



Berghof Pressure Reactors

와이비(주) 황용배 팀장



Products +
Instruments

회사소개

- Berghof
 - 본사: 독일 Eningen
 - 1966년 설립. 직원 약 400명
 - 9개 divisions
 - **Products+Instrument**: laboratory
 - Fluoroplastic: PTFE 등 제조
 - Membrane, Testing 등



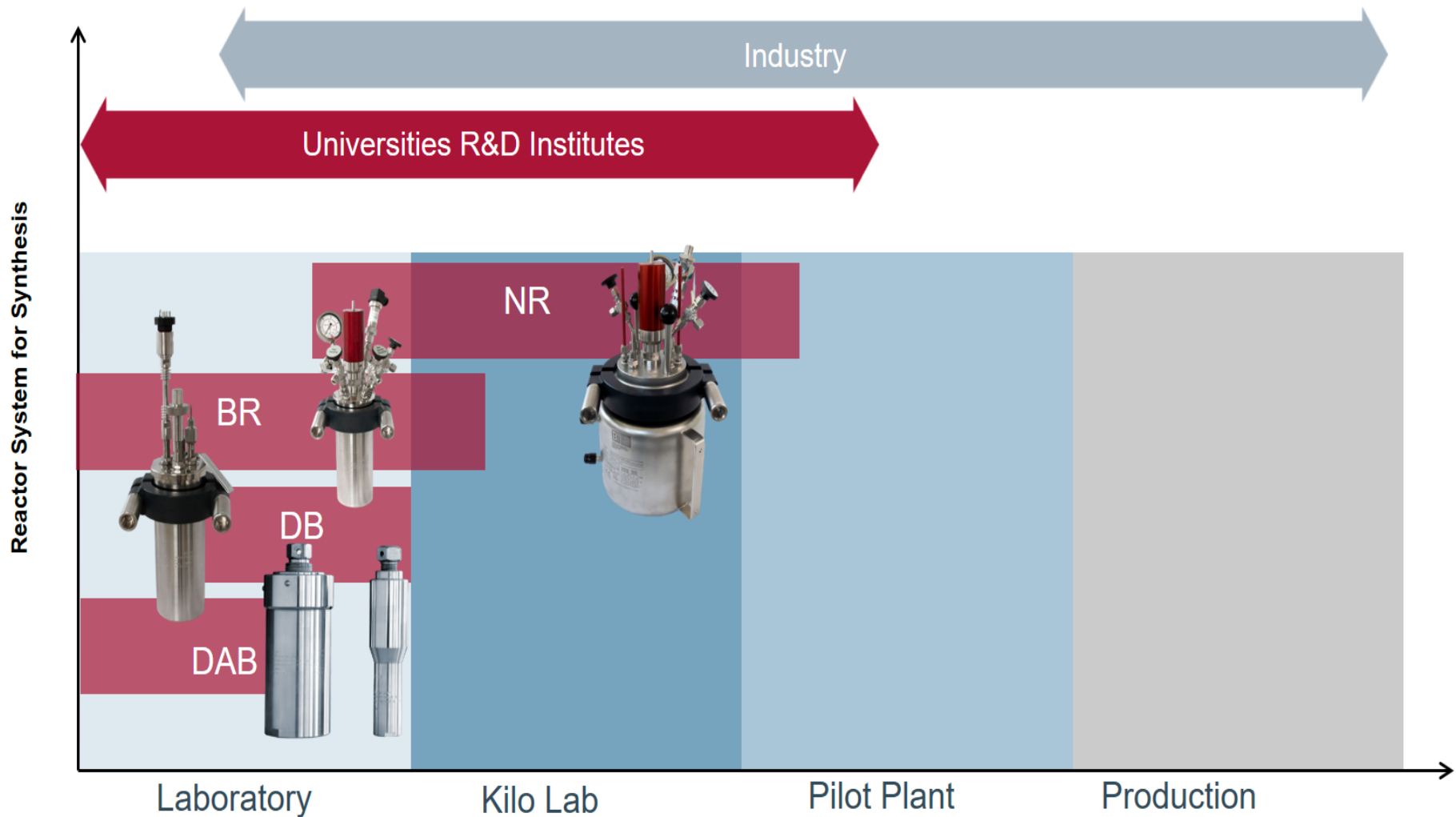
- 와이비(주)
 - 수원 소재. 제약회사 위주 영업
 - 다년간 경력. 수입 및 국산 장비 공급
 - Pressure Reactors, Autoclave, Rapid Transfer port, Anaerobic chamber, Incubators, Cleanbench etc.

