BINDER
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Operating Manual

APT.line™ KB (E3.1)

Refrigerated Incubators

with microprocessor program controller RD3

Model	Art. No.
KB 23 (E3.1)	9020-0112, 9120-0112
KB 23-UL (E3.1)	9020-0113, 9120-0113
KB 53 (E3.1)	9020-0114, 9120-0114
	9020-0243, 9120-0243
KB 53-UL (E3.1)	9020-0115, 9120-0115
KB 53 (115 V) (E3.1)	9020-0252, 9120-0252
KB 115 (E3.1)	9020-0116, 9120-0116
	9020-0242, 9120-0242
KB 115-UL (E3.1)	9020-0117, 9120-0117
KB 115 (115 V) (E3.1)	9020-0253, 9120-0253

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Issue 08/2012 Art. No. 7001-0115

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:	Kühlbrutschränke mit Programmregelung Refrigerated incubators with program control Incubateurs réfrigérés à régulation programmable
Typenbezeichnung / Type / Type:	KB 23, KB 53, KB 115

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:

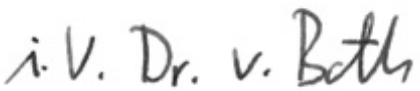
EN 61010-1:2010	Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte – Teil 1: Allgemeine Anforderungen (DIN EN 61010-1:2011, VDE 411-1:2011)
	Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements (IEC 61010-1:2010, 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, 16.01.2012

BINDER GmbH



P. M. Binder

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Leiter F & E
Director R & D
Chef de service R&D

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Contents

Dear customer,
For the correct operation of the refrigerated incubator KB, 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. 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 refrigerated incubator KB.

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 a **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

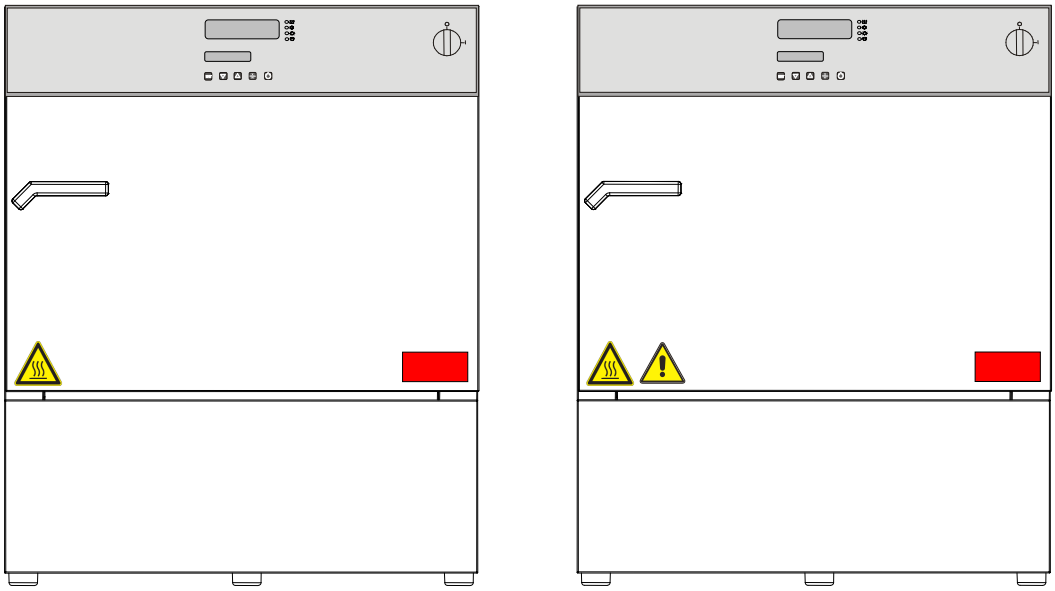
Type / cause of hazard.
Possible consequences.
∅ Instruction how to avoid the hazard: prohibition
➢ Instruction how to avoid the hazard: mandatory action

Observe all other notes and information not necessarily emphasized in the same way, in order to avoid disruptions that 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)	Service label
 Hot surface	
 Risk of injury (UL units only)	



Unit front KB Unit front KB-UL

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

Figure 2: Position of type plate

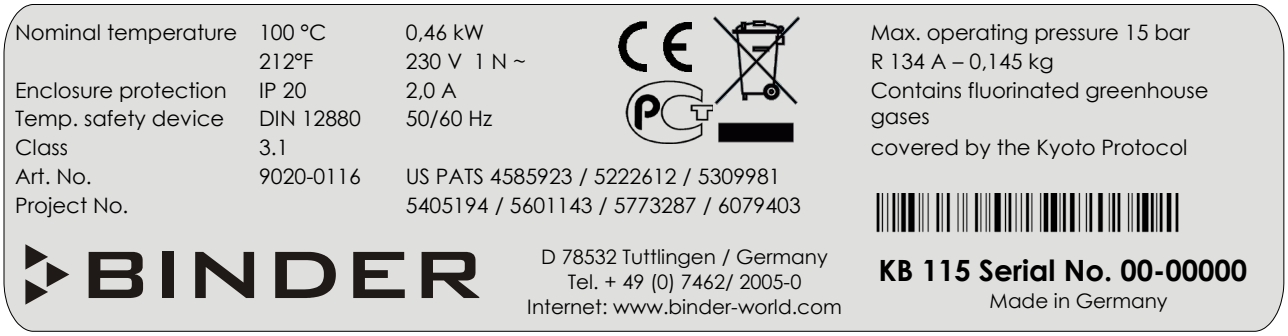


Figure 3: Type plate (example of KB 115 regular unit 9020-0122)

Indications of the type plate		Information
BINDER		Manufacturer: BINDER GmbH
KB 115		Model KB 115
Serial No.	00-00000	Serial No. 00-00000
Nominal temperature	100 °C 212 °F	Nominal temperature
Enclosure protection	IP 20	IP type of protection 20 acc. to EN 60529
Temp. safety device	DIN 12880	Temperature safety device acc. to standard DIN 12880
Class	3.1	Temperature safety device, class 3.1
Art. No.	9020-0122	Art. No. 9020-0122
Project No.	---	(Special application acc. to project no.)
0,46 kW		Nominal power 0.46 kW
230 V 1 N ~		Nominal voltage 230 V ± 10%, single-phase unit
2,0 A		Nominal current 2.0 Amp
50/60 Hz		Power frequency 50/60 Hz
Max. operating pressure 15 bar		Max. operating pressure 15 bar in the refrigerating system
R 134 A - 0,145 kg		Refrigerant type R 134 A, max. filling weight 0.145 kg
Contains fluorinated greenhouse gases covered by the Kyoto Protocol		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).
	The equipment is certified in the GOST R certification system of GOSTSTANDARD Russia.
c UL us LISTED LABORATORY EQUIPMENT 43KM (KB-UL only)	The equipment is certified by Underwriters Laboratories Inc.® according to standards UL 61010A-1, UL 61010A-2-10, CSA C22.2 No. 1010.1-92, and CSA C22.2 No. 1010.2.010-94.

1.5 General safety instructions on installing and operating the refrigerated incubator

With regard to operating the refrigerated incubator KB 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 refrigerated incubator KB 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 refrigerated incubator KB does not dispose of any measures of explosion protection.

DANGER

Explosion hazard.

Danger of death.

∅ Do NOT introduce any substance into the refrigerated incubator 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 which may arise during the temperature process. Take adequate measures to exclude such risks prior to putting the refrigerated incubator into operation.

DANGER

Electrical hazard.

Danger of death.

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

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

CAUTION

The glass doors and the inner chamber will become hot during operation.

Danger of burning.

∅ Do NOT touch the glass doors, the inner surfaces 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 on the lower housing cover.

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

1.6 Intended use

Refrigerated incubators KB are suitable for exact conditioning of harmless materials. Because of their precise temperature accuracy these devices are especially useful for cultivation of microorganisms with a narrow temperature optimum in a range of 5 °C / *41 °F* to 40 °C / *104 °F*. Main fields of application are tests of long-term storage (e.g. at 5 °C), refrigerated incubation between 20 °C / *68 °F* and 30 °C / *86 °F* and incubation with alternating temperatures (e.g. 40/5 °C / *104/41 °F*).

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.

	Following the instructions in this operating manual and conducting regular maintenance work (chap. 17.1) are part of the intended use.

Other applications are not approved.

	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.

	WARNING: If customer should use a BINDER chamber running in non-supervised continuous operation, we strongly recommend in case of inclusion of irrecoverable specimen or samples to split such specimen or samples and store them in at least two chambers, if this is feasible.

2. Unit description

A high level of precision, reliability, and safety for all growth parameters ensures optimum incubation conditions. Moreover, the KB refrigerated incubator is designed for maximum usability – even in continuous operation year after year. It fulfills all technical and application-specific requirements arising in experimentation such as in the areas of biotechnology, medicine, the nutrition industry, pharmaceutical and cosmetics industries, botany, and zoology.

Two important temperature technologies have been combined to achieve perfect temperature control. The newly developed DCT™ refrigerating system, a direct refrigerating process, in conjunction with the APT.line™ preheating chamber technology, satisfies the unique prerequisites for attaining highly-precise temperature control and particularly short recovery times after opening the door.

The refrigerating system is distinguished by direct, precise, and rapid temperature conduction. Large-area labyrinth evaporator plates are integrated into the outer walls of the preheating chamber system. In contrast to the indirect systems, such as the air-jacket system, they conduct the cold directly to the atmosphere of the working space.

The APT.line™ preheating chamber system guarantees high level of spatial and time-based temperature precision, thanks to the direct and distributed air circulation into the interior. This is especially important for maintaining temperatures – especially with full chambers – and for rapid restoration of optimum growth conditions after opening the door. The inner glass door ensures that the temperature remains constant when observing the incubation process. The air turbine supports exact attainment and maintenance of the desired temperature accuracy. The fan speed is digitally adjustable from 0 % to 100%. The heating and refrigerating systems are microprocessor regulated to a tenth of a degree. In addition, the refrigerated incubator provides almost unlimited possibilities for adaptation to individual customer requirements based upon extensive programming options and on the week program timer and real time clock of the controller.

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 inner chamber, the pre-heating chamber and the interior side of the doors are all made of stainless steel (material no. 1.4301 (V2A) in Germany, US equivalent 304). The housing is RAL 7035 powder-coated. All corners and edges are also completely coated.

The refrigerated incubator KB is equipped with a serial interface RS 422 for computer communication, e.g. via the communication software APT-COM™ 3 DataControlSystem (option, chap. 16.1). For further options, see chap. 20.5.

Temperature range at ambient temperature of max. 25 °C / *77 °F*: -5 °C / *23 °F* up to +100 °C / *212 °F.*

2.1 Unit overview

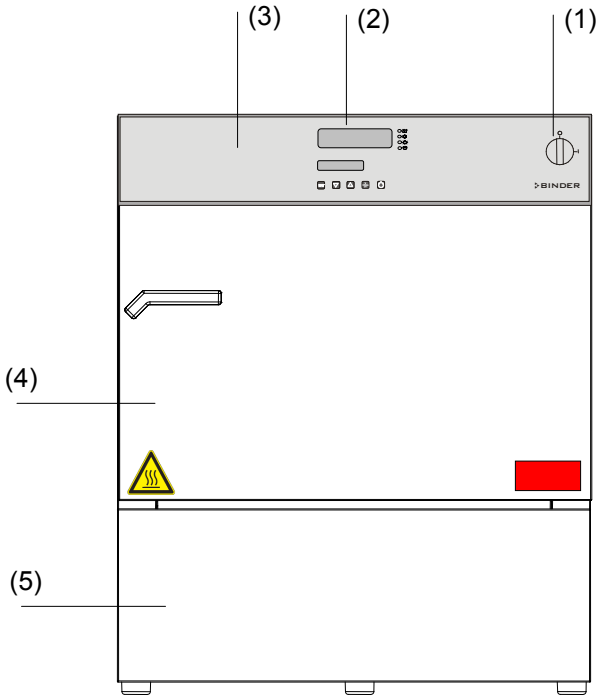


Figure 4: Refrigerated incubator KB

(1) Main power switch On/Off
(2) Temperature controller RD3
(3) Instrument panel
(4) Unit door
(5) Compressor housing

2.2 Instrument panel

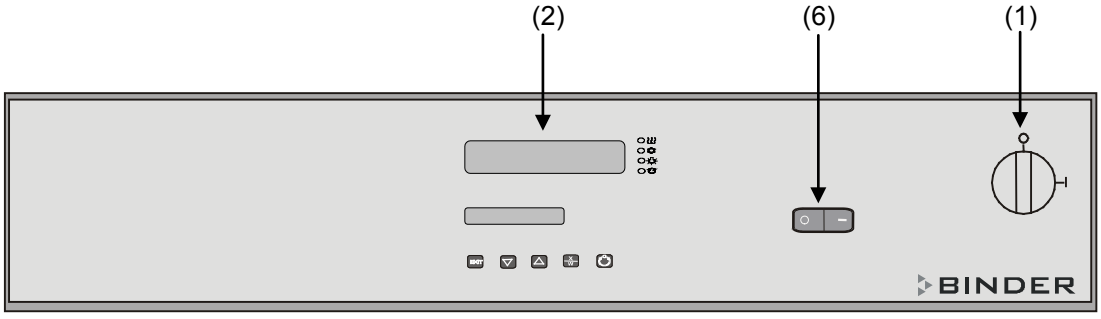


Figure 5: Control panel of standard unit

(1) Main power switch On/Off
(2) Program controller RD3
(6) Switch for interior illumination (option)

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 note for completeness and for transportation damage. If transportation damage has occurred, inform the carrier immediately.

The final tests of the manufacturer may cause traces of the racks 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 the 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. 18.1.

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 temporary decommissioning (chap. 18.2).

CAUTION

Sliding or tilting of the unit.

Damage to the unit.

Risk of injury by lifting heavy loads.

➢ Transport the unit in its original packaging only.

➢ For moving or shipping, secure the unit with transport straps.

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

➢ Lift the unit at the four lower corners with the aid of 4 people.

- Permissible ambient temperature range during transport: -10 °C to +60 °C.

You can order transport packing and rolling 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. 18.2).

- Permissible ambient temperature range during storage: -10 °C to +60 °C.
- 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 one hour until the chamber has attained ambient temperature and is completely dry.

3.4 Location of installation and ambient conditions

Set up the KB refrigerated incubator on a flat, even 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. 20.4). The chambers are designed for setting up inside a building (indoor use).

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 to +32 °C. 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 to which the specified technical data relate. For other ambient conditions, deviations from the indicated data are possible.

With each degree of ambient temperature >25 °C, the refrigeration power decreases by 1.5 K.

- 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 / *6.6 ft.* above sea level.

When placing several units of the same size side by side, maintain a minimum distance of 250 mm between each unit. Wall distances: rear 100 mm / *3.94 in*, sides 160 mm / 6.*29 in*. Spacing above the unit of at least 100 mm / *3.94 in* must also be maintained.

Two devices up to size 115l can be piled on top of each other. For this purpose place rubber pads under every foot of the upper unit to prevent the device from slipping.

CAUTION

Sliding or tilting of the upper unit.

Damage to the units.

➢ When stacking, place rubber pads under every foot of the upper unit.

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 unit 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 of the equipment

4.1 Electrical connection

- The refrigerated incubator comes with a fixed power connection cable that has a length of 1800 mm / *5.9 ft* and is equipped with a semi time-lag fine-wire fuse.

Model	Art. no. (x = 0 or 1)	Power plug	Voltage + /-10 %	Current type	Power frequency	Unit fuse
KB 23	9x20-0112	Shock-proof plug	230 V	1N~	50/60 Hz	10 A
KB 53	9x20-0114	Shock-proof plug	230 V	1N~	50/60 Hz	10 A
KB 53	9x20-0243	Shock-proof plug	230 V	1N~	50 Hz	10 A
KB 115	9x20-0116	Shock-proof plug	230 V	1N~	50/60 Hz	10 A
KB 115	9x20-0242	Shock-proof plug	230 V	1N~	50 Hz	10 A
KB 23-UL	9x20-0113	NEMA 5-15	115 V	1N~	60 Hz	12.5 A
KB 53-UL	9x20-0115	NEMA 5-15	115 V	1N~	60 Hz	12.5 A
KB 53 (115V)	9x20-0252	NEMA 5-15	115 V	1N~	60 Hz	12.5 A
KB 115-UL	9x20-0117	NEMA 5-15	115 V	1N~	60 Hz	12.5 A
KB 115 (115V)	9x20-0253	NEMA 5-15	115 V	1N~	60 Hz	12.5 A

- 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, see chap. 1.4).
- When connecting, please observe the regulations specified by the local electricity supply company as well as the VDE directives (for Germany)
- 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. 20.4).

