

Broschüre Freigegeben:
Thomas Horvath

BERGHOF PRODUCTS + INSTRUMENTS GMBH

Highpreactor BR

High-pressure reactors for
all requirements



highpreactor **BR high-pressure reactors**

The matching reactor system for
synthesis, material testing and
catalysis research



BERGHOF PRODUCTS + INSTRUMENTS GMBH

Our philosophy

The philosophy of Berghof Products + Instruments GmbH can be summed up concisely: Adding value for our customers. Even in the product development stage, we attach great importance to designing reliable, easy-to-operate and safe instruments, which optimally satisfy the demands of our customers. Through our application expertise, we can create products as we ourselves and our customers want them: high-performance, safe and durable.

Reactor technology

With over 50 years of experience, Berghof offers comprehensive expertise in the production of reactor systems with and without PTFE lining. The PTFE lining enables the reactors to be used for experiments with corrosive reagents in their liquid phase. The needs of the users are the core of our work. Intensive dialogue with our customers lets us develop innovative products with a variety of application options.

Our specially trained authorised representatives are pleased to give you the best possible advice. You can find your contact at www.berghof-instruments.com/en/distributor-network.

Berghof reactor technology

highpreactor **BR** high-pressure reactors



**BR-25/40
BR-100/200**

The professional entry into the world of reactors

For batches with very small volumes up to 200 mL

More information starting on page 4

**BR-300/500/700
BR-800/1000/1500/2000**

The allround reactor with an extended functionality

For the field of process developments in laboratory and kilo scale between 300 mL and 2 L

More information starting on page 6

BR-4000

The huge allround reactor with an extended functionality

For chemical experiments in kilo scale labs at 4 L; higher volumes as custom-made reactors

More information starting on page 9

highpreactor **BR high-pressure reactors**

Technical specifications

highpreactor **BR-25** and **BR-40**



highpreactor BR-25 BR-40		BR-25		BR-40	
		without PTFE insert	with PTFE insert	without PTFE insert	with PTFE insert
General information	Material	Stainless steel 316Ti (1.4571) or Hastelloy® C-22 (2.4602)			
	Working pressure (rel.)	-0.9 up to 200 bar			
	Sealing system	O-ring			
Technical data	Usable volume	32 mL	29 mL	45 mL	46 mL
	Working temperature	-40 °C up to 300 °C	-40 °C up to 230 °C	-40 °C up to 300 °C	-40 °C up to 230 °C
	Inner measurements (Ø/h)	22 mm / 83 mm	22 mm / 77 mm	24 mm / 100 mm	24 mm / 101 mm
Armatures	Standard armatures	Rupture disc, dip tube for thermal sensor, pressure relief valve			
	Pressure measurement	Pressure gauge, electric pressure sensor, digital pressure gauge			
	Connections (total/free/extendable)	6 / 3 / yes, by use of t-connections			
	Connection type	1/8 " tube connection			
Accessories	Heating and stirring	magnetic stirrer with heating function and corresponding hot block			

highpreactor BR-100 and BR-200



highpreactor BR-100 BR-200		BR-100		BR-200	
		without PTFE insert	with PTFE insert	without PTFE insert	with PTFE insert
General information	Material	Stainless steel 316Ti (1.4571) or Hastelloy® C-22 (2.4602)			
	Working pressure (rel.)	-0.9 up to 200 bar			
	Sealing system	O-ring			
Technical data	Usable volume	170 mL	95 mL	225 mL	195 mL
	Working temperature	-40 °C up to 300 °C	-40 °C up to 230 °C	-40 °C up to 300 °C	-40 °C up to 230 °C
	Inner measurements (Ø/h)	42 mm / 126 mm	32 mm / 121 mm	42 mm / 165 mm	40 mm / 159 mm
Armatures	Standard armatures	Rupture disc, dip tube for thermal sensor, pressure relief valve			
	Pressure measurement	Pressure gauge, electric pressure sensor, digital pressure gauge			
	Connections (total/free/extendable)	5 / 1 / yes, by use of t-connections			
	Connection type	8 mm tube connection			
Accessories	Heating and stirring	magnetic stirrer with heating function and corresponding hot block			