기초 Reactors



- 한정적 조건: limited condition
 - Max. $p \rightarrow$ Atmospheric pressure
 - Max. $T \rightarrow$ Boiling point of solvent
 - Limited possibilities of gases as reaction
- Possible reactions and reaction rates are strictly limited
- Thermodynamical and kinetical restrictions

Berghof Reactors



Digestec DAB

Usage:

for high pressure sample digestion or as a simple reactor

Advantages:

- TFM-PTFE-inserts: metal-free conditions
- High-quality stainless steel: reduction of corrosion
- Approval of by german testing authorities (TÜV)
- User safety: Controlled decompression during opening
- Simple handling: time saving



DAB-2



DAB-3



DAB-3 XXL



DAB complete package

DAB vessel



Heating block



Controller



Mounting tools



max. pressure

200 bar

max. temperature

250 °C

volume range

25 – 420 mL

available in

3 vessel sizes

DB Highreactor

Usage:

for wide range of applications in **metal-free environment**:
synthesis, catalysis, hydrogenation, crystallization, material testing.

Advantages:

- Complete PTFE-lining:

reactions under **totally metal-free** conditions, no vessel and armature corrosion

- **The only complete PTFE-lined reactor with pressure and temperature measurement**
- Robust, high quality TFM-PTFE linings: very long service life / for all acids
- Approval by German testing authorities (TÜV)
- Controlled decompression of vessels during opening: user safety
- Easy handling, no tools needed: time saving
- Different heating, cooling and stirring possibilities: high flexibility



DB complete package



DB vessel



Heating block
heating or double jacket



Controller



Options

O-Rings,
Sample holder for
material testing,
electric pressure sensor

max. pressure

200 bar

max. temperature

230 °C

volume range

300 – 2000 mL

available in

6 vessel sizes

Overview **BR** Reactor Series

BR-25/40



BR-100/200



BR-300/500/700



BR-800/1000/1500/2000



BR-4000



Lid	Number of Ports (Total/free)	Stirring	Cooling coil
BR 25/40	5 / 3	Magnetic bar	No
BR-100/200	5 / 1	Magnetic bar	No
BR-300/500/700	6 / 2	Magnetic clutch (BR-300 also Magnetic bar possible)	Yes
BR-800/1000/1500/2000	6 / 2	Magnetic clutch	Yes
BR-4000	7 / 3	Magnetic clutch	Yes

BR Highreactor



Overview

Series	Volume	p-max	T-max
BR-25	25 - 40 mL	200 bar	300°C
BR-100	75 - 200 mL	200 bar	300°C
BR-300	300 - 900 mL	200 bar	300°C
BR-1000	1000 - 2300 mL	200 bar	300°C
BR-4000	4700 - 5500 mL	150 bar	230°C

Reactors & fittings: available in SS316Ti, Hastelloy, PTFE, customized alloys...

BR Reactors with and w/o PTFE Insert

200 bar

230 / 300 °C

25 – 5700 mL

12 vessel sizes

- High-quality stainless steel pressure vessels
- Each reactor is build according to PED 2014/68/EU
- **PTFE insert and PTFE lid lining**
- Rupture discs as safety device
- O-ring as sealing system
- **Quick closing system – no wrench needed**
- Various armatures, configuration acc. customer request
- Magnetic coupled overhead stirring with different stirrer geometries
- Heating via double jacket (BTM) and/or electrical heating device (BHM)



BR-500

BR complete package

BR vessel



reactor set consisting of reactor vessel and lid, full PTFE lining, closure ring, rupture disc and vent valve. Optional: pressure sensor

Options



Options:
O-Rings, Sample holder for material testing, manometer w/ rupture discs, catalysis basket, stirrer

