

Operating Manual

Translation of the original operating manual

LIT MK (E5)

Battery test chambers

Model	Model version	Art. No.
LIT MK 240	LITMK240-400V	9020-0402, 9120-0402
	LITMK240-400V-C	9020-0404 (with voltage and frequency changer)
LIT MK 720	LITMK720-400V	9020-0403, 9120-0403
	LITMK720-400V-C	9020-0405 (with voltage and frequency changer)

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Dear customer,

For the correct operation of the chambers, 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 chamber and/or poor equipment performance.

1. Safety

1.1 Personnel Qualification

The chamber must only be installed, tested, and started up by personnel qualified for assembly, startup, and operation of the chamber. Qualified personnel are persons whose professional education, knowledge, experience and knowledge of relevant standards allow them to assess, carry out, and identify any potential hazards in the work assigned to them. They must have been trained and instructed, and be authorized, to work on the chamber.

Only trained personnel with knowledge of the handling of hazardous substances and lithium-ion accumulators as well as knowledge of the operating instructions may set up and install, commission, operate, clean and decommission the chamber. Further technical requirements (e.g. electrical knowledge) and knowledge of the service manual are required for maintenance and repairs. The requirements specified by the operator for PPE (personal protective equipment) must be observed. Training on handling compressed gas cylinders is required to replace the CO₂ compressed gas cylinder.

1.2 Operating manual

This operating manual is part of the components of delivery. Always keep it handy for reference in the vicinity of the chamber. If selling the unit, hand over the operating manual to the purchaser.

To avoid injuries and damage observe the safety instructions of the operating manual. Failure to follow instructions and safety precautions can lead to significant risks.

	<div data-bbox="391 1209 1473 1294" style="background-color: red; color: white; padding: 5px;"> DANGER</div> <p>Dangers due to failure to observe the instructions and safety precautions. Serious injuries and chamber damage. Risk of death.</p> <ul style="list-style-type: none">➤ Observe the safety instructions in this Operating Manual.➤ Follow the operating procedures in this Operating Manual.➤ Carefully read the complete operating instructions of the chamber prior to installing and using the chamber.➤ Keep the operating manual for future reference
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	<p>Make sure that all persons who use the chamber and its associated work equipment have read and understood the Operating Manual.</p>
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This Operating Manual is supplemented and updated as needed. Always use the most recent version of the Operating Manual. When in doubt, call the BINDER Service Hotline for information on the up-to-date-ness and validity of this Operating Manual.

1.3 Legal considerations

This operating manual is for informational purposes only. It contains information for correct and safe installing, start-up, operation, decommissioning, cleaning 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. Images are to provide basic understanding. They may deviate from the actual version of the chamber. The actual scope of delivery can, due to optional or special design, or due to recent technical changes, deviate from the information and illustrations in these instructions this operating manual. 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, e.g. 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 and the general terms and conditions, as well as the legal regulations valid at the time the contract is concluded. The statements in this manual neither augment nor restrict the contractual warranty provisions.

1.4 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.

1.4.1 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

NOTICE
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.

1.4.2 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.

1.4.3 Pictograms

Warning signs			
 Electrical hazard	 Hot surface	 Explosive atmosphere	 Stability hazard
 Lifting hazard	 Pollution Hazard	 Harmful substances	 Risk of corrosion and / or chemical burns
 Biohazard	 Danger of frost		
Mandatory action signs			
 Mandatory regulation	 Read operating instructions	 Disconnect the power plug	 Lift with mechanical assistance
 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.		

1.4.4 Word message panel structure

<p>Type / cause of hazard.</p> <p>Possible consequences.</p> <p>Ø Instruction how to avoid the hazard: prohibition.</p> <p>➤ Instruction how to avoid the hazard: mandatory action.</p>

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.

1.5 Localization / position of safety labels on the chamber

The following labels are located on the chamber:

Pictograms (Warning signs)	
	Hot surface (on chamber door)
	Cold surface (on chamber door)
	Electrical hazard (chamber with voltage and frequency changer: on the voltage and frequency changer)
Service label	
<div style="background-color: #ff0000; color: white; padding: 5px;"> <p>Service - Hotline</p> <p>International: + 49 (0) 7462 / 2005-555 USA Toll Free: + 1 866 885 9794 or: + 1 631 224 4340 Россия и СНГ: + 7 495 98815 17</p> <p>service@binder-world.com www.binder-world.com </p> </div>	

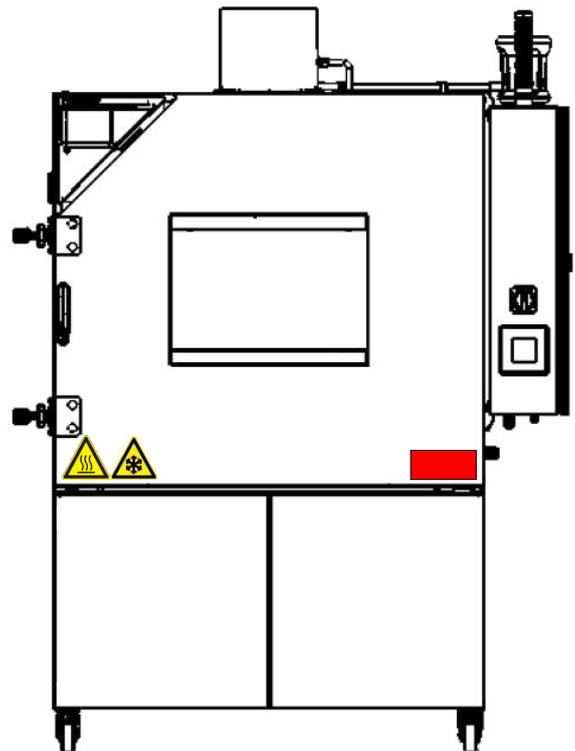


Figure 1: Position of labels on the chamber

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

1.6 Type plate

The type plate sticks to the left side of the chamber, bottom right-hand, above the refrigerating module.

Nominal temp.	110 °C 230 °F	5,60 kW / 12,0 A 400 V / 50 Hz	 	Max. operating pressure 29 bar Stage 1: R 452 A – 1,40 kg
IP protection	20			Contains fluorinated greenhouse gases covered by the Kyoto Protocol
Safety device	DIN 12880	3 N ~		
Class	2.0			
Art. No.	9020-0402			
Project No.				
Built	2021	Battery test chamber		
		BINDER GmbH Im Mittleren Ösch 5 78532 Tuttlingen / Germany www.binder-world.com	LIT MK 240 E5	 Serial No. 00000000000000 Made in Germany

Figure 2: Type plate (example of LIT MK 240 regular chamber)

Indications of the type plate (example)

Indication		Information
BINDER		Manufacturer: BINDER GmbH
LIT MK 240		Model
Battery test chamber		Device name
Serial No.	00000000000000	Serial no. of the chamber
Built	2021	Year of construction
Nominal temperature	180 °C 356 °F	Nominal temperature
IP protection	20	IP type of protection acc. to EN 60529
Temp. safety device	DIN 12880	Temperature safety device acc. to standard DIN 12880
Class	2.0	Class of temperature safety device
Art. No.	9020-0402	Art. no. of the chamber
Project No.	---	Optional: Special application acc. to project no.
5,60 kW		Nominal power
400 V / 50 Hz		Nominal voltage +/- 10% at the indicated power frequency
3 N ~		Current type
12,0 A		Nominal current
Max operating pressure 29 bar		Max operating pressure in the refrigerating system
Stage 1: R 452A – 1,40 kg		Cooling 1 st stage: Refrigerant type, filling weight
Contains fluorinated greenhouse gases covered by the Kyoto Protocol		Contains fluorinated greenhouse gases covered by the Kyoto Protocol

Symbols on the type plate

Symbol	Information
	CE conformity marking
	Electrical and electronic equipment manufactured / placed on the market in the EU after 13 August 2005 and to be disposed of in separate collection according to Directive 2012/19/EU on waste electrical and electronic equipment (WEEE).
	GS mark of conformity of the “Deutsche Gesetzliche Unfallversicherung e.V. (DGUV), Prüf- und Zertifizierungsstelle Nahrungsmittel und Verpackung im DGUV Test” (German Social Accident Insurance (DGUV), Testing and Certification Body for Foodstuffs and Packaging Industry in DGUV Test).

1.7 General safety instructions

With regard to operating the chambers and to the installation location, please observe the local and national regulations relevant for your country (for Germany: DGUV guidelines 213-850 on safe working in laboratories, issued by the employers' liability insurance association). Observe the relevant regulations for handling lithium accumulators, CO₂ and inert gases (e.g. DGUV Information 205-026 for Germany).

With regard to the safety concept for the installation site of the chamber and the connection of the CO₂ fire suppression, please observe the local and national fire protection regulations applicable in your country.

BINDER GmbH is only responsible for the safety features of the chamber 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 chambers were produced in accordance with VDE regulations and were routinely tested in accordance to VDE 0411-1 (IEC 61010-1).

A function test is carried out on each safety module before delivery.

To operate the chamber, 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.

1.7.1 Notes on the installation site

	NOTICE
	<p>Danger of overheating due to lack of ventilation.</p> <p>Damage to the chamber.</p> <ul style="list-style-type: none"> ⊘ Do NOT install the chamber in unventilated recesses. ➤ Ensure sufficient ventilation for dispersal of the heat. ➤ Observe the prescribed minimum distances when installing the chamber (chap. 8.4)

	 DANGER
	<p>Electrical hazard by water entering the chamber.</p> <p>Deadly electric shock.</p> <ul style="list-style-type: none"> ⊘ The chamber must NOT become wet during operation, cleaning, or maintenance. ⊘ Do NOT install the chamber in damp areas or in puddles. ➤ Set up the chamber in a splash-proof manner.

Do not install or operate the chamber in hazardous locations.

	 DANGER
	<p>Danger of explosion due to combustible dusts or explosive mixtures in the vicinity of the chamber.</p> <p>Serious injury or death from burns and / or explosion pressure.</p> <ul style="list-style-type: none"> ⊘ Do NOT operate the chamber in potentially explosive areas. ➤ KEEP combustible dust or air-solvent mixtures AWAY from the chamber.

 	 WARNING
	<p>Danger of injury and damages by the chamber tipping over or breakaway of the protruding lower housing cover.</p> <p>Injuries and damage to the chamber and the loading material</p> <ul style="list-style-type: none"> ⊘ Do NOT load the lower housing cover with heavy objects while the chamber door is open and do NOT climb on it.

1.7.2 Notes on loading and operation

The chamber does not dispose of any measures of explosion protection.

	 DANGER
	<p>Danger of explosion due to introduction of flammable or explosive substances in the chamber.</p> <p>Serious injury or death from burns and / or explosion pressure.</p> <ul style="list-style-type: none"> ⊘ Do NOT introduce any substance into the chamber which is combustible or explosive at working temperature. ⊘ Do NOT introduce any combustible 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.

The occurrence of a EUCAR hazard level 7 (explosion) event if the LEL of a released gas is exceeded must be reliably prevented.

	 DANGER
	<p>Risk of emergence of an explosive atmosphere due to outgassing of the cells Risk of explosion.</p> <p>Serious injury or death from burns and / or explosion pressure.</p> <ul style="list-style-type: none"> ⊘ Do not carry out destructive tests (“abuse tests”). ➤ When testing 18650-type cells without customer-provided flushing/inertization, ensure that a maximum of one cell (LIT MK 240) / three cells (LIT MK 720) is inserted. When inserting several cells, ensure a minimum clearance between the individual cells. ➤ With customer-provided flushing/inertization: Ensure a minimum clearance between the individual cells. ➤ Ensure that customer-provided permanent inertization is properly connected. ➤ Ensure that the main switch of the gas detection system is switched on during operation.

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

Damage to lithium-ion batteries can lead to an atmosphere inside the battery test chamber that is harmful to health.

	 DANGER
	<p>Risk of occurrence of toxic gases due to damaged or burning cells/modules/systems. Risk of self-ignition of cells, modules, or battery systems with flue gas (CO) development. Risk of emission of hazardous gases from the interior of the chamber.</p> <p>Death by suffocation. Poisoning.</p> <ul style="list-style-type: none"> ➤ Shut the entire test down when the first signs of a EUCAR hazard level 4 to 6 event are detected. ➤ Ensure ventilation measures: Active extraction (technical ventilation in accordance with national regulations) must be connected to the exhaust port on the chamber. Extraction must remain effective throughout operation of the chamber. ➤ Observe the relevant regulations for handling lithium-ion batteries.

During and shortly after operation, the temperature of the inner surfaces almost equals the set-point. The window, the access ports and the inner chamber will become hot during operation.

	 CAUTION
	<p>Danger of burning by touching hot chamber parts during operation.</p> <p>Burns.</p> <ul style="list-style-type: none"> ⊘ Do NOT touch the inner surfaces, the front panel around the inner chamber, the window, the access port area or the charging material during operation.

1.7.3 Notes on handling CO₂

The CO₂ purge when the CO₂ fire suppression device is activated can create a harmful atmosphere inside the chamber.

Carbon dioxide (CO₂) in high concentrations is hazardous to health. It is colorless and almost odorless and therefore practically imperceptible. An active extraction system (technical ventilation according to country-specific regulations) must be connected to the exhaust air nozzle of the appliance. The extraction must be effective during the entire operation of the chamber.

Vent out any CO₂ gas that may escape via good room ventilation or a suitable connection to an exhaust system. We recommend installing a CO₂ warning system.

	 DANGER
	<p>Danger of suffocation and poisoning by high concentration of CO₂ (> 4 Vol.-%).</p> <p>Death by suffocation.</p> <ul style="list-style-type: none"> ⊘ Do NOT set up the chamber in non-ventilated recesses. ➤ Ensure technical ventilation measures: An active extraction system (technical ventilation in accordance with country-specific regulations) must be connected to the exhaust air connection of the chamber. The extraction must be effective during the entire operation of the chamber. ➤ Observe the relevant regulations for handling CO₂.

The operator of plant-specific measures must observe the relevant country-specific regulations, which are intended to ensure safe handling of CO₂. Other national or international guidelines or the requirements of insurance companies or authorities must also be observed. In Germany, please pay particular attention to DGUV Information 205-026.

Also observe the information in the safety data sheet for CO₂.

1.7.4 Notes on handling nitrogen when using it as inert gas

Inertization by the operator can create a harmful atmosphere inside the chamber.

Nitrogen (N₂) in high concentrations is hazardous to health. It is colorless and almost odorless and therefore practically imperceptible. Active extraction (technical ventilation in accordance with country-specific regulations) must be connected to the exhaust air nozzle of the appliance. The extraction must be effective during the entire operation of the chamber.

Any N₂ gas that may escape must be safely led out via good room ventilation or a suitable connection to an exhaust system.

	 DANGER
	<p>Risk of suffocation through high concentration of N₂.</p> <p>Death by suffocation.</p> <ul style="list-style-type: none"> ∅ Do NOT set up the chamber in non-ventilated recesses. ➤ Ensure technical ventilation measures: An active extraction system (technical ventilation in accordance with country-specific regulations) must be connected to the exhaust air connection of the chamber. The extraction must be effective during the entire operation of the chamber. ➤ Observe the relevant regulations for handling N₂. ➤ Close the N₂ supply when decommissioning the chamber.

The operator of plant-specific measures must observe the relevant country-specific regulations, which are intended to ensure safe handling of inert gases. Other national or international guidelines or the requirements of insurance companies or authorities must also be observed. Also observe the information in the safety data sheet for the inert gas used.

1.7.5 Precautions when handling gas cylinders

	<p>General information for safe handling of gas cylinders:</p> <ul style="list-style-type: none"> • Store and use gas cylinders only in well-ventilated locations. • Open the gas cylinder valve slowly to avoid pressure surges. • Secure gas cylinders during storage and use against falling (chaining). • Transport gas cylinders with a cylinder cart, do not carry, roll, or throw them. • Always close the valve even with apparently empty cylinders; screw on the cap when not in use. Return gas cylinders with the valve closed. • Do not open gas cylinders by force. Mark them when damaged. • Protect gas cylinders against fire, e.g. do not store together with flammable liquids. • Observe relevant regulations for dealing with gas cylinders.
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Secure the gas cylinders against falling and other mechanical damage.

	 WARNING
	<p>Risk of injury through sudden release of the stored pressure energy when the valve safety is torn off.</p> <p>Injuries.</p> <ul style="list-style-type: none"> ➤ Secure gas cylinders against falling (chaining). ➤ Transport gas cylinders with a cylinder cart.

The valve of the gas cylinder **always** must be closed before screwing on or unscrewing the gas hose.

	 WARNING
	<p>Risk of injury through sudden release of the stored pressure energy when opening the cylinder valve of a not connected cylinder.</p> <p>Injuries.</p> <ul style="list-style-type: none"> ➤ Close the gas cylinder valve before connecting or removing the gas hose.

	<p>After connecting the gas cylinder, check all gas connections for leaks (e.g. with leak spray or diluted soap solution).</p>
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2. Intended use

	<p>Following the instructions in this operating manual and conducting regular maintenance work (chap. 27) are part of the intended use.</p>
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Any use of the chambers that does not comply with the requirements specified in this Operating Manual shall be considered improper use.

Other applications than those described in this chapter are not approved.

Observe the relevant regulations for handling lithium accumulators, CO₂ and inert gases (e.g. DGUV Information 205-026 for Germany).

2.1 Use

Battery test chambers LIT MK are suitable for temperature treatment of solid or pulverized charging material, as well as bulk material, using the supply of heat or cold and as a test cabinet for lithium-ion energy storage.

The chambers can be used for drying processes, but they are particularly suitable for all tasks that occur in materials testing and aging tests. The chambers are suitable for harmless materials.

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

Ageing tests and performance tests of lithium-ion accumulators (secondary cells) may be carried out. Exposure of non-energized and alternately energized and non-energized accumulators at different temperatures and, if necessary, humidity values is permitted for testing the service life and determining performance.

Charge and discharge cycles can be carried out within the test room (chamber interior) at different temperature values. When testing lithium-ion batteries, various faults may occur. The *European Council for Automotive and R&D* (EUCAR) has divided these into different hazard levels (chap. 2.1.1). The battery test chambers LIT MK can, under defined conditions, cover error cases up to and including hazard level 6. In order to enable safe inclusion of the event in the chamber for such error cases, the chamber includes various safety measures (chap. 7.1).

Depending on the EUCAR hazard level of the planned tests, the insertion of different battery types is permitted:

- For tests with **EUCAR hazard level** up to max. 3, cells, modules (interconnected cells), and battery systems (total systems including monitoring electronics) are permitted.
- For tests with **EUCAR hazard level 4 to 6**, only individual cells (i.e., not interconnected) are permitted.

Abuse testing, destructive testing, and the generation of short-circuits in the cells, modules, and systems are NOT generally permitted. Deliberate destruction of the inserted batteries (operational, mechanical) is not permitted. Deeply discharged cells or mechanically damaged cells must NOT be introduced.

The development of an explosive atmosphere must be reliably ruled out. Never exceed the Lower Explosive Limit (LEL) when releasing gases. For this reason, the quantity of gas released during operation must be reliably limited.

The chambers are not equipped with explosion protection measures. Tests with EUCAR hazard level 7 are not permitted.

Additional safety measures (flushing/inertization) may be connected by the operator. Gas connection facilities for inertization, as well as a pressure reducing valve and flow meter are provided by BINDER. Inertization can be used by a certain continuous flow or by regulation for oxygen suppression. The customer will be provided with the connections for the solenoid valve and the analog value of the oxygen sensor. **The operator is responsible for safe operation of the flushing/inertization.** Technical measures of the operator are not monitored by the test cabinet. Responsibility for safety in such measures lies exclusively with the operator. In the event of damage, there is a possibility that the cell itself generates oxygen through the internal chemical reaction (EUCAR hazard level 4).

2.1.1 EUCAR Hazard levels – Overview

EUCAR Hazard level	Classification criteria and effects	
0	➤ No effect	∅ no functional impairment
1	➤ Activation of passive safety device Cell still usable, safety devices must be repaired	∅ No defect, no leakage, no degassing, no thermal reactions, cell is reversibly damaged
2	➤ Defect, damage	∅ no leakage, no degassing, no thermal reactions, cell is irreversibly damaged
3	➤ Leakage mass loss < 50%	∅ No degassing Mass loss / weight loss of electrolyte < 50% No fire, no breakage, no explosion
4	➤ Degassing mass loss > 50%	∅ no fire, no breakage, no explosion, mass loss / weight loss of electrolyte > 50%
5	➤ Fire or flames	∅ no breakage, no explosion, no flying parts
6	➤ Bursting, breakage. Flying parts of the active electrode masses	∅ no explosion
7	➤ Explosion. Cell destruction	

2.2 General requirements for the chamber load

Observe the specification and safety instructions depending on the tests to be performed:

- Requirements for the chamber load for tests with EUCAR hazard level up to max. 3 (chap. 2.3.1)
- Requirements for the chamber load for tests with EUCAR hazard level 4 to 6 (chap. 2.4.1)

Any solvent must not be explosive and flammable. A mixture of any component of the charging material with air must NOT be explosive. The operating temperature must lie below the flash point or below the sublimation point of the charging material. Any component of the charging material must NOT be able to release toxic gases.

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.

Contamination of the chamber by toxic, infectious or radioactive substances must be prevented

	WARNING
 	<p>Danger of intoxication and infection through contamination of the chamber with toxic, infectious or radioactive substances.</p> <p>Damages to health.</p> <ul style="list-style-type: none"> ➤ Protect the interior of the chamber from contamination by toxic, infectious or radioactive substances. ➤ Take suitable protective measures when introducing and removing toxic, infectious or radioactive material

In case of foreseeable use of the chamber there is no risk for the user through the integration of the chamber into systems or by special environmental or operating conditions in the sense of EN 61010-1:2010. For this, the intended use of the chamber and all its connections must be observed.

2.3 Tests with EUCAR hazard level up to max. 3

2.3.1 Requirements for the chamber load

ONLY lithium-ion batteries are permitted for aging and performance tests on cells, modules, and battery systems. Do NOT insert other types of battery, such as lead batteries, into the chamber.

Cells, modules, and battery systems may be inserted into the chamber.

Ensure adequate minimum clearances between the inserted batteries for heat dissipation. The minimum distance in the chamber between individual cells must be dimensioned in such a way that activation of additional cells as a follow-up reaction is safely excluded in the event of a start reaction of an individual cell.

	<p>The customer must take their own safety precautions to ensure that the batteries cannot exceed a temperature of 90°C.</p>
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The chamber does not dispose of any measures of explosion protection.

 	 DANGER
	<p>Explosion or implosion hazard and danger of poisoning by introduction of unsuitable loading material.</p> <p>Poisoning. Serious injury or death from burns and / or explosion pressure.</p> <ul style="list-style-type: none"> ∅ Do NOT introduce any combustible dust or air-solvent mixture into the chamber. ∅ Do NOT introduce any substance which could lead to release of toxic gases into the chamber. ∅ DO NOT insert other types of battery, such as lead batteries, into the chamber. ONLY lithium-ion batteries are permitted. ∅ Do NOT carry out destructive tests (“abuse tests”). ➤ Ensure a minimum clearance between individual cells.

2.3.2 Operation with the max. Expectation of an EUCAR event with hazard level 3

In the event that the user tests cells, modules, or systems with a higher energy content than that of an individual 18650 cell with LIT MK 240 or of three cells with LIT MK 720, the maximum expected damage to the test object may be consistent with EUCAR hazard level 3.

There is no fire development, no containment measures are necessary.

2.4 Tests with EUCAR hazard level 4 to 6

2.4.1 Requirements for the chamber load

ONLY lithium-ion batteries are permitted for aging and performance tests on cells. Do NOT insert other types of battery, such as lead batteries, into the chamber. NO modules or systems may be inserted, i.e., cells must not be interconnected.

Without customer-supplied flushing/inertization, only the following cells may be inserted into the chamber:

- LIT MK 240: a single individual cell of type 18650
- LIT MK 720: up to three cells of type 18650

The chamber does not dispose of any measures of explosion protection.

 	 DANGER
	<p>Explosion or implosion hazard and danger of poisoning by introduction of unsuitable loading material.</p> <p>Poisoning. Serious injury or death from burns and / or explosion pressure.</p> <ul style="list-style-type: none"> ∅ Do NOT introduce any combustible dust or air-solvent mixture into the chamber. ∅ DO NOT insert any other battery types, such as lead-acid batteries, into the chamber. Only lithium-ion accumulators are permitted. ∅ DO NOT insert modules, i.e. connected cells, or battery systems into the chamber. ∅ Do NOT perform destructive tests (so-called abuse tests). ➤ When testing 18650 cells, ensure that no more than one cell (LIT MK 240) / three cells (LIT MK 720) are inserted without a customer-connected purge/inertization. Make sure to observe the minimum distance between individual cells when inserting several cells. ➤ With customer connected purge/inertization: Observe the minimum distance between the individual cells.

Defined load (max. one single 18650 cell with LIT MK 240, max. three 18650 cells with LIT MK 720)

Battery test chambers LIT MK offer with a defined load (max. one single 18650 cell with LIT MK 240, max. three 18650 cells with LIT MK 720), chap. 2.4.2) Sufficient security to securely include an event up to hazard level 6. Additional measures taken by the customer are not taken into account here; these are the sole responsibility of the operator.

- Permitted cell type: Individual cell(s) of type 18650 (no untested prototypes), no modules/packs, no total systems
Cell 18650: Capacity up to 5.0 Ah; dimension diam. 18 x 65 mm
- Total permitted energy of an 18650 cell in Wh (usable capacity plus chemical energy) released in the event of damage: max. 200 Wh
- Permitted charge level: 0 - 100% of the usable capacity

Exceeding the defined load with additional measures provided by the operator

In addition, if the operator wishes to test other 18650-type cells in the chamber simultaneously, operator-provided flushing/inertization must be provided. The minimum distance in the chamber between individual cells must be dimensioned in such a way that activation of additional cells as a follow-up reaction is safely excluded in the event of a start reaction of an individual cell. The minimum distance in the chamber between individual cells is 10 cm.

- Permissible cell type: Cells, no modules / packs, no overall systems
- Permissible charge level: 0 - 100% of usable capacity
- Use the information in the technical data in chap. 30.4 to calculate the max. released gas quantity from LEL of the gases used and the steam chamber volume of the chamber.

2.4.2 Detection and secure inclusion of an event within the battery test chamber by imminent safety with a defined load (max. one single 18650 cell with LIT MK 240, max. three 18650 cells with LIT MK 720)

The maximum energy and gas quantity released by lithium-ion accumulators, the effect of which can be reduced by containment measures to a level that can be safely tolerated by the battery test chamber, including gas disposal via a ventilation flap, must not be exceeded.

Without customer-provided flushing/inertization, the battery test chamber LIT MK 240 can dissipate the energy of a single 18650 cell (safety factor 3), LIT MK 720 can dissipate the energy of a max. three 18650 cells (safety factor 3), and any amount of gas released will be reliably below the LEL. **Consequently, only a single individual cell (LIT MK 240) / three cells (LIT MK 720) of type 18650 may be inserted in this case.**

The default signal values of the gas sensors are selected such that the maximum possible concentration of the respective gas until the CO₂ fire suppression device is triggered is safely below the LEL, even in the event of an event.

In that case, the battery test chamber ensures safe containment in the event of a EUCAR hazard level 4 to 6 event.

2.4.3 Detection and safe inclusion of an event within the battery test chamber by additional operator-provided measures with a defined load

If the operator tests multiple or larger cells with a larger single or total energy content than that of an individual 18650 cell with LIT MK 240 / of three cells with LIT MK 720, the occurrence of larger quantities of gas and released energy can be expected.

In that case, the battery test chamber will no longer ensure safe containment with standard measures (intrinsic safety) in the event of a EUCAR hazard levels 4 to 6. For this reason, it is essential that more stringent safety measures are taken, which are the responsibility of the operator.

In that case, the operator must take enhanced safety precautions. Equipment for the supply of flushing gas/inert gas is provided by BINDER GmbH. The dosing or expansion of this equipment is the responsibility of the operator. The operator is responsible for providing and controlling inertization with inert gas. The O₂ detection switching thresholds for releasing a higher-level control system are defined by the operator.

At the start of the project, the operator must develop a complete safety concept and prepare a risk assessment.

As soon as the intrinsic safety of the chamber for controlling an event of EUCAR hazard levels 4 to 6 is no longer guaranteed due to the defined load being exceeded (max. one single 18650 cell with LIT MK 240 / max. three cells with LIT MK 720), the operator must take precautions against the occurrence of such an event. Consequently, the responsibility for these measures and the further course of action lies solely with the operator.

The operator must take precautions to ensure that the spread of this event to other cells is safely prevented (both thermally and mechanically):

- Degrees of freedom are: Distance between cells, flame arrestors, mechanical protection, devices for switching off individual cells
- The user is obliged to shut down the entire attempt/test upon detection of the first signs of an EUCAR Hazard Level 4 to 6 event.
- All cells in the cabinet can potentially be pre-damaged after an EUCAR Hazard Levels 4 to 6 event and must be replaced before starting a new test

- The operator is responsible for compliance with the relevant regulations on the safety and instruction of personnel involved in the installation, installation, commissioning, operation, cleaning and decommissioning as well as maintenance and repair of the chamber as well as environmental protection.
- The battery test chamber detects the beginnings of an EUCAR Hazard levels 4 to 6 event and provides signals via a two-stage alarm, the evaluation of which serves the user to take safety or countermeasures.
- The operator must operate the battery test chamber in an environment that reduces all effects of a non-containment event of EUCAR Hazard levels 4 to 6 to a safe level. Danger to persons or the environment must be safely ruled out.
- The battery test chamber can be completely destroyed in the event of this event.

2.5 Medical devices

The chambers are not classified as medical devices as defined by the Medical Device Directive 93/42/EEC and Regulation (EU) No 2017/745.



Due to the special demands of the Medical Device Directive (MDD), these chambers are not qualified to perform sterilization of medical devices as defined by the directive 93/42/EEG.

2.6 Personnel Requirements

Only trained personnel with knowledge of the handling of hazardous substances and lithium-ion accumulators as well as knowledge of the operating instructions may set up and install, commission, operate, clean and decommission the chamber. Further technical requirements (e.g. electrical knowledge) and knowledge of the service manual are required for maintenance and repairs. The requirements specified by the operator for PPE (personal protective equipment) must be observed. Training on handling compressed gas cylinders is required to replace the CO₂ compressed gas cylinder.

2.7 Installation site requirements and ambient conditions

The chambers are designed for setting up inside a building (indoor use).

The requirements described in the Operating Manual for installation site and ambient conditions (chap. 8.4) must be met.

Dangerous gases must be safely prevented from spreading to the surroundings of the chamber. Active extraction (technical ventilation in accordance with national regulations) must be connected to the exhaust port on the chamber. Extraction must remain effective throughout operation of the chamber. If the extraction fails, the chamber must be disconnected from the power supply.

We recommend the installation of a CO₂ alarm system at the place of installation.

It must be possible to switch the chamber off immediately in the event of an error.

The chamber must not be operated without continuous monitoring.

3. Foreseeable Misuse

Other applications than those described in chap. 2 are not approved.

This expressly includes the following misuses (the list is not exhaustive), which pose risks despite the inherently safe construction and existing technical safety equipment:

- Non-observance of Operating Manual
- Non-observance of information and warnings on the chamber (e.g. control unit messages, safety identifiers, warning signals)
- Installation, startup, operation, maintenance and repair by untrained, insufficiently qualified, or unauthorized personnel
- Missed or delayed maintenance and testing
- Non-observance of traces of wear and tear
- Insertion of materials excluded or not permitted by this Operating Manual.
- Non-compliance with the admissible parameters for processing the respective material.
- Installation, testing, service or repair in the presence of solvents
- Installation of replacement parts and use of accessories and operating resources not specified and authorized by the manufacturer
- Installation, startup, operation, maintenance or repair of the chamber in absence of operating instructions
- Bypassing or changing protective systems, operation of the chamber without the designated protective systems
- Non-observance of messages regarding cleaning and disinfection of the chamber.
- Spilling water or cleaning agent on the chamber, water penetrating into the chamber during operation, cleaning or maintenance.
- Cleaning activity while the chamber is turned on.
- Operation of the chamber with a damaged housing or damaged power cord
- Continued operation of the chamber during an obvious malfunction
- Insertion of objects, particularly metallic objects, in louvers or other openings or slots on the chamber
- Human error (e.g. insufficient experience, qualification, stress, exhaustion, laziness)
- Non-observance of information and warnings on the chamber (in particular signals from the gas detection device)
- Operation of the device and work on the chamber without personal protective equipment, if required
- Insertion of defective accumulators or prototypes
- Insertion of inadmissible battery types, e.g. lead batteries
- Inserting modules (interconnected cells) or battery systems into the chamber during tests with EUCAR hazard levels 4 to 6
- Insertion of several cells with LIT MK 240 / of more than three cells with LIT MK 720 simultaneously into the chamber without customer rinsing/inertization during tests with EUCAR Hazard Levels 4 to 6
- Exceeding the permissible total energy or potentially released gas quantity
- Failure to observe the minimum distances between the inserted batteries

- Structural changes to the chamber without a subsequent risk assessment by the operator
- Failure to observe the inspection and maintenance regulations (inspection before initial commissioning, recurring tests, inspection after maintenance or repairs, qualification of the tester)
- Replacement of the CO₂ compressed gas cylinder by untrained personnel
- Commissioning after maintenance or repairs without passing the electrical and safety tests
- Installation, commissioning, operation, maintenance or repair of the chamber without the existence of a risk assessment and operating instructions of the operator
- Door opening when the main switch of the gas detection system is switched on
- Operation with the main switch of the gas detection system switched off
- Non-observance of the relevant regulations for handling lithium-ion accumulators
- Failure to observe the relevant regulations for handling CO₂ and inert gases. DGUV Information 205-026 must currently be taken into account for the operator in Germany.

To prevent these and other risks from incorrect operation, the operator shall issue operating instructions. (chap. 5.3). The operator is also recommended to create Standard Operating Procedures (SOPs) (chap. 5.5).

4. Residual Risks

The unavoidable design features of a chamber, as well as its proper field of application, can also pose risks, even during correct operation. These residual risks include hazards which, despite the inherently safe design, existing technical protective equipment, safety precautions and supplementary protective measures, cannot be ruled out.

Messages on the chamber and in the Operating Manual warn of residual risks. The consequences of these residual risks and the measures required to prevent them are listed in the Operating Manual. Moreover, the operator must take measures to minimize hazards from unavoidable residual risks. This includes, in particular the Operator measures described in chap. 2.4.3. Residual hazards are to be taken into account by the operator in their risk assessment. Based on a risk assessment, the operator must create appropriate operating instructions.

The following list summarizes the hazards against which this Operating Manual and the Service Manual warn, and specifies protective measures at the appropriate spots (list is not exhaustive):

Unpacking, Transport, Installation

- Sliding or tilting the chamber
- Setup of the chamber in unauthorized areas
- Installation of a damaged chamber
- Installation of a chamber with damaged power cord
- Inappropriate site of installation
- Missing protective conductor connection
- Improper connection of customer inerting unit
- Improper connection of CO₂ compressed gas cylinder, empty CO₂ compressed gas cylinder
- Lack of extraction connection (technical ventilation in accordance with the country-specific regulations) to the extraction nozzle of the chamber
- Inaccessibility of the emergency shutdown of the chamber

Normal operation

- Assembly errors
- Loading error
- Errors in user-side components (e.g. superordinate control system)
- Operation of the chamber without continuous monitoring
- Heating of the inserted accumulators above 90 °C
- Contact with hot surfaces on the housing
- Contact with hot surfaces in the interior and inside of doors
- Emission of non-ionizing radiation from electrical operating resources
- Contact with live parts in normal state
- Reuse of potentially pre-damaged cells after an EUCAR Hazard Levels 4 to 6 event
- Carrying out destruction tests (so-called abuse tests)
- Operation of the appliance without effective extraction (technical ventilation) at the exhaust air connection of the appliance
- Use of inert gas in high concentration (if necessary according to chap. 2.4.3)

Error, activation of the safety device

- Toxic atmosphere in the interior of the chamber due to inertization or CO₂ flushing
- Occurrence of toxic gases due to damaged or burning cells/modules/systems
- Emission of dangerous gases from the interior of the chamber (e.g., due to improper connection of the exhaust system, door opening, etc.)
- Emergence of an explosive atmosphere due to outgassing of the cells
- Failing to shut the entire test down when the first signs of a EUCAR hazard level 4 to 6 event are detected
- Setting up, installing, commissioning, operating, cleaning, and decommissioning, as well as maintenance and repair by untrained or insufficiently trained personnel
- Maintenance and repair without knowledge of the service manual
- Self-ignition of cells, modules, or battery systems
- Continued operation of the chamber in the event of an obvious malfunction or failure of the safety device
- Failure to trigger the CO₂ fire suppression device due to technical defect, faulty connection, empty CO₂ compressed gas cylinder or operation with deactivated gas detection
- Exceeding the LEL due to incorrect setting of the O₂ switching threshold by the operator with O₂ reduction through permanent inertization
- Hazards from CO₂
- Hazards due to inert gas (e.g. N₂)
- Flames, explosions, toxic gases
- Release of corrosive and corrosive substances inside the chamber
- Missing entries in the plant logbook

Cleaning and Decontamination

- Penetration of water into the chamber
- Inappropriate cleaning and decontamination agents
- Enclosure of persons in the interior

Malfunction and Damage

- Continued operation of the chamber during an obvious malfunction or outage of the heating or cooling system
- Contact with live parts during error status
- Operation of a unit with damaged power cord

Inspection, maintenance, testing

- Execution of maintenance work by untrained/insufficiently qualified personnel
- Presence of a toxic or explosive atmosphere or substances in the interior
- Maintenance work on live parts.
- Electrical safety check not carried out at yearly inspection
- Safety check not carried out at yearly inspection
- CO₂ fire suppression device not tested at annual inspection
- Missing entries in the plant logbook

Trouble-shooting and repairs, testing

- Non-observance of warning messages in the Service Manual
- Trouble-shooting of live parts without specified safety measures
- Absence of a plausibility check to rule out erroneous inscription of electrical components
- Performance of repair work by untrained/insufficiently qualified personnel
- Inappropriate repairs which do not meet the quality standard specified by BINDER
- Use of replacement parts other than BINDER original replacement parts
- Electrical safety test not carried out before recommissioning after repair
- Safety check not carried out before recommissioning after repair
- Missing entries in the plant logbook

5. Operator responsibility, documentation, and measures



This is NOT an exhaustive list of the required measures and documents!
Follow applicable national and international regulations.

The chamber is intended for commercial use. The operator must know, comply with, and implement the relevant regulations on occupational safety.

The operator must develop a complete safety concept and prepare a risk assessment. As part of the risk assessment, measures for safety and health protection must be taken by the operator. These can be structural, technical and organizational measures.

5.1 Risk assessment

First, a risk assessment shall be carried out to determine the hazards that are present where the chamber is used due to the working conditions. When documenting the risk assessment, the operator must provide specific evidence of the hazards.

The safety concept to be developed by the operator represents the entirety of the technical and organizational measures determined and specified on the basis of the risk assessment. When creating the safety concept, applicable national regulations must be observed.

In particular, the risk assessment must indicate

- Determination and evaluation of the hazards
- Safety concept: determined and specified technical and organizational measures.
- Protection measures
- Cooperation with various companies
- Requirements for safety checks and technical protection measures

5.2 Employee training and protocols

The operator must ensure that all employees have read and understood the Operating Manual of the chamber.

Before employees use the vacuum drying oven and related work equipment for the first time, the operator must provide them with sufficient and suitable information on the hazards presented and measures to be taken in a form and language that is understandable.

This includes the information resulting from the risk assessment:

- Hazards when using the chamber and related work equipment, in particular fire hazards, functioning of protective devices
- Required protective measures and code of conduct
- Necessity of wearing personal protective equipment
- Procedure for cleaning and repair work
- Measures for operational interruptions, accidents, and first aid for emergencies

The operator must clearly define the responsibilities for installation, operation, troubleshooting, maintenance, and cleaning. It must be ensured that untrained personnel have no access to the chamber and related work equipment and systems.

The operator must instruct employees with regard to their activity before they begin using the chamber and related work equipment. Following this, further instruction must be provided at regular intervals, at least once per year. The date of each instruction and the names of the instructed persons must be recorded in writing.

It is essential for safe and secure operation of the chamber that the user be familiar with the safety plan from the operator.

Do not work on the chamber or in its surroundings, under any circumstances, after consuming alcohol, drugs, and certain medications which may impair the ability to perceive, assess, and react.

5.3 Operating instructions

The measures to avoid hazards resulting from the risk assessment (chap. 5.1) are to be specified as Operating instructions. Before employees use the chamber and related work equipment for the first time, the operator must specify instructions for safe use in one or more operating instructions. These must comply with regulatory requirements and be verified regularly to ensure that they are up to date.

When creating the operating instructions, follow applicable national regulations.



Keep these operating instructions with the chamber at all times in a place where they are clearly visible. They must be comprehensible and written in the language of the employees.

5.4 Protective equipment

If required, the operator must provide the operating personnel with the necessary protective equipment.

5.5 Standard Operating Procedures (SOPs)

In order to ensure the measures under the responsibility of the operator, creating Standard Operating Procedures (SOPs) is recommended.

In particular, this should prevent the Residual Risks due to incorrect operation specified in the chapter "Residual Risks" (chap. 4).

5.6 Testing and maintenance

The operator must ensure that the chamber is always in a technically functional state.

Observe the maintenance intervals specified by the manufacturer. If there is above-average strain, the intervals must be shortened accordingly.

The operator must regularly verify that the safety-related devices are functioning correctly.

Document tests with results and measures that were potentially initiated, as well as maintenance and repairs, in a System logbook

For testing see chap. 6

Maintenance measures, see chap. 28.

5.7 System logbook

Inspections with results and any measures taken, as well as measures taken for maintenance and repair, must be documented in a system logbook as written evidence.

All events that occur during operation and all measures to safeguard operational readiness must be entered into the system logbook.

- Chamber data: Overview and master data of the system
- Operating events such as alarms, fault notifications, shutdowns
- Maintenance and repair measures such as inspection, maintenance, repair, checks/tests
- Notification and fault statistics

Observe the relevant statutory regulations.

Entries in the system logbook must be made by the installer and the operator of the system.

The logbook must be available at all times and stored in the immediate vicinity of the plant.

5.8 Operation log

For safety reasons, keeping an operation log, in which every use of the chamber can be entered is recommended

The following contents should be entered and recorded:

- Type of charging, arrangement and specification of the accumulators
- Entered set-points on the MB2chamber controller
- Set test parameters of the operator, test series...
- Set safety controller mode (Limit/Offset) and safety controller value
- Activation of gas detection
- Activation of additional safety measures by the operator
- Information on the superordinate control system of the operator
- Condition after checking the safety devices
- Responsible, date, signature

6. Testing

6.1 Objective of testing

The operator must have the system checked by an expert for proper function and safe condition.

The objective is to determine the suitability and functionality of the safety measures. When testing the system, the safety concept must be evaluated and the target condition derived from it compared with the actual condition of the system (in accordance with the available test records):

- Checking the completeness and plausibility of the safety-related documents
- Check whether the system is erected in accordance with national regulations and in a safe condition
- the specified technical measures are suitable and functional
- the necessary organizational measures are suitable
- the time limit for the next periodic inspection has been set appropriately in accordance with national rules.

6.2 Scope of the tests

The scope of the tests must be determined by the operator in accordance with the risk assessment and taking into account the relevant regulations.

The test encompasses the entirety of all equipment relevant to safety. This includes the battery test chamber LIT MK with all safety, control and regulation devices, associated equipment, extraction devices and ventilation systems, gas warning devices, inertization devices including the connecting elements as well as the installation area and any other safety-related building components (non-exhaustive list).

Chambers, protection systems, safety, control and regulation devices, connection devices and interactions with other system components must be checked in accordance with the relevant regulations.

Tests can also be carried out by an approved monitoring body or by appropriately qualified personnel. Observe the regulations relevant for the qualification requirement.



Proceed in accordance with the relevant national regulations.

6.2.1 Testing before initial commissioning

A comprehensive test of the entirety of the system is required. The test serves to determine the safety of the system, including the work equipment and the working environment in accordance with the relevant regulations. Proper operation is only ensured after the test has been carried out and any necessary measures have been implemented.

The test represents a comprehensive consideration of the safety of the system with regard to the protection of employees and other persons in the hazard area, including all functional units relevant to protection and their interactions. The safety test is based on the safety plan from the operator and its implementation. Equivalent test results according to other legal regulations can be considered. It is also permissible to refer to tests that have already been carried out.

- **Testing the plausibility of the safety plan and measures**

Verification of the traceability and plausibility of the safety plan and the measures derived from this in consideration of underlying constraints.

The test does not apply to systems for which this test has already been carried out in the course of a permit or approval process.

- **Verifying the implementation of measures**

Verification of the measures described in the safety plan with regard to their implementation includes a holistic examination of the technical and organizational measures in accordance with the specifications of the safety plan.

- **Checking the deadlines for the recurring tests**

When doing so, assess whether the system can be operated safely until the next specified recurring test.

- **Verifying the maintenance plan**

When doing so, assess whether the maintenance plan is suitable for maintaining the safety of the system until the next recurring test. The maintenance plan can also be used to test the technical protective measures. It can also be part of an integrated management system

- **Definition of responsibilities** for the maintenance plan, definition of maintenance and inspection content, e.g. when creating work plans, processing the maintenance and inspection content, e.g. in the form of work plans, the assessment of deviations from the target state, and any necessary repairs.
- Determination of maintenance and inspection measures and deadlines for devices, protective systems, safety, control and regulating devices as well as their connections and interactions, technical ventilation systems, gas warning devices and inerting devices and MSR devices
- Comprehensible description of the required maintenance measures and deadlines e.g. in the form of work plans, work equipment of comparable design can be summarized.
- Implementation of the maintenance plan: Implementation of maintenance and inspection in accordance with the defined maintenance plan, notification of completion of the implementation of maintenance and inspection, documentation of identified repair needs and implementation of the repairs. Necessary maintenance measures must be carried out immediately. Maintenance work must be carried out by qualified specialist personnel who have sufficient experience in the maintenance of Ex systems based on the maintenance plan. The maintenance plan and the implementation of maintenance measures must be clearly documented.

6.2.2 Tests of technical ventilation systems, extinguishing systems, gas warning devices, inerting devices, devices, protective systems or safety, control or regulating devices, and other technical devices for explosion protection

Test content that has been checked and documented as part of conformity assessment procedures do not need to be checked again. Verify the plausibility and completeness of documents.