highpreactor **BR high-pressure reactors**

Technical specifications

highpreactor **BR-300, BR-500 and BR-700**



highpreactor BR-300 BR-500 BR-700		BR-300	BR-500	BR-700
General information	Material	Stainless steel 316Ti (1.4571) or Hastelloy® C-22 (2.4602)		
	Working pressure (rel.)	-0.9 up to 200 bar		
	Sealing system	O-ring		
Technical data reactor vessel	Volume without PTFE insert	390 mL	630 mL	980 mL
	Inner measurements (Ø/h)	68 mm / 108 mm	68 mm / 175 mm	68 mm / 271 mm
	Working temperature without PTFE insert	-40 °C up to 300 °C		
Technical data PTFE insert	Volume with PTFE insert	310 mL	500 mL	800 mL
	Inner measurements PTFE insert (Ø/H)	62.5 mm / 98 mm	62.5 mm / 165 mm	62.5 mm / 261 mm
	Working temperature with PTFE insert	-40 °C up to 230 °C		
Armatures	Standard armatures	Rupture disc, dip tube for thermal sensor, pressure relief valve		
	Pressure measurement	Pressure gauge, electric pressure sensor, digital pressure gauge		
	Connections (total/free/extendable)	6 / 2 / yes, by use of t-connections		
	Connection type	8 mm tube connection		
Accessories	Heating and stirring	Electrical heating jacket, double jacket or cooling coil and magnetically coupled overhead stirrer		

highpreactor BR-800 and BR-1000



highpreactor BR-800 BR-1000		BR-800	BR-1000
General information	Material	Stainless steel 316Ti (1.4571) or Hastelloy® C-22 (2.4602)	
	Working pressure (rel.)	-0.9 up to 200 bar	
	Sealing system	O-ring	
Technical data reactor vessel	Volume without PTFE insert	990 mL	1,220 mL
	Inner measurements (Ø/h)	90 mm / 155 mm	90 mm / 193 mm
	Working temperature without PTFE insert	-40 °C up to 300 °C	
Technical data PTFE insert	Volume with PTFE insert	800 mL	1.000 mL
	Inner measurements PTFE insert (Ø/H)	84 mm / 144 mm	84 mm / 182.5 mm
	Working temperature with PTFE insert	-40 °C up to 230 °C	
Armatures	Standard armatures	Rupture disc, dip tube for thermal sensor, pressure relief valve	
	Pressure measurement	Pressure gauge, electric pressure sensor, digital pressure gauge	
	Connections (total/free/extendable)	6 / 2 / yes, by use of t-connections	
	Connection type	8 mm tube connection	
Accessories	Heating and stirring	Electrical heating jacket, double jacket or cooling coil and magnetically coupled overhead stirrer	

highpreactor **BR high-pressure reactors**

Technical specifications

highpreactor **BR-1500** and **BR-2000**



highpreactor BR-1500 BR-2000		BR-1500	BR-2000
General information	Material	Stainless steel 316Ti (1.4571) or Hastelloy® C-22 (2.4602)	
	Working pressure (rel.)	-0.9 bar up to 200 bar	
	Sealing system	O-ring	
Technical data reactor vessel	Volume without PTFE insert	1,740 mL	2,230 mL
	Inner measurements (Ø/h)	90 mm / 275 mm	90 mm / 352 mm
	Working temperature without PTFE insert	-40 °C up to 300 °C	
Technical data PTFE insert	Volume with PTFE insert	1,460 mL	1,880 mL
	Inner measurements PTFE insert (Ø/H)	84 mm / 264 mm	84 mm / 340 mm
	Working temperature with PTFE insert	-40 °C up to 230 °C	
Armatures	Standard armatures	Rupture disc, dip tube for thermal sensor, pressure relief valve	
	Pressure measurement	Pressure gauge, electric pressure sensor, digital pressure gauge	
	Connections (total/free/extendable)	6 / 2 / yes, by use of t-connections	
	Connection type	8 mm tube connection	
Accessories	Heating and stirring	Electrical heating jacket, double jacket or cooling coil and magnetically coupled overhead stirrer	

