



# BINDER Scientific

## Product Catalog



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# BINDER GmbH

## Best conditions for your success.

BINDER is the leading name for perfect simulation of biological, chemical and physical environmental conditions. For years, our simulation chambers have been considered the best in the world. Our comprehensive range of products covers routine applications as well as highly specific jobs, providing unequalled precision in both.

You'll find that many of the advances in temperature chambers around the world originated from BINDER. The many patents we hold are impressive evidence of this fact. Our list of customers includes all of the best-known companies in 120 countries.

BINDER is known for maintaining the highest standards in research and development, as well as in manufacturing and quality assurance. Our products are developed consistently and with a clear focus on what we do best, namely climatic simulation technology, process technology, measurement and control technology, lighting technology, vacuum technology, and software solutions.

## We maintain a clear lead in cutting edge technology.

Success is nothing new to us! We have been the uncontested leader in the development of simulation chambers for science and industry for years. Setting this standard has not been easy. It takes much more than just producing an outstanding product; it requires the correct philosophy. Because our job isn't finished when we file another new patent - that simply fuels our enthusiasm.

Admittedly, our love for detail and our penchant for cutting edge technology has something to do with it. However, it has also something to do with what our equipment accomplishes - namely improving the quality of life. Whether it concerns making certain that vital medical equipment will operate perfectly even under difficult climatic conditions, or simply ensuring that everyday items continue to function properly; or creating the foundations to not only reduce the harmful effects of genetic diseases and cancer, but to actually find cures for them, BINDER simulation chambers are helping to shape the future in all of these areas.

We are well aware of this responsibility, and that is why we are extremely proud of the confidence our customers have placed in us.

**[www.binder-world.com](http://www.binder-world.com)**



# APT.line™

## Precision shows through superior results

### **The APT.line™**

Any new idea, no matter how small, is an opportunity to improve climatic chamber performance. We generate these types of new ideas daily through our ongoing dialogue with customers, users, and specialists. We're always ready to explore new approaches, and with our firm knowledge of what is feasible and what isn't, we examine these ideas and use them for innovative technical improvements.

The APT.line™ is one result of this process, and one of which we are truly proud. We found it necessary to devise new revolutionary solutions in temperature technology in order to keep pace with growing and increasingly specialized market requirements. This prompted our development of its unique preheating chamber technology as a fundamental technical principle for extremely precise temperature performance. As with many other new ideas introduced by BINDER, this technology has since become almost legendary as a patented exemplar for precision temperature chambers.

### **Unmistakably BINDER**

Even though they all are based upon APT.line™ technology, each of our units is basically worth patenting on its own. This is because each series is a separate, unique development, designed for a variety of different applications and users to meet the broad range of requirements found in modern laboratories. For years, the APT.line™ has covered a range of products that meet virtually the entire range of applications in all sectors of climatic testing. Its appearance and technology are distinct features of BINDER products. The technology is evidence of our solid design capabilities and technical expertise, and is an incentive for us to become even better in the future. Success is not just the best reward, it's also the best motivation.







# Research and progress

The BINDER prize for innovations has been awarded every year since 1998 by the Deutsche Gesellschaft für Zellbiologie (DGZ) [German association for cell biology]. The prize is donated by BINDER. It is awarded for excellent work in basic research in the field of cellbiology. As one of the world's largest manufacturers of temperature chambers and CO<sub>2</sub>-incubators, BINDER thereby emphasizes its personal engagement and close co-operation with science and research. BINDER is an excellent partner for implementing complex tasks and projects, particularly where cell cultivation is concerned.

## The award-winners:

### 1998

Dr. Ronald Frank, Gesellschaft für Biotechnologische Forschung in Braunschweig, for his work in the field of SPOT analysis

### 1999

Dr. Ludger Fink, Institute for Pathology at the Justus Liebig University of Giessen for his work on mRNA analysis according to laser-assisted cell-picking from complex tissues

### 2000

Dr. Maria Wartenberg and Dr. Heinrich Sauter, Institute for Neurophysiology in Cologne, for their work: "Thalidomide inhibits angiogenesis in embryoid bodies by the generation of hydroxyl radicals"

### 2001

Dr. Nicole Maas-Szabowski und Dr. Axel Szabowski, German cancer research center in Heidelberg, for their in-vitro research on the complex interactions between the human subcutis and cutis

### 2003

Dr. Thomas Korff and Prof. Hellmut Augustin, Cancer Biology Clinic in Freiburg, for fundamental research on an in-vitro model of the endothelium differentiation and blood vessel formation (angiogenesis).

### 2004

Dr. M. Christina Cardoso Max-Delbrück-Center for Molecular Medicine (MDC) Franz-Volhard-Klinik, For her work: "A look at genome duplication in living cells and the development of cell cycle markers"

### 2005

Prof. Frauke Melchior, Georg-August-University, Göttingen for her work: "Ubiquitin-related modifier SUMO"

### 2006

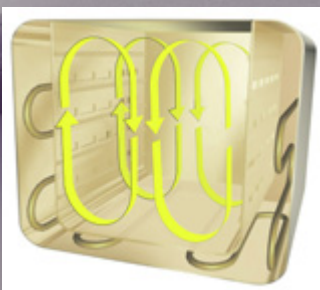
Prof. Dr. Ivan Dikic; University Frankfurt/Main for his work: "Ubiquitin and Ub-like modifiers in the heart of cell signalling"



# ED | FD

## An innovative alternative to expensive test equipment

The basic prerequisite for all projects is efficient drying and long-term storage at precisely controlled elevated temperatures. BINDER meets these requirements with advanced expertise and avoidance of energy loss through our patented APT.line™ technology with preheating chamber. If you want to meet the highest quality standards, but can do without all the bells and whistles, this series provides a cost-effective alternative.



APT.line™: natural convection

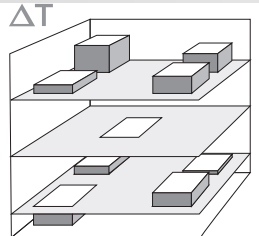


APT.line™: forced convection



# APT.line™ drying ovens

## Facts you should know:



### ▶ APT.line™ - absolute precision from 5 °C (9 °F) above ambient temperature to 300 °C (572 °F)

Only BINDER offers this precision temperature range as a standard. Unmistakable extra performance for universal use, either with natural convection or with forced convection. BINDER possesses the invaluable advantage of extremely rapid heating-up rates and recovery times.

ED/FD



### ▶ Precision in the details

Details such as significantly reduced energy use, a good working environment, and high occupational safety are the factors that make the difference with state-of-the-art performance characteristics in drying ovens. Mechanical quality in particular affects the precision of temperature parameters, speed and consistency.

1. All of our drying ovens have above-average thermal insulation. No temperature loss occurs in the interior and there is virtually no radiation of heat from the outside housing.
2. The specially designed 2-point door closure seals the door securely, even at maximum temperatures.

ED/FD



### ▶ Compliance with standards at the highest level.

We know that your jobs have to comply with the strictest standards and guidelines. BINDER can significantly reduce the time and effort needed for equipment qualification. We provide customized calibration certificates, IQ/OQ qualification documents, and assist with validation on site.

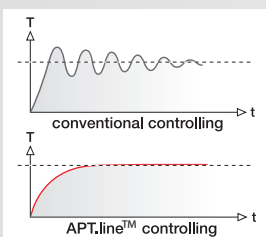
ED/FD



### ▶ BINDER test certificate: Your guarantee for top quality

Our equipment is tested meticulously. Each unit is re-inspected by Quality Control prior to delivery and calibrated to our factory standard. We also supply a free test certificate as quality confirmation.

ED/FD



### ▶ APT.line™ - electronic controller technology

Although many drying ovens have electronic controls, it is a well-known fact that two factors significantly affect the quality of thermal processes:

1. The quality of the control technology.
2. The efficiency of the temperature technology. Here, the electronic controls of the APT.line™ preheating chamber technology set absolute standards with respect to precision.

ED/FD



#### ► Natural convection

The extremely high rate of air exchange (approximately one-third higher than comparable units) substantially increases the efficiency of thermal processes such as drying.

ED



#### ► Forced convection

Only from BINDER. Produced by a specifically designed, extremely efficient air turbine that has approximately 20 % higher performance than comparable models. Our patented APT.line™ Airflow Design produces an extremely high airflow; and the airflow rate and the air exchange rate are variably adjustable from 0 % - 100 %.

##### Advantages:

- Faster heating-up and recovery times than with natural air recirculation
- Completely homogenous temperature performance, even with fully loaded chambers
- Significant time-saving through high drying efficiency

FD

Product	Controller features	Temperature-time functions
ED series FD series	<ul style="list-style-type: none"> <li>- DS controller</li> <li>- Constant temperature control</li> <li>- One ramp function</li> <li>- Integrated timer with one time function 0 to 99 hours, delayed OFF</li> <li>- Independent adjustable temperature safety device, Class 2 (DIN 12880), with visual alarm</li> <li>- Digital temperature setting with an accuracy of one degree</li> </ul>	<div> Constant temperature Ramp function Delayed OFF </div>

## ED series: Drying ovens with natural convection

Routine drying and sterilization applications up to 300° C (572 °F) and storage at precisely controlled elevated temperatures are the strengths of ED drying ovens. Because of the natural convection with a high rate of air exchange, thermal processes run with significantly increased efficiency.



### ► Performance features and equipment:

- Electronically-controlled APT.line™ preheating chamber technology with natural convection
- Temperature range of 5 °C (9 °F) above ambient temperature up to 300 °C (572 °F)
- DS controller with integrated timer 0 to 99 hours
- Digital temperature setting with an accuracy of one degree
- One ramp function
- Independent adjustable temperature safety device, Class 2 (DIN 12880), with visual temperature alarm
- Adjustable ventilation by means of rear exhaust duct Ø 50 mm (2 inch) with ventilation flap and front ventilation slide
- 2 chrome-plated racks
- Units up to 115 liters (4.1 cu.ft.) are stackable
- Optional RS 422 interface for communication software APT-COM™ DataControlSystem
- BINDER test certificate

► **Only at BINDER: Precision regardless of size – the 20-liter (0.7 cu.ft.) bench-top units.**





# Technical specification ED series



	ED 23	ED 53	ED 115	ED 240	ED 400	ED 720
<b>Exterior dimensions</b>						
Width (mm/inch)	433 / 17.1	634 / 25.0	834 / 32.8	1034 / 40.7	1234 / 48.6	1234 / 48.6
Height (inclusive feet/castors) (mm/inch)	492 / 19.4	617 / 24.3	702 / 27.6	822 / 32.4	1022 / 40.2	1528 / 60.2
Depth (mm/inch)	516 / 20.3	575 / 22.6	645 / 25.4	745 / 29.3	765 / 30.1	865 / 34.1
plus door handle, I-panel and exhaust duct (mm/inch)	85 / 3.4	85 / 3.4	85 / 3.4	85 / 3.4	85 / 3.4	85 / 3.4
Wall clearance rear (mm/inch)	100 / 3.9	100 / 3.9	100 / 3.9	100 / 3.9	100 / 3.9	100 / 3.9
Wall clearance side (mm/inch)	100 / 3.9	160 / 6.3	160 / 6.3	160 / 6.3	160 / 6.3	160 / 6.3
Exhaust duct outer-Ø (mm/inch)	52 / 2.1	52 / 2.1	52 / 2.1	52 / 2.1	52 / 2.1	52 / 2.1
Steam space volume (l/cu.ft.)	36 / 1.3	70 / 2.5	142 / 5.0	283 / 10.0	457 / 16.2	808 / 28.6
Number of doors	1	1	1	2	2	2
<b>Interior dimensions</b>						
Width (mm/inch)	222 / 8.7	400 / 15.8	600 / 23.6	800 / 31.5	1000 / 39.4	1000 / 39.4
Height (mm/inch)	330 / 13.0	400 / 15.8	480 / 18.9	600 / 23.6	800 / 31.5	1200 / 47.2
Depth (mm/inch)	277 / 10.9	330 / 13.0	400 / 15.8	500 / 19.7	500 / 19.7	600 / 23.6
Interior volume (l/cu.ft.)	20 / 0.7	53 / 1.9	115 / 4.1	240 / 8.6	400 / 14.3	720 / 25.7
Racks, chrome-plated (number standard/max.)	2 / 3	2 / 5	2 / 6	2 / 7	2 / 10	2 / 16
Load per rack (kg/lbs.)	12 / 26	15 / 33	20 / 44	30 / 66	35 / 77	45 / 99
Permitted total load (kg/lbs.)	25 / 55	40 / 88	50 / 110	70 / 155	90 / 199	120 / 265
Weight of the unit (empty) (kg/lbs.)	22 / 49	42 / 93	57 / 126	86 / 190	125 / 276	174 / 384
<b>Temperature data</b>						
Temperature range, 5 °C (9 °F) above ambient up to (°C/°F)	300 / 572	300 / 572	300 / 572	300 / 572	300 / 572	300 / 572
Temperature variation <sup>1)</sup>						
at 70 °C (158 °F) (± °C)	1.5	2	1.5	1.5	1.7	1.5
at 150 °C (302 °F) (± °C)	2.5	3.2	2.5	2.5	3	2.8
at 300 °C (572 °F) (± °C)	3.8	4.5	4.5	5.0	5.0	5.0
Temperature fluctuation at 70 °C (158 °F) (± °C)	0.3	0.3	0.3	0.3	0.3	0.3
Heating up time <sup>2)</sup>						
to 70 °C (158 °F) (Min.)	13	14	15	40	49	56
to 150 °C (302 °F) (Min.)	24	27	29	48	62	69
to 250 °C (482 °F) (Min.)	35	61	66	61	74	80
Recov. time after door was opened for 30 sec. <sup>2)</sup>						
at 70 °C (158 °F) (Min.)	2.5	2	2	5	4	4
at 150 °C (302 °F) (Min.)	5	6	9	13	20	14
at 300 °C (572 °F) (Min.)	8	11	14	18	24	18
Air change <sup>3)</sup>						
at 150 °C (302 °F) (x/h)	13	12	10	10	10	9
<b>Electrical data</b>						
Housing protection acc. to EN 60529	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Nominal voltage (±10 %) 50/60 Hz (V)	230 / 115	230 / 115	230 / 115	230 / 208 (3N)	400 / 208 (3N)	400 / 208 (3N)
Nominal power (W)	800	1200	1600	2700	3400	5000
Energy consumption						
at 70 °C (158 °F) (W)	43	60	90	143	201	220
at 150 °C (302 °F) (W)	148	210	300	447	672	750
at 300 °C (572 °F) (W)	450	600	360	700	1000	1200

<sup>1)</sup> value without window <sup>2)</sup> up to 98 % of the set value <sup>3)</sup> The air change depends on the inner chamber- and ambient temperature and is subject to significant individual variance. The indicated air change rate represents average values for standard equipment. Individual measurement of air change rate in acc. to ASTM D 5374 are optionally available.

All technical specification are specified for units with standard equipment at an ambient temperature of +25 °C (77 °F) and a voltage fluctuation of ±10 %. The temperature data are determined in accordance to factory standard following DIN 12880, part 2 respecting the recommended wall clearances of 10 % of the height, width and depth of the inner chamber. All indications are average values, typical for units produced in series. We reserve the right to alter technical specifications at all times.

## FD series: Drying ovens with forced convection

FD series units are primarily used in applications needing rapid drying and sterilization. Totally homogenous temperature distribution, rapid dynamic response, and a special air turbine which was developed by us and has 20 % higher output, have made the FD series a genuine time-saving device.



### ► Performance features and equipment:

- Temperature range of 5 °C (9 °F) above ambient temperature up to 300 °C (572 °F)
- Electronically controlled APT.line™ preheating chamber technology with forced convection
- DS controller with integrated timer 0 to 99 hours
- Digital temperature setting with an accuracy of one degree
- One ramp function
- Independent adjustable temperature safety device, Class 2 (DIN 12880), with visual temperature alarm
- Adjustable ventilation by means of rear exhaust duct Ø 50 mm (2 inch) with ventilation flap and front ventilation slide
- 2 chrome-plated racks
- Units up to 115 liters (4.1 cu.ft.) are stackable
- BINDER test certificate

► **Only at BINDER: Precision regardless of size – the 20-liter (0.7 cu.ft.) bench-top units.**



# Technical specification FD series



	FD 23	FD 53	FD 115	FD 240
<b>Exterior dimensions</b>				
Width (mm/inch)	433 / 17.1	634 / 25.0	834 / 32.8	1034 / 40.7
Height (inclusive feet/castors) (mm/inch)	492 / 19.4	617 / 24.3	702 / 27.6	822 / 32.4
Depth (mm/inch)	516 / 20.3	575 / 22.6	645 / 25.4	745 / 29.3
Plus door handle, I-panel and exhaust duct (mm/inch)	85 / 3.4	105 / 4.1	105 / 4.1	105 / 4.1
Wall clearance rear (mm/inch)	100 / 3.9	100 / 3.9	100 / 3.9	100 / 3.9
Wall clearance side (mm/inch)	100 / 3.9	160 / 6.3	160 / 6.3	160 / 6.3
Exhaust duct outer- Ø (mm/inch)	52 / 2.1	52 / 2.1	52 / 2.1	52 / 2.1
Steam space volume (l/cu.ft.)	36 / 1.3	77 / 2.7	158 / 5.6	308 / 10.9
Number of doors	1	1	1	2
<b>Interior dimensions</b>				
Width (mm/inch)	222 / 8.7	400 / 15.8	600 / 23.6	800 / 31.5
Height (mm/inch)	330 / 13.0	400 / 15.8	480 / 18.9	600 / 23.6
Depth (mm/inch)	277 / 10.9	330 / 13.0	400 / 15.8	500 / 19.7
Interior volume (l/cu.ft.)	20 / 0.7	53 / 1.9	115 / 4.1	240 / 8.6
Racks, chrome-plated (number standard/max.)	2 / 3	2 / 5	2 / 6	2 / 7
Load per rack (kg/lbs.)	12 / 26	15 / 33	20 / 44	30 / 66
Permitted total load (kg/lbs.)	25 / 55	40 / 88	50 / 110	70 / 155
Weight of the unit (empty) (kg/lbs.)	33 / 73	44 / 97	62 / 137	96 / 212
<b>Temperature data</b>				
Temperature range, 5°C (9°F) above ambient up to (°C/°F)	300 / 572	300 / 572	300 / 572	300 / 572
Temperature variation <sup>1)</sup>				
at 70 °C (158 °F) (± °C)	0.8	0.8	0.7	0.8
at 150 °C (302 °F) (± °C)	2.2	2	1.8	2
at 300 °C (572 °F) (± °C)	4.3	3.7	3.9	4.3
Temperature fluctuation (± °C)	0.3	0.3	0.3	0.3
Heating up time <sup>1), 2)</sup>				
to 70 °C (158 °F) (Min.)	7	7	7	11
to 150 °C (302 °F) (Min.)	22	22	28	24
to 300 °C (572 °F) (Min.)	45	60	49	50
Recov. time after door was opened for 30 sec. <sup>1), 2)</sup>				
at 70 °C (158 °F) (Min.)	2	2	2	2
at 150 °C (302 °F) (Min.)	4	4	5	6
at 300 °C (572 °F) (Min.)	9	9	12	13
Air change <sup>3)</sup>				
at 150 °C (302 °F) (x/h)	64	64	32	20
<b>Electrical data</b>				
Housing protection acc. to EN 60529	IP 20	IP 20	IP 20	IP 20
Nominal voltage (±10 %) 50/60 Hz (V)	230 / 115	230 / 115	230 / 115	230 / 208 (3N)
Nominal power (W)	800	1200	1600	2700
Energy consumption				
at 70 °C (158 °F) (W)	145	172	230	370
at 150 °C (302 °F) (W)	300	429	544	850
at 300 °C (572 °F) (W)	720	951	1100	1400

<sup>1)</sup> value without window <sup>2)</sup> up to 98 % of the set value <sup>3)</sup> The air change depends on the inner chamber- and ambient temperature and is subject to significant individual variance. The indicated air change rate represents average values for standard equipment. Individual measurement of air change rate in acc. to ASTM D 5374 are optionally available.

All technical specification are specified for units with standard equipment at an ambient temperature of +25 °C (77 °F) and a voltage fluctuation of ±10 %. The temperature data are determined in accordance to factory standard following DIN 12880, part 2 respecting the recommended wall clearances of 10 % of the height, width and depth of the inner chamber. All indications are average values, typical for units produced in series. We reserve the right to alter technical specifications at all times.



## Options/accessories ED/FD series:



### ► Access ports

With silicon plugs for inserting external measuring devices into the chamber. Access ports with 10, 30, 50 mm (0.4, 1.2, 2 inch) diameter.

ED/FD



### ► Door with window and interior lighting

For optimum process control in the interior, available for all equipment sizes.

ED/FD



### ► Lockable door

Prevents unauthorized access and interference with processes in the chamber.

ED/FD



### ► Calibration certificates

Measurement in the center at specified values. Additional measuring points or test values according to your specification.

ED/FD



### ► Transportable precision measuring unit

For temperature, using a PT 100 temperature sensor. Suitable for universal use as an independent monitoring device for temperature chambers.

ED/FD

	ED						FD			
	23	53	115	240	400	720	23	53	115	240
Access port with silicone plug	○	○	○	○	○	○	○	○	○	○
Rack, chrome-plated or stainless steel	○	○	○	○	○	○	○	○	○	○
Shelf, perforated, stainless steel	○	○	○	○	○	○	○	○	○	○
Reinforced rack, stainless steel, with 1 set of rack securing elements (max. 70 kg / 154 lbs.)	–	–	–	–	–	–	–	–	–	○
Rack securings for additional fastening of racks (1 set of 4)	–	–	–	–	–	–	○	○	○	○
Indep. adj. temp. safety device, Class 3.1 (DIN 12880) 230/400 V only	○	○	○	○	○	○	○	○	○	○
Door with window and interior lighting	○	○	○	○	○	○	○	○	○	○
Lockable door	○	○	○	○	○	○	○	○	○	○
Door gasket, viton (temperature-resistant up to 200 °C (392 °F))	○	○	○	○	○	○	○	○	○	○
Over-temperature alarm, acoustic, can be switched off	○	○	○	○	○	○	○	○	○	○
Analogue temperature output, 4–20 mA, with 6-pin DIN socket	○	○	○	○	○	○	○	○	○	○
RS 422 interface	○	○	○	✓	✓	✓	–	–	–	–
Measurement of air change rate according to ASTM D5374 with definition and protocol	○	○	○	○	○	○	○	○	○	○
Calibration certificate	○	○	○	○	○	○	○	○	○	○
Extension for calibration certificate (additional values)	○	○	○	○	○	○	○	○	○	○
Stable table on castors with stop brake	–	○	○	○	○	–	–	○	○	○
Evaporating dish with rim	○	○	○	○	○	○	○	○	○	○
Rubber pads for safe stacking	○	○	○	–	–	–	○	○	○	–

○ option    – not available    ✓ standard

Technical specifications subject to change





# FED

## A hot tip for thermal applications

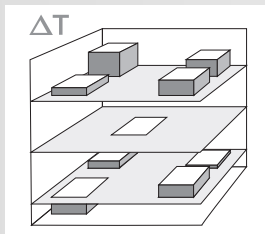
Heating chambers need to meet complex requirements. Rather than being dedicated to a single application, these chambers must fulfill a wide range of needs simultaneously, including sterilization, drying, and controlled storage over a wide range of temperature stages, all of which must be maintained accurately. At BINDER, we see this not as a target to be achieved, but as our standard.



APT.line™: forced convection

# APT.line™ heating chambers

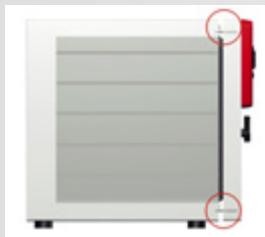
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FED



### ▶ Precision in the details

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1. All of our drying ovens have above-average thermal insulation. No temperature loss occurs in the interior and there is virtually no radiation of heat from the outside housing.
2. The specially designed 2-point door closure seals the door securely, even at maximum temperatures.

FED



### ▶ Compliance with standards at the highest level.

We know that your jobs have to comply with the strictest standards and guidelines. BINDER can significantly reduce the time and effort needed for equipment qualification. We provide customized calibration certificates, IQ/OQ qualification documents, and assist with validation on site.

