

# BPG columns

## BIOPROCESS CHROMATOGRAPHY COLUMNS

BPG columns are glass chromatography columns designed for industrial applications, which demand high standards of hygiene. The columns are constructed from component materials of the highest quality and withstand the harsh conditions used for cleaning in place of packed downstream purification resins. The simple design of BPG columns makes them suitable for use with most chromatography resin types.

The columns provide:

- Hygienic design and operation: microbial attachment and growth is hindered through the use of calibrated precision glass, high grade electropolished stainless steel, and an absence of dead pockets.
- Ease of use due to the simple and intuitive design.
- Polymeric materials that are manufactured to meet the requirements for USP class VI, described in USP <88> Biological Reactivity Tests, *In Vivo*.

## General description

BPG columns are designed to meet the needs of process development and biopharmaceutical manufacture:

- Scalable inner diameters (i.d.) of 100 to 450 mm, and bed volumes from 2 up to 121 L.
- Pressure rating up to 0.8 MPa (8 bar, 116 psi).
- Low flow resistance.
- Single screw adapter.
- Suitable for ion exchange, size exclusion chromatography (gel filtration chromatography), affinity, and hydrophobic interaction chromatography with compatible BioProcess™ resins.
- Tubing connections made with hygienic sanitary clamp fittings.
- All gaskets are suitable for use in biopharmaceutical production.
- An instruction manual containing full details of components, packing, testing, procedures for cleaning and sanitizing, troubleshooting, and spare parts lists.
- Packing devices available for long bed heights.
- Installation and operational qualification (IQ/OQ) documentation packages available.



Fig 1. BPG column family.

## Design features

### Column tube

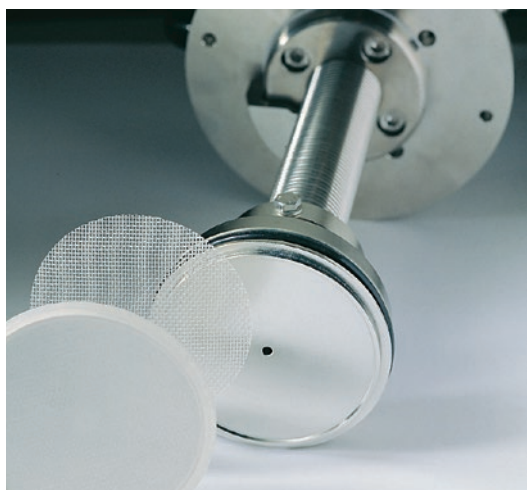
The columns are designed to very high standards and use high-quality materials:

- Manufactured from calibrated precision borosilicate glass.
- Exact internal diameter tolerance of the glass tube.
- Thin O-ring between the column tube and the adapter/end-piece forms a very tight seal.
- Minimum dead volume.
- Liquid distribution over a great surface area.

## Liquid distribution

Efficient liquid distribution is crucial for optimal column performance. BPG columns ensure this through:

- Adapters and end-pieces based on the well-proven design of a single channel inlet/outlet.
- Support nets with a coarse, open structure to distribute liquid from the central inlet rapidly and uniformly over the entire surface area.
- Thin nets to maintain even pressure distribution over the bed surface and permit liquid to pass through quickly and evenly onto the bed, without creating extra back pressure.
- Polypropylene distribution plates in the adapter, which give uniform distribution/collection of liquid at the interface between the net and the packed bed.



**Fig 2.** Adapter and net. Flat surfaces give even spread of sample.

## Operation

### Hygiene

BPG columns are intended for use in environments with some of the toughest regulatory controls:

- Design and materials of construction ensure hygienic operation.
- Little maintenance is required in routine use. The columns are easy to keep clean and free from microbial contamination.
- Autoclavable when disassembled.
- All tubing connections are made with sanitary clamp fittings.
- Columns are easily sanitized. A packed BPG column was subjected to microbial challenge testing using five microorganisms recommended by the United States Pharmacopeia (USP XX III). Sodium hydroxide (NaOH) was the antimicrobial agent. The study showed that 0.5 M NaOH applied for 30 to 60 min is a good basis for developing an effective sanitisation procedure. The study is presented in Application note CY1424308Jun20AN.

### Easy to pack

The design of adapter with a single-screw makes light work of all adapter movement. It is easily adjusted during packing and operation, even on the largest columns.

