

8.4.5 Cleaning air-cooled condenser

**DANGER**

The fins of the condenser may cause hand injuries.

- Wear safety gloves!

Dust deposits on the air-cooled condenser's fins will lead to an unacceptable rise in pressure in the refrigerating unit.

- Check the air-cooled condenser regularly for dust deposits
- Clean condenser every 3 months, or at shorter intervals in the event of heavy dust accumulations.
- Use a vacuum cleaner, compressed air or a hand brush

8.4.6 Cleaning the switchgear cabinet's dust filters

The controller and electrical components in the switchgear cabinet are cooled by a fan. Dust filters are installed in the switchgear cabinet's supply and exhaust air system.

- Clean the filters every 3 months, more often in dusty environments, as follows:
 - Open the door to the switchgear cabinet at the back of the test system
→ Fig. 2-1 (Page 9)
 - Remove the filter guards (1)
 - Reassemble in reverse order

The following methods may be employed for cleaning the filters (2):

- Rinsing with water
- Tapping the filter
- Vacuum-cleaning the filter
- Blowing out with compressed air

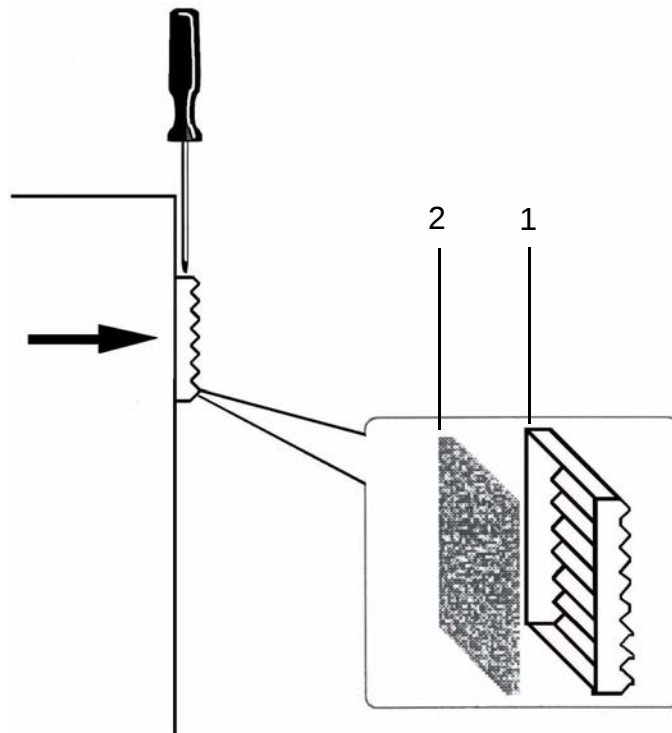


Fig. 8-2
Removing the switchgear cabinet filter

8.4.7 Replacing¹⁾ the halogen bulb

The halogen bulbs for lighting the test space are located behind the test space ceiling, at the left and right. To reach the halogen bulbs, remove the test space ceiling as follows:

- Push the test space ceiling (1) upward at the back (directly in front of the rear panel)
- Slide the test space ceiling forward on the moulded guides
- Pull out the defective bulb (2)
- Take hold of the new halogen bulb with a clean cloth and fit it in
- Slide the test space ceiling rearward

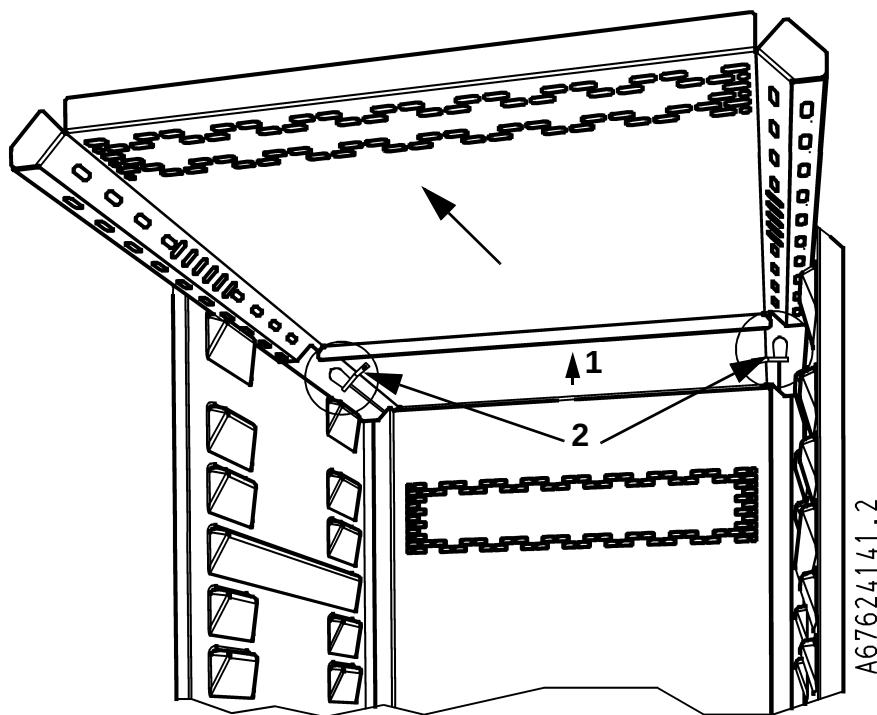


Fig. 8-3
Test space ceiling

8.4.8 Cleaning the water reservoir

The water is discharged via the overflow/condensate drain. → 4.4.1 (Page 31)

Clean the water reservoir as follows:

- Shut off water supply
- Open the front flap
- Open the hose clamp (2)
- Let water drain
- Open the cover (1)



CAUTION

Do not damage the float switches in the reservoir!

- Clean the reservoir carefully through the feed opening, using a brush.
- Rinse the water reservoir with water
- Close the front flap to empty the reservoir completely
- Open the front flap
- Close the cover (1)
- Close the hose clip

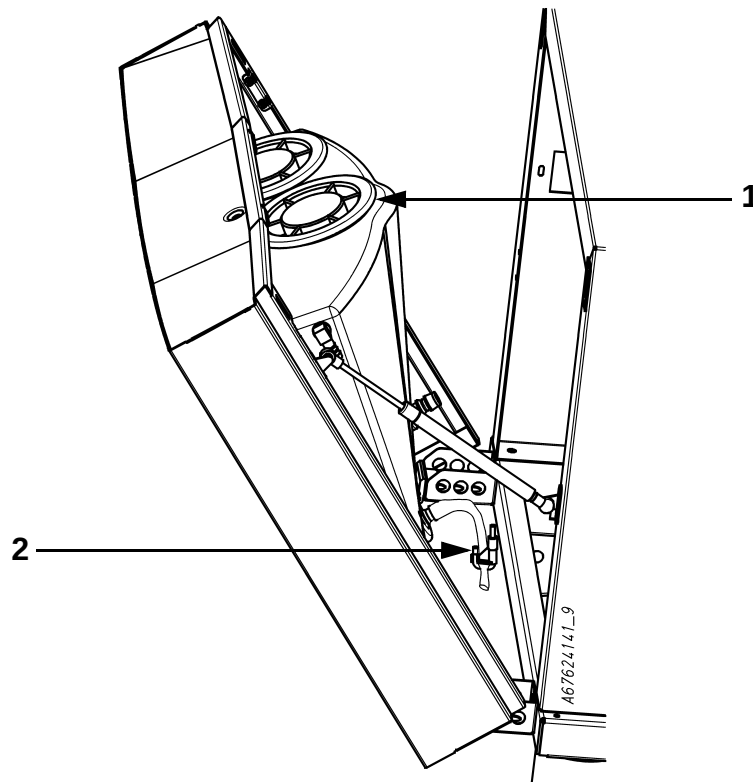


Fig. 8-4
Emptying the reservoir

- Fill the reservoir with demineralised water.
→ 5.4 Filling the humidification system with water (Page 36)

8.4.9 Checking the humidification sleeve and replacing if necessary

If the humidity measurement sensor's humidification sleeve is soiled or damaged you must replace it.

- Remove the old humidification sleeve (1) by pulling it toward the right
- Cut the new humidification sleeve to a length of approx. 150 mm
- Pull humidification sleeve over the humidity sensor (3) until it covers approx. 15 mm of the water feed tube (4)
- Connect the humidification sleeve to the drain tube (2)

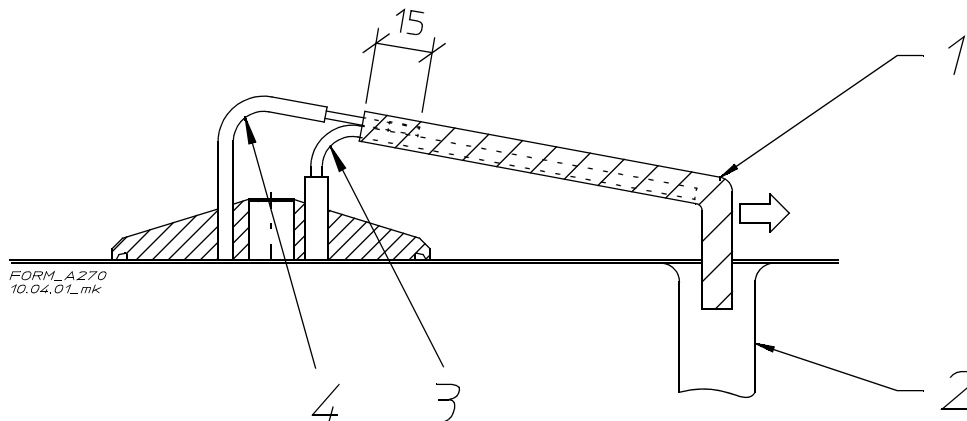


Fig. 8-5

Psychrometric humidity measuring system humidity measurement sensor

APPENDIX: INTERFACES

Position of the connections → Fig. 2-3 Master switch panel (Page 12)



DANGER

The following activities must be performed by a specialist electrician only; switch off the test system before starting.



CAUTION

Plug connections may only be made when the test system is switched off.

1 Ethernet interface

Communication with the SIMPATI¹⁾ software, version 3.0 or later, via a local area network (Ethernet LAN) can be conducted with this interface. The communication uses TCP/IP. Each test system must have its own IP address.



NOTE

We strongly recommend that you have the networking done by your network administrator! Take into account the description of the software in the Appendix of the SIMPATI¹⁾ installation and operating manual.

The interface can be located in the master switch panel or on the the switchgear cabinet¹⁾.
→ 1.3 Interface on the rear side of the control cabinet¹⁾ (Page 2)

It is marked as follows:



1.1 Technical data

For connection to the network you need an RJ45, Cat. 5, STP, 4 x 2 patch cable.



