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Mode d'emploi

INSTALLATION AND OPERATING INSTRUCTIONS

Temperature Test Systems

VT 4002

VTM 4004

VTM 7004

with Mincon / 32-Controller

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1 INTRODUCTION

1.1 General information

This manual shall be read carefully prior to operating the 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 system or test specimen.

**NOTE**

is used to indicate any form of assistance

1.3 Separate operating instructions

Please observe the separate documentation for the following equipment:

- Control unit
- Printer¹⁾
- Interface converter¹⁾
- Software SIMPATI¹⁾

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 instructions 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

1.5 Normal use and application

The test system has been exclusively designed and constructed for temperature tests.

You can perform testing methods to determine the effects of temperature on the material properties and reliability of a test specimen.

The test system is suitable for residential areas if it complies with standard EN 50081-1 for emitted interference → *Declaration of conformity*.

If, however, the declaration of conformity states emitted interference as per EN 50081-2, operation of the test system is restricted to industrial areas.



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

Exceptions are possible provided the test system is equipped with the necessary safety devices (e.g. explosion protection¹⁾). In that case see appendix for details.

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 should only be performed by our service or a skilled person authorized by us. The necessary documentation, which is kept in the switchgear cabinet, should only be used by these persons.

The user must ensure that the directions regarding installation and operation of refrigerating units as per EN 378-1 chap. 5.3, EN 378-2, appendix C, EN 378-4 chap. 4 and 5, 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.

1.6.4 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 »0«



WARNING ABOUT PLUG-AND-SOCKET CONNECTIONS

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



WARNING ABOUT HOT SURFACES

The air in the test space as well as the parts exposed to it may be extremely hot

- Wear safety clothing (gloves, face guard)



WARNING ABOUT COLD SURFACES

The air in the test space as well as the parts exposed to it may be extremely cold

- Wear safety clothing (gloves, face guard)



WARNING ABOUT HAND INJURIES

The heat exchanger fins are sharp-edged

- Wear protective gloves

1.6.5 Safety instructions

Thorough knowledge of the operating instructions for the test system as well as the control unit is indispensable for operating the test system.

- Follow these instructions:
 - 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.
 - In case of electrically connected test specimens the local and/or national safety regulations must be observed, particularly with regard to equipotential bonding for leakage currents which may be caused by the test specimens. The maximum leakage current depends on the conductor cross section.
 - The test space is only protected against excess temperatures when the test system is switched on. For this reason, heat-emitting test specimens must never be placed in the test space when the test system is switched off. Fire hazard.

Maintenance work

- Set the mains switch to »0« → 2.2.9 Main switch panel²⁾ (page 11)
- Padlock the mains switch against accidental switching on
- Lock the door lock while the door is open, and take out the key to prevent accidental closing of the door.
- Provide a safety clearance of > 500 mm between test system and wall, as escape route, in accordance with VDE 0100 Part 729.

When using the entry ports

- Observe the safety standards for 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 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 department or a skilled person authorized by us. Ensure that the site is well ventilated.
- Observe additional safety specifications in the Service Manual

1.6.6 Safety devices

The test systems are equipped with the following safety devices:

Test system protection

- Safety temperature limiter (protection against overtemperature in the test system). Thermal safety class 1 in accordance with EN 60519-2, 1995.

Test specimen protection

- 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, 1995.
- Software temperature limiter (protection against non-permissible temperatures in the test space)

Disconnection of test specimens

- Potential-free contact for disconnecting heat-emitting test specimens

Excess pressure in the refrigeration circuit

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

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

2 DESCRIPTION OF THE TEST SYSTEM

2.1 Structure



Fig. 2-1VT 4002

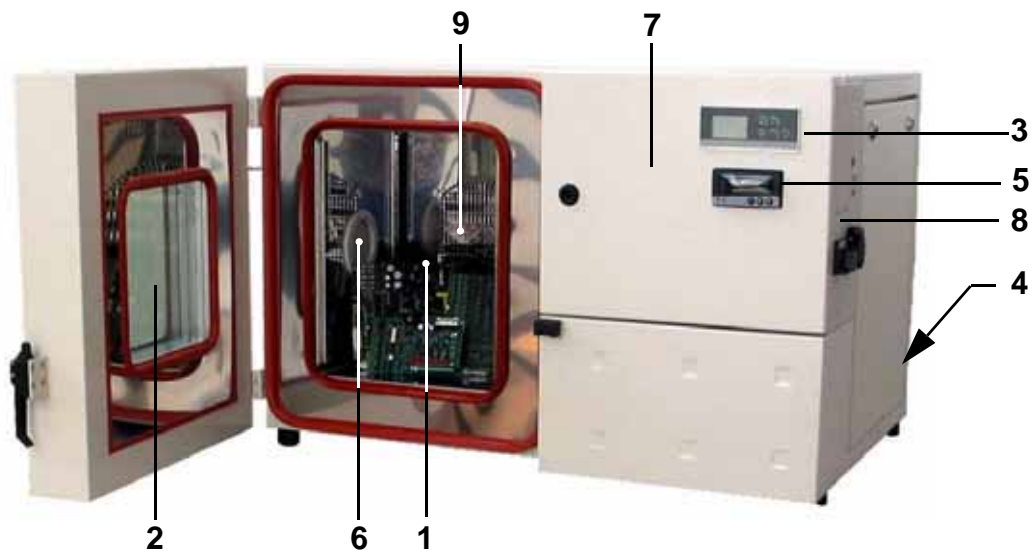


Fig. 2-2VTM 4004 / VTM 7004

- 1 Test space
- 2 Test space door
- 3 Control unit
- 4 Mechanical section
- 5 Independent temperature limiter
- 6 Entry port
- 7 Switchgear cabinet
- 8 Main switch panel²⁾, Mains switch³⁾
- 9 Temperature sensor

2.2 Components and their function

→ 2.1 Structure (page 9)

2.2.1 Test space

The test space is made of high-grade steel, material no. 1.4301. The test specimens can either be placed on the insert shelf¹⁾²⁾ or the test space floor.

2.2.2 Test space door

The test space door can be locked with a key²⁾.

2.2.3 Control unit

All control and operating commands can be activated on the control unit by touching the respective function symbols.

2.2.4 Mechanical section

The mechanical section contains the equipment necessary for producing the test conditions. It is accessible via detachable panels. A special key²⁾ is supplied for locking and unlocking.

2.2.5 Independent temperature limiter

This device protects the test specimens against thermal overstressing, independent of the controller.

2.2.6 Entry ports

The entry port at the left side of the test system enables measuring lines and testing equipment to be introduced into the test space

- Observe the relevant safety instructions → (page 6)

2.2.7 Switchgear cabinet

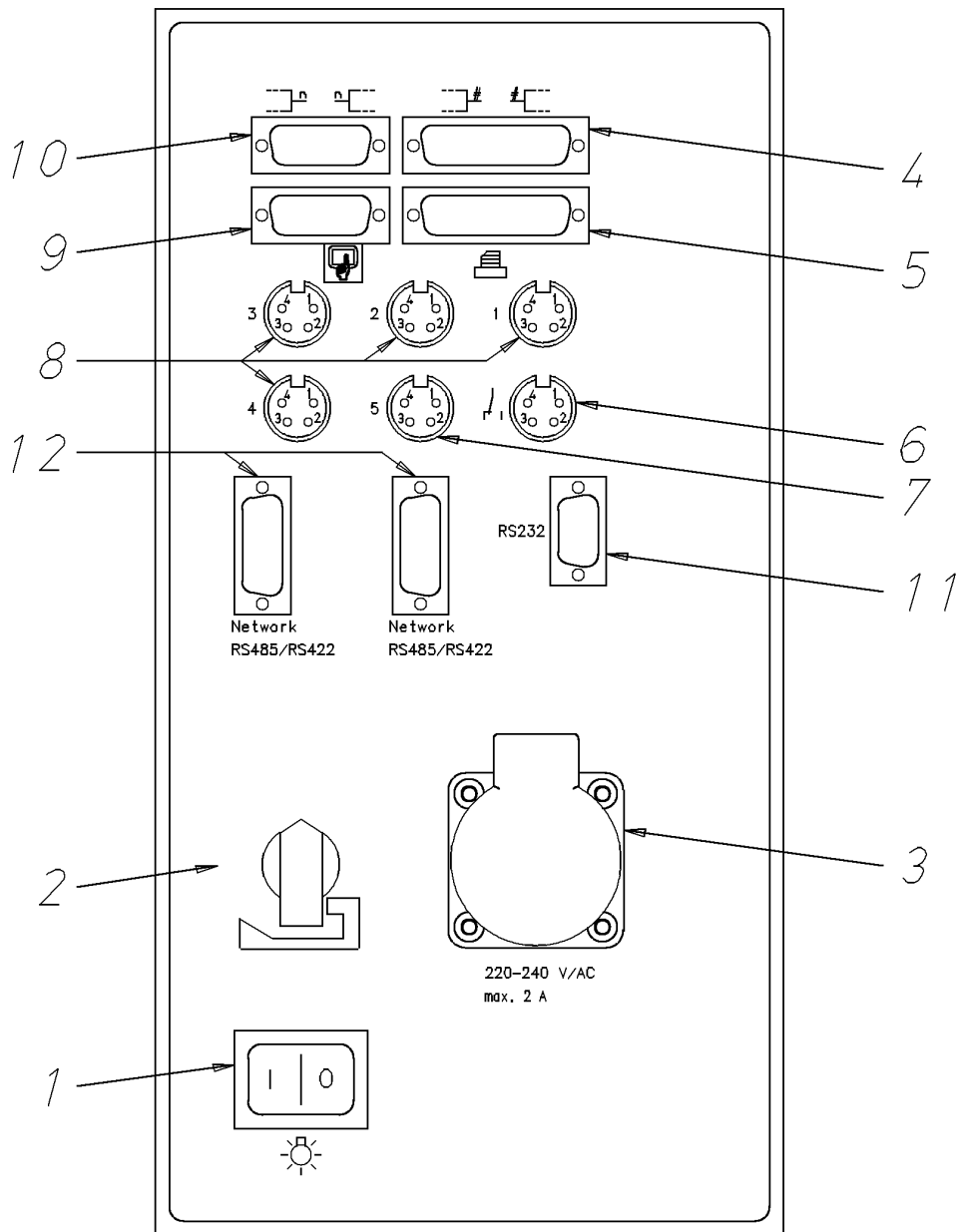
The switchgear cabinet contains the control modules and electrical components.

