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INSTALLATION AND OPERATING INSTRUCTIONS

Photostability Test System

VP 500-L

With Simcon/32-NET Controller

GB 64567851 08.2005

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1 INTRODUCTION

1.1 General information

This manual shall be read carefully prior to operating the test system in order to avoid malfunctioning and resultant damage.

This manual contains detailed information and directions regarding

– Installation

– Operation

– Mode of operation

– Faults

– Fault rectification

• Please observe the separate operating manual for the control unit.

• Please observe the operating instructions for options in the appendix

1.2 For your guidance

Explanation of the signs and symbols:

1.2.1 Symbols

– A dash is used for enumerations

• A dot denotes directions which must be followed by operator and user

→ cross-references are preceded by an arrow

1.2.2 Danger warnings

consist of explanatory remarks with a symbol right next to it.

DANGER
is used, if non-compliance with the instructions may endanger living beings or the environment.

WARNING
is used, if non-compliance with the instructions may cause damage to the test system or test specimen.

NOTE
is used to indicate any form of assistance.

1) option

1.3 Separate operating instructions

Please observe the separate documentation for the following equipment:

– Control unit

– Printer[1)]

– Interface converter[1)]

– Software SIMPATI[1)]

1.4 Warranty

– The design of the test system as supplied by us must not be altered

– No warranty can be given in case of improper use contrary to the directions in this manual

– The test system has been designed, manufactured and inspected before delivery with all due care in accordance with the EC directives as per enclosed declaration of conformity

– The test system meets the standards for conducted and emitted interference specified in the declaration of conformity

– It is imperative for the safety of the test system that the necessary maintenance and repair work should be performed by our service organisation or authorized service outlets

– The user himself can service and clean the test system in accordance with the maintenance schedule

– Only use original spares when performing maintenance or repair work

– For translations into other languages the statements and specifications of the German operating instructions are binding

1) option

1.5 Normal use and application

The test system has been designed and constructed exclusively for climatic tests with our without irradiation.

You can perform testing methods to determine the effects of temperature, humidity and radiation on the quality of pharmaceutical products.

DANGER

Improper and inadmissible use of the test system means e.g.:

- Placing inflammable or explosive gases, dusts or fluids inside or in the vicinity of the test system
- Placing inflammable, explosive, toxic or corrosive test specimens inside or near the test system
- Placing test specimens, which become potentially hazardous when exposed to the temperature range of the test system, in or near the test system.
- Placing substances, which can create an explosive atmosphere with air, inside or in the vicinity of the test system
- Endangering living beings by allowing them into the test system
- Using the test system for heating or storing food
- Placing heat-emitting or energized test specimens in the test space

1) option

1.6 Safety

1.6.1 General information

Certain basic rules must be observed even for reliable safety devices.

Improper and inadmissible use may represent a danger to life and limb of the operator or third parties or result in destruction of the test specimen or the test system.

- Do not remove protective covers
- Do not render safety devices ineffectual
- Do not manipulate safety devices

Such manipulations are particularly dangerous as others know nothing about them and have confidence in the safety of the test system.

1.6.2 Requirements to be met by the user

– Operation of the test system may only be performed by trained personnel

– The user must compile operating instructions on the basis of this manual, taking the relevant local and plant-internal conditions and the language of the operating personnel into account.

– The user must ensure that all personnel working with the test system know and observe the safety instructions

– Work on electrical devices and the refrigerating unit must be performed by our service organisation or a skilled person authorized by us. The necessary documentation is in the Service Manual and should only be used by these persons.

The user must ensure that the directions regarding installation and operation of refrigerating plants as per EN 378-1 chap. 5.3, EN 378-2 Appendix C, EN 378-4 chap. 4 and 5, and national directives are duly observed.

1.6.3 Definition of a skilled person

Personnel who, based on their training and experience are in a position to prevent electricity-related potential hazards or dangers connected with the refrigerating unit.

1) option

1.6.4 Safety symbols

Please observe the safety symbols on the test system

OPERATING AND SAFETY INSTRUCTIONS

- Carefully read the operating instructions before putting the test system into operation
- Observe the safety instructions when operating the test system

WARNING ABOUT DANGER AREAS

- Observe the danger warnings in the operating instructions

WARNING ABOUT DANGEROUS ELECTRICAL VOLTAGE

Work on these devices to be performed by electrical experts only

- Set the mains switch to »O«

WARNING ABOUT PLUG-AND-SOCKET CONNECTIONS

- Connectors may only be plugged if the test system is switched off.

WARNING ABOUT HAND INJURIES

The heat exchanger fins are sharp-edged

- Wear safety gloves

NOT FOR DRINKING

Demineralized water is required for climatic operation

- Demineralized water is not drinkable

EYE PROTECTION MUST BE WORN

The safety goggles must be impermeable to ultraviolet rays.

1) option

1.6.5 Safety instructions

- Read first the operating instructions for the control unit
- Keep the operating instructions near the test system
- In addition to these operating instructions, the relevant national laws, regulations and directives must be observed when installing and operating the test system.

Maintenance work

- Set the test system to room temperature
- Set the mains switch to »O« → *2.2.9 Front panel (page 11)*
- Padlock the mains switch against accidental switching on
- Provide a safety clearance of > 500 mm between test system and wall, as escape route, in accordance with VDE 0100 Part 729.
- Remove the key from the test space door
- Do not use sharp tools for maintenance work
- Wear safety gloves

When using the entry ports[1)]

– Observe the safety standards applicable to electrical systems, e.g. IEC 60364-4-41, VDE 0100 part 410 and EN 60204 part 1, as well as the relevant accident prevention regulations.

– Only use lines that are resistant to temperature and humidity

– Seal the used entry ports[1)] with temperature and humidity-resistant material

Refrigerants

The refrigerants used (→ *rating plate*) belong to group L1 according to EN 378. They are not inflammable, nor are they harmful to humans. Refrigerants are heavier than air. Leaking refrigerants will, therefore, accumulate around the floor.

- Should refrigerants be released, please notify our service organisation, or a skilled person authorized by us. Ensure that the site is well ventilated.
- Observe the safety data sheets in the Service Manual

Ultraviolet radiation

If the test space door is open while irradiation is in progress, the ultraviolet rays can harm your eyes.

1) option

1.6.6 Safety devices

The test systems are equipped with the following safety devices:

Test system and test specimen protection

– Safety temperature limiter (protection against overtemperature in the test system). Thermal safety class 1 in accordance with EN 60519-2, 1993.

– Independent temperature limiter t_{min}/t_{max} (protection against thermal overstressing of the test specimen). Thermal safety class 2 in accordance with EN 60519-2, 1993.

– Software temperature limiter (protection against non-permissible temperatures in the test space)

Excess pressure in the refrigeration circuit

– Pressure switch (protection against non-permissible pressure in the refrigeration circuit)

DANGER

The safety devices are only working if the test system is switched on

The test systems may be equipped with options. For relevant safety directions see the respective appendices.