NOTE

The Ethernet and RS 485/422¹⁾ interfaces cannot be used simultaneously.

1.2 Inputting the TCP/IP address

→ Operating manual for the control unit, Chapter »Configure interfaces«

- Input the TCP/IP address via the following menu:
»Home-menu« → »Settings« → »Configuration« → »Interface«
- In case the TCP/IP address is assigned automatically, select »DHCP«.



NOTE

The protocols are recognised automatically. The MAC address is located in the control cabinet on the frame of the control board.

1.3 Interface on the rear side of the control cabinet¹⁾

To install the connecting cable, proceed as follows:

- Open door to the supply section
- Open the switchgear cabinet
- Guide connection cable (2) and plug through the cutout (3) in the ceiling of the test system
- Insert plug into socket (1)

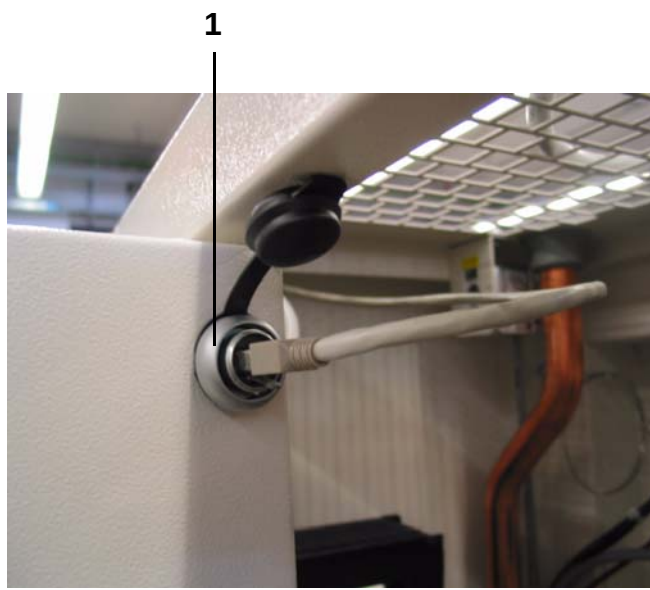
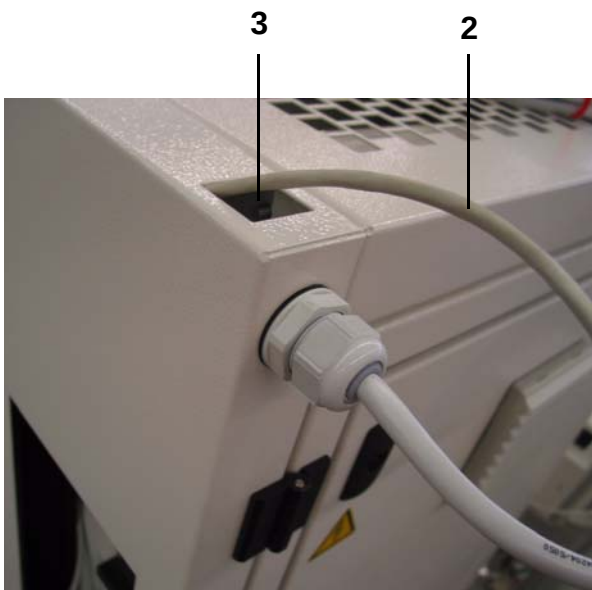


Fig. 1-1
Connecting cable on switchgear cabinet

2 USB interface

The USB interface is used for data exchange, archiving and documentation.

You can connect printing and storage media in the master switch panel.



CAUTION

Use only USB sticks that have been checked for viruses.

3 RS 232 Interface¹⁾

The RS 232¹⁾ interface can be used for external control via a computer, for example.

- Note the pin assignment, which corresponds to the number of poles of the PC port.

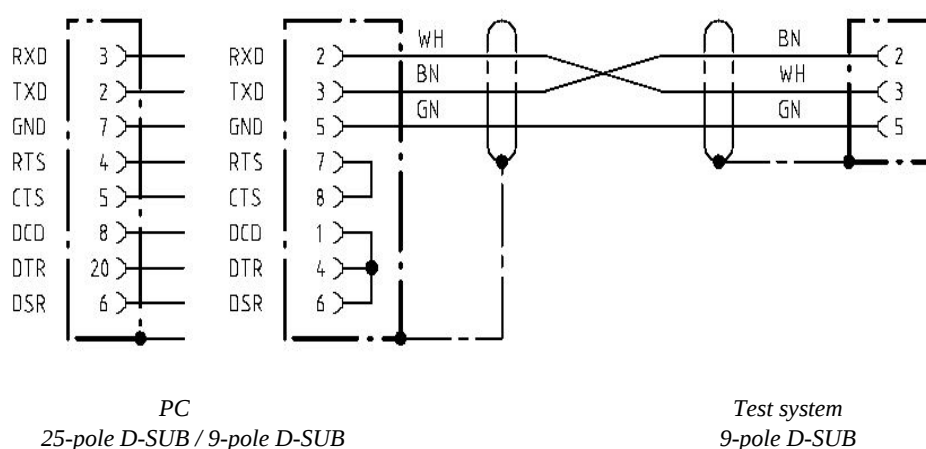


Fig. 3-1
RS 232 pin assignment¹⁾

Pre-assembled connecting cables and adapters are available for making the connections.



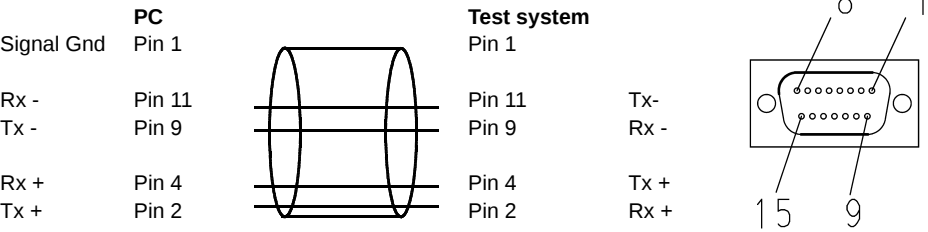
NOTE

If you wish to create the connecting cable yourself, please note that the screening must be fastened to the metal housing at both ends.

4 RS 485/RS 422 interface¹⁾

The RS 485/RS 422¹⁾ network interfaces are used in conjunction with the mini-Combox 2 for networking several test systems.

The 15-pin D-sub sockets are assigned as follows:



NOTE
PC assignment is only valid in conjunction with interface converter¹⁾
RS 232/RS 485, Order No. 63823080. The RS 232 and RS 485/RS 422 interfaces cannot be used simultaneously.

5 Independent measuring system for temperature and humidity measurement¹⁾

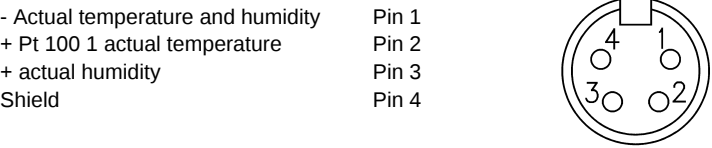
The installed type Pt 100 controller-independent capacitive temperature and humidity sensor is used to acquire the actual value.

These values can be acquired via the socket in the master switch panel.

- Connect the supplied 4-pole plug
- Insert the plug in the master switch panel

Output of the temperature values	0 to 10 V correspond to -100 °C to +200 °C
Output of the humidity values	0 to 10 V correspond to 0% to 100%

The 4-pole socket is assigned as follows:



1) option
2) not assigned
3) test systems from 600 ltr only

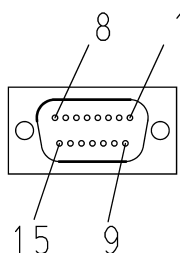
6 Analogue I/O¹⁾

The connection is used for external acquisition of the actual temperature and humidity values.

Output of the temperature values	0 to 10 V correspond to -100 °C to +200 °C
Output of the humidity values	0 to 10 V correspond to 0% to 100%
max. insulation voltage to earth	1 kV DC

The 15-pole D-sub 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
- Pt 100 4	Pin 6
+ Pt 100 4	Pin 14



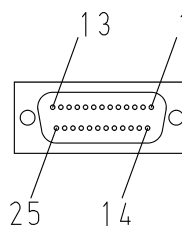
7 Digital I/O¹⁾

The connection comprises the digital inputs/outputs.

max. load at the outputs	24 V, 0.5 A
max. load at the inputs	24 V DC, approx. 30 mA
max. insulation voltage to earth	1 kV DC

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

Input 1	+24 V	Pin 1
Input 2	+24 V	Pin 14
Input 3	+24 V	Pin 2
Input 4	+24 V	Pin 15
Common	GND	Pin 5

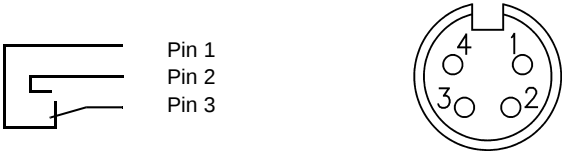


Pin 7	Output 1
Pin 12	Output 1
Pin 8	Output 2
Pin 10	Output 2
Pin 19	Output 3
Pin 22	Output 3
Pin 20	Output 4
Pin 24	Output 4

8 Dry contact for test specimen deactivation

max. load	24 V, 0.5 A
Fault/test stop/pause	Pins 1 and 3 closed
Test running	Pins 2 and 3 closed

The 4-pole socket is assigned as follows:



- Make sure the dry contact is compatible with the on-site measuring system.

APPENDIX: TEMPERATURE MEASUREMENT SENSORS »SENSOR 1«¹⁾ TO »SENSOR 4«¹⁾ AND »CONTROL/MEASURE«¹⁾

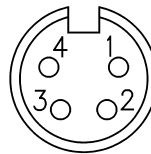
One or more movable Pt 100 temperature sensors can be used to measure the temperature of the test specimen or of any spot within the test space.

1 Technical data

The measuring range corresponds to the temperature range of the test system.
→ 3 Technical data (Page 15)

The 4-pole socket is assigned as follows:

+Pt 100	Current/current	Pin 1
+Pt 100	Voltage/voltage	Pin 2
-Pt 100	Voltage/voltage	Pin 3
-Pt 100	Current/current	Pin 4
Shield		Housing



2 Preparing for startup

The Pt 100 temperature measurement sensor is located in the test space on delivery of the test system. Connect the temperature sensor as follows:

- Plug the temperature sensor »control/measure« into socket »control/measure« on the master switch panel → Fig. 2-3 (Page 12)
- Plug the temperature measurement sensor »Sensor 1« into socket 1 on the master switch panel → Fig. 2-3 (Page 12)



NOTE

If there are several temperature measurement sensors, match them with the respective socket number.