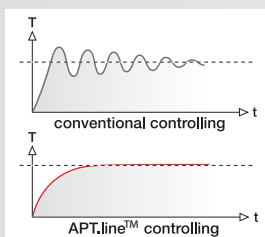
FED



### ▶ BINDER test certificate: Your guarantee for top quality

Our equipment is tested meticulously. Each unit is re-inspected by Quality Control prior to delivery and calibrated to our factory standard. We also supply a free test certificate as quality confirmation.

FED



### ▶ APT.line™ - electronic controller technology

Although many drying ovens have electronic controls, it is a well-known fact that two factors significantly affect the quality of thermal processes:

1. The quality of the control technology.
2. The efficiency of the temperature technology. Here, the electronic controls of the APT.line™ preheating chamber technology set absolute standards with respect to precision.

FED



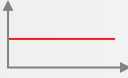


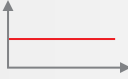



#### ► Forced convection

Only from BINDER. Produced by a specifically designed, extremely efficient air turbine that has approximately 20 % higher performance than comparable models. Our patented APT.line™ Airflow Design produces an extremely high airflow; and the airflow rate and the air exchange rate are variably adjustable from 0 % - 100 %.

#### Advantages:

- Faster heating-up and recovery times than with natural air recirculation
- Completely homogenous temperature performance, even with fully loaded chambers
- Significant time-saving through high drying efficiency

FED

Product	Controller features	Temperature-time functions
ED series FD series	<ul style="list-style-type: none"> <li>- DS controller</li> <li>- Constant temperature control</li> <li>- One ramp function</li> <li>- Integrated timer with one time function 0 to 99 hours, delayed OFF</li> <li>- Independent adjustable temperature safety device, Class 2 (DIN 12880), with visual alarm</li> <li>- Digital temperature setting with one degree accuracy</li> </ul>	 <p>Constant temperature</p>  <p>Ramp function</p>  <p>Delayed OFF</p>
FED series	<b>Additional functionality compared to ED/FD series:</b> <ul style="list-style-type: none"> <li>- MS controller</li> <li>- Integrated timer with several timer functions, such as 0 to 99 h 59 min, delayed OFF 0 to 99 h 59 min, delayed ON 0 to 99 h 59 min, temperature-dependent delayed OFF</li> </ul>	 <p>Constant temperature</p>  <p>Ramp function</p>  <p>Delayed ON</p>  <p>Temperature-dependent Delayed OFF</p>

## FED series: Heating chambers with forced convection

The FED series is a true all-rounder. It has a virtually unlimited capacity and is at the same time particularly adaptable to the specific requirements of a large variety of testing applications. The enhanced time functions and the digitally controlled air turbine can be used to adjust ideal temperature parameters and recirculation air conditions.



### ► Performance features and equipment:

- Electronically-controlled APT.line™ preheating chamber technology with forced convection
- Temperature range of 5 °C (9 °F) above ambient temperature up to 300 °C (572 °F)
- MS Controller with several timer functions
- Controller timer functions: delayed ON, delayed OFF, temperature dependent delayed OFF
- Digital temperature setting with an accuracy of one degree
- One ramp function
- Adjustable fan speed (0 to 100 %)
- Independent adjustable temperature safety device, Class 2 (DIN 12880), with visual temperature alarm
- Adjustable ventilation by means of rear exhaust duct Ø 50 mm (2 inch) with ventilation flap and front ventilation slide
- RS 422 interface for communication software APT-COM™ DataControlSystem, or switch over to printer output with RS 232 / RS 422 interface converter
- Adjustable intervals for printer
- Units up to 115 liters (4.1 cu.ft.) are stackable
- 2 chrome-plated racks
- BINDER test certificate





# Technical specification FED series



	FED 53	FED 115	FED 240	FED 400	FED 720
<b>Exterior dimensions</b>					
Width (mm/inch)	634 / 25.0	834 / 32.8	1034 / 40.7	1234 / 48.6	1234 / 48.6
Height (inclusive feet/castors) (mm/inch)	617 / 24.3	702 / 27.6	822 / 32.4	1022 / 40.2	1528 / 60.2
Depth (mm/inch)	575 / 22.6	645 / 25.4	745 / 29.3	765 / 30.1	865 / 34.1
Plus door handle, I-panel and exhaust duct (mm/inch)	105 / 4.1	105 / 4.1	105 / 4.1	105 / 4.1	105 / 4.1
Wall clearance rear (mm/inch)	100 / 3.9	100 / 3.9	100 / 3.9	100 / 3.9	100 / 3.9
Wall clearance side (mm/inch)	160 / 6.3	160 / 6.3	160 / 6.3	160 / 6.3	160 / 6.3
Exhaust duct outer-Ø (mm/inch)	52 / 2.1	52 / 2.1	52 / 2.1	52 / 2.1	52 / 2.1
Steam space volume (l/cu.ft.)	77 / 2.7	158 / 5.6	308 / 10.9	498 / 17.6	869 / 30.7
Number of doors	1	1	2	2	2
<b>Interior dimensions</b>					
Width (mm/inch)	400 / 15.8	600 / 23.6	800 / 31.5	1000 / 39.4	1000 / 39.4
Height (mm/inch)	400 / 15.8	480 / 18.9	600 / 23.6	800 / 31.5	1200 / 47.2
Depth (mm/inch)	330 / 13.0	400 / 15.8	500 / 19.7	500 / 19.7	600 / 23.6
Interior volume (l/cu.ft.)	53 / 1.9	115 / 4.1	240 / 8.6	400 / 14.3	720 / 25.7
Racks, chrome-plated (number standard/max.)	2 / 5	2 / 6	2 / 7	2 / 10	2 / 16
Load per rack (kg/lbs.)	15 / 33	20 / 44	30 / 66	35 / 77	45 / 99
Permitted total load (kg/lbs.)	40 / 88	50 / 110	70 / 155	90 / 199	120 / 265
Weight of the unit (empty) (kg/lbs.)	44 / 97	62 / 137	96 / 212	145 / 320	195 / 430
<b>Temperature data</b>					
Temperature range, 5 °C (9 °F) above ambient up to (°C/°F)	300 / 572	300 / 572	300 / 572	300 / 572	300 / 572
Temperature variation <sup>1)</sup>					
at 70 °C (158 °F) (± °C)	0.8	0.7	0.8	1	1
at 150 °C (302 °F) (± °C)	2	1.8	2	2.5	2
at 300 °C (572 °F) (± °C)	3.7	3.9	4.3	4.8	5.5
Temperature fluctuation (± °C)	0.3	0.3	0.3	0.3	0.3
Heating up time <sup>2)</sup>					
to 70 °C (158 °F) (Min.)	6	7	12	18	25
to 150 °C (302 °F) (Min.)	24	30	27	35	39
to 250 °C (572 °F) (Min.)	45	49	50	60	65
Recov. time after door was opened for 30 sec. <sup>2)</sup>					
at 70 °C (158 °F) (Min.)	2	2	2	2	2
at 150 °C (302 °F) (Min.)	5	8	10	17	20
at 300 °C (572 °F) (Min.)	10	15	16	21	24
Air change <sup>3)</sup>					
at 150 °C (302 °F) (x/h)	43	32	20	18	12
<b>Electrical data</b>					
Housing protection acc. to EN 60529	IP 20	IP 20	IP 200	IP 20	IP 20
Nominal voltage (±10 %) 50/60 Hz (V)	230 / 115	230 / 115	230 / 208 (3N)	400 / 208(3N)	400 / 208 (3N)
Nominal power (W)	1200	1600	2700	3400	5000
Energy consumption					
at 70 °C (158 °F) (W)	162	230	370	520	570
at 150 °C (302 °F) (W)	397	544	850	1200	1320
at 300 °C (572 °F) (W)	933	1100	1400	2340	2600

<sup>1)</sup> value without window <sup>2)</sup> up to 98 % of the set value <sup>3)</sup> The air change depends on the inner chamber- and ambient temperature and is subject to significant individual variance. The indicated air change rate represents average values for standard equipment. Individual measurement of air change rate in acc. to ASTM D 5374 are optionally available.

All technical specification are specified for units with standard equipment at an ambient temperature of +25 °C (77 °F) and a voltage fluctuation of ±10 %. The temperature data are determined in accordance to factory standard following DIN 12880, part 2 respecting the recommended wall clearances of 10 % of the height, width and depth of the inner chamber. All indications are average values, typical for units produced in series. We reserve the right to alter technical specifications at all times.

## Options/accessories FED series:



### ► Access ports

With silicon plugs for inserting external measuring devices into the chamber. Access ports with 10, 30, 50 mm (0.4, 1.2, 2 inch) diameter.

FED



### ► Door with window and interior lighting

For optimum process control in the interior, available for all equipment sizes.

FED



### ► Lockable door

Prevents unauthorized access and interference with processes in the chamber.

FED



### ► Calibration certificates

Measurement in the center at specified values. Additional measuring points or test values according to your specification.

FED



### ► Transportable precision measuring unit

For temperature, using a PT 100 temperature sensor. Suitable for universal use as an independent monitoring device for temperature chambers.

FED



### ► Reinforced inner chamber

Includes two reinforced racks for heavy loads.  
(Total load maximum 250 kg / 551 lbs.)

FED



### ► Serial printer

For recording temperature data. Suitable for connection to an RS 232 printer interface. Includes cables for the RS 422 interface and an interface converter.

FED

	FED				
	53	115	240	400	720
Access port with silicone plug	○	○	○	○	○
Rack, chrome-plated or stainless steel	○	○	○	○	○
Shelf, perforated, stainless steel	○	○	○	○	○
Reinforced rack, stainless steel, with 1 set of rack securing elements (max. 70 kg / 154 lbs.)	–	–	○	○	○
Reinforced inner chamber, including 2 reinforced racks (max. total load 250 kg / 552 lbs.; Load per rack 70 kg / 154 lbs.)	–	–	○	○	○
Rack securings for additional fastening of racks (1 set of 4)	○	○	○	○	○
Indep. adj. temp. safety device, Class 3.1 (DIN 12880) 230 / 400 V only	○	○	○	○	○
Door with window and interior lighting	○	○	○	○	○
Lockable door	○	○	○	○	○
Door gasket, viton (temperature-resistant up to 200 °C / 392 °F)	○	○	○	○	○
Over-temperature alarm, acoustic, can be switched off	○	○	○	○	○
Analogue temperature output, 4–20 mA, with 6-pin DIN socket	○	○	○	○	○
Air change rate measurement according to ASTM D5374 with definition and measurement protocol	○	○	○	○	○
Serial printer with interface converter for printing temperature logs. Connects to RS 232 printer interface. Includes set of connection cables for RS 422 interface and RS 232/RS 422 interface converter, 230 V.	○	○	○	○	○
RS 422 interface	✓	✓	✓	✓	✓
Calibration certificate	○	○	○	○	○
Extension for calibration certificate (additional values)	○	○	○	○	○
Stable table on castors with stop brake	○	○	○	○	–
Evaporating dish with rim	○	○	○	○	○
Rubber pads for safe stacking	○	○	–	–	–
Transportable precision measuring equipment for temperature TM 01	○	○	○	○	○





FP

## Complex applications are our favorites!

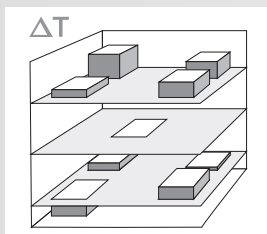
These test chambers prove themselves best in complex applications, using advanced APT.line™ technology. Preheating chamber technology for maximum precision over a broad temperature range, plus comprehensive programming options for selecting any desired combinations of ramps, profiles, and test sequences.



APT.line™: forced convection

## APT.line™ drying ovens

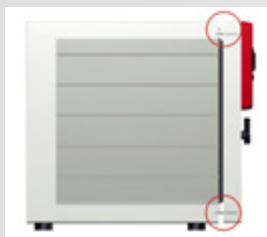
### Facts you should know:



#### ▶ APT.line™ - absolute precision from 5 °C (9 °F) above ambient temperature to 300 °C (572 °F)

Only BINDER offers this precision temperature range as a standard. Unmistakable extra performance for universal use, either with natural convection or with forced convection. BINDER possesses the invaluable advantage of extremely rapid heating-up rates and recovery times.

FP



#### ▶ Precision in the details

Details such as significantly reduced energy use, a good working environment, and high occupational safety are the factors that make the difference with state-of-the-art performance characteristics in drying ovens. Mechanical quality in particular affects the precision of temperature parameters, speed and consistency.

1. All of our drying ovens have above-average thermal insulation. No temperature loss occurs in the interior and there is virtually no radiation of heat from the outside housing.
2. The specially designed 2-point door closure seals the door securely, even at maximum temperatures.

FP



#### ▶ Compliance with standards at the highest level.

We know that your jobs have to comply with the strictest standards and guidelines. BINDER can significantly reduce the time and effort needed for equipment qualification. We provide customized calibration certificates, IQ/OQ qualification documents, and assist with validation on site.

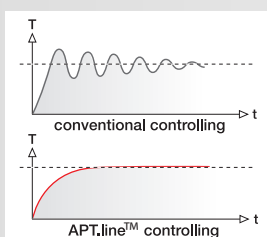
FP



#### ▶ BINDER test certificate: Your guarantee for top quality

Our equipment is tested meticulously. Each unit is re-inspected by Quality Control prior to delivery and calibrated to our factory standard. We also supply a free test certificate as quality confirmation.

FP



#### ▶ APT.line™ - electronic controller technology

Although many drying ovens have electronic controls, it is a well-known fact that two factors significantly affect the quality of thermal processes:

1. The quality of the control technology.
2. The efficiency of the temperature technology. Here, the electronic controls of the APT.line™ preheating chamber technology set absolute standards with respect to precision.

FP






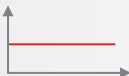


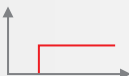

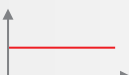

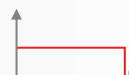



### ► Forced convection

Only from BINDER. Produced by a specifically designed, extremely efficient air turbine that has approximately 20 % higher performance than comparable models. Our patented APT.line™ Airflow Design produces an extremely high airflow; and the airflow rate and the air exchange rate are variably adjustable from 0 % - 100 %.

#### Advantages:

- Faster heating-up and recovery times than with natural air recirculation
- Completely homogenous temperature performance, even with fully loaded chambers
- Significant time-saving through high drying efficiency

FP

Product	Controller features	Temperature-time functions
ED series FD series	<ul style="list-style-type: none"> <li>- DS controller</li> <li>- Constant temperature control</li> <li>- One ramp function</li> <li>- Integrated timer with one time function 0 to 99 hours, delayed OFF</li> <li>- Independent adjustable temperature safety device, Class 2 (DIN 12880), with visual alarm</li> <li>- Digital temperature setting with one degree accuracy</li> </ul>	   <p>Constant temperature    Ramp function    Delayed OFF</p>
FED series	<b>Additional functionality compared to ED/FD series:</b> <ul style="list-style-type: none"> <li>- MS controller</li> <li>- Integrated timer with several timer functions, such as 0 to 99 h 59 min, delayed OFF 0 to 99 h 59 min, delayed ON 0 to 99 h 59 min, temperature-dependent delayed OFF</li> </ul>	   <p>Constant temperature    Ramp function    Delayed OFF</p>   <p>Delayed ON    Temperature-dependent Delayed OFF</p>
FP series	<b>Additional functionality compared to FED series:</b> <ul style="list-style-type: none"> <li>- MP controller</li> <li>- 2 programs with 10 sections each, or 1 program with 20 sections</li> <li>- The time intervals of single program sections can be adjusted up to a maximum of 99:59 hours or 999:59 hours</li> </ul>	   <p>Constant temperature    Ramp function    Delayed OFF</p>    <p>Delayed ON    Temperature-dependent Delayed OFF    Program mode</p>

## FP series: Temperature test chambers with forced convection

FP series chambers are designed for the most demanding test applications and are particularly effective, thanks to their extensive programming abilities. The forced convection reliably facilitates quick drying times as well as extra rapid heating-up, even with fully loaded chambers.



### ► Performance features and equipment:

- Electronically controlled APT.line™ preheating chamber technology with forced convection
- Temperature range of 5 °C (9 °F) above ambient temperature up to 300 °C (572 °F)
- MP controller with 2 programs with 10 sections each, alternatively 1 program with 20 sections
- The time interval of single program sections can be adjusted up to a maximum of 99:59 hours or 999:59 hours. This adjustment applies to all program sections.
- Adjustable ramp function via program editor
- Adjustable fan speed (0 to 100 %)
- Elapsed time indicator
- Independent adjustable temperature safety device, Class 2 (DIN 12880), with visual alarm
- Adjustable ventilation by means of rear exhaust duct Ø 50 mm (2 inch) with ventilation flap and front ventilation slide
- RS 422 interface for communication software APT-COM™ DataControlSystem, or switch over to printer output with RS 232 / RS 422 interface converter
- Adjustable intervals for printer
- Units up to 115 (4.1 cu.ft.) liters are stackable
- 2 chrome-plated racks
- BINDER test certificate





# Technical specification FP series



	FP 53	FP 115	FP 240	FP 400	FP 720
<b>Exterior dimensions</b>					
Width (mm/inch)	634 / 25.0	834 / 32.8	1034 / 40.7	1234 / 48.6	1234 / 48.6
Height (inclusive feet/castors) (mm/inch)	617 / 24.3	702 / 27.6	822 / 32.4	1022 / 40.2	1528 / 60.2
Depth (mm/inch)	575 / 22.6	645 / 25.4	745 / 29.3	765 / 30.1	865 / 34.1
Plus door handle, I-panel and exhaust duct (mm/inch)	105 / 4.1	105 / 4.1	105 / 4.1	105 / 4.1	105 / 4.1
Wall clearance rear (mm/inch)	100 / 3.9	100 / 3.9	100 / 3.9	100 / 3.9	100 / 3.9
Wall clearance side (mm/inch)	160 / 6.3	160 / 6.3	160 / 6.3	160 / 6.3	160 / 6.3
Exhaust duct outer-Ø (mm/inch)	52 / 2.1	52 / 2.1	52 / 2.1	52 / 2.1	52 / 2.1
Steam space volume (l/cu.ft.)	77 / 2.7	158 / 5.6	308 / 10.9	498 / 17.6	869 / 30.7
Number of doors	1	1	2	2	2
<b>Interior dimensions</b>					
Width (mm/inch)	400 / 15.8	600 / 23.6	800 / 31.5	1000 / 39.4	1000 / 39.4
Height (mm/inch)	400 / 15.8	480 / 18.9	600 / 23.6	800 / 31.5	1200 / 47.2
Depth (mm/inch)	330 / 13.0	400 / 15.8	500 / 19.7	500 / 19.7	600 / 23.6
Interior volume (l/cu.ft.)	53 / 1.9	115 / 4.1	240 / 8.6	400 / 14.3	720 / 25.7
Racks, chrome-plated (number standard/max.)	2 / 5	2 / 6	2 / 7	2 / 10	2 / 16
Load per rack (kg/lbs.)	15 / 33	20 / 44	30 / 66	35 / 77	45 / 99
Permitted total load (kg/lbs.)	40 / 88	50 / 110	70 / 155	90 / 199	120 / 265
Weight of the unit (empty) (kg/lbs.)	45 / 99	62 / 137	98 / 216	145 / 320	184 / 406
<b>Temperature data</b>					
Temperature range, 5 °C (9 °F) above ambient up to (°C/°F)	300 / 572	300 / 572	300 / 572	300 / 572	300 / 572
Temperature variation <sup>1)</sup>					
at 70 °C (158 °F) (± °C)	0.8	0.7	0.8	1	1
at 150 °C (302 °F) (± °C)	2	1.8	2	2.5	2
at 300 °C (572 °F) (± °C)	3.7	3.9	4.3	4.8	5.5
Temperature fluctuation (± °C)	0.3	0.3	0.3	0.3	0.3
Heating up time <sup>2)</sup>					
to 70 °C (158 °F) (Min.)	6	7	12	18	25
to 150 °C (302 °F) (Min.)	24	30	27	35	39
to 250 °C (482 °F) (Min.)	45	49	50	60	65
Recov. time after door was opened for 30 sec. <sup>2)</sup>					
at 70 °C (158 °F) (Min.)	2	2	2	2	2
at 150 °C (302 °F) (Min.)	5	8	10	17	20
at 300 °C (572 °F) (Min.)	10	15	16	21	24
Air change <sup>3)</sup>					
at 150 °C (302 °F) (x/h)	64	32	20	18	12
<b>Electrical data</b>					
Housing protection acc. to EN 60529	IP 20	IP 20	IP 20	IP 20	IP 20
Nominal voltage (±10 %) 50/60 Hz (V)	230 / 115	230 / 115	230 / 208 (3N)	400 / 208 (3N)	400 / 208 (3N)
Nominal power (W)	1200	1600	2700	3400	5000
Energy consumption					
at 70 °C (158 °F) (W)	145	230	370	520	570
at 150 °C (302 °F) (W)	300	544	850	1200	1320
at 300 °C (572 °F) (W)	720	1100	1400	2340	2600

<sup>1)</sup> value without window <sup>2)</sup> up to 98 % of the set value <sup>3)</sup> The air change depends on the inner chamber- and ambient temperature and is subject to significant individual variance. The indicated air change rate represents average values for standard equipment. Individual measurement of air change rate in acc. to ASTM D 5374 are optionally available.

All technical specification are specified for units with standard equipment at an ambient temperature of +25 °C (77 °F) and a voltage fluctuation of ±10 %. The temperature data are determined in accordance to factory standard following DIN 12880, part 2 respecting the recommended wall clearances of 10 % of the height, width and depth of the inner chamber. All indications are average values, typical for units produced in series. We reserve the right to alter technical specifications at all times.

## Options/accessories FP series:



### ► Access ports

With silicon plugs for inserting external measuring devices into the chamber. Access ports with 10, 30, 50 mm (0.4, 1.2, 2 inch) diameter.

FP



### ► Door with window and interior lighting

For optimum process control in the interior, available for all equipment sizes.

FP



### ► Lockable door

Prevents unauthorized access and interference with processes in the chamber.

FP



### ► Calibration certificates

Measurement in the center at specified values. Additional measuring points or test values according to your specification.

FP



### ► Transportable precision measuring unit

For temperature, using a PT 100 temperature sensor. Suitable for universal use as an independent monitoring device for temperature chambers.

FP



### ► Reinforced inner chamber

Includes two reinforced racks for heavy loads.  
(Total load maximum 250 kg / 551 lbs.)

FP



#### ► Serial printer

For recording temperature data. Suitable for connection to an RS 232 printer interface. Includes cables for the RS 422 interface and an interface converter.

FP



#### ► Increased air change rate

Higher capacity air turbine (+ approx. 280 %)

FP

	FP				
	53	115	240	400	720
Access port with silicone plug	○	○	○	○	○
Rack, chrome-plated or stainless steel	○	○	○	○	○
Shelf, perforated, stainless steel	○	○	○	○	○
Reinforced rack, stainless steel, with 1 set of rack securing elements (max. 70 kg / 154 lbs.)	–	–	○	○	○
Reinforced inner chamber, including 2 reinforced racks (max. total load 250 kg / 552 lbs. Load per rack 70 kg / 154 lbs.)	–	–	○	○	○
Rack securings for additional fastening of racks (1 set of 4)	○	○	○	○	○
Indep. adj. temp. safety device, Class 3.1 (DIN 12880) 230 / 400 V only	○	○	○	○	○
Door with window and interior lighting	○	○	○	○	○
Lockable door	○	○	○	○	○
Door gasket, viton (temperature-resistant up to 200 °C / 392 °F)	○	○	○	○	○
Analogue temperature output, 4–20 mA, with 6-pin DIN socket	○	○	○	○	○
Additional measuring channel for digital display of specimen temperature	○	○	○	○	○
Mostly gas-tight constructed chamber	○	○	–	–	–
Inert gas connection (gas inlet and outlet)	○	○	–	–	–
Temperature measurement according to DIN 12880-2 or with 9 measuring points with measurement protocol and certificate	○	○	○	○	○
Fresh-air filter, Class EU 14	○	○	○	○	○
Increased air change rate through stronger fan	○	○	○	○	○
Air change rate measurement according to ASTM D5374 with definition and measurement protocol	○	○	○	○	○
Serial printer with interface converter for printing temperature logs.					
Connects to RS 232 printer interface. Includes set of connection cables for RS 422 interface and RS 232 / RS 422 interface converter, 230V	○	○	○	○	○
Potential-free relay outputs accessible with DIN bushing 6 poles	○	○	○	○	○
RS 422 interface	✓	✓	✓	✓	✓
Calibration certificate	○	○	○	○	○
Extension for calibration certificate (additional values)	○	○	○	○	○
Stable table on castors with stop brake	○	○	○	○	–
Evaporating dish with rim	○	○	○	○	○
Rubber pads for safe stacking	○	○	–	–	–
Transportable precision measuring equipment for temperature TM 01	○	○	○	○	○

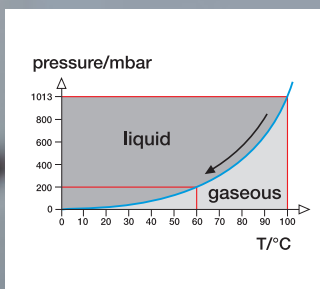




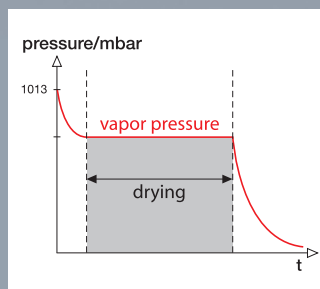
# VD|VDL

## Absolutely reliable drying

Rapid drying with no residues, no danger of incrustation, no oxidation – all under gentle cycle conditions. Safe drying of materials under vacuum always presents a special challenge. You can meet this challenge with confidence, however. Working together with companies in the industry, we have developed a special safety concept that sets new standards for safe interaction, all while maintaining our usual perfect performance and quality.



