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Operating Manual

APT.line™ MK (E2.1)

Alternating climate chamber with program control

Model	Art. No.
MK 53 (E2.1)	9020-0006, 9120-0006

BINDER GmbH

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EC – Declaration of Conformity

CE

EG – KONFORMITÄTSERKLÄRUNG
EC - DECLARATION OF CONFORMITY
CE - DECLARATION DE CONFORMITE

Anbieter / Supplier / Fournisseur:	BINDER GmbH
Anschrift / Address / Adresse:	Im Mittleren Ösch 5, D-78532 Tuttlingen
Produkt / Product / Produit:	Umweltsimulations-Schrank für klassische Temperaturprofile mit Programmregelung Environmental simulation chamber for traditional temperature profiles with program control Chambre d'essais climatiques pour profils thermiques classiques à régulation programmable
Typenbezeichnung / Type / Type:	MK 53

Die oben beschriebenen Produkte sind konform mit folgenden EG-Richtlinien:
The products described above are in conformity with the following EC guidelines:
Les produits décrits ci-dessus sont conformes aux directives CE suivantes:

Niederspannungsrichtlinie 2006/95/EG Low voltage directive 2006/95/EC Directive basse tension 2006/95/CE	Richtlinie 2006/95/EG des Europäischen Parlaments und des Rates vom 12. Dezember 2006 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten betreffend elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen Council Directive 2006/95/EC of 12 December 2006 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits Directive 2006/95/CE du Parlement Européen et du Conseil du 12 décembre 2006 concernant le rapprochement des législations des États membres relatives au matériel électrique destiné à être employé dans certaines limites de tension
EMV-Richtlinie 2004/108/EG EMC Directive 2004/108/EC Directive CEM 2004/108/CE	Richtlinie 2004/108/EG des Europäischen Parlaments und des Rates vom 15. Dezember 2004 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit und zur Aufhebung der Richtlinie 89/336/EWG. Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 98/336/EEC. Directive 2004/108/CE du Parlement Européen et du Conseil du 15 décembre 2004 relative au rapprochement des législations des États membres concernant la compatibilité électromagnétique et abrogeant le directive 98/336/CEE.

Die oben beschriebenen Produkte tragen entsprechend die Kennzeichnung CE.
The products described above, corresponding to this, bear the CE-mark.
Les produits décrits ci-dessus, en correspondance, portent l'indication CE.

Die oben beschriebenen Produkte sind konform mit folgenden harmonisierten Normen:
The products described above are in conformity with the following harmonized standards:
Les produits décrits ci-dessus sont conformes aux normes harmonisées suivantes:

Sicherheit / safety / sécurité:

EN 61010-1:2010	Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte – Teil 1: Allgemeine Anforderungen (DIN EN 61010-1:2011, VDE 411-1:2011)
	Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements (IEC 61010-1:2010, BS EN 61010-1:2010)
	Règles de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire – Partie 1: Prescriptions générales (CEI 61010-1:2010, NF EN 61010:2011)
EN 61010-2-010:2003	Sicherheitsbestimmungen für elektrische Meß-, Steuer-, Regel- und Laborgeräte – Teil 2-010: Besondere Anforderungen an Laborgeräte für das Erhitzen von Stoffen (DIN EN 61010-2-010:2004)
	Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-010: Particular requirements for laboratory equipment for the heating of materials (IEC 61010-2-10:2005, BS EN 61010-2-10:2003)
	Règles de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire – Partie 2-010 : Prescriptions particulières pour appareils de laboratoire utilisés pour l'échauffement des matières (CEI 61010-2-10:2003, NF EN 61010-2-10:2005)

EMV / EMC / CEM:

EN 61326-1:2006 + Corr. 1:2008 + Corr. 2:2010	Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen - Teil 1: Allgemeine Anforderungen (DIN EN 61326-1:2006 + Berichtigung 1:2008 + Berichtigung 2:2011)
	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements (IEC 61326-1:2005 + Corr. 1:2008 + Corr. 2:2010, BS EN 61326-1:2006+ A1:2008)
	Matériel électrique de mesure, de commande et de laboratoire - Exigences relatives à la CEM - Partie 1: Exigences générales (CEI 61326-1:2005 + AC1:2008, NF EN 61326-1:2006 mod.)
EN 61326-2-2:2006	Elektrische Mess-, Steuer-, Regel- und Laborgeräte – EMV-Anforderungen. Teil 2-2: Besondere Anforderungen - Prüfanordnung, Betriebsbedingungen und Leistungsmerkmale für ortsveränderliche Prüf-, Mess- und Überwachungsgeräte in Niederspannungs-Stromversorgungsnetzen. (DIN EN 61326-2-2:2006)
	Electrical equipment for measurement, control and laboratory use – EMC requirements. Part 2-2: Particular requirements - Test configurations, operational conditions and performance criteria for portable test, measuring and monitoring equipment used in low-voltage distribution systems. (IEC 61326-2-2:2005, BS EN 61326-2-2:2006)
	Matériel électrique de mesure, de commande et de laboratoire – Exigences relatives à la CEM. Partie 2-2: Exigences particulières - Configurations d'essai, conditions de fonctionnement et critères d'aptitude à la fonction des matériels portatifs d'essai, de mesure et de surveillance utilisés dans des systèmes de distribution basse tension. (CEI 61326-2-2:2005 + AC1:2007, NF EN 61326-2-2:2006)

D-78532 Tuttlingen, 16.01.2013

BINDER GmbH

P. M. Binder

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B. Hofmann

Leiter F & E
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CONTENTS

Dear customer,

For the correct operation of the alternating climate chamber MK, it is important that you read this operating manual completely and carefully and observe all instructions as indicated. Failure to read, understand and follow the instructions may result in personal injury. It can also lead to damage to the unit and/or poor equipment performance.

1. Safety

This operating manual is part of the components of delivery. Always keep it handy for reference. The device should only be operated by laboratory personnel especially trained for this purpose and familiar with all precautionary measures required for working in a laboratory. Observe the national regulations on minimum age of laboratory personnel. To avoid injuries and damage observe the safety instructions of the operating manual.

WARNING

Failure to observe the safety instructions.

Serious injuries and unit damage.

- Observe the safety instructions in this operating manual
- Carefully read the complete operating instructions of the alternating climate chamber MK.

1.1 Legal considerations

This operating manual is for informational purposes only. It contains information for installing, start-up, operation and maintenance of the product. Note: the contents and the product described are subject to change without notice.

Understanding and observing the instructions in this operating manual are prerequisites for hazard-free use and safety during operation and maintenance. In no event shall BINDER be held liable for any damages, direct or incidental arising out of or related to the use of this manual.

This operating manual cannot cover all conceivable applications. If you would like additional information, or if special problems arise that are not sufficiently addressed in this manual, please ask your dealer or contact us directly by phone at the number located on page one of this manual

Furthermore, we emphasize that the contents of this operating manual are not part of an earlier or existing agreement, description, or legal relationship, nor do they modify such a relationship. All obligations on the part of BINDER derive from the respective purchase contract, which also contains the entire and exclusively valid statement of warranty administration. The statements in this manual neither augment nor restrict the contractual warranty provisions.

1.2 Structure of the safety instructions

In this operating manual, the following safety definitions and symbols indicate dangerous situations following the harmonization of ISO 3864-2 and ANSI Z535.6.

1.2.1 Signal word panel

Depending on the probability of serious consequences, potential dangers are identified with a signal word, the corresponding safety color, and if appropriate, the safety alert symbol.

DANGER

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

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

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

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

1.2.2 Safety alert symbol

Use of the safety alert symbol indicates **risk of injury**.

Observe all measures that are marked with the safety alert symbol in order to avoid death or injury.

1.2.3 Pictograms

Warning signs			
 Electrical hazard	 Hot surface	 Explosive atmosphere	 Stability hazard
 Lifting hazard	 Risk of corrosion and / or chemical burns	 Harmful substances	 Biohazard
 Pollution Hazard			
Mandatory action signs			
 Mandatory regulation	 Read operating instructions	 Disconnect the power plug	 Lift with several persons
 Environment protection	 Wear protective gloves	 Wear safety goggles	

Prohibition signs			
 Do NOT touch	 Do NOT spray with water	 Do NOT climb	

	**Information** to be observed in order to ensure optimum function of the product.

1.2.4 Word message panel structure

Type / cause of hazard.

Possible consequences.

∅ Instruction how to avoid the hazard: prohibition.

➢ Instruction how to avoid the hazard: mandatory action.

Observe all other notes and information not necessarily emphasized in the same way, in order to avoid disruptions which could result in direct or indirect injury or property damage.

1.3 Localization / position of safety labels on the unit

The following labels are located on the unit:

Pictograms (Warning signs)
 Hot surface (on outer unit door)
Service label

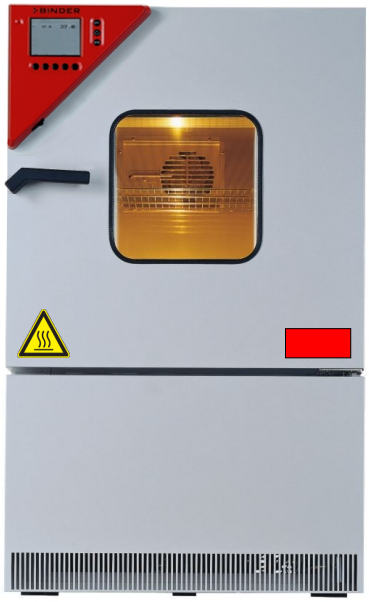



Figure 1: Position of labels on the unit

	Keep safety labels complete and legible.

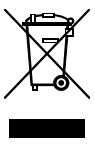
Replace safety labels that are no longer legible. Contact BINDER service for these replacements.

1.4 Type plate

The type plate sticks to the left side of the unit, bottom right-hand.

Figure 2: Type plate (example of MK 53 regular unit)

Indications of the type plate (example)		Information
BINDER		Manufacturer: BINDER GmbH
MK 53		Model designation
Alternating climate chamber		Device name
Serial No.	00-00000	Serial no. of the unit
Built	2014	Year of construction
Nominal temperature	180 °C 356°F	Nominal temperature
Enclosure protection	IP 20	IP type of protection acc. to EN 60529
Temp. safety device	DIN 12880	Temperature safety device acc. to standard DIN 12880
Class	2.0	Class of temperature safety device
Art. No.	9020-0006	Art. no. of the unit
Project No.	---	Optional: Special application acc. to project no.
2,60 kW		Nominal power
230 V 1 N ~		Nominal voltage ± 10%, phase indication
11,3 A		Nominal current
50 Hz		Power frequency
Max operating pressure 25 bar		Max operating pressure in the refrigerating system
R 404 A - 0,85 kg		Refrigerant type and filling weight (0.85 kg / *1.87 lb*)
Contains fluorinated greenhouse gases covered by the Kyoto Protocol		

Symbol on the type plate	Information
CE	CE conformity marking
	Electrical and electronic equipment manufactured / placed on the market in the EC after 13 August 2005 and to be disposed of in separate collection according to directive 2002/96/EC on waste electrical and electronic equipment (WEEE).

Symbol on the type plate	Information
 or 	The equipment is certified in the GOST R certification system of GOSTSTANDARD Russia.
	The equipment is certified according to Customs Union Technical Regulation (CU TR) for Russia, Belarus and Kazakhstan

1.5 General safety instructions on installing and operating the alternating climate chamber MK

With regard to operating the alternating climate chamber MK and to the installation location, please observe the guideline BGI/GUV-I 850-0 on safe working in laboratories (formerly BGR/GUV-R 120 or ZH 1/119 laboratory guidelines issued by the employers' liability insurance association) (for Germany).

BINDER GmbH is only responsible for the safety features of the unit provided skilled electricians or qualified personnel authorized by BINDER perform all maintenance and repair, and if components relating to chamber safety are replaced in the event of failure with original spare parts.

To operate the unit, use only original BINDER accessories or accessories from third-party suppliers authorized by BINDER. The user is responsible for any risk caused by using unauthorized accessories.

CAUTION

Danger of overheating.

Damage to the unit.

∅ Do NOT install the unit in unventilated recesses.

➢ Ensure sufficient ventilation for dispersal of the heat.

Do not operate the alternating climate chamber MK in hazardous locations.

DANGER

Explosion hazard.

Danger of death.

∅ Do NOT operate the unit in potentially explosive areas.

∅ KEEP explosive dust or air-solvent mixtures AWAY from the unit.

The alternating climate chamber MK does not dispose of any measures of explosion protection.

DANGER

Explosion hazard.

Danger of death.

∅ Do NOT introduce any substance into the alternating climate chamber which is combustible or explosive at working temperature.

∅ NO explosive dust or air-solvent mixture in the inner chamber.

Any solvent contained in the charging material must not be explosive or inflammable. I.e., irrespective of the solvent concentration in the steam room, NO explosive mixture with air must form. The temperature inside the chamber must lie below the flash point or below the sublimation point of the charging material. Familiarize yourself with the physical and chemical properties of the charging material, as well as the contained moisture constituent and its behavior with the addition of heat energy.

Familiarize yourself with any potential health risks caused by the charging material, the contained moisture constituent or by reaction products that may arise during the temperature process. Take adequate measures to exclude such risks prior to putting the alternating climate chamber into operation.

DANGER

Electrical hazard.

Danger of death.

∅ The unit must NOT become wet during operation or maintenance.

The alternating climate chambers were produced in accordance with VDE regulations and were routinely tested in accordance to VDE 0411 (IEC 61010-1).

CAUTION

The inner chamber, the door window and the access ports will become hot during operation.

Danger of burning.

∅ Do NOT touch the inner surfaces, the door window, the access ports, or the charging material during operation.

WARNING

Stability hazard.

Danger of injury.

Damage to the unit and the charging material.

Housing cover breakaway.

∅ Do NOT climb the lower housing cover.

∅ Do NOT load the lower housing cover with heavy objects while the unit door is open.

1.6 Intended use

The alternating climate chamber MK is suitable for temperature treatment of solid or pulverized charging material, as well as bulk material, using the supply of heat or cold. It is suitable for harmless materials. A mixture of any component of the charging material with air must NOT be explosive. The operating temperature must lie below the flash point or below the sublimation point of the charging material. Any component of the charging material must NOT be able to release toxic gases.

Other applications are not approved.

The alternating climate chamber MK can be used for drying purposes but are specially designed for solving all the problems which occur during material and ageing tests.

Do NOT use the unit for drying purpose, especially if greater quantities of steam leading to condensation will be set free.

	Observing the instructions in this operating manual and conducting regular maintenance work (chap. 15) is part of the intended use.

DANGER

Explosion or implosion hazard.

Danger of poisoning.

Danger of death.

- ∅ Do NOT introduce any substance combustible or explosive at working temperature into the alternating climate chamber.
- ∅ NO explosive dust or air-solvent mixture in the inner chamber.
- ∅ Do NOT introduce any substance which could lead to release of toxic gases.

	The charging material shall not contain any corrosive ingredients that may damage the machine components made of stainless steel, aluminum, and copper. Such ingredients include in particular acids and halides. Any corrosive damage caused by such ingredients is excluded from liability by BINDER GmbH.

2. Unit description

The alternating climate chamber MK is a specially developed precision refrigerating / warming cabinet with an unrivalled capacity, which by far exceeds the capabilities of normal test cabinets. With its extensive program control, the alternating climate chamber MK is designed for optimum performance with regard to temperature accuracy and rapid heating up and cooling down phases, thus providing the ideal facilities for solving all the problems which occur during material as well as ageing and stress tests. In addition, the alternating climate chamber MK provides almost unlimited possibilities for adaptation to individual customer requirements based upon extensive programming options.

The patented APT.line™ preheating chamber and air conduction technology guarantees excellent spatial temperature values for the total working area. The alternating climate chamber MK provides a powerful refrigerating system with rapid cooling-down speeds. In addition, the alternating climate chamber MK provides almost unlimited possibilities for adaptation to individual customer requirements based upon extensive programming options.

The high-quality housing insulation guarantees both a low noise mode of operation and a consistently low housing temperature. The inner chamber, the pre-heating chamber and the interior side of the doors are all made of stainless steel V2A (German material no. 1.4301, US equivalent AISI 304). When operating the chamber at temperatures above 150 °C / *302°F,* the impact of the oxygen in the air may cause discoloration of the metallic surfaces (yellowish-brown or blue) by natural oxidation processes. These colorations are harmless and will in no way impair the function or quality of the unit. The housing is RAL 7035 powder-coated. All corners and edges are also completely coated.

All unit functions are easy and comfortable to use thanks to their clear arrangement. Major features are easy cleaning of all unit parts and avoidance of undesired contamination.

The efficient program controller is equipped with a multitude of operating functions, in addition to recorder and alarm functions. Programming of test cycles is easily accomplished via the modern color-display controller MB1 and is also possible directly with a computer via Intranet in connection with the communication software APT-COM™ 3 DataControlSystem. The alternating climate chamber MK is regularly equipped with a serial interface RS 422 for computer communication, e.g. with the communication software APT-COM™, which permits networking up to 30 units and connecting them to a PC for controlling and programming, as well as recording and representing temperature data 3 DataControlSystem (option, chap. 14.1) For further options, see chap. 18.5.

At an ambient temperature of +18 °C / *64.4 °F* to +32 °C / *89.6 °F*, you can operate the alternating climate chamber MK in a temperature range from -40 °C / *-40 °F* up to +180 °C / *356 °F*.

2.1 Unit overview

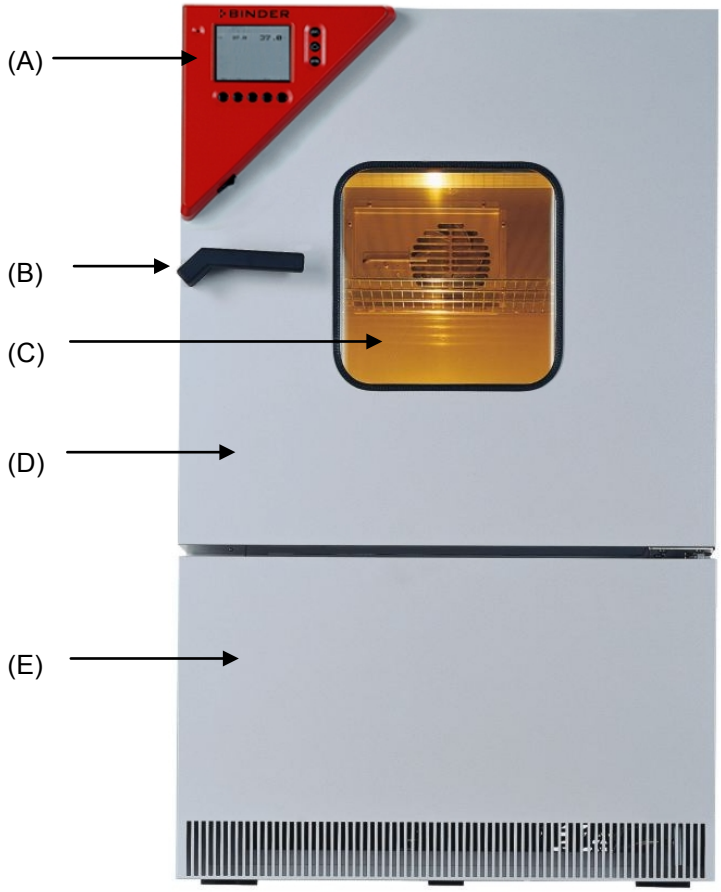


Figure 3: Alternating climate chamber MK 53

(A) Instrument box
(B) Door handle
(C) Inspection window
(D) Unit door
(E) Refrigerating machine

2.2 Instrument box MK

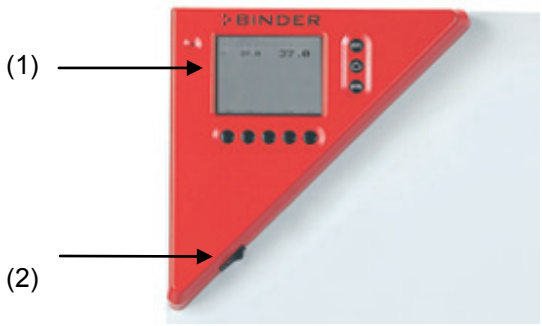


Figure 4: Triangle instrument box MK

(1) Microprocessor program controller MB1
(2) Main power switch ON/OFF

2.3 Lateral control panel MK

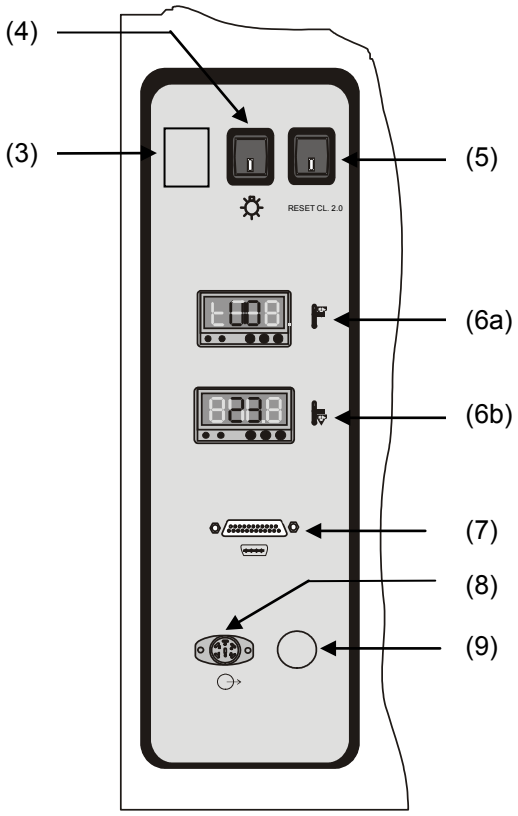


Figure 5: Lateral control panel at the left side of the refrigerating machine with options over-/under temperature safety device, and analog output

(3) Free place for optional button

(4) Switch for interior chamber light on / off

(5) RESET button for option over-/under temperature safety device class 2 (option, chap. 11.3)

(6) Over-/under temperature safety device (option, chap. 11.3)

(6a) Module for upper temperature limit

(6b) Module for lower temperature limit

(7) RS 422 serial interface for computer communication

(8) Analog output (option)

The current temperature value is put out as analogue signal 4-20 mA to a DIN socket. Measuring range 4 mA = -40 °C, 20 mA = +180 °C.