	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. 4.1), turn on the unit via the main power switch (1).

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.

	WARNING: If customer should use a BINDER chamber running in non-supervised continuous operation, we strongly recommend in case of inclusion of irrecoverable specimen or samples to split such specimen or samples and store them in at least two chambers, if this is feasible.

5.1 Settings at the RD3 program controller

After turning the unit on with the main power switch (1) the controller is in Normal Display / fixed value operation mode.

Depending on the temperature value entered before LED (3a) is lit if the heating is active, or LED (3b) if the refrigeration is active, or no LED if the actual temperature is equal to the set-point.

In **Display 1** of the controller the actual temperature value is displayed.

- With inactive week program timer:

  In **Display 2** of the controller the actual date and time are displayed. Example:

  15.05.06 13:52

- With active week program timer:

  In **Display 2** of the controller the actual date and time and the states of the week program timer channels are displayed. Examples:

15.05.06 13:52 - -	15.05.06 13:52 - □	15.05.06 13:52 □ -	15.05.06 13:52 □ □
Channel 1 Off, Channel 2: Off	Channel 1: Off, Channel 2: On	Channel 1: On, Channel 2: Off	Channel 1 On, Channel 2: On

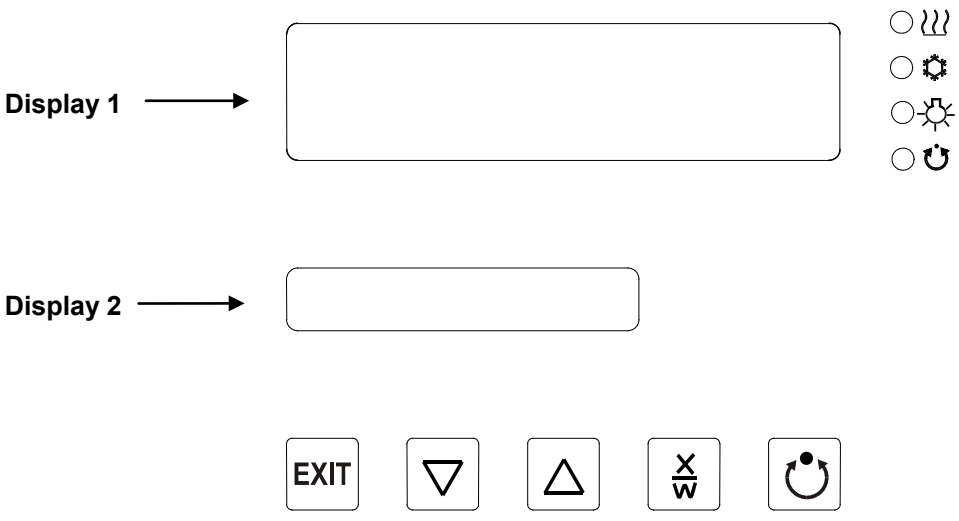


Figure 6: RD3 program controller

LED function indications and their signification:

(3a) (yellow)  Heating active

(3b) (yellow)  Refrigeration active

(3c) (yellow)  No function

(3d) (green)  Illuminates: program operation
Flashes: exceeding of the tolerance limits in Fixed value entry mode or in Program operation. In program operation: program interruption.

The program controller RD3 permits programming of temperature cycles. For each program section also the fan speed can be regulated.

Two programs with up to 10 sections each or one program with up to 20 sections can be entered (setting in the user level, chap. 10).

	When changing from 2 programs to 1 program or vice-versa, existing programs are deleted

The maximum length of an individual program section can be set to either 99 hs 59 min or to 999 hs 59 min (setting in the user level, chap. 10). This setting is then valid for all program sections.

Programming can be done directly via the controller keyboard or graphically at the computer using the communication software APT-COM™ 3 DataControlSystem (option, chap. 16.1) specially developed by BINDER.

5.2 General indications

The program controller RD3 offers several functional levels:

Normal Display / fixed value operation:

- Display of the actual value of temperature (display 1) and of the actual date and time (display 2).
- The chamber is in fixed value operating mode, equilibrating to the entered set-points.

Fixed value entry mode (chap. 6)

- Entry of set-points for temperature, fan speed, and the safety controller for fixed value operating mode
- Entry of temperature set-points SP 1 and SP 2 for week program operation

Program editor (chap. 8)

- Two programs with up to 10 sections each or one program with up to 20 sections can be entered (selection in the user level, chap. 10). Entry of set-points for temperature and fan speed in all program sections (chap. 8.2).
- Deleting a program section (chap. 8.4)

Program start level (chap. 9)

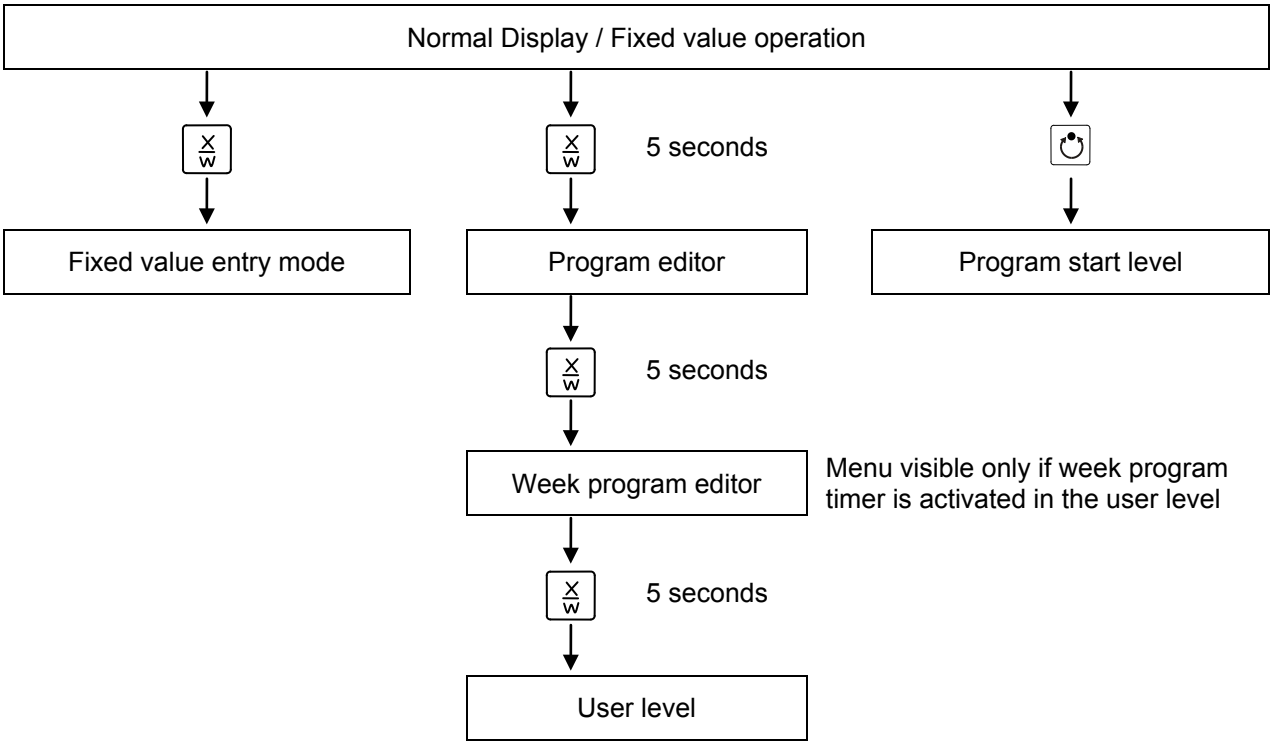
- Selection of an entered program
- Entry of settings affecting the program course, as start delay time or number of program cycles
- Program start

Week program editor (chap.7)

- Setting the shift points

User level (chap. 10)

- User specific controller settings
- Setting the real time clock



If no button is touched within more than 120 sec. the controller returns from the current level to Normal Display.

6. Fixed value entry mode

	If you do not want to use the week program timer, deactivate it (factory setting, setting in the user level, chap. 10) before entering any set-points. Any setting of the operation lines in fixed value entry mode is ineffective with active week program timer.

Basic entry principle: Access the individual parameters with button X/W one after the other. Enter the values with the arrow keys. A value flashing once after 2 seconds indicates that it has been applied by the controller.

→ **Normal Display**

Display 1 shows	e.g. 19.8 °C	(actual temperature value)
Display 2 shows	e.g. 15.05.06 13:52 - -	(actual date and time) (actual switching state of week program timer channel 1: Off, channel 2: Off; visible only if week program timer is activated in the user level, chap. 10)

Press key X/W ↓

Display 1 shows	e.g. 10.0 °C	(actual temperature set-point 1)
Display 2 shows	SP1 TEMPERATURE	(variable: temperature in °C)

Enter temperature set-point in °C with arrow keys ▼ ▲ ↓ Value is shown in display 1.

Press key [X/w] ↓

Display 1 shows	e.g. 37.0 °C	(actual temperature set-point 2) (visible only if week program timer is activated in the user level, chap. 10)
Display 2 shows	SP2 TEMPERATURE	(variable: temperature in °C)

Enter temperature set-point in °C with arrow keys [▼][▲] ↓ Value is shown in display 1.

Press key [X/w] ↓

Display 1 shows	e.g. 100 °C	(actual fan speed set-point)
Display 2 shows	SP FAN SPEED	(variable: fan speed in %)

Enter fan speed set-point in % with arrow keys [▼][▲] ↓ Value is shown in display 1.

Press key [X/w] ↓

Only with option zero-voltage relay outputs via operation lines (chap. 16.6):

Display 1 shows	e.g. 000	(actual switching state of operation lines)
Display 2 shows	OPERATION LINE	(variable: switching state of operation lines)

Enter switching state with arrow keys [▼][▲] ↓

Display 1 shows	e.g. 40 °C	(actually set safety controller set-point)
Display 2 shows	SP SAFETY CONTR.	(variable: safety controller set-point)

Set safety controller class 3.1 set-point in °C with arrow keys [▼][▲] ↓ Note setting “limit” or “offset” selected at the user level (chap. 10)!
Value is shown in display 1.

Press key [X/w] ↓

If no button is pressed within more than 120 sec, or if the EXIT button is pressed, the controller changes to Normal Display.

☞	When changing the set-point, check the safety controller setting in the user level (chap. 10) if the safety controller has been set to “limit” mode.

☞	If the fan is operated with less than 100 % speed, the temperature performance and the spatial exactitude of the temperature can differ from the manufacturer’s specifications. Do reduce the fan speed only if absolutely necessary due to special requirements.

☞	KB 23: Cooling power is reduced when fan speed is set to # 20%.

☞	The values entered in fixed-value entry mode remain valid after program run-off and are then equilibrated.

If the week program timer is active, depending on the running week program another set-point (SP2) may be targeted. Temperatures too high for the introduced solvent quantity can occur. Deactivate the week program timer if you do not use it (default setting, setting in the User level, chap. 10).

	**CAUTION**
	Too high or too low temperature. **Damage to the charging material.** ➢ Inactivate the week program timer if you do not use it.

7. Week program editor

The Week program editor permits defining up to 4 shift point for each week day. A shift point defines a moment and the switching state ON or OFF of the channels that become active in this instance.

Channel function:

- Channel 1 On = Set-point 2 is equilibrated.
- Channel 1 Off = Set-point 1 is equilibrated
- Channel 2 = reserve

	The week program timer is initially set to inactive (factory setting). Therefore, you need to activate the week program timer in the user level (chap. 10).

Normal Display

Display 1 shows	e.g. 19.8 °C	(actual temperature value)
Display 2 shows	e.g. 15.05.06 13:52 - -	(actual date and time, actual state of week program timer channel 1: Off, channel 2: Off)

Press down key [x/w] ↓ for 5 sec

Display 1 shows	e.g. 0000	
Display 2 shows	PROGRAM EDITOR	(you are in the program editor)

Press down key [x/w] ↓ for 5 sec

Display 1 shows	0000	Menu visible only if week program timer is activated in the user level (chap. 10)
Display 2 shows	WEEK PROG. EDITOR	(you are in the week program editor)

Hit program key [↻] ↓

Display 1 shows	0000	
Display 2 shows	UserCod? 0000	(enter user code, display flashes)

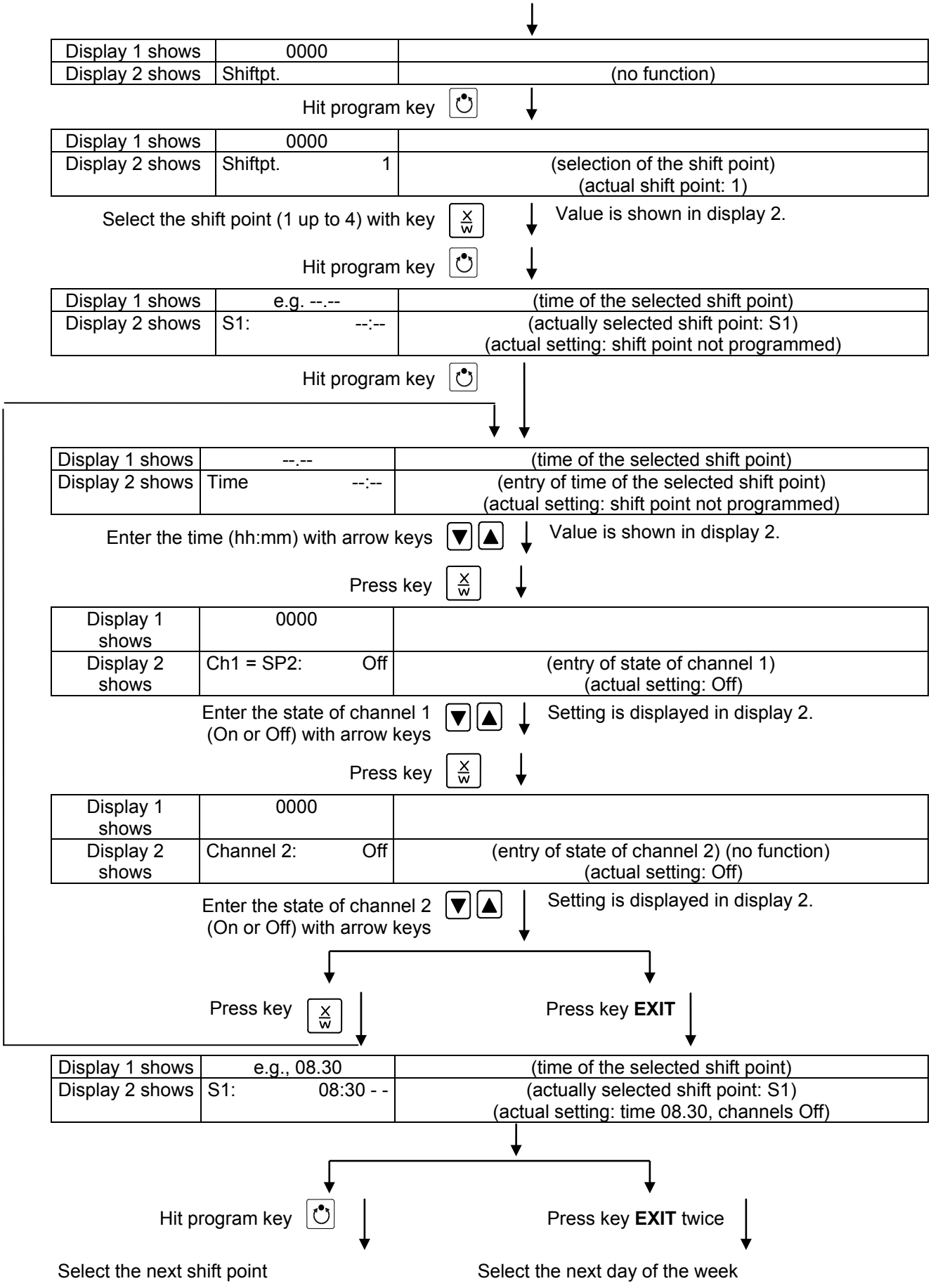
Enter the user code with arrow keys [▼][▲] ↓ e.g. **0001** (basic setting, adjustable in the user level, chap. 10).
Value is shown in both displays.