### Scalable

BPG columns are ideal for scaling up from smaller lab-scale or method development columns. Figure 3 shows that a chromatogram obtained with an XK 16/20 column, i.d. 16 mm, is consistent with the chromatogram obtained from the scaled up run on BPG 300/500 column, i.d. 300 mm. The scale-up factor was 350. No evidence of dilution or loss of recovery was detected.

**Table 1.** Overview of BPG columns

Column diameter (mm)	Column area (cm²)	Column height (cm)	Bed height (cm)				Bed volume (L)				Max. pressure (bar g) <sup>4,5</sup>	Total weight (kg)	Adapter weight (kg)	Overall dimensions W × H × D (cm)
			Min.	Max. <sup>1</sup>	With extension <sup>2</sup>	With extension <sup>3</sup>	Min.	Max. <sup>1</sup>	With extension <sup>2</sup>	With extension <sup>3</sup>				
100	78.5	50	9	26	35	45	0.3	2.0	2.7	3.5	8	15	7	48 × 48 × 127
100	78.5	75	26	42	56	67	2.0	3.2	4.3	5.2	8	16	7	48 × 48 × 152
100	78.5	95	46	55	74	N/A	3.6	4.3	5.8	N/A	8	17	7	48 × 48 × 172
140	154	50	1	26	35	45	0.1	4.0	5.3	6.9	6	25	11	59 × 59 × 127
140	154	75	26	42	55	67	4.0	6.4	8.4	10.3	6	26	11	59 × 59 × 152
140	154	95	46	55	74	N/A	7.0	8.4	11.3	N/A	6	27	11	59 × 59 × 172
200	314	50	1	26	35	45	0.3	8.1	10.9	14.1	6	34	13	59 × 59 × 127
200	314	75	26	42	56	67	8.1	13.1	17.5	21.0	6	36	13	59 × 59 × 152
200	314	95	46	55	74	N/A	14.4	17.2	22.7	N/A	6	39	13	59 × 59 × 172
296	688	50	3	25	33	45	0.6	17.2	22.7	30.9	4	68	29	69 × 69 × 133
296	688	75	28	41	55	66	19.2	28.2	37.8	45.4	4	73	29	69 × 69 × 158
296	688	95	48	54	72	N/A	33.0	37.1	49.5	N/A	4	78	29	69 × 69 × 178
446	1562	50	16	23	30	42	25.0	35.9	46.8	65.6	2.5	200	100	80 × 80 × 140
446	1562	75	28	39	52	59	43.7	60.9	81.2	92.1	2.5	215	100	80 × 80 × 165
446	1562	100	53	55	74	N/A	82.8	85.9	115.6	N/A	2.5	230	100	80 × 80 × 190

Bed volumes and bed heights are based on a slurry concentration of 75% and a packing compression of 15%. Where compression is the difference in volume between a sedimented bed and a bed under pressure.

<sup>1</sup> Values achievable without a packing extension.

<sup>2</sup> Values achievable when a packing extension is used for sedimentation of the bed (75% of the slurry must fit into the column and extension when the adapter is mounted).

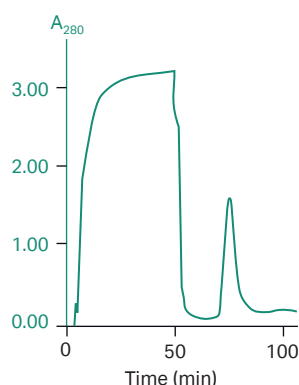
<sup>3</sup> Values achievable when the packing extension remains attached to the column for the duration of column use. The adapter must seal at least 5 cm into the column tube to avoid high tensions in the glass tube.

<sup>4</sup> Use a manometer to monitor the pressure (to order, see Tables 5 and 6).