1) option

1) option

2 DESCRIPTION OF THE TEST SYSTEM

2.1 Structure

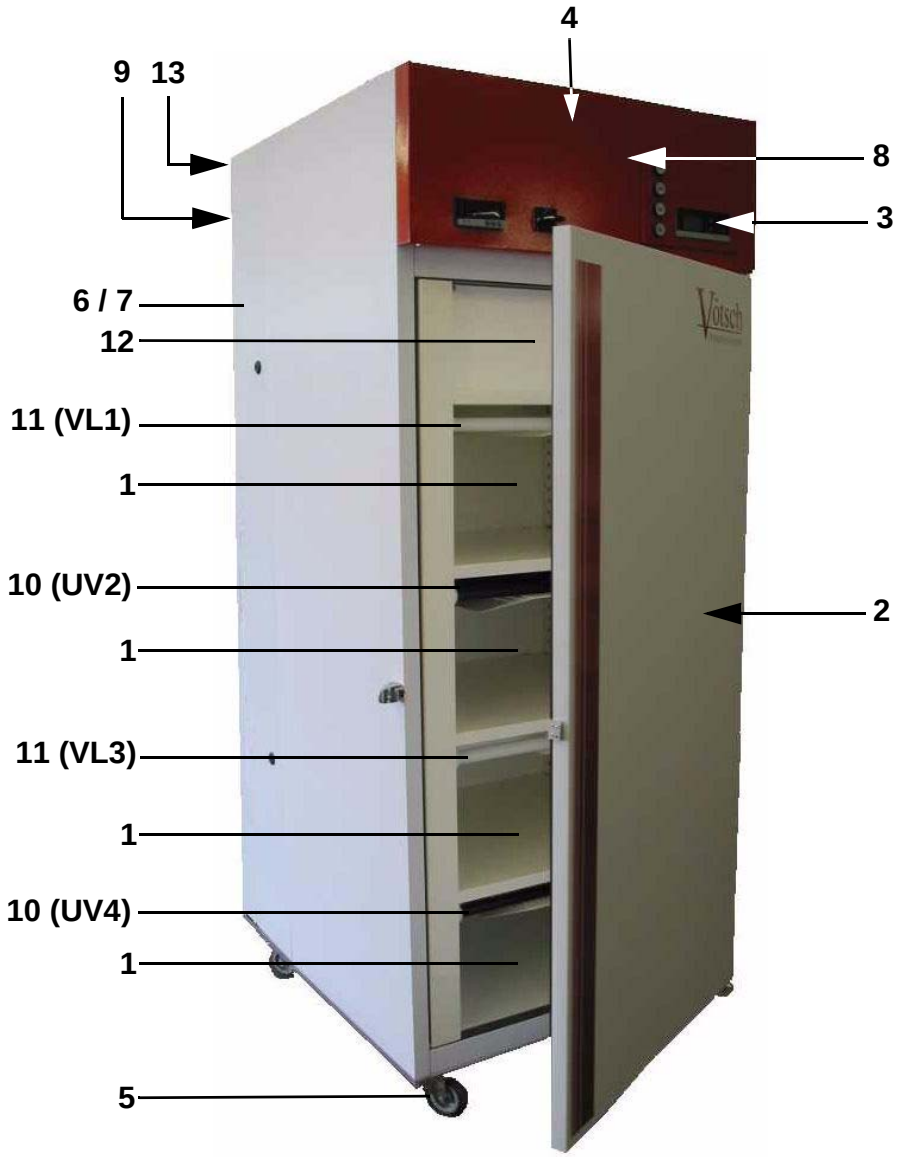


Fig. 2-1
Test system

1	Test spaces		
2	Test space door	8	Front panel
3	Control unit	9	Connector panel
4	Mechanical section	10	Irradiation module 1 and 3 (with UV fluorescent lamps)
5	Castors	11	Irradiation module 2 and 4 (with cool white fluorescent lamps)
6	Switchgear cabinet	12	Sensor cover
7	Supply section	13	Electrical connection, cable length 5 m

1) option

2.2 Components and their function

→ *Fig. 2-1 (page 9)*

2.2.1 Test spaces

The test spaces are made of lacquered high-grade steel. The test specimens can be placed on the test space floor.

2.2.2 Test space door

The test space door can be locked with a key.

2.2.3 Control unit

All control and operating commands can be activated by pressing the function keys on the control unit.

2.2.4 Mechanical section

The mechanical section is accessible from the top. It contains the equipment necessary for producing the test conditions.

2.2.5 Castors

The test system is equipped with four castors.

2.2.6 Entry ports[1)]

Entry ports[1)] enable the inserting of measuring lines and testing equipment.

- Observe the relevant safety instructions → *When using the entry ports[1)] (page 6)*

1) option

2.2.7 Switchgear cabinet

The switchgear cabinet is located in the supply section. It contains the system fuses, control modules and electrical components.

The controller design complies with EN 60204 Part 1.

2.2.8 Irradiation modules

Two test spaces contain UV-lamps, two contain cool white fluorescent lamps.

The lamps can be operated individually via the switches on the front panel → *2.2.9 (page 11)*

Cool white lamps	Switch »VL 1« and »VL 3«
UV fluorescent lamps	Switch »UV 2« and »UV 4«

2.2.9 Front panel

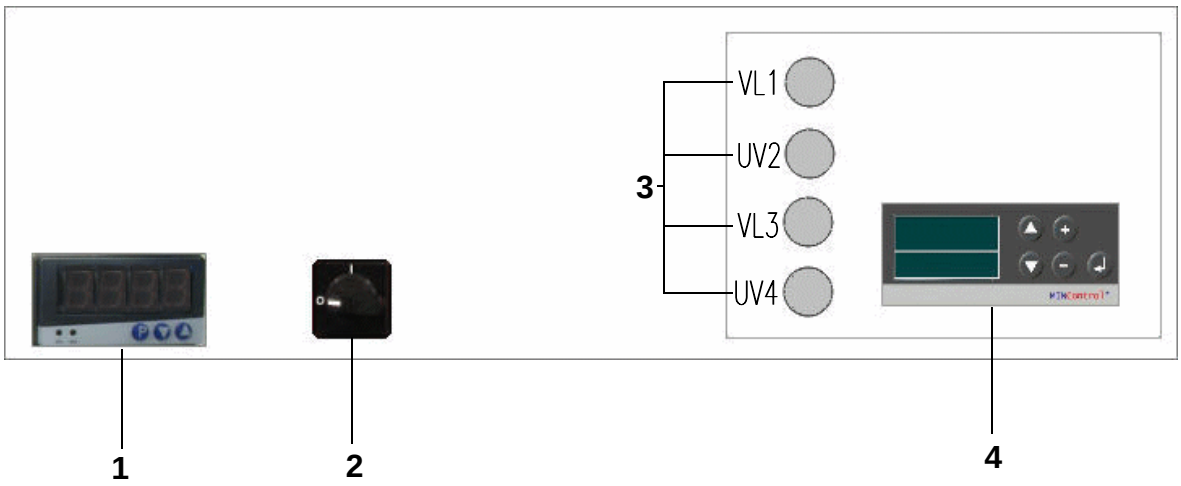


Fig. 2-2
Front panel

The front panel contains:

1 Independent temperature limiter

2 Mains switch

3 Switches for the irradiation modules

4 Control unit

1) option

2.2.10 Connector panel

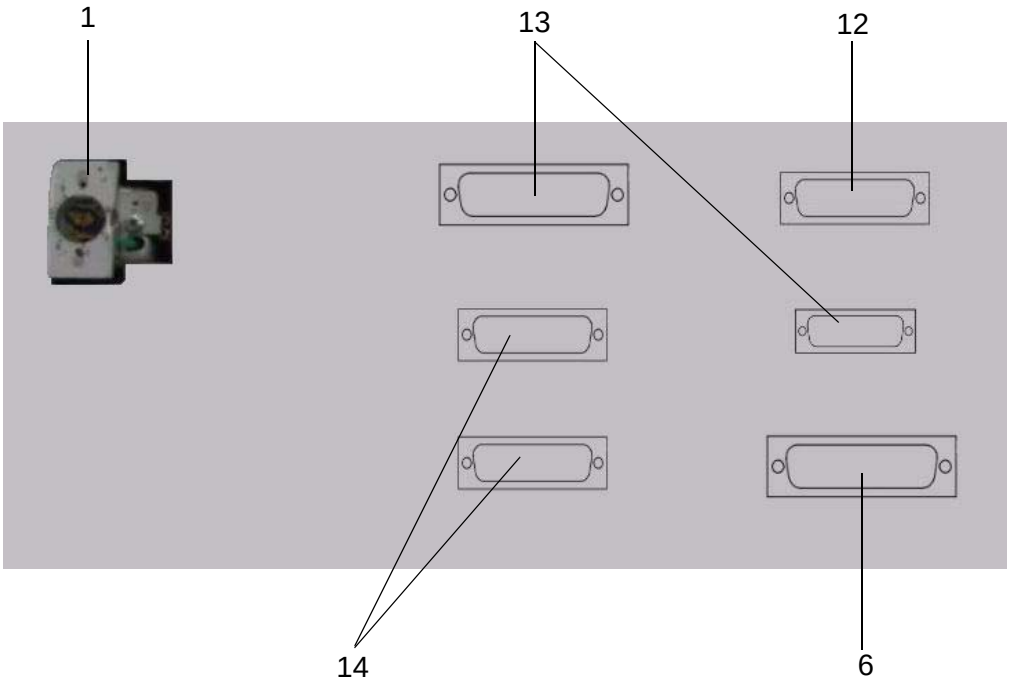


Fig. 2-3
Connector panel

1 Temperature limiter

6 Digital I/O[1)] → *Appendix: Interface connections[1)]* → *1.4 (page 3)*

12 Analog I/O[1)] → *Appendix: Interface connections[1)]*, → *1.3 (page 2)*

13 RS 232 interface → *Appendix: Interface connections[1)]*, → *1.1 (page 1)*

14 RS 485 / RS 422[1)] interface → *Appendix: Interface connections[1)]*, → *1.2 (page 2)*

WARNING

Connecting cables may only be plugged if the test system is switched off

1) option

3 TECHNICAL DATA

These figures represent average values of standard test systems, based on an ambient temperature of +25 °C. Rated voltage → *3.3 (page 13)*.
Without test specimen, without options.