Automatically forward after 2 sec

Display 1 shows	0000	
Display 2 shows	Monday	(selection of day of the week) (actual selection: Monday)

Select the day of the week (Monday up to Sunday) with key [x/w] ↓ Day of the week is displayed in display 2.

Hit program key [↻] ↓



To exit the menu, hit several times key EXIT or wait for 120 seconds. Controller returns to normal display.

7.1 Program table template for Week program Editor

Program editor	
Program title	
Project	
Date:	

Day of the week	Time			Channel 1 (temperature)	Channel 2*
	hh:mm	AM	PM	ON = SP2 OFF = SP1	ON OFF
Monday	S1				
	S2				
	S3				
	S4				
Tuesday	S1				
	S2				
	S3				
	S4				
Wednesday	S1				
	S2				
	S3				
	S4				
Thursday	S1				
	S2				
	S3				
	S4				
Friday	S1				
	S2				
	S3				
	S4				
Saturday	S1				
	S2				
	S3				
	S4				
Sunday	S1				
	S2				
	S3				
	S4				

* Channel 2 is non-functional in the standard unit

8. Program editor

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

You can program various kinds of temperature transitions. In the user level (chap. 10) you can select between the settings “Ramp” (default setting) and “Step”.

	Setting “Ramp” permits programming all kinds of temperature transitions. With setting “Step” the controller will equilibrate only to constant temperatures; programming ramps is no longer possible.

	Switching between settings “Ramp” and “Step” will influence all programs. Please note that this can cause the time courses of existing programs to change significantly.

8.1.1 Programming with setting “Ramp” (default setting)

Set-points always refer to the start of a program section, i.e., at the beginning of each program section, the entered set-point will be reached. During program section operation, the temperature gradually passes to the set-point entered for the subsequent program section.

By appropriate design of the program section timing, all kinds of temperature transitions can be programmed:

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

  The set-point gradually moves from one set-point to the one of the following program section during a given interval. 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; therefore the temperature is kept 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. Two program sections with an identical set-point are followed by a section with a different set-point. If the duration of this transitional program section is very short (minimum entry 1 min), the temperature change will proceed rapidly in the minimum amount of time.

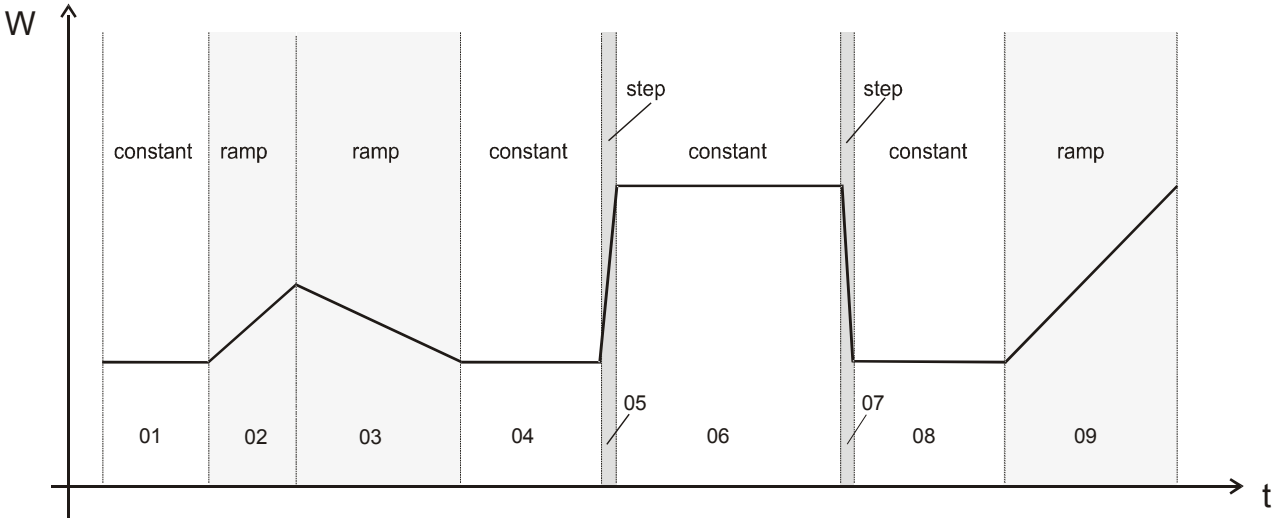
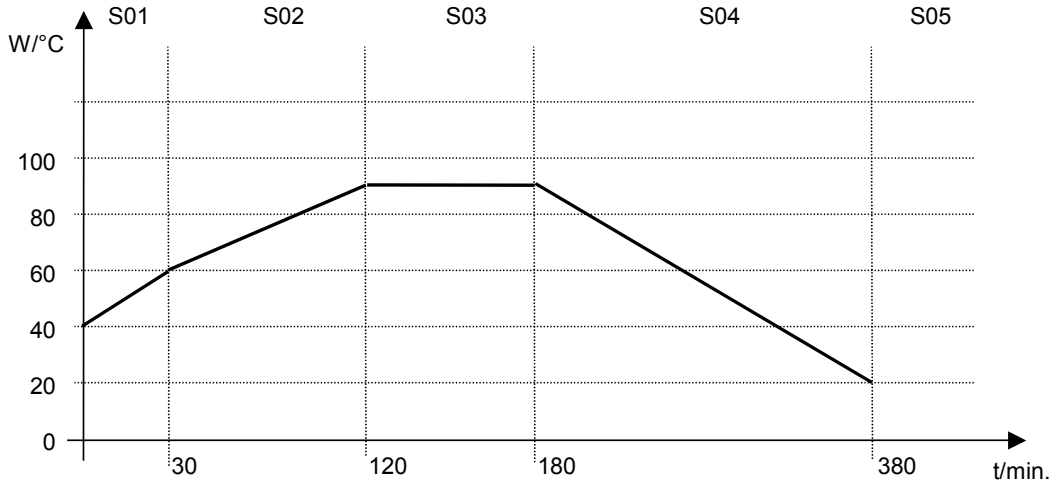


Figure 7: Possible temperature transitions
(with default setting “ramp” in the user level (chap. 10)

Program entry as set-point ramp (example):



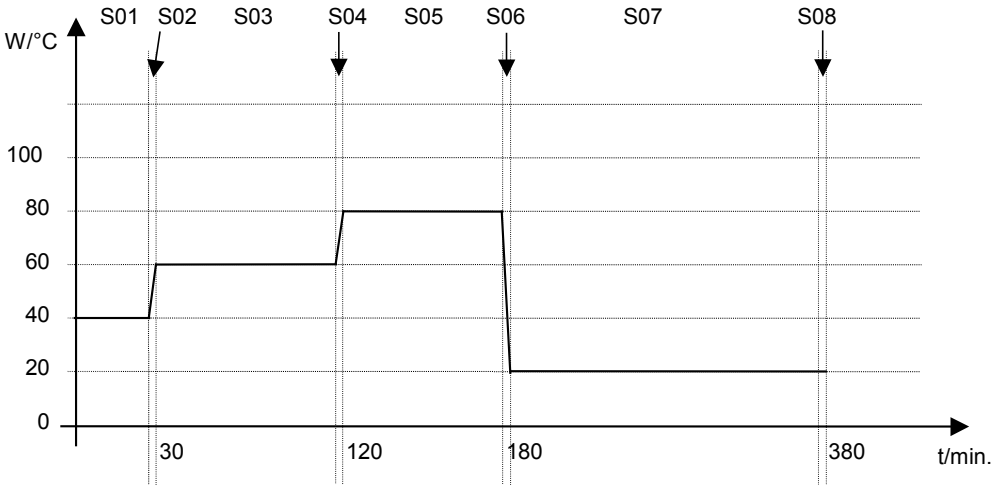
Program table corresponding to the diagram (with default setting “Ramp”):

Section SEC	Temperature set-point [°C] TEMP	Section length [hh.mm] TIME	Fan speed [%] FAN	Operation lines O.LINE
S01	40	00:30	50	000
S02	60	01:30	100	000
S03	90	01:00	100	000
S04	90	03:20	100	000
S05	20	00:01	100	000

***** Only with option zero-voltage relay outputs via operation lines, see chap. 16.6.

The values of such a program table can now be entered to the RD3 program controller (chap. 8.2).

Program entry as set-point step (example):



Program table corresponding to the diagram (with default setting “Ramp”):

Section SEC	Temperature set-point [°C] TEMP	Section length [hh.mm] TIME	Fan speed [%] FAN	Operation lines O.LINE
S01	40	00:30	50	000
S02	40	00:01	100	000
S03	60	01:30	100	000
S04	60	00:01	100	000
S05	80	01:00	100	000
S06	80	00:01	100	000
S07	20	03:20	100	000
S08	20	00:01	100	000

***** Only with option zero-voltage relay outputs via operation lines, see chap. 16.6.

The values of such a program table can now be entered to the RD3 program controller (chap. 8.2).

The end point of the desired cycle must be programmed with an additional section (in our examples S05 for set-point ramp and S08 for set-point step) with a section time of at least one minute. Otherwise, the program will stop one section too early because the program line is incomplete.

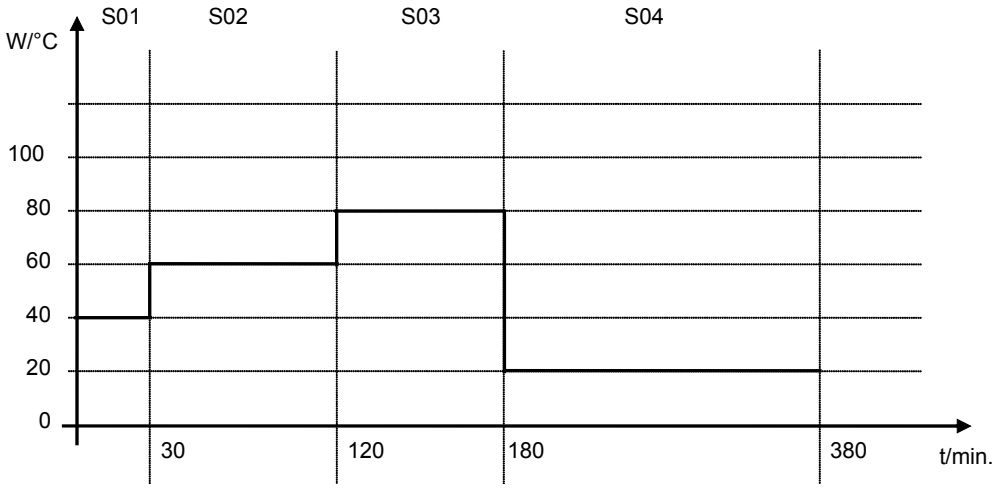
8.1.2 Programming with setting “step”

With setting “Step” selected, you don’t need to program the transition section in the Program Editor.

	With setting “step” the controller will equilibrate only to constant temperatures; programming ramps is no longer possible.

The set-points are maintained constant for the duration of a program section. At the start of each program section, the unit heats up with the maximum speed in order to attain the entered set-point.

Program entry as set-point step (example):



Program table corresponding to the diagram (with setting “Step”):

Section SEC	Temperature set-point [°C] TEMP	Section length [hh.mm] TIME	Fan speed [%] FAN	Operation lines O.LINE
S01	40	00:30	50	000
S02	60	01:30	100	000
S03	80	01:00	100	000
S04	20	03:20	100	000

***** Only with option zero-voltage relay outputs via operation lines, see chap. 16.6.

The values of such a program table can now be entered to the RD3 program controller (chap. 8.2).

8.1.3 General notes on programming temperature transitions

If the tolerance limits set in the user level (chap. 10) are exceeded, the program is halted until the actual temperature value returns to within the tolerance range. During this program interruption, the LED (3d) flashes. Therefore, the duration of the program might be extended due to the programming of tolerances

The programming is saved even in case of a power failure or after turning off the unit.

	KB 23: Cooling power is reduced when fan speed is set to ≤ 20%.

After program rundown the controller returns to fixed value operation showing Normal Display and equilibrates to the temperature value previously entered in fixed value entry mode.

	Before starting the program, check the set-point value entered in fixed value entry mode. After program rundown temperature will equilibrate to this value.

	Deactivate the week program timer (factory setting, setting in the user level, chap. 10) before starting a program.

8.2 Set-point entry for program operation

From Normal Display the program editor is accessed by hitting button X/W for 5 sec. Then enter the set-points one after the other in all program sections of a selected program.

You can enter two programs with up to 10 sections each or one program with up to 20 sections (setting in the user level, chap. 10).

In order to avoid incorrect programming the values of the program course should be entered into a table (template in chap. 8.3).

Example program table (with default setting “Ramp”):

Section SEC	Temperature set-point [°C] TEMP	Section length [hh.mm] TIME	Fan speed [%] FAN	Operation lines O.LINE
S01	40	00:30	50	000
S02	60	01:30	100	000
S03	90	01:00	100	000
S04	90	03:20	100	000
S05	20	00:01	100	000

***** Only with option zero-voltage relay outputs via operation lines, see chap. 16.6.

The values of the program table can now be entered to the RD3 program controller.

Step 1 – Selecting the program and the program section:

Normal Display

Display 1 shows	e.g. 19.8 °C	(actual temperature value)
Display 2 shows	e.g. 15.05.06 13:52 - -	(actual date and time, actual state of week program timer channel 1: Off, channel 2: Off)

Press down key [X/W] ↓ for 5 sec

Display 1 shows	e.g. 0000	
Display 2 shows	PROGRAM EDITOR	(you are in the program editor)

Hit program key [↻] ↓

Display 1 shows	0000	
Display 2 shows	UserCod? 0000	(enter user code)

Enter user code with arrow keys [▼][▲] ↓ e.g. **0001**
(basic setting, adjustable in the user level, chap. 10).
Value is shown in both displays.

Automatically forward after 2 sec.

Display 1 shows	e.g. 01	(program P01 selected)
Display 2 shows alternating	--- : --- PRG.	(program can be selected)
	CONTINUE X/W	(information: to 1st program section with X/W)

Select program P01 or P02 with arrow keys [▼][▲] ↓ Value is shown in display 1.

Press key [X/W] ↓

In the selected program P01 or P02, program sections can be selected:

Display 1 shows	e.g. 01	(section S01 selected)
Display 2 shows alternating	P01: --- SEC.	section S01 has already been created. enter new set-points for the individual variables with button X/W
	CONTINUE X/W	

or:

Display 1 shows	e.g. 01	(section S01 selected)
Display 2 shows alternating	P01: --- SEC.	section S01 has not yet been created. enter set-points for the individual variables with button X/W
	NEW SEC. X/W	

Select sections S01 to S10 or to S20 with arrow keys [▼][▲] ↓

As long as no program section has been entered, the display switches back to 01 in case of any entry > 01, because all sections have to be entered one after, and each new section is created as NEWSEC.

Example: If three programs sections have been already entered, the next section to be entered is S04. Before this, no section > S04 can be selected.

↓

Next step – set-point entry in the desired program sections:

Basic entry principle: Access the parameters of individual program sections with button X/W one after the other. Enter the values of the individual parameters with the arrow keys. A value flashes once after 2 seconds thus indicating that it has been taken over to the controller. If several parameters are to be skipped (e.g. in order to change a parameter in a posterior program section), the parameters can be rapidly jumped over by holding down the X/W key. If no button is pressed for more than 120 sec the controller switches back to Normal Display. The program entered to this point remains saved.