Exceptionally gentle drying at low temperatures



Controlled drying processes



Precise and reproducible drying through patented expansion rack technology

## APT.line™ vacuum drying ovens

### Facts you should know:



Option VD series:  
extended temperature range  
250 °C (482 °F)

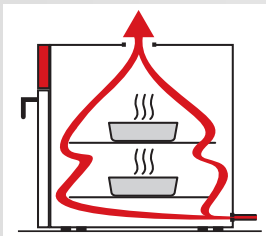
#### ► APT.line™ air jacket system with patented expansion rack technology

5 °C (9 °F) above ambient temperature to 200 °C (392 °F).

The complete heating of the inner chamber, including the back wall, prevents condensation and therefore potential corrosion. This is especially important when handling aggressive corrosive substances.

Two technologies ensure outstanding homogenous temperature distribution. The air jacket system, which guarantees uniform temperature throughout the inner chamber. The patented expanded rack technology; large-area contact with the interior walls facilitates optimal heat transfer directly to the materials. This is a simple and ingenious method to guarantee ideal temperature conditions with maximum safety, thanks to the absence of ignition sources in the interior chamber.

VD/VDL



#### ► Cross-Flow inertization

This special feature is offered only by BINDER. An innovative gas flow configuration circulates inert gas throughout the interior, which results in a homogenous, short drying period.

VD/VDL



#### ► Details for absolute precision

Mechanical quality strongly affects the precision of temperature parameters, speed and consistency.

1. All of our drying ovens have above-average thermal insulation. No temperature loss occurs in the interior and virtually no radiation of heat from the outside housing.
2. The specially designed 2-point door closure seals the door securely. This also ensures that vacuum can be reliably maintained in the chamber.

VD/VDL



#### ► Compliance with standards

Adherence to GLP/GMP practices is possible because of precise and reproducible temperature accuracy, including compliance with a wide variety of standard processes. Increasing certification for laboratories around the globe requires extensive documentation; this can easily be accomplished with the APT-COM™ DataControlSystem.

VD/VDL



#### ► BINDER test certificate: Your guarantee for top quality

Our equipment is tested meticulously. Each unit is re-inspected by Quality Control prior to delivery and calibrated to our factory standard. We also supply a free test certificate as quality confirmation.

VD/VDL



#### ► Professional quality

The APT.line™ vacuum drying ovens can handle almost all types of materials (except for HCl and similar chlorine-containing substances). The electropolished inner chamber, removable rack support, and all vacuum connections and valves are made of highly corrosive resistant stainless steel, quality Mat. No. 1.4571 (V4A) / AISI 316 Ti.

Hoses that become porous with prolonged use are a thing of the past. The APT.line™ air jacket system provides constant temperature equalization of all relevant equipment components, which assures additional corrosion protection. The inner chamber has a completely smooth surface and rounded corners, which permits easy cleaning without leaving any residue. This ensures maximum process safety, particularly during frequent changes of test batches.

VD/VDL



#### ► Certified safety

Standard safety features

The APT.line™ vacuum drying ovens have a pressure-proof housing design and a specially shatter proof safety glass panel with anti-splinter protection, flexibly suspended in the door frame. This ensures safe pressure equalization in case of implosions or explosions and provides maximum protection against glass splinters.

VD/VDL



Only from BINDER:

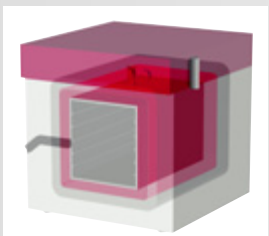
#### Safety glass window with flame protection gasket

Should a detonation occur in the interior chamber, the flame retardant gasket will prevent any fire.

Special safety against materials containing solvents

The safety concept is the ingenious result of prolonged discussions with industry and professional associations for the purpose of effectively eliminating risks when handling flammable solvents, while at the same time complying with international safety regulations such as the ATEX Directive. Scores of installations around the world have made BINDER the leading supplier of safety chambers. TÜV quality mark.

VDL



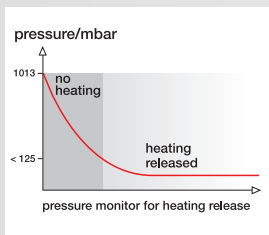
#### ► Safe prevention of explosive atmospheres

Vacuum drying is the optimal process, because the vacuum atmosphere does not contain oxygen and the drying temperatures remain below ignition temperature.

#### Overpressure encapsulation of all current-carrying equipment components

Compressed air recirculation reliably protects all electrical components against penetration by solvent vapors, with the protection extending to both interior and exterior components. No ignition sources are located in the interior.

VDL



#### Controlled heating release

A controlled, pressure-dependent activation of the heating avoids potential ignition with flammable air mixtures. The release occurs at a pressure lower than 125 mbar (94 torr).

VDL

## VD series: Vacuum drying ovens with patented heat transfer technology

The VD series offers safe drying with homogenous temperature distribution, thanks to its APT.line™ air jacket system. Optimum heat transfer through patented expansion rack technology; the racks can be positioned as needed and are easy to clean. In addition to these many features, the units have an individually programmable controller.



### ► Performance features and equipment:

- Electronically controlled APT.line™ preheating chamber technology with 2 expansion racks
- Temperature range: 5 °C (9 °F) above ambient temperature up to 200 °C (342 °F) (optional up to 250 °C (482 °F))
- MP controller with 2 programs with 10 sections each, or alternatively 1 program with 20 sections
- The time interval of single program sections can be adjusted up to a maximum of 99:59 hours or 999:59 hours. This adjustment applies to all program sections.
- Digital temperature setting with an accuracy of one degree
- Adjustable ramp functions via program editor
- Elapsed time indicator
- Fine dosing ventilation valve
- Spring-mounted shatter proof safety glass panel
- Fine dosing inert gas valve with cross-flow technology
- Independent adjustable temperature safety device, Class 2 (DIN 12880), with visual temperature alarm
- DN 16 measuring port in rear wall
- Analog pressure gauge (display pressure difference between the inner chamber and the ambient pressure)
- Electro polished inner chamber
- All suction and ventilation tubes, as well as the internally-welded pressure container, the removable rack support and the vacuum valve are made of stainless steel Mat. No. 1.4571 (V4A) / AISI 316 Ti
- Door gasket made of tempered silicone
- 2 × 24 V DC (max 0.4 A) switching outputs, switched via 2 controller contacts in the program controller
- RS 422 interface for communication software APT-COM™ DataControlSystem, or switch over to printer output with RS 232 / RS 422 interface converter
- BINDER test certificate



# Technical specification VD series



	VD 23	VD 53	VD 115
<b>Exterior dimensions</b>			
Width (mm/inch)	515 / 20.3	634 / 25.0	740 / 29.1
Height (inclusive feet/castors) (mm/inch)	655 / 25.8	775 / 30.5	900 / 35.5
Depth (mm/inch)	500 / 19.7	550 / 21.7	670 / 26.4
Height of the option vacuum module (mm/inch)	624 / 24.6	624 / 24.6	624 / 24.6
Total height with option vacuum module (mm/inch)	1279 / 50.2	1400 / 55.2	1522 / 59.9
Plus door handle, connection (mm/inch)	100 / 3.9	100 / 3.9	100 / 3.9
Wall clearance rear (mm/inch)	100 / 3.9	100 / 3.9	100 / 3.9
Wall clearance side (mm/inch)	135 / 5.3	135 / 5.3	135 / 5.3
<b>Interior dimensions</b>			
Width (mm/inch)	285 / 11.2	400 / 15.8	506 / 19.9
Height (mm/inch)	285 / 11.2	400 / 15.8	506 / 19.9
Depth (mm/inch)	285 / 11.2	330 / 13.0	450 / 17.7
Interior volume (l/cu.ft.)	23 / 0.8	53 / 1.9	115 / 4.1
Expansion shelves (Aluminium) (number standard/max.)	2 / 4	2 / 5	2 / 6
Distance between the racks (width x depth) (mm/inch)	53 / 2.1	62 / 2.4	68 / 2.7
Usable space per rack (width x depth) (mm/inch)	234 x 280 / 9.2 x 11	349 x 320 / 13.7 x 12.6	455 x 440 / 17.9 x 17.3
Load per rack (kg/lbs.)	20 / 44	20 / 44	20 / 44
Permitted total load (kg/lbs.)	35 / 77	45 / 99	65 / 143
Weight of the unit (empty) (kg/lbs.)	63 / 139	80 / 177	150 / 331
<b>Temperature data</b>			
Temperature range, 5 °C (9 °F) above ambient up to (°C/°F)	200 / 392	200 / 392	200 / 392
Temperature variation <sup>3)</sup>			
at 100 °C (212 °F) (± °C)	2	2.5	4
at 200 °C (392 °F) (± °C)	4	4.5	7
at 250 °C (482 °F) (± °C) (optional)	5	6.5	8
Temperature fluctuation <sup>3)</sup> (± °C)	0.4	0.4	0.4
Heating up time <sup>2)</sup>			
to 100 °C (212 °F) (Min.)	80	70	80
to 200 °C (392 °F) (Min.)	110	130	150
to 250 °C (482 °F) (Min.) (optional)	140	180	240
Vacuum connection with small flange (DN mm/inch)	16 / 0.63	16 / 0.63	16 / 0.63
Measuring access port with small flange (DN mm/in)	16 / 0.63	16 / 0.63	16 / 0.63
Inert gas connection with flow limiter - thread (RP")	3/8	3/8	3/8
Inert gas connection with flow limiter			
Adapter with hose olive (DN mm/inch)	8/0.31	8/0.31	8/0.31
Permitted end vacuum (mbar / torr)	0.01 / 0.008	0.01 / 0.008	0.01 / 0.008
Leak rate (max. mbar 1/h / torr 1/h)	0.01 / 0.008	0.01 / 0.008	0.01 / 0.008
<b>Electrical data</b>			
Housing protection acc. to EN 60529	IP 20	IP 20	IP 20
Nominal voltage (±10 %) 50/60 Hz (V)	230 / 115	230 / 115	230 / 115
Nominal power (W)	800	1200	1900
Energy consumption			
at 100 °C (212 °F) (W)	120	160	280
at 200 °C (392 °F) (W)	320	460	800
at 250 °C (482 °F) (W)	450	700	1120

<sup>1)</sup> value with aluminium racks <sup>2)</sup> up to 98 % of the set value

All technical specification are specified for units with standard equipment at an ambient temperature of +25 °C (77 °F) and a voltage fluctuation of ±10 %. The temperature data are determined in accordance to factory standard following DIN 12880, part 2 respecting the recommended wall clearances of 10 % of the height, width and depth of the inner chamber. All indications are average values, typical for units produced in series. We reserve the right to alter technical specifications at all times.



## VDL series: Vacuum drying ovens with patented heat transfer and a special safety concept

The VDL series with its expanded package of safety features ensures maximum safety when drying organic solvents in accordance with TÜV/GS guidelines. The interior chamber is designed in accordance with the ATEX Directive for Zone 2, but the VDL series can also be equipped in accordance with the explosion risk requirements for zone 2 explosion hazard areas.



### ► Performance features and equipment:

- Electronically controlled APT.line™ preheating chamber technology with 2 expansion racks
- Temperature range of 5 °C (9 °F) above ambient temperature up to 200 °C ( 392 °F)
- MP controller with 2 programs with 10 sections each, or alternatively 1 program with 20 sections
- The time interval of single program sections can be adjusted up to a maximum of 99:59 hours or 999:59 hours. This adjustment applies to all program sections.
- Digital temperature setting with an accuracy of one degree
- Adjustable ramp function via program editor
- Adjustable heat output (0 to 100 %)
- Pressure monitor for controlled heating release at < 125 mbar (94 torr)
- Pressure encapsulated instrument compartment with controlled overpressure by means of compressed air
- Flame protection gasket
- Fine dosing ventilation valve
- Fine dosing inert gas valve with cross-flow technology
- Spring-mounted safety glass pane with splinter protection
- Analog pressure gauge (display pressure difference between the inner chamber and the ambient pressure)
- Electro polished inner chamber
- All suction and ventilation tubes, as well as the internally-welded pressure container, the removable rack support and the vacuum valve are made of stainless steel Mat. No. 1.4571 (V4A) / AISI 316 Ti
- Door gasket made of tempered silicone
- Independent adjustable temperature safety device, Class 2 (DIN 12880), with visual temperature alarm
- DN 16 measuring port in rear wall
- Printer and communications interface RS 232 for communication software APT-COM™ DataControlSystem
- BINDER test certificate



# Technical specification VDL series



	VDL 23	VDL 53	VDL 115
<b>► Exterior dimensions</b>			
Width (mm/inch)	515 / 20.3	634 / 25.0	740 / 29.1
Height (inclusive feet/castors) (mm/inch)	655 / 25.8	775 / 30.5	900 / 35.3
Depth (mm/inch)	500 / 19.7	550 / 21.7	670 / 26.4
Height with option vacuum module (mm/inch)	624 / 24.6	624 / 24.6	624 / 24.6
Total height with option vacuum module (mm/inch)	1279 / 50.4	1400 / 55.2	1522 / 59.9
Plus door handle, connection (mm/inch)	100 / 3.9	100 / 3.9	100 / 3.9
Wall clearance rear (mm/inch)	100 / 3.9	100 / 3.9	100 / 3.9
Wall clearance side (mm/inch)	135 / 5.3	135 / 5.3	135 / 5.3
<b>► Interior dimensions</b>			
Width (mm/inch)	285 / 11.2	400 / 15.8	506 / 19.9
Height (mm/inch)	285 / 11.2	400 / 15.8	506 / 19.9
Depth (mm/inch)	285 / 11.2	330 / 13.0	450 / 17.7
Interior volume (l/cu.ft.)	23 / 0.8	53 / 1.9	115 / 4.1
Expansion racks (Aluminium) (number standard/max.)	2 / 4	2 / 5	2 / 6
Distance between the racks (width x depth) (mm/inch)	53 / 2.1	62 / 2.4	68 / 2.7
Usable space per rack (width x depth) (mm/inch)	234 x 280 / 9.2 x 11	349 x 320 / 13.7 x 12.6	455 x 440 / 17.9 x 17.3
Load per rack (kg/lbs.)	20 / 44	20 / 44	20 / 44
Permitted total load (kg/lbs.)	35 / 77	45 / 99	65 / 143
Weight of the unit (empty) (kg/lbs.)	63 / 139	80 / 177	150 / 331
<b>► Temperature data</b>			
Temperature range, 5 °C (9 °F) above ambient up to (°C/°F)	200 / 392	200 / 392	200 / 392
Temperature variation <sup>3)</sup>			
at 100 °C (212 °F) (± °C)	2	2.5	4
at 200 °C (392 °F) (± °C)	4	4.5	7
Temperature fluctuation <sup>3)</sup> (± °C)	0.4	0.4	0.4
Heating up time <sup>2)</sup>			
to 100 °C (212 °F) (Min.)	80	70	80
to 200 °C (392 °F) (Min.)	110	130	150
Vacuum connection with small flange (DN mm/inch)	16 / 0.63	16 / 0.63	16 / 0.63
Measuring access port w. small flange (DN mm/in)	16 / 0.63	16 / 0.63	16 / 0.63
Inert gas connection with flow limiter - thread (RP")	3/8	3/8	3/8
Inert gas connection with flow limiter			
Adapter with hose olive (DN mm/inch)	8/0.31	8/0.31	8/0.31
Permitted end vacuum (mbar / torr)	0.01 / 0.008	0.01 / 0.008	0.01 / 0.008
Leak rate (mbar 1/h / torr 1/h)	0.01 / 0.008	0.01 / 0.008	0.01 / 0.008
Compressed air connect. f. pressure-encapsulation (Ø mm/in.)	8 / 0.32	8 / 0.32	8 / 0.32
Compressed air use (l/Min.)	50	50	50
<b>► Electrical data</b>			
Housing protection acc. to EN 60529	IP 54	IP 54	IP 54
Nominal voltage (± 10 %) 50/60 Hz (V)	230	230	230
Nominal power (W)	800	1200	1900
Energy consumption			
at 100 °C (212 °F) (W)	120	160	280
at 200 °C (392 °F) (W)	320	460	800

<sup>1)</sup> value with aluminium racks <sup>2)</sup> up to 98 % of the set value

All technical specification are specified for units with standard equipment at an ambient temperature of +25 °C (77 °F) and a voltage fluctuation of ± 10 %. The temperature data are determined in accordance to factory standard following DIN 12880, part 2 respecting the recommended wall clearances of 10 % of the height, width and depth of the inner chamber. All indications are average values, typical for units produced in series. We reserve the right to alter technical specifications at all times.

## Options/accessories VD/VDL series:

► **Acid-proof models**

VD series ovens are supplied with:

- Interior chamber of acid-proof Hastelloy C-22 alloy
- Two stainless steel Mat. No. 1.4571 (V4A) / AISI 316 Ti expansion racks
- Rack support of acid-proof stainless steel Hastelloy C-22 alloy
- Suction tube and vacuum valve of acid-proof PTFE Teflon
- Ventilation and inertization valves of stainless steel Mat. No. 1.4571 (V4A) / AISI 316 Ti
- Viton door gasket

VD

► **Measuring port**

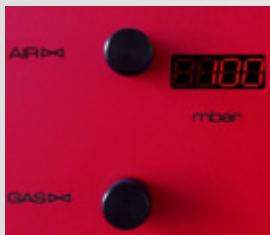
Vacuum-tight bushing for instrument connection (9-pin) into the unit.

VD/VDL

► **Specimen temperature display**

Using a PT 100 sensor with digital temperature display.

VD/VDL

► **Digital pressure display**

The pressure in the interior chamber is measured with an installed pressure sensor and is displayed by a digital display to an accuracy of 1 mbar (0.8 torr).

VD/VDL

► **Compact vacuum measuring unit**

Unit has an external pressure sensor for precise and independent pressure measurement of the vacuum, with a range of 0.1 - 1100 mbar (0.08 - 825 torr).

VD/VDL



### ► Calibration certificates

Measurement in the center at specified values. Additional measuring points or test values according to your specification.

VD/VDL

	VD			VDL		
	23	53	115	23	53	115
Increased temperature range up to max. 250 °C (482 °F)	○	○	○	–	–	–
Expansion racks, stainless steel AISI 316 Ti*	○	○	○	○	○	○
Acid-resistant version made of Hastelloy C-22 alloy	○	○	○	–	–	–
Door gasket, viton	○	○	○	○	○	○
Measuring port	○	○	○	○	○	○
Specimen temperature measuring with PT 100 and specimen temperature display						
Digital pressure display	○	○	○	–	○	○
Serial printer with interface converter for printing temperature logs	○	○	○	○	○	○
Connection kit with multiple components	○	○	○	○	○	○
Program controlled ventilation through air valve for exact pressure control						
Calibration certificate	○	○	○	○ **	○ **	○ **
Evaporating dish with rim	○	○	○	○	○	○
Vacuum module for installation of vacuum pumps	○	○	○	○	○	○
Vacuum module with chemical membrane pump with separator and emission condenser (for VDL Ex-proof version)						
Nominal airflow (DIN 28432) (m³/h / cu.ft./h)	1.7 / 60	1.7 / 60	1.7 / 60	1.9 / 67	1.9 / 67	1.9 / 67
End vacuum (mbar / torr)	9 / 7	9 / 7	9 / 7	12 / 9	12 / 9	12 / 9
Electrical connection (50/60 Hz) (V)	230 / 115	230 / 115	230 / 115	230	230	230
Vacuum module with chemical membrane pump with separator and emission condenser (for VDL Ex-proof version)						
Nominal airflow (DIN 28432) (m³/h / cu.ft./h)	3 / 106	3 / 106	3 / 106	–	–	3.7 / 131
End vacuum (mbar / torr)	2 / 1.5	2 / 1.5	2 / 1.5	–	–	3 / 2
Electrical connection (50/60 Hz) (V)	230 / 115	230 / 115	230 / 115	–	–	230
Vacuum module with speed-controlled chemical membrane pump	○	○	○	–	–	–
Nominal airflow (DIN 28432) (50/60Hz) (m³/h)	3.8 / 134	3.8 / 134	3.8 / 134	–	–	–
End vacuum (mbar / torr)	2 / 1.5	2 / 1.5	2 / 1.5	–	–	–
Electrical connection (50/60 Hz) (V)	230 / 115	230 / 115	230 / 115	–	–	–

○ option – not available \* we recommend stainless steel racks in case of frequent removing

\*\* not available in combination with stainless steel racks

Technical specifications subject to change

## Only from BINDER: Vacuum drying oven plus vacuum module with vacuum pump – the complete solution



VD vacuum drying oven with matching vacuum module and integrated vacuum pump

### ► BINDER's one-stop solution consists of:

- A matching single-source solution consisting of the vacuum drying oven with a vacuum pump
- Space-saving, low-noise modular vacuum pump unit
- Easy and user-friendly condenser access
- A technically proven and approved solution, easy to start up and operate
- Time-saving, programmable intermediate air release and 2-stage drying
- Full compliance with ATEX Directives





## Technical specification of selected vacuum pump



Vacuum module with integrated chemical membrane pump	Vacuum module with VP 1 chemical membrane pump	Vacuum module with VP 2 chemical membrane pump	Vacuum module with VP 3 speed-controlled chemical membrane pump	Vacuum module with VP 4 chemical membrane pump, Ex-proof	Vacuum module with VP 5 chemical membrane pump, Ex-proof
<b>Nominal airflow</b>	1.7 m <sup>3</sup> /h (60 cu.ft./h)	3.0 m <sup>3</sup> /h (106 cu.ft./h)	3.8 m <sup>3</sup> /h (134 cu.ft./h)	1.9 m <sup>3</sup> /h (67 cu.ft./h)	3.7 m <sup>3</sup> /h (131 cu.ft./h)
<b>Final pressure (mbar / torr)</b>	9 / 7	2 / 1.5	2 / 1.5	12 / 9	3 / 2
<b>ATEX approved according to ATEX Directive 94/9/EC</b>	no	no	no	yes	yes
<b>VD 23</b>	○	○	○	–	–
<b>VD 53</b>	○	○	○	–	–
<b>VD 115</b>	○	○	○	–	–
<b>VDL 23</b>	–	–	–	○	–
<b>VDL 53</b>	–	–	–	○	–
<b>VDL 115</b>	–	–	–	○	○
<b>Application details</b>	Powerful pump for each application	Increased volumetric displacement for samples with higher solvent content and for achieving a lower ultimate vacuum	Variably adjustable suction capacity and automatic vacuum adjustment during the process achieves up to 30 % shorter processing times	Approved ATEX-compliant diaphragm pump for VDL 23, VDL 53 and VDL 115 series	Approved ATEX-compliant diaphragm pump with a reduced final vacuum for the VDL 115 series

○ option    – not available

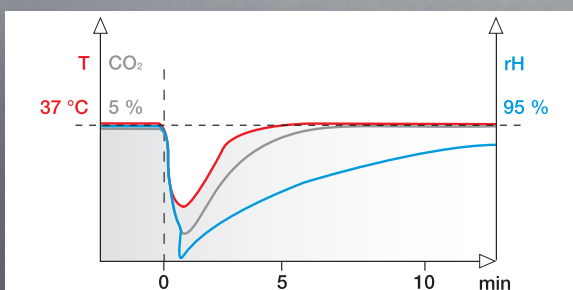
Technical specifications subject to change



# CB

Nature always sets the standard, but we come very close.