NOTE
The dimensions are specified in the layout → Fig. 4-1 (page 18)

3.1 General characteristics

Test space volume gross net	 approx. 700 ltr approx. 460 ltr
Weight	approx. 250 kg

3.2 Mechanical loads

Maximum load (evenly distributed over the entire surface)	
on each test space floor	25 kg
total load	100 kg

3.3 Operating data

Irradiation module 1 and 3	Cool white fluorescent lamps
Irradiation module 2 and 4	UV fluorescent lamps
Emitted interference, interference immunity	see declaration of conformity
Rated voltage	1/N / PE AC 230 V ± 10 % 50 Hz or 1/N / PE AC 254 V ± 10 % 60 Hz[1)]
Rated power	3.3 kW
Rated current	14 A
On-site fuse protection	16 A slow
Protection switchgear cabinet	IP 20

1) option

3.4 Noise measurement

in accordance with DIN 45635 (Part 1 accuracy class 2)

Sound pressure level measured at a distance of 1 m from the front, 1 m in height, free-field measurement	approx. 52 dB(A)

3.5 Humidification system

Volume of reservoir	19 ltr
Water quality	demineralized
pH-value	6 to 7
Conductivity	5 to 20 μS/cm^3

3.6 Climatic tests without irradiation

- → *3.8 Humidity diagram (page 16)*.

Temperature range	+10 to +50 °C
Humidity range	20 to 90 % r.h.
Dew point range	+5 °C to +40 °C
Temperature deviation in space	± 0.5 K to ± 1 K
Temperature deviation in time in centre of working space	± 0.1 K to ± 0.5 K
Humidity deviation in time in centre of working space	.± 1 % to ± 2 % r.h.
Temperature gradient (according to IEC 60068-3-5)	1 to 2 K
Humidification water consumption at constant +25 °C / 60 % r.h.	approx. 0.5 ltr/24 h

1) option

3.7 Climatic tests with irradiation

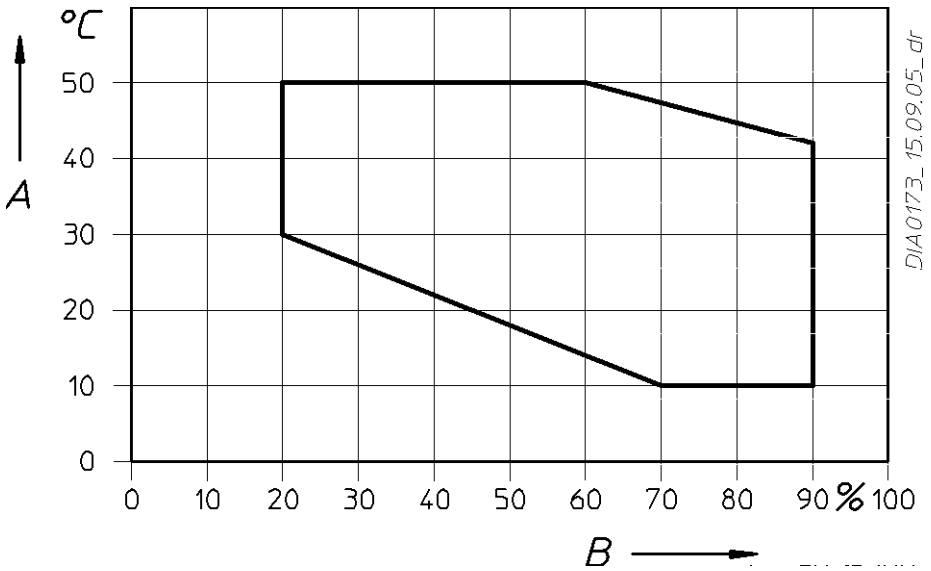
- → *3.8 Humidity diagram (page 16)*.

Temperature range	+10 °C to +50 °C
Humidity range	20 % to 90 % r.h.
Dew point range	+5 °C to +40 °C
Temperature deviation in space	± 0.5 K to ± 1 K
Temperature deviation in time in centre of working space	± 0.1 K to ± 0.5 K
Humidity deviation in time in centre of working space	± 1 % to ± 2 % r.h.
Temperature gradient (according to IEC 60068-3-5)	1 to 2 K
Humidification water consumption at constant +25 °C, 60 % r.h., 100 % irradiation	approx. 0.5 ltr/24 h
Lamps for irradiation module 1 and 3 cool white fluorescent lamps TDL 18 W/33	6 each
Lamps for irradiation module 2 and 4 UV fluorescent lamps F18 W/BLB-T8 Spectrum 320 nm to 400 nm	6 each

1) option

3.8 Humidity diagram

The following humidity range may be used:



A Test space temperature in °C

B Relative humidity in % r.h

Fig. 3-1
Humidity range

3.9 Illumination

at 100% irradiation, relating to the test space temperature.

Test space temperature	Irradiation module 1 and 3	Irradiation module 2 and 4
	Illumination	UV energy
15 °C	approx. 15 kLux	approx. 1.75 W/m^2
25 °C	approx. 18 kLux	approx. 3 W/m^2
45 °C	approx. 25 kLux	approx. 3.7 W/m^2
Light distribution / UV distribution	± 6 %	± 10 %

1) option

4 PREPARATION FOR INITIAL OPERATION

4.1 Preparing the place of installation

4.1.1 Installation requirements

Ensure that the place of installation meets the following requirements:

- Rooms must be dry and ventilated
- A minimum volume of 2.5 m^3/kg of refrigerant is necessary.
  For quantity of refrigerant → *Rating plate*.
- If open flames or similarly hot surfaces are used on site, adequate ventilation must be provided due to potential leaks and decomposition products caused by refrigerants.
- Max. pollution degree 2 according to EN 50178
- Altitude max. 1000 m above mean sea level
- Do not expose the test system to direct sunlight
- Avoid installing in the vicinity of heat sources
- Permissible ambient temperature during operation: +18 °C to +27 °C
- Permissible storage temperature: -25° C to +55 °C
- Relative atmospheric humidity: 75 % max.

WARNING

Observe the directions → chap. 1.5 (page 3)

Floor requirements

- The floor must be suitable for the weight of the test system and the test specimens → *3.2 Mechanical loads (page 13)*
- The floor must be horizontal with an even surface. Slight unevenness can be compensated by adjusting the feet[1)].

Space requirements

→ *Fig. 4-1 Layout (page 18)*

WARNING

Be sure to maintain the required distance from the wall.

1) option

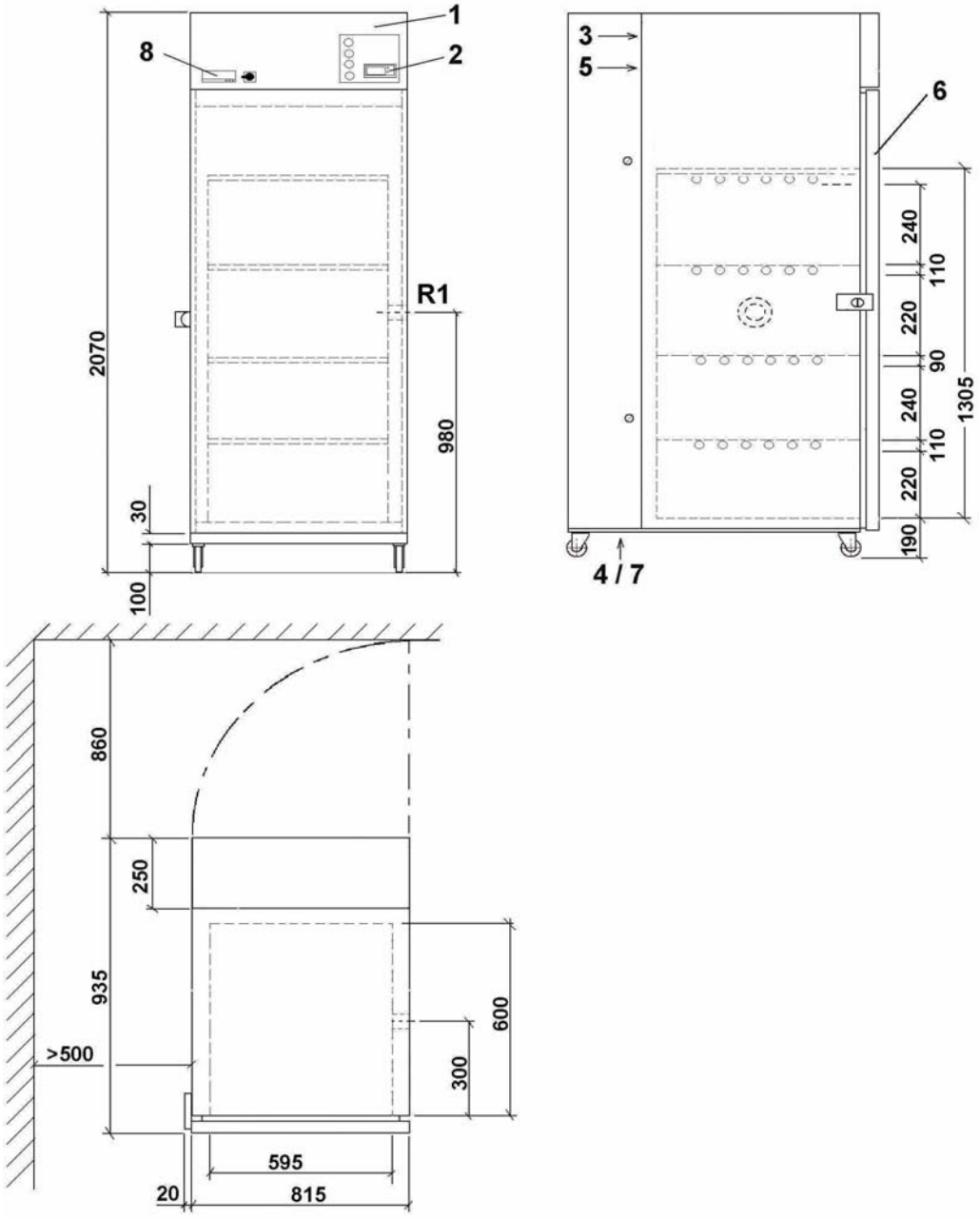


Fig. 4-1 Layout

R1 Entry port NW 50 mm[1)]
1 Front panel
2 Control unit
3 Connector panel
4 Connection for overflow/condensate drain
5 Electrical connection, cable length 5 m
6 Test space door
7 Connection for automatic water replenishment, external thread R ¾“
8 Independent temperature limiter
Useful width