Press key X/W ↓

Display 1 shows	e.g. 9.0°C	(actual temperature set-point)
Display 2 shows alternating	S01: TEMP 9.0	(variable: temperature in °C)
	CONTINUE X/W	(information: go on with X/W)

Enter temperature set-point of S01 in °C with arrow keys ▼ ▲ ↓

Press key X/W ↓

Display 1 shows	e.g. 00.01	(actual section length set-point)
Display 2 shows alternating	S01: TIME 00:10	(variable: section length in hh:mm)
	CONTINUE X/W	(information: go on with X/W)

Enter section length set-point of S01 in hh.mm with arrow keys ▼ ▲ ↓ Value is shown in both displays.

Press key X/W ↓

Display 1 shows	e.g. 50	(actual fan speed set-point)
Display 2 shows alternating	S01:FAN 50	(variable: fan speed in %)
	CONTINUE X/W	(information: go on with X/W)

Enter fan speed set-point of S01 in % with arrow keys ▼ ▲ ↓ Value is shown in both displays.

Press key X/W ↓

Only with option zero-voltage relay outputs via operation lines (chap. 16.6):

Display 1 shows	e.g. 000	(actually set switching state)
Display 2 shows alternating	S01:O.LINE 000	(variable: switching state)
	CONTINUE X/W	(Information: go on with X/W)

Enter switching state with arrow keys ▼ ▲ ↓

Press key X/W ↓

↓

Selecting the next program sections to be entered

Display 1 shows	e.g. 02	(section S02 selected)
Display 2 shows alternating	P01: --- SEC. CONTINUE X/W	Section S02 has already been created. enter new set-points for the individual parameters with X/W.

or:

Display 1 shows	e.g. 02	(section S02 selected)
Display 2 shows alternating	P01: --- SEC. NEW SEC. X/W	Section S02 has not yet been created. enter set-points for the individual parameters with X/W

Select the next section to be entered with arrow keys ▼ ▲ ↓

Display 1 shows	e.g. 12.5°C	(actual temperature set-point)
Display 2 shows alternating	S02:TEMP 12.5	(variable: temperature in °C)
	CONTINUE X/W	(information: go on with X/W)

Enter the temperature set-point of S02 in °C with arrow keys ▼ ▲ ↓

Etc.

If all sections up to S10 or up to S20 have been programmed, section S01 follows again. In order to quit the entry mode, press the EXIT button several times or wait 120 sec → the controller will then return to Normal Display.

☞	When changing the set-point, check the setting of the safety controller in the user level (chap. 10) if the safety controller has been set to “limit” mode.

☞	If the fan is operated with less than 100 % speed, the temperature performance and the spatial exactitude of the temperature can differ from the manufacturer’s specifications. The fan speed rate should only be reduced if absolutely necessary to meet special requirements.

☞	KB 23: Cooling power is reduced when fan speed is set to # 20%.

8.3 Program table template for Program Editor

Program editor	
Program title	
Project	
Program No.	
Date:	

Section **SEC**	Temperature set-point [°C] **TEMP**	Section length [hh.mm] **TIME**	Fan speed [%] **FAN**	Operation lines * **O.LINE**
S01				
S02				
S03				
S04				
S05				
S06				
S07				
S08				
S09				
S10				
S11				
S12				
S13				
S14				
S15				
S16				
S17				
S18				
S19				
S20				

* Only with option zero-voltage relay outputs via operation lines, see chap. 16.6.

	With the standard device the operation lines (O.LINE) are without any function.

8.4 Deleting a program section

A program section is deleted from the program by setting the section duration to Zero.

→ **Normal display**

Press down key [X/W] ↓ for 5 sec.

Display 1 shows	e.g. 0000	
Display 2 shows	PROGRAM EDITOR	(you are in the program editor)

Hit program key [⏻] ↓

Display 1 shows	0000	
Display 2 shows	UserCod? 0000	(enter user code)

Enter the user code with arrow keys [▼][▲] ↓ e.g. **0001** (basic setting, adjustable in the user level, chap. 10).
Value is shown in both displays.

Automatically forward after 2 sec

Display 1 shows	e.g. 01	(program P01 selected)
Display 2 shows alternating	--- : --- PRG.	(program can be selected)
	CONTINUE X/W	(information: to 1st program section with X/W)

Select the desired program, e.g. P01, with arrow keys [▼][▲] ↓ Value is shown in display1.

Press key [X/W] ↓

In the selected program P01 or P02, program sections can be selected:

Display 1 shows	e.g. 01	(actual selected section: S01)
Display 2 shows alternating	P01: --- SEC.	(program section can be selected)
	CONTINUE X/W	(information: set-point entry with X/W)

Select desired section, e.g. S03, with arrow keys [▼][▲] ↓ (omitted if section S01 shall be deleted).

Press key [X/W] ↓

Display 1 shows	e.g. 15.0°C	(actual temperature set-point)
Display 2 shows alternating	S03:TEMP 15.0	(variable: temperature)
	CONTINUE X/W	(information: continue with X/W)

No entry ↓

Press key [X/W] ↓

Display 1 shows	e.g. 02.30	(actual section length)
Display 2 shows alternating	S03:TIME 02:30	(variable: section length)
	CONTINUE X/W	(information: continue with X/W)

Enter set-point **Zero** for section length in hh:mm of S03 with arrow keys [▼][▲] ↓ Value is shown in display 2 or in both displays (display depends on maximum time setting in the user level chap. 10)

Display 1 shows	e.g. 00.00	(actual section length)
Display 2 shows alternating	S03:TIME 00:00	(variable: section length)
	DELETE SEC. X/W	(information: delete section with X/W)

Press key [X/W] ↓

The following section (in our example now S03) is displayed:

Display 1 shows	e.g. 03	(actually selected section: S03)
Display 2 shows alternating	P01:S03	(program section can be selected)
	CONTINUE X/W	(information: set-point entry with X/W)

Press key **EXIT** or wait 120 sec

Controller returns to Normal Display

If you delete a program section which is followed by further sections, those following move up to the place of the deleted section.

In our example, section S03 has been deleted. If sections S04, S05, etc. have been programmed earlier, they will now replace the preceding sections, i.e., S04 is now called S03 etc.

Deletion leads to overwriting the section by the following one. It is therefore not possible to temporarily inactivate a program section. To enter a section later to a program, all the sections following the new one must be entered again.

9. Program start level

Before starting the program, check the set-point entered in Fixed value operation mode. After end of the program, the temperature will equilibrate to this value.

CAUTION

Too high or too low temperature after the program ends.

Damage to the charging material.

➢ Check the set-point of Fixed value operation and if necessary adapt it.

After the program ends, the temperature will equilibrate to the set-point entered in Fixed value operation mode. If the week program timer is active, another set-point (SP2) might be targeted according to programming. Deactivate the week program timer before starting the program (default setting, setting in the User level, chap. 10).

CAUTION

Too high or too low temperature after the program ends.

Damage to the charging material.

➢ Deactivate the week program timer before starting the program.

In the first step, select a program. This is on condition that a program has been entered previously (chap. 8.2) and that program type “2 programs with 10 sections each” has been selected in the user level (chap. 10).

Then the settings for the program course are defined. Two parameters can be set:

- **Program delay time**, i.e. a defined time before a program starts. It can be entered with a precision of 1 minute, and its maximum value is 99.59 (99 hs 59 min). If the value is 00.00 the program will start immediately. During the program delay time, all unit functions (heating, refrigeration, and fan) are off.
- **Number of program cycles**, i.e. the desired number of program repeats. Values from 1 to 99 can be entered. If the program is not going to be repeated, enter the value “0”. For infinite repeats, enter the value “–1”. The program is repeated as a whole; it is not possible to repeat individual sections.

In the last step start the selected program. These steps must be carried out subsequently.

	Deactivate the week program timer (factory setting, setting in the user level, chap. 10) before starting a program.

Step 1 – Program selection (only with program type “2 programs” set):

Normal Display

Hit program key ↓

Display 1 shows	e.g. 1	(actually selected program)
Display 2 shows	SEL.PRG.	(select program 1 or 2)

Enter program number 1 or 2 with arrow keys ▼ ▲ ↓ Value is shown in display 1.

Next step – entry of program course settings

Hit program key ↓

Display 1 shows	e.g. 00.00	(entered delay time hh.mm)
Display 2 shows	RUN TIME	(enter delay time of program start)

Set delay time in hh.mm with arrow keys ▼ ▲ ↓ Value is shown in display 1.

Hit program key ↓

Display 1 shows	e.g. -1	(actually selected number of program cycles)
Display 2 shows	REPEAT	(enter number of program cycles)

Select number of cycles -1, 0, 1 etc. with arrow keys ▼ ▲ ↓ Value is shown in display 1.

Last step – program start:

Hit program key ↓

Display 1 shows	e.g. 1	(selected program)
Display 2 shows	RUN PRG.	(Question: start selected program?)

Hit program key ↓

Display 1 shows	e.g. 25.5°C	actual temperature value
Display 2 shows	P01:S01 01:49:39 (time running backwards)	(actual program P01, actual section S01, and remaining time of program section S01)

↓

Program is running. The green LED (3d) lights up.

In addition to the green LED (3d) indicating a running program, the LED (3a) is lit if the heating is active, or LED (3b) if the refrigeration is active, or none of both if the actual temperature equals the set-point.

	During program course the arrow keys and the EXIT button are not functional.

	By pressing the program key for 3 seconds, you can terminate the program course.

If you press button [x/w] during program course, the entered set-points of the actually running program section are shown one after the other for 5 sec. each:

Display 1 shows	e.g. 25.5°C	(actual temperature value)
Display 2 shows	P01:S03 02:07:12	(actual program P01, actual section S03, and remaining time of program section S03)

Press key [x/w] ↓

Display 1 shows	e.g. 15 °C	(actual temperature set-point 1)
Display 2 shows	SP1 TEMPERATURE	

5 seconds ↓

Display 1 shows	e.g. 0 °C	(actual temperature set-point 2)
Display 2 shows	SP2 TEMPERATURE	(no function during program operation)

5 seconds ↓

Display 1 shows	e.g. 100	(actual fan speed setting)
Display 2 shows	SP FAN SPEED	

5 seconds ↓

Only with option zero-voltage relay outputs via operation lines (chap. 16.6):

Display 1 shows	e.g. 000	(actual operating contact setting)
Display 2 shows	OPERATION LINE	

↓

After program rundown (and, if appropriate, of the program repeats) the controller returns to fixed value operation showing Normal Display and adjusting to the temperature and fan speed values that have been previously entered in the fixed value entry mode.

10. User level

In this menu the following parameters can be se (in brackets the corresponding abbreviated information given in display 2):

- **Unit address** (Adress)

  Setting of controller address (1 to 254) for operation with the communication software APT-COM™.

- **User code** (User-cod)

  Modification of the user code setting (factory setting “0001”) for access to the user level and the program editor.

	Keep in mind any modification of the user code. Without a valid user code it is no longer possible to access these levels.

- **Safety controller mode** (Saf.mode)

  The set-point mode can be entered as ...

  Limit: Maximally permitted temperature as absolute value (example: temperature set-point 37 °C, limit setting to 39 °C)

  Offset: Maximally permitted temperature exceeding of the actual set-point temperature (e.g. 2 °C). This maximally permitted temperature automatically changes with every change of the temperature set-point.

- **Safety controller set-point** (Saf.setp)

  The temperature set-point setting of the safety controller (over temperature safety device class 3.1) is displayed and can be changed. An absolute value (e.g. 40 °C) in case of setting “limit” or a relative value (e.g. 2 °C) in case of setting “Offset” can be entered.

	Regularly check the setting of the set-point mode and of the over temperature safety device set-point entered in this mode for the temperature value in fixed value operation or for the maximum temperature value of the selected temperature program in program operation mode.

- **Decimal point position** (Decimal)

  Selection if integer values or one position after the decimal point can be entered. The integer representation is shown in Display 2 (set-point entry) while the actual value in Display 1 is always shown with one decimal point.

- **Audio Alert** (Buzzer)

  Inactive: no audible signal (buzzer) in case of an alarm event.

  Active: in case of an alarm event (see chap. 13.2) an audible signal (buzzer) will sound. It can be reset by pressing the “**EXIT**” button.

- **Selection of controller menu language** (Language)

  You can select **German**, **English**, or **French**.

- **Counter of operating hours** (Oper.hs)

  Information about the number of operating hours currently reached or since the last reset. (no setting, display only).

- Max**. number of operating hours** (Op.limit)

  Entry of a limit number of operating hours, i.e., the maximum number of operating hours that can be run. Maximum setting: 9999. Reaching the limit has no effect.

- **Reset operating hours** (Op.back)

  Reset operating hours to zero.

- **Interface protocol** (Protocol)

  “**Modbus**”: The chamber interface can be used as a communication interface to connect it to a computer. This serves to control the chamber by the communication software APT-COM™. It is possible to read and write the values of all parameters.

  “**Printer**”: A protocol printer (option) for data printouts can be connected to the chamber interface. The printer regularly protocols the actual temperature value with fixed formatting and with adjustable print intervals (see chap. 16.2).

  In both cases an interface converter RS 422 / RS 232 is used.

- **Print interval** (Prt.-Inv.)

  Setting of the print interval in minutes. Function is available only if setting “Printer” has been selected in the previous menu point.

- **Display illumination** (Disp.LED)

  Selection between continuous display illumination and limited illumination that will automatically go off 300 sec after the last entry.

- **Program type selection** (PrgSelec)

  Select between entry of two programs with up to 10 sections each or of one program with up to 20 sections.

	When changing from 2 programs to 1 program or vice-versa, existing programs are deleted in the program editor.

- **Maximum section duration** (Prg.Time)

  The maximum length of an individual program section can be set to either 99 hs 59 min or to 999 hs 59 min. This setting is then valid for all program sections.

	When changing the maximum duration setting, pre-existing programs will be deleted in the program editor.

- **Set-point programming type** (Setp.sim)

  Selection between “Ramp” and “Step”. With setting “Step” selected, you don’t need to program the transition section in the Program Editor.

	If you select setting “step”, the controller will equilibrate only to constant temperatures; programming ramps becomes impossible.

	A change between settings “ramp” and “step” will influence all programs. Note that significant change in time courses may arise in existing programs.

- **Tolerance limit range** (Tol.band)

  Entry of a tolerance limit value in °C. Program operation: If the actual value of temperature exceeds the set-point of a program section by more than the entered tolerance limit value, the program is halted (LED (3d) flashing) until the actual temperature value is again within the tolerance range.

  Entry of “0” means tolerance limits are off.

- **Activating or inactivating the week program timer** (Prog.Clk)

  „**Inactive**“: The week program timer is switched off (factory setting). The corresponding setting menu (chap. 7) is not visible, nor is set-point 2 in the fixed value entry mode (chap. 6).

  „**Active**“: The week program timer is activated.

	When deactivating the week program timer, any programming made in advance will remain in memory and take effect when the week program timer is activated again.

	Deactivate the week program timer before entering set-points in fixed value entry mode (chap. 6). Otherwise, any setting of the operation lines is ineffective.

	Inactivate the week program timer before staring a program (chap. 9).

- **Display mode** (12h/24h)

  Select between 12 hours (display “AM” or “PM”) or 24 hours.

- **Date of the real time clock** (Date)

  Main menu. Use the program key to access the settings of year, month, and day in the corresponding submenus.

  - **Year of the real time clock** (Year)

    Enter the year (2006 up to 2050)

  - **Month of the real time clock** (Month)

    Enter the month (1 up to 12).

  - **Day of the real time clock** (Day)

    Enter the day (1 up to 31).

- **Time of the real time clock** (Time)

  Main menu. Use the program key to access the settings of hour and minute in the corresponding submenus.

  There is no automatic switch between daylight saving time and regular time.

  - **Hour of the real time clock** (Hour)

    Enter the hour (0 up to 23).

  - **Minute of the real time clock** (Minute)

    Enter the minute (0 up to 59).