highpreactor BR-4000


highpreactor BR-4000		BR-4000
General information	Material	Stainless steel 316Ti (1.4571) or Hastelloy® C-22 (2.4602)
	Working pressure (rel.)	-0.9 bar up to 150 bar
	Sealing system	O-ring
Technical data reactor vessel	Volume without PTFE insert	5.7 L
	Inner measurements (Ø/h)	136 mm / 393 mm
	Working temperature without PTFE insert	-40 °C up to 300 °C
Technical data PTFE insert	Volume with PTFE insert	4.7 L
	Inner measurements PTFE insert (Ø/H)	126 mm / 379 mm
	Working temperature with PTFE insert	-40 °C up to 230 °C
Armatures	Standard armatures	Rupture disc, dip tube for thermo sensor, pressure relief valve
	Pressure measurement	Pressure gauge, electric pressure sensor, digital pressure gauge
	Connections (total/free/extendable)	7 / 2 / yes, by use of t-connections
	Connection type	8 mm tube connection
Accessories	Heating and stirring	Electrical heating jacket, double jacket or cooling coil and magnetically coupled overhead stirrer

highpreactor **BR high-pressure reactors**

Application overview

The reactors from Berghof Products + Instruments GmbH are used in a wide variety of applications in research and industrial laboratories worldwide. The fields of application are listed in the following table sorted by branches of industries.

Pharma, Food & Cosmetics



Filler syntheses

Process optimization

Carrier syntheses

Drug syntheses

Fragrance syntheses

Flavor syntheses

Phytosanitary syntheses

Catalyst tests in sugar chemistry

Environment & Geology



Alternative raw materials

Biomass conversions

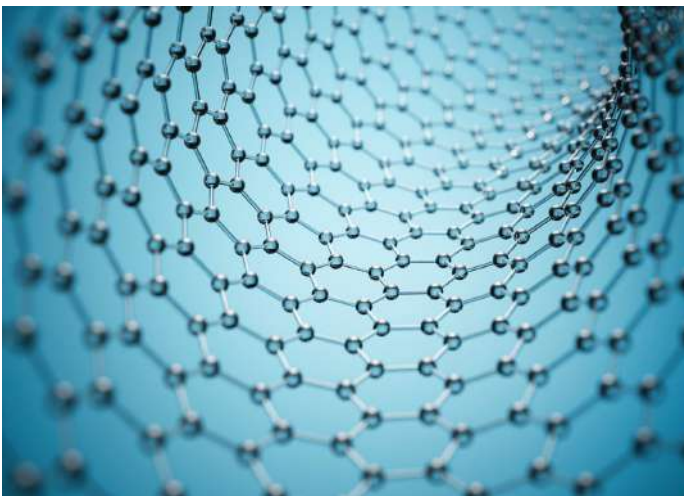
Renewable energy

Plastic recycling

Precious metal recycling

Mining explorations and material tests

Technology



Research on alternative platform chemicals

Chemical syntheses

Electrochemistry research

Homogeneous and heterogeneous catalysis

Adhesive research

Colloid and interface research

Nanomaterial syntheses

Process optimization

Textile research

Process technology

Battery research

Automotive



Aging tests

Component tests

Fuel cell research

Corrosion tests

Fuel research

Coolant research

Material testing

Polymer research

Lubricant research

Materials research

highpreactor **BR** high-pressure reactors

Product benefits

Innovations in a design that has proven itself over many years.

The entry into the laboratory reactor world with a wide range of fittings and temperature control options - that is what the highpreactor BR stands for. The reactors bring a plus in user safety and convince by an above-average service life.



VERSATILE

Wide range of individual adaptations to customer needs

- Tempering and stirring systems
- Fittings for adding and removing gases, liquids and solids
- Sensors for temperature and pressure
- Preparation for special fittings such as IR probes



INNOVATIVE

Innovations for our customers

- Sophisticated closure system with opening tool
- Use of the reactor with and without PTFE lining
- Flexible positioning and arrangement of the attached fittings



DURABLE

Above-average service life

- Strict receiving inspections of raw materials and components
- Reactor corrosion minimization by the use of PTFE lining when highly corrosive reagents are deployed

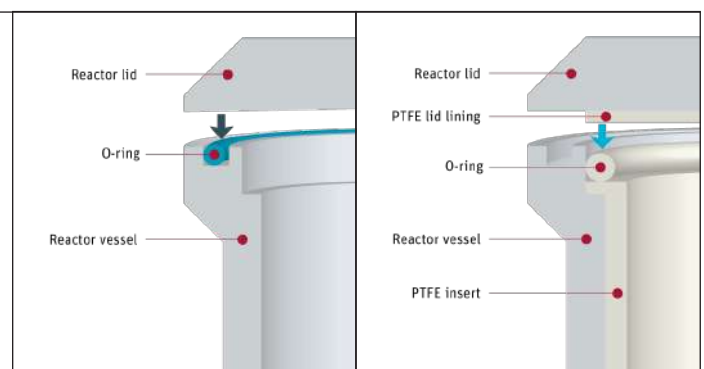
SAFE

Operator safety first

- Design and production according to AD 2000 and Pressure Equipment Directive 2014/68/EU
- Forced ventilation before opening of the reactor
- Permanent pressure monitoring by analog and digital sensors
- Use of certified rupture discs

