

# Model MK 115 | Dynamic climate chambers for rapid temperature changes

The BINDER MK series chamber is suitable for all heat and cold tests between -40 °C and 180 °C. The MK is a clever alternative to complex individual solutions for cyclical temperature tests.

## BENEFITS

- Homogeneous climate conditions thanks to APT.line™ technology
- Comprehensive programming and data acquisition
- Large heated viewing window



Model 115



Model 115

## MAIN FEATURES

- Temperature range: -40 °C to 180 °C
- APT.line™ preheating chamber technology
- Programmable condensation protection for test material
- Heated viewing window with LED interior lighting
- BINDER Multi Management Software APT-COM™ Basic Edition
- Troubleshooting system with visual and audible alarms
- Intuitive touchscreen controller with time-segment and real-time programming
- Internal data logger, measured values can be read out in open format via USB
- Access port with silicone plug, 50 mm, left
- Class 2 independent adjustable temperature safety device (DIN 12880) with visual alarm
- 4 castors, two with brakes
- Computer interface: Ethernet
- 230 V power socket on the right-side control panel
- Adjustable ramp function
- Integrated chart recorder
- Real-time clock
- Door heating
- 1 stainless steel rack
- Inner chamber made of stainless steel
- CFC-free refrigerant R-452A
- Cooling with compressor cooling unit

## ORDERING INFORMATION

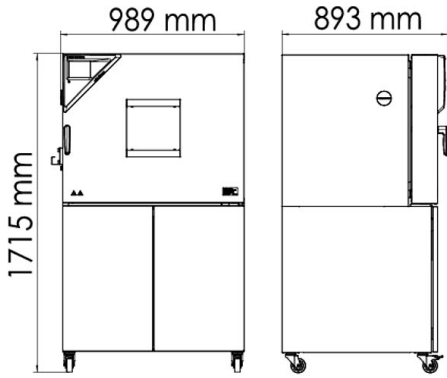
Interior volume [L]	Voltage	Option model	Version	Art.-No.
Model MK 115				
115	400 V 3~ ph 50 Hz	Standard	MK115-400V	9020-0375
	480 V 3~ ph 60 Hz	with voltage and frequency converter	MK115-480V-C	9020-0303

## TECHNICAL DATA

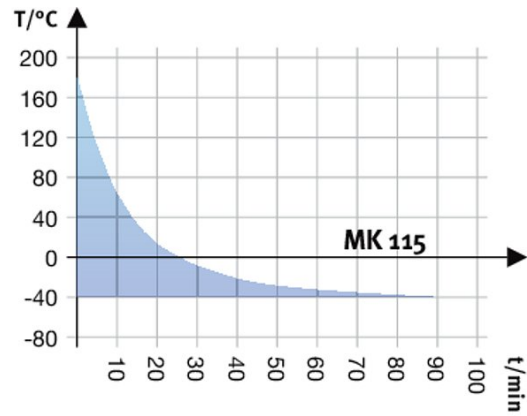
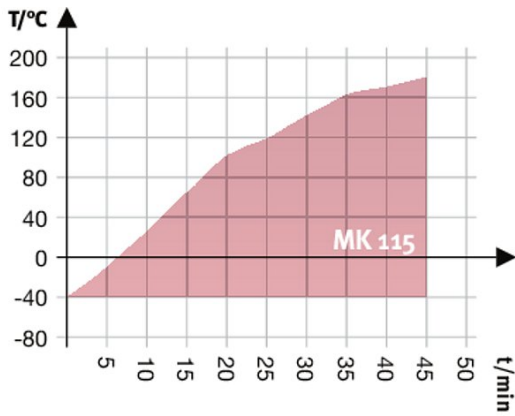
Description	MK115-400V <sup>1</sup>	MK115-480V-C <sup>1</sup>
Article Number	9020-0375	9020-0303
<b>Performance Data Temperature</b>		
Temperature range [°C]	-40...180	-40...180
Temperature variation depending on setpoint [± K]	0.1...2	0.1...2
Temperature fluctuation depending on setpoint [± K]	0.1...0.5	0.1...0.5
Average heating-up rate according to IEC 60068-3-5 [K/min]	5.3	5.3
Cooling down time from 180 °C to -40 °C [min]	90	90
Average cooling down time according to IEC 60068-3-5 [K/min]	5	5
Max. heat compensation at 25 °C [W]	1500	1500
<b>Electrical data</b>		
Rated Voltage [V]	400	480
Power frequency [Hz]	50	60
Nominal power [kW]	3.5	3.5
Unit fuse [A]	16	16
Phase (Nominal voltage)	3~	3~
<b>Internal Dimensions</b>		
Depth [mm]	400	400
Height [mm]	480	480
Width [mm]	600	600
<b>Housing dimensions not incl. fittings and connections</b>		
Width net [mm]	980	980
Height net [mm]	1725	1725
Depth net [mm]	865	865
<b>Measures</b>		
Viewing window width [mm]	288	288
Viewing window height [mm]	222	222
Wall clearance back [mm]	300	300
Wall clearance sidewise [mm]	200	200
Interior volume [L]	115	115
Net weight of the unit (empty) [kg]	260	260
permitted load [kg]	60	60
Load per rack [kg]	30	30
<b>Doors</b>		
Unit doors	1	1
<b>Environment-specific data</b>		
Sound-pressure level [dB(A)]	62	67
<b>Fixtures</b>		
Number of shelves (std./max.)	1/4	1/4