<sup>5</sup> 1 bar g = 0.1 MPa = 14.5 psi

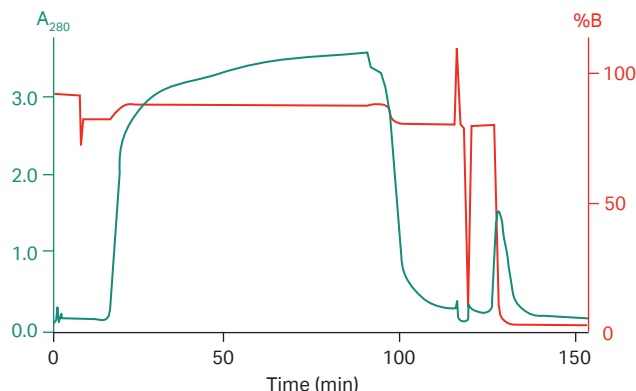
### Separation at lab scale

**Column:** XK16/20 (i.d. 16 mm), 10 cm bed height, 20 mL  
**Resin:** Phenyl Sepharose™ 6 Fast Flow (high sub)  
**Sample:** Yeast supernatant, (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> added to 0.5 M  
**Loading:** 450 mL of sample: 8.1 mg of EGF; 0.41 mg/mL resin  
**Starting buffer:** 0.5 M ammonium sulfate, 20 mM sodium phosphate pH 7.0  
**Elution buffer:** 20 mM sodium phosphate pH 7.0  
**Flow velocity, flow rate:**  
     **Loading:** 300 cm/h, 600 mL/h  
     **Elution:** 60 cm/h, 120 mL/h  
**Purification time:** 1.5 h  
**System:** BioPilot



### Separation at process scale

**Column:** BPG 300/500 (i.d. 300 mm), 10 cm bed height, 7.1 L  
**Resin:** Phenyl Sepharose 6 Fast Flow (high sub)  
**Sample:** Yeast supernatant, (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> added to 0.5 M  
**Loading:** 80 L of sample: 2.56 g of EGF; 0.36 mg/mL resin  
**Starting buffer:** 0.5 M ammonium sulfate, 20 mM sodium phosphate pH 7.0  
**Elution buffer:** 20 mM sodium phosphate pH 7.0  
**Flow velocity, flow rate:**  
     **Loading:** 300 cm/h, 2100 L/h  
     **Elution:** 60 cm/h, 42 L/h  
**Purification time:** 1.5 h  
**System:** BioProcess controlled by UNICORN™ software



**Fig 3.** Development and scale-up of a chromatographic downstream process for the purification of recombinant EGF expressed as an extracellular protein from *S. cerevisiae*. The starting material was clarified supernatant. (Daniels, A.I., Petersson, N.T., Scandella, C. Poster presentation, Crystal City, USA, 1992).

**Table 2.** Column component materials. Components may be considered to contain wet parts, parts coming into contact with process liquids, and dry parts. The Table identifies the materials from which the wet and dry parts are manufactured

Material	Major components							
	Adapter		Tube		End-piece		Stand	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
Borosilicate glass	–	–	•	–	–	–	–	–
Ethylene Propylene rubber (EPDM)	•	–	–	•	•	–	–	–
Stainless steel:	ASTM 316L	•	–	•	•	–	–	•
	ASTM 304 <sup>1</sup>	–	–	–	–	–	–	–
Polypropylene (PP)	•	–	–	–	•	–	–	–
Polytetrafluoroethylene (PTFE)	–	–	–	–	•	•	–	–
Polyamide (PA) nylon (10 µm net)	•	–	–	–	•	–	–	–
Polyetheretherketone (PEEK)	–	•	–	–	–	–	–	–
Acetal plastic (POM)	–	•	–	–	–	–	–	–
Fluoroethenepropene (FEP) <sup>2</sup>	•	–	–	–	•	–	–	–
Polyurethane	–	–	–	–	–	–	–	•
Polyvinylchloride (PVC) <sup>3</sup>	–	–	–	–	–	–	–	–

<sup>1</sup> The clamps are made of stainless steel.

<sup>2</sup> FEP is an option to EPDM for wetted O-rings.

<sup>3</sup> The tubing is made of PVC.

## Materials

BPG columns are made with high-quality materials (Table 2). All polymeric materials have been tested and meet the requirements for USP <88> class VI:

- Materials are compatible with liquids used in process-scale chromatography (including sanitization and cleaning agents such as NaOH and ethanol, Table 3).
- Parts in contact with sample and process liquids are made from chemically resistant materials.

- All stainless steel components are electropolished for improved resistance to corrosion and reduced friction and contamination.
- All polymeric materials have been tested and meet the requirements for USP <88> class VI.

### Chemical resistance

Table 3 is a guide to the resistance of materials to chemical solvents. The information has been compiled from published material from several sources. Please note that the effects of a solvent will be more severe at higher temperatures and that combined effects have not been taken into consideration.