1) option

4.2 Transporting the test system

A fork stacker or other suitable lifting equipment with adjustable fork width is necessary for lifting and transporting the test system.

WARNING

- Do not apply straps

You can lift the test system from the front or from behind if the fork is long enough to support the entire depth of the test system → *Fig. 4-1 Layout (page 18)*

- Position the fork under the test system
- Adjust the fork width
- Raise the test system by approx. 50 mm
- Transport the test system to the place of installation
- The packing material must be disposed of according to regulations

4.3 Installing the test system

- Apply the wheel brakes
- Turn the feet[1)] to compensate any floor unevenness. Relieve the castors.

1) option

4.4 Supply and discharge connections

The connections are located in the supply section

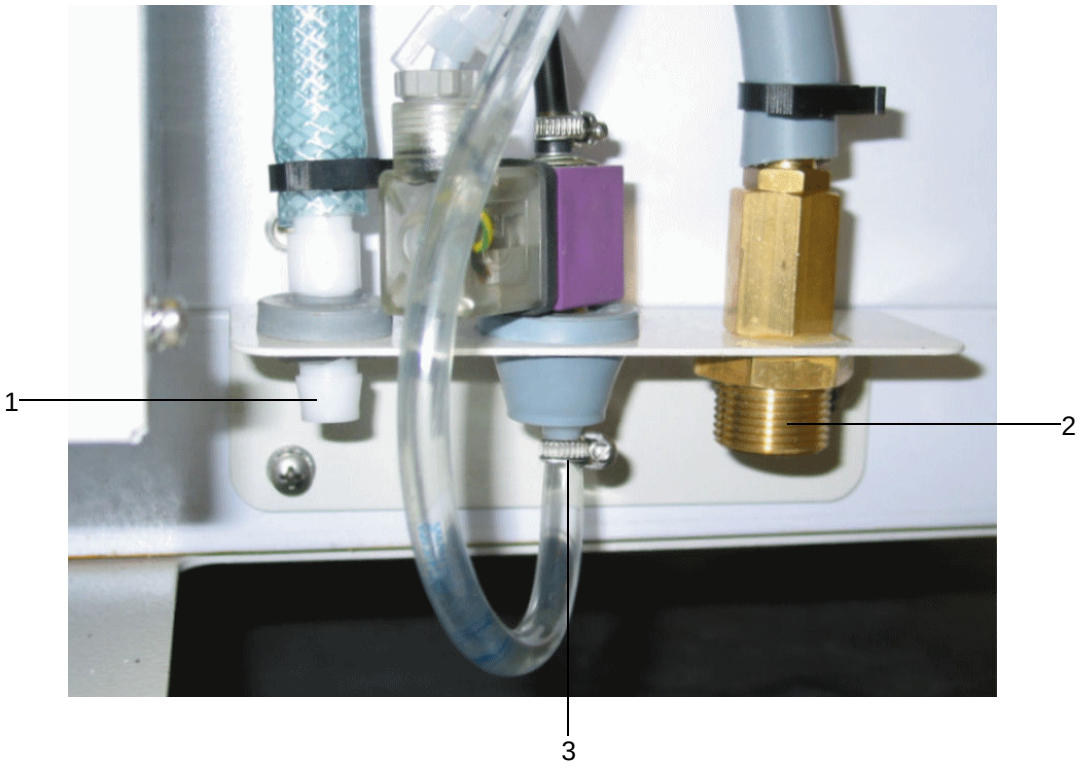


Fig. 4-2
Supply and discharge connections

1 Connection for overflow/condensate drain, outlet NW 12

2 Connection for automatic water replenishment, external thread R ¾“

3 Hose clamp for draining the reservoir

1) option

4.4.1 Overflow/condensate drain

→ *Fig. 4-2 (page 20)*

- Open the door of the supply section
- Attach hose to the outlet connection (1)
- Lead the hose to a floor outlet without bending it. The water must flow by gravity.

4.4.2 Automatic water replenishment

→ *Fig. 4-2 (page 20)*

- Use a pressure-proof hose to link the demineralized water network or the demineralization unit[1)] to connection (2)
- Secure the hose with a hose clamp

WARNING

When using automatic water replenishment or the demineralization unit[1)], the overflow/condensate drain must always be connected to a floor outlet.

– The maximum admissible water pressure is 6 bar

– For quality of humidification water → *3.5 (page 14)*

WARNING

It is advisable to install a water stop or sensor device in the humidification water supply line, as a precaution against damage by water. Such safety devices are available at your stockist.

4.4.3 Setting up the power supply

- Ensure that the mains voltage and frequency correspond to the specifications on the rating plate
- Ensure that the mains fuse is adequate
- Connect the test system to the mains supply

WARNING

If the on-site mains voltage and frequency differ from our standard values as per → 3.3 (page 13), the test system must be connected by a skilled person in accordance with the »Special voltage« manual enclosed.

1) option

4.4.4 Temperature limiter for the test space

NOTE

*If the control panel displays the fault message »Temp. limiter activate**« check temperature limiter »STM«. It may have tripped due to shocks during transport or ambient temperatures <10 °C.*

The temperature limiter for the test space is located in the mechanical section.

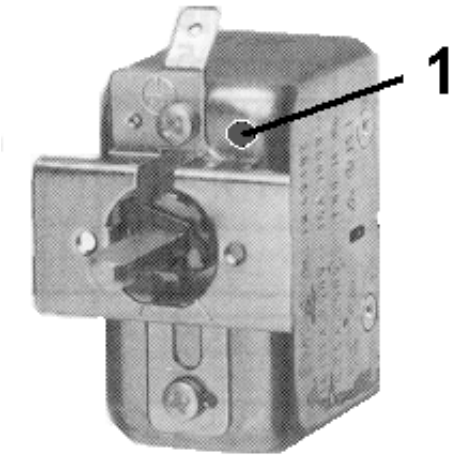


Fig. 4-3
Temperature limiter

To rectify the fault proceed as follows:

- Open the door of the switchgear cabinet
- Press the green button (1)
- Acknowledge the message on the control panel → *operating manual for the control unit*

4.5 Precommissioning check list

- Verify these preparatory steps:

– Does the place of installation meet the requirements? → *4.1 (page 17)*
– Does the wall distance comply with the specifications? → *Fig. 4-1 Layout (page 18)*
– Is the test system horizontal?
– Are the wheel brakes applied? → *4.3 (page 19)*
– Are the supply and discharge connections set up correctly? → *4.4 (page 20)*
– Are the hose connections secured with hose clamps?
– Does the humidification water comply with our specifications → *3.5 (page 14)*?
– Does the electrical supply comply with our specifications? → *3.3 (page 13)*
– Have all options been installed correctly?

1) option

5 PUTTING INTO OPERATION

5.1 Adding humidification water

You may fill the reservoir by hand or connect it to a demineralized water network.

5.1.1 Automatic water replenishment from a network

WARNING

If you are using demineralization cartridges with ion exchanger resins, please remember to replace exhausted cartridges (i.e. conductivity meter reading >20 µS/cm) without delay. Failure to do so may result in acidification of the humidification water, which has the potential of damaging the test specimens and the test system.

- Open the on-site water supply
- Open the door of the supply section
- Watch the level during the filling process

WARNING

The water level is controlled by a float valve. If the float valve becomes leaky, the water discharges via the overflow/condensate drain. Be sure to shut the on-site water supply at the end of operation.

5.1.2 Filling by hand

- Undo the screw cap at the right side of the test system
- Pour demineralized water into the reservoir, using e.g. a watering can.