- Guide the temperature measurement sensor through the entry port into the test space
- Install the temperature measurement sensor in a convenient spot in the test space or on the test specimen



DANGER

The temperature sensor must not make contact with live parts.

3 Startup

3.1 Displaying temperature values on the control unit

The actual temperature is displayed on the control unit via the following menu:

»Home-menu« → »Operating« → »Options« → »Measure value« → »T.Sensor 1«

- If there are several temperature measurement sensors, select the appropriate sensor number
- For temperature sensor »control/measure« select measuring value »T.specimen«.

→ operating manual for the control unit, Chapter »Measurement values«

3.2 Calling temperature values via interface or analogue outputs

Measured values can be called via interfaces RS 232¹⁾, RS 485¹⁾, Ethernet or free analogue outputs as follows:

- Call the temperature value on the PC via the SIMPATI¹⁾ software
- Use recording equipment to print out the temperature value

4 Shutdown

- Unplug the temperature measurement sensor
- Remove the temperature measurement sensor from the test space

5 Troubleshooting

The temperature measurement sensor is monitored by the controller for sensor break and short circuiting. If a malfunction occurs, a temperature < -90 °C is displayed.

In this case, the temperature measurement sensor must be replaced.

APPENDIX: »CONTROL/MEASURE« TEMPERATURE CONTROL SENSOR¹⁾

Temperature control is normally conducted by the permanently integrated temperature measurement sensor.

If the »control/measure« temperature control sensor is used, temperature can be controlled via the actual temperature value at any convenient spot in the test space.



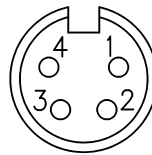
CAUTION

The air in the test space can become very hot or cold, since only the temperature of the test specimen is being controlled. Therefore, to prevent damage to test specimens, we recommend that you use this method of control for small-mass, temperature-insensitive test specimens only.

1 Technical data

The 4-pole socket is assigned as follows:

+Pt 100	Current/current	Pin 1
+Pt 100	Voltage/voltage	Pin 2
-Pt 100	Voltage/voltage	Pin 3
-Pt 100	Current/current	Pin 4
Shield		Housing



2 Preparing for startup

The Pt 100 temperature control sensor is located in the test space on delivery of the test system. Connect the temperature control sensor as follows:

- Plug the temperature control sensor into the master switch panel
→ Fig. 2-3 Master switch panel (Page 12)
- Pass the temperature control sensor through the entry port into the test space
- Attach the temperature control sensor to the test specimen or to any convenient spot in the test space



DANGER

The temperature control sensor must not make contact with live parts.

3 Startup and shutdown

- Activate/deactivate »Cont.Spec.« digital channel
→ operating instructions for the control unit, Chapter »Switch additional functions«
- Set the temperature setpoint
→ operating manual for the control unit, Chapter »Manual mode«

4 Troubleshooting

If digital channel »Cont.Spec.« is activated and the temperature control sensor is not plugged into the master switch panel, the following message will be displayed: »Act. value defect: DAIO1/X38«.

APPENDIX: TEST SPACE FAN¹⁾ WITH SPEED CONTROL

For reducing the amount of circulating air the test space fan's speed is infinitely variable.

1 Technical data

Adjustable speed range	
for temperature tests	30 % to 100%
for climatic tests	50 % to 100%
Protection class	IP 22

Owing to this option the test system's emitted interference corresponds to EN 61000-6-4 (→ Declaration of conformity). Operation of the test system is therefore restricted to industrial areas.



DANGER

The mains connection must have a separate protective copper conductor of at least 10 mm² (only for test systems with a conductor size < 10 mm²).



NOTE

The performance values indicated in Chapter 3 Technical data (Page 15) cannot be guaranteed when the amount of circulating air is reduced. In the case of programmed test cycles, please note that the designated performance values cannot be achieved within the time programmed.

2 Preparing for startup

The test system is provided with a connecting cable for a non-detachable mains connection on site.



DANGER
The connection to the on-site mains supply must be performed by a specialist technician.

- Have the cable connected to a non-detachable mains connection
- connect separate protective conductor at the back of the test system to the on-site PE terminal (only for test systems with a conductor size < 10 mm²); observe VDE 0160, section 6.5 and EN 50178 in this regard



NOTE
Connection to a residual-current circuit-breaker < 300 mA is not possible.

3 Startup

- Set the speed on the control unit via the following menu:
»Home-menu« → »Options« → »Set value« → »Fan speed«
→ operating manual for the control unit, Chapter »Set values«

4 Shutdown

- Reset the speed to 100 %. For procedure → 3 Startup (Page 2)

5 Troubleshooting

Malfunction	Possible causes	Correction
On-site r.c.d. tripped	The pulsating DC controller affects the tripping function of the on-site residual current device.	Use a suitable AC/DC-sensitive residual-current circuit-breaker. (→ DIN VDE 0160/ EN 50178)

APPENDIX: DEMINERALISATION UNIT¹⁾ TYPE B10DN

The demineralisation unit ensures a reliable supply of demineralised water for the humidification system. Filling by hand is no longer necessary.

1 Setup

Choose a convenient place near the test system in which to set up the demineralisation unit. Use flexible hoses to connect the unit to the on-site water supply and to the test system.

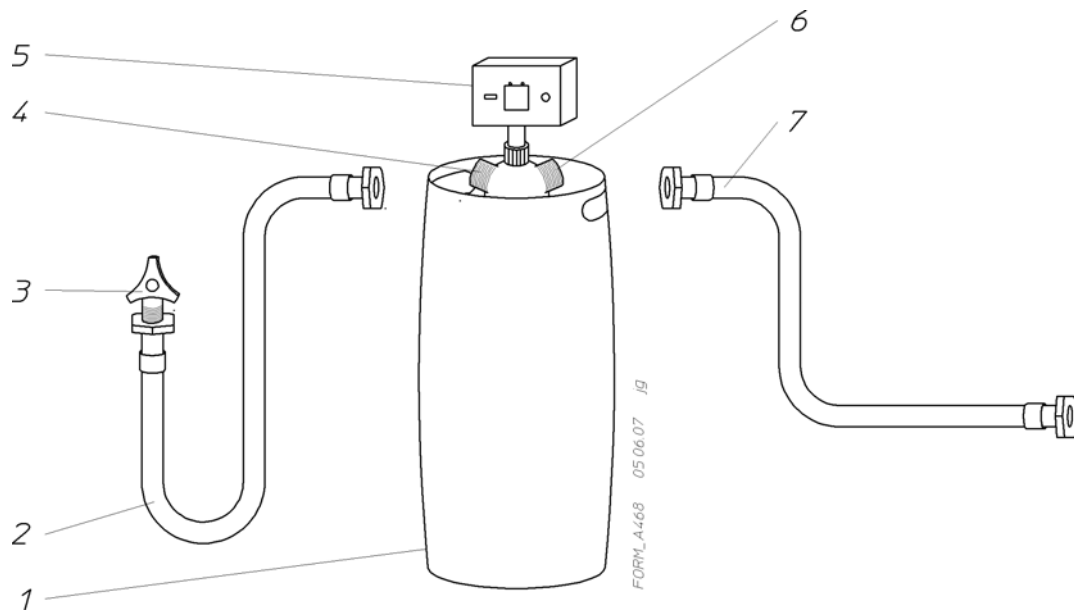


Fig. 1-1
Demineralisation unit

- 1 Demineralisation cartridge
- 2 Water inlet hose with connection R $\frac{3}{4}$ "
- 3 On-site water supply
- 4 Inlet connection
- 5 Conductivity meter
- 6 Outlet connection
- 7 Water outlet hose with connection R $\frac{3}{4}$ "

2 Technical data

→ Fig. 1-1 Demineralisation unit (Page 1)

2.1 Dimensions

Diameter	210 mm
Height incl. conductivity meter (5)	680 mm
Height of the demineralisation cartridge (1)	550 mm

2.2 Connection data

Permissible operating pressure	8 bar
Inlet connection (4)	R ¾"
Outlet connection (6)	R ¾"

2.3 Performance data

Performance at: 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

2.4 Power supply

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

3 Connection and setup



CAUTION

Ensure that that on-site water pressure is between 1.5 to 6 bar.

- Connect the demineralisation unit to a cold water tap only.
- Protect the demineralisation unit against freezing and heat.

4 Preparing for startup



CAUTION

- The accompanying seals must be inserted into all hose connections.
- Keep the cartridge caps and apply them when returning the demineralisation cartridges for regeneration.

Connect the demineralisation unit as follows: → *Fig. 1-1 (Page 1)*

- Connect the water inlet hose (2) to the on-site water supply (3).
- Connect the water inlet hose (2) to the inlet connection (4) of the demineralisation cartridge (1).
- Connect the water outlet hose (7) to the outlet connection (6) of the demineralisation cartridge.
- Open door³⁾ to the supply section.
- Attach the hose to the test system from below. → *Fig. 4-8 (Page 30)*
- Screw the conductivity meter (5) onto the demineralisation cartridge.
- Connect the overflow/condensate drain → *Fig. 4-8 (Page 30)* to an on-site floor outlet.
- Insert the conductivity meter's mains plug in an on-site socket-outlet.

5 Startup

- Execute startup per Chapter → 5 Startup (Page 35).

After prolonged pauses in operation and at low flow rates, re-ionisation can cause an increase in the conductivity value. If this happens, drain water until the conductivity value drops below 20µS/cm.

If the value fails to drop below 20 µS/cm → 8 Maintenance (Page 5).

5.1 Venting the cartridge



CAUTION
Ensure that every new or newly regenerated cartridge is properly vented as follows:

- Fix the water inlet hose to the outlet connection. (For pressure-resistant demineralisation cartridges, pull back the red ring on the quick connector).
- Open the water tap until water comes out of the inlet connection.
- Restore the connection. → 4 Preparing for startup (Page 3)
- Open the water supply.
- Drain water until the pointer of the conductivity meter is back in the green zone.

6 Shutdown

Depending on the duration of the shutdown, the following items must be observed:

- Shut off on-site water supply.
- Unscrew the water hoses.
- → 6 Shutdown (Page 47)

7 Troubleshooting

Malfunction	Possible causes	Correction
Conductivity value exceeds 20 µS/cm	Resin in the demineralisation cartridge is consumed.	Replace the cartridge. → 8.1 (Page 5)
	Re-ionisation caused by lengthy pauses in operation or weak flow	Allow water to drain until the conductivity falls below 20 µS/cm.