**Table 3.** Chemical resistance of materials of construction

Substance	Concentration	60–90 d <sup>1</sup>	Substance	Concentration	60–90 d <sup>1</sup>
Acetic acid	10%	see note 2	Hydrochloric acid	0.1 M	see note 2, 7
Acetic acid	25%	see note 2	Isopropyl alcohol	100%	see note 3
Acetonitrile	5%	see note 3	Methanol	100%	see note 3
Acetonitrile	50%	see note 4	Nitric acid	0.1 M	see note 2
Acetone	10%	OK	n-Propanol	100%	OK
Cyclohexane	100%	see note 4	Sodium chloride	2 M	see note 6
Ethanol	100%	see note 3	Sodium hydroxide	2 M	OK
Ethyl acetate	100%	see note 5	Trifluoroacetic acid	0.1%	see note 2, 8
Ethylene glycol	50%	OK	–	–	–
Glycerol	100%	OK	Urea	8 M	OK
Hexane	100%	see note 2, 3	–	–	–

<sup>1</sup> The test does not include PVC tubing.<sup>2</sup> Not recommended for use with PA nets.<sup>3</sup> For repetitive, long-term use, use FEP/PFR/PTFE O-rings and gaskets.<sup>4</sup> Change to FEP/PFR/PTFE O-rings and gaskets. Polypropylene plastic resistance is acceptable.<sup>5</sup> Polypropylene plastic resistance is acceptable.<sup>6</sup> Can be used under normal running conditions. Do not use NaCl in storage solutions.

Please note that NaCl can cause corrosion on stainless steel in acid solutions (pH below 4.5).

<sup>7</sup> Contact time no longer than 4 h.<sup>8</sup> Use EPDM rubber instead of FEP.

## Individual testing

As evidence of good manufacturing practice, all BPG columns are individually inspected. A test certificate accompanies each column delivery.

## Spare parts

### Nets

The column is delivered with 23 µm (polypropylene) nets. For resins with an average particle diameter < 70 µm, change to 10 µm (polyamide) or 12 µm (polypropylene) in both adapters and end-pieces. For Sepharose Big Beads, use 54 µm (polypropylene) nets. Also, consider chemical resistance when choosing net type.

### O-rings

FEP adapter and sealing O-rings if solvents not compatible with the EPDM O-rings supplied with the column.

### Gaskets

If solvents are not compatible with the EPDM gasket supplied with the column, use PTFE gaskets.

### Longer bed heights

Packing extensions are available for all diameters.

### Isolating the column after packing

We recommend using sanitary stainless steel valves of the appropriate inner diameter to prevent contamination of the packed bed. Either the 2-way or 4-way valves with a 6 mm i.d. are suitable for BPG 100, 140, and 200 columns and with a 10 mm i.d. for BPG 300 and BPG 450 columns. For storage purposes, the 25 mm blind flange with a clamp and gasket can be used to seal off the column.

### Connecting the column to your system

A clamp and gasket, 6 or 10 mm i.d., are required to connect the 25 mm sanitary flanged inlet/outlet to either valves or tubing of the same type. Preflanged tubing in 6 and 10 mm i.d. is also available.

## Assembly/disassembly of column

A torque wrench with a appropriate sized socket is required and can be ordered separately.

## Column accessories

*Technical support online:* The process chromatography technical support portal at [cytivalifesciences.com/support/contact-us](http://cytivalifesciences.com/support/contact-us) provides BPG users with a range of information about spares and accessories for columns and includes packing, and testing information as well as troubleshooting guides.

*Column stands:* BPG 100, 140, and 200 Column Stand must be ordered separately. BPG 100 has adjustable feet, wheels with brakes are available. BPG 140 and 200 stands have wheels with brakes as standard. BPG 300 and 450 are supplied with stainless steel stand with wheels and foot-operated brakes.

*Air Traps:* BPG Air Trap Complete includes the air trap, mounting bracket, steel valves, clamps, and gaskets. Tubing is included for BPG 100, 140, and 200 air traps.

*Manometers:* Manometer kits contain a pressure gauge, T-junction, necessary clamps and gaskets for sanitary connections.

*Pressure relief valves:* Connected between the pump and column inlet permit flow delivery at a constant pressure throughout the packing procedure.

