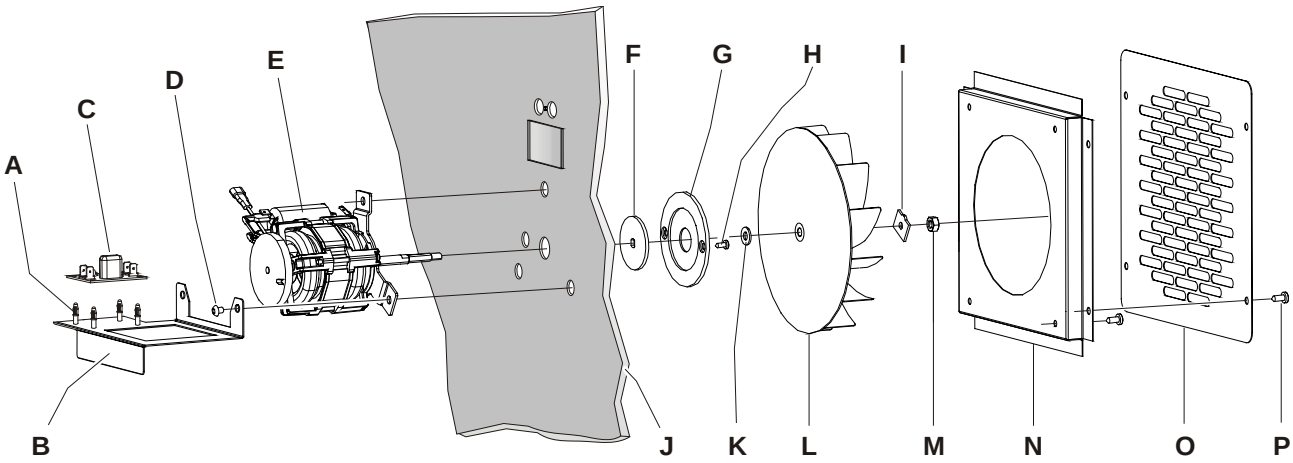


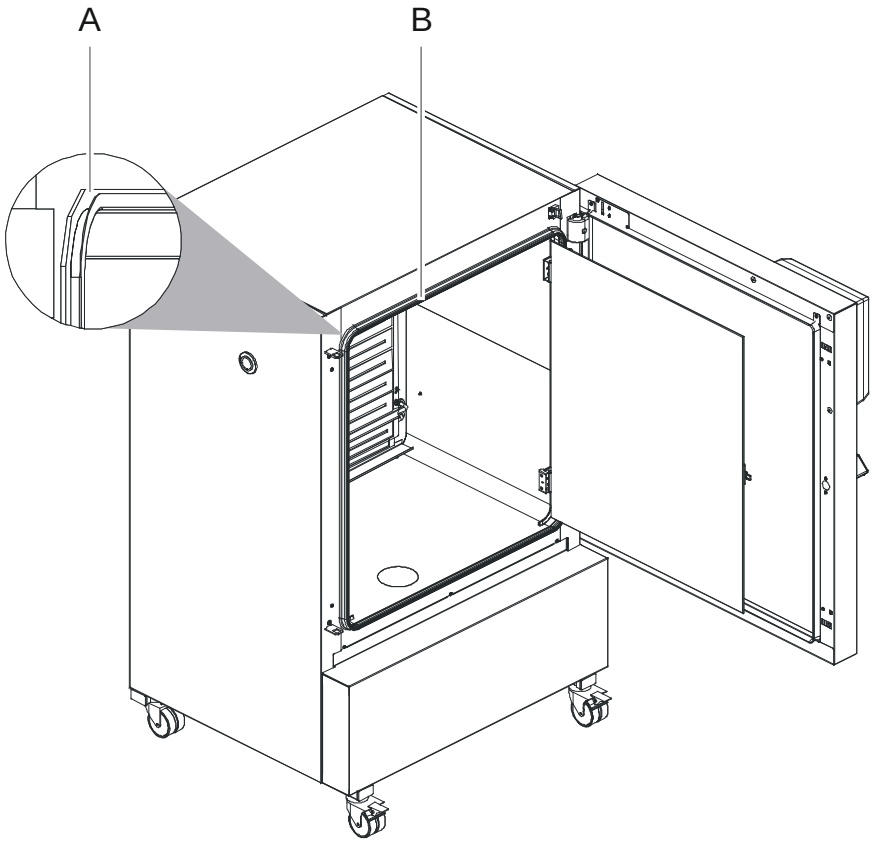
Figure 23: Replacing the fan (*-4M1*)

A	Board spacer	**I**	Driving sheet
B	Carrier	**J**	Rear panel
C	Overvoltage cutout board	**K**	Disk
D	Hexagon socket screws M6	**L**	Fan wheel
E	Fan motor	**M**	Nut M6
F	Fan drive shaft gasket	**N**	Fan panel
G	Seal ring for fan drive shaft	**O**	Fan cover
H	Hexagon socket screws	**P**	Screws

7.5 Replacing the frame gasket

Spare parts:	Frame gasket KBF 115, (Art. Nr. 6005-0207) Frame gasket KBF 240, (Art. Nr. 6005-0147) Frame gasket KBF 720, (Art. Nr. 6005-0196

1. Carefully pull the frame gasket (B) off the inner chamber edges (A). Clean the inner chamber edges.
2. Place the new frame gasket on the inner chamber edges in such a way that the seam where the gasket is glued to be situated at the right side in the middle between the door hinges.
3. Push the frame gasket with its groove onto the inner chamber edges.
4. Pull the frame gasket all around onto the inner chamber edges.
5. Afterwards, check the correct fitting of the frame gasket against the interior side of the outer door. For this you need to temporarily remove the outer door gasket (chap. 6.2.6).



A Inner chamber edge

B Frame gasket

Figure 24: Replacing the frame gasket

7.6 Checking and replacing the frame heating wire (*-4E3*)

Spare parts:	Frame heating wire KBF 115, (order no. 5005-0185) Frame heating wire KBF 240, (order no. 5005-0168) Frame heating wire KBF 720, (order no. 5005-0177) Connector 6-poles (order no. 5024-0157)
Necessary tools	Crosstip screwdriver, size 2 Multimeter measuring device

	It is impossible to remove the frame heating wire (*-4E3)* because it is included in the insulating foam above the door frame. A new frame heating wire can be placed under the frame gasket.

1. Disconnect the unit from the power supply andremove the frame gasket (chap. 7.5).
2. Disconnect the connection of the frame heating wire (A) at the compact plug (*-X70*).
3. Use a multimeter to measure the resistance of the frame heating wire at pins 3 and 6 of the compact plug (*-X70*). The resistance should be 480 Ω ± 10%. If the measuring results in another value, the frame heating wire is defective and must be replaced.
4. Disconnect the frame heating wire approx. 10 cm / *3.9 in* after the plug (*-X70*) at pins 3 and 6.
5. Place the new frame heating wire tightly along the inner chamber edge (B). Pull the edges through a previously made opening in the insulating foam of the lower door hinge towards the electric mounting plate.
6. Strip the insulation of the cut cable ends at the plug (*-X70*) and of the new frame heating wire by approx. 10 to 15 mm / *0.4 to 0.6 in*.
7. Place the frame heating wire towards the rear on the silicone casing and connect the ends with connection clamps.
8. Mount the frame gasket and then check if the frame gasket fits correctly against the interior side of the outer door (chap. 6.2.6).

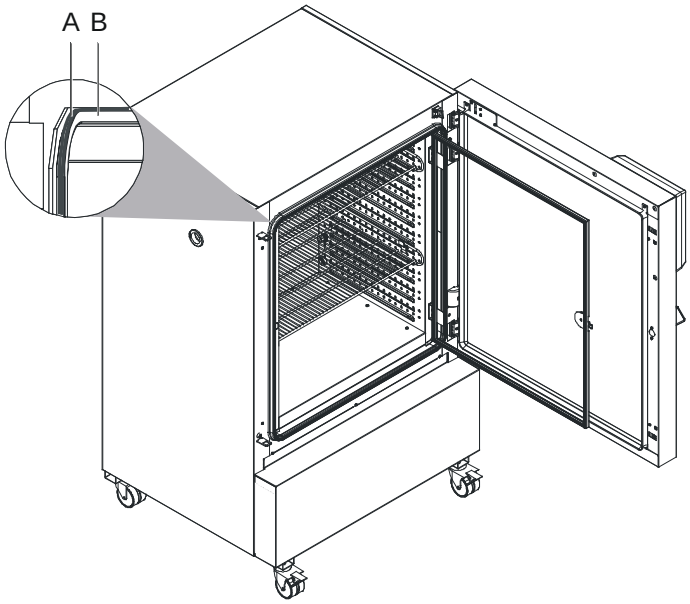


Figure 25: Checking and replacing the frame heating wire (-4E3 *)*

A Frame heating wire

B Inner chamber edge

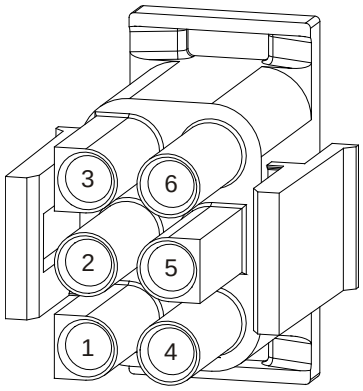


Figure 26: Assignment of compact plug (*-X70*)

7.7 Replacing the inner chamber and the gaskets between the inner and the outer chamber

Spare parts:	Stop ledge KBF 115 (order no. 4005-0402) Stop ledge KBF 240 (order no. 4005-0410) Stop ledge KBF 720 (order no. 4005-0376) Side plate left of inner chamber KBF 115 (order no. 8005-0182) Side plate left of inner chamber KBF 240 (order no. 8005-0185) Side plate left of inner chamber KBF 720 (order no. 8005-0223) Side plate right of inner chamber KBF 115 (order no. 8005-0183) Side plate right of inner chamber KBF 240 (order no. 8005-0184) Side plate right of inner chamber KBF 720 (order no. 8005-0224) Rear panel of inner chamber KBF 115 (order no. 4005-0461) Rear panel of inner chamber KBF 240 (order no. 4005-0406) Rear panel of inner chamber KBF 720 (order no. 4005-0374) Bottom of inner chamber KBF 115 (order no. 4005-0400) Bottom of inner chamber KBF 240 (order no. 4005-0409) Bottom of inner chamber KBF 720 (order no. 4005-0375) Left spoiler (order no. 4020-0646) Right spoiler (order no. 4020-0644) Gaskets between the inner chamber and the outer chamber, cut goods (order no. 6005-0210) KBF 115 → 0,92 m, KBF 240 → 1,53 m, KBF 720 → 2,46 m
Necessary tools:	Crosstip screwdriver, size 2 Hexagon wrench, size 10

CAUTION!



Danger of cutting injuries by sharp edges.

- Wear protective gloves against cutting injuries during mounting and dismantling of inner chamber parts because the sheet metal components are sharp-edged.

1. Disconnect the unit from the power supply.
2. Remove the glass door (chap. 7.1).
3. Remove the racks (E) from the inner chamber.
4. Remove the fan cover (K) (chap. 7.4), if you want to replace the rear panel of the inner chamber (I).
5. Unscrew the stop ledge screws (J) and remove the stop ledge.
6. Unscrew the bottom screws (D) and remove the bottom. The bottom screws (D) are fixed with nuts at the side plates (C, G) and the rear panel (I).
   When dismounting the inner chamber components mind not to loose these clip nuts.

7. Die side plates (C, G) are screwed with cap nuts at the stud bolts at the inner chamber ceiling. Incline the side plates (C, G) with the lower edge to the inside, pull them forward and remove the parts.
8. Remove the gaskets between the inner and the outer chamber (B, F)
9. Unscrew the screws of the rear panel of inner chamber (I) and remove the panel.
10. Install the inner chamber by following steps 1 to 11 in reverse order. When replacing the inner chamber side plates (C, G), we recommend replacing the gaskets between the inner and the outer chamber (B, F) as well.

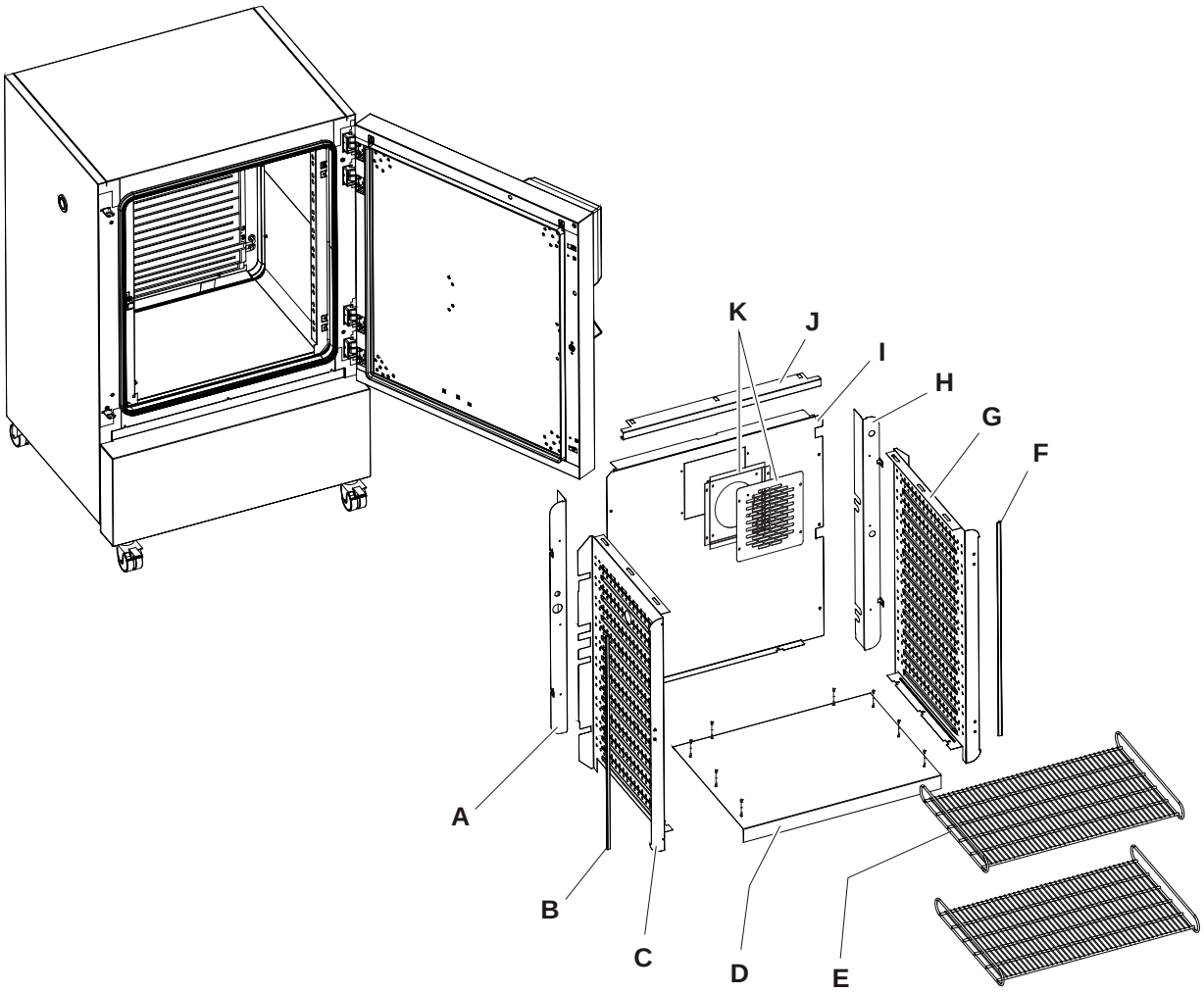


Figure **27**: Replacing the inner chamber and the gaskets between the inner and the outer chamber

A Left spoiler
B Gasket between the inner and the outer chamber
C Inner chamber side plate, left
D Inner chamber bottom
E Rack, stainless steel
F Gasket between the inner and the outer chamber
G Inner chamber side plate, right
H Right spoiler
I Inner chamber rear panel
J Stop ledge, top
K Fan panel, fan cover

7.8 Testing and replacing the heating element (*-4E1*)

Spare parts:	Heating element 240 V / 600 W (order no. 5005-0183) Heating element spacer (order no. 4020-0003) PU foam (order no. 1004-0009) Shrink down silicon hose, length 160 mm / *6.3 in* (order no. 6007-0023) Silicone, red (order no. 1004-0007) Gasket (order no. 6005-0146) Cable sockets stainless steel (order no. 5024-0007)
Necessary tools	Crosstip screwdriver, size 2 Multimeter measuring device Fork wrench, size 20 Universal cutter Side cutter Vise-grip wrench

1. Disconnect the unit from the power supply.
2. Remove the rear panel (chap. 5).
3. Measure with a multimeter the resistance of the heating element (D) at the connector (-X60) at pins 1 and 2. If the resistance is 96 Ω ± 10 %, the heating element is OK. If the measuring results in another value, the heating element is defective and must be replaced.
4. Remove with a knife the foam in the mounting opening above the fan, which surrounds the connections of the heating element (D).

	Protect the fan which is located underneath by covering it with suitable foil etc.

5. Cut open the shrink down silicon hoses filled with silicone and uncover the connections of the heating element. Disconnect the cables.
6. Remove the inner chamber (chap. 7.7).
7. Then remove the fixing screw (E) in the inner chamber.
8. Now pull out the heating element through the inner chamber and remove the heating element spacer (F).
9. Mount the new heating element by following steps 5 to 8 in reverse order.

	The gasket (C) at the heating element must be replaced.

10. Install new cable sockets at the cut cable ends and put approx. 80 mm / 3.15 in long shrink down silicon hoses over the connections of the heating elements. Connect the heating element and fill the shrink down silicon hoses with red silicone.

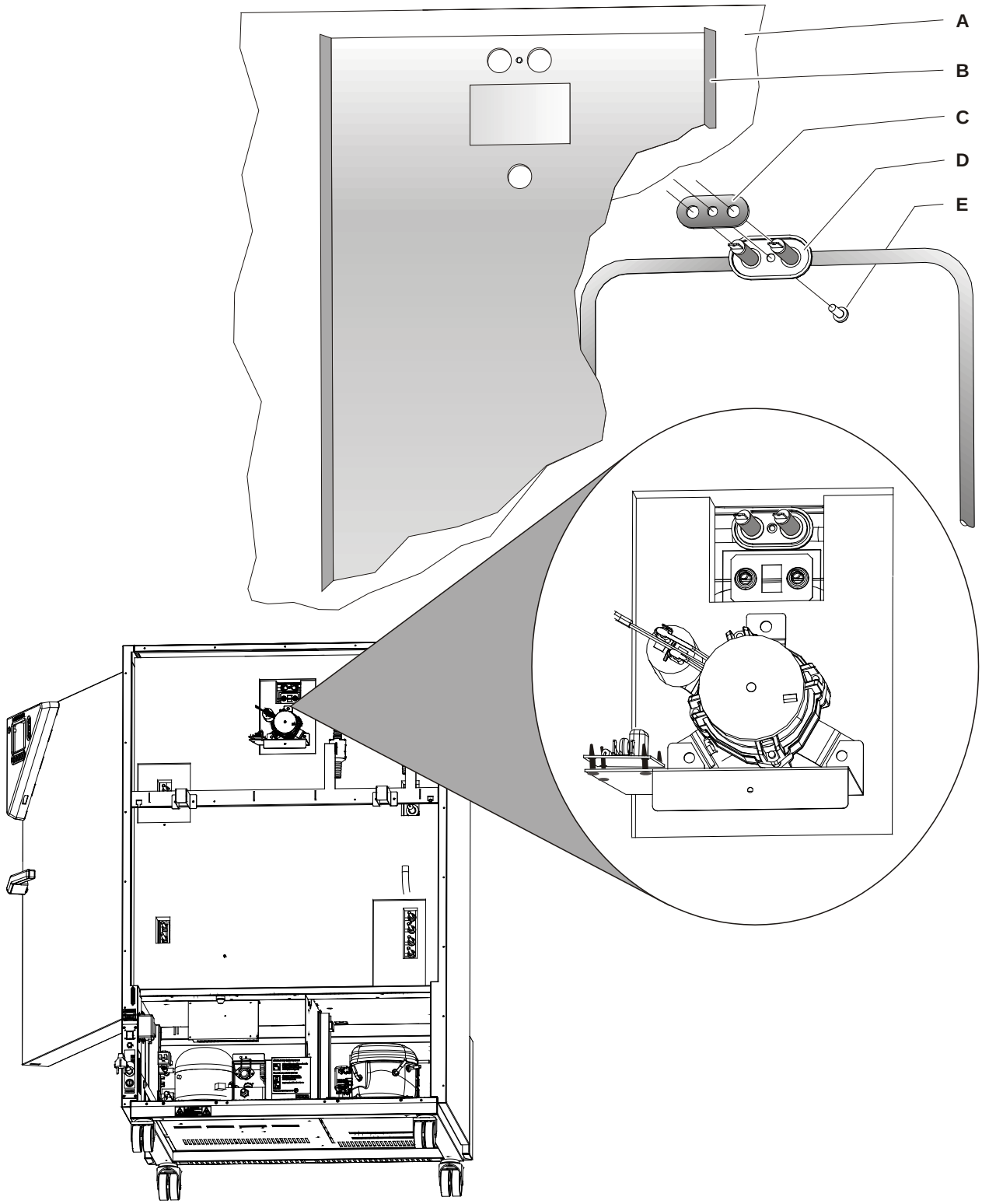


Figure 28: Replacing the heating element

A	Rear panel of the outer chamber	**D**	Heating element
B	Bottom plate	**E**	Fixing screws
C	Gasket		

Following installation, fill the open spot around the connections with insulating foam.

Before mounting the inner chamber, check the distance between the heating element (D) and the rear panel of the outer chamber (A). The heating element spacer (F) must be oriented with its long side towards the rear panel of the outer chamber.

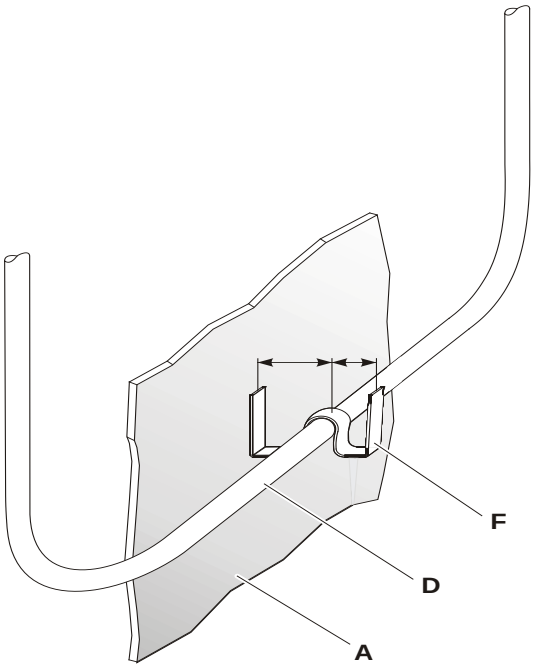


Figure 29: Mounting the heating element spacer

A Rear panel of the outer chamber

D Heating element

F Heating element spacer

7.9 Checking and replacing the inner chamber Pt 100 temperature sensor (*-3B1*)

Spare parts:	Temperature sensor, 2 x Pt100	order no. 5002-0050
	Sensor holder	order no. 4020-0643
	Screwed cable fitting	order no. 6002-0397
	Cable access port	order no. 6005-0117
	PU foam	order no. 1004-0009
Necessary tools	Crosstip screwdriver, size 2	
	Multimeter measuring device	
	Fork wrench, size 15/18	
	Universal cutter	
	Side cutter	

1. Disconnect the unit from the power supply.
2. Remove the housing cover of the lower front (chap. 5.1).
3. Pull the bottom electric mounting plate out of the unit (chap. 8.5).
4. Pull the wires of the Pt100 temperature sensor out of the terminal strip E1-Pt100 and the Safety controller Pt100 entry on the MB1controller MB1 I/O-board (-3N2) (see wiring diagram and chap. 8.6).

Terminal strip on the controller MB1 I/O-board (*-3N2*)	**Pin**	**Temperature sensor wire**
E1-Pt100	+1	white
	-2	blue
	3	blue
Safety controller Pt100 entry	1	white-blue
	2	red-blue
	3	red

Table 2: Connection of the Pt100 temperature sensor (*-3B1*) on the controller MB1 I/O-board (*-3N2*)

Checking the temperature sensor (*-3B1*):

5. To test the temperature sensors, measure the resistance with a multimeter between one of the blue wires and the white wire (for Pt100 inner chamber), resp. between the white-blue wire and the red or the red-blue wire (for Pt100 safety controller).
6. Refer to Table 1 for the temperature value of the respective measured resistance value. Compare this temperature value with the temperature measured with a reference thermometer measuring the temperature inside the inner chamber. If the temperature values deviate by < 5°C, perform an adjustment (chap.11). If the temperature values deviate by more than 5°C, the temperature sensor is defective and must be replaced.
7. Remove the inner chamber (chap. 7.7).
8. Remove the cable access port of the Pt100 temperature sensor from the left spoiler.
9. Remove the left spoiler (chap. 7.7).

10. Remove with a cutter the insulating foam at the unit rear in the area of the temperature sensor.
11. Detach all fixings (cable connector etc.) of the Pt100 temperature sensor cable in the machine room and at the unit rear.
12. Loosen the screwed cable fitting (D) in the interior.
13. Pull the Pt100 temperature sensor cable into the interior.
14. Pull the temperature sensor (C) out of the cable access port (B) at the sensor holder (A).
15. Install the new Pt100 temperature sensor in reverse order.
16. When installing the sensor mind that the end of the temperature sensor fits the marking (E) on the outer chamber
17. After the installation fill the mounting opening on the rear with insulating foam.
18. Calibrate and adjust the temperature controller (chap. 11).