Normal Display

Display 1 shows	e.g. 19.8 °C	(actual temperature value)
Display 2 shows	e.g. 15.05.06 13:52 - -	(actual date and time, actual switching state of week program timer channel 1: Off, channel 2: Off)

Press down key [X/W] ↓ for 5 sec

Display 1 shows	e.g. 0000	
Display 2 shows	PROGRAM EDITOR	(you are in the program editor)

Press down key [X/W] ↓ for 5 sec

Display 1 shows	0000	Menu visible only if week program timer is activated.
Display 2 shows	WEEK PROG. EDITOR	(you are in the week program editor)

Press down key [X/W] ↓ for 5 sec

Display 1 shows	0000	
Display 2 shows	USER – LEVEL	(you are in the user level)

Hit program key [↻] ↓

Display 1 shows	0000	
Display 2 shows	UserCod? 0000	(enter user code, display flashes)

Enter the user code with arrow keys [▼][▲] ↓ e.g. **0001** (basic setting, or the valid code in case it has been previously changed in this menu). Value is shown in both displays.

Automatically forward after 2 sec

↓

Display 1 shows	1	(actual address: 1)
Display 2 shows	Adress 1	(entry of unit address) (actual address: 1)

Enter the unit address (1 up to 254) with arrow keys [▼][▲] ↓ Address is displayed in both displays.

Press key [X/W] ↓

Display 1 shows	1	(actually valid user code: 1)
Display 2 shows	User-cod 1	(change user code) (actually set: 1)

Enter a new value with arrow keys [▼][▲] ↓ Value is shown in both displays.

Press key [X/W] ↓

Display 1 shows	0000	(no function)
Display 2 shows	Saf.mode: Limit	(select set-point mode of safety controller) (actual setting: “limit”)

Select between “Limit” and “Offset” with arrow keys [▼][▲] ↓ Setting is displayed in display 2.

Press key [X/W] ↓

Display 1 shows	e.g. 65	(actual setting: 65 °C)
Display 2 shows	Saf.setp 65	(temperature value of over temperature safety device) (actual value: 65 °C)

Enter a new value with arrow keys [▼][▲] ↓ Value is shown in both displays.

Press key [X/W] ↓

Display 1 shows	0000	(no function)
Display 2 shows	Decimal: XXX.X	(setting of decimal point position) (actual setting: XXX.X)

Select decimal point position with arrow keys ▼ ▲ ↓ Decimal point position XXX.X or XXXX. is displayed in display 2.

Press key X/W ↓

Display 1 shows	0000	(no function)
Display 2 shows	Buzzer : Active	(setting of the alarm buzzer) (actual setting: „Active“)

Select between “Active” and “Inactiv” with arrow keys ▼ ▲ ↓ Setting is displayed in display 2.

Press key X/W ↓

Display 1 shows	0000	(no function)
Display 2 shows	Language : English	(selection of controller language) (actual setting: English)

Select between languages German, English, and French with arrow keys ▼ ▲ ↓ Setting is displayed in display 2.

Press key X/W ↓

Display 1 shows	e.g. 0004	(unit operating hours)
Display 2 shows	Oper.hs 0004:28	(operating hours up to now hhhh:mm) (actually displayed: 4 hs 28 min)

Press key X/W ↓

Display 1 shows	e.g. 9999	(actual setting: 9999 hs)
Display 2 shows	Op.limit 9999:00	(maximum number of operating hours hhhh:mm (actual setting: 9999 hs)

Set value with arrow keys ▼ ▲ ↓ Setting is displayed in both displays.

Press key X/W ↓

Display 1 shows	0000	(no function)
Display 2 shows	Op.back : No	(reset counter of operating hours ?) (actual setting: No)

Select between “Yes” and “No” with arrow keys ▼ ▲ ↓ Setting is displayed in display 2.

Press key X/W ↓

Display 1 shows	0000	(no function)
Display 2 shows	Protocol: MODBUS	(Selection of interface mode) (actual setting: Modbus)

Select between protocols “MODBUS” and “Printer” with arrow keys ▼ ▲ ↓ Setting is displayed in display 2.

Press key X/W ↓

Display 1 shows	e.g. 3	(actual setting: 3 minutes)
Display 2 shows	Prt-Inv. 3	(print interval) (actual setting: 3 min)

Select value between 0 and 255 minutes with arrow keys ▼ ▲ → Setting is displayed in displays 1 and 2.

Press key X/W →

Display 1 shows	0000	
Display 2 shows	Disp.LED: No	(continuous display illumination?) (actual setting: No)

Select between “Yes” and “No” with arrow keys ▼ ▲ → Setting is displayed in display 2.

Press key X/W →

Display 1 shows	0000	
Display 2 shows	PrgSelec: 2Prg10S	(1 program with max. 20 sections or 2 programs with max. 10 sections each?) (actual setting: 2Prg10S)

Select between “2Prg10S” and “1Prg20S” with arrow keys ▼ ▲ → Setting is displayed in display 2.

Press key X/W →

Display 1 shows	0000	
Display 2 shows	Prg.Time: 99:59	(max. section length 99:59 or 999:59?) (actual setting: 99:59)

Select between 99:59 in hh:mm or 999:59 in hhh:mm with arrow keys ▼ ▲ → Setting is displayed in display 2.

Press key X/W →

Display 1 shows	0000	
Display 2 shows	Setp.sim Ramp	(ramp or step?) (actual setting: ramp)

Select between Ramp and Step with arrow keys ▼ ▲ → Setting is displayed in display 2.

Press key X/W →

Display 1 shows	0000	
Display 2 shows	Tol.band 0	(Tolerance limits in °C) (actual setting: 0)

Set value in °C with arrow keys ▼ ▲ → Setting is displayed in display 2.

Press key X/W →

Display 1 shows	0000	
Display 2 shows	Prog.Clk Inactive	(Week program timer active or inactive? (actual setting: Inactive)

Select between “Active” and “Inactive” with arrow keys ▼ ▲ → Setting is displayed in display 2.

Press key X/W →

Display 1 shows	0000	
Display 2 shows	12h/24h 24h	(Display mode 12 hours or 24 hours? (actual setting: 24h)

Select between 12 hours and 24 hours with arrow keys ▼ ▲ → Setting is displayed in display 2.

Press key X/W →

Display 1 shows	0000	
Display 2 shows	Date	(Main menu: Setting the date of the real time clock)

X/W

Hit program key →

Display 1 shows	e.g. 2006	(Actual setting: 2006)
Display 2 shows	Year 2006	(Setting the year of the real time clock)

Set year (2006 up to 2050) with arrow keys ▼ ▲ → Setting is displayed in display 2.

Press key X/W →

Display 1 shows	e.g. 5	(Actual setting: may)
Display 2 shows	Month 5	(Setting the month of the real time clock)

Set month (1 up to 12) with arrow keys ▼ ▲ → Setting is displayed in display 2.

Press key X/W →

Display 1 shows	e.g. 15	(Actual setting: 15)
Display 2 shows	Day 15	(Setting the day of the real time clock)

Set day (1 up to 31) with arrow keys ▼ ▲ → Setting is displayed in display 2.

Press key **EXIT** →

Press key X/W →

Display 1 shows	0000	
Display 2 shows	Time	(Main menu: Setting the time of the real time clock)

Hit program key →

Display 1 shows	e.g. 13	(Actual setting: 13, i.e. 1 p.m.)
Display 2 shows	Hour 13	(Setting the hour of the real time clock)

Set hour (0 up to 23) with arrow keys ▼ ▲ → Setting is displayed in display 2.

Press key X/W →

Display 1 shows	e.g. 30	(Actual setting: 30 minutes)
Display 2 shows	Minute 30	(Setting the minute of the real time clock)

Set minute(0 up to 59) with arrow keys ▼ ▲ → Setting is displayed in display 2.

Hit several times key **EXIT** → or wait for 120 seconds

Controller returns to normal display.

11. Programming example of the Week Program Editor

11.1 Desired time function

From Monday to Friday the chamber shall maintain a temperature of +20 °C, and during the week-end (Saturday and Sunday) a temperature of +5 °C.

This program shall automatically run during the whole year, i.e. it shall be programmed just once.

11.2 Proceeding overview

1. Settings in the user level (see chap. 10)

- **Set safety controller to “Limit” and 3 °C above the maximum temperature value of the program**

  The temperature set-point of the safety controller (over temperature protection class 3.1) is displayed and can be changed. You can enter an absolute value in case of setting “limit”, or a relative value in case of setting “Offset”. Select setting “Limit” and enter a value by 3 °C above the maximum value (i.e., 23 °C).
- **Activating the week program timer**
- **Checking and, if necessary, setting the real time clock**

2. Enter the set-points for the week program in Fixed value entry mode (see chap. 6)

Set-points for the example program:

- SP 1 (night / weekend) = 5 °C
- SP 2 (day / week) = 20 °C

3. Enter the time program to the week program editor (see chap. 7)

Program table for the example program:

Day of the week	Time			Channel 1 (temperature)
	hh:mm	AM	PM	ON = SP2 OFF = SP1
Monday	S1 06:00			ON
Friday	S1 20:00			OFF

	Make sure that no other shift points have been preprogrammed. If so, they must be deleted: Set the time of the respective shift point to “ **--:--** ” using key ▼.

11.3 Proceeding in detail

1. Settings in the user level:

- **Set safety controller to “Limit” and 3 °C above the maximum temperature value of the program**
- **Activating the week program timer**
- **Checking and, if necessary, setting the real time clock**

Normal Display

Display 1 shows	e.g. 19.8 °C	(actual temperature value)
Display 2 shows	e.g. 15.05.06 13:52 - -	(actual date and time, actual switching state of week program timer channel 1: Off, channel 2: Off)

Press down key [X/W] ↓ for 5 sec

Display 1 shows	e.g. 0000	
Display 2 shows	PROGRAM EDITOR	(you are in the program editor)

Press down key [X/W] ↓ for 5 sec

Display 1 shows	0000	Menu visible only if week program timer is activated.
Display 2 shows	WEEK PROG. EDITOR	(you are in the week program editor)

Press down key [X/W] ↓ for 5 sec

Display 1 shows	0000	
Display 2 shows	USER – LEVEL	(you are in the user level)

Hit program key [↻] ↓

Display 1 shows	0000	
Display 2 shows	UserCod? 0000	(enter user code, display flashes)

Enter the user code using arrow keys [▼][▲] ↓ e.g. **0001** (basic setting, or the valid code in case it has been previously changed in this menu). Value is shown in both displays.

Automatically forward after 2 sec

Display 1 shows	1	(actual address)
Display 2 shows	Address 1	(entry of unit address) (actual address: 1)

Hit several times key [X/W] ↓ until **Saf.mode** appears:

Display 1 shows	0000	(no function)
Display 2 shows	Saf.mode: Limit.	(select set-point mode of safety controller) (actual setting: „limit“)

Select “**Limit**” with arrow keys [▼][▲] ↓ Setting is displayed in display 2.

Press key [X/W] ↓

Display 1 shows	23	(actually set temperature value)
Display 2 shows	Saf.setp 23	(temperature value of over temperature safety device) (actual value: 23 °C)

Enter the temperature value of **23** in °C with arrow keys [▼][▲] ↓ Value is shown in both displays.

Hit several times key [X/W] ↓ until **Prog.Clk** appears:

Display 1 shows	0000	
Display 2 shows	Prog.Clk Active	(Week program timer active or inactive? (actual setting: Active)

Select “**Active**” with arrow keys [▼][▲] ↓ Setting is displayed in display 2.

Press key [X/W] ↓

Display 1 shows	0000	
Display 2 shows	12h/24h 24h	(Display mode 12 hours or 24 hours? (actual setting: 24h)

Press key [x/w]

Display 1 shows	0000	
Display 2 shows	Date	(Main menu: Setting the date of the real time clock)

Hit program key

Display 1 shows	e.g. 2006	(Actual setting: 2006)
Display 2 shows	Year 2006	(Setting the year of the real time clock)

Set **year** (2006 up to 2050) with arrow keys [▼][▲] Setting is displayed in display 2.

Press key [x/w]

Display 1 shows	e.g. 5	(Actual setting: may)
Display 2 shows	Month 5	(Setting the month of the real time clock)

Set **month** (1 up to 12) with arrow keys [▼][▲] Setting is displayed in display 2.

Press key [x/w]

Display 1 shows	e.g. 15	(Actual setting: 15)
Display 2 shows	Day 15	(Setting the day of the real time clock)

Set **day** (1 up to 31) with arrow keys [▼][▲] Setting is displayed in display 2.

Press key **EXIT**

Press key [x/w]

Display 1 shows	0000	
Display 2 shows	Time	(Main menu: Setting the time of the real time clock)

Hit program key

Display 1 shows	e.g. 13	(Actual setting: 13, i.e. 1 p.m.)
Display 2 shows	Hour 13	(Setting the hour of the real time clock)

Set **hour** (0 up to 23) with arrow keys [▼][▲] Setting is displayed in display 2.

Press key [x/w]

Display 1 shows	e.g. 30	(Actual setting: 30 minutes)
Display 2 shows	Minute 30	(Setting the minute of the real time clock)

Set **minute**(0 up to 59) with arrow keys [▼][▲] Setting is displayed in display 2.

Hit several times key **EXIT** or wait for 120 seconds

Controller returns to normal display.

2. Enter the set-points for the week program in Fixed value entry mode (see chap. 6)

Set-points for the example program:

- SP 1 (night / weekend) = 5 °C
- SP 2 (day / week) = 20 °C

Normal Display

Display 1 shows	e.g. 19.8 °C	(actual temperature value)
Display 2 shows	e.g. 15.05.06 13:52 - -	(actual date and time, actual switching state of week program timer channel 1: Off, channel 2: Off)

Press key [X/W] ↓

Display 1 shows	5.0	(actual temperature set-point 1)
Display 2 shows	SP1 TEMPERATURE	(variable: temperature in °C)

Enter temperature set-point **5 °C** with arrow keys [▼][▲] ↓ Value is shown in display 1.

Press key [X/W] ↓

Display 1 shows	20.0	(actual temperature set-point 2)
Display 2 shows	SP2 TEMPERATURE	(variable: temperature in °C)

Enter temperature set-point **20 °C** with arrow keys [▼][▲] ↓ Value is shown in display 1.

Hit the EXIT button. The controller changes to Normal Display.

3. Enter the time program to the week program editor

Program table for the example program:

Day of the week	Time			Channel 1 (temperature)
	hh:mm	AM	PM	ON = SP2 OFF = SP1
Monday	S1 06:00			ON
Friday	S1 20:00			OFF

SP 1 (night / weekend) = 5 °C, SP 2 (day / week) 20 °C

☞	Make sure that no other shift points have been programmed due to previous programming. If so, they must be deleted: Set the time of the respective shift point to " **--:--** " with key [▼].

Normal Display

Display 1 shows	e.g. 19.8 °C	(actual temperature value)
Display 2 shows	e.g. 15.05.06 13:52 - -	(actual date and time, actual state of week program timer channel 1: Off, channel 2: Off)

Press down key [X/W] ↓ for 5 sec

Display 1 shows	e.g. 0000	
Display 2 shows	PROGRAM EDITOR	(you are in the program editor)

Press down key [X/W] ↓ for 5 sec

Display 1 shows	0000	
Display 2 shows	WEEK PROG. EDITOR	(you are in the week program editor)

Hit program key [↻] ↓

Display 1 shows	0000	
Display 2 shows	UserCod? 0000	(enter user code, display flashes)

Enter the user code with arrow keys [▼][▲] ↓ e.g. **0001** (basic setting, adjustable in the user level, chap. 10).
Value is shown in both displays.

Automatically forward after 2 sec

Display 1 shows	0000	
Display 2 shows	Monday	(selection of day of the week) (actual selection: Monday)

Select the first day of the week (**Monday**) with key [X/W] ↓ Day of the week is displayed in display 2.

Hit program key [↻] ↓

Display 1 shows	0000	
Display 2 shows	Shiftpt.	(no function)

Hit program key [↻] ↓

Display 1 shows	0000	
Display 2 shows	Shiftpt. 1	(selection of the shift point) (actual shift point: 1)

Select shift point **1** with key [X/W] ↓ Value is shown in display 2.