*Safety valve:* Pre-calibrated valve, which releases pressure if the calibrated value is exceeded. Recommended if column might exceed its maximum pressure limit and no other pressure sensor is included in the chromatographic system. T-junction, clamps, and gaskets may be ordered separately.

*Top valve:* Manually operated valve is recommended at the top of the airtrap as an air outlet control.

### Grounding kit

A grounding kit is available as an accessory for BPG columns.

### Connectors

The connectors shown in Figure 4 are available as accessories.

**Table 4.** Recommended spare parts

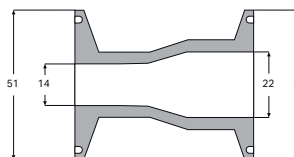
Spare parts	BPG 100	BPG 140	BPG 200	BPG 300	BPG 450	Quantity/Pack	Material
Flange O-ring	18849401	18111306	18848901	18101226	18110533	2	EPDM
Flange O-ring	18001941	18111307	18001951	18101227	18111767	1	FEP
Adapter O-ring	18847501	18111310	18027501	18101251	18101747*	2	EPDM
Adapter O-ring	18001940	18111311	18001950	18101252	18111766	1	FEP
U-shaped seal	–	–	–	–	18110440	1	EPDM
U-shaped seal	–	–	–	–	28992187	1	PFR
Support net, adapter	18110304	18111299	18025256	18101253	18110434*	2	PP
Support net, end-piece	18025155	18111298	18025255	18101236	18110435*	2	PP
Net, 10 µm, adapter	18110305	18111303	18025276	18101255	18101746*	2	PA
Net, 10 µm, end-piece	18025177	18111302	18025277	18101235	18110318*	2	PA
Net, 12 µm, adapter	18114837	18114839	18114841	18114843	18114845*	2	PEEK
Net, 12 µm, end-piece	18114838	18114840	18114842	18114844	18114846*	2	PEEK
Net, 23 µm, adapter	18110308	18111301	18925301	18101254	18100162*	2	PP
Net, 23 µm, end-piece	18925201	18111300	18925401	18101234	18110319*	2	PP
Net, 54 µm, adapter	18112696	18112698	18112700	18112702	18112704*	2	PP
Net, 54 µm, end-piece	18112697	18112699	18112701	18112703	18112705*	2	PP

\* One piece per pack.

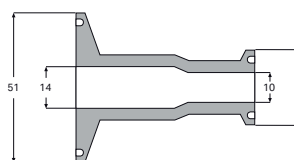
## Recommended spare parts

Table 4 lists the recommended spare parts. It is advisable to keep spares of nets, support screens, O-rings, and tubes on site at all times. O-rings and filters should be checked regularly for wear. Worn O-rings may not seal properly and overused filter nets can affect distribution. If solvents are not compatible with EPDM seals, change to seals in FEP/PFR. Check the HETP and  $A_s$  regularly to prevent poor performance due to old nets. Contact your representative for advice regarding change of spare parts.

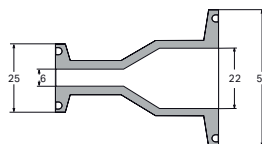
Connector i.d. 14, 51 mm TC-i.d. 22 mm, 51 mm TC,  
Product code 18102726



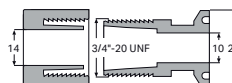
Connector i.d. 14, 51 mm TC-i.d. 10 mm,  
25 mm TC, Product code 18102725



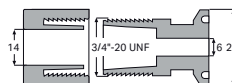
Connector i.d. 6 mm, 25 mm TC- i.d. 22 mm,  
50 mm TC, PEEK, USP Class VI,  
Product code 28405761



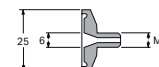
Connector 3/4"-20 UNF-i.d. 10 mm, 25 mm TC,  
Product code 18101268



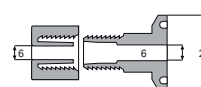
Connector 3/4"-20 UNF-i.d. 6 mm, 25 mm TC,  
Product code 18101267