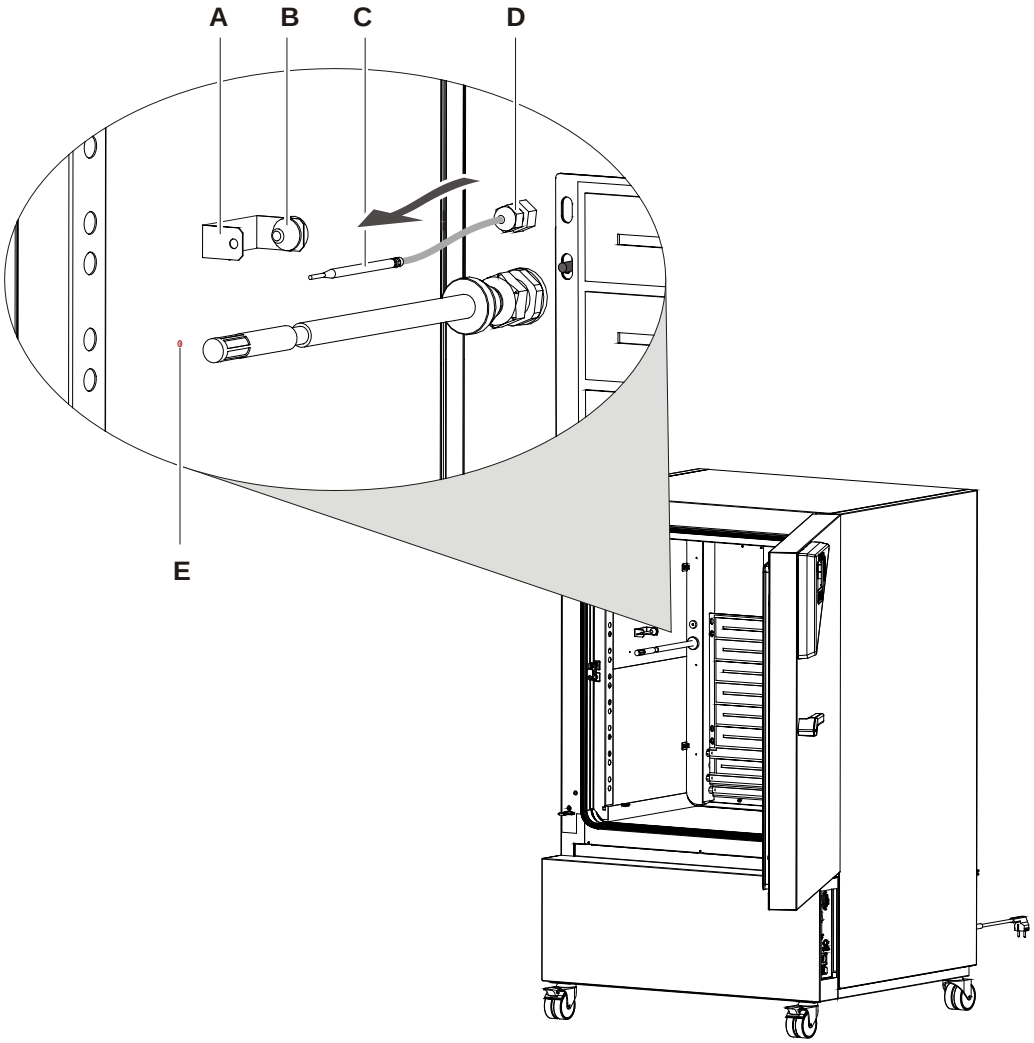


Figure 30: Replacing the inner chamber Pt 100 temperature sensor (*-3B1*)

A Sensor holder
B Cable access port
C Pt 100 temperature sensor
D Screwed cable fitting
E Position marking

7.10 Checking and replacing the humidity sensor and the sensor board (-*3B2*)

Spare parts:	Humidity sensor long with sensor board F2CX (order no. 5002-0143) Cable access port (order no. 6005-0112) Screwed cable fitting (order no. 6002-0398) PU foam (order no. 1004-0009)
Necessary tools	Crosstip screwdriver, size 2 Multimeter measuring device Hygrometer Fork wrench, size 30/32 Universal cutter Side cutter



The humidity sensor and the sensor board have been calibrated together. For this reason always replace them together.

1. Disconnect the unit from the power supply.
2. Remove the housing cover of the lower front (chap. 5.1).
3. Pull the bottom electric mounting plate out of the unit (chap. 8.5).

Checking the humidity sensor (-*3B2*)

4. Remove the wire from the connection +10, (E4 / 4-20 mAmp) on the controller MB1 I/O-board (-3N2) (see wiring diagram). Use an ampere meter connected in series to measure the current between the free cable ending and the controller MB1 I/O-board (for this purpose, connect the unit temporarily to the power supply and switch it on).
5. The measured current should be in the range between 4 mAmp and 20 mAmp (≙ 0 – 100 % rel. humidity). Refer to Table 3 to determine the air humidity corresponding to the measured current value. Compare this value with the reference measuring value of a hygrometer placed inside the unit. If the deviation is more than 20 % the humidity sensor is defective and must be replaced.
6. Disconnect the unit from the power supply.
7. Remove the rear housing panel (chap. 5.3).
8. Pull the contactor from the connection -20, (voltage output 45 mAmp / 24V DC) of the controller MB1 I/O-board (-3N2) (see wiring diagram).
9. Pull the wire of the humidity sensor from the connection -11 (E4 / 4 - 20 mAmp) on the controller MB1 I/O-board (-3N2) (see wiring diagram).
10. Detach all cable holders and cable ties of the humidity sensor in the machine room and at the unit rear.
11. Remove the inner chamber (chap. 7.7).
12. Remove the cable access port sealed with silicone (B) from the left spoiler.
13. Remove the left spoiler (chap. 7.7).

14. Remove with a cutter the insulating foam at the unit rear in the area of the humidity sensor.
15. Unscrew the nut of the screwed cable fitting (C) on the inside of the outer chamber.
16. Pull the humidity sensor (A) toward the rear out of the outer chamber.
17. Remove the sensor board of the humidity sensor (chap. 8.6).
18. Mount the new humidity sensor with its board by following steps 1 to 16 in reverse order.
19. When installing the sensor mind that the end of the humidity sensor fits the marking (D) on the outer chamber.
20. After the installation fill the mounting opening on the rear with insulating foam.
21. Calibrate and adjust the humidity controller (chap. 11.5).

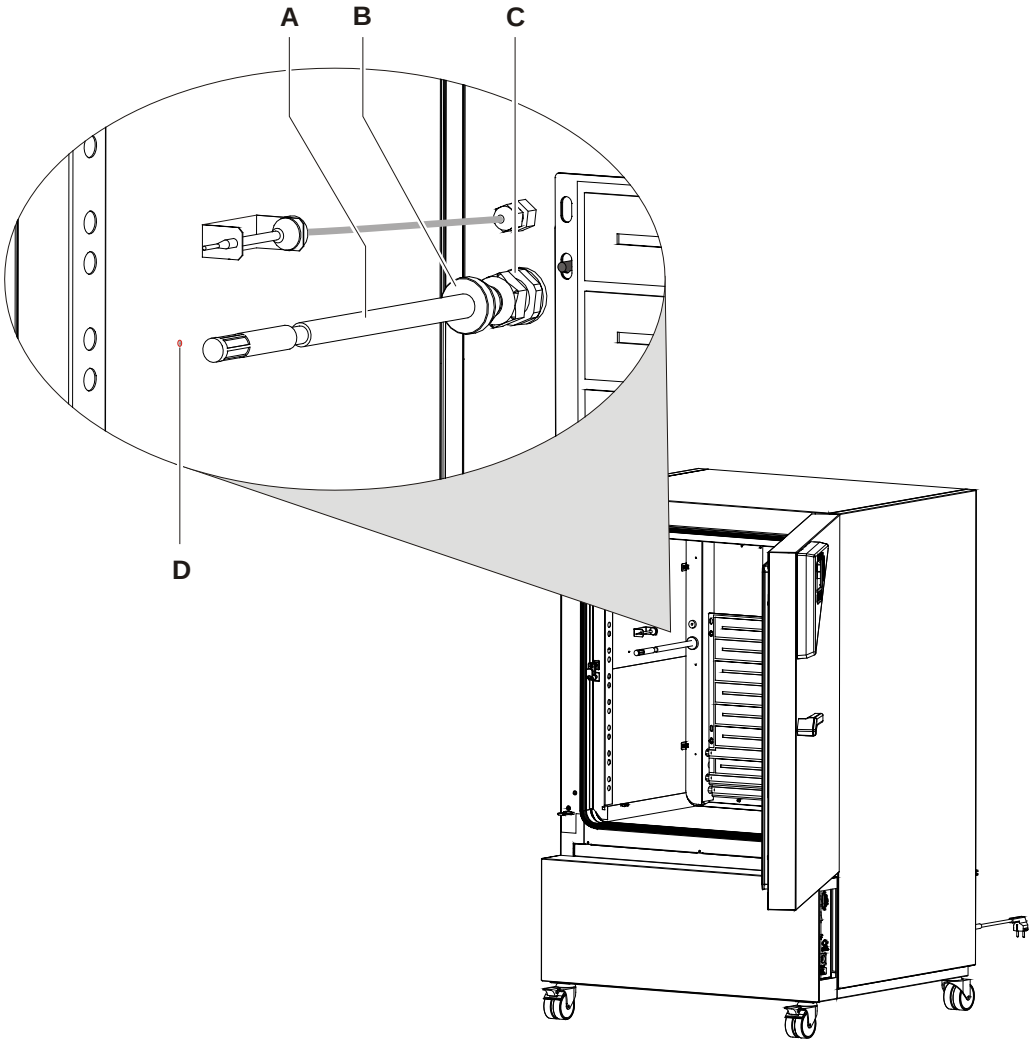


Figure 31: Replacing the humidity sensor and the sensor board (*-3B2*)

A Humidity sensor

B Cable access port

C Screwed cable fitting

D Position marking

Air humidity % r.H.	Measured current mA	Air humidity % r.H.	Measured current mA	Air humidity % r.H.	Measured current mA	Air humidity % r.H.	Measured current mA	Air humidity % r.H.	Measured current mA
0	**4.00**	**20**	**7.20**	**40**	**10.40**	**60**	**13.60**	**80**	**16.80**
1	4.16	21	7.36	41	10.56	61	13.76	81	16.96
2	4.32	22	7.52	42	10.72	62	13.92	82	17.12
3	4.48	23	7.68	43	10.88	63	14.08	83	17.28
4	4.64	24	7.84	44	11.04	64	14.24	84	17.44
5	4.80	25	8.00	45	11.20	65	14.40	85	17.60
6	4.96	26	8.16	46	11.36	66	14.56	86	17.76
7	5.12	27	8.32	47	11.52	67	14.72	87	17.92
8	5.28	28	8.48	48	11.68	68	14.88	88	18.08
9	5.44	29	8.64	49	11.84	69	15.04	89	18.24
10	**5.60**	**30**	**8.80**	**50**	**12.00**	**70**	**15.20**	**90**	**18.40**
11	5.76	31	8.96	51	12.16	71	15.36	91	18.56
12	5.92	32	9.12	52	12.32	72	15.52	92	18.72
13	6.08	33	9.28	53	12.48	73	15.68	93	18.88
14	6.24	34	9.44	54	12.64	74	15.84	94	19.04
15	6.40	35	9.60	55	12.80	75	16.00	95	19.20
16	6.56	36	9.76	56	12.96	76	16.16	96	19.36
17	6.72	37	9.92	57	13.12	77	16.32	97	19.52
18	6.88	38	10.08	58	13.28	78	16.48	98	19.68
19	7.04	39	10.24	59	13.44	79	16.64	99	19.84
20	**7.20**	**40**	**10.40**	**60**	**13.60**	**80**	**16.80**	**100**	**20.00**

Table 3: Current and humidity values of the humidity sensor

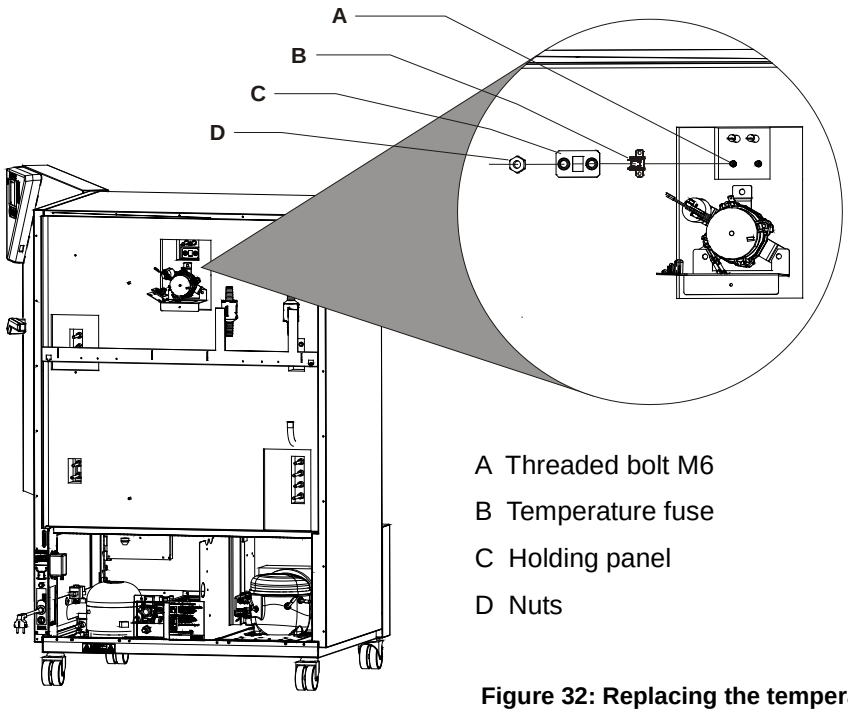
7.11 Replacing the temperature fuse 110°C / *230°F* (*-1F2*)

Spare parts:	Temperature fuse 110°C / *230°F* (order no. 5006-0043) Cable sockets (order no. 5024-0007) PU foam (order no. 1004-0009) Silicone, red (order no. 1004-0007) Shrink down silicon hose D 16.0 x 1.0
Necessary tools	Crosstip screwdriver, size 2 Wrench, size 10 Universal cutter Side cutter Vise-grip wrench

1. Disconnect the unit from the power supply and remove the rear housing panel (chap. 5.3).
2. Remove with a cutter the foam which is located in the mounting opening above the fan, which surrounds the connections of the temperature fuse (A).

	Protect the fan which is situated below by covering it with a suitable foil etc.

3. Cut open the shrink down silicon hose filled with red silicone which is located at the connections of the temperature fuse, and remove it.
4. Disconnect the cables and then remove the nuts (D).
5. Remove the holding panel (C) and the temperature fuse (B).
6. Install the new temperature fuse (B) by following steps 1 to 5 in reverse order.
7. Install new cable sockets at the cut cable ends. Coat the fuse with a new shrink down silicon hose and fill this tubing with red tube silicone.
8. After the installation fill the open spot around the connections with PU foam.



A Threaded bolt M6
B Temperature fuse
C Holding panel
D Nuts

Figure 32: Replacing the temperature fuse 110°C / *230°F* (*-1F2*)

8 Repair work at electric and electronic components

DANGER!	
	**Danger of electric shock.** **Danger to life.** ➢ The unit must be switched off and disconnected from the power supply prior to performing most of the described service tasks. ➢ Take all precautionary measures that a unit which is disconnected from the power supply will not be inadvertently connected to the power supply. ∅ The unit must be live to perform some of the service tasks. In this case, a second person must be present who is able to switch off the unit in case of emergency.

CAUTION!	
	**Danger of damaging the electronics.** Circuit boards may be damaged by handling malpractices and touching of its components. ➢ Prior to work at electronic components the technician must take appropriate protective measures against electrostatic discharge. Wearing ESD shoes and a grounding bracelet have shown to be useful. ➢ Before opening the triangle instrument box the technician should at least electrostatically discharge by touching grounded metallic objects.

8.1 Activating and replacing the miniature circuit breaker (*-1F1*)

Spare parts:	Miniature circuit breaker (order no. 5006-0075)
Necessary tools	Flathead screwdriver, size 2

1. Disconnect the unit from the power supply.
2. Remove the housing cover on the lower front (chap. 5.1).
3. Check the miniature circuit breaker.

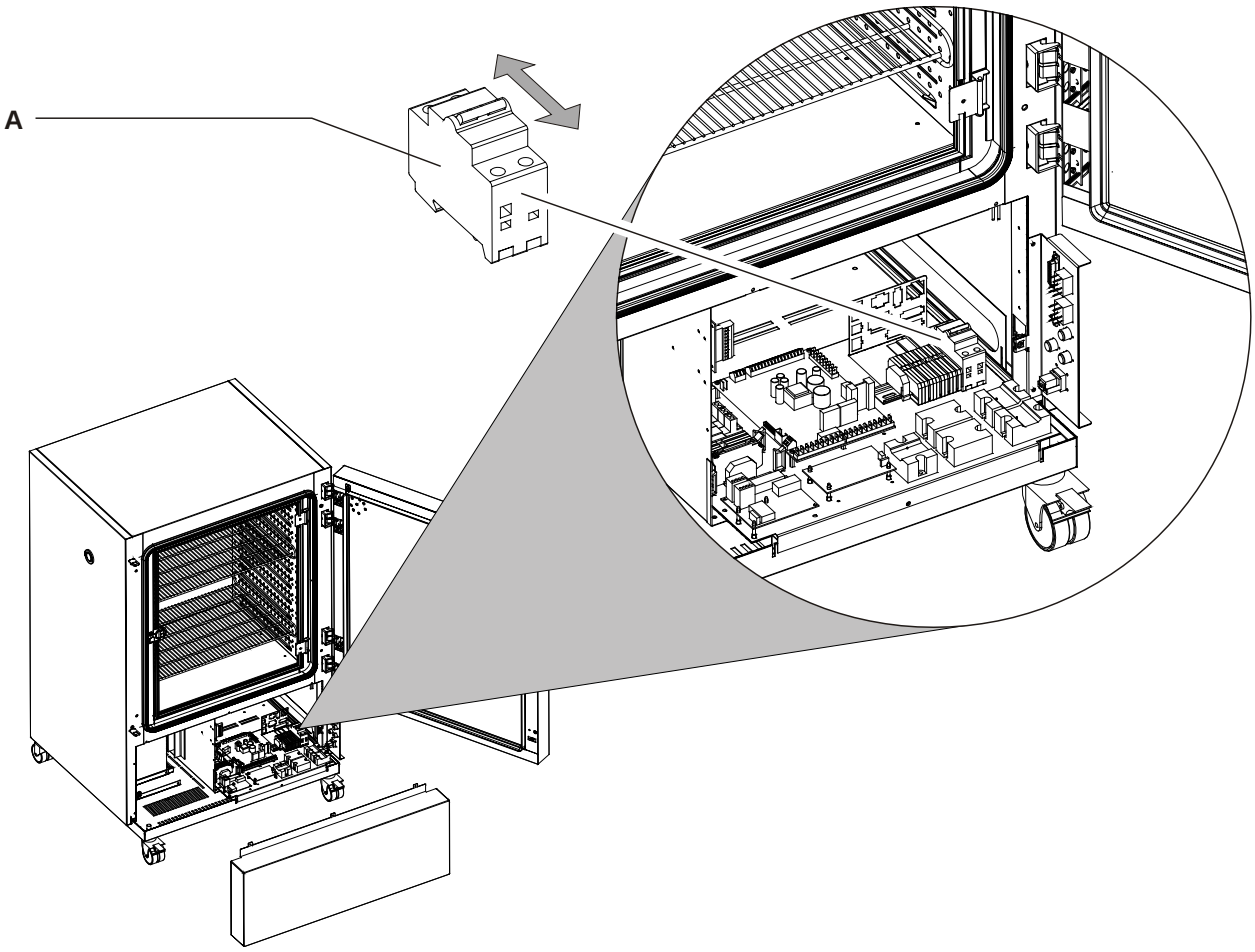


Figure 33: Miniature circuit breaker (*-1F1*)

A Miniature circuit breaker

CAUTION!
If the miniature circuit breaker has responded, identify and remove the cause before taking the unit into operation again!

8.2 Replacing the power cord with plug

Spare parts:	Power cord with power plug (order no. 8009-0483) Power cord with power plug Switzerland (order no. 8012-0583) Power cord with power plug England (order no. 8012-0220) Power cord with power plug UL (order no. 8009-0436) Power cord KBF 720 UL (order no. 8009-0360) Power module plate of housing (order no. 4001-0269)
Necessary tools	Crosstip screwdriver, size 2

1. Disconnect the unit from the power supply and remove the rear panel (chap. 5.3).
2. Remove the screws (A) from the power cord holder (D).
3. By pressing down the clip of the power cord holder (D) you can take the holder out of the power module plate
4. Pull the power cable (E) out of the power module plate.
5. Mark the connections at the connector block (C).
6. Remove the protective conductor connection und all connections at the connector block (C).
7. Install the new power cord by following steps 1 to 6 in reverse order.

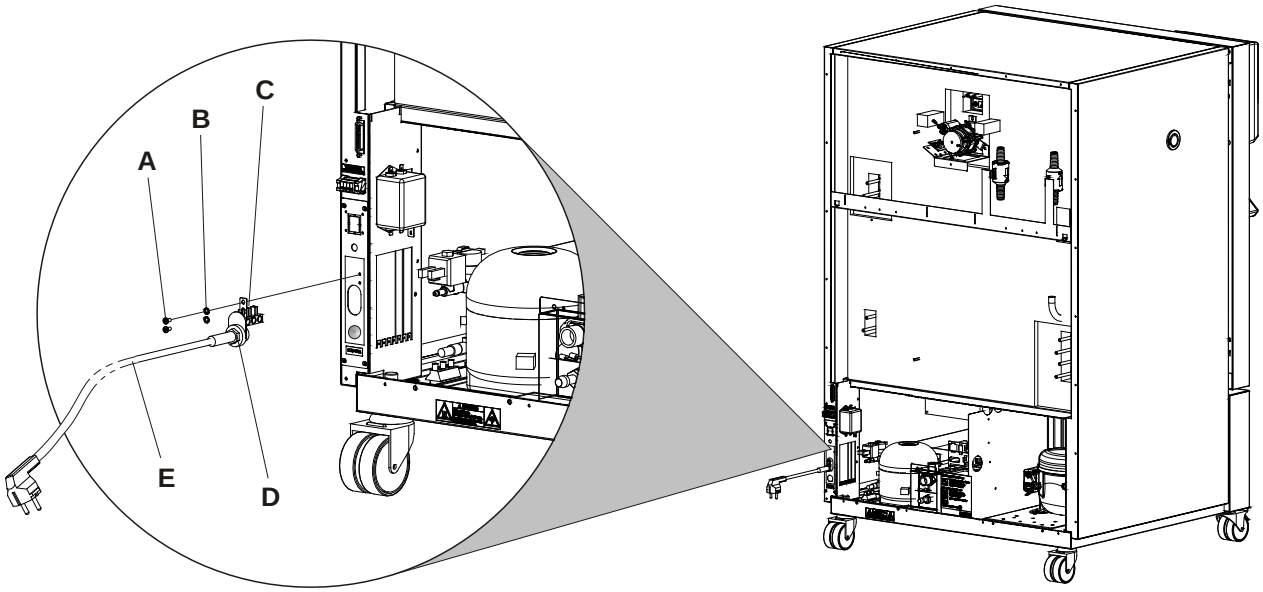


Figure 34: Replacing the power cord with plug

A Screws
B Toothed disk
C Connector block
D Power cord holder
E Power cord

8.3 Replacing the line filter (*-1Z1*)

Spare parts:	Line filter (order no. 5026-0016)
Necessary tools	Crosstip screwdriver, size 2

1. Disconnect the unit from the power supply and remove the rear panel (chap. 5.3).
2. Mark the position of the connections.
3. Pull the contactors from the connections (A).
4. Remove the fixing screws (C).
5. Install the new line filter (B) by following steps 1 to 4 in reverse order.

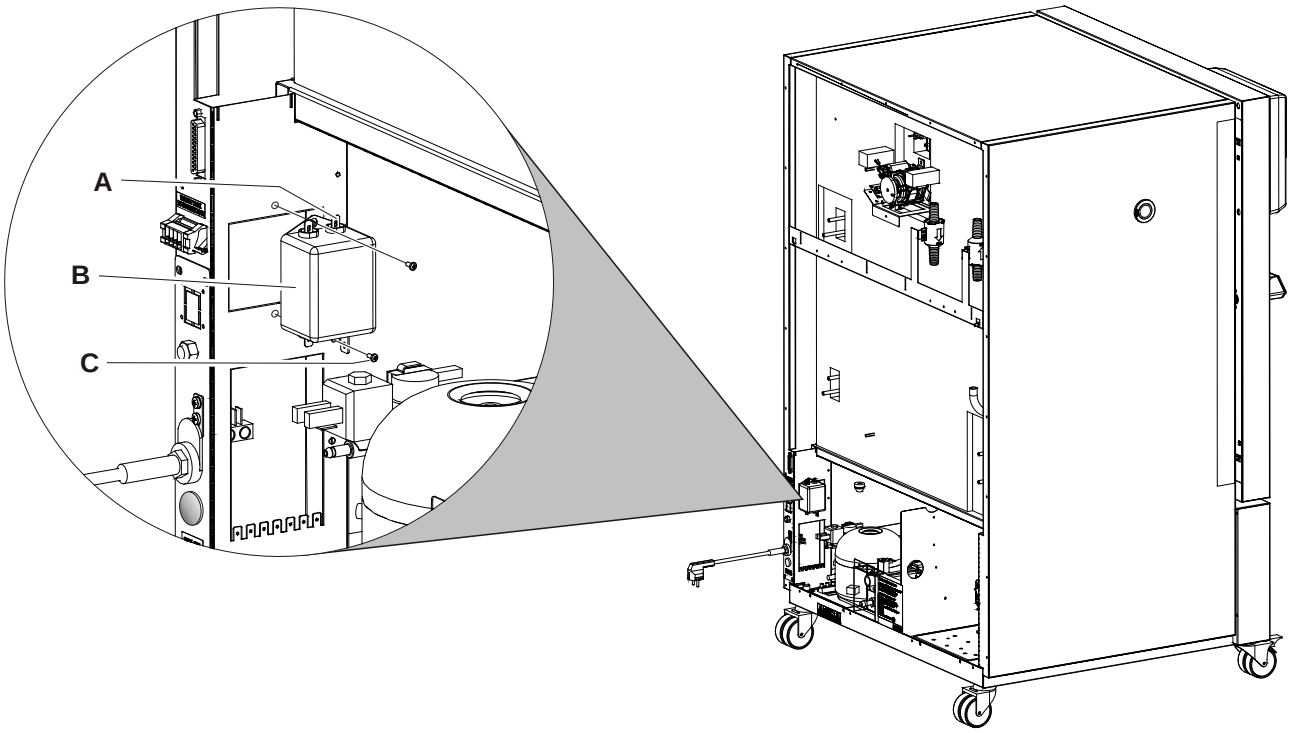


Figure 35: Replacing the line filter (-1Z1)

A Connections

B Line filter

C Fixing screws

8.4 Checking and replacing the main switch (*-1S1*) and the humidity switch (*-8S1*)

Spare parts:	Rocker switch (2W) 230VAC (order no. 5019-0010)
Necessary tools	Crosstip screwdriver, size 2 Continuity checker or multimeter measuring device

1. Disconnect the unit from the power supply.
2. Remove the housing cover on the lower front (chap. 5.1).
3. Mark the connection position of each connector at the corresponding switch (B; C).
4. Pull off the contactors from the connections of the corresponding switch.
5. Set the switch to be tested to ON.
6. With the main switch, test the continuity between the connections 1A and 2A and between the connections 4B and 5B. With the humidity switch, test in addition also the continuity between the connections 3A and 2A and between 6B and 5B.
7. For replacing press together the four clips of the switch and push the switch forward out of the lateral control panel (D).
8. Install the new switch by following steps 1 to 7 in reverse order.