The following points must generally be verified:

- Technical ventilation systems, gas warning devices, inerting devices with regard to their suitability, their functionality, their interconnections, their installation conditions, their proper condition, and their installation / assembly
- Extinguishing equipment / fire suppression equipment
- Devices, protective systems, or safety, control, or regulating devices within the meaning of Directive 2014/34/EU on explosion protection with regard to their proper condition, their suitability, their interconnections, their installation conditions, and their installation / assembly

-
- Safety, control, or regulating devices to determine whether ventilation systems, gas warning devices, inerting devices ensure the proper functionality.
 - Connection elements and other technical devices (such as lightning protection, requirements for floors) with regard to their condition, their interconnections, and their installation / assembly for explosion safety (e.g. type of installation, insulation resistance of electrical cables and lines)
 - Take into account the significant interactions of devices, protective systems, safety, control, or regulating devices and their connecting elements – with each other and with other system parts. This includes, for example, testing the equipotential bonding, the involvement of pipes in equipotential bonding, overvoltage protection, and lightning protection, alignment of units.

6.2.3 Inspection after changes requiring review

Prior to recommissioning after changes subject to mandatory inspection, a full inspection of the system as a whole is required.

There is a need for a change requiring review if the safety of the system is affected by the change. Changes requiring review are evaluated in accordance with applicable national regulations. Checks after a change requiring review may be limited to the changes made. Verify whether the system has been changed in accordance with the regulations and is working properly. See the requirements for initial commissioning (chap. 6.2.1).

6.2.4 Recurring tests

Plants must be tested in their entirety on a recurring basis in accordance with the relevant regulations. The recurring tests serve to maintain the safety of the system. Among other things, the actual state of the system is compared with the target state (according to the safety plan and available test records).

Extinguishing systems/ fire suppression systems must be tested at least every 2 years. Testing of ventilation systems, gas warning and inertization equipment must be carried out at least annually.

Periodic testing, e.g. of devices, protection systems, etc., as well as ventilation systems, gas warning and inertization devices can be partially dispensed with if a tested maintenance concept is available. The full inspection of the entire system remains unaffected by this.

6.3 Proof of tests

The results of the tests in accordance with sections must be recorded in a test log or test report. This also applies to identified defects or concerns regarding the operation of the system.

Proceed in accordance with the relevant national regulations.

For Germany, please pay particular attention to DGUV Information 205-026 on retention of records.

7. Chamber description

The battery test chamber LIT MK is a specially developed precision cooling/warming cabinet for the domain of industrial material testing and environment simulation, with an unrivalled capacity, which far exceeds the capabilities of normal test cabinets, providing the ideal facilities for solving all the problems which occur during material as well as ageing and stress tests.

The chamber is equipped with a number of safety features (chap. 7.1). This enhances the usage options to include the option of testing lithium-ion batteries. **To this end, it is absolutely necessary to observe and comply with the information on the permissible loading of the chamber as well as all safety instructions and instructions in this document.**

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

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

Controller: The chambers are equipped with a multifunctional microprocessor display controller for temperature with a digital display accurate to one-tenth of a degree. With its comprehensive program control functions, the display program controller MB2 permits the high precision performance of temperature cycles with rapid heating up and cooling down phases.

The efficient program controller is equipped with a multitude of operating functions, in addition to recorder and alarm functions. Programming of test cycles is easily accomplished via the modern touchscreen display controller MB2 and is also possible directly with a computer via Intranet in connection with the APT-COM™ 4 Multi Management Software (option, chap. 26.1). The chamber comes regularly equipped with an Ethernet serial interface for computer communication. In addition, the BINDER APT-COM™ 4 Multi Management Software (option) permits networking up to 100 chambers and connecting them to a PC for controlling and programming, as well as recording and representing temperature data. For further options, see chap. 30.5.

The chambers are equipped with four castors. Both front castors can be easily locked via the attached brakes.

You can operate the chamber in a temperature range from -40 °C / -40 °F up to +120 °C / 230 °F.

7.1 Manufacturer's safety plan: Protective measures and equipment

The operator of the chamber must observe the following rule: "Betreiben von Arbeitsmitteln. Betreiben von Kälteanlagen, Wärmepumpen und Kühleinrichtungen" (Operation of work equipment. Operation of refrigeration systems, heat pumps and refrigeration equipment) (GUV-R 500 chap. 2.35) (for Germany).

Observe the relevant regulations for handling lithium accumulators, CO₂ and inert gases (e.g. DGUV Information 205-026 for Germany).

The manufacturer took the following measures to prevent ignition and explosions:

- **Limitation of the nominal temperature in the controller**

The temperature setting in the chamber controller and thus the nominal temperature of the chamber is limited to **110 °C**.

- **Temperature safety devices** (chap. 15)

An additional temperature limiter class 2 acc. to DIN 12880:2007 is fixed at **120 °C** and provides additional safety in the event of a fault. (chap. 15.2)

- **Temperature monitoring**

Temperature monitoring by a rod controller (bimetal switch) is used to detect a temperature increase due to thermal run-through or fire. As soon as the threshold value of 120 °C is exceeded, message level 2 is triggered directly and the CO₂ fire suppression system is activated.

The adjustable safety controller class 2 and optional safety devices class 2 remain functional and offer additional protection against excessive temperatures for the chamber.

- Gas detection (chap. 7.8)

- **Alarms**

Alarm via indicator light and buzzer with forwarding of notifications and alarms to customer systems (chap. 13.1), notification and alarm messages on the MB2 controller (chap. 13.2)

- CO₂ fire suppression device (chap. 7.9)

- **Mechanical door lock** (chap. 7.10)

- **Exhaust port with reversible pressure relief flap** (chap. 7.11)

- **Interior spark protection**

Partition disks between the fan and rear wall and between the fan and suction element are used to prevent sparks on moving surfaces.

- **Inertization connections for customer systems** (chap. 9.2)

Further measures to prevent accidents

- **Indications on the type plate**

See operating manual chap. 1.6.

- **Operating manual**

An operating manual is available for each chamber.

- **Overtemperature monitoring**

The chamber is equipped with a temperature display, which can be read from outside.

The chamber is equipped with an additional safety controller (temperature safety device class 2 acc. to DIN 12880:2007). Visual and audible (buzzer) signals indicate temperature exceeding.

- **Safety, measurement, and control equipment**

The safety, measuring, and control equipment is easily accessible.

- **Electrostatic charge**

The interior parts are grounded.

- **Non-ionizing radiation**

Non-ionizing radiation is not intentionally produced, but released only for technical reasons by electrical equipment (e.g. electric motors, power cables, solenoids). The machine has no permanent magnets. If persons with active implants (e.g. pacemakers, defibrillators) keep a safe distance (distance of field source to implant) of 30 cm, an influence of these implants can be excluded with high probability.

- **Protection against touchable surfaces**

Tested according to EN ISO 13732-1:2008.

- **Floors**

See operating manual chap. 8.4 for correct installation

- **Cleaning**

See operating manual chap. 28.4.

7.2 Chamber overview

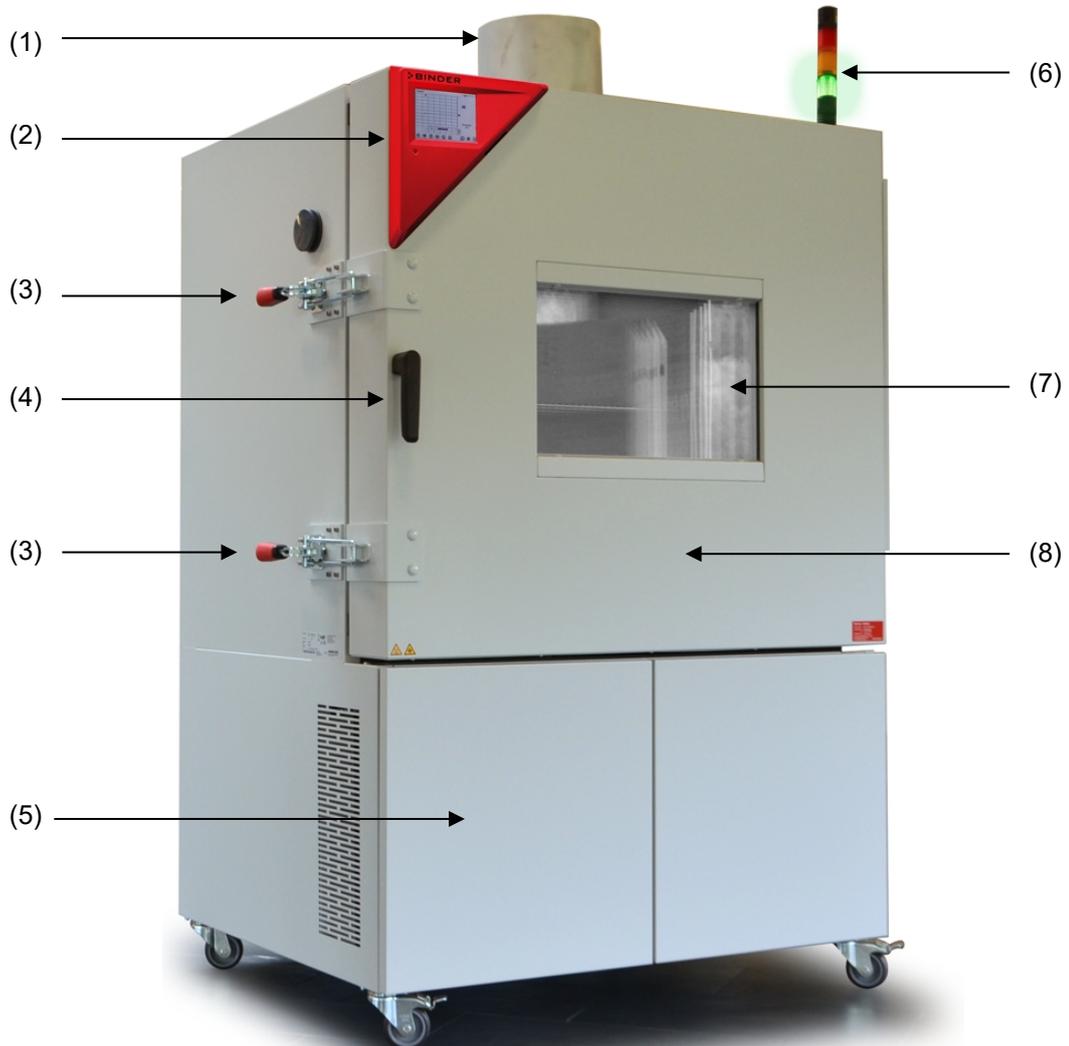


Figure 3: Battery test chamber, front left view (example: LIT MK 240)

- (1) Exhaust port with reversible pressure relief flap
- (2) Instrument panel
- (3) Mechanical door lock
- (4) Door handle
- (5) Refrigerating machine, maintenance access flaps
- (6) Signal lamp
- (7) Inspection window
- (8) Chamber door

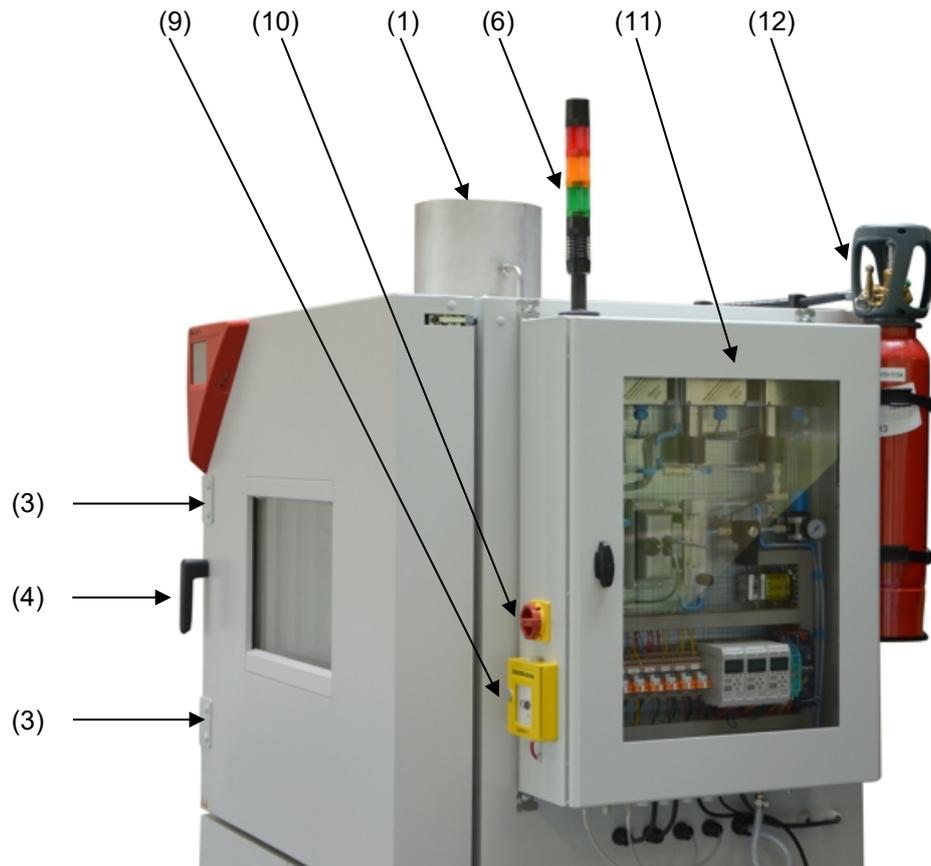


Figure 4: Front right view with safety equipment (example LIT MK 240)

- (1) Exhaust port with reversible pressure relief flap
- (2) Mechanical door lock
- (3) Door handle
- (4) Signal lamp
- (5) Manual trigger for CO₂ fire suppression (flushing)
- (6) Main switch of the gas detection system and fire suppression system
- (7) Safety module with gas detectors and fire suppression device control
- (8) CO₂ compressed gas cylinder

7.3 Safety module on the right side of the chamber

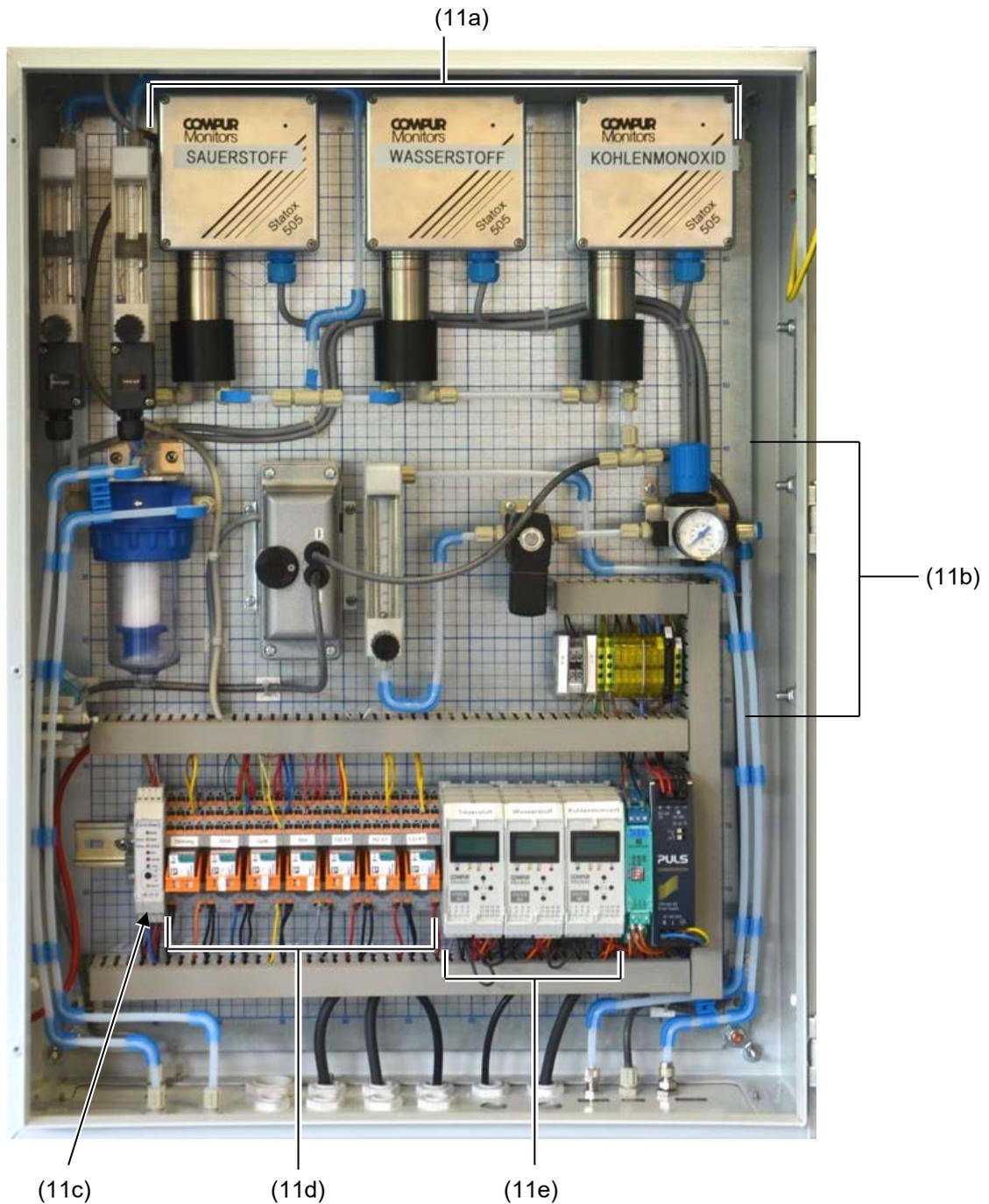


Figure 5: Safety module (11) on the right side of the chamber

- (11a) Gas sensors for O₂ / H₂ / CO detection (chap. 7.8)
- (11b) Components of gas detection (chap. 7.8) and the inerting device (chap. 9.2)
- (11c) Monitoring device/alarm system
- (11d) Relay
- (11e) Evaluation unit of the gas sensors, output to analog outputs 4-20 mA

7.4 Lateral control panel

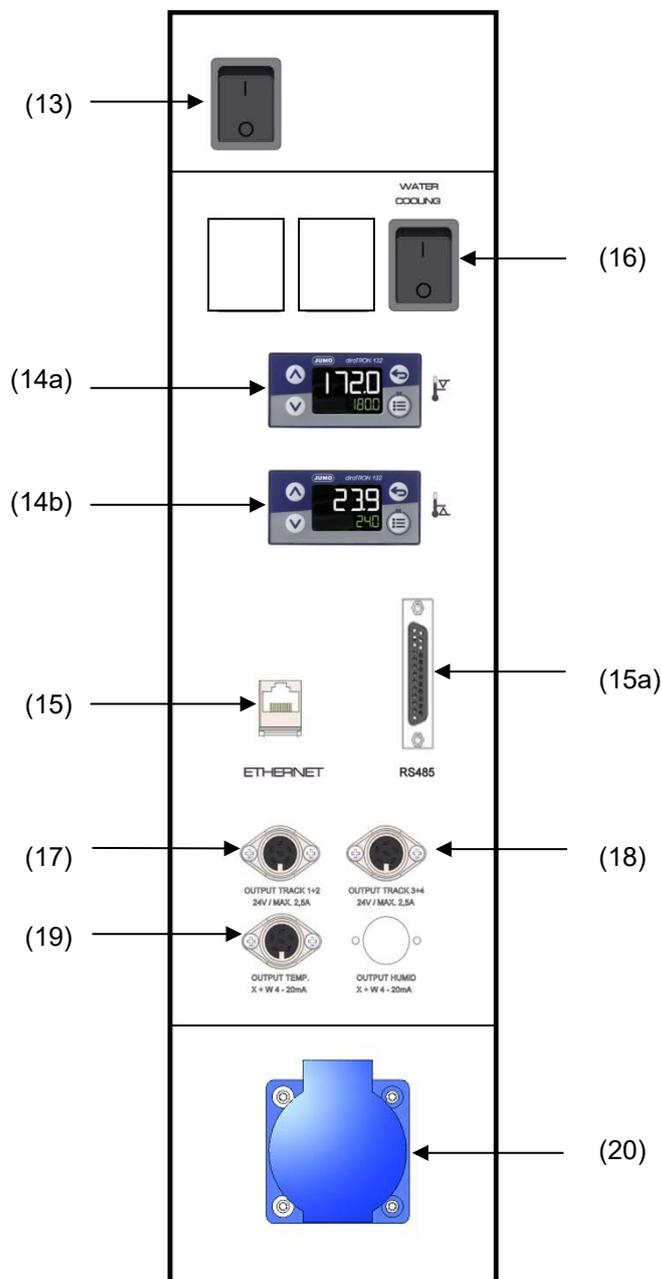


Figure 6: Lateral control panel at the right side of the refrigerating machine, with options

(13) Main power switch On/Off	(16) Optional switch (BINDER Individual Customized Solutions)
(14) Temperature safety device class 2 for over and under temperature (option): Entry displays for upper (14a) and lower (14b) temperature limit	(17) 2 zero-voltage switching outputs via operation lines (option)
(15) Ethernet interface for computer communication	(18) 2 zero-voltage switching outputs via operation lines (option)
(15a) RS485 interface for computer communication (option)	(19) Analog output for temperature (option)
	(20) Socket 230 V AC, max. 500 W

7.5 Rear power switch

This switch allows completely switching off the chamber (de-energized condition).



Figure 7: Rear view LIT MK

- | | |
|------|----------------------------|
| (13) | Main power switch On / Off |
| (21) | Rear power switch |

7.6 Instrument panel

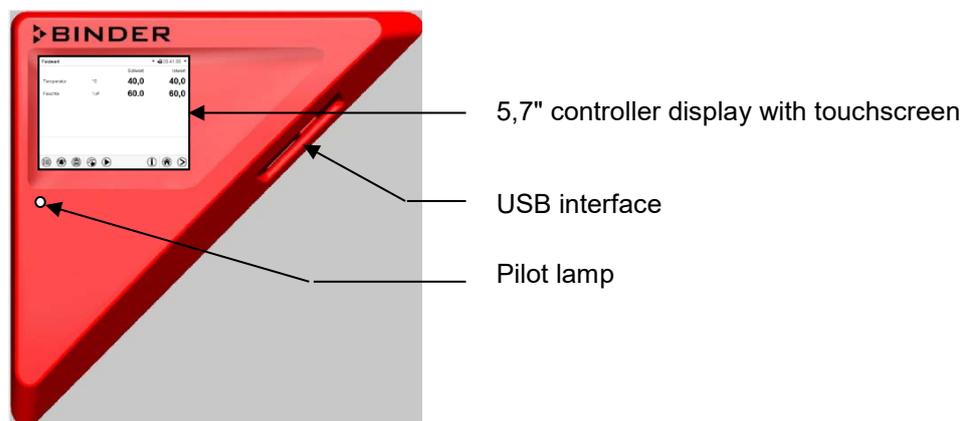


Figure 8: Triangle instrument panel with program controller MB2 and USB interface

7.7 Rear chamber view

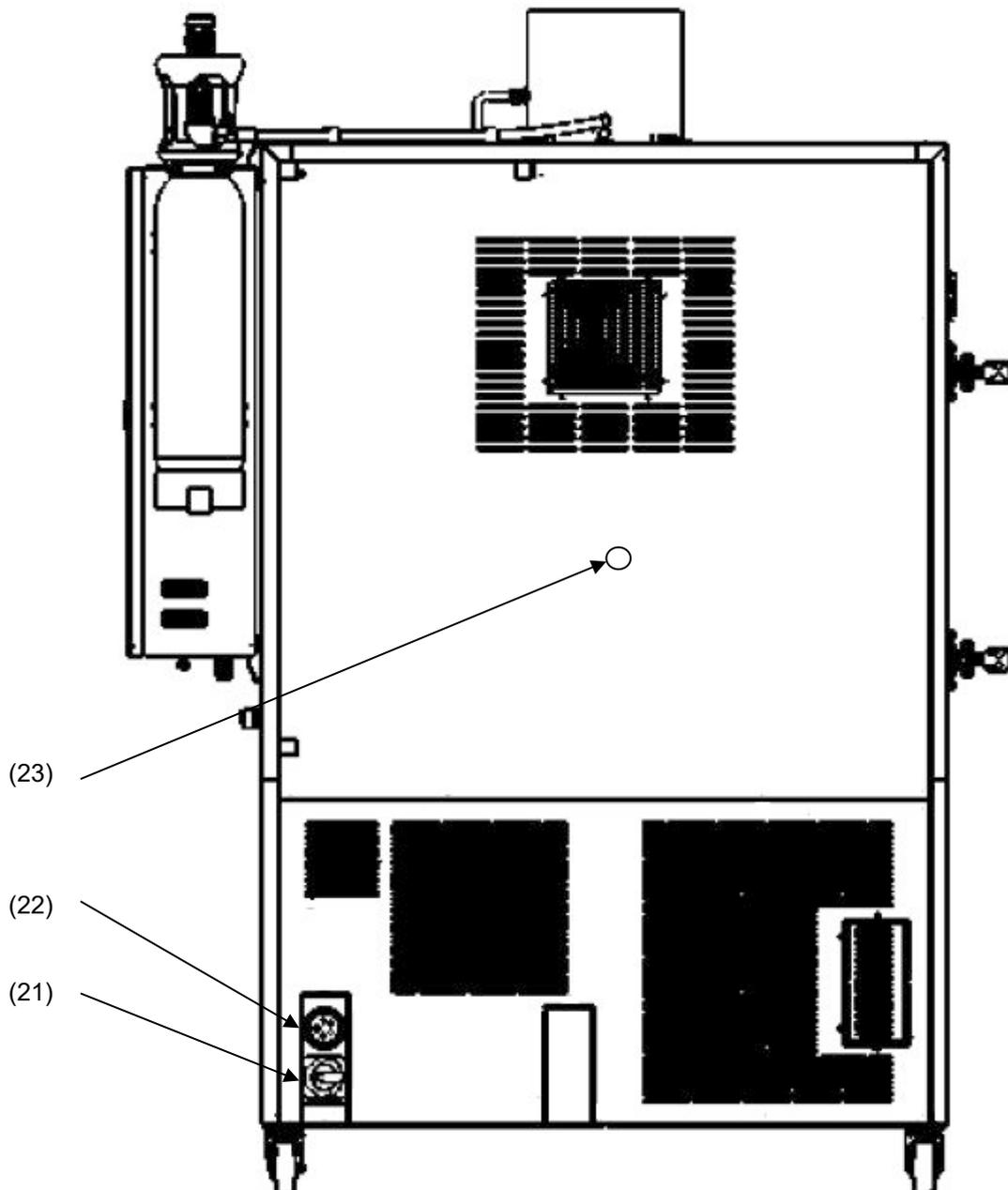


Figure 9: LIT MK rear chamber view with optional compressed air connection (example: LIT MK 240)

- (21) Rear power switch
- (22) Power connection
- (23) Compressed air connection (option): Coupling connector to connect compressed air

7.8 Gas detection



Gas detection is only active when the main switch (10) of the gas detection system is activated (ON position).

Gas detection (measurement of atmospheric composition in the interior of the chamber) is used to determine the start of a EUCAR hazard level 4 to 6 event. When predefined thresholds are reached, warnings or alarms are triggered via the alarm center (chap. 13.1). If a limit value for alarm level 2 is exceeded, the CO₂ fire suppression system is activated.

H₂ and O₂ are produced when a defective battery is outgassed. If a fire or flame develops, CO (flue gas) is released.

The concentration of these three gases is monitored by means of sensors when gas detection is activated via the main switch of the gas detection system (ON position).



Figure 10: Gas detection system main switch (OFF position)

Switching thresholds of the sensor systems

	Notification level 1	Notification level 2
O ₂ *	25 vol.-%	30 vol.-%
H ₂	100 ppm	200 ppm
CO	30 ppm	60 ppm

* Switching thresholds can be individually configured, e.g., release of the higher-level control system

Notification level 1: Warning, the indicator light flashes yellow

Notification level 2: The indicator light flashes red, the CO₂ fire suppression device is activated

An air sample is continuously taken from inside the battery test chamber and monitored for the gases O₂, H₂, and CO.

The air flow from inside is supplied directly to the O₂ sensor. The oxygen concentration is displayed on the evaluation unit in vol-% O₂.

The air flow is then diluted 1:1 with dilution air (filtered ambient air) to the H₂ and CO measuring sensors. The concentration of these gases is displayed on the evaluation unit in ppm. The dilution of the air flow is necessary to ensure that the H₂ and CO sensors receive sufficient oxygen to accurately measure the concentration of the gases.

Downstream of the pump, the air flow is returned to the interior of the battery test chamber. The dilution air and measuring gas volumetric flows are monitored by means of flow meters with ring initiators. A deviation from the volumetric flow set point will result in a fault notification and activation of the yellow indicator light (flashing signal).

Gas detection measuring principle

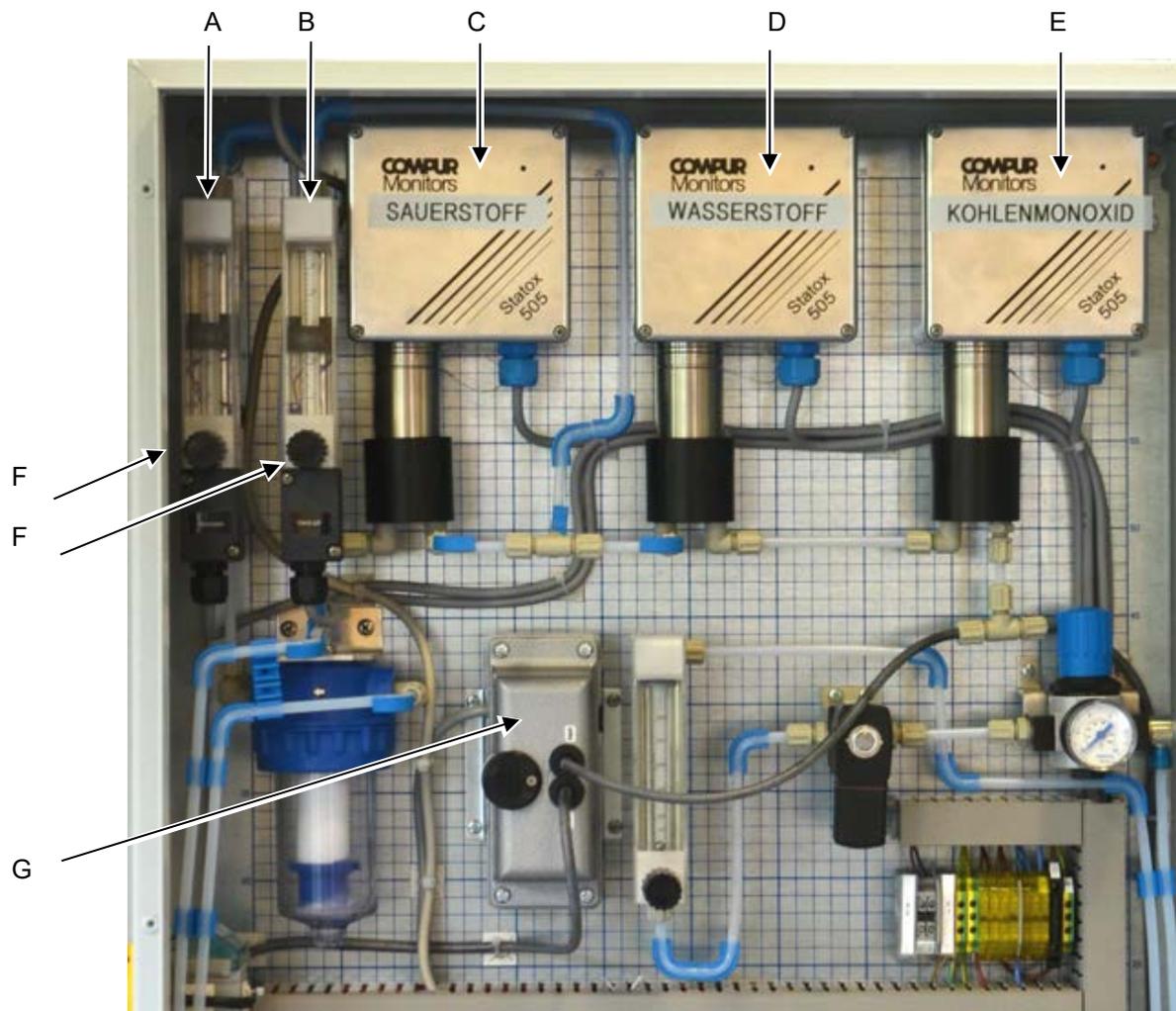
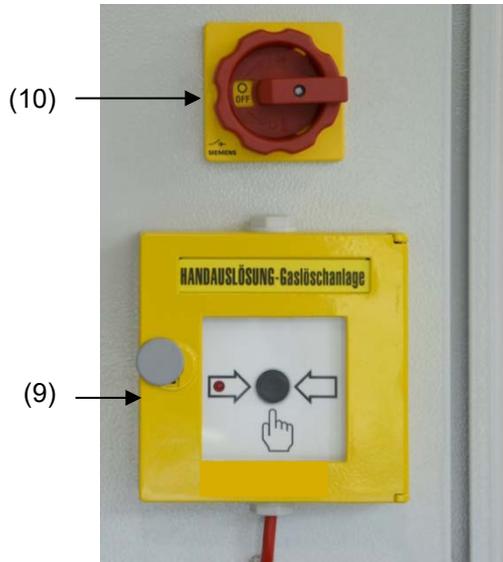


Figure 11: Components of the gas detection

- A Flow meter with ring initiator for measuring gas
- B Flow meter with ring initiator for dilution air
- C Gas sensor for O₂
- D Gas sensor for H₂
- E Gas sensor for CO
- F Flow setting for readjusting
- G Pump of the gas detection device

7.9 CO₂ fire suppression device (can be triggered automatically and manually)

The CO₂ fire suppression device includes a 5 kg pressurized CO₂ gas cylinder for fire suppression. For installation, please refer to chap. 11.1).



Main switch (10) of the gas detection system and manual release (9) of the fire suppression device (example illustration)



CO₂ pressurized gas cylinder



Figure 12: Location of the devices for the CO₂ fire suppression device

The CO₂ fire suppression device can be triggered in four different ways:

- Automatically via the alarm system (notification level 2) by gas detection. At least one programmed alarm threshold 2 threshold value for O₂ / H₂ / CO has been exceeded. To this end, the main switch for gas detection must be activated (ON position). (chap. 7.8)
- Automatically via the alarm system (notification level 2) by rod controller temperature monitoring. The temperature of 120°C has been exceeded. (chap. 13.1)
- Mechanically by pressing the manual release

In these three cases, an alarm is output via the indicator light (flashing red) and buzzer

- Manually, directly on the valve after pin pulled

This operation does NOT activate the alarm via the indicator light and buzzer.

7.9.1 Automatic triggering of the CO₂ fire suppression device

When the main switch of the gas detection system is switched on, the CO₂ fire suppression device is automatically activated when the alarm threshold 2 is reached. In that case, the concentration of the monitored parameters (temperature, O₂, H₂, CO) has, in at least one case, exceeded the threshold value for notification level 2, indicating a defect on a battery with outgassing.

Activation of the CO₂ fire suppression device includes CO₂ flushing with cooling effect.

When triggered, the entire content of the CO₂ pressurized gas cylinder is introduced into the interior of the battery test chamber via a stainless steel pipe and nozzle. The resulting overpressure is discharged through the pressure relief flap and the connection to customer-provided exhaust air. The oxygen concentration in the working space is thereby reduced so that a fire can be stabilized or suppressed.

The triggering of alarm threshold 2 with activation of the CO₂ fire suppression device can be used by forwarding to the customer's systems (chap. 13.1.1) to switch off the power supply to the batteries, the heating system, and for report-forwarding to a control station.

When alarm threshold 2 is triggered, the indicator light flashes red and the buzzer sounds.

7.9.2 After triggering of the CO₂ fire suppression device



Please observe the correct procedure when/after triggering of the CO₂ fire suppression device (chap. 14).

If the CO₂ fire suppression device has been triggered, whether automatically by gas detection or temperature monitoring, or manually, a check must be carried out in each case to determine, depending on the fire or chamber damage, whether the chamber can still be used afterwards. For further use, the three gas sensors must be checked and calibrated. In addition, the CO₂ pressurized gas cylinder must be replaced. Both must be carried out by trained specialists and are the responsibility of the operator.

A reset is carried out by switching the mains switch of the gas detection system off and on again.

7.10 Mechanical door lock

There are two door tensioners on the locking side of the chamber. These are used to prevent uncontrolled swinging of the doors during pressure reduction in the event of an error.

On two-door chamber, the door tensioners are located between the doors, and on single-door chamber, on the side of the chamber.



Figure 13: Mechanical door lock

7.11 Exhaust port with reversible pressure relief flap

The chamber has a pressure relief flap with an internal diameter of 150 mm. This is equipped with a 250 mm outlet for connection to an exhaust system.

The pressure relief flap is heated and is located at the top center of the chamber. It prevents pressure build-up by outgassing the cell(s). In the event of damage, released gases can only escape to the outside via the reversible pressure relief flap.

Active extraction (technical ventilation in accordance with national regulations) must be connected to the **exhaust port**. Extraction must remain effective throughout operation of the chamber. The connection of the exhaust air system must be attached decoupled from the building exhaust air system, otherwise over-pressure could arise in the entire exhaust air system. The minimum volume flow rate of the extraction is to be designed by the operator depending on the load.



Figure 14: Exhaust port with reversible pressure relief flap (1)

	 DANGER
<p>Risk of emission of hazardous gases from the interior of the chamber. Death due to suffocation. Poisoning.</p> <ul style="list-style-type: none"> ➤ Ensure ventilation measures: Active extraction (technical ventilation in accordance with national regulations) must be connected to the exhaust port on the chamber ➤ Ensure that extraction is decoupled from the building exhaust air system. ➤ Ensure that extraction remains effect throughout operation of the chamber. ➤ Ensure discharge of potentially corrosive and toxic gases to suitable areas. 	

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

8.1 Unpacking, and checking equipment and completeness of delivery

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

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

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

Remove the upholstered transport piece (L-type profile) from the lower door locking and keep it for possible later transportation.

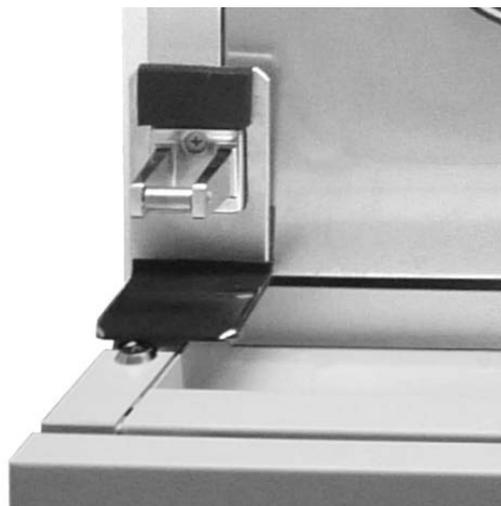


Figure 15:
Door locking with transport piece (state of delivery)

  	 CAUTION
<p>Risk of injury and damages by lifting heavy loads and by sliding or tilting of the chamber due to improper lifting.</p> <p>Injuries, damage to the chamber.</p> <ul style="list-style-type: none"> ⊘ Do NOT lift or transport the chamber using the door, the handle or the lower housing. ⊘ Do NOT lift the chamber by hand. ➤ Keep the chamber in upright position. ➤ Lift chambers from the pallet using technical devices (fork lifter). Set the fork lifter only from the rear in the middle of the chamber. Make sure to place all the lateral supports of the chamber on the forks. 	

If you need to return the chamber, please use the original packing and observe the guidelines for safe lifting and transportation (chap. 8.2).

For disposal of the transport packing, see chap. 29.1.

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

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

8.2 Guidelines for safe lifting and transportation

The front castors of the chamber can be blocked by brakes. Please move the chambers with castors only when empty and on an even surface, otherwise the castors may be damaged. Mount the upholstered steel L-type profile at the lower door locking. After operation please observe the guidelines for temporarily decommissioning the chamber (chap. 29.2).

  	 CAUTION
<p>Risk of injury and damages by lifting heavy loads and by sliding or tilting of the chamber due to improper transportation.</p> <p>Injuries, damage to the chamber.</p> <ul style="list-style-type: none"> ∅ Do NOT lift or transport the chamber using the door, the handle or at the lower housing. ∅ Do NOT lift the chamber by hand. ➤ Transport the chamber only in its original packaging. ➤ Secure the alternating climate chamber with transport straps for transport. ➤ Keep the chamber in upright position. ➤ Place the chamber using technical devices (fork lifter) on the transport pallet. Set the fork lifter only from the rear in the middle of the chamber. Make sure to place all the lateral supports of the chamber on the forks. ➤ Transport the chamber with the original transport pallet. Set the fork lifter ONLY to the pallet. Without the pallet the chamber is in imminent danger of overturning. 	

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

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

8.3 Storage

Intermediate storage of the chamber is possible in a closed and dry room. Observe the guidelines for temporary decommissioning (chap. 29.2).

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

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

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

8.4 Location of installation and ambient conditions

Set up the chamber on a flat, even and non-flammable surface, free from vibration, and in a well-ventilated, dry location and align it using a spirit level. The site of installation must be capable of supporting the chamber's weight (see technical data, chap. 30.4). The chambers are designed for setting up inside a building (indoor use).

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

	NOTICE
	<p>Danger of overheating due to lack of ventilation.</p> <p>Damage to the chamber.</p> <ul style="list-style-type: none"> ∅ Do NOT install the chamber in unventilated recesses. ➤ Ensure sufficient ventilation for dispersal of the heat. ➤ Observe the prescribed minimum distances when installing the chamber.

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

	 DANGER
	<p>Danger of explosion due to combustible dusts or explosive mixtures in the vicinity of the chamber.</p> <p>Serious injury or death from burns and / or explosion pressure.</p> <ul style="list-style-type: none"> ∅ Do NOT operate the chamber in potentially explosive areas. ➤ KEEP explosive dust or air-solvent mixtures AWAY from the vicinity of the chamber.

Ambient conditions

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

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

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

Minimum distances:

- Distance between each chamber when placing several chambers of the same size side by side: 250 mm / 9.84 in
- Wall distances: rear 300 mm / 11.81 in, sides 200 mm / 7.87 in
- Chambers with optional water cooling (without optional voltage and frequency changer): Wall distance rear 100 mm / 3.94 in.
- Chambers with voltage and frequency changer: rear wall distance of the battery test chamber approx. 1 m / 3.28 ft to set up the voltage and frequency changer
- Spacing above the chamber: 100 mm / 3.94 in

The chambers are NOT intended for stacking.

	NOTICE
	<p>Danger by stacking.</p> <p>Damage to the chambers.</p> <ul style="list-style-type: none"> ∅ Do NOT place the chambers on top of each other.

Other requirements

To completely separate the chamber from the power supply, you must disconnect the power plug. Install the chamber 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 several times a year. We recommend checking the fan grid (behind the left maintenance access flap) every week. In case of visible dirt accumulation, disconnect the chamber and clean the fan grid by suction.

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

9. Installation and connections

9.1 Connecting the CO₂ pressurized gas cylinder

Connecting the CO₂ pressurized gas cylinder serves to ensure the effectiveness of all safety devices. It is carried out as part of commissioning after the installation has been completed, see chap. 11.1.

9.2 Inertization connections for customer systems

Permanent inertization of the test space displaces atmospheric oxygen and reduces the risk of ignition of combustible gases or vapors released by escaping or venting the cell(s) into the chamber.

BINDER provides connections for this purpose.

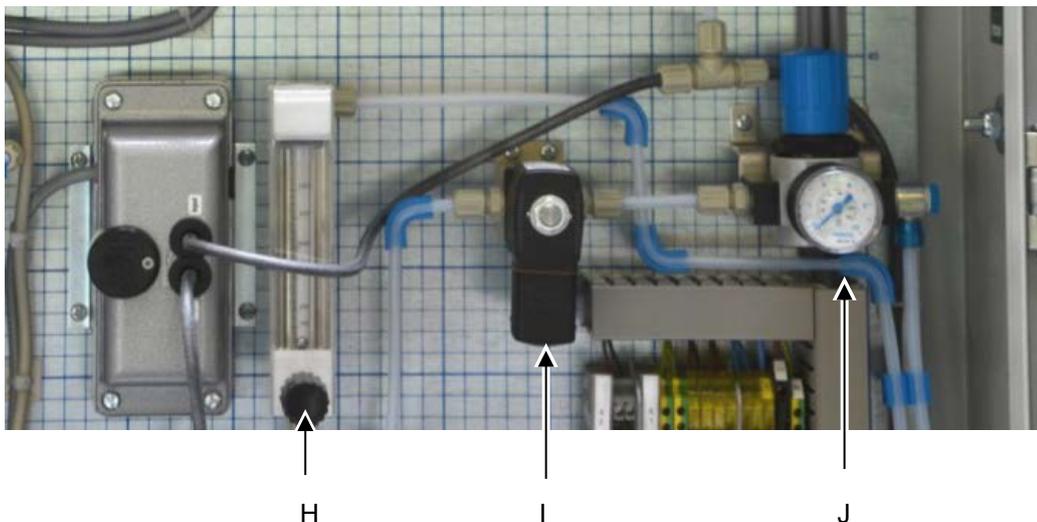


Figure 16: Inertization device components in the safety module

- H Flow meter
- I Solenoid valve
- J Pressure reducer

The operator is responsible for provision and control of inert gas (e.g., N₂).

The connection is established via a quick-release coupling.



Figure 17: Connection for inert gas at the bottom of the safety module

O₂ reduction

The inert gas connection allows the operator to reduce the oxygen content in order to stay below the LEL. The settings for inertization are the responsibility of the operator.

Gas connection for N₂ permanent inertization (O₂ suppression)

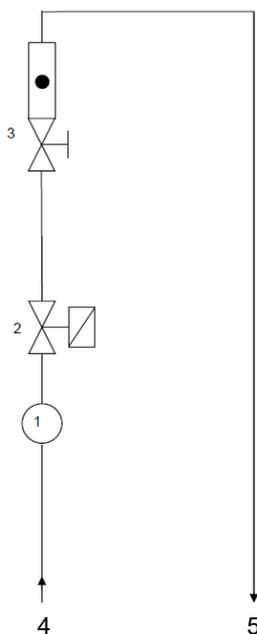
O₂ sensor system switching thresholds, default setting:

Notification level 1: 25 Vol.-%

Notification level 2: 30 Vol.-%

These switching thresholds can be set according to customer specifications, e.g., to release a higher-level control system.

Max. connection pressure N₂: 10 bar.



- 1: Pressure controller with manometer, outlet pressure max. 2 bar
- 2: 2/2-way solenoid valve
- 3: Flow meter 100 - 1000 l/h
- 4: Gas inlet coupling connector (NW%), inlet pressure max. 10 bar
- 5: Gas outlet coupling socket (NW5)

The interior of the battery test chamber is permanently inertized via a flush air connection for nitrogen N₂. This uses the oxygen concentration and the flush air connection installed in the safety module. The nitrogen provided by the operator may be supplied to the flush air inlet at a maximum pressure of 10 bar. A pressure reducer is provided in the safety module to reduce this admission pressure to 1.2 bar. The flush air volumetric flow is indicated by a flow meter. The 2/2-way solenoid valve is actuated by the operator according to the desired O₂ concentration.