Our CO<sub>2</sub> incubators simulate natural conditions, where many perfect details make up the sum total. We also fuse together the details by amalgamating the growth parameters such as CO<sub>2</sub>, temperature and humidity into a finely tuned interaction that we call “natural simulation.” This is a process that we have developed and patented, unparalleled in our industry and the closest thing to natural conditions.



Short recovery times:  
ideal growth parameters

# CO<sub>2</sub> incubators from the APT.line™

## Nature sets the standard



### ► Temperature

Temperature is a decisive factor for growth. Strong cell growth can be achieved only within a very narrow tolerance range around the optimal temperature.

**Only from BINDER: the VENTAIR jacket system™, precise, dynamic, reliable, and sterile.**

**Precision:** The electronically controlled APT.line™-air jacket system ensures fully homogenous temperature control of the complete interior.

#### **Dynamics:**

BINDER Airflow Design and Intelligent Temperature Control for optimal temperature stability for natural temperature conditions

CB



### ► CO<sub>2</sub> concentration

#### **CO<sub>2</sub> infrared measurement system**

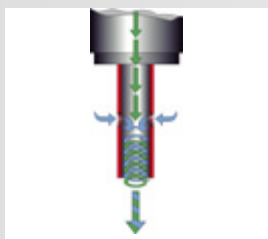
Conventional measurement systems basically measure the CO<sub>2</sub> content as a function of humidity. Both humidity and CO<sub>2</sub> concentration change when the door is opened. Such measurements can be incorrect in real time. IR measurement technology, which is the professional standard at BINDER, prevents such deviations.

**Performance:** Single-beam differential measurement with a drift-free FPI sensor. Permanent digital CO<sub>2</sub> gas measurement, direct and fast. Indispensable for precise and fast adjustment of the required CO<sub>2</sub> content. Result: up to 20 times faster CO<sub>2</sub> content recovery times compared to thermoconductivity measurements.

**Time:** This measurement process does not require time-consuming and imprecise auto-zero calibration.

**CO<sub>2</sub> injection: Patented gas mixing head.** This actually provides completely homogenous gas distribution without the use of fans to prevent turbulence and mixing of germs in the interior.

CB



### ► Humidity

Naturally, high saturated air humidity is important. It prevents cell cultures from drying out and also keeps the osmolarity constant in the culture medium.

#### **The patented Permadyr™ system**

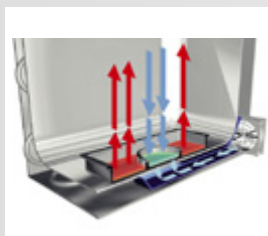
The Permadyr™ double pan system with defined condensation point is a simple and innovative humidification principle.

#### **Performance:**

- High saturated air humidity up to 95 % RH with simultaneously dry inner chamber walls
- Fast humidity build-up throughout the entire interior chamber

#### **Quality and comfort**

- Rugged system without any sensitive parts
- Uncomplicated and quick water replacement
- Easy dosage of bactericidal additives
- Constant optical monitoring of water level



CB



### ► Sterile incubation conditions

The overall technical concept for the CO<sub>2</sub> incubators of the APT.line™ was specifically designed for all potential situations, with active and passive protection against contamination. The focus is clearly on the interior chamber and the protection of cultures. This focus actively reduces the risk of procedural failures and financial losses.

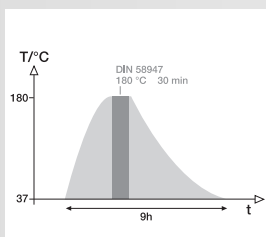


#### 1. World's first: inner chamber design with integrated shelf support system

- Superior quality deep-drawn inner chamber made stainless steel mat. no. 1.4301/ AISI 304. No seams for particulate matter to accumulate, no joints. complete elimination of connections into and out of the interior.
- Fanless inner chamber eliminating the risk of spreading of germs
- Novel integrated shelf support system for the shelves
- **27% less surface** for potential contamination inside the CO<sub>2</sub> incubator through elimination of the shelf mounting system.
- Significant time & cost savings when cleaning the incubator by manual spray wipe disinfection
- Integrated anti-tilt shelf supports facilitate easy shelf withdrawal

#### 2. Germ-free culture processes

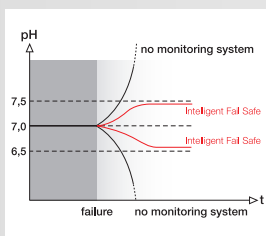
This is possible only with Permady™: Constant humidity values of up to 95 % RH with a completely condensation-free interior.



#### 3. Hot air sterilization at 180 °C (356 °F) in compliance with standards

- The most reliable and internationally recognized method for ensuring a microbiologically clean environment - compliance with international standards with regard to hot air sterilization (e.g. DIN58947, Pharmacopoeias)
- A prerequisite for work in accordance with GLP/GMP standards
- The safety standard for handling infectious and pathogenic material

CB



### ► Intelligent process monitoring

1. **MCS controller.** User friendly LCD screen with integrated electronic chart recorder for monitoring process growth parameters.
2. **World's first: Intelligent Fail Safe.** BINDER has pioneered an effective safety function for CO<sub>2</sub> stability. Even small process-related pH fluctuations are identified. This triggers a safety function that keeps the CO<sub>2</sub> content close to the setpoint. There is no better method to safeguard the cell survival.

CB



### ► BINDER test certificate: Your guarantee for top quality

Our equipment is tested meticulously. Each unit is re-inspected by Quality Control prior to delivery and calibrated to our factory standard. We also supply a free test certificate as quality confirmation.

CB



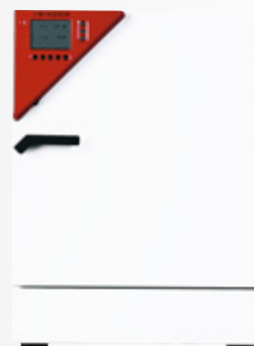
## CB series: CO<sub>2</sub> incubators with hot air sterilization

Precision equipment for cell cultivation of the future. It has a drift-free infrared CO<sub>2</sub> measuring system to ensure stable pH values, condensation-free Permady™ interior chamber with integrated shelf supports, easy to clean, where the surface area is kept to a minimum in order to reduce potential sites for germs to establish; an effective sterilization program that operates at 180 °C (356 °F) in compliance with standards, for cultivation without any contamination. All of these features along with the absolutely precise temperature accuracy, which you have come to expect from us.



### ► Performance features and equipment:

- Electronically controlled APT.line™ preheating chamber technology
- Temperature range of 7 °C (13 °F) above ambient temperature up to 60 °C (140 °F)
- MCS controller for temperature and CO<sub>2</sub> concentration
- User-friendly LCD screen
- Easy-to-read menu guide
- Integrated electronic chart recorder
- Variety of options for the graphic display of process parameters
- Real-time clock
- Standard-compliant hot-air sterilization at 180 °C (356 °F) (DIN 58947)
- VENTAIR jacket system™
- Drift free infrared CO<sub>2</sub> measurement system
- Gas mixing head
- Weldless deep-drawn inner chamber made of stainless steel Mat. No. 1.4301 (V2A) / AISI 304 with integrated shelf support system. Copper models with dismantable shelf mounting system.
- Permady™ system, condensation-free double-pan humidification system
- Electronic self-diagnostic system for errors with optical and acoustic alarm, as well as relay contact for central monitoring
- Independent adjustable temperature safety device, Class 3.1 (DIN 12880) with visual and acoustic temperature alarm
- Tightly closing inner glass door
- RS 422 interface for communication software APT-COM™ DataControlSystem
- 3 perforated shelves made of stainless steel Mat. No. 1.4301 (V2A) / AISI 304 or copper (in standard and O<sub>2</sub>-control versions)
- BINDER test certificate



# Technical specification CB series

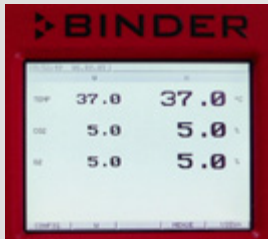


	CB 150	CB 210
► <b>Exterior dimensions</b>		
Width (mm/inch)	680 / 26.8	740 / 29.1
Height (incl. feet/roller) (mm/inch)	919 / 36.2	1069 / 42.1
Depth (plus 55 mm (2.17 in.) for instrument panel) (mm/in.)	722 / 28.4	722 / 28.4
Wall clearance (mm/inch)	50 / 2.0	50 / 2.0
Wall clearance side/rear (mm/inch)	100 / 3.94	100 / 3.94
► <b>Interior dimensions</b>		
Width (mm/inch)	500 / 19.7	560 / 22.1
Height (mm/inch)	600 / 23.6	750 / 29.5
Depth (mm/inch)	500 / 19.7	500 / 19.7
Interior volume (l/cu.ft.)	150 / 5.4	210 / 7.5
Perforated shelves, stainless steel (number standard/max.)	3 / 8	3 / 11
Dimensions of perforated shelves, Width (mm/inch)	473 / 18.6	533 / 21.0
Load per rack (kg/lbs.)	10 / 22	10 / 22
Permitted total load (kg/lbs.)	30 / 66.1	30 / 66.1
Depth (mm/inch)	448 / 17.6	448 / 17.6
Weight (empty) (kg/lbs.)	107 / 236	121 / 267
► <b>Temperature data</b>		
Temperature range		
7 °C (13 °F) above ambient up to °C/°F	60 / 140	60 / 140
Temperature variation at 37 °C (98.6 °F) (± °C)	0.3	0.4
Temperature fluctuation (± °C)	0.1	0.1
Recovery time after door was opened for 30 sec. <sup>1)</sup>		
at 37 °C (98.6 °F) (Min.)	3	3
CO <sub>2</sub> -range (Vol.-% CO <sub>2</sub> )	0–20	0–20
Setting accuracy (Vol.-% CO <sub>2</sub> )	0.1	0.1
Recovery time after door was opened for 30 sec. <sup>1)</sup>		
up to 5 vol. % (min)	6	6
CO <sub>2</sub> -measurement	IR	IR
Hose connectors for CO <sub>2</sub> (mm/inch)	6 / 0.24	6 / 0.24
Humidity (average values) (% RH)	95	95
► <b>Electrical data</b>		
Housing protection acc. to EN 60529	IP 20	IP 20
Nominal voltage (±10 %) 50/60 Hz (V)	230 / 115	230 / 115
Nominal power (W)	1400	1600
Energy consumption at 37 °C (98.6 °F) (W)	140	140
O <sub>2</sub> -range (Vol.-% O <sub>2</sub> )	0.2–95	0.2–95
Setting accuracy (Vol.-% O <sub>2</sub> )	0.1	0.1
Recovery time <sup>1)</sup>		
from 20 vol % up to 0.2 vol % O <sub>2</sub> (Min.)	120	120
from 20 vol % up to 5 vol % O <sub>2</sub> (Min.)	64	64
from 20 vol % up to 10 vol % O <sub>2</sub> (Min.)	31	31
from 20 vol % up to 15 vol % O <sub>2</sub> (Min.)	14	14
from 20 vol % up to 30 vol % O <sub>2</sub> (Min.)	7	7
from 20 vol % up to 50 vol % O <sub>2</sub> (Min.)	25	25
from 20 vol % up to 80 vol % O <sub>2</sub> (Min.)	75	75

<sup>1)</sup> up to 98 % of the set value

Specified ambient temperature range 18°C/64°F to 30°C/ 86°F. All technical specification are specified for units with standard equipment at an ambient temperature of +25 °C (77 °F) and a voltage fluctuation of ±10 %. The temperature data are determined in accordance to factory standard following DIN 12880, part 2 respecting the recommended wall clearances of 10 % of the height, width and depth of the inner chamber. All indications are average values, typical for units produced in series. We reserve the right to alter technical specifications at all times.

## Options/accessories CB series



### ► Trigas model with O<sub>2</sub> control for variable O<sub>2</sub> values

This adjustment is performed with an additional control circuit by controlled feeding of oxygen or nitrogen for hyperoxic or hypoxic culture conditions. Measurement is performed with a zirconium oxide sensor (ZrO<sub>2</sub>).

CB

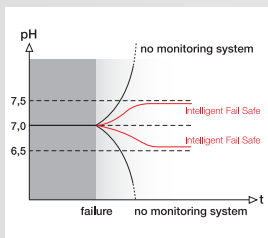


### ► Gas-tight, divided inner glass door

Maintains consistent climatic conditions within the incubator. Minimal loss of incubator atmosphere, heat and, CO<sub>2</sub> during loading, as well as fast recovery times.

(CB 150: 4 doors, CB 210: 6 doors)

CB



### ► Intelligent Fail Safe

Electronic safety system for the independent monitoring of the CO<sub>2</sub> adjustment in the incubator. When tolerance limits are exceeded, the Intelligent Fail Safe system automatically takes over control of the CO<sub>2</sub> concentration.

CB



### ► Modular expandable roller bottle system

The system is used for the cultivation of adherent cells and suspension cultures.

CB



### ► CTM 01 measuring unit for CO<sub>2</sub> concentration and temperature

Universally usable, portable measuring unit for precise determination of CO<sub>2</sub> concentration and temperature.

CB

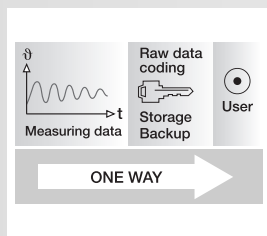


### ► Cleaning kit

Halogenfree detergents for gentle cleaning of interior chamber without causing corrosion:

1. Mild cleaner for stainless steel to provide long-term protection
2. Clinically approved disinfectant
3. Cleaning cloths

CB



### ► APT-COM™ DataControlSystem GLP Edition

Software for GLP-compliant control, programming, and documentation. Permits networking of up to 30 units or controllers. Complies with FDA 21 CFR Part 11 requirements.

CB

	CB	
	150	210
CO <sub>2</sub> -incubator with gastight, divided inner glass door and divided shelves*	<input type="radio"/>	<input type="radio"/>
CO <sub>2</sub> -incubator with O <sub>2</sub> control, Inner chamber stainless steel	<input type="radio"/>	<input type="radio"/>
CO <sub>2</sub> -incubator with O <sub>2</sub> control with gastight, divided inner glass door and divided shelves*	<input type="radio"/>	<input type="radio"/>
Shelf, perforated, stainless steel or cooper	<input type="radio"/>	<input type="radio"/>
Divided shelf for divided inner glass door, stainless steel or cooper	<input type="radio"/>	<input type="radio"/>
Divided inner glass door (4 doors) with 2 divided shelves, cooper or stainless steel	<input type="radio"/>	–
Divided inner glass door (6 doors) with 3 divided shelves, cooper or stainless steel	–	<input type="radio"/>
Silicone access port with two silicone lids, Ø 30 mm (1.2 inch)	<input type="radio"/>	<input type="radio"/>
Looking of controller keyboard	<input type="radio"/>	<input type="radio"/>
CO <sub>2</sub> bottle changer for connecting two gas cylinders with alarm messaging and incident reporting	<input type="radio"/>	<input type="radio"/>
Additional O <sub>2</sub> control	<input type="radio"/>	<input type="radio"/>
CO <sub>2</sub> bottle changer for connecting two gas cylinders with external connection for up to one additional CO <sub>2</sub> incubator with alarm messaging and incident reporting	<input type="radio"/>	<input type="radio"/>
O <sub>2</sub> and N <sub>2</sub> bottle changer for connecting two cylinders of either gas (Attention: Only in combination with O <sub>2</sub> control!)	<input type="radio"/>	<input type="radio"/>
Connection kit for CO <sub>2</sub> , O <sub>2</sub> or N <sub>2</sub> , consisting of a bootle pressure regulator, max. pressure 10 bar (145 psi) with connection parts, and a 5 m (16 ft.) hose	<input type="radio"/>	<input type="radio"/>
Interior LEMO socket (with cover) with LEMO plug (max. power rating 230 V AC, 3A)	<input type="radio"/>	<input type="radio"/>
CELLROLL set. Modular, expandable roller bottle system for cell cultivation. Complete set consisting of: motor drive, connection cables, low voltage connection (8-pin) (max. 24 V AC, 2A)	<input type="radio"/>	<input type="radio"/>
Stacking adapter for direct thermal decoupled stacking of 2 CB incubators	<input type="radio"/>	<input type="radio"/>
Stacking frame for 2 CB incubators on castors with brakes	<input type="radio"/>	<input type="radio"/>
Analog output 4–20 mA for temperature and CO <sub>2</sub> , with 6-pin DIN socket (output not adjustable)	<input type="radio"/>	<input type="radio"/>
Independent electronic safety system Intelligent Fail Safe. Unique safety plus for continous monitoring of the CO <sub>2</sub> control, preventing any unnoticed deviations of the CO <sub>2</sub> concentration form set point. (Attention: Only available for models with stainless steel interior! Not available in conjunction with O <sub>2</sub> control!)	<input type="radio"/>	<input type="radio"/>
Calibration certificate for temperature and CO <sub>2</sub> or O <sub>2</sub> . Temperature measurement in center/calibration with analyzed test gas	<input type="radio"/>	<input type="radio"/>
Cleaning kit for cleaning and disinfection	<input type="radio"/>	<input type="radio"/>
Manual for Primary Human Cell Culture	<input type="radio"/>	<input type="radio"/>

\* CB 150 I with 2 shelf levels and 2 divided shelves, CB 210 I with 3 shelf levels and 3 divided shelves

☐ option – not available

Technical specifications subject to change





# BD | BFI | KB

## High precision for tiny organisms

Working with microorganisms requires careful handling. Maintaining precise and consistent incubation conditions is absolutely crucial. The preheating chamber and DCT™ Direct Cooling Technology components that we have developed work together to deliver a unique level of precision, as well as results that can be reproduced in any routine test procedure. This is particularly useful when your procedures require high output capacity in long-term operation.

BINDER offers a complete range of microbiological incubators for a wide range of applications, such as in the food industry, hygiene compliance in production plants, or clinical diagnostics. Standardized precision in incubation. Selecting the right incubator for the application – at BINDER, naturally complete with the RS 422 communication interface for networking with the APT-COM™ software. Can be fully validated in accordance with GLP/GMP and FDA 21 CFR Part 11. Significant cost savings through our IQ/OQ validation documentation.



APT.line™: natural convection



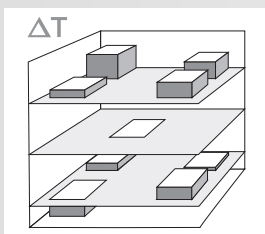
APT.line™: forced convection



Innovative refrigeration system:  
Direct, precise, effective.

# Microbiological incubators from the APT.line™

## Facts you should know:



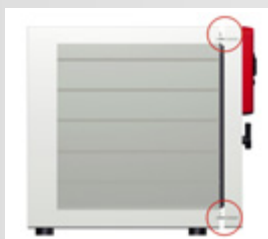
### ► Temperature

Temperature is a decisive factor for growth. Optimal and strong cell growth can only be achieved within a very narrow tolerance range.

**APT.line™ – Absolute precision from 5 °C (9 °F) above ambient temperature to 100 °C (212 °F).**

Only BINDER offers this precision in this temperature range as a standard. Disinfection routines up to 100 °C (212 °F) for contamination caused by handling. Indispensable extra performance for precise performance of all microbiological procedures, either with natural convection or forced convection. BINDER offers the invaluable advantage of extremely rapid heating up rates and recovery times.

BD/BF/KB

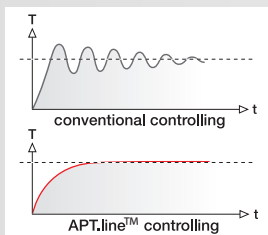


### ► Quality is in the details

It is the sum total of details such as significantly reduced energy use, a good working environment, and high occupational safety that determine our unique performance capabilities. Mechanical quality in particular affects the temperature parameters of precision, speed and consistency.

1. All of our microbiological incubators have above-average thermal insulation. This means that temperature accuracy is not affected, even with changing environmental conditions.
2. The specially designed 2-point door closure seals the door securely.
3. The inner glass door provides a hermetic seal for the interior chamber. An additional advantage: Unhindered monitoring of cultures without influencing the constancy of the temperature.
4. The capacity of the microbiological incubators from the APT.line™ enables to integrate additional equipment at any time, such as shakers, etc.

BD/BF/KB



### ► APT.line™ electronic controller technology

Although many incubators have electronic controls, it is well known that two factors significantly affect the quality of thermal processes:

1. The quality of the control technology.
2. The efficiency of the temperature technology. The electronically controlled APT.line™ preheating chamber technology has defined absolutely new standards with respect to precision.

BD/BF/KB



### ► Compliance with standards

Adherence to standards, such as GLP/GMP practices, is possible because of precise and reproducible temperature accuracy.

1. **Equipment documentation: Validation and calibration.** We provide professional calibration support either ex-factory or on-site as well as supporting documents for validation at customer premises.
2. **Operational data documentation: APT-COM™ DataControlSystem.** The only standard software that guarantees seamless documentation of all testing parameters in compliance with standards. Can be fully validated in accordance with GLP/GMP and FDA21 CFR Part 11.

BD/BF/KB



### ► BINDER test certificate: Your guarantee for top quality

Our equipment is tested meticulously. Each unit is re-inspected by Quality Control prior to delivery and calibrated to our factory standard. We also supply a free test certificate as quality confirmation.

BD/BF/KB



### ► Microbiological incubators with natural convection

Natural convection is perfectly suited for incubation of microorganisms, and for microbiological heating and conditioning. Professional equipment for long-term and stable continuous operation.

BD



### ► Microbiological incubators with forced convection

These incubators are the leading products for all incubation tasks requiring high specimen volumes and fast temperature recovery times. A specially designed, very powerful air turbine produces a high airflow rate, which can be meticulously adjusted from 0 % to 100 %. In combination with a patented APT.line™ Horizontal Airflow Design, this achieves both highly effective as well as very gentle incubation.

#### Advantages:

- Faster heating up and recovery times than with natural air convection
- Completely homogenous temp. performance, even with fully loaded chamber

BF



### ► Microbiological refrigerated incubators

#### DCT™ Direct Cooling Technology.



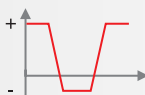
Expanded temperature range from -10 °C - 100 °C (14 °F - 212 °F).

KB 23: 0 °C - 100 °C (32 °F - 212 °F). Unique and patented. Effective, fast,

and precise. Optimal specimen quality thanks to minimal dehumidification.

No condensation in the interior. The smooth DCT™ surfaces offer reliable contamination prevention. Expanded programmable control functions can be realized by integrated week program timer with real time function.

KB

Product	Product features	Application profile
<b>BD series</b>	<ul style="list-style-type: none"> <li>- Incubator with natural convection</li> <li>- DS controller</li> <li>- Temperature range of 5 °C (9 °F) above ambient temperature up to 100 °C (212 °F)</li> </ul>	<ul style="list-style-type: none"> <li>- For all standard incubation applications</li> <li>- High spatial temperature accuracy</li> <li>- Recovery times after opening the door: 4 - 6 min at 37 °C (98.6 °F)</li> <li>- Ideally suited for continuous operation, universally usable</li> </ul> 
<b>BF series</b>	<ul style="list-style-type: none"> <li>- Incubator with forced convection</li> <li>- MS controller</li> <li>- Adjustable fan speed for higher dynamic</li> <li>- Temperature range of 5 °C (9 °F) above ambient temperature up to 100 °C (212 °F)</li> </ul>	<ul style="list-style-type: none"> <li>- For applications with a high specimen volume</li> <li>- For incubation of specimens with large volume and weight (e.g. Stomacher® sample bags)</li> <li>- For frequent batch changes</li> <li>- High spatial temperature accuracy, with loaded chamber</li> <li>- Fastest recovery times after opening the door: 1 - 2 min at 37 °C (98.6 °F)</li> </ul> 
<b>KB series</b>	<ul style="list-style-type: none"> <li>- Refrigerated incubator with forced convection</li> <li>- MP controller</li> <li>- Adjustable fan speed for higher dynamic</li> <li>- Program-controlled (1 program with 20 sections, switchable to 2 programs with 10 sections each)</li> <li>- Integrated week program timer with real time function</li> <li>- Temperature range: -10 °C - 100 °C (14 °F - 212 °F)</li> <li>KB 23 Benchtop: 0 °C - 100 °C (32 °F - 212 °F)</li> </ul>	<ul style="list-style-type: none"> <li>- For complex incubation experiments</li> <li>- Refrigerated incubation or incubation independent of ambient temperature</li> <li>- High spatial temperature accuracy across the entire temperature range</li> <li>- Fastest recovery times after opening the door: 1 - 2 min at 37 °C (98.6 °F)</li> <li>- Additional control functions (e.g. weekly program cycle in real time: 37 °C/98.6 °F / 4 °C /39.2 °F)</li> </ul> 

## BD series: Microbiological incubators with natural convection

BD series test chambers are specially designed for long-term and stable continuous operation. Ideal for gentle incubation of organisms, such as on agar plates, and also for conditioning of heat sensitive media.