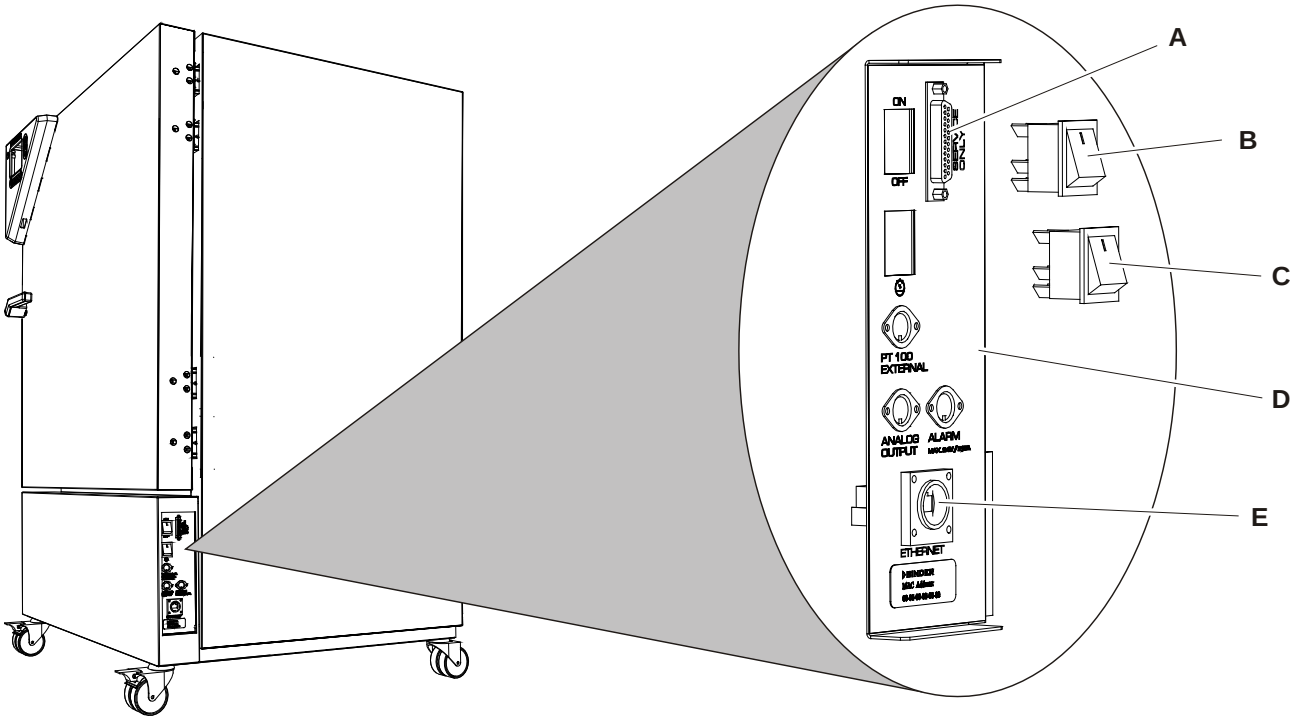


Figure 36: Checking and replacing the main switch (*-1S1*) and the humidity switch (*-8S1*)

A Interface RS422

B Main switch (*-1S1*)

C Humidity switch (*-8S1*)

D Right lateral control panel

E Socket RJ45

8.5 Removing the electric mounting plates from the machine room

DANGER!



Danger of electric shock.

Danger to life.

- ➢ The unit must be switched off and disconnected from the power supply prior to performing most of the described service tasks.
- ➢ Take all precautionary measures that a unit which is disconnected from the power supply will not be inadvertently connected to the power supply.
- ∅ The unit must be live to perform some of the service tasks.
  In this case, a second person must be present who is able to switch off the unit in case of emergency.

CAUTION!

Danger of functional disorders and damaging the electronic.

- ➢ Prior to work at the electrical equipment check identity of the components with the aid of the wiring diagram. The order of the electrical equipment may be different from the description in this service manual.

CAUTION!



Danger of damaging the electronics.

Circuit boards may be damaged by handling malpractices and touching of its components.

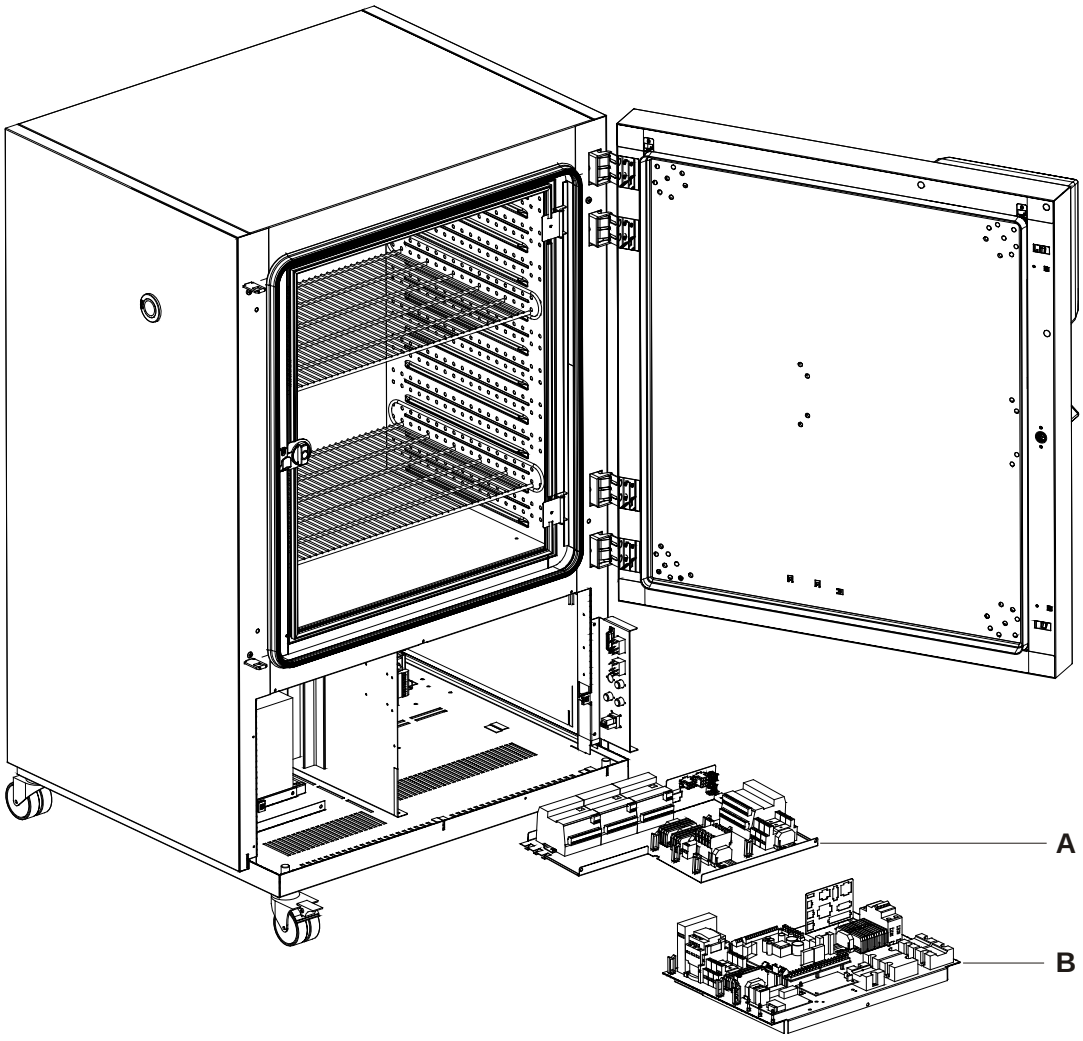
- ➢ Prior to work at electronic components the technician must take appropriate protective measures against electrostatic discharge. Wearing ESD shoes and a grounding bracelet have shown to be useful.
- ➢ Before opening the triangle instrument box the technician should at least electrostatically discharge by touching grounded metallic objects.

Spare parts:	Electric mounting plate, standard KBF 115, 240, 720, Electric mounting plate, complete (order no. 8007-0339)
Necessary tools	Crosstip screwdriver, size 2 Torx screwdriver, size T20

1. Disconnect the unit from the power supply.
2. Remove the housing cover on the lower front (chap. 5.1).
3. Remove the fixing screws from the corresponding electric mounting plate (A; B).

	To remove the electric mounting plate (option) (A) you need to unscrew all lateral control panels.

4. Pull the electric mounting plate out of the machine room as far as possible due to the cable lengths.
5. Mount the electric mounting plate by following steps 1 to 4 in reverse order.



6.

Figure 37: Pulling the electric mounting plate out of the machine room

A Electric mounting plate (option)

B Electric mounting plate (standard)

8.6 Components of the electric mounting plate (standard)

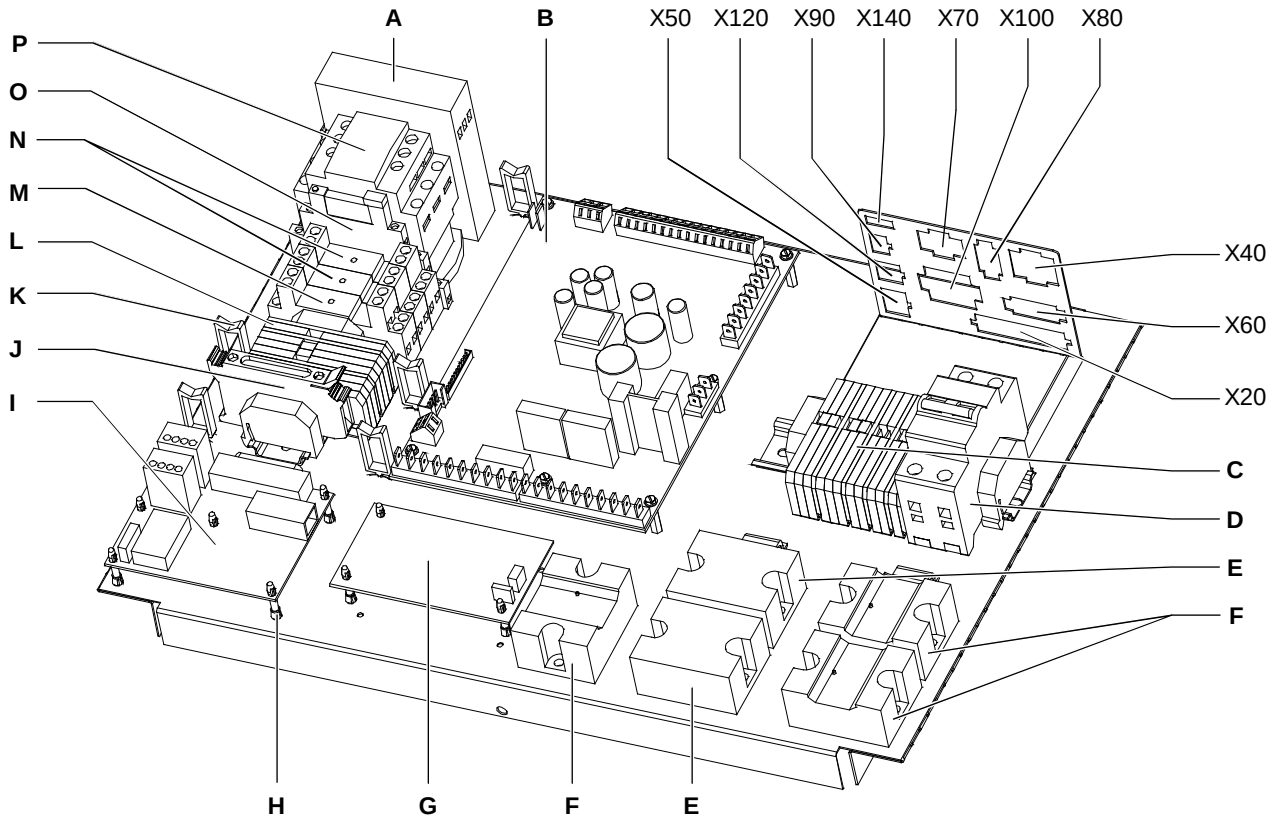


Figure 38: Components of the electric mounting plate (standard)

A	Slow-release time relay	**I**	Converter RS422 / Ethernet
B	Controller MB1 I/O board 115/230 V AC	**J**	Fuse terminal 6.3x32 mm
C	4-wire through terminals	**K**	Cable clamp, white 35 mm / *1.38 in*
D	Miniature circuit breaker 2-pol. B16 A	**L**	4-wire through terminals
E	Solid state relay (1S / 3 A) 24 VDC	**M**	Relay (2 W / 5 A) 230 VAC + relay socket
F	Solid state relay (1S / 25 A) 280 VAC	**N**	Relay (2W / 8A) 24 VDC
G	Humidity sensor board	**O**	Solid state relay (1S/2 A) 24 VDC + socket
H	Board spacer 15.9 mm / *0.625 in*	**P**	Power contactor (3H/1S/1Ö) 24 VDC

8.7 Components of the electric mounting plate (optional plate)

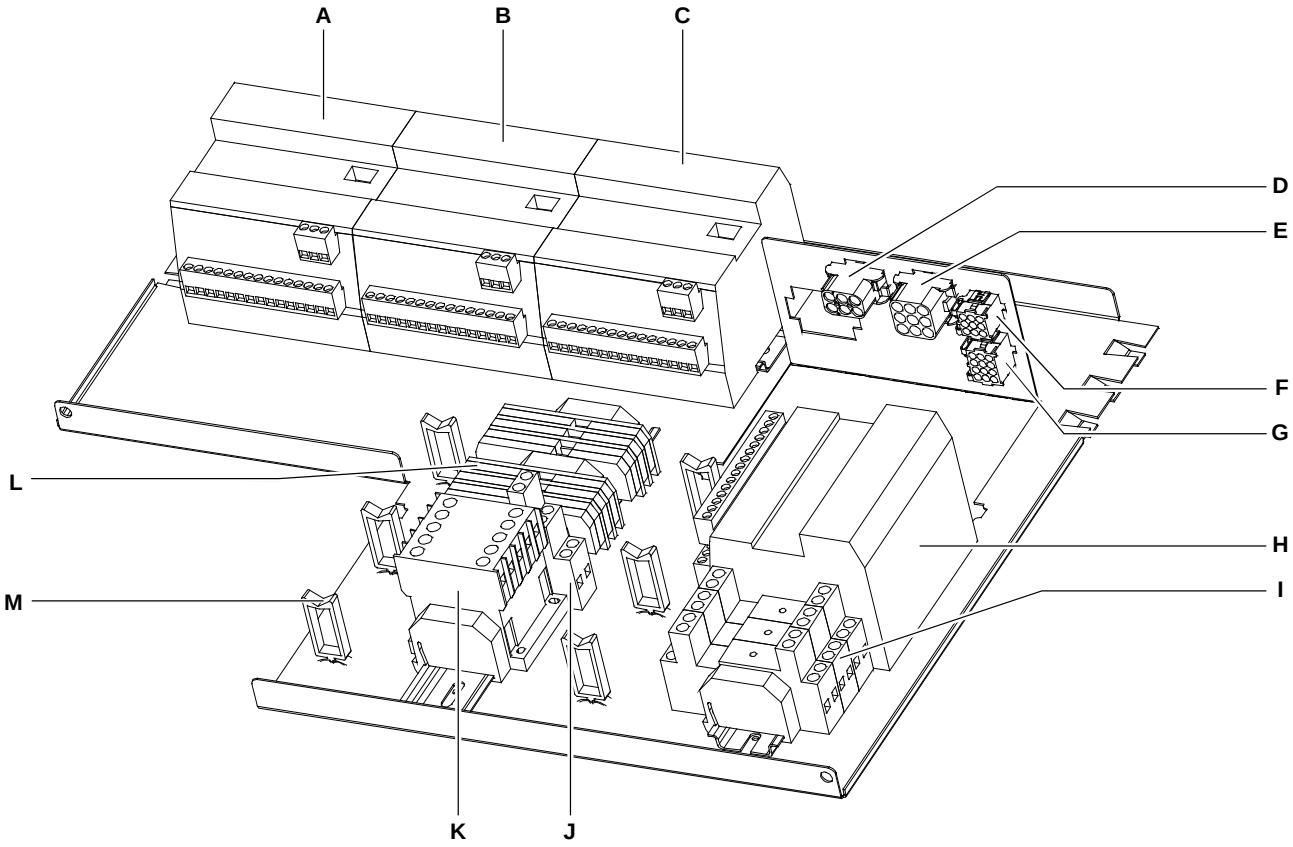


Figure **39**: Components of the electric mounting plate (optional)

A	Controller mTRON 4025 analog output	**H**	Controller mTRON 4030 logic relay
B	Controller mTRON 4025 analog output	**I**	Relay (2 W / 8 A) 24 VDC
C	Controller mTRON 4015 relay	**J**	Relay (1W / 10A) 230VAC + relay socket
D	Connector socket 6-poles	**K**	Power contactor (3H/1Ö) 230 VAC - 2,2 kW
E	Connector socket 9-poles	**L**	4-wire through terminal
F	Connector socket 9-poles	**M**	Cable clamp, white 35 mm / *1.38 in*
G	Connector socket 12-poles		

	Depending on the optional equipment the components of the electric mounting plate may be different to those shown in the above figure. If required please refer to the appropriate valid optional wiring diagram for further information on the structural component or component parts used in the unit.

8.8 Controller MB1 I/O Board (*-3N2*)

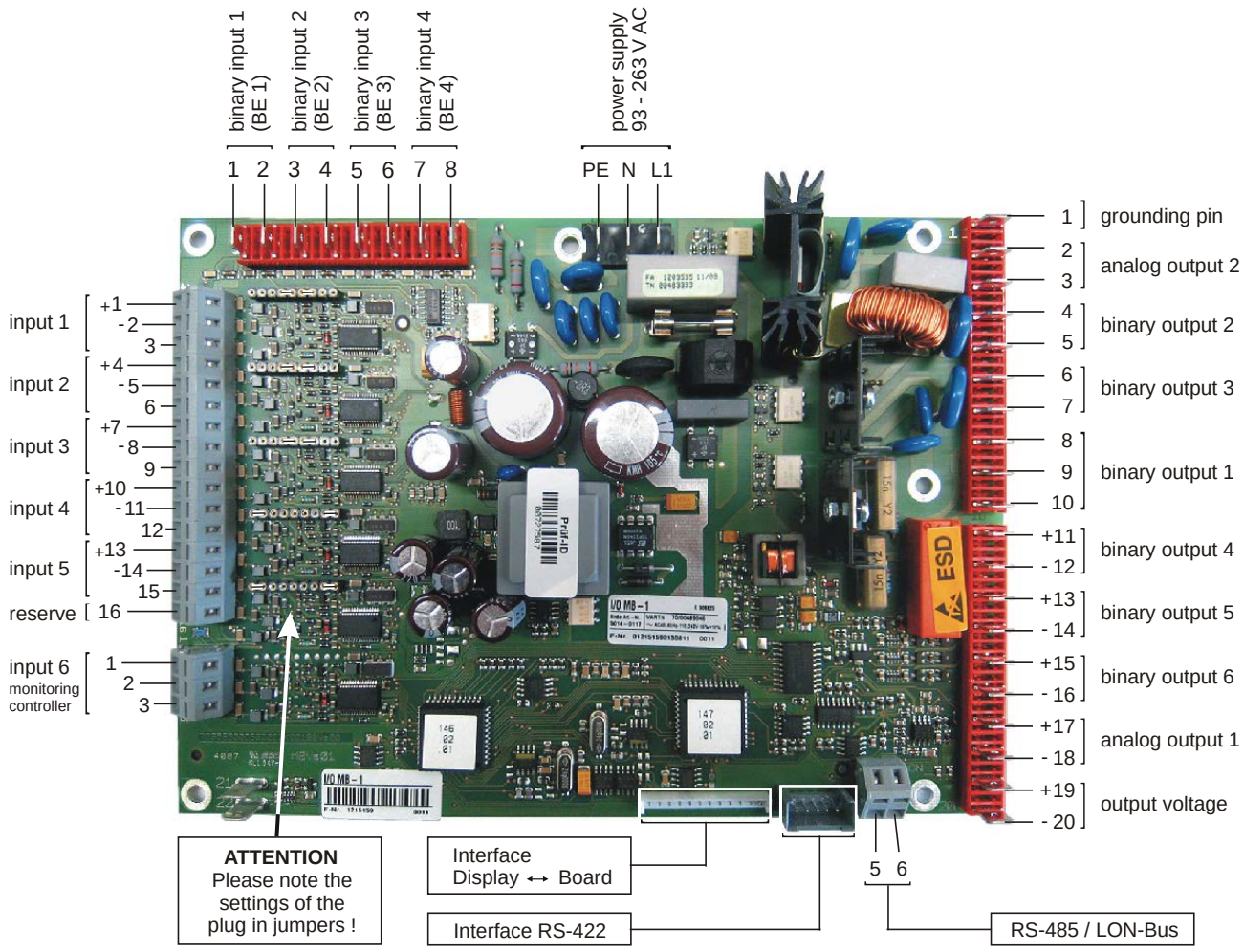


Figure 40: Pin configuration controller MB1 I/O Board

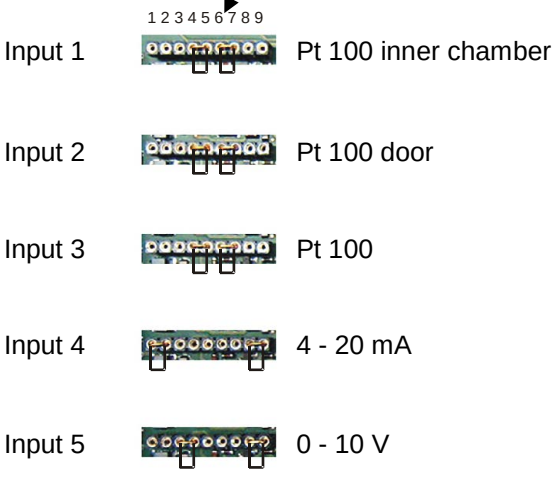


Figure 41: Jumper configuration for inputs 1 to 5

8.8.1 Replacing the controller MB1 I/O Board (*-3N2*)

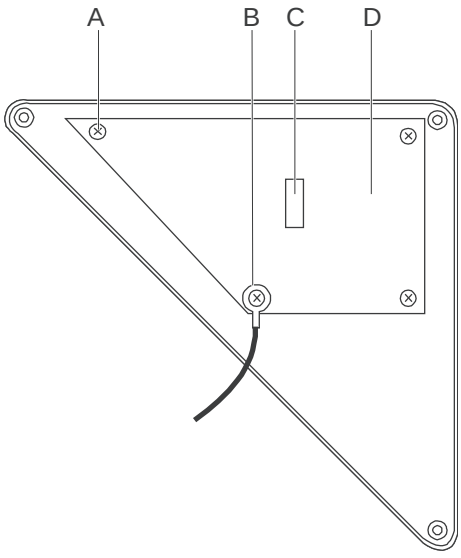
Spare parts:	Controller MB1 I/O Board 115/230V AC	(order no. 5014-0117)
Necessary tools	Crosstip screwdriver, size 2	

1. Disconnect the unit from the power supply.
2. Remove the housing cover of the lower front (chap. 5.1).
3. Pull the electric mounting plate with the controller out of the machine room. (chap. 8.5)
4. Mark the connection wirings and remove them from the controller.
5. Remove the fixing screws and take out the controller board.
6. Before installing the new board, check the configuration of the jumpers (chap. 8.8).
7. Install the new board by following steps 1 to 5 in reverse order.

8.9 Replacing the controller display *(-3N1)*

Spare parts:	Display board	(order no. 5014-0182)
Necessary tools:	Crosstip screwdriver, size 2	

1. Disconnect the unit from the power supply.
2. Remove the triangle instrument box from the unit (chap. 6.3.1).
3. Remove the screw with the grounding wire (B).
4. Unscrew the screws (A).
5. Remove the controller display (D) from the instrument box.
6. Install the new controller display by following steps 1 to 5 in reverse order. Take care to fasten the grounding wire again with screw (B).
7. Adjust the temperature and humidity control (chap. 11).



A Screws

B Screw for grounding wire

C Contactor for controller cable

D Controller display

Figure 42: Replacing the controller display (*-3N1*)

	With the options Analog outputs for temperature and humidity Alarm outputs for temperature and humidity Two-channel pen recorder following replacement of the controller display (-3N1) you need to record again the mTRON setup. When ordering a spare part, therefore always indicate the type and the corresponding serial no. of the climatic chamber. You will then receive a complete set with the mTRON modules corresponding to the required data. Send the removed mTRON modules back to BINDER-Service. Prior to sending, inscribe on the modules the date and, if the order was issued by BINDER GmbH Tuttlingen, also the “SAB no.”.