NOTE

The reservoir holds 19 ltr.

The warning signal for water shortage occurs in two steps:

– On reaching the minimum water level a warning signal indicates that the reservoir needs replenishing

– Another warning signal, i.e. »Reservoir humidity system empty*« is emitted when the reservoir is empty. The climatic system is switched off. The test system continues with the set temperature values.

1) option

5.2 Preparing the test specimens

5.2.1 Requirements

The test specimens can be placed on the test space floor. They must be distributed evenly over the entire surface.

- Ensure that the test specimens are suitable with regard to
  - Quality → *1.5 (page 3)*
  - Corrosive effect → *1.5 (page 3)*
  - Weight → *3.2 (page 13)*

5.3 Adjusting the test specimen protection

5.3.1 Software temperature limiter

The controller has a software temperature limiter for setting alarm and warning limits for permissible minimum and maximum temperature values.

If no limits are set, the test system will automatically use the limits of the previous test.

Set the limits in accordance with the separate operating manual for the control unit.

WARNING

On starting a test, ensure that the lower limit to be set is below the actual test space temperature and the upper limit above the actual test space temperature.
The permissible limits must be at least 5 K higher / lower than the respective set-points of the test system.
The exact upper and lower limits depend on the temperature sensitivity of the test specimen.

1) option

5.3.2 Test specimen protection by independent temperature limiter

A temperature limiter which operates independently of the controller protects the test specimen against thermal overstressing. The temperature sensor is located behind the cover over the test spaces.

On exceeding or falling below the set maximum / minimum limits, the test system is switched off permanently by the controller. The control unit displays a fault message. Simultaneously, the respective indicator light (»MIN« / »MAX«) on the temperature limiter lights up.

The temperature limiter is located on the front panel.

WARNING

The limit for the maximum value must be approx. 5 to 10 K above, the limit for the minimum value approx. 5 to 10 K below the temperature setpoint.

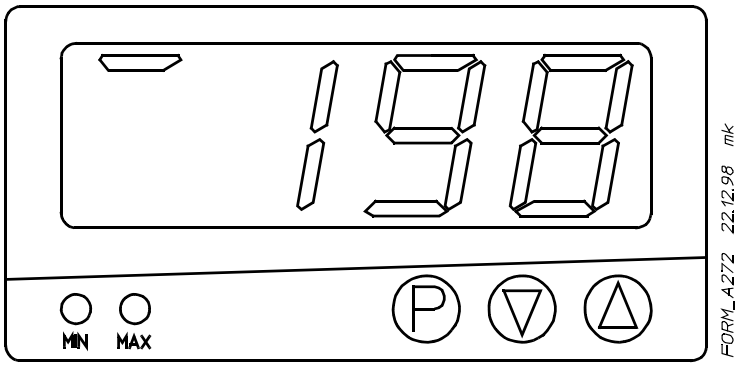


Fig. 5-1
Temperature limiter

The limits are factory-set in accordance with the temperature range of the test system.

You can adapt these values to your requirements as follows:

1) option

Input the maximum temperature value as follows:

- Use Ⓟ to select display »AH«

Ⓟ + Ⓐ >3s	»AH« (alarm limit high) and actual maximum temperature value are displayed alternately
Ⓐ or Ⓥ	Select the desired temperature value
2 x Ⓟ	Save the temperature value, return to basic setting.

Input the minimum temperature value as follows:

- Use Ⓟ to select display »AL«

Ⓟ + Ⓥ >3s	»AL« (alarm limit low) and actual minimum temperature value are displayed alternately
Ⓐ or Ⓥ	Select the desired temperature value
2 x Ⓟ	Save the temperature value, return to basic setting.

NOTE

Depress the combinations Ⓟ+Ⓐ or Ⓟ+Ⓥ simultaneously for more than 3 seconds while »AH« or »AL« is being displayed, otherwise the temperature value cannot be changed. In this case use Ⓟ again to select display »AH« or »AL«. If the changed temperature value is not saved with 2 x Ⓟ , the test system will return to the previously set temperature value after 30 seconds.

Malfunctions will cause the respective indicator light on the temperature limiter to light up. In addition, a fault message will be displayed on the control unit.

To eliminate the fault, proceed as follows:

- Increase the »AH« value or reduce the »AL« value by approx. 10 K. Alternatively, open the test space door until the temperature in the test space is back within the limit range.
- Save the new temperature value with 2 x Ⓟ
- Keep Ⓟ pressed for approx. 3 seconds, the indicator light goes off.
- Acknowledge the fault message on the control unit → *operating manual for the control unit.*

If the test space temperature is still outside the limit range, the fault signal will occur again. By pressing Ⓟ, the actual value can be interrogated on the temperature limiter via function »INP«.

1) option

5.4 Sealing the entry ports[1)]

- Close the entry ports with the sealing plugs supplied

NOTE

Open entry ports will cause high water consumption during climatic tests. As a result, tests with extreme humidity values are not feasible, and low test space temperatures may cause icing of the evaporator.

5.5 Switching on the test system

- Set the mains switch to »I«

5.6 Starting a test

Tests are started on the control unit. Two modes are available:

– Manual mode

– Automatic mode

- For further details please refer to the separate operating manual for the control unit.

5.6.1 Photostability test in manual mode

NOTE

Use a UV and Lux sensor[1)] to determine the illumination under the desired test conditions and calculate the necessary irradiation time.

- → *operating manual for the control unit, chap. »Menu layout«.*
- → *operating manual for the control unit, chap. »Manual mode«*
- Irradiation time for irradiation module 1: via control variable »1 Daylight«
- Irradiation time for irradiation module 2: via control variable »2 UV-light«
- Irradiation time for irradiation module 3: via control variable »3 Daylight«
- Irradiation time for irradiation module 4: via control variable »4 UV-light«
- Activate digital channel »Start«
- Switch on the irradiation module in question.

1) option

5.7 Preoperational check list

- Verify these preparatory steps:

– Has humidification water been added? → *5.1 (page 23)*
Has the automatic water replenishment been set up? → *5.1.1 (page 23)*

– Is the test specimen suitable for the planned test? → *5.2 (page 24)*

– Check settings on software temperature limiter → *5.3.1 (page 24)*

– Check settings on independent temperature limiter → *5.3.2 (page 25)*

– Are the entry ports[1)] sealed? → *5.4 (page 27)*

– Maintenance work to be expected during the scheduled test period should be carried out beforehand → *8.3 (page 36)*

– Have all options been installed correctly?

1) option

6 PUTTING OUT OF OPERATION

The following directions must be observed:

6.1 After each test

- Set the test system to room temperature
- Finish the test
- Put external systems out of operation
- Put optional equipment out of operation
- Open the test space door
- Remove the test specimen from the test space
- Clean and dry the test space

6.2 Longer rest periods

If a longer rest period is expected, or if the test system is moved to a place with room temperatures below zero, the following activities - in addition to those in chapter → *6.1 After each test (page 29)* - must be performed:

- Set the mains switch to »O«
- Pull the mains plug
- Shut off the automatic water replenishment
- Open the door of the supply section
- Open the hose clamp → *Fig. 4-2 Supply and discharge connections (page 20)*
- Connect the hose to a floor outlet
- Empty the reservoir

1) option

6.3 Final disposal of the test system

In the event the test system is no longer needed, please ensure it is disposed of professionally.

DANGER

The following materials represent hazardous waste and must be disposed of separately:

– Refrigerants

– Compressor oil

– Electrical components

– Irradiation lamps

If desired, our service organisation can take care of the disposal, at customer's expense. Please get in touch with us so that we can arrange for a professional and environmentally acceptable way of disposal.

If you decide to dispose of the test system yourselves, please take the following precautions:

- Ensure that materials like refrigerants, compressor oil, electrical components and irradiation lamps are treated as special waste.

With regard to the specified materials and the disposal of the remaining components, the national and local waste disposal regulations, valid at the time of disposal, must be observed.

1) option

7 FAULT DIAGNOSIS AND RECTIFICATION

Depending on the kind of fault signal, the rectification can be performed by the user, a skilled person, or our service organisation.

If a warning signal (marked ***** in chap. 7.2) occurs, the test operation is restricted.

If a fault signal (marked ****** in chap. 7.2) occurs, the test operation is interrupted.

7.1 General malfunctions

Fault	Possible cause	Rectification
Temperature setpoints cannot be achieved	Lack of refrigerant in the refrigerating unit	Contact our service organisation
Actual humidity value deviates from setpoint	The water from the reservoir fails to reach the steam humidifier (defective pump).	Contact our service organisation

7.2 Messages on the control unit

Malfunctions which occur during operation are signalled by a flashing message on the control unit.