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8 Maintenance

- Observe the safety instructions. → 1.4.2 »Service and maintenance« (Page 5)
- Pull the conductivity meter mains plug.

8.1 Replacing the cartridge

If the conductivity limit of 20 µS/cm is exceeded during operation, the cartridge must be replaced as follows:



NOTE

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

- Shut off water supply.
- Pull the conductivity meter mains plug.



CAUTION

Water is still in the hoses.

- Release screw fittings on the demineralisation cartridge.
- Detach the conductivity meter from the cartridge.
- Empty the cartridge.
- Connect new demineralisation cartridge. → 4 Preparing for startup (Page 3)
- Send used cartridges to one of the behropur stations for regeneration.

8.2 Consumables

Ordering code	Designation
6 3640 241	Demineralisation cartridge

- Consumables may be ordered from our service organisation.
You will find our service organisation's address information in the Appendix.

8.3 behropur station in Germany

BEHR

Labor-Technik

Spangerstraße 8

40599 Düsseldorf

Phone: +49 (0)211 74 84 717

Fax: +49 (0)211 74 84 748

APPENDIX: ADDITIONAL HUMIDITY CONTROL WITH CAPACITIVE MEASURING SYSTEM¹⁾

In addition to the psychrometric humidity measuring system, or instead of the psychrometric humidity measuring system, a capacitive humidity measuring system¹⁾ can be installed.

1 Description

The sensors used for humidity measurement are located in the test space, at the front, underneath the perforated floor.



Fig. 1-1 Humidity measuring sensor for capacitive humidity measurement system

2 Technical data

This function can be used across the entire temperature and humidity range of the test system. → 3 *Technical data* (Page 15)

3 Startup

- Input temperature and humidity setpoints
→ 5.9.2 *Climatic tests in manual mode* (Page 44)
→ operating manual for the control unit, Chapter »Manual mode«
- Activate »Cap.sensor« digital channel
→ operating manual for the control unit, Chapter »Switch additional functions«
- Start the test

4 Shutdown

- Deactivate »Cap.sensor« digital channel

5 Maintenance

5.1 Consumables

Ordering code	Designation
6 3838 029	Filter for capacitive humidity sensor ¹⁾

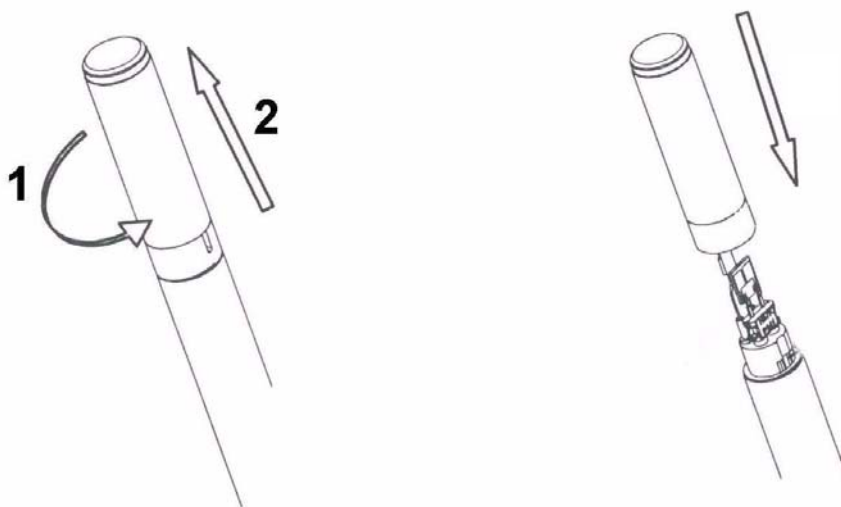
- Consumables may be ordered from our service organisation.
You will find our service organisation's address information in the Appendix.

5.2 Replacing the capacitive humidity sensor's filter

The capacitive humidity measurement sensor is protected by a filter.

Gas emissions from the test specimens may cause the pores of the filter to clog up. Depending on how clogged the filter becomes, replace it, but do so at least once a year, as follows:

- Remove the perforated floor
- Turn the filter of the humidity measurement sensor anticlockwise and remove it
- Attach the new filter to the humidity measurement sensor
- Fasten it by turning clockwise



Removing the filter

Installing the filter

Fig. 5-1

Replacing the capacitive humidity measurement sensor filter

5.3 Calibrating the capacitive humidity measuring system¹⁾

The humidity values displayed may deviate from the humidity setpoints.

This deviation depends on the test conditions (high temperature and humidity values), test specimens and operating hours of the test system.

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

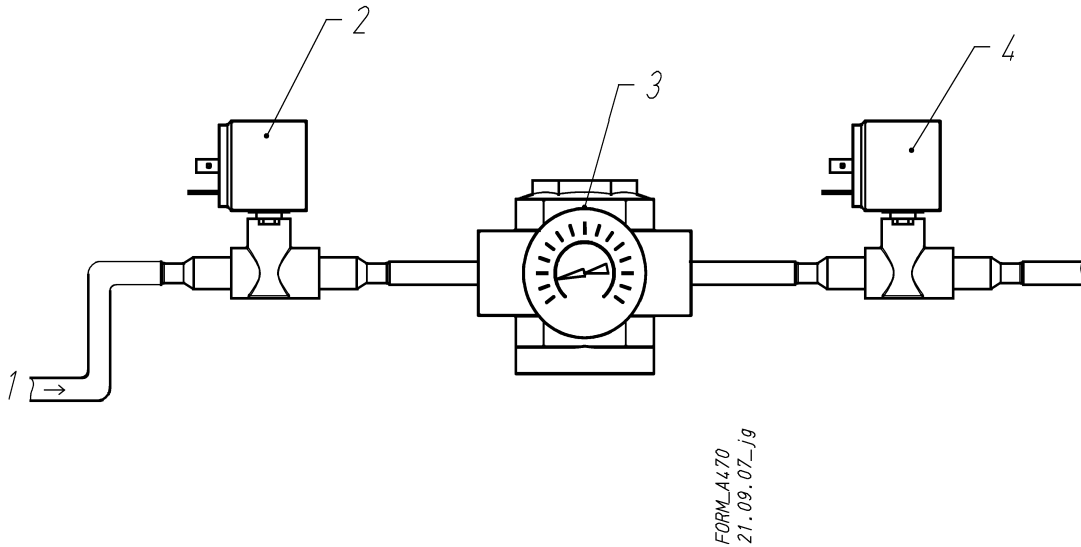
APPENDIX: COMPRESSED AIR CONNECTION¹⁾

This appendix describes the connection for on-site dried compressed air.

For location of the connection → *Fig. 4-8 Supply and disposal connections (Page 30)*

1 Setup

The compressed-air system is located in the supply section.



*Fig. 1-1
Layout*

- 1 Compressed-air supply
- 2 Solenoid valve
- 3 Pressure reducer with pressure gauge
- 4 Solenoid valve

2 **Function**

Depending on the type of test system and equipment this option enables the following functions:

- Condensation protection by dehumidification during the heating phase¹⁾ (Page 4)
- Regulated dew points up to -12 °C¹⁾, with psychrometer (Page 5)
- Dew points unregulated up to -30 °C¹⁾ (Page 5)
- Regulated dew points up to -20 °C, with capacitive humidity measuring system¹⁾ (Page 6)

The on-site dried compressed air passes through a pressure reducer which adjusts the flow rate to the volume of the test space with a 4x air exchange. The dried air is fed into the test space via a solenoid valve, where it mixes with the existing air.

The achievable dew point depends on the quality of the compressed air.



CAUTION
The compressed air discharges via the pressure compensation opening. If the test specimen releases harmful substances, channel the compressed air into an exhaust system having an open funnel connection.

3 **Technical data**

3.1 **General data**

Permissible operating pressure	4 to 10 bar g
Compressed-air consumption	approx. 6 m³/h (expanded)
Temperature range for compressed air	+2 to +50 °C
Compressed air connection	Quick coupler, self-locking, DN 7.2
Quality of compressed air according to ISO 8573-1	
solid impurities per class 2	max. particle size 1 µm
Moisture content (vaporous): appropriate to the application	
Total oil content (liquid and gaseous)	≤ 0.01 mg/m³

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3.2 Expanded compressed air with atmospheric dew point $\leq -20\text{ °C}$

If the available compressed-air network provides an atmospheric dew point of $\leq -20\text{ °C}$, you can use the following functions:

- Condensation protection by dehumidification during the heating phase¹⁾ (Page 4)
- Regulated dew points up to $-12\text{ °C}^{1)}$, with psychrometer (Page 5)

3.3 Expanded compressed air with atmospheric dew point $\leq -40\text{ °C}$

If the available compressed-air network provides an atmospheric dew point of $\leq -40\text{ °C}$, you can use the following functions:

- Condensation protection by dehumidification during the heating phase¹⁾ (Page 4)
- Regulated dew points up to $-12\text{ °C}^{1)}$, with psychrometer (Page 5)
- Dew points unregulated up to $-30\text{ °C}^{1)}$ (Page 5)
- Regulated dew points up to -20 °C , with capacitive humidity measuring system¹⁾ (Page 6)

4 Preparing for startup

- Attach the coupling to the on-site compressed-air hose (inside diameter: 6 mm)
- Open door³⁾ to the supply section
- Connect the on-site compressed-air hose to the test system from below
→ Fig. 4-8 (Page 30)

5 Startup and shutdown

5.1 Condensation protection by dehumidification during the heating phase¹⁾

Dried compressed air can be used to dehumidify the test system's air.

Dried compressed air is continuously fed into the test space. Dried air in the test space prevents the test specimen from dewing.



NOTE

To enhance the effectiveness of dehumidification during the heating phase, we recommend that you pre-dry the test space with compressed air. For this purpose, the »Cond.protect« digital channel must be activated before or during the cooling phase.

5.1.1 Startup

- Make sure the compressed-air supply is in order
- Set the temperature setpoint
→ operating manual for the control unit, Chapter »Manual mode«
- Set the humidity setpoint to »0.0 % RH«
- Activate »Cond.protect« digital channel
→ operating manual for the control unit, Chapter »Switch additional functions«
- Start the test

5.1.2 Shutdown

Dehumidification ends automatically 5 minutes after reaching the setpoint or at the start of the cooling phase.

5.2 Regulated dew points up to -12 °C¹⁾, with psychrometer

In climate mode, dew points up to -12 °C can be set and regulated via clocking of the solenoid valve.



