

# Model MKF 115 | Dynamic climate chambers for rapid temperature changes with humidity control

A BINDER MKF series environmental simulation chamber is ideally suited for any cold and heat testing based on current temperature and climate testing methods according to DIN and IEC standards. The comprehensive standard equipment for this environmental simulation chamber ensures ease of operation.

## BENEFITS

- Homogeneous climate conditions thanks to APT.line™ technology
- Automatic water and wastewater management
- Pressure humidification with fast response times
- Comprehensive programming and data acquisition
- Large heated viewing window



Model 115



Model 115

## MAIN FEATURES

- Temperature range: -40 °C to 180 °C
- Humidity range: 10 % to 98 % RH
- Integrated water-storage tank, 20 liters
- 4 zero-voltage relay contacts
- APT.line™ preheating chamber technology
- Programmable condensation protection for test material
- Heated viewing window with LED interior lighting
- Humidity regulation with capacitive humidity sensor and vapor humidification
- BINDER APT-COM™ 3 Basic Edition communication software
- Troubleshooting system with visual and audible alarms
- Intuitive touchscreen controller with time-segment and real-time programming
- Interner Datenlogger, Messwerte im offenen Format über USB auslesbar
- 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
- Alarm notification in the event of insufficient water in fresh water tank
- 1 stainless steel rack
- Complete safety connection kit for water supply and drainage, up to 1 m height
- Inner chamber made of stainless steel
- CFC-free refrigerant R-404A
- Cooling with compressor cooling unit

## ORDERING INFORMATION

Interior volume [cu.ft.]	Voltage	Option model	Version	Art.-No.
Model MKF 115				
4.1	400 V 3 ph 50 Hz	Standard	MKF115-400V	9020-0207
	480 V 3 ph 60 Hz	with voltage and frequency converter	MKF115-480V-C	9020-0357

## TECHNICAL DATA

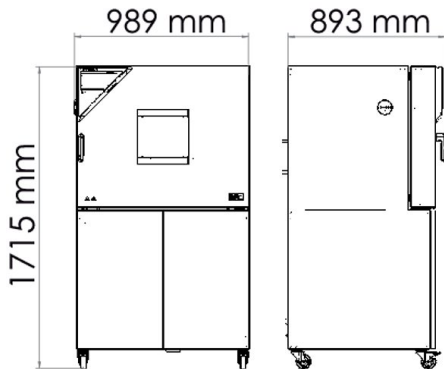
Description	MKF115-400V <sup>1</sup>	MKF115-480V-C <sup>1</sup>
Article Number	9020-0207	9020-0357
Performance Data Temperature		
Temperature range [°C]	-40...180	-40...180
Temperature variation depending on setpoint [± K]	0.1...1.3	0.1...1.3
Temperature fluctuation depending on setpoint [± K]	0.1...0.6	0.1...0.6
Average heating-up rate according to IEC 60068-3-5 [K/min]	5.5	5.5
Cooling down time from 180 °C to -40 °C [min]	95	95
Average cooling down time according to IEC 60068-3-5 [K/min]	4.5	4.5
Max. heat compensation at 25 °C [W]	2100	2100
Performance Data Climate		
Temperature range [°C]	10...95	10...95
Temperature fluctuation depending on setpoint [± K]	0.1...1.3	0.1...1.3
Humidity range [% RH]	10...98	10...98
Humidity fluctuation depending on setpoint	≤2,5 ± % RH	≤2,5 ± % RH
Dew point temperature range [°C]	5...94	5...94
Electrical data		
Rated Voltage [V]	400	480
Power frequency [Hz]	50	60
Nominal power [kW]	4.8	4.8
Unit fuse [A]	16	16
Phase (Nominal voltage) [ph]	3	3
Outer dimensions		
Width net [mm]	980	980
Height net [mm]	1725	1725
Depth net [mm]	865	865
Wall clearance back [mm]	300	300
Wall clearance sidewise [mm]	200	200
Viewing window width [mm]	288	288
Viewing window height [mm]	222	222
Doors		
Unit doors	1	1
Internal Dimensions		
Width [mm]	600	600
Height [mm]	480	480
Depth [mm]	400	400
Measures		
Interior volume [L]	115	115
Net weight of the unit (empty) [kg]	280	280
permitted load [kg]	60	60
Load per rack [kg]	30	30

<sup>1</sup> 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.