8.10 Replacing individual mTRON relay modules

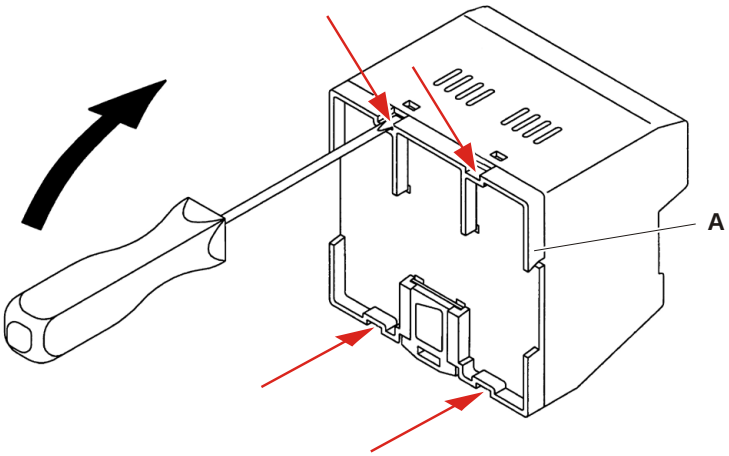
Spare parts:	mTRON relay module 4015 (-11N1), (order no. 5014-0075) mTRON Analog output module 4025 (-12N1), (order no. 5014-0074)
Necessary tools:	Crosstip screwdriver, size 2 Small slotted screwdriver

	**Replacing individual mTRON modules:** The replacement of individual mTRON modules is made easy by the “Plug & Play” function. In each module is a storage board (C) containing the configuration data for the LON-bus addressing. When replacing a module, you only need to place the storage board onto the new module, and it then works with the original configuration data.

CAUTION!

- If you don’t replace the storage board when replacing a module, the module must receive the appropriate data set, according to the optional equipment of the unit.
- Only replace a module with one of the same type (e.g. *relay module 4015* with *relay module 4015*)
- If you place the storage board at a module with a different functionality, the network will not recognize the individual options. And in this case the data on the storage board will be deleted!

1. Disconnect the unit from the power supply and remove the housing cover of the lower front (chap. 5.1).
2. Pull the electric mounting plate with the options out of the machine room (chap. 8.5).
3. Remove the connector blocks from the corresponding mTRON module and pull the module off the top hat rail.
4. Open the module by unlocking the bottom plate (A) with a suitable tool (e.g. small slotted screwdriver) at the four marked positions (Figure 43).
5. Remove the bottom plate (A) and pull the boards (B) out of the housing (D) (Figure 44).
6. Pull the storage board (C) out of its base and place it into the new module at the same location.
7. Assemble the new module by following steps 4 to 6 in reverse order.



A Bottom plate

Figure 43: Removing the bottom plate from the mTRON module

A Bottom plate

B Boards

C Storage board

D Housing

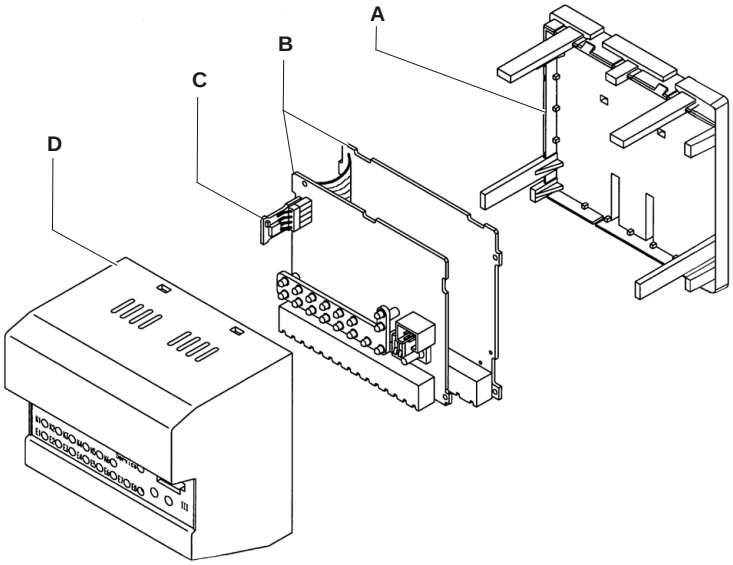


Figure 44: Replacing the storage board with mTRON module

8.11 Replacing the RS422 / Ethernet converter (*-2U1*)

Spare parts:	RS422 / Ethernet converter (order no. 5021-0021)
Necessary tools:	Crosstip screwdriver, size 2

1. Disconnect the unit from the power supply.
2. Remove the housing cover of the lower front (chap. 5.1).
3. Pull the electric mounting plate with the RS422 / Ethernet converter out of the machine room (chap. 8.5)
4. Mark and remove the connection wirings.
5. Remove the fixing screws and take out the converter.
6. Install the converter by following steps 1 to 5 in reverse order.
7. Apply the sticker bearing the new MAC address next to the RJ 45 socket on the lateral control panel.

8.12 Replacing the 24 V power supply unit (*-2T1*)

Spare parts:	Power supply unit (order no. 5020-0032)
Necessary tools:	Crosstip screwdriver, size 2

1. Disconnect the unit from the power supply.
2. Remove the rear panel (chap. 5.3).
3. Mark and remove the electrical connections from the power supply unit (B).
4. Unscrew the screws (C) to remove the power supply unit from the intermediate bottom (A).
5. Install the power supply unit by following steps 1 to 4 in reverse order.

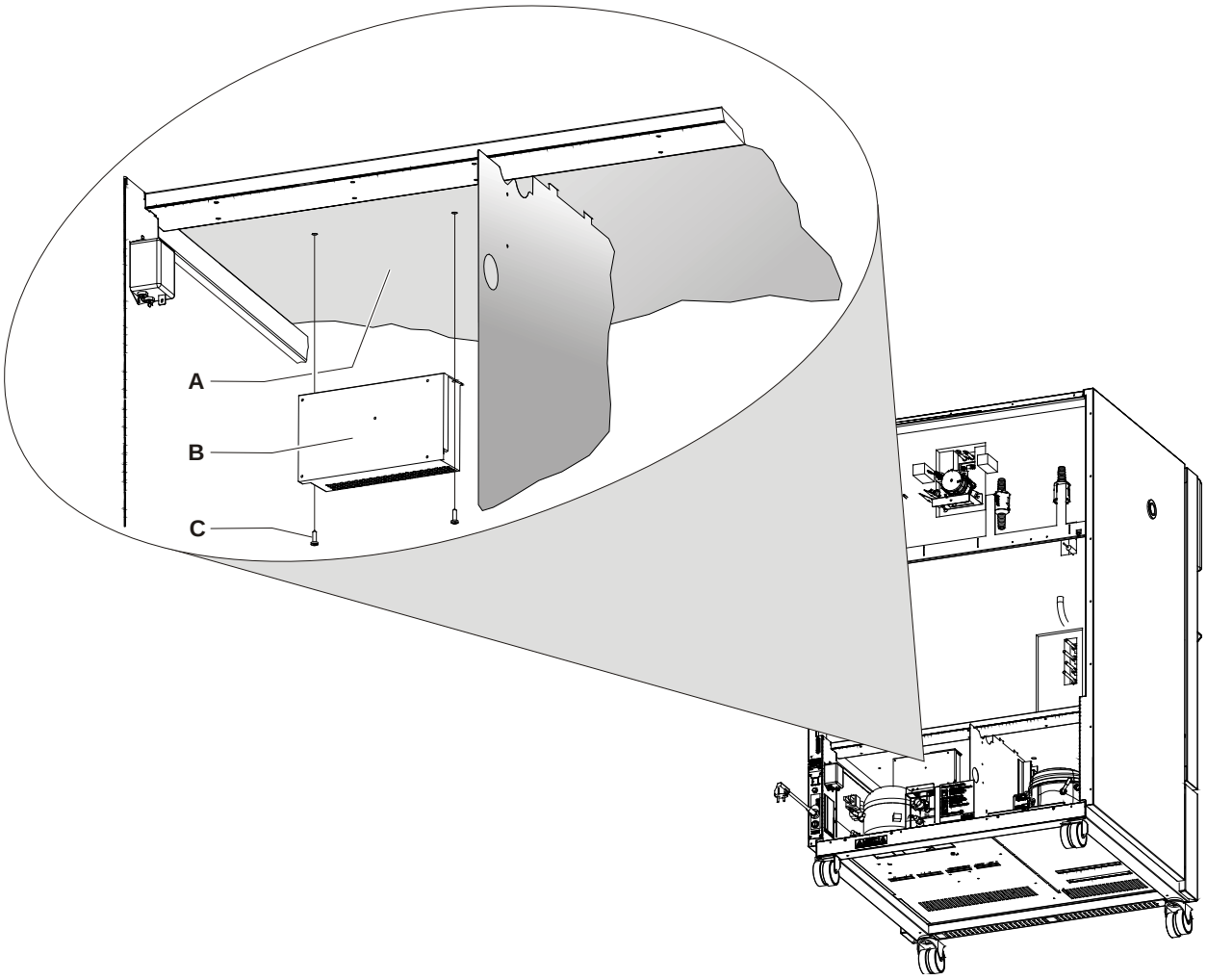


Figure 45: Replacing the 24 V power supply unit (-2T1)

A Intermediate bottom

B Power supply unit

C Screws

9 Humidifying and dehumidifying system

General information

DANGER!	
	**Danger of electric shock.** **Danger to life.** ➢ The unit must be switched off and disconnected from the power supply prior to performing most of the described service tasks. ➢ Take all precautionary measures that a unit which is disconnected from the power supply will not be inadvertently connected to the power supply. ➢ The unit must be live to perform some of the service tasks. In this case, a second person must be present who is able to switch off the unit in case of emergency.

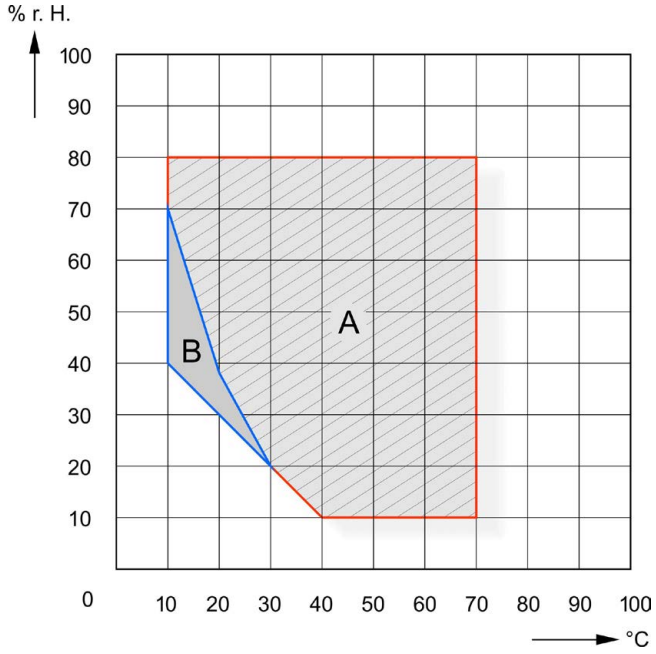
DANGER!	
	**Danger by hot water.** **Danger of scalding.** ➢ Prior to start working, make sure that the unit has cooled down.

The humidity system is switched on with the humidity switch (*-8S1*) located in the right lateral control panel.

The climatic chamber KBF is equipped with a digital humidity sensor. This results in a control accuracy of up to ± 3 % r.H. of the set point. The temperature-humidity diagram (Figure 46) shows the possible working ranges for humidity.

With typical standard climate values, e.g. 30°/ 65% or 40°/ 75%, water consumption without opening the door is between one and three liters daily.

	The preset temperature and humidity values should be situated within the optimum range (hatched range in Figure 46). Only within this area can the unit will not be exposed to excessive moisture due to condensation. In the short-term set points outside the optimum range can also be targeted. The control accuracies of ± 3 % r.H., however, cannot be guaranteed in this case.



Range A: Control range of temperature and relative humidity

Range B: Discontinuous range (no continuous operation

Figure 46: Temperature-humidity diagram KBF

	Entry of the humidity set-point 0 % in defined program sections permits completely switching off humidity in Program Mode and thus attaining faster temperature changes.

The climatic chamber KBF is equipped with a door heating and door frame heating system to prevent condensation in the door area.

If the set points for temperature or humidity are outside the optimum range, condensation can arise in the door area.

CAUTION	
	Condensation by excess humidity. **Danger of corrosion on the housing after operating at humidity values > 70 % r.H. for a long period.** ➢ Before shut-down for several days we recommend drying the appliance: • Set the humidity to 0 % r.H. and switch on the humidity switch. • Set the temperature set point to 60°C / *140°F* for approx. 2 hours (Manual mode). • Only then, shut down the unit at the main switch and close the tap of the water supply.

	Having switched off the unit by the main switch, always close the tap of the water supply.

Function of the humidifying and dehumidifying system

Freshwater

You can supply the unit with freshwater via a water pipe or by manually filling a freshwater can. You can fix the can (optionally available) on the unit rear or place it next to the unit

	**In order to guarantee perfect humidifying, observe the following points with regard to the freshwater supply:** - Supply pressure 1 to 10 bar when connecting to a water pipe - Type of water: deionized (demineralized) water. - To guarantee humidification during 24 hours even at high humidity set-points with manual water supply, we recommend filling the freshwater can (option) daily at the end of the day. - Water intake temperature NOT below +5°C / *41°F* and not exceeding 40°C / *104°F*.

	BINDER GmbH is NOT responsible for the water quality at the customer. Any problems and malfunctions that might arise following use of water of deviating quality is excluded from liability by BINDER GmbH.

Automatic fresh water supply via water pipe

With this type of supply, the humidification module is continuously functional without any precautionary measures.

Manual fresh water supply via freshwater can (option)

With this type of supply, the humidification module is functional only if the water can is sufficiently filled. Check the filling level daily. The water reserve in the water can is sufficient for one up to several days, depending on the humidity demand (set humidity set-point, number of door openings).

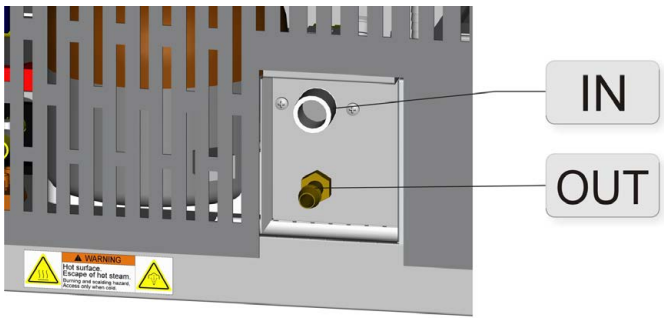
Dehumidifying system

After switching on the humidity switch (located on the lateral control panel), the KBF humidifies or dehumidifies appropriately to reach the selected humidity set-point at the set temperature.

Appropriate dehumidification takes place via concerted dew point underflow of different evaporators in the cooling system. The condensate forming is drained off as waste-water.

With decreasing temperature courses and the humidity system switched off, cooling system operation may cause dehumidification of the loading material.

9.1 Variant A



9.1.1 Functional description of the humidification module *(-9A1)*

Area of application:

The system described hereafter as humidification module (*-9A1*) consists of the steam boiler (*-9A10*) and the components mounted on the same mounting plate like the inlet and outlet tank with their filling level sensors, the waste water pump and the water inlet valve; and of some control elements, which that are mounted on the main electric mounting plate of the unit.

Note to this description:

	• Equipment codes refer to the wiring diagram KBF 240. The equipment encoding is equal to the equipment codes of the wiring diagram and the equipment codes of the unit components. Other unit sizes may have different equipment codes. • Some individual parts of the structural component “Humidification module ” *(-9A1)* are not assigned own equipment codes and are designated in this manual with their order numbers of the part or the structural component, which can be used to order them as spare parts at BINDER Service.

Humidifying system

In a cylindrical steam boiler with a volume of about 2 liters there is an electrical resistance heating. The produced steam is maintained on a stable pressure level and is thus available in sufficient quantity for rapid humidity increases or for compensation of humidity losses, e.g. by door openings. Condensation forming on the outer walls of the useable volume and on the evaporator plates is led through a water drain in the outer chamber into the waste water can which is pumped off automatically to the wastewater pipe when required.

Functional overview:

The humidification module provides steam with a pressure below 1.5 bar as soon as the humidity switch (*-8S1*) in the lateral control panel is switched on. The steam enters the inner chamber via the solenoid valve (*-9Y10*) through a hose. The valve is switched by the semiconductor relay (*-9K1*) dependent on the controller regulation ratio (controller MB1 I/O board (*-3N2*), binary output BA5). Apart from that, the humidification module operates entirely autonomously.

Freshwater and waste water are intermediately stored in the tanks next to the steam boiler. The steam boiler is filled out of the inlet tank by the water pump (*-9M10*). When operating free from troubles, the outlet tank only collects the condensate from the inner chamber. In case of malfunction only, it serves to drain off excessive freshwater. If necessary, the water is pumped off the outlet tank by the evacuation pump (*-8M1*).

The filling levels of the inlet tank and the outlet tank are detected by the float switches (*-10S1*, *-10S2,* and *-10S3*) inside them and are controlled by relay connections.

System structure and all functions are identical for the freshwater and waste water piping connection (with and without the option “BINDER *Pure Aqua Service*”, order no. 8012-0625) and for the option “external freshwater and waste water cans (order no. 8012-0643). The parts of these options are not described in this service manual.

All the following functions are active only if the humidity system is switched on at the humidity switch (*-8S1*) in the lateral control panel.

Functioning of the humidification module (*-9A1*):

Power supply of the humidification module is switched on with the humidity switch (*-8S1*) in the right lateral control panel. During filling of the inlet tank, this power supply is switched off temporarily or in case of error, with no filling of the inlet tank, permanently. This power supply is also switched off temporarily (automatic reset) in case of exceeding the maximum temperature set by the user at the safety controller MB1 I/O board (relay (*-5K1*)) or at the option under-/overtemperature protection class 3.3 (relay (*-5K2*)).

The heating element in the steam boiler has a power of 1500 W at 230 V AC. Installation of the diode (*-9V10*) in series to the heater circuit reduces the power to 750 W. The heating is controlled by the boiler pressure. At the steam boiler there is a manometric switch, which is switched off at the set overpressure above ambient pressure of approx.1.5 bar and is switched on below 1.5 bar. Via a micro switch or a directly connected relay it switches “on” or “off” the heating.

Overpressure protection:

If the pressure control of the steam boiler fails, the heating of the steam boiler is not switched off any more. The pressure that forms in this case is limited by a safety valve to 5.5 bar up to 6.5 bar. With a higher pressure, the safety valve allows steam to escape via the pressure compensation hose into the outlet tank.

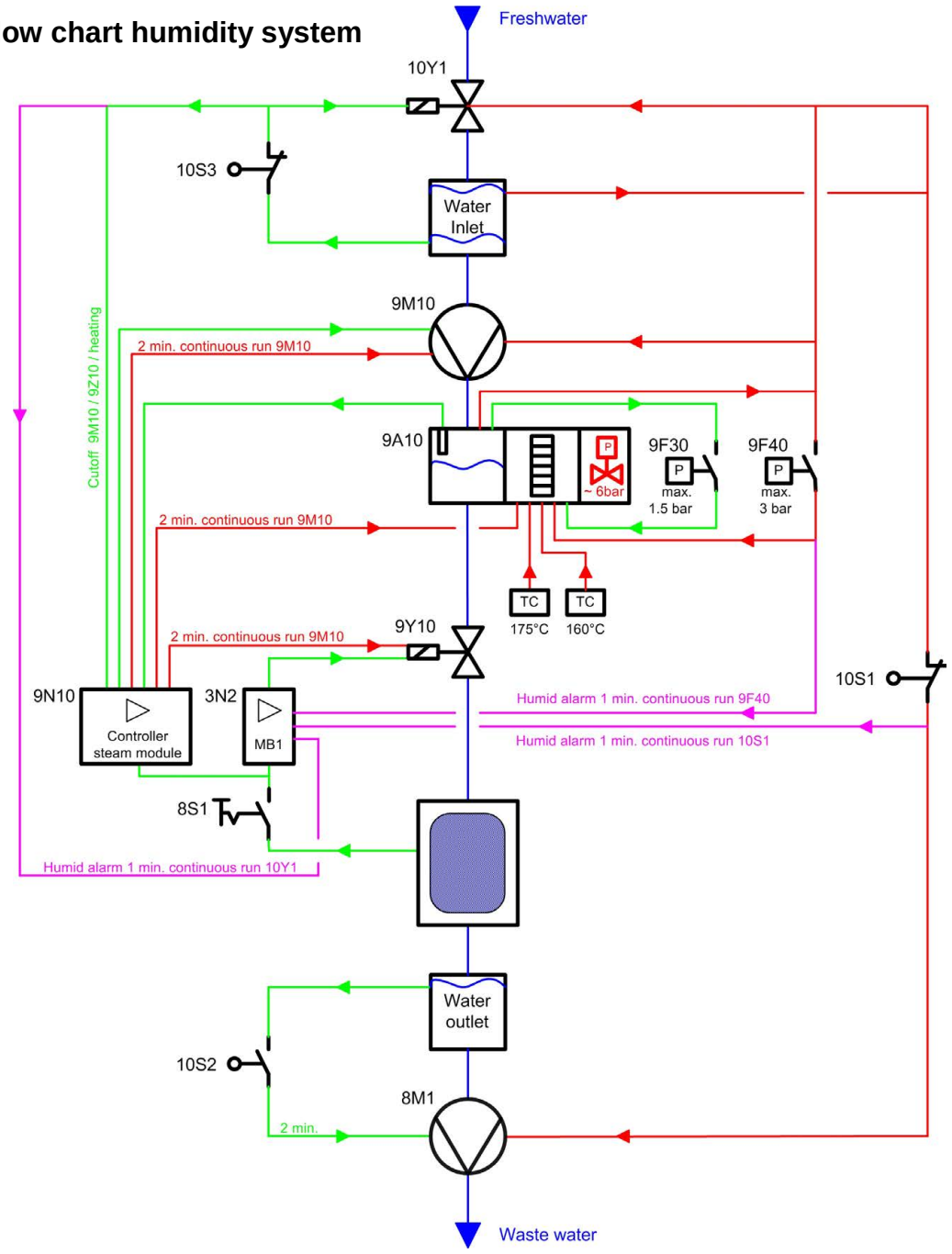
Over temperature protection of the steam boiler:

If the level control of the steam boiler fails, overheating of the humidification module is prevented by two temperature fuses mounted at the steam boiler and connected in series. The first one (*-9F20*) interrupts at 160°C / *320°F* the current supply to the heating element in the steam boiler. It is automatically reactivated after cooling-down. The second one (*-9F10*) switches off at 175°C / *347°F*, this one must then be replaced.

CAUTION!

If one of the temperature fuses is blown, find and remove the cause of the fault before taking the unit into operation again!

9.1.2 Flow chart humidity system



Equipment code	Designation
(*-3N2*)	Controller MB1 I / O board
(*-8M1*)	Evacuation pump
(*-8S1*)	Humidity switch
(*-9A10*)	Steam boiler
(*-9N10*)	Control board humidification module
(*-9M10*)	Water pump

Equipment code	Designation
(*-9Y10*)	Solenoid valve steam release
(*-10S1*)	Float switch for filling level and overflow sensor
(*-10S2*)	Side mounted float switch outlet tank
(*-10S3*)	Side mounted float switch inlet tank
(*-10Y1*)	Freshwater inlet valve

9.1.3 Freshwater supply

CAUTION	
	**Calcification of the Humidification module.** **Damage to the unit.** ➢ Operate the unit with deionized (demineralized) water **only**.



- Supply pressure 1 to 10 bar when connecting to a water pipe
- Type of water: deionized (demineralized) water.
- Water intake temperature NOT below +5 °C / 41°F and not exceeding 40 °C / 104°F.
- The water intake should be provided with a shut-off slide or water-tap.
- Protect the water supply at one side with the delivered hose clamp.

Types of suitable water quality

- Deionized water from a water treatment installation already existing at the customer's site.
- Water treated by the optional water treatment system BINDER *Pure Aqua Service*.



BINDER GmbH is not responsible for the water quality at the customer.
Any problems and malfunctions that might arise following use of water of deviating quality are excluded from liability by BINDER GmbH.
We recommend using the optional water treatment system BINDER *Pure Aqua Service*.



clean deionized water

Figure 47: Water samples out of the steam boiler



polluted water

9.1.4 Function of the freshwater control

Level control in the inlet tank:

Water supply is effected by the solenoid valve (*-10Y1*) until the float switch (*-10S3*) opens. During filling the relay (*-10K3*) is switched. It switches off the entire humidification module (*-9A1*) for the duration of the filling and closes binary input 3 of the controller MB1 I/O board. If filling takes more than 5 minutes, an alarm "**HUMID ALARM**" is given out on the controller MB1.

Safety system against inlet tank overflow:

With undisturbed operation the second float switch (*-10S1*) is closed. This float switch (*-10S1*) will be opened if in case of error the maximal filling level of the inlet tank is exceeded. Also the relay (*-10K1*) switches off the water inlet valve (*-10Y1*). The time lag relay (*-10K2*), switches on the evacuation pump (*-8M1*). If this state of error lasts for more than 5 minutes, an alarm "**HUMID ALARM**" is given out on the controller MB1 display via the binary input 3 of the controller MB1 I/O board.

Level control in the steam boiler:

Level control of the steam boiler is effected via the boiler sensor installed topside, which is controlled by the control board (*-9N10*) of the humidification module.

This electronics directly controls the water pump (*-9M10*). It pumps the water from the inlet tank via the reflux valve (6009-0162) and the pressure hose (6008-0117) into the steam boiler.

Run-dry protection of water pump (*-9M10*):

If there is no water in the inlet can, float switch (*-10S3*) is closed.

The relay (*-10K3*) switches off the complete humidification module (*-9A1*), that makes the operating of the freshwater pump impossible.

Time-out function of water pump (*-9M10*):

If the filling level in the steam boiler is not reached after the water pump has operated for 90 sec, the humidification module control board (*-9N10*) activates its buzzer and switches off the pump. This may happen if the water pump is defective, if the reflux valve does not open or if the inlet to the steam boiler is blocked.

The buzzer can only be switched off by switching off the humidity system with the humidity switch (*-8S1*) in the right lateral control panel.

Temperature protection of water pump (*-9M10*):

At the pump a temperature fuse is located, which switches off the pump temporarily (automatic reset) in case of excessive temperature rise.