NOTE

Use of the psychrometric humidity measuring system limits the application to humidity ranges 1 and 2. → 3.6.1 Humidity diagram (Page 19)

5.2.1 Startup

- Make sure the compressed-air supply is in order
- Set the temperature setpoint
→ operating manual for the control unit, Chapter »Manual mode«
- Set the humidity setpoint
- Activate »Comp.air/GN2« digital channel
→ operating manual for the control unit, Chapter »Switch additional functions«
- Start the test

5.2.2 Shutdown

- Deactivate »Comp.air/GN2« digital channel

5.3 Dew points unregulated up to -30 °C¹⁾

In temperature mode, dew points up to -30 °C can be achieved. Dried compressed air is continuously fed into the test space. Dry air in the test space protects the test specimen against humidity and/or dilutes the concentration of harmful gas emissions from the test specimen.



NOTE

*This function can be used across the entire temperature range of the test system.
→ 3 Technical data (Page 15)*

5.3.1 Startup

- Make sure the compressed-air supply is in order
- Set the temperature setpoint
→ operating manual for the control unit, Chapter »Manual mode«
- Set the humidity setpoint to »0.0 % RH«
- Activate »Comp.air/GN2« digital channel
→ operating manual for the control unit, Chapter »Switch additional functions«
- Start the test

5.3.2 Shutdown

- Deactivate »Comp.air/GN2« digital channel

5.4 Regulated dew points up to -20 °C, with capacitive humidity measuring system¹⁾

In climate mode, dew points up to -20 °C can be set and regulated via clocking of the solenoid valve in conjunction with the capacitive humidity sensor.



NOTE
The temperature and humidity setpoints must conform to the data in the humidity diagram. → 3.6.1 Humidity diagram (Page 19)

5.4.1 Startup

- Make sure the compressed-air supply is in order
- Set the temperature setpoint
→ operating manual for the control unit, Chapter »Manual mode«
- Set the humidity setpoint
- Activate »Comp.air/GN2« digital channel
→ operating manual for the control unit, Chapter »Switch additional functions«
- Start the test



NOTE
In the case of setpoints in humidity range 1, changeover to the capacitive measuring system is effected automatically.

5.4.2 Shutdown

- Deactivate »Comp.air/GN2« digital channel

6 Troubleshooting

Malfunction	Possible causes	Correction
Dew point too high	Working pressure too low	Increase on-site pressure within permissible range → 3 (Page 2)
	Test space not airtight	Make sure the door seal and ports are tight
	Test specimen contains too much moisture	Reduce the moisture content of the test specimen
	Compressed air too humid	Improve the quality of the compressed air
No drying	Digital channel not activated	Activate »Comp.air/GN2« / »Cond.protect« digital channel
	Compressed air supply insufficient	Check at the pressure reducer pressure gauge whether compressed air is present, ensure the compressed air supply is fully functional

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1) option
2) not assigned
3) test systems from 600 ltr only

APPENDIX: COMPRESSED-AIR DRYER¹⁾ »BEKO«

This appendix contains a description of the compressed-air dryer and the following options:

- Dew points unregulated up to $-30\text{ °C}^{1)}$ (Page 4)
- Condensation protection by dehumidification during the heating phase¹⁾ (Page 3)
- Regulated dew points up to $-12\text{ °C}^{1)}$, with psychrometer (Page 4)
- Regulated dew points up to -20 °C , with capacitive humidity measuring system¹⁾ (Page 5)

1 Setup

The compressed-air dryer is located in the supply section and is set up as follows:

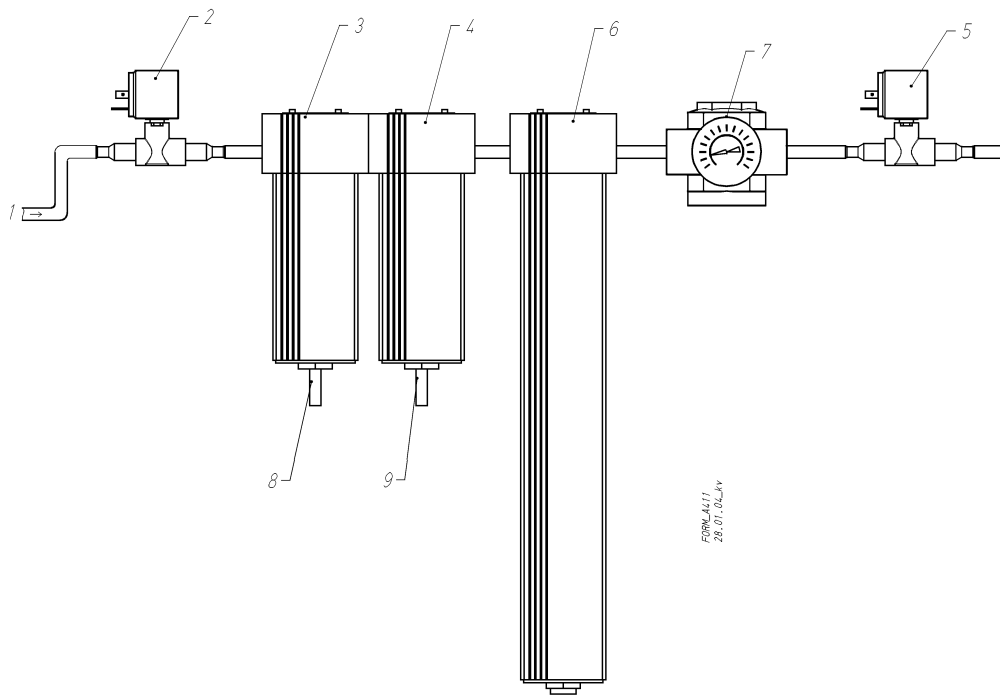


Fig. 1-1
Layout

- 1 Compressed-air supply
- 2 Solenoid valve
- 3 Fine filter
- 4 Superfine filter
- 5 Solenoid valve
- 6 Compressed-air dryer
- 7 Pressure reducer with pressure gauge
- 8 Condensate drain, fine filter (oil/water mixture)
- 9 Condensate drain, superfine filter (oil/water mixture)

2 Function

- Depending on the type of test system and equipment this option enables the following functions:
- Condensation protection by dehumidification during the heating phase¹⁾ (Page 3)
 - Regulated dew points up to -12 °C¹⁾, with psychrometer (Page 4)
 - Dew points unregulated up to -30 °C¹⁾ (Page 4)
 - Regulated dew points up to -20 °C, with capacitive humidity measuring system¹⁾ (Page 5)
 - Please refer to the description → *Appendix: Compressed air connection*¹⁾

On-site compressed air is purified via a fine filter and a superfine filter and dehumidified in the compressed-air dryer.

The pressure reducer adjusts the flow rate of dried compressed air to the volume of the test space with a 4x air exchange and feeds it via a solenoid valve into the test space where it mixes with the existing air.



CAUTION
The compressed air discharges via the pressure compensation opening. If the test specimen releases harmful substances, channel the compressed air into an exhaust system having an open funnel connection.

3 Technical data

Recommended compressed-air pressure (corresponding to factory-set air exchange)	6 bar g
Permissible operating pressure	4 to 10 bar g
Compressed-air consumption at 6 bar g	approx. 6 m³/h (expanded)
Temperature range for compressed air	+2 to +60 °C
Compressed air connection	Quick coupler, self-locking, DN 7.2
Quality of compressed air according to ISO 8573-1	
solid impurities per class 2	max. particle size 1 µm
Moisture content (vaporous) per class 5	
Pressure dew point	≤ +7 °C
Residual moisture	≤ 7.8 g/m³
Total oil content (liquid and gaseous)	≤ 0.1 mg/m³

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4 Preparing for startup

- Attach the coupling to the on-site compressed-air hose (inside diameter 6 mm)
- Open door³⁾ to the supply section
- Connect the on-site compressed-air hose to the test system from below
→ Fig. 4-8 (Page 30)

5 Startup and shutdown

5.1 Condensation protection by dehumidification during the heating phase¹⁾

Dried compressed air can be used to dehumidify the test system's air.

Dried compressed air is continuously fed into the test space. Dried air in the test space prevents the test specimen from dewing.



NOTE

To enhance the effectiveness of dehumidification during the heating phase, we recommend that you pre-dry the test space with compressed air. For this purpose, the »Cond.protect« digital channel must be activated before or during the cooling phase.

5.1.1 Startup

- Make sure the compressed-air supply is in order
- Set the temperature setpoint
→ operating manual for the control unit, Chapter »Manual mode«
- Set the humidity setpoint to »0.0 % RH«
- Activate »Cond.protect« digital channel
→ operating manual for the control unit, Chapter »Switch additional functions«
- Start the test

5.1.2 Shutdown

Dehumidification ends automatically 5 minutes after reaching the setpoint or at the start of the cooling phase.

5.2 Regulated dew points up to -12 °C¹⁾, with psychrometer

In climate mode, dew points up to -12 °C can be set and regulated via clocking of the solenoid valve.



NOTE

Use of the psychrometric humidity measuring system limits the application to humidity ranges 1 and 2. → 3.6.1 Humidity diagram (Page 19)

5.2.1 Startup

- Make sure the compressed-air supply is in order
- Set the temperature setpoint
→ operating manual for the control unit, Chapter »Manual mode«
- Set the humidity setpoint
- Activate »Comp.air/GN2« digital channel
→ operating manual for the control unit, Chapter »Switch additional functions«
- Start the test

5.2.2 Shutdown

- Deactivate »Comp.air/GN2« digital channel

5.3 Dew points unregulated up to -30 °C¹⁾

In temperature mode, dew points up to -30 °C can be achieved. Dried compressed air is continuously fed into the test space. Dry air in the test space protects the test specimen against humidity and/or dilutes the concentration of harmful gas emissions from the test specimen.



NOTE

*This function can be used across the entire temperature range of the test system.
→ 3 Technical data (Page 15)*

5.3.1 Startup

- Make sure the compressed-air supply is in order
- Set the temperature setpoint
→ operating manual for the control unit, Chapter »Manual mode«
- Set the humidity setpoint to »0.0 % RH«
- Activate »Comp.air/GN2« digital channel
→ operating manual for the control unit, Chapter »Switch additional functions«
- Start the test

5.3.2 Shutdown

- Deactivate »Comp.air/GN2« digital channel

5.4 Regulated dew points up to -20 °C, with capacitive humidity measuring system¹⁾

In climate mode, dew points up to -20 °C can be set and regulated via clocking of the solenoid valve in conjunction with the capacitive humidity sensor.