UNIQUE

- Huge variety of O-rings – for all purposes
- From BR-300 series on, the reactor vessel can be used with and without PTFE lining
- Reactor sealing between lid and vessel or between PTFE lid lining and PTFE insert



highpreactor **BR** high-pressure reactors

Components and parts

The production of our highpreactor BR reactors requires high-quality components. Therefore, we have developed intelligent solutions that convince by quality and user-friendliness.

The reactors are made of AISI 316Ti stainless steel, which has established itself as the standard material in chemical equipment construction due to its extremely high resistance to corrosion and pitting. With volumes between 25 mL and 5,700 mL, the highpreactor BR line covers the complete range of laboratory scale. The continuously developed stirring system also guarantees the best mixing results with maximum reliability.

O-RINGS

Berghof offers a wide range of O-rings, which are available in the following materials, depending on the application:

- FKM (Viton®)
- FKM/FEP (Viton® coated with FEP)
- PTFE (Teflon®)
- FFKM (Kalrez®, Perlast®)



ADVANTAGES OF THE BERGHOF CLOSURE SYSTEM

Safe and secure

All Berghof reactors are equipped with the tool for opening and closing. To operate Berghof reactors, the tool must be attached to a screw connection provided for this purpose. If the tool is required to open the reactor, controlled forced venting takes place when the tool is removed from the screw connection, if the reactor has not previously been vented.

Easy and fast

The tool is used to manually tighten the hand screws on the clamping ring, before using the reactor. When opening, they are loosened again by using the tool. No other tool is required to open and close the reactors.

Reliable

The robust construction of the Berghof locking system in combination with the sealing concept, which prevents jamming during opening and closing, guarantees minimal wear even with frequent use.



ARMATURES

Pressure measurement

- Analog manometers
- Digital manometers with USB and/or Bluetooth interfaces
- Electronic pressure sensors

Temperature measurement

- Type K thermocouples
- Resistance thermometer PT-100

Further armatures

- Needle valves
- Ball valves
- Sampling tubes
- Pressure relief valves



Customized products

For a target-oriented use of the Berghof high-pressure reactors the portfolio includes many special designs such as:

Catalyst baskets

- Application-specific designs
- Made of stainless steel or Hastelloy®

Sample holders

- Various standard geometries
- Available in stainless steel, Hastelloy® or PTFE
- Special custom-made designs possible

Further custom-made designs

- Adaptation of armatures arrangement
- Lid drillings
- Fixtures in reactors, such as baffles



highpreactor **BR** high-pressure reactors

Accessories and options

HEATING & STIRRING SOLUTION FOR BR-25 TO BR-300

Aluminium heating block

- Improved heat transmission
- Temperature isolated surface
- Robust, long service life

Magnetic stirrer with heating function

- Soft start of the stirrer motor
- Low-maintenance

Controller BTC-3000

- Regulation via reactor internal temperature
- Pressure and temperature recording
- Setting of temperature programs



TECHNICAL SPECIFICATIONS HEATING BLOCK BAH

Dimensions W x D x H	180 x 180 x 100-180 mm / 7,1 x 7,1 x 4-7 "
Suitable heating plate diameter	135 mm / 5,7 "
Suitable magnetic stirring bar (l x Ø)	20 x 8 mm / 0,3 "

TECHNICAL SPECIFICATIONS HEATING PLATE BLH-650

Dimensions W x D x H	160 x 250 x 125 mm / 6,3 x 9,8 x 4,9 "
Power supply	230 V / 50 Hz
Heating output	600 W
Max. rotational speed	100 - 2,000 U/min
Temperature sensor	NiCrNi DIN 43710 Typ k
Total weight	4 kg / 8.8 lb