9.3 Installation of the voltage and frequency changer (chambers with voltage and frequency changer)

The voltage and frequency changer is supplied packed separately together with the battery test chamber.

  	 CAUTION
	<p>Risk of injury and danger of damages by lifting heavy loads and by sliding or tilting of the voltage and frequency changer in case of improper lifting.</p> <p>Injuries; damage to the voltage and frequency changer.</p> <ul style="list-style-type: none"> ⊘ Do NOT lift the voltage and frequency changer by hand. ➤ Lift the voltage and frequency changer from the pallet using technical devices (fork lifter). Set the fork lifter only from the rear in the middle of the chamber. ➤ Alternatively, the voltage and frequency changer can also be lifted at the eyelets on the top by means of a lifting crane or fork lifter



(a) Eyelets for lifting with a lifting crane or fork lifter

(b) Positions for a fork lifter

Figure 18: Positioning of aids for lifting the voltage and frequency changer

For the installation of the voltage and frequency changer behind the battery test chamber, provide a rear wall distance of the chamber of approx. 1 m / 3.3 ft.

If possible, fix the voltage and frequency changer at the battery test chamber. For this purpose, an Allen key size 4 is required. Connect the slots at the end of the chassis with two M6 screws to the threads provided below on the rear panel of the battery test chamber (see Figure 19).

	NOTICE
	<p>Danger of overheating due to lack of ventilation.</p> <p>Damage to the voltage and frequency changer.</p> <ul style="list-style-type: none"> ∅ Do NOT install the voltage and frequency changer in unventilated recesses. ➤ Ensure sufficient ventilation for dispersal of the heat.

The voltage and frequency changer is equipped with four castors. The rear castors can be easily locked via the attached brakes

9.4 Electrical connection

9.4.1 Information on connecting the battery test chamber

The chambers are supplied ready for connection.

The chambers come with a fixed power connection cable of at least 1800 mm / 70.87 in in length. They are equipped with three internal overload releases against excess-current.

Model	Power plug	Nominal voltage +/- 10% at the indicated power frequency	Current type	Chamber fuse
LIT MK 115 LIT MK 240 LIT MK 720	CEE plug 5-poles 16 Amp	400 V at 50 Hz	3 N~	16 Amp 3 x internal

- The domestic socket must also provide a protective conductor. Make sure that the connection of the protective conductor of the domestic installations to the chamber's protective conductor meets the latest technology. The protective conductors of the socket and plug must be compatible!

	 DANGER
	<p>Electrical hazard due to missing protective conductor connection.</p> <p>Deadly electric shock.</p> <ul style="list-style-type: none"> ➤ Make sure that the chamber's power plug and the power socket match and securely connect the electrical protective conductors of the chamber and the house installation.

- Only use original connection cables from BINDER according to the above specification.
- Prior to connection and start-up, check the power supply voltage. Compare the values to the specified data located on the chamber's type plate (left chamber side, bottom right-hand, see chap. 1.6)

	NOTICE
	<p>Danger of incorrect power supply voltage due to improper connection.</p> <p>Damage to the chamber.</p> <ul style="list-style-type: none"> ➤ Check the power supply voltage before connection and start-up. ➤ Compare the power supply voltage with the data indicated on the type plate.

- When connecting, please observe the regulations specified by the local electricity supply company as well as the local or national electrical regulations (VDE directives for Germany).
- Observe a sufficient current protection according to the number of devices that you want to operate. We recommend the use of a residual current circuit breaker.

- Pollution degree (acc. to IEC 61010-1): 2
- Over-voltage category (acc. to IEC 61010-1): II

See also electrical data (chap. 30.4).



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

9.4.2 Connecting the voltage and frequency changer (for chambers equipped with a voltage and frequency changer)

The voltage and frequency changer is supplied with a fixed power connection cable without a plug. It is protected against excess-current with 3 internal overload releases. The connection is made by the customer.

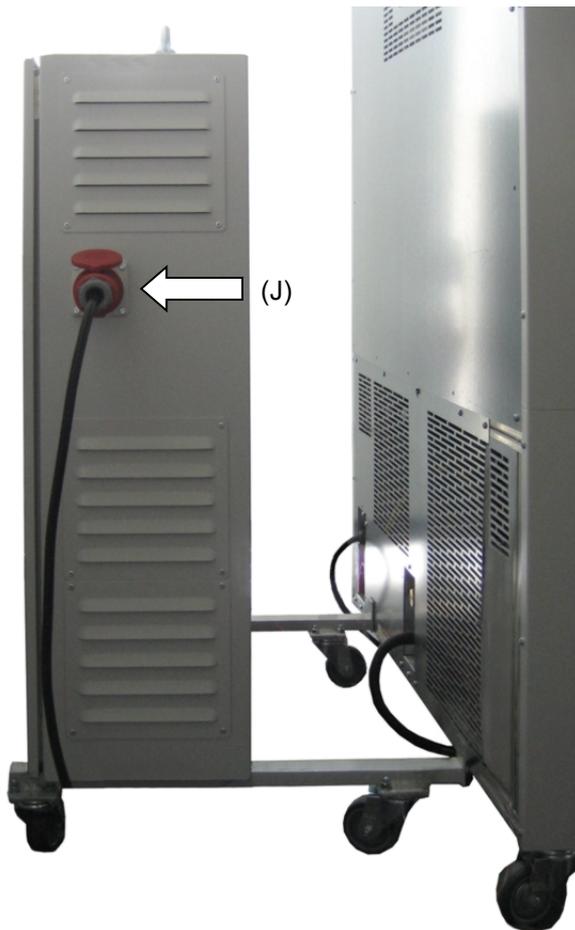
The socket must provide a protective conductor.

Electrical connection data:

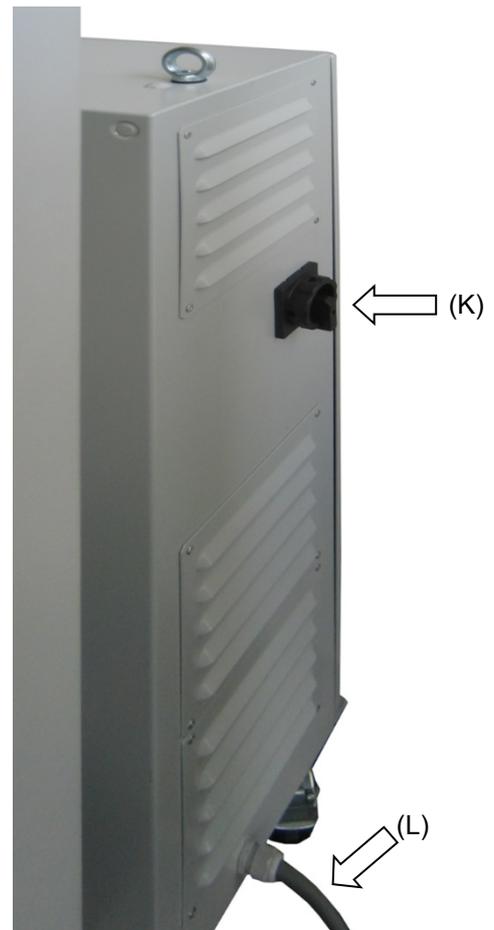
- Input side: 480 V, 60 Hz, 4-wire
- Output side (to the chamber): 400 V, 50 Hz, 5-wire

To establish the electrical connection of the battery test chamber with the voltage and frequency changer, proceed in the following order:

1. Connect the battery test chamber to the connection socket (J) of the voltage and frequency changer
2. Establish the power connection of the voltage and frequency changer using the power cable (L)
3. Turn on the voltage and frequency changer at the power switch (K) (position "ON")
4. Turn on the battery test chamber with the main power switch (13) in the lateral control panel



Left side of the voltage and frequency changer with connection socket (J) for the battery test chamber



Right side of the voltage and frequency changer with power switch (K) and power cable (L)

Figure 19: Voltage and frequency changer, mounted



Figure 20: Power switch (K) of the voltage and frequency changer in position "ON"

In position "OFF" the switch can be locked, e.g. with a padlock.

10. Functional overview of the MB2 chamber controller

The MB2 chamber controller controls the temperature (closed loop control), and the fan speed (adjustable only with MK 56) inside the chamber.

You can enter the desired set point values in fixed value operation mode directly on the display surface or via the setpoint menu. For program operation the controller offers programming week and time programs. In addition there is a timer program available (stopwatch function).

The controller offers various notifications and alarm messages with visual and audible indication and remote alarms via e-mail, an event list (trace file) and the graphical display of the measuring values in the chart recorder view. The MB2 program controller permits programming temperature cycles and special controller functions for each program section. You can enter values or programs directly at the controller or use the APT-COM™ 4 Multi Management Software (option) specially developed by BINDER.

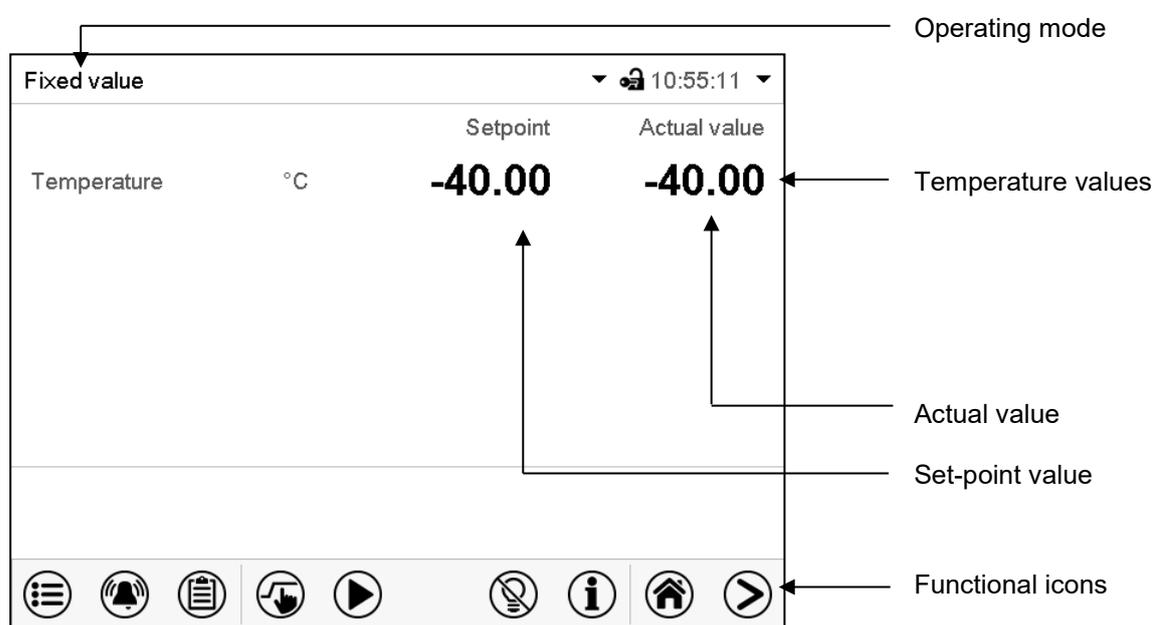


Figure 21: Normal display of the MB2 program controller (sample values)

10.1 Operating functions in normal display

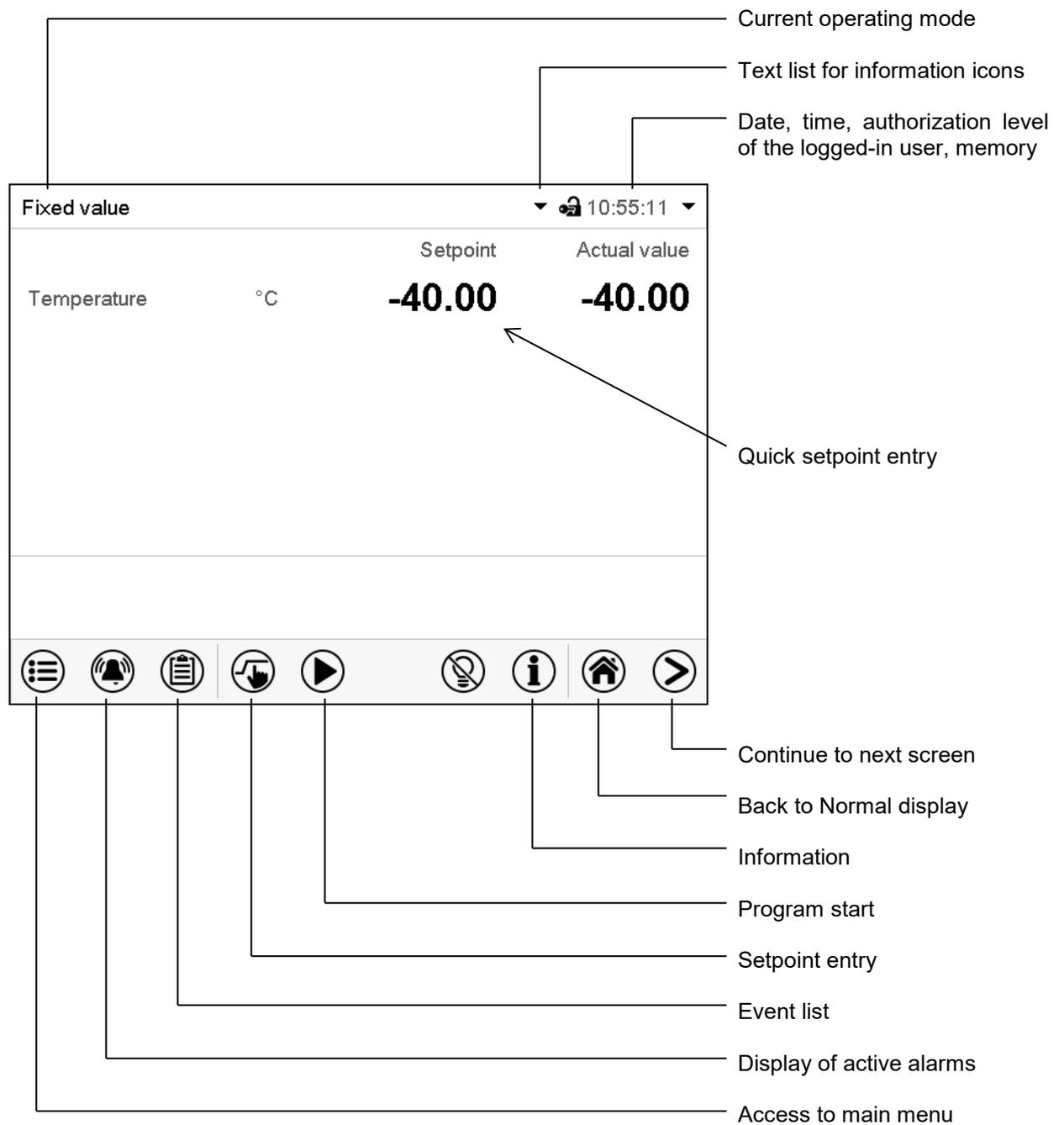
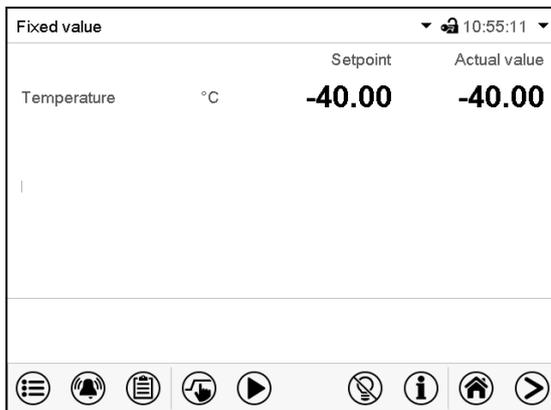


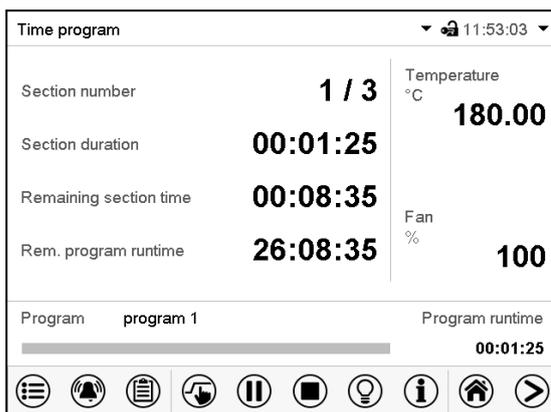
Figure 22: Operating functions of the MB2 controller in normal display (sample values)

10.2 Display views: Normal display, program display, chart-recorder display

	Press the Change view icon to toggle between normal display, program display and chart-recorder display.
	Press the Normal display icon to return from program display and chart recorder display back to Normal display.



Normal display (actual values / setpoint values)



Program display (example: time program)

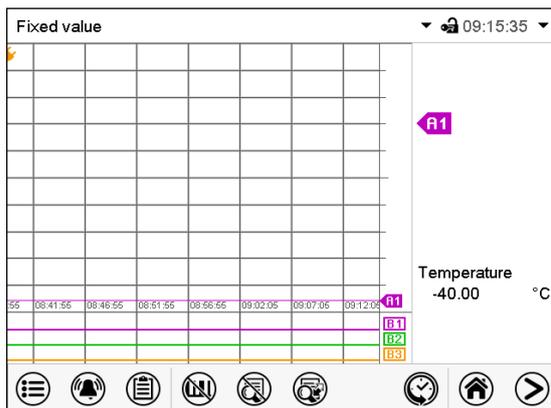


Chart recorder display

10.3 Controller icons overview

Navigation icons in Normal display

Icon	Signification	Function
	Main menu	Access from Normal display to the main menu
	Alarm	Access from Normal display to the list of active alarms
	Event list	Access from Normal display to the event list
	Setpoint setting	Access from Normal display to the setpoint entry menu: setpoint entry for Fixed value operation, safety controller settings
	Program start	Start a previously entered time or week program, continue a paused time program
	Program pause	Pause a running time program
	Program cancelling	Cancel a running time or week program
	Information	Information on program operation, setpoints, actual values, and the safety controller
	Normal display	Return from program display or chart recorder display to Normal display
	Change view	Toggle between Normal display, program display, and chart recorder display
	Interior lighting	Turn on and off the interior lighting

Functional icons in individual menus

Icon	Signification	Function
	Back	Return from each menu to Normal display
	Update	Update the event list and alarm messages
	Confirm	Take over the entries and exit the menu / continue menu sequence.
	Close	Exit the menu / cancel menu sequence. Entries are not taken over. When terminating a menu sequence, an information window appears, which must be confirmed.
	Reset alarm	Acknowledge the alarm and mute the buzzer.
	Change keyboard	Change between uppercase and lower case characters, digits and special characters
	Edit	Edit settings of time and week programs

Functional icons in the chart recorder display

Icon	Signification	Function
	Show legend	Show legend
	Hide legend	Hide legend
	Switch legend	Switch between legend pages
	Show indications	Show indications "Door open" (B1), "Anti-condensat." (B2), "Compressed air" (B3)
	Hide indications	Hide indications "Door open" (B1), "Anti-condensat." (B2), "Compressed air" (B3)
	History display	Pause chart recorder and change to history display. Data recording continues.
	Curve selection	Go to "Curve selection" submenu in the history display
	Search	Go to "Search" submenu in the history display to select the required instant
	Zoom	Go to "Zoom" submenu in the history display to select the zoom factor
	Show scroll buttons	Show scroll buttons in the history display to scroll to an instant
	Hide scroll buttons	Hide scroll buttons in the history display to scroll to an instant

Information icons referring to chamber conditions

Icon	Text information	Condition
	"Idle mode"	Controller is in Idle mode
	"Door open"	Chamber door is open
	"Preheating phase"	1-hour preheating phase, no cooling function
	Anti-condensation protection	Operation line "Anti-condensation protection" on

Information icon for data processing

Icon	Information
	Waiting icon: Data processing is running. Remaining time to touch the display when calibrating the touchscreen.

10.4 Operating modes

The MB2 program controller operates in the following operating modes:

- **Idle mode**

The controller is not functional, i.e., there is no heating or refrigeration. The fan is off. The chamber approximates ambient values.

You can activate and deactivate this operating mode with the “Idle mode” control contact in Fixed value operating mode (chap. 12.3), time program operation (chap. 17.7.3) and week program operation (chap.18.6.5).

- **Fixed value operating mode**

The controller operates as a fixed-point controller, i.e., set-points can be defined, which are then maintained until the next manual change (chap. 12.1).

- **Timer program operation**

Stopwatch function: during an entered duration the controller constantly equilibrates to the setpoints entered in Fixed value operation mode.

- **Time program operation**

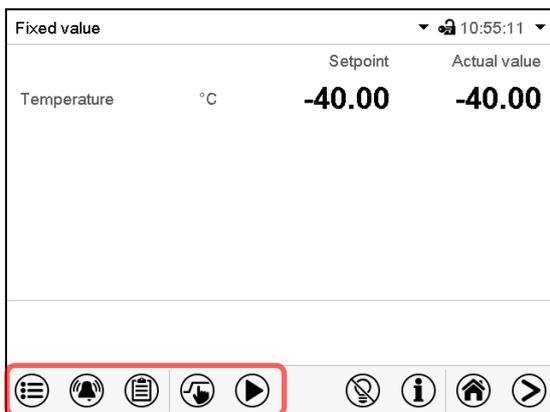
An entered time program is running. The controller offers 25 program memory places with 100 program sections each. The total number of program sections of all programs is unlimited

- **Week program operation**

An entered week program is running. The controller offers 5 program memory places with 100 switching points each. The switching points can be distributed over all days of the week.

10.5 Controller menu structure

Use the **navigation icons** in the screen footer in Normal display to access the desired controller functions.



The available functions depend on the current **authorization level** “Service”, “Admin” or “User” (chap. 19.1). This is selected either during login or can be available without password protection.

	Main menu: program settings, further information, “Service” submenu. The “Settings” submenu allows general configuration of the controller.	chap. 10.5.1
	List of active alarms	chap. 13
	Access to the event list	chap. 21.2
	Setpoint entry for Fixed value operation, safety controller settings	chap. 12, 15.3
	Start/ pause/ cancel an already entered, respectively a running time program or start / cancel an already entered, respectively a running week program	chap. 17.1, 17.2, 18.1

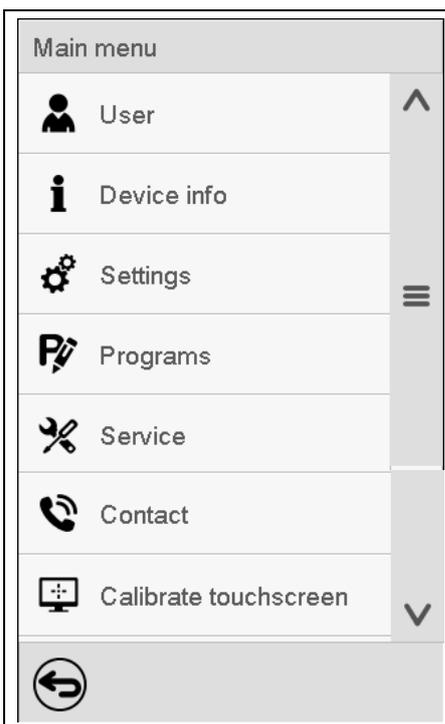
Unless noted otherwise, the figures show the functional range, which is available for the user with “Admin” authorization level.

10.5.1 Main menu

The main menu provides access to the general configuration of the controller as well as to program entry and the user administration. Additionally there are support functions like a contact page or the display calibration depending on the available angle.

	Press the Main menu icon to access the main menu from Normal Display.
	Press the Back icon to return from each setting menu to Normal Display.

The main menu provides the following functions and submenus.

	Main menu		
	User	User management: login and logout, password management	chap. 19
	Device info	Chamber information	chap. 21.2
	Settings	“Settings” submenu (not visible for user with “User” authorization level)	chap. 20
	Programs	Program entry submenu for time and week programs	chap. 17 and 18
	Service	“Service” submenu	chap. 10.5.3
	Contact	BINDER Service contact page	chap. 21.1
	Calibrate touchscreen	Calibrating the touch screen	chap. 20.4.2
	Back to Normal Display		

“Settings” submenu

- Settings of many general controller functions and network settings (chap. 20).
- Available only for users with “Service” and “Admin” authorization level

“Service” submenu

- Access to service data, controller reset to factory settings (chap. 10.5.3)
- Available only for users with “Service” and “Admin” authorization level. Full functional range only for BINDER Service (users with “Service” authorization level).

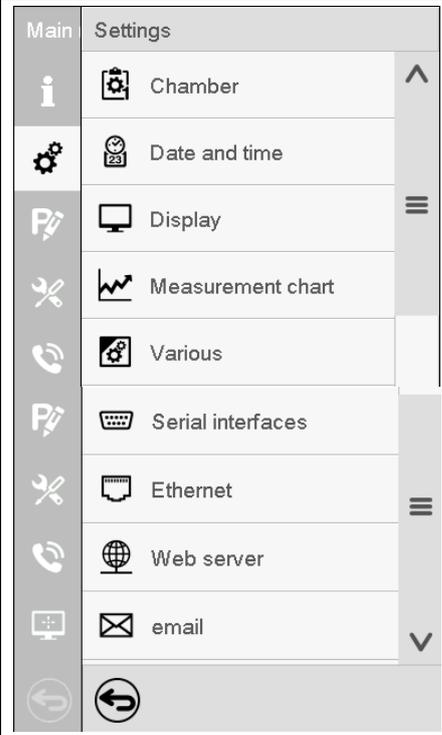
“Programs” submenu

- Access to the controller’s program functions (chap. 13, 17, 18)

10.5.2 “Settings” submenu

The “Settings” submenu is available for users with “Service” or “Admin” authorization level. It serves to enter date and time, select the language for the controller menus and the desired temperature unit and to configure the controller’s communication functions.

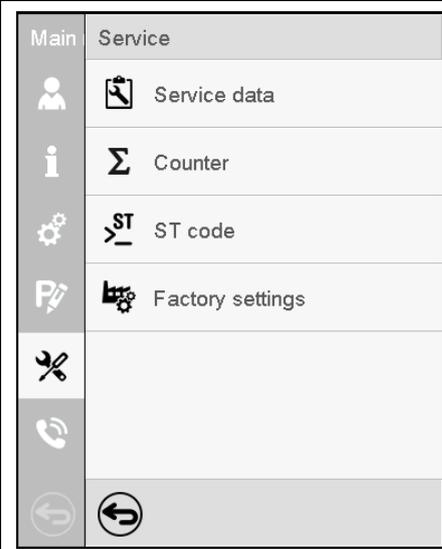
Path: [Main menu > Settings](#)

	Chamber	Setting the temperature unit, menu language...	chap. 20.1, 20.2
	Date and time	Setting date and time	chap. 20.2
	Display	Setting the display brightness, continuous operation and screen saver	chap. 20.4
	Measurement chart	Settings for the measurement chart: storage interval, storage values, minimum and maximum values	chap. 22.2
	Various	Turning off the interior lighting automatically	chap. 20.7
	Serial interfaces	Configuration of the optional RS485 interface, setting of the device address	chap. 20.5.1
	Ethernet	Entry of the MAC address and IP address	chap. 20.5.2
	Web server	Password protection for web server access	chap. 20.5.3
	email	Configuration of the e-mail server, assignment of e-mail addresses	chap. 20.5.4
		Back to main menu	

10.5.3 “Service” submenu

The “Service” submenu is available for users with “Service” or “Admin” authorization level. When logged-in with “Admin” authorization level the user will find information to tell the BINDER Service in service case.

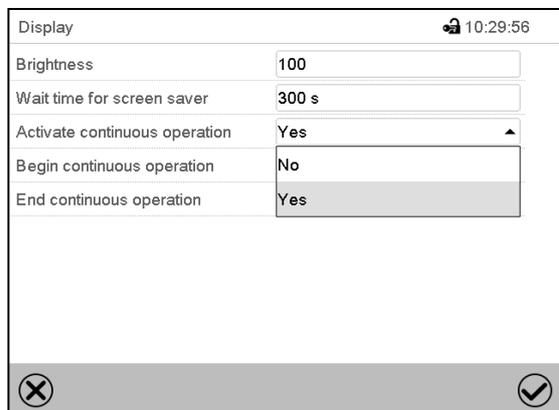
Path: [Main menu > Service](#)

	Service data	Serial number of the chamber, setup version of the controller software	chap. 20.2
	Counter	No function	
	ST code	Information for BINDER Service	
	Factory settings	Reset to factory settings	
		Back to main menu	

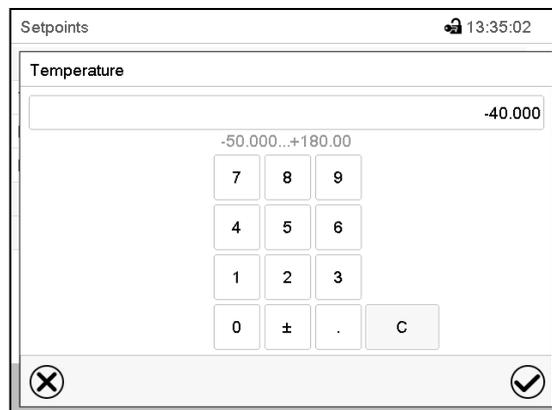
(view with “Admin” authorization level)

10.6 Principle of controller entries

In the selection and entry menus there are icons displayed in the footers which you can use to take over the entry or cancel it.



Selection menu (example)



Entry menu (example)

After completing the settings there are the following possibilities:

	Press the Confirm icon to take over the entries and exit the menu or continue the menu sequence.
	Press the Close icon to exit the menu or cancel the menu sequence without taking over the entries. When terminating a menu sequence, an information window appears, which must be confirmed.

10.7 Performance during and after power failures

During a power failure, all controller functions are shut down.

After the power returns, all functions return to the same status the chamber had before power failure. . The controller continues to function in the original operating mode it was in previously before the power failure occurred.

- Performance after power failure in Idle mode
Control is deactivated
- Performance after power failure in Fixed value operation mode
All functions return to the same status the chamber had before power failure. The set-points are immediately resumed.
- Performance after power failure during time program operation
The program is resumed at the point where the interruption occurred with the latest set-points reached during the program run.
- Performance after power failure during week program operation
The week program continues with the values corresponding to the current time.

Power failure and power return are noted in the event list (chap. 21.3).

If during power failure an alarm has occurred (tolerance range, safety controller, optional over/under temperature safety device class 2), confirm the alarm. See chap. 13.2.4.

10.8 Performance when opening the door

The fan turns off immediately after opening the door.

After 60 seconds from opening the door, heating, and refrigeration turn off. The compressor continues operating during 5 minutes without cooling function.

After closing the door, heating, refrigeration, and fan turn on again.

11. Commissioning

To ensure the effectiveness of all safety devices, commissioning should be carried out by BINDER Service.

Ensure that commissioning is carried out by trained personnel with the necessary expertise. (see chap. 1.1)

Ensure that the test is carried out and passed before initial commissioning (chap. 6.2.1).

Installation of the chamber has been carried out in accordance with the information in chap. 9.

All connections on the chamber have been established and the chamber is ready for commissioning.

11.1 Preparing and activating the general safety devices

11.1.1 Inserting the CO₂ pressurized gas cylinder

Ensure that the CO₂ pressurized gas cylinder of the fire suppression device is sufficiently filled.



Observe the safety instructions when handling CO₂ gas (chap. 1.7.3) and gas cylinders (chap. 1.7.5).

- Mount the solenoid coil onto the valve

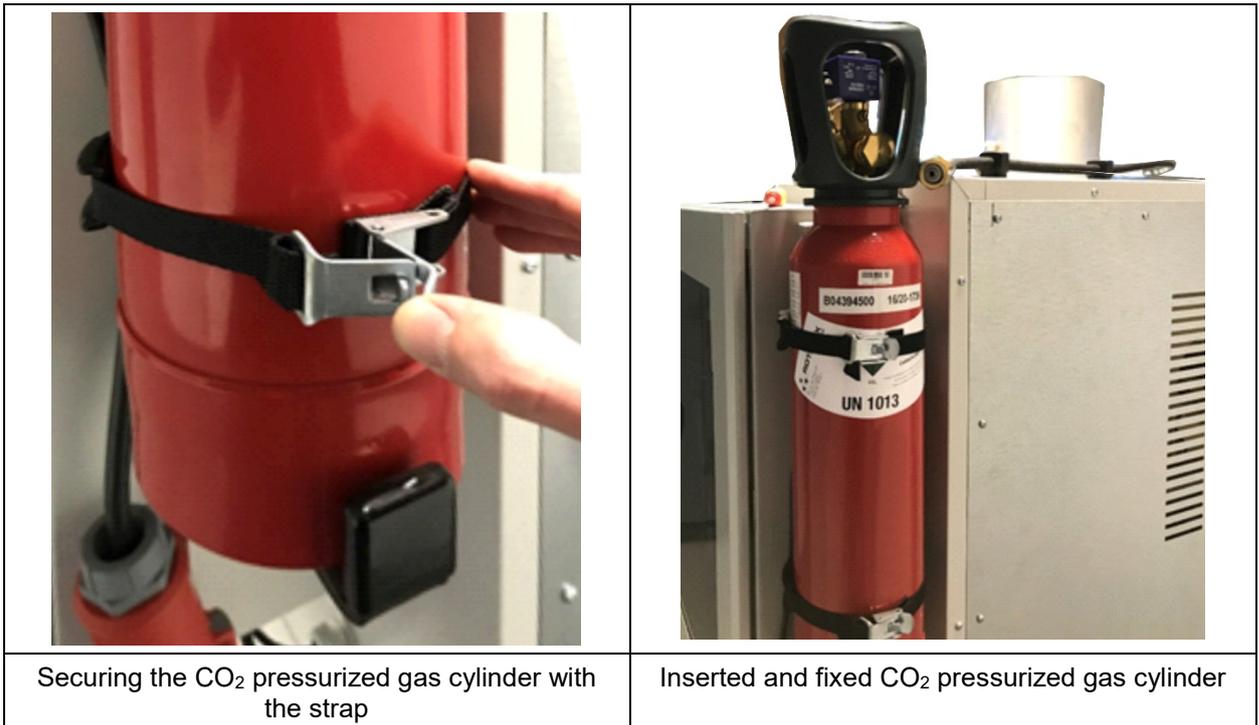


State of delivery



Valve with mounted solenoid coil

- Place the CO₂ pressurized gas cylinder in the bracket provided and secure it with the strap.



11.1.2 Activating the gas detection system

Switch on the activation switch of the gas detection system.

Attention! When the gas detection system is activated via the main switch, the CO₂ fire suppression device may be triggered automatically. In that case, CO₂ flows quickly from the pressurized gas cylinder into the interior of the chamber. If the door is open, there is a risk of suffocation and frostbite.

	<div style="background-color: red; color: white; padding: 5px; text-align: center;">  DANGER </div> <p>Risk of suffocation, poisoning, and frostbite due to triggering of the CO₂ fire suppression device.</p> <p>Death due to suffocation. Frostbite.</p> <ul style="list-style-type: none"> ⊘ Do NOT open the chamber door when the gas detection system is active. ➤ Switch the main switch of the gas detection system off before opening the door of the chamber.
---	---

- After switching the gas detection system on, wait approx. 5 minutes until the sensors are initialized (during initialization, sensors show "Err 2")
- In the meantime, check the flow meter for measuring gas and dilution gas and adjust, if necessary.

IMPORTANT: The measuring and dilution gas must always be set to a ratio of 1:1, otherwise the CO and H₂ sensors will malfunction. A deviation from the volumetric flow set point will result in a fault notification and activation of the yellow indicator light (flashing signal).

- After successful initialization, the display changes to the measured gas concentration

11.1.3 Connection of the coil connector on the CO₂ pressurized gas cylinder

- Attach the coil connector to the solenoid coil



Connecting the coil connector

11.1.4 Function test of the valve

The valve must be checked for function after connecting the coil connector and before removing the lock nut for connecting the high-pressure hose. The correct opening and closing of the valves can be proven by means of this function test.

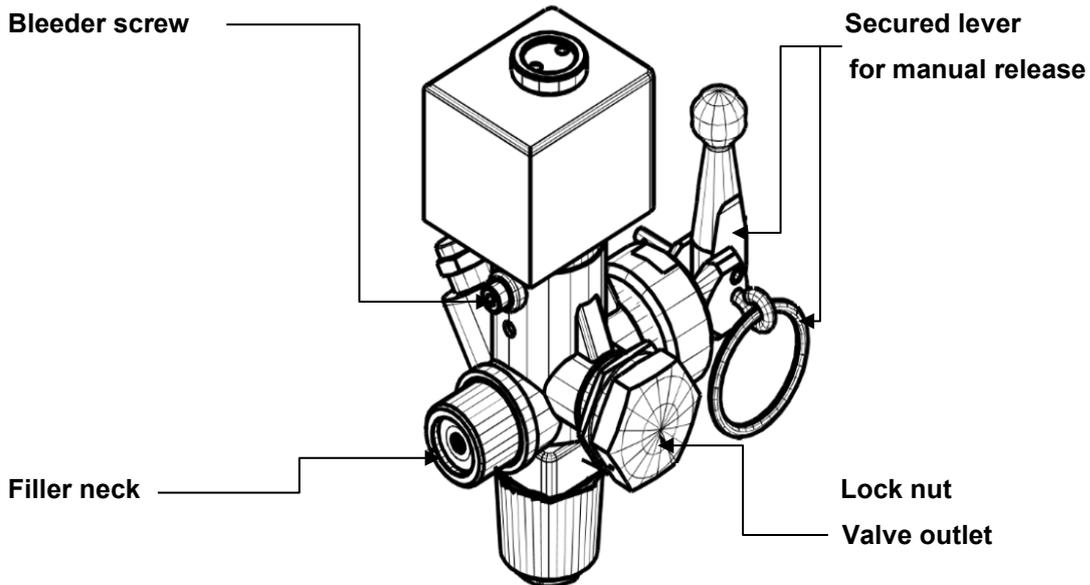
Initial state:

- The lever for manual release is secured
- The valve outlet is sealed gas-tight with the lock nut

A conventional hexagon socket wrench SW 3 and a lock nut with ventilation bore are required to carry out the function test.

Function test

- Actuate the valve electrically by manual release for a short time (2 to 3 seconds) and then switch off the power to reset the manual release and the control unit.
- Loosen the bleeder screw with the hex socket wrench by half a turn. This bleeds the upper valve area so that the valve audibly closes. However, the pressure in the valve outlet is maintained.
- Carefully loosen the lock nut by approx. half a turn to bleed the valve outlet. An audible, brief gas leak signals that the valve has opened correctly. **This gas leak must stop immediately. Otherwise the valve is not closed. In that case, the lock nut must not be removed under any circumstances.**
- If the valve does not close, it must be replaced. Contact BINDER Service.
- If the valve is functioning correctly, screw the bleeder screw back in a gas-tight manner.

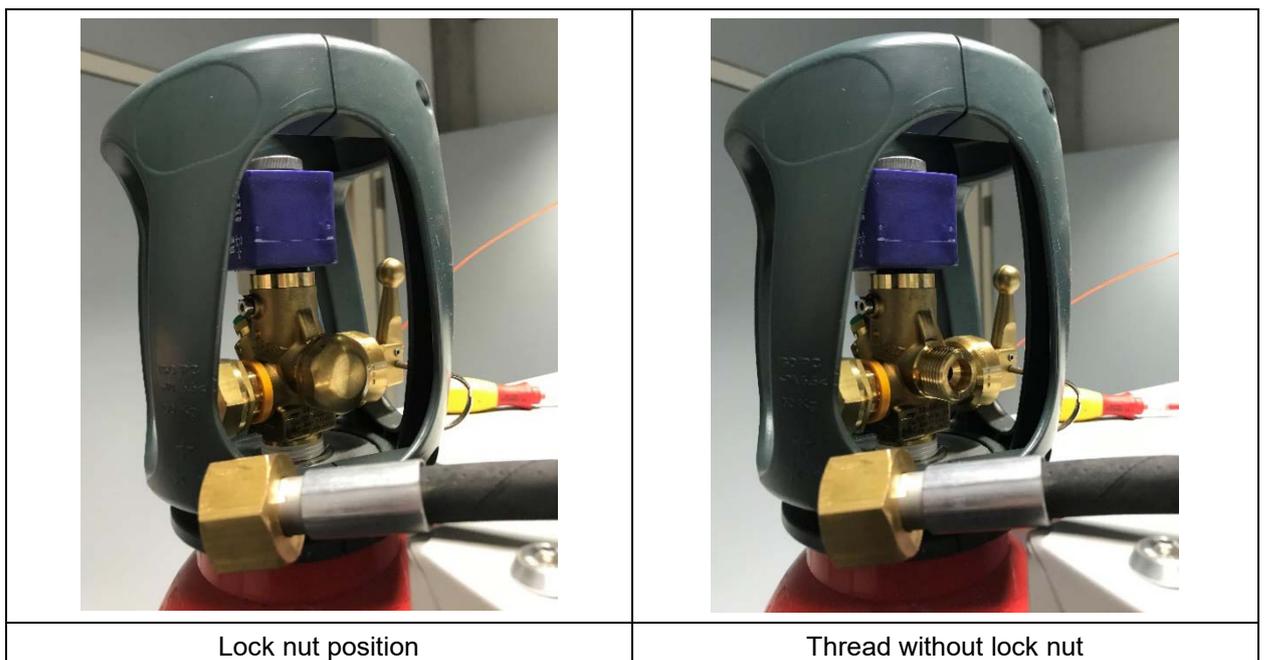


The high-pressure hose may only be connected after a successful test.

	DANGER
<p>Danger of suffocation and poisoning by leakage of CO₂ in high concentration (> 4 Vol.-%).</p> <p>Death due to suffocation.</p> <ul style="list-style-type: none"> ⊘ Do NOT remove the lock nut for connecting the high-pressure hose (chap. 11.1.5), without a successful valve test. ➤ After the test, screw the bleeder screw back in a gas-tight manner. 	

11.1.5 Connecting the CO₂ flushing line (high-pressure hose)

- To connect the high-pressure hose, remove the lock nut



- Connect the high-pressure hose. Tightening torque of the union nut: 30 Nm +/- 5 Nm



The union nut must be firmly tightened, otherwise leakage of CO₂ is possible.

	 DANGER
<p>Danger of suffocation and poisoning by leakage of CO₂ in high concentration (> 4 Vol.-%).</p> <p>Death due to suffocation.</p> <p>➤ Make sure that the union nut is firmly tightened. Observe the prescribed tightening torque.</p>	

11.2 Commissioning an operator-provided inertization

If operator-provided inertization is used, ensure that it is correctly configured and functional.

The operator is responsible for the effectiveness of the customer-provided inertization measures.

Configuration

- **Setting O₂ sensor alarm threshold 1**

To release the higher-level control system, alarm threshold 1 of the O₂ sensor can be set to the desired value (e.g. 4 Vol.% O₂). To do this, contact BINDER Service.

- If desired: **Set alarm threshold 2**

To do this, contact BINDER Service.

- **Setting the inert gas flow rate**

Set the flow rate for inert gas at the flow meter according to whether O₂ control or permanent inertization with constant flow is to be used

To do this, the solenoid valve must be open. This should be done by means of an appropriate circuit. (chap. 9.2)

The solenoid valve can be used to control the oxygen concentration

An operator-provided control system can be connected to the “inertization solenoid valve” binary input to control flushing/inertization.

Connection

Connect the hose for the inert gas supply to the quick-release coupling at the bottom of the safety module (chap. 9.2) and establish the inert gas supply. Ensure that the gas cylinder is sufficiently filled, correctly connected, and opened for the inert gas supply. Observe the safety instructions when handling inert gases (chap. 1.7.4) and gas cylinders (chap. 1.7.5).

Activation

Activate the operator-provided inertization.

11.3 Handling the safety devices during operation

Ensure that the main switch of the gas detection system is switched on and that the gas detection system and the fire suppression device are active.

If operator-provided inertization is being used, ensure that it is functional and active.

Continuous monitoring of the system must be ensured.

If, in the operational state of the fire suppression system, work needs to be carried out in the working area of the battery test chamber where there is a risk of a person being endangered, triggering of the CO₂ cylinder must be prevented. Ensure that the gas detection device is disabled when you open the chamber.

	 DANGER
<p>Risk of suffocation, poisoning, and frostbite due to triggering of the CO₂ fire suppression device.</p> <p>Death due to suffocation. Frostbite.</p> <ul style="list-style-type: none"> ⊘ Do NOT open the chamber door when the gas detection system is active. ➤ Switch the main switch of the gas detection system off before opening the door of the chamber. 	
	<p>Observe the safety instructions in the operating manual, as well as the operator's operating instructions.</p>

11.4 Turning on the chamber

After connecting the electrical supply (chap. 9), you can start up the chamber.

Turn on the main power switch (13) in the lateral control panel and the rear power switch (21) at least one hour before operating the chamber

The lit pilot lamp shows the chamber is ready for operation. When the chamber is turned on and yet the controller display is dark, the display is in stand-by mode. Press on the touchscreen to activate it.

The refrigerating function is available only one hour after turning on the main power switch (13) and the rear power switch (21). This is indicated by the information message “Preheating phase” in the controller display.

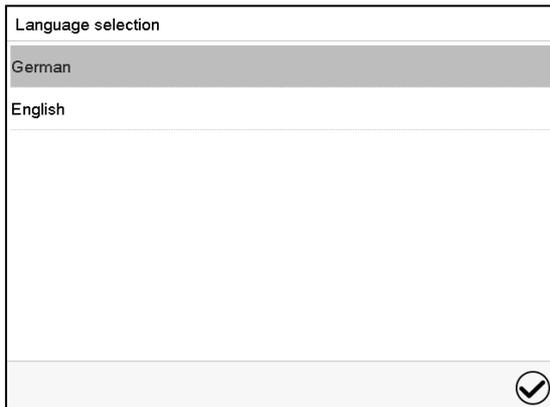
Warming chambers may release odors in the first few days after commissioning. This is not a quality defect. To reduce odors quickly we recommend heating up the chamber to its nominal temperature for one day and in a well-ventilated location.



For control reasons the refrigeration machine starts with a delay time. The refrigeration machine also turns off with a 5 minutes delay. This explains why the compressor may remain operating also during positive temperature jumps.

11.5 Controller settings upon start up

The window “Language selection” enables the **language selection**, in case that it’s activated in the “Start-up” menu. Afterwards occurs a request of the **time zone** and the **temperature unit**.