NOTE

The temperature and humidity setpoints must conform to the data in the humidity diagram. → 3.6.1 Humidity diagram (Page 19)

5.4.1 Startup

- Make sure the compressed-air supply is in order
- Set the temperature setpoint
→ operating manual for the control unit, Chapter »Manual mode«
- Set the humidity setpoint
- Activate »Comp.air/GN2« digital channel
→ operating manual for the control unit, Chapter »Switch additional functions«
- Start the test



NOTE

In the case of setpoints in humidity range 1, changeover to the capacitive measuring system is effected automatically.

5.4.2 Shutdown

- Deactivate »Comp.air/GN2« digital channel

6 **Troubleshooting**

Malfunction	Possible cause	Correction
Dew point too high	Working pressure too low	Increase on-site pressure within permissible range → 3 (Page 2)
	Test space not airtight	Make sure the door seal and ports are tight
	Test specimen contains too much moisture	Reduce the moisture content of the test specimen
No drying, Dryer fails to operate	Digital channel not activated	Activate »Comp.air/GN2« / »Cond.protect« digital channel
	Compressed air supply insufficient	Check at the pressure reducer pressure gauge whether compressed air is present, generate compressed air supply

7 **Maintenance**

- Observe the safety instructions. → 1.4.2 »Service and maintenance« (Page 5)

7.1 **Monthly maintenance**

Condensate (oil/water mixture) is building up in both filters.

- Open condensate drain (8) and (9) → Fig. 1-1 Layout (Page 1) discharge the condensate

7.2 **Maintenance after 4000 operating hours or at least once a year**

Replace the filter elements in fine filter and superfine filter as follows:

→ Fig. 7-1 Replacing the filter element (Page 7)

- Open door to the supply section
- Detach the quick coupler (system unpressurised)
- Loosen screw (2) on slide (1)
- Push slide (1) downward
- Unscrew the filter housing (3)
- Pull filter element (4) off the filter top (5)
- Replace fine filter »04F« and superfine filter »04S« with new filter element. For type designation see bottom of filter elements and filter housing.



CAUTION
Take care not to mix up the filter elements!

- Attach sticker for the next filter change in an easily visible location on the test system
- Reassemble in reverse order

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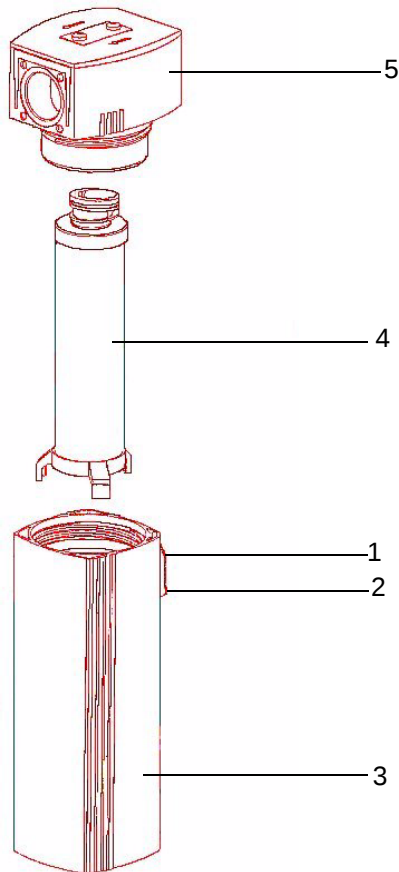


Fig. 7-1
Replacing the filter element



CAUTION

Failure to replace the filter elements will destroy the diaphragm in the compressed-air dryer and render the dryer ineffective.

7.3 Consumables

Ordering code	Designation
6 2836 003	Filter elements »04F« and »04S«

- Consumables may be ordered from our service organisation.
You will find our service organisation's address information in the Appendix.

APPENDIX: COMPRESSED-AIR DRYER¹⁾ »DONALDSON«

This appendix contains a description of the compressed-air dryer and the following options:

- Dew points unregulated up to $-30\text{ °C}^{1)}$ (Page 4)
- Condensation protection by dehumidification during the heating phase¹⁾ (Page 3)
- Regulated dew points up to $-12\text{ °C}^{1)}$, with psychrometer (Page 4)
- Regulated dew points up to -20 °C , with capacitive humidity measuring system¹⁾ (Page 5)

1 Setup

Depending on the type of test system, the compressed-air dryer is located on the side panel or in the mechanical section and is set up as follows:

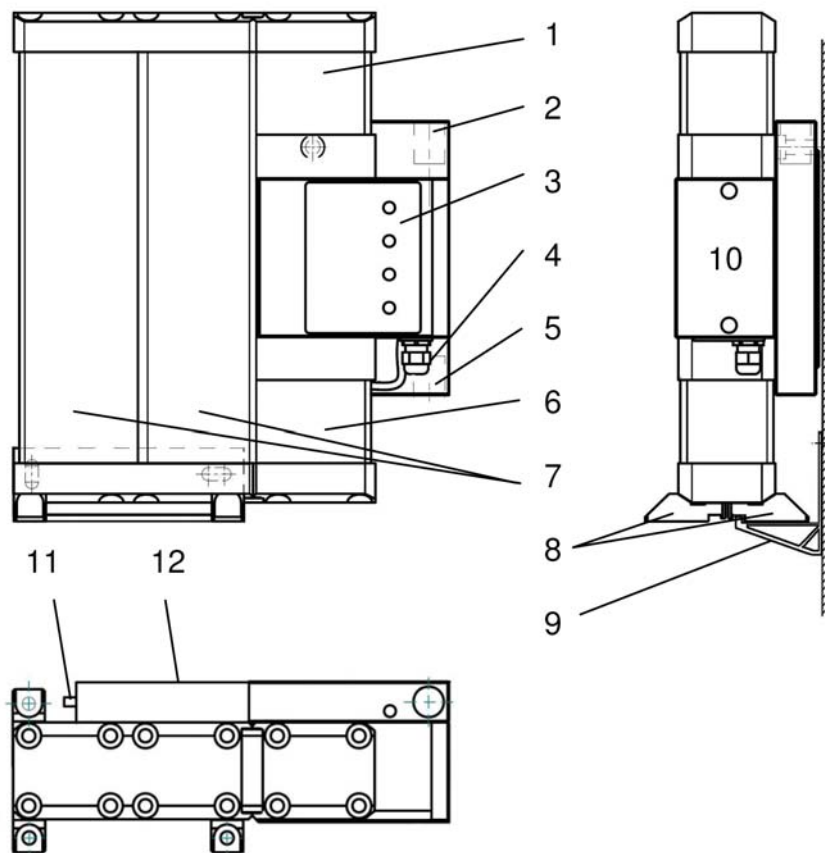


Fig. 1-1
Layout

- | | |
|------------------------------|---|
| 1 Afterfilter | 7 Desiccant cartridges |
| 2 Air outlet | 8 Feet for horizontal installation |
| 3 Control block with display | 9 Bracket for vertical installation ¹⁾ |
| 4 Electrical connection | 10 Control board cover |
| 5 Air inlet | 11 Condensate outlet |
| 6 Prefilter | 12 Silencer |

2 Function

On-site compressed air is purified via a prefilter and an afterfilter and dehumidified in the compressed-air dryer.

The pressure reducer adjusts the flow rate of dried compressed air to the volume of the test space with a 4x air exchange. The dried air is fed into the test space via a solenoid valve, where it mixes with the existing air.



CAUTION
The compressed air discharges via the pressure compensation opening. If the test specimen releases harmful substances, channel the compressed air into an exhaust system having an open funnel connection.

3 Technical data

Accessible pressure dew point dryer	-40 °C with max. inlet temperature +35 °C and operating pressure 6 bar g
Recommended compressed-air pressure (corresponding to factory-set air exchange)	6 bar g
Permissible operating pressure	6 to 10 bar g (referring to standard equipment with throttle unit 7)
Compressed-air consumption at 6 bar g	approx. 15 m³/h (expanded)
max compressed-air temperature	+50 °C
Electrical data	230 V / 50 to 60 Hz
Sound pressure level	approx. 5 dB(A) above test system level
Condensate outlet	Ø 6 mm, hose connection
Compressed air connection	Quick coupler, self-locking, DN 7.2
Compressed-air standard according to ISO 8573-1	
solid impurities per class 2	max. particle size 1 µm
Moisture content (vaporous) per class 6	
Pressure dew point	≤ +10 °C
Residual moisture	≤ 9.4 g/m³
Total oil content (liquid and gaseous)	≤ 3 mg/m³

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1) option
2) not assigned
3) test systems from 600 ltr only

4 Preparing for startup

- Attach the coupling to the on-site compressed-air hose (inside diameter 6 mm)
- Open door to the supply section³⁾
- Connect the on-site compressed-air hose to the test system from below
→ Fig. 4-8 (Page 30)

5 Startup and shutdown



NOTE

Due to controller-related scanning at test system startup, it takes approx. 90 seconds to activate the compressed-air dryer.

For initial startup or for prolonged shutdown periods you first have to regenerate the compressed air dryer's desiccant cartridges. Regeneration takes at least 1 hour. The compressed air dryer is fully functional on completion of the regeneration process.

- Switch on the »Dryer« digital channel for the compressed-air dryer in a timely manner.



NOTE

Regeneration time is not monitored by the controller.

5.1 Condensation protection by dehumidification during the heating phase¹⁾

Dried compressed air can be used to dehumidify the test system's air.

Dried compressed air is continuously fed into the test space. Dried air in the test space prevents the test specimen from dewing.



NOTE

To enhance the effectiveness of dehumidification during the heating phase, we recommend that you pre-dry the test space with compressed air. For this purpose, the »Cond.protect« digital channel must be activated before or during the cooling phase.

5.1.1 Startup

- Make sure the compressed-air supply is in order
- Set the temperature setpoint
→ operating manual for the control unit, Chapter »Manual mode«
- Activate »Cond.protect« digital channel
→ operating manual for the control unit, Chapter »Switch additional functions«
- Start the test

5.1.2 Shutdown

Dehumidification ends automatically 5 minutes after reaching the setpoint or at the start of the cooling phase.

5.2 Regulated dew points up to -12 °C¹⁾, with psychrometer

In climate mode, dew points up to -12 °C can be set and regulated via clocking of the solenoid valve.