STIRRING SOLUTION FOR BR-300 TO BR-4000

Electric drives BRM-1 and BRM-2

Electric drives for stirring

- BRM-1: up to 2,000 rpm; 30 Ncm torque
- BRM-2: up to 500 rpm; 120 Ncm torque
- Interchangeable at any time

Clutch RV-GL

Magnetic couplings for power transmission

- Contactless, friction-free power transmission
- With water cooling, therefore particularly suitable for high temperatures
- Long service life, nearly maintenance-free
- Max. torque 90 Ncm
- Medium-contacting parts made of 316 Ti stainless steel or Hastelloy® C-22

Stirrer

Optimized mixing of medium

- Various materials such as 316 Ti stainless steel, Hastelloy® C-22 or PTFE
- Paddle stirrer and gas entrainment stirrer
- Individual stirrer geometries according to customer requirements



TEMPERATURE CONTROL SOLUTIONS FOR BR-300 TO BR-4000



BTM Thermostatic jacket

- Heating by fluid
- Cooling by fluid
- Control via the selected temperature control system

BHM Heating jacket

- Electric ring heater
- Without cooling
- Control via BTC or BDL controller

highreactor **BR high-pressure reactors**

Lifting systems and stands

Heavy reactors? No problem for our lift systems or our benchtop stand. The reactor can be moved vertically by means of the electric lifting system and manually swung to the side for cleaning and filling. With the stand, the reactor can be moved manually to the desired position by using a crank. Just like the lifting system, the stand arm can also be moved horizontally. The lifting system and the stand make the work much easier.

BRL LIFTING SYSTEM

Lifting system for reactors BR-1500, BR-2000 and BR-4000

- Moveable by means of wheels
- Fixed-head-system
- Integrated vessel swivel system
- Electrically powered lifting and lowering of the vessel



BRS BENCHTOP-STAND

Stands for reactors BR-300, BR-500, BR-800 and BR-1000

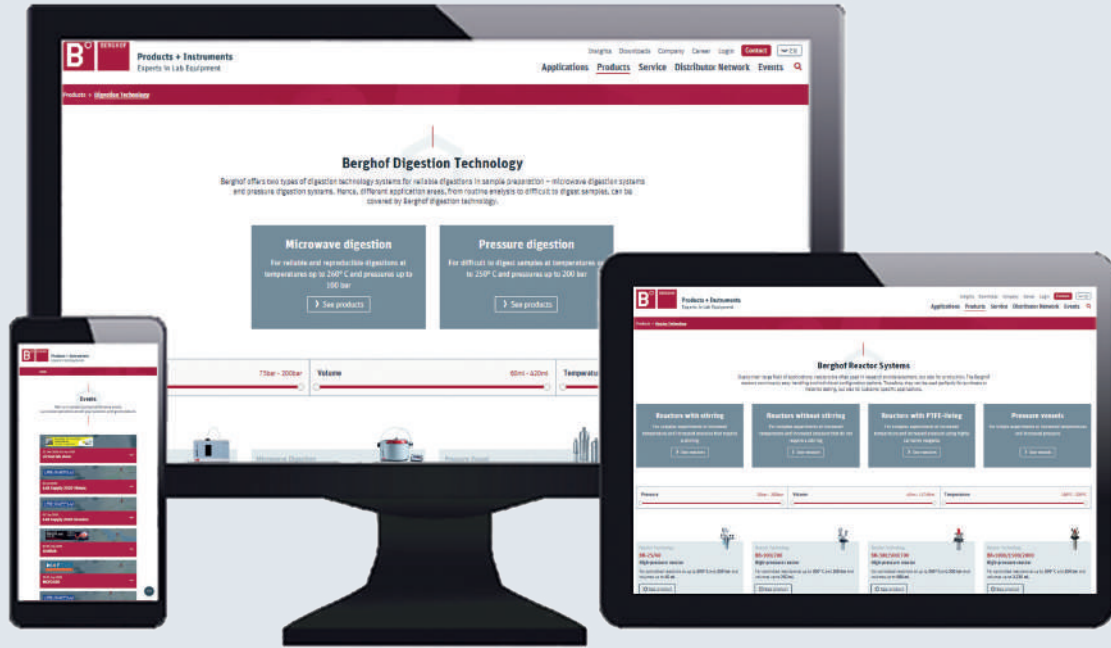
- Fixed-head-system
- Mechanical lifting and lowering of the vessel by a hand crank
- Heating and tempering system is integrated in the stand
- Reactor vessel can be removed for cleaning
- Built-in tightening lock
- Integrated vessel swivel system



Visit us on our website

www.berghof-instruments.com

Inform yourself about our microwave systems or configure your future reactor.