(9) Not used

3. Completeness of delivery, transportation, storage, and installation

3.1 Unpacking, and checking equipment and completeness of delivery

After unpacking, please check the unit and its optional accessories, if any, based on the delivery receipt for completeness and for transportation damage. Inform the carrier immediately if transportation damage has occurred.

The final tests of the manufacturer may cause traces of the shelves on the inner surfaces. This has no impact on the function and performance of the unit.

Please remove any transportation protection devices and adhesives in/on the unit and on the doors and take out the operating manuals and accessory equipment.

CAUTION

Sliding or tilting of the unit.

Damage to the unit.

Risk of injury by lifting heavy loads.

∅ Do NOT lift or transport the unit using the door, the handle or the lower housing.

➢ Lift the unit from the pallet at its four lower corners with the aid of four people.

If you need to return the unit, please use the original packing and observe the guidelines for safe lifting and transportation (chap. 3.2).

For disposal of the transport packing, see chap. 16.1.

Note on second-hand units (Ex-Demo-Units):

Second-hand units are units that were used for a short time for tests or exhibitions. They are thoroughly tested before resale. BINDER ensures that the chamber is technically sound and will work flawlessly.

Second-hand units are marked with a sticker on the unit door. Please remove the sticker before commissioning the unit.

3.2 Guidelines for safe lifting and transportation

After operation please observe the guidelines for temporarily decommissioning the unit (chap. 16.2).

CAUTION

Sliding or tilting of the unit.

Damage to the unit.

Risk of injury by lifting heavy loads.

- ➢ Transport the unit only in its original packaging.
- ➢ Secure the alternating climate chamber with transport straps for transport.
- ∅ Do NOT lift or transport the unit using the door handle, the door or the lower housing.
- ➢ Lift he unit at its four lower corners with the aid of 4 people and place it on a transport pallet with wheels. Push the pallet to the desired site and then lift the unit at its four lower corners from the pallet..

- Permissible ambient temperature range during transport: -10 °C / *14 °F* to +60 °C / *140 °F*.

You can order transport packing and pallets for moving or shipping purposes from BINDER service.

3.3 Storage

Intermediate storage of the unit is possible in a closed and dry room. Observe the guidelines for temporary decommissioning (chap. 16.2).

- Permissible ambient temperature range during storage: -10 °C / *14 °F* to +60 °C / *140 °F*.
- Permissible ambient humidity: max. 70 % r.H., non-condensing

When after storage in a cold location you transfer the unit to its warmer installation site, condensation may form. Before start-up, wait at least two hours until the chamber has attained ambient temperature and is completely dry and the oil in the compressors has warmed up.

In case of a prolonged temporal decommissioning: Leave the unit door open or remove the access port plugs.

3.4 Location of installation and ambient conditions

Set up the alternating climate chamber on a flat, even and non-flammable surface, free from vibration, and in a well-ventilated, dry location and align it using a spirit level. The site of installation must be capable of supporting the unit's weight (see technical data, chap. 18.4). The chambers are designed for setting up inside a building (indoor use).

When after storage in a cold location you transfer the unit to its warmer installation site, condensation may form. Before start-up, wait at least two hours until the chamber has attained ambient temperature and is completely dry and the oil in the compressors has warmed up.

CAUTION

Danger of overheating.

Damage to the unit.

- ∅ Do NOT set up units in non-ventilated recesses.
- ➢ Ensure sufficient ventilation for dispersal of the heat.

Permissible ambient temperature range during operation: +18 °C / *64.4 °F* to +32 °C / *89.6 °F*. At elevated ambient temperature values, fluctuations in temperature can occur.

	The ambient temperature should not be substantially higher than the indicated ambient temperature of +25 °C / *77 °F* to which the specified technical data relate. For other ambient conditions, deviations from the indicated data are possible.

- Permissible ambient humidity: 70 % r.H. max., non-condensing.

When operating the chamber at temperature set-points below ambient temperature, high ambient humidity may lead to condensation on the unit.

- Installation height: max. 2000 m / *6562 ft.* above sea level.

When placing several units of the same size side by side, maintain a minimum distance of 250 mm / *9.84 in* between each unit. Wall distances: rear 100 mm / *3.94 in*, sides 160 mm / *6.31 in*. Spacing above the unit of at least 100 mm / *3.94 in* must also be maintained.

	**CAUTION** **Danger by stacking.** **Damage to the units.** ∅ Do NOT place alternating climate chambers on top of each other.

To completely separate the unit from the power supply, you must disconnect the power plug. Install the unit in a way that the power plug is easily accessible and can be easily pulled in case of danger.

With an increased amount of dust in the ambient air, clean the condenser fan (by suction or blowing) several times a year.

Avoid any conductive dust in the ambiance according to the unit layout complying with pollution degree 2 (IEC 61010-1).

Do not install or operate the alternating climate chamber MK in potentially explosive areas.

	**DANGER** **Explosion hazard.** **Danger of death.** ∅ Do NOT operate the unit in potentially explosive areas. ∅ KEEP explosive dust or air-solvent mixtures AWAY from the vicinity of the unit.

4. Installation and connections

4.1 Electrical connection

The alternating climate chamber MK is supplied ready for connection.

- Shockproof plug, power supply voltage 230 V (1N~) +/- 10 %, 50 Hz

  Fixed power connection cable 1800 mm / *5.9 ft* in length
- The socket must also provide a protective conductor.
- Prior to connection and start-up, check the power supply voltage. Compare the values to the specified data located on the unit's type plate (unit front behind the door, bottom left-hand, chap. 1.4)
- When connecting, please observe the regulations specified by the local electricity supply company and as well as the VDE directives (for Germany). We recommend the use of a residual current circuit breaker.
- Pollution degree (acc. to IEC 61010-1): 2
- Over-voltage category (acc. to IEC 61010-1): II

CAUTION

Danger of incorrect power supply voltage.

Damage to the equipment.

- ➢ Check the power supply voltage before connection and start-up.
- ➢ Compare the power supply voltage with the data indicated on the type plate.

See also electrical data (chap. 18.4).

To completely separate the unit from the power supply, you must disconnect the power plug. Install the unit in a way that the power plug is easily accessible and can be easily pulled in case of danger.

5. Start up

After connecting the electrical supply (chap. 4), turn on the unit by the main power switch (2).

Warming chambers may release odors in the first few days after commissioning. This is not a quality defect. To reduce odors quickly we recommend heating up the chamber to its nominal temperature for one day and in a well-ventilated location.

5.1 Function overview of display program controller MB1

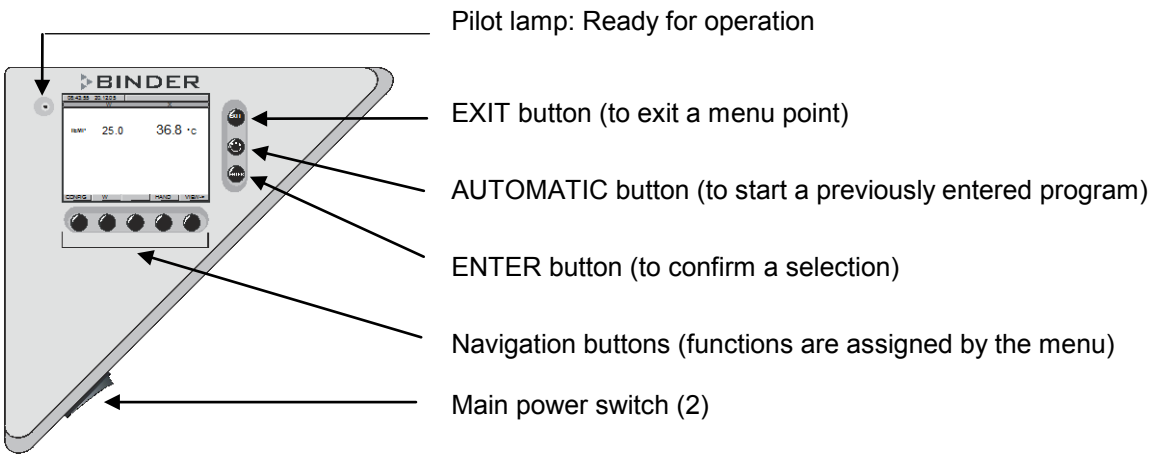


Figure 6: Display program controller MB1

The program controller MB1 controls the temperature inside the alternating climate chamber.

You can enter the desired set point values in Manual Mode or Program Mode (chap. 5.2) in the display controller.

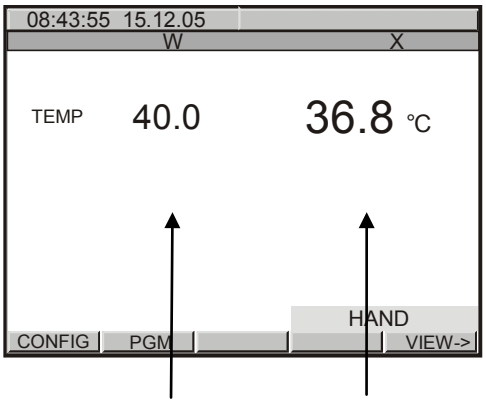


Figure 7: Normal display of the MB1 program controller in Manual mode

5.2 Operating modes

The MB1 program controller operates in 3 modes:

Idle Mode	The controller is not functional, i.e., there is no heating. The fan is off.
Manual Mode (Fixed value operation) (HAND)	The controller operates as a fixed-point control, i.e., a temperature set-point can be defined, which is then maintained (chap. 8).
Program Mode (AUTO)	An entered temperature program is run (chap. 9).

The MB1 program controller permits programming temperature cycles.

The controller offers 25 program memory positions with 100 program sections each. The total number of program sections of all programs is limited to 500.

Programming can be done directly through the keypad of the controller or graphically through the software APT-COM™ 3 DataControlSystem (option, chap. 14.1) specially developed by BINDER.

5.3 Behavior after power failure

After the power returns, the unit continues to function in the original operating mode it was in previously before an actual power failure had occurred. In Manual Mode (HAND), the controller regulates the temperature to the last entered set-points, while in Program Mode (AUTO) it regulates the temperature to its set-point that were reached during the program operation. The power failure is noted in the event list (chap. 6.2) however, no error message is displayed indicating that a power failure has taken place.

5.4 Performance when opening the door

When you open the door, temperature control (heating and refrigeration) immediately stops (the compressor continues running for 5 minutes without cooling). The fan is off.

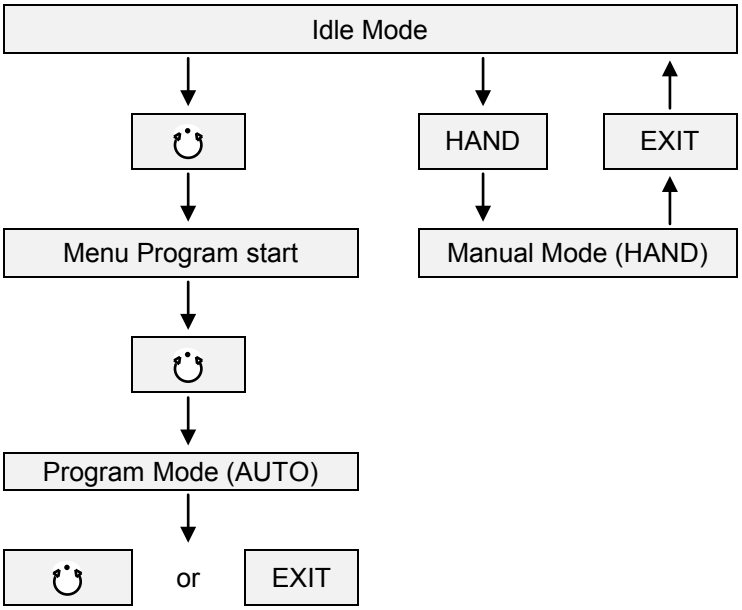
5.5 Turning on the unit

Put the main power switch (2) in position I. The pilot lamp shows the unit being ready for operation.

	Observe a delay time of approx. 30s between turning Off and again On. Otherwise an initialization problem may occur (display showing e.g. “–1999”).

Note that the chamber is in stand-by mode when the main power switch is in position I and the controller display is dark. Turn on the unit by pressing any button. When turned on, the unit functions in the operating mode entered before turning off. In Manual Mode (HAND), the controller regulates the temperature to the last entered set-point, and in Program Mode (AUTO) it regulates the temperature to the set-points reached during previous program operation.

Structure of toggling between Idle Mode / Manual Mode / Program Mode:



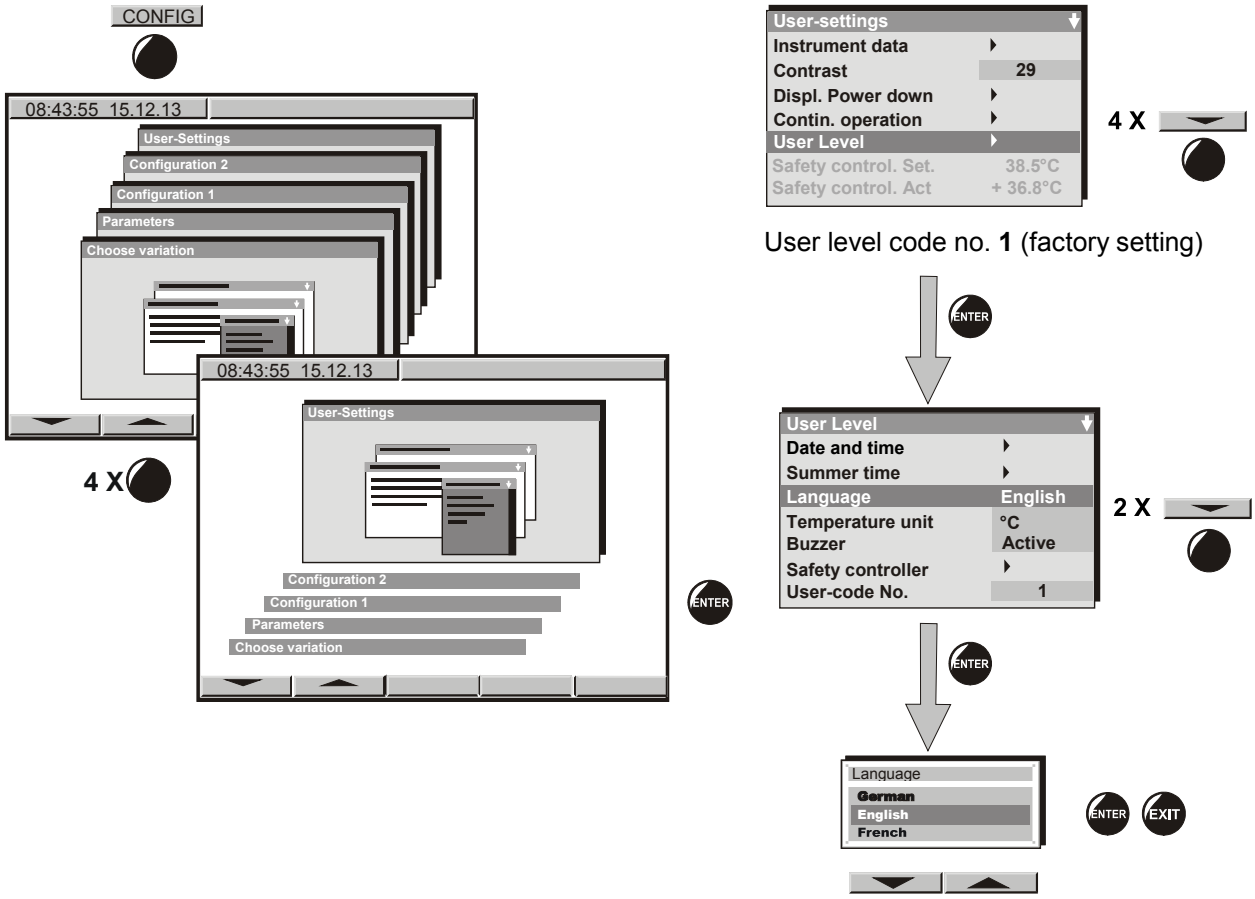
For control reasons the refrigeration machine starts with a delay time of about 30 seconds. The refrigeration machine also turns off with a 90 seconds delay. This explains why the compressor may remain operating also during positive temperature jumps.

6. Controller MB1 settings

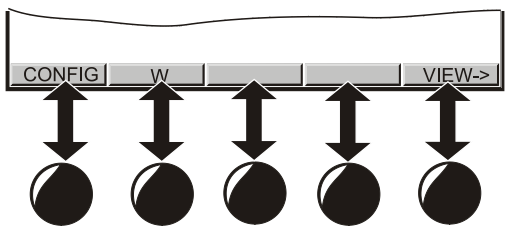
6.1 Selection of the menu language

The display program controller MB1 controls the temperature inside the alternating climate chamber. The controller communicates by a menu guide using real words in German, English and French.

The selection of the desired menu language is located in the sub-menu “User-Level” of the “User-Settings“ menu. Select menu point “Language“.



The row of buttons below the display is context- sensitive. The inscription above the buttons on the display defines the button’s function.



	Do NOT change the temperature unit from °C to °F.

6.2 Overview of program controller MB1 displays

The main operation level contains the following different displays:

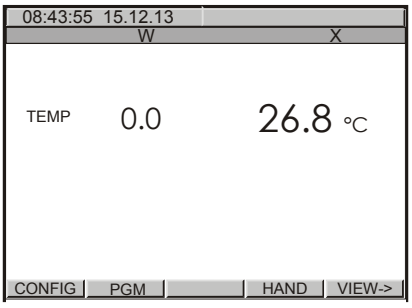
- **Normal display** (Idle Mode or Manual Mode or Program Mode)
- **Event List**
- **Chart recorder function**
- **Contact page**

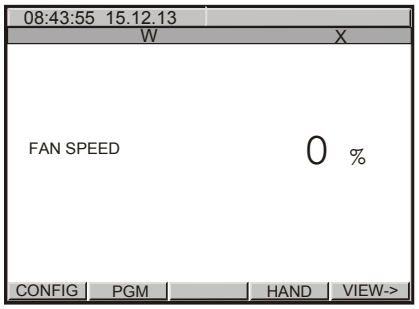
Button VIEW -> permits toggling between the displays.