Level control in the outlet tank:

When operating free from troubles, the outlet tank only collects the condensate from the inner chamber. In case of malfunction only, it serves to drain off excessive freshwater. At maximum filling level, the floating switch (*-10S2*) closes. The time lag relay (*-10K2*) switches on the evacuation pump (*-8M1*) for 10 sec.

As only little condensate is produced during normal unit function, the evacuation pump (*-8M1*) is operating only rarely.

If you operate the unit at high humidity and then directly switch off the unit, the internal waste-water collector may overflow due to the condensate. This may lead to emergence of water at the unit.

9.1.5 Humidification module (*-9A1*) structure

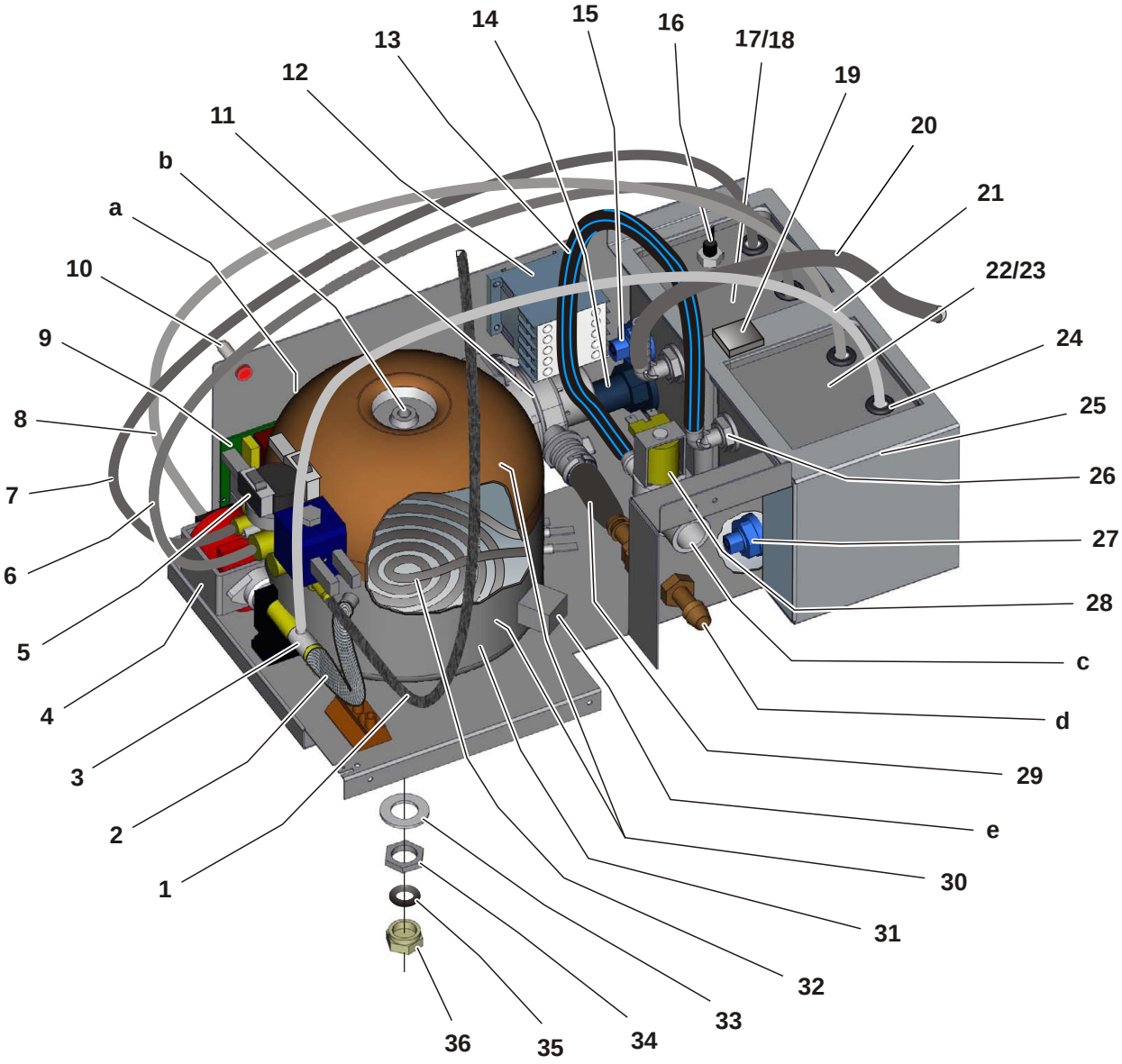


Figure 48: Humidification module (*-9A1*)

1	• Steam hose (tissue), 1200 mm / 47.24 in
2	• Pressure hose with metal braiding
3	• Reflux valve
4	• Water pump for steam boiler (*-9M10*)
5	• Valve block pressure controller complete - Valve block with safety valve - Manometric switch with relay (*-9F30*) - Solenoid valve steam outlet (*-9Y10*) - Screw nut for valve block - Squeezing ring for valve block
6	• Pressure compensation hose to outlet tank, 730 mm / *28.47 in*
7	• Pressure compensation hose to outlet tank, 720 mm / *28.35 in*
8	• Suction hose for water pump (*-9M10*), 800 mm / 31.49 in (freshwater)
9	• Control board humidification module (*-9N10*)
10	• Pilot lamp, red 230 V
11	• Evacuation pump 200 - 240V, 50 / 60 Hz (*-8M1*)
12	• Power contactor (*-9K10*)
13	• Freshwater inlet hose: Water hose ½", length: 450 mm
	• Hose clamp 12-20 mm / 0.47 x 0.79
14	• Tank connection
15	• Tipping float switch (*-10S2*)
16	• Float switch (filling level and overflow sensor) (*-10S1*)
17	• Square tank, outlet
18	• Square lid, outlet
19	• Diode (max. 240 VDC), (*-10V2*)
20	• Condensate outlet hose ½" outer chamber KBF 115: 1360 mm / *53.54 in* KBF 240: 1450 mm / *57.09 in* KBF 720: 1650 mm / 6496 in
	• Hose clamp 20-32 mm / 0.79 x 1.26 in
21	• Air relief hose of reflux valve, 700 mm (freshwater)
22	• Square tank, inlet
23	• Square lid, inlet
24	• Cable nozzle D10 mm
25	• Tank fixing sheet
26	• Hose holder fix ½"
27	• Tipping float switch (*-10S3)*)
28	• Solenoid valve 24 V, 0.2 - 10 bar, freshwater inlet valve (*-10Y1*)

c	• Freshwater connection
d	• Waste water connection
29	• Waste-water hose evacuation pump: Silicon hose, transparent Ø 20, length: 130 mm
	• Hose clamp 20-32 mm / 0.79 x 1.26 in
30	• Boiler insulation complete - Boiler insulation upper part - Boiler insulation bottom part
31 a e b	• Steam boiler complete (-9A10) - Steam boiler - Boiler sensor - Power contactor (*-9K10*), (order no. 5011-0007) - Diode 6 A/600 V (*-9V10*), (order no. 5022-0001) - Double manometric switch 2 -6 bar (*-9F30*), (order no. 5006-0078) - Temperature fuse 160°C / *320°F* (*-9F20*) automatic - Temperature fuse 175°C / *347°F* (*-9F10*) - Filling level electrode
32	• Heating steam boiler
33	• Insulating disk M 16
34	• Boiler fixing nut M 16
35	• Seal ring for discharging screw
36	• Discharging screw

DANGER!





Danger of electric shock.

Danger to life.

The humidification module is supplied with electrical tension event if the humidity switch is switched off.

- ➢ Any service tasks at the humidification module must only be performed if the KBF is disconnected from the power supply.
- ➢ Disconnect the unit from the power supply, prior to performing repairs at the humidification module.

DANGER!




Danger by hot water.

Danger of scalding.

- ➢ Prior to start working, make sure that the unit has cooled down.

9.1.6 Dismantling the humidification module (-*9A1*)

	To exchange the module from variant A to variant B, we refer to the " Replacement guide, humidification module ", order no.: 7001-0276

Necessary tools:	• Crosstip screwdriver, size 2 • Torx screwdriver, size T 20

1. Disconnect the unit from the power supply.
2. Remove the rear panel (chap. 5.3).
3. Disconnect the unit from the water supply.
4. Remove the lower fixing screws (B).
5. Disconnect all electrical contacts at the humidification module.
6. Remove the condensate outlet hose from the waste water tank.
7. Remove the hose clamp of the steam hose (C) either on the top of the insulation of the outer chamber or at the steam boiler, and pull off the steam hose.
8. Pull the humidification module (A) out of the unit. Take care to hold the humidification module horizontally to avoid water running off.
9. Remove all further hoses from the humidification module.
10. Install the humidification module by following steps 1 to 9 in reverse order.

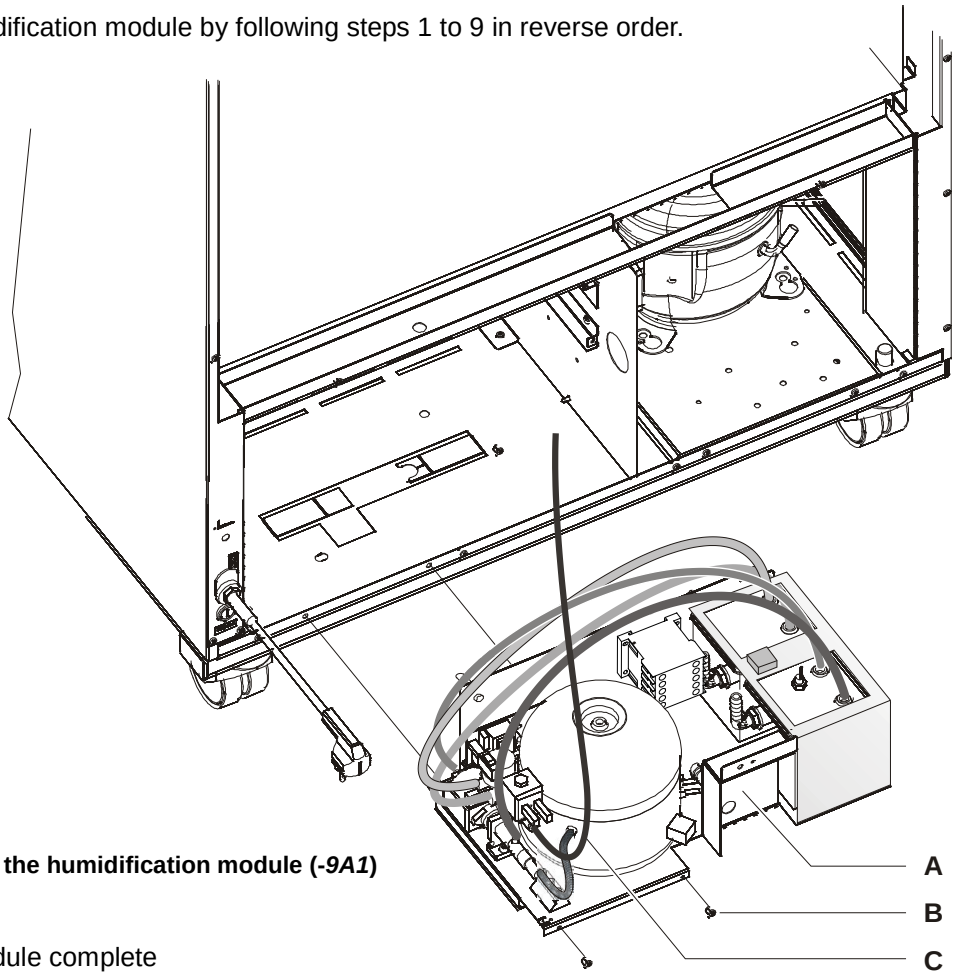


Figure 49: Dismantling the humidification module (-*9A1*)

A Humidification module complete
B Fixing screws
C Steam hose

9.1.7 Piping of the humidification module

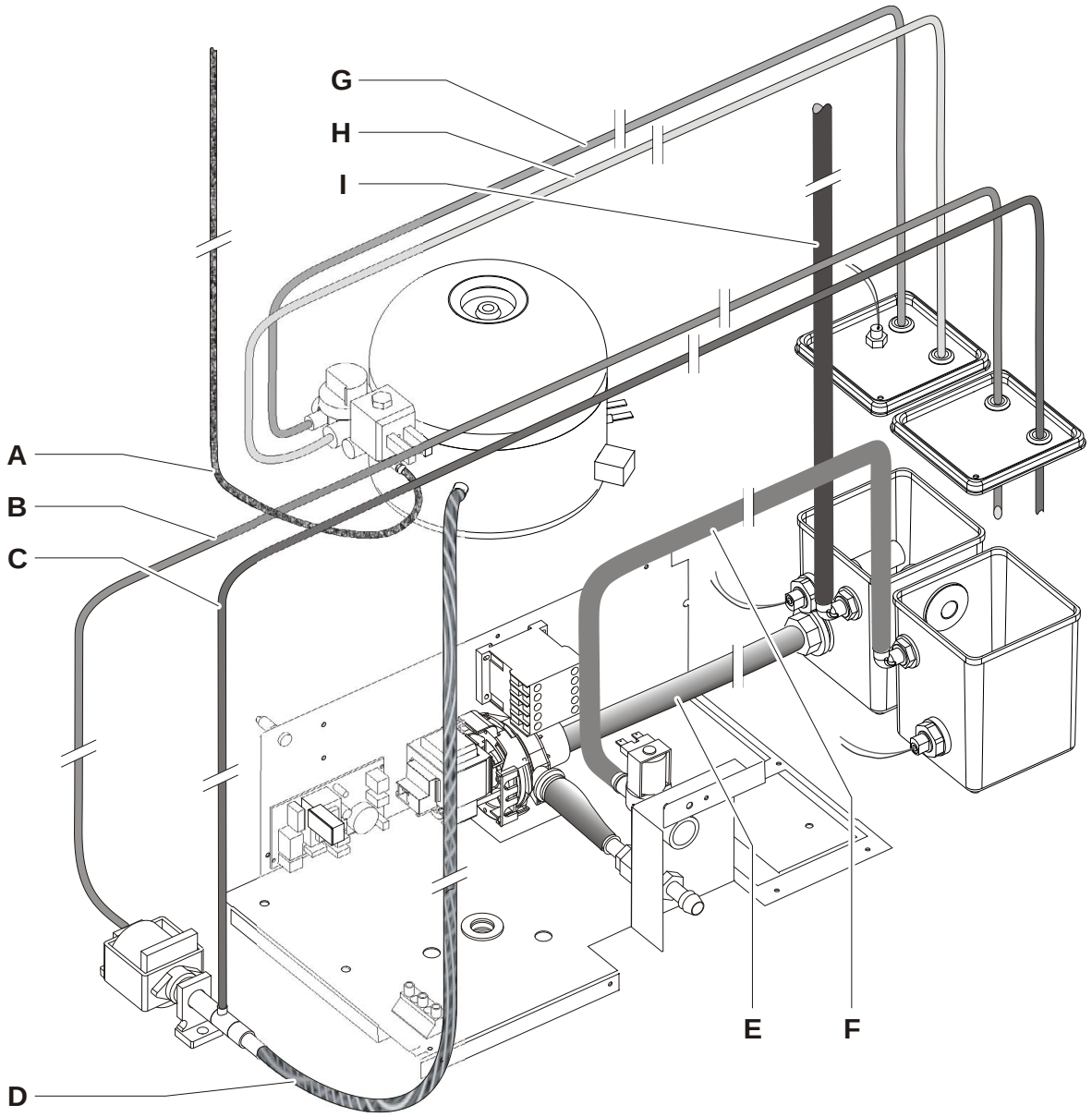


Figure 50: Piping of the humidification module

A Steam hose (tissue) (1200 mm / 47.24 in)
B Suction hose for water pump (800 mm / 31.49 in)
C Air relief hose of reflux valve (700 mm / 27.56 in)
D Pressure hose with metal braiding
E Wastewater hose of evacuation pump (130 mm / 5.12 in)
F Freshwater inlet hose (450 mm / 17.72 in)
G Pressure compensation hose to outlet tank (720 mm / 28.35 in)
H Pressure compensation hose to outlet tank (730 mm / 28.74 in)
I Condensate outlet hose ½" outer chamber
Hose clamp, 8-12 mm / 0.31 x 0.47 in
Hose clamp, 12-20 mm / 0.47 x 0.79
Hose clamp, 20-32 mm / 0.79 x 1.26 in

9.1.8 Notifying and alarm system overview (auto diagnosis system)

The unit provides notification and alarm functions indicating messages in up to three steps:

1. Visual indication of notifying or error messages as blue notes on the screen of the controller MB1.
2. Visual indication of alarm messages as red notes with an alarm bell symbol. After a delay time, some notes change their color from blue to red.

   Additionally there is an audible alert, provided that the buzzer has not been deactivated in menu “User level”.
3. Zero-voltage relay outputs (option) permit transmission of the alarm e.g., to a central monitoring system.

Notifying sequence	1	2	3
Event	**Note (blue field)**	**Alarm (red field)**	**Zero-voltage relay alarm outputs** (option)
In case of freshwater supply via water pipe: the water tap is closed, or the unit is defective. In case of freshwater supply via freshwater can (option): Water can is empty. Humidification is switched off. In case of refrigerating operation, the interior is strongly dehumidified. When the water supply is functional again, the humidity system restarts working, or the unit is defective.		**HUMID ALARM** after 60 sec.	
Temperature deviation of more than +/- 2°C of the entered set-point	**TEMP RANGE** immediately	**TEMP RANGE** after 16 min.	after 16 min.
Humidity deviation of more than +/- 5 % r.H. of the entered set-point	**HUMID RANGE** immediately	**HUMID RANGE** after 16 min.	after 16 min.
Exceeded temperature limit of the safety controller		**TEMPERATURE LIMIT** immediately	
Humidity system switched off with switch (4)	**HUMID OFF** immediately		
Door open	**DOOR OPEN** immediately	**DOOR OPEN** after 5 min.	
Power failure			immediately
With option temperature safety device class 3.3			
Exceeding the maximum or minimum temperature		**TEMP ALARM** immediately	
With option locking of the keyboard (BINDER Individual)			
Locked keyboard	**KEY LOCK** immediately		

The indicated intervals refer to the time after occurrence of the error or indicated condition.

9.2 Variant B



Spare part:	Humidification module with drain tap and one heating element	Art.-Nr. 8009-0789

9.2.1 Function of the humidifying and dehumidifying system

Humidifying system

The humidifying system is located in the humidification module. In a cylindrical steam boiler with a volume of about 2 liters there is an electrical resistance heating. The produced steam is maintained on a stable pressure level and is thus available in sufficient quantity for rapid humidity increases or for compensation of humidity losses, e.g. by door openings. Condensation forming on the outer walls of the useable volume and on the evaporator plates is led through a water drain in the outer chamber into the wastewater can which is pumped off automatically to the wastewater pipe when required.

Fehler! Es ist nicht möglich, durch die Bearbeitung von Feldfunktionen Objekte zu erstellen.	BINDER GmbH is not responsible for the water quality at the customer. Any problems and malfunctions that might arise following use of water of deviating quality is excluded from liability by BINDER GmbH.

Wastewater

The condensation water from the interior is collected in the drain tank. It is pumped off only if necessary via the wastewater pipe or into the optionally available wastewater can.

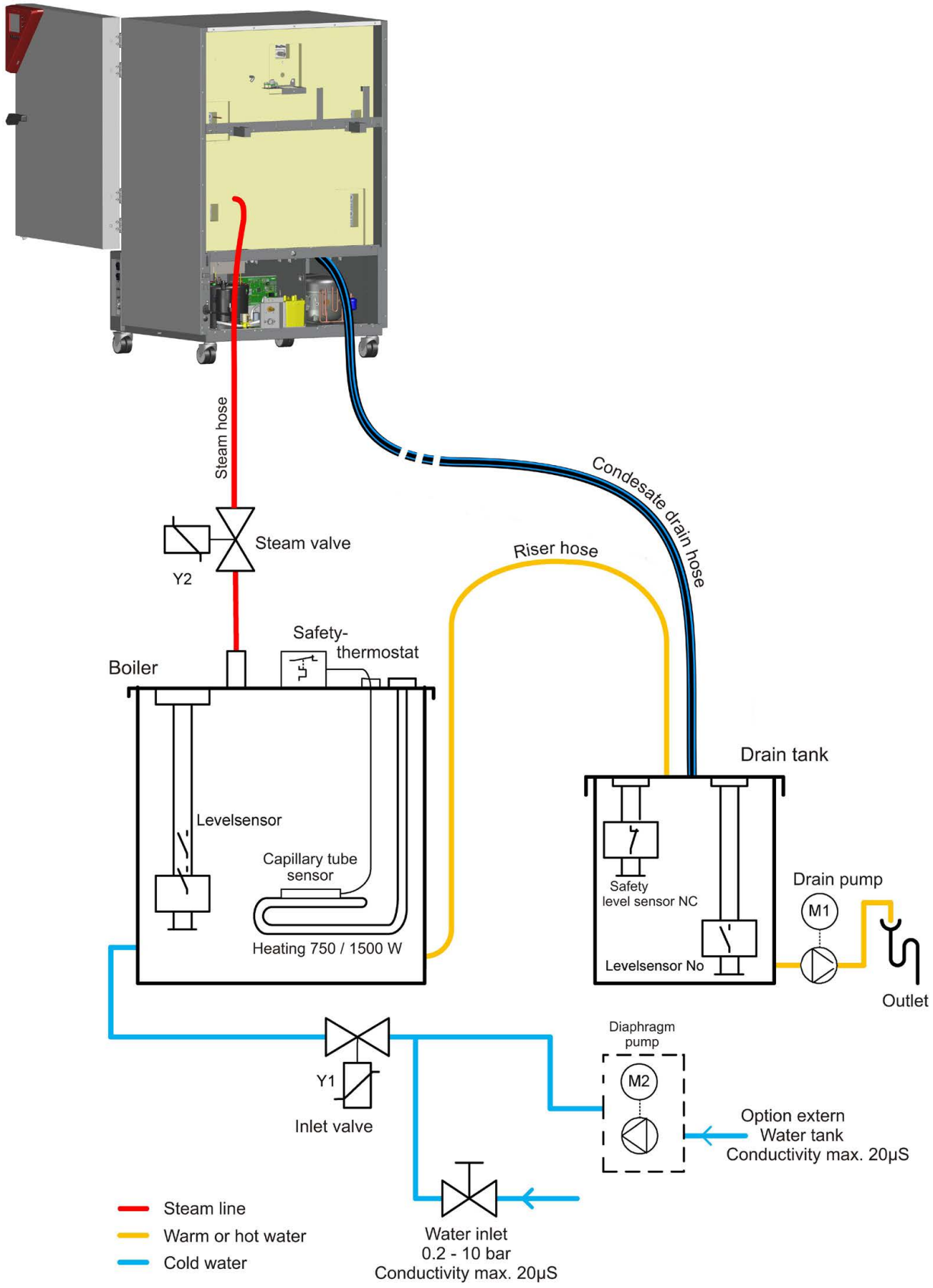
Dehumidifying system

After switching on the humidity switch (located on the lateral control panel), the KBF humidifies or dehumidifies appropriately to reach the selected humidity set-point at the set temperature.

Appropriate dehumidification takes place via concerted dew point underflow of different evaporators in the cooling system. The condensate forming is drained off as wastewater.

With decreasing temperature courses and the humidity system switched off, cooling system operation may cause dehumidification of the loading material.

9.2.2 Hydraulic scheme humidification module (*-9A1*)



9.2.3 Components of the humidification module (-*9A1*)

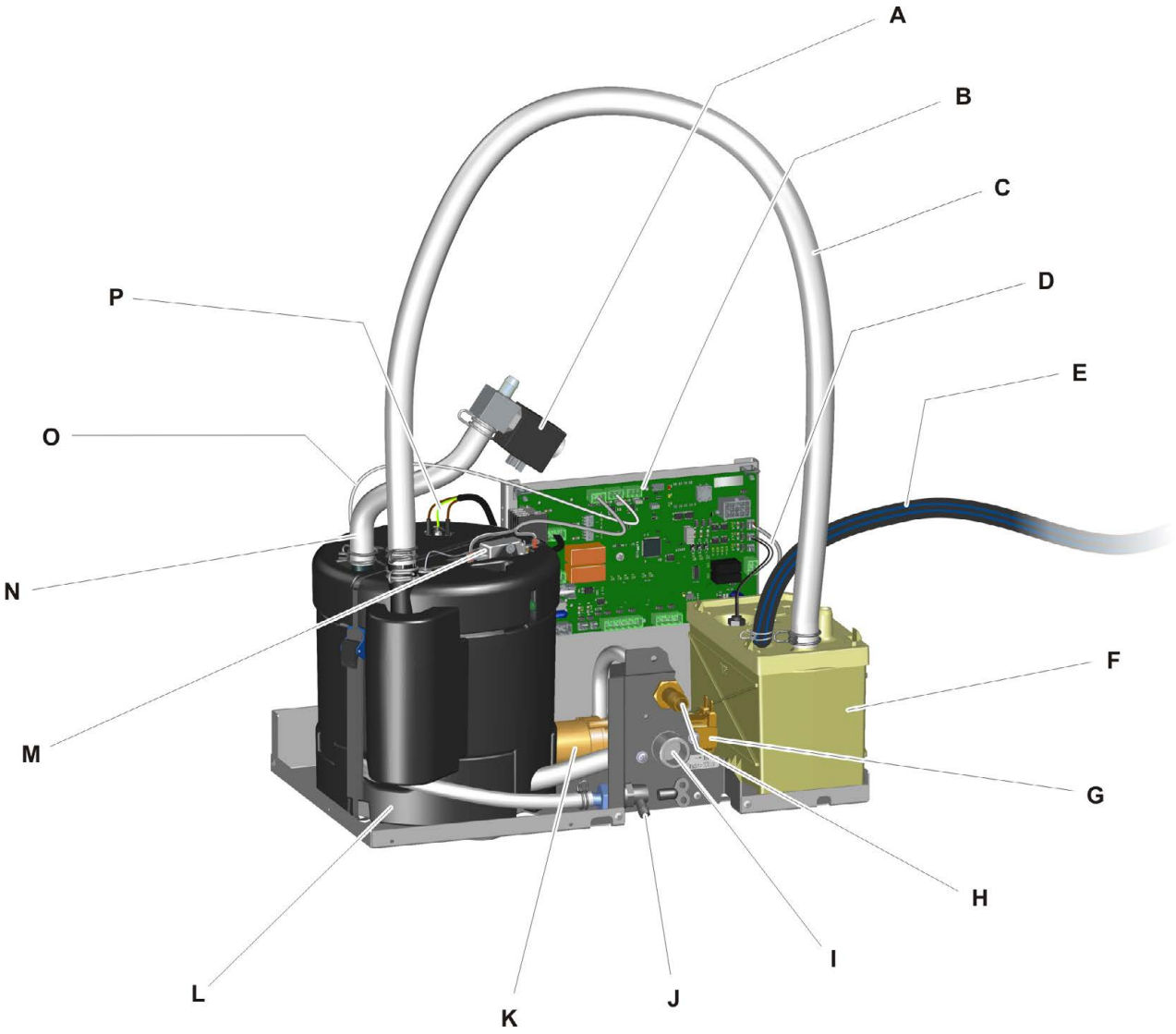


Figure 51: Components of the humidification module

A	Steam valve (-*Y2*)	**I**	Connection water inlet
B	Controller board	**J**	Drain tap
C	Riser hose	**K**	Drain pump (-*M1*)
D	Safety level sensors	**L**	Boiler
E	Condensate drain hose	**M**	Safety thermostat (130 °C)
F	Drain tank	**N**	Steam hose
G	Inlet valve (-*Y1*)	**O**	Level sensor
H	Connection water outlet	P	Heating connection

9.2.4 Replacing the complete humidification module (*-9A1*)

Spare part:	• Humidification module order no. 8009-0789
Necessary tools:	• Slotted and crosstip screwdrivers • Torx screwdriver, T 20 • Cutter • Side cutter • . . .