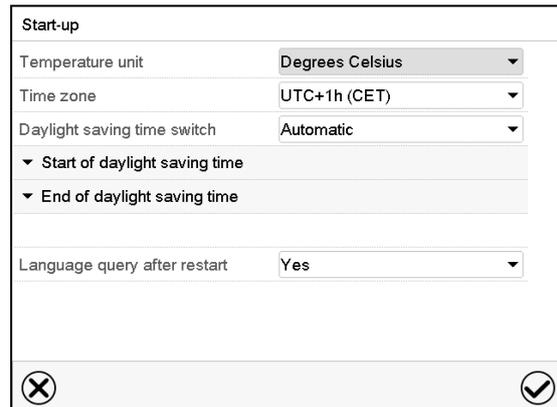


Language selection

German

English

✓



Start-up

Temperature unit: Degrees Celsius

Time zone: UTC+1h (CET)

Daylight saving time switch: Automatic

Start of daylight saving time

End of daylight saving time

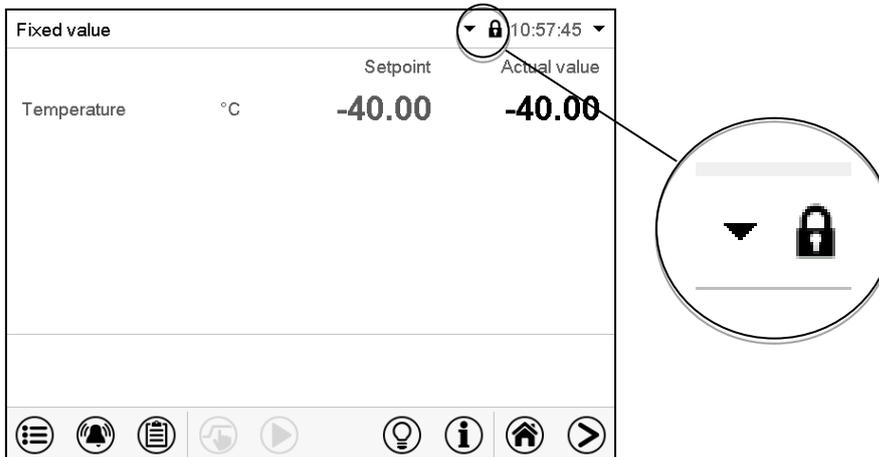
Language query after restart: Yes

✗ ✓

The controller will function in the **operating mode**, which was active before the last shut-down. It controls temperature in fixed value operating mode to the last entered values and in the program mode to the set points achieved beforehand.

Locked operation

Provided that the user administration has been activated by the assignment of passwords for the different authorization types, the **controller operation** is first locked after turning on the unit, recognizable by the closed lock icon in the header.



Fixed value

10:57:45

Setpoint Actual value

Temperature °C -40.00 -40.00

⌵ 🔒

⌵ 🔒

☰ 🔔 📄 🔄 ▶ ⚙️ ⓘ 🏠 ➡

In the locked view the controller provides all display functions. No setting functions are available.

The setpoints are shaded (light grey) in normal display. Changing them by direct entry in the fixed value operating mode is not possible. The functional icons for setpoint entry and program start in the footer are without function.

After turning on the unit, user log-in is required to operate the controller (chap. 19.2)

Operation without user log-in / without password-protection

If the password function has been deactivated, after turning on the unit without user log-in there are those controller functions available, which correspond to the highest authorization level without a password protection. There is no lock icon in the header.

12. Set-point entry in “Fixed value” operating mode

In Fixed value operating mode you can enter a temperature set-point, and the switching-state of up to 16 operation lines.

All settings made in Fixed value operating mode remain valid until the next manual change. They are saved also when turning off the chamber or in case of toggling to Idle Mode or Program Mode.

	Setting ranges	Control ranges
Temperature	-50 °C / -58 °F up to 110 °C / 230 °F. (range -50 °C / -58 °F up to -40 °C / -40 °F not provided for operation)	-40 °C / -40 °F up to 110 °C / 230 °F



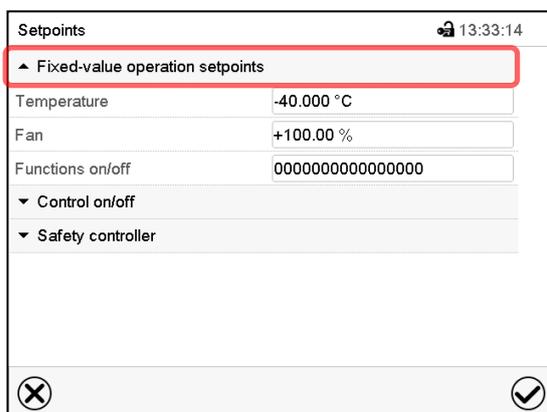
With set-point type “**Limit**”, adapt the safety controller (chap. 15.3) or the over/under temperature safety device class 2 (option, chap.15.4) always when you changed the temperature set-point. Set the safety controller set-point or the set-point of the over/under temperature safety device class 3.3 (option) by approx. 2 °C to 5 °C above the controller temperature set-point.

Recommended setting: Set-point type “**Offset**” with safety controller set-point 2 °C.

12.1 Set-point entry through the “Setpoints” menu



Press the **Setpoint setting** icon to access the “Setpoint” setting menu from Normal display.



The screenshot shows the 'Setpoints' menu with a red box highlighting the 'Fixed-value operation setpoints' option. Below it, the following parameters are visible:

Temperature	-40.000 °C
Fan	+100.00 %
Functions on/off	0000000000000000
Control on/off	
Safety controller	

“Setpoints” menu.

Select “Fixed value operation setpoints” to access the individual parameters.

- Select the field “Temperature” and enter the desired temperature setpoint.

Setting range: -50 °C / -58 °F up to 110 °C / 230 °F. Confirm entry with **Confirm** icon.

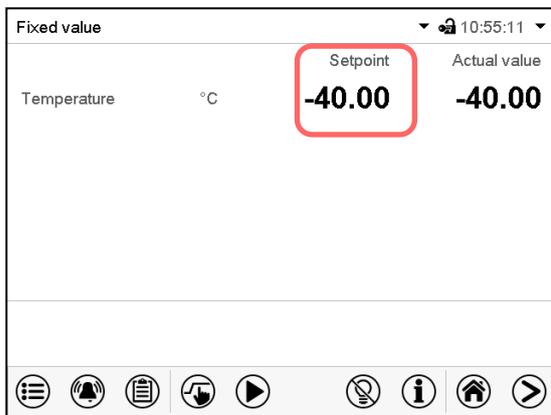


When entering a value outside the setting range, the message: “Value outside of limits! (Min: xxx, Max: xxx)” appears (xxx is a wildcard for the limits of the respective parameter). Press the **Confirm** icon and repeat the entry with a correct value.

After completing the settings, press the **Confirm** icon to take over the entries and exit the menu, **or** press the **Close** icon to exit the menu without taking over the entries.

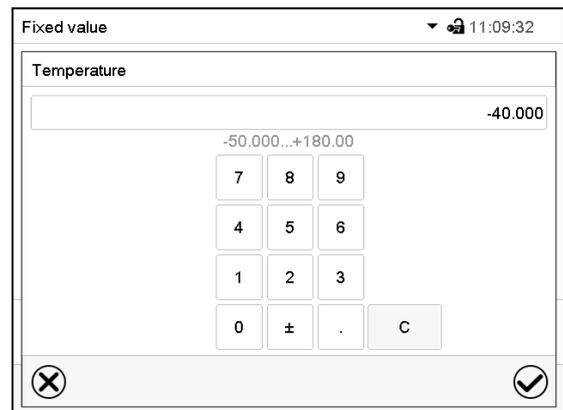
12.2 Direct setpoint entry via Normal display

Alternatively you can also enter the setpoints directly via Normal display.



Normal display.

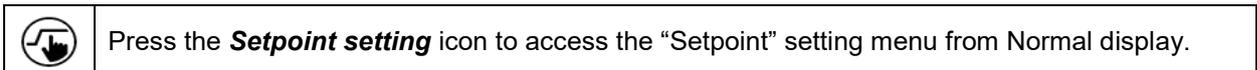
Select the setpoint you want to change.



Example: "Temperature" entry menu.

Enter the desired setpoint and confirm entry with **Confirm** icon

12.3 Special controller functions via operation lines

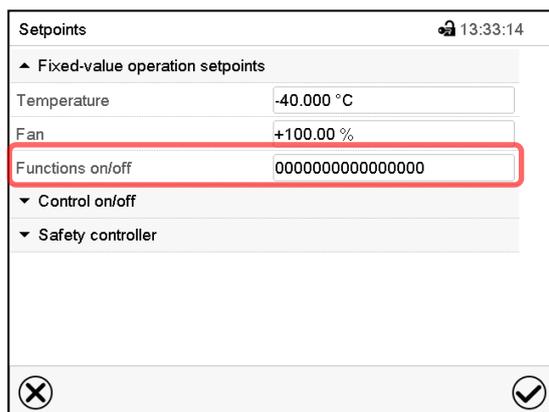


You can define the switching state of up to 16 operation lines (control contacts). They are used to activate / deactivate special controller functions.

- Operation line "Idle mode" activates / deactivates the operating mode "Idle mode".
- Operation lines "Switching output 1" up to "4" can be used to turn on and off any equipment connected to the zero-voltage switching outputs (DIN sockets (17) and (18) (option, chap. 25).
- Operation line "Compressed air valve" serves to open the solenoid valve of the compressed air connection (for optional compressed air connection, chap. 26.5)
- Operation line "Anti-condensation" serves to switch the anti-condensation protection (chap. 24).

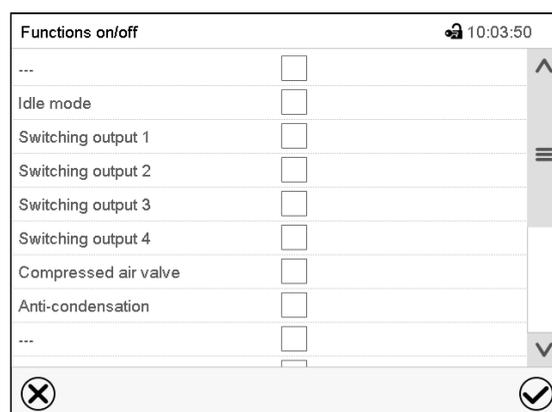
The other operation lines are without function.

Use the “Setpoints” menu to configure the operation lines.



“Setpoints” menu.

Select the field “Functions on/off”.



“Functions on/off” entry menu.

Mark / unmark the checkbox to activate / deactivate the desired function and press the **Confirm** icon

Activated operation line: switching status “1” (On)

Deactivated operation line: switching status “0” (Off)

The operation lines count from right to left.

Example:

Activated operation line “Switching output 3” = 0000000000000000**100**

Deactivated operation line “Switching output 3” = 0000000000000000**000**

13. Notification and alarm functions

13.1 Alarms via indicator light with integrated buzzer

Audible and visual signals alert the user to different operating states. This alarm is independent of the chamber controller.

The indicator light indicates three operating states as follows:

Indicator light green, steady light signal

- Normal operation
- All monitored parameters (temperature, O₂, H₂, CO) are below the threshold values for notification levels 1 and 2

Indicator light yellow, flashing signal

- Gas detection alarm threshold 1 triggered: At least one threshold value for notification level 1 has been exceeded
or
- Fault notification (cable break, sensor fault, deviation of the gas detection volumetric flow, etc.)
- Warning, CO₂ fire suppression device inactive.

Indicator light red, flashing signal

- Gas detection alarm threshold 2 triggered: At least one threshold value for notification level 2 has been exceeded
or
- Alarm threshold for temperature monitoring (rod controller) triggered: Threshold value of 120°C exceeded
or
- CO₂ fire suppression device activated by manual release
- The buzzer sounds.



Indicator light (6) with integrated buzzer (normal operation)

13.1.1 Connections and forwarding of notifications and alarms to customer systems

The following signals are available to the customer for further processing:

Terminal	Signal
1-2	Alarm threshold 1 O ₂ sensor (binary output)
3-4 bridged	Analog signal for O ₂ sensor (4 - 20 mA) 0 vol.-% - 35 vol.-% (detection limit 2 vol.-%)
5-6	Alarm threshold 1 H ₂ sensor (binary output)
7-8 bridged	Analog signal for H ₂ sensor (4 - 20 mA) 0 ppm -1000 ppm (detection limit 5 ppm)
9-10	Alarm threshold 1 CO sensor (binary output)
11-12 bridged	Analog signal for CO sensor (4 - 20 mA) 0 ppm - 300 ppm (detection limit 3 ppm)
13-14	Fault notification (binary output), e.g., wire break, sensor defect, flow meter, etc.
15-16	Indicator light green (binary output): Normal operation
17-18	Indicator light yellow (binary output): Alarm threshold 1 triggered, or fault notification
19-20	Indicator light red (binary output): Alarm threshold 2 triggered, fire suppression device activated
21-22	Inertization solenoid valve (binary input): Connection of customer-supplied control system for flushing/inertization control

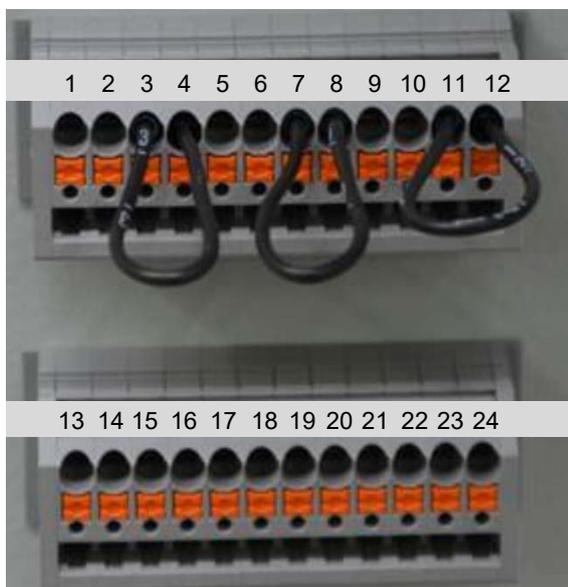


Figure 23: Terminal assignment



The bridges of the terminals may only be removed if the respective analog signal shall be used for transmission.

13.2 Notification and alarm messages overview on the MB2 chamber controller

During normal operation (indicator light green), no notification regarding the LIT safety equipment is displayed.

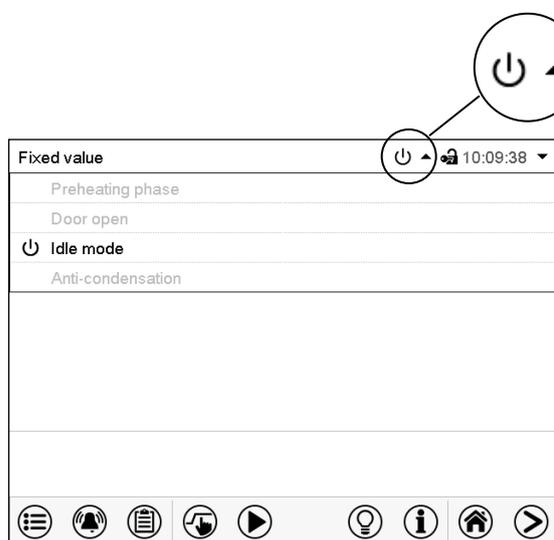
13.2.1 Notifications

Notifications are indicated by **information icons** displayed in the screen header in Normal display

An information icon serves as an indication of a certain condition.

If this condition persists, in some cases an alarm will be triggered after a fix or configurable interval. As long as the condition persists, the information icon therefore continues to be displayed also in state of alarm. If during alarm the conditions ends, e.g., if during a tolerance range alarm the actual value returns to within the tolerance range, the information icon disappears, whereas the alarm will continue until manual acknowledgement.

Press the flash icon next to the information icon to access the corresponding text information.



Normal display showing the text information.

The currently valid information texts are highlighted in black (example: "Idle mode")

Condition	Information icon	Text information	Start after condition occurred
1-hour preheating phase, no cooling function		"Preheating phase"	immediately
Open chamber door		"Door open"	immediately
The controller is in Idle mode (chap. 10.4).		"Idle mode"	immediately
Operation line "Anti-condensation" on. Anti-condensation protection is activated.		"Anti-condensation"	immediately

Notifications are not shown in the event list.

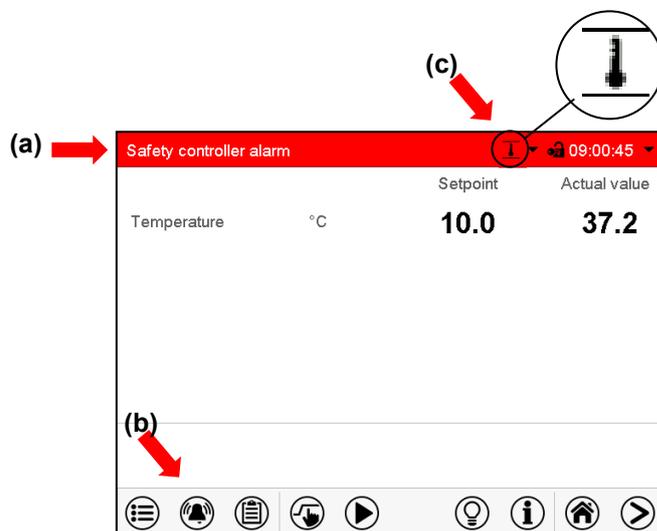
13.2.2 Alarm messages

Condition	Alarm message	Start after condition occurred
Open chamber door	"Door open"	after 5 minutes
Exceeded setpoint of the safety controller class 2	"Safety controller"	immediately
Exceeded maximum or minimum temperature (option temperature safety device class 2)	"Temperature safety device"	immediately
Temperature sensor defective	e.g. "- - - -" or "<-<-<" or ">->->"	immediately
Safety controller temperature sensor defective	"Safety controller sensor"	immediately
Fault in refrigerating machine. Contact BINDER service.	Compressor overcurrent	immediately
Indicator light off	LIT - Approval is missing	immediately
Indicator light yellow: Gas detection alarm threshold 1 triggered	LIT - Gas warning	immediately
Indicator light yellow: Fault notification, e.g., wire break, sensor defect, flow meter, etc.	LIT - Error	immediately
Indicator light red: CO ₂ fire suppression device triggered by gas detection alarm threshold 2 or temperature monitoring alarm threshold or manual triggering	LIT - Fire suppression	immediately

Alarm messages are displayed in the list of active alarms until acknowledging them. They are also shown in the event list.

13.2.3 State of alarm

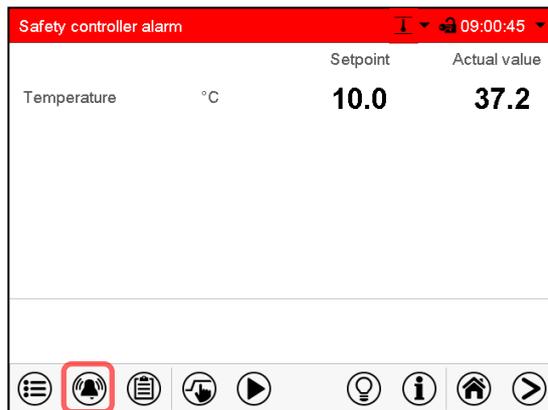
1. Visual indications in Normal display: alarm message, screen header flashing in red color
2. Audible alert, if the buzzer is enabled (chap. 13.2.5).



Normal display in state of alarm (example).

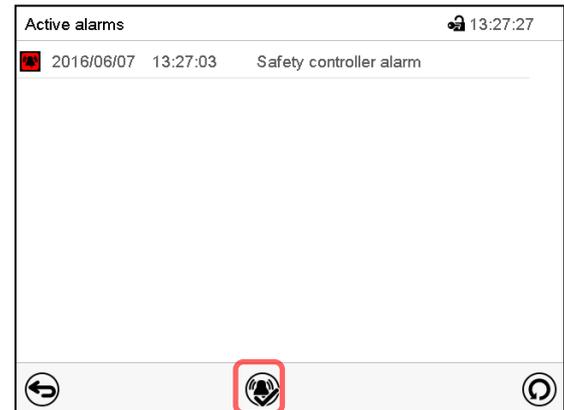
- (a) Screen header flashing in red color and showing the alarm message
- (b) **Alarm** icon on the bottom of the screen: change to the list of active alarms and alarm acknowledgement
- (c) If applicable, information icon in the screen header. Indication of a certain condition

13.2.4 Resetting an alarm, list of active alarms



Normal display in state of alarm (example).

Press the **Alarm** icon



List of active alarms.

Press the **Reset alarm** icon.

Pressing the **Reset alarm** icon mutes the buzzer for all active alarms. The icon then disappears.

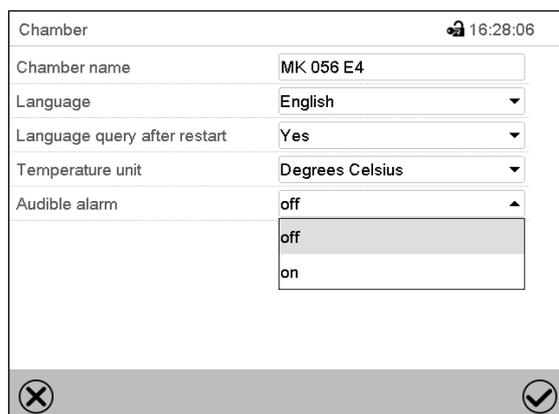
- Acknowledging while the alarm condition persists: Only the buzzer turns off. The visual alarm indication remains on the controller display. The alarm remains in the list of active alarms.

When the alarm condition has ended, the visual alarm indication is automatically cleared. The alarm is then no longer in the list of active alarms.

- Acknowledging after the alarm condition has ended: The buzzer and the visual alarm indication are reset together. The alarm is then no longer in the list of active alarms.

13.2.5 Activating / deactivating the audible alarm (alarm buzzer) of the MB2 controller

Path: [Main menu](#) > [Settings](#) > [Chamber](#)



“Chamber” submenu (example).

In the field “Audible alarm” select the desired setting “off” or “on” and press the **Confirm** icon.

14. Behavior when/after triggering of the CO₂ fire suppression device

When the chamber door is closed and the extraction system is connected, triggering the CO₂ fire suppression device does not endanger persons. Nevertheless, when the buzzer sounds and the red indicator light flashes, persons in the danger zone as defined by the operator must vacate the area and move to a safe place.

In order to avoid hazards to health, the operator must compile a risk assessment, which must define measures for safety and health protection. These measures could include structural, technical, or organizational measures.

Observe the relevant regulations, in particular DGUV-I 205-026 in Germany.

Record triggering of the CO₂ fire suppression device in the logbook.

To open the chamber, proceed as follows:

1. Ensure that there are no hazardous gases in the test space. These include, for example, CO₂ and N₂ at elevated concentrations as well as H₂, O₂, and other gases released from batteries. Ensure that ventilation measures are effective before opening the chamber. Take appropriate precautions to avoid inhalation of harmful gases and sparking.
2. Switch the main switch of the gas detection system off.
3. Turn off the battery test chamber and disconnect the power plug.
4. Ensure that the test object in the chamber is disconnected from the power supply.
5. Only then can the battery test chamber be opened.

Take suitable protective measures when removing the test material.

	 WARNING
<p>Danger of intoxication through contamination of the chamber with toxic, corrosive or chemically aggressive material. Danger of chemical burns due to contact with skin, inhalation, or contact with the eyes.</p> <p>Damages to health. Skin and eye damage. Environmental damage.</p> <ul style="list-style-type: none"> ➤ Take appropriate precautions when removing toxic, corrosive or chemically aggressive material. ➤ Wear protective gloves and goggles. ➤ Avoid skin contact with the test material and the interior of the chamber. 	

All cells in the cabinet could be damaged after a EUCAR hazard level 4 to 6 event and must be replaced before starting a new test

If the CO₂ fire suppression device has been triggered, a check must be carried out in each case to determine, depending on the fire or chamber damage, whether the chamber can still be used afterwards. For continued use, note the information in chap. 7.9.2 on handling the components of the CO₂ fire suppression device and the information in chap. 27.2 on cleaning the chamber.

15. Temperature safety devices

15.1 Over temperature protective device (class 1)

The chamber is equipped with an internal temperature safety device, class 1 acc. to DIN 12880:2007. It serves to protect the chamber and prevents dangerous conditions caused by major defects.

If the actual temperature exceeds the nominal temperature by approx. 20 °C, the over temperature protective device permanently turns off the chamber. The user cannot restart the chamber 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.

15.2 Temperature limiter class 2

A temperature limiter class 2 acc. to DIN 12880:2007 provides additional safety in the event of a fault. This is fixed at **120 °C**.

When this temperature is reached, the heating, cooling and fan of the test cabinet are switched off and the appliance controller remains on.

Resetting via a reset button not accessible to the user is always carried out by BINDER Service.

The adjustable safety controller class 2 and optional safety devices class 2 remain functional and offer additional protection against excessive temperatures for the chamber.

15.3 Overtemperature safety controller (adjustable temperature limiter class 2)

The chambers are regularly equipped with an electronic overtemperature safety controller (temperature safety device class 2 according to DIN 12880:2007). The safety controller is functionally and electrically independent of the temperature control system and serves to protect the chamber, its environment and the contents from exceeding the maximum permissible temperature.



With option temperature safety device class 3.3 (chap. 15.4), the safety controller is **not** used. In this case it must be set to the maximum temperature.

Please observe the regulations applicable to your country (for Germany: DGUV guidelines 213-850 on safe working in laboratories, issued by the employers' liability insurance association).

When the entered safety controller set-point is reached, the overtemperature safety controller turns off the heating, fan, and refrigeration system. This condition (state of alarm) is indicated visually and additionally with an audible alert if the buzzer is enabled (chap. 13.2.5). The alarm persists until the chamber cools down below the configured safety controller setpoint and the alarm is manually reset.



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



The safety controller only activates after the set-point has been reached once.

15.3.1 Safety controller modes

You can select between "Limit (absolute)" and "Offset (relative)" safety controller mode

- **Limit:** Absolute maximum permitted temperature value

This setting offers high safety as a defined temperature limit will not be exceeded. It is important to adapt the safety controller set-point after each modification of the temperature set-point. Otherwise, the limit could be too high to ensure efficient protection, or, in the opposite case, it could prevent the controller from reaching an entered set-point outside the limit range.

- **Offset:** Maximum overtemperature above any active temperature set point. The maximum temperature changes internally and automatically with every set-point change.

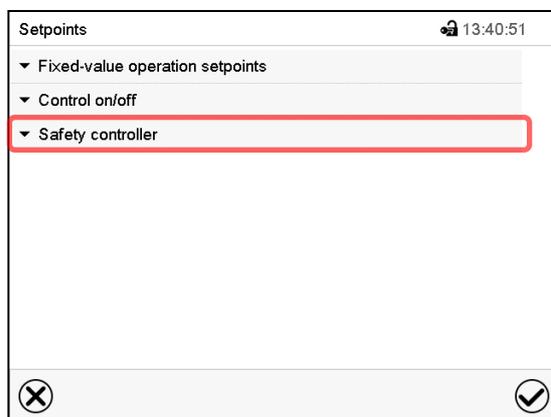
This setting is recommended for program operation. It is important to check the safety controller set-point and safety controller mode occasionally, as it does not offer a fix, independent limit temperature value, which would never be exceeded.

Example: Desired temperature value: 40 °C, desired safety controller value: 45 °C.
Possible settings for this example:

Temperature set point	Safety controller mode	Safety controller set-point
40 °C	Limit (absolute)	45 °C
	Offset (relative)	5 °C

15.3.2 Setting the safety controller

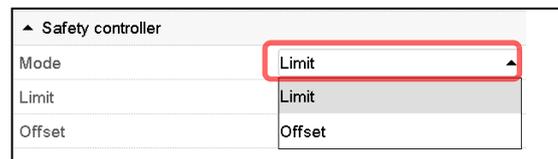
 Press the **Setpoint setting** icon to access the “Setpoint” setting menu from Normal display.



“Setpoints” menu.

Select the field “Safety controller” to access the settings.

- In the field “Mode” select the desired setting “Limit” or “Offset”.



- Select the corresponding field “Limit” or “Offset” according to the selected mode and enter the desired safety controller setpoint. Confirm entry with **Confirm** icon.

 Regularly check the safety controller setting for set-point type “Limit” or “Offset”

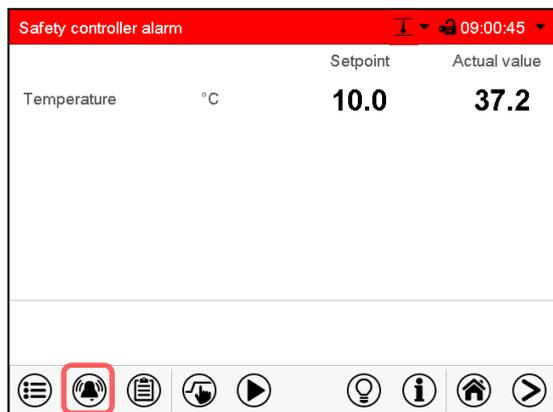
- in Fixed value operating mode according to the entered set-point temperature value
- in program mode according to the highest temperature value of the selected temperature program

Set the safety controller set-point by approx. 2 °C to 5 °C above the desired temperature set-point.

After completing the settings, press the **Confirm** icon to take over the entries and exit the menu, **or** press the **Close** icon to exit the menu without taking over the entries.

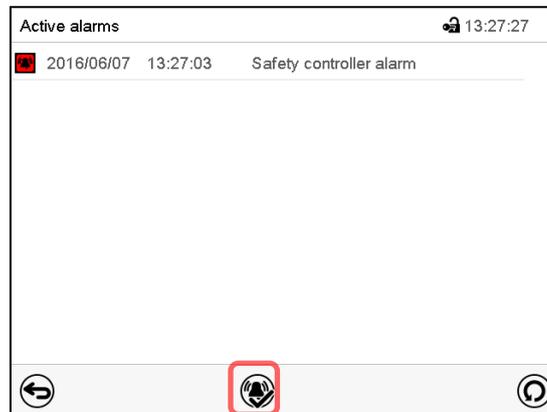
15.3.3 Message and measures in the state of alarm

The state of alarm is indicated visually in Normal display by the alarm message “Safety controller alarm” and the screen header flashing in red color. If the buzzer is enabled (chap. 13.2.5) there is an additional audible alert (chap. 13.2.3). The alarm remains active until it is acknowledged on the controller and the inner temperature falls below the set safety controller setpoint. Then the heating is released again.



Normal display with safety controller alarm.

Press the **Alarm** icon.



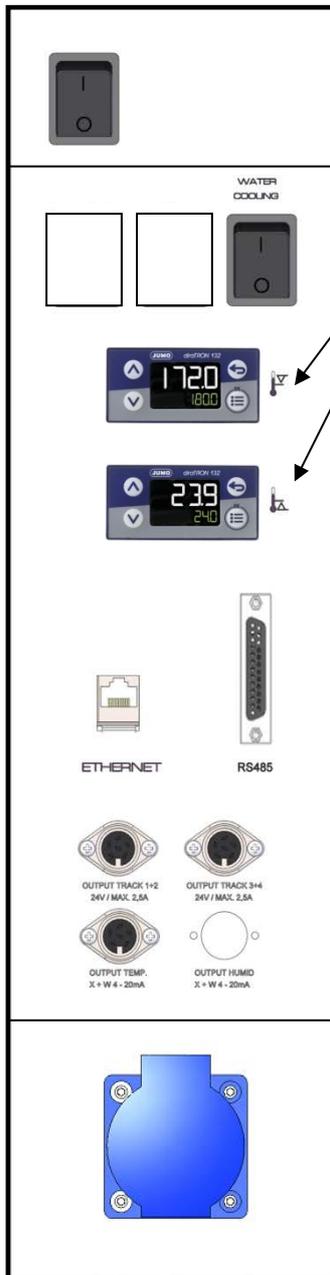
List of active alarms.

Press the **Reset alarm** icon.

15.3.4 Function check

Check the safety controller at appropriate intervals for its functionality. It is recommended that the authorized operating personnel should perform such a check, e.g., before starting a longer work procedure.

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



The over-/under temperature safety device (14) consists of two entry modules (14a) and (14b) located in the lateral control panel. Both modules can be set from $-50\text{ }^{\circ}\text{C}$ / $-58\text{ }^{\circ}\text{F}$ up to $200\text{ }^{\circ}\text{C}$ / $392\text{ }^{\circ}\text{F}$ and serve to define the maximum high and low temperature limits.



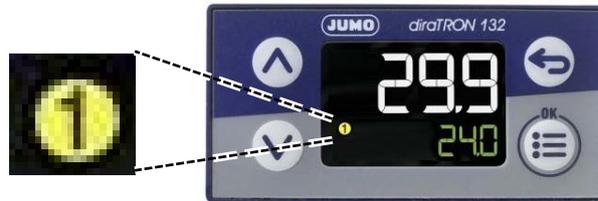
With this option, the safety controller (chap. 15.3) must be set to maximum temperature.

(14a) Upper module: Entry of the higher limit temperature.

(14b) Lower module: Entry of the lower limit temperature.

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

At the corresponding entry module, the pilot lamp "1" lights up.



The controller displays the alarm message "Temp. safety device" (chap. 13.2.2). Additionally there is an audible alert, provided that the buzzer has not been deactivated (chap. 13.2.5).

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

Then reset the alarm message on the controller (see chap. 13.2.4) to reactivate the chamber. The pilot lamp "1" goes off as soon as the temperature will again be below / above the threshold.

Setting limit temperatures at modules (14a) and (14b):



The upper line shows the actual temperature. The bottom line shows the set-point of the limit temperature.

- Press the arrow-up or arrow-down key

The display changes to entry mode: The set-point in the bottom line flashes

- Enter the desired limit temperature via the arrow keys and confirm with the "OK" button.
- Press the Back button.

The set-point in the bottom line stops flashing.

Function check:

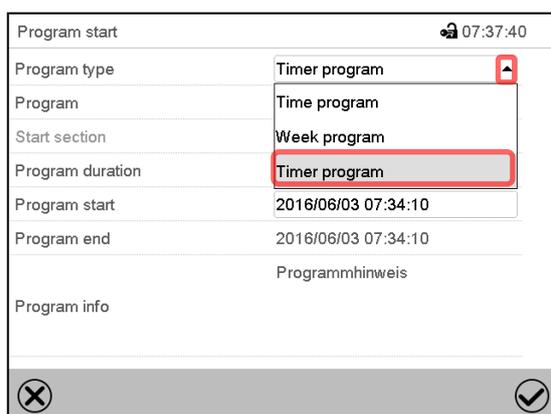
Check the over/under temperature safety device class 2 at appropriate intervals for its functionality. It is recommended that the authorized operating personnel should perform such a check, e.g., before starting a longer work procedure.

16. Timer program: stopwatch function

During an entered duration the controller constantly equilibrates to the setpoints entered in Fixed value operation mode (temperature, configuration of the operation lines). This duration can be entered as a “Timer program”. During the program runtime, any setpoint changes do not become effective; the controller equilibrates to the values which were active during program start.

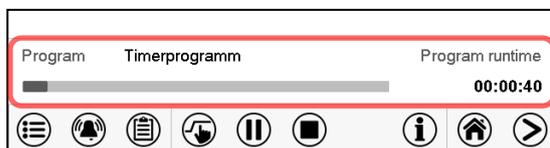
16.1 Starting a timer program

 In Normal display press the **Program start** icon to access the “Program start” menu.



“Program start” menu

- In the field “Program type” select “Timer program”.
- Select the field “Program duration” and enter the desired program duration. Press the **Confirm** icon.
- Select the field “Program start” and enter the desired start time of the program in the “Program start” entry menu. Press the **Confirm** icon. The program delay time until program start begins.



Normal display.

Information on the bottom of the screen indicates the currently running program and the time already passed. The grey bar shows how much time of the whole time is elapsed.

16.1.1 Performance during program delay time

During the configured program delay time until program start, the controller equilibrates to the current setpoints of Fixed value operation mode. Modifications of these setpoints are possible but become effective only after the timer program is finished. When the configured moment for program start is reached, the program delay time ends and the program starts running. The controller equilibrates to the values which had been active during program start

16.2 Stopping a running timer program

16.2.1 Pausing a running timer program

	Press the Program pause icon to interrupt the program.
---	---

The program is paused. The program runtime stops running down, the time display flashes.

There are the following options:

	Press the Program start icon to continue the program
	Press the Cancelling icon to cancel the program

16.2.2 Cancelling a running timer program

	Press the Program cancelling icon to cancel the program.
---	---

A confirmation prompt is displayed. Press the **Confirm** icon to confirm that the program shall really be cancelled.

After confirming the message the controller changes to Fixed value operation mode. The temperature will then equilibrate to the setpoints of Fixed value operation mode.

16.3 Performance after the end of the program



After the end of the program the message “Device changes to fixed value operation mode” appears on the screen.

Press the **Confirm** icon.

After confirming the message the controller changes to Fixed value operation mode. The temperature will then equilibrate to the setpoints of Fixed value operation mode.

17. Time programs

The MB2 program controller permits programming time programs with real-time reference. It offers 25 program memory positions with up to 100 program sections each.

For each program section you can enter a temperature set-point, section duration, type of temperature transition (ramp or step) and the tolerance range.



If the safety controller has been set to "limit" mode, check the setting of the safety controller when changing the temperature set-point, (chap. 15.3).

Programming remains saved in case of a power failure or after turning off the unit.

Path: [Main menu](#) > [Programs](#) > [Time program](#)

17.1 Starting an existing time program



In Normal display press the **Program start** icon to access the "Program start" menu.

Program start		🔔 08:07:19
Program type	Time program	▼
Program	program 1	▼
Start section	1	
Program duration		
Program start	2016/06/03 08:04:24	
Program end	2016/06/06 23:04:24	
Program info		
⊗ ✔		

"Program start" menu

- In the field "Program type" select the setting "Time program".
- In the field "Program" select the desired program.
- Select the field "Program start" and enter the desired program start time in the "Program start" entry menu. Press the **Confirm** icon. The program delay time until program start begins.

The program end is adapted automatically depending on the entered program duration.

After completing the settings, press the **Confirm** icon to take over the entries and exit the menu. The program starts running.

If instead you press the **Close** icon to exit the menu without taking over the entries, the program will not start.

Program	program 1	Program runtime
<div style="background-color: #cccccc; width: 100%; height: 10px;"></div>		00:01:23
☰ 🔔 📄 👇 ⏸ ⏹ ℹ 🏠 ➡		

Normal display. Information on the bottom of the screen indicates the currently running program and the time already passed. The grey bar shows how much time of the whole time is elapsed. If program duration has been set to infinite, the grey bar is not displayed.

17.1.1 Performance during program delay time

During the configured program delay time until program start, the controller equilibrates to the current setpoints of Fixed value operation mode. Modifications of these setpoints are effective. When the configured moment for program start is reached, the program delay time ends and the program starts running.

17.2 Stopping a running time program

17.2.1 Pausing a running time program

	Press the Program pause icon to interrupt the program..
---	--

The program is paused. The program runtime stops running down, the time display flashes.

There are the following options:

	Press the Program start icon to continue the program
	Press the Cancelling icon to cancel the program

17.2.2 Cancelling a running time program

	Press the Program cancelling icon to cancel the program.
---	---

A confirmation prompt is displayed. Press the **Confirm** icon to confirm that the program shall really be cancelled.

After confirming the message, the controller changes to Fixed value operation mode. The temperature will then equilibrate to the setpoints of Fixed value operation mode.

17.3 Performance after the end of the program



After the end of the program the message “Device changes to fixed value operation mode” appears on the screen.

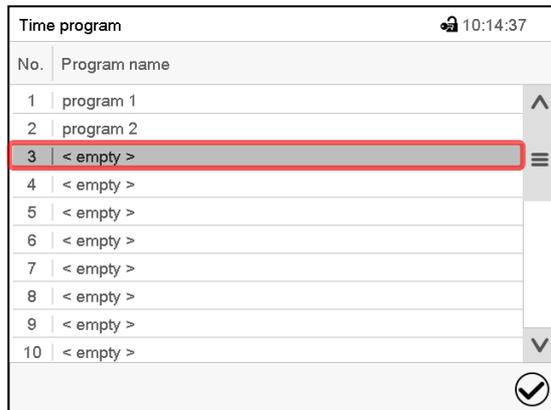
Press the **Confirm** icon.

As long as the message has not been confirmed, the setpoint of the last program section remains effective. Program the last section as desired. If e.g. heating and refrigeration shall turn off, activate operation line “Idle mode” in the last program section.

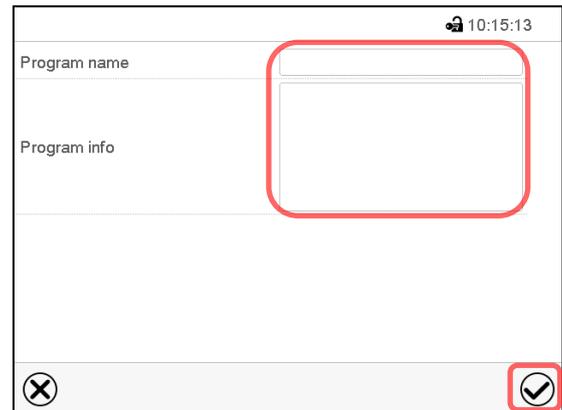
After confirming the message the controller changes to Fixed value operation mode. The temperature will then equilibrate to the setpoints of Fixed value operation mode.

17.4 Creating a new time program

Path: [Main menu](#) > [Programs](#) > [Time program](#)



“Time program” menu:
overview of the existing programs.
Select an empty program place.



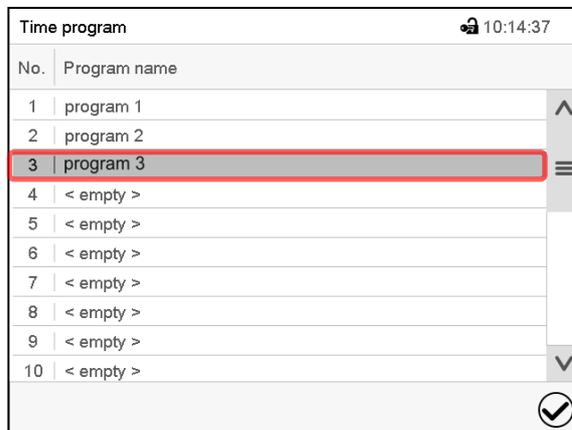
Enter the program name and, if desired, additional program information in the corresponding fields.

Press the **Confirm** icon.

The program view opens (chap. 17.5).

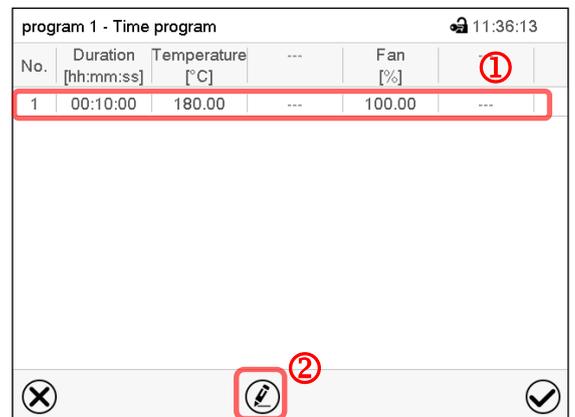
17.5 Program editor: program management

Path: [Main menu](#) > [Programs](#) > [Time program](#)



“Time program” menu:
overview of the existing programs.
Select an existing program (example: program 3) or create a new program (chap. 17.4).

The program view opens.

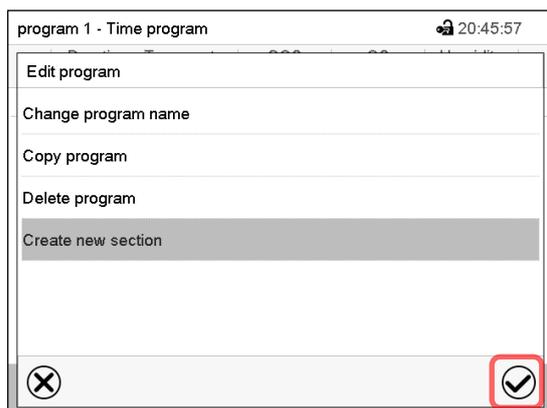


Program view (example: program 3).

If a new program has been created, there is just one program section.

There are the following options:

- ① Select a program section to open the section editor (chap. 17.6)
- ② Press the **Edit** icon to open the program editor

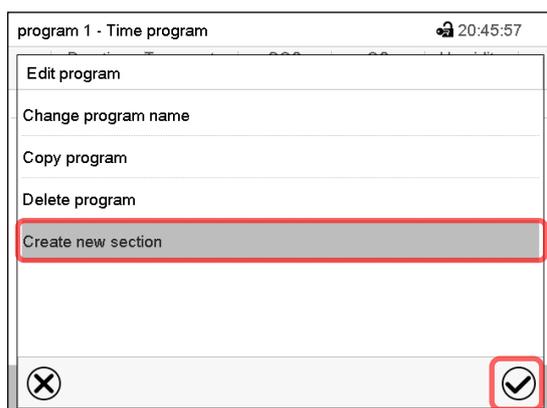


Program editor: "Edit program" menu

Select the desired function and press the **Confirm** icon.

The program editor offers following options:

- Change the program name
- Copy program
- Replace program: Replacing an new or an existing program with the copied program. This menu point is visible only after a program has been copied.
- Delete program
- Create new section



To add a new section, select "Create new section" and press the **Confirm** icon.

The program view opens.



No.	Duration [hh:mm:ss]	Temperature [°C]	...	Fan [%]	...
1	00:10:00	180.00	...	100.00	...
2	00:00:01	180.00	...	100.00	...

Program view.

A new section is always added at the very bottom (example: section 2).

17.5.1 Deleting a time program

Path: [Main menu](#) > [Programs](#) > [Time program](#)

In the "Time program" menu select the program to be deleted. The program view opens.



In the **program view** press the **Edit** icon to open the program editor



In the **program editor** select "Delete program" and press the **Confirm** icon.

The program is deleted. The controller returns to the program view.

17.6 Section editor: section management

Path: **Main menu > Programs > Time program**

Select the desired program.

No.	Duration [hh:mm:ss]	Temperature [°C]	---	Fan [%]	---
1	00:10:00	180.00	---	100.00	---
2	00:00:01	180.00	---	100.00	---

Program view.

Select the desired program section
(example: section 1)

program 1 - Section number 1		13:44:03
Duration	00:10:00	^
Course	Ramp	①
Functions on/off	0000000000000100	
Number of repetitions	0	②
Start section for repetition	1	
Temperature	+180.00	
Tolerance band min.	+0.0000	
Tolerance band max.	+0.0000	
Fan	100.00	②

Section view (example: section 1).

There are the following options:

- ① Select a parameter to enter or modify the according value (chap. 17.7)
- ② Press the **Edit** icon to open the program editor

program 1 - Section number 1		23:22:19
Edit section		
Copy section		
Delete section		
Create new section		

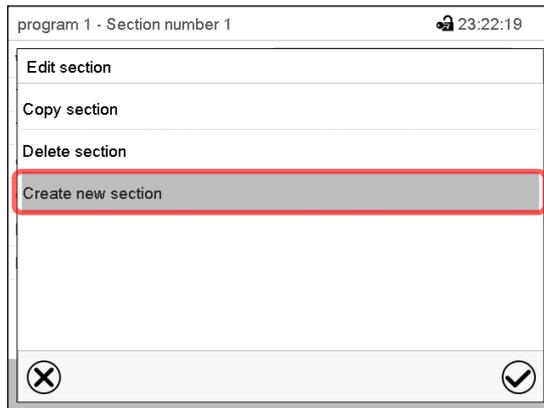
Section editor: "Edit section" menu

Select the desired function and press the **Confirm** icon.