Connector M6 - i.d. 6 mm, 25 mm TC,  
PEEK, USP Class VI, Product code 28405764



Connector i.d. 6 mm-i.d. 6 mm, 25 mm TC,  
Product code 18025198



1 inch = 25 mm

UNF = Standard for finer pitch that fits many female connectors

**Fig 4.** Guide to connectors for process-scale columns.

**Table 5.** Accessories for BPG 100, 140, and 200 columns

Accessory	BPG 100	BPG 140	BPG 200	Quantity	Material
Air Trap Complete <sup>2</sup>	18110296	18110297	18110297	1	Stainless steel 316/ EPDM/PVC/glass
Top valve for air trap <sup>2</sup>	18112144	18112144	18112144	1	316/EPDM
T-junction i.d. 6 mm <sup>4</sup>	18110429	18110429	18110429	1	316
Valve sealing washer <sup>6</sup>	18112869	18112869	18112869	2	PTFE
Manometer kit <sup>3</sup> (0–10 bar)	18103107	18103107	18103107	1	304/316/EPDM <sup>8</sup>
Manometer <sup>3</sup> (0–10 bar)	18110367	18110367	18110367	1	316
Wheel with brake	29600126	29601455	29601455	1	–
Adjustable foot	18112693	18112693	18112693	1	–
Torque wrench	18025137	18025137	18025137		304
12-point opening socket	18103103	18103104	18103104		304
Allen key	18103098	18103098	18103098		304
Packing device <sup>1</sup>	18110475	18111333	18110477	1	glass
Grounding kit	18115787	18115787	18115787	1	–
Media stirrer (80 mm plate diam.)	28919103	28919103	28919103	1	–
<i>Tubing with sanitary fitting<sup>2</sup> i.d. 6 mm</i>					
30 cm	18000542	18000542	18000542	1	PVC
75 cm	18000543	18000543	18000543	1	PVC
125 cm	18000544	18000544	18000544	1	PVC
150 cm	18000545	18000545	18000545	1	PVC
200 cm	18000547	18000547	18000547	1	PVC
<i>Connectors<sup>5</sup></i>					
i.d. 6, 25 mm TC-6 mm threaded	18025198	18025198	18025198	2	PP
i.d. 6, 25 mm TC-3/4"-20 UNF threaded	18101267	18101267	18101267	2	PP
i.d. 6, 25 mm TC-M6 threaded	18103109	–	–	2	PP
i.d. 6, 25 mm TC-i.d. 22, 51 mm TC	18101269	18101269	18101269	2	PP
<i>Clamps, gaskets</i>					
Clamp 25 mm	18100131	18100131	18100131	1	316
Clamp 25 mm	28404338	28404338	28404338	5	316
Clamp 51 mm	44713401	44713401	44713401	1	316
Gasket 25 mm i.d. 6 mm	18001927	18001927	18001927	2	EPDM
Gasket 25 mm i.d. 6 mm	18001928	18001928	18001928	2	PTFE
Gasket 51 mm i.d. 22 mm	44713301	44713301	44713301	5	EPDM
Gasket 51 mm i.d. 22 mm	28966886	28966886	28966886	2	PTFE
Blind flange 25 mm incl. gasket	18100125	18100125	18100125	1	316/EPDM
Blind flange 51 mm incl. gasket	44713501	44713501	44713501	1	316/EPDM
<i>Valves</i>					
4-port, 2-way i.d. 6 mm <sup>2</sup>	18575701	18575701	18575701	1	316L/PTFE
4-port, 4-way i.d. 6 mm <sup>2</sup>	18575801	18575801	18575801	1	316L/PTFE
Pressure relief valve i.d. 6 mm <sup>2</sup>	18110536	18110536	18110536	1	316/FPM
Safety valve <sup>3</sup>	18103580	18103581	18103581	1	316/EPDM

<sup>1</sup> The packing device consists of a 380 mm height glass tube, flanges, rods, O-rings in EPDM, nuts, and screws.<sup>2</sup> 25 mm TC.<sup>3</sup> 51 mm TC.<sup>4</sup> 2 × 25 mm, 1 × 51 mm TC.<sup>5</sup> See Figure 4.<sup>6</sup> Fits 6 and 10 mm, 2- and 4-way valves.<sup>7</sup> For O-rings as spare parts, see Table 4.<sup>8</sup> Note that material 304 is not a wetted part.