Or download the latest case studies and application notes.

Case Study

highREACTOR BR-40, BR-200 and BR-300 | PharmaFluidics

Issue
PharmaFluidics' pharmaceutical catalyst filler filling technology is a unique and novel approach to the synthesis of pharmaceuticals. In order to be able to use this technology, PharmaFluidics requires a reactor system that is capable of handling high temperatures and pressures. The reactor system must be able to handle high temperatures and pressures, and must be able to handle high pressures. The reactor system must be able to handle high temperatures and pressures, and must be able to handle high pressures.

Product
The high pressure version highREACTOR BR-40, BR-200 and BR-300 (see next).

Applications
The high pressure version highREACTOR BR-40, BR-200 and BR-300 (see next).

Customer Testimonial
"After receiving our highREACTOR BR-40, BR-200 and BR-300, we were able to successfully perform our catalyst filler filling process. The reactor system is very reliable and easy to use. We are very satisfied with the performance of the reactor system and the support provided by Berghof Instruments."

PharmaFluidics
www.pharmafluidics.com

Technology, Pharma

Screening of metathesis catalysts

Summary
Berghof reactor systems are often used for screening of metathesis catalysts. In the case of the reactor it can be tested which effects different catalyst structures have on the catalytic process or which effect smaller changes of process parameters have.

Equipment	Reactor	Heating technology	Berghof controller	Setting via the panel available
BR-25	BR-25	Electric	ETC-2000	✓
BR-40	BR-40	Electric	ETC-3000	✓
BR-100	BR-100	Electric	ETC-3000	✓
BR-200	BR-200	Electric	ETC-3000	✓

Notes: The applicable version can be found in the application note for your version.

Technology, Pharma

Synthesis of microporous and mesoporous materials

Summary
Berghof reactors are used for synthesis of microporous and mesoporous materials. Depending on the application, Berghof offers reactors that are suitable for hydrothermal synthesis (up to 200 bar) or reactors that are suitable for both supercritical and hydrothermal synthesis. Please note when using a reactor for both supercritical and hydrothermal synthesis, it is necessary that the reactor has the liquid phase in contact. Furthermore, the reactor has to be equipped with PTFE tubes and it is necessary, with a reactor just as a synthesis unit.

Equipment	Reactor	Heating technology	Berghof controller
BR-25	BR-25	Electric	ETC-2000
BR-40	BR-40	Electric	ETC-3000
BR-100	BR-100	Electric	ETC-3000
BR-200	BR-200	Electric	ETC-3000

Notes: The applicable version can be found in the application note for your version.

Automotive, Technology

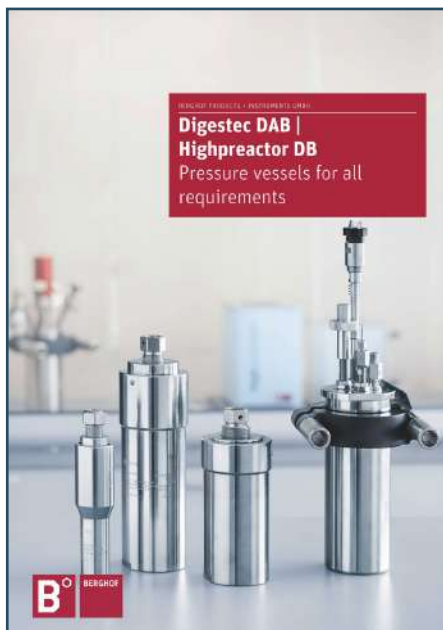
Material testing of elastomers in coolants

Summary
Test samples of elastomer are fixed on a sample holder and put into a Berghof reactor filled with coolant. The coolant reactor is heated up to a desired temperature and the elastomer is tested in the liquid phase. The design of the sample holder allows tests of samples in liquid phase as well as in the gas phase, such as the gas flow.

Equipment
DAB-300L, DAB-300, DAB-100, DAB-50

Technical Drawing
DAB-300L with sample holder (Pressure: 300 bar, Temperature: 200°C)

Notes: The applicable version can be found in the application note for your version.



Your local contact:



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