The section editor offers following options:

- Copy section
- Replace section: Replacing an existing section with the copied section. This menu point is visible only after a section has been copied.
- Insert section: Adding the copied section. This menu point is visible only after a section has been copied.
- Delete section
- Create new section

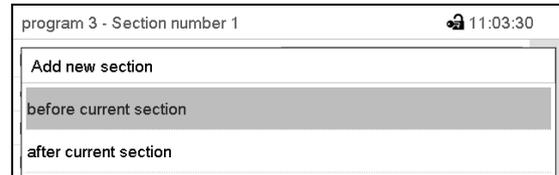
17.6.1 Add a new program section



Section editor: “Edit section” menu.

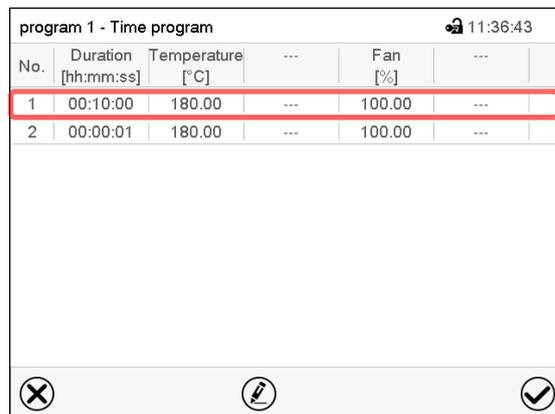
Select “Create new section” and press the **Confirm** icon.

Then select whether to insert the new section before or after the current section.



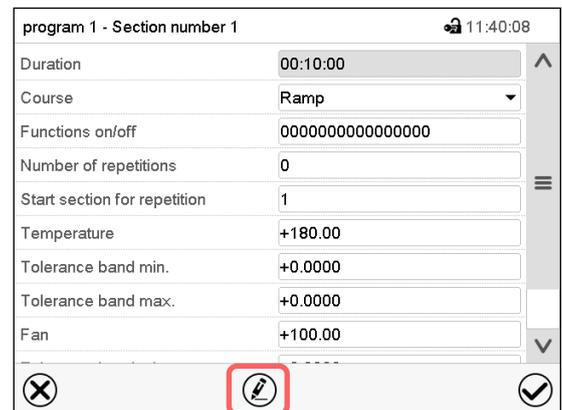
Press the **Confirm** icon. The new section opens.

17.6.2 Copy and insert or replace a program section



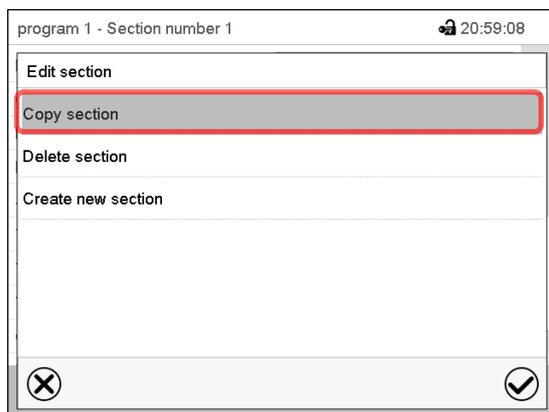
Program view.

Select the program section to be copied (example: section 1)



Section view (example: section 1).

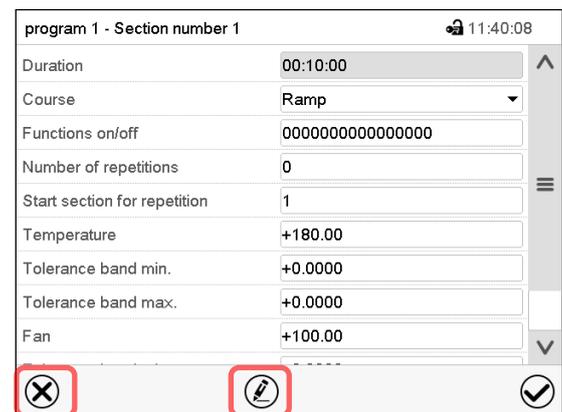
Press the **Edit** icon to open the section editor.



Section editor: “Edit section” menu

Select “Copy section” and press the **Confirm** icon. The current section (example: section 1) is copied.

The controller returns to the section view.



Section view (example: section 1).

Press the **Close** icon to change to the program view, if you want to select another section to be replaced or before or after which the copied section shall be inserted...

or

Press the **Edit** icon to open the section editor if you want the current section to be replaced or the copied section to be inserted before or after it

program 1 - Time program						🔒 11:36:43
No.	Duration [hh:mm:ss]	Temperature [°C]	---	Fan [%]	---	
1	00:10:00	180.00	---	100.00	---	
2	00:00:01	180.00	---	100.00	---	

Program view.

Select the section to be replaced or before or after which the copied section shall be inserted (example: section 2) and press the **Confirm** icon.

program 1 - Section number 1		🔒 11:40:08
Duration	00:10:00	↑
Course	Ramp	↓
Functions on/off	0000000000000000	
Number of repetitions	0	
Start section for repetition	1	
Temperature	+180.00	
Tolerance band min.	+0.0000	
Tolerance band max.	+0.0000	
Fan	+100.00	↓

Section view (example: section 1).

Press the **Edit** icon to open the section editor

program 1 - Section number 1		🔒 21:00:40
Edit section		
Copy section		
Replace section		
Insert section		
Delete section		
Create new section		

Section editor: "Edit section" menu

Select "Replace section" to replace the selected section with the copied section

or

Select "Insert section" to additionally add the copied section.

In this case select whether to insert it before or after the selected section.

Insert section	
before current section	
after current section	

Press the **Confirm** icon

17.6.3 Deleting a program section

In the **program view** select the program section to be deleted. The section view opens.

➔ In the **section view** press the **Edit** icon to open the section editor

➔ In the **section editor** select "Delete section" and press the **Confirm** icon.

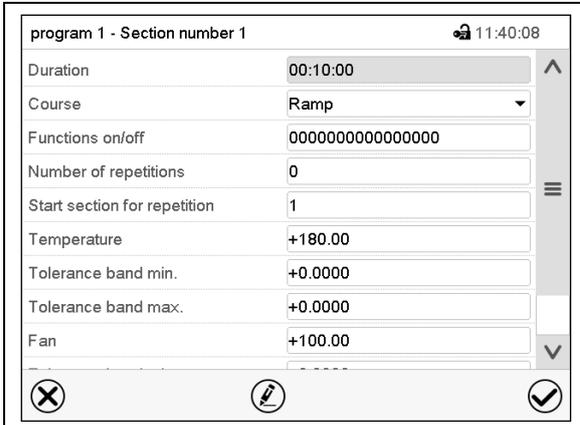
➔ The section is deleted. The controller returns to the section view.

17.7 Value entry for a program section

Path: [Main menu](#) > [Programs](#) > [Time program](#)

Select the desired program and section.

The section view gives access to all parameters of a program section. You can enter or modify the values.

	<table border="1"> <tr> <th>Program name and section number</th> </tr> <tr> <td>Section duration</td> </tr> <tr> <td>Type of setpoint transition: ramp or step</td> </tr> <tr> <td>Operation lines</td> </tr> <tr> <td>Repeating one or several sections within a program</td> </tr> <tr> <td>Temperature setpoint</td> </tr> <tr> <td>Temperature tolerance range: minimum and maximum</td> </tr> </table>	Program name and section number	Section duration	Type of setpoint transition: ramp or step	Operation lines	Repeating one or several sections within a program	Temperature setpoint	Temperature tolerance range: minimum and maximum
Program name and section number								
Section duration								
Type of setpoint transition: ramp or step								
Operation lines								
Repeating one or several sections within a program								
Temperature setpoint								
Temperature tolerance range: minimum and maximum								

The setting and control ranges for the individual parameters are the same as for “Fixed value” operating mode (chap. 12).

17.7.1 Section duration



Section view (partial view).

Select the field “Duration” indicating the time.



“Duration” entry menu.

Enter the desired section duration with the arrow keys and press the **Confirm** icon.

Setting range: 0 up to 99 hours 59 min 59 sec.

17.7.2 Set-point ramp and set-point step

You can define the type of temperature transitions for each individual program section.

“Ramp” mode: Gradual changes of temperature

The set-point of a given program section functions as the section’s start temperature. During the section’s duration, the set-point gradually passes to the set-point of the subsequent program section. The actual value follows the continually changing set-point.

If the last program section is in “ramp” mode and the setpoint shall change within this section, then you must program an additional section (with the shortest possible section duration) to provide the target temperature of the last program section. Otherwise, the setpoint would remain constant during the section’s duration.

Programming in the “ramp” mode allows all kinds of temperature transitions:

- Gradual changes of temperature
The setpoint changes its value gradually during the entered section duration. The actual value follows the continually moving set-point at any time.
- Program sections with constant temperature
The setpoints (initial values) of two subsequent program sections are identical; so the temperature remain constant during the entire duration of the first program section.
- Sudden changes of temperature
Steps can be programmed in ramp mode as temperature changes (ramps) that occur during a very short interval. If the duration of this transitional program section is very short (minimum entry 1 sec), the temperature change will proceed rapidly within the minimum amount of time.

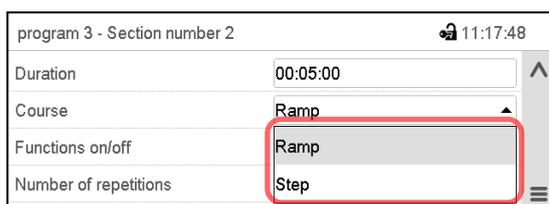
“Step” mode: Sudden changes of temperature

The set-point of any program section functions as the section’s target value. At the start of the program section, the unit heats up or cools down the chamber with the maximum speed to reach the entered value; and then it holds it for the remaining section time. Therefore the set-point temperature remains constant for the section’s duration. These changes occur rapidly within the minimum amount of time (minimum entry: 1 second).

Programming in the “step” mode allows only two kinds of temperature transitions:

- Programming gradual changes of temperature (ramps) is impossible in the “step” mode
- Program sections with constant temperature
The setpoints (target values) of two subsequent program sections are identical; so the temperature remain constant during the entire duration of the first program section.
- Sudden changes of temperature
The entered setpoint of the section is reached as fast as possible and then held constant for the remaining section duration.

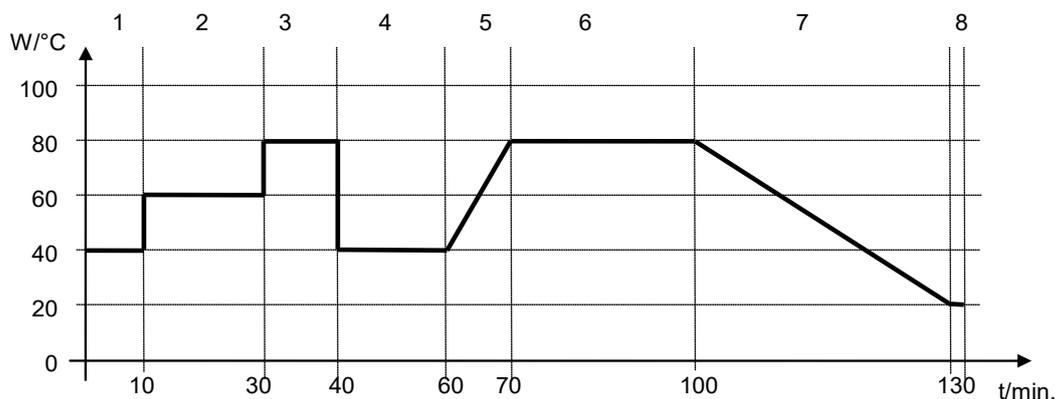
Selecting the setting “Ramp” or “Step”



Section view (partial view).

In the field “Course” select the desired setting “Ramp” or “Step”.

“Ramp” and “Step” mode example (representation of a temperature course)



Corresponding program table

Section No.	Duration [hh:mm:ss]	Temperature [°C]	Ramp or Step
1	00:10:00	40.0	Step
2	00:20:00	60.0	Step
3	00:10:00	80.0	Step
4	00:20:00	40.0	Step
5	00:10:00	40.0	Ramp
6	00:30:00	80.0	Ramp
7	00:30:00	80.0	Ramp
8	00:00:01	20.0	Ramp

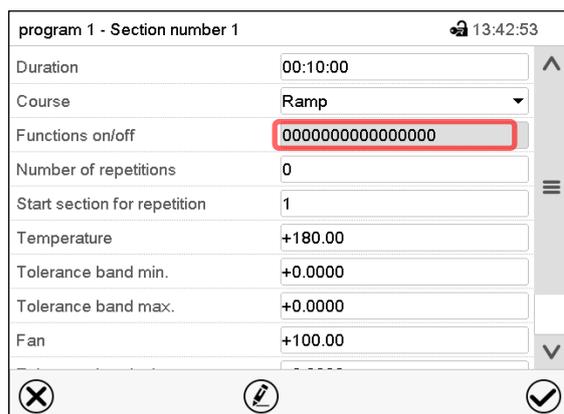
17.7.3 Special controller functions via operation lines

You can define the switching state of up to 16 operation lines (control contacts). They are used to activate / deactivate special controller functions.

- Operation line “Idle mode” activates / deactivates the operating mode “Idle mode”.
- Operation lines „Switching output 1“ up to „4“ can be used to turn on and off any equipment connected to the zero-voltage switching outputs (DIN sockets (17) and (18) (option, chap. 25).
- Operation line “Compressed air valve” serves to open the solenoid valve of the compressed air connection (for optional compressed air connection, chap. 26.5)
- Operation line “Anti-condensation protection” serves to switch the anti-condensation protection (chap. 24).

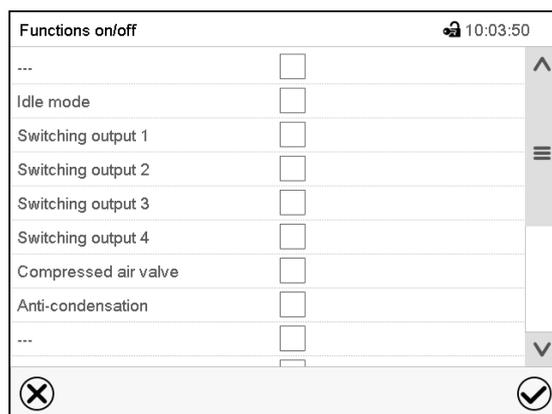
The other operation lines are without function.

Use the Section editor to configure the operation lines.



Section view.

Select the field "Functions on/off".



"Functions on/off" entry menu.

Mark / unmark the checkbox of the desired function to activate / deactivate it and press the **Confirm** icon.

The controller returns to the section view.

Activated operation line: switching status "1" (On)

Deactivated operation line: switching status "0" (Off)

The operation lines count from right to left.

Example:

Activated operation line "Switching output 3" = 00000000000000**100**

Deactivated operation line "Switching output 3" = 00000000000000**000**

17.7.4 Setpoint entry

- Select the field "Temperature" and enter the desired temperature setpoint.
 Setting range: -50 °C / -58°F up to 110 °C / 230 °F:
 Confirm entry with **Confirm** icon. The controller returns to the section view.

17.7.5 Tolerance range

You can specify a temperature program tolerance range for each program section with different values for the tolerance minimum and maximum. When the actual value exceeds the given threshold, the program is interrupted. This is indicated on the display (see below). When the actual temperature is situated again within the entered tolerance limits, the program automatically continues. Therefore, the duration of the program may be extended due to the programming of tolerances.

	Programming of tolerances may extend program duration.
---	--

An entry of “-99999” for the tolerance minimum means “minus infinite” and an entry of “999999” for the tolerance maximum means “plus infinite”. Entry of these values will never lead to program interruption. The entry of “0” for the tolerance minimum and/or maximum deactivates the respective tolerance function.

When requesting rapid value transitions, we recommend not programming tolerance values in order to enable the maximum heating-up or cooling-down speed.

program 1 - Section number 1		13:44:03
Duration	00:10:00	^
Course	Ramp	v
Functions on/off	0000000000000100	
Number of repetitions	0	≡
Start section for repetition	1	
Temperature	+180.00	
Tolerance band min.	+0.0000	
Tolerance band max.	+0.0000	
Fan	+100.00	v

✕
⚡
✓

Section view, showing the temperature tolerance band.

- Select the field “Tolerance band min” and enter the desired lower tolerance band value. Setting range: -99999 to 99999. Confirm entry with **Confirm** icon. The controller returns to the section view.
- Select the field “Tolerance band max” and enter the desired upper tolerance band value. Setting range: -99999 to 99999. Confirm entry with **Confirm** icon. The controller returns to the section view.

If the actual temperature value is outside the program tolerance range the whole program course is interrupted. During this program interruption time the controller equilibrates to the set-points of the current section.

The screen header indicates “Program pause (tolerance band)”. The program runtime indication flashes and does not proceed any further.

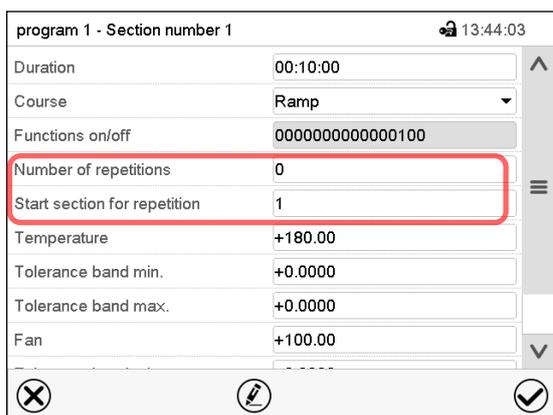
When the actual temperature value is back within the entered program tolerance range, the program continues automatically.

17.7.6 Repeating one or several sections within a time program

You can repeat several subsequent sections together. It is not possible to define the start section the same time also as the target section, therefore you cannot repeat a single individual section.

Enter the desired number of repetitions in the field „Number of repetitions“ and the number of the section to start the repetition cycle with in the field “Start section for repetition” To have sections repeated infinitely, enter the number of repetitions as “-1”.

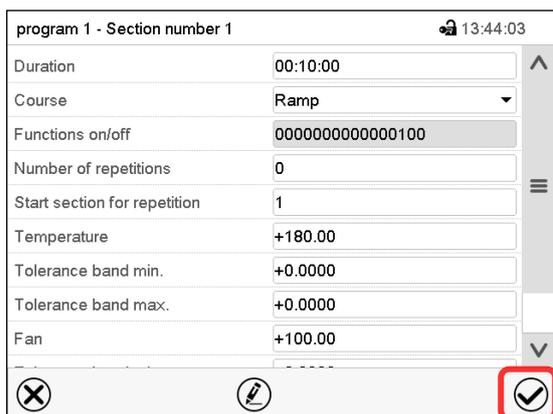
The selected sections are repeated as many times as selected. Then the program continues.



Section view, showing the repetition function.

- Select the field “Number of repetitions” and enter the desired number of repetitions. Setting range: 1 to 99, and -1 for infinite. Confirm entry with **Confirm** icon. The controller returns to the section view.
- Select the field “Start section for repetition” and enter the section number, at which the repetition should start. Setting range: 1 up to the section before the currently selected section. Confirm entry with **Confirm** icon. The controller returns to the section view.

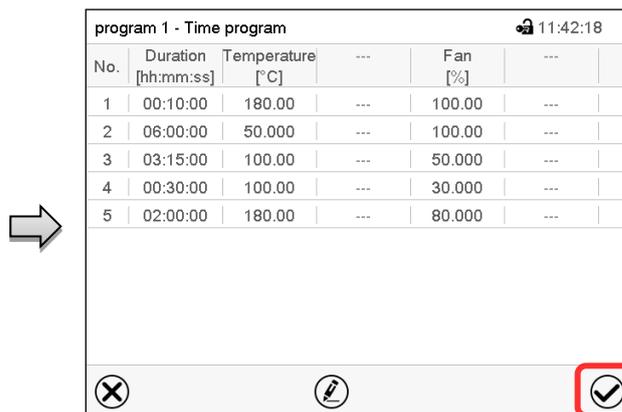
17.7.7 Saving the time program



Section view.

After the all desired values of the program section have been configured, press the **Confirm** icon to take over the programming.

The controller changes to the program view.



Program view.

Press the **Confirm** icon to take over the programming.

The controller changes to the Normal display.

To save the programming it is absolutely required to press the **Confirm** icon. Otherwise all settings will be lost! There is no confirmation prompt!

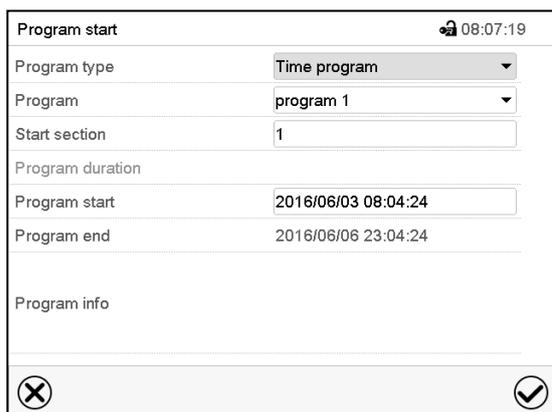
18. Week programs

The MB2 program controller permits programming week programs with real-time reference. It offers 5 week program places in total with up to 100 shift points for each week program.

Path: [Main menu > Programs > Week program](#)

18.1 Starting an existing week program

 In Normal display press the **Program start** icon to access the “Program start” menu.



“Program start” menu.

- In the field “Program type” select the setting “Week program”.
- In the field “Program” select the desired program.
- There are no further settings available in the “Program start” menu for week programs, as they are needed only for time programs.

After completing the settings, press the **Confirm** icon to take over the entries and exit the menu. The program starts running.

If instead you press the **Close** icon to exit the menu without taking over the entries, the program will not start.

After starting the week program, the previously entered week program setpoints are active and will be equilibrated according to the current time.



Information on the bottom of the screen indicates the currently running program.

18.2 Cancelling a running week program

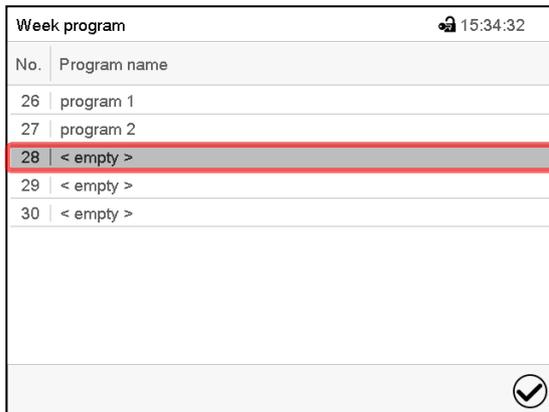
 Press the **Program cancelling** icon to cancel the program.

A confirmation prompt is displayed. Press the **Confirm** icon to confirm that the program shall really be cancelled.

After confirming the message the controller changes to Fixed value operation mode. The temperature will then equilibrate to the setpoints of Fixed value operation mode.

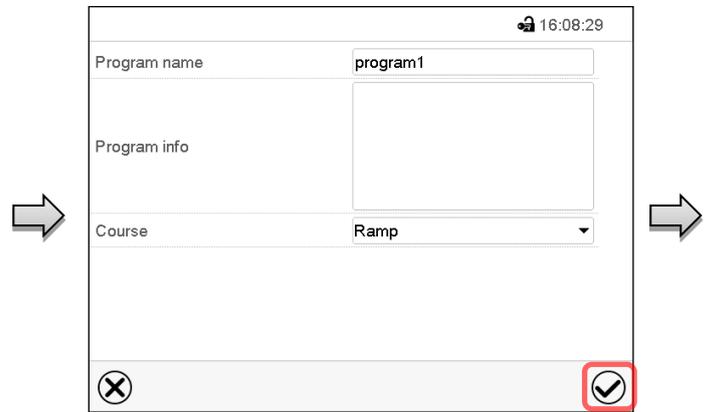
18.3 Creating a new week program

Path: [Main menu](#) > [Programs](#) > [Week program](#)



No.	Program name
26	program 1
27	program 2
28	< empty >
29	< empty >
30	< empty >

“Week program” menu:
overview of the existing programs.
Select an empty program place.



Program name:

Program info:

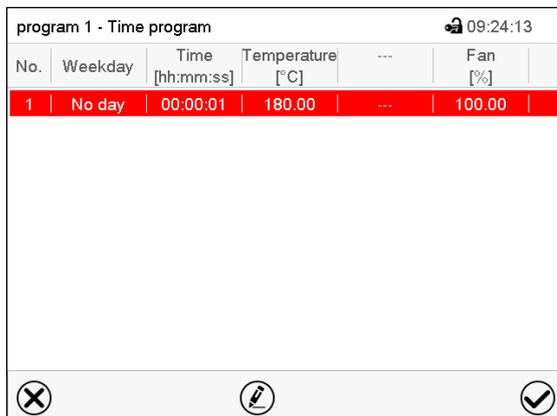
Course:

Enter the program name and, if desired, additional program information in the corresponding fields.

Select the set-point course “Ramp” or “Step” (chap. 18.6.1).

Press the **Confirm** icon.

The program view opens.



No.	Weekday	Time [hh:mm:ss]	Temperature [°C]	---	Fan [%]
1	No day	00:00:01	180.00	---	100.00

Program view.

For the first section no weekday is specified. Therefore the section is first marked in red and cannot be saved.

18.4 Program editor: program management

Path: **Main menu > Programs > Week program**

No.	Program name
26	program 1
27	program 2
28	< empty >
29	< empty >
30	< empty >

“Week program” menu:
overview of the existing programs.
Select an existing program (example: program 1).

No.	Weekday	Time [hh:mm:ss]	Temperature [°C]	...	Fan [%]
1	Wednesday	11:30:00	180.00	...	100.00
2	Friday	06:00:00	100.00	...	80.000

Program view (example: program 1).
If a new program has been created, there is just one program section.

There are the following options:

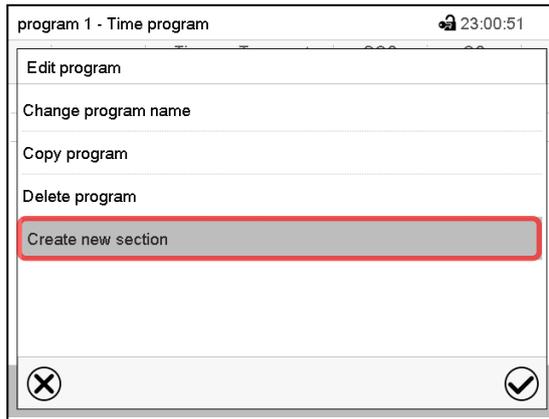
- ① Select a program section to open the section editor (chap. 18.5)
- ② Press the **Edit** icon to open the program editor

Edit program	
Change program name	
Copy program	
Delete program	
Create new section	

Program editor: “Edit program” menu.
Select the desired function and press the **Confirm** icon.

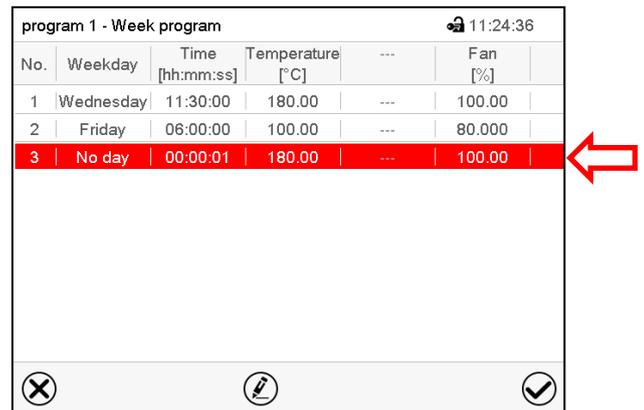
The program editor offers following options:

- Change program name. This menu also offers to configure the ramp / step mode setting (chap. 18.6.1).
- Copy program
- Replace program: Replacing an new or an existing program with the copied program. This menu point is visible only after a section has been copied.
- Delete program
- Create new section



To add a new section, select “Create new section” and press the **Confirm** icon.

The program view opens.



No.	Weekday	Time [hh:mm:ss]	Temperature [°C]	---	Fan [%]
1	Wednesday	11:30:00	180.00	---	100.00
2	Friday	06:00:00	100.00	---	80.000
3	No day	00:00:01	180.00	---	100.00

Program view.

With a new section no weekday is specified. Therefore the section is first marked in red and cannot be saved.

A new section is always added at the very bottom (example: section 3). When the section start is specified the sections are automatically arranged in the correct chronological order.

18.4.1 Deleting a week program

Path: [Main menu](#) > [Programs](#) > [Week program](#)

In the “Week program” menu select the program to be deleted. The program view opens.



In the **program view** press the **Edit** icon to open the program editor



In the **program editor** select “Delete program” and press the **Confirm** icon.

The program is deleted. The controller returns to the program view.

18.5 Section editor: section management

Path: [Main menu](#) > [Programs](#) > [Week program](#)

Select the desired program.

No.	Weekday	Time [hh:mm:ss]	Temperature [°C]	...	Fan [%]
1	Wednesday	11:30:00	180.00	---	100.00
2	Friday	06:00:00	100.00	---	80.000

Program view.

Select the desired program section (example: section 1)



program 1 - Section number 2		🔒 11:23:53
Weekday	Wednesday	
Time	11:30:00	①
Temperature	+180.00	
Fan	+100.00	
Functions on/off	0000000000000000	

Section view (example: section 1).

There are the following options:

- ① Select a parameter to enter or modify the according value (chap. 18.6)
- ② Press the **Edit** icon to open the program editor



program 1 - Section number 1		🔒 23:22:19
Edit section		
Copy section		
Delete section		
Create new section		

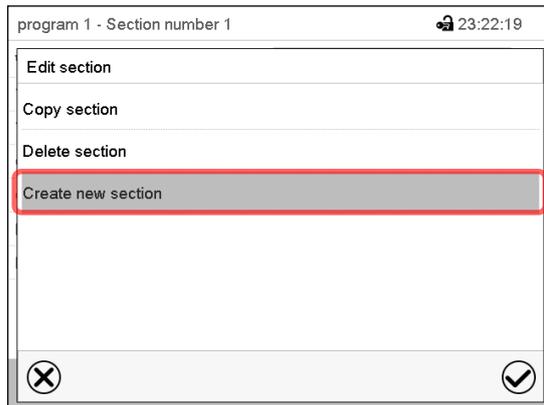
Section editor: "Edit section" menu

Select the desired function and press the **Confirm** icon.

The section editor offers following options:

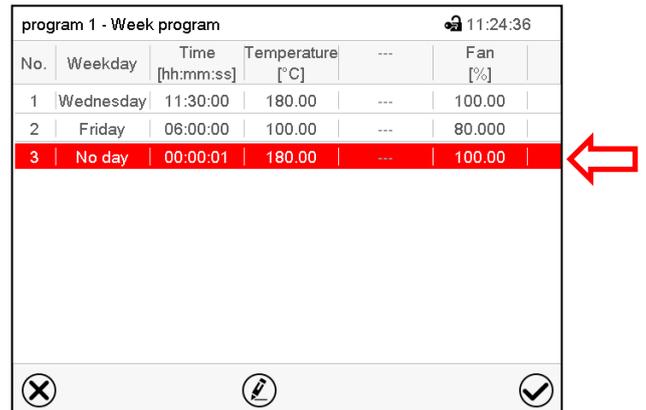
- Copy section
- Replace section: Replacing an existing section with the copied section. This menu point is visible only after a section has been copied.
- Insert section: Adding the copied section. This menu point is visible only after a section has been copied.
- Delete section
- Create new section

18.5.1 Add a new program section



Section editor: “Edit section” menu.

Select “Create new section” and press the **Confirm** icon.

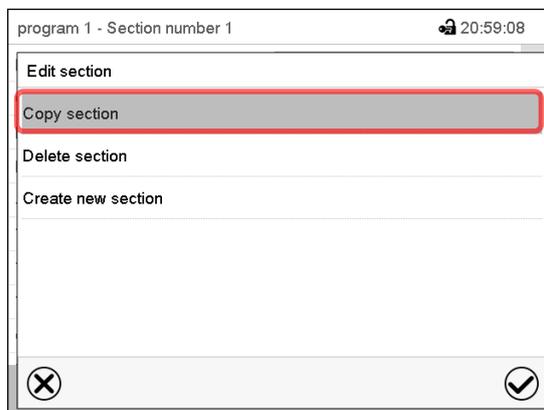


Program view.

With a new section no weekday is specified. Therefore the section is first marked in red and cannot be saved.

A new section is always added at the very bottom (example: section 3). When the section start is specified the sections are automatically arranged in the correct chronological order.

18.5.2 Copy and insert or replace a program section

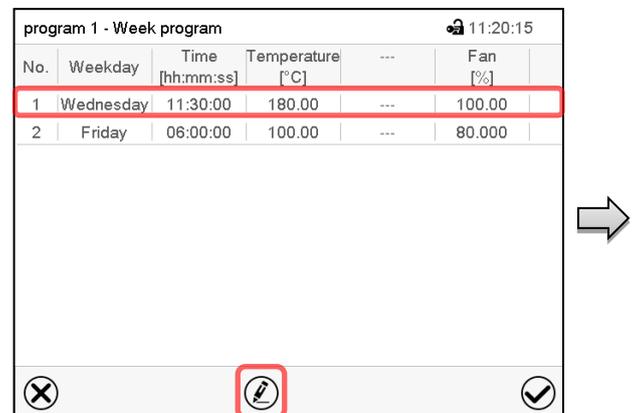


Section editor: “Edit section” menu

Select “Copy section” and press the **Confirm** icon.

The current section (example: section 1) is copied.

The controller returns to the program view.

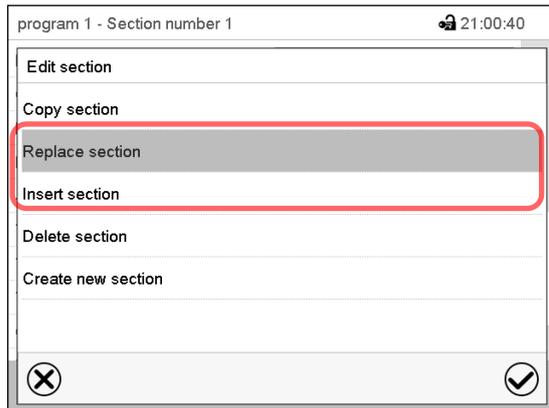


Program view

Select the section to be replaced or before or after which the copied section shall be inserted (example: section 2).

Press the **Confirm** icon

The controller returns to the section editor



Section editor: “Edit section” menu

Select “Replace section” to replace the selected section with the copied section

or

Select “Insert section” to additionally add the copied section.

Press the **Confirm** icon.

If you selected “Insert section” the sections are automatically arranged in the correct chronological order.

18.5.3 Deleting a program section

In the **program view** select the program section to be deleted. The section view opens.



In the **section view** press the **Edit** icon to open the section editor



In the **section editor** select “Delete section” and press the **Confirm** icon.

The section is deleted. The controller returns to the section view.

18.6 Value entry for a program section

Path: [Main menu > Programs > Week program](#)

Select the desired program and section.

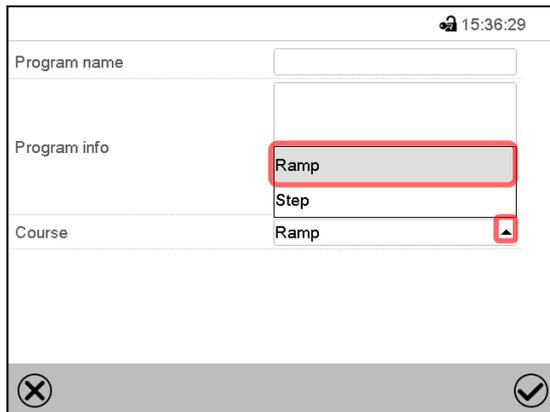
The setting and control ranges for the individual parameters are the same as for “Fixed value” operating mode (chap. 12).

18.6.1 Set-point ramp and set-point step modes

The explanation of the settings “Ramp” or “Step” is given in chap. 17.7.2.

You can define the type of temperature transitions for the entire week program.

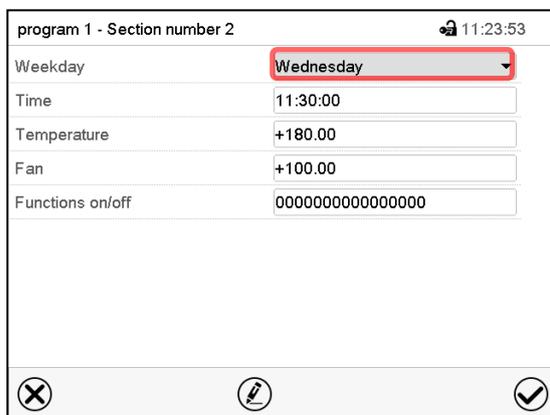
Select the desired program and press the **Edit** icon to open the program editor. In the program editor select the “Change program name” function and press the **Confirm** icon.



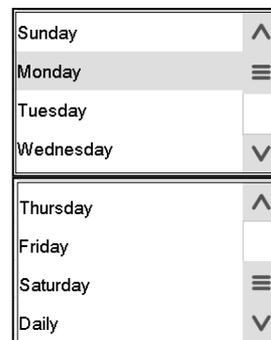
“Change program name” menu.

In the field “Course” select the desired setting “Ramp” or “Step” and press the **Confirm** icon.

18.6.2 Weekday



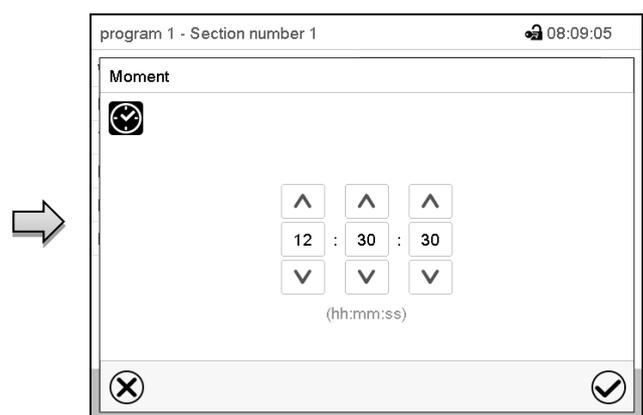
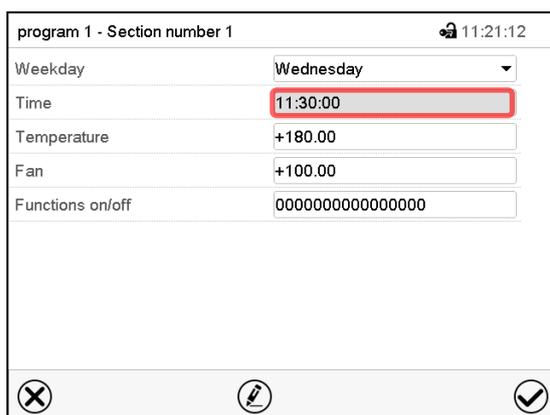
In the field “Weekday” select the desired weekday.



Section view.

With “Daily” selected, this section will run every day at the same time.

18.6.3 Start time



Section view.

Entry menu “Moment”.

Select the field “Moment”.

Select with the arrow keys the desired start moment of the section and press the **Confirm** icon.

18.6.4 Setpoint entry

- Select the field “Temperature” and enter the desired temperature setpoint.
Setting range: -50 °C / -58 °F up to 110 °C / 230 °F :
Confirm entry with **Confirm** icon. The controller returns to the section view.

18.6.5 Special controller functions via operation lines

You can define the switching state of up to 16 operation lines (control contacts). They are used to activate / deactivate special controller functions.

- Operation line “Idle mode” activates / deactivates the operating mode “Idle mode”.
- Operation lines „Switching output 1“ up to „4“ can be used to turn on and off any equipment connected to the zero-voltage switching outputs (DIN sockets (17) and (18) (option, chap. 25).
- Operation line “Compressed air valve” serves to open the solenoid valve of the compressed air connection (for optional compressed air connection, chap. 26.5)
- Operation line “Anti-condensation protection” serves to switch the anti-condensation protection (chap. 24).

The other operation lines are without function.

Select the desired program and section. You can set the operation lines in the “Functions on/off” field.

For details please refer to chap. 17.7.3.

19. User management

19.1 Authorization levels and password protection

The available functions depend on the current authorization level “Master”, “Service”, “Admin” or “User”.

The authorization levels are hierarchical: Every authorization includes all functions of the next lower level.

“Master” authorization level

- Highest authorization level, only for developers
- Extensive authorization for controller operation and configuration, outputs/inputs, alarm settings, parameter sets and operating ring display
- All passwords can be changed in the “log out” submenu (chap. 19.3).

“Service” authorization level

- Authorization level only for BINDER service
- Extensive authorization for controller operation and configuration, access to service data
- The passwords for “Service”, “Admin” and “User” authorization levels can be changed in the “log out” submenu (chap. 19.3).

“Admin” authorization level

- Expert authorization level, for the administrator
- Authorization for controller configuration and network settings and for operating those controller functions required for operating the chamber. Restricted access to service data.
- Password (factory setting): “2”.
- The passwords for “Admin” and “User” authorization levels can be changed in the “log out” submenu (chap. 19.3).

“User” authorization level

- Standard authorization level for the chamber operator
- Authorization for operating the controller functions required for operating the chamber.
- No authorization for controller configuration and network settings. The “Settings” and “Service” submenus of the main menu are not available.
- Password (factory setting): “1”
- The password for the “User” authorization level can be changed in the “log out” submenu (chap. 19.3).

As soon as a password has been assigned for an authorization level, the access to this level and the related controller functions are only available after log-in with the appropriate password.

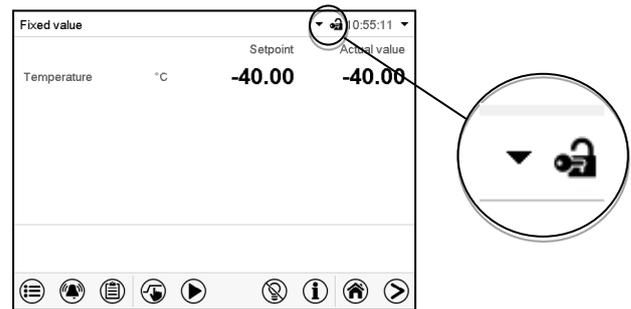
If for an authorization level no password is assigned, the related controller functions of this level are available for every user without login.

If passwords have been assigned for all authorization levels, access to the controller functions is locked without login.

Operation after user login

At user login, the authorization level is selected and confirmed by entering the respective password.

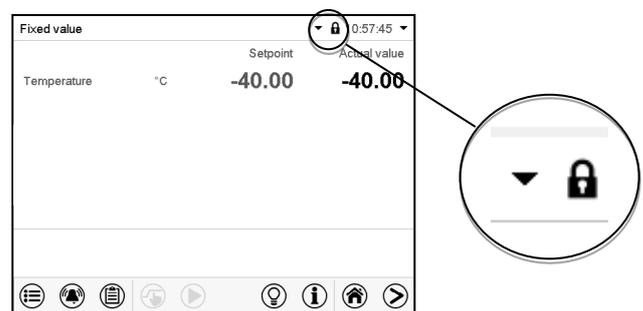
Following user login, controller operation is available, recognizable by the open-lock icon in the header. The available controller functions correspond to the user's authorization level.



Password protection activated for all levels: operation without user login is locked

If passwords have been assigned for all authorization levels, the controller is locked without registration of a user.

As long as no user is registered, controller operation is locked, recognizable at the closed-lock icon in the header. This requires that the user management has been activated by the assignment of passwords for the individual authorization levels.



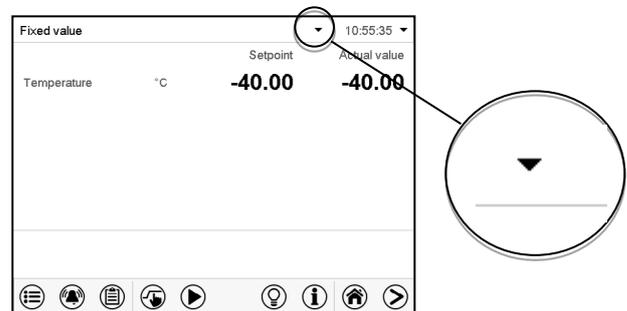
Password protection for at least one level deactivated: operation without user login is possible

If passwords have not been assigned for all authorization levels, after turning on the chamber there are those controller functions available, which correspond to the highest authorization level without password protection.

No lock icon is shown in the display header.

User login is neither required nor possible.

To activate the password protection and user login, perform new password assignment (chap. 19.5.3).



Information window

To check the authorization level of the user currently logged-in, select in Normal display the arrow far right in the display header.

Fixed value		14:19:52	
	Setpoint	Actual value	
Temperature	°C	40.0	40.0

The information window shows date and time, the controller's free memory space and under "Authorization" the authorization level of the current user.

If passwords have been assigned for all authorization levels, a user without login (password entry) has no authorization. There are only viewing functions available.

Fixed value		14:32:10	
Tuesday, 2016/05/24		Free storage: 98%	
Authorization:			

Display when all authorization levels are password protected and no user has logged in:

No authorization level is displayed.

If passwords have been assigned only for some of the authorization levels, a user without login (password entry) has access to the functions of the highest authorization level without password protection.

Fixed value		14:29:26	
Tuesday, 2016/05/24		Free storage: 98%	
Authorization: Admin			

Display when only some of the authorization levels are password protected (example: no protection for the "User" and "Admin" levels) and no user has logged in:

The user's effective authorization (due to lack of password protection) is shown.

Example: user with "Admin" authorization.

If passwords have been assigned for some or all of the authorization levels, user login (password entry) provides the authorization for the corresponding password-protected level.