The controller design complies with EN 60204 Part 1.

2.2.8 Temperature sensor

The temperature sensor is located behind the rear panel in the test space.

2.2.9 Main switch panel²⁾



FORM_A415

Fig. 2-3
Main switch panel²⁾

1) Option
2) only for test systems from 37 ltr up
3) only for 16 ltr test system

The main switch panel²⁾ contains:

- 1 Light switch
- 2 Mains switch
- 3 Outlet for e.g. notebook or measuring and recording devices

Plugs for:

- 4 Digital I/O¹⁾ → *Appendix: Interface connections, (page 3)*
- 11 RS 232 interface → *Appendix: Interface connections, 1.1 (page 1)*
- 12 RS 485/RS 422 interface¹⁾ → *Appendix: Interface connections, 1.2 (page 2)*

Sockets for:

- 5 Centronics interface¹⁾
- 6 Potential-free contact → *Appendix: Interface connections, (page 3)*
- 7 Not assigned
- 8 Mobile temperature sensors Pt 100¹⁾ → *Appendix: Temperature sensors¹⁾*
- 9 Control unit
- 10 Analog I/O¹⁾²⁾ → *Appendix: Interface connections, (page 2)*



WARNING

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

2.2.10 Connector panel³⁾

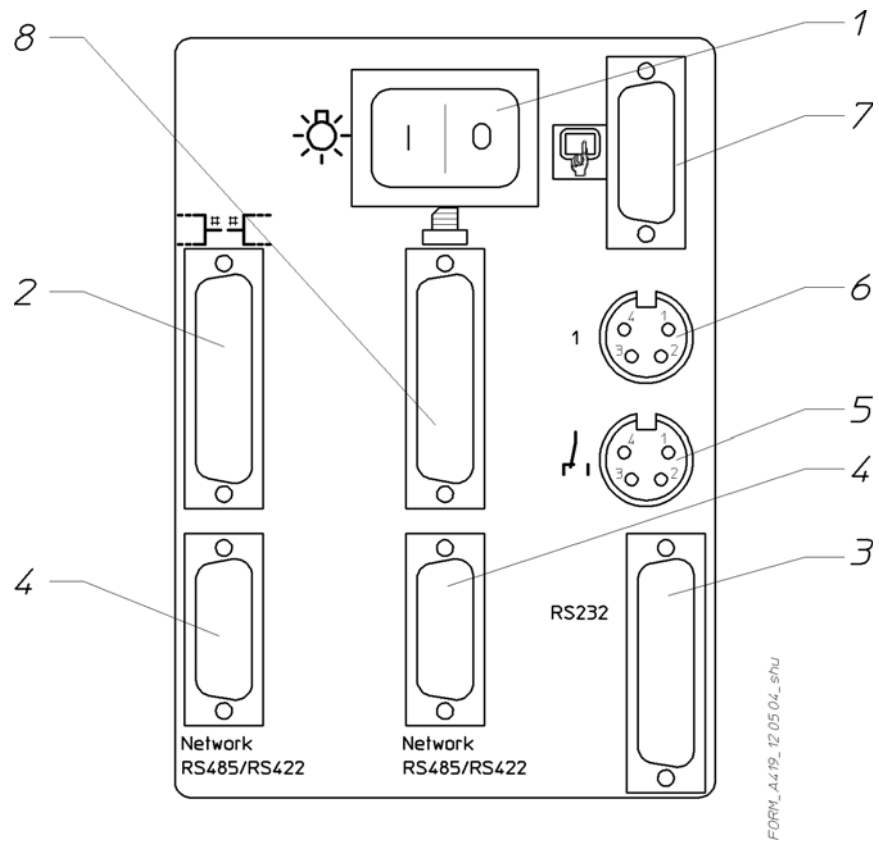


Fig. 2-4
Connector panel³⁾

The connector panel³⁾ contains:

1 Light switch

Plugs for:

2 Digital I/O¹⁾ → Appendix: Interface connections, (page 3)

3 RS 232 interface → Appendix: Interface connections, (page 1)

4 RS 485/RS 422 interface¹⁾ → Appendix: Interface connections, (page 2)

Sockets for:

5 Potential-free contact → Appendix: Interface connections, (page 3)

6 Mobile temperature sensors Pt 100¹⁾ → Appendix: Temperature sensors¹⁾

7 Control unit¹⁾

8 Centronics interface¹⁾



WARNING

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

3 TECHNICAL DATA

These figures represent average values of standard test systems, based on an ambient temperature of +25 °C. Rated voltage → 3.3 *Operating data* (page 15). Without test specimen, without options.



NOTE

The dimensions are specified in the layouts
→ 4.1 *Preparing the place of installation* (page 21)

3.1 General characteristics

Temperature test system	VT 4002	VTM 4004	VTM 7004
Test space volume	16 ltr	37 ltr	37 ltr
Weight	60 kg	115 kg	140 kg

3.2 Mechanical loads

Temperature test system	VT 4002	VTM 4004	VTM 7004
Maximum load (evenly distributed over the entire surface)			
on test space floor	200 kg/m ²		
on each insert shelf ¹⁾²⁾	-	20 kg	
total shelf load ¹⁾²⁾	-	80 kg	

3.3 Operating data

Temperature test system	VT 4002	VTM 4004	VTM 7004
Test space illumination ¹⁾	Incandescent bulb 230 V, 15 W	Halogen bulb 12 V, 20 W	
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	0.7 kW	0.7 kW	0.9 kW
Rated current	4 A	4 A	6 A
On-site fuse protection	16A slow		
Protection class			
switchgear cabinet and control unit	IP 20	IP 54	
Energy consumption at -25 °C	10 kWh/24 hrs	10 kWh/24 hrs	21 kWh/24 hrs
max. heat dissipation to environment	2.5 kW	2.5 kW	1.6 kW

1) Option
2) only for test systems from 37 ltr up
3) only for 16 ltr test system

3.4 Noise measurement

in accordance with DIN 45635 (Part1 accuracy class 2)

Temperature test system	VT 4002	VTM 4004	VTM 7004
Sound pressure level approx. measured at a distance of 1 m from the front, 1 m in height, free-field measurement	< 55 dB(A)	< 54 dB(A)	< 55 dB(A)

3.5 Characteristics for temperature tests

- 3.6 Performance diagrams (page 17)

Temperature test system	VT 4002	VTM 4004	VTM 7004
Temperature range	-40 to +130 °C	-40 to +180 °C	-70 to +180 °C
Temperature differences (after stabilization, according to IEC 60068-3-5)			
Temperature fluctuation temporal, in centre of working space	± 1 K	± 0.2 to ± 0.5 K	
Temperature deviation, spatial (equivalent to temperature gradient)	± 2 K (2 to 4)	± 0.5 to ± 1.5 K (1 to 3)	
Rate of temperature change (according to IEC 60068-3-5)			
Heating	5 K/min	5.3 K/min	5.3 K/min
Cooling	3.5 K/min	6 K/min	4.7 K/min
Heat compensation max.	350 W	550 W	500 W

3.6 Performance diagrams

3.6.1 Rate of temperature change

See → 3.5 Characteristics for temperature tests (page 16)