The **NORMAL DISPLAY** enables comparison of the current temperature (W) to the set-point value (X) or shows the fan working rate.

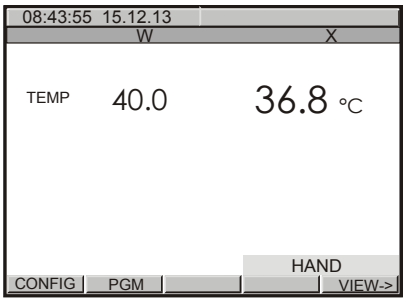
CONTACT PAGE

NORMAL DISPLAY Idle Mode

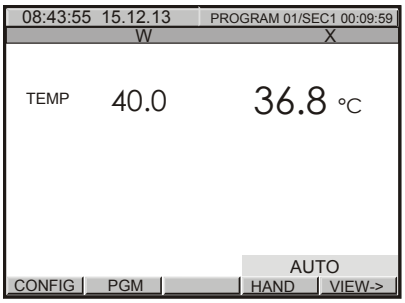




NORMAL DISPLAY Manual Mode



NORMAL DISPLAY Program Mode



EVENT LIST

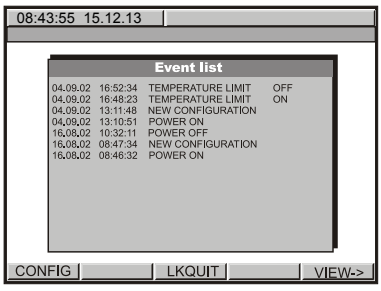
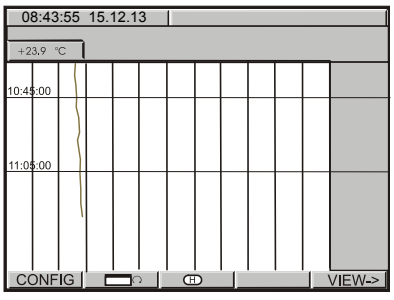
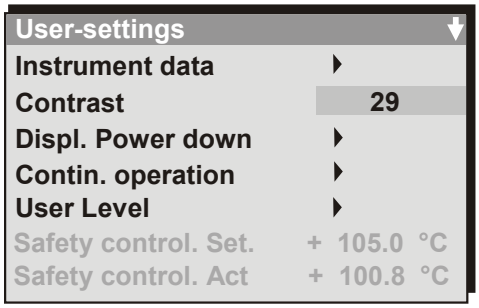


CHART RECORDER FUNCTION



6.3 Menu settings in the “User-settings” menu



Instrument data

- **Instrument Name**

  Enter an individual name of the alternating climate chamber.

- Address

  Enter a controller address (1 to 30) for operation with the communication software APT-COM™.

All other entries are relevant only for service purposes.

Contrast

(no function)

Displ. power down

- **Switch off event**

  Do not change the entry “Wait. Period”.

- **Waiting period**

  You can enter a delay time after which the display, following manual activation, will automatically be turned off. This happens when the moment is outside the operation time defined in menu ”Contin. operation”.

Contin. operation

Enter an operation time to determine the period of display activity. Outside the defined time, the display is automatically turned off. Pressing down any key will reactivate the display. After the time set in menu “Displ. power down“, the display will turn off again when the actual time is not within the operation time fixed in menu “Cont. operation“.

User Level

Toggle here to the display menu “User Level” (chap. 6.4) by entering a password. Factory default setting for this password is +00001. You can change the password (“user code”) in the “User Level” menu.

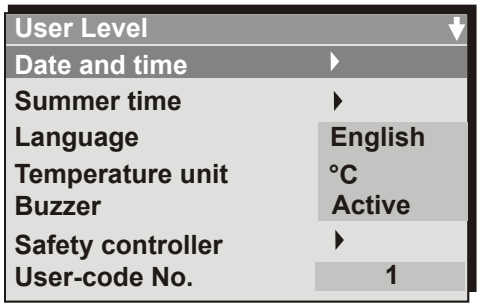
Safety control.Set

The setting of the tolerance limit of the safety controller (see chap. 11.3) is displayed. You cannot change it in this view.

Safety control.Act

The measuring result of the safety controller is displayed. The safety controller compares the value measured by a second independent temperature sensor to the entered tolerance limit.

6.4 Menu settings in the “User Level” menu



Date and time

Enter the actual date and time to provide the proper measurement records. Data is displayed in the chart recorder function (chap. 7) of the controller and will remain stored in case of a power failure.

Summer time

Time is set one hour in advance during the summer time period.

Setting the summer time switch:

- **Off:** No change to summer time occurs
- **User timed:** Beginning and end of summer time can be set individually
- **Automatic:** The summer time arrangement for central Europe is enabled (summer time from last Sunday of March until last Sunday of October)

Language

Select the menu language as German, English, or French (chap. 6.1).

Temperature unit

	Do NOT change the temperature unit from °C to °F.

Buzzer

Audible alarm buzzer

- **Inactive:** No audible alarm will sound if an alarm event happens (chap. 12).
- **Active:** An audible alarm will sound in case of an alarm event (chap. 12).

Safety controller

Enter a safety controller tolerance limit to prevent temperature from exceeding this setting. For setting, see chap. 11.3.

User-Code No.

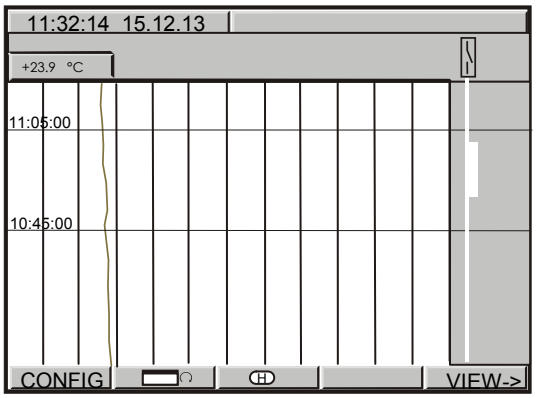
Change the password (“user code”) needed to access the “User settings” menu. Factory default setting +00001.

	Keep in mind any change of the user password. There is no entrance to this menu without the correct password.

7. Graphical representation of the historical measurement (chart recorder function)

The representation of data imitates a chart recorder and allows recalling any set of measured data of any point of time taken from the recorded period.

Normal display of the chart recorder function:



Top left: The actual date and time are displayed.

Below: The current temperature value [°C] is numerically and graphically displayed.

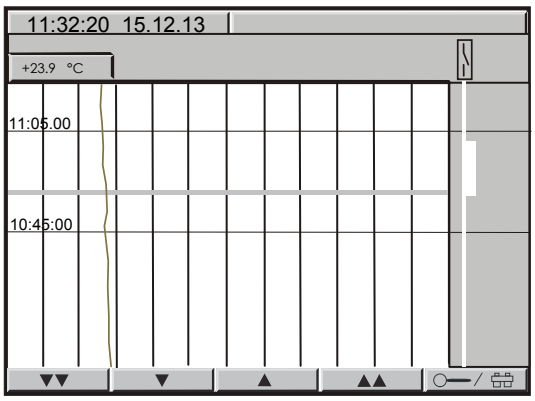
Scaling of temperature: -40 °C to +180 °C.

If the bedew protection is active, this is displayed on the right side as an enlarged line.

Button [▭] permits toggling between different representations.

Depending on the selected kind of representation, button [H] might not have been visible until now.

History display with cursor:



Select button [H] = History. A pink line appears on the display marking as a cursor the selected moment. You can now recall the recorded data of any defined moment.

Top left: Date and time of the selected cursor position are displayed.

Below: The corresponding temperature value of this moment is numerically and graphically displayed.

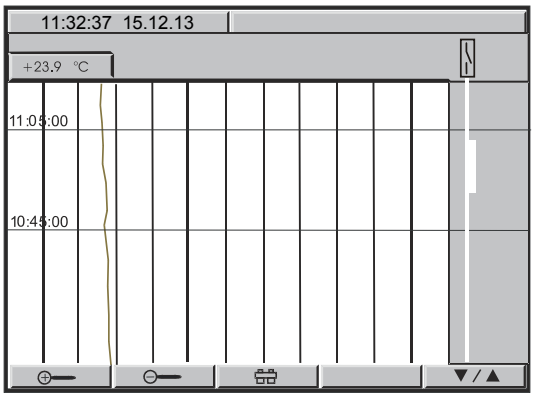
Scroll the cursor position using the arrow buttons.

Single arrow buttons: fine-tuning.

Double arrow buttons: page-up and page-down.

Toggle to the zoom display by pressing button [⊖/⊞] :

History - zoom function:

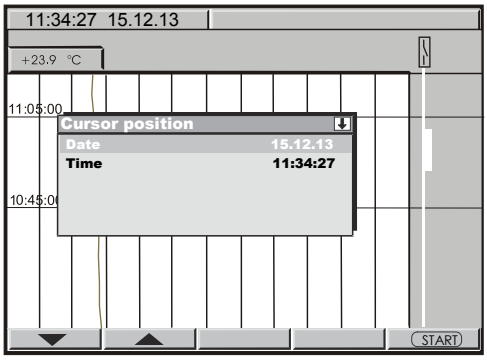


Magnifier buttons [⊕] [⊖] : Zoom and zoom back (i.e., shorten or extend the displayed period).

Toggle back to the former representation display using this button [▼/▲].

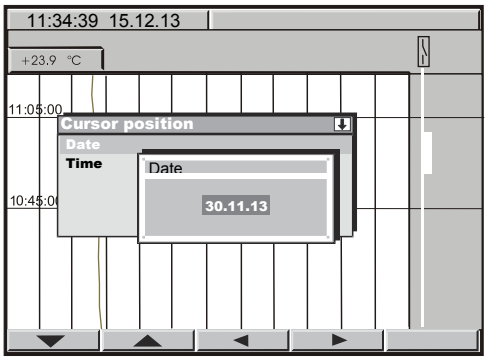
You can also directly enter any cursor position as a numerical input.

History representation: Toggling to any defined moment:



Press button . The window “Cursor position” opens to enter date and time.

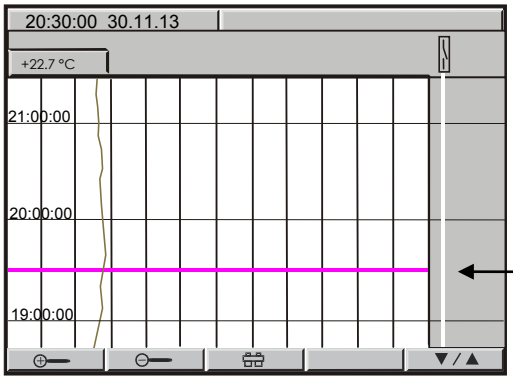
Select date or time with the arrow buttons and confirm with ENTER.



Now you can access any moment that you would like to recall. Enter date and time with the arrow buttons and confirm with ENTER.

Press button START .

History display at the selected point of time:



Top left: Date and time of the selected cursor position are displayed.

Below: The corresponding temperature value of this moment is numerically and graphically displayed.

The cursor line marks the corresponding moment.

The available presentation depends on the pre-selected storage rate. This means the higher the storage rate, the more precisely but shorter the data representation will be, see table below:

Storage rate	Storage duration	
	(hours)	(days)
5 sec	60	2.5
10 sec	120	5
1 min	720	30
5 min	3600	150
10 min	7200	300

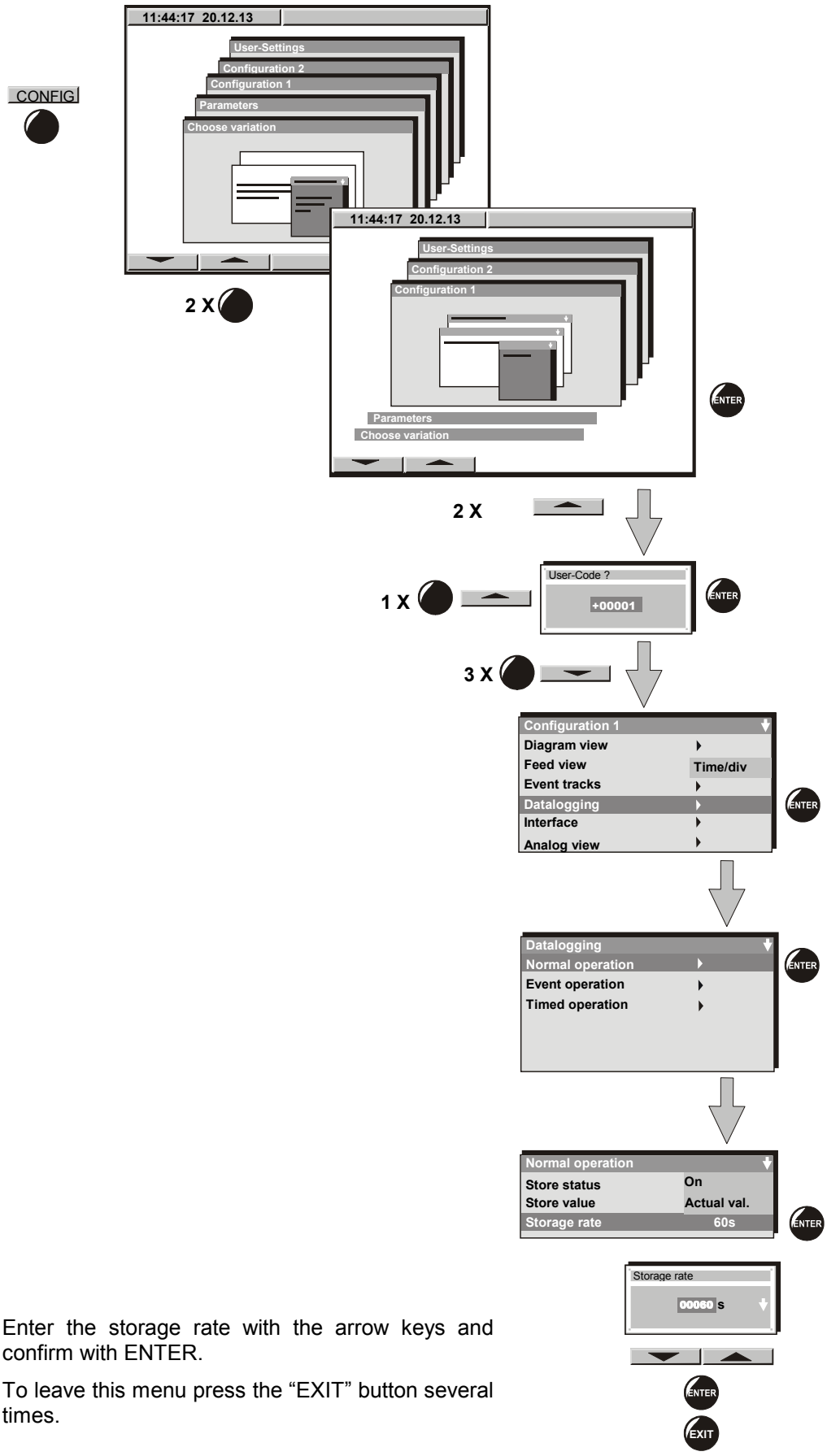
CAUTION

Setting the storage rate clears the measured-value memory.

Danger of information loss.

➢ Change the storage rate ONLY if the previously registered data is no longer needed.

7.1 Setting the storage rate



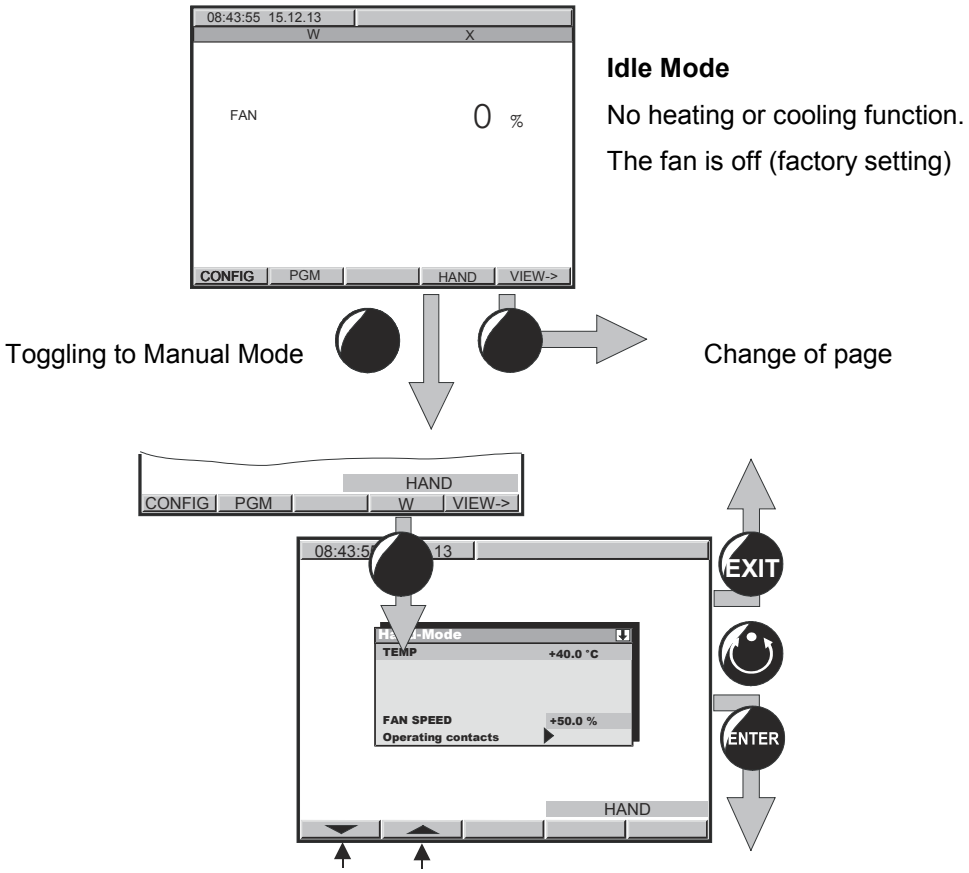
Enter the storage rate with the arrow keys and confirm with ENTER.

To leave this menu press the “EXIT” button several times.

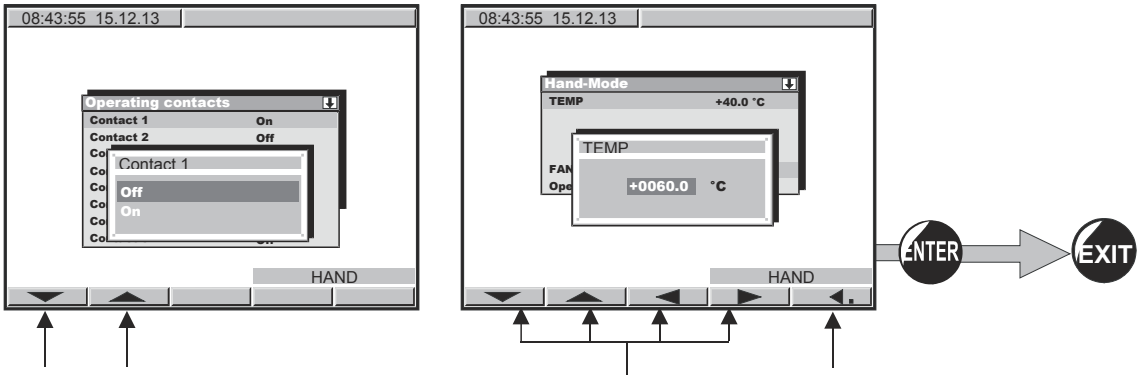
8. Manual Mode

In Manual Mode (HAND) you can enter a temperature set-point, the fan speed (0% to 100%), and the switching-state of up to 8 operation lines. Operation line 1 is used to control the bedew protection (chap. 10). The other operation lines are non-functional. All settings remain valid for Manual Mode (HAND) until the next manual change, if the unit had been turned off or in case of toggling to Idle Mode or Program Mode (AUTO).

8.1 Set-point entry



Toggling between temperature set-point, fan speed, and operation line 1 (bedew protection).