NOTE

Use of the psychrometric humidity measuring system limits the application to humidity ranges 1 and 2. → 3.6.1 Humidity diagram (Page 19)

5.2.1 Startup

- Make sure the compressed-air supply is in order
- Set the temperature setpoint
→ operating manual for the control unit, Chapter »Manual mode«
- Set the humidity setpoint
- Activate »Comp.air/GN2« digital channel
→ operating manual for the control unit, Chapter »Switch additional functions«
- Start the test

5.2.2 Shutdown

- Deactivate »Comp.air/GN2« digital channel

5.3 Dew points unregulated up to -30 °C¹⁾

In temperature mode, dew points up to -30 °C can be achieved. Dried compressed air is continuously fed into the test space. Dry air in the test space protects the test specimen against humidity and/or dilutes the concentration of harmful gas emissions from the test specimen.



NOTE

*This function can be used across the entire temperature range of the test system.
→ 3 Technical data (Page 15)*

5.3.1 Startup

- Make sure the compressed-air supply is in order
- Set the temperature setpoint
→ operating manual for the control unit, Chapter »Manual mode«
- Activate »Comp.air/GN2« digital channel
→ operating manual for the control unit, Chapter »Switch additional functions«
- Start the test

5.3.2 Shutdown

- Deactivate »Comp.air/GN2« digital channel

5.4 Regulated dew points up to -20 °C, with capacitive humidity measuring system¹⁾

In climate mode, dew points up to -20 °C can be set and regulated via clocking of the solenoid valve in conjunction with the capacitive humidity sensor.



NOTE

The temperature and humidity setpoints must conform to the data in the humidity diagram. → 3.6.1 Humidity diagram (Page 19)

5.4.1 Startup

- Make sure the compressed-air supply is in order
- Input the temperature setpoint
→ operating manual for the control unit, Chapter »Manual mode«.
- Set the humidity setpoint
- Activate »Comp.air/GN2« digital channel
→ operating manual for the control unit, Chapter »Switch additional functions«
- Start the test



NOTE

In the case of setpoints in humidity range 1, changeover to the capacitive measuring system is effected automatically.

5.4.2 Shutdown

- Deactivate »Comp.air/GN2« digital channel

6 Troubleshooting

Malfunction	Possible causes	Correction
Dew point too high	Working pressure too low	Increase on-site pressure within permissible range → 3 (Page 2)
	Test space not airtight	Make sure the door seal and ports are tight
	Test specimen contains too much moisture	Reduce the moisture content of the test specimen
	Compressed air too humid	Improve the quality of the compressed air
	Throttle soiled or wrong type	Check/replace
	Silencer soiled	Clean
No drying, Dryer fails to operate	Digital channel not activated	Activate »Comp.air/GN2« / »Cond.protect« digital channel
	Compressed air supply insufficient	Check at the pressure reducer pressure gauge whether compressed air is present, generate compressed air supply

7 Maintenance

- Observe the safety instructions. → 1.4.2 »Service and maintenance« (Page 5)

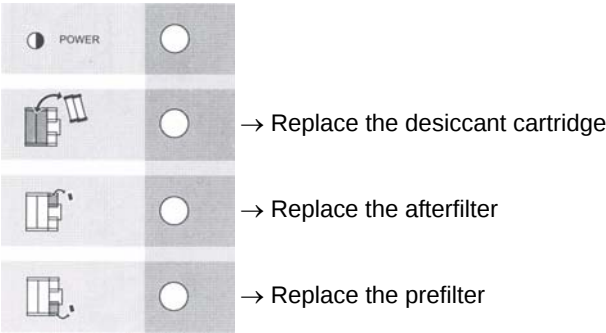


Fig. 7-1
Maintenance display

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1) option
2) not assigned
3) test systems from 600 ltr only

7.1 Replacing the filter elements

Replace the prefilter and afterfilter according to the following criteria:

- After a maximum of 8000 operating hours
- After 1 year at the latest
- When the respective LED on the compressed air dryer display lights up

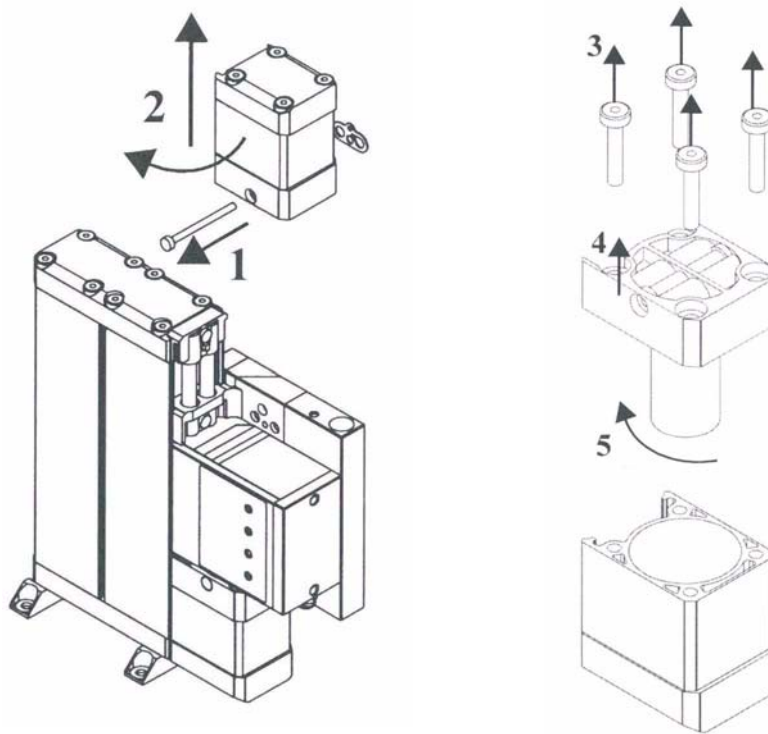


Fig. 7-2
Replace the filter elements

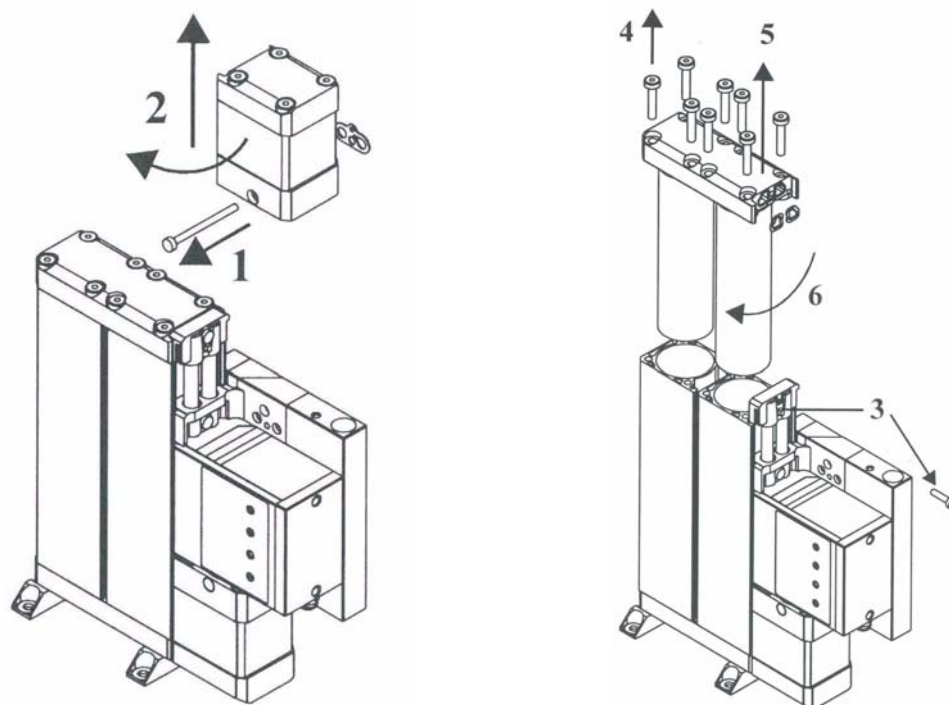
Proceed in the following order:

- Release the clamping lever (1)
- Swing filter unit (2) out, pull prefilter out in downward motion, pull afterfilter out in upward motion
- Undo 4x screws (3)
- Pull out filter flange (4) and filter element (5)
- Unscrew filter element (5)
- Screw new filter element in
- Reassemble in reverse order

7.2 Replacing the desiccant cartridges

Replace the desiccant cartridges in accordance with the following criteria:

- After 10000 operating hours
- After 2 years at the latest
- When the respective LED on the compressed air dryer display lights up



- Release the clamping lever (1)
- Swing filter unit (2) for the afterfilter out, pull afterfilter out in upward motion.
- Undo the screw (3) at the nozzle housing; pull the tube support slightly away from the absorber cover
- Undo 8x screws (4)
- Pull absorber cover (5) out along with the desiccant cartridges, pulling the nozzle housing slightly to the right.
- Unscrew desiccant cartridges (6)
- Screw new desiccant cartridges in

Resetting the reset switch

- Set master switch to »O«
- Open the control board cover → *Fig. 1-1 Layout (Page 1)*
- Actuate the reset switch 1x
- Reassemble in reverse order

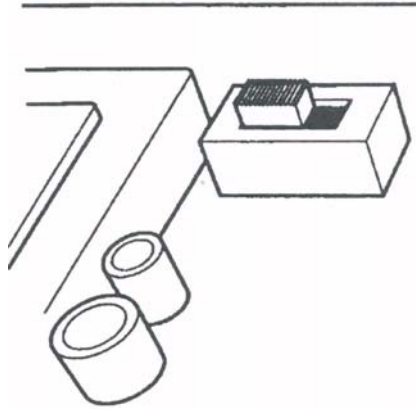


Fig. 7-3
Reset switch

7.3 Consumables

Ordering code	Designation
6 3651 023	Set of wearing parts, consisting of: – Dessicant cartridge – Prefilter and afterfilter – Set of seals
6 3651 024	Set of wearing parts, consisting of: – Prefilter and afterfilter – Set of seals

- Consumables may be ordered from our service organisation.
You will find our service organisation's address information in the Appendix.

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1) option
2) not assigned
3) test systems from 600 ltr only

APPENDIX: LEAD-THROUGH PAD¹⁾

This appendix contains operating instructions for the lead-through pad¹⁾.

To enable the introduction of individual cables, a lead-through pad is glued to the masking frame around the test space opening.