Heating



Two options:
electrical heating
or
double jacket
(oil as medium)

Controller



Controller:
BR-HS: ~ BR-300
BRC: Touch screen
BRTR-88: simple

General Design of Highpreactor **BR** Series

200 bar

230 / 300 °C

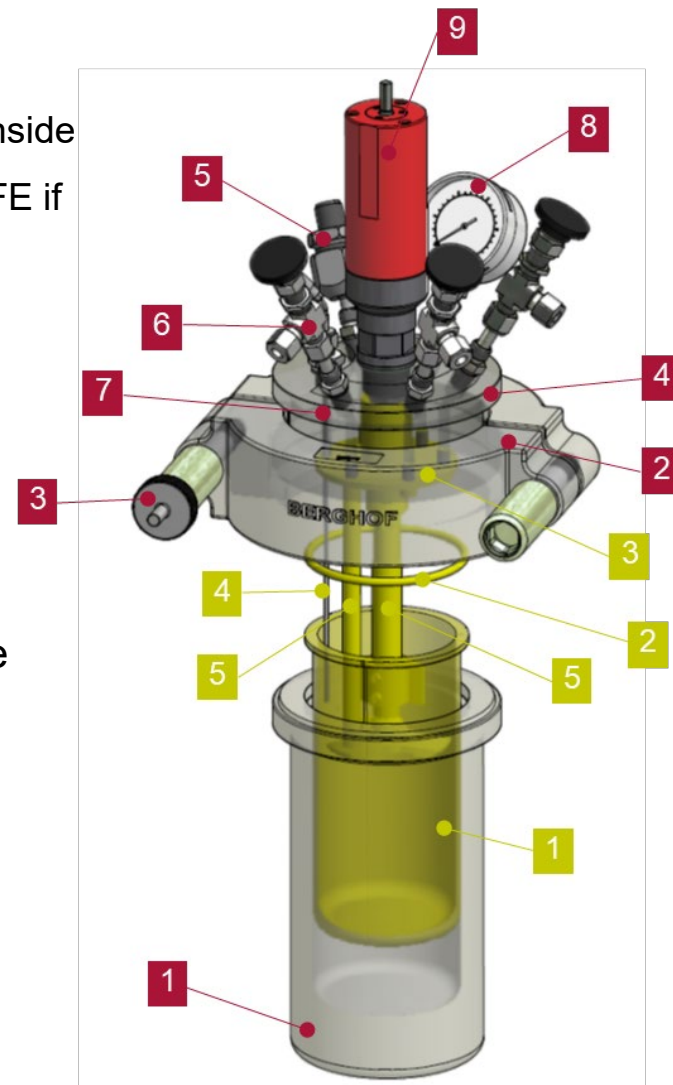
25 – 5700 mL

12 vessel sizes

1. Reactor vessel
2. Closing clamp
3. Opening tool
4. Reactor lid
5. Rupture disc holder
6. Vent valve
7. Dip tube for thermocouple
8. Manometer / pressure gauge
9. Magnetic clutch