Hit program key [↻] ↓

Display 1 shows	e.g. --.--	(time of the selected shift point)
Display 2 shows	S1: --:--	(actually selected shift point: S1) (actual setting: shift point not programmed)

Hit program key

Display 1 shows	06.00	(time of the selected shift point)
Display 2 shows	Time 06:00	(entry of time of the selected shift point) (actual setting: 6.00, i.e. 6 a.m.)

Enter the time **06:00** with arrow keys — Value is shown in display 2.

Press key

Display 1 shows	0000	
Display 2 shows	Ch1 = SP2: On	(entry of state of channel 1) (actual setting: On)

Enter the state of channel 1 **On** with arrow keys — Setting is displayed in display 2.

Press key

Display 1 shows	0000	
Display 2 shows	Channel 2: Off	(entry of state of channel 2) (actual setting: Off)

Press key **EXIT**

Display 1 shows	06.00	(time of the selected shift point)
Display 2 shows	S1: 06:00 -	(actually selected shift point: S1) (actual setting: time 06.00, channel 1 ON)

Press key **EXIT** twice — to select the next day of the week

Display 1 shows	0000	
Display 2 shows	Friday	(selection of day of the week) (actual selection: Friday)

Select the next day of the week (**Friday**) with key — Day of the week is displayed in display 2.

Hit program key

Display 1 shows	0000	
Display 2 shows	Shiftpt.	(no function)

Hit program key

Display 1 shows	0000	
Display 2 shows	Shiftpt. 1	(selection of the shift point) (actual shift point: 1)

Select shift point **1** with key — Value is shown in display 2.

Hit program key

Display 1 shows	e.g. --.--	(time of the selected shift point)
Display 2 shows	S1: --:--	(actually selected shift point: S1) (actual setting: shift point not programmed)

Hit program key

Display 1 shows	20.00	(time of the selected shift point)
Display 2 shows	Time 20:00	(entry of time of the selected shift point) (actual setting: 20.00, i.e. 8 p.m.)

Enter the time **20:00** with arrow keys ▼ ▲ ↓ Value is shown in display 2.

Press key X/W ↓

Display 1 shows	0000	
Display 2 shows	Ch1 = SP2: Off	(entry of state of channel 1) (actual setting: OFF)

Enter the state of channel 1 **Off** with arrow keys ▼ ▲ ↓ Setting is displayed in display 2.

Press key X/W ↓

Display 1 shows	0000	
Display 2 shows	Channel 2: Off	(entry of state of channel 2) (actual setting: Off)

Press key **EXIT** ↓

Display 1 shows	20.00	(time of the selected shift point)
Display 2 shows	S1: 20:00 - -	(actually selected shift point: S1) (actual setting: time 20.00, channels OFF)

Hit several times key **EXIT** ↓ or wait for 120 seconds

Controller returns to normal display.

12. Example programming for the Program Editor

12.1 Desired time function

From Monday to Friday the chamber shall maintain a temperature of +20 °C, and during the week-end (Saturday and Sunday) a temperature of +5 °C.

This program shall automatically run during the whole year, i.e. it shall be programmed just once.

12.2 Proceeding overview

1. Settings in the user level (see chap. 10)

- **Set safety controller to "Limit" and 3 °C above the maximum temperature value of the program**

  The temperature set-point of the safety controller (over temperature protection class 3.1) is displayed and can be changed. You can enter an absolute value in case of setting "limit", or a relative value in case of setting "Offset". Select setting "Limit" and enter a value by 3 °C above the maximum value (i.e., 23 °C).

- **Set maximum section duration (Prg. Time) to 999 hs. 59 min.**

  The maximum length of a program section can be set – in common for all program sections – to 99 hs 59 min or to 999 hs 59 min. Select setting 999:59.

	When changing the maximum duration setting, pre-existing programs will be deleted in the program editor.

- **Turn off tolerance limits function**

  Select setting "0" meaning tolerance limits off. Thus an interruption of the program course during the heating-up or cooling-down phases during the rapid "set-point step" phase is avoided.

- **Inactivating the week program timer**

  Inactivate the week program timer before entering a program (factory setting). Otherwise, any setting of the operation lines in the program editor is ineffective.

2. Enter the time program to the program editor

Program table for the example program:

Section SEC	Temperature set-point [°C] TEMP	Section length [hh.mm] TIME	Fan speed [%] FAN	Operation lines O.LINE
S01	20	119:59	100	000
S02	20	000:01	100	000
S03	5	047:59	100	000
S04	5	000:01	100	000

	Make sure that there are no more program sections (S05 etc.) existing due to previous programming. If so, they must be deleted (see chap. 8.4)

3. Set the number of cycles to infinite in the program start level and start the program

☞	The described example program must be started once at the precise moment of temperature change (on Monday e.g., at 0.01 or at 7.00). If the program cannot be manually started at the desired moment, you can program a suitable program delay-time of 99 hs. 59 min. max. After rundown of this delay time the program starts automatically (chap. 9).

12.3 Proceeding in detail

1. Settings in the user level:

- **Set safety controller to "Limit" and 3 °C above the maximum temperature value of the program**

  The temperature set-point of the safety controller (over temperature protection class 3.1) is displayed and can be changed. An absolute value in case of setting „limit", or a relative value in case of setting „Offset" can be entered Select setting „Limit" and enter a value by 3 °C above the maximum value (i.e., 23 °C).

- **Set maximum section duration (Prg. Time) to 999 hs. 59 min.**

  The maximum length of a program section can be set – in common for all program sections – to 99 hs 59 min or to 999 hs 59 min. Select setting 999:59.

☞	When changing the maximum duration setting, pre-existing programs will be deleted in the program editor.

- **Turn off tolerance limits function**

  Select setting "0" meaning tolerance limits off. Thus an interruption of the program course during the heating-up or cooling-down phases during the rapid "set-point step" phase is avoided.

- **Inactivating the week program timer**

  Inactivate the week program timer before entering a program (factory setting). Otherwise, any setting of the operation lines in the program editor is ineffective.

Normal Display

Display 1 shows	e.g. 19.8 °C	(actual temperature value)
Display 2 shows	e.g. 15.05.06 13:52 - -	(actual date and time, actual switching state of week program timer channel 1: Off, channel 2: Off)

Press down key [X/W] ↓ for 5 sec

Display 1 shows	e.g. 0000	
Display 2 shows	PROGRAM EDITOR	(you are in the program editor)

Press down key [X/W] ↓ for 5 sec

Display 1 shows	0000	Menu visible only if week program timer is activated
Display 2 shows	WEEK PROG. EDITOR	(you are in the week program editor)

Press down key [X/W] ↓ for 5 sec

Display 1 shows	0000	
Display 2 shows	USER-LEVEL	(you are in the user level)

Hit program key [⟳] ↓

Display 1 shows	0000	
Display 2 shows	UserCod? 0000	(enter user code, display flashes)

Enter the user code with arrow keys ▼ ▲ e.g. **0001** (basic setting, or the valid code in case it has been previously changed in this menu). Value is shown in both displays.

Automatically forward after 2 sec

Display 1 shows	1	(actual address)
Display 2 shows	Adress 1	(entry of unit address) (actual address: 1)

Hit several times key X/W until **Saf.mode** appears

Display 1 shows	0000	(no function)
Display 2 shows	Saf.mode: Limit.	(select set-point mode of safety controller) (actual setting: „limit“)

Select “**Limit**” with arrow keys ▼ ▲ Setting is displayed in display 2.

Press key X/W

Display 1 shows	23	(actually set temperature value)
Display 2 shows	Saf.setp 23	(temperature value of over temperature safety device) (actual value: 23 °C)

Enter the temperature value of **23** in °C with arrow keys ▼ ▲ Value is shown in both displays.

Hit several times key X/W until **Prg.Time** appears

Display 1 shows	0000	
Display 2 shows	Prg.Time: 999:59	(max. section length 99:59 or 999:59?) (actual setting: 999:59)

Select **999:59** in hhh:mm with arrow keys ▼ ▲ Setting is displayed in display 2.

Press key X/W

Display 1 shows	0000	
Display 2 shows	Tol.Band 0	(Tolerance limits in °C) (actual setting: 0)

Set value **0** meaning tolerance limits off with arrow keys ▼ ▲ Setting is displayed in display 2.

Press key X/W

Display 1 shows	0000	
Display 2 shows	Prog.Clk Inactive	(Week program timer active or inactive? (actual setting: Inactive)

Select “**Inactive**” meaning week program timer off, with arrow keys ▼ ▲ Setting is displayed in display 2.

Hit several times key **EXIT** or wait 120 sec.

Controller returns to Normal Display.

2. Enter the time program to the program editor

Program table for the example program:

Section SEC	Temperature set-point [°C] TEMP	Section length [hh.mm] TIME	Fan speed [%] FAN	Operation lines O.LINE
S01	20	119:59	100	000
S02	20	000:01	100	000
S03	5	047:59	100	000
S04	5	000:01	100	000

In this example the program is entered to the first program place (P01).

Normal display

Display 1 shows	e.g. 19.8 °C	(actual temperature value)
Display 2 shows	e.g. 15.05.06 13:52 - -	(actual date and time, actual switching state of week program timer channel 1: Off, channel 2: Off)

Press key X/W ↓ for 5 sec.

Display 1 shows	e.g. 0000	
Display 2 shows	PROGRAM EDITOR	(you are in the program editor)

Hit program key ↓

Display 1 shows	0000	
Display 2 shows	UserCod? 0000	(enter user code)

Enter user code with arrow keys ▼ ▲ ↓ e.g. **0001** (basic setting, adjustable in the user level, chap. 10). Value is shown in both displays.

Automatically forward after 2 sec.

Display 1 shows	01	program P01 selected
Display 2 shows alternating	---:--- PRG.	program can be selected
	CONTINUE X/W	(information: to 1st program section with X/W)

Select program **P01** with arrow keys ▼ ▲ ↓ Value is shown in Display 1.

Press key X/W ↓

In the selected program P01 the first program section S01 is displayed:

Display 1 shows	01	section S01 has been selected
Display 2 shows alternating	P01: --- SEC. CONTINUE X/W or NEW SEC. X/W	enter new set-points for the individual variables with button X/W.

Select section S01with arrow keys ▼ ▲ ↓

Press key X/W ↓

Display 1 shows	20.0 °C	(actual temperature set-point)
Display 2 shows alternating	S01: TEMP 20.0	(variable: temperature in °C)
	CONTINUE X/W	(information: go on with X/W)

Entry of temperature set-point of **20 °C** with arrow keys ▼ ▲ ↓

Press key X/W ↓

Display 1 shows	119	(actual section length set-point)
Display 2 shows alternating	S01: TIME 119:59	(variable: section length in hhh:mm)
	CONTINUE X/W	(information: go on with X/W)

Enter section length set-point of S01 of **119 hs. 59 min.** with arrow keys ▼ ▲ ↓ Value is shown in both displays.

Hit several times key X/W ↓ until **P01: --- SEC** appears:

Display 1 shows	02	section S02 has been selected
Display 2 shows alternating	P01: --- SEC.	enter new set-points for the individual variables with button X/W.
	CONTINUE X/W or NEW SEC. X/W	

Select section S02with arrow keys ▼ ▲ ↓

Press key X/W ↓

Display 1 shows	20.0°C	(actual temperature set-point)
Display 2 shows alternating	S02: TEMP 20.0	(variable: temperature in °C)
	CONTINUE X/W	(information: go on with X/W)

Entry of temperature set-point of **20** in °C of S02 with arrow keys ▼ ▲ ↓

Press key X/W ↓

Display 1 shows	000	(actual section length set-point)
Display 2 shows alternating	S02: TIME 000:01	(variable: section length in hhh:mm)
	CONTINUE X/W	(information: go on with X/W)

Enter section length set-point of S02 of **1 min** with arrow keys ▼ ▲ ↓ Value is shown in both displays.

Hit several times key X/W ↓ until **P01: --- SEC** appears:

Display 1 shows	03	section S03 has been selected
Display 2 shows alternating	P01: --- SEC.	enter new set-points for the individual variables with button X/W.
	CONTINUE X/W or NEW SEC. X/W	

Select section S03with arrow keys ▼ ▲ ↓

Press key X/W ↓

Display 1 shows	5°C	(actual temperature set-point)
Display 2 shows alternating	S03:TEMP 5	(variable: temperature in °C)
	CONTINUE X/W	(information: go on with X/W)

Entry of temperature set-point of **5 °C** of S03 with arrow keys ▼ ▲ ↓

Press key X/W ↓

Display 1 shows	047	(actual section length set-point)
Display 2 shows alternating	S03: TIME 047:59	(variable: section length in hhh:mm)
	CONTINUE X/W	(information: go on with X/W)

Enter section length set-point of S03 of **47 hs. 59 min.** with arrow keys ▼ ▲ ↓ Value is shown in both displays.

Hit several times key X/W ↓ until **P01: --- SEC** appears:

Display 1 shows	04	section S04 has been selected
Display 2 shows alternating	P01: --- SEC.	enter new set-points for the individual variables with button X/W.
	CONTINUE X/W or NEW SEC. X/W	

Select section S04 with arrow keys ▼ ▲

Press key X/W

Display 1 shows	5°C	(actual temperature set-point)
Display 2 shows alternating	S04:TEMP 5	(variable: temperature in °C)
	CONTINUE X/W	(information: go on with X/W)

Entry of temperature set-point of **5 °C** of S04 with arrow keys ▼ ▲

Press key X/W

Display 1 shows	000	(actual section length set-point)
Display 2 shows alternating	S04: TIME 000:01	(variable: section length in hhh:mm)
	CONTINUE X/W	(information: go on with X/W)

Enter section length set-point of S04 of **1 min.** with arrow keys ▼ ▲ Value is shown in both displays.

Press key **EXIT** several times or wait 120 sec.

Controller returns to Normal Display

	Make sure that there are no more program sections (S05 etc.) existing due to previous programming. If so, they must be deleted (see chap. 8.4)

3. Set the number of cycles to infinite in the program start level and start the program

	The described example program must be started once at the precise moment of temperature change (on Monday e.g., at 0.01 or at 7.00). If the program cannot be manually started at the desired moment, a suitable program delay-time of 99 hs. 59 min. max. can be programmed. After rundown of this delay time the program starts automatically (see chap. 9).

Normal Display

Hit program key

Display 1 shows	1	actually selected program
Display 2 shows	SEL.PRG.	select program 1 or 2

Enter program number **1** with arrow keys ▼ ▲ Value is shown in display 1.

Hit program key

Display 1 shows	e.g. 00.00	(entered delay time hh.mm)
Display 2 shows	RUN TIME	(enter delay time of program start)

Set delay time, if desired, in hh.mm with arrow keys ▼ ▲ Setting 00.00 means no delay time (immediate program start)
Value is shown in display 1.

Hit program key

Display 1 shows	-1	actually selected number of program cycles: infinite
Display 2 shows	REPEAT	(enter number of program cycles)

Select number of cycles **–1**, i.e. infinite repeats, with arrow keys ▼ ▲ → Value is shown in display 1.

Hit program key ↻ →

Display 1 shows	1	selected program
Display 2 shows	RUN PRG.	Question: start selected program?

Hit program key ↻ →

Display 1 shows	20.0°C	actual temperature value
Display 2 shows	P01:S01 119:49 (time running backwards)	actual program P01, actual section S01, and remaining time of program section S01

→

Program is running. The green LED (3d) lights up.

Additionally to the green LED (3d) indicating a running program LED (3a) is lit if the heating is active, or LED (3b) if the refrigeration is active, or none of both if the actual temperature equals the set-point.

During program course the arrow keys and the EXIT button are not functional.

☞	By hitting the program key ↻ for 3 seconds, you can terminate the program course.

If during program course button ⓦ is hit, the entered set-points of the actually running program section are shown one after the other for 5 sec. each:

13. Behavior in case of failures

13.1 Behavior after power failure

Power failure during fixed-value operation (Normal Display):

The entered parameters remain saved. After the power returns, operation continues with the set parameters.

Power failure during program operation:

After the power returns, program course continues with the set-points that have been reached previously during program operation.