1. Switch off the unit (main switch, *-1S1*).
2. Switch off the humidification module (humidity switch, *-8S1*).
3. Disconnect the unit from the power supply (Power plug, *-X1*).
4. Disconnect the unit from the water supply.
5. Remove the rear panel (chap. 5.3).
6. Disconnect the plugs *-X1*, *-X4* and *SIG1* from the controller board of the humidification module.

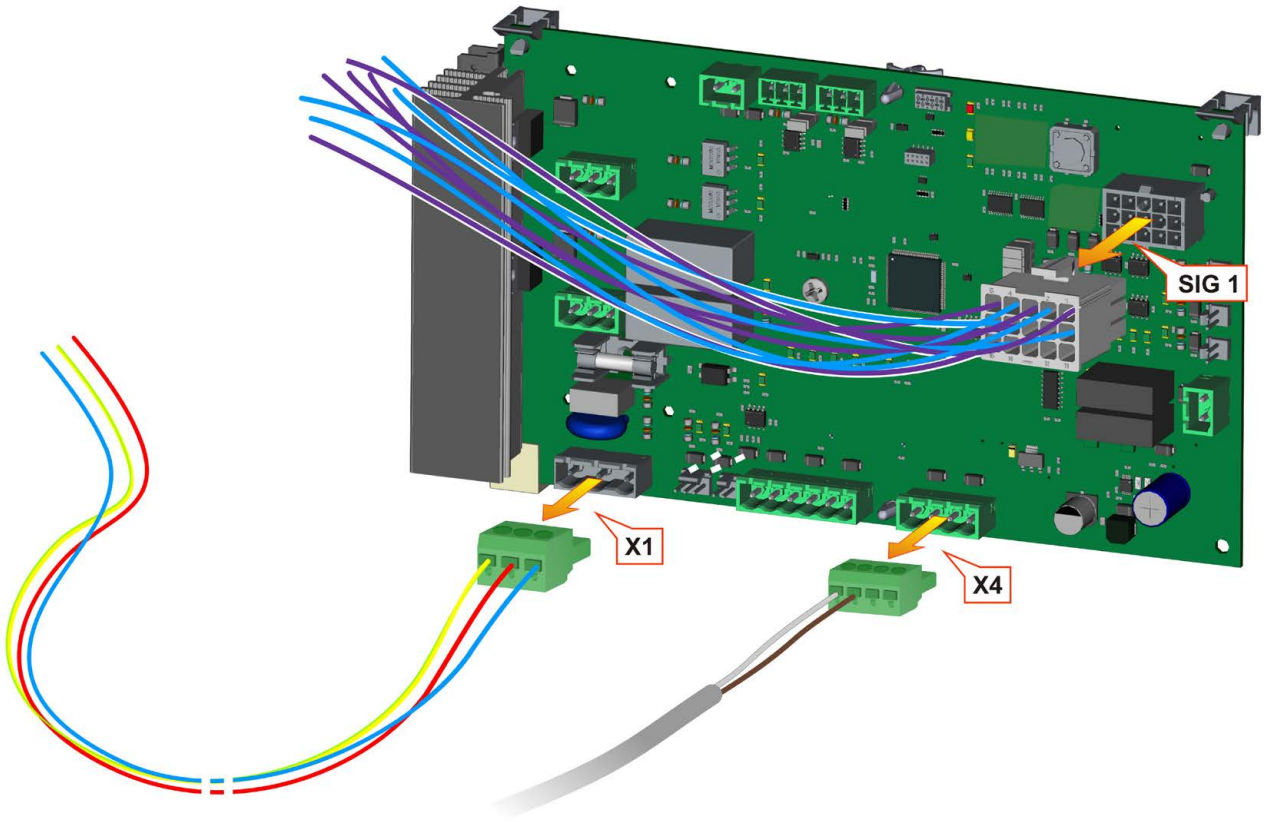


Figure 52: Removing plugs from the controller board

7. Remove the condensate drain hose (E, Figure 51) from the drain tank (J, Figure 51).
8. Remove the hose clamp at the steam valve (A, Figure 51) of the steam hose (O, Figure 51).
9. Pull off the steam hose (O, Figure 51).
10. Remove the steam valve (A, Figure 51) from the moist collecting sheet.
11. Remove the fixing screws (Z, **Figure 53**).
12. Pull the humidification module out of the unit.
13. Make sure to keep the humidification module horizontally to prevent water leaking out.
14. Install the module by following steps 1 to 12 in reverse order.

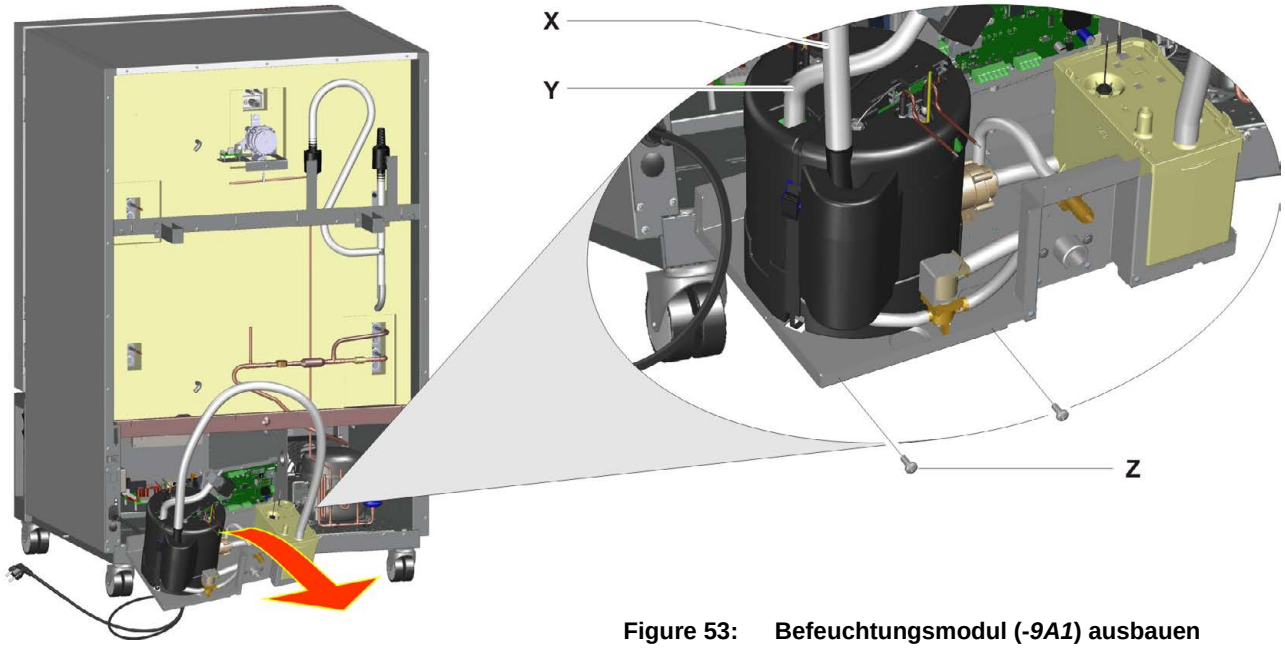


Figure 53: Befeuchtungsmodul (*-9A1*) ausbauen

X Riser hose
Y Steam hose
Z Fixing screws

	After beeing connected to the water supply the humidification module is immediately ready for operation.

9.2.5 Checking the steam boiler

DANGER!	
	**Danger by hot water.** **Danger of scalding.** ➢ Prior to work, make sure that the steam boiler has cooled down.

To put out of action the humidification module, e.g. for maintenance proceed as follows:

1. Switch off the unit (main switch, *-1S1*).
2. Make sure that the fresh water supply is interrupted.
3. Disconnect the unit from the power supply
4. Remove the rear panel (chap. 5.3).
5. Empty the humidification module as well as possible. Emptying manually through the stopcock or by removing the input hose to the hot water valve.

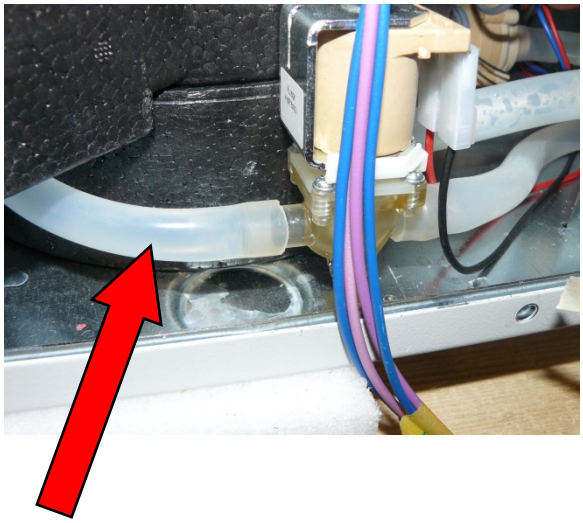


Figure 54: Hose hot water valve



6. Remove the double wire clamp from the steam connection The steam hose can now be removed.

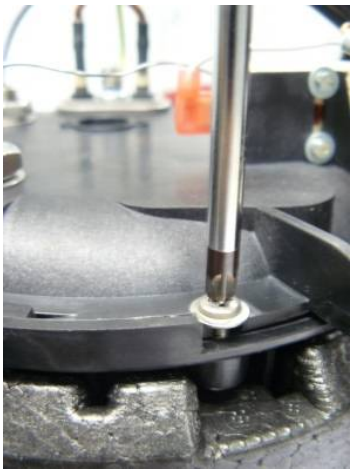


7. Open the blue fastener of the holding band (steam boiler fixation).



8. The insulation of the steam cylinder can now be pushed over the lid, and the cables.

   Make sure that the cable of the capillary tube sensor is carefully passed through the opening.



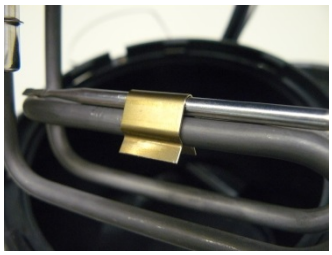
9. Remove the screws on the lid of the steam boiler.

   The lid of the steam boiler can now be removed.

9.2.6 Reassembling the steam boiler

Assemble the steam bolier in reverse order.
Please observe the following instructions:

Check the capillary tube to correct resting on the heating elements and the correct fitting of the clamp.



Before installing the steam boiler cover place the o-ring carefully into the edge of the steam cylinder. To allow a good fitting the o-ring must never protrude at the cylinder edge. The O-ring must be clean and undamaged (replace if necessary).





Put the lid carefully on the steam cylinder.

The cover can now be pressed on the steam cylinder and screwed again.

Pull the insulation over the cable and put them back on the lid.

Make sure that the cable of capillary tube sensor is not unnecessarily bent and properly conducted by the cover insulation.



Attach the clamping band over the insulation and pull it firmly.

Fix the steam hose with the double wire clamp.

It it must be ensured that the double wire clamp is recessed in the lid insulation.
A leaky steam hose can lead to moisture damage inside the device.

Close the stopcock or attach the intake hose of the hot water valve back into the original position.

9.2.7 Alarm system overview

Malfunctions are detected by the system and displayed on the display of the MB1 controller.
The internal buzzer of the device is activated. The alarm can be reset with the RESET key.

On the control board of the humidification module, the red LED (ERROR) flashes. The error number can be derived from the number of flashes (1s ON / 1s OFF) with a pause of 5 seconds at the end.

By switching off/on the humidity and by switching off/on the unit the humidifying module can be restarted.

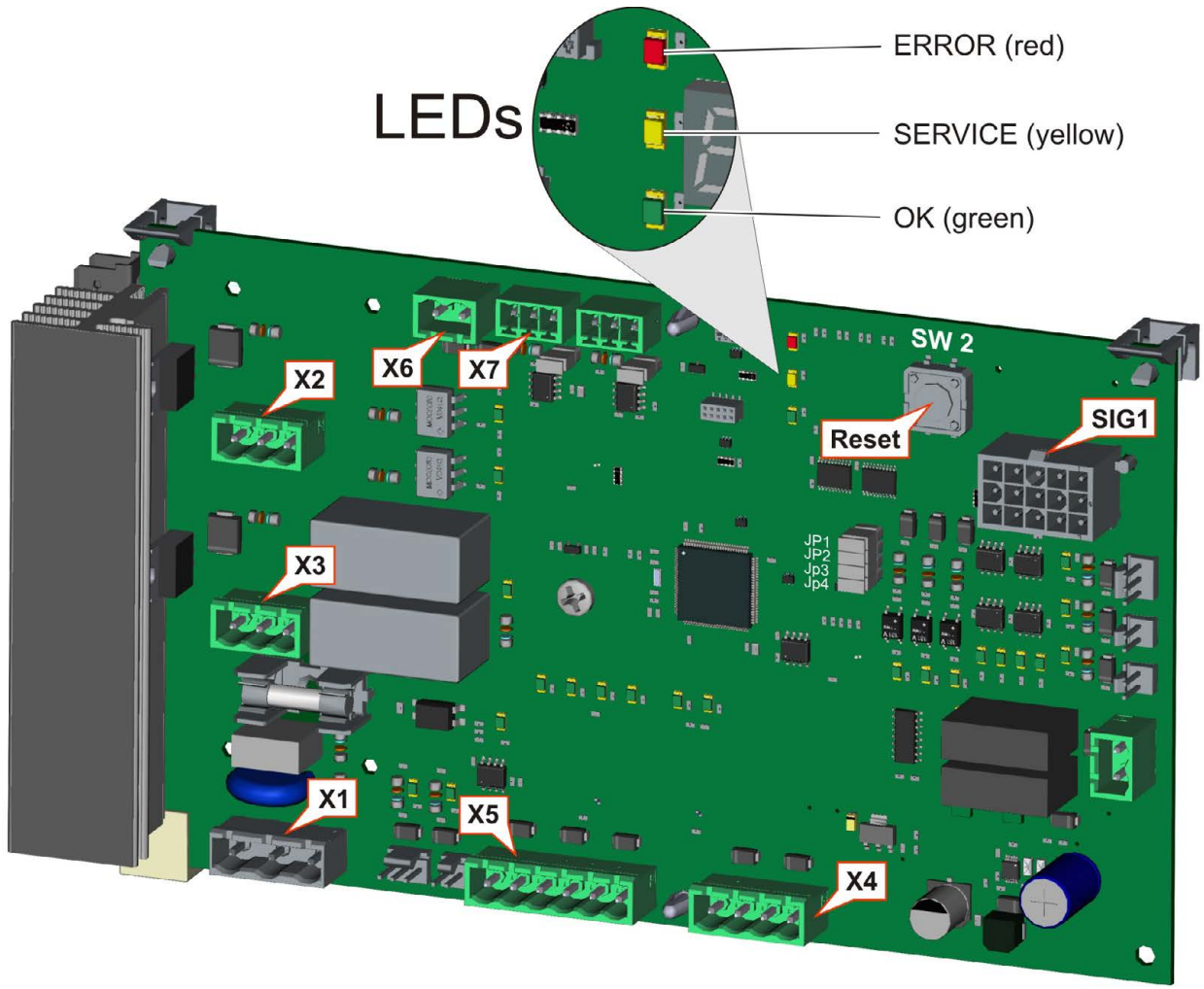


Figure 55: Control board of the humidification module

A detailed list of errors is given in chap. 4.5.

	With the button "SW2" (Reset) you can reset the "Service Reminder" (see chap. 4.5). The recommended service interval is 8760 hours of operation or 2000 kg of steam.

CAUTION!	
	**Overflow of the internal wastewater tank due to condensate.** **Emergence of water at the unit.** Following high humidity operation, do NOT directly switch off the unit. Pump off the condensate before shut-down: • Set the humidity to 0 % r.H. and switch on humidity switch (-8S1). Operate the unit for at least 2 hours. • Only then, shut down the unit at the main power switch (*-1S1*) and close the tap of the water supply.

Functioning of the humidification module (*-9A1*):

Power supply of the humidification module is switched on with the humidity switch (*-8S1*) in the right lateral control panel.
This power supply is also switched off temporarily (automatic reset) in case of exceeding the maximum temperature set by the user at the safety controller MB1 I/O board (relay (*-5K1*)) or at the option under-/overtemperature protection class 3.3 (relay (*-5K2*))

Over temperature protection of the steam boiler:

If the level control of the steam boiler fails, overheating of the humidification module is prevented by the safety thermostat. It is automatically reactivated after cooling-down.

CAUTION!
If the safety thermostat has triggered, find and remove the cause of the fault before taking the unit into operation again!

10 Repair work at the cooling system

10.1 General information

WARNING!	
	If the KBF is maintained or repaired incorrectly, there is a risk of malfunction which could cause harm to human beings and material damage to the equipment and samples.

CAUTION!
If the KBF is calibrated or adjusted incorrectly, there is a risk of malfunction which could cause material damage to the samples and false test results.

	Only service personnel with specialized training as cooling technician must perform repair of the cooling system To avoid repair attempts by unqualified personnel, repair of the cooling system is not described in this service manual.

Qualified for service and maintenance work on the cooling system is only staff that has a certification in accordance with regulation 303/2008/EC and expert knowledge in accordance with EN 13313:2010.

Personnel should be trained for the maintenance of the cooling system and be familiar with the content of the KBF service manual and operating manual.

	R 134a is used as refrigerant in the KBF. The amount of refrigerant may differ due to technical reasons. The amount of refrigerant for a unit is specified on its type plate.

	Refrigerant R 134a must not enter the atmosphere. Before opening the refrigeration cycle, the refrigerant must be sucked off completely. Dispose of the refrigerant according to the international regulations.

10.2 Required tools for repairing the cooling system

In addition to standard tools for cooling technicians like wrenches and pliers the following special tools must be available when repairing the cooling system of the unit:

Electric leak indicator for refrigerant R 134a

Service magnet coils (permanent magnets) for manual operation of the solenoid valves

Suction implement for refrigerant R 134a to remove old refrigerant from the cooling system

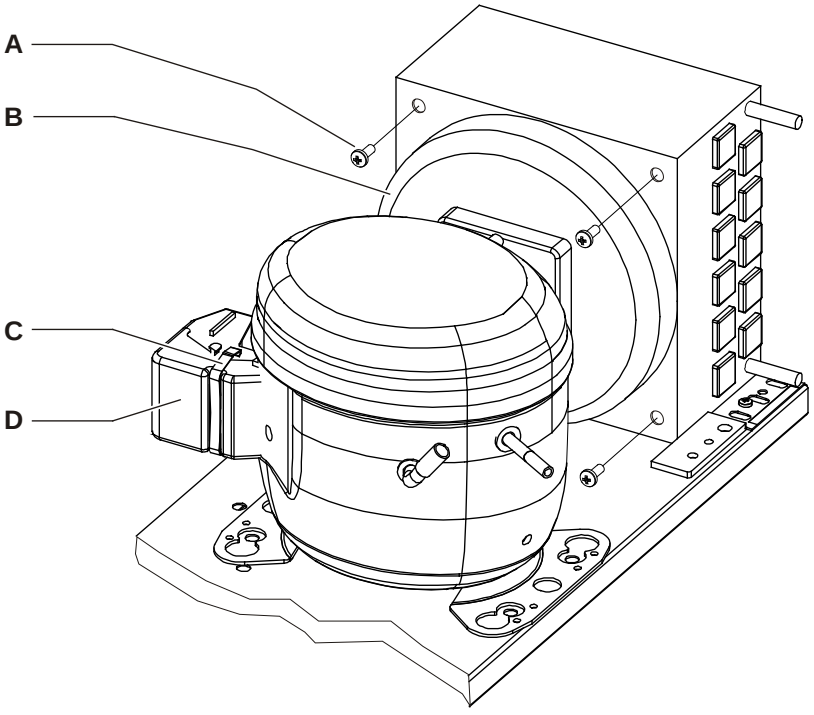
Special recycling gas bottles for collecting the sucked off old refrigerant

Evacuation and filling apparatus for refrigerant R 134a

10.3 Replacing the condenser fan

Spare parts:	Condenser complete	
	KBF 115	Art.-Nr. 5013-0163
	KBF 115 UL	Art. Nr. 5013-0163
	KBF 240	Art.-Nr. 5013-0165
	KBF 240 UL	Art.-Nr. 5013-0165
	KBF 720	Art.-Nr. 5013-0163
	KBF 720 UL	Art. Nr. 5013-0163
	Condenser fan	
	KBF 115	Art.-Nr. 5013-0164
	KBF 115 UL	Art. Nr. 5013-0164
	KBF 240	Art.-Nr. 5013-0166
	KBF 240 UL	Art.-Nr. 5013-0166
	KBF 720	Art.-Nr. 5013-0164
	KBF 720 UL	Art. Nr. 5013-0164
Necessary tools	Crosstip screwdriver, size 2	

1. Disconnect the unit from the power supply.
2. Remove the rear housing panel (chap. 5.3).
3. Remove the bracket (C) and the cover from the junction box (D).
4. Release the strain relief of the connection cables.
5. Remove the connection cable of the fan from the terminal board.
6. Remove the housing cover at the front (chap. 5.1).
7. Remove the fixing screws (A) left and right of the fan grid.
8. You can now lift the entire fan with the grid above the condenser.
9. Mount the fan by following steps 1 to 8 in reverse order.



A Fixing screws
B Fan
C Bracket
D Junction box

Figure 56: Replacing the condenser fan

10.4 Replacing the capillary tubes

When replacing the capillary tubes mind their tightness.
The capillary tubes should protrude by at least 40-50 mm / *1.57 x 1.97 in* into the copper pipe.

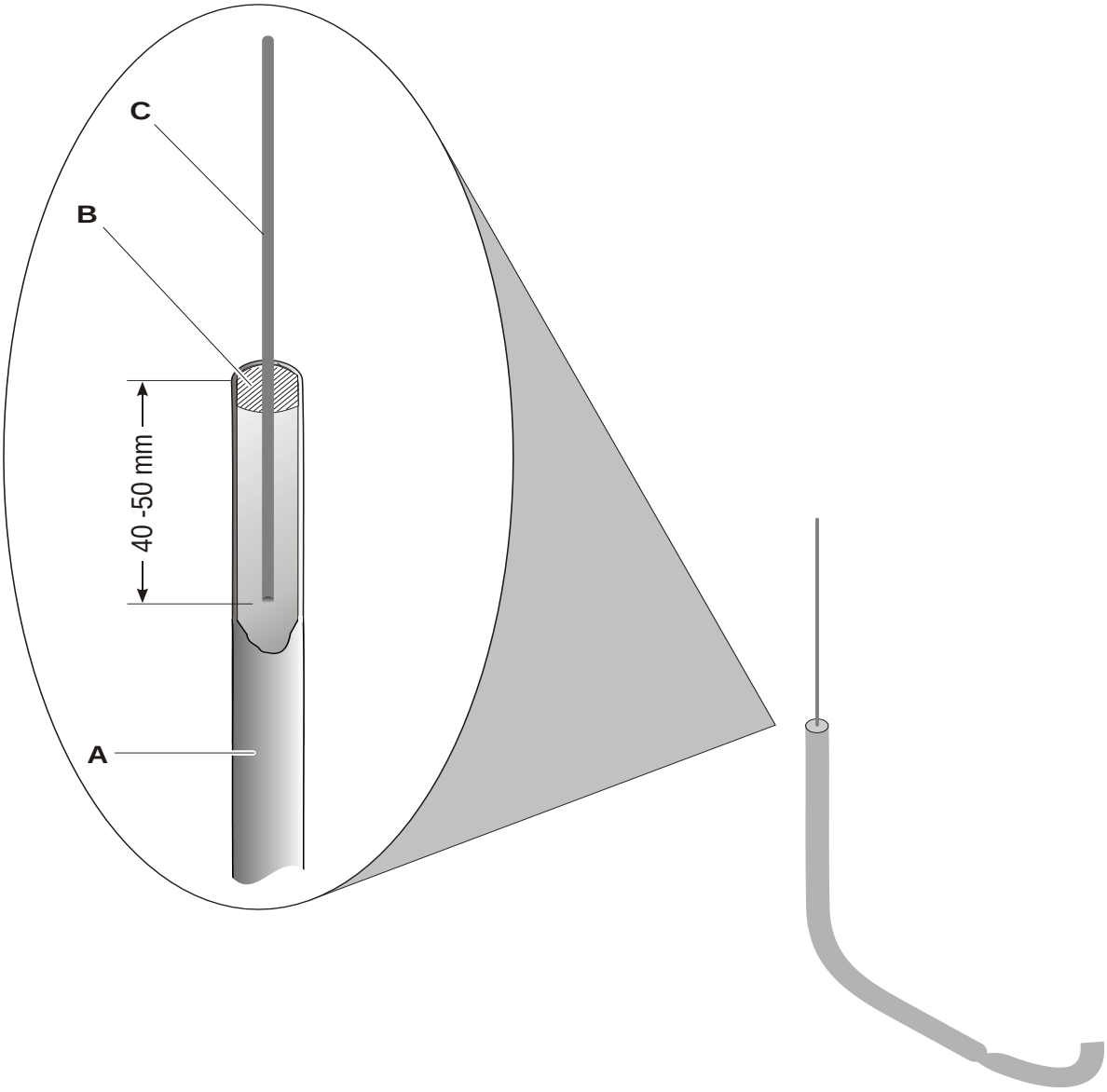


Figure 57: Replacing the capillary tubes

A Copper pipe
B Soldering joint
C Capillary tube

10.5 Checking the step motor valve (*-7Y3*)

Spare parts:	• Step motor valve (order no. 5025-0023)
Necessary tools	• Crosstip screwdriver, size 2 • Multimeter measuring device

1. Disconnect the unit from the power supply.
2. Remove the rear housing panel (chap. 5.3).
3. Remove the housing cover of the lower front (chap. 5.1).
4. Pull the electric mounting plate out of the machine room (chap. 8.5).
5. Mark and remove the connection cables from the interface board of the step motor valve (-7N1).
6. Measure the resistance between the black and the white connection of the step motor valve (-7Y3). With normal ambient temperature the resistance value should be approx. 70 Ω.
7. Measure the resistance between the green and the red connection of the step motor valve (-7Y3). The measuring result should not deviate by more than ± 5 % from the resistance value between the black and the white connection.
8. Measure the resistance between each single connection (black, white, green, red) and the valve housing. The resistance value should be infinite here.
9. If you notice a deviation from the indicated values at one of the measurements, the step motor valve is defective and must be replaced.