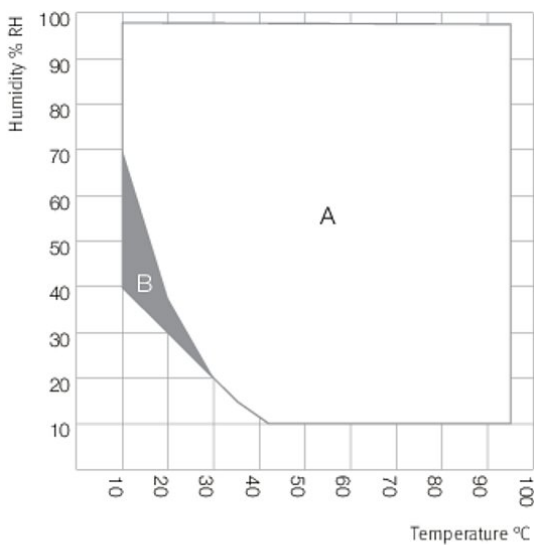
Description	MKF115-400V <sup>1</sup>	MKF115-480V-C <sup>1</sup>
Article Number	9020-0207	9020-0357
Environment-specific data		
Sound-pressure level [dB(A)]	62	67
Fixtures		
Number of shelves (std./max.)	1/4	1/4

<sup>1</sup> 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]**

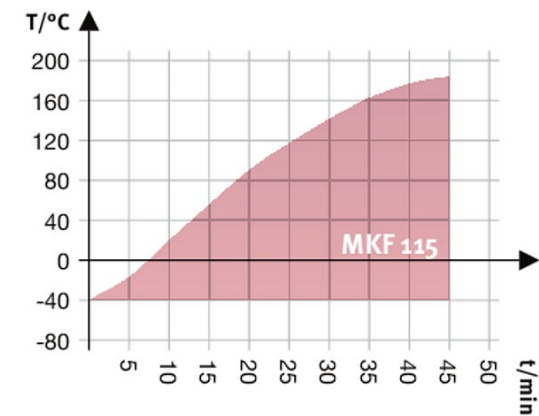


**CHARTS**

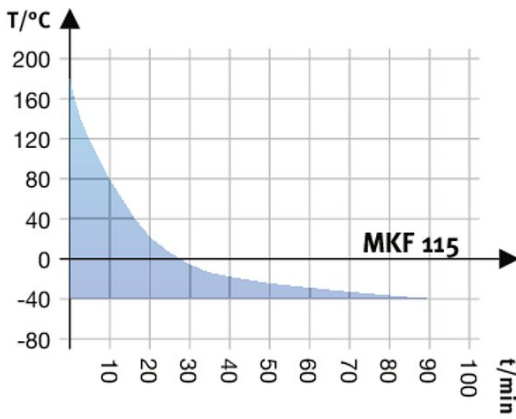


A: Standard Climate range  
 B: Time-limited operation (max. 24 hours)