Fixed value		14:29:26	
Tuesday, 2016/05/24		Free storage: 98%	
Authorization: Admin			

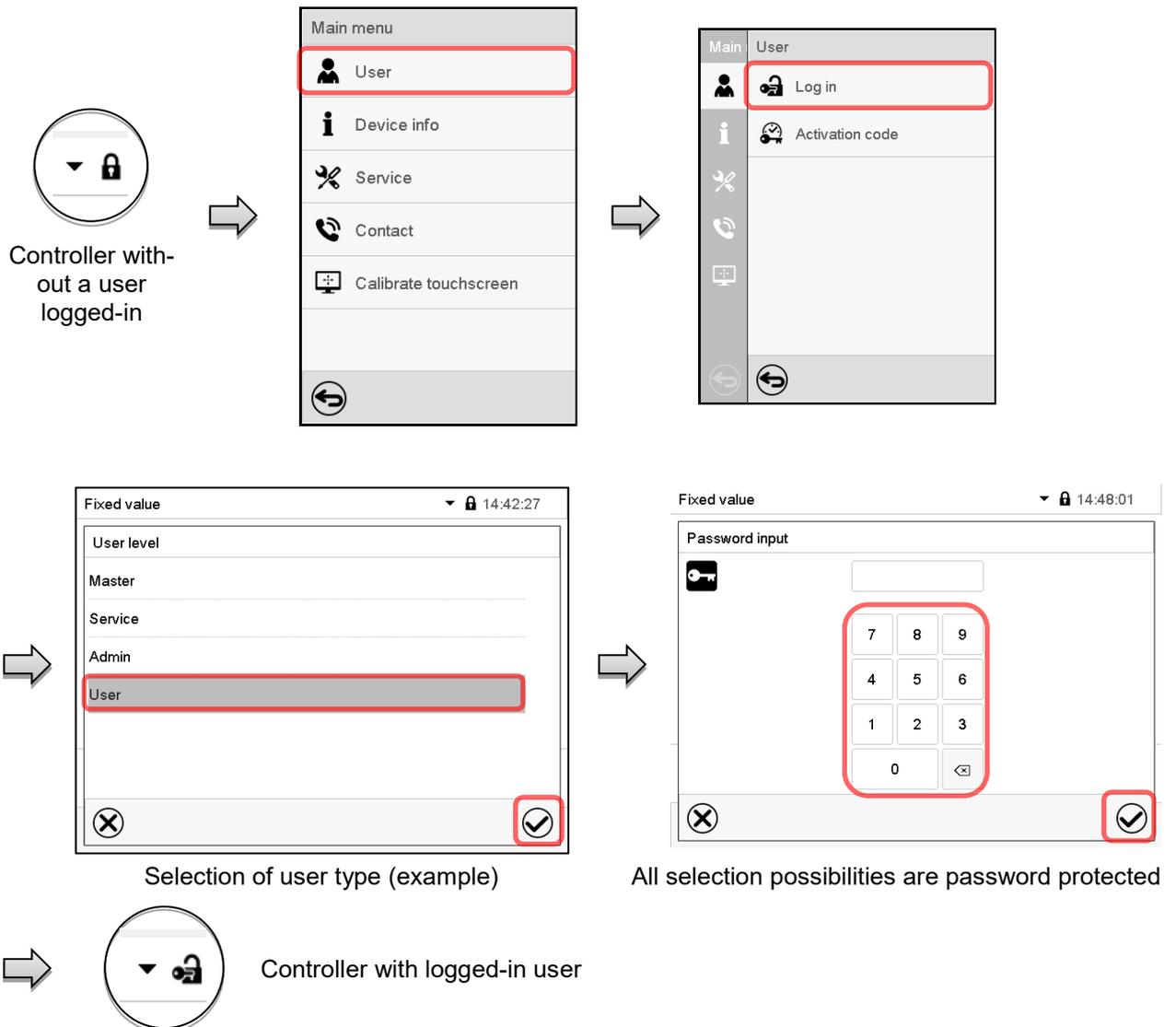
Display when at least some of the authorization levels are password protected and a user has logged in.

The user's authorization (by password entry) is shown.

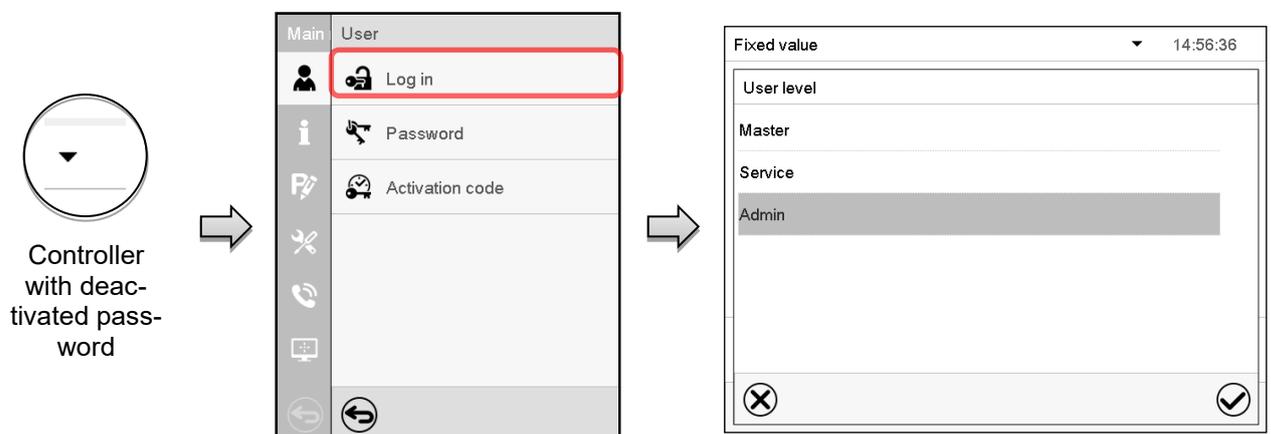
Example: user with "Admin" authorization.

19.2 Log in

Path: *Main menu > User > Log in*



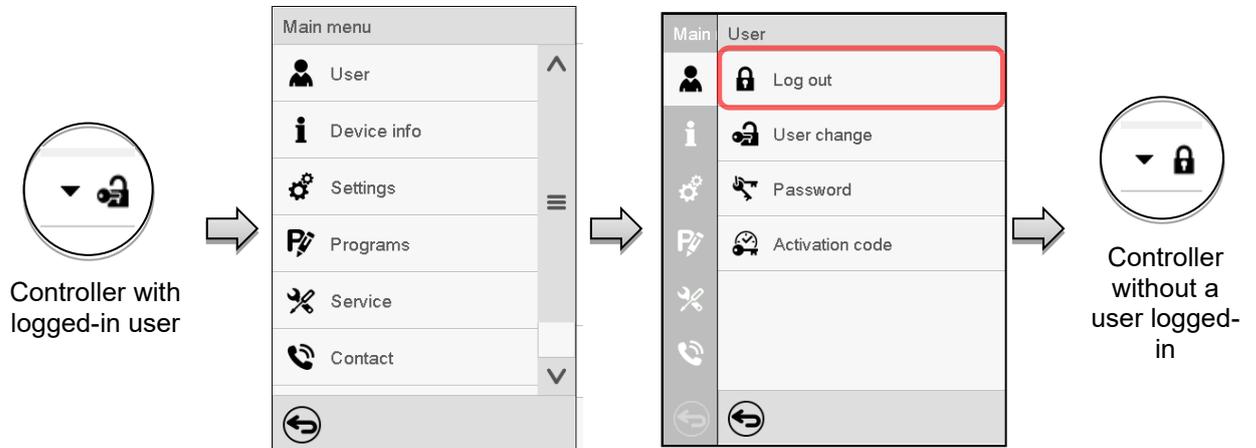
After completing the settings, press the **Confirm** icon to take over the entries and exit the menu, **or** press the **Close** icon to exit the menu without taking over the entries.



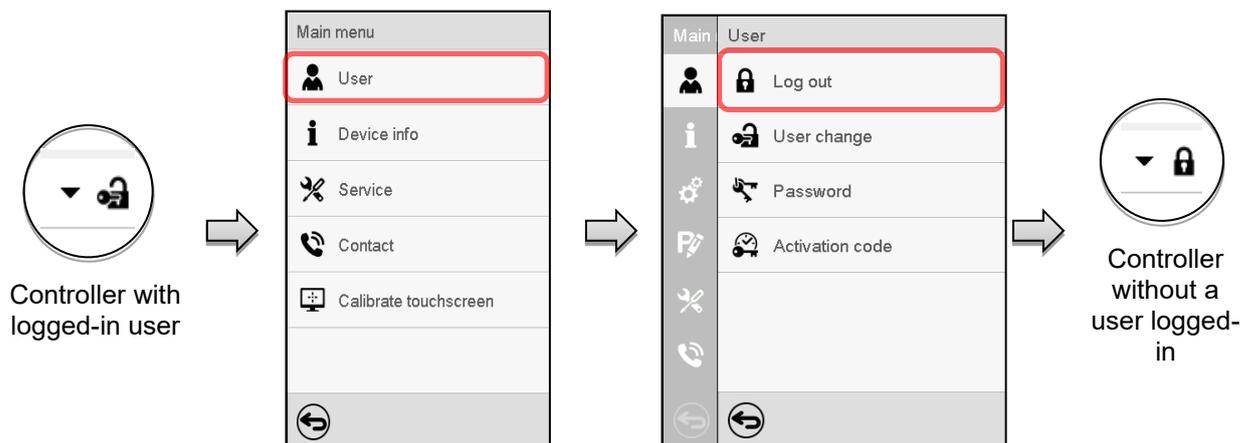
19.3 Log out

Path: [Main menu](#) > [User](#) > [Log out](#)

User logoff with “Admin” authorization



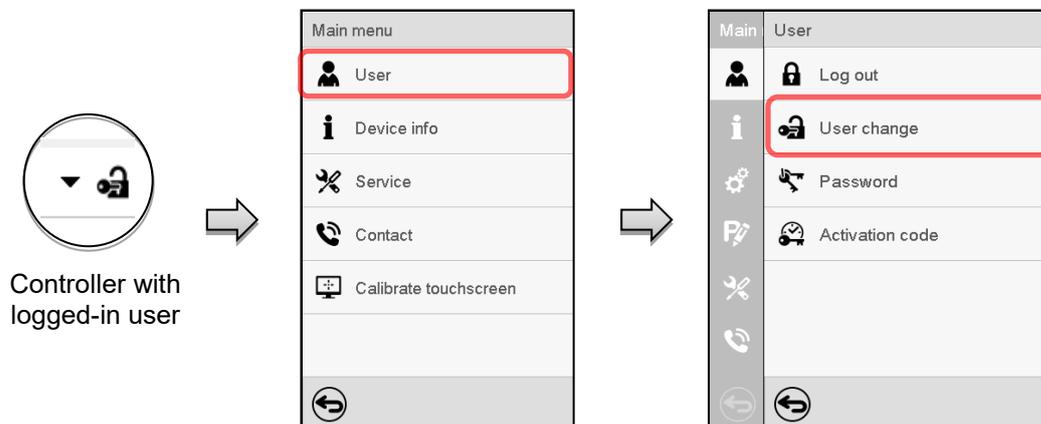
User logoff with “User” authorization

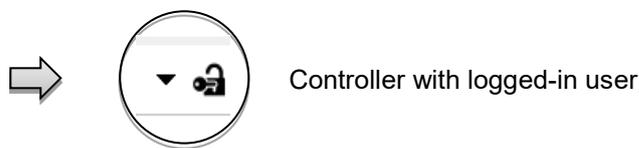
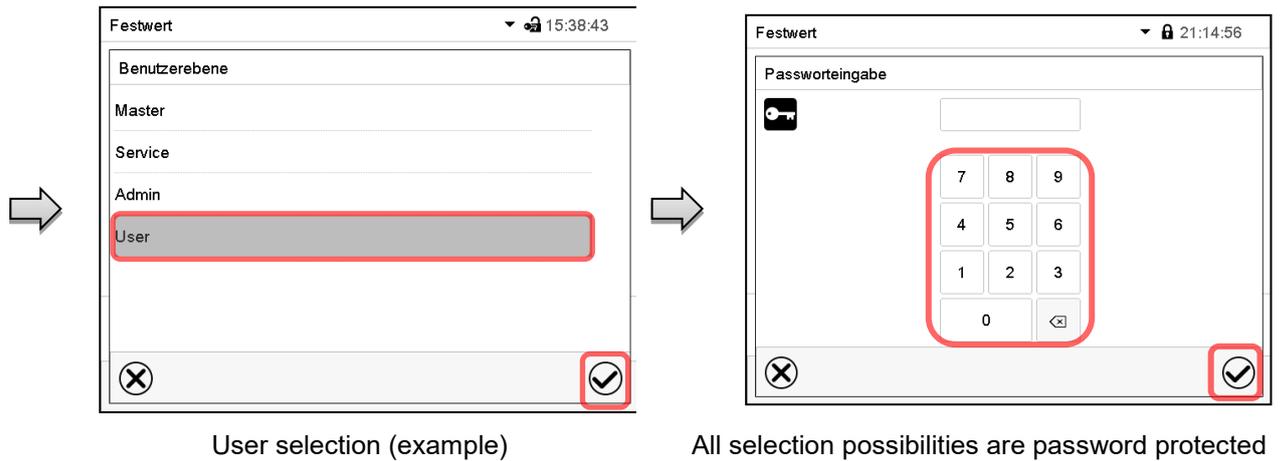


19.4 User change

If the password function has been deactivated (chap.19.5.2) this function is not available.

Path: [Main menu](#) > [User](#) > [User change](#)





19.5 Password assignment and password change

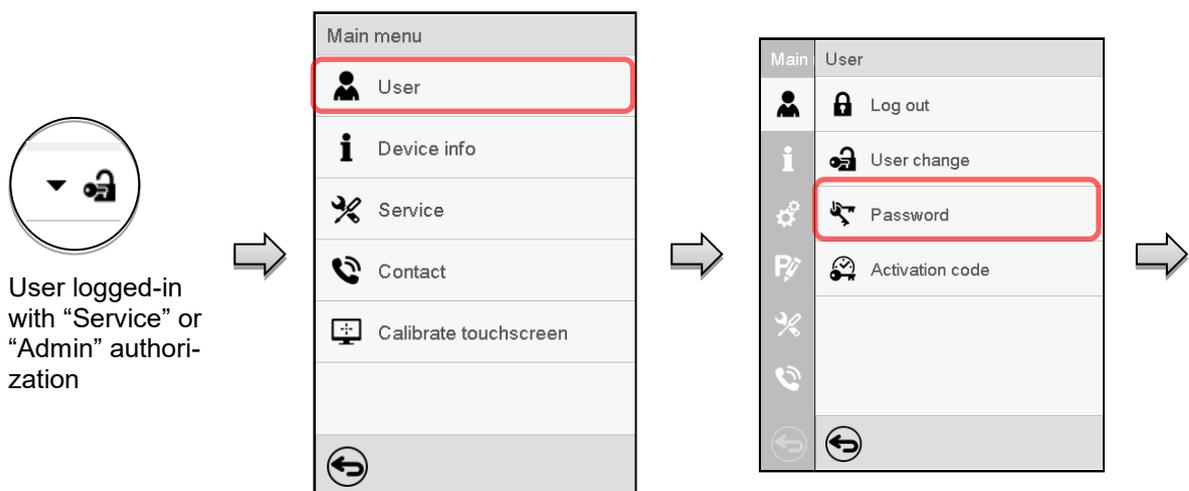
This function is not available for a user logged-in with “User” authorization.

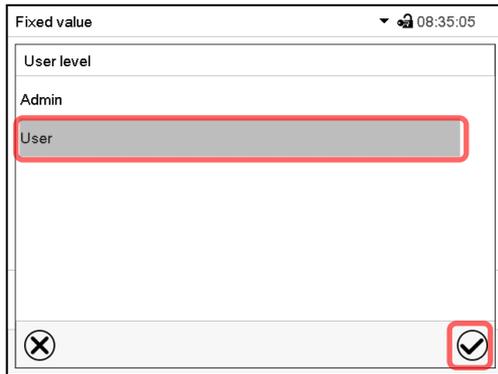
19.5.1 Password change

A logged-in user can change the passwords of his current level and of the next lower level(s).

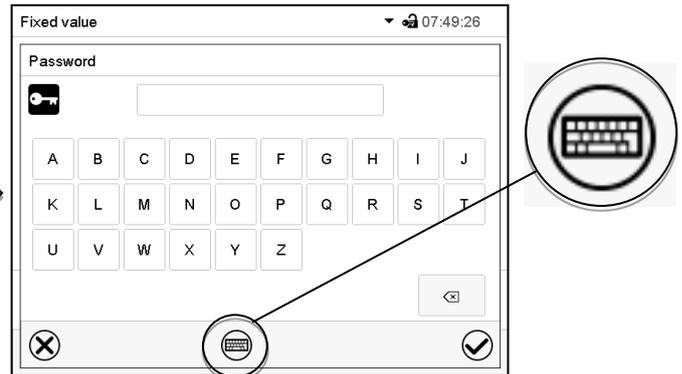
Example: A user with “Admin” authorization can change the passwords for the “Admin” and “User” authorization levels.

Path: [Main menu](#) > [User](#) > [Password](#)



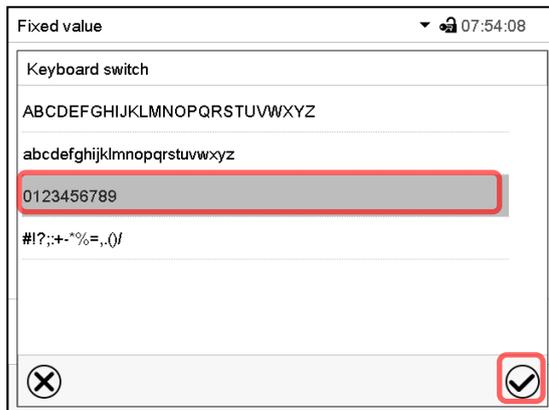


Selection of the authorization level
(example: view with "Admin" authorization)

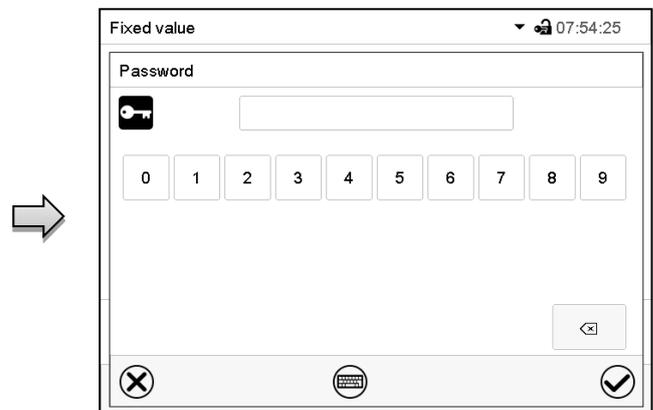


Enter desired password. If desired, press the **Change keyboard** icon to access other entry windows.

In the "Keyboard switch" window you can select different keyboards to enter uppercase and lowercase letters, digits, and special characters. All types of characters can be combined within one single password.

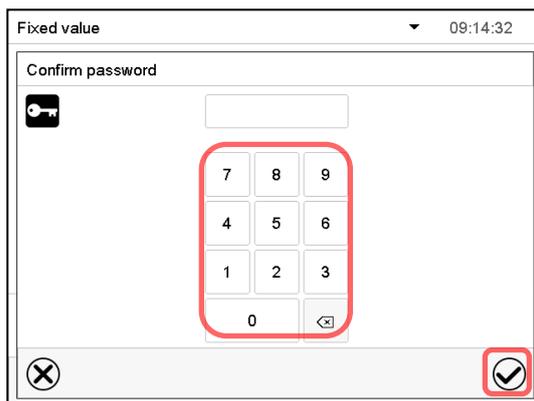


Example: access the digit entry window



Entry of digits

To confirm the entry, press the **Confirm** icon.



Repeat the password entry for confirmation (sample picture). For each character of the password, the required keyboard appears automatically.

Then press the **Confirm** icon.

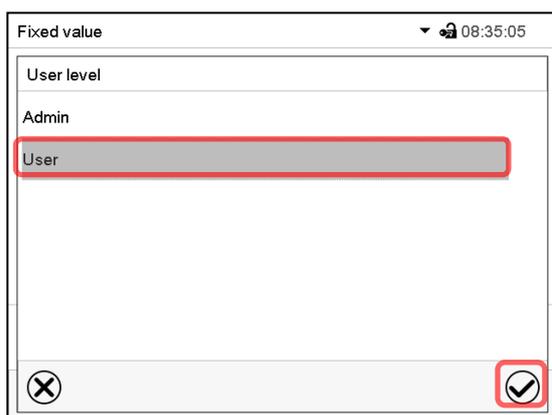
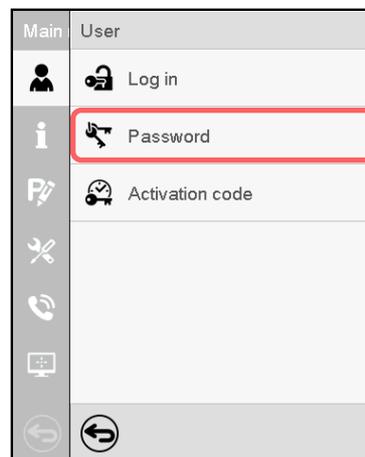
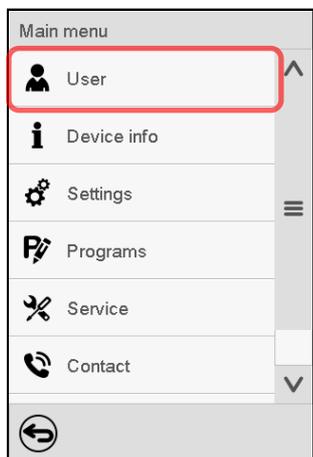
19.5.2 Deleting the password for an individual authorization level

A user logged-in with “Service” or “Admin” authorization can delete the passwords of his current level and of the next lower level(s). To do this no password is entered during a password change.

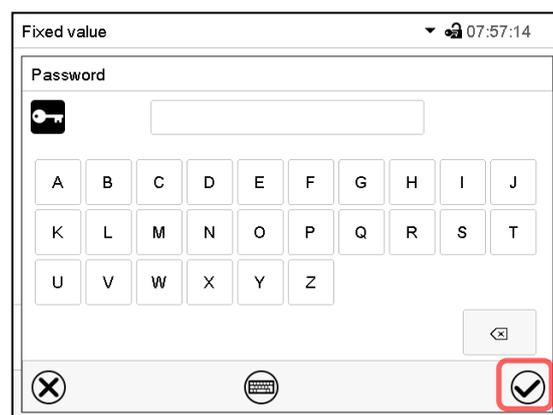
Path: *Main menu > User > Password*



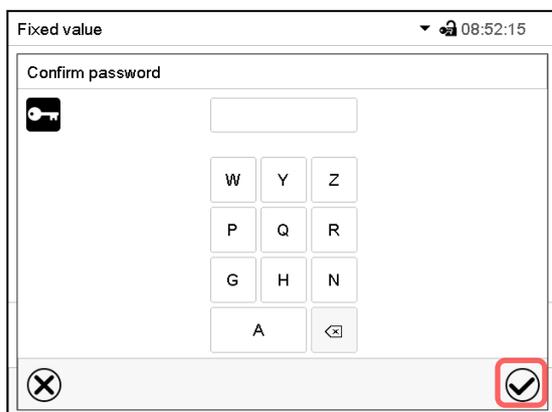
Controller with logged-in user (e.g. with “Admin” authorization)



Select the authorization level for which the password shall be deleted.



Do NOT enter anything in the “Password” screen. Press the **Confirm** icon.



Do NOT enter anything in the “Confirm password” screen. Press the **Confirm** icon.

The password is deleted.

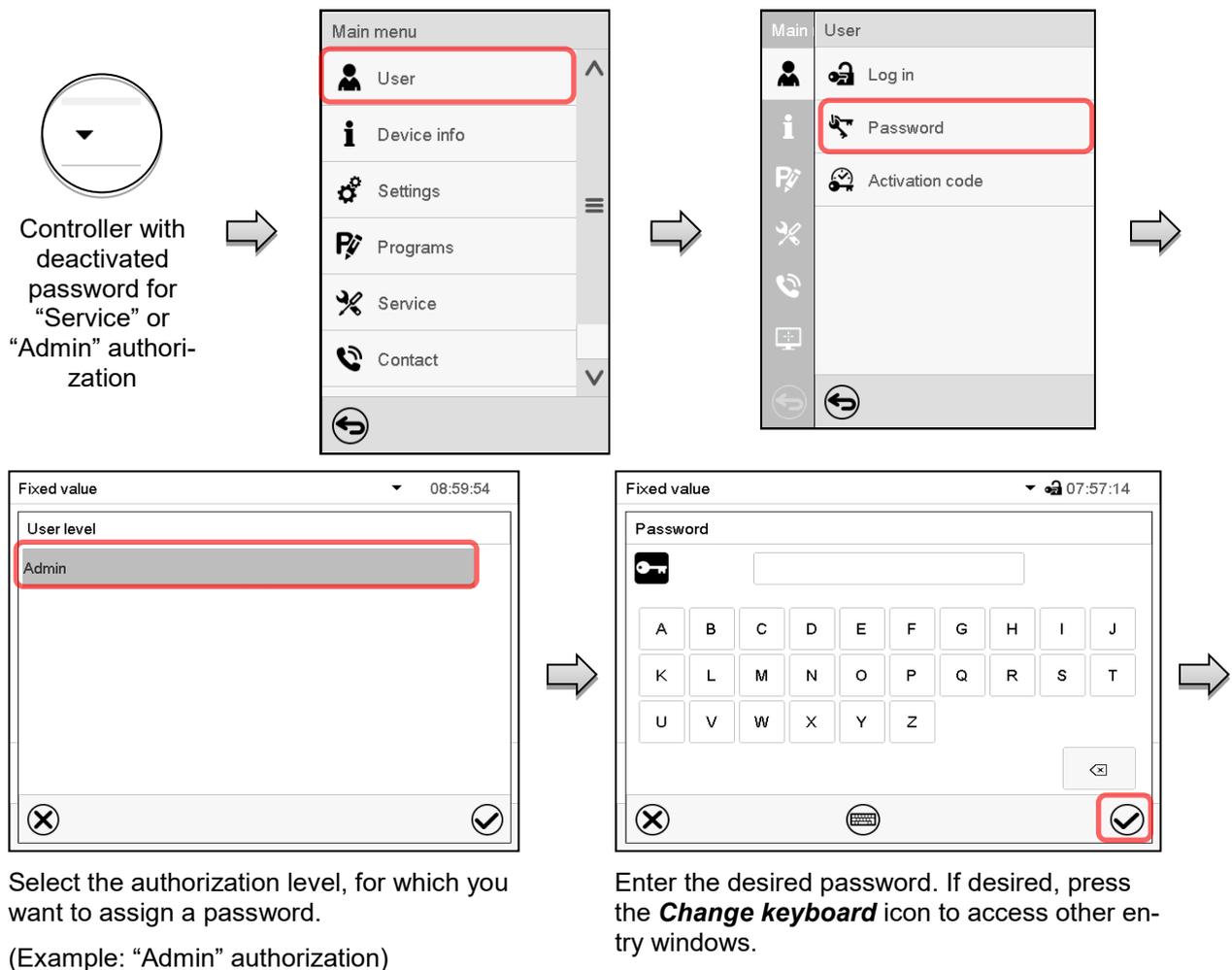
19.5.3 New password assignment for “Service” or “Admin” authorization level when the password function was deactivated

If the password protection for an authorization level has been deactivated, i.e., no password is assigned, no login for this level is possible. Therefore access to this authorization level is available without login.

If the password for the “Service” or “Admin” authorization has been deleted (chap. 19.5.2), a new password can be assigned for the current level and the next lower level(s) without user login.

Example: The password for the “Admin” authorization level was deleted, therefore every user without login has full access to the functions of the “Admin” authorization level. If access to this level shall become password protected again, the user can assign a new password for the “Admin” authorization level with the “Password” function.

Path: [Main menu](#) > [User](#) > [Password](#)



To confirm the entry, press the **Confirm** icon.

Repeat the password entry for confirmation. While doing this, for each character of the password the required keyboard appears automatically. Then press the **Confirm** icon.

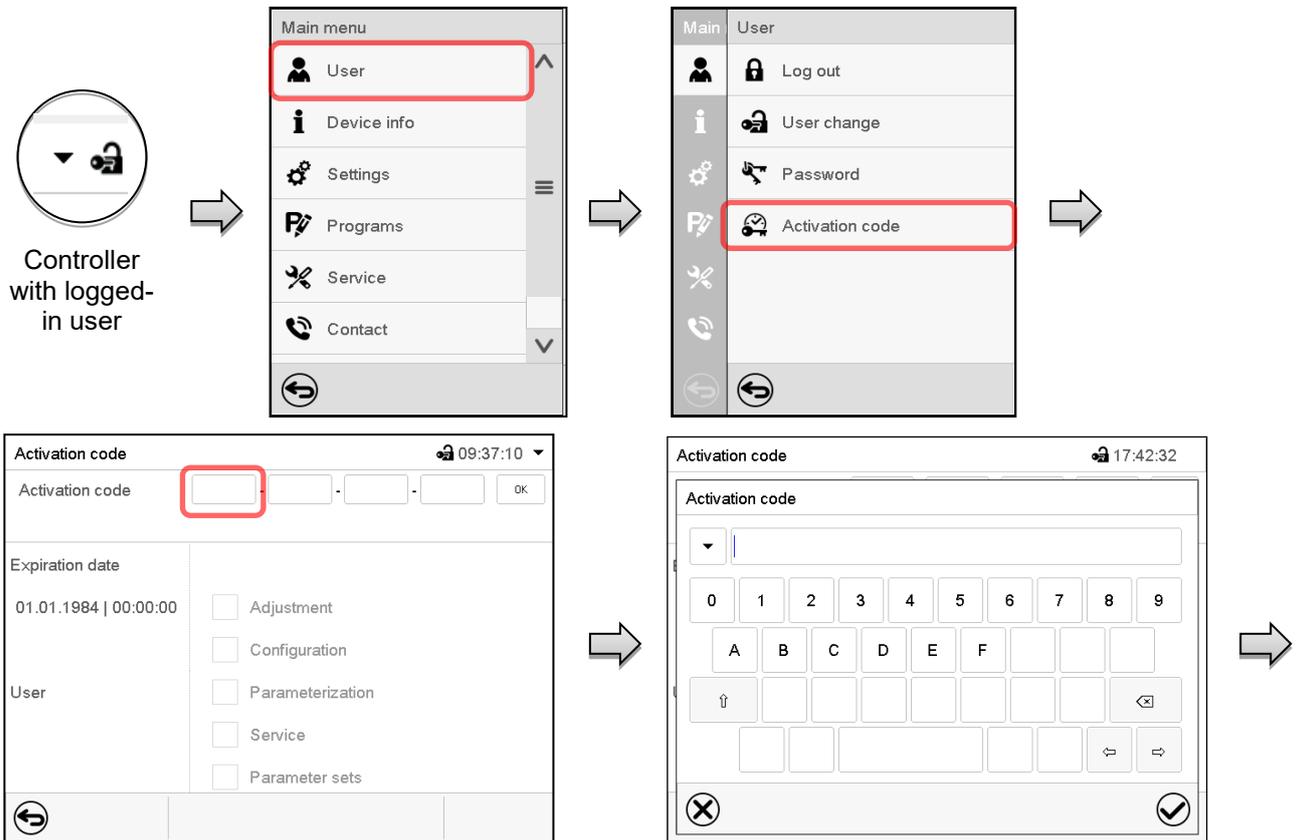
19.6 Activation code

Certain functions of the controller can be unlocked with a previously generated activation code.

The activation code enables access to functions available only in the “Service” authorization level by users without a “Service” authorization. Such functions include e.g., adjustment or extended configurations.

The activation code is available in authorization levels.

Path: **Main menu > User > Activation code**



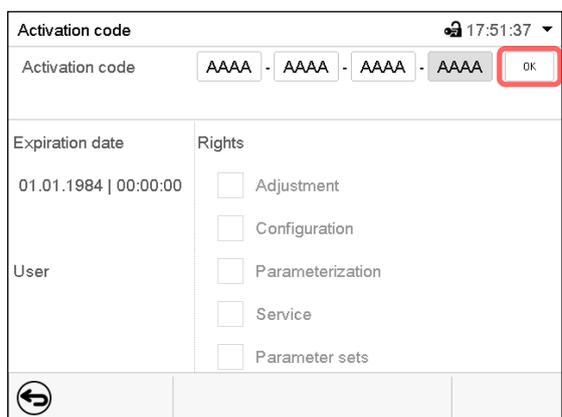
Activation code menu.

Select the first of the four entry fields.

Activation code entry window.

Enter the first four characters of the activation code and press the **Confirm** icon.

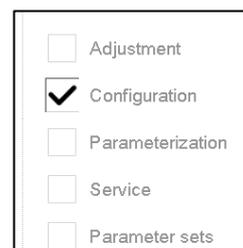
Select the next of the four entry fields and proceed accordingly until the entire code has been entered.



“Activation code” menu with entered code (sample view). Press **OK** to take over the entry

The available functions are indicated by marked checkboxes.

Example: Extended configurations available.



Under “Expiration date” the date of expiry of the code is displayed.

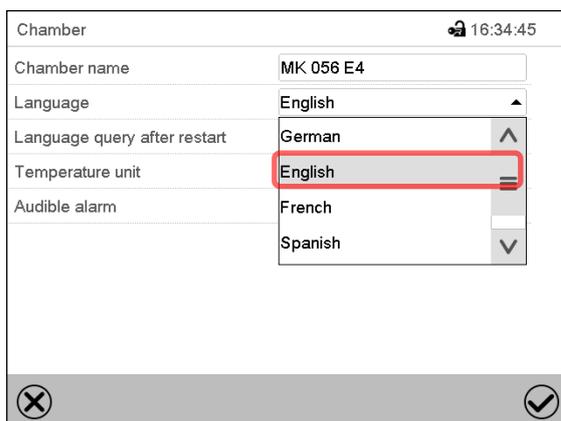
20. General controller settings

Most of the general settings can be accessed in the “Settings” submenu, which is available for users with “Service” or “Admin” authorization level. It serves to enter date and time, select the language for the controller menus and the desired temperature unit and to configure the controller’s communication functions.

20.1 Selecting the controller’s menu language

The MB2 program controller communicates by a menu guide using real words in German, English, French, Spanish, and Italian.

Path: **Main menu > Settings > Chamber**



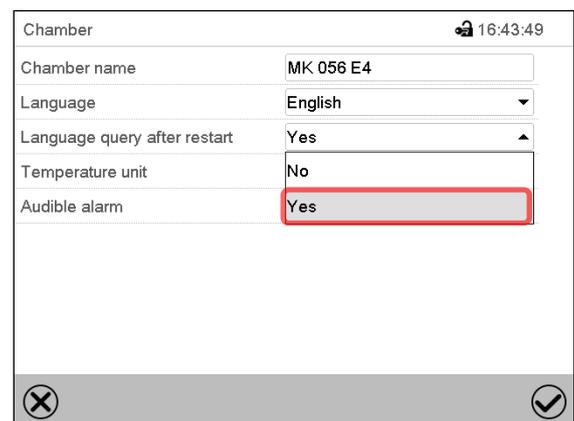
Chamber 16:34:45

Chamber name	MK 056 E4
Language	English
Language query after restart	German
Temperature unit	English
Audible alarm	French
	Spanish

Navigation icons: Back (X), Confirm (checkmark)

“Chamber” submenu.

Select the desired language.



Chamber 16:43:49

Chamber name	MK 056 E4
Language	English
Language query after restart	Yes
Temperature unit	No
Audible alarm	Yes

Navigation icons: Back (X), Confirm (checkmark)

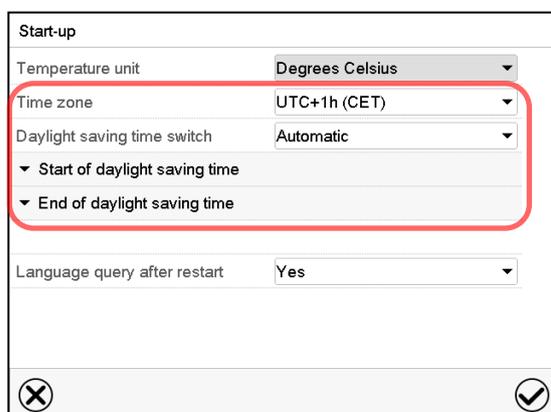
“Chamber” submenu.

Select if there shall be a language query after restarting the chamber and press the **Confirm** icon.

Return to Normal display with the **Back** icon to take over the entries.

20.2 Setting date and time

Following start-up of the chamber after language selection:



Start-up

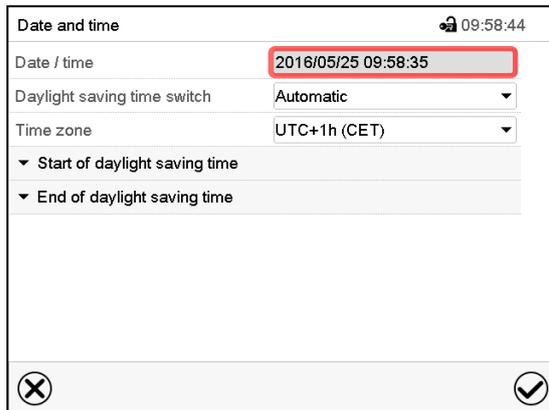
Temperature unit	Degrees Celsius
Time zone	UTC+1h (CET)
Daylight saving time switch	Automatic
Start of daylight saving time	
End of daylight saving time	
Language query after restart	Yes

Navigation icons: Back (X), Confirm (checkmark)

Select the time zone and configure the daylight saving time switch.

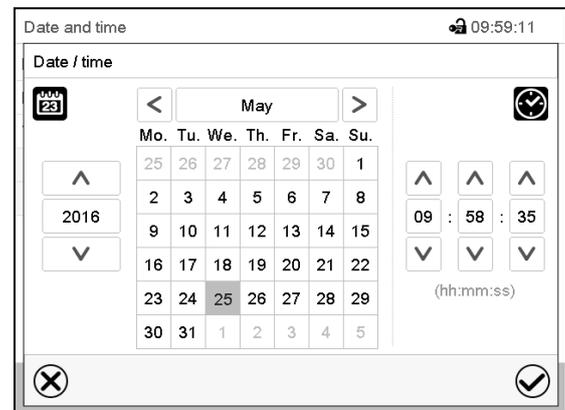
Or later:

Path: **Main menu > Settings > Date and time**



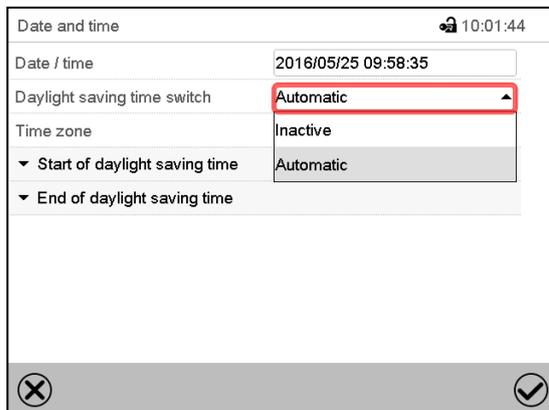
“Date and time” submenu.

Select the field “Date / time”.



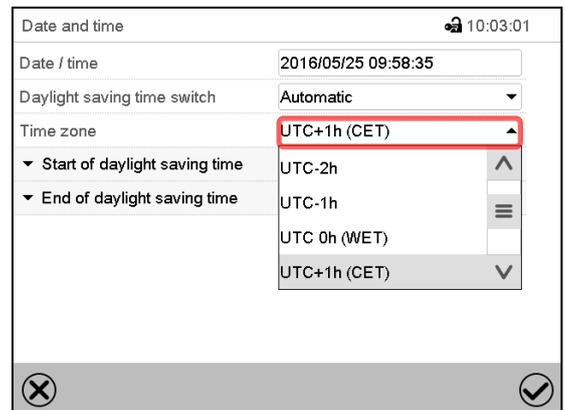
“Date / time” entry menu.

Enter date and time and press the **Confirm** icon.



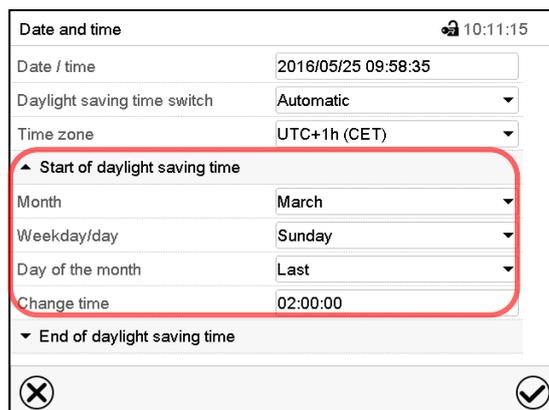
“Date and time” submenu.

In the field “Daylight saving time switch” select the desired setting “Automatic” or “Inactive”.



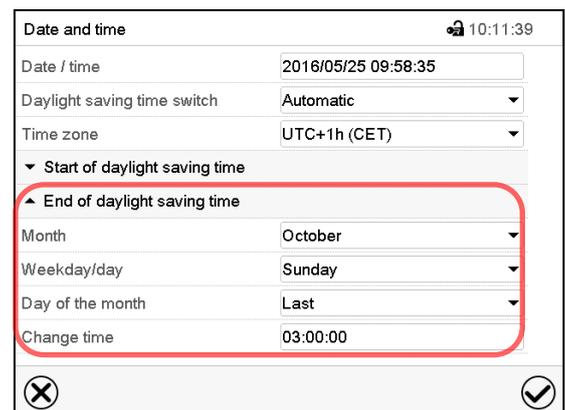
“Date and time” submenu.

Select the desired time zone and press the **Confirm** icon.



“Date and time” submenu.

Select the desired start of the daylight saving time.



“Date and time” submenu.

Select the desired end of the daylight saving time and press the **Confirm** icon.

After completing the settings, press the **Confirm** icon to take over the entries and exit the menu, **or** press the **Close** icon to exit the menu without taking over the entries.

20.3 Selecting the temperature unit

Following start-up of the chamber:

The screenshot shows the 'Start-up' configuration screen. The 'Temperature unit' dropdown menu is open, and 'Degrees Celsius' is selected and highlighted with a red box. Other settings include Time zone: UTC+1h (GET), Daylight saving time switch: Automatic, Start of daylight saving time, End of daylight saving time, and Language query after restart: Yes. Navigation icons for back and confirm are at the bottom.

Or later:

Path: [Main menu](#) > [Settings](#) > [Chamber](#)

The screenshot shows the 'Chamber' settings screen. The 'Temperature unit' dropdown menu is open, and 'Degrees Celsius' is selected and highlighted with a red box. Other settings include Chamber name: MK 056 E4, Language: English, Language query after restart: No, and Audible alarm: Degrees Celsius. Navigation icons for back and confirm are at the bottom.

Select the desired temperature unit and press the **Confirm** icon.

Change of the temperature unit between °C and °F.

If the unit is changed, all values are converted accordingly

	C = degree Celsius	0 °C = 31°F	Conversion: [value in °F] = [value in °C] * 1,8 + 32
	F = degree Fahrenheit	100 °C = 212°F	

20.4 Display configuration

20.4.1 Adapting the display parameters

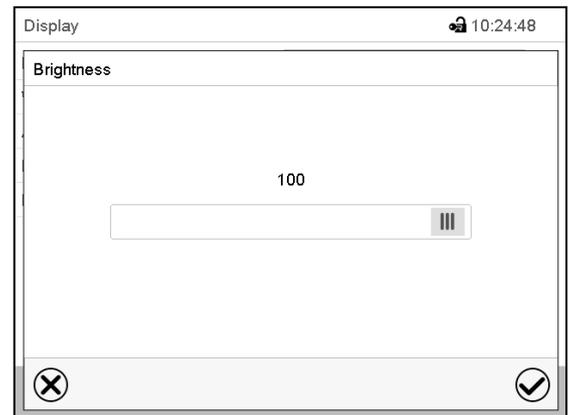
This function serves to configure parameters like display brightness and operating times.

Path: [Main menu](#) > [Settings](#) > [Display](#) > [Display](#)

The screenshot shows the 'Display' configuration screen. Parameters include Brightness: 100, Wait time for screen saver: 300 s, Activate continuous operation: Yes, Begin continuous operation: 06:00:00, and End continuous operation: 20:00:00. Navigation icons for back and confirm are at the bottom.

“Display” submenu.

- Select the field “Brightness”.
Move the grey slide to the left or right to define the brightness of the display
 - left = darker (minimum value: 0)
 - right = brighter (maximum value: 100)
 Press the **Confirm** icon.



- Select the field “Wait time for screen saver” and enter the desired waiting time for the screen saver in seconds. Setting range: 10 sec up to 32767 sec. During the waiting time the display is off. Confirm entry with **Confirm** icon.
- In the field “Activate continuous operation” select the desired setting “Yes” or “No”.

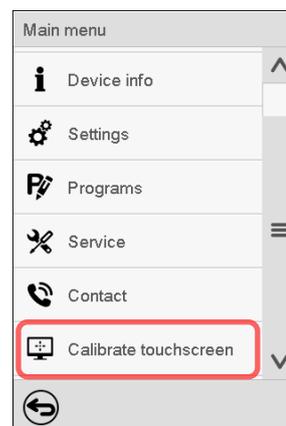
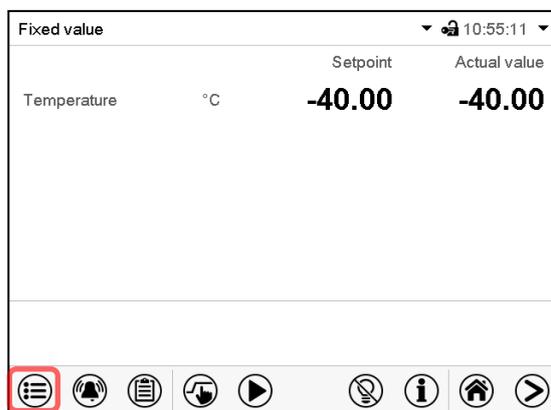
wait time for screen saver	000 s
Activate continuous operation	Yes
Begin continuous operation	No
End continuous operation	Yes
- Select the field “Begin continuous operation” (possible only if continuous operation is activated) and enter the time with the arrow keys. Confirm entry with **Confirm** icon.
- Select the field “End continuous operation. (only possible if continuous operation is activated) and enter the time with the arrow keys. Confirm entry with **Confirm** icon.

After completing the settings, press the **Confirm** icon to take over the entries and exit the menu, **or** press the **Close** icon to exit the menu without taking over the entries.

20.4.2 Touchscreen calibration

This function serves to optimize the display for the user’s individual angular perspective.

Path: [Main menu > Calibrate touchscreen](#)



Normal display.

Select “Calibrate touchscreen” and follow the instructions on the display.

You need to touch all four corners of the touchscreen to calibrate it. Appropriate boxes appear successively in each corner.

	<p>The waiting icon shows how much time there is left to touch the currently activated box. If the box is not touched within this period, calibration is aborted and the display changes to Normal display.</p>
---	---

After completing the calibration, i.e., touching all four boxes, the display changes to Normal display.

20.5 Network and communication

For these settings at least the “Admin” authorization level is required.

20.5.1 Serial interfaces

The chamber is optionally equipped with a serial RS485 interface.

This menu allows to configure the communication parameters of the RS485 interface.

The device address is required to recognize chambers with this interface type in a network, e.g. when connecting it to the optional BINDER APT-COM™ 4 Multi Management Software (chap. 26.1). In this case do not change the other parameters.

Path: [Main menu](#) > [Settings](#) > [Serial interfaces](#)

Serial interfaces		🔒 10:55:30
Baud rate	9600	▼
Data format	8 - N - 1	▼
Minimum response time	40 ms	
Device address	1	

⊗ ⊙

“Serial interfaces” submenu.

- Select the desired setting in the field “Baud rate”.