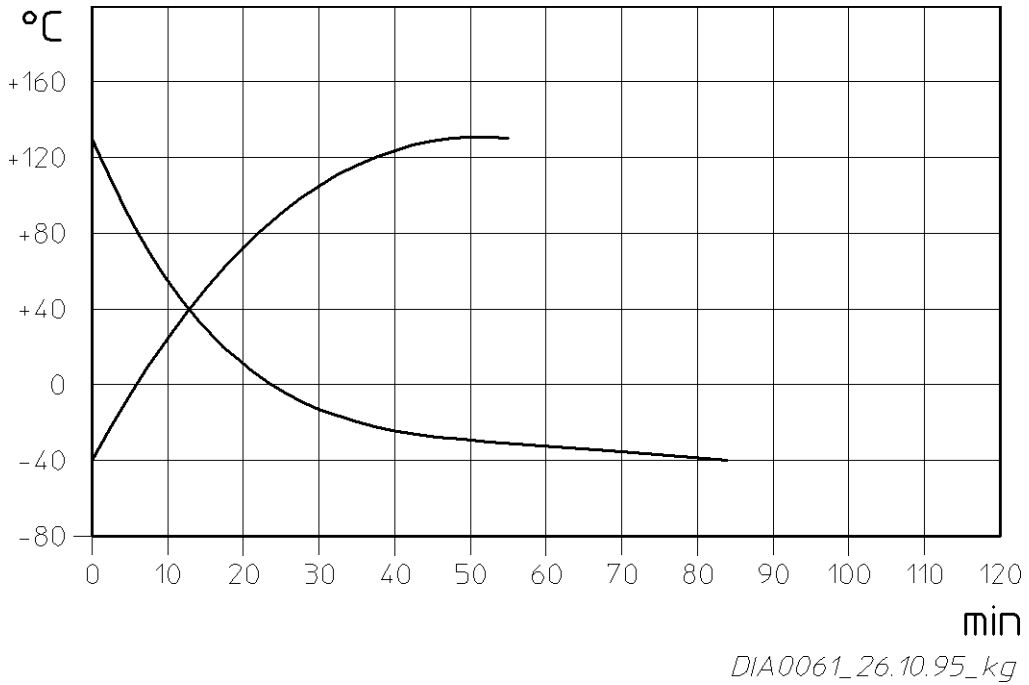


Fig. 3-1
Rate of temperature change without test specimen VT 4002

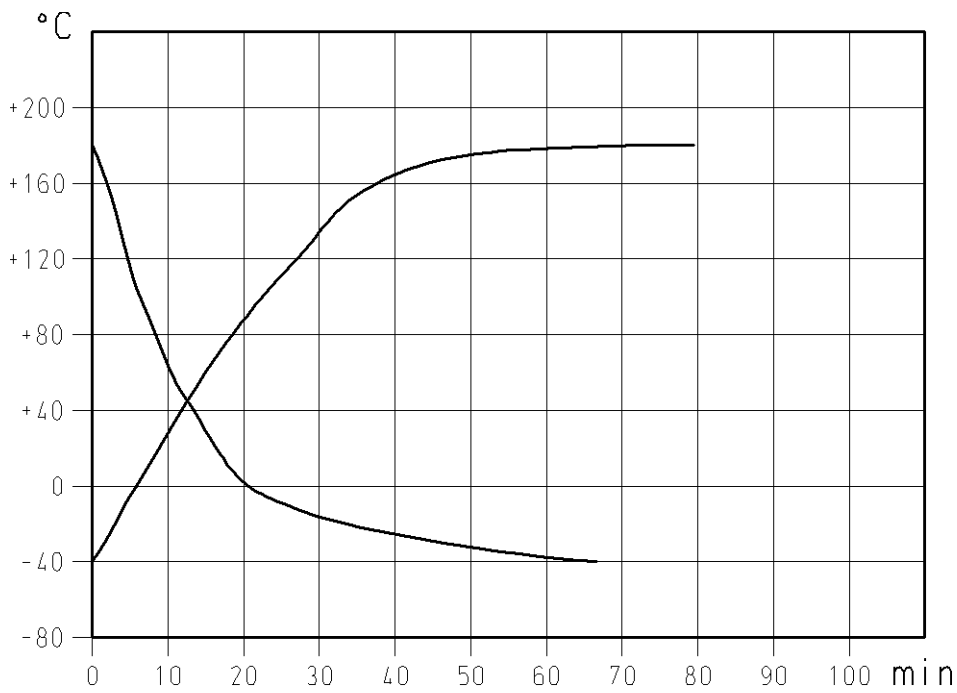
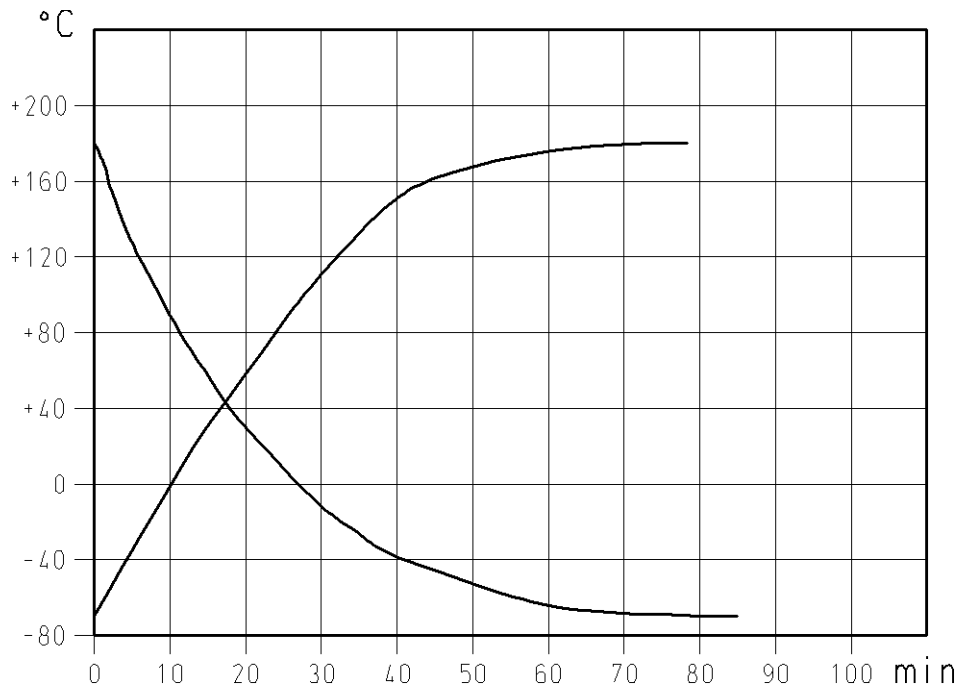


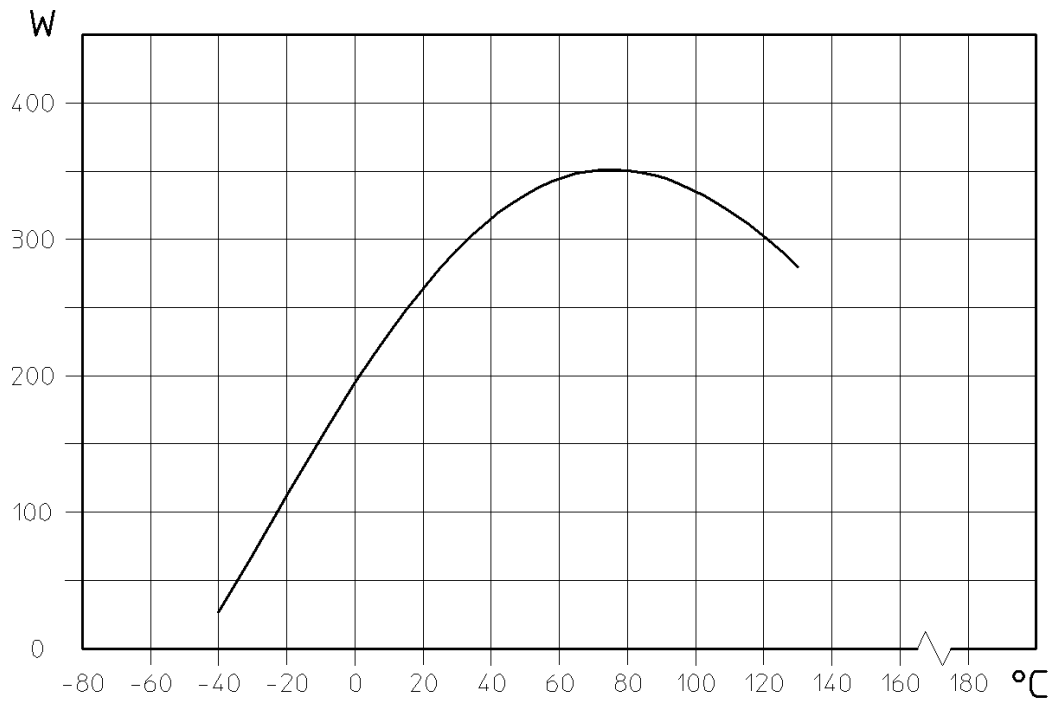
Fig. 3-2
Rate of temperature change without test specimen VTM 4004



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Fig. 3-3
Rate of temperature change without test specimen VTM 7004