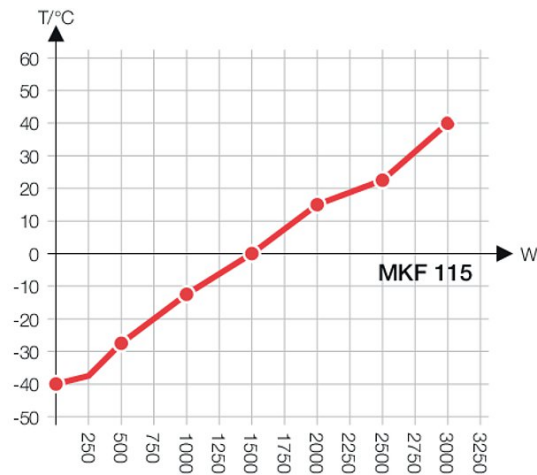
Climate chart



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	-	8012-1853
	left		
	30 mm	01	8012-1323
	50 mm	01	8012-1329
	80 mm	01	8012-1335
	100 mm	01, 11	8012-1543
	125 mm	01, 11	8012-1352
	right		
Access port with silicone plug	30 mm	01	8012-1320
	50 mm	01	8012-1326
	80 mm	01	8012-1332
	100 mm	01, 11	8012-1540
	125 mm	01, 11	8012-1349
	top		
	80 mm	01	8012-1537
	100 mm	01, 11	8012-1531
	125 mm	01, 11	8012-1534
Analog output 4-20 mA	for temperature and humidity values (output not adjustable)	-	8012-1085
BINDER PURE AQUA SERVICE	System for preparation or complete desalination of tap water, complete set containing PURE AQUA 300 single-use cartridge, measuring device, and all necessary connecting parts	-	8012-1809
BINDER PURE AQUA SERVICE, accessories	PURE AQUA 300 single-use replaceable cartridge for the BINDER PURE AQUA SYSTEM, filter capacity approx. 700 liters (for a conductivity of 200 µS/cm = 6.6 °dH)	-	6011-0179
	PURE AQUA 600 single-use replaceable cartridge for the BINDER PURE AQUA SYSTEM, filter capacity approx. 1,400 liters (for a conductivity of 200 µS/cm = 6.6 °dH)	-	6011-0180
Calibration certificate, expanded	for temperature and humidity; for extending the measurement in center of chamber to include another test value	-	8012-1194
Calibration certificate, temperature	temperature measurement incl. certificate and 27 measuring points at specified temperature	-	8012-1609
	temperature measurement incl. certificate, 15- 18 measuring points at specified temperature	-	8012-1589
	temperature measurement incl. certificate, 9 measuring points at specified temperature	-	8012-1568
Calibration certificate, temperature and humidity	Measurement in center of chamber at 25 °C / 60% RH or at specified test values	-	8012-1188
	temperature (according to DIN12880) and humidity measurement incl. certificate, 27 temperature measuring points and 1 humidity measuring point, at 25 °C / 60 % RH or at specified values	-	8012-1615

\* Notes › See last page

Designation	Description	*	Art.-No.
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
	TH 100/70: For continuous temperature and humidity logging from -40 °C to 100 °C / 0% to 100% RH and additional logging of ambient conditions. Kit includes 1 data logger, 2 attachable combined humidity/temperature sensors, 2 m extension cable and 1 fixture for mounting to the BINDER unit	19	8012-1838
	TH 100: For continuous temperature and humidity logging from -50 °C to 100 °C; 0% to 100% RH. Kit includes 1 data logger, Pt 100 sensor with 2 m extension cable, and 1 magnetic fixture for mounting to the BINDER unit	19	8012-1837
Door lock	lockable door handle	-	8012-1862
Dry-air purge	controlled, incl. connection; suitable for the simulation of current automobile industry standards	-	8012-1863
Dry-air purge, connection	for the connection to an existing pressurized air network	-	8012-1802
Interface converter	RS 422 cable set and RS 232 / RS 422 interface converter for connection to 10-way plug distributor or for connection to a unit		
	120 V, 60 Hz option model	-	8012-0557
	230 V, 50/60 Hz option model	-	8012-0556
Interface converter	RS 422 cable set and RS 422 / Ethernet interface converter for connection to 10-way plug distributor or for connection to a unit		
	120 V, 60 Hz option model	-	8012-0405
	230 V, 50/60 Hz option model	-	8012-0380
Interface converter, USB / RS422	RS 422 cable set and RS 422 / USB interface converter for connection to 10-way plug distributor or for connection to a unit (USB-powered converter)	-	8012-0665
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	-	8012-1094
Rack	stainless steel	-	6004-0008
Rack accessories	Rack accessories – fasteners (1 set of 4) for additional security of racks	-	8012-0620
Rack, reinforced	stainless steel, with 1 set of 4 fasteners, max. load 70 kg	-	8012-0709
RS 422 interface	modular plug distributor for 10 RS 422 interfaces	-	8012-0295
RS 422 interface, cable (15 m)	RS 422 connection cable (15 m) between plug distributor and RS 422 interface	-	5023-0036
RS 422 interface, cable (50 m)	RS 422 extension cable (50 m) between interface converter and unit or RS 232 / RS 422 plug distributor	-	5023-0117
RS 485 / RS 422 interface converter	RS 422 cable set and RS 485 / RS 422 interface converter for connection to 10-way plug distributor		
	230 V option model	-	8012-0589
		-	8012-0599
RS 485, 2-wire	Additional serial interface can be used parallel to Ethernet, for communication software	-	8012-1769
Shelf, perforated	Stainless steel	-	6004-0030
Software	APT-COM™ communications software		
	version 2 to 3, GLP edition	19	9053-0016
	version 3, BASIC edition	19	9053-0014
	version 3, GLP edition	19	9053-0015
	version 3, STANDARD edition	19	9053-0013
	APT-COM™ communications software, price: for free		
	version 3, GLP DEMO Edition	19	9053-0008
Temperature safety device class 2	with visual alarm (DIN 12880)	-	8012-1864
Water circuit	allows condensed water to be reused	-	8012-1512
Water cooling	for reduced heat loss to ambient air	-	8012-0843