### ► Performance features and equipment:

- Electronically controlled APT.line™ preheating chamber technology
- Temperature range of 5 °C (9 °F) above ambient temperature up to 100 °C (212 °F)
- DS controller with integrated timer 0 to 99 hours
- Digital temperature setting with an accuracy of a tenth of a degree
- Independent adjustable temperature safety device, Class 3.1 (DIN 12880), with visual alarm
- Adjustable ventilation by means of rear exhaust duct, 50 mm (2 inch) diameter with ventilation flap and front ventilation slide
- Inner glass door
- RS 422 interface for communication software APT-COM™ DataControlSystem
- Units up to 115 liters (4.1 cu.ft.) are stackable
- 2 chrome-plated racks
- BINDER test certificate

► **Only at BINDER: Precision regardless of size – the 20-liter (0.7 cu.ft) bench-top units.**



# Technical specification BD series



	BD 23	BD 53	BD 115	BD 240	BD 400	BD 720
► <b>Exterior dimensions</b>						
Width (mm/inch)	433 / 17.1	634 / 25.0	834 / 32.8	1034 / 40.7	1234 / 48.6	1234 / 48.6
Height (inclusive feet/castors) (mm/inch)	492 / 19.4	617 / 24.3	702 / 27.6	822 / 32.4	1022 / 40.2	1528 / 60.2
Depth (mm/inch)	516 / 20.3	575 / 22.6	645 / 25.4	745 / 29.3	765 / 30.1	865 / 34.1
Plus door handle, I-panel and exhaust duct (mm/in.)	85 / 3.4	85 / 3.4	85 / 3.4	85 / 3.4	85 / 3.4	85 / 3.4
Wall clearance rear (mm/inch)	100 / 3.9	100 / 3.9	100 / 3.9	100 / 3.9	100 / 3.9	100 / 3.9
Wall clearance side (mm/inch)	100 / 3.9	160 / 6.3	160 / 6.3	160 / 6.3	160 / 6.3	160 / 6.3
Steam space volume (l/cu.ft.)	36 / 1.3	70 / 2.5	142 / 5.0	283 / 10.0	457 / 16.2	808 / 28.6
Number of doors	1	1	1	2	2	2
Number of inner glass doors	1	1	1	2	2	2
► <b>Interior dimensions</b>						
Width (mm/inch)	222 / 8.7	400 / 15.8	600 / 23.6	800 / 31.5	1000 / 39.4	1000 / 39.4
Height (mm/inch)	330 / 13.0	400 / 15.8	480 / 18.9	600 / 23.6	800 / 31.5	1200 / 47.2
Depth (mm/inch)	277 / 10.9	330 / 13.0	400 / 15.8	500 / 19.7	500 / 19.7	600 / 23.6
Interior volume (l/cu.ft.)	20 / 0.7	53 / 1.9	115 / 4.1	240 / 8.6	400 / 14.3	720 / 25.7
Racks (number standard/max.)	2 / 3	2 / 4	2 / 5	2 / 7	2 / 10	2 / 16
Load per rack (kg/lbs.)	12 / 26	15 / 33	20 / 44	30 / 66	35 / 77	45 / 99
Permitted total load (kg/lbs.)	25 / 55	40 / 88	50 / 110	70 / 155	90 / 199	120 / 265
Weight (empty) (kg/lbs.)	26 / 57	43 / 95	61 / 135	93 / 205	135 / 298	191 / 422
► <b>Temperature data</b>						
Temperature range 5 °C (9 °F) above ambient up to (°C/°F)	100 / 212	100 / 212	100 / 212	100 / 212	100 / 212	100 / 212
Temperature variation						
at 37 °C (98.6 °F) (± °C)	0.5	0.5	0.4	0.5	0.5	0.5
at 50 °C (122 °F) (± °C)	1.8	1.1	0.8	0.9	0.9	0.8
Temperature fluctuation						
at 37 °C (98.6 °F) (± °C)	0.2	0.1	0.1	0.1	0.1	0.1
at 50 °C (122 °F) (± °C)	0.3	0.1	0.1	0.1	0.1	0.1
Heating up time <sup>1)</sup>						
to 37 °C (98.6 °F) (Min.)	49	38	62	70	105	84
to 50 °C (122 °F) (Min.)	32	59	91	115	132	90
Recovery time after door was opened 30 sec. <sup>1)</sup>						
at 37 °C (98.6 °F) (Min.)	3	5	5	5	6	4
at 50 °C (122 °F) (Min.)	4	7	7	6	29	24
► <b>Electrical data</b>						
Housing protection acc. to EN 60529	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Nominal voltage (±10 %) 50 / 60 Hz (V)	230 / 115	230 / 115	230 / 115	230 / 115	230 / 115	230 / 115
Nominal power (W)	200	400	400	680	850	1250
Energy consumption at 37 °C (98.6 °F) (W)	11	11	20	33	56	80

<sup>1)</sup> up to 98 % of the set value

All technical specification are specified for units with standard equipment at an ambient temperature of + 25°C (77 °F) and a voltage fluctuation of ±10 %. The temperature data are determined in accordance to factory standard following DIN 12880, part 2 respecting the recommended wall clearances of 10 % of the height, width and depth of the inner chamber. All indications are average values, typical for units produced in series. We reserve the right to alter technical specifications at all times.



## BF series: Microbiological incubators with forced convection

Premium equipment for all gentle incubation applications, including processing large numbers of samples at high throughput. Outstanding dynamics keep the required temperature virtually stable with homogenous distribution, irrespective of how many times the door is opened.



### ► Performance features and equipment:

- Electronically controlled APT.line™ preheating chamber technology
- Temperature range of 5 °C (9 °F) above ambient temperature up to 100 °C (212 °F)
- MS controller with several timer functions
- Digital temperature setting with an accuracy of a tenth of a degree
- Time functions: delayed ON, delayed OFF, and temperature-dependent delayed OFF
- One ramp function
- Adjustable fan speed (0 – 100 %)
- Adjustable ventilation by means of rear exhaust duct, 50 mm (2 inch) diameter with ventilation flap and front ventilation slide
- Inner glass door
- Independent adjustable temperature safety device, Class 3.1 (DIN 12880), with visual alarm
- RS 422 interface for communication software APT-COM™ DataControlSystem, or switch over to printer output with RS 232 / RS 422 interface converter
- Adjustable intervals for printer
- Units up to 115 liters (4.1 cu.ft) are stackable
- 2 chrome-plated racks
- BINDER test certificate



# Technical specification BF series



	BF 53	BF 115	BF 240	BF 400	BF 720
<b>Exterior dimensions</b>					
Width (mm/inch)	634 / 25.0	834 / 32.8	1034 / 40.7	1234 / 48.6	1234 / 48.6
Height (inclusive feet/castors) (mm/inch)	617 / 24.3	702 / 27.6	822 / 32.4	1022 / 40.2	1528 / 60.2
Depth (mm/inch)	575 / 22.6	645 / 25.4	745 / 29.3	765 / 30.1	865 / 34.1
Plus door handle and exhaust duct (mm/inch)	85 / 3.4	85 / 3.4	85 / 3.4	85 / 3.4	85 / 3.4
Wall clearance rear (mm/inch)	100 / 3.9	100 / 3.9	100 / 3.9	100 / 3.9	100 / 3.9
Wall clearance side (mm/inch)	160 / 6.3	160 / 6.3	160 / 6.3	160 / 6.3	160 / 6.3
Exhaust duct outer-Ø (mm/inch)	52 / 2.1	52 / 2.1	52 / 2.1	52 / 2.1	52 / 2.1
Steam space volume (l/cu.ft.)	70 / 2.5	142 / 5.0	283 / 10.0	457 / 16.2	808 / 28.6
Number of doors	1	1	2	2	2
Number of inner glass doors	1	1	2	2	2
<b>Interior dimensions</b>					
Width (mm/inch)	400 / 15.8	600 / 23.6	800 / 31.5	1000 / 39.4	1000 / 39.4
Height (mm/inch)	400 / 15.8	480 / 18.9	600 / 23.6	800 / 31.5	1200 / 47.2
Depth (mm/inch)	330 / 13.0	400 / 15.8	500 / 19.7	500 / 19.7	600 / 23.6
Interior volume (l/cu.ft.)	53 / 1.9	115 / 4.1	240 / 8.6	400 / 14.3	720 / 25.7
Racks, chrome-plated (number standard/max.)	2 / 5	2 / 5	2 / 7	2 / 10	2 / 16
Load per rack (kg/lbs.)	15 / 33	20 / 44	30 / 66	35 / 77	45 / 99
Permitted total load (kg/lbs.)	40 / 88	50 / 110	70 / 155	90 / 199	120 / 265
Weight of the unit (empty) (kg/lbs.)	43 / 95	64 / 141	104 / 230	145 / 320	180 / 397
<b>Temperature data</b>					
Temperature range, 5 °C (9 °F) above ambient up to (°C/°F)	100 / 212	100 / 212	100 / 212	100 / 212	100 / 212
Temperature variation <sup>1)</sup>					
at 37 °C (98.6 °F) (± °C)	0.4	0.3	0.3	0.4	0.4
at 50 °C (122 °F) (± °C)	0.7	0.6	0.8	0.9	0.6
Temperature fluctuation					
at 37 °C (98.6 °F) (± °C)	0.2	0.2	0.2	0.2	0.1
at 50 °C (122 °F) (± °C)	0.2	0.2	0.2	0.2	0.2
Heating up time <sup>2)</sup>					
to 37 °C (98.6 °F) (Min.) 98 %	12	22	12	18	21
to 50 °C (122 °F) (Min.) 98 %	20	23	24	26	24
Recov. time after door was opened for 30 sec. <sup>2)</sup>					
at 37 °C (98.6 °F) (Min.)	1	1	1	2	1
at 50 °C (122 °F) (Min.)	1,5	2	2	4	4
Air change at 70 °C (158 °F) (x/h) <sup>3)</sup>	59	29	19	17	11
<b>Electrical data</b>					
Housing protection acc. to EN 60529	IP 20	IP 20	IP 20	IP 20	IP 20
Nominal voltage (±10 %) 50/60 Hz (V)	230 / 115	230 / 115	230 / 115	230 / 115	230 / 115
Nominal power (W)	400	400	680	850	1250
Energy consumption at 37 °C (98.6 °F) (W)	11	20	33	56	80

<sup>1)</sup> value without window <sup>2)</sup> up to 98 % of the set value <sup>3)</sup> The air change depends on the inner chamber- and ambient temperature and is subject to significant individual variance. The indicated air change rate represents average values for standard equipment. Individual measurement of air change rate in acc. to ASTM D 5374 are optionally available.

All technical specification are specified for units with standard equipment at an ambient temperature of +25 °C (77 °F) and a voltage fluctuation of ±10 %. The temperature data are determined in accordance to factory standard following DIN 12880, part 2 respecting the recommended wall clearances of 10 % of the height, width and depth of the inner chamber. All indications are average values, typical for units produced in series. We reserve the right to alter technical specifications at all times.

## KB series: Refrigerated microbiological incubators with program controller

KB is the all-rounder for work with microorganisms. With its wide range of individual programming functions, including real-time clock function and an incredibly large temperature range, it can be used for a broad range of sophisticated applications in laboratories. The APT.line™ preheating chamber and the DCT™ refrigeration system will ensure rapid recovery times and maximum precision, unaffected by the ambient temperature.

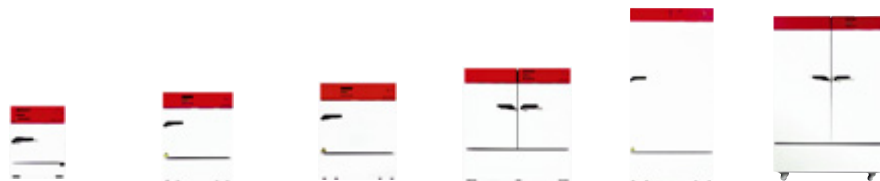


### ► Performance features and equipment:

- Electronically controlled APT.line™ preheating chamber technology with DCT™ refrigeration system
- Temperature range: -10 °C to 100 °C (14 °F - 212 °F)  
KB 23 Benchtop: 0 °C - 100 °C (32 °F - 212 °F)
- MP controller with 2 programs with 10 sections each, alternatively switchable to 1 program with 20 sections
- The time interval of single program sections can be adjusted up to a maximum of 99:59 hours or 999:59 hours. This adjustment applies to all program sections.
- Adjustable ramp function via program editor
- Integrated week program timer with real time function
- Digital temperature setting with an accuracy of a tenth of a degree
- Adjustable fan speed (0 to 100 %)
- Elapsed time indicator
- Independent adjustable temperature safety device, Class 3.1 (DIN 12880) with visual and acoustic alarm
- Inner glass door
- Environmentally friendly refrigerant R 134a
- RS 422 interface for communication software APT-COM™ DataControlSystem, or switch over to printer output with RS 232 / RS 422 interface converter
- Adjustable intervals for printer
- Units up to 115 liters (4.1 cu.ft) are stackable
- 2 stainless steel racks
- BINDER test certificate



## Technical specification KB series



	KB 23	KB 53	KB 115	KB 240	KB 400	KB 720
<b>Exterior dimensions</b>						
Width (mm/inch)	433 / 17.1	634 / 25.0	834 / 32.8	1034 / 40.7	884 / 34.8	1234 / 48.6
Height (incl. feet/roller) (mm/inch)	618 / 24.3	837 / 33.0	1022 / 40.2	1142 / 45.0	1850 / 72.8	1816 / 71.5
Depth (mm/inch)	516 / 20.3	576 / 22.7	646 / 25.4	746 / 29.4	716 / 28.2	867 / 34.1
Plus door handle, I-panel, connection (mm/inch)	73 / 2.9	100 / 3.9	100 / 3.9	100 / 3.9	100 / 3.9	100 / 3.9
Wall clearance (mm/inch)	100 / 3.9	100 / 3.9	100 / 3.9	100 / 3.9	100 / 3.9	100 / 3.9
Wall clearance with open door(s) (mm/inch)	100 / 3.9	160 / 6.3	160 / 6.3	160 / 6.3	160 / 6.3	160 / 6.3
Steam space volume (l/cu.ft.)	36 / 1.3	77 / 2.7	158 / 5.6	308 / 10.9	515 / 18.2	855 / 30.2
Number of doors	1	1	1	2	1	2
Number of inner glass doors	1	1	1	2	1	2
<b>Interior dimensions</b>						
Width (mm/inch)	222 / 8.7	400 / 15.8	600 / 23.6	800 / 31.5	650 / 25.6	1000 / 39.4
Height (mm/inch)	330 / 13.0	400 / 15.8	480 / 18.9	600 / 23.6	1308 / 51.5	1168 / 46.0
Depth (mm/inch)	277 / 10.9	330 / 13.0	400 / 15.8	500 / 19.7	470 / 18.5	600 / 23.6
Interior volume (l/cu.ft.)	20 / 0.7	53 / 1.9	115 / 4.1	240 / 8.5	400 / 14.1	700 / 24.7
Racks (number standard/max.)	2 / 3	2 / 4	2 / 5	2 / 7	2 / 15	2 / 14
Load per rack (kg/lbs.)	12 / 26	15 / 33	20 / 44	30 / 66	20 / 44	45 / 99
Permitted total load (kg/lbs.)	25 / 55	40 / 88	50 / 110	70 / 155	100 / 221	120 / 265
Weight (empty) (kg/lbs.)	44 / 97	72 / 159	105 / 232	147 / 325	216 / 477	262 / 578
<b>Temperature data</b>						
Temperature range (°C/°F)	<b>0 – 100 / 32 – 212</b>	-10 – 100 / 14 – 212	-10 – 100 / 14 – 212	-10 – 100 / 14 – 212	-10 – 100 / 14 – 212	-10 – 100 / 14 – 212
Temperature variation <sup>1)</sup>						
at 10 °C (50 °F) (± °C)	1.1	0.5	0.5	0.6	0.6	0.6
at 37 °C (98.6 °F) (± °C)	0.4	0.4	0.4	0.5	0.3	0.4
Temperature fluctuation during heating operation (± °C)	0.1	0.1	0.1	0.1	0.1	0.1
Temperature fluctuation during cooling operation (± °C)	0.3	0.3	0.3	0.3	0.3	0.3
Heating up time <sup>2)</sup>						
to 37 °C (98.6 °F) (Min.)	16	22	23	27	26	28
Cooling down time from ambient temperature <sup>2)</sup>						
to 10 °C (50 °F) (Min.)	21	35	35	38	35	45
Recovery time after door was open for 30 sec <sup>1), 2)</sup>						
at 37 °C (98.6 °F) (Min.)	3	1	2	1	2	1
at 50 °C (122 °F) (Min.)	3	2	4	2	4	4
<b>Electrical data</b>						
Housing protection acc. to EN 60529	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Nominal voltage (±10 %) 50/60 Hz (V)	230 / 115	230 / 115	230 / 115	230 / 115	230 / 115	230 / 115
Nominal power (W)	340	460	460	930	1100	1350
Energy consumption <sup>3)</sup> at 37 °C (98.6 °F) (W)	40	64	77	100	90	160

Based on the ice increase on the evaporators the refrigerating capacity decreases at a set value of < 0 °C (32 °F).

For this reason the chambers have to be defrosted regularly (approx. once a week).

<sup>1)</sup> at ambient temperature 20 °C (68 °F)

<sup>2)</sup> not applicable for units with option independent adjustable temperature safety device 3.3

<sup>3)</sup> these energy consumption values can be used upon calculation of air conditioning systems

All technical specification are specified for units with standard equipment at an ambient temperature of +20 °C (68 °F) and a voltage fluctuation of ±10 %.

The temperature data are determined in accordance to factory standard following DIN 12880, part 2 respecting the recommended wall clearances of 10 % of the height, width and depth of the inner chamber. All indications are average values, typical for units produced in series. We reserve the right to alter technical specifications at all times.

## Options/accessories series BD | BF | KB



## ► Access ports

With silicon plugs for inserting external measuring devices into the chamber.  
Access ports with 10, 30, 50 mm (0.4, 1.2, 2 inch) diameter.

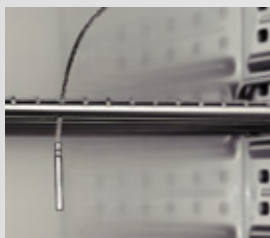
BD/BF/KB



## ► Waterproof interior power socket in the inner chamber

Connected to the main switch. To connect ancillary equipment inside the chamber.

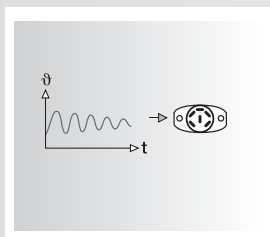
BD/BF/KB



## ► Additional PT 100 temperature sensor

In situ or flexible installation for exact temperature measurement within the specimen material; connects to a special plug on the back wall of the inner chamber.

BD/BF



## ► Analog output

For temperature 4 - 20 mA with 6-pin DIN socket (non-adjustable output).

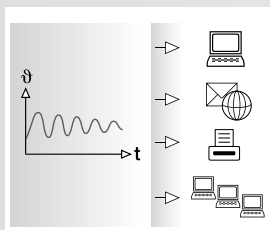
BD/BF/KB



## ► Calibration certificates

Measurement in the center at specified values. Additional measuring points or test values according to your specification.

BD/BF/KB

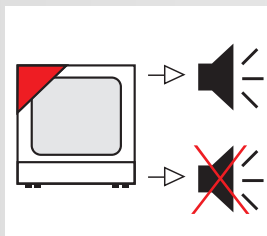


## ► Operational data documentation: APT-COM™ DataControlSystem

The only standard software that guarantees seamless documentation of all testing parameters in compliance with standards. Can be fully validated in accordance with GLP/GMP and FDA21 CFR Part 11.

BD/BF/KB





### ► Acoustic alarm

Activates in the event of excess temperature, with adjustable setpoint at the temperature controller. Acoustic alarm can be switched off.

BD/BF



### ► Petri dish rack

For fast and organized loading of specimens. Available in stainless steel or with different color coding for rapid identification of batches.

BD/BF/KB

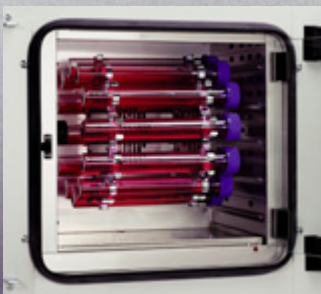
	BD						BF					KB					
	23	53	115	240	400	720	53	115	240	400	720	23	53	115	240	400	720
Access port with silicone plug	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Rack, chrome-plated or stainless steel	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Shelf, perforated, stainless steel	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Perforated shelf (positioned at bottom level), with additional fixation for shaker operation	–	–	–	–	–	–	–	–	–	–	–	–	○	○	○	○	○
Reinforced rack, stainless steel, with 1 set of rack securings (max. 70 kg / 154 lbs.)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	○	○	○
Securing elements for additional fastening of racks (1 set of 4)	–	–	–	–	–	–	–	–	–	–	–	○	○	○	○	○	○
Enhanced refrigeration system	–	–	–	–	–	–	–	–	–	–	–	–	–	–	○	○	○
Interior lighting	–	–	–	–	–	–	–	–	–	–	–	–	○	○	○	○	○
Lockable door	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Waterproof interior socket 230 V (maximum 500 W)	○	○	○	○	○	○	○	○	○	○	○	–	○	○	○	○	○
Temperature measurement according to DIN 12880-2 or with 9 measuring points with measurement log and certificate	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Ind. adjustable temp. safety device, Class 3.3 (DIN 12880)	–	–	–	–	–	–	–	–	–	–	–	–	○	○	○	○	○
Additional PT 100 temperature sensor flexible or fix with external connection, incl. LEMO collector (3-pin)	○	○	○	○	○	○	○	○	○	○	○	–	○	○	○	○	○
Analog temperature output, 4-20 mA, with 6-pin DIN socket (output not adjustable)	○	○	○	○	○	○	○	○	○	○	○	–	○	○	○	○	○
Potential free switching outputs accessible via 6-pin DIN socket. Additional module to controll 3 switching outputs via 3 contacts of program controller	–	–	–	–	–	–	–	–	–	–	–	–	○	○	○	○	○
Over-temperature alarm, acoustic, can be switched off	○	○	○	○	○	○	○	○	○	○	○	–	–	–	–	–	–
Rubber pads for safe stacking	○	○	○	–	–	–	○	○	○	–	–	○	○	○	–	–	–
Serial printer with interface converter for printing temp. logs. Incl. set of connection cables for RS 422 interface and RS 232 / RS 422 interface converter, 230 V	–	–	–	–	–	–	○	○	○	○	○	–	○	○	○	○	○
Calibration certificate	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Extension of calibration certificate (additional values)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Cleaning kit cleaning and disinfection	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Rack for stacking petri dishes	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Stable table on castors with locking brakes	–	○	○	○	○	–	○	○	○	○	–	–	○	○	○	○	–



# BFD|BFED

## Technology in monoculture

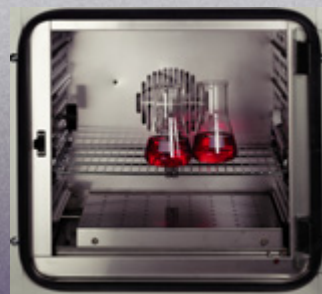
It's often the little things that count, and this is particularly so in genetics. A temperature variation of as little as one tenth of a degree can sometimes make a vast difference. That's why our hybridization chambers maintain 100 % temperature precision. This precision is the product of our patented APT.line™ preheating chamber technology, which gives us the competitive edge in this area as well.