Only service personnel with specialized training as cooling technician must perform repair of the cooling system

To avoid repair attempts by unqualified personnel, repair of the cooling system is not described in this service manual.

10.6 Interface board IB3 (*-7N1*) for step motor valve

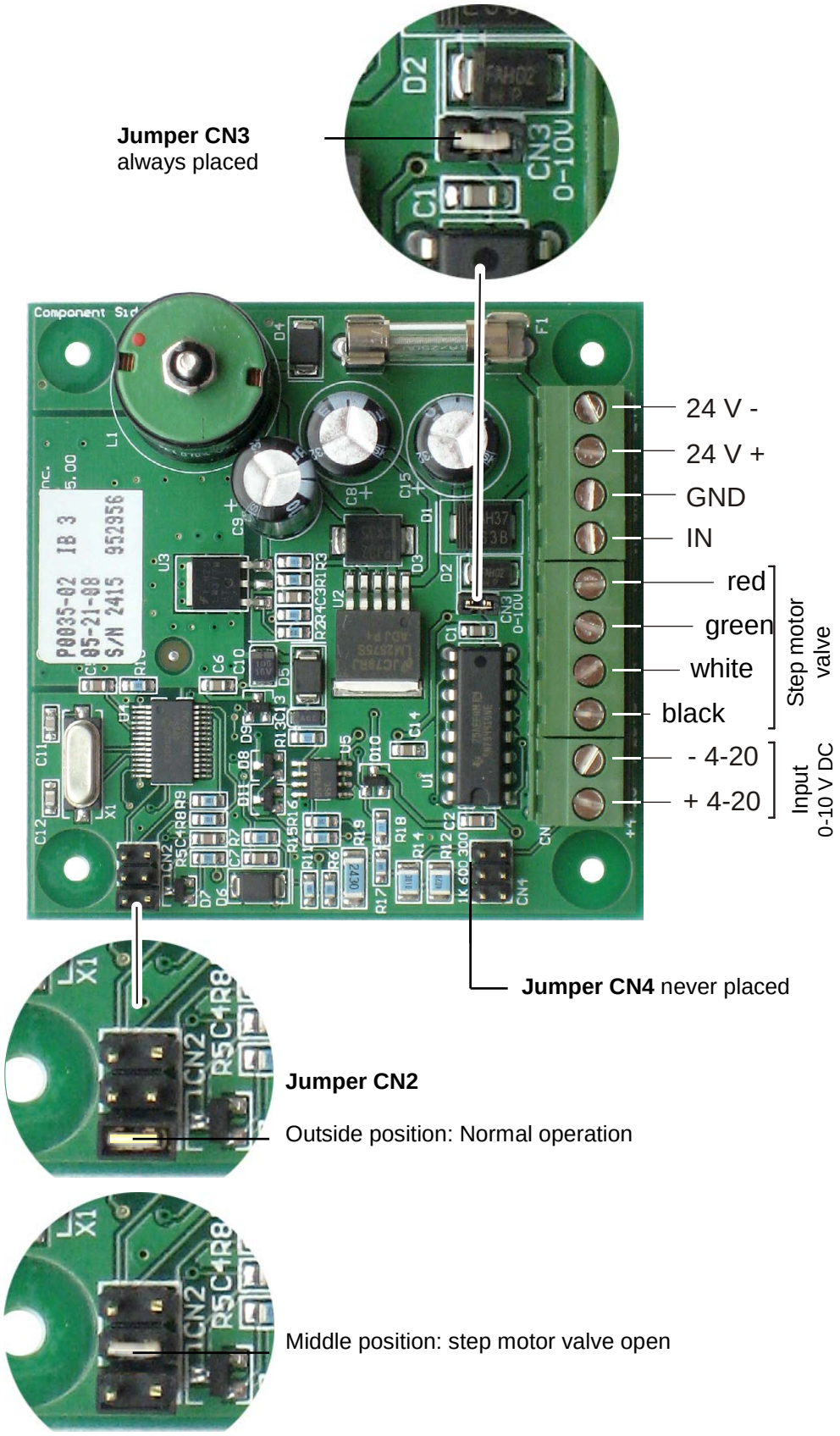
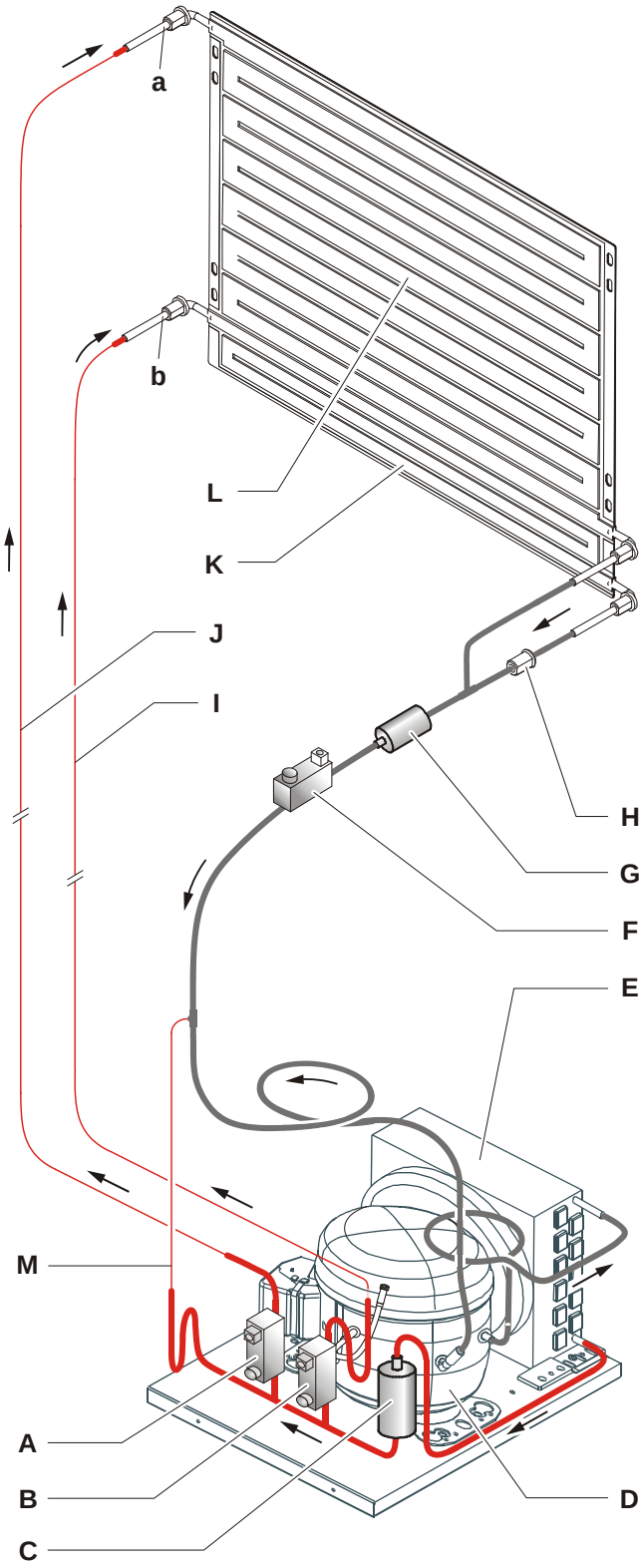


Figure 58**: Interface board IB3 (*-7N1*) for step motor valve**

10.7 Overview cooling cycle



A	Solenoid valve (*-7Y2*)
B	Solenoid valve (*-7Y1*)
C	Filter dryer (*-1J1*)
D	Compressor (*-6M1*)
E	Condenser (*-6M2*)
F	Solenoid valve (*-7Y3*)
G	Filter (*-1J6*)
H	Reflux valve (*-1J7*)
I	Capillary tube (*-1J3*)
J	Capillary tube (*-1J2*)
K	Evaporator plate, small (*-1J5*)
L	Evaporator plate, large (*-1J5*)
M	Capillary tube (*-1J4*)
a	Injection point cooling
b	Injection point dehumidification

Figure 59: Cooling cycle

11 Calibrating and adjusting the temperature and humidity control

	The temperature and humidity control of the unit have to be calibrated and if necessary adjusted annually and after the following repair works: Replacing the inner chamber Pt100 temperature sensor (*-3B1*) (chap. 7.9) Replacing the humidity sensor incl. board (*-3B2*) (chap. 7.10) Replacing the controller MB1 I/O board (*-3N2*) (chap.8.8.1) Replacing the controller display (*-3N1*) (chap. 8.9)

At the calibration the temperature and humidity values measured and displayed by the KBF are compared with values measured and displayed by external reference measuring instruments.

If the deviations of the temperature or humidity values of the KBF and the reference measuring instruments exceed defined values, called confidence criteria, the temperature or the humidity control of the KBF have to be adjusted.

The reference measuring instruments for temperature and humidity must have a valid calibration certificate which has been approved by a recognized standards or calibration authority or regulatory body.

The measuring uncertainty of the reference measuring instrument for the temperature should be below +/-0.5 K.
The measuring uncertainty of the reference measuring instrument for the humidity should be below +/-2.0 % r.H..

11.1 General execution of the calibration

1. The reference measuring instruments should have sensors connected to the display of the instrument via a slim cable that can be placed through the silicone access port without causing a leak.
2. Place the usual number of racks in the inner chamber of the KBF.
3. Attach the sensors of the reference measuring instruments in the middle of the rack which is positioned in the center of the KBF useable volume.
4. Conduct the sensor cables out through the silicone access port in such a way that you can tightly close the access port with its plug.
5. Close the glass door and the outer door.
6. Switch on the unit and set the operating parameters set-points (temperature, humidity, fan speed) to that values at which the unit shall be calibrated (chap. 11.2).

Steady-state condition

The steady-state condition is that operating state at which the values of temperature and humidity are not changing by more than the specified fluctuations in the useable space (see chap. “Technical data” in the operating manual).

If the KBF has been stored at the permitted ambient operating temperature of +18°C to +32°C / *64.4°F to 89.6°F* for more than 12 hours, the empirical time to reach the steady-state condition for the KBF is 1-2 hours after switching on.

	Before starting the calibration and adjustment the unit must be in steady-state condition.

11.2 Calibrating and adjusting points

11.2.1 Calibrating and adjusting point of the temperature control

The adjustment of the temperature control is carried out as a single point adjustment.

Choose the most common operating temperature or a temperature situated in the middle of the most common used temperature range as calibrating and adjusting point.

11.2.2 Calibrating and adjusting points of the humidity control

The adjustment of the humidity control is carried out as a dual point adjustment.

Choose the values which limit the most common used humidity range as calibrating and adjusting points.

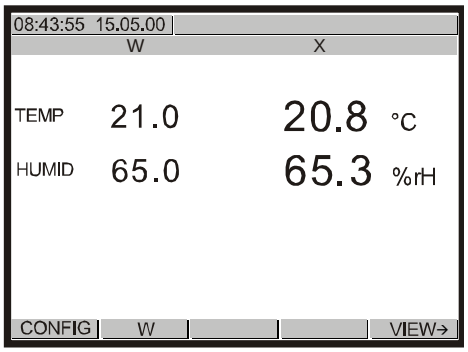
11.3 Calibrating and adjusting the temperature control

1. Set the set temperature to the selected value (chap. 11.2.1).
2. Set the set humidity to one of the selected values for the humidity calibration and adjustment (chap. 11.2.2).
3. Reset the temperature controller adjustment.
4. Calibrate the temperature controller (chap. 11.3.2).
5. If necessary, adjust the temperature controller.

11.3.1 Resetting the temperature controller adjustment

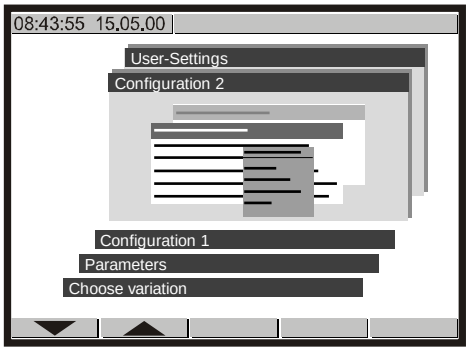
Before the unit can be re-adjusted the current adjustment has to be reset and the input value correction has to be switched off.

1. Starting from Normal Display push <CONFIG>.



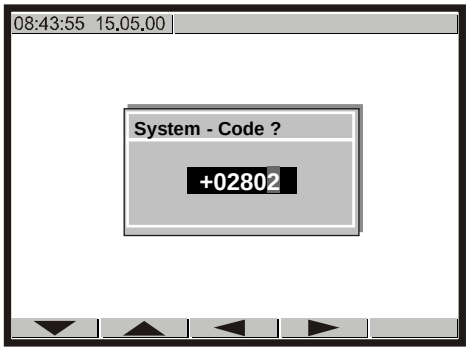
↓

Use the buttons ▼ or ▲ to select the menu “Configuration 2” and confirm with <ENTER>.



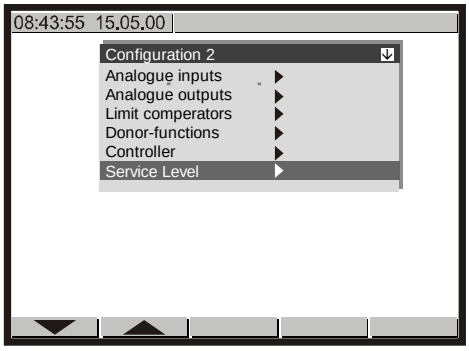
↓

Use the buttons ▼, ▲, ◄ and ► to key in the System-Code “+02802” and confirm with <ENTER>.



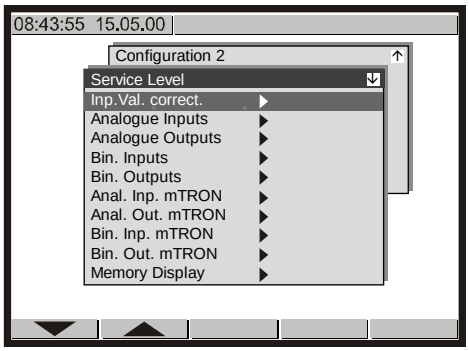
↓ “

Use the buttons ▼ or ▲ to select the menu item “Service Level” and confirm with <ENTER>.



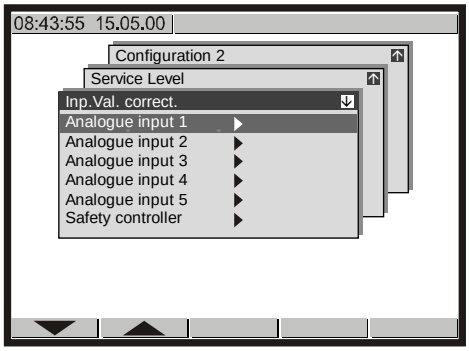
↓

Use the buttons ▼ or ▲ to select the menu item “Inp.Val. correct.” and confirm with <ENTER>.



↓

Use the buttons ▼ or ▲ to select the menu item “Analogue Input 1” and confirm with <ENTER>.



↓

Use the buttons ▼ or ▲ to select a menu item and confirm with <ENTER>.
For each menu item a submenu will be opened.

Use the buttons ▼, ▲, ◄ and ► to key in the values given below and confirm with <ENTER>.

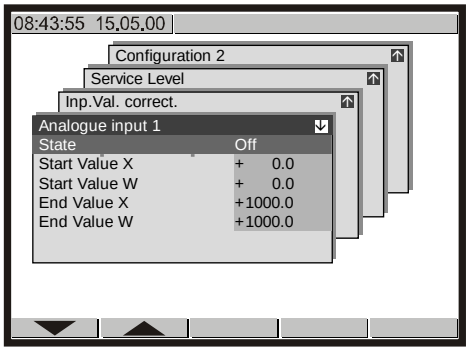
State: Off

Start value X: 0.0

Start value W: 0.0

End value X: 1000.0

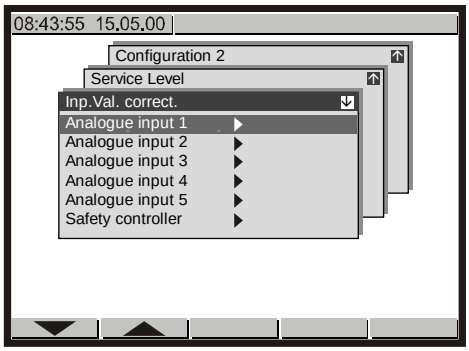
End value W: 1000.0



↓

Push <EXIT> to return to the menu “Inp.Val. correct.“.

Use the buttons ▼ or ▲ to select the menu item “Safety controller” and confirm with <ENTER>.



↓

Use the buttons ▼ or ▲ to select a menu item and confirm with <ENTER>.
For each menu item a submenu will be opened.

Use the buttons ▼, ▲, ◄ and ► to key in the values given below and confirm with <ENTER>.

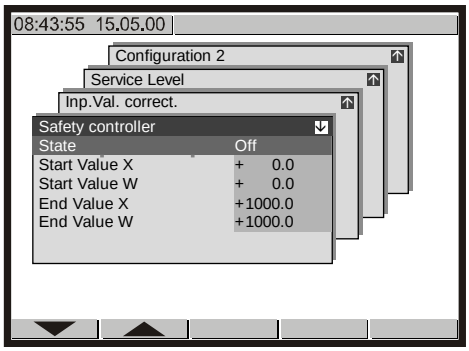
State: Off

Start value X: 0.0

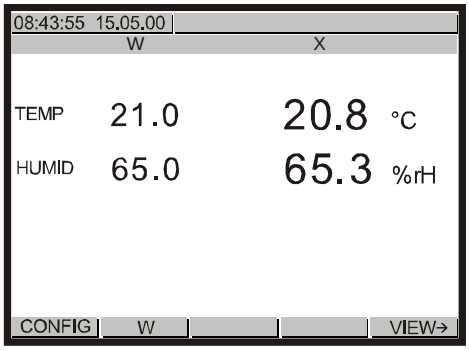
Start value W: 0.0

End value X: 1000.0

End value W: 1000.0



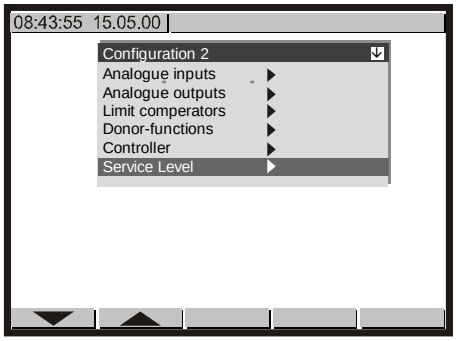
↓



Push <EXIT> four times to return to the controller's normal display.

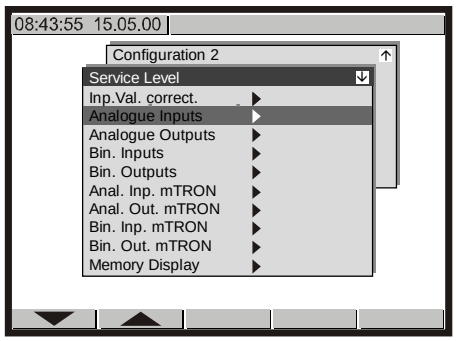
11.3.2 Calibrating the temperature controller

1. Enter the “Service Level”
(see steps 1 to 0, chap. 11.3.1).



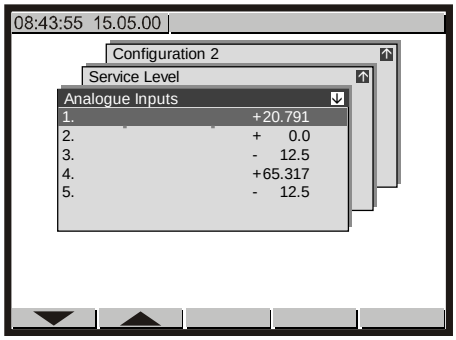
↓

Use the buttons ▼ or ▲ to select the menu item “Analogue Inputs” and confirm with <ENTER>.



↓

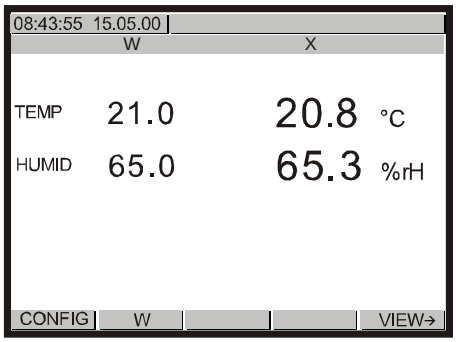
Note down the actual value of “1.” (e.g. +20.791).



↓

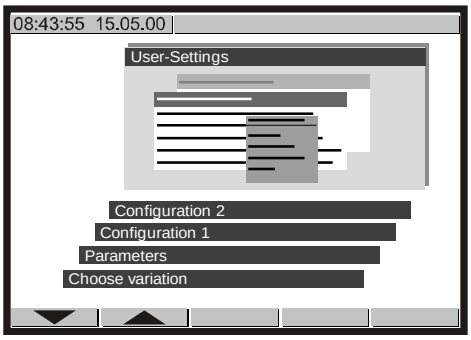
Push <EXIT> four times to return to the basic display.

Push <CONFIG>.



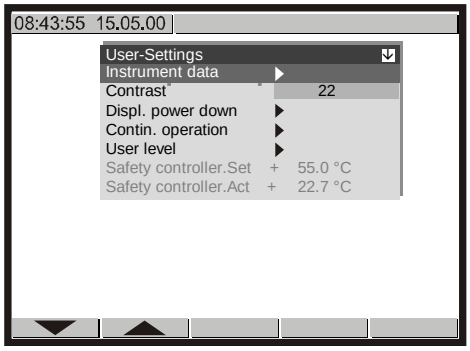
↓

Use the buttons ▼ or ▲ to select the menu “User-Settings” and confirm with <ENTER>.



↓

Note down the actual value of “Safety control.Act” (e.g. +22.7).



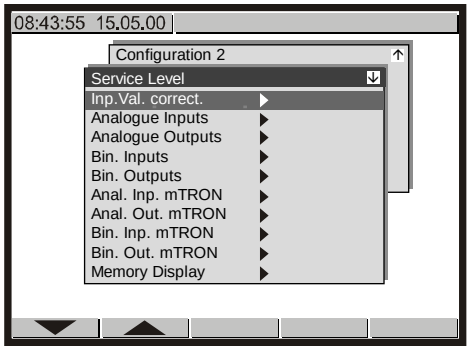
Note down the displayed temperature value of the reference measuring instrument (e.g. +21.6).

Compare the values of the noted controller parameters “1.” (KBF 720: also “2.”) and “Safety control.Act” with the displayed temperature value of the reference measuring instrument.

Adjust the main and the safety temperature controller if the deviation of the values of the controller parameters “1.”, (KBF 720: also “2.”) resp. “Safety control.Act” and the reference measuring instrument is found to be larger than +/-0.5 K (confidence criteria).
In case the reference measuring instrument has a measuring uncertainty larger than +/-0.5 K (see its calibration certificate), this is the confidence criteria (e.g. +/-0.75 K).
If the deviation is found to be larger than +/-2 K replace the Pt100 temperature sensor.

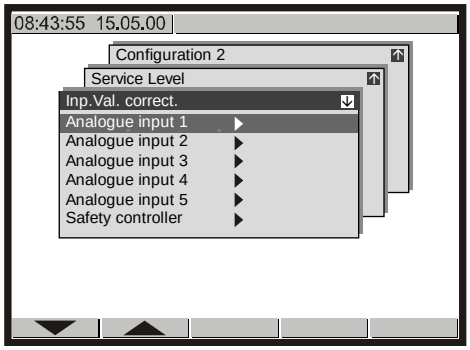
11.3.3 Adjusting the temperature controller

1. Enter the menu “Inp.Val. correct.“ (see steps 1 to 0, chap. 11.3.1).



↓

Use the buttons ▼ or ▲ to select the menu item “Analogue Input 1” and confirm with <ENTER>.



↓

Use the buttons ▼ or ▲ to select a menu item and confirm with <ENTER>. For each menu item a submenu will be opened.

Use the buttons ▼, ▲, ◄ and ► to key in the values given below and confirm with <ENTER>.

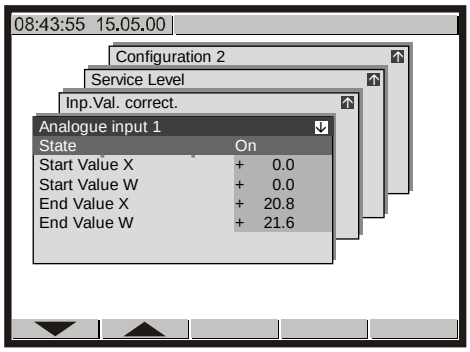
State: On

Start value X: 0.0

Start value W: 0.0

End value X: Value of “Analogue Inputs.“/“1.” (e.g. +20.8) (step 0, chap. 11.3.2).