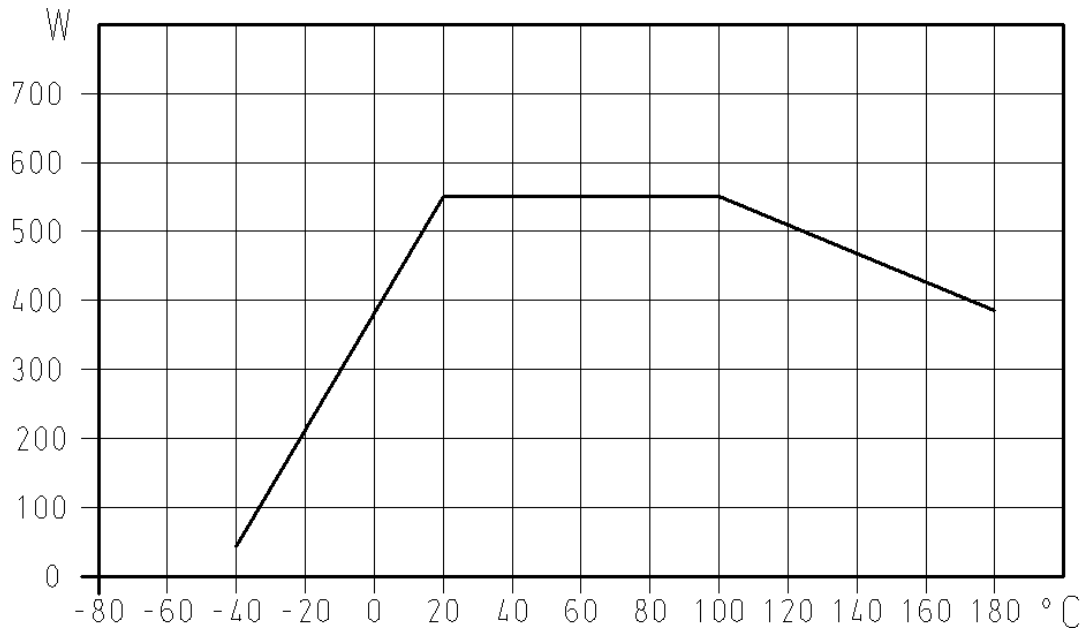
3.6.2 Heat compensation



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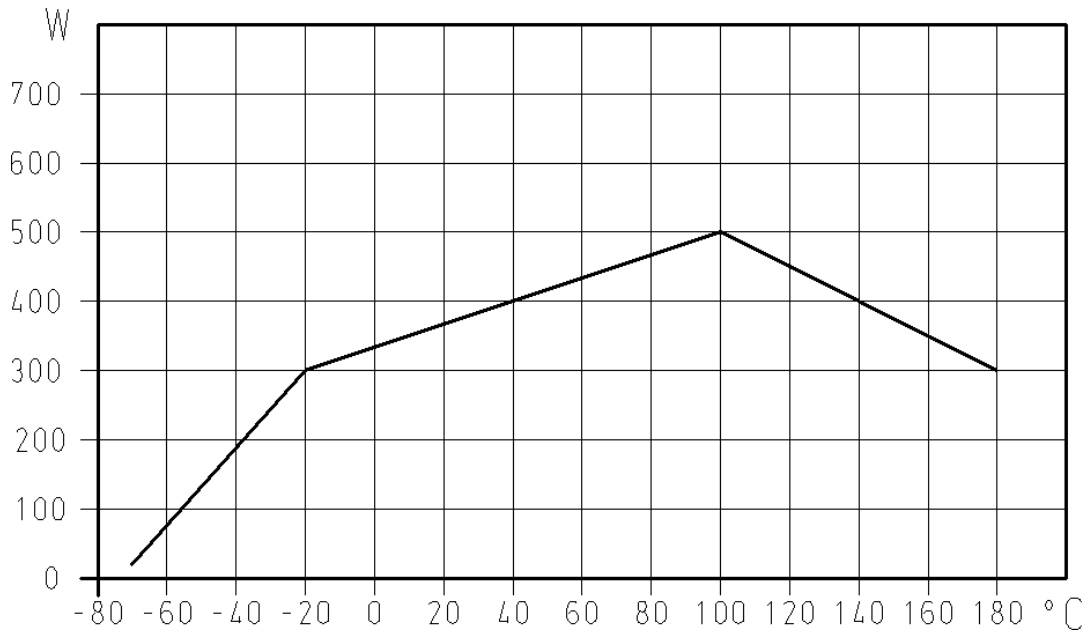
Fig. 3-4
Heat compensation VT 4002

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Kap3.fm 63837034 GB 07.2004



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Fig. 3-5
Heat compensation VTM 4004



DIA0166_08.12.03_shc

Fig. 3-6
Heat compensation VTM 7004

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Kap.3.fm 63837034 GB 07.2004

- 1) Option
- 2) only for test systems from 37 ltr up
- 3) only for 16 ltr test system

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 m³/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 DIN EN 50178
- Altitude <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: +10 °C to +35 °C
- Permissible storage temperature: -25° C to +55 °C
- Relative atmospheric humidity: 75 % max.



WARNING

- Observe the directions in chap. → 1.5 (page 3)

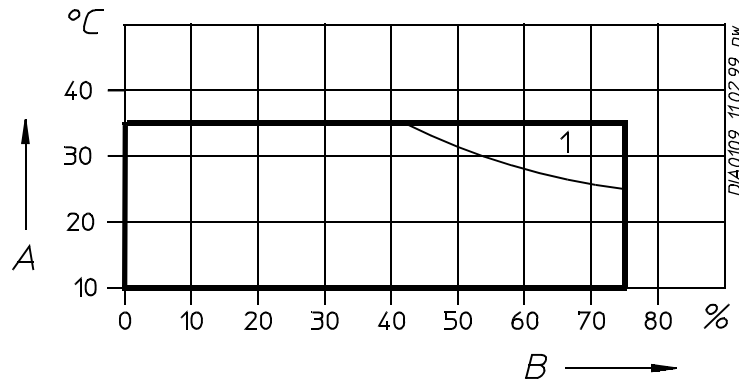


Fig. 4-1
Installation requirements

A = ambient temperature in °C
B = relative humidity in %



NOTE

Low test space temperatures, in conjunction with environmental conditions according to range 1, may cause condensation on the surface of the test system.

4.1.2 Floor requirements

- The floor must be suitable for the weight of the test system and the test specimens → 3.2 Mechanical loads (page 15)
- The floor must be horizontal with an even surface

4.1.3 Space requirements

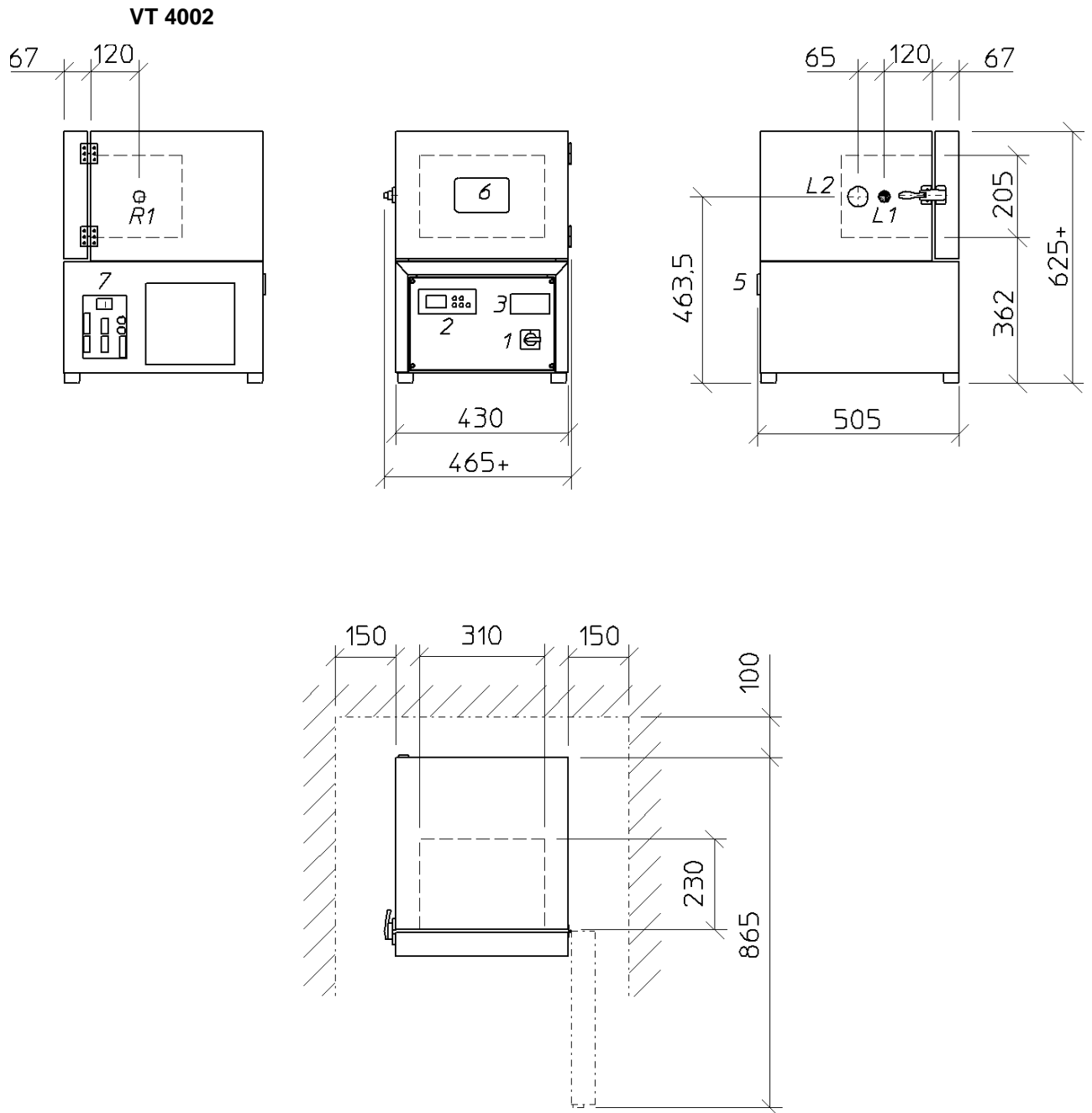
The space requirements depend on the size of the test system.

- Fig. 4-2 Layout VT 4002 (page 23)
- Fig. 4-3 Layout VTM 4004 / VTM 7004 (page 24)