The following yellow parts inside the reactor are made of PTFE if needed

1. Insert
2. O-ring sealing
3. Lid lining
4. Lining of the dip tube
5. Sampling tube
6. Stirrer



Constructing Materials / Sealing

200 bar

230 / 300 °C

25 – 5700 mL

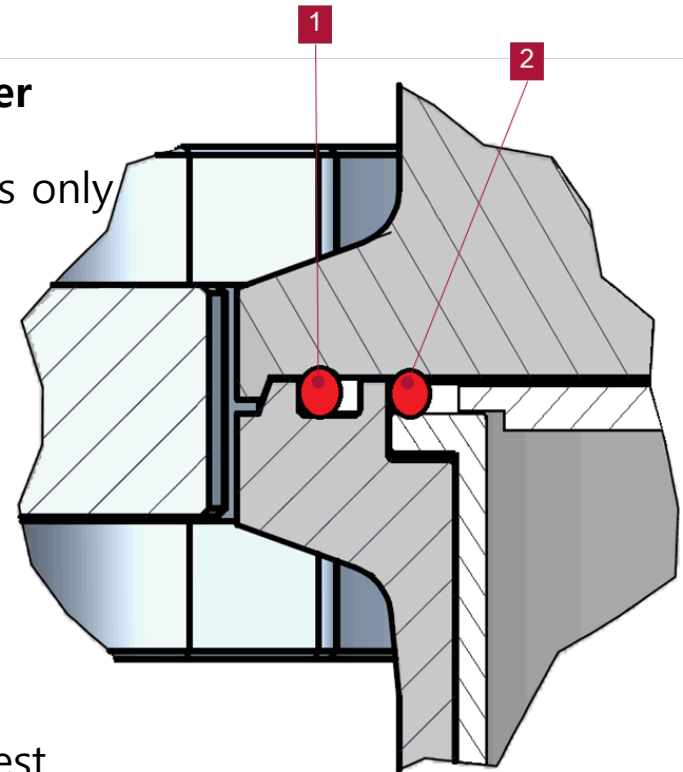
12 vessel sizes

Two alternative sealing positions at BR-300 and bigger

1. Outer O-ring for working with stainless steel reactors only
2. Inner O-ring for working with PTFE-lined reactors

Different materials of construction

- Stainless steel 316Ti (1.4571) as standard material
- Hastelloy C-22 (2.4602)
- Other materials and coatings, e.g. Tantalum, on request



O-Ring

Overview

Trade name	ISO Symbol	Temperature Resistance	Short Term
Viton® (Flourel®, Tecnoflon®)	FPM	-20 to +200°C	250°C
PFA sheated Viton®	FEP + FPM	-20 to +200°C	250°C
Lubriflon®, Teflon®, Hostaflon®, Fluon®	PTFE	-20 to +250°C	280°C
Kalrez®, Perlast®, Chemraz®	FFKM	-20 to +300°C	310°C



Pressure measurement

Standard Pressure Measurement

- Pressure gauge (Option A) direct read-out at reactor
- Pressure sensor (Option B) read-out and control only through data logger

Extras

- Display (Only with option B)
 - no pressure control
- Enables direct read-out at reactor without data logger



Stirring

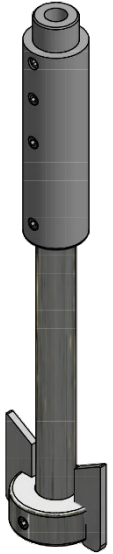
- Effective stirring by magnetic clutch and strong motor
- Contact free transmission

	RV-GL BRM-1	RV-GL BRM-2
Torque [Ncm]	30	120
Speed [rpm]	2000	500
Bearings	Polymer	Polymer

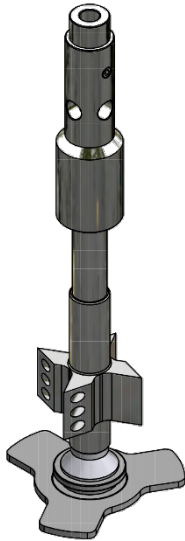
- Clutch for BR-300 and bigger
- Variety of different stirrer types
- Pressured air motor for ATEX applications available