1 All technical data is specified for unloaded units with standard equipment at an ambient temperature of +22 °C ±3 °C and a power supply voltage fluctuation of ±10 %. The temperature data is determined in accordance to BINDER factory standard following DIN 12880, observing the recommended wall clearances of 10 % of the height, width, and depth of the inner chamber. Technical data refers to 100 % fan speed. All indications are average values, typical for units produced in series. We reserve the right to change technical specifications at any time.

DIMENSIONS incl. fittings and connections [mm]

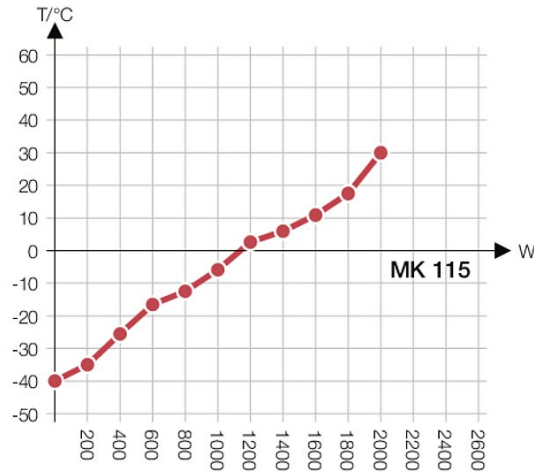


CHARTS



Heating up rate

Cooling down rate



Heat compensation chart

## OPTIONS AND ACCESSORIES

Designation	Description	*	Art.-No.
Access port	notch-type access port in door, 100 x 35 mm	-	8012-1849
	left		
	30 mm	01	8012-1322
	50 mm	01	8012-1328
	80 mm	01	8012-1334
	100 mm	01, 11	8012-1542
	125 mm	01, 11	8012-1351
	right		
Access port with silicone plug	30 mm	01	8012-1319
	50 mm	01	8012-1325
	80 mm	01	8012-1331
	100 mm	01, 11	8012-1539
	125 mm	01, 11	8012-1348
	top		
	80 mm	01	8012-1536
	100 mm	01, 11	8012-1530
	125 mm	01, 11	8012-1533
Analog output 4-20 mA	for temperature values (output not adjustable)	-	8012-1084
APT-COM™ 4 GLP-Edition	for working under GLP-compliant conditions. Measured values are documented in a tamper-proof way in line with the requirements of FDA Regulation 21 CFR 11. version 4, GLP edition	19	9053-0042
APT-COM™ 4 PROFESSIONAL-Edition	convenient unit and user management built on the BASIC edition. Suitable for networking up to 100 units. version 4, PROFESSIONAL edition	19	9053-0040
Calibration certificate, expanded	for temperature; for extending the measurement in center of chamber to include another test temperature	-	8012-1124
	for temperature, measurement in center of chamber at specified temperature	-	8012-1143
Calibration certificate, temperature	temperature measurement incl. certificate and 27 measuring points at specified temperature	-	8012-1602
	temperature measurement incl. certificate, 15- 18 measuring points at specified temperature	-	8012-1581
	temperature measurement incl. certificate, 9 measuring points at specified temperature	-	8012-1560
Data Logger Kit	T 220: For continuous temperature logging from -90 °C to 220 °C. The kit includes 1 data logger, Pt 100 sensor with 2 m extension cable and 1 magnetic fixture for mounting to the BINDER unit	19	8012-0715
Data Logger Software	LOG ANALYZE software kit, configuration and evaluation software for all BINDER Data Logger Kits (incl. USB data cable)	19	8012-0821
Door lock	lockable door handle	-	8012-1861
Dry-air purge	uncontrolled, incl. connection; for preventing condensation	-	8012-1087
Dry-air purge, connection	for the connection to an existing pressurized air network	-	8012-1801
pH-neutral detergent	concentrated, for gentle remove of residual contaminants; 1 kg	-	1002-0016
Pt 100 temperature sensor	additional flexible Pt 100, interior, for displaying the temperature on the unit display	-	8012-1093
Rack	stainless steel	-	6004-0008