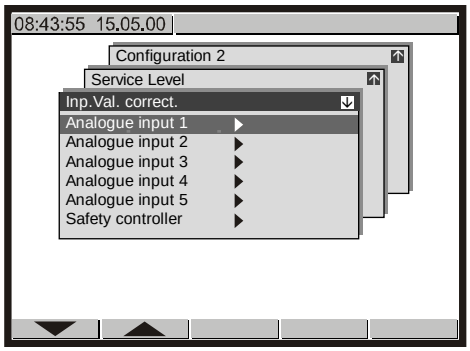
End value W: Value of reference measuring instrument (e.g. +21.6) (step 0, chap. 11.3.2).



↓

Push <EXIT> to return to the menu “Inp.Val. correct.“

Use the buttons ▼ or ▲ to select the menu item “Safety controller” and confirm with <ENTER>.



↓

Use the buttons ▼ or ▲ to select a menu item and confirm with <ENTER>. For each menu item a submenu will be opened.

Use the buttons ▼, ▲, ◄and ► to key in the values described below and confirm with <ENTER>.

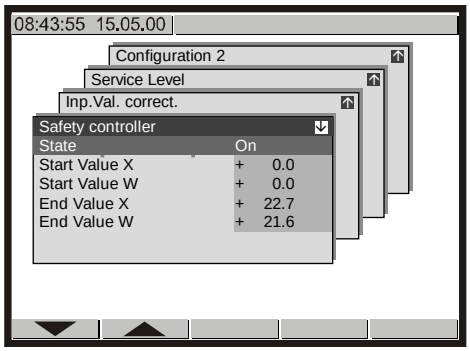
State: On

Start value X: 0.0

Start value W: 0.0

End value X: Value of “Safety controller“/“1.” (e.g. +22.7) (step 0, chap. 11.3.2)

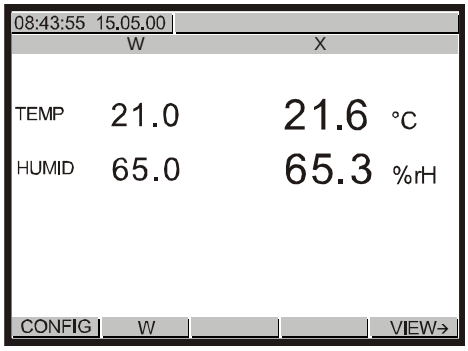
End value W: Value of reference measuring instrument (e.g. +21.6) (step 0, chap. 11.3.2).



↓

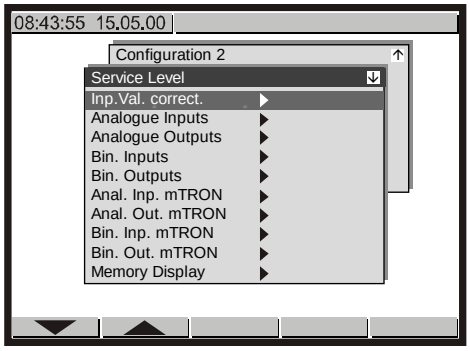
Push <EXIT> four times to return to the basic display. The corrected value appears on the controller display after 5 seconds.

Compare the displayed temperature values of the controller display and the reference measuring instrument. The deviation must be less than the confidence criteria.



11.4 Setting the door heating correction

1. Enter the menu “Inp.Val. correct.“ (see steps 1 to 0, chap. 11.3.1).



↓

Use the buttons ▼ or ▲ to select the menu item „ Analogue Input 2” and confirm with <ENTER>.



↓

Use the buttons ▼ or ▲ to select a menu item and confirm with <Enter>. For each menu item a submenu will be opened.

Use the buttons ▼, ▲, ◄and ► to key in the values described below and confirm with <ENTER>.

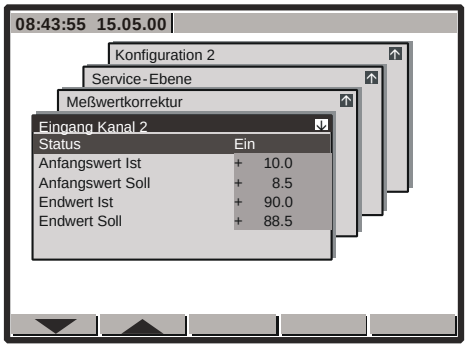
State: On

Start value X: 10.0

Start value W: 8.5

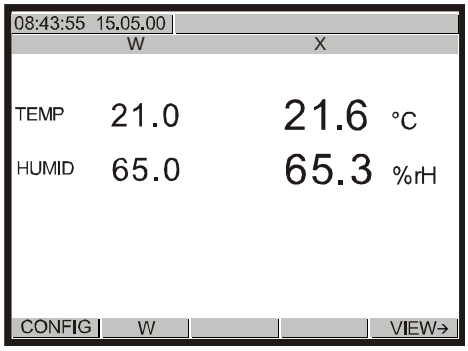
End value X: 90.0.

End value W: 88.5



↓

Push <EXIT> four times to return to the basic display.



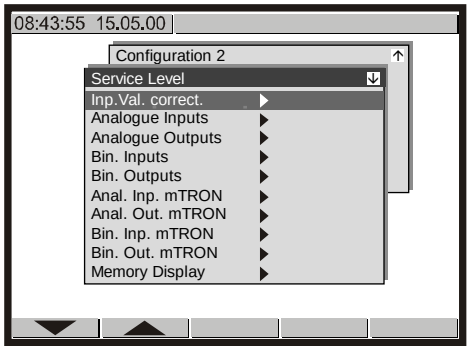
11.5 Calibrating and adjusting the humidity controller

1. Set the temperature set-point to that value the calibration of the temperature control is performed at (chap. 11.3).
2. Set the humidity set-point to that value the calibration of the temperature control is performed at (chap. 11.3).
3. Reset the humidity controller adjustment (chap. 11.5.1).
4. Calibrate the humidity controller at the first calibrating and adjusting point (chap. 11.5.2).
5. Set the humidity set-point to the other selected value for the humidity calibration and adjustment (chap. 11.2.2).
6. Calibrate the humidity controller at the second calibrating and adjusting point (chap. 11.5.2).
7. If necessary, adjust the humidity controller (chap. 11.5.3).

11.5.1 Resetting the humidity controller adjustment

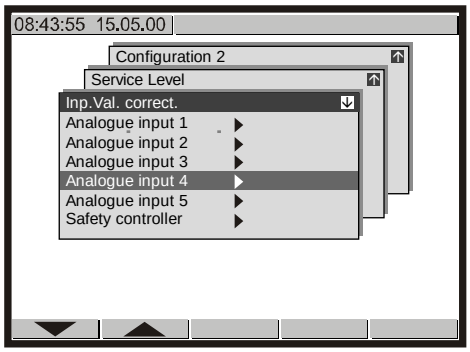
Before the unit can be re-adjusted the current adjustment has to be reset and input value correction has to be switched off.

1. Enter the menu “Inp.Val. correct.“ (see steps 1 to 0, chap. 11.3.1).



↓

Use the buttons ▼ or ▲ to select the menu item “Analogue Input 4” and confirm with <ENTER>.



↓

Use the buttons ▼ or ▲ to select a menu item and confirm with <ENTER>. For each menu item a submenu will be opened.

Use the buttons ▼, ▲, ◄ and ► to key in the values described below and confirm with <ENTER>.

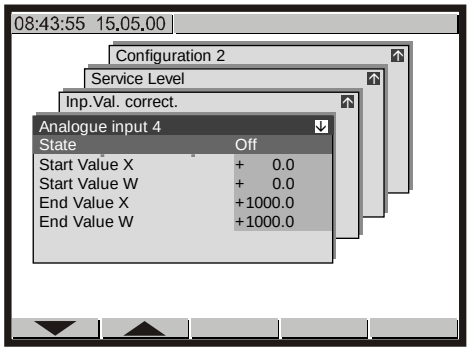
State: Off

Start value X: 0.0

Start value W: 0.0

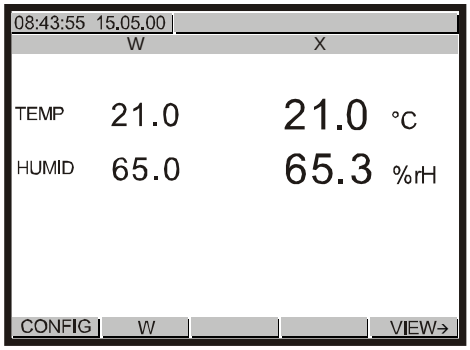
End value X: 1000.0

End value W: 1000.0



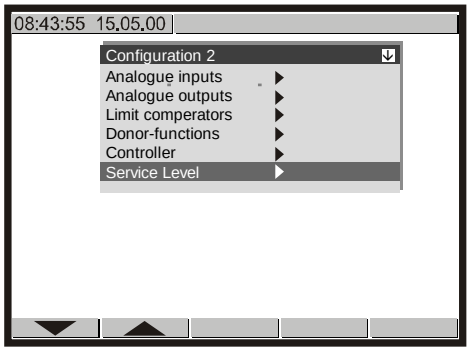
↓

Push <EXIT> four times to return to the basic display.



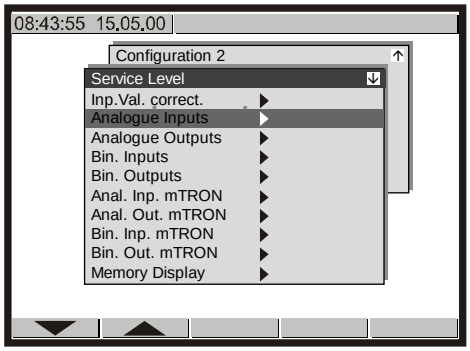
11.5.2 Calibrating the humidity controller

1. Enter the “Service Level”
(see steps 1 to 0, chap. 11.3.1).



↓

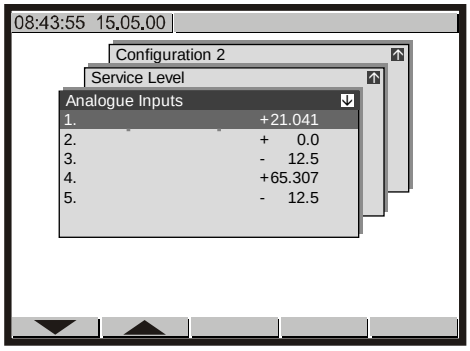
Use the buttons ▼ or ▲ to select the menu item “Analogue Inputs.“ and confirm with <ENTER>.



↓

Note down the actual value of “4.” (e.g. +65.307).

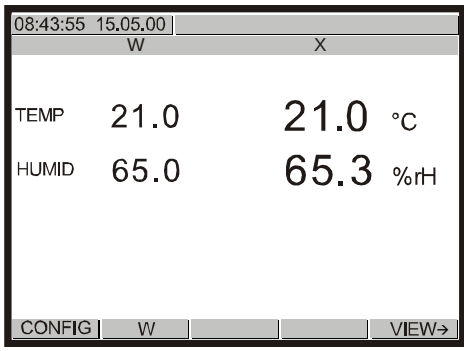
Note down the displayed humidity value of the reference measuring instrument (e.g. 67.5% r.H.).



↓

Push <EXIT> four times to return to the basic display.

Push <CONFIG>.



Set the set humidity to the other of the desired values for the humidity calibration and adjustment (chap. 11.2.2).

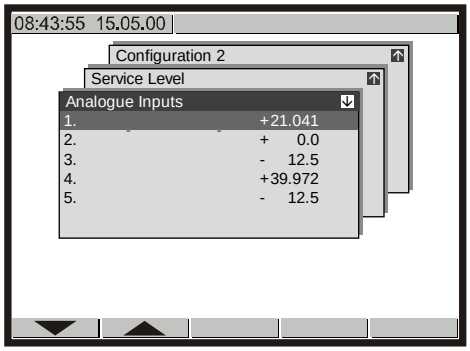
Wait until the steady-state condition is reached (chap. 11.1).

↓

Enter the menu “Analogue Inputs“ (see steps 1 and 2)

Note down the actual value of “4.” (e.g. +39.972).

Note down the displayed humidity value of the reference measuring instrument (e.g. 42.2% r.H.).

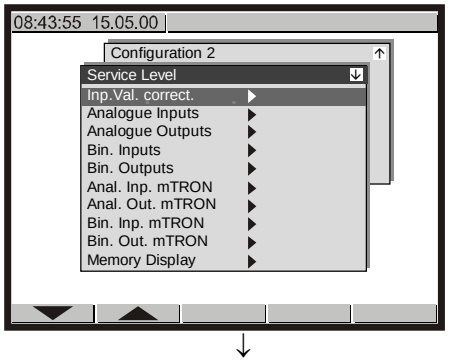


Compare the values of the noted controller parameter “4.” at both set humidity values with the displayed humidity values of the reference measuring instrument at the corresponding set points.

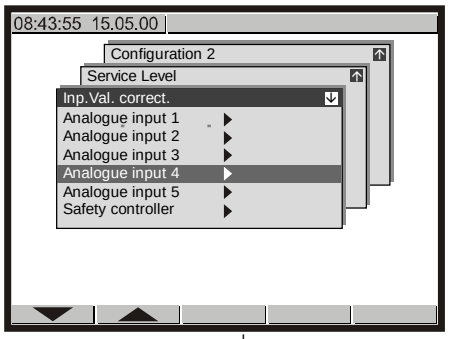
Adjust the humidity controller if the deviation of one of the values of the controller parameter “4.” and the reference measuring instrument is found to be larger than +/-2.0% r.H. (confidence criteria) (chap. 11.5.3).
In case the reference measuring instrument has a measuring uncertainty larger than +/-2.0% r.H. (see its calibration certificate), this is the confidence criteria (e.g. +/-2.5% r.H.).
If the deviation is found to be between ± 3.0% r.H. and 5.0% r.H., calibration of the humidity controller should from now on be performed every 6 months.
If the deviation is found to be larger than +/-5 % r.H. replace the humidity sensor (chap. 7.10).

11.5.3 Adjusting the humidity controller

1. Enter the menu “Inp.Val. correct.“ (see steps 1 to 0, chap. 11.3.1).

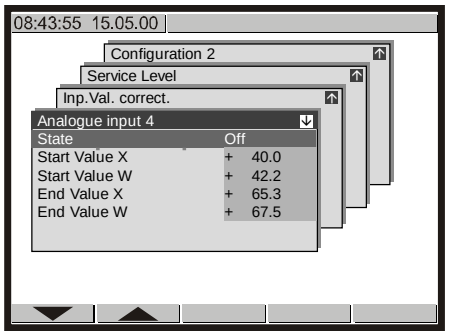


Use the buttons ▼ or ▲ to select the menu item “Analogue Input 4” and confirm with <ENTER>.



Use the buttons ▼ or ▲ to select a menu item and confirm with <ENTER>.
For each menu item a submenu will be opened.

Use the buttons ▼, ▲, ◄ and ► to key in the values described below and confirm with <ENTER>.



State: On

Start value X: Value of “Analogue Inputs“ / “4.” at the lower set humidity (e.g. +40.0) (step 0, chap. 11.5.2).

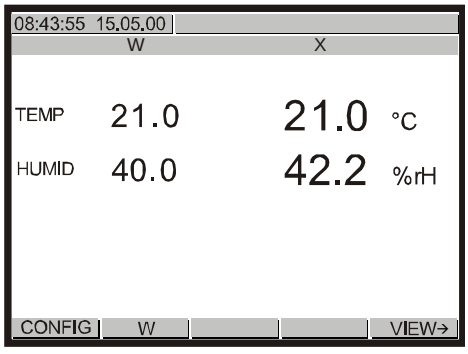
Start value W: Value of reference measuring instrument at the lower set humidity (e.g. 42.2) (step 0, chap. 11.5.2).

End value X: Value of “Analogue Inputs“ / “4.” at the higher set humidity (e.g. +65.3) (step 0, chap. 11.5.2).

End value W: Value of reference measuring instrument at the higher set humidity (e.g. 67.5) (step 0, chap. 11.5.2).

Push <EXIT> four times to return to the basic display. The corrected value appears on the controller display after 5 seconds.

Compare the displayed humidity values of the controller display and the reference measuring instrument. The deviation must be less than the confidence criteria (chap. 11.5.2).



12 Spare parts

Name of spare part	order no.	Installation
Housing cover standard KBF 115 KBF 240 KBF 720	 4001-0726 4001-0745 8001-0256	chap. 5
Housing cover for option temperature safety device class 3.3 KBF 115 KBF 240 KBF 720	 4001-0727 4001-0747 8001-0255	
Lateral control panel, right KBF standard	8007-0319	chap. 5.1
Lateral control panel, left KBF with option temperature safety device class 3.3	8007-0306	chap. 5.1
Rear panel KBF 115 Rear panel KBF 240 Rear panel KBF 720 top Rear panel KBF 720 bottom	4001-0728 4001-0746 4001-0692 4001-0693	chap. 5.3
Silicone access port	6016-0033	chap. 5.4
Plug for silicone access port	6016-0035	
Seal ring	6016-0034	
Fixing disk	4020-0509	
Castor KBF 240, 720	6006-0028	chap. 5.5
Castor with lock KBF 240, 720	6006-0029	
Device feet KBF 115	6002-0006	
Door		
Cover, grey	6002-0008	chap. 6.1.1
Door hinge cover	6002-0007	chap. 6.2.2
KBF 115 Interior side of the outer door KBF 240 Interior side of the outer door KBF 720 Interior side of the outer door, right KBF 720 Interior side of the outer door, left	8003-0181 8003-0182 8003-0184 8003-0183	chap. 6.2.3 chap. 6.2.4
Door heating wire KBF 115 (*-4E2*) KBF 240 (*-4E2*) KBF 720 (*-4E3*)	 5005-0101 5005-0169 5005-0169	chap. 6.2.3
KBF 115 door complete KBF 240 door complete KBF 720 door complete, right KBF 720 door complete, left	8002-0587 8002-0594 8002-0560 8002-0561	chap. 6.2.4
KBF 115 door housing KBF 240 door housing KBF 720 door housing, right KBF 720 door housing, left	8002-0588 8002-0595 8002-0558 8002-0559	chap. 6.2.4
Temperature sensor door (*-3B3*)	5002-0048	chap. 6.2.3
Door contact switch (*-3S1*)	5019-0061	chap. 6.2.5
Outer door gasket KBF 115 KBF 240 KBF 720	 6005-0203 6005-0161 6005-0197	chap. 6.2.6

Name of spare part	order no.	Installation
Door handle KBF 115, 240, right 104 mm KBF 720, right 77,5 mm KBF 720, left 77,5 mm	 6002-0104 6002-0121 6002-0122	chap. 6.4
Screw	3001-0003	
Push rod guide KBF 115, 240 KBF 720	 6002-0018 6002-0202	chap. 6.4
Push rod KBF 115 KBF 240 KBF 720	 4021-0034 4021-0365 8009-0458	
Cover 13,5	6002-0008	
O-ring	3004-0002	
Axle guide	6002-0119	
Push rod lever	6006-0009	
Axle bearing	4020-0018	
Screw 3,9x13	3001-0012	
Washer	3003-0003	
Screw M5x10 zinc-coated	3001-0002	
Cover d 19	6002-0023	
Glass door KBF 115 complete KBF 240 complete KBF 720 complete (2 x) left / right Fastener block	 8010-0088 8010-0143 8010-0086 6002-0124	chap. 7.1
Glass door gasket KBF 115 KBF 240 KBF 720 (2 x)	 6005-0204 6005-0149 6005-0198	chap. 7.1 chap. 7.3
Intermediate door gasket KBF 720	6005-0192	
Locking stud glass door	6002-0316	chap. 7.2
Disk spring DIN2093-C 12,5 x 6,2 x 0,35	3003-0034	
Washer DIN9021-A 3.2 A2 140 HV	3003-0025	
Screw DIN7985-A M3x6-4.8 zinc-coated	3001-0029	
Triangle instrument box		
Triangle instrument box complete	8008-0246	chap.6.3
Housing instrument box	6002-0180	
Switch mat 5-fold	6002-0184	
Switch mat 3-fold	6002-0196	
Filter pane	6002-0160	
Controller display	5014-0059	chap8.9
Inner chamber		
Radial fan complete	5013-0088	chap. 7.4
Fan drive shaft gasket	6005-0160	
Fan drive shaft ring	6006-0310	

Name of spare part	order no.	Installation
Fan sheet KBF 115 KBF 240, 720	 4020-0576 4020-0597	chap. 7.4
Fan cover KBF 115 KBF 240, 720	 4020-0949 4020-0918	
Frame gasket KBF 115 KBF 240 KBF 720	 6005-0207 6005-0147 6005-0196	chap. 7.5
Frame heating wire KBF 115 (*-4E3*) KBF 240 (*-4E3*) KBF 720 (*-4E5*)	 5005-0185 5005-0168 5005-0177	chap. 7.6
Connector 6-polig	5024-0157	
KBF 115 Stop ledge KBF 240 Stop ledge KBF 720 Stop ledge	4005-0402 4005-0410 4005-0376	chap. 7.7
KBF 115 Side plate left of inner chamber KBF 240 Side plate left of inner chamber KBF 720 Side plate left of inner chamber	8005-0182 8005-0185 8005-0223	
KBF 115 Side plate right of inner chamber KBF 240 Side plate right of inner chamber KBF 720 Side plate right of inner chamber	8005-0183 8005-0184 8005-0224	
KBF 115 Rear panel of inner chamber KBF 240 Rear panel of inner chamber KBF 720 Rear panel of inner chamber	4005-0461 4005-0406 4005-0374	
KBF 115 Bottom of inner chamber KBF 240 Bottom of inner chamber KBF 720 Bottom of inner chamber	4005-0400 4005-0409 4005-0375	
Gaskets between the inner chamber and the outer chamber KBF 115, 0,92 m KBF 240, 1,53 m KBF 720, 2,46 m	 6005-0210	
Heating element KBF 115 (*-4E1*) KBF 240 (*-4E1*) KBF 720 (*-4E1, -4E2*)	 5005-0183 5005-0183 5005-0183	chap. 7.8
Heating element spacer	4020-0003	
Inner chamber Pt 100 temperature sensor, (*-3B1*)	5002-0050	chap. 7.9
Sensor holder	4020-0643	
Screwed cable fitting	6002-0397	
Cable access port	6005-0117	
Humidity sensor	5002-0143	chap. 7.10
Temperature fuse 110°C / *230°F*	5006-0043	chap. 7.11
Cable sockets	5024-0007	
Miniature circuit breaker (*-1F1*)	5006-0075	chap. 8.1
Interior socket	5024-0240	
Cable plug	5024-0241	

Name of spare part	order no.	Installation
Power cord with plug	8009-0483	chap. 8.2
Power cord with plug UL	8009-0436	
Power cord with plug Switzerland	8012-0583	
Power cord with plug England	8012-0220	
Power connection board	4001-0269	
Line filter (*-1Z1*)	5026-0016	chap. 8.3
Rocker switch 230 V AC/2 W (main switch and humidity switch)	5019-0010	chap. 8.4
Electric mounting plates		
KBF 115, 720, electric mounting plate, complete KBF 240, electric mounting plate, complete	8007-0349 8007-0348	chap. 8.6
Power relay (*-5K2*)	5011-0055	chap. 8.6
Solid state relay (*-5K1*)	5011-0042	
Solid state relay (*-4K1*), (*-4K2*)	5011-0036	
Solid state relay (*-7K1*), (*-7K2*)	5011-0045	
Electric mounting plate option		
Controller mTRON 4025 analog output (*-12N1*) Controller mTRON 4015 relay (*-11N1*) Through terminal green/yellow Through terminal blue Through terminal grey Connector socket 12-poles Connector socket 6-poles Connector socket 9-poles Connector socket 9-poles Power contactor 230 V AC-2,2 kW (*-5K4*) Relay (1 W / 10 A) 230 V AC + relay socket (*-5K3*)	5014-0074 5014-0075 5024-0022 5024-0021 5024-0020 5024-0153 5024-0157 5024-0173 5024-0185 5011-0008 5011-0010	chap. 8.7
Controller MB1 I/O Board (*-3N1*)	5014-0117	chap. 8.8.1
RS422 / Ethernet converter	5021-0021	chap. 8.11
Power supply unit	5020-0032	chap. 8.12
Humidification module, variant B	8009-0789	chap. 9.2
PU foam	1004-0009	chap. 7.8 chap. 7.9 chap. 7.11
Cooling system		
Condenser complete. KBF 115 KBF 115 UL KBF 240 KBF 240 UL KBF 720 KBF 720 UL Condenser fan KBF 115 KBF 115 UL KBF 240 KBF 240 UL KBF 720 KBF 720 UL	 5013-0163 5013-0163 5013-0165 5013-0165 5013-0163 5013-0163 5013-0164 5013-0164 5013-0166 5013-0166 5013-0164 5013-0164	chap. 10.3

13 Parts subject to wear

Name of spare part	order no.	Equipment code
Heating		
Door heating wire		
KBF 115	5005-0101	*(-4E2)*
KBF 240	5005-0169	*(-4E2)*
KBF 720	5005-0169	*(-4E3, -4E4)*
Frame heating wire		
KBF 115	5005-0185	*(-4E3)*
KBF 240	5005-0168	*(-4E3)*
KBF 720	5005-0169	*(-4E5)*
Radial fan complete with motor and fan wheel	5013-0088	*(-4M1)*
Fan drive shaft ring	6006-0310	
Fan drive shaft gasket	6006-0160	
Gaskets		
Outer door gasket		
KBF 115	6005-0203	
KBF 240	6005-0161	
KBF 720	6005-0197	
Intermediate door gasket KBF 720	6005-0192	
Glass door gasket		
KBF 115	6005-0204	
KBF 240	6005-0149	
KBF 720	6005-0198	
Frame gasket (inner chamber)		
KBF 115	6005-0207	
KBF 240	6005-0147	
KBF 720	6005-0196	
Gaskets between the inner chamber and the outer chamber		
KBF 115, 2x 765 mm	6005-0210	
KBF 240, 2x 1200 mm	6005-0210	
KBF 720, 2x 1230 mm	6005-0210	

14 Revision history

Issue	Modification/Amendment
02-2013	• Condenser and interior socket updated
06-2014	• Revision of chap. 9, new humidification module
10-2014	• Humidification module variant A (chap. 9.1) and variante B (chap. 9.2) added
04-2015	• New fan cover, amendment no. 14-050 • New temperature sensor, amendment no. 14-009 • Spare parts list updated

BINDER