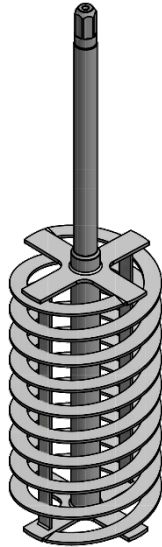
Stirrer



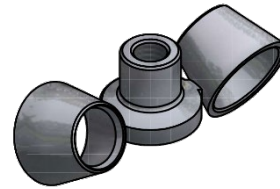
Paddle



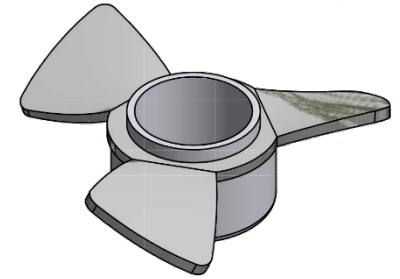
Gas entrainment



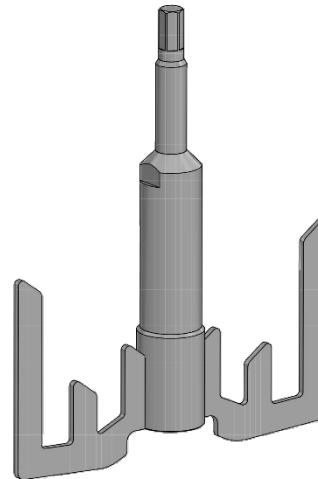
Helical ribbon



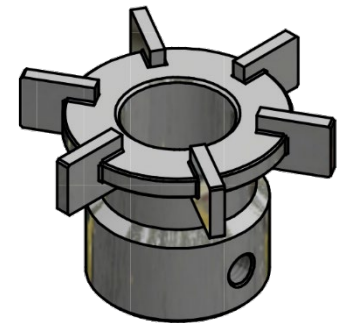
Jet



Propeller



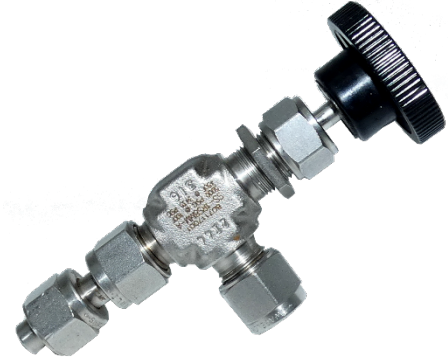
Anchor



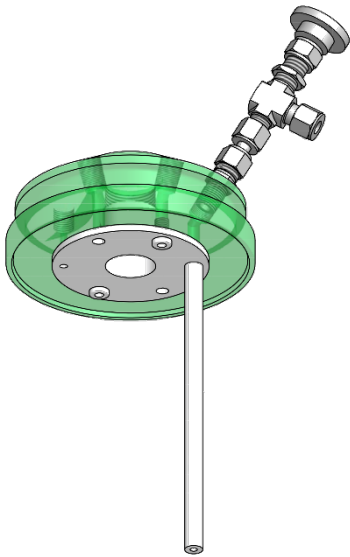
Rushton turbine

Connection System

- Swagelok fittings
- 8 mm tube connection for BR-100 and bigger
- 1/8" tube connection for BR-25/40
- Easy system – can be removed and reconnected by the customer
- Fittings available in stainless steel and Hastelloy
- Allows high flexibility
- (e.g. different pressure sensors)