Rack accessories	fasteners (1 set of 4) for additional security of racks	-	8012-0620
Rack, reinforced	stainless steel, with fasteners (1 set of 4)	-	8012-0709
RS 485 / RS 422 interface converter	RS 422 cable set and RS 485 / RS 422 interface converter for connection to 10-way plug distributor 115 V option model	-	8012-0599
	230 V option model	-	8012-0589
RS 485 interface, 2-wire	Additional serial interface can be used parallel to Ethernet, for Multi Management Software APT-COM™	-	8012-1768
Shelf, perforated	Stainless steel	-	6004-0030
Temperature safety device class 2	with visual alarm (DIN 12880)	-	8012-1792
Zero voltage relay contacts	for controlling 3 relay contacts via program regulators, accessible via 6-pin DIN socket (max. 24 V - 2.5 A)	-	8012-1095

\* Notes › See last page

## SERVICES

Designation	Description	*	Art.-No.
<b>Installation services</b>			
Installation	and set up of unit at operating location, connect to existing connections	13, 18	DL10-0300
Instruction	unit function instructions for operation and programming of the controller	18	DL10-0700
<b>Preventive maintenance</b>			
Preventive maintenance	Executive of equipment inspection according to maintenance plan	14, 18	DL20-0500
<b>Calibration services</b>			
Calibration temperature incl. certificate	including certificate, one measuring point in center of chamber at specified temperature	14, 16, 17, 18	DL30-0101
Temperature measurement 18 measuring points	including certificate, 18 measuring points at specified temperature	14, 16, 17, 18	DL30-0118
Temperature measurement 27 measuring points	including certificate, 27 measuring points at specified temperature	14, 16, 17, 18	DL30-0127
Temperature measurement 9 measuring points	including certificate, 9 measuring points at specified temperature	14, 16, 17, 18	DL30-0109
<b>Validation services</b>			
Execution of IQ/OQ	in accordance with qualification folder	15, 18, 20	DL41-0200
Execution of IQ/OQ/PQ	in accordance with customer's requirement, price: on request	15, 18	DL44-0500
Qualification folder IQ/OQ	supporting documents for validation performed by customer, consisting of: IQ/OQ checklists, unit schematics, QM certificate in accordance with ISO 9001	15, 18, 20	8012-0863
Qualification folder IQ/OQ/PQ	supporting documents for validation performed by customer, in accordance with customer's requirement, extension of Qualification folder IQ/OQ by chapter PQ	15, 18	8012-0951
<b>Warranty service</b>			
Extension of the warranty from 2 to 3 years	beginning with the date of delivery, wearing parts are not included	-	DL01-1041
Extension of the warranty from 2 to 5 years	beginning with the date of delivery, wearing parts are not included	-	DL01-1042

\* Notes › See last page

# Climate chambers series KB with package P for lithium-ion energy storage system tests

KB-P

The test chambers for energy storage systems from BINDER for carrying out aging and performance tests (package P) offer maximum user convenience and comply with **EUCAR Hazard Level 4**. Within a manufacturing process, the KB series climatic chamber is perfectly suited for **forming of the cells**.