	Unlock the keyboard locking (option, chap. 14.3) via the key switch to enter the set-point.

Setting ranges:

Temperature	- 40 °C / *-40 °F* up to + 180 °C / *356 °F*
Fan speed	0 % to 100 % Fan speed can be reduced to standstill of the fan. Do this only if needed, because the spatial distribution of temperature is as well reduced. **Technical data refer to 100% fan speed.**

	With set-point type "**Limit**", adapt the safety controller (chap. 11.2) always when you changed the temperature set-point. Set the safety controller set-point by approx. 5 °C to 10 °C above the desired temperature set-point. Recommended setting: Set-point type "**Offset**" with safety controller set-point 5 °C. We recommend using the keyboard locking (option, chap. 14.3) during operation.

	In case of the optional over-/under temperature safety device (chap. 11.3), check also the temperature limits entered there, and adjust them if necessary.

In Manual Mode, no program can be started. A set-point can be entered for temperature. The actual value equilibrates to this set-point.

When pushing the EXIT button in Manual Mode, the controller changes to Idle Mode. The set-points entered in Manual Mode remain saved.

	When incidentally pressing the EXIT or AUTOMATIC button during Manual Mode operation, the controller will change to Idle Mode and thus will not adjust any longer to the program set-points. We recommend the keyboard locking (option, chap. 14.3) during operation.

	For a negative set-point entry, enter the numerical value first and only then the minus sign (-).

8.2 Performance after power failure in Manual Mode

In Manual Mode (HAND), all functions return exactly to the same status the chamber had before power failure. The set-point is immediately resumed, the switching states of the operation lines are conserved. No error message indicating that a power failure has taken place is displayed. However, the power failure will appear in the event list.

9. Program operation

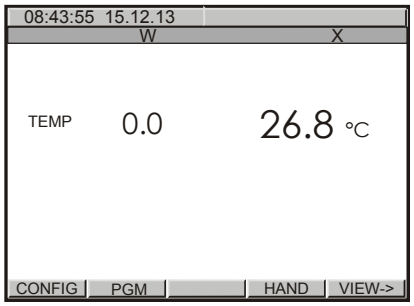
The 1-channel program controller MB1 permits programming temperature cycles. It offers 25 program memory positions with 100 program sections each. The total cumulative number of program sections is limited to 500. It is not possible to link several programs.

For each program section you can enter a temperature set-point, the fan speed (0% up to 100%), and the switching-state of up to 8 operation lines. Operating line 1 serves to control the bedew protection (chap. 10). The other operation lines are non-functional.

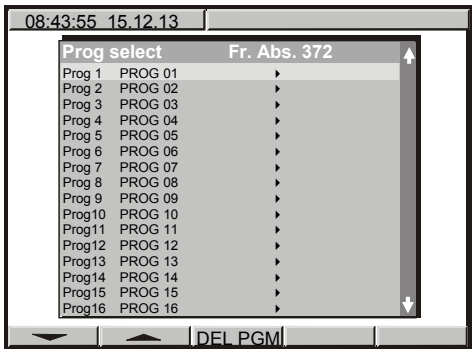
Programming is possible directly by the keypad of the controller or graphically by the software APT-COM™ 3 DataControlSystem (option, chap. 14.1) specially developed by BINDER.

9.1 Overview menu-based program entry

Display showing the initial normal display in Idle Mode

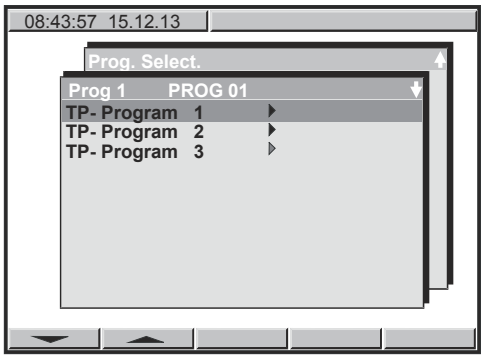


Press the “PGM” button. The window **program selection** appears



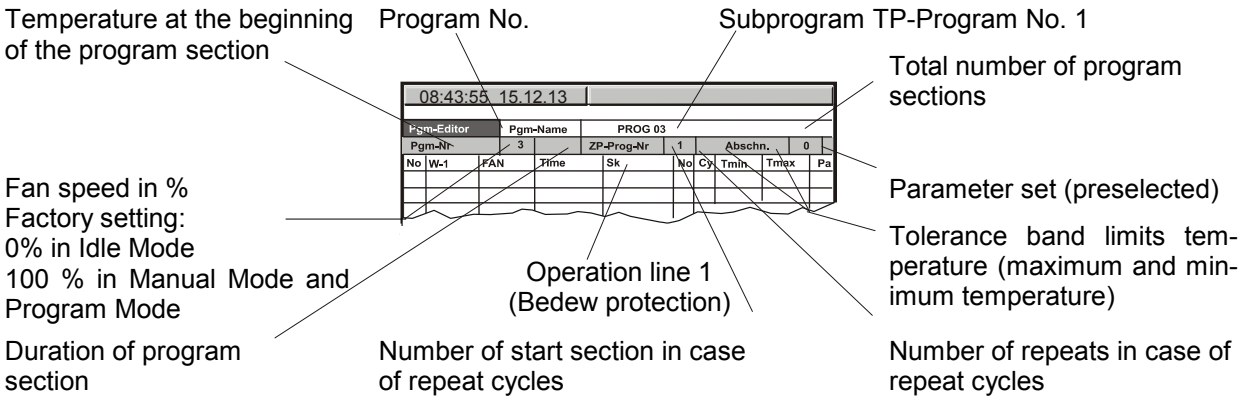
Select a program via the arrow keys and confirm by pressing ENTER

The following display serves to select a **subroutine**:



Select the first subroutine “**TP-Program 1**” (TP-Program 2 und TP-Program 3 are without function) and confirm by pressing ENTER.

A **program table** will appear, which is initially empty until you enter the temperature values. You can now enter the temperature program.



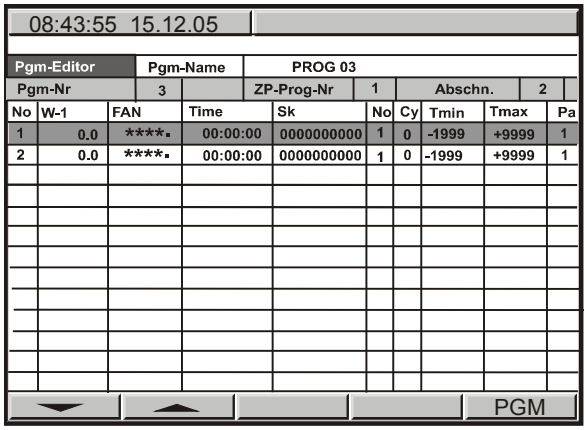
You can enter **Program sections** into this program table.

Press the “PGM” button. An inquiry display appears allowing you to enter or delete individual program sections:

In this view, new program lines can be entered or deleted:

new	New lines are added below in the table
insert	New lines are added above a previously selected line
delete	Individual lines that have been selected previously are deleted

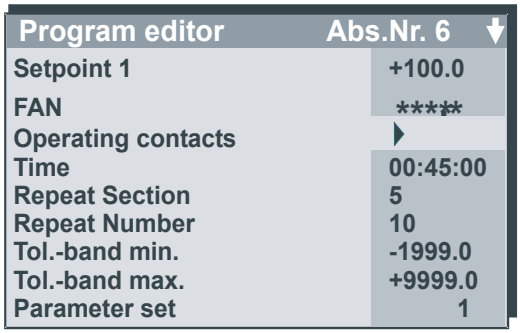
Create as many lines, i.e. program sections, as desired. As a next step, values can be entered into these lines. It is possible to add supplementary lines later or to delete individual lines at any time.



To enter values, select the corresponding line via the arrow keys.

Press the “ENTER” button. The **program editor** appears.

Enter the individual values of the selected program section.



-- Temperature value at the start of the program section
-- Fan speed in %
-- Operating contact (operation line) 1 = Bedew protection
-- Duration of the program section
-- No. of start section in case of repeat cycles
-- No. of repeats in case of repeat cycles
-- Temperature limits (maximum / minimum temperature)
In case of exceeding: temporary program stop.
-- Pre-selected value (Do NOT change!)

Select the parameters via the arrow keys and confirm by pressing ENTER.

Then enter the values via the arrow keys, and confirm the entry by pressing ENTER.

	For a negative set-point entry, enter the numerical value first, and then the minus sign (-).

	With set-point type “**Limit**”, the user shall adapt the safety controller (chap. 11.2) to the highest temperature set-point value of the program actually used. Check the safety controller for each temperature program and change it if necessary. Set the safety controller set-point by approx.. 5 °C to 10 °C above the highest temperature set-point of the program. Recommended setting: set-point type “**Offset**” with safety controller set-point 5 °C.

	In case of the optional over-/under temperature safety device (chap. 11.3), check also the temperature limits entered there, and adjust them if necessary.

Performance after completing the program:

The controller changes to Idle Mode. The heating and the cooling are inactive; the chamber approximates ambient temperature. The fan is off.

9.2 Selecting between set-point ramp and set-point step

Temperature set-points always refer to the start of a program section, i.e., at the beginning of each program section the entered temperature set-point is targeted. During program section operation, the temperature gradually passes to the set-point entered for the next section.

By appropriate planning of the program section timing, you can enter all kinds of temperature transitions.

- **Gradual temperature changes "set-point ramp"**

  The set-point changes its value gradually while proceeding from one program section to the next one during the programmed section length. The actual temperature value (X) follows the continually moving set-point (W) at any time.

- **Program sections with constant temperature**

  The initial values of two subsequent program sections are identical; so the temperature remains constant during the whole time of the first program section.

- **Sudden temperature changes "set-point step"**

  Steps are temperature changes (ramps) that occur during a very short interval. A section with a different set-point follows two program sections with an identical set-point. If the duration of this transitional program section is very short (minimum entry 1 sec), the temperature change will proceed rapidly within the minimum amount of time.

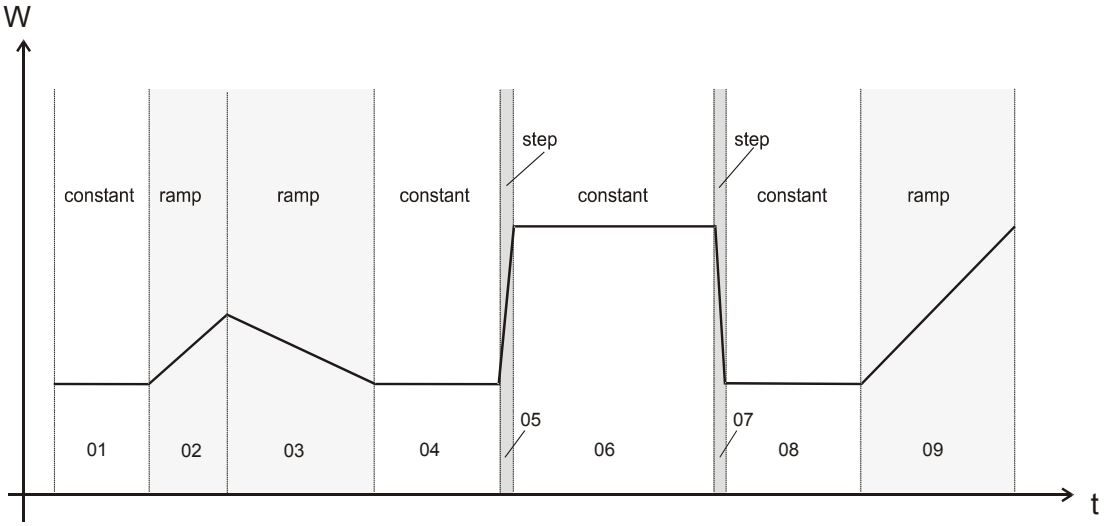


Figure 8: Possible temperature transitions

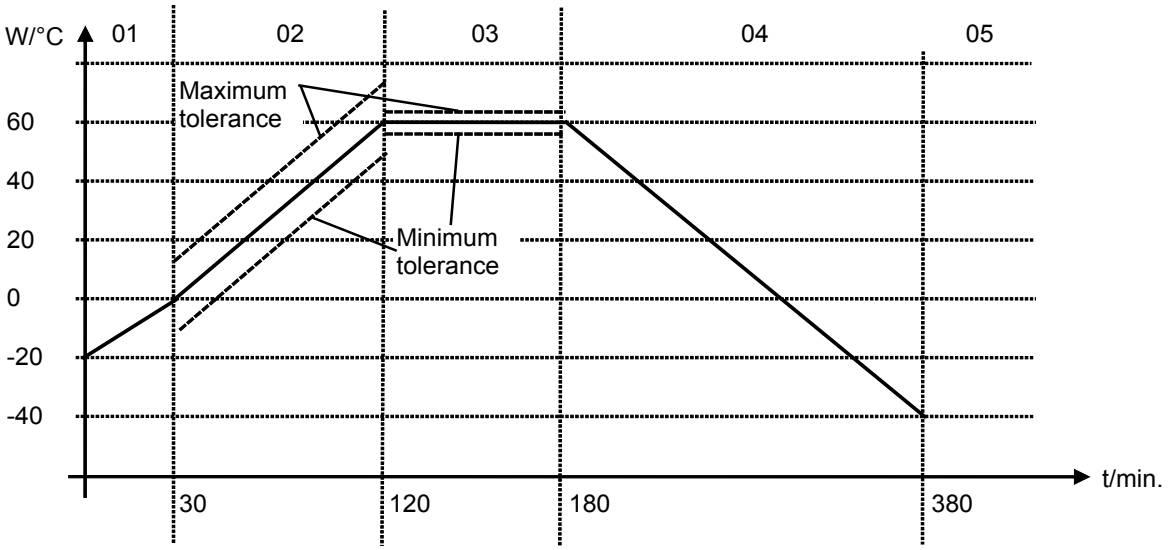
The following chapter offers examples of programming a set-point ramp and a set-point step.

9.3 Program entry as set-point ramp or as set-point step

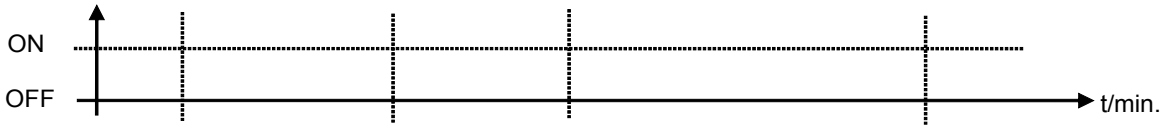
In order to avoid incorrect programming, we recommend plotting the temperature profile (chart template in chap. 0) and entering the values into a table (template in chap. 9.10).

The controller provides 8 operation lines that can be activated or de-activated for each program section. Operating contact 1 serves to control the bedew protection (chap. 10). The other operation lines are non-functional.

Program entry as set-point ramp (example)



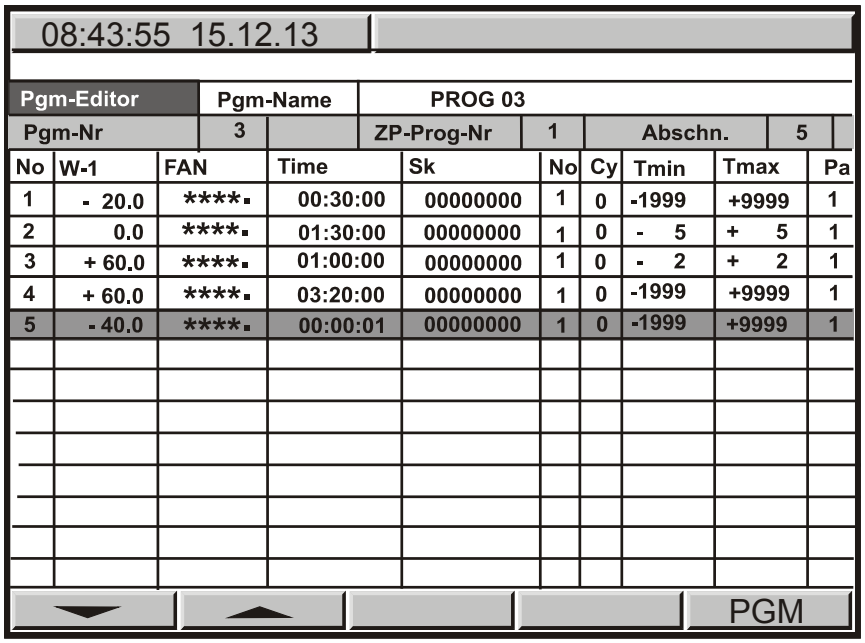
Operation line 1 = Bedew protection



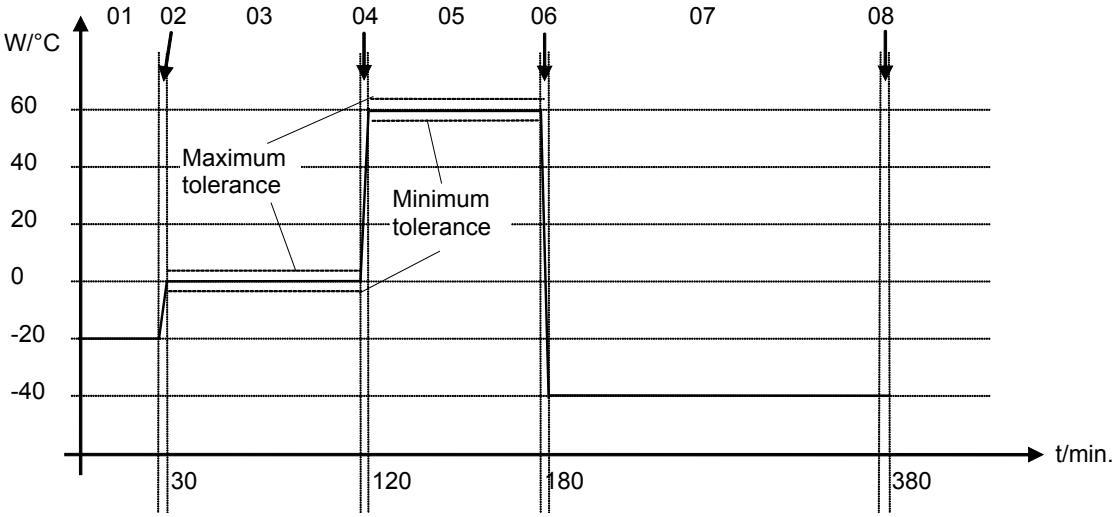
Program table corresponding to the diagram above:

Program section	Set-point temp.	Fan	Section time	Operation line1	Target section	No. of cycles	Min. tolerance	Max. tolerance
01	-20	100 %	00:30:00	Off	1	0	-1999	+9999
02	0	100 %	01:30:00	Off	1	0	-5	+5
03	60	100 %	01:00:00	Off	1	0	-2	+2
04	60	100 %	03:20:00	Off	1	0	-1999	+9999
05	-40	100 %	00:00:01	Off	1	0	-1999	+9999

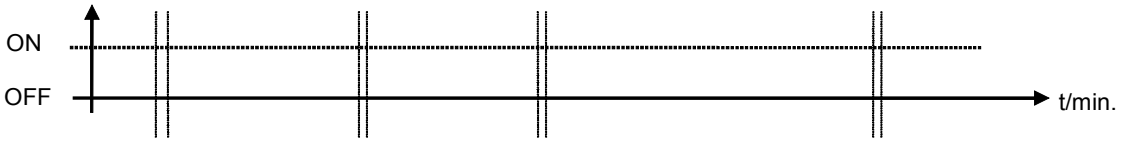
Now enter the values of the above program table into one of the 25 program places of the controller MB1:



Program entry as set-point step (example)



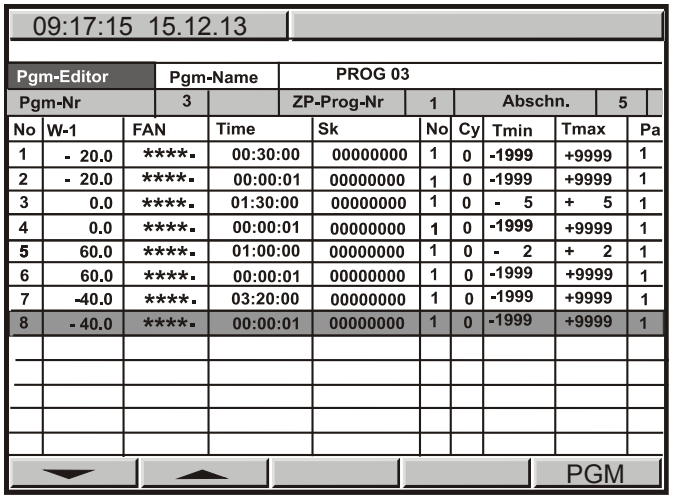
Operation line 1 = Bedew protection



Program table corresponding to the diagram above:

Program section	Set-point temp.	Fan	Section time	Operation line1	Target section	No. of cycles	Min. tolerance	Max. tolerance
01	-20	100 %	00:30:00	Off	1	0	-1999	+9999
02	-20	100 %	00:00:01	Off	1	0	-1999	+9999
03	0	100 %	01:30:00	Off	1	0	-5	+5
04	0	100 %	00:00:01	Off	1	0	-1999	+9999
05	60	100 %	01:00:00	Off	1	0	-2	+2
06	60	100 %	00:00:01	Off	1	0	-1999	+9999
07	-40	100 %	03:20:00	Off	1	0	-1999	+9999
08	-40	100 %	00:00:01	Off	1	0	-1999	+9999

Now enter the values of the above program table into one of the 25 program places of the controller MB1:



For rapid transition phases, do NOT program any tolerance limits in order to permit maximum heating and cooling speed.