In case of malfunctions please proceed as follows:

- Rectify the fault in accordance with the following table
- Acknowledge the message → *operating manual for the control uni*t
- Resume operation

Code No.	Message *** warning signal** **** fault signal**	Possible cause	Rectification
1	Act. value defect:EKO/X21******	Temperature sensor defective	Switch off the test system. Contact our service organisation.
4	Act. value defect:EK3/X24******	Sensor defective	Switch off the test system. Contact our service organisation.
6	Act. value defect:EK5/X26******	Sensor defective	Switch off the test system. Contact our service organisation.
13	Communication control unit*****	Connection control unit - controller is interrupted	Check connectors
15	Chambertype invalid ******	Wrong test system parameters	Switch off the test system. Contact our service organisation.
16	Power fail*****	Power failure or tolerance band outside defined range	Check duration of power failure and tolerance band values. Restart the test system.

1) option

Code No.	Message * warning signal ** fault signal	Possible cause	Rectification
17	Door not closed*	The test space door has been open for more than 10 minutes	Close the test space door
19	Temp. limiter activate**	Thermal safety device in the test space triggered	Switch off the test system. → *4.4.4 (page 22)* Contact our service organisation.
20	Thermal specimen protection**	Limits of test specimen protection exceeded	Press „P“ or „RESET“ on the adjustable temperature limiter to clear fault. Check limit setting and programmed setpoint. Switching point hysteresis is 2 K.
	Display of temperature limiter is flashing and reads 1999	Sensor of temperature limiter is broken or short-circuited	Switch off the test system. Contact our service organisation.
21	Software specimen protection**	Actual temperature value is outside the test chamber configuration	Check input values and adjust setpoint to temperature range → *3 (page 13)*
22	Communication Datalogging*	Connection to software SIMPATI[1)] interrupted	Check connections to PC. Check test system settings.
23	Tolerance temperature*	The actual temperature value has been outside the tolerance band for more than 15 min	Close the door. Clean the condenser. Check if the temperature deviation is permissible for the test running. Contact our service organisation.
24	Tolerance humidity*	The actual humidity value has been outside the tolerance band for more than 15 min	Close the door. Make sure the water supply is ok. Clean the overflow/condensate drain. Check if the humidity deviation is permissible for the test running. Contact our service organisation.
34	High pressure compr. precooling**	Excess pressure in the refrigerating unit	Switch off the test system. Clean the condenser.
49	Humidity out of range*	Actual humidity value has been outside the test chamber configuration for 5 min	Check input on the control unit. Adjust setpoint to permissible humidity range → *3 (page 13)*
50	Steam temp. limiter activated**	Fault at steam humidifier	Contact our service organisation
54	Refill demin. water*	The humidification water supply is running short	Replenish the reservoir. The test system continues operating.
55	Reservoir humidity system empty*	No water in humidity system or pump not working	Fill reservoir with water. If the pump is defective, contact our service organisation.

1) option

Code No.	Message * warning signal ** fault signal	Possible cause	Rectification
57	Door not closed*	The test space door is open	This incident is saved in the SIMPATI [1)] report file. Close the door.

Contact our service organisation if a fault cannot be rectified with the aforementioned measures, or if a fault occurs repeatedly.

For service agencies → *Appendix.*

NOTE

To ensure speedy service, please quote the following particulars when reporting a fault:

– Type of test system / order no.

– ID no.

– Fault message on the control unit

You will find this data on the rating plate over the mains switch and on the reverse of the front cover of this manual.

1) option

1) option

8 MAINTENANCE

8.1 General information

Regular care and maintenance are essential for optimum operation and long service life of the test system.

The maintenance schedule → *8.3 (page 36)* contains some basic maintenance work which may be performed on site, by trained personnel only. It does, however, not replace the expert maintenance offered by our service organisation.

The inspection intervals for refrigerating unit, electrical equipment and safety devices are specified in a maintenance contract with our service organisation. For the address → *Appendix*.

NOTE

Annual inspection of the pressure limiter is necessary according to EN 378-2, Appendix C.6 Safety Requirements. The inspection must be performed by our service organisation, or a skilled person authorized by us.

DANGER

Maintenance work on refrigerating unit and electrical equipment must be performed by a skilled person.

- Contact our service organisation

We will either charge a qualified maintenance specialist to perform the servicing, or name you authorized experts.

Our service organisation has the technical facilities required for expert disposal of the waste material resulting from servicing. If desired, our service organisation will take back the material to be disposed of, at customer's expense.

1) option

8.2 Consumables

The following material is used for maintenance:

Ordering code	Designation
64567051	Lamp set consisting of 6 UV fluorescent lamps F18 W/BLB-T8 Blacklight-Blue
64567050	Lamp set consisting of 6 cool white fluorescent TDL 18 W/33

Consumables may be ordered from our service organisation. For the address → *Appendix.*

8.3 Maintenance schedule

Interval	Assembly group / component	Activity	Follow directions in chap.
After each test	Test space	Clean	→ *8.4.1 (page 37)*
	Test space seal	Clean	→ *8.4.2 (page 37)*
Monthly	Water reservoir	Clean	→ *8.4.4 (page 38)*
Quarterly	Fins on air-cooled condenser	Clean	→ *8.4.3 (page 37)*
Yearly	Capacitive humidity system	Calibrate	→ *8.4.5 (page 39)*
As necessary	Demineralization cartridge[1)]	Replace	→ *separate operating instructions*
	Irradiation lamps	Replace	→ *8.4.6 (page 40)*

1) option

8.4 Maintenance work

- *Observe the safety instructions → 1.6.5 (page 6) »Maintenance work«*

8.4.1 Cleaning the test space

To prevent corrosion, the test spaces must be cleaned with a damp cloth.

- Remove impurities with a brush
- Dry the test space

8.4.2 Cleaning the test space seal

To prevent the test space seal from sticking to the test space door, it must be cleaned with clear water and subsequently dried after each test. You may use a regular detergent.

8.4.3 Cleaning the air-cooled condenser

DANGER

The fins of the condenser may cause hand injuries

- Be sure to wear safety gloves

Dust deposits on the fins of the air-cooled condenser will cause non-permissible pressure increase in the refrigerating unit.

- Check the air-cooled condenser regularly for dust deposits
- Clean it every three months, more often in dusty environments
- Use a vacuum cleaner, compressed air or brush.

1) option

8.4.4 Cleaning the water reservoir

Clean the reservoir as follows:

- Shut off the automatic water replenishment
- Open the door of the supply section
- Detach hose (1) and (2) from the reservoir, the water drains off.
- Detach connecting cable (4) of float switch F53 and F54
- Detach hose (3) of automatic water replenishment
- Undo screw cap (5)
- Undo screws (6)
- Remove the reservoir from its support

WARNING

Be careful not to damage the float switches in the reservoir.

- Clean the reservoir carefully through the filling hole, using a brush.
- Rinse the reservoir with water

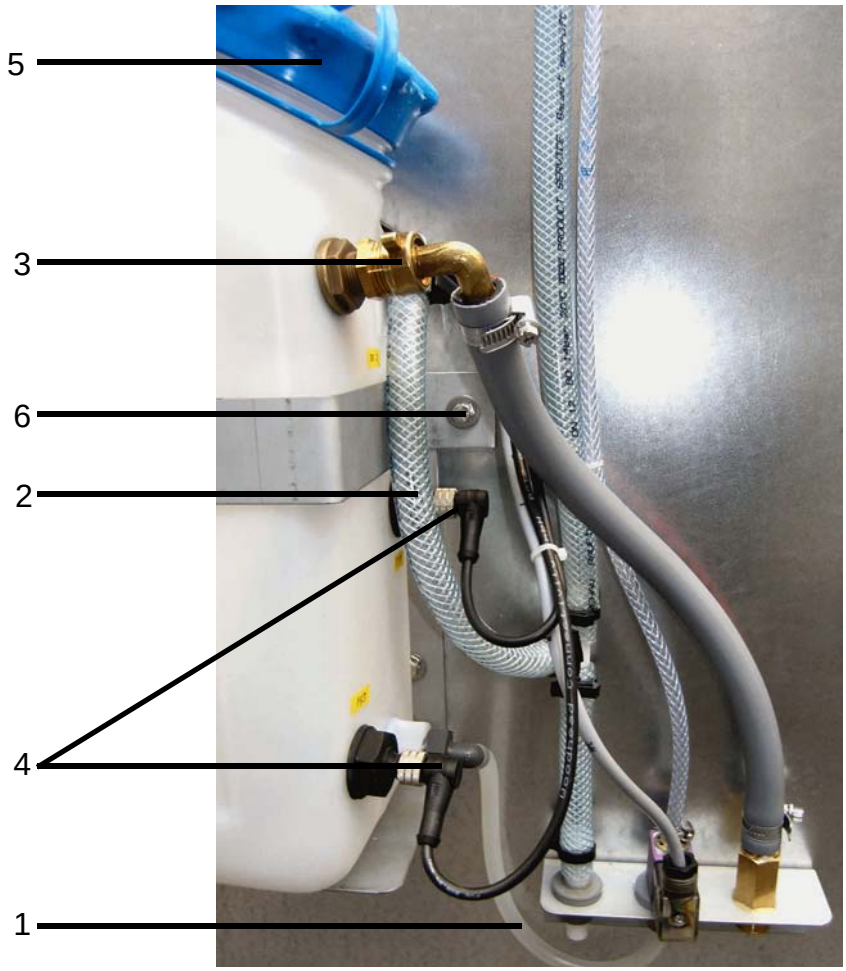


Fig. 8-1
Water reservoir

1) option

8.4.5 Calibrating the capacitive humidity measuring system

As regards the humidity control with capacitive humidity measuring system, please bear in mind that the displayed humidity values may differ from the actual ones, depending on the test conditions (high temperature and humidity values) and operating hours of the test system.