Rotisserie can hold up to 12 hybridization bottles



Rotisserie can be easily removed

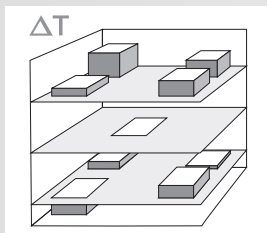


Can be used without restrictions as microbiological incubator



# Hybridization chambers from the APT.line™

## Facts you should know:



### ► APT.line™ – absolute precision in temperatures from 5 °C (9 °F) above ambient temperature to 100 °C (212 °F)

Only BINDER offers this precision in this temperature range as a standard. Unmistakable extra performance that permits both exact hybridization as well as precise performance of microbiological procedures.

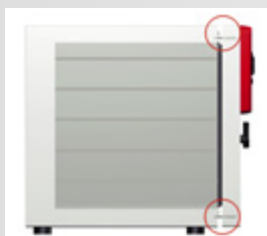
BFD/BFED



### ► Unmistakable precision

The electronically controlled APT.line™ preheating chamber technology combined with a specially designed, very powerful air turbine produces a high airflow rate. Together with the patented APT.line™ Horizontal Airflow Design, this produces outstanding precision in temperatures, even with fully loaded ovens.

BFD/BFED



### ► Precision in the details

Details such as significantly reduced energy use, a good working environment, and high occupational safety are the factors that make the difference with state-of-the-art performance characteristics in hybridization ovens. Mechanical quality in particular affects the precision of temperature parameters, speed and consistency.

1. All of our hybridization ovens have above-average thermal insulation. No temperature loss occurs in the interior and virtually no radiation of heat from the outside housing.
2. The specially designed 2-point door closure seals the door securely, even at maximum temperatures.
3. The inner glass door provide a hermetic seal for the interior chamber. An additional advantage: Unhindered process control without influencing the constancy of the temperature.

BFD/BFED



### ► Perfect cleaning options

**Disinfection routine.** Only from BINDER. Disinfection routines up to 100 °C (212 °F) for contamination caused by handling.

**APT.line™ interior.** Residue-free cleaning of the entire inner chamber and the inner glass door. Maximum process safety. A bonus for changing batches.

**Maximum equipment safety.** A special collection pan safely keeps hybridization solutions from penetrating into the equipment.

BFD/BFED



### ► Compliance with standards at the highest level.

We know that your jobs have to comply with the strictest standards and guidelines. BINDER can significantly reduce the time and effort needed for equipment qualification. We provide customized calibration certificates, IQ/OQ qualification documents, and assist with validation on site.

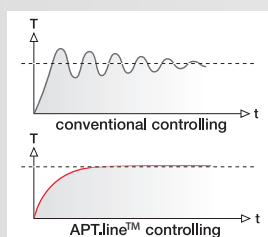
BFD/BFED



► **BINDER test certificate: Your guarantee for top quality**

Our equipment is tested meticulously. Each unit is re-inspected by Quality Control prior to delivery and calibrated to our factory standard. We also supply a free test certificate as quality confirmation.

BFD/BFED



► **APT.line™ electronic controller technology**

Although many hybridization ovens have electronic controls, it is well known that two factors significantly affect the quality of thermal processes:

1. The quality of the control technology
2. The efficiency of the temperature technology. Here, the electronically adjusted APT.line™ preheating chamber technology sets absolute standards with respect to precision.

BFD/BFED



► **Digitally adjustable shaker platform**

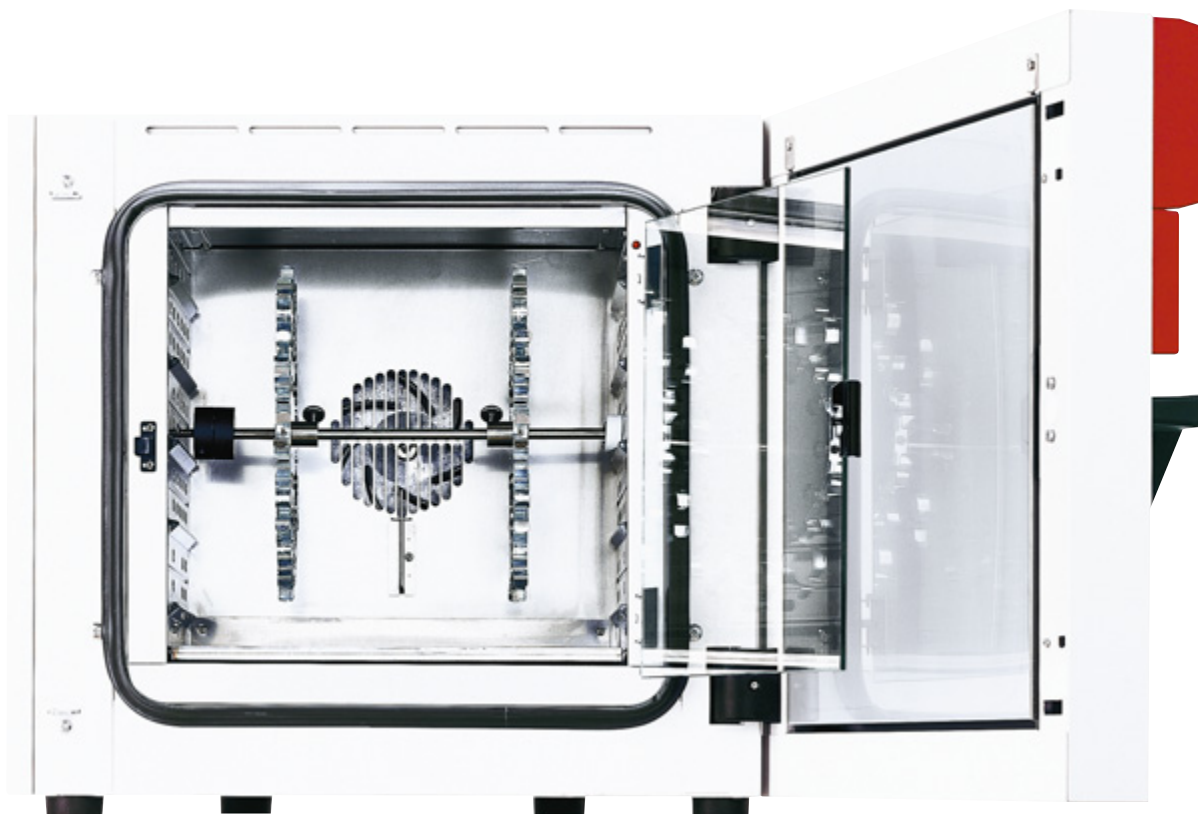
The BFED series also includes a digitally adjustable shaking platform, and is therefore perfectly suited for the widest variety of hybridization uses, such as bag hybridization, in situ hybridization, or incubation in Erlenmeyer flasks.

BFED



## BFD series: Hybridization chambers

The BFD series by far exceeds the requirements expected from standard hybridization ovens, with its unmistakably precise temperature accuracy, above-average thermal insulation, and perfect cleaning options. The wide temperature range is particularly pleasing from economic aspects. The BFD series can also be used as an incubator, if needed.



### ► Performance features and equipment:

- Electronically controlled APT.line™ preheating chamber technology
- Temperature range of 5 °C (9 °F) above ambient temperature up to 100 °C (212 °F)
- DS controller
- Digital temperature setting with an accuracy of a tenth of a degree
- Timer 0 to 24 hours
- Removable rotation unit for 12 hybridization bottles
- Low profile collection pan
- Adjustable ventilation by means of rear exhaust duct, 50 mm (2 inch) diameter, with ventilation flap and front ventilation slide
- Inner glass door
- Independent adjustable temperature safety device, Class 3.1 (DIN 12880), with visual temperature alarm
- Units are stackable
- 1 chrome-plated rack
- BINDER test certificate



# Technical specification BFD/BFED series



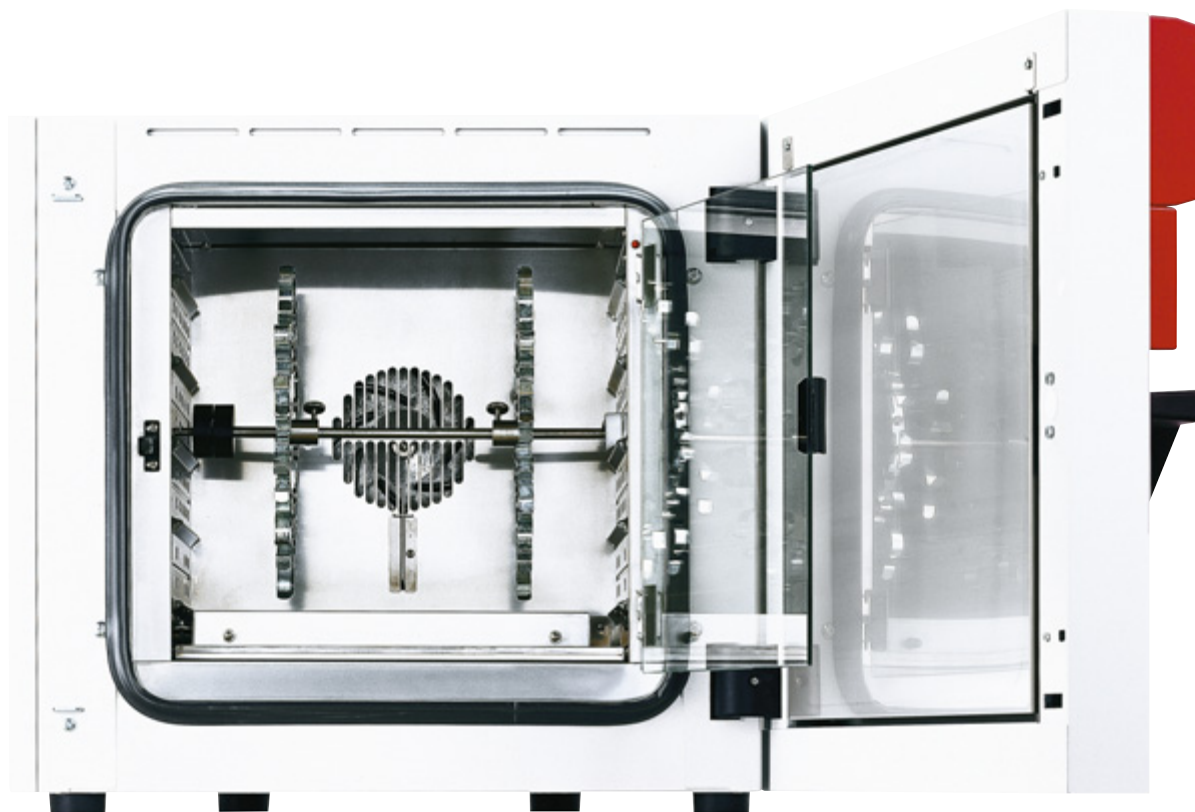
	BFD 53	BFED 53
► <b>Exterior dimensions</b>		
Width (mm/inch)	659 / 25.9	659 / 25.9
Height (inclusive feet/castors) (mm/inch)	617 / 24.3	617 / 24.3
Depth (mm/inch)	575 / 22.6	575 / 22.6
Plus door handle, I-panel and exhaust duct (mm/inch)	85 / 3.4	85 / 3.4
Wall clearance rear (mm/inch)	100 / 3.9	100 / 3.9
Wall clearance side (mm/inch)	160 / 6.3	160 / 6.3
Steam space volume (l/cu.ft.)	77 / 2.7	77 / 2.7
Number of doors/inner glas door	1/1	1/1
► <b>Interior dimensions</b>		
Width (mm/inch)	400 / 15.8	400 / 15.8
Height (mm/inch)	400 / 15.8	400 / 15.8
Depth (mm/inch)	330 / 13.0	330 / 13.0
Interior volume (l/cu.ft.)	53 / 1.9	53 / 1.9
Racks (number standard/max.)	1 / 3	1 / 3
Load per rack (kg/lbs.)	15 / 33	15 / 33
Permitted total load (kg/lbs.)	40 / 88	40 / 88
Weight (empty) (kg/lbs.)	45 / 99	45 / 99
► <b>Temperature data</b>		
Temperature range, 5 °C (9 °F) above ambient up to (°C/°F)	100 / 212	100 / 212
Temperature variation		
at 37 °C (98.6 °F) (± °C)	0.5	0.5
at 50 °C (122 °F) (± °C)	1.5	1.5
Temperature fluctuation		
at 37 °C (98.6 °F) (± °C)	0.1	0.1
at 50 °C (122 °F) (± °C)	0.2	0.2
Heating up time <sup>1)</sup>		
to 37 °C (98.6 °F) (Min.)	12	12
to 50 °C (122 °F) (Min.)	22	22
Recovery time after door was opened 30 sec. <sup>1)</sup>		
at 37 °C (98.6 °F) (Min.)	1	1
at 50 °C (122 °F) (Min.)	1.5	1.5
► <b>Electrical data</b>		
Housing protection acc. to EN 60529	IP 20	IP 20
Nominal voltage (±10 %) 50/60 Hz (V)	230 / 115	230 / 115
Nominal power (W)	400	400
Energy consumption		
at 37 °C (98.6 °F) (W)	20	20
at 50 °C (122 °F) (W)	130	130

<sup>1)</sup> up to 98 % of the set value

All technical specification are specified for units with standard equipment at an ambient temperature of +25 °C (77 °F) and a voltage fluctuation of ±10 %. The temperature data are determinated in accordance to factory standard following DIN 12880, part 2 respecting the recommended wall clearances of 10 % of the height, width and depth of the inner chamber. All indications are average values, typical for units produced in series. We reserve the right to alter technical specifications at all times.

## BFED series: Hybridization chambers with shaker platform

BFED is just as ideally suited for reproducible incubation results as the closely related BFD unit, although it offers a little extra when it comes to versatility. The shaking platform is particularly suited for hybridization in bags, or for in situ hybridization. The shaking frequency is digitally adjustable.



### ► Performance features and equipment:

- Electronically controlled APT.line™ preheating chamber technology
- Temperature range of 5 °C (9 °F) above ambient temperature up to 100 °C (212 °F)
- MS controller with several timer functions
- Digital temperature setting with an accuracy of a tenth of a degree
- Time functions: delayed ON, delayed OFF, and temperature-dependent delayed OFF
- Shaker platform, digitally adjustable (20–100 %)
- Adjustable ramp function
- Adjustable heat output (0 to 100 %)
- Removable rotation unit for 12 hybridization bottles
- Low profile collection pan
- Adjustable ventilation by means of rear exhaust duct, 50 mm (2 inch) diameter, with ventilation flap and front ventilation slide
- Inner glass door
- Independent adjustable temperature safety device, Class 3.1 (DIN 12880), with visual temperature alarm
- RS 232 printer and communication interface for communication software APT-COM™ DataControlSystem
- Adjustable intervals for printer
- Units are stackable
- 1 chrome-plated rack
- BINDER test certificate



## Options/accessories BFD/BFED series



### ► Lockable door

Prevents unauthorized access and interference with processes in the chamber.

BFD/BFED



### ► Serial printer

For recording temperature data. Connects to RS 232 printer interface.

BFED



### ► Wide-necked glass bottles

For even wetting of samples and thus homogenous marking of the entire nitrocellulose filter for hybridization in bottles. This ensures reliable hybridization results, even with small fluid quantities.

BFD/BFED



### ► Calibration certificates

Measurement in the center at specified values. Additional measuring points or test values according to your specification.

BFD/BFED

	BFD	BFED
	<b>53</b>	<b>53</b>
Rack, chrome-plated	○	○
Serial printer with interface converter for printing temperature logs. Connects to RS 232 printer interface. Attention: Only available for 230 V models!	–	○
Wide-necked glass bottles 290 x 35 mm or 150 x 35 mm (11.43 x 1.38 inch or 5.91 x 1.38 inch)	○	○
Analog temperature output, 4–20 mA, with 6-pin DIN socket (output not adjustable)	○	○
Lockable door	○	○

○ option – not available

Technical specifications subject to change

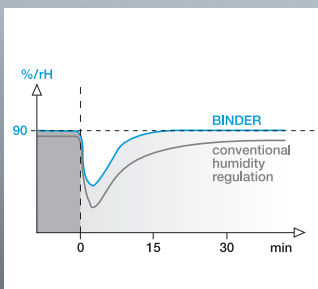




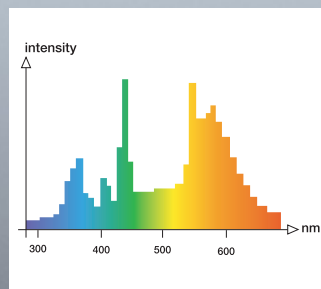
# KBF | KBF ICH

## More of the same – fortunately!

If you resist even the smallest change, relax! Absolutely constant temperature and humidity values are the outstanding features of this series, specifically designed to create precise simulation of climatic conditions. These features are rarely found, especially at this level of precision. So it's no coincidence that we are the uncontested market leader in this sector.



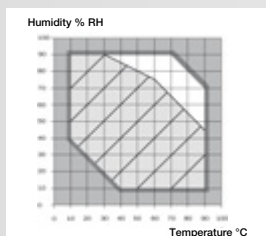
Humidity:  
Fast, precise, long-term stability.



Illumination:  
In total compliance with  
ICH guidelines.

# Climatic chambers for constant conditions from the APT.line™

## Facts you should know:



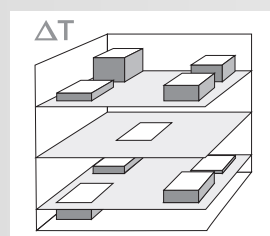
### ► Maximum performance potential

This special feature is offered only by BINDER. A temperature and humidity testing range that far exceeds the required values. This above-average performance potential guarantees the precise fulfillment of all standard climate tests as well as a number of individually configured testing profiles. This reserve capacity also safely covers future requirements.

### Individual programming. MCS controller

Comprehensive programming options and digital data storage.

KBF



### ► Precise long-term stability for temperature and humidity

**APT.line™ – absolutely precise temperatures from -10 °C to 100 °C (14 °F - 212 °F).**

The electronically adjusted APT.line™ preheating chamber technology combined with a specially designed, very powerful air turbine produces a high airflow rate, which can be meticulously adjusted from 0 %-100 %. Together with the patented APT.line™ Horizontal Airflow Design, this produces outstanding precision in temperature distribution, even with fully loaded ovens.

**DCT™- Direct Cooling Technology.** Unique and patented. The most efficient refrigeration with minimal dehumidification. Effective, fast, and precise at low temperatures.

### Electronically controlled humidification and dehumidification system.

**Humidity range of maximum 10 % RH - 90 % RH**

Effective, fast, and precise. Reliably constant humidity values even with frequent batch changes.

### Capacitive humidity sensor with SPH sensor technology

Maintenance-free sensor for absolutely precise humidity measurement.

KBF

terms	months											
T/°C / %rH	0	1	2	3	6	9	12	18	24	36		
25/60	x			x	x	x	x	x	x	x		
30/65				x	x	x	x	x	x	x		
40/75		x	x	x	x							

### ► Practical long-term stability

#### Direct water connection using normal tap water

Water is changed automatically. An important condition for problem-free long-term experiments.

#### Automatic de-frosting device for long-term operation

Only from BINDER. Tests no longer have to be interrupted for de-frosting.

#### Operational data documentation

APT-COM™ DataControlSystem. The only standard software that guarantees seamless documentation of all testing parameters in compliance with standards. Can be fully validated in accordance with GLP/GMP and FDA 21 CFR Section 11.

KBF



#### ► Compliance with standards at the highest level.

We know that your jobs have to comply with the strictest standards and guidelines. BINDER can significantly reduce the time and effort needed for equipment qualification. We provide customized calibration certificates, IQ/OQ qualification documents, and assist with validation on site.

KBF



#### ► Photostability tests

As part of the ICH guidelines, photo-sensitive substances must be tested for degradation resulting from light exposure. BINDER decided to offer the possibility of a realistic, simultaneous testing of the active substances under climate and lighting conditions. The result is an unmistakably sturdy concept that sets the standard for future developments.

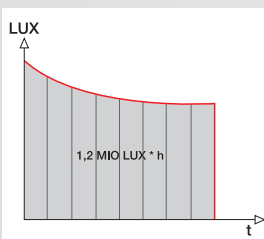
##### ICH-compliant illumination

A specially designed lighting system, sealed behind glass, is integrated into the doors in order to dissipate the generated heat. While receiving optimal lighting in the inner chamber, batches are safely protected from the thermal radiation emitted by the light sources. The standard series light spectrum completely covers the spectral lighting requirements according to ICH guideline Q1B, Option 2.



##### Light measurement

Two spherical, non-directional sensors capture the available light quantity at a specific sampling location; this flexible method has proven more reliable than those found in any other systems and, in combination with BINDER's light integration, is the only method of simulating the chemical actinometry electronically in accordance with ICH Q1B. BINDER has patented this process and is the only company offering this system.



##### Automated testing processes

A world's first from BINDER: The optional real-time light integration precisely calculates the effective light dose exposed; the tubular lamps for visible and UVA light are switched off when the specific programmable dose is reached. Advantages: No risk of sample overheating due to extreme light intensity like that produced by sun simulators; cost savings due to elimination of the need for a separate climatic simulation chamber.

The KBF ICH represents a truly complete solution for performing stability testing in accordance with ICH Q1A and photostability testing in accordance with ICH Q1B in the same unit; it produces authentic results that can be reproduced at any time.

KBF ICH



#### ► BINDER test certificate: Your guarantee for top quality

Our equipment is tested meticulously. Each unit is re-inspected by Quality Control prior to delivery and calibrated to our factory standard. We also supply a free test certificate as quality confirmation.

KBF

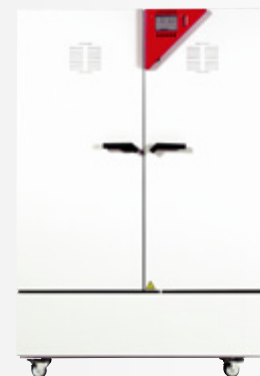
## KBF series: Environmental simulation chambers for constant climatic conditions

The KBF series was particularly designed for absolutely reliable stability tests and precise maintenance of constant climatic conditions. It naturally also complies with all applicable guidelines such as ICH, FDA, GMP and GLP, with respect to programming and documentation requirements; with its large reserve capacity and many optional features, it is designed to meet future challenges for many years to come.



### ► Performance features and equipment:

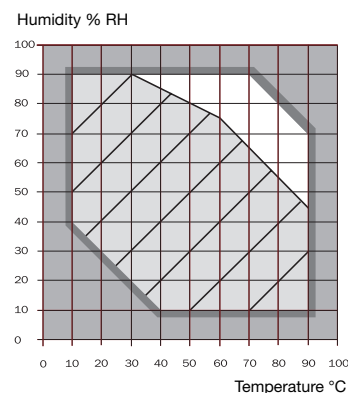
- Electronically controlled APT.line™ preheating chamber technology with DCT™ refrigeration system
- Temperature range: -10 °C to +100 °C (14 °F to 212 °F) (without humidity)
- Humidity range: 10 % RH to 90 % RH
- MCS controller with 25 storable programs of 100 sections each for a maximum of 500 program segments
  - User-friendly LCD screen
  - Easy-to-read menu guide
  - Integrated electronic chart recorder
  - Variety of options for the graphic display of process parameters
  - Real-time clock
- Electronically controlled humidification and dehumidification system with SPH sensor technology
- Capacitive humidity sensor
- Suitable for stability tests in accordance with the ICH guideline Q1A
- Automatic defrosting device for long-term operation
- Inner glass door
- Environmentally friendly refrigerant R 134a
- Collecting pan for condensate on the door
- Independent adjustable temperature safety device, Class 3.1 (DIN 12880) with optical and acoustic alarm
- Access port with silicone plug, Ø 30 mm (1.2 inch), right side
- Complete safety connection kit for water supply incl. water hose and drain (total length 6 m / 19.7 ft)
- Ethernet or RS 422 interface for communication software APT-COM™ DataControlSystem
- 2 stainless steel racks
- BINDER test certificate



# Technical specification KBF series



## Temperature-humidity chart



The light area indicates the control range of temperature and relative humidity. The hatched area indicates the control range of temperature and relative humidity without condensation.