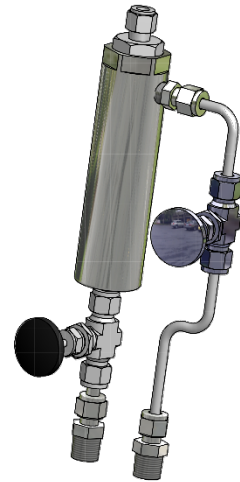
Accessories



Liquid sample extraction



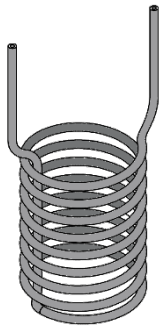
Portable cylinder for gas sampling



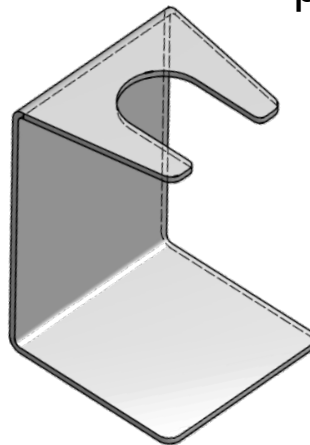
Liquid sample injection under pressure



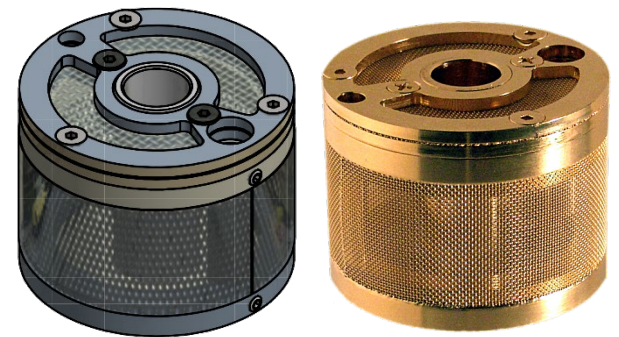
Sample holder



Cooling coil



Lid stand



Basket for catalyst

Heating: ~BR-300

Standard Heating Control

- Hot plate + heating block for BR-25 to BR-300 (≤ 300 mL)
- Laboratory hot plate with integrated magnetic stirrer BLH-650
- Isolated heating block adapter
- Control of either outside temperature by hot plate BLH-650 or inner temperature by controller
- Stirring with magnetic stirring bar
- BR-HS: all in one system. **Cooling**



BLH/BAH



BR-HS

Heating: BR-300 ~

Two alternative heating devices

1. BHM „Berghof Heating Mantle“

- Electrical heating device with over temperature protection
- Controller needed

2. BTM „Berghof Thermostated Mantle“

- Double jacket for heating with oil / heating fluid
- Heating circulator needed



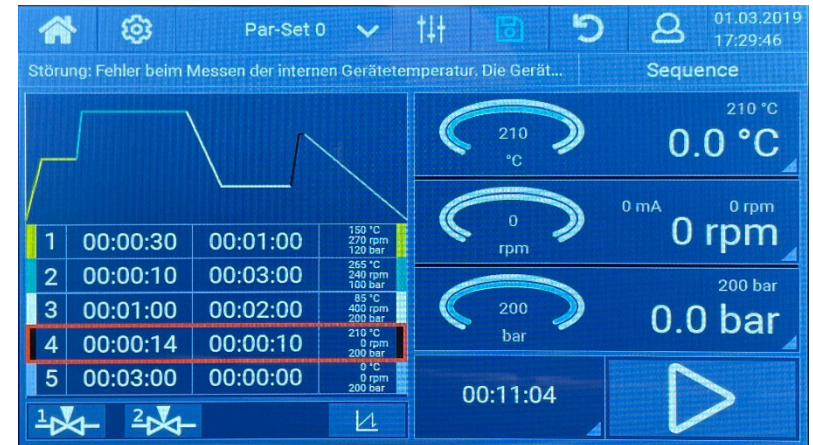
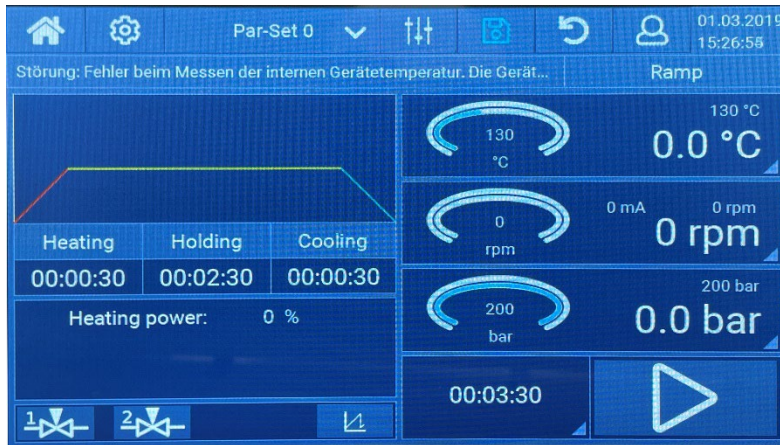
BHM



BTM

Controller: BRC

- New controller for suitable for all Berghof reactor systems
- Includes stirrer controlling
- Able to switch valves
- Big 7' touch display
- Controls all parameters of **one** reactor



Controller: BRTR-88

- For simple reactor systems
- Efficient, safe and durable
- smaller and more affordable control solution
- enables temperature programs with several ramp and hold times