## FORMING IN CLIMATE CHAMBERS SERIES KB

An important and final production step in the manufacture of a lithium-ion cell is formation. At this point the cell is charging and discharging for the first time and boundary layers there are inside the cell between the electrolyte and the active material. In addition, a quality control step can be performed simultaneously by a further charging and discharging process. The forming process can take up to 2 days.

## PERFORMANCE AND AGING TESTS

Calendar and cyclic aging tests are carried out. With calendar aging, the behavior of the energy storage system e.g. with different capacities across some or all of the lifetime of the energy storage system at different temperatures. During cyclic aging, the lifetime is determined in relation to the charging and discharging process of the energy storage system.

## THE POWERFUL ALLROUNDER IN CLIMATE CHAMBERS

### Important features of the KB series with package P:

- Perfectly suited for temperature tests between 0°C and 100°C
- Best price-performance ratio
- Compact dimensions compared to other models
- Solution request via BINDER INDIVIDUAL
- Small footprint - for small setup area
- Space-saving solution possible

Model KB 400 with package P



## YOUR ADVANTAGES AT A GLANCE



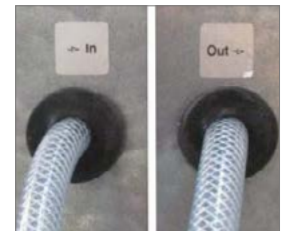
Class 2 independent temperature safety device when temperature is set to 120°C.



Door-locking mechanism with strong closing brackets on the side



Pressure relief flap with an additional relieving spring as a safety measure in the event of faults



Inert gas connections for flushing (e.g., for nitrogen)

## TEST CHAMBER FOR ENERGY STORAGE SYSTEMS SERIES KB - MODEL SELECTION AND TECHNICAL DATA

Model	KB 53	KB 115	KB 240	KB 400	KB 720
Housing dimensions not including attachments and connections <i>Width x Height x Depth [mm]</i>	635 x 835 x 580	835 x 1025 x 650	925 x 1465 x 800	925 x 1950 x 805	1250x 1952 x 885
Internal Dimensions <i>Width x Height x Depth [mm]</i>	400 x 400 x 330	600 x 480 x 400	650 x 785 x 485	650 x 1270 x 485	970 x 1250 x 576
Interior volume [L]	53	115	247	400	698
Footprint [m <sup>2</sup> ]	0,13	0,54	0,74	0,74	1,10
Temperature range	-5...100	--5...100	-5...100	-5...100	-5...100
Humidity range	-	-	-	-	-
Number of shelves (Std./max.)	2/4	2/5	2/9	2/15	2/15
Load per rack [kg]	15	20	30	30	45
Permitted load [kg]	40	50	100	100	100
Heat compensation at 40°C [W]	100	150	300	500	500

- not available

KB-P

### ACCESS PORTS SERIES KB

Model	Top possible size [mm]	At side (left/right) possible size [mm]	At back possible size [mm]
KB 53	-	-	10, 30, 50
KB 115	-	-	10, 30, 50
KB 240	10, 30, 50	10, 30, 50	-
KB 400	10, 30, 50	10, 30, 50	-
KB 720	10, 30, 50	10, 30, 50	-



Access ports for cables and power cables.

Precise positioning in almost all sizes and locations is possible in consultation with our BINDER INDIVIDUAL department. Access ports available in silicone or stainless steel.

### FURTHER ADAPTATIONS SERIES KB



Program sequence display using indicator lamps



Electromechanical door lock mechanism controlled in a program and/or manually



Additional access ports available in almost all sizes and locations



Telescopic rails for easier loading of the chamber

### STANDARDS

UN 38.3 | IEC 62660-1 | IEC 62660-2 | IEC 62660-3 | IEC 61960 | IEC 62133 | UL 1642 | UL 2054 | SAE J2464

## OTHER BINDER MODELS FOR LITHIUM-ION TESTS

### 1. Aging and performance tests

BINDER offers test chambers for aging tests with a standardized package A and a more advanced package P for Performance and aging tests. The following models can be equipped by our BINDER INDIVIDUAL department with package A and P:

Series	56	115	240	400	720	1020
MK	•	•	•	–	•	–
MKF	•	•	•	–	•	–
MKT	–	•	•	–	•	–
MKFT	–	•	•	–	•	–
KB	•	•	•	•	•	–
KBF	–	•	•	–	•	•
KMF	–	•	•	–	•	•
KBF-S	–	–	•	–	•	•

• Available – not available



Model MK 240 with package P

Basics

### 2. Drying & vacuum drying in the manufacturing process

In the manufacturing process of the lithium-ion cell, components are dried. Our **vacuum drying ovens series VD and series VDL** as well as our **drying oven Series FED** are suitable for this.