	KBF 115	KBF 240	KBF 720
<b>Exterior dimensions</b>			
Width (mm/inch)	834 / 32.8	893 / 35.2	1234 / 48.6
Height (incl. feet/roller) (mm/inch)	1022 / 40.2	1372 / 54.0	1816 / 71.5
Depth (mm/inch)	646 / 25.4	733 / 28.9	867 / 34.1
Plus door handle, I-panel, connection (mm/inch)	100 / 3.9	100 / 3.9	100 / 3.9
Wall clearance rear (mm/inch)	100 / 3.9	100 / 3.9	100 / 3.9
Wall clearance side (mm/inch)	160 / 6.3	160 / 6.3	160 / 6.3
Steam space volume (l/cu.ft.)	158 / 5.6	332 / 11.7	855 / 30.2
Height of water connections (± 3 mm / 0.12 inch)	84 / 3.3	113 / 4.5	190 / 7.5
Number of doors	1	1	2
Number of inner glass doors	1	1	2
<b>Interior dimensions</b>			
Width (mm/inch)	600 / 23.6	650 / 25.6	1000 / 39.4
Height (mm/inch)	480 / 18.9	785 / 30.9	1168 / 46.0
Depth (mm/inch)	400 / 15.8	470 / 18.5	600 / 23.6
Interior volume (l/cu.ft.)	115 / 4.1	240 / 8.6	700 / 24.7
Racks (number standard/max.)	2 / 5	2 / 7	2 / 14
Load per rack (kg/lbs.)	20 / 44	30 / 66	45 / 99
Permitted total load (kg/lbs.)	50 / 110	70 / 155	120 / 265
Weight (empty) (kg/lbs.)	115 / 254	185 / 408	278 / 614
<b>Temperature data</b>			
Permissible ambient temperature range (°C/°F) <sup>1)</sup>	18-32/64.4-89.6	18-32/64.4-89.6	18-32/64.4-89.6
KBF without humidity (°C/°F)	-10-100/14-212	-10-100/14-212	-10-100/14-212
KBF with humidity (°C/°F)	10-90 / 50-194	10-90 / 50-194	10-90 / 50-194
Temperature variation without humidity			
at 10 °C (50 °F) (± °C)	0.4	0.4	0.4
at 37 °C (98.6 °F) (± °C)	0.3	0.4	0.4
Temperature variation with humidity <sup>2)</sup> (± °C)	1	1	1
Temperature fluctuation from 5 °C (9 °F) above ambient temperature <sup>2)</sup> (± °C)	0.1	0.1	0.1
Temperature fluctuation when refrigeration system is in operation (± °C)	0.5	0.5	0.5
Heating up time <sup>1), 2)</sup>			
at 37 °C (98.6 °F) (Min.)	23	30	28
Cooling down time from room temp. <sup>1), 2)</sup>			
at 10 °C (50 °F) (Min.)	35	35	35
Recovery time after doors were open for 30 sec. <sup>1), 2)</sup>			
at 37 °C (98.6 °F) (Min.)	5	5	5
at 50 °C (122 °F) (Min.)	4	4	4
Humidity fluctuation <sup>1), 2), 3)</sup> (± RH%)	1.5	1.5	1.5
<b>Electrical data</b>			
Housing protection acc. to EN 60529	IP 20	IP 20	IP 20
Nominal voltage (± 10 %) 50/60 Hz (V)	230	230	230
Nominal power (W) KBF	1700	2250	2760
Energy consumption <sup>4)</sup> at 37 °C (W) KBF	530	550	610

- <sup>1)</sup> up to 98 % of the set value
- <sup>2)</sup> value without illumin.
- <sup>3)</sup> upon door opening or water ex change in humidity cylinder: > ± 1.5 RH%, recovery time approx. 20 min
- <sup>4)</sup> these energy consumption values can be used upon calculation of air conditioning systems
- <sup>5)</sup> Recommended ambient temperature: +20 °C

By introducing in a humidity source to the inner chamber the minimal humidity range is affected. **A water tap (1–10 bar/14.5–145 psi) with normal tap water (approx. 200–500 µS/cm tolerance + 300–150 µS/cm, total hardness 4°–8° dH, content of chloride < 100mg/l) is necessary for the installation of the humidifying and dehumidifying system.** Furthermore, a 40 mm (1.6 inch) water drain with descending gradient is required. All technical data are specified for units with standard equipment at an ambient temperature of +20 °C (68 °F) and a voltage fluctuation of ± 10 %. The temperature data are determined in accordance to factory standard following DIN 12880, part 2 respecting the recommended wall clearances of 10 % of the height, width and depth of the inner chamber. All indications are average values, typical for units produced in series. We reserve the right to alter technical specifications at all times.



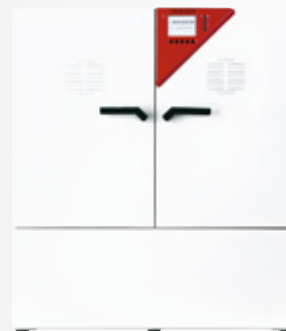
## KBF series with ICH-compliant illumination: Environmental simulation chambers for constant climatic conditions with light

As regards compliance with standards, performance and functionality, the characteristics are identical to the KBF series, except for the following impressive expanded photostability test features: two spherical, non-directional sensors capture the available light quantity at a specific sampling location; this flexible method has proven more reliable than those found in any other systems and, in combination with BINDER's light integration, is the only method of simulating the chemical actinometry electronically in accordance with ICH Q1B. BINDER has patented this process and is the only company offering this system.



### ► Performance features and equipment:

- Electronically controlled APT.line™ preheating chamber technology with DCT™ refrigeration system
- Temperature range: -5 °C to +100 °C (23 °F to 212 °F) (without humidity)
- Humidity range: 10 % RH to 90 % RH
- MCS controller with 25 storable programs of 100 sections each for a maximum of 500 program segments
  - User-friendly LCD screen
  - Easy-to-read menu guide
  - Integrated electronic chart recorder
  - Variety of options for the graphic display of process parameters
  - Real-time clock
- Electronically controlled humidification and dehumidification system with SPH sensor technology
- Capacitive humidity sensor
- Suitable for stability tests in accordance with the ICH guideline Q1A
- Automatic defrosting device for long-term operation
- Inner glass door
- Environmentally friendly refrigerant R 134a
- Collecting pan for condensate on the door
- Independent adjustable temperature safety device, Class 3.1 (DIN 12880) with optical and acoustic alarm
- Access port with silicone plug, Ø 30 mm (1.2 inch), right side
- Complete safety connection kit for water supply incl. water hose and drain (total length 6 m / 19.7 ft)
- Ethernet or RS 422 interface for communication software APT-COM™ DataControlSystem
- 2 stainless steel racks
- ICH-compliant illumination in the doors for photostability tests in accordance with the ICH guideline Q1B, Option 2
- Vertically positioned illumination in both doors (10 light tubes)
- Fulfills all criteria of the ICH guideline for the visible and the ultraviolet part of the light spectrum.
- BINDER test certificate

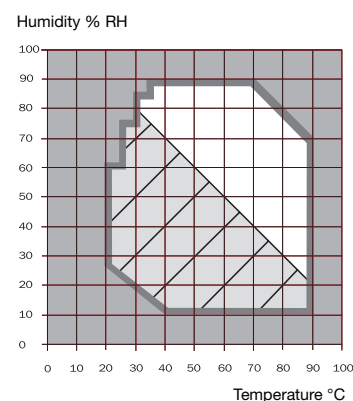


# Technical specification KBF series with ICH-illumination



	KBF ICH 240	KBF ICH 720
<b>Exterior dimensions</b>		
Width (mm/inch)	1034 / 40.7	1234 / 48.6
Height (incl. feet/roller) (mm/inch)	1142 / 45.0	1816 / 71.5
Depth (mm/inch)	746 / 29.4	867 / 34.1
Plus door handle, I-panel, connection (mm/inch)	100 / 3.9	100 / 3.9
Wall clearance rear (mm/inch)	100 / 3.9	100 / 3.9
Wall clearance side (mm/inch)	160 / 6.3	160 / 6.3
Steam space volume (l/cu.ft.)	308 / 10.9	855 / 30.2
Height of water connections (± 3 mm / 0.12 inch)	84 / 3.3	190 / 7.5
Number of doors	2	2
Number of inner glass doors	2	2
<b>Interior dimensions</b>		
Width (mm/inch)	800 / 31.5	1000 / 39.4
Height (mm/inch)	600 / 23.6	1168 / 46.0
Depth (mm/inch)	500 / 19.7	600 / 23.6
Interior volume (l/cu.ft.)	240 / 8.6	700 / 25.1
Racks (number standard/max.)	2 / 7	2 / 14
Load per rack (kg/lbs.)	30 / 66	45 / 99
Permitted total load (kg/lbs.)	70 / 155	120 / 265
Weight (empty) (kg/lbs.)	184 / 405.7	345 / 762
<b>Temperature data</b>		
Permissible ambient temperature range (°C/°F) <sup>6)</sup>	18-32/64.4-89.6	18-32/64.4-89.6
KBF-ICH without humidity / without illumin. (°C/°F)	-5-100 / 23-212	-5-100 / 23-212
KBF-ICH without humidity / with illumination (°C/°F)	5-100 / 41-212	5-100 / 41-212
KBF-ICH with humidity / with/without illumin. (°C/°F)	20-90 / 68-194	20-90 / 68-194
Temperature variation without humidity at 10 °C (50 °F) (± °C)	0.4	0.4
at 37 °C (98.6 °F) (± °C)	0.4	0.4
Temperature variation with humidity <sup>2)</sup> (± °C)	1	1
Temperature fluctuation from 5 °C (9 °F) above ambient temperature <sup>2)</sup> (± °C)	0.1	0.1
Temperature fluctuation when refrigeration system is in operation (± °C)	0.5	0.5
Heating up time <sup>1), 2)</sup> at 37 °C (98.6 °F) (Min.)	30	28
Cooling down time from room temp. <sup>1), 2)</sup> at 10 °C (50 °F) (Min.)	35	35
Recovery time after doors were open for 30 sec. <sup>1), 2)</sup>		
at 37 °C (98.6 °F) (Min.)	5	5
at 50 °C (122 °F) (Min.)	4	4
Humidity fluctuation <sup>1), 2) 3)</sup> (± RH %)	1.5	1.5
<b>Electrical data</b>		
Housing protection acc. to EN 60529	IP 20	IP 20
Nominal voltage (± 10 %) 50 / 60 Hz (V)	230	230
Nominal power (W)	2420	2950
Energy consumption <sup>4)</sup> at 37 °C (W)	730	970
<b>Illumination data KBF ICH</b>		
ICH compliant illumination in the doors in acc. Lux	4000	4000
with ICH guideline Q1B Option 2 UVA (W/m²) <sup>5)</sup>	1.7	1.7
ICH compliant illumination underneath the ceiling in acc. Lux	4000	4000
with ICH guideline Q1B Option 2 UVA (W/m²) <sup>5)</sup>	1.7	1.7

Temperature-humidity chart with ICH compliant illumination



The light area indicates the control range of temperature and relative humidity. The hatched area indicates the control range of temperature and relative humidity without condensation.

- <sup>1)</sup> up to 98 % of the set value
- <sup>2)</sup> value without illumin.
- <sup>3)</sup> upon door opening or water exchange in humidity cylinder: > ± 1.5 RH%, recovery time approx. 20 min
- <sup>4)</sup> these energy consumption values can be used upon calculation of air conditioning systems
- <sup>5)</sup> maximal value, measured in center of usable volume
- <sup>6)</sup> Recommended ambient temperature: +20 °C

By introducing in a humidity source to the inner chamber the minimal humidity range is affected. **A water tap (1–10 bar/14.5–145 psi) with normal tap water (approx. 200–500 µS/cm tolerance + 300–150 µS/cm, total hardness 4°–8° dH, content of chloride < 100mg/l) is necessary for the installation of the humidifying and dehumidifying system.** Furthermore, a 40 mm (1.6 inch) water drain with descending gradient is required. All technical data are specified for units with standard equipment at an ambient temperature of + 20 °C (68 °F) and a voltage fluctuation of ± 10 %. The temperature data are determined in accordance to factory standard following DIN 12880, part 2 respecting the recommended wall clearances of 10 % of the height, width and depth of the inner chamber. All indications are average values, typical for units produced in series. We reserve the right to alter technical specifications at all times.

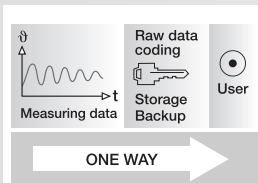
## Options/accessories KBF/KBF series with ICH-illumination



### ► Calibration certificates

Measurement in the center at specified values. Additional measuring points or test values according to your specification.

KBF ICH



### ► APT-COM™ DataControlSystem GLP Edition

Software for GLP compliant control, programming, and documentation. Permits networks of up to 30 units and/or controllers. Meets the requirements of FDA 21 CFR Part 11.

KBF ICH



### ► Illumination below the working space ceiling

ICH-compliant illumination below the working space ceiling with thermal decoupling and ventilation, for photostability tests in accordance with ICH guidelines Q1B, Option 2.

KBF ICH



### ► Light integration

Measurement, display and integration of visible and UV-light intensity acc. ICH including. As soon as the individually settable light dosages are reached, the unit automatically and separately switches off the UV and visible illumination.

KBF ICH

	KBF		
	115	240	720
Access port with silicone plug	○	○	○
Rack, stainless steel	○	○	○
Rack, perforated, stainless steel	○	○	○
Reinforced rack, stainless steel, with 1 set of rack securings (max. 70 kg / 154 lbs.)	–	○	○
Independent adjustable temperature safety device, Class 3.3 (DIN 12880)	○	○	○
Analog output, 4-20 mA for temperature and humidity with 6-pin DIN socket (Outputs are adjusted automatically as the controller is adjusted)	○	○	○
Potential free alarm outputs for temperature and humidity, accessible via 6-pin DIN socket, with acoustic signal that can be switched off (maximum power 24 V AC/DC, 2.5 A)	○	○	○
Interior lighting (W)	15	30	30
Lockable door	○	○	○
ICH-compliant illumination according ICH guideline Q1B, Option 2 underneath the chamber ceiling	–	○	○
Light integration: Measurement, display and integration of illuminance and UV-light intensity for ICH-compliant illumination. Optional documentation of light intergration data in APT-COM™ software possible	–	○	○
Light qualification for ICH-compliant illumination	–	○	○
Built-in 2-channel chart recorder, with digital display for the documentation of temperature and humidity	○	○	○
Waterproof interior socket 230 V (maximum 500 W)	○	○	○
Safety kit for water connection. Pre-mounted assembly of reflux prevention device and hose burst protection device	○	○	○
Locking of controller keyboard	○	○	○
Temperature measurement according to DIN 12880-2 or with 9 measuring points with measurement log and certificate	○	○	○
Calibration certificate for temperature and humidity	○	○	○
Extension for calibration certificate (additional values)	○	○	○

○ option – not available

Technical specifications subject to change

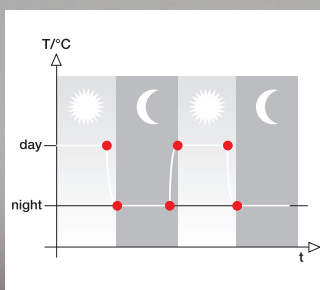




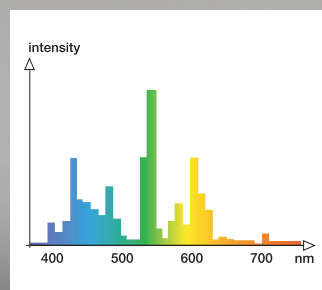
# KBW | KBWF

## In vitro as good as in vivo

Nature could hardly improve on our patented Direct Cooling Technology, which compensates for the thermal effect of light by interaction with the highly efficient APT.line™ preheating chamber to produce the unparalleled dynamics of our chambers. Uncompromisingly realistic, reproducible, hygienic, and with lighting conditions that are precisely adjusted to the requirements of your tested plants.



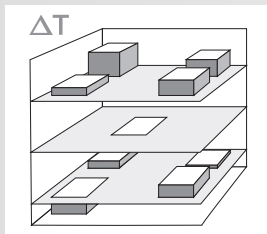
Precise day and night simulation



Specific illumination conditions

# Plant growth chambers from the APT.line™

## Facts you should know:



### ► Temperature

APT.line™ – Absolute precision from:

KBW: -10 °C (14 °F) up to 60 °C (140 °F)

KBWF: -5 °C (23°F) up to 100°C (212 °F)

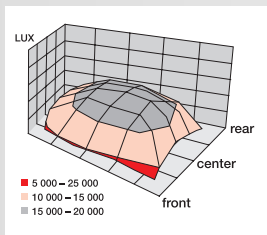
#### 1. Electronically controlled APT.line™ preheating chamber technology.

The most powerful technology for de facto compensation of thermal influences from light.

#### 2. Patented APT.line™ Airflow Design. Optimal airflow for perfect in vitro cultivation.

#### 3. DCT™ Direct Cooling Technology. Unique and patented. Guaranteed maximum high humidity values in the cultures.

KBW/KBWF



### ► Light

#### 1. Light distribution

Special reflector geometries guarantee an absolutely even illumination of the interior. The configuration of the interior illumination cassettes is flexible.

#### 2. Light intensity

Extremely reflective materials make optimal use of the installed illumination.

#### 3. Light spectrum

Users can select their own combination of different light qualities to produce individual spectra.

KBW/KBWF



### ► Sterile incubation conditions

Contamination could be caused by handling, with the risk of transference into the cultures. The plant growth chambers from the APT.line™ have been designed down to the last detail to provide every possible active and passive protection against contamination. The focus is clearly on the interior chamber and the protection of cultures. This focus actively reduces the risk of procedural failures.



#### 1. No condensation

**Patented APT.line™ Airflow Design.**

Keeps the culture vessels completely free of condensation.

**BINDER temperature technology.**

Precision guarantees a condensation-free interior in every temperature range.

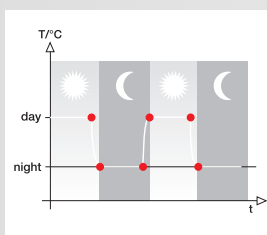
#### 2. Cleaning

Maximum process safety through residue-free cleaning of the entire inner chamber and the inner glass door.

#### 3. Direct and indirect protection against contamination

Unnoticed nesting of parasites is impossible. All accessible surfaces as well as the outside of the DCT™ evaporator plates are absolutely smooth.

KBW/KBWF



### ► Individual programming.

**MP controller.** Guarantees multifunctional programming options for a wide variety of processes. Integrated week program timer with real time function.

**MCS controller.** Comprehensive programming options, easy day/night simulation, and digital data storage.

KBW

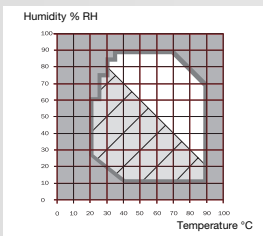
KBWF



► **Compliance with standards at the highest level.**

We know that your jobs have to comply with the strictest standards and guidelines. BINDER can significantly reduce the time and effort needed for equipment qualification. We provide customized calibration certificates, IQ/OQ qualification documents, and assist with validation on site.

KBW/KBWF



► **Plant growth chambers with humidity control**

Because of their powerful humidification system, KBWF plant growth chambers can carry out a wide variety of climate simulations for plants, with precision and reproducibility.

**Maximum performance potential**

This special feature is offered only by BINDER. A temperature and humidity range that far exceeds the required values. This exceptional performance potential guarantees exact reproduction of a wide range of climatic conditions.

**Electronically controlled humidification and dehumidification system.**

**Humidity range of maximum 10 % RH - 90 % RH**

Effective, fast, and precise. Reliably constant humidity values even with frequent batch changes.

1. **Capacitive humidity sensor with SPH sensor technology**

Maintenance-free sensor for absolutely precise humidity measurement.

2. **Direct water connection**

Water is changed automatically. An important condition for problem-free long-term cultivation.

KBWF



► **BINDER test certificate: Your guarantee for top quality**

Our equipment is tested meticulously. Each unit is re-inspected by Quality Control prior to delivery and calibrated to our factory standard. We also supply a free test certificate as quality confirmation.

KBW/KBWF

## KBW series: Plant growth chambers with optimal lighting conditions

Precision combined with maximum dynamics. KBW exceeds any requirements with respect to optimal lighting and temperature conditions for exactly defined culture processes. Extremely short reaction times keep all growth parameters in equilibrium - natural simulation as never before. Handling is truly enhanced by the integrated real-time clock function in the controller.



### ► Performance features and equipment:

- Electronically controlled APT.line™ preheating chamber technology
- Temperature range: -10 °C to 60 °C (14 °F to 140 °F)
- MP controller with 2 programs with 10 sections each, alternatively switchable to 1 program with 20 sections
- The time interval of single program sections can be adjusted up to a maximum of either 99:59 hours or 999:59 hours. This adjustment applies to all program sections.
- Adjustable ramp functions via program editor
- Integrated week program timer with real time function for programming day/night cycles
- Digital temperature setting with an accuracy of a tenth of a degree
- Adjustable fan speed (0 to 100 %)
- Elapsed time indicator
- Illumination: flexible illumination cassettes with 4 daylight fluorescent tubes each (KBW 720 with 8 tubes), switchable (OFF – 50 % – 100 %)
- Access port, Ø 30 mm (1.2 inch) , right side, top and bottom
- Inner glass door
- Independent adjustable temperature safety device, Class 3.1 (DIN 12880) with visual and acoustic alarm
- Environmentally friendly refrigerant R 134a
- RS 422 interface for communication software APT-COM™ DataControlSystem, or switch over to printer output with RS 232 / RS 422 interface converter
- Adjustable intervals for printer
- Flexible illumination cassettes with daylight fluorescent tubes
- Stainless steel shelves
- BINDER test certificate



# Technical specification

## KBW series



	KBW 240	KBW 400	KBW 720
<b>Exterior dimensions</b>			
Width (mm/inch)	1034 / 40.7	884 / 34.8	1234 / 48.6
Height (incl. feet/roller) (mm/inch)	1142 / 45.0	1850 / 72.8	1816 / 71.5
Depth (mm/inch)	746 / 29.4	716 / 28.2	867 / 34.1
Plus door handle, I-panel, connection (mm/inch)	100 / 3.9	100 / 3.9	100 / 3.9
Wall clearance (mm/inch)	100 / 3.9	100 / 3.9	100 / 3.9
Wall clearance with open door(s) (mm/inch)	160 / 6.3	160 / 6.3	160 / 6.3
Steam space volume (l/cu.ft.)	308 / 10.9	515 / 18.2	855 / 30.2
Number of door(s) / inner glass door(s)	2 / 2	1 / 1	2 / 2
<b>Interior dimensions</b>			
Width (mm/inch)	800 / 31.5	650 / 25.6	1000 / 39.4
Height (mm/inch)	600 / 23.6	1308 / 51.5	1168 / 46.0
Depth (mm/inch)	500 / 19.7	470 / 18.5	600 / 23.6
Interior volume (l/cu.ft.)	240 / 8.5	400 / 14.1	700 / 24.7
Load per shelf (kg/lbs.)	30 / 66	20 / 44	45 / 99
Permitted total load (kg/lbs.)	70 / 155	100 / 221	100 / 221
Weight (empty) (kg/lbs.)	160 / 353	236 / 521	262 / 578
Shelves (number standard/max.)	2 / 7	3 / 15	3 / 14 **
Flexible adjustable illumination cassetts	2	3	3 **
<b>Temperature data</b>			
Temperature range 0 % illumination (°C/°F)	-10–60 / 14–140	-10–60 / 14–140	-10–60 / 14–140
Temperature range 100 % illumination (°C/°F)	14–60 / 57–140	14–60 / 57–140	30–60 / 86–140
Temperature range 0 % illumination with option enhanced refrigeration (°C/°F)	-10–60 / 14–140	-10–60 / 14–140	-10–60 / 14–140
Temperature range 100 % illumination with option enhanced refrig. (°C/°F)	0–60 / 32–140	0–60 / 32–140	9–60 / 48–140
Temperature variation			
at 0 °C (32 °F), 0 % / 100 % illumination and enhanced refrigeration (± °C)	0.7 / 2.5	0.7 / 2.9	0.7 / –
at 25 °C (77 °F), 0 % / 100 % illumination (± °C)	0.4 / 3.6	0.5 / 4	0.5 / –
at 25 °C (77 °F), 100 % illumination and enhanced refrigeration (± °C)	3.4	2.8	3.5
Temperature fluctuation during heating operation (± °C)	0.1	0.1	0.1
Temperature fluctuation during cooling operation (± °C)	0.3	0.3	0.3
Heating up time at 37 °C (98.6 °F), 0 % / 100 % illumination <sup>1)</sup> (Min.)	22 / 15	26 / 22	28 / 24
Cooling down time room temperature			
at 4 °C (39.2 °F), 0 % illumination <sup>1), 2)</sup> (Min.)	77	120	125
at 4 °C (39.2 °F), 0 % / 100 % illumination / enhanced refrigeration <sup>1)</sup> (Min.)	30 / 47	39 / 84	62 / –
Recovery time after door was opened for 30 sec. <sup>1)</sup>			
at 4 °C (39.2 °F), 0 % illumination (Min.)	5	8	10
at 4 °C (39.2 °F), 0 % / 100 % illumination / enhanced refrigeration (Min.)	3 / 5	3 / 5	5 / –
at 37 °C (98.6 °F), 0 % / 100 % illumination (Min.)	3 / 2	2 / 3	2 / 4
Max. illumination intensity / daylight illumination tubes <sup>3)</sup>			
(Lux) / $\mu\text{E}/(\text{s} \times \text{m}^2)^*$	12500 / 190	12300 / 180	15200 / 225
Max. illumination intensity / growth lamps <sup>3)</sup> (Lux) / $\mu\text{E}/(\text{s} \times \text{m}^2)^*$	6900 / 150	6900 / 150	8300 / 185
<b>Electrical data</b>			
Housing protection acc. to EN 60529	IP 20	IP 20	IP 20
Nominal voltage (± 10 %) 50/60 Hz (V)	230 / 115	230 / 115	230 / 115
Nominal power (W)	1100	1350	2000
Energy consumption <sup>2)</sup> at 37 °C (W)	100	90	160

<sup>1)</sup> up to 98 % of the set value

<sup>2)</sup> these energy consumption values can be used upon calculation of air conditioning systems

<sup>3)</sup> Max. values based on 25 measuring points. The distance between the measuring plain and each illuminated shelf is 12 cm (4.7 inch).