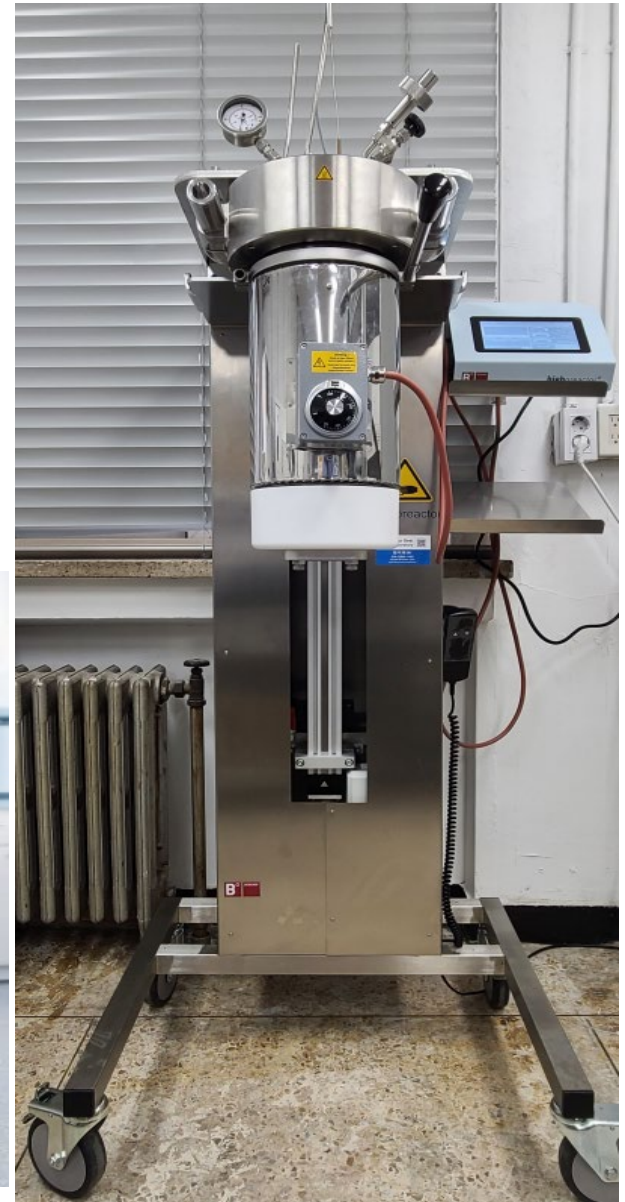
Stand: BRS-2

- Combines lift system and electrical heating
- Static lid for easy installation of tubes, cables and sensors
- Tabletop device that can be placed in a fume hood
- No lifting of heavy vessels by the user
- Available for BR-300, 500, 800, 1000



Lift: BRL-1

- Combines lift system and electrical heating/thermostatic mantle
- Electric up and down by manual switch
- Static lid for easy installation of tubes, cables and sensors
- Floor stand device
- No lifting of heavy vessels by the user
- Available for BR-1500, 2000, 4000



Safety

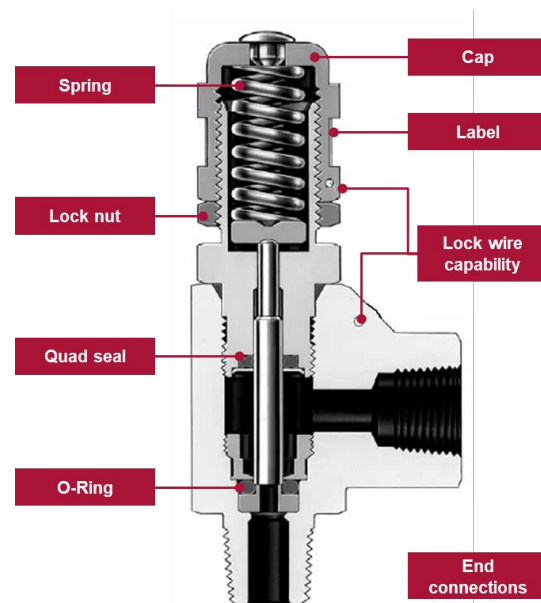
Standard safety (standard fittings)

- Always included
- Rupture disc
- Vent valve
- Safe opening tool



Extra safety

- Exhaust tubing (A)
- PTFE high Pressure relief valve (B)
- Degreased valves (Working with O₂)
- ATEX Pressure sensor (Working with H₂, other explosive chemicals)