\* 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 and humidity	including certificate, one measuring point in center of chamber at 25 °C / 60 % RH or at specified values	14, 16, 17, 18	DL30-0301
Temperature and humidity measurement according to DIN12880	including certificate (27 temperature measuring points and one humidity measuring point, at 25 °C / 60 % RH or at specified values)	14, 16, 17, 18	DL30-0427
Temperature measurement 18 temperature measuring points and 1 humidity measuring point	including certificate, 18 temperature measuring points and 1 humidity measuring point in center of chamber, at 25 °C / 60 % RH or at specified values	14, 16, 17, 18	DL30-0318
Temperature measurement 27 temperature measuring points and 1 humidity measuring point	including certificate, 27 temperature measuring points and 1 humidity measuring point in center of chamber, at 25 °C / 60 % RH or at specified values	14, 16, 17, 18	DL30-0327
<b>Validation services</b>			
Execution of IQ/OQ	in accordance with qualification folder	15, 18, 20	DL42-0300
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	8012-0865
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	8012-0953
<b>Warranty service</b>			
Extension of the warranty from 2 to 3 years	beginning with the date of delivery, wearing parts are not included	-	DL01-3041
Extension of the warranty from 2 to 5 years	beginning with the date of delivery, wearing parts are not included	-	DL01-3042

\* Notes › See last page

## NOTES

- 01 Condensation may occur in the area around the access port. Access ports may be placed in custom locations for an additional charge.
- 02 UL mark is not granted when this option is used.
- 03 Heat resistant only to max. 200 °C.
- 04 Only available on units rated for 230 V.
- 06 Heating-up time may increase as a result of the lower heat conductivity.
- 07 The additional heat input may affect the temperature behavior.
- 09 Not in conjunction with the optional access port, door with window and interior lighting.
- 10 Not available on 23-liter units.
- 11 Not available on 23- or 53-liter units.
- 12 Only available on units rated for 230 V or 400 V.
- 13 Installation and connections take place at unit location; transport within the company only upon consultation.
- 14 We recommend a BINDER service contract to cover unit inspections, calibrations and validations.
- 15 OQ according to Yellow Paper = completed factory validation documentation of all OQ checklists.
- 16 Sensor calibration is performed in an accredited calibration laboratory.
- 17 Calibration is performed according to the BINDER factory standard.
- 18 Quoted prices do not include travel costs. Please refer to the chapter on BINDER Service for travel costs for your region. Quoted prices for services performed in Switzerland do not include a country-specific added fee (available on request).
- 19 For additional accessories, refer to the Process documentation chapter.
- 20 When ordering IQ/OQ qualification folders and associated IQ/OQ execution on one order, we offer a 15 % discount for the item of the IQ/OQ folder.  
When ordering IQ/OQ/PQ qualification folders and associated IQ/OQ/PQ execution on one order, we offer a 15 % discount for the item of the IQ/OQ/PQ folder.

# 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



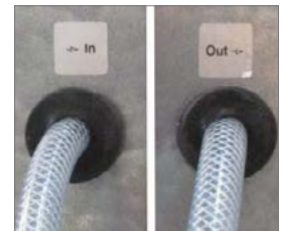
Class 2 independent temperature safety device when temperature is set to 120°C.



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

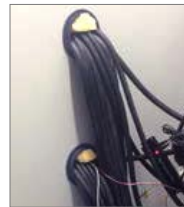
Model	KB 53	KB 115	KB 240	KB 400	KB 720
Housing dimensions not including attachments and connections <i>Width x Height x Depth [mm]</i>	635 x 835 x 580	835 x 1025 x 650	925 x 1465 x 800	925 x 1950 x 805	1250x 1952 x 885
Internal Dimensions <i>Width x Height x Depth [mm]</i>	400 x 400 x 330	600 x 480 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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Please contact us if this literature doesn't answer all your questions.