Baud rate	9600	▲
Data format	9600	
Minimum response time	19200	
Device address	38400	

- Select the desired setting in the field “Data format”.

Data format	8 - N - 1	▲
Minimum response time	8 - N - 1	
Device address	8 - O - 1	
	8 - E - 1	

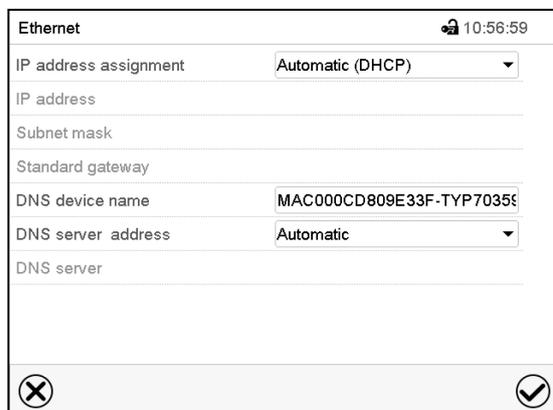
- Select the field “Minimum response time” and enter the desired minimum response time. Confirm entry with **Confirm** icon.
- Select the field “Device address” and enter the device address. Factory setting is “1”. Confirm entry with **Confirm** icon.

After completing the settings, press the **Confirm** icon to take over the entries and exit the menu, **or** press the **Close** icon to exit the menu without taking over the entries.

20.5.2 Ethernet

20.5.2.1 Configuration

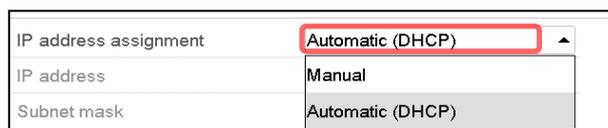
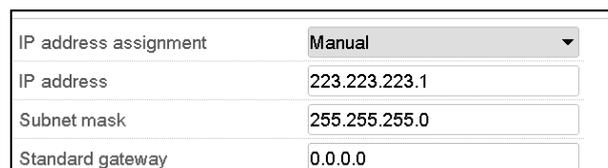
Path: [Main menu](#) > [Settings](#) > [Ethernet](#)



“Ethernet” submenu.

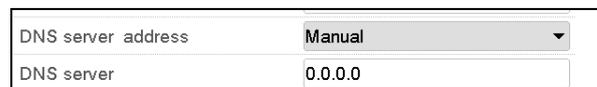
- In the field “IP address assignment” select the desired setting “Automatic (DHCP)” or “Manual”.

With selection “Manual” you can enter the IP-address, the subnet mask and the standard gateway manually.

- Select “DNS device name” and enter the DNS device name. Confirm entry with **Confirm** icon.
- In the field “DNS server address” select the desired setting “Automatic” or “Manual”.

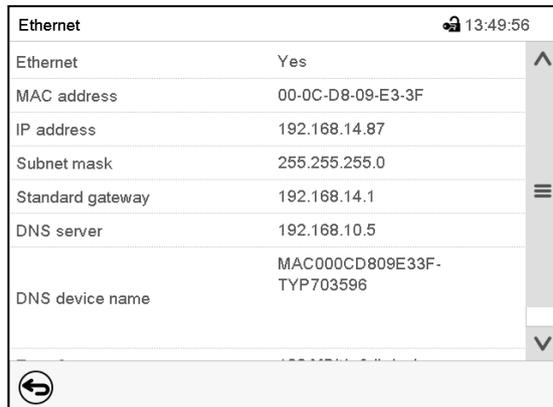
With selection „Manual“ you can enter the DNS server address manually.

After completing the settings, press the **Confirm** icon to take over the entries and exit the menu, **or** press the **Close** icon to exit the menu without taking over the entries.

20.5.2.2 Display of MAC address

Path: [Main menu](#) > [Device info](#) > [Ethernet](#)



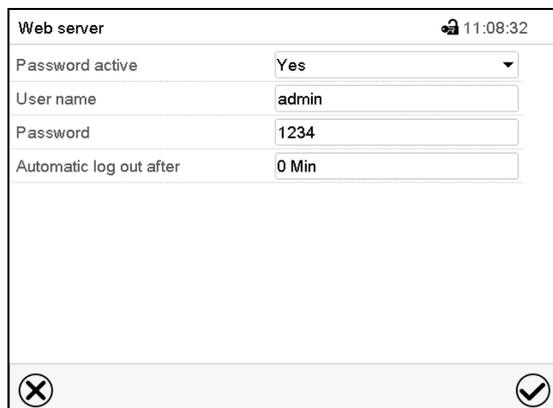
Ethernet	
Ethernet	Yes
MAC address	00-0C-D8-09-E3-3F
IP address	192.168.14.87
Subnet mask	255.255.255.0
Standard gateway	192.168.14.1
DNS server	192.168.10.5
DNS device name	MAC000CD809E33F-TYP703596

“Ethernet” submenu (example).

20.5.3 Web server

This controller menu serves to configure the web server. Then you can enter the chamber’s IP-address in the Internet. The IP address is available via [Chamber information](#) > [Ethernet](#). The BINDER web server opens. Enter the user name and password which have been assigned for the web server in the controller menu. This enables online access to the controller display, to see e.g., the event list or error messages. In this view no settings can be changed.

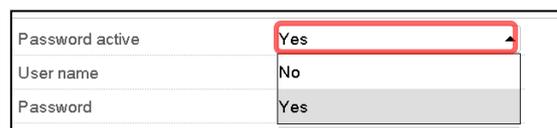
Path: [Main menu](#) > [Settings](#) > [Web server](#)



Web server	
Password active	Yes
User name	admin
Password	1234
Automatic log out after	0 Min

“Webserver” submenu.

- In the field “Password active” select the desired setting “Yes” or “No”.



Password active	Yes
User name	No
Password	Yes

- Select the field “User name” and enter the desired user name. Confirm entry with **Confirm** icon.
- Select the field “Password” and enter the desired password. Confirm entry with the **Confirm** icon.
- Select the field “Automatic log out after” and enter the time in minutes after which the webserver shall log out automatically. Setting range: 0 min to 65535 min. Confirm entry with **Confirm** icon.

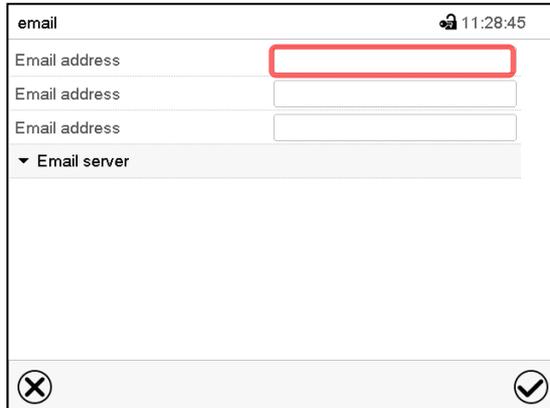
After completing the settings, press the **Confirm** icon to take over the entries and exit the menu, **or** press the **Close** icon to exit the menu without taking over the entries.

20.5.4 E-Mail

As soon as an alarm was triggered, an e-mail is sent to the configured e-mail address.

Path: [Main menu](#) > [Settings](#) > [Email](#)

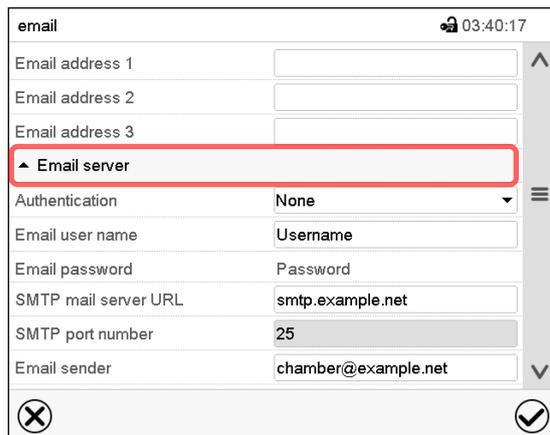
E-mail address entry:



“Email” submenu.

Select the desired e-mail address field and enter the e-mail address. You can use the **Keyboard change** icon for entry. Confirm entry with **Confirm** icon.

E-mail server settings:

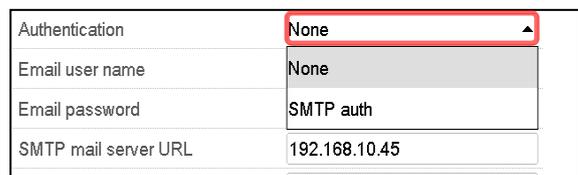


“Email” submenu.

Select the field “Email server” to access the settings

- In the field “Authentication” select the desired setting “None” or “SMTP” auth“.

With the setting “SMTP auth”, you can enter a password under “Email password”.



Authentication	None
Email user name	None
Email password	SMTP auth
SMTP mail server URL	192.168.10.45

- Select the field “Email user name” and enter the desired user name. Confirm entry with **Confirm** icon.
- Select the field “SMTP mail server URL” and enter the SMPT mail server URL. Confirm entry with **Confirm** icon.
- Select the field “SMTP port number” and enter the desired port number. Standard setting: “25”. Confirm entry with **Confirm** icon.
- Select the field “Email sender” and enter the desired Email sender. Confirm entry with **Confirm** icon.

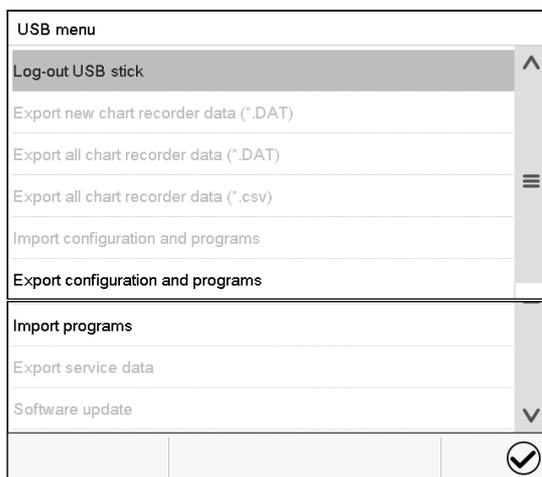
After completing the settings, press the **Confirm** icon to take over the entries and exit the menu, **or** press the **Close** icon to exit the menu without taking over the entries.

20.6 USB menu: Data transfer via USB interface

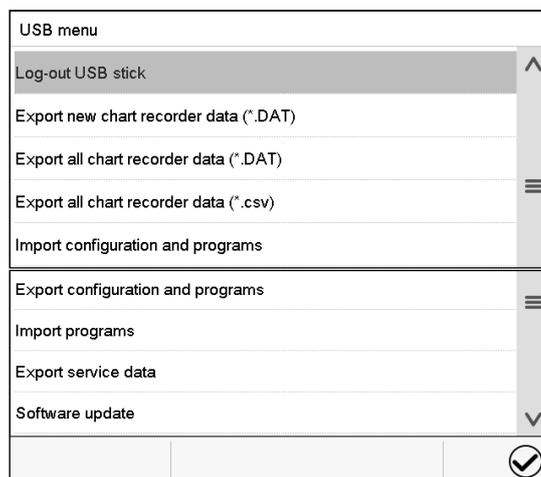
The USB port is located in the instrument box.

When you insert a USB-stick, the “USB” menu opens.

Depending on the user’s authorization level, different functions (highlighted in black) are available for the logged-in user.



Available functions
with “User” authorization level



Available functions
with “Admin” authorization level

Function	Explanation
Log-out USB stick	Log-out USB stick bevor pulling it
Export new chart recorder data (*.DAT)	Export chart recorder data, which have been added since last export, in .dat format
Export all chart recorder data (*.DAT)	Export all chart recorder data in .dat format
Export all chart recorder data (*.csv)	Export all chart recorder data in .csv format
Import configuration and programs	Import configuration and timer / time / week programs
Export configuration and programs	Export configuration and timer / time / week programs
Import programs	Import timer / time / week programs
Export service data	Export service data
Software update	Controller firmware update

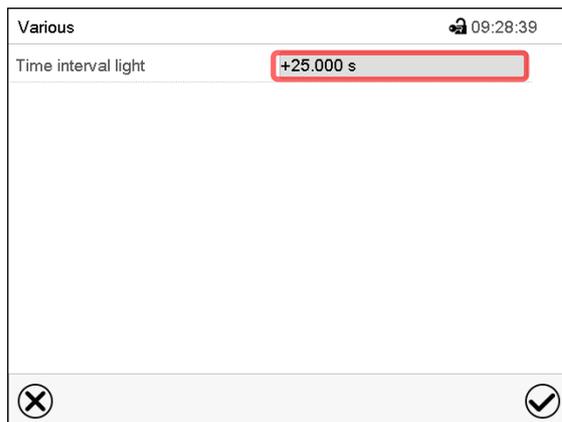
20.7 Turning off the interior lighting automatically



Press the *Interior lighting* icon to turn on and off the interior lighting.

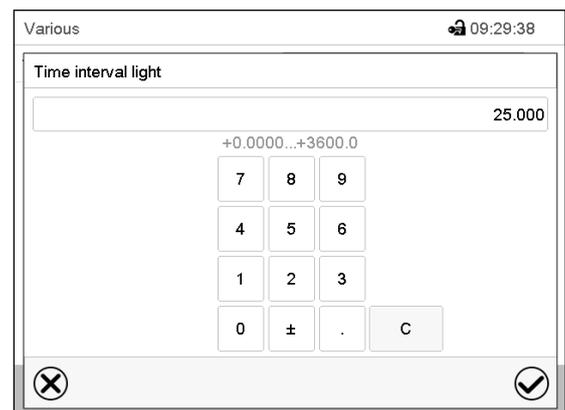
Additionally, you can define in this menu the interval after which the turned-on light will turn off automatically.

Path: [Main menu](#) > [Settings](#) > [Various](#)



“Various” submenu

Select the field “Time interval light”.



„Time interval light“ entry menu

Enter the time in seconds after which the light shall turn off automatically.

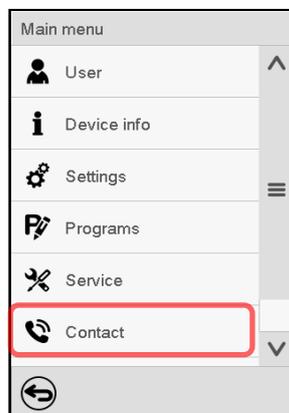
Setting range: 0 sec up to 3600 sec

After completing the settings, press the **Confirm** icon to take over the entries and exit the menu, **or** press the **Close** icon to exit the menu without taking over the entries.

21. General information

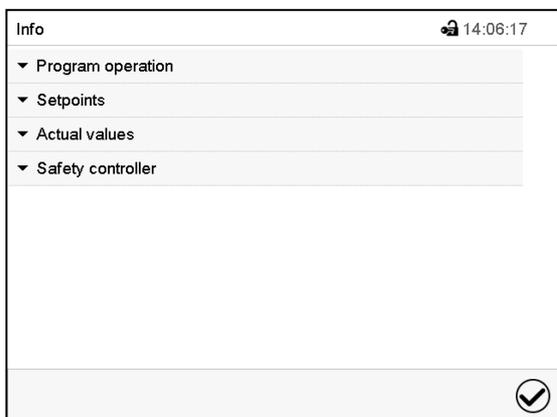
21.1 Service contact page

Path: [Main menu](#) > [Contact](#)



21.2 Current operating parameters

 Press the **Information** icon to access the “Info” menu from Normal display.



“Info” menu.

Select the desired information.

- Select “Program operation” to see information on a currently running program.

▲ Program operation	
Program type	Time program
Program name	program 1
	Programmhinweis
Program info	
Program start	08.06.2016 07:34:57
Program duration	87:00:00
Rem. program runtime	87:00:00
Program end	11.06.2016 22:35:49
Section number	1 / 87
Section duration	00:00:00
Remaining section time	01:00:00

- Select “Setpoints” to see information on the entered setpoints and operation lines.

▲ Setpoints	
Temperature	-40.00 °C
Fan	100 %
Operation lines	0000000000000000

- Select “Actual values” to see information on the current actual values.

▲ Actual values	
Temperature	-40.00 °C

- Select “Safety controller” to see information on the safety controller status.

▲ Safety controller	
Switch value	40.0 °C
Actual value	20.3 °C
Status	Not triggered

21.3 Event list

The “Event list” displays status information and errors of the current day. It enables to view the last 100 events or defective conditions of the chamber.

 Press the **Event list** icon to access the event list from Normal display.

Event list			🔒 13:18:52
	2016/06/07 09:09:53	Login Service (Touch)	^
	2016/06/07 09:09:53	Automatic log out Admin	
	2016/06/07 07:47:25	Login Admin (Touch)	
	2016/06/07 07:46:15	Automatic log out Admin	
🔔	2016/06/07 07:46:15	Power on	☰
🔔	2016/06/06 16:08:09	Power off	
	2016/06/06 10:50:25	Login Admin (Touch)	
	2016/06/06 10:49:44	Automatic log out Admin	
🔔	2016/06/06 10:49:44	Power on	∇

Event list

 Press the **Update** icon to update the event list.

 **Attention:** Following a modification of the language setting (chap. 20.1) or the storage interval of the chart recorder (chap. 22.2) the Event list is cleared.

21.4 Technical chamber information

Path: [Main menu](#) > [Device info](#)

Main	Device info		
	 General	Chamber name and setup	
	 Versions	Versions of CPU, I/O module and safety controller	for BINDER Service
	 In-/Outputs	Information on digital and analog inputs and outputs and phase angle outputs	for BINDER Service
	 Modbus inputs	Information on modbus analog and digital inputs	for BINDER Service
	 Ethernet	Information on Ethernet connection, MAC address display	chap. 20.5.2
			
		Back to main menu	

22. Chart recorder display

This view offers graphic representation of the measurement course. Data representation imitates a chart recorder and allows recalling any set of measured data at any point of time taken from the recorded period.

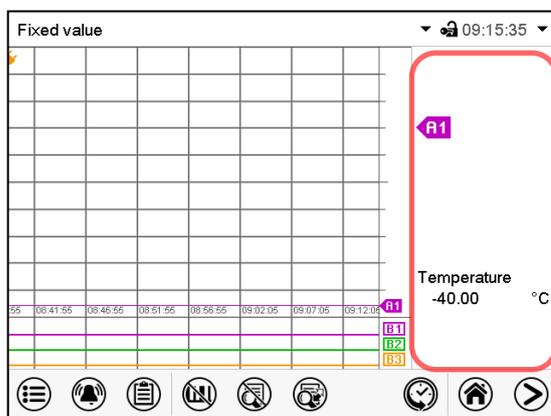
22.1 Views

	Press the Change view icon to access the pen recorder display.
--	---

22.1.1 Show and hide legend

	Show legend		Hide legend
--	--------------------	--	--------------------

Press the **Show legend** icon to display the legend on the right side of the display

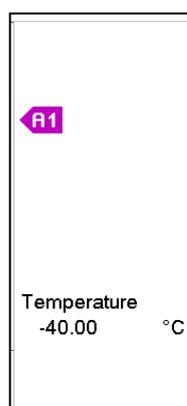


Legend shown on the right side of the display

22.1.2 Switch between legend pages

	Switch legend
--	----------------------

Press the **Switch legend** icon to switch between the legend pages



1st page



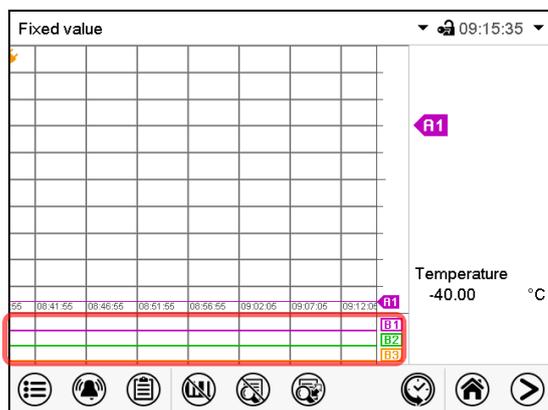
2nd page

Switching between the legend pages

22.1.3 Show and hide specific indications



Press the **Show indications** icon to display the indications "Door open" (B1), "Anti-condensat." (B2), "Compressed air" (B3).

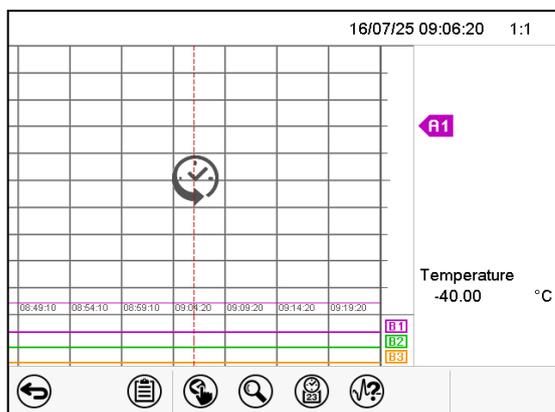


Indications "Door open" (B1), "Anti-condensat." (B2), and "Compressed air" (B3) are displayed.

22.1.4 History display



Press the **History display** icon to change to the history display.



History display.

The chart recorder is paused. Data recording continues in the background.

Move the central red line by tapping and holding to the desired position.

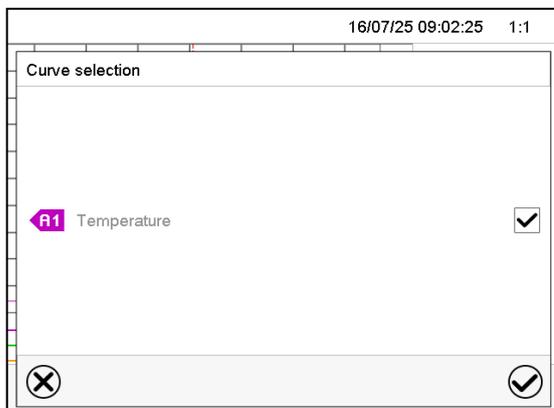
The legend at the right side shows the values of the current line position.

Then further icons appear:

History display: Curve selection



Press the **Curve selection** icon to access the "Curve selection" submenu.



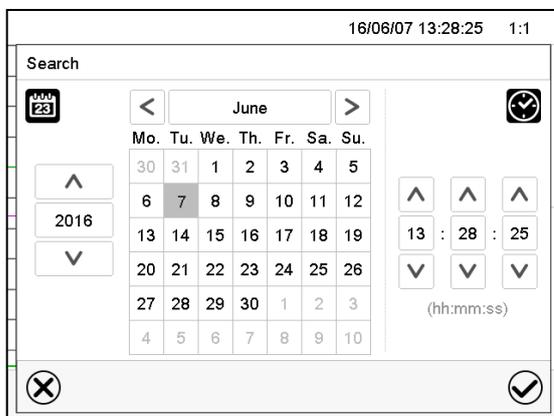
"Curve selection" submenu.

Select the curves to be displayed by checking the checkbox of the corresponding parameter. Press the **Confirm** icon

History display: Search the required instant



Press the **Search** icon to access the "Search" submenu.



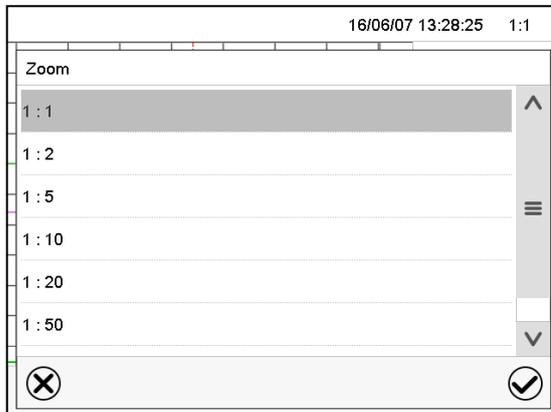
"Search" submenu.

Select the required instant by entering its date and time and press the **Confirm** icon

History display: Zoom function



Press the **Zoom** icon to access the "Zoom" submenu.



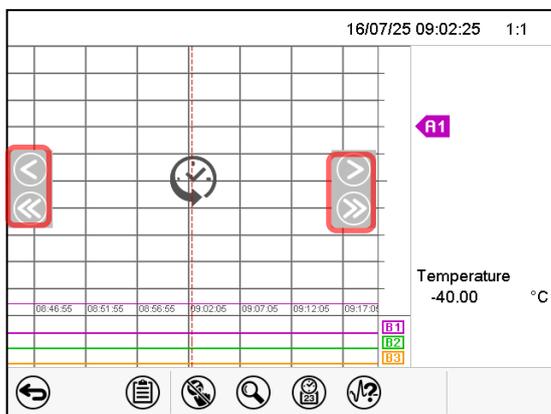
"Zoom" submenu.

Select the zoom factor and press the **Confirm** icon

History display: Show and hide *scroll buttons* to scroll to an instant



Press the **Show scroll buttons** icon to access the "Page selection" submenu.



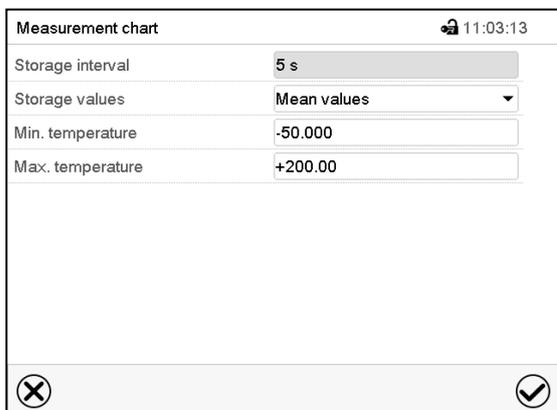
"Page selection" submenu.

Scroll buttons are shown on the left and on the right. Use them to move along the timeline.

22.2 Setting the parameters

This menu allows setting the storage interval, the type of values to be shown and the scaling of the temperature charts.

Path: **Main menu > Settings > Measurement chart**



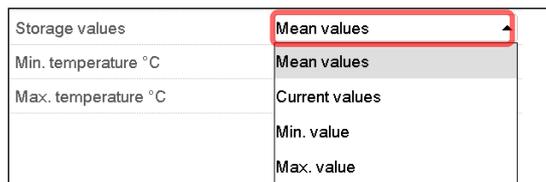
Measurement chart	
Storage interval	5 s
Storage values	Mean values
Min. temperature	-50.000
Max. temperature	+200.00

“Measurement chart” submenu.

- Select the field “Storage interval” and enter the desired storage interval. Confirm entry with **Confirm** icon.

The available presentation depends on the pre-selected storage rate. Factory setting: 60 seconds. This means the higher the storage rate, the more precisely but shorter the data representation will be.

- In the field “Storage values” select the desired value type to be displayed.



Storage values	Mean values
Min. temperature °C	Mean values
Max. temperature °C	Current values
	Min. value
	Max. value

- For scaling the representation select the desired minimum and maximum temperature value and enter the desired value. Temperature display range: -50 °C (MK) up to 110 °C. Confirm entry with **Confirm** icon.

Setting the storage rate or rescaling (minimum and/or maximum) will clear the measured-value memory and the event list.

NOTICE	
	<p>Danger of information loss when setting the storage rate or rescaling.</p> <p>Data loss of measured-value memory and event list.</p>
	<p>➤ Change the storage rate or scaling ONLY if the previously registered data is no longer needed.</p>

After completing the settings, press the **Confirm** icon to take over the entries and exit the menu, **or** press the **Close** icon to exit the menu without taking over the entries.

23. Notes on refrigerating operation

Defrosting:

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



Always close the door properly.

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

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

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

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



With temperature set-points below +5 °C / 41 °F, regularly defrost the chamber manually:

- Set the temperature to 60 °C / 140 °F (Manual Mode).
- Let the chamber operate for approx. 1 hour with the door closed. Remove the access port plugs.



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

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

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



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

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



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



NOTICE

Danger of overflowing due to uncontrolled defrosting of icing on the evaporator.

Damage to the surroundings of the chamber.

After several days of refrigerating below +5 °C / 41 °F:

- Ø Do NOT directly turn off the chamber.
- Manually defrost the chamber (see description above).
- Then, shut down the chamber at the main power switch (13). Keep removed the access port plugs.

24. Anti-condensation protection via operation line

The anti-condensation protection condensates the chamber humidity at the coldest point in order to avoid the samples becoming wet from condensation. Anti-condensation protection is performed by the evaporator and can be programmed On/Off via operation line "Anti-condensation" in Fixed value and program modes.



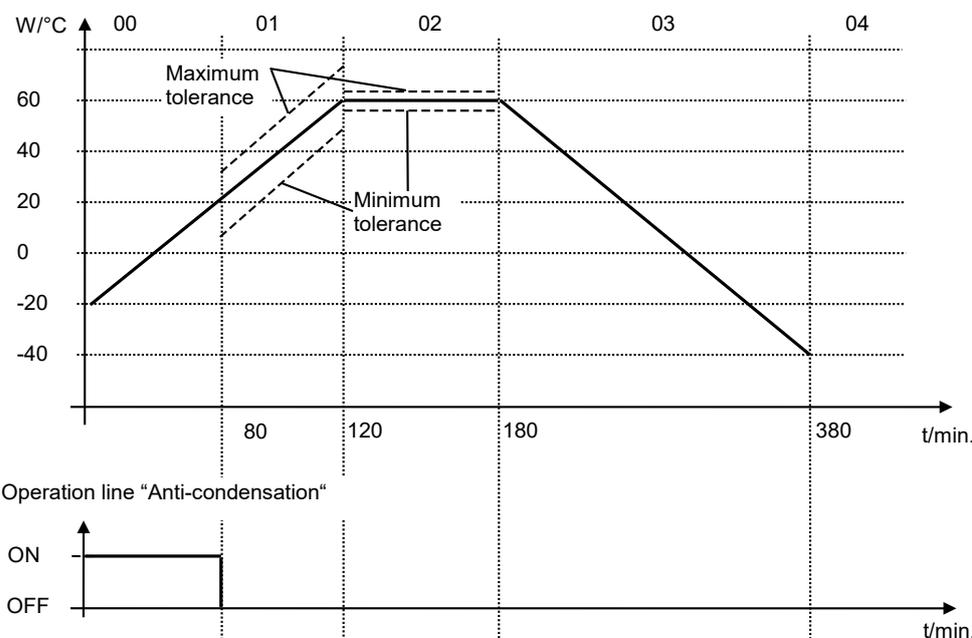
Use the anti-condensation protection only if absolutely necessary to prevent condensation on the charging material.

When the anti-condensation protection is enabled the refrigeration machine keeps operating within warm-up phases (On = refrigeration machine operating, Off = refrigeration machine off).

- **If possible, use the anti-condensation protection only during warm-up phases.** If necessary it can also be activated during hold phases.
- **Do NOT use the anti-condensation protection above a temperature set-point of +20 °C / 68 °F maximum.**

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

Example:



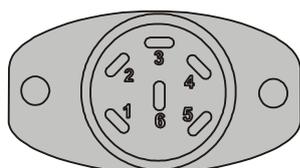
Depending on size, material, and shape of the charging material and on the heating-up rate, condensation may form despite the activated anti-condensation protection. This condensation is, however, reduced compared to the state without anti-condensation protection.

25. Zero-voltage switching outputs via operation lines

The chambers are equipped optionally with four zero-voltage switching outputs (DIN sockets (17) and (18) located in the lateral control panel).

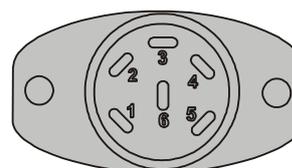
The operation lines serve to switch any device connected to the zero-voltage relay output. They can be programmed On/Off in Fixed value and program modes.

Connection for operation lines “Switching output 1” and “2” occurs via DIN socket (17), connection for operation lines “Switching output 3” and “4” via DIN socket (18) in the lateral control panel:



OUTPUT TRACK 1+2

24V/MAX.2,5A

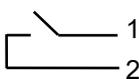
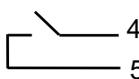


OUTPUT TRACK 3+4

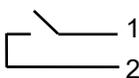
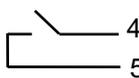
24V/MAX.2,5A

Figure 24: Pin configuration of DIN sockets (17) left and (18) right

DIN socket (17):

<p>Operation line “Switching output 1”</p>  <p>Pin 1: Pin Pin 2: Make</p>	<p>Operation line “Switching output 2”</p>  <p>Pin 4: Pin Pin 5: Make</p>
--	--

DIN socket (18):

<p>Operation line “Switching output 3”</p>  <p>Pin 1: Pin Pin 2: Make</p>	<p>Operation line “Switching output 4”</p>  <p>Pin 4: Pin Pin 5: Make</p>
--	--

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

	 DANGER
	<p>Electrical hazard through overload of contacts.</p> <p>Deadly electric shock. Damage to the switching contacts and connection socket.</p> <ul style="list-style-type: none"> Ø Do NOT exceed the maximum switching load of 24V AC/DC – 2.5A. Ø Do NOT connect any devices with a higher loading capacity.

26. Options

26.1 APT-COM™ 4 Multi Management Software (option)

The chambers are regularly equipped with an Ethernet interface (15) that can connect the BINDER APT-COM™ 4 Multi Management Software. The MAC Address is indicated in the “Device info” controller menu (chap. 20.5.2.2). The actual temperature values are given at adjustable intervals. Programming can be performed graphically via PC. Up to 100 chambers can be cross-linked. For further information please refer to the APT-COM™ 4 operating manual.

26.1.1 APT-COM™ 4 Basic Edition

APT-COM™ 4 Basic Edition is included with the chamber. APT-COM™ 4 is available for download on the BINDER website. Upon registering the chamber, you will receive a license key with which you can activate the functionality of the Basic Edition for your downloaded version.

Registration of the Multi Management Software APT-COM™ BASIC-Edition

Register now for getting your free BINDER Multi Management Software APT-COM™ 4 BASIC-Edition.

With the purchase of your BINDER chamber you will receive the **BINDER Multi Management Software APT-COM4™ 4 BASIC-Edition** for free.

BINDER's new Multi Management Software provides management, logging, programming and documentation options and much more.

Important characteristics of **APT-COM™ 4 BASIC-Edition**:

- ▶ Administration of up to five connected chambers
- ▶ Log management (creating, deleting, archiving)
- ▶ Documentation of recording values
- ▶ Central overview of all chambers in both graphic and tabular form
- ▶ Graphical presentation of recording values
- ▶ Graphical/numerical program editor
- ▶ Manual export of recording values (CSV/PDF file)
- ▶ Multilingual user interface (German, English, French, Spanish, Italian)
- ▶ Optional program execution via APT-COM™
- ▶ Timer function
- ▶ Import of data from APT-COM™ 3

Register your chamber today and request your personal software serial number.

Click here to register: <https://www.binder-world.com/en/service-support/product-registration>

26.2 RS485 interface (option)

With this option, the chamber is equipped with an additional 2-wire RS485 serial interface (15a) that can connect the BINDER APT-COM™ 4 Multi Management Software. The actual temperature values are given at adjustable intervals. For further information please refer to the APT-COM™ 4 operating manual.

26.3 Data logger kit (option)

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

Data Logger Kit T 220: Temperature range $-90\text{ }^{\circ}\text{C}$ / $-130\text{ }^{\circ}\text{F}$ up to $+220\text{ }^{\circ}\text{C}$ / $428\text{ }^{\circ}\text{F}$

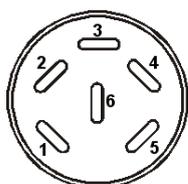


For detailed information on installation and operation of the BINDER Data Logger, please refer to the mounting instructions Art. No. 7001-0204 and to the original user manual of the manufacturer, supplied with the data logger.

26.4 Analog outputs for temperature (option)

With this option, the chamber is equipped with analog outputs 4-20 mA for actual value and set-point value of temperature. These outputs allow transmitting data to external data registration systems or devices.

The connection is realized as a DIN socket (19) in the lateral control panel as follows:



ANALOG OUTPUTS TEMPERATURE 4-20 mA DC

- PIN 1: Temperature actual value –
- PIN 2: Temperature actual value +
- PIN 4: Temperature set-point value –
- PIN 5: Temperature set-point value +

Temperature range: $-40\text{ }^{\circ}\text{C}$ / $-40\text{ }^{\circ}\text{F}$ up to $+180\text{ }^{\circ}\text{C}$ / $-356\text{ }^{\circ}\text{F}$

A suitable DIN plug is enclosed.

Figure 25: Pin allocation of the DIN socket (19) for option analog outputs

26.5 Object temperature display with flexible Pt 100 temperature sensor (option)

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

Fixed value		Setpoint	Actual value
Temperature	$^{\circ}\text{C}$	10.0	11.1
Obj. Temp.	$^{\circ}\text{C}$		10.6

Normal display with object temperature display (sample values)

The object temperature data is given out together with the data of the temperature controller to the Ethernet interface as a second measuring channel and can be documented by the APT-COM™ 4 Multi Management Software (option, chap. 26.1) developed by BINDER.

Technical data of the Pt 100 sensor:

- Three-wire technique
- Class B (DIN EN 60751)
- Temperature range up to $320\text{ }^{\circ}\text{C}$ / $608\text{ }^{\circ}\text{F}$
- Stainless steel protective tube 45 mm / 1.78 in length, material no. 1.4501

26.6 Compressed air connection (option)

This option permits directly connecting compressed air to the chamber.

Requirements for the compressed air supplied directly to the chamber

- Quality of the air: DIN ISO 8573-1:2010 [2:2:1]
- Supply pressure: 6-8 bar domestic connection
If a different connection pressure is required, please contact BINDER INDIVIDUAL Customized Solutions.
- Permissible temperature: +10 °C / 50 °F up to +50 °C / 122 °F.
- Air requirement: 15 m³/h (at normal pressure)
- Connection:

Connection is established to the coupling connector (25) in the rear panel : Standard quick acting closure socket for compressed air, nominal width 7.85 mm / 0.31 in.

Activation:

Operation line "Compressed air valve" serves to open the solenoid valve of the compressed air connection (25).

27. Cleaning and decontamination

Clean the chamber after each use in order to prevent potential corrosion damage by ingredients of the loading material.

Prior to renewed startup, allow the chamber to completely dry after all cleaning and decontamination measures.

The safety module must NOT be opened for cleaning purposes or poured over with water.

	 DANGER
	<p>Electrical hazard by water entering the chamber and the safety module. Deadly electric shock. Damage of components of the safety equipment.</p> <ul style="list-style-type: none"> Ø Do NOT spill water or cleaning agents over the inner and outer chamber surfaces. Ø Do NOT spill water or cleaning agents over the safety module. Ø Do NOT open the safety module for cleaning. Ø Do NOT put ANY cleaning aids (cloth or brush) into slots or openings on the chamber. ➤ Before cleaning turn off the main switch of the gas detection system. ➤ Before cleaning, turn off the chamber at the main power switch and disconnect the power plug. Let the chamber cool down to ambient temperature. ➤ Completely dry the chamber before turning it on again.
	

27.1 Cleaning the battery test chamber following normal operation

Disconnect the chamber from the power supply before cleaning. Disconnect the power plug. Before cleaning turn off the main switch of the gas detection system.

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

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

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

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

	<p>We recommend using the neutral cleaning agent Art. No. 1002-0016 for a thorough and mild cleaning.</p> <p>Any corrosive damage that may arise following use of other cleaning agents is excluded from liability by BINDER GmbH.</p> <p>Any corrosive damage caused by a lack of cleaning, is excluded from liability by BINDER GmbH.</p>
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	NOTICE
	<p>Danger of corrosion by using unsuitable cleaners.</p> <p>Damage to the chamber.</p> <ul style="list-style-type: none"> Ø Do NOT use acidic or chlorine cleaning detergents. Ø Do NOT use a neutral cleaning agent on other kind of surfaces e.g., the zinc coated hinge parts or the rear chamber wall.

	<p>For surface protection, perform cleaning as quickly as possible.</p> <p>After cleaning completely remove cleaning agents from the surfaces with a moistened towel. Let the chamber dry.</p>
---	--

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

	With every decontamination method, always use adequate personal safety controls.
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Following cleaning, leave the chamber door open or remove the access port plugs.

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

	<table border="1"> <tr> <th colspan="2" data-bbox="539 456 1495 548">  CAUTION </th> </tr> <tr> <td colspan="2" data-bbox="539 548 1495 622"> <p>Danger of chemical burns through contact with skin or ingestion of the neutral cleaning agent.</p> </td> </tr> <tr> <td colspan="2" data-bbox="539 622 1495 667"> <p>Skin and eye damage. Environmental damage.</p> </td> </tr> <tr> <td colspan="2" data-bbox="539 667 1495 887"> <ul style="list-style-type: none"> ∅ Do not ingest the neutral cleaning agent. Keep it away from food and beverages. ∅ Do NOT empty the neutral cleaning agent into drains. ➤ Wear protective gloves and goggles. ➤ Avoid skin contact with the neutral cleaning agent. </td> </tr> </table>	 CAUTION		<p>Danger of chemical burns through contact with skin or ingestion of the neutral cleaning agent.</p>		<p>Skin and eye damage. Environmental damage.</p>		<ul style="list-style-type: none"> ∅ Do not ingest the neutral cleaning agent. Keep it away from food and beverages. ∅ Do NOT empty the neutral cleaning agent into drains. ➤ Wear protective gloves and goggles. ➤ Avoid skin contact with the neutral cleaning agent. 	
 CAUTION									
<p>Danger of chemical burns through contact with skin or ingestion of the neutral cleaning agent.</p>									
<p>Skin and eye damage. Environmental damage.</p>									
<ul style="list-style-type: none"> ∅ Do not ingest the neutral cleaning agent. Keep it away from food and beverages. ∅ Do NOT empty the neutral cleaning agent into drains. ➤ Wear protective gloves and goggles. ➤ Avoid skin contact with the neutral cleaning agent. 									

27.2 Cleaning the battery test chamber after triggering of the CO₂ fire suppression device

Observe the instructions in chap. 27.1. Also note the following information:

- Ensure that there are no hazardous gases in the test space. Ensure that the ventilation measures are effective.
- Ensure that the main switch of the gas detection system is switched off.
- Ensure that the battery test chamber is switched off and de-energized (power plug disconnected).
- Ensure that no test equipment remains in the battery test chamber.

Clean the chamber after each use in order to prevent potential corrosion damage from substances contained in charges. If damage has occurred to the inserted cells/modules/battery systems, use appropriate protective equipment to prevent contamination and damage to health.

	<table border="1"> <tr> <th colspan="2" data-bbox="391 1460 1495 1552">  WARNING </th> </tr> <tr> <td colspan="2" data-bbox="391 1552 1495 1659"> <p>Danger of intoxication through contamination of the chamber with toxic, corrosive or chemically aggressive material. Danger of chemical burns due to contact with skin, inhalation, or contact with the eyes.</p> </td> </tr> <tr> <td colspan="2" data-bbox="391 1659 1495 1704"> <p>Damages to health. Skin and eye damage. Environmental damage.</p> </td> </tr> <tr> <td colspan="2" data-bbox="391 1704 1495 1868"> <ul style="list-style-type: none"> ➤ Take appropriate precautions when removing toxic, corrosive or chemically aggressive material. ➤ Wear protective gloves and goggles. ➤ Avoid skin contact with the interior of the chamber. </td> </tr> </table>	 WARNING		<p>Danger of intoxication through contamination of the chamber with toxic, corrosive or chemically aggressive material. Danger of chemical burns due to contact with skin, inhalation, or contact with the eyes.</p>		<p>Damages to health. Skin and eye damage. Environmental damage.</p>		<ul style="list-style-type: none"> ➤ Take appropriate precautions when removing toxic, corrosive or chemically aggressive material. ➤ Wear protective gloves and goggles. ➤ Avoid skin contact with the interior of the chamber. 	
 WARNING									
<p>Danger of intoxication through contamination of the chamber with toxic, corrosive or chemically aggressive material. Danger of chemical burns due to contact with skin, inhalation, or contact with the eyes.</p>									
<p>Damages to health. Skin and eye damage. Environmental damage.</p>									
<ul style="list-style-type: none"> ➤ Take appropriate precautions when removing toxic, corrosive or chemically aggressive material. ➤ Wear protective gloves and goggles. ➤ Avoid skin contact with the interior of the chamber. 									

27.3 Decontamination / chemical disinfection



With every decontamination / disinfection method, always use adequate personal safety controls.
If the CO₂ fire suppression device has been triggered, please observe the information in chap. 27.2.

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

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

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

You can use the following disinfectants:

Inner chamber	Standard commercial surface disinfectants free from acid or halides. Alcohol based solutions. We recommend using the disinfectant spray Art. No. 1002-0022.
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We recommend using the disinfectant spray Art. No. 1002-0022 for chemical disinfection.
Any corrosive damage that may arise following use of other disinfectants is excluded from liability by BINDER GmbH.
Any corrosive damage caused by a lack of cleaning, is excluded from liability by BINDER GmbH.

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 chamber 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
<p>Danger of chemical burns through eye contact with the disinfectant spray.</p> <p>Eye damage. Environmental damage</p> <ul style="list-style-type: none"> ⊘ Do NOT empty the disinfectant into drains. ➤ Wear protective goggles. 	



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

28. Maintenance: inspection, maintenance, troubleshooting, repair, testing

28.1 General information, personnel qualification

Maintenance of the chamber includes all measures that enable and ensure the determination, maintenance, and restoration of the intended state as well as the determination and assessment of the actual state of the system. Maintenance is divided into inspection, maintenance, and repair or replacement.

Intended state: The defined state of a system that enables the full and safe use of the system over the entire operating period.

Actual state: The actual state of the system at the time of the inspection.

All information must be recorded in the system logbook.

- **Maintenance**

Maintenance includes all measures for maintaining the intended state of technical units of the system.

Maintenance must be carried out **at least once** a year. See chap. 28.2.

Maintenance can be carried out by BINDER Service or by BINDER qualified service partners or technicians in accordance with the description in the service manual. Refer to the service manual for personnel requirements.

The CO, H₂, and O₂ sensors must be replaced after 2 years at the latest.

- **Inspection of the safety equipment**

The inspection includes all measures for determining and assessing the actual state of technical units of **the safety device**.

Inspections must be carried **out at least four times a year** at approximately the same time interval. The activities involved in checking components for proper function and the procedure for this are specified in the service manual.

Inspection can be carried out by BINDER Service or by BINDER qualified service partners or technicians in accordance with the description in the service manual. Refer to the service manual for personnel requirements.

In addition, the system must be checked for interference (e.g., changes to the use of the space or layout) that have not been assessed in terms of operation.

Inspections must be carried out at least once a year for all NDT detectors.

- **Simple troubleshooting on the battery test chamber**

Chap. 28.4 describes troubleshooting by operating personnel. It does not require technical intervention into the chamber, nor disassembly of chamber parts.

For personnel requirements please refer to chap. 1.1.

- **Detailed troubleshooting on the battery test chamber**

If errors cannot be identified with simple troubleshooting, further troubleshooting must be performed by BINDER Service or by BINDER qualified service partners or technicians, in accordance with the description in the Service Manual. For personnel requirements please refer to the Service Manual.

- **Troubleshooting on the safety device**

It must be performed by BINDER Service or by BINDER qualified service partners or technicians, in accordance with the description in the Service Manual. For personnel requirements please refer to the Service Manual.