9.4 Information on programming different temperature transitions

- For the end value of the desired cycle, add an additional section (in the examples section 05 for set-point ramp and section 08 for set-point step) with a section time of at least one second. Otherwise, the program will stop one section too early because the program line is incomplete.
- If the tolerance minimum is set to e.g. -5 and the tolerance maximum to e.g. +5, the program will be interrupted when the actual value deviates by 5 °C or more from the set-point value. During this program interruption, the display reads AUTO HAND on the bottom right instead of AUTO (program operation). You can enter different values for tolerance maximum and minimum for each section. When the temperature is situated within the entered tolerance limits, the program will continue automatically, and the indication AUTOHAND will disappear.

	Programming of tolerances can extend program duration.

  Therefore, the duration of the program may be extended due to the programming of tolerances.

  The number -1999 for the tolerance minimum means “-∞“ and the number 9999 for the tolerance maximum means “+ ∞“. Entry of these numbers will never lead to program interruption.

  During the rapid transition phase, do NOT program any tolerance limits in order to permit the maximum heating and cooling speed.

- The initial setting ****.* of the fan speed corresponds to the maximal speed of 100 %.

	Do reduce the fan speed rate ONLY if absolutely necessary for the essay. Usually, the spatial exactitude of the temperature decreases with decreasing ventilation. Technical data refers to a 100 % fan speed rate.

- Programming is conserved even in case of a power failure or after turning off the unit.
- The controller memory can store a maximum of 25 programs. Each program cannot exceed 100 sections. It is not possible to link programs. The total number of program sections of all programs is limited to a maximum of 500.
- When the program is finished, the controller changes to Idle Mode.

	If you incidentally press the EXIT or AUTOMATIC button during program operation, the controller will change to Idle Mode and thus will not adjust any more to the program set-points. We recommend keyboard locking (option, chap. 14.3) during operation.

General note:

The controller MB1 displays more menu entries than those described in this manual. These are password protected because they are relevant for service purpose only and the user must not modify them. Only service authorized by BINDER can access these entries.

9.5 Repetition of a section or several sections within a program

Here we use the example of a set-point ramp temperature program of chap. 9.3. The shaded sections 02 and 03 shall be repeated e.g. 30 times.

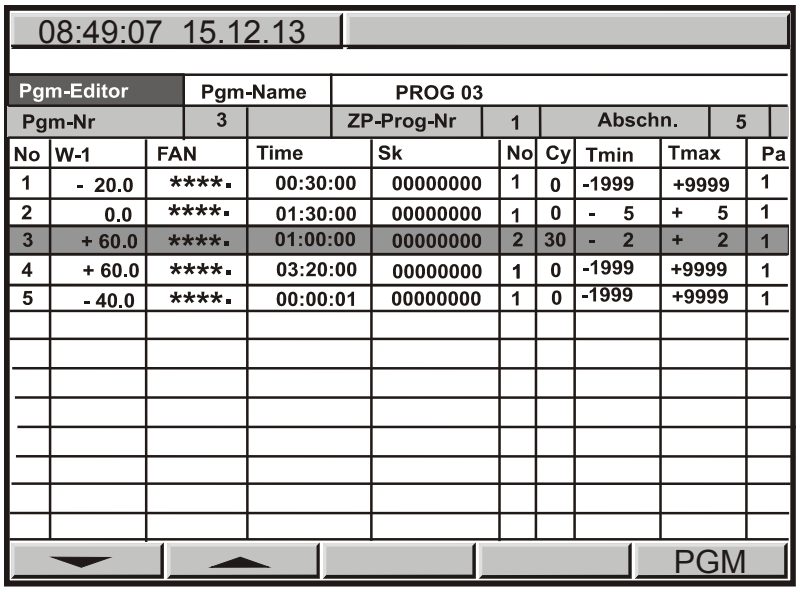
Program section	Set-point temp.	Fan	Section time	Operation line1	Target section	No. of cycles	Min. tolerance	Max. tolerance
01	-20	100 %	00:30:00	Off	1	0	-1999	+9999
02	0	100 %	01:30:00	Off	1	0	-5	+5
03	60	100 %	01:00:00	Off	1	0	-2	+2
04	60	100 %	03:20:00	Off	1	0	-1999	+9999
05	-40	100 %	00:00:01	Off	1	0	-1999	+9999

The following table shows the program that results, whereby the differences to the table above are shaded.

Program section	Set-point temp.	Fan	Section time	Operation line1	Target section	No. of cycles	Min. tolerance	Max. tolerance
01	-20	100 %	00:30:00	Off	1	0	-1999	+9999
02	0	100 %	01:30:00	Off	1	0	-5	+5
03	60	100 %	01:00:00	Off	2	30	-2	+2
04	60	100 %	03:20:00	Off	1	0	-1999	+9999
05	-40	100 %	00:00:01	Off	1	0	-1999	+9999

Sections 02 and 03 will be executed in total 31 times; only then will the program continue.

Entry of the values into the display program table:



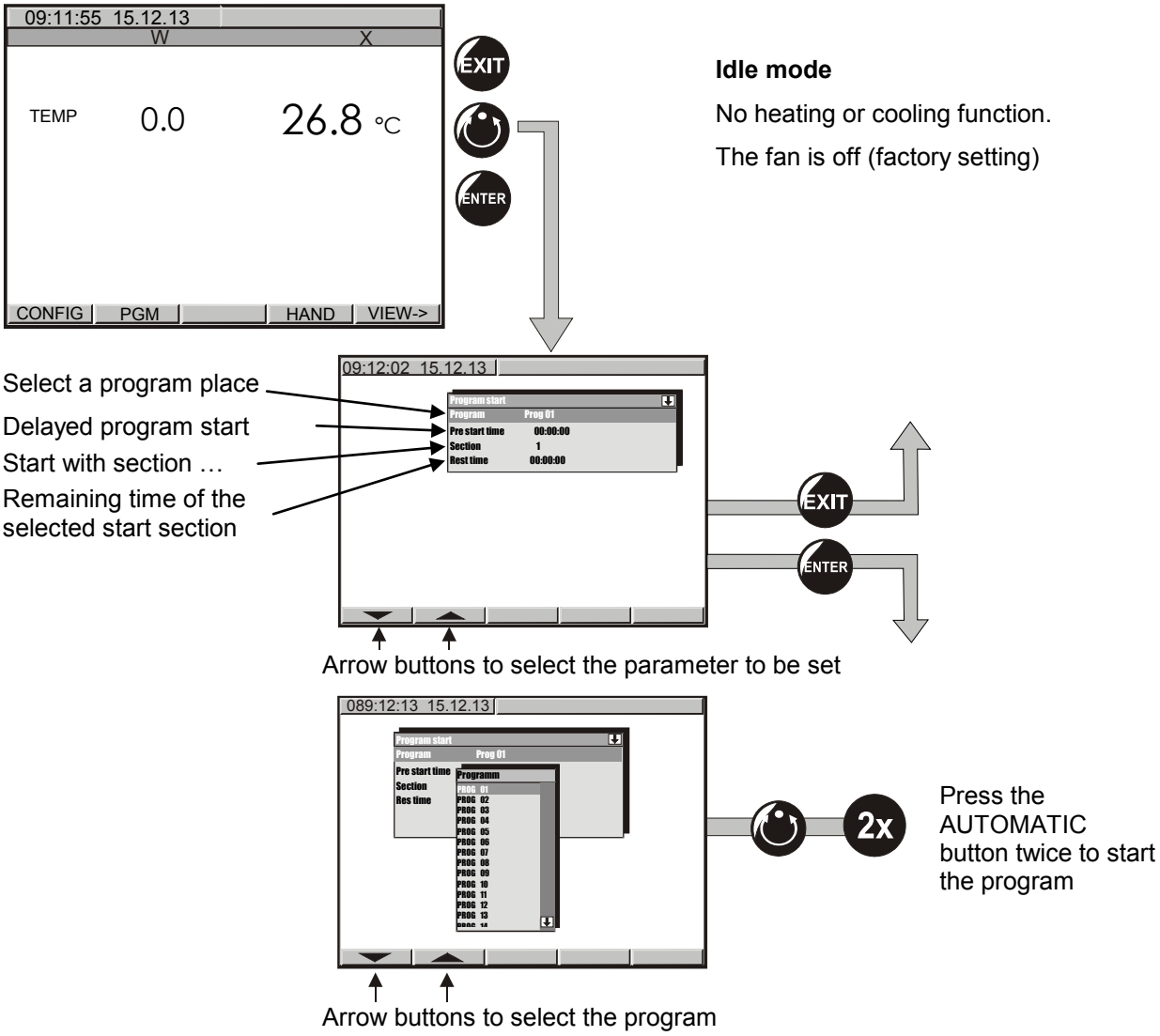
	To have sections repeated infinitely, enter the number of cycles “Cy” as “-1”.

9.6 Performance after power failure in Program Mode

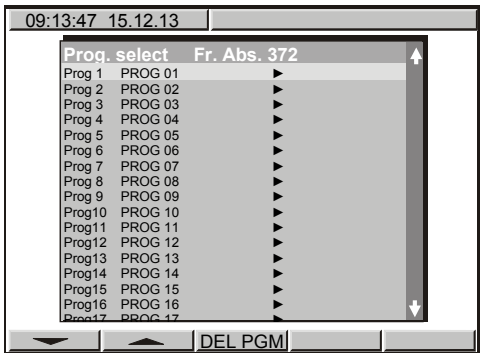
The program is resumed at the point where the interruption occurred with the latest set-points reached during the program run. The power failure is noted in the event list. No error message is displayed indicating that a power failure had taken place.

9.7 Starting a previously entered program

The program has to be previously entered via a programming table (chap. 9.3, 9.5).



9.8 Deleting a program



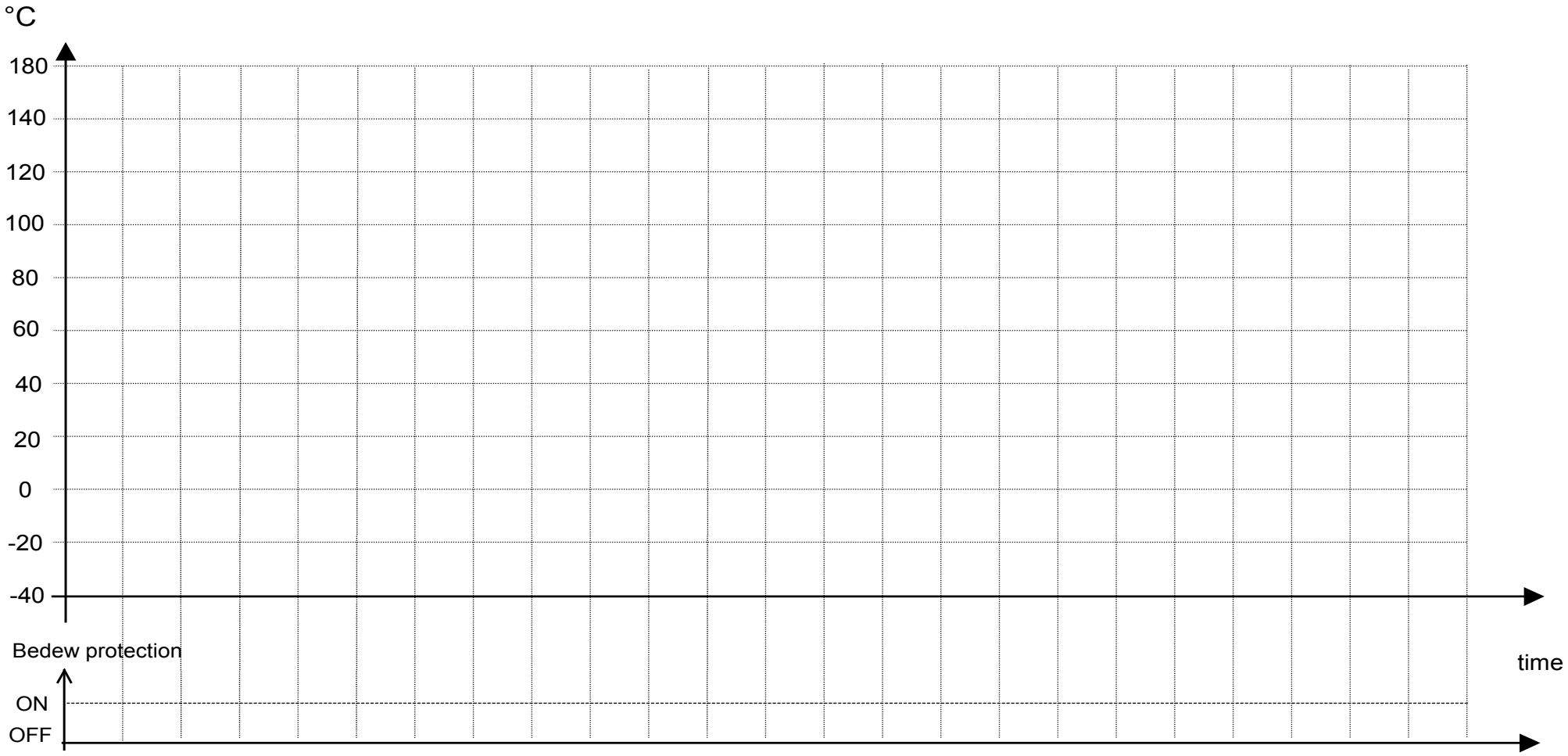
Select a program via the arrow keys

Press button DEL PGM to delete the selected program.

To delete individual program sections (table lines) use the inquiry display for adding or deleting program sections (chap. 9.1).

9.9 Temperature profile and operation lines template

Programmer :		**Program No. (1 to 25):**		**Date:**	
Program title:		**Operation line 1 controls the bedew protection**			
Project:		**On = active**	**Off = not active**		



9.10 Program table template

Programmer :		**Program No. (1 to 25):**		**Date:**	
Program title:		**Operation line 1**	**Controls the bedew protection**		
Project:		**On = active**	**Off = not active**		

Section No.	Set-point Temperature W-1	Fan speed [%] FAN	Section time Time	Operation line 1 Bedew protection Sk	Start section for repeat cycles No	Number of repeat cycles Cy	Tolerance-minimum Tmin	Tolerance-maximum Tmax	Parameter-set Pa
01									1
02									1
03									1
04									1
05									1
06									1
07									1
08									1
09									1
10									1
11									1
12									1
13									1
14									1
15									1
16									1
17									1
18									1
19									1
20									1

Default setting

10. Bedew protection facility (operation line 1)

The bedew protection condensates the chamber humidity at the coldest point in order to avoid the samples becoming wet from condensation. Bedew protection is performed by the evaporator and can be programmed On/Off via operation line 1 in Manual Mode (HAND) and in Program Mode (AUTO). The other operation lines are non-functional.

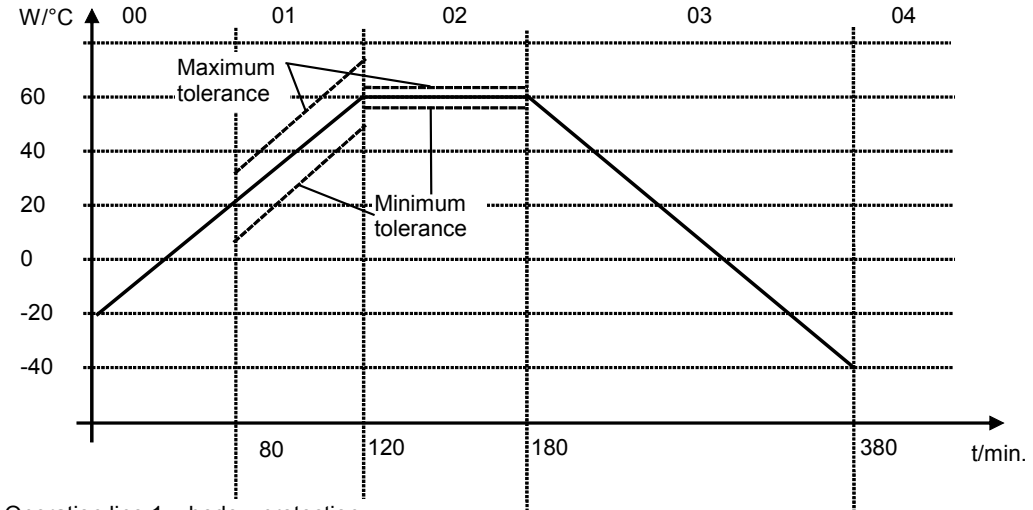
	Use the bedew protection only if absolutely necessary to prevent condensation on the charging material.

When the bedew protection is enabled (operation line 1 = On) the refrigeration machine keeps operating within warming-up phases (On = refrigeration machine operating, Off = refrigeration machine off).

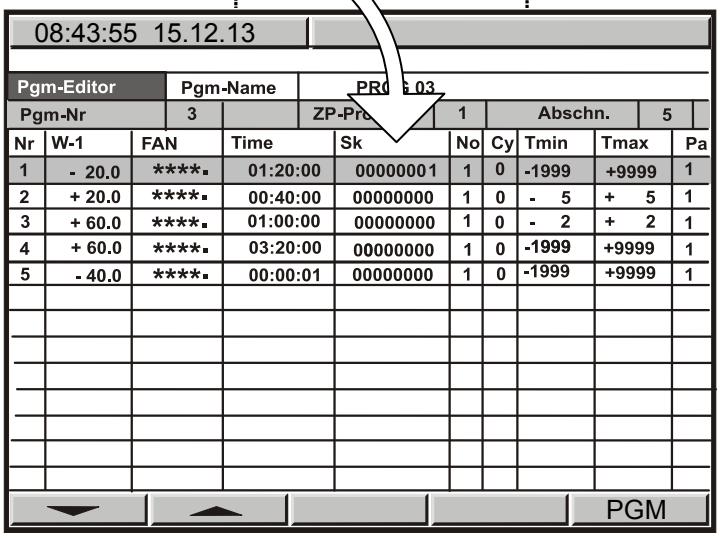
- **If possible, use the bedew protection only during warm-up phases.** If necessary it can also be activated during hold phases.
- **Do NOT use the bedew protection above a temperature set-point of +20 °C maximum.**

To obtain optimal warming results without condensation on the samples, program a heating gradient of about 0.5 °C/min.

Example:



Operation line 1 = bedew protection



In the program table the state of operation line 1 for bedew protection is represented in the column “Sk”:

On = 0000000**1**

Off = 0000000**0**

Example:

Operation line 1 is activated in the first program section and remains active up to +20 °C.

Then the refrigeration machine turns off automatically.

Depending on size, material, and shape of the charging material and on the heating-up rate, condensation may form despite the activated bedew protection. This condensation is, however, reduced compared to the state without bedew protection.