Gas emissions from the test specimens may affect the humidity measuring system, thus causing deviations.

Yearly calibration of the humidity values by our service organisation is advisable.

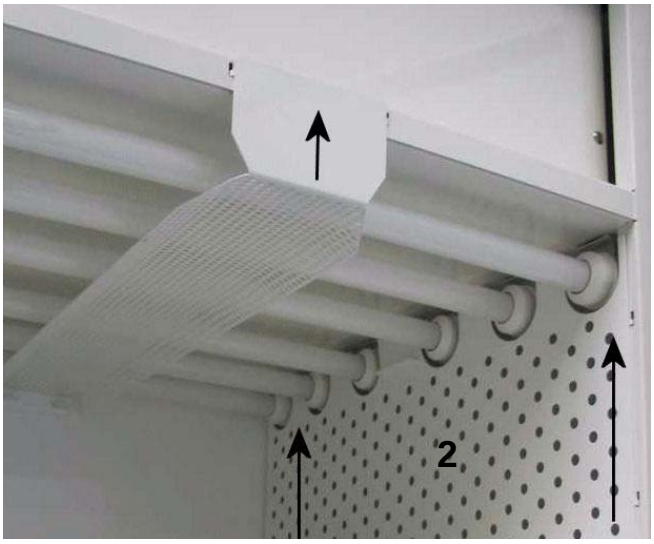
1) option

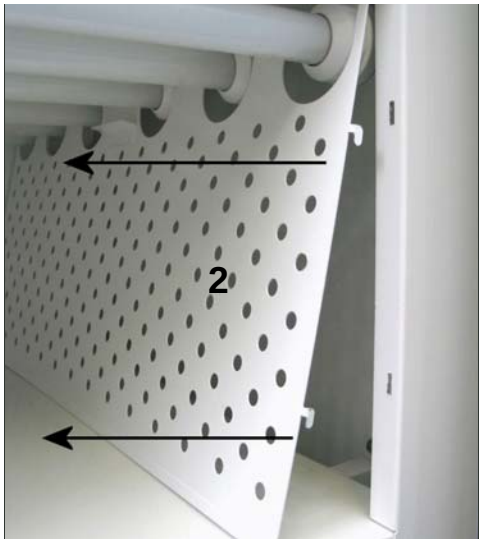
8.4.6 Replacing the fluorescent lamps

NOTE
Always replace the whole set to ensure homogenous light distribution in the test space

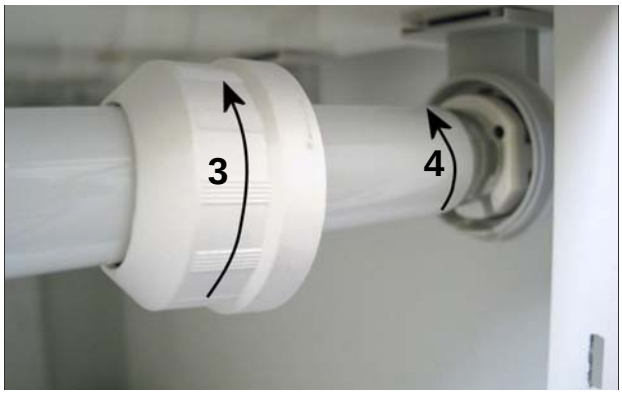
To detach the lamps, proceed as follows:

- Push the light filter (1) upward and detach it
- Push the lateral panels (2) upward and detach them





- Undo the screw connections (3) left and right



Turn the fluorescent lamps (4) and remove them

Fig. 8-2
Detaching the lamps

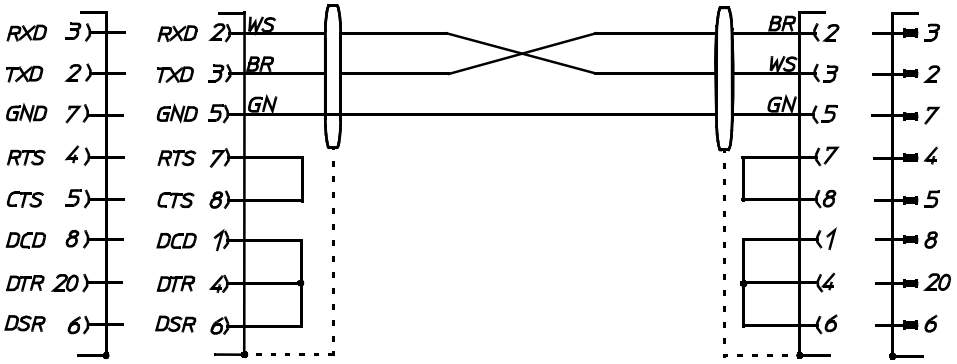
1) option

APPENDIX: INTERFACE CONNECTIONS[1)]

→ *2.2.10 Connector panel (page 12)*

1.1 Interface RS 232[1)]

The RS 232 interface is used for e.g. external control via computer. Depending on the number of poles, the pin assignment is as follows:



PC
25-pole D-SUB / 9-pole D-SUB

Test system
9-pole D-SUB / 25-pole D-SUB

Fig. 1-1
Pin assignment RS 232

Suitable connecting cables and adaptors are available

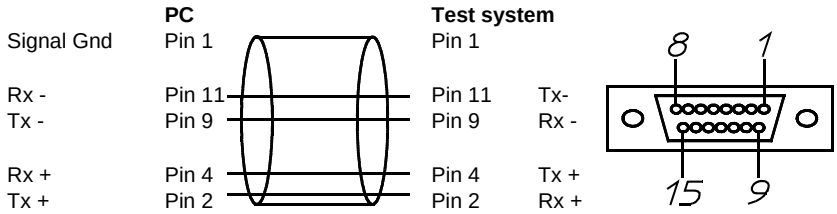
NOTE
If the connecting cable is produced by yourselves, be sure that both ends of the shield are fixed to the metallic enclosure.

1) option

1.2 Interface RS 485 / RS 422[1)]

The network RS 485/RS 422[1)] interfaces in connection with mini-Combox 2 are used for networking several test systems.

The 15-pole D-subminiature connectors are assigned as follows:



NOTE

The pin assignment for PC is only valid in connection with interface converter[1)] RS 232/RS 485, ordering code 63823080.
Interfaces RS 232 and RS 485/422[1)] cannot be used simultaneously.

1.3 Analog I/O[1)]

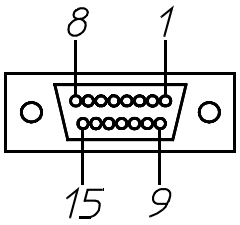
The Analog I/O[1)] connection is used for external acquisition of actual temperature and humidity values.

Outputs 0 - 10 V = 0 to +100 °C or 0 to 100 % r.h.

Max. insulation voltage to ground is 1 kV-DC.

The 15-pole D-subminiature socket is assigned as follows:

- actual temperature	Pin 1
+actual temperature	Pin 9
- actual humidity	Pin 2
+actual humidity	Pin 10
- Pt 100 1	Pin 3
+Pt 100 1	Pin 11
- Pt 100 2	Pin 4
+Pt 100 2	Pin 12
- Pt 100 3	Pin 5
+Pt 100 3	Pin 13



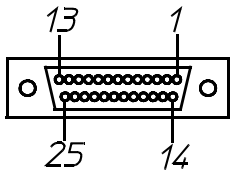
1) option

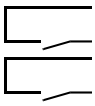
1.4 Digital I/O[1)]

The Digital I/O[1)] connection comprises the digital inputs and outputs which can be freely programmed within a program or as additional function in manual mode (max. output load 24 V, 0.5 A, max. input load 24 V-DC, approx. 30 mA). Max. insulation voltage to ground is 1 kV-DC.

The 25-pole D-subminiature plug is assigned as follows:

Input 1	Pin 6
Input 1	Pin 14
Input 2	Pin 9
Input 2	Pin 15





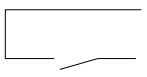
Pin 12	Output 1
Pin 7	Output 1
Pin 10	Output 2
Pin 8	Output 2

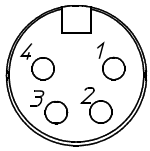
1.5 Potential-free contact for fault signal[1)]

A potential-free contact is available for alerting an external monitoring system. In case of power failure, this contact can be used for fault indication.

