

## DATA SHEET

# WorkBeads Dsalt GoBio preppacked columns

WorkBeads™ Dsalt resin and the preppacked columns, GoBio™ Mini Dsalt 1 mL and 5 mL, GoBio Prep 16x100 Dsalt, GoBio Prep 26x100 Dsalt and the five different GoBio Prod columns starting from 1 L allow quick and easy separation of high- and low molecular weight substances for efficient desalting and/or buffer exchange of proteins, large peptides or nucleic acids. This technique is easy and allows fast scale-up.

- Designed for rapid and efficient desalting and/or buffer exchange
- Group separation of high molecular weight substances from low molecular weight substances
- Prepacked GoBio columns for convenience and reproducibility
- Pre-swollen bulk resin for packing own columns

## Resin description

WorkBeads Dsalt is a pre-swollen cross-linked dextran-based resin, optimized for desalting, and/or buffer exchange. This is achieved by group separation of high molecular weight substances, such as proteins, and low molecular weight substances, such as salts. The exclusion limit of the resin is  $M_r$  5000 for proteins and 10 bp for nucleic acids.

Substances that are larger than  $M_r$  5 000 do not enter the porous beads and are therefore eluted in the void volume (early elution). Substances smaller than  $M_r$  5 000 (e.g., salts, buffer substances and other low-molecular weight additives or impurities) enter the bead pores. These substances are delayed (late elution).



WorkBeads Dsalt allow desalting or buffer exchange by group separation of protein samples before or after various purification steps. The chromatographic desalting technique can be run at high flow rates and can be scaled up for bioproduction.

The main characteristics of WorkBeads Dsalt resin are shown in Table 1. For additional information, see instructions, IN 40 360 010.

The different sizes of preppacked Dsalt columns are designed for fast, easy and reproducible desalting or buffer exchange, which is often necessary before protein analysis, before or after a chromatographic purification. Desalting is often carried out before an ion exchange chromatography step to condition the sample or after an ion exchange chromatography step to remove the salt used for elution.

**Table 1.** Main characteristics of WorkBeads Dsalt.

| WorkBeads Dsalt                                  |                                                                                                                                                 |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Target substance                                 | Proteins, large peptides ( $M_r > 5\,000$ ), nucleic acids and other biomolecules of similar size                                               |
| Matrix                                           | Highly cross-linked dextran                                                                                                                     |
| Average particle size ( $D_{v50}$ ) <sup>1</sup> | 150 $\mu\text{m}$                                                                                                                               |
| Typical sample volume                            | 20 – 30% of the column volume (0.2 – 0.3 CV)                                                                                                    |
| Typical flow rate                                | 150 – 300 cm/h                                                                                                                                  |
| Chemical stability                               | Compatible with all standard aqueous buffers used for protein purification, 0.2 M NaOH, 0.2 M HCl, 1 M acetic acid, 8 M urea, 6 M guanidine HCl |
| pH stability                                     | 2 – 12                                                                                                                                          |
| Storage                                          | 2 – 25 °C in 20% ethanol or other suitable storage solution                                                                                     |
| Shipping solution                                | 0.15% ProClin™ 150 in deionized water                                                                                                           |

<sup>1</sup> The median particle size of the cumulative volume distribution.

ProClin is a trademark of the Dow Chemical Company (Dow) or an affiliated company of Dow.

## GoBio prepacked column family

GoBio prepacked column family is developed for convenient, reproducible and fast results and includes columns with different sizes and formats.

GoBio Mini 1 mL and GoBio Mini 5 mL for small scale purification and screening using a shorter packed bed.

GoBio Screen 7x100 (3.8 mL) for reproducible process development including fast and easy optimization of methods and parameters.

GoBio Prep 16x100 (20 mL) and GoBio Prep 26x100 (53 mL) for lab-scale purifications and scaling up.

GoBio Prep 16x600 (120 mL) and GoBio Prep 26x600 (320 mL) for preparative lab-scale size exclusion chromatography.

GoBio Prod 80x200 (1 L), GoBio Prod 130x200 (2.7 L), GoBio Prod 200x200 (6 L), GoBio Prod 240x200 (9 L) and GoBio Prod 330x250 (21.4 L) for production-scale purifications.