11. Temperature safety devices

11.1 Over-temperature protective device (class 1)

The alternating climate chamber MK is equipped with an internal temperature safety device class 1 according to DIN 12880. It serves to protect the unit and prevents dangerous conditions caused by major defect.

If the actual temperature exceeds the nominal temperature by approx. 20 °C, the over temperature protective device permanently turns off the unit. The user cannot restart the device again. This protective cut-off device is located internally. Only a service specialist can replace it. Therefore, please contact an authorized service provider or BINDER service.

11.2 Safety controller (over-temperature safety device class 2)

The alternating climate chamber MK is equipped with an over temperature safety device class 2 acc. to DIN 12880. It is designated as the “safety controller”. This second, electrically independent temperature controller takes over control at a selectable set point in case of a faulty condition. It serves to protect the charging material against extremely high temperatures.

	With the option over-/under temperature safety device (chap. 11.3), the safety controller must be set to maximum temperature.

The message “TEMPERATURE LIMIT” on the controller display indicates safety controller activity. The safety controller controls the alternating climate chamber to the entered safety controller set-point until the temperature inside the chamber returns below this temperature and until you then reset the alarm message by button RESET.

	Regularly check the safety controller setting for set-point type “Limit” or “Offset” • in Manual Mode according to the entered set-point temperature value • in Program Mode according to the highest temperature value of the selected temperature program Set the temperature value of the safety device by approx. 5 °C to 10 °C above the highest temperature set-point.

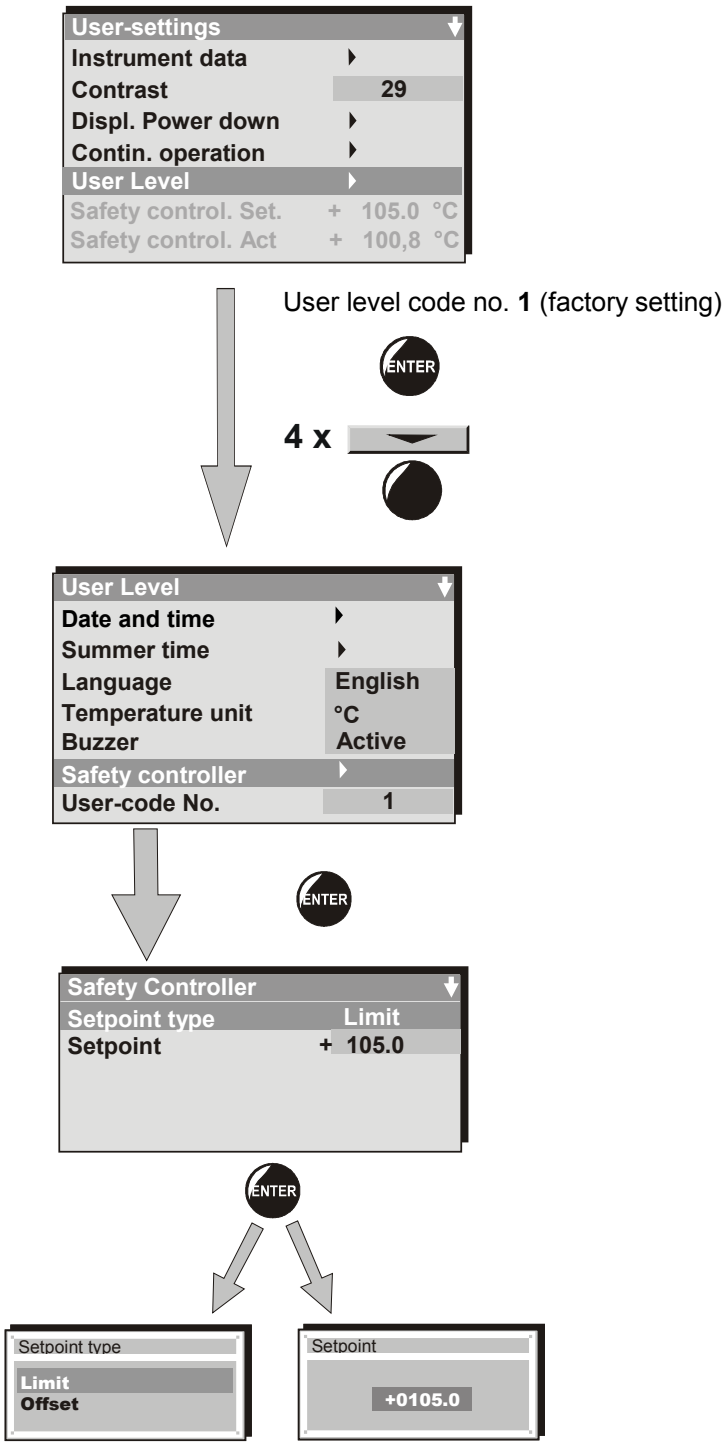
Safety controller set-point types:

Limit	Absolute maximum permitted temperature value. Example: Temperature set-point 100 °C/ *212 °F* Limit value (safety controller set-point) set to 110 °C.
Offset	Maximum over temperature above the active temperature set point. The maximum temperature changes internally and automatically with every set-point change it. Example: Temperature set-point 100 °C / *212 °F* Offset value (safety controller set-point) set to 10 °C.

	Do NOT change the temperature unit from °C to °F.

Checking and setting the safety controller set-point type and safety controller set-point:

Unlock the keyboard locking (option, chap. 14.3).



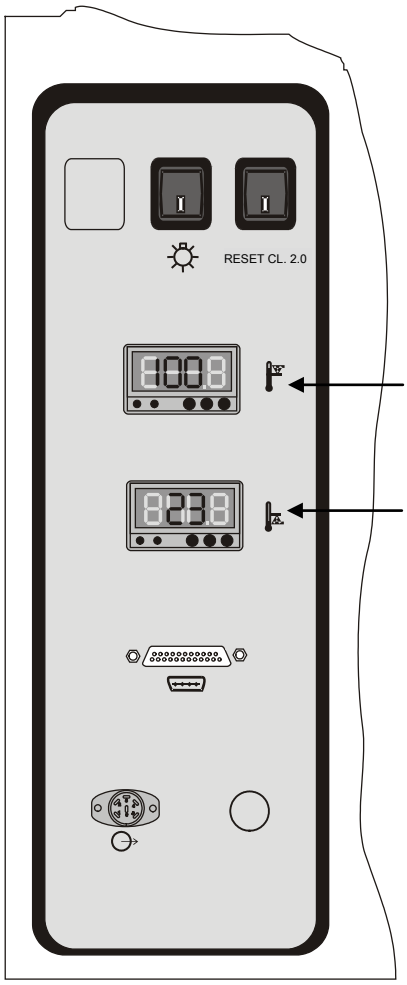
In the menu “User Level” select the submenu “Safety controller”.

- Select the safety controller set-point type “Limit” or “Offset” in the field “Setpoint type”
- Enter the value for “Limit” or “Offset” in the field “Setpoint”.

Lock afterwards the keyboard locking (option, chap. 14.3).

For temperature disturbances see alarm indications, chap. 12.

11.3 Over/under temperature safety device class 2 (option)



The over-/under temperature safety device (6) consists of two entry modules located in the lateral control panel. Both modules can be set from -50 °C / *-58°F* up to 200 °C / *392°F* and serve to define the maximum high and low temperature limits.

	With this option, the safety controller (chap. 11.2) must be set to maximum temperature.

(6a) Upper module: Entry of the higher limit temperature.

(6b) Lower module: Entry of the lower limit temperature.

When the temperature inside the chamber leaves this tolerance bandwidth, the temperature control, and herewith the heating and refrigeration, are turned off permanently.

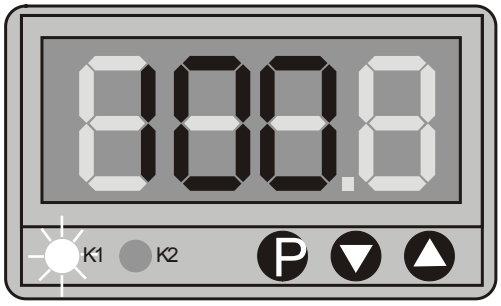
At the corresponding entry module, the red pilot lamp K1 lights up (K2 is without function).

The controller displays the alarm message „TEMP CLASS“. Additionally there is an audible alert, provided that the buzzer has not been deactivated in the “User level” menu.

Let the chamber heat up or cool down to the defined safety temperature range.

The press down RESET button (5) “RESET CL 2.0” located in the lateral control panel to re-activate the chamber. The red pilot lamp K1 goes off.

Then reset the alarm message at the controller display by controller button RESET (see chap. 12).



Setting limit temperatures at modules (6a) and (6b):

- Press down button P
- The display changes to entry mode
- Enter the desired limit temperature via the arrow keys
- The entered temperature value is adopted after a few seconds. The display shows the actual temperature again.

12. Notification and alarm functions

12.1 Notification and alarm system overview (auto diagnosis system)

The alternating climate chamber MK provides notification and alarm functions.

- Visual indications of notifications or error message are blue notes on the display of the MB1 controller.
- Visual indications of an alarm message are red notes with an alarm bell symbol.

  In addition, there is an audible alert, if you did not deactivate the buzzer in the “User level” menu (chap. 6.4).

Event	**Note (blue field)**	**Alarm (red field)**
Door open	**DOOR OPEN** immediately	
Operation line 1 (bedew protection) activated	**DRY** immediately	
Limit value of safety controller exceeded		**TEMPERATURE LIMIT** immediately
Power failure		
With option over/under temperature safety device class 2 (chap. 11.3):		
Exceeding the maximum / minimum temperature		**TEMP CLASS** immediately
With option keyboard locking (chap. 14.3):		
Keyboard locked	**KEY LOCK** immediately	

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

12.2 Resetting the notifications or alarm messages

The “RESET” button, which serves to acknowledge and reset the indication, will become visible automatically whenever a notification or an alarm message appears.

1. Depending on the type of error, remove the cause of the disturbance or wait until the unit compensates for the reason of the error.
2. Press the “RESET” button to reset the notification or alarm message.

	CAUTION
	In case the “RESET” button does not cancel the notification or alarm indication, the reason for the disturbance was not removed correctly ➢ Contact BINDER service.

13. Notes on refrigerating operation

Defrosting:

BINDER alternating climate chambers are very diffusion-proof. To ensure high temperature precision there is no automatic cyclic defrosting device. The refrigerating system largely avoids icing of the evaporation plates. However, at very low temperatures the moisture in the air can condense on the evaporator leading to icing.

	Always close the door properly.

Operation with temperature set-points above +5 °C / *41 °F* at an ambient temperature of 20 °C / *68 °F:*

The air defrosts the ice cover automatically. Defrosting is continually performed.

Operation with temperature set-points below +5 °C / *41 °F*:

Icing on the evaporator is possible. Defrost the unit manually.

	With temperature set-points below +5 °C / *41 °F,* regularly defrost the unit manually: • Set the temperature to 60 °C / *140 °F* (Manual Mode). • Let the unit operate for approx. 1 hour with the door closed. Remove the access port plugs.

	Too much ice on the evaporator is noticeable by reduced refrigerating performance.

Operation with temperature set-points below 0 °C / *32 °F*:

While operating the chamber with set-points below 0 °C / *32 °F* condensation is possible at the inner surface of the door around the door gasket.

	In case of heavy condensation, check tightness of the door gasket.

After one or two days operation at a set-point below 0 °C / *32 °F* a thin ice layer can cover the inner unit door , the front margins of the inner kettles and may be the glass window.. The amount depends of the ambient temperature and humidity. This does not influence the proper function of the refrigerating system.

	Refrigerating performance decreases while operating the chamber at temperatures below 0 °C / *32 °F* due to icing of the evaporators. For this reason defrost the chamber regularly, e.g. once a week.

	**CAUTION** **Uncontrolled defrosting of icing on the evaporator.** After several days of refrigerating below +5 °C / *41 °F*: ∅ Do NOT directly turn off the unit. ➢ Manually defrost the unit (see description above). ➢ Then, shut down the unit at the main power switch (2) and close the tap of the water supply. Keep removed the access port plugs.

14. Options

14.1 Communication software APT-COM™ 3 DataControlSystem (option)

The alternating climate chamber MK is regularly equipped with a serial interface RS 422 that can connect the BINDER communication software APT-COM™ 3 DataControlSystem. The actual temperature values are given at adjustable intervals. Programming can be performed graphically via PC. Up to 30 chambers with RS 422 interface can be cross-linked. For further information, please refer to the operating manual of the BINDER communication software APT-COM™.

Pin allocation of the RS 422 interface:

pin 2:	RxD (+)
pin 3:	TxD (+)
pin 4:	RxD (-)
pin 5:	TxD (-)
pin 7:	Ground

14.2 Analog output for temperature (option)

With this option the chamber is equipped with an analog output 4-20 mA for temperature. This output permits transmitting data to external data registration systems or devices.

The connection is realized as a DIN socket (8) in the lateral control panel as follows:

ANALOG OUTPUT 4-20 mA DC

PIN 1: Temperature –
PIN 2: Temperature +

Temperature range: -40 °C / *-40 °F* up to +180 °C / *-356 °F*

A suitable DIN plug is enclosed.

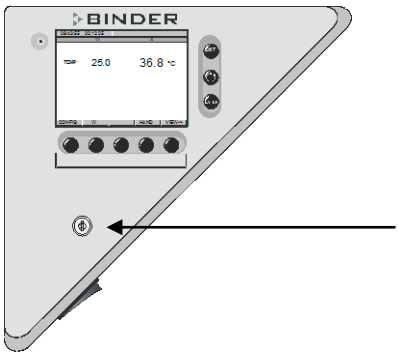
Figure 9: Pin allocation of the DIN socket (8) for option analog output

14.3 Keyboard locking (option)

The keyboard of the MB1 controller can be locked and unlocked via the key switch (option). In locked state, no entries to the controller are possible.

Locked keyboard:	Switch position vertical
Unlocked keyboard:	Switch position to the right

You can remove the key only when the keyboard is locked.



Key switch

Figure 10: Keyboard locking (option)

If the keyboard is locked, the notification “KEY LOCK” is displayed on the controller MB1 display next to a flashing blue information symbol.

14.4 Data logger kit

BINDER Data Logger Kits offer an independent long-term measuring system for temperature. They are equipped with a keyboard and a large LCD display, alarm functions and a real-time function. Measurement data are recorded in the Data Logger and can be read out after the measurement via the RS232 interface of the Data Logger. It offers a programmable measuring interval and permits storing up to 64000 measuring values. Reading out is done with the Data Logger evaluation software. You can give out a combined alarm and status protocol directly to a serial printer.

Data Logger Kit T 220: Temperature range -90 °C / *-130 °F* up to +220 °C / *428 °F*

	For detailed information on installation and operation of the BINDER Data Logger, please refer to the mounting instructions Art. No. 7001-0204 and to the original user manual of the manufacturer, supplied with the data logger.

14.5 Additional measuring channel for digital object temperature indicator with flexible temperature sensor Pt 100 (option)

The object temperature display enables the determination of the actual temperature of the charging material during the whole process. The object temperature is measured via a flexible Pt100 temperature sensor and can be viewed at the display controller MB1. The sensor top protective tube of the flexible Pt 100 can be immersed into liquid substances.

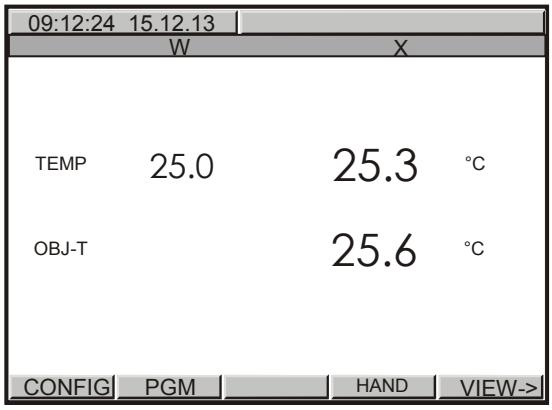


Figure 11: Display controller MB1 MB1with object temperature display

The object temperature data is given out together with the data of the temperature controller to the RS 422 interface as a second measuring channel and can be documented by the communication software APT-COM™ (option, chap. 14.1) developed by BINDER.

Technical data of the Pt 100 sensor:

- Three-wire technique
- Class B (DIN EN 60751)
- Temperature range up to 320 °C
- Stainless steel protective tube 45 mm length, material no. 1.4501

15. Maintenance, cleaning, and service

15.1 Maintenance intervals, service

DANGER

Electrical hazard.

Danger of death.

∅ The unit must NOT become wet during operation or maintenance works.

∅ Do NOT remove the rear panel of the unit.

➢ Before conducting maintenance work, turn off the unit at the main power switch and disconnect the power plug.

➢ General maintenance work must be conducted by licensed electricians or experts authorized by BINDER.

➢ Maintenance work at the refrigeration system must only be conducted by qualified personnel who underwent training in accordance with EN 13313:2010 (e.g. a refrigeration technician with certified expert knowledge acc. to regulation 303/2008/EC). Follow the national statutory regulations.

Ensure regular maintenance work is performed at least once a year and that the legal requirements are met regarding the qualifications of service personnel, scope of testing and documentation. All work on the refrigeration system (repairs, inspections) must be documented in a service log book (equipment records).

The warranty becomes void if maintenance work is conducted by non-authorized personnel.

Replace the door gasket only when cold. Otherwise, the door gasket may become damaged.

With an increased amount of dust in the ambient air, clean the condenser fan (by suction or blowing) several times a year.

We recommend taking out a maintenance agreement. Please consult BINDER Service.

BINDER telephone hotline:	+49 (0) 7462 2005 555
BINDER fax hotline:	+49 (0) 7462 2005 93555
BINDER e-mail hotline:	service@binder-world.com
BINDER service hotline USA:	+1 866 885 9794 or +1 631 224 4340 x3 (toll-free in the USA)
BINDER service hotline Asia Pacific:	+852 390 705 04 or +852 390 705 03
BINDER service hotline Russia and CIS	+7 495 988 15 16
BINDER Internet website	http://www.binder-world.com
BINDER address	BINDER GmbH, post office box 102, D-78502 Tuttlingen

International customers, please contact your local BINDER distributor.

15.2 Cleaning and decontamination

Clean the unit after each use to avoid potential corrosion damage by ingredients of the test material.

DANGER

Electrical hazard.

Danger of death.

∅ Do NOT spill water or cleaning agents over the inner and outer surfaces.

➢ Before cleaning, turn off the unit at the main power switch and disconnect the power plug.

➢ Completely dry the appliance before turning it on again.

15.2.1 Cleaning

Disconnect the chamber from the power supply before cleaning. Disconnect the power plug.

The interior of the unit must be kept clean. Thoroughly remove any residues of test material.

Wipe the surfaces with a moistened towel. In addition, you can use the following cleaning agents:

Exterior surfaces inner chamber racks door gaskets	Standard commercial cleaning detergents free from acid or halides. Alcohol-based solutions. We recommend using the neutral cleaning agent Art. No. 1002-0016.
Instrument panel	Standard commercial cleaning detergents free from acid or halides. We recommend using the neutral cleaning agent Art. No. 1002-0016.
Zinc coated hinge parts rear unit wall	Standard commercial cleaning detergents free from acid or halides. Do NOT use a neutral cleaning agent on zinc coated surfaces.

Do not use cleaning agents that may cause a hazard due to reaction with components of the device or the charging material. If there is doubt regarding the suitability of cleaning products, please contact BINDER service.

CAUTION

Danger of corrosion.

Damage to the unit.

∅ Do NOT use acidic or chlorine cleaning detergents.

∅ Do NOT use a neutral cleaning agent on other kind of surfaces e.g., the zinc coated hinge parts or the rear unit wall.

We recommend using the neutral cleaning agent Art. No. Art. Nr. 1002-0016 for a thorough cleaning.

Any corrosive damage that may arise following use of other cleaning agents is excluded from liability by BINDER GmbH.

Any corrosive damage caused by a lack of cleaning, is excluded from liability by BINDER GmbH.

	For surface protection, perform cleaning as quickly as possible. After cleaning completely remove cleaning agents from the surfaces with a moistened towel. Let the unit dry.