\* Light measurement using Quantum sensors with cosinus correction positioned vertically upside.

\*\* KBW 720 / 115 V: Standard equipped with 2 illumination cassetts and 2 shelves stainless steel.

All technical specification are specified for units with standard equipment at an ambient temperature of +20 °C (68 °F) and a voltage fluctuation of ± 10 %.

The temperature data are determined in accordance to factory standard following DIN 12880, part 2 respecting the recommended wall clearances of 10 % of the height, width and depth of the inner chamber. All indications are average values, typical for units produced in series. We reserve the right to alter technical specifications at all times.



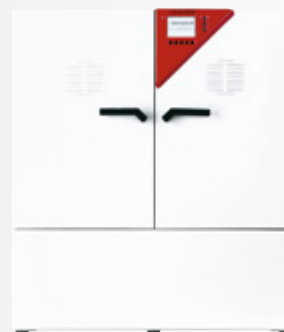
## KBWF series: Plant growth chambers with optimal climatic conditions

The closest thing to natural conditions. Making use of the multifaceted programming options, we achieve perfect interaction between heat or cold, humidity and light. This wide climatic range can simulate any climatic condition precisely and constant over extended periods of time, including natural lighting conditions and day-night simulation.



### ► Performance features and equipment:

- Electronically controlled APT.line™ preheating chamber technology with DCT™ refrigerating system
- Temperature range: -5 °C to 100 °C (23 °F to 212 °F) without humidity and illumination
- Temperature range: 20 °C to 90 °C (68 °F to 194 °F) with humidity respective illumination
- MCS controller for temperature, humidity, and illumination with 25 storable programs of 100 sections each for a maximum of 500 program segments, for programming day/night cycles
- Integrated electronic chart recorder
- Variety of options for the graphic display of process parameters
- Real-time clock
- Illumination system with daylight fluorescent tubes in the doors, thermally isolated from the inner chamber and ventilated (optimized illumination)  
KBWF 240 - 10 count × 18 W  
KBWF 720 - 10 count × 36 W
- Electronically controlled humidification and dehumidification system for use with tap water
- Capacitive humidity sensor with SPH technology
- Automatic defrosting device
- Independent adjustable temperature safety device, Class 3.1 (DIN 12880) with visual and acoustic temperature alarm
- 2 access ports, Ø 30 mm (1.2 inch) each
- Environmentally friendly refrigerant R 134a
- Inner glass door
- Collecting pan for condensate on the door
- Complete safety connection kit for water supply incl. water hose as well as for water drain (total length 6 m / 19.7 ft.)
- RS 422 interface for communication software APT-COM™ DataControlSystem
- 2 stainless steel shelves
- BINDER test certificate

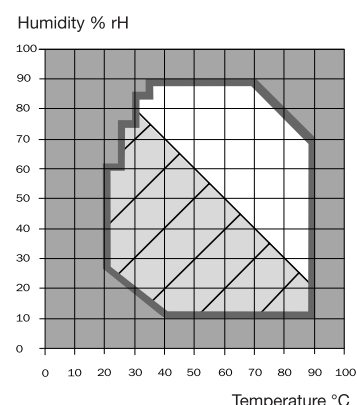


# Technical specification KBWF series



	KBWF 240	KBWF 720
<b>Exterior dimensions</b>		
Width (mm/inch)	1034 / 40.7	1234 / 48.6
Height (incl. feet/roller) (mm/inch)	1142 / 45.0	1816 / 71.5
Depth (mm/inch)	746 / 29.4	867 / 34.1
Plus door handle, I-panel, connection (mm/inch)	100 / 3.9	100 / 3.9
Wall clearance (mm/inch)	100 / 3.9	100 / 3.9
Wall clearance with open door(s) (mm/inch)	160 / 6.3	160 / 6.3
Steam space volume (l/cu.ft.)	308 / 10.9	855 / 30.2
Height of water connections ( $\pm 3$ mm / $\pm 0.12$ inch) in mm/inch	84 / 3.3	190 / 7.5
Number of doors	2	2
Number of inner glass doors	2	2
<b>Interior dimensions</b>		
Width (mm/inch)	800 / 31.5	1000 / 39.4
Height (mm/inch)	600 / 23.6	1168 / 46.0
Depth (mm/inch)	500 / 19.7	600 / 23.6
Interior volume (l/cu.ft.)	240 / 8.6	700 / 25.1
Shelves (number standard/max.)	2 / 7	2 / 14
Load per shelf (kg/lbs.)	30 / 66	45 / 99
Permitted total load (kg/lbs.)	70 / 155	120 / 265
Weight (empty) (kg/lbs.)	184 / 406	345 / 762
<b>Temperature data</b>		
Temperature range		
without humidity / without illumination ( $^{\circ}\text{C}/^{\circ}\text{F}$ )	-5-100/23-212	-5-100/23-212
without humidity / with illumination ( $^{\circ}\text{C}/^{\circ}\text{F}$ )	5-100 / 41-212	5-100 / 41-212
with humidity / without illumination ( $^{\circ}\text{C}/^{\circ}\text{F}$ )	20-90/68-194	20-90/68-194
with humidity / with illumination (illumination in the door) ( $^{\circ}\text{C}/^{\circ}\text{F}$ )	20-90/68-194	20-90/68-194
Temperature variation without humidity		
at 10 $^{\circ}\text{C}$ (50 $^{\circ}\text{F}$ ) ( $\pm$ $^{\circ}\text{C}$ )	0.4	0.4
at 37 $^{\circ}\text{C}$ (98.6 $^{\circ}\text{F}$ ) ( $\pm$ $^{\circ}\text{C}$ )	0.4	0.4
Temperature variation with humidity ( $\pm$ $^{\circ}\text{C}$ )	1.0	1.0
Temperature fluctuation during heating operation ( $\pm$ $^{\circ}\text{C}$ )	0.1	0.1
Heating up time <sup>1), 2)</sup> to 37 $^{\circ}\text{C}$ (98.6 $^{\circ}\text{F}$ ) (Min.)	30	28
Cooling down time from room temperature <sup>1), 2)</sup> to 10 $^{\circ}\text{C}$ (50 $^{\circ}\text{F}$ ) (Min.)	35	35
Recovery time after door was open for 30 sec <sup>1), 2)</sup>		
at 37 $^{\circ}\text{C}$ (98.6 $^{\circ}\text{F}$ ) (Min.)	5	5
at 50 $^{\circ}\text{C}$ (122 $^{\circ}\text{F}$ ) (Min.)	4	4
Max. illumination / growth lamps <sup>5)</sup>		
(Lux) / $\mu\text{E}/(\text{s} \times \text{m}^2)$ *	7500 / 164	7500 / 164
Max. illumination/daylight lamps <sup>5)</sup>		
(Lux) / $\mu\text{E}/(\text{s} \times \text{m}^2)$ *	16600 / 250	16600 / 250
Max. illum. with option high intensity illum. under the chamber ceiling (Lux) <sup>5)</sup>	19000	19000
Humidity fluctuation <sup>1), 2), 3)</sup> ( $\pm$ % RH)	1.5	1.5
Programming of light intensity 20 % / 40 % / at 60 % / at 100 %	✓	✓
<b>Electrical data</b>		
Housing protection acc. to EN 60529	IP 20	IP 20
Nominal voltage ( $\pm 10$ %) 50/60 Hz (V)	230	230
Nominal power (W)	2420	2950
Energy consumption <sup>4)</sup> at 37 $^{\circ}\text{C}$ (98.6 $^{\circ}\text{F}$ ) (W)	730	970

### Temperature-humidity chart



The light area indicates the control range of temperature and relative humidity. The hatched area indicates the control range of temperature and relative humidity without condensation.

<sup>1)</sup> to 98 % of the set value <sup>2)</sup> value without illumination <sup>3)</sup> upon door opening or water exchange in humidity cylinder:  $> \pm 1.5$  % RH, recovery time approx. 20 min.

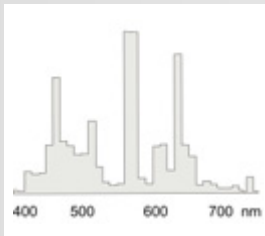
<sup>4)</sup> these energy consumption values can be used upon calculation of air conditioning systems <sup>5)</sup> max. value, distance 120mm/4.7 in. from the glass door

\* Light measurement using Quantum sensors with cosinus correction positioned vertically upside.

All technical specification are specified for units with standard equipment at an ambient temperature of  $+ 20$   $^{\circ}\text{C}$  (68  $^{\circ}\text{F}$ ) and a voltage fluctuation of  $\pm 10$  %.

The temperature data are determined in accordance to factory standard following DIN 12880, part 2 respecting the recommended wall clearances of 10 % of the height, width and depth of the inner chamber. All indications are average values, typical for units produced in series. We reserve the right to alter technical specifications at all times.

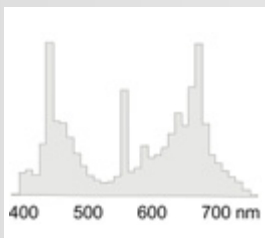
## Options/accessories KBW/KBWF series



## ► Different illumination

Lighting can be selected based upon application and light intensity.  
Day light lamps, light color 865 (standard version)

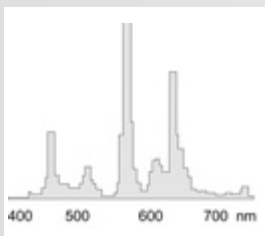
KBW/KBWF



## ► Different illumination

Growth lamps Fluora® light color 77

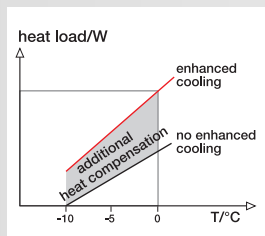
KBW/KBWF



## ► Different illumination

Arabidopsis lamps light color 741

KBW/KBWF



## ► Enhanced refrigeration

To compensate for heat from the lamps.

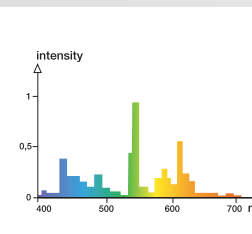
KBWF



## ► Waterproof interior power socket in the inner chamber

Maximum 500 W, switched via the main switch, with associated plug  
(protection type IP 65), 230 V 1N ~50/60 Hz.

KBW/KBWF



## ► Classification of illumination conditions

Radiometric measurements of the visible spectral range, with definition and documentation of intensity distribution from a light module on three measurement levels.

KBW/KBWF



### ► Calibration certificates

Measurement in the center at specified values. Additional measuring points or test values according to your specification.

KBW/KBWF

	KBW			KBWF	
	240	400	720	240	720
Access port with silicone plug	○	○	○	○	○
Shelf, stainless steel	○	○	○	○	○
Shelf, perforated, stainless steel	○	○	○	○	○
Reinforced shelf, stainless steel, with 1 set of securing elements (max. 70 kg / 154 lbs.)	○	○	○	–	–
Securing elements for additional fastening of racks (1 set of 4)	○	○	○	○	○
Lockable door	○	○	○	○	○
Locking of controller keyboard	–	–	–	○	○
Independent adjustable temperature safety device, Class 3.3 (DIN 12880)	○	○	○	○	○
Safety kit for water connection. Pre-mounted assembly of reflux prevention device and hose burst protection device.	–	–	–	○	○
High-intensity illumination under ceiling of chamber with additional daylight fluorescent tubes (KBWF 240: 6 x 18 W, KBWF 720: 8 x 18 W)	–	–	–	○	○
Potential-free alarm outputs for temperature and humidity, accessible via 6-pin DIN socket with acoustic signal that can be switched off. (max. power 24 V AC/DC, 2.5 A) <sup>3)</sup>	–	–	○	○	○
Analog output, 4–20 mA for temperature and humidity measurements, with 6-pin DIN socket (Outputs are adjusted automatically as the controller is adjusted)	○	○	○	○	○
Enhanced refrigeration system	○	○ <sup>1)</sup>	○ <sup>1)</sup>	–	–
FLUORA growth lamps	○	○	○	○	○
Arabidopsis lamps	○	○	○	○	○
Serial printer with interface converter for printing temperature logs. Connects to RS 232 printer interface. Inclusive connection cables for RS 422 interface and RS 232 / RS 422 interface converter, 230 V <sup>1)</sup>	○	○	○	–	–
Certificate illumination measurement for KBW. Radiometric measurements in the visible spectral range with definition and documentation of intensity allocation from the illumination cassette to 3 measurement levels.	○	○	○	–	–
Waterproof interior socket 230 V (maximum 500 W) <sup>2)</sup>	○	○	○	○	○
Temperature measurement according to DIN 12880-2 at 25 °C (77 °F) or at specified temperature measurement log and certificate	○	○	○	○	○
Calibration certificate for temperature (KBW) or for temperature and humidity (KBWF)	○	○	○	○	○
Extension for calibration certificate (additional values)	○	○	○	○	○
Fanfold chart paper	–	–	–	○	○
1 set fibre pens	–	–	○	○	○

<sup>1)</sup> only available for KBW 230 V models

<sup>2)</sup> 230 V AC (maximum 500 W) <sup>3)</sup> maximum power rating 24 V AC/DC 2.5 A





# APT-COM™

## APT-COM™ DataControlSystem

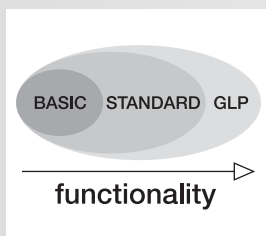
Working in compliance with standards always requires excellent documentation. FDA guidelines 21 CFR 11 (Code of Federal Regulations No. 21, FDA April 2000) have now precisely specified requirements for electronic documentation, and these requirements are internationally binding. APT-COM™ 3 GLP Edition was originally developed especially for GLP and/or GMP-compliant work in the pharmaceutical industry. This resulted in standard software with a uniquely universal capability: Users can easily achieve process safety and data security in accordance with the guideline 21 CFR 11, as well as validation of the entire system using standard features. Easy. Cutting edge.

The system, which consists of software in three different editions and the connected equipment, offers features that are needed for tasks ranging from the simplest measurements to guideline-compliant work: Seamless monitoring of processes and documentation of process data. Documentation is automatically generated in electronic format and as hard copy. This produces guideline-compliant documentation without extra effort, just like having a tailor-made suit for every PC user. Easy to use for a broad range of applications, up to and including GLP/GMP-compliant laboratory applications.



# APT-COM™ DataControlSystem

## CONTROL AND DOCUMENTATION SYSTEM



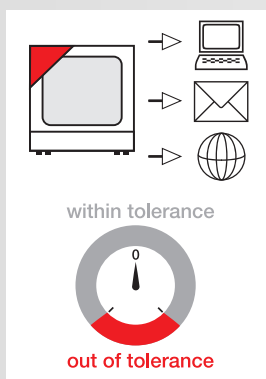
### ► Performance potential in 3 classes

The motto here is not “as much as possible,” but rather “as much as necessary.” This has less to do with the ever-present pressure to reduce costs, and much more to do with the fact that processes today have to be as efficient as possible to achieve the best results. This includes a software system that can meet the individual requirements of a multitude of different tests and users, all while maintaining optimal adaptability.

This is the reason why we developed three different comprehensive versions of the APT-COM™ software:

- **BASIC** permits remote adjustment of test parameters for the connected equipment, graphic interface programming, and manual documentation of your data.
- **STANDARD** links up several units within a network, provides automatic documentation if required, and can be controlled with telemonitoring.
- **GLP** meets all of the requirements and regulations for the pharmaceutical sector as required by law, including data security and access control (FDA 21 CFR Part 11 complaint).

## GLP EDITION EXAMPLE



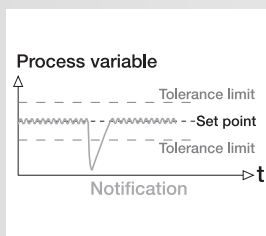
### ► Clear presentation of process data

#### **Always up-to-date:**

Process data can be constantly accessed everywhere, either locally, by e-mail, or through the Internet.

#### **Important information always available at a glance:**

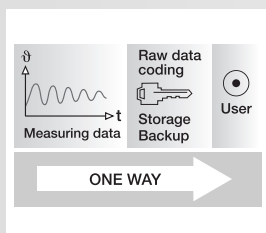
Making a decision on whether or not a process is running well is easy, thanks to the control console function.



### ► Unsurpassed process safety and security

**Tolerance limits for each monitored parameter:** No parameter can exceed the specified tolerance limits without setting off an automatic alert. The alert is sent via an intranet, the Internet, as e-mail, or as a phone call to the person responsible.

**Access restriction:** User IDs and passwords control access to sensitive processes. Different levels of authorization for system changes ensure proper system administration.

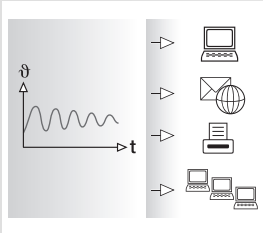


### ► Guideline-compliant data security (meets the requirements of 21 CFR 11)

**Storage of measured data:** Protected against manipulation by an encrypted format, access restricted to the author or the administrator.

**Backup of measured data:** Automatic backup at user-defined time intervals for storage on all available storage media. Backed up information is easy to find thanks to automatic naming of the backup with a timestamp.

**Documentation of operator interventions:** Complete documentation of any operator interventions, with user ID, timestamp, archived protected against manipulation, and automatic backup of measured data.



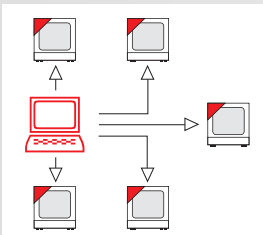
### ► Time-saving documentation and presentation of results

**Generation of measured data on the monitor:** Measured data is constantly regenerated from protected raw data and protected against manipulation.

**Display of measured data on the internet:** Users can access the process sequence with a standard browser on any PC connected to an intranet or the Internet, even without the APT-COM™ software.

**Coordinated file archiving:** Enables quick and easy display and printing of any past test runs.

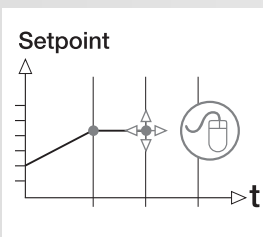
**Clear printouts:** The measured data can be printed out automatically, at adjustable time intervals. Form fields for comments with respect to the measurements and for authentication ensures correct data assignment and coordination. Signature fields and page numbering provide an easy way to meet documentation requirements with minimum effort.



### ► Control and programming

#### **Remote monitoring of setpoints over great distances:**

Equipment isn't always within close proximity of the workstation. This is why we have provided the option of transmitting process variables to the equipment via PC and reviewing equipment settings.



#### **Graphic program editor:**

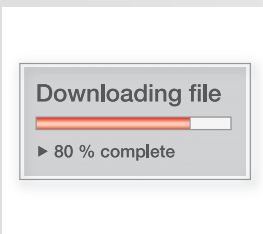
Facilitates the easy generation of extensive programs, which can be reviewed and transferred to different units. This saves time and increases transparency.



### ► System qualification

**Qualification folders with records for IQ and OQ:** Customized for the actual equipment and software configuration. Facilitates system validation, enjoys an excellent reputation among auditors, and saves time when implementing systems. Together with equipment qualification, a complete solution that takes full advantage of our experience.

**System qualification:** Our highly experienced BINDER service technicians supervise the proper commissioning and functionality of the system on site, and document these inspections in IQ/OQ protocols. The documentation of these important qualification steps is a comprehensive, time-saving service to ensure successful qualification.



### ► Always state-of-the-art with updates

**Software updates without added costs:** It goes without saying that our software is constantly being improved and updated. In addition to adding new equipment models, we also incorporate new guidelines and customer suggestions for improvements. Updates are available for free download from the BINDER website. Qualification documents are available for every version of the software.





# BINDER Individual

## Customized solutions.

Special applications sometimes require a special solution. Stainless steel housing and individual access ports are just the tip of the iceberg. In many cases, special projects require more technical know-how. For example, some customers have particularly heavy specimens that can't be stored in a conventional chamber, while others need a low-particle design. But no matter what the need, BINDER provides a solution. In countless projects over the years we have found successful solutions for the most diverse applications.



# BINDER Individual

## Providing the customized solutions you need.

### ► Know-how

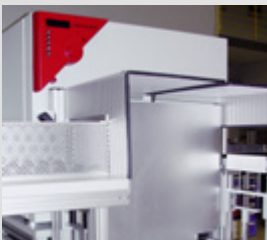
BINDER Individual is a new name for a proven service. As a manufacturer present in many markets, sectors and applications, BINDER offers you a broad knowledge base gained through years of experience. Some examples:

- Customized optimization of heat, refrigeration, humidity, light, air, CO<sub>2</sub>, or O<sub>2</sub> supply
- Customized measurement, management, control, switching
- Customized connections, outlets, access ports
- Customized design of parameters (interior chamber)
- Customized integration of accessories (e.g. rollers)

### ► Reasons

Some of the reasons to discuss a customized solution with BINDER:

- To take advantage of know-how transfer through BINDER's extensive experience in a wide range of markets
- To create innovative solutions through individual technical consultation
- To implement simple and cost-effective customized solutions
- To optimize company-specific functionality
- To increase ease-of-use through customized designs
- Because an integrated solution is better than an in-house solution produced after the fact



► Customized access ports in the door



► Additional access port for electronic measuring current

### ► Service

Our technical support team is made up of application specialists, technical consultants, and engineers.

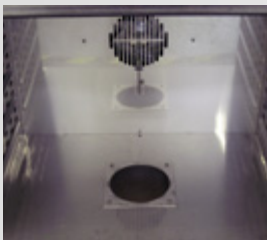
This has the distinct advantage of being able to provide comprehensive services:

- including customized solutions
- professional planning
- full application support
- certified calibration and validation (factory calibration certificate)
- state-of-the-art production

### ► Our guarantee

All of our components complement each other since they come from a single source. All work meets the requirements of ISO 9001 standards. We also guarantee our customized solutions, and provide an operating manual that covers the additional modifications.

We also guarantee a supply of spare parts for 10 years; all drawings and components for customized solutions have individual identification codes which are archived, in order to ensure that any spare parts for your customized application are provided correctly and promptly.



► Customized access port (round)



► Reinforced inner chamber for heavy specimens