13.2 Alarm messages

Alarm messages, e g. “TEMP. LIMIT” when exceeding the tolerance limit, are shown in Display 2 only in Normal Display.

A buzzer can be activated / deactivated in the user level (chap. 10). It can be reset by pressing the EXIT button. The alarm text shown in Normal Display goes off only if the cause of the alarm does not exist any longer.

14. Temperature safety devices

14.1 Over temperature protective device (class 1)

The refrigerated incubator is equipped with an internal temperature safety device, class 1 acc. to DIN 12880. It serves to protect the unit and prevents dangerous conditions caused by major defects.

If a temperature of approx. 110 °C / *230 °F* is reached, the over temperature protective device permanently turns off the unit. The user cannot restart the device again. The protective cut-off device is located internally. Only a service specialist can replace it. Therefore, please contact an authorized service provider or BINDER service.

14.2 Safety controller (temperature safety device class 3.1)

The refrigerated incubator is regularly equipped with an electronic safety controller (over temperature safety device class 3.1 acc. to DIN 12880) that can be set in the user level (chap. 10) of the program controller.

The safety controller serves to protect the refrigerated incubator, its environment and the material under treatment from excess temperatures. In case of error the temperature of the inner chamber will be limited to the set value.

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).

14.3 Temperature safety device class 3.3 (option from size 53 on)

With the option over/under temperature protective device (temperature safety device class 3.3 acc. to DIN 12880) the unit is equipped with two additional safety devices (class 3.1 and class 3.2) that can be set via control knobs at the KB control panel.

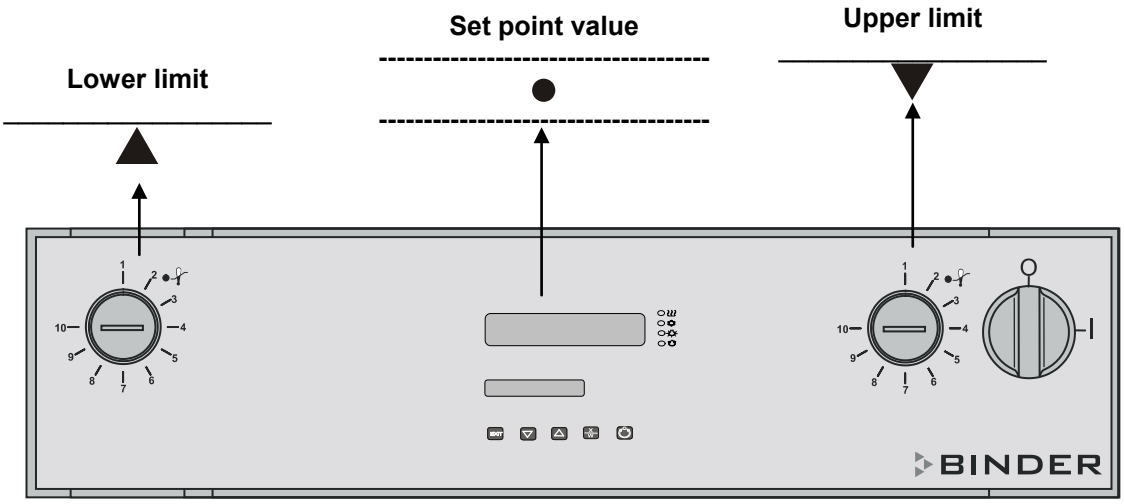


Figure 8: Temperature safety device class 3.3

With a **safety device class 3.1** a maximum value for the temperature is set that the unit will not exceed due to the regulatory function of the safety device class 3.1. This protection against excessively high temperatures can, for example, serve to protect the refrigerated incubator, its environment and the material under treatment from excess temperatures.

With a **safety device class 3.2** a minimum value for the temperature is set that the unit will not fall below due to the regulatory function of the safety device class 3.2. This protection against excessively low temperatures can, for example, serve to protect sensitive loads from under cooling.

The combination of the safety devices class 3.1 and class 3.2 can be regarded as a safety device class 3.3.

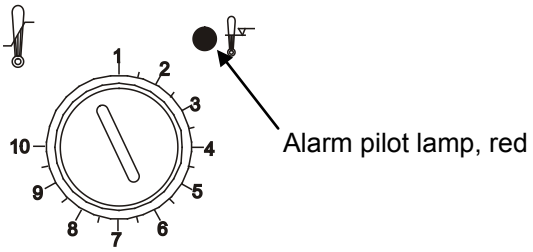


Figure 9: Temperature safety device class 3.1 or class 3.2

Both safety devices are functionally and electrically independent of the temperature control system. If an error occurs, they perform a regulatory function.

Temperature safety device class 3.1

If you turn the control knob to its end-stop (position 10), the safety device class 3.1 protects the appliance. If you set the temperature a little above the set-point, it protects the charging material. If the safety device class 3.1 has taken over control, identifiable by the red alarm lamp (6a) lighting up, proceed as follows:

- Disconnect the unit from the power supply
- Have an expert examine and rectify the cause of the fault
- Restart the unit as described in chap. 5.

Setting:

To check the response temperature of the safety device class 3.1, turn on the chamber and set the desired set point on the temperature controller.

The sections of the scale from 1 to 10 correspond to the temperature range from 0 °C to 120 °C and serve as a setting aid.

- Turn the control knob of the safety device using a coin to its end-stop (position 10) (unit protection).
- When the set point is reached, turn back the control knob until its trip point (turn it counter-clockwise).
- The trip point is identifiable by the red alarm lamp.
- The optimum setting for the safety device is obtained by turning the control knob clockwise by approximately two scale divisions, which shuts off the red alarm lamp.

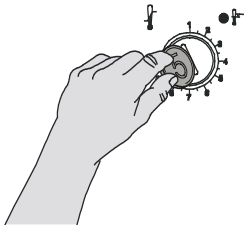


Figure 10: Setting safety device class 3.1

	Check the setting regularly and adjust it following changes of the set-point or charge.

	It is still possible to set the safety controller (chap. 14.2) via the controller menu. In case different values are set via the menu and via the control knob, the one that will be reached the first is the valid one. The additional setting of the safety device class 3.1 via the control knob provides additional security because it guarantees turning off the unit in case of temperature exceeding independently from the controller.

Temperature safety device class 3.2

The safety device class 3.2 is equivalently set to a minimum temperature the unit will not fall below. This protection against prohibited low temperatures can, for example, serve to protect sensitive cultures from cooling down too much.

If the control knob is turned to its end-stop (position 0), the safety device class 3.2 has no effect. If it is set to a temperature somewhat lower than that selected by means of the controller, it functions as a protective device for the material under treatment. If the temperature safety device class 3.2 has assumed regulation, identifiable by the red alarm lamp lighting up, please proceed as follows:

- Disconnect the unit from the power supply.
- Have an expert examine and rectify the cause of the fault.
- Restart the unit as described in chap. 5.

Setting:

To check the response temperature of the safety device class 3.2, put the unit into operation and set the desired set point on the temperature controller.

The sections of the scale from 1 to 10 correspond to the temperature range from -40 °C to +160 °C and serves as a setting aid.

- Turn the control knob of the safety device by means of a coin to its end-stop (position 0) (thermostat without effect).
- When the set point is reached, reset the safety device to its trip point (turn it clockwise).
- The trip point is identifiable by the red alarm lamp.
- The optimum setting for the safety device is obtained by turning the control knob counter-clockwise by approximately two scale divisions, which shuts o the red alarm lamp.

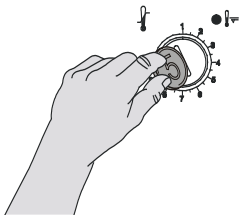


Figure 11: Setting safety device class 3.2

	Check the setting regularly and adjust it following changes of the set-point or charge.

15. Notes on refrigerating operation

Defrosting:

BINDER refrigerated incubators are built to be highly diffusion-tight. Due to the adverse effects on temperature accuracy, automatic cyclical defrosting has not been implemented. However, the humidity in the air can condense on the evaporator plates. The DCT™ refrigerating system largely prevents icing on the evaporator plates.

	Always close the door properly.

Two cases must be distinguished:

1. At an inner chamber temperature of more than +5 °C and an ambient temperature of +22 °C, the air thaws the ice layer independently. Defrosting is performed continuously and independently.
2. Since the evaporator can ice up at very low temperatures, the unit should be defrosted manually. To do this, open the door. Set a temperature of 30 °C to 40 °C, and allow the unit to operate for about 15 to 30 minutes.
3. Defrosting of the unit is now completed.

	Excessive frosting of the evaporator is indicated by reduced refrigerating performance.

	KB 23: Cooling power is reduced when fan speed is set to ≤ 20%.

16. Options

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

The unit is regularly equipped with a serial interface RS 422 that can connect the BINDER communication software APT-COM™ 3 DataControlSystem. The connection to a computer is established using the KB interface via an interface converter RS 422 / RS 232.

	Make sure that the interface mode is correctly set to “Modbus” in the user level (chap. 10).

The actual temperature and fan speed 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 at the rear of the incubator:

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

16.2 Ethernet interface (option)

With this option, the chamber is equipped with an Ethernet interface instead of the RS422 interface, that can connect the BINDER communication software APT-COM™ 3 DataControlSystem. The MAC Address is indicated below the Ethernet interface. The actual temperature, and fan speed values are given in adjustable intervals. Programming can be performed graphically via PC. For further information, refer to the operating manual of the BINDER communication software APT-COM™ 3.

16.3 Protocol printer (option from size 53 on)

The protocol printer is connected using the KB interface via an interface converter RS 422 / RS 232.

	Make sure that the interface mode is correctly set to “Printer” in the user level (chap. 10).

Interface configuration:

Baud rate: 9600
Stop bit: 1
Parity: none

Figure 12: Protocol printer

The actual temperature values are put out regularly with fixed formatting.

Printout: one printed line for each print interval with relative time stamp, temperature value with one decimal point, curve representation (see “Manual for Setting Matrix Printer Epson LX-300+“, Art. No. 7001-0041). In every 5th line the set print interval “Ptime” in minutes is noted. The printer interval is set in the user level (chap. 10).

Example:

```
Temp.: 34.7                *
Temp.:  35.6                 *
Temp.:  32.8               *
Temp.:  30.1              *
Ptime : 001.              *
Temp.:  27.4            *
Temp.:  26.9           *
Temp.:  26.6          *
Temp.:  26.4          *
Ptime : 001.          *
Temp.:  26.2         *
```

In this example the print interval is set to 1 min, i.e., every minute a new temperature value is printed.

	In connection with the set print interval, referring to real time can be achieved by noting down the start time of the registration.

16.4 Data logger kit

The BINDER Data Logger Kit offers an independent long-term measuring system for temperature, available for different temperature ranges.

The BINDER Data Logger is 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: Measuring sensor for the temperature values of the chamber: Temperature range -90 °C / *194 °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.

16.5 Additional Pt100 temperature sensor (option from size 53 on)

An additional fixed or flexible temperature sensor Pt100 allows measuring the chamber temperature (fixed Pt100) or the temperature of the charging material (flexible Pt100) by means of an independent measuring system utilizing Pt100 entry. The sensor top protective tube of the flexible Pt100 can be immersed into liquid substances.

Technical data of the Pt100 sensor:

- Three-wire technique
- Class B (DIN EN 60751)
- Temperature range up to 320 °C / *608 °F*
- Stainless steel protective tube 45 mm length material no. 1.4501

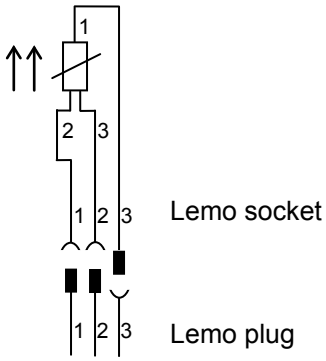
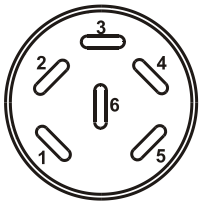


Figure 13: Option temperature sensor Pt100

16.6 Analog output for temperature (option from size 53 on)

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

The connection is realized as a DIN socket at the rear of the incubator as follows:



ANALOG OUTPUT 4-20 mA DC

PIN 1: Temperature –
PIN 2: Temperature +

Temperature range: -5 °C / *41 °F* to +100 °C / *212 °F*

A suitable DIN plug is enclosed.

Figure 14: Pin configuration of the DIN socket

16.7 Zero-voltage relay outputs via operation lines (option from size 53 on)

Operation lines 1, 2 und 3 are used to switch any device connected to the zero-voltage relay outputs via a DIN socket at the rear of the incubator. The operation lines permit turning on and off the individual zero-voltage relay outputs through the program controller. They can be programmed in fixed value entry mode (chap. 6) as well as in the program editor (chap. 8.2) via the operation lines (switching state **0** = Off, switching state **1** = On).

	Inactivate the week program timer before entering set-points in fixed value entry mode (chap. 6) or before entering a program in the program editor (chap. 8). Otherwise, any setting of the operation lines in fixed value entry mode or in the program editor is ineffective.

Connection occurs via the DIN socket at the rear of the incubator:

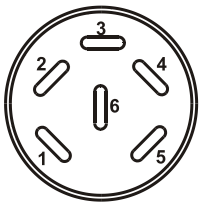
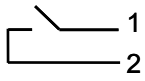
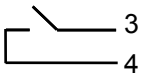
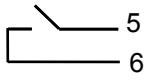


Figure 15: Pin configuration of the DIN socket

A suitable DIN plug is enclosed.

Operation line 1	Operation line 2	Operation line 3
 Pin 1: Pin Pin 2: Make	 Pin 3: Pin Pin 4: Make	 Pin 5: Pin Pin 6: Make
Switching state On: **1**xx	Switching state On: x**1**x	Switching state On: xx**1**

Maximum loading capacity of the switching contacts: 24V AC/DC – 2.5 A

DANGER

Electrical hazard.

Danger of death.

Damage to switching contacts and connection socket.

∅ Do NOT exceed the maximum switching load of 24V AC/DC – 2.5A.

∅ Do NOT connect any devices with a higher loading capacity.

16.8 Water protected internal socket (option from size 53 on)

The internal socket is splash proof.

IP system of protection 65 230 V 1N ~ 50-60 Hz
Charge max. 500 W

Maximum permitted operating temperature with this option: 50 °C / *122 °F*.

WARNING

Exceeding the permitted maximum temperature.

Electrical hazard.

Danger of death.

Damage to the internal socket.

∅ Do NOT exceed the temperature set-point of 50 °C / *122 °F*.

➢ Set the safety controller to 50 °C / *122 °F*.

➢ With optional temperature safety device, class 3.3, set the mechanical thermostat class 3.1 to 50 °C / *122 °F*.

Heat emission of electrical devices connected inside the chamber may modify the temperature range.

CAUTION

Risk of short circuit.

Damage to the unit.

➢ Use the supplied plug only (IP protection type 66). Plug it in and turn it to secure contact.

➢ If the socket is not used, close the lift-up lid and turn it to secure.

17. Maintenance, cleaning, and service

17.1 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.

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 39070500 or +852 39070503
BINDER service hotline Russia and CIS	+7 495 98815 17
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.

17.2 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.

17.2.1 Cleaning

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

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

Exterior surfaces inner chamber shelves 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.

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.

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.

For surface protection, perform cleaning as quickly as possible.

After cleaning completely remove any 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.

17.2.2 Decontamination

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

You can use the following disinfectants:

Inner chamber	Standard commercial surface disinfectants free from acid or halides. Alcohol based solutions. We recommend using the disinfectant spray 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 material, 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.

17.3 Sending the unit back to BINDER GmbH

If you return a BINDER product to us for repair or any other reason, we will only accept the product upon presentation of an authorization number that has previously been issued to you. An authorization number will be issued 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 below:

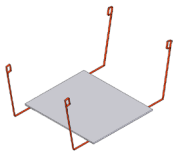
- BINDER product type and serial number
- Date of purchase
- Name and address of the dealer from which you bought the BINDER product
- Exact description of the defect or fault
- Complete address, contact person and availability of that person
- Exact location of the BINDER product in your facility
- A contamination clearance certificate (chap. 21) must be faxed in advance

The authorization number must 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 a unit delivery if it does not carry an authorization number.