	Soapsuds may contain chlorides and must therefore NOT be used for cleaning.

	With every cleaning method, always use adequate personal safety controls.

Following cleaning, leave the unit door open or remove the access port plugs.

	The neutral cleaning agent may cause health problems in contact with skin and if ingested. Follow the operating instructions and safety hints labeled on the bottle of the neutral cleaning agent.

Recommended precautions: To protect the eyes use sealed protective goggles. Suitable protective gloves with full contact: butyl or nitrile rubber, penetration time >480 minutes.

	**CAUTION** **Contact with skin, ingestion.** **Skin and eye damage due to chemical burns.** ∅ Do not ingest. Keep away from food and beverages. ∅ Do NOT empty into drains. ➢ Wear protective gloves and goggles. ➢ Avoid skin contact.

15.2.2 Decontamination

The operator must ensure that proper decontamination is performed in case a contamination of the chamber by hazardous substances has occurred.

Disconnect the chamber from the power supply prior to chemical decontamination. Disconnect the power plug.

Do not use decontamination agents that may cause a hazard due to reaction with components of the device or the charging material. If there is doubt regarding the suitability of cleaning products, please contact BINDER service.

You can use the following disinfectants:

Inner chamber	Standard commercial surface disinfectants free from acid or halides. Alcohol-based solutions. We recommend using disinfectant Art. No. 1002-0022.

	For chemical disinfection, we recommend using the disinfectant spray Art. No. 1002-0022. Any corrosive damage that may arise following use of other disinfectants is excluded from liability by BINDER GmbH.

	With every decontamination method, always use adequate personal safety controls.

In case of contamination of the interior by biologically or chemically hazardous goods, there are two possible procedures depending on the type of contamination and charging material.

(1) Spray the inner chamber with an appropriate disinfectant.

Before start-up, the unit must be absolutely dry and ventilated, as explosive gases may form during the decontamination process.

(2) If necessary, have strongly contaminated inner chamber parts removed by an engineer for cleaning, or have them exchanged. Sterilize the inner chamber parts in a sterilizer or autoclave.

	In case of eye contact, the disinfectant spray may cause eye damage due to chemical burns. Follow the operating instructions and safety hints labeled on the bottle of the disinfectant spray.

Recommended precautions: To protect the eyes use sealed protective goggles.

	**CAUTION** **Eye contact.** **Eye damage due to chemical burns.** ∅ Do NOT empty into drains. ➢ Wear protective goggles.

	After using the disinfectant spray, allow the unit to dry thoroughly, and aerate it sufficiently.

15.3 Sending back the unit to the BINDER GmbH

If you send a BINDER product to us for repair or any other reason, we will only accept the product upon presentation of an **authorization number** (RMA number) that has previously been issued to you. We will issue an authorization number after receiving your complaint either in writing or by telephone prior to your sending the BINDER product back to us. The authorization number will be issued following receipt of the information mentioned below:

- BINDER product type and serial number
- Date of purchase
- Name and address of the dealer from which you bought the BINDER product
- Exact description of defect or fault
- Your full address; if possible contact person and availability of that person
- Exact location of the BINDER product
- Contamination clearance certificate (chap. 19) via fax in advance

The authorization number needs to be applied to the packaging in such a way that it can be easily recognized or be recorded clearly in the delivery documents.

	For security reasons we cannot accept your delivery if it does not carry an authorization number.

Return address: BINDER GmbH Gänsäcker 16
Abteilung Service 78502 Tuttlingen, Germany

16. Disposal

16.1 Disposal of the transport packing

Packing element	Material	Disposal
Straps to fix packing on pallet	Plastic	Plastic recycling
Wooden transport box (option)	Non-wood (compressed match-wood, IPPC standard)	Wood recycling
with metal screws	Metal	Metal recycling
Pallet with foamed plastic stuffing	Solid wood (IPPC standard)	Wood recycling
	PE foam	Plastic recycling
Transport box with metal clamps	Cardboard	Paper recycling
	Metal	Metal recycling
Edge protection	Styropor® or PE foam	Plastic recycling
Protection of doors and racks	PE foam	Plastic recycling
Bag for operating manual	PE foil	Plastic recycling
Insulating air cushion foil (packing of optional accessories)	PE foil	Plastic recycling

If recycling is impossible, all packing parts can also be disposed of with normal waste.

16.2 Decommissioning

Turn off the main power switch (2). Disconnect the unit from the power supply.

	When turning off the main power switch ON / OFF (2), the stored parameters remain saved.

- Temporal decommissioning: See indications for appropriate storage, chap. 3.3.

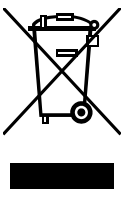
  In case of a prolonged temporal decommissioning: Leave the unit door open or remove the access port plugs.

- Final decommissioning: Dispose of the unit as described in chap. 16.3 to 16.5.

16.3 Disposal of the unit in the Federal Republic of Germany

According to directive 2002/96/EC of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE), BINDER devices are classified as “monitoring and control instruments” (category 9) only intended for professional use“. They must not be disposed of at public collecting points.

The alternating climate chamber MK bears the symbol for the marking of electrical and electronic equipment manufactured / placed on the market in the EC after 13 August 2005 and be disposed of in separate collection according to the directive 2002/96/EC on waste electrical and electronic equipment (WEEE) and German national law for electrical and electronic equipment (Elektro- und Elektronikgerätegesetz, ElektroG). WEEE marking: crossed-out wheeled bin with solid bar under. A significant part of the materials must be recycled in order to protect the environment.



At the end of the device's service life, have the device disposed of according to the German national law for electrical and electronic equipment (Elektro- und Elektronikgerätegesetz, ElektroG) from 23 March 2005, BGBl. I p. 762 or contact BINDER service who will organize taking back and disposal of the unit according to the German national law for electrical and electronic equipment (Elektro- und Elektronikgerätegesetz, ElektroG) from 23 March 2005, BGBl. I p. 762.

CAUTION

Violation against existing law.

∅ Do NOT dispose of BINDER devices at public collecting points.

➢ Have the device disposed of professionally at a recycling company which is certified according to the German national law for electrical and electronic equipment (Elektro- und Elektronikgerätegesetz, ElektroG) from 23 March 2005, BGBl. I p. 762.

or

➢ Instruct BINDER service to dispose of the device. The general terms of payment and delivery of the BINDER GmbH apply, which were valid at the time of purchasing the unit.

Certified companies disassemble waste (used) BINDER equipment in primary substances for recycling according to directive 2002/96/EC. The devices must be free from toxic, infectious or radioactive substances in order to eliminate any health hazards to the employees of the recycling companies.

It is the user's responsibility that the unit is free from toxic, infectious or radioactive substances prior to handing it over to a recycling company.

- Prior to disposal, clean all introduced or residual toxic substances from the unit.
- Prior to disposal, disinfect the unit from all sources of infection. Be aware of the fact that sources of infection may also be located outside the inner chamber.
- If you cannot safely remove all toxic substances and sources of infection from the unit, dispose of it as special waste according to national law.
- Fill out the contamination clearance certificate (chap. 19) and enclose it with the unit.

WARNING

Contamination of the device with toxic, infectious or radioactive substances.

Danger of intoxication.

Danger of infection.

∅ NEVER take a unit contaminated with toxic substances or sources of infection for recycling according to directive 2002/96/EC.

➢ Prior to disposal, remove all toxic substances and sources of infection from the unit.

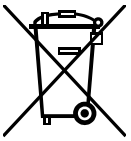
➢ Dispose of a unit from which all toxic substances or sources of infection cannot be safely removed as special waste according to national law.

The refrigerant used R404a is not inflammable at ambient pressure. It must not escape into the environment. In Europe, recovery of the refrigerant R404a (GWP 3750) is mandatory according to regulation No. 842/2006/EC. Ensure the compliance with the applicable legal requirements regarding qualification of staff, disposal, and documentation.

16.4 Disposal of the unit in the member states of the EC except for the Federal Republic of Germany

According to directive 2002/96/EC of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE), BINDER devices are classified as “monitoring and control instruments” (category 9) only intended for professional use“. They must not be disposed of at public collecting points.

The alternating climate chamber MK bears the symbol for the marking of electrical and electronic equipment manufactured / placed on the market in the EC after 13 August 2005 and be disposed of in separate collection according to the directive 2002/96/EC on waste electrical and electronic equipment (WEEE). WEEE marking: crossed-out wheeled bin with solid bar under.



At the end of the device’s service life, notify the distributor who sold you the device, who will take back and dispose of the unit according to the directive 2002/96/EC of 27 January 2003 on waste electrical and electronic equipment (WEEE).

CAUTION

Violation against existing law.

∅ Do NOT dispose of BINDER devices at public collecting points.

➢ Have the device disposed of professionally at a recycling company which is certified according to conversion of the directive 2002/96/EC into national law.

or

➢ Instruct the distributor who sold you the device to dispose of it. The agreements apply that were reached with the distributor when purchasing the unit (e.g. his general terms of payment and delivery).

➢ If your distributor is not able to take back and dispose of the unit, please contact BINDER service.

Certified companies disassemble waste (used) BINDER equipment in primary substances for recycling according to directive 2002/96/EC. The devices must be free from toxic, infectious or radioactive substances in order to eliminate any health hazards to the employees of the recycling companies.

It is the user’s responsibility that the unit is free from toxic, infectious or radioactive substances prior to handing it over to a recycling company.

- Prior to disposal, clean all introduced or residual toxic substances from the unit.
- Prior to disposal, disinfect the unit from all sources of infection. Be aware of the fact that sources of infection may also be located outside the inner chamber.
- If you cannot safely remove all sources of infection and toxic substances from the unit, dispose of it as special waste according to national law.
- Fill out the contamination clearance certificate (chap. 19) and enclose it with the unit.

WARNING

Contamination of the device with toxic, infectious or radioactive substances.

Danger of intoxication.

Danger of infection.

∅ NEVER take a unit contaminated with toxic substances or sources of infection for recycling according to directive 2002/96/EC.

➢ Prior to disposal, remove all toxic substances and sources of infection from the unit.

➢ Dispose of a unit from which all toxic substances or sources of infection cannot be safely removed as special waste according to national law.

The refrigerant used R404a is not inflammable at ambient pressure. It must not escape into the environment. In Europe, recovery of the refrigerant R404a (GWP 3750) is mandatory according to regulation No. 842/2006/EC. Ensure the compliance with the applicable legal requirements regarding qualification of staff, disposal, and documentation.

16.5 Disposal of the unit in non-member states of the EC

CAUTION

Alteration of the environment.

➢ For final decommissioning and disposal of the alternating climate chamber, please contact BINDER service.

➢ Observe the statutory regulations for appropriate, environmentally friendly disposal.

The main board of the alternating climate chamber includes a lithium cell. Please dispose of it according to national regulations.

The refrigerant used R404a is not inflammable at ambient pressure. It must not escape into the environment. In Europe, recovery of the refrigerant R404a (GWP 3750) is mandatory according to regulation No. 842/2006/EC. Ensure the compliance with the applicable legal requirements regarding qualification of staff, disposal, and documentation.

17. Troubleshooting

Fault description	Possible fault cause	Required measures
Heating		
Chamber heating permanently, set-point not held.	Controller defective.	Contact BINDER service.
	Pt 100 sensor defective.	
	Semiconductor relay defective.	
	Controller not adjusted.	Calibrate and adjust controller.
Chamber doesn't heat up.	Heating element defective.	Contact BINDER service.
	Semiconductor relay defective	
Chamber doesn't heat up when turning on the chamber. Safety controller responds.	Limit temperature reached. Safety controller (chap. 11.2) set too low.	Let the chamber cool down and hit the RESET button of the MB1 controller. If appropriate, select suitable limit value.
	Safety controller (chap. 11.2) defective.	Contact BINDER service.
Unit permanently turned off.	Nominal temperature exceeded by 20° due to unit failure. Over temperature protective device (class 1) responds.	Contact BINDER service.
Safety device class 2 responds	Limit temperature reached.	Disconnect the chamber from the power supply and let it cool down. Detect cause and remove it. Hit the RESET button of the controller. Start up the chamber and check control functions. If appropriate, select suitable limit value.
Over-/under temperature safety device class 2 (option) responds.	Limit temperature reached.	Disconnect the chamber from the power supply and let it cool down. Detect cause and remove it. Hit RESET button (5). Start up the chamber and check control functions. If appropriate, select suitable limit value.
Refrigerating performance		
No or too low refrigerating performance.	Ambient temperature > 25 °C (chap. 3.4).	Select cooler place of installation.
	Compressor not turned on.	Contact BINDER service.
	Electro-valves defective.	
	No or not enough refrigerant.	
Condensation		
Condensation at the samples.	Heating-up phase without bedew protection.	Use the bedew protection (chap. 10).
Condensation or icing at the sides of the inner chamber.	Set-point for a long time below ambient temperature, icing in the preheating chamber.	Defrost the unit.

Fault description	Possible fault cause	Required measures
Controller		
No unit function (dark display).	Display mode “Standby” active.	Press any controller key.
	Main power switch turned off.	Turn on the main power switch.
No entries to controller keypad possible. Notification “KEY LOCK” is displayed	Keyboard locking (option) activated.	Unlock keyboard locking (chap. 14.3).
No access to menu “User settings”“.	User code forgotten.	Contact BINDER service.
Wrong temperature alarms, disturbance of temperature accuracy	Temperature unit changed to °F.	Set temperature unit to °C (chap. 6.4).
Chart recorder function: measured-value memory cleared, information loss.	New setting of storage rate.	Change the storage rate ONLY if the previously registered data are no more required (chap. 7).
Controller does not attain set-points entered in Manual Mode.	Button EXIT or AUTOMATIC has been hit: Unit is in Idle Mode.	Change to Manual Mode (chap. 8).
Controller does not attain program set-points.	Button EXIT or AUTOMATIC has been hit: Unit is in Idle Mode.	Start the program again (chap. 9.7).
Program duration longer than programmed.	Tolerances have been programmed.	For rapid transition phases, do NOT program tolerance limits in order to permit maximum heating, speed.
Program stops one section too early.	Program line is incomplete.	When programming, define the end value of the desired cycle by adding an additional section with a section time of at least one second.
RESET button does not cancel the notifying or alarm indication.	Cause of disturbance not removed correctly.	Remove cause of disturbance. If the RESET button still does not cancel the indication, contact BINDER service.
Ramp temperature transitions are only realized as steps.	When using the Program Editor of the software APT-COM™ 3 DataControlSystem, the setting “step” has been selected.	Select setting „ramp“ in the Program Editor of the software APT-COM™ 3 DataControlSystem and transfer a program to the chamber controller.
Display flashing: 1999 or -1999 or 9999.	Sensor rupture between sensor and controller or Pt 100 sensor defective.	Contact BINDER service.
	Short-circuit.	
	Initialization problem due to turning on the chamber too early.	Observe a delay time of about 30s between turning Off and On again the chamber.
Miscellaneous		
Fan does not turn	Fan speed set to 0%..	Set the fan speed to the desired value.

	Repair must only be performed by qualified service personnel authorized by BINDER. Repaired units must comply with the BINDER quality standards.

18. Technical description

18.1 Factory calibration and adjustment

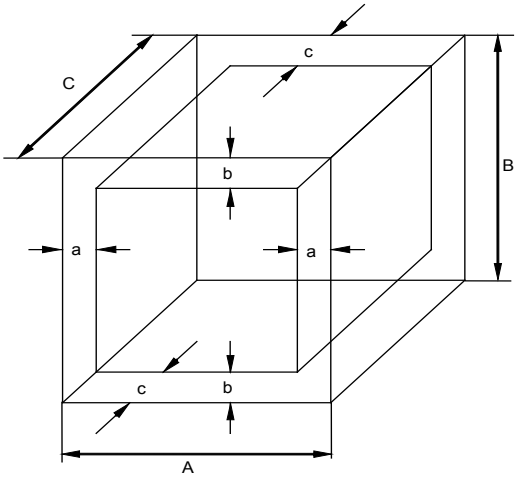
This unit was calibrated and adjusted in factory. Calibration and adjustment were performed using standardized test instructions, according to the QM DIN EN ISO 9001 system applied by BINDER (certified since December 1996 by TÜV CERT). All test equipment used is subject to the administration of measurement and test equipment that is also constituent part of the BINDER QM DIN EN ISO 9001 systems. They are controlled and calibrated to a DKD standard at regular intervals.

18.2 Over-current protection

As a single-phase device, the alternating climate chamber MK 53 is protected with an over-current protection accessible from the outside. It is situated at the rear of the chamber above the stress relief of the power cable. The fuse holder is equipped with a fuse clip 5x20 mm. If necessary, replace the fuse only with a substitute of identical ratings; see technical data specifications (chap. 18.4).

18.3 Definition of usable volume

The usable volume illustrated below is calculated as follows:



A, B, C = internal dimensions (W, H, D)
a, b, c = wall separation

a = 0.1*A
b = 0.1*B
c = 0.1*C

V_{USE} = (A - 2 * a) * (B - 2 * b) * (C - 2 * c)

Figure 12: Determination of the useable volume

The technical data refers to the so defined usable volume.

	Do NOT place samples outside this usable volume. Do NOT load this volume by more than half to enable sufficient airflow inside the chamber. Do NOT divide the usable volume into separate parts with large area samples. Do NOT place samples too close to each other in order to permit circulation between them and thus obtain a homogenous distribution of temperature.

18.4 Technical Data MK 53 (E2.1)

Exterior dimensions			
Width (including access port 80 mm with plug)		mm / *inch*	745 / *29.33*
Height (feet included)		mm / *inch*	1245 / *49.02*
Depth (including 55 mm controller and door handle)		mm / *inch*	795 / *31.30*
Wall clearance sides		mm / *inch*	160 / *6.30*
Wall clearance rear		mm / *inch*	100 / *3.94*
Window width		mm / *inch*	280 / *11.02*
Window height		mm / *inch*	280 / *11.02*
Interior dimensions			
Width		mm / *inch*	402 / *15.83*
Height		mm / *inch*	402 / *15.83*
Depth		mm / *inch*	330 / *12.99*
Interior volume		l / *cu.ft.*	53 / *1.9*
Number of racks (standard / max.)			1/5
Load per rack		Kg / *lbs.*	15 / *33*
Permitted total load		Kg / *lbs.*	40 / *88*
Temperature data			
Temperature range		°C / *°F*	-40 to +180
Temperature uniformity (variation)		± K	0.4 to 2.0
Temperature fluctuation		± K	0.1 to 0.5
Recovery time after door was opened for 30 sec 1)	at -10 °C	minutes	5
	at + 70 °C	minutes	1
	at +150 °C	minutes	5
Average heating up time from -40 °C to 180 °C		K/min.	4.6
Average cooling down time from 180 °C to -40 °C		K/min.	4.1
Max. heat compensation		W	500
Electrical data			
IP-system of protection acc. to EN 60529		IP	20
Nominal voltage (+10%) 50 Hz		V	230 1N~
Power plug			shockproof plug
Over-voltage category acc. to IEC 61010-1			II
Pollution degree acc. to IEC 61010-1			2
Nominal power		kW	2.60
Energy consumption 2) at 20 °C / *68 °F*		Wh/h	1020
Further information			
Weight (empty)		Kg / *lbs.*	150 / *331*
Filling weight of refrigerant		Kg / *lbs.*	0.85 / *1.87*
Noise level		approx. dB(A)	59

1) to 98% of the set value

2) These values can be used for dimensioning air condition systems.

All technical data is specified for unloaded units with standard equipment at an ambient temperature of +25 °C / *77 °F* and a power supply voltage fluctuation of ±10. The temperature data is determined in accordance to BINDER factory standard following DIN 12880, observing the recommended wall clearances of 10 % of the height, width and depth of the inner chamber. Technical data refers to 100% fan speed.

All indications are average values, typical for units produced in series. We reserve the right to change technical specifications at any time.

	If the cabinet is fully loaded, the specified heating up and cooling down times may vary according to the load.

18.5 Equipment and options MK 53

	To operate the alternating climate chamber MK, use only original BINDER accessories or accessories / components from third-party suppliers authorized by BINDER. The user is responsible for any risk arising from using unauthorized accessories.