**Table 6.** Accessories for BPG 300 and 450 columns

Accessory	BPG 300	BPG 450	Quantity	Material
Air Trap Complete <sup>3</sup>	18110298	18110300	1	316/EPDM/glass
Top valve <sup>3</sup>	18112144	18112144	1	316/EPDM
Torque wrench	18025137	18025137	1	304
12-point opening socket	18103105	18110531	1	304
Allen key	18103098	18103098	1	304
Packing device <sup>1,8</sup>	18110816	—	1	glass
Packing device <sup>2,8</sup>	—	18110532	1	316
T-junction i.d. 10 mm <sup>5</sup>	18100363	18100363	1	316
Valve sealing washer <sup>7</sup>	18112869	18112869	2	PTFE
Manometer kit <sup>4</sup> (0–6 bar)	28994472	28994472	1	304/316/EPDM <sup>9</sup>
Wheel with brake	29601455	29018717	1	—
Media stirrer (150 mm plate diameter)	28919104	28919104	1	—
<i>Tubing with sanitary fitting<sup>3</sup> length i.d.</i>				
30 cm 10 mm	18101285	18101285	1	PVC
40 cm 10 mm	18101286	18101286	1	PVC
75 cm 14 mm	—	18102728	1	PVC
90 cm 10 mm	18101262	18101262	1	PVC
140 cm 10 mm	18101263	18101263	1	PVC
170 cm 10 mm	18101264	18101264	1	PVC
180 cm 14 mm	—	18102729	1	PVC
200 cm 10 mm	18101287	18101287	1	PVC
<i>Connectors<sup>6</sup></i>				
i.d. 10, 25 mm TC-3/4"-20 UNF threaded	18101268	18101268	2	PP
i.d. 10, 25 mm TC-i.d. 14 mm, 51 mm TC	18102725	18102725	2	PP
i.d. 14, 51 mm TC-i.d. 22 mm, 51 mm TC	—	18102726	2	PP
<i>Clamps, gaskets</i>				
Clamp 25 mm	18100131	18100131	1	316
Clamp 25 mm	28404338	28404338	5	316
Clamp 51 mm	44713401	44713401	1	316
Gasket 25 mm i.d. 10 mm	18103579	18103579	2	EPDM
Gasket 25 mm i.d. 10 mm	18101240	18101240	2	PTFE
Gasket 25 mm i.d. 12 mm	—	18020000	2	EPDM
Gasket 25 mm i.d. 12 mm	—	44550620	2	PTFE
Blind flange 25 mm incl. gasket	18100125	18100125	1	316
Gasket 51 mm i.d. 10 mm	18101288	18101288	5	EPDM
Gasket 51 mm i.d. 14 mm	—	18101757	5	EPDM
Gasket 51 mm i.d. 22 mm	28966886	28966886	5	EPDM
Gasket 51 mm i.d. 22 mm	44551203	44551203	2	PTFE
Blind flange 51 mm incl. gasket	44713501	44713501	1	316
<i>Valves</i>				
4-port, 2-way i.d. 10 mm <sup>3</sup>	18101256	18101256	1	316L/PTFE
4-port, 4-way i.d. 10 mm <sup>3</sup>	18101257	18101257	1	316L/PTFE
3-port, 2-way i.d. 15 mm <sup>3</sup>	—	44549990	1	316L/PTFE
Pressure relief valve i.d. 10 mm <sup>3</sup>	18110697	18110697	1	316/FPM
Safety valve <sup>4</sup>	18103582	18110365	1	316/EPDM

<sup>1</sup> The packing device consists of a 380 mm height glass tube, flanges, rods, O-rings in EPDM, nuts, and screws.<sup>2</sup> The packing device consists of a 300 mm high stainless steel tube, O-rings, nuts, and a clamp.<sup>3</sup> 25 mm TC.<sup>4</sup> 51 mm TC.<sup>5</sup> 2 × 25 mm, 1 × 51 mm TC.<sup>6</sup> See Figure 4.<sup>7</sup> Fits 6 and 10 mm, 2- and 4-way valves. For replacement, consult Instructions for Use.<sup>8</sup> For O-rings as spare parts, see Flange O-rings for the respective column in Table 4.<sup>9</sup> Note that material 304 is not a wetted part.

# Ordering information

Diameter	Column tube length (mm)			Column Stand
	500	750	950	
100	18110301	18110302	18110303	18103110
140	18111308	44732047	18111309	18103120
200	18110311	18110312	18110313	18103120
300	18110321	18110322	18110323	–
450	18110371	18110372	18110373*	–

\* Tube height for BPG 450 is 1000 mm.

Literature	Product code
Application note: Sanitizing BPG 450 column with sodium hydroxide	CY1424308Jun20AN

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