NR Reactors with and w/o PTFE Insert

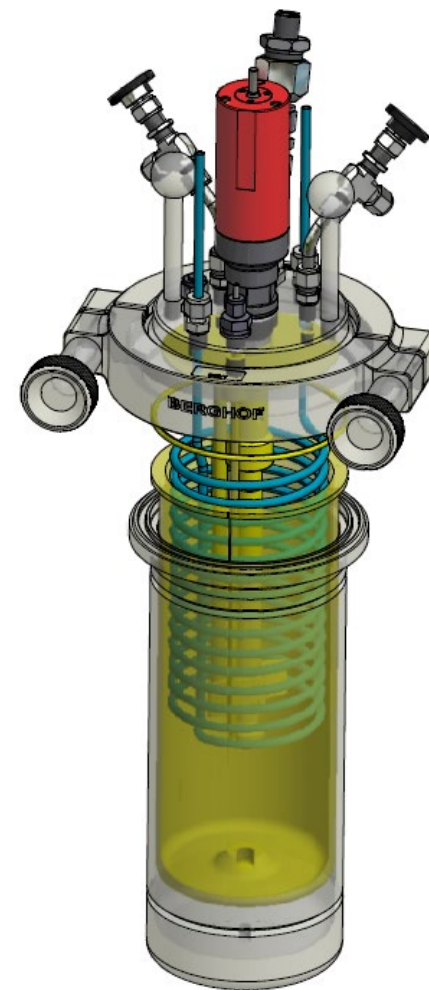
25 bar

230 / 300 °C

1500 – 11400 mL

Series	Volume vessel	Volume PTFE insert
NR-1500	1800 mL	1500 mL
NR-3000	3500 mL	3000 mL
NR-6000	6900 mL	6000 mL
NR-10000	11400 mL	-

- Available with and w/o PTFE insert, except NR-10000
- Bottom drain valve is also available, but only w/o PTFE
- Magnetic coupled overhead stirring with bottom bearing
- Electrical heating mantle with controller or isolated double jacket, directly welded onto the reactor vessel

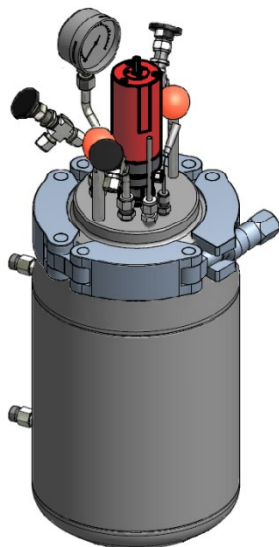
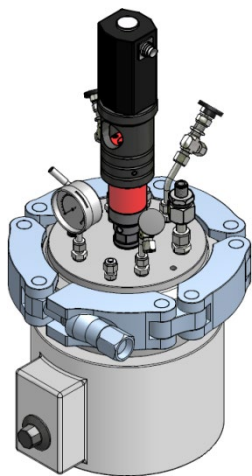


NR Reactors without PTFE Insert

Overview

Series	Material	Volume	p-max	T-max*
NR-20000	SS316Ti	20L	25 bar	300°C 230°C
NR-40000	SS316Ti	40L	25 bar	300°C 230°C

*300°C with FFKM O-Seal Ring (e.g. Kalrez®), 230°C with PTFE or FPM (e.g. Viton®)



Merits of Berghof Reactors

- Simple, tool-less operation
- Unique reactors with complete PTFE-lining
- Massive, durable PTFE-inserts
- Glandless stirring
- Accredited application laboratory EN ISO/IEC17025:2000
- Collection of applications
- Work-Shops and personally demonstrations
- Specifically trained dealers and service technicians
- Customized solutions
- Quality management system EN ISO 9001:2000

Reference

- Korea
 - 학교
 - 강원대: BR-1000 with stand. BR-4000 with lift. DAB-2
 - 서울대: BR-100
 - 관공서
 - 한국에너지기술연구원: DAB-2 complete system
 - 울산기초과학연구원: DAB-3
 - 한국원자력연구원. 융합기술원 외
- Global
 - Company
 - Institutes
 - University

Contact



<https://www.berghof-instruments.com/en/>



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