Regular equipment
Microprocessor display program controller
Communication interface RS 422
Fan speed controller
Programmable bedew protection of charging material
Door with window and interior lighting
Access ports with silicone plug, 80 mm on top
1 rack, stainless steel
Temperature safety device class 2 acc. to DIN 12880:2007

Options / accessories
Additional rack, stainless steel
Perforated rack ,stainless steel
Securing elements for additional fastening of racks (4 pieces)
Keyboard locking
Lockable door
Access ports 80 mm right or left with silicone plug
Over-/under temperature safety device class 2
Analogue output 4-20 mA for temperature with 6 pole DIN socket, DIN plug included
Additional measuring channel for digital object temperature display with flexible Pt100 temperature sensor
BINDER Data Logger kit for temperature TH 220
Calibration of temperature including certificate
Spatial temperature measurement including certificate
Spatial temperature measurement acc. to DIN 12880 including certificate
Qualification folder

18.6 Accessories and spare parts MK 53

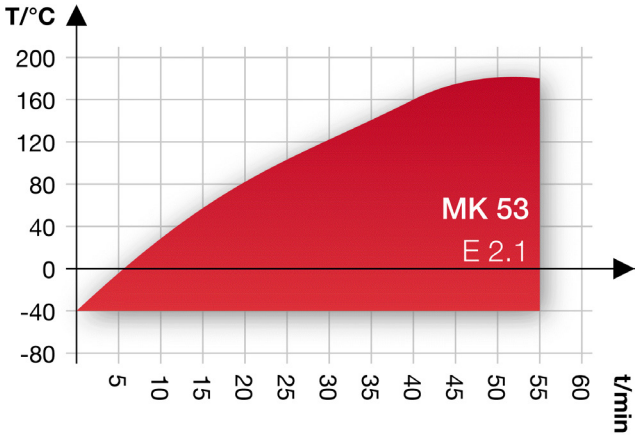
	BINDER GmbH is responsible for the safety features of the unit only, provided skilled electricians or qualified personnel authorized by BINDER perform all maintenance and repair, and if components relating to chamber safety are replaced in the event of failure with original spare parts. The user is responsible for any risks arising from using unauthorized accessories / components.

Description	Art. No.
Rack, stainless steel	6004-0007
Perforated rack, stainless steel	6004-0029
Rack lockings (4 pieces)	8012-0531
Door gasket silicone outside	6005-0114
Door gasket silicone inside	6005-0113
Plug for silicon access port d80	6016-0029
Program controller MB1, screen	5014-0059
Program controller MB1, E/A board	5014-0060
Temperature fuse 229 °C class 1	5006-0037
Temperature sensor 2xPt 100 bend-off	5002-0031
Unit fuse 5x20mm 250V 16A semi time lag (M)	5006-0013
Lamp interior lighting	5008-0004
Data Logger Kit T 220	8012-0715
Stable table on wheels with castors and locking brakes	9051-0018
Qualification folder	8012-0423
Neutral cleaning agent, 1 kg	1002-0016
Calibration of temperature including certificate	DL011021
Spatial temperature measurement including certificate (2-5 measuring points)	DL011022
Spatial temperature measurement including certificate (6-9 measuring points)	DL011023
Spatial temperature measurement including certificate (10-18 measuring points)	DL011024
Spatial temperature measurement acc. to DIN 12880 including certificate (27 measuring points)	DL011025

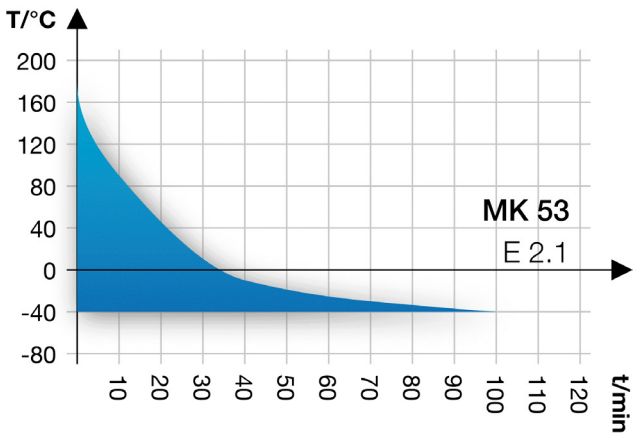
18.7 Heating-up and cooling-down graphs

The maximal speed of temperature change is 4.1 K/min in refrigerating operation and 4.6 K/Min in heating operation.

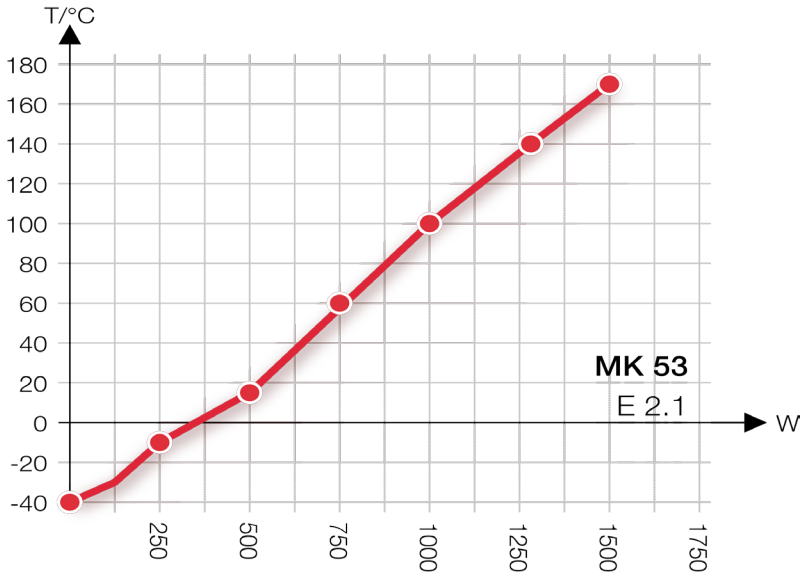
Heating-up times MK 53:



Cooling-down times MK 53:

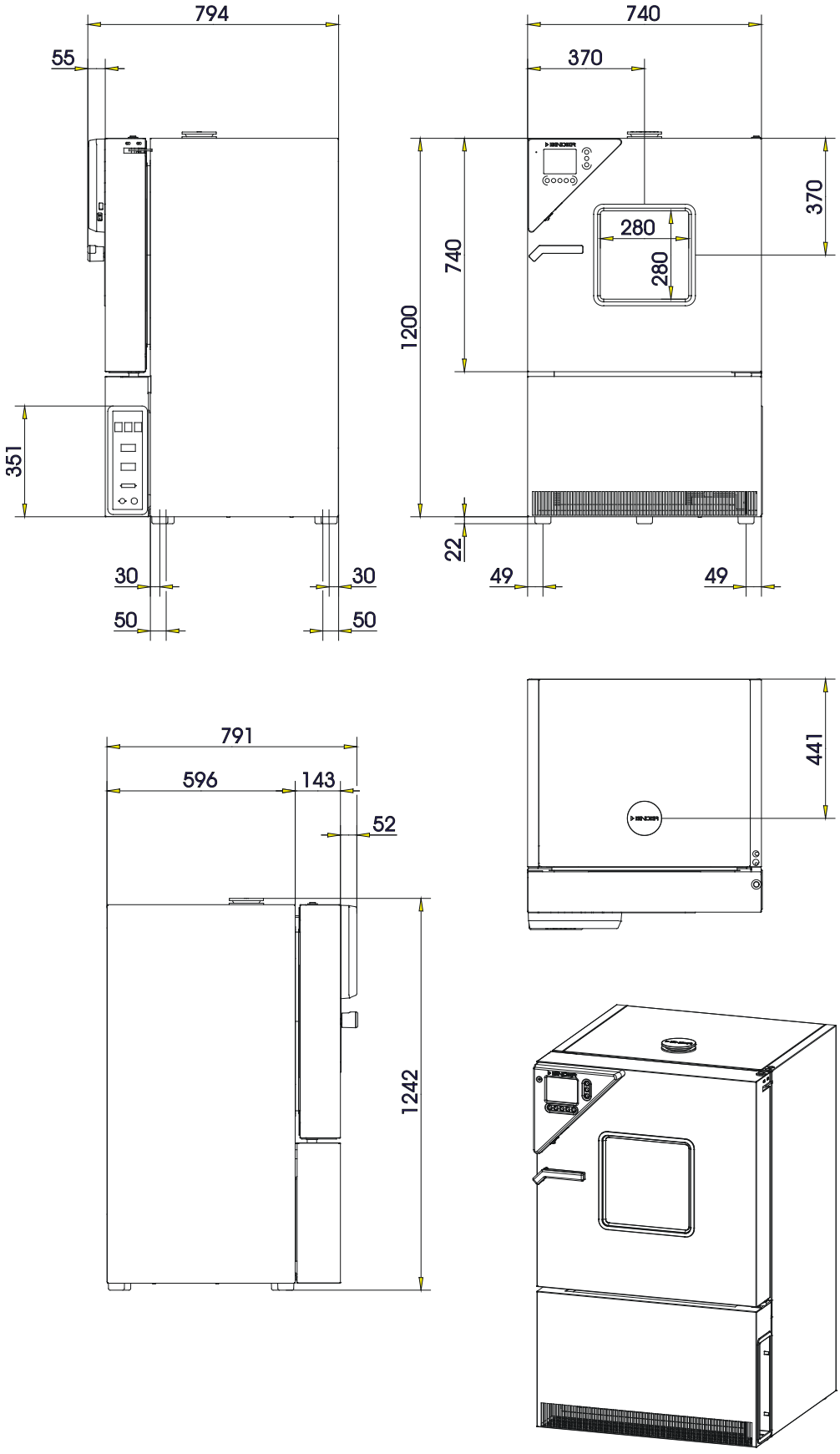


18.8 Heat compensation



	Bringing in a heat load leads to continuous operation of refrigerating machine. In this case frequent maintenance intervals are necessary.

18.9 Dimensions MK 53



19. Contamination clearance certificate

Unbedenklichkeitsbescheinigung

19.1 For units located outside North America and Central America

Declaration with regard to safety and health

Erklärung zur Sicherheit and gesundheitlichen Unbedenklichkeit

The German Ordinance on Hazardous Substances (GefStofV), and the regulations regarding safety at the workplace, require that this form be filled out for all products that are returned to us, so that the safety and health of our employees can be warranted.

Die Sicherheit und Gesundheit unserer Mitarbeiter, die Gefahrstoffverordnung GefStofV und die Vorschriften zur Sicherheit am Arbeitsplatz machen es erforderlich, dass dieses Formblatt für alle Produkte, die an uns zurückgeschickt wird.

	In the absence of a completely filled out form, a repair is not possible. Ohne Vorliegen des vollständig ausgefüllten Formblattes ist eine Reparatur nicht möglich.

- A completely filled out form should be transmitted by Fax (+49 (0) 7462 2005 93555) or by letter in advance to us, so that this information is available before the equipment/component part arrives. A second copy of this form should accompany the equipment/component part. Eventually the carrier should be informed.

  Eine vollständig ausgefüllte Kopie dieses Formblattes soll per Telefax (Nr. +49 (0) 7462 2005 93555) oder Brief vorab an uns gesandt werden, so dass die Information vorliegt, bevor das Gerät/Bauteil eintrifft. Eine weitere Kopie soll dem Gerät/Bauteil beigefügt sein. Ggf. ist auch die Spedition zu informieren.

- Incomplete information or non-conformity with this procedure will inevitably lead to substantial delays in processing. We hope you will have understanding for this measure, which lies outside of our area of influence, and that you will help us to speed up this procedure.

  Unvollständige Angaben oder Nichteinhalten dieses Ablaufs führen zwangsläufig zu beträchtlichen Verzögerungen in der Abwicklung. Bitte haben Sie Verständnis für Maßnahmen, die außerhalb unserer Einflussmöglichkeiten liegen und helfen Sie mit, den Ablauf beschleunigen.

- **Please fill out this form completely.**

  Bitte unbedingt vollständig ausfüllen!

1.	**Unit/ component part / type:** / **Gerät / Bauteil / Typ:**
2.	**Serial No./ Serien-Nr.:**
3.	**Details about utilized substances / biological substances** / **Einzelheiten über die eingesetzten Substanzen/biologische Materialien:**
3.1	**Designations** / **Bezeichnungen:**
a)	_____
b)	_____
c)	_____
3.2	**Safety measures required for handling these substances** / **Vorsichtsmaßnahmen beim Umgang mit diesen Stoffen:**
a)	_____
b)	_____
c)	_____

3.3 Measures to be taken in case of skin contact or release into the atmosphere / Maßnahmen bei Personenkontakt oder Freisetzung:

a) _____

b) _____

c) _____

d) _____

3.4 Other important information that must be taken into account / Weitere zu beachtende und wichtige Informationen:

a) _____

b) _____

c) _____

4. Declaration on the risk of these substances (please checkmark the applicable items) / Erklärung zur Gefährlichkeit der Stoffe (bitte Zutreffendes ankreuzen) :

❑ **4.1 For non toxic, non radioactive, biologically harmless materials / für nicht giftige, nicht radioaktive, biologisch ungefährliche Stoffe:**

We herewith guarantee that the above-mentioned unit / component part… / Wir versichern, dass o.g. Gerät/Bauteil...

❑ Has not been exposed to or contains any toxic or otherwise hazardous substances / weder giftige noch sonstige gefährliche Stoffe enthält oder solche anhaften.

❑ That eventually generated reaction products are non-toxic and also do not represent a hazard / auch evtl. entstandene Reaktionsprodukte weder giftig sind noch sonst eine Gefährdung darstellen.

❑ Eventual residues of hazardous substances have been removed / evtl. Rückstände von Gefahrstoffen entfernt wurden.

❑ **4.2 For toxic, radioactive, biologically harmful or hazardous substances, or any other hazardous materials / für giftige, radioaktive, biologisch bedenkliche bzw. gefährliche Stoffe oder anderweitig gefährliche Stoffe.**

We herewith guarantee that … / Wir versichern, dass …

❑ The hazardous substances, which have come into contact with the above-mentioned equipment/component part, have been completely listed under item 3.1 and that all information in this regard is complete / die gefährlichen Stoffe, die mit dem o.g. Gerät/Bauteil in Kontakt kamen, in 3.1 aufgelistet sind und alle Angaben vollständig sind.

❑ That the unit /component part has not been in contact with radioactivity / das Gerät/Bauteil nicht mit Radioaktivität in Berührung kam

5. Kind of transport / transporter / Transportweg/Spediteur:

Transport by (means and name of transport company, etc.) Versendung durch (Name Spediteur o.ä.)

_____

Date of dispatch to BINDER GmbH / Tag der Absendung an BINDER GmbH:

_____

We herewith declare that the following measures have been taken / Wir erklären, dass folgende Maßnahmen getroffen wurden:

- ❑ Hazardous substances were removed from the unit / component part, so that no hazard exists for corresponding persons in the handling or repair of these items / das Gerät/Bauteil wurde von Gefahrstoffen befreit, so dass bei Handhabung/Reparaturen für die betreffenden Person keinerlei Gefährdung besteht
- ❑ The unit was securely packaged and properly identified / das Gerät wurde sicher verpackt und vollständig gekennzeichnet.
- ❑ Information about the hazardousness of the shipment (if required) has been provided to the transporter / der Spediteur wurde (falls vorgeschrieben) über die Gefährlichkeit der Sendung informiert.

We herewith commit ourselves and guarantee that we will indemnify BINDER GmbH for all damages that are a consequence of incomplete or incorrect information provided by us, and that we will exempt BINDER GmbH from eventual damage claims by third parties./ Wir versichern, dass wir gegenüber BINDER für jeden Schaden, der durch unvollständige und unrichtige Angaben entsteht, haften und BINDER gegen eventuell entstehende Schadenansprüche Dritter freistellen.

We are aware that, in accordance with Article 823 of the German Civil Code (BGB), we are directly liable with regard to third parties, in this instance especially the employees of BINDER GmbH, who have been entrusted with the handling / repair of the unit / component. / Es ist uns bekannt, dass wir gegenüber Dritten – hier insbesondere mit der Handhabung/Reparatur des Geräts/des Bauteils betraute Mitarbeiter der Firma BINDER - gemäß §823 BGB direkt haften

Name: _____

Position: _____

Date / Datum: _____

Signature / Unterschrift: _____

Company stamp / Firmenstempel:

	Equipment that is returned to the factory for repair must be accompanied by a completely filled out contamination clearance certificate. For service and maintenance works on site, such a contamination clearance certificate must be submitted to the service technician before the start of the works. No repair or maintenance of the equipment is possible, without a properly filled out contamination clearance certificate.

19.2 For units in North America and Central America

Product Return Authorization Request

Please complete this form and the Customer Decontamination Declaration (next 2 pages) and attach the required pictures. E-mail to: IDL_SalesOrderProcessing_USA@binder-world.com

After we have received and reviewed the complete information we will decide on the issue of a RMA number. Please be aware that size specifications, voltage specifications as well as performance specifications are available on the internet at www.binder-world.us at any time.

Take notice of shipping laws and regulations.

	Please fill:	
Reason for return request	○ Duplicate order	
	○ Duplicate shipment	
	○ Demo	*Page one completed by sales*
	○ Power Plug / Voltage	115V / 230 V / 208 V / 240V
	○ Size does not fit space	
	○ Transport Damage	Shock watch tripped? *(pictures)*
	○ Other (specify below)	
	_____	
Is there a replacement PO?	○ Yes ○ No	
If yes -> PO #		
If yes -> Date PO placed		
Purchase order number		
BINDER model number		
BINDER serial number		
Date unit was received		
Was the unit unboxed?	○ Yes ○ No	
Was the unit plugged in?	○ Yes ○ No	
Was the unit in operation?	○ Yes ○ No	
Pictures of unit attached? *Pictures of Packaging attached?*	○ Yes ○ No ○ Yes ○ No	Pictures have to be attached!

	Customer Contact Information	Distributor Contact Information
Name		
Company		
Address		
Phone		
E-mail		

Customer (End User) Decontamination Declaration

Health and Hazard Safety declaration

To protect the health of our employees and the safety at the workplace, we require that this form is completed by the user for all products and parts that are returned to us. (Distributors or Service Organizations cannot sign this form)

	NO RMA number will be issued without a completed form. Products or parts returned to our NY warehouse without a RMA number will be refused at the dock.

A second copy of the completed form must be attached to the outside of the shipping box.

1.	**Unit/ component part / type**:
2.	**Serial No.**
3.	**List any exposure to hazardous liquids, gasses or substances and radioactive material**
3.1	**List with MSDS sheets attached where available or needed (if there is not enough space available below, please attach a page):** a) _____ b) _____ c) _____
3.2	**Safety measures required for handling the list under 3.1** a) _____ b) _____ c) _____
3.3	**Measures to be taken in case of skin contact or release into the atmosphere**: a) _____ b) _____ c) _____ d) _____
3.4	**Other important information that must be considered**: a) _____ b) _____ c) _____

4. Declaration of Decontamination

For toxic, radioactive, biologically and chemically harmful or hazardous substances, or any other hazardous materials.

We hereby guarantee that

4.1 Any hazardous substances, which have come into contact with the above-mentioned equipment / component part, have been completely listed under item 3.1 and that all information in this regard is complete.

4.2 That the unit /component part has not been in contact with radioactivity

4.3 Any Hazardous substances were removed from the unit / component part, so that no hazard exists for a persons in the shipping, handling or repair of these returned unit

4.4 The unit was securely packaged in the original undamaged packaging and properly identified on the outside of the packaging material with the unit designation, the RMA number and a copy of this declaration.

4.5 Shipping laws and regulations have not been violated.

I hereby commit and guarantee that we will indemnify BINDER Inc. for all damages that are a consequence of incomplete or incorrect information provided by us, and that we will indemnify and hold harmless BINDER Inc. from eventual damage claims by third parties.

Name: _____

Position: _____

Company: _____

Address: _____

Phone #: _____

Email: _____

Date: _____

Signature: _____

	Equipment returned to the NY warehouse for repair must be accompanied by a completed customer decontamination declaration. For service and maintenance works on site, such a customer decontamination declaration must be submitted to the service technician before the start of work. No repair or maintenance of the equipment is possible without a completed form.