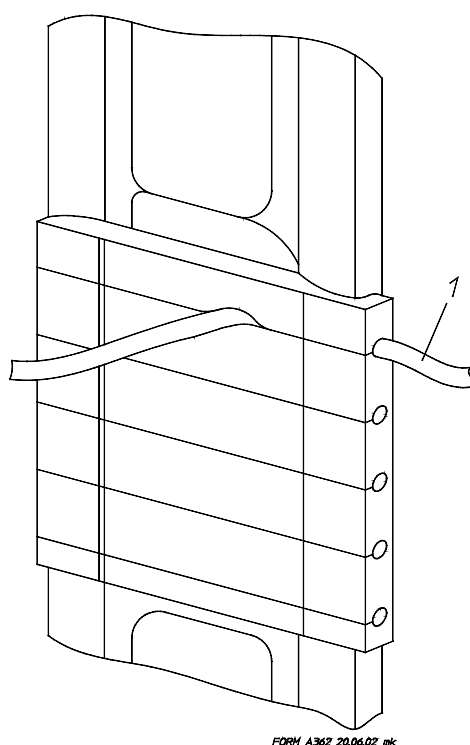
It is designed for 5 cables, with a maximum diameter of 7 mm each. The cables can be introduced into the test space without separating the test specimen from the measuring equipment. The matching shape of lead-through pad and masking frame ensure that the test space is perfectly sealed when the door is closed.

1 Technical data

Number of ports	5
Diameter of cables	2 to 7 mm

2 Inserting the cables

- Beginning at the edge squeeze the individual cables (1) into the designated slots.



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Fig. 2-1

Inserting cables into lead-through pad

3 Maintenance

3.1 Replacing the lead-through pad

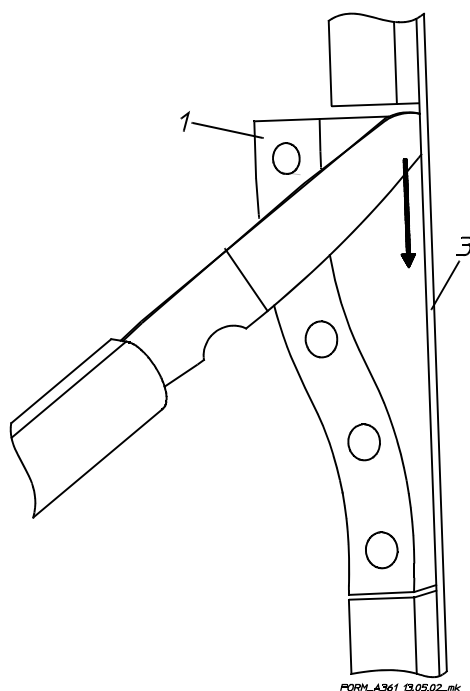
If the lead-through pad is damaged, replace it with the spare pad supplied, proceeding as follows:

- Detach the lead-through pad (1) from the masking frame (3) with a knife.



CAUTION

Be careful not to damage the test space seals



*Fig. 3-1
Detaching the lead-through pad*

- Use a knife to remove silicone residues from the masking frame

Fitting a new lead-through pad

- Apply two lines of silicone (approx. 2 mm high) to the back of the lead-through pad.
- Insert the lead-through pad into the masking frame in such a way that the slots are accessible from the outside
- Insert the lugs (4) of the lead-through pad in the recess of the test space seals
- Close the test space door
- Allow the silicone adhesive to set for approx. 24 h

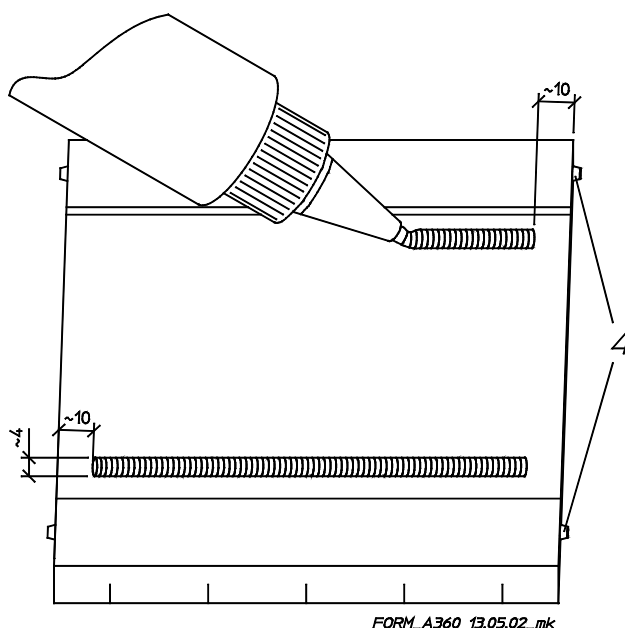


Fig. 3-2
Back of lead-through pad

**NOTE**

Should the storage life of the silicone adhesive supplied be exceeded (12 months from date of delivery), you may use a regular transparent acetic acid-based silicone adhesive for cementing the lead-through pad in place.

3.2 Consumables

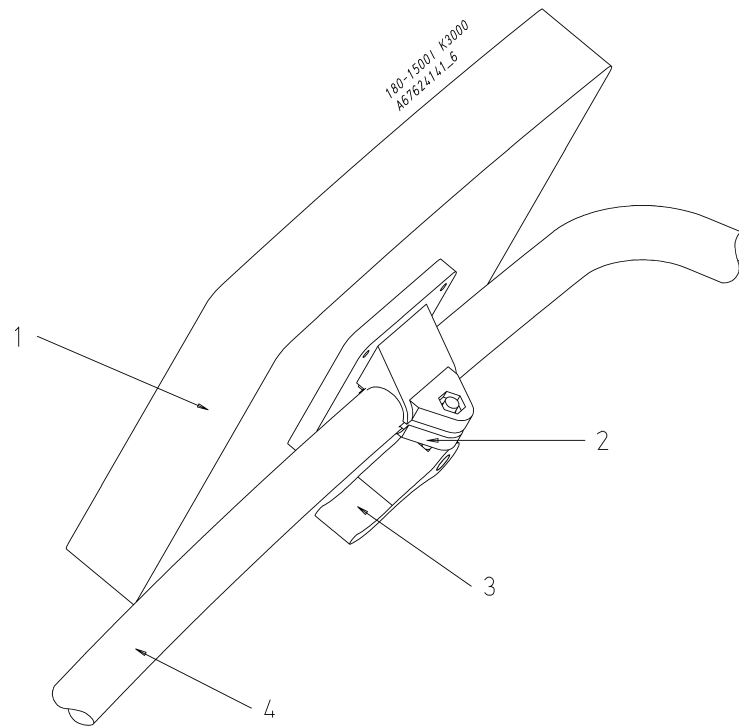
Ordering code	Designation
62652002	Lead-through pad
60272309	Silicone adhesive

- Consumables may be ordered from our service organisation.
You will find our service organisation's address information in the Appendix.

APPENDIX: ATTACHING THE 8" CONTROL UNIT¹⁾ TO THE MOUNTING BAR

Attach the control unit to the mounting bar on the door as follows:

- Remove the control unit from the carton and unpack it
- Release the clamping lever
- Remove the clamp collar
- Position the control unit on the mounting bar
- Insert the clamp collar in the support of the control unit
- Screw in the clamp lever
- Adjust the desired inclination and secure the control unit
- Insert the connecting cable in the connector panel



*Fig.
Attaching the control unit to the mounting bar*

- 1 Control unit
- 2 Clamp collar
- 3 Clamp lever
- 4 Mounting bar

APPENDIX: ATTACHING THE 8" CONTROL UNIT TO THE SIDE OF THE TEST SYSTEM¹⁾

Attach the control unit below or on the door lock, proceeding as follows:

- Remove the control unit from the carton and unpack it
- Undo the star screw / clamping lever
- Position the swivel arm
- Lock star screw
- Release the clamping lever on the control unit
- Attach the control unit to the swivel arm
- Adjust the desired inclination with the clamping lever
- Insert the connecting cable in the connector panel

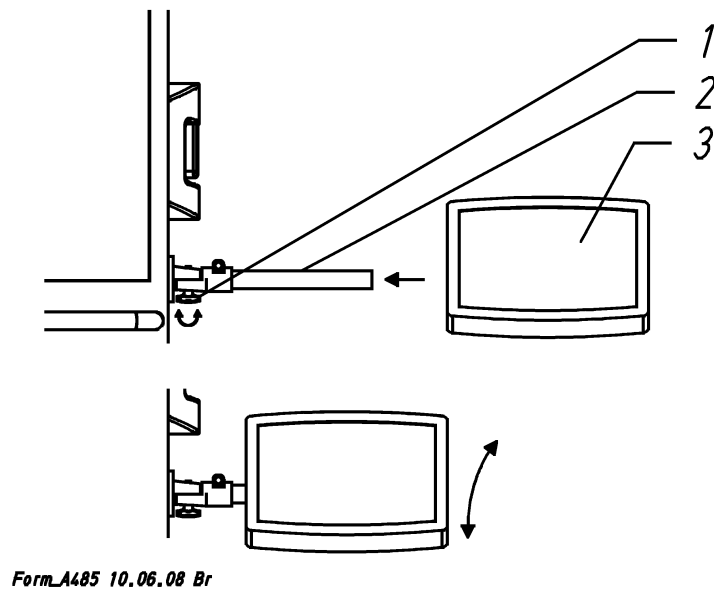


Fig.
Installing control unit below the door lock

- 1 Star screw
- 2 Swivel arm
- 3 Control unit

APPENDIX: HANDHOLE PORTS¹⁾

This appendix contains operating instructions for the handhole ports¹⁾.

The handhole ports are built into the test space door; sealing plugs with protective gloves are inserted into them to allow access to the test specimens during a test without opening the door.

Use of the protective gloves is strictly limited to temperatures from -30 °C to +80 °C.



CAUTION

These temperature limits must be strictly observed. The safety gloves are light- and UV-sensitive. Store the safety gloves in a dark and dry place.



DANGER

The protective gloves are designed for short-term application only. Remove the protective gloves from the handhole ports after use. Seal the handhole ports with the short, closed plugs.

Seal the entry ports from the inside with the slotted plugs for long-duration tests

→ Fig. 5-4 Slotted plugs for long-duration climatic tests and for inserting cables (Page 40).

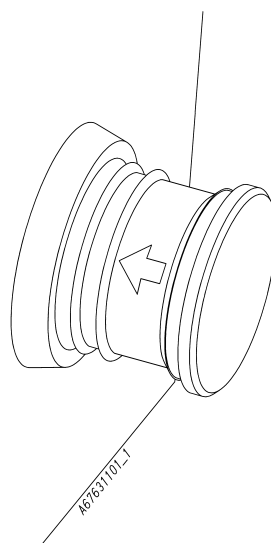


Fig.
Short closed plugs for handhole entry ports

1 Consumables

Ordering code	Designation
64 60 94 63	1 pair safety gloves for entry port, Ø 125 mm

- Consumables may be ordered from our service organisation.
You will find our service organisation's address information in the Appendix.

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