- **Repair**

Repair includes all measures for restoring the intended state of technical equipment. Repairs to safety devices must be carried out immediately if impermissible deviations from the intended state of the system are detected during inspections.

Repair of the chamber can be performed by BINDER Service or by BINDER qualified service partners or technicians, in accordance with the description in the Service Manual. For personnel requirements please refer to the Service Manual

After maintenance, the chamber must be tested prior to resuming operation. An electrical test and a test of the Safety device are required.

- **Electrical testing**

To prevent the risk of electrical shock from the electrical equipment of the chamber, an annual repeat inspection as well as a test prior to initial startup and prior to resuming operation after maintenance or repair, are required. This test must meet the requirements of the competent public authorities. We recommend testing under DIN VDE 0701-0702:2008 in accordance with the details in the Service Manual. For personnel requirements please refer to the Service Manual.

- **Testing the safety device**

Testing before restarting after maintenance or repair as well as repeat tests according to the safety plan created by the operator is required. Testing of the chamber can be performed by BINDER Service or by BINDER qualified service partners or technicians, in accordance with the description in the Service Manual. For personnel requirements please refer to the Service Manual. Observe the relevant legal regulations for the qualification of the examiner.

28.2 Maintenance intervals, service

 	 DANGER
	<p>Electrical hazard during live maintenance work.</p> <p>Deadly electric shock.</p> <ul style="list-style-type: none"> Ø The chamber must NOT become wet during operation or maintenance works. Ø Do NOT remove the rear panel of the chamber. ➤ Before maintenance works, turn off the main switch of the gas detection system. ➤ Disconnect the chamber before conducting maintenance work. Turn off the main power switch and pull the power plug. ➤ Make sure that general maintenance work will be conducted by licensed electricians or experts authorized by BINDER. ➤ Make sure that maintenance work at the refrigeration system will 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 (EC) n° 303/2008). Follow the national statutory regulations.

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

Maintenance of the safety equipment may include, for example, maintenance of system components, replacement of components with a limited service life (e.g., light bulbs), adjustment, re-adjustment, and calibration of components and chambers. In addition, the safety device should be checked every five years to ensure that it still meets all requirements in accordance with DIN VDE.

In the course of the annual maintenance, a leak test shall be carried out in accordance with Regulation (EU) 517/2014 (Article 4 and Article 10 (1) (b)).



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.

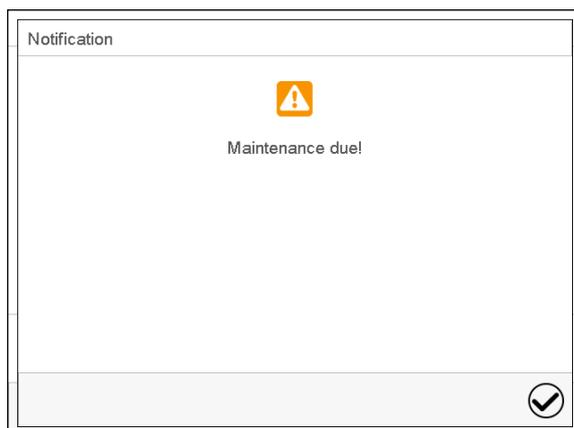
With an increased amount of dust in the ambient air, clean the condenser fan several times a year. We recommend checking the fan grid (behind the left maintenance access flap) every week. In case of visible dirt accumulation, disconnect the chamber and clean the fan grid by suction.

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

International customers, please contact your local BINDER distributor.

After 8760 operating hours or two years the following message appears:



After confirmation with the **Confirm** icon, the message window will pop up again every two weeks until it is reset by BINDER Service.

28.3 Inspections

Inspections must be carried **out at least four times a year** at approximately the same time interval. The activities involved in checking components for proper function and the procedure for this are specified in the service manual.

28.4 Simple troubleshooting

Defects and shortcomings can compromise the operational safety of the chamber and can lead to risks and damage to equipment and persons. If there is a technical fault or shortcoming, take the chamber out of operation and inform BINDER Service. If you are not sure whether there is a technical fault, proceed according to the following list. If you cannot clearly identify an error or there is a technical fault, please contact BINDER Service.



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

Fault description	Possible cause	Required measures
General		
Chamber without function.	No power supply.	Check connection to power supply. Check whether the chamber is turned on at the main power switch.
	Wrong voltage.	Check power supply for correct voltage (chap. 9.4).
	Main power switch (13) not turned on	Turn on the main power switch (13).
	Rear power switch (21) not turned on.	Turn on the rear power switch (21).
	Chamber fuse has responded.	Check chamber fuse and replace it if appropriate. If it responds again, contact BINDER service.
	Controller defective.	Contact BINDER service.
	Nominal temperature exceeded by 20 °C due to chamber failure. Over temperature protective device (class 1) responds.	
Heating		
Chamber heating permanently, set-point not maintained.	Semiconductor relay defective.	Contact BINDER service.
	Pt100 sensor defective.	
	Controller defective.	
	Controller not adjusted.	Calibrate and adjust controller.
Chamber doesn't heat up.	Heating element defective.	Contact BINDER service.
	Semiconductor relay defective	
Chamber doesn't heat up when turned on. Safety controller responds.	Inner chamber temperature has reached the safety controller setpoint. Safety controller set too low.	Acknowledge the alarm on the controller. Check temperature setpoint setting. If appropriate, select suitable safety controller setpoint (chap. 15.3).
	Safety controller (chap. 15.3) defective.	Contact BINDER service.
Safety controller class 2 responds	Limit temperature reached.	Acknowledge the alarm on the controller. Disconnect the chamber from the power supply and let it cool down. Detect cause and remove it. Start up the chamber and check control functions. If appropriate, select suitable limit value.
Over-/under temperature safety device class 2 (option) responds.	Limit temperature reached.	Acknowledge the alarm on the controller. Disconnect the chamber from the power supply and let it cool down. Detect cause and remove it. reset the alarm message on the controller (chap. 13.2.4). Start up the chamber and check control functions. If appropriate, select suitable limit value.
Refrigerating performance		
No or low refrigerating performance.	Ambient temperature > 25 °C / 77°F (chap. 8.4).	Select cooler place of installation.
	Compressor not turned on.	Contact BINDER service.
	Electro-valves defective.	
	No or not enough refrigerant.	

Fault description	Possible cause	Required measures
Refrigerating performance (continued)		
No refrigerating performance; notification "Preheat phase" on the controller display.	Main power switch (13) and/or rear power switch (21) turned on less than 1 hour before operating the chamber.	Turn on the main power switch (13) and/or the rear power switch (21) at least one hour before operating the chamber.
Condensation		
Condensation at the samples.	Heating-up phase without anti-condensation protection.	Use the anti-condensation protection (chap. 24).
Condensation or icing at the sides of the inner chamber.	Set-point for a long time below ambient temperature, icing in the preheating chamber.	Defrost the chamber.
Condensation at the samples or at the sides of the inner chamber; notification "Preheat phase" on the controller display.	Main power switch (13) and/or rear power switch (21) turned on less than 1 hour before operating the chamber.	Turn on the main power switch (13) and/or the rear power switch (21) at least one hour before operating the chamber.
Controller		
No chamber function (dark display).	Display in standby mode.	Press on touchscreen.
	Main power switch (13) not turned on	Turn on the main power switch (13).
	Rear power switch (21) not turned on.	Turn on the rear power switch (21).
Menu functions not available.	Menu functions not available with current authorization level.	Log in with the required higher authorization or contact BINDER service to obtain an activation code.
No access to controller	Password incorrect.	Contact BINDER service.
Chart recorder function: measured-value memory cleared, information lost.	New setting of storage rate or scaling (minimum and/or maximum) (chap. 22.2).	Change the storage rate or scaling ONLY if the previously registered data are no longer required.
Controller does not equilibrate to setpoints entered in Fixed value operation mode	Controller is not in Fixed value operation mode.	Change to Fixed value operation mode.
Controller does not equilibrate to program set-points.	Controller is not in program operation mode, or program delay time is running.	Start the program again. If appropriate, wait for the program delay time.
Program duration longer than programmed.	Tolerances have been programmed.	For rapid transition phases, do NOT program tolerance limits in order to permit maximum heating, speed.
Program keeps the last program setpoint constant while in setting "ramp".	Program line with setting "ramp" is incomplete.	When programming with setting "ramp", define the end value of the desired cycle by adding an additional section with a section time of at least one second.
Ramp temperature transitions are only realized as steps.	Setting "step" has been selected.	Select setting "ramp".
Acknowledging the alarm does not cancel the alarm state.	Cause of alarm persists.	Remove cause of alarm. If the alarm state continues, contact BINDER service.
Alarm message: "- - - -" or "<-<-<" or ">->->"	Sensor rupture between sensor and controller or Pt 100 sensor defective.	Contact BINDER service.
	Short-circuit.	

28.5 Sending the chamber 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** (RMA 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
- Contamination clearance certificate (chap. 32) 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 chamber delivery if it does not carry an authorization number.

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

29. Disposal

29.1 Disposal of the transport packing

Packing element	Material	Disposal
Straps to fix packing on pallet (size 240)	Plastic	Plastic recycling
Wooden transport box (size 720, option for size 240) with metal screws	Non-wood (compressed matchwood, IPPC standard)	Wood recycling
	Metal	Metal recycling
Pallet with foamed plastic stuffing	Solid wood (IPPC standard)	Wood recycling
	PE foam	Plastic recycling
Outer packaging (size 240) with metal clamps	Cardboard	Paper recycling
	Metal	Metal recycling
Top cover	Cardboard	Paper recycling
Edge protection	Styropor® or PE foam	Plastic recycling
Protection of doors and racks	PE foam	Plastic recycling
Upholstered transport piece (L-type profile) for door support	Steel or aluminum with plastic	Keep it for transportation purpose. Disposal: Metal recycling
Bag for operating manual	PE foil	Plastic recycling
Insulating air cushion foil (packing of optional accessories)	PE foil	Plastic recycling

If recycling is not possible, all packing parts can also be disposed of with normal waste.

29.2 Decommissioning

- Turn off the main switch of the gas detection system.
- Turn off the chamber at the main power switch On/Off (13) and disconnect it from the power supply.
- Turn off the rear power switch (21).
- Temporal decommissioning: See indications for appropriate storage, chap. 8.3.

In case of a prolonged temporal decommissioning: Leave the chamber door open or remove the access port plugs. For several weeks out of service, we recommend turning on the chamber every 3 days and operating it about 30 minutes in the cooling mode. This will ensure a quicker restart.

- Final decommissioning: Dispose of the chamber as described in chap. 29.3 to 29.5.

29.3 Disposal of the chamber in the Federal Republic of Germany

According to Annex I of Directive 2012/19/EU 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 chambers bear the symbol for the marking of electrical and electronic equipment manufactured / placed on the market in the EU after 13 August 2005 and be disposed of in separate collection according to Directive 2012/19/EU 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 chamber disposed of according to the German national law for electrical and electronic equipment (Elektro- und Elektronikgerätegesetz, ElektroG from 20 October 2015, BGBl. I p. 1739) or contact BINDER service who will organize taking back and disposal of the chamber according to the German national law for electrical and electronic equipment (Elektro- und Elektronikgerätegesetz, ElektroG from 20 October 2015, BGBl. I p. 1739).

NOTICE	
	<p>Danger of violation against existing law if not disposed of properly.</p> <p>Failure to comply with applicable law.</p> <ul style="list-style-type: none"> ⊘ Do NOT dispose of BINDER devices at public collecting points. ➤ Have the device disposed of professionally at a recycling company which is certified according to the German national law for electrical and electronic equipment (Elektro- und Elektronikgerätegesetz, ElektroG from 20 October 2015, BGBl. I p. 1739). <li style="text-align: center;"><i>or</i> ➤ Instruct BINDER Service to dispose of the device. The general terms of payment and delivery of BINDER GmbH apply, which were valid at the time of purchasing the chamber.

Certified companies disassemble waste (used) BINDER equipment in primary substances for recycling according to Directive 2012/19/EU. 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.

	<p>Prior to handing the chamber over to a recycling company, it is the user's responsibility that it is free from toxic, infectious or radioactive substances.</p> <ul style="list-style-type: none"> • Prior to disposal, clean all introduced or residual toxic substances from the chamber. • Prior to disposal, disinfect the chamber 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 chamber, dispose of it as special waste according to national law. • Fill out the contamination clearance certificate (chap. 32) and enclose it with the chamber.
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  	<p style="text-align: center;">WARNING</p> <p>Danger of intoxication and infection through contamination of the chamber with toxic, infectious or radioactive substances.</p> <p>Damages to health.</p> <ul style="list-style-type: none"> Ø NEVER take a chamber contaminated with toxic substances or sources of infection for recycling according to Directive 2012/19/EU. ➤ Prior to disposal, remove all toxic substances and sources of infection from the chamber. ➤ A chamber 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.
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The refrigerant used 452A is not inflammable at ambient pressure. It must not escape into the environment. In Europe, recovery of the refrigerant 452A (GWP 2140) is mandatory according to regulation No. 842/2006/EC. Ensure the compliance with the applicable legal requirements regarding qualification of staff, disposal, and documentation.

29.4 Disposal of the chamber in the member states of the EU except for the Federal Republic of Germany

According to Annex I of Directive 2012/19/EU 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 chambers bear 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 2012/19/EU 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 chamber according to the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE).



	NOTICE
	<p>Danger of violation against existing law if not disposed of properly.</p> <p>Failure to comply with applicable law.</p> <ul style="list-style-type: none"> ∅ 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 2012/19/EU into national law. <i>or</i> ➤ Instruct the distributor who sold you the device to dispose of it. The agreements apply that were agreed with the distributor when purchasing the chamber (e.g. his general terms of payment and delivery). ➤ If your distributor is not able to take back and dispose of the chamber, please contact BINDER service.

Certified companies disassemble waste (used) BINDER equipment in primary substances for recycling according to Directive 2012/19/EU. 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.

	<p>Prior to handing the chamber over to a recycling company, it is the user's responsibility that it is free from toxic, infectious or radioactive substances.</p> <ul style="list-style-type: none"> • Prior to disposal, clean all introduced or residual toxic substances from the chamber. • Prior to disposal, disinfect the chamber 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 chamber, dispose of it as special waste according to national law. • Fill out the contamination clearance certificate (chap. 32) and enclose it with the chamber.
---	---

	 WARNING
	<p>Danger of intoxication and infection through contamination of the chamber with toxic, infectious or radioactive substances.</p> <p>Damages to health.</p> <ul style="list-style-type: none"> ∅ NEVER take a chamber contaminated with toxic substances or sources of infection for recycling according to Directive 2012/19/EU. ➤ Prior to disposal, remove all toxic substances and sources of infection from the chamber. ➤ A chamber 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 452A is not inflammable at ambient pressure. It must not escape into the environment. In Europe, recovery of the refrigerant 452A (GWP 2140) is mandatory according to regulation No. 842/2006/EC. Ensure the compliance with the applicable legal requirements regarding qualification of staff, disposal, and documentation.

29.5 Disposal of the chamber in non-member states of the EU

 	NOTICE
<p>Danger of violation against existing law if not disposed of properly.</p> <p>Failure to comply with applicable law. Alteration of the environment.</p> <ul style="list-style-type: none"> ➤ For final decommissioning and disposal of the chamber, please contact BINDER service. ➤ Follow the statutory regulations for appropriate, environmentally friendly disposal. 	

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

The refrigerant used 452A is not inflammable at ambient pressure. It must not escape into the environment. In Europe, recovery of the refrigerant 452A (GWP 2140) is mandatory according to regulation No. 842/2006/EC. Ensure the compliance with the applicable legal requirements regarding qualification of staff, disposal, and documentation.

30. Technical description

30.1 Factory calibration and adjustment

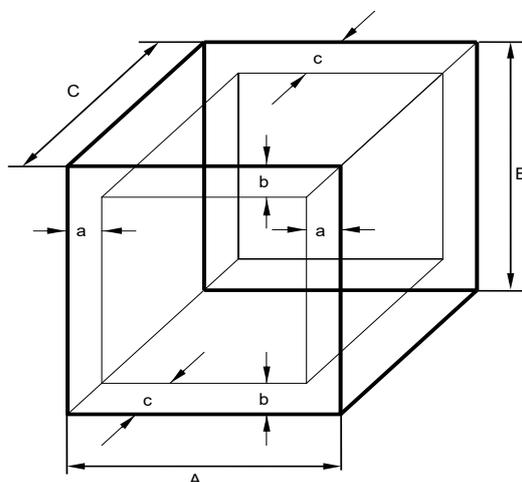
The chambers were calibrated and adjusted in the factory. Calibration and adjustment were performed using standardized test instructions, according to the QM DIN EN ISO 9001 system applied by BINDER (certified since December 1996 by TÜV CERT). All test equipment used is subject to the administration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

30.2 Over-current protection

The chambers are equipped with an internal protection not accessible from outside. If these fuses have responded, please contact an electronic engineer or BINDER Service.

30.3 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

$$a = 0.1 \cdot A$$

$$b = 0.1 \cdot B$$

$$c = 0.1 \cdot C$$

$$V_{USE} = (A - 2 \cdot a) \cdot (B - 2 \cdot b) \cdot (C - 2 \cdot c)$$

Figure 26: Determination of the useable volume

The technical data refers to the so defined usable volume.

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

Chamber size		240	720
Exterior dimensions including safety system and connections			
Width, gross (including 18 mm for 1 access port MK LIT 240), 36 mm for 2 access ports (MK LIT 720), with plug)	mm / inch	1439 / 56.65	1898 / 74.72
Height, gross (incl. castors)	mm / inch	1929 / 75.94	2221 / 87.44
Depth, gross (incl. cable and door handle)	mm / inch	1040 / 40.94	1168 / 45.98
Exterior dimensions without safety system and connections			
Width, gross (including 18 mm for 1 access port MK LIT 240), 36 mm for 2 access ports (MK LIT 720), with plug)	mm / inch	1335 / 52.56	1794 / 70.63
Height, gross (incl. castors)	mm / inch	1929 / 75.94	2005 / 78.94
Depth, gross (incl. cable and door handle)	mm / inch	925 / 36.42	1168 / 45.98
Depth, gross (incl. cable and door handle) with voltage and frequency changer	mm / inch	1615 / 63.58	1845 / 72.64
Wall clearance rear (minimum)	mm / inch	300 / 11.81	300 / 11.81
Further exterior dimensions and distances			
Wall clearance sides (minimum)	mm / inch	200 / 7.87	200 / 7.87
Wall clearance rear to set up the voltage and frequency changer (minimum)	mm / inch	1000 / 39.37	1000 / 39.37
Window width	mm / inch	508 / 19.99	508 / 19.99
Window height	mm / inch	300 / 11.81	300 / 11.81
Safety module width	mm / inch	600 / 23.62	600 / 23.62
Safety module height	mm / inch	800 / 31.50	800 / 31.50
Safety module depth	mm / inch	200 / 7.87	200 / 7.87
Doors			
Number of doors		1	1
Interior dimensions			
Width	mm / inch	735 / 28.94	1200 / 47.24
Height	mm / inch	700 / 27.56	1020 / 40.16
Depth	mm / inch	443 / 17.44	600 / 23.62
Interior volume	l / cu.ft.	228 / 8.05	734 / 25.92
Steam space volume *	l / cu.ft.	320 / 11.3	925 / 32.7
Racks			
Quantity of racks (regular)		1	1
Quantity of racks (max.)		6	11
Maximum load per rack	Kg / lbs.	30 / 66	40 / 88
Maximum permitted total load	Kg / lbs.	70 / 155	160 / 353

Chamber size		240	720
Weight			
Weight (empty)	Kg / lbs.	375 / 827	584 / 1287
Temperature data			
Temperature range	°C / °F	-40 to +110 -40 to 230	-40 to +110 -40 to 230
Temperature fluctuation	± K	0.1 to 0.5	0.1 to 0.5
Temperature uniformity (variation)	± K	0.1 to 1.2	0.3 to 2.0
Average heating up time acc. to IEC 60068-3-5	K/min.	5.0	4.0
Average cooling down time acc. to IEC 60068-3-5	K/min.	3.5	3.4
Heating up time from -40 °C to 110 °C	minutes	40	96
Cooling down time from 110 °C to -40 °C	minutes	160	100
Max. heat compensation at 25 °C / 77°F	W	2000	3500
Electrical data (model version MK056-230V)			
IP-system of protection of the battery test chamber acc. to EN 60529	IP	23	23
IP-system of protection of the safety module acc. to EN 60529	IP	20	20
Nominal voltage (+/-10%) at 50 Hz power frequency	V	400	400
Current type		3N~	3N~
Nominal power	kW	5.60	8.70
Power plug		CEE plug 5 poles, 16 Amp	CEE plug 5 poles, 16 Amp
Over-voltage category acc. to IEC 61010-1		II	II
Pollution degree acc. to IEC 61010-1		2	2
Over-current release category B, internal	A	3x 16	3x 16
Electrical data of the voltage and frequency changer			
IP-system of protection acc. to EN 60529	IP	23	23
Nominal voltage (+/-10%) at 60 Hz power frequency (input side)	V	480	480
Current type		3N~	3N~
Nominal power	kW	9	13
Over-voltage category acc. to IEC 61010-1		II	II
Pollution degree acc. to IEC 61010-1		2	2
Fuse	A	16	16
Environment-specific data			
Noise level (mean value)	dB(A)	62	65
Noise level (mean value) with voltage and frequency changer	dB(A)	67	67
Energy consumption at +20 °C / 68 °F	Wh/h	1300	1900
Filling weight of refrigerant R 452A (GWP 2140)	kg / lbs.	1.40 / 3.09	3.20 / 7.10

* Used to calculate the LEL

Note: Chambers with voltage and frequency changer: Average heating up time reduced by 0.3 K/min each.

All technical data is specified for unloaded chambers with standard equipment at an ambient temperature of +22 °C +/- 3 °C / 71.6 °F +/- 5.4 °F and a power supply voltage fluctuation of +/-10%. Technical data is determined in accordance to BINDER Factory Standard Part 2:2015 and DIN 12880:2007.

All indications are average values, typical for chambers 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.

30.5 Equipment and options (extract)



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

Regular equipment
Microprocessor display program controller
Door with heated window and interior lighting
Programmable anti-condensation protection of charging material
Environmentally friendly refrigerant R452A
Safety controller (temperature safety device class 2 acc. to DIN 12880:2007)
Internal socket 230 V AC, 1N ~ 50-60 Hz, max. load 500W, protection type IP 54
Ethernet interface for computer communication
1 access port with silicone plug, diameter 50 mm / 1.97 in left (LIT MK 240), 2 access ports with silicone plug, diameter 80 mm / 3.18 in left and right (LIT MK 720)
1 rack, stainless steel
Aeration / venting
Four castors (2 lockable)

Options / accessories
Additional rack, stainless steel
Perforated rack, stainless steel
Reinforced rack with 1 set of rack lockings
Securing elements for additional fastening of racks (4 pieces)
Lockable door
Access ports 30mm, 50mm, 80mm, 100mm, 125mm, left or right, with silicone plug
Over-/under temperature safety device class 2
Analogue outputs 4-20 mA for temperature actual value and set-point value to 6 pole DIN connection socket, DIN plug included
Object temperature display with flexible Pt100 temperature sensor
Notch-type access port 35 x 100 mm in the door
Interface RS 485
BINDER Data Logger kit for temperature TH 220
4 zero-voltage switching outputs, addressable via operation lines
Calibration of temperature including certificate
Spatial temperature measurement including certificate
Spatial temperature measurement acc. to DIN 12880 including certificate
Qualification folder

30.6 Accessories and spare parts (extract)

	<p>BINDER GmbH is responsible for the safety features of the chamber only, provided skilled electricians or qualified personnel authorized by BINDER perform all maintenance and repair, and if components relating to chamber safety are replaced in the event of failure with original spare parts. The user is responsible for any risks arising from using unauthorized accessories / components.</p>
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Chamber size	240	720
Description	Art. No.	
Rack, stainless steel	6004-0097	6004-0102
Perforated rack, stainless steel	8009-0447	8009-0511
Reinforced rack, stainless steel, with rack lockings	8012-0605	8012-0684
Rack lockings (4 pieces)	8012-0620	8012-0620
Door gasket silicone inside	6005-0188	6005-0199
Door gasket silicone outside	6005-0157	6005-0173

Description	Art. No.
Plug for silicon access port d50	6016-0032
Plug for silicon access port d 80	6016-0029
Data Logger Kit T 220	8012-0715
Door switch	5019-0061
Neutral cleaning agent, 1 kg	1002-0016

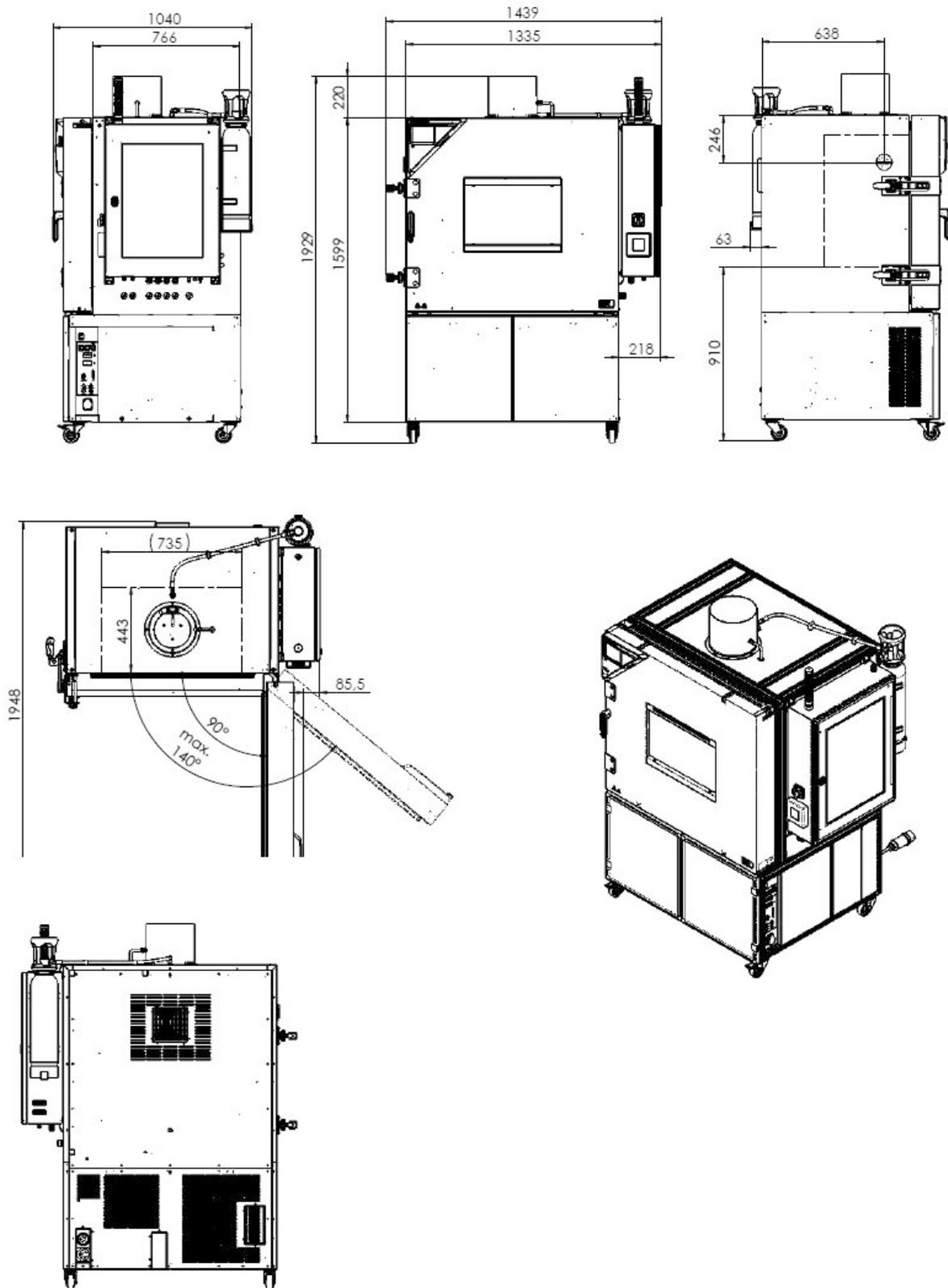
Validation service	Art. No.
Qualification folder IQ-OQ (printed version)	7007-0001
Qualification folder IQ-OQ (digital version)	7057-0001
Qualification folder IQ-OQ-PQ (printed version)	7007-0005
Qualification folder IQ-OQ-PQ (digital version)	7057-0005
Execution of IQ-OQ	DL410200
Execution of IQ-OQ-PQ	DL440500

Calibration service	Art. No.
Calibration of temperature including certificate (1 measuring point)	DL300101
Spatial temperature measurement including certificate (9 measuring points)	DL300109
Spatial temperature measurement including certificate (18 measuring points)	DL300118
Spatial temperature measurement including certificate (27 measuring points)	DL300127

For information on components not listed here, please contact BINDER Service.

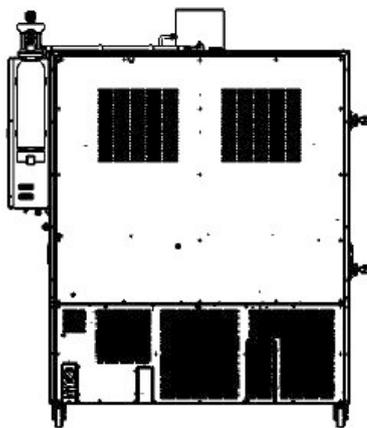
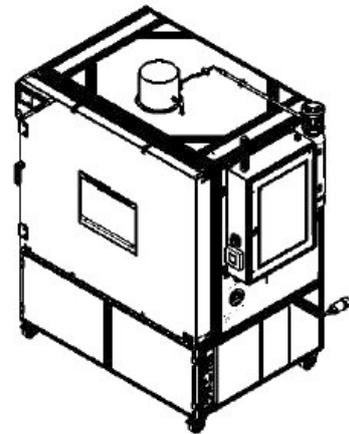
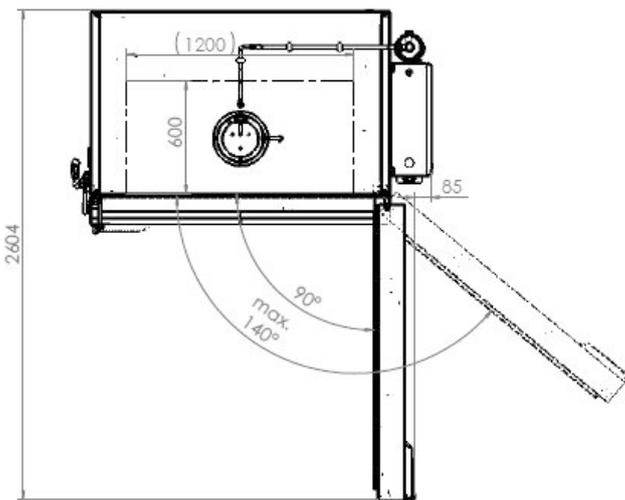
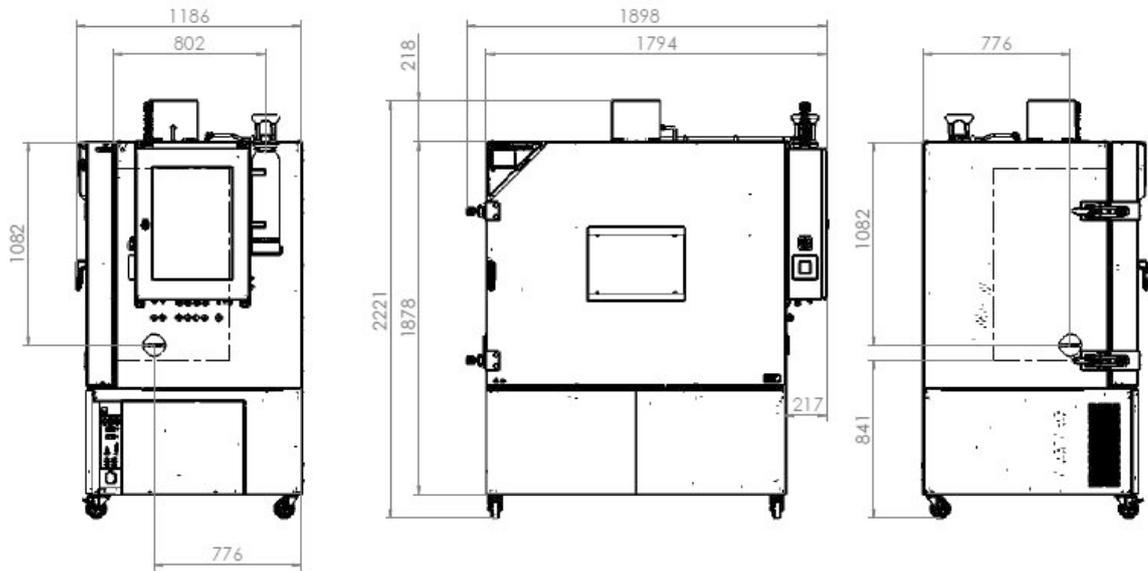
30.7 Dimensions

LIT MK 240 dimensions:



[mm]

LIT MK 720 dimensions:



[mm]

31. Certificates and declarations of conformity

31.1 EU Declaration of Conformity



BINDER
Best conditions for your success

	EU-Konformitätserklärung / EU Declaration of Conformity / Déclaration de conformité UE / Declaración de conformidad UE / Dichiarazione di conformità UE / Декларация соответствия EU
Hersteller / Manufacturer / Fabricant / Fabricante / Fabbricante / Производитель	BINDER GmbH
Anschrift / Address / Adresse / Dirección / Indirizzo / Адрес	Im Mittleren Ösch 5, 78532 Tuttlingen, Germany
Produkt / Product / Produit / Producto / Prodotto / Продукт	Batterietestschränke Battery test chambers Chambres de test de batteries Cámaras de pruebas de baterías Camere per test di batterie Камеры для испытания батарей
Typenbezeichnung / Type / Type / Tipo / Tipo / Тип	LIT MK 240, LIT MK 720
Art. No. / Art. no. / Réf. / Art. N° / Art. n. / № арт.	9020-0402, 9120-0402, 9020-0403, 9120-0403 9020-0404, 9120-0404, 9020-0405, 9120-0405

Die oben beschriebenen Maschinen sind konform mit folgenden EG/EU-Richtlinien (gemäß Veröffentlichung im Amtsblatt der europäischen Kommission):

The machines described above are in conformity with the following EC/EU Directives (as published in the Official Journal of the European Union):

Les machines décrites ci-dessus sont conformes aux directives CE/UE suivantes (selon leur publication dans le Journal officiel de l'Union européenne):

La máquina descrita arriba cumple con las siguientes directivas de la CE/UE (publicados en el Diario oficial de la Unión Europea):

Le macchine sopra descritte sono conforme alle seguenti direttive CE/UE (secondo la pubblicazione nella Gazzetta ufficiale della Commissione europea):

Машина, указанная выше, полностью соответствует следующим регламентам ЕС/ЕУ (опубликованным в Официальном журнале Европейского Содружества):

- **2006/42/EC**
Maschinenrichtlinie 2006/42/EG / Machinery directive 2006/42/EC / Directive Machines 2006/42/EC / Directiva 2006/42/CE (Máquinas) / Direttiva macchine 2006/42/CE / Директива о машинах 2006/42/EC
- **2014/30/EU**
EMV-Richtlinie 2014/30/EU / EMC Directive 2014/30/EU / Directive CEM 2014/30/UE / Directiva CEM 2014/30/UE / Direttiva EMC 2014/30/UE / Директива ЭМС 2014/30/EU
- **2011/65/EU**
RoHS-Richtlinie 2011/65/EU / RoHS Directive 2011/65/EU / Directive RoHS 2011/65/UE / Directiva RoHS 2011/65/UE / Direttiva RoHS 2011/65/UE / Директива RoHS 2011/65/EU

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BINDER GmbH Postfach 102 D-78502 Tuttlingen **Anschrift:** BINDER GmbH Im Mittleren Ösch 5 D-78532 Tuttlingen
Kontakt: Telefon: +49 (0) 74 62 / 20 05 - 0 | Telefax: +49 (0) 74 62 / 20 05 - 100 | info@binder-world.com | www.binder-world.com
Geschäftsführung: Dipl.-Ing. Peter M. Binder | Amtsgericht Stuttgart, HRB 727150 | Sitz der Gesellschaft: Tuttlingen
Bankverbindung: Kreissparkasse Tuttlingen Konto-Nr.: 2266 BLZ: 643 500 70 | IBAN-Code: DE05643 500700 000002266 | SWIFT-Code: SOLA DE S1TUT
 \$-Account 2202 611 55 | IBAN-Code: DE7464350070 0220 261155 | SWIFT-Code: SOLA DE S1TUT
 Deutsche Bank Tuttlingen Konto-Nr.: 2 138 709 BLZ: 653 700 75 | IBAN-Code: DE56653 70075 0213870900 | SWIFT-Code: DEUT DE SS603
 Altgeräte-Entsorgung gemäß WEEE-Reg.-Nr. DE 37004983

Die oben beschriebenen Maschinen entsprechen aufgrund ihrer Konzipierung und Bauart sowie in der von uns in Verkehr gebrachten Ausführung den einschlägigen grundlegenden Sicherheits- und Gesundheitsanforderungen der genannten EG/EU-Richtlinien.

The machines described above are conform to the mentioned EC/EU directives in regard to the relevant safety and health demands due to their conception and style of construction as well as to the version put onto market by us.

Les machines décrites ci-dessus correspondent aux demandes de sécurité et de santé des directives citées de la CE/UE due à leur conception et construction et dans la réalisation mise sur le marché par nous.

Las máquinas descritas arriba se corresponden con los requisitos básicos pertinentes de seguridad y salud de las citadas directivas de la CE/UE debido a su concepción y fabricación, así como a la realización llevada a cabo por nosotros.

Le macchine sopra descritte sono conforme ai requisiti essenziali di sanità e sicurezza pertinenti delle summenzionate direttive CE/UE in termini di progettazione, tipo di costruzione ed esecuzione messa da noi in circolazione.

Машины описано выше, соответствует указанным директивам ЕС/ЕУ в отношении требований соответствующей безопасности и здоровья по концепции и конструкции так же как и версия, применяемая нами на рынке.

Die oben beschriebenen Maschinen tragen entsprechend die Kennzeichnung CE.

The machines described above, corresponding to this, bear the CE-mark.

Les machines décrits ci-dessus, en correspondance, portent l'indication CE.

Las máquinas descritas arriba, en conformidad, llevan la indicación CE.

Le macchine sopra descritte sono contrassegnate dal marchio CE.

Машины описано выше, в соответствии с изложенным выше маркированы знаком CE.

Grundlage der Konformität mit den genannten EG/EU-Richtlinien:

Basis of conformity with the mentioned EC/EU directives:

Base de la conformité avec les directives citées de la CE/UE:

Bases de conformidad con las citadas directivas de la CE/UE:

Base di conformità alle summenzionate direttive CE/UE:

Основа соответствия указанным директивам ЕС/ЕУ:

Sicherheit / Safety / Sécurité / Seguridad / Sicurezza / Нормативы по безопасности
<ul style="list-style-type: none">• EN ISO 12100:2010 + Corr. 1:2011• EN ISO 13732-1:2008• EN 60204-1:2006 + A1:2009 + Corr. :2010
EMV / EMC / CEM / CEM / EMC / ЭМС
<ul style="list-style-type: none">• EN 61326-1:2013
RoHS
<ul style="list-style-type: none">• EN 50581:2012

78532 Tuttlingen, 26.08.2020
BINDER GmbH



P. Wimmer
Vice President
Vice President
Vice président
Vicepresidente
vicepresidente
Вице-президент



J. Bollaender
Letter F & E
Director R & D
Chef de service R&D
Responsable I & D
Direttore R & D
Глава департамента R&D

31.2 Certificate for the GS mark of conformity of the “Deutsche Gesetzliche Unfallversicherung e.V.” (German Social Accident Insurance) DGUV

Zertifikat
Nr. NV 20237
vom 30.11.2020

 **DGUV Test**
Prüf- und Zertifizierungsstelle
Nahrungsmittel und Verpackung
Fachbereich Nahrungsmittel

GS-Zertifikat

Name und Anschrift des Zertifikatsinhabers: (Auftraggeber)	Binder GmbH Im Mittleren Ösch 5 78532 Tuttlingen
Produktbezeichnung:	Batterietestschrank
Typ:	LIT MK 240, LIT MK 720
Prüfgrundlage:	GS-NV 5:2019/08 Prüfgrundsätze für Kühl- und Gefriermaschinen für Industrie und Gewerbe
Zugehöriger Prüfbericht:	Prüfbericht zum Zertifikat NV 20237
Weitere Angaben:	Das Zertifikat bezieht sich auf die im zugehörigen Prüfbericht beschriebene Ausführung des Produkts.

Das geprüfte Baumuster stimmt mit den in § 21 Absatz 1 des Produktsicherheitsgesetzes genannten Anforderungen überein. Der Zertifikatsinhaber ist berechtigt, das umseitig abgebildete GS-Zeichen an den mit dem geprüften Baumuster übereinstimmenden Produkten anzubringen. Der Zertifikatsinhaber hat dabei die umseitig aufgeführten Bedingungen zu beachten.

Dieses Zertifikat einschließlich der Berechtigung zur Anbringung des GS-Zeichens ist gültig bis einschließlich:

29.11.2025

Weiteres über die Gültigkeit, eine Gültigkeitsverlängerung und andere Bedingungen regelt die Prüf- und Zertifizierungsordnung.



Rückseite GS-Zertifikat: NV 20237

GS-Zeichen



NV 20237

Normalausführung



NV 20237

dguv.de/dguv-test

Bei einer Höhe von 20 mm oder weniger
auch zulässige Ausführung

1. Der Zertifikatsinhaber hat die Voraussetzungen einzuhalten, die bei der Herstellung des umseitig genannten Produktes zu beachten sind, um die Übereinstimmung mit dem geprüften Baumuster zu gewährleisten.
2. Die Prüf- und Zertifizierungsstelle des Fachbereichs Nahrungsmittel führt in regelmäßigen Abständen Kontrollmaßnahmen zur Überwachung der Herstellung und rechtmäßigen Verwendung des GS-Zeichens durch.
3. Die für die Herstellung verantwortliche Person hat sich zur Einhaltung der Voraussetzungen nach Nummer 1 und Duldung der Kontrollmaßnahmen verpflichtet.
4. Die Prüf- und Zertifizierungsstelle entzieht dem Zertifikatsinhaber die Zuerkennung des GS-Zeichens, wenn sich die Anforderungen nach § 21 Absatz 1 Produktsicherheitsgesetz geändert haben oder die Voraussetzungen nach Nummer 1 nicht eingehalten werden.
5. Das GS-Zeichen darf nur verwendet und mit ihm darf nur geworben werden, wenn die Voraussetzungen nach § 22 Produktsicherheitsgesetz erfüllt sind.

31.3 Safety concept certificate from TÜV Süd

BESCHEINIGUNG ■ CERTIFICATION ■ ATTESTATION ■ COMPROBANTE ■ ZAŚWIADCZENIE ■ СПРАВКА	 Industrie Service
	Bescheinigung Nr. IS-EG13-STG-20587292
	für Binder GmbH Gänsäcker 16 D-78532 Tuttlingen
	Produkte: Temperatur- und Klimaprüfschränke für Li-Ion-Zellen
	Typ: LIT MK240 / 720
	Hersteller: Binder GmbH, 78532 Tuttlingen
	Spezifikation: Sicherheitskonzept des Herstellers für Temperatur- und Klimaprüfschränke zur Erzeugung definierter Umgebungsbedingungen beim Prüfen von Lithium-Ionen-Batterien
	Beurteilungsreferenz: TÜV SÜD Industrie Service GmbH Nur gültig in Verbindung mit Technischem Bericht Nr. 20587292
	Hiermit wird bescheinigt, dass mit dem vorgestellten Sicherheitskonzept für Temperatur- und Klimaprüfschränke ausreichend risikomindernde Maßnahmen in Bezug auf die festgestellten möglichen Gefahren beim Prüfen von Lithium-Ionen-Zellen/Modulen/Systemen bis zum EUCAR Hazard Level 6 (Brand) getroffen werden können.
	Bedingungen: Jeder Temperatur- und Klimaprüfschrank muss vor erstmaliger Inbetriebnahme auf Übereinstimmung mit der Sicherheitsspezifikation sowie die wirksame Integration ins Gesamt-Test-System hin überprüft werden

Filderstadt, 04. September 2020

 M. Sc. Tara Rauscher-Fink Abteilung Elektro- und Gebäudetechnik	 B. Eng. Michael Ewinger Abteilung Elektro- und Gebäudetechnik
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TÜV SÜD Industrie Service GmbH • Elektro- und Gebäudetechnik • Gottlieb-Daimler Straße 7 • 70794 Filderstadt 

32. Contamination clearance certificate

32.1 For chambers located outside the USA and Canada

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 be 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 beigelegt 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) :
<input type="checkbox"/>	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...
<input type="checkbox"/>	Has not been exposed to or contains any toxic or otherwise hazardous substances / weder giftige noch sonstige gefährliche Stoffe enthält oder solche anhaften.
<input type="checkbox"/>	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.
<input type="checkbox"/>	Eventual residues of hazardous substances have been removed / evtl. Rückstände von Gefahrstoffen entfernt wurden.
<input type="checkbox"/>	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 ...
<input type="checkbox"/>	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. Geräte/Bauteil in Kontakt kamen, in 3.1 aufgelistet sind und alle Angaben vollständig sind.
<input type="checkbox"/>	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 Schadensansprüche 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.

32.2 For chambers located in the USA and Canada

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	<input type="radio"/> Duplicate order	
	<input type="radio"/> Duplicate shipment	
	<input type="radio"/> Demo	<i>Page one completed by sales</i>
	<input type="radio"/> Power Plug / Voltage	115V / 230 V / 208 V / 240V
	<input type="radio"/> Size does not fit space	
	<input type="radio"/> Transport Damage	Shock watch tripped? (<i>pictures</i>)
	<input type="radio"/> Other (specify below)	

Is there a replacement PO?	<input type="radio"/> Yes <input type="radio"/> No	
<i>If yes -> PO #</i>		
<i>If yes -> Date PO placed</i>		
Purchase order number		
BINDER model number		
BINDER serial number		
Date unit was received		
Was the unit unboxed?	<input type="radio"/> Yes <input type="radio"/> No	
Was the unit plugged in?	<input type="radio"/> Yes <input type="radio"/> No	
Was the unit in operation?	<input type="radio"/> Yes <input type="radio"/> No	
<i>Pictures of unit attached?</i>	<input type="radio"/> Yes <input type="radio"/> No	Pictures have to be attached!
<i>Pictures of Packaging attached?</i>	<input type="radio"/> Yes <input type="radio"/> No	

	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.