## EXPLANATION EUCAR HAZARD LEVEL

The failures which result from the cell or module are classified in hazard levels. The hazard levels according to EUCAR (European Council for Automotive R&D) offer an orientation. Operators define the hazard classification for the risk of their test objects and the test system/test equipment is then designed in the appropriate safety class.

Hazard classification	Description	Classification Criteria & Effect	
0	No effect	No effect. No loss of functionality	Paket A Paket P
1	Passive protection activated	No defect; no leakage; no venting, fire, or flame; no rupture; no explosion; no exothermic reaction or thermal runaway. Cell reversibly damaged. Repair of protection device needed	
2	Defect/Damage	Same as Hazard classification 1; however, the cell is damaged irreversibly and it must be replaced	
3	Leakage mass < 50 %	No venting, fire, or flame; no rupture; no explosion. Weight loss < 50 % of electrolyte weight (electrolyte = solvent + salt)	
4	Venting mass > 50 %	No venting, fire, or flame; no rupture; no explosion. Weight loss < 50 % of electrolyte weight (electrolyte = solvent + salt)	
5	Fire or Flame	No rupture; no explosion (i.e., no flying parts)	
6	Rupture	No explosion, but flying parts of the active mass	
7	Explosion	Explosion (i.e., disintegration of the cell)	

Operator is responsible for ultimate safety measures

## EXPLANATION PACKAGE A

### FOR AGING TESTS

#### Solution:

Cells and modules are tested at different temperatures always without a current supply in order to assess Aging during storage.

## EXPLANATION PACKAGE P

### FOR AGING AND PERFORMANCE TESTS

#### Solution:

Cells and modules are tested at different temperatures with and without a current supply to measure performance.



## TIPS AND TRICKS AND EXAMPLE OF APPLICATION

### Aging and performance test for cells and modules for lithium batteries (TÜV SÜD, Germany)

Extensive performance tests are carried out in order to determine the performance of the cells and modules (safety package P). The components are therefore brought to the limits of their performance and load capacities by exposing them to constantly changing temperatures, with and without a current. The test object is exposed, for example, to temperatures of -10 °C to 55 °C in the cooling incubator under continuous temperature changes.

Read more

[go2binder.com/en-TUEV-SUED-Battery-Testing](https://go2binder.com/en-TUEV-SUED-Battery-Testing)



Source: TÜV SÜD

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### Battery research (Car manufacturer, Germany)

The University of Warwick in the UK is successfully using BINDER simulation chambers from Tuttlingen in its research work. The newly founded Energy Innovation Centre, part of the International Automotive Research Centre (IARC), is working on the development of batteries for hybrid and electric vehicles. The aim is for batteries to be made more efficient in the near future, and for this reason scientists also need ever better climate chambers. So, with BINDER chambers, they have most likely found exactly the product they need, "Because the more powerful the batteries become, the more dangerous the tests in the laboratory. The scientists therefore need absolute safety," says Mark Amor-Segan, engineer at the new test center. In the new video interview on the "Select Science" website, the scientist emphasizes that safety will become even more important in the context of battery tests over the next few years.

See more:

<https://youtu.be/a9nr-l8snBg>



Source: TÜV SÜD



Source: University Warwick

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### Forming (WWU/MEET, Germany)

In use are climatic chambers of the KB series, which are used for forming. Drying ovens of the FED series are also used to dry components of the lithium-ion cell as well as accessories like gloves, for example.



Source: © WWU/MEET



# WolfLabs

**Pricing on any accessories shown can be found by keying the part number into the search box on our website.**

The specifications listed in this brochure are subject to change by the manufacturer and therefore cannot be guaranteed to be correct. If there are aspects of the specification that must be guaranteed, please provide these to our sales team so that details can be confirmed.

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