WARNING

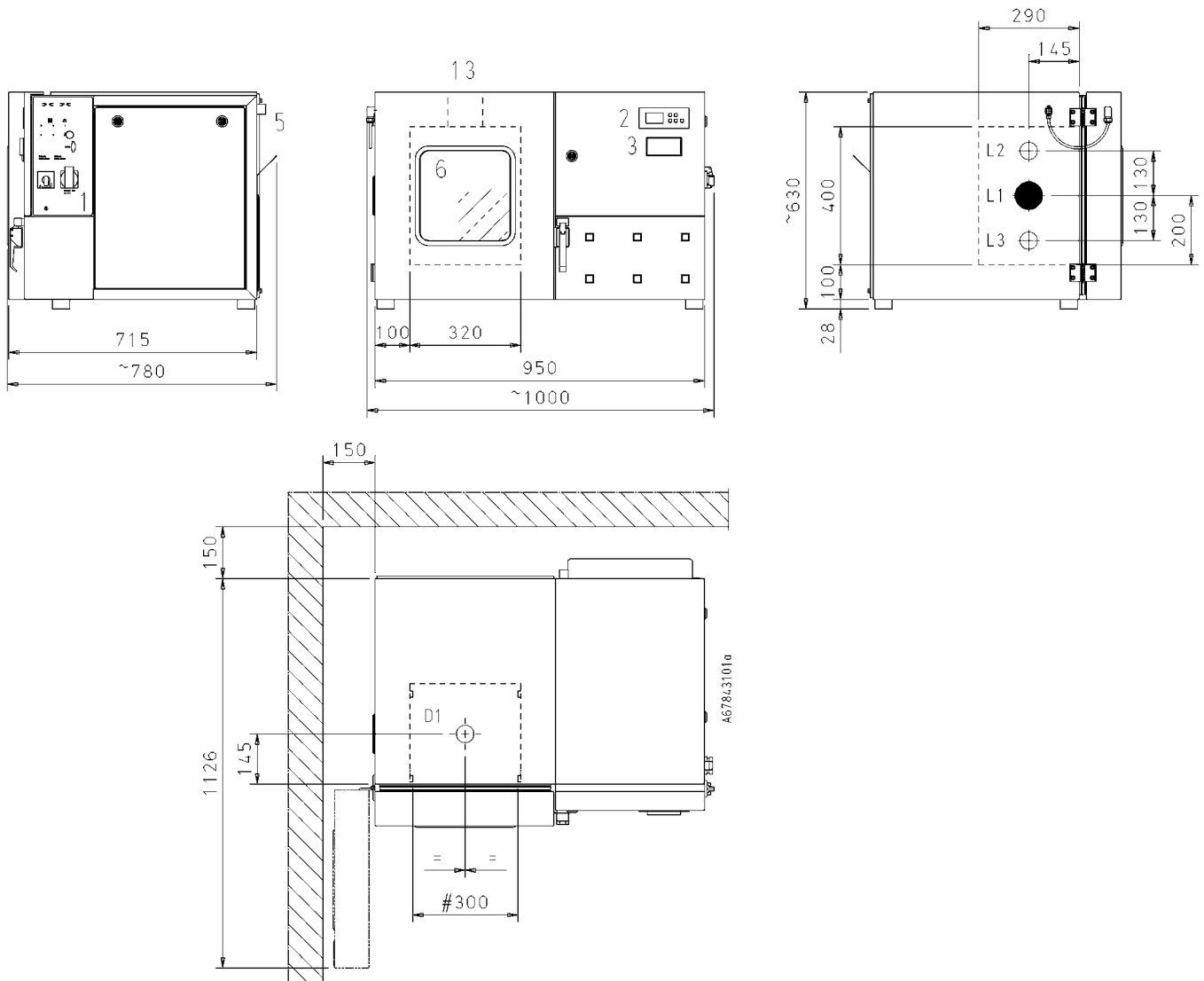
Be sure to maintain the required distance from the wall.



- Entry port installed in basic version
 - L1: NW 25 mm
 - L2¹⁾, R1¹⁾ additional installation position
- 1 Mains switch
- 2 Control unit
- 5 Electrical connection, cable length approx. 5 m
- 6 Door with window
- 7 Connector panel

Fig. 4-2
Layout VT 4002

VTM 4004 / VTM 7004



- Entry port installed in basic version
 - L1: NW 80 mm
 - L2¹⁾, L3¹⁾ additional installation position, left
 - D1¹⁾ installation position in the ceiling
- 1 Main switch panel
- 2 Control unit
- 3 Independent temperature limiter
- 4 Connection for condensate drain¹⁾
- 5 Electrical connection, cable length approx. 5 m
- 6 Door with window¹⁾²⁾
- 13 Lead-through pad¹⁾²⁾
- # Useful width

Fig. 4-3
Layout VTM 4004 / VTM 7004

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 Kap4_fm 63837034 GB 07.2004

1) Option
 2) only for test systems from 37 ltr up
 3) only for 16 ltr test system

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



NOTE

Test systems must be lifted from the front or from behind to enable the pallet to be detached.

- Position the fork under the test system
- Raise the test system by approx. 50 mm
- Transport the test system to the place of installation and unpack it
- The packing material should be disposed of according to regulations

4.3 Supply connections

4.3.1 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



WARNING

If the on-site mains voltage and frequency differ from our standard values as per → 3.3 (page 15) the test system must be connected by a skilled person in accordance with the »Special voltage« manual enclosed.

- Connect the test system to the mains supply

4.4 Precommissioning checks

Verify these preparatory steps:

- Does the place of installation meet the requirements? → 4.1 (page 21)
- Does the wall distance comply with the specifications? → 4.1.3 (page 22)
- Is the test system truly horizontal?
- Are the supply connections set up correctly? → 4.3 (page 25)
- Does the electrical supply comply with our specifications → 3.3 (page 15)

5 PUTTING INTO OPERATION

5.1 Preparing the test specimens

5.1.1 Requirements

You may place the test specimens either on the test space floor or the insert shelf¹⁾²⁾ supplied. Ensure that they are 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 15)
 - Heat influence → 1.6.5 (page 6)

5.1.2 Corrosion caused by the test specimen

In conjunction with high temperatures some test specimens will set harmful substances free which will corrode the chromium-nickel steels in the test space. Regular cleaning of the test space prevents such damage.

Corrosion is mainly caused by:

- Compounds of chlorines
- Acids
- Alkaline solutions



WARNING

Unwashed, mounted PCBs and some plastics set chlorides free. Please do talk to us about suitable precautions before using such test specimens.

5.1.3 Heat-emitting test specimens

Heat-emitting test specimens may be used. The permissible heat emission depends on the size of the test system as well as the test space temperature.
For permissible values → 3.6.2 *Heat compensation* (page 18)



WARNING

The test system switches off automatically in case of faults thus disabling the cooling system. Heat-emitting test specimens would heat up the test space to inadmissible levels. It is therefore necessary to ensure that heat emission from the test specimen is interrupted when the test system is switched off. This may be triggered, for example, by the appropriately converted potential-free contact → Appendix: Interface connections, 1.5 (page 3).

5.2 Adjusting the test specimen protection

5.2.1 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 limit values of the previous test.

Set the limits in accordance with the separate operating manual for the control unit, chapter »Setting the limits«.



NOTE

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.

5.2.2 Test specimen protection by independent temperature limiter

To protect the test specimen against thermal overstressing, the test system is equipped with a temperature limiter which operates independently of the controller. A mobile temperature sensor can be conveniently positioned in the test space.



DANGER

The temperature sensor must not make contact with any live parts

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 at the front of the test system. The measuring sensor »min./max. protect« is in the test space.



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.

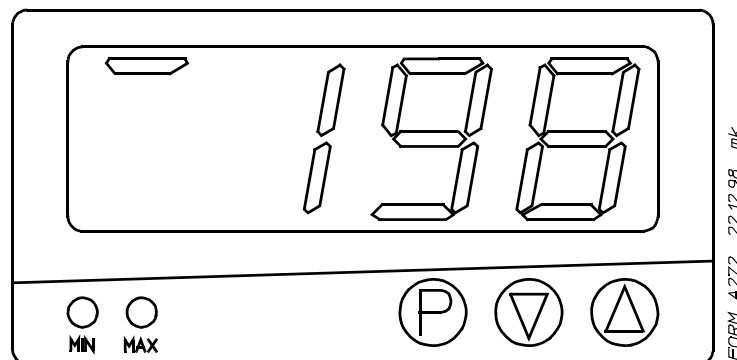


Abb 5-1
Temperature limiter

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:

Input the maximum temperature value as follows:

Use P to select display »AH«

$\text{P} + \Delta > 3\text{s}$	»AH« (alarm limit high) and actual maximum temperature value are displayed alternately
Δ or ∇	Select the desired temperature value
2 x P	Save the temperature value, return to basic setting

Input the minimum temperature value as follows:

Use P to select display »AH«

$\text{P} + \nabla > 3\text{s}$	»AL« (alarm limit low) and actual minimum temperature value are displayed alternately
Δ or ∇	Select the desired temperature value
2 x P	Save the temperature value, return to basic setting



NOTE

Depress the combinations $\text{P} + \Delta$ or $\text{P} + \nabla$ simultaneously for more than 3 seconds while »AH« is being displayed, otherwise the temperature value cannot be changed. In this case use P again to select display »AH«.

If the changed temperature value is not saved with 2 x P , 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 P
- Keep P pressed for approx. 3 seconds, the indicator light goes off
- Acknowledge the fault message on the control unit as follows:
 - Mark the fault message with arrow
 - Press »QUIT« to eliminate the fault message → *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 P , the actual value can be interrogated on the temperature limiter via function »INP«.

If no test specimen protection is required, the sensor may be placed in the mounting at the rear panel.

5.3 Sealing the entry ports

- Close the entry ports with the sealing plugs supplied.
- If cables etc. are introduced through the entry ports, ensure the clearance is sealed.

5.4 Switching on the test system

Set the mains switch to position »I«

5.5 Test space illumination

Test systems from 37 ltr up are provided with test space illumination only if ordered with window¹⁾.

- Use the test space illumination only when actually needed.
For location of light switch → *Fig. 2-3 (page 11)* or → *Fig. 2-4 (page 13)* .

5.6 Starting a test

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

- Manual mode
- Automatic mode → *5.6.2 Stored standard programs (page 32)*
- For further details please refer to the separate operating manual for the control unit

5.6.1 Temperature tests in manual mode

→ *operating manual for the control unit, chap. 4*

Proceed as follows:

- Input the temperature setpoint on the control unit
- Start the test

5.6.2 Stored standard programs

Fixed standard programs are available for automatic mode.