18. Disposal

18.1 Disposal of the transport packing

Packing element	Material	Disposal
Straps to fix packing on pallet	Plastic	Plastic recycling
Wooden shipping box (option)	Non-wood (compressed matchwood, IPPC standard)	Wood recycling
with metal screws	Metal	Metal recycling
Pallet	Solid wood (IPPC standard)	Wood recycling
Transport box with metal clamps	Cardboard	Paper recycling
	Metal	Metal recycling
Wooden sticks for stabilizing and for removal (size 115)	Solid wood (IPPC standard)	Wood recycling
Foamed plastic stuffing (pallet, top cover)	PE foam	Plastic recycling
Top cover	Cardboard	Paper recycling
Removal aid (size 115) 	Cardboard	Paper recycling
	Plastic	Plastic 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.

18.2 Decommissioning

Turn off the main power switch (1). Disconnect the unit from the power supply.

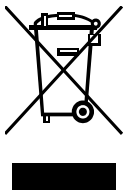
	When turning off the main power switch (1), the stored parameters remain saved.

- Temporal decommissioning: See indications for appropriate storage, chap. 3.3.
- Final decommissioning: Dispose of the unit as described in chap. 18.3 to 18.5.

18.3 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 refrigerated incubator KB 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 that 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.

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

- 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 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. 21) 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.

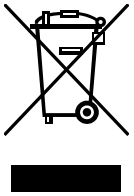
➢ A unit from which all toxic substances or sources of infection cannot be safely removed must be considered as "special" waste according to national law. Dispose of it accordingly.

The refrigerant used R134A (1,1,1,2-tetrafluorethane) is not inflammable at ambient pressure. It must not be exposed to the environment. In Europe, recovery of the refrigerant R134A (GWP 1300) is mandatory according to regulation No. 842/2006/EC. Ensure the compliance with the applicable legal requirements regarding qualification of staff, disposal, and documentation.

18.4 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 refrigerated incubator KB 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 that 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 agreed 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.

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

- 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 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. 21) 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.

➢ A unit from which all toxic substances or sources of infection cannot be safely removed must be considered as “special” waste according to national law. Dispose of it accordingly.

The refrigerant used R134A (1,1,1,2-tetrafluorethane) is not inflammable at ambient pressure. It must not be exposed to the environment. In Europe, recovery of the refrigerant R134A (GWP 1300) is mandatory according to regulation No. 842/2006/EC. Ensure the compliance with the applicable legal requirements regarding qualification of staff, disposal, and documentation.

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

CAUTION

Alteration of the environment.

- For final decommissioning and disposal of the unit, please contact BINDER service.
- Follow the statutory regulations for appropriate, environmentally friendly disposal.

The main board of the refrigerated incubator includes a lithium cell. Please dispose of it according to national regulations.

The refrigerant used R134A (1,1,1,2-tetrafluorethane) is not inflammable at ambient pressure. It must not be exposed to the environment. In Europe, recovery of the refrigerant R134A (GWP 1300) is mandatory according to regulation No. 842/2006/EC. Ensure the compliance with the applicable legal requirements regarding qualification of staff, disposal, and documentation.

19. Troubleshooting

Fault description	Possible cause	Required measures
Heating		
Set-point temperature is not reached after specified time.	Unit door not properly closed.	Completely close unit door.
	Door gasket defective.	Replace door gasket.
	Controller not adjusted, or adjustment interval exceeded.	Calibrate and adjust controller.
Chamber heating permanently, set-point not maintained.	Controller defective.	Contact BINDER service.
	Pt 100 sensor defective.	
	Semiconductor relay defective	
	Controller not adjusted, or adjustment interval exceeded.	Calibrate and adjust controller.
Chamber doesn't heat up. LED (3a) "Heating active" lit.	Heating element defective.	Contact BINDER service.
	Semiconductor relay defective.	
Chamber doesn't heat up. LED (3a) "Heating active" not lit.	Safety controller has turned off the oven. Limit temperature reached. Safety controller set too low.	Allow the chamber to cool down and press the RESET button. Check temperature set-point and setting of safety controller. If appropriate, select suitable limit value.
	Safety controller defective.	Contact BINDER service.
	Semiconductor relay defective.	
	Controller defective.	

Fault description	Possible cause	Required measures
Heating (continued)		
Unit without function.	No power supply.	Check connection to power supply.
	Wrong voltage.	Check power supply for voltage of 115V or 230V.
	Unit fuse has responded.	Check unit fuse and replace it if appropriate. If it responds again, contact BINDER service.
	Controller defective.	Contact BINDER service.
	Nominal temperature exceeded by 10° due to unit failure. Over temperature protective device (class 1) responds.	
Deviations from the indicated heating-up times.	Oven fully loaded.	Charge the chamber less or consider longer heating-up times.
Mechanical safety device class 3.1 responds (with option safety device class 3.3).	Limit temperature reached.	Check setting of temperature set-point and of safety device class 3.1. If appropriate, select suitable limit value.
	Too much external heat load.	Reduce heat load.
	Controller defective.	Contact BINDER service.
	Safety device defective.	
	Semi-conductor relay defective	
Mechanical safety device class 3.2 responds (with option safety device class 3.3).	Limit temperature reached.	Check setting of temperature set-point and of safety device class 3.2. If appropriate, select suitable limit value.
	Controller or safety device defective.	Contact BINDER service.
Refrigerating performance		
No or too low refrigerating performance.	Ambient temperature > 20 °C (chap. 3.4).	Select cooler place of installation.
	Compressor not turned on.	Contact BINDER service.
	Electro-valves defective.	
	No or not enough refrigerant.	
	Too much external heat load.	Reduce heat load.
Controller		
Program duration longer than programmed.	Inappropriate tolerances have been programmed.	For rapid transition phases, do NOT program tolerance limits in order to allow 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 minute (with setting “ramp”).
Programs have been deleted.	Change from 2 programs to 1 program or vice-versa	When changing, ensure that the programs are no longer needed.
The controller returns to Normal Display from any level.	No button was pressed for more than 120 sec.	Repeat entries, enter the values rapidly.
Message RANGE ERROR CH1 in Normal Display in Display 2	Sensor rupture between sensor and controller	Contact BINDER service.
Ramp temperature transitions are only realized as steps.	Set-point programming type set to “Step” in the User level (chap. 10).	Set the set-point programming type to setting “Ramp” in the User level (chap. 10).

	Only qualified service personnel authorized by BINDER must perform repair. Repaired units must comply with the BINDER quality standards.

20. Technical description

20.1 Factory calibration and adjustment

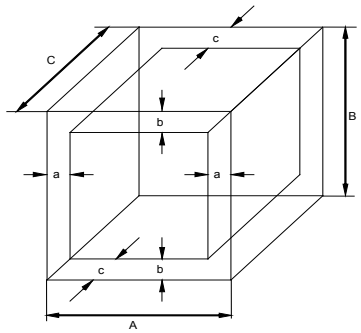
This unit was calibrated and adjusted in the factory. Calibration and adjustment were performed using standardized test instructions, according to the QM DIN EN ISO 9001 system applied by BINDER (certified since December 1996 by TÜV CERT). All test equipment used is subject to the administration of measurement 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.

20.2 Over current protection

This device is protected by a unit-protection against over current, accessible from the outside. It is located at the rear of the chamber below the strain relief of the power cord. The fuse holder is equipped with a fuse clip 5mm x 20 mm (CUL-Version 6.3 x32 mm). Replace this fuse only with a substitute of the same ratings. Refer to the technical data of the respective device type. If this fuse is blown, please contact an electronic engineer or BINDER service.

20.3 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 16: Determination of the usable volume

The technical data refers to the 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 and humidity.

20.4 KB technical data

Unit size			23	53	115
Exterior dimensions					
Width		mm / *inch*	433 / *17.05*	634 / *24.96*	834 / *32.83*
Height (incl. feet)		mm / *inch*	618 / *24.33*	837 / *32.95*	1022 / *40.24*
Depth		mm / *inch*	516 / *20.31*	576 / *22.68*	646 / *25.43*
incl. door handle, I-panel, connection		mm / *inch*	73 / *2.87*	100 / *3.94*	100 / *3.94*
Wall clearance		mm / *inch*	100 / *3.94*	100 / *3.94*	100 / *3.94*
Wall clearance door open		mm / *inch*	100 / *3.94*	160 / *6.30*	160 / *6.30*
Steam space volume		l / *cu.ft.*	36 / *1.27*	77 / *2.72*	158 / *5.58*
Interior dimensions					
Width		mm / *inch*	*222 / 8.74*	400 / *15.75*	600 / *23.62*
Height		mm / *inch*	330 / *12.99*	400 / *15.75*	480 / *18.90*
Depth		mm / *inch*	*277 / 10.91*	330 / *12.99*	400 / *15.75*
Interior volume		l / *cu.ft.*	10 / *0.35*	53 / *1.9*	115 / *4.1*
Number of racks standard / max.			2/3	2/4	2/5
Load per rack		Kg / *lbs*	12 / *26*	15 / *33*	20 / *44*
Permitted total load		Kg / *lbs*	*25 / 55*	40 / *88*	50 / *110*
Weight (empty)		Kg / *lbs*	*44 / 97*	*72 / 159*	105 / *232*
Number of door(s)		number	1	1	1
Inner glass door(s)		number	1	1	1
Temperature data					
Temperature range 1)		°C *°F*	0 to +100 *4 to 212*	-5 to +100 *23 to 212*	-5 to +100 *23 to 212*
Temperature fluctuation	at 5 °C	± K	0.2	0.1	0.1
	at 40 °C	± K	0.2	0.1	0.1
Temperature uniformity (variation)	at 5 °C	± K	0.7	0.6	0.4
	at 25 °C	± K	0.3	0.2	0.1
	at 40 °C	± K	0.3	0.3	0.2
Heating up time 2)	to 40 °C	min	11	5	9
Cooling down time from 40 °C to 5 °C		min	61	58	83
Recovery time after doors were open for 30 sec. 2)	at 5 °C	min	5	4	5
	at 40 °C	min	2	1	1
Electrical data KB					
IP System of protection acc. to EN 60529			20	20	20
Nominal voltage (±10 %)		V	230 1N~	230 1N~	230 1N~
Power frequency		Hz	50/60	50/60 (9x20-0114) 50 (9x20-0243)	50/60 (9x20-0116) 50 (9x20-0242)
Power plug			shock proof plug		
Nominal power		kW	0.34	0.46	0.46
Energy consumption 3)	at 5 °C	Wh/h	50	260	222
	at 40 °C	Wh/h	60	215	115
Overvoltage category acc. to IEC 61010-1			II	II	II
Pollution degree acc. to IEC 61010-1			2	2	2
Unit fuse 5x20 mm 230V / middle-time-lag M		Amp	10	10	10
			external	external	external

Unit size		23	53	115
Electrical data KB-UL and KB (115 V) (for the USA and Canada)				
Nominal voltage (±10%)	V	115 1N~	115 1N~	115 1N~
Power frequency	Hz	60	60	60
Power plug	NEMA	5-15P	5-15P	5-15P
Nominal power:	kW	0.34	0.36	0.46
Overvoltage category acc. to IEC 61010-1		II	II	II
Pollution degree acc. to IEC 61010-1		2	2	2
Unit fuse 6,3 x 32 mm	Amp	12.5	12.5	12.5
250V / super-time-lag TT		external	external	external
Additional temperature fuses		class 1 (DIN 12880) internal		

Legend:
1) at an ambient temperature <= 25 °C / 77 °F.
2) to 98% of the set-point
3) Use these values for sizing 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 chamber is fully loaded, the specified heating up and cooling down times may vary according to the load.

20.5 Equipment and Options

	To operate the refrigerated incubator, 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.

Unit size	23	53	115
Regular equipment			
Multifunction program controller, digital display	●	●	●
Temperature safety controller class 3.1 acc. to DIN 12880	●	●	●
Communication interface RS 422	●	●	●
Inner glass door	●	●	●
DCT™ refrigerating system, refrigerant R134a	●	●	●

Options / accessories			
Temperature safety device class 3.3 acc. to DIN 12880	--	❍	❍
Additional racks, stainless steel	❍	❍	❍
Perforated rack with additional fixation for shaker operation	--	❍	❍
Rack lockings (4 pieces)	❍	❍	❍
Lockable door	❍	❍	❍
Interior lighting	--	❍	❍
Access ports 29 mm or 50 mm, silicone plugs	❍	❍	❍
Rubber pads for safe stacking (4 pieces)	❍	❍	❍
Additional Pt 100 temperature sensor, fix or flexible, with external connection including LEMO plug (3 pins)	--	❍	❍

Unit size	23	53	115
Options / accessories (continued)			
Analog output temperature 4-20mA with DIN socket (6 poles), DIN plug included	--	❍	❍
Zero-voltage relay outputs via DIN socket 6 poles	--	❍	❍
Water-proof interior socket 230 V	--	❍	❍
Spatial temperature measurement with measuring protocol and certificate	❍	❍	❍
Factory calibration certificate	❍	❍	❍
Spatial temperature measurement with measuring protocol and certificate	❍	❍	❍
Serial printer with interface, for numerical and graphical temperature registration	❍	❍	❍
Data Logger Kit T 220	❍	❍	❍
Qualification folder	❍	❍	❍

Legend: ● Standard equipment ❍ Optional -- Not available

20.6 Spare parts and accessories

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. The user is responsible for any risk arising from using unauthorized accessories.

Accessories and spare parts:

Unit size	23	53	115
Designation	**Art. No.**		
Rack, stainless steel	6004-0051	6004-0007	6004-0008
Perforated rack, stainless steel	6004-0052	6004-0029	6004-0030
Perforated rack with additional fixation for shaker operation	--	8012-0287	8012-0288
Reinforced rack with rack lockings	--	--	--
Door gasket silicone	6005-0090	6005-0095	6005-0096
Stable table on wheels with castors and locking brakes	--	9051-0018	9051-0018
Serial printer	--	8012-0418	8012-0418
Rubber pads for safe stacking (4 pieces)	8012-0001	8012-0001	8012-0001

Designation	Art. No.
Unit fuse 5x20 mm 230V / 10 Amp / middle-time-lag M	5006-0012
Unit fuse 6,3 x 32 mm 250V / super-time-lag TT for 115 V units	5006-0045
Securing elements for additional fastening of racks (4 pieces)	8012-0531
2-channel pen recorder, external	8012-0152
Temperature safety device, class 1 (complete)	8009-0335
Temperature sensor Pt 100 bent-off	5002-0031
Calibration of temperature including certificate	DL018021
Spatial temperature measurement including certificate (2-5 measuring points)	DL018022
Spatial temperature measurement including certificate (6-9 measuring points)	DL018023
Spatial temperature measurement including certificate (10-18 measuring points)	DL018024
Spatial temperature measurement acc. to DIN 12880 including certificate (27 measuring points)	DL018025
Qualification folder	DL018031
Data Logger Kit T 220	8012-0715
Neutral cleaning agent, 1 kg	1002-0016

21. Contamination clearance certificate

21.1 For units located outside North America and Central America

Declaration regarding safety and health
Erklärung zur Sicherheit und 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 the health of our employees can be guaranteed.

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.

	Note: A repair is not possible without a completely filled out form. Ohne Vorliegen des vollständig ausgefüllten Formblattes ist eine Reparatur nicht möglich.

- A completely filled out form must transmitted via Fax (+49 (0) 7462 2005 93555) or by letter in advance, so that this information is available before the equipment/component part arrives. A second copy of this form must accompany the equipment/component part. In addition, 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. Please understand the reason for this measure, which lies outside our area of influence, and 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 print and 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 hereby 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 hereby 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 hereby declare that the following measures have been taken / Wir erklären, dass folgende Maßnahmen getroffen wurden:

- ❑ Hazardous substances were removed from the unit including component parts, so that no hazard exists for any person 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 hereby 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/Title: _____

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 on site, such a contamination clearance certificate must be submitted to the service technician before the start of any work. No repair or maintenance of the equipment is possible, without a properly filled out contamination clearance certificate.

21.2 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.