An audible and visual signal[1)] is emitted.

The connection for the potential-free contact is taken to a socket (max. load 24 V, 0.5 A).





In case of malfunction pin 2 and 3 are open.

If the potential-free contact is used, ensure it is compatible with the on-site measuring system.

1) option

1) option

APPENDIX: ETHERNET INTERFACE[1)]

This appendix contains installation instructions for the Ethernet interface.

1.1 Description

The interface enables communication with the SIMPATI[1)] software (from version 2.04 up) in LAN (Ethernet LAN). The communication occurs via TCP/IP. A separate IP address must be assigned to each test system.

NOTE

We would advise you to have the networking done by your network administrator. The description in the appendix in the installation and operating instructions for the SIMPATI software must be observed.

The connector socket »RJ 45« is located in the switchgear cabinet.

1.2 Technical Data

For setting up the connection, a network cable type patch cable RJ45, Cat.5, STP, 4 x 2 is required.

NOTE

The Ethernet and RS 485/422[1)] interfaces cannot be used simultaneously.

1.3 Preparation for initial operation

1.3.1 Installing the connecting cable

DANGER

The connecting cable must be installed by a skilled person. Pull the mains plug prior to installing the connecting cable.

1) option

Install the connecting cable as follows:

- Open the door of the switchgear cabinet
- Unscrew cable gland (1)
- Open the cable gland, insert the cable.

- Screw cable gland and cable to the switchgear cabinet
- Insert plug in socket (2)

Fig. 1-1
Ethernet interface - Test system with Simcon controller

1.3.2 Entering the TCP/IP address

→ *Operating manual for the control unit*

- Select interface protocol »J-Bus TCP/IP« on the control unit
- Enter the TCP/IP address

1) option

APPENDIX: DEMINERALIZATION UNIT[1)] TYPE B10DN

1.1 Introduction

This appendix contains installation and operating instructions for the demineralization unit.

1.2 Description

1.2.1 Design

Choose a convenient place in the vicinity of the test system. Use flexible hoses to connect the unit to the on-site water supply and test system.

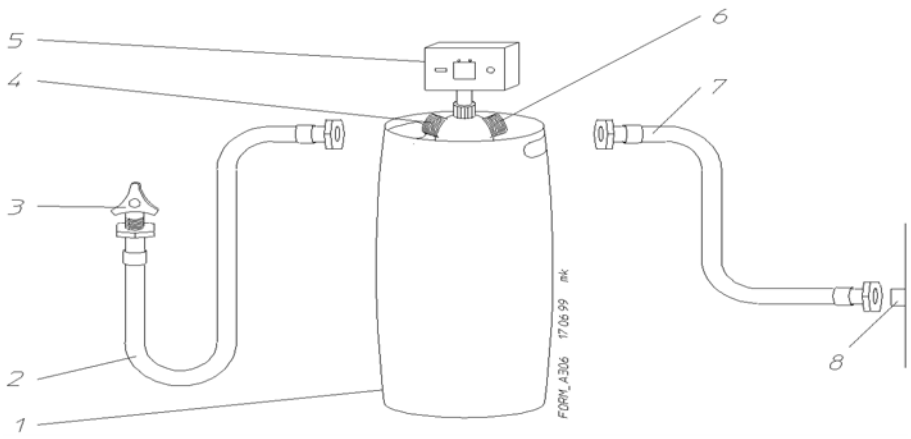


Fig. 1-1
Demineralization unit

1 Cartridge
2 Water inlet R ¾“
3 On-site water tap
4 Inlet connection piece
5 Conductivity meter
6 Outlet connection piece
7 Outlet R ¾“
8 Connection for automatic water replenishment

1.2.2 Function

The demineralization unit ensures a reliable supply of demineralized water for the humidification system.

Filling by hand is no longer necessary.

1) option

1.3 Technical data

1.3.1 Dimensions

Diameter	210 [mm]
Height incl. cond. meter	680 [mm]
Height cartridge only	550 [mm]

1.3.2 Connection data

Max. allowable working press.	10 bar
Inlet	R $^3/_4$“
Outlet	R $^3/_4$“

1.3.3 Performance data

Output based on water hardness: 10° dH (approx. 100 mg CaO/ltr) 20° dH (approx. 200 mg CaO/ltr)	 1200 ltr 600 ltr
Maximum flow	300 ltr/h
Exhaustion point	20 µS/cm

1.3.4 Power supply

Rated voltage	230 V AC / 50 - 60 Hz
Rated current	5 mA
Protection	IP 65

1) option

1.4 Preparation for initial operation

1.4.1 Setting up the connections

Connect the supply hoses as follows:
→ *Fig. 1-1 Demineralization unit (page 1)*

- Fix the straight screw connection of the water inlet (2) to the on-site tap (3), size R ¾“
- Fix the elbow screw connection of the water inlet (2) to the inlet connection piece (4) of the demineralization cartridge (1)
- Fix the elbow screw connection of the outlet (7) to the outlet connection piece (6) of the demineralization cartridge
- Fix the straight screw connection of the outlet (7) to connection piece (8) on the test system
- Screw the conductivity meter (5) to the top of the demineralization cartridge

WARNING

For safe operation it is essential to:

– Insert the seals supplied in the hose connections

– Ensure a water pressure between 1.5 and 6 bar

WARNING

Connect the demineralization unit to a cold water tap only

- Protect the unit against freezing and heat

NOTE

The local plumbing regulations and water board instructions must be observed

- Keep the cartridge caps and use them when returning the cartridges for regeneration

1.4.2 Electrical connection

- Insert the mains plug of the conductivity meter into an on-site socket-outlet

1) option

1.5 Putting into operation

WARNING

Prior to switching on, be sure to:

– Put the test system into operation in accordance with → *5 (page 23)*

– Close the test space door

Longer rest periods and a weak flow will cause reionization thus increasing the conductivity value. If this happens, drain water until the conductivity value drops below 20 µS/cm.

If the value fails to drop below 20 µS/cm → *1.8 Maintenance (page 5)*

1.5.1 Venting the cartridge

WARNING

Ensure that every new or newly regenerated cartridge is thoroughly vented

- Fix the water inlet to the outlet connection piece (on pressure-proof cartridges pull back the red ring of the quick release coupling)
- Open the water tap until water comes out of the inlet connection piece
- Set up the connection again in accordance with → *1.4.1 (page 3)*
- Open the water tap
- Drain water until the pointer of the conductivity meter is back in the green zone

1.6 Putting out of operation

Depending on the scheduled duration of the rest period, the following steps must be taken:

- Turn off the on-site water supply
- Undo the hose screw connections
- Allow the water to drain off

1.7 Malfunctions

1.7.1 Fault diagnosis and rectification

Fault	Possible cause	Rectification
Conductivity value exceeds 20 µS/cm	The resin in the cartridge is exhausted	Replace the cartridge → *1.8.1 (page 5)*
	Reionization caused by long rest periods or weak flow	Drain water until the conductivity value drops below 20 µS/cm

1) option

1.8 Maintenance

- Observe the directions → *1.6.5 (page 6)* »Maintenance work«
- Pull the mains plug of the conductivity meter

1.8.1 Changing the cartridge

On reaching a conductivity limit of 20 µS/cm during operation, the cartridge must be replaced.

NOTE

It is advisable to keep a spare cartridge ready when the conductivity meter reads 10 µS/cm

To change the cartridge proceed as follows:

- Turn off the on-site water supply
- Undo the screw connections on the cartridge
- Detach the conductivity meter from the cartridge
- Drain off the residual water in the cartridge
- Send exhausted cartridges to one of the behropur stations for regeneration
- Connect a new cartridge → *1.4.1 (page 3)*

WARNING

There is still some water left in the hoses

1.8.2 Consumables

The following material is used for maintenance:

Ordering code	Designation
63640241	Cartridge for demineralization unit[1)]

Consumables may be ordered from our service organisation. For the address → *Appendix*

1.8.3 behropur station Germany

BEHR

Labor - Technik

Spangerstraße 8

40599 Düsseldorf

Tel.: (0211) 7 48 47 - 0

Fax: (0211) 7 48 97 72

1) option

1) option

APPENDIX: TOLERANCE BAND MONITORING[1)]

The test system is equipped with tolerance band monitoring.

The tolerances for temperature (± 2 K) and humidity (± 5 % r.h.) are factory-set.

Monitoring begins automatically 10 minutes after reaching the tolerance band.

If the actual value remains outside the tolerance band for more than 15 minutes, fault message »Tolerance temperature*« or »Tolerance humidity*« → *7.2 Messages on the control unit (page 31)* is displayed on the control unit.

1) option

1) option

1) option

1) option

T

W

1) option

1) option