Program location	Test standard	Identical with test standard	Example
101	IEC 60068-2-1, Test A	DIN 40046 Part 3 BS 2011 Part 3 MIL STD 810 Meth. 502.2	t = -25 °C, 96 h
102	IEC 60068-2-2, Test B	DIN 40046 Part 4 BS 2011 Part 2 MIL STD 810 Meth. 501.1	t = +125 °C, 96 h
103	IEC 60068-2-14, TEST Nb	MIL STD 331 Part 112 DIN 40046 Part 14	t ₀ = +125 °C, t _U = -25 °C 1 K/min, t ₀ , t _U : 2 h

5.7 Preoperational check list

Verify these preparatory steps:

- Is the test specimen suitable for the planned test? → 5.1 (page 27)
- Disconnection of heat-emitting test specimens must be ensured → 5.1.3 (page 28)
- Check settings on software temperature limiter → 5.2.1 (page 28)
- Check settings on independent temperature limiter → 5.2.2 (page 29)
- Are the entry ports sealed? → 5.3 (page 31)
- Maintenance work to be expected during the scheduled test period should be carried out beforehand → 8.3 (page 40)
- Have all options been installed correctly?

6 PUTTING OUT OF OPERATION

Please observe the following differentiations:

6.1 After each test

After termination of a test, and before removing the test specimen, ensure that the inside of the test system has assumed room temperature.

- Input 25 °C on the control unit (→ *operating manual for the control unit*)
- Set the test system to room temperature
- Press »Stop« to finish the test
- Put external systems out of operation
- Put optional equipment out of operation



DANGER

The test space, the inside of the door, the air in the test space as well as the test specimen may still be hot or extremely cold.

- Open the test space door - be sure to avert your face from the test space air.
- Avoid contact with hot or extremely cold parts
- Remove the test specimen from the test space - be sure to wear protective gloves
- 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 chapter 6.1 *After each test* (page 33) - must be performed:

- Set the mains switch to »O«
- Pull the mains plug

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

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 and electrical components 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.

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.

7.1 General malfunctions

Fault	Possible cause	Rectification
Temperature setpoints cannot be achieved	Lack of refrigerant in the refrigerating unit	Contact our service organisation


7.2 Fault messages

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

If a fault occurs proceed as follows:

- Rectify the fault in accordance with the following table
- Acknowledge the error message in accordance with the operating manual for the control unit
- Resume operation

Code No.	Message	Possible cause	Rectification
1	Act. value defect:EKO/X21	Temperature sensor defective	Switch off the test system Contact our service organisation
2	Act. value defect:EK1/X22	Sensor defective	Switch off the test system Contact our service organisation
3	Act. value defect:EK2/X23	Sensor defective	Switch off the test system Contact our service organisation
12	Change backup-battery	Controller battery exhausted	Switch off the test system Contact our service organisation
13	Communication control unit	Connection control unit - controller interrupted	Check connectors
14	Communication I/O system	Connection controller - I/O system interrupted	Switch off the test system Contact our service organisation
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 power failure and tolerance band values. Restart the test system.

Code No.	Message	Possible cause	Rectification
17	Service	Overload or short circuit of motor protecting switch	 DANGER This fault can cause contact welding of the associated load contactor thus rendering the safety device ineffective. Switch off the test system and notify our service organisation.
18	Thermal protection fan	Thermal protection of test space fan triggered	Switch off the test system. Check motor for smooth running and impurities. Check cooling air supply. If necessary, clean and remove impurities.
19	Temp. limiter testchamber	Thermal safety device in the test space triggered	Switch off the test system Contact our service organisation
20	Thermal specimen protection	1. 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	2. 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 <i>Technical Data (page 15)</i>
33	Thermal prot. compr. precooling	Thermal protection of precooling compressor triggered	Contact our service organisation
34	High pressure compr. pre-cooling	Excess pressure in the refrigerating unit	Switch off the system. Clean condenser. On water-cooled ¹⁾ systems check water inlet, clean dirt filter, check water pressure and water inlet temperature.
36	Low pressure compressor PC	Low pressure in the refrigerating circuit	Switch off the system. Contact our service organisation.

- 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 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.

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 40) 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 should only be performed by our service, 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.

8.2 Consumables

The following material is used for maintenance:

Ordering code	Designation
60885666	Halogen bulb 12 V / 20 W ¹⁾²⁾
60450202	Incandescent bulb 230 V, 15 W ³⁾

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

1) Option
2) only for test systems from 37 ltr up
3) only for 16 ltr test system

8.3 Maintenance schedule

Interval	Assembly group / component	Activity	Follow directions in chap.
After each test	Test space	Clean	→ 8.4.1 (page 40)
	Test space seal	Clean	→ 8.4.2 (page 41)
	Condensate drain ¹⁾²⁾	Open	→ 8.4.7 (page 44)
Quarterly	Fins on air-cooled condenser	Clean	→ 8.4.4 (page 41)
As necessary	Halogen bulb ¹⁾²⁾	Replace	→ 8.4.5 (page 42)
	Incandescent bulb ³⁾	Replace	→ 8.4.6 (page 43)

8.4 Maintenance work

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



DANGER

Prior to performing maintenance work, guard the mains switch against accidental switching on.



WARNING

When servicing the switchgear cabinet or mechanical section, ensure there is a sufficiently large clearance around the test system - even with open doors - to serve as escape route. If the clearance is too small, move the test system as required.



WARNING

Do not use sharp tools for maintenance work



DANGER

- Wear protective gloves

8.4.1 Cleaning the test space

To prevent corrosion, the inner walls and the test space floor must be cleaned after each test with clean water and a regular detergent and subsequently dried.

Corrosive deposits must be removed without delay with a regular stainless steel cleanser. Be sure to remove all cleanser residue afterwards. If corrosive spots cannot be eliminated this way, polish with stainless steel cleaning wool only.

8.4.2 Cleaning the test space seal

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

8.4.3 Checking the test space tightness

The test space must be sealed up tightly. Check the tightness as follows:

- Place a paper strip between test space door and seal
- Pull it out - there must be a noticeable resistance
- Repeat this procedure all around the door

If the sealing is not tight, contact our service organisation.

8.4.4 Cleaning the air-cooled condenser



DANGER

The fins of the condenser may cause hand injuries

- Be sure to wear protective 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 a brush.

8.4.5 Replacing the halogen bulb¹⁾²⁾

The light is located behind the rear panel in the test space, on the left.

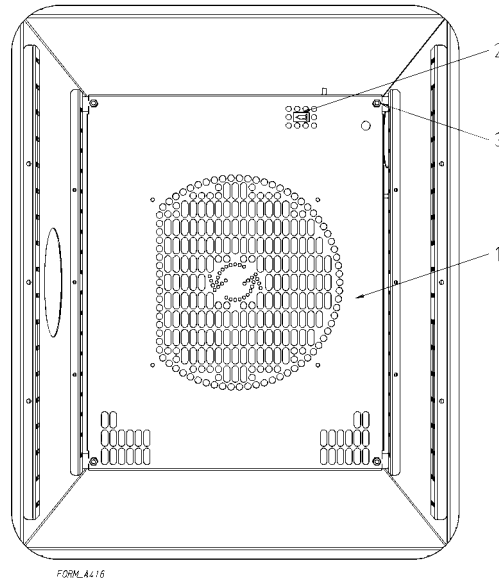


Fig. 8-1
Test space illumination¹⁾²⁾

To reach the halogen bulb, remove the rear panel in the test space as follows:

- Undo 4 nuts (3)
- Remove the rear panel (1)
- Pull out the defective bulb (2)
- Take the new bulb in a clean cloth and insert it
- Reassemble in reverse order

8.4.6 Replacing the incandescent bulb³⁾

The light is located behind the rear panel in the test space, on the left.

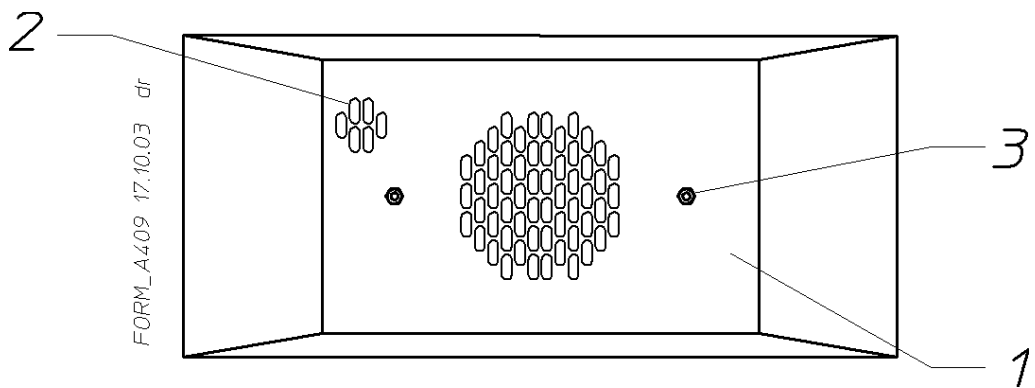


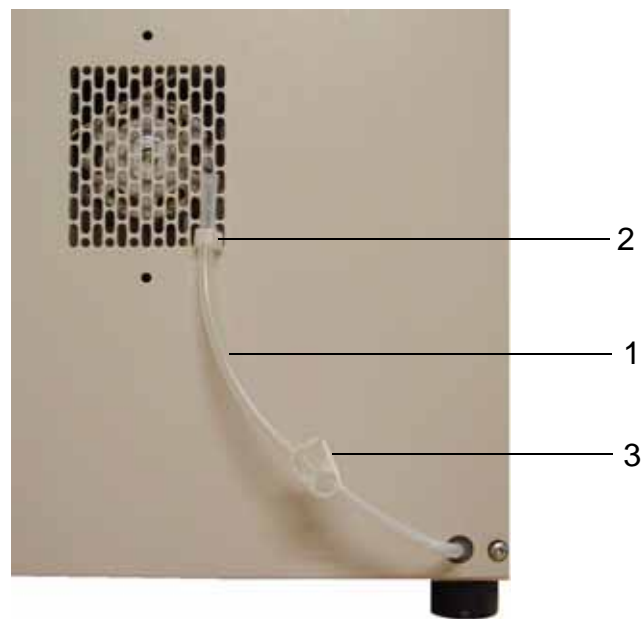
Fig. 8-2
Test space illumination³⁾

To reach the incandescent bulb, remove the rear panel in the test space as follows:

- Undo 2 nuts (3)
- Remove the rear panel (1)
- Pull out the defective bulb (2)
- Take the new bulb in a clean cloth and insert it
- Reassemble in reverse order

8.4.7 Draining the condensate¹⁾²⁾

Condensate collects in the discharge hose. To empty the hose, proceed as follows:



*Fig. 8-3
Condensate drain*

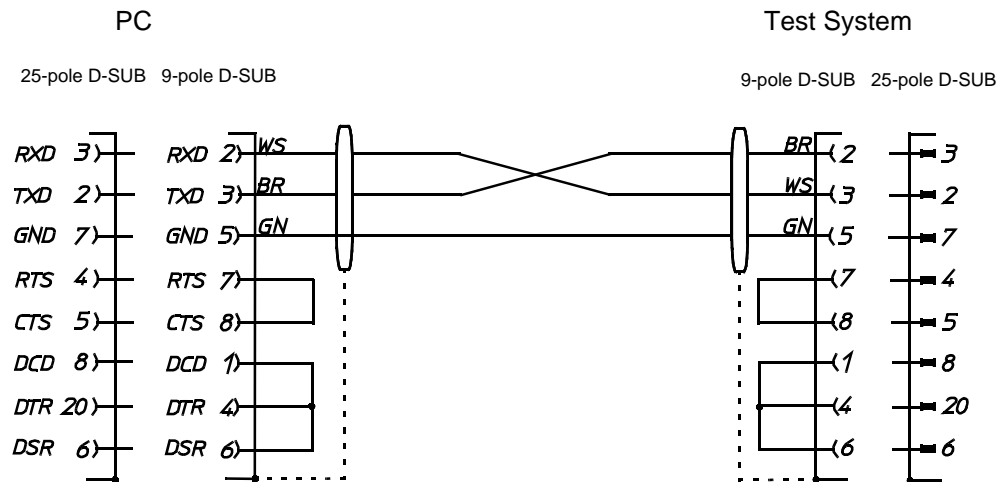
- Detach the hose (1) from the sleeve (2)
- Open the hose clip (3) and drain the water into a vessel
- Close the hose clip (3)
- Fit the hose (1) in the sleeve (2)

APPENDIX: INTERFACE CONNECTIONS

→ 2.2.9 Main switch panel2) (page 11) or → 2.2.10 Connector panel3) (page 13)

1.1 Interface RS 232

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



Suitable connecting cables and adaptors are available as an option.



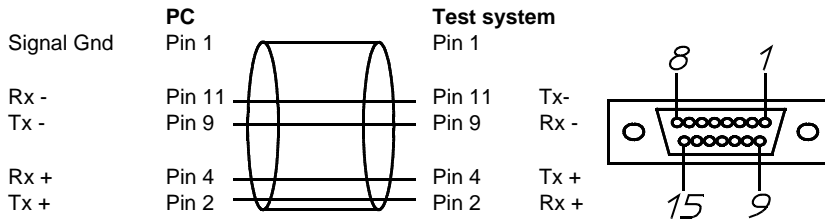
NOTE

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

1.2 Interface RS 485 / RS 422¹⁾

The network RS 485/RS 422¹⁾ 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

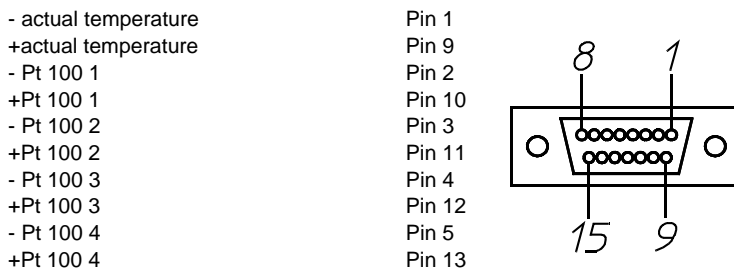
The pin assignment for PC is only valid in connection with interface converter RS 232 / RS 485, ordering code 63823080.

Interfaces RS 232 and RS 485/422 cannot be used simultaneously.

1.3 Analog I/O¹⁾²⁾

The Analog I/O¹⁾²⁾ connection is used for external acquisition of actual temperature values. Outputs 0 - 10 V = -100 °C to +200 °C. Max. insulation voltage to ground is 1 kV-DC.

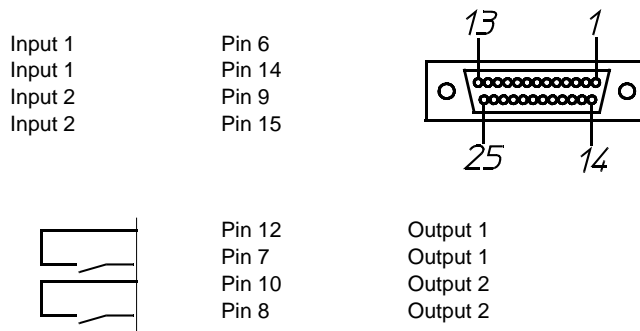
The 15-pole D-subminiature connector is assigned as follows:



1.4 Digital I/O¹⁾

The Digital I/O¹⁾ 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 connector is assigned as follows:



1.5 Potential-free contact for disconnecting test specimens

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.

APPENDIX: ETHERNET INTERFACE¹⁾

This appendix contains installation instructions for the Ethernet interface.

1.1 Description

The interface enables communication with the Simpati software¹⁾ (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

Owing to the installation of the TCP/IP interface, interface RS 232 is no longer available. The Ethernet and RS 485/422¹⁾ interfaces cannot be used simultaneously.

1.3 Preparation for initial operation

1.3.1 Installing the connecting cable

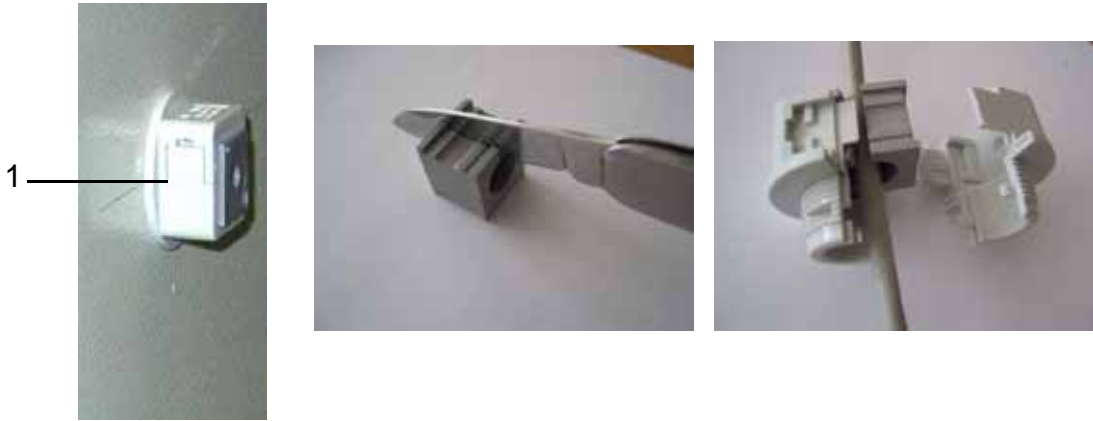


DANGER

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

Install the connecting cable as follows:

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



- Screw the cable gland including cable to the test system
- Insert the plug into socket (2)



Fig. 1-1
Cable gland Ethernet interface

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

APPENDIX: TEMPERATURE SENSORS¹⁾

This appendix contains installation and operating instructions for temperature measurement on the test specimen.

1.1 Description

A mobile Pt 100 sensor is used for temperature measurement on the test specimen or any other place in the test space.

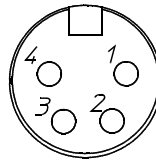
Plug the mobile temperature sensor into the assigned socket on the main switch panel²⁾ → 2.2.9 Main switch panel²⁾ (page 11) or connector panel³⁾ → 2.2.10 Connector panel³⁾ (page 13) and lead it through the entry port into the test space. Fix it to a convenient spot in the test space or on the test specimen. The measured temperature value can be displayed on the control unit or called via interface RS 232 or free analog outputs.

1.2 Technical data

For measuring range (temperature range of the test system) see *chap. 3 (page 15)*.

The 4-pole socket is assigned as follows:

- Pt 100 1	Pin 1
+ Pt 100 1	Pin 2
Shield	Pin 3



Pin assignment, if option Analog I/O is used → *Appendix: Interface connections, 1.3 (page 2)*

1.3 Preparation for initial operation

On delivery of the test system you will find the Pt 100 sensor in the test space. Connect it as follows:

- Insert the connector of temperature sensor »Sensor 1« into socket 1 on the main switch panel



NOTE

If there are several sensors, match them with sockets 1 - 4 accordingly.

- Lead the sensor through the entry port into the test space
- Fix it to a convenient spot in the test space or on the test specimen



DANGER

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

1.4 Putting into operation

In addition to this manual, the operating manual for the control unit must be observed prior to performing temperature measurement on the test specimen.

1.4.1 Display of temperature values on the control unit

The actual temperature values are displayed on the control unit via menu »Program selection« → »Pt 100 No. 1 (...4)« → *Operating manual for the control unit, chap. »Input mode«*.

1.4.2 Calling temperature values via interface RS 232 or analog outputs

Proceed as follows:

- Call temperature value on on-site PC with software SIMPATI¹⁾, or
- Use on-site recording equipment for printout

1.5 Putting out of operation

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

1.6 Fault diagnosis and rectification

The sensor is monitored for fractures and short circuit by the controller. If a fault occurs, a temperature below -90 °C will be displayed. In this case, the sensor must be replaced.

APPENDIX: CONTROL UNIT »TOUCHPANEL«¹⁾

Instead of control unit »Mincontrol«, which is installed in the switchgear cabinet, the test system can be supplied with control unit »Touchpanel«¹⁾.

1.1 Installation

Install the control unit as follows:

- Remove it from the carton and unpack it
- Place it on top of the test system
- Insert the connecting cable in the connector panel

APPENDIX: LEAD-THROUGH PAD¹⁾²⁾

This appendix contains operating instructions for the lead-through pad¹⁾²⁾.

1.1 Description

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 lead-through pad enables cables to 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 sealed when the door is closed.

1.2 Technical data

Number of ports	5
Diameter of cables	2 to 7 mm

1.3 Inserting the cables

- Squeeze the individual cables (1) into the slots, starting at the edge → Fig. 1-1 .

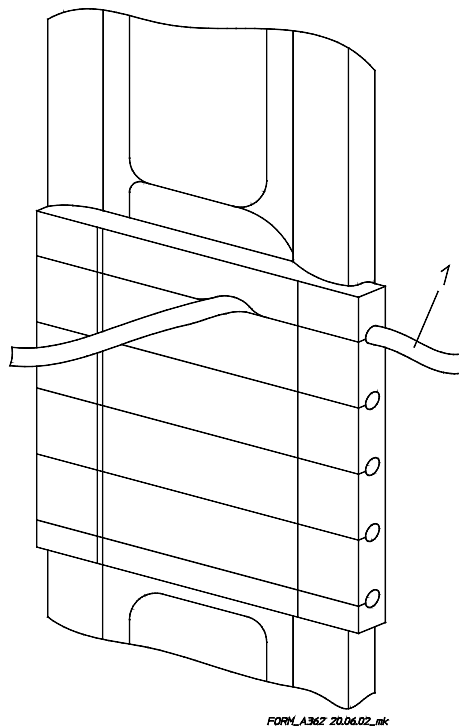


Fig. 1-1

1.4 Maintenance

1.4.1 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 → Fig. 1-2 (page 2).

**NOTE**

Be careful not to damage the test space seals

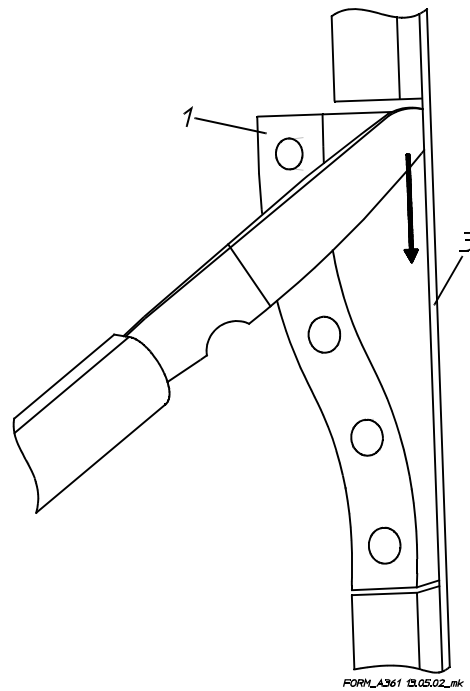


Fig. 1-2

- 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 → Fig. 1-3 (page 3).

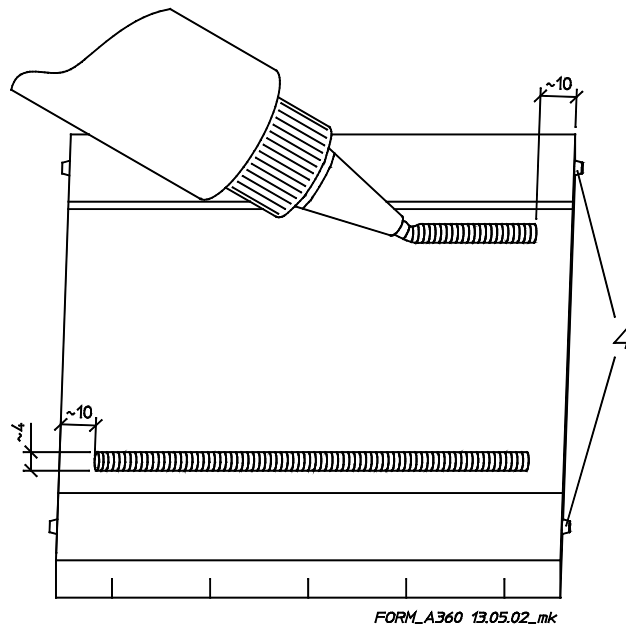


Fig. 1-3

- Insert the lead-through pad in the masking frame in such a manner that the slots remain accessible (they must be on the outside)
- Insert the lugs (4) of the lead-through pad into the recess of the test space seals
- Close the test space door
- Allow the silicone adhesive to set for approx. 24 h



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 fixing the lead-through pad.

1.4.2 Consumables

Ordering code	Designation
62652002	Lead-through pad
60272309	Silicone adhesive

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

APPENDIX: DEHUMIDIFICATION DURING THE HEATING PHASE¹⁾²⁾

This appendix contains operating instructions for the dehumidification during the heating phase.

1.1 Description

To prevent moisture condensation on the test specimen, part of the cooling system is activated during the heating phase.

Dehumidification is effective only in the temperature range of -40 °C to +60 °C. On reaching the setpoint, or as soon as the cooling phase starts, dehumidification is switched off with a 5-minute delay.

Activation → 1.2 (page 1)

1.2 Putting into operation

→ *Operating manual for the control unit*

- Input the temperature setpoint on the control unit
- Activate digital channel »START«
- Activate digital channel »Condensation protection«



NOTE

Dehumidification is only effective from -40 °C to +60 °C during the heating phase. Its effectiveness depends on the mass and surface of the test specimen.

1.3 Putting out of operation

- Deactivate digital channel »Condensation protection« (→ *Operating manual for the control unit*)



NOTE

Hose clip SK1 on the discharge hose must be opened regularly to allow the condensate to drain off → 8.4.7 (page 44)

APPENDIX: GN₂ PURGING¹⁾²⁾

This appendix contains operating instructions for purging with gaseous nitrogen.

1.1 Description

Purging with gaseous nitrogen is used to prevent oxydation of the test specimens.

The nitrogen is introduced into the test space via a solenoid valve. The nitrogen flow rate is factory-adjusted to the test space volume.

The nitrogen discharges via the pressure compensation module at the side of the test system.

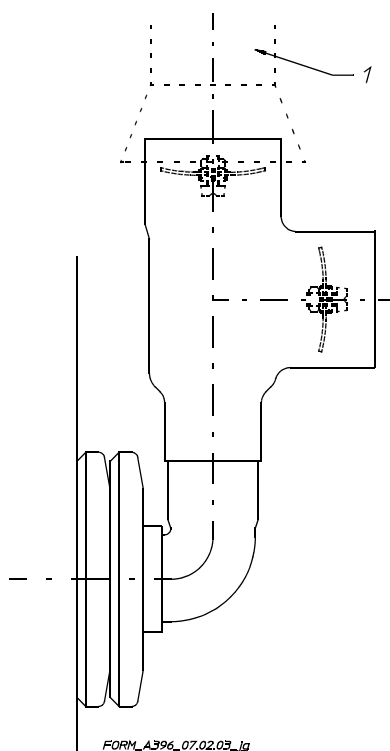


Abb 1-1
Pressure compensation module

- 1 Connection to on-site exhaust system



DANGER

Nitrogen is odourless, tasteless, colourless and non-toxic. If it escapes into the room, it displaces the oxygen. Adequate ventilation of the room is therefore indispensable.

1.2 Technical data

On-site nitrogen supply	Max. 12 bar g
Nitrogen flow rate	The nitrogen content in the test space is renewed approx. 4 times per hour

1.3 Preparation for initial operation

Prior to putting into operation take the following steps:

- Attach the coupling to the on-site nitrogen hose (inside diameter 6 mm)
- Insert the coupling into connection »Compressed air/GN2«
- Set the pressure reducer of the nitrogen supply to max. 12 bar g
- If necessary, reduce the flow rate on the pressure reducer at the test system

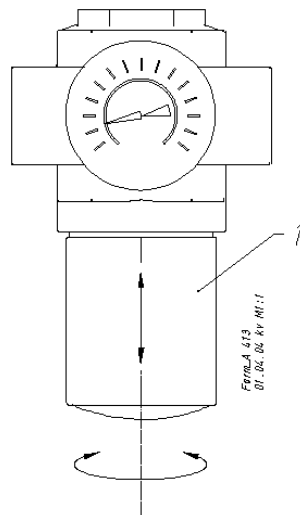


Abb 1-2
Pressure reducer

- Pull part (1) downward
- Set the operating pressure
- Push part (1) back into initial position
- Lead the nitrogen discharged by the pressure compensation module into an exhaust system with open funnel connection



DANGER

To prevent overpressure in the test space, the nitrogen flow rate must not be increased.

1.4 Putting into operation

In addition to this manual, the separate operating instructions for the control unit must be observed prior to performing nitrogen purging.

First, put the test system into operation in accordance with → 5 *Putting into operation* (page 27) and the operating instructions for the control unit. Then start nitrogen purging as follows:

- Make sure the nitrogen supply is in order
- Check the setting on the pressure reducer of the nitrogen supply
- Activate digital channel »Compressed air/GN2«

1.5 Putting out of operation

- Disconnect the nitrogen supply
- Deactivate digital channel »Compressed air/GN2«

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1) Option
 2) only for test systems from 37 ltr up
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