**Table 2.** Main characteristics of GoBio Mini and GoBio Prep columns.

|                                               | GoBio Mini 1 mL                              | GoBio Mini 5 mL                              | GoBio Prep 16x100                            | GoBio Prep 26x100                            |
|-----------------------------------------------|----------------------------------------------|----------------------------------------------|----------------------------------------------|----------------------------------------------|
| Column hardware                               | Polypropylene                                | Polypropylene                                | Acrylic                                      | Acrylic                                      |
| Top and bottom filters                        | Polyethylene                                 | Polypropylene                                | Polyamide                                    | Polyamide                                    |
| Top and bottom plugs                          | Polypropylene                                | Polypropylene                                | Polypropylene                                | Polypropylene                                |
| Connections                                   | 1/16" female (top)<br>1/16" male (bottom)    | 1/16" female<br>1/16" male (bottom)          | 1/16" female<br>(both ends)                  | 1/16" female<br>(both ends)                  |
| Column volumes                                | 1 mL                                         | 5 mL                                         | 20 mL                                        | 53 mL                                        |
| Column dimensions                             | 7 × 28 mm                                    | 13 × 38 mm                                   | 16 × 100 mm                                  | 26 × 100 mm                                  |
| Maximal column hardware pressure <sup>1</sup> | 0.3 MPa, 3 bar, 43 psi                       | 0.3 MPa, 3 bar, 43 psi                       | 5 bar, 0.5 MPa, 70 psi                       | 5 bar, 0.5 MPa, 70 psi                       |
| Recommended flow rates                        | 0.25 – 1 mL/min<br>(37 – 150 cm/h)           | 1.25 – 5 mL/min<br>(56 – 225 cm/h)           | 5 – 10 mL/min<br>(150 – 300 cm/h)            | 13 – 26 mL/min<br>(150 – 300 cm/h)           |
| Maximum flow rates <sup>2</sup>               | 5 mL/min<br>(780 cm/h)                       | 20 mL/min<br>(900 cm/h)                      | 15 mL/min<br>(450 cm/h)                      | 40 mL/min<br>(450 cm/h)                      |
| Sample volumes                                | 20 – 300 $\mu\text{L}$                       | 0.1 – 1.5 mL                                 | ≤ 6 mL                                       | ≤ 16 mL                                      |
| Chemical stability                            | 1 M NaOH,<br>30% isopropanol,<br>70% ethanol | 1 M NaOH,<br>30% isopropanol,<br>70% ethanol | 1 M NaOH,<br>20% isopropanol,<br>20% ethanol | 1 M NaOH,<br>20% isopropanol,<br>20% ethanol |

<sup>1</sup> The maximum pressure the packed bed can withstand depends on the sample/liquid viscosity and chromatography resin characteristics. The pressure also depends on the tubing used to connect the column and the system restrictions after the column outlet.

**Table 3.** Main characteristics of and GoBio Prod columns.

|                                            | GoBio Prod 80x200, GoBio Prod 130x200, GoBio Prod 200x200, GoBio Prod 280x200, GoBio Prod 330x250      |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Column hardware                            | Acrylic                                                                                                |
| Top and bottom filters                     | Polyamide                                                                                              |
| Top and bottom plugs                       | Polypropylene                                                                                          |
| Connections                                | TC-connections                                                                                         |
| Column volumes                             | 1 L, 2.7 L, 6 L, 9 L, 21.4 L                                                                           |
| Column dimensions                          | 80 × 200 mm (1 L), 130 × 200 mm (2.7 L), 200 × 200 mm (6 L), 280 × 200 mm (9 L), 330 × 250 mm (21.4 L) |
| Max. column hardware pressure <sup>1</sup> | 5 bar, 0.5 MPa, 70 psi                                                                                 |
| Chemical stability                         | 1 M NaOH, 20% isopropanol, 20% ethanol                                                                 |

<sup>1</sup> The maximum pressure the packed bed can withstand depends on the sample/liquid viscosity and chromatography resin characteristics. The pressure also depends on the tubing used to connect the column and the system restrictions after the column outlet.

High-molecular weight components start to elute at 0.3 mL for the GoBio Mini Dsalt 1 mL and the low-molecular weight components at 0.7 mL. For the GoBio Mini Dsalt 5 mL column corresponding values are 1.25 mL and 3.2 mL. Increasing the sample volumes increases the tail of the peaks of both the high- and low- $M_r$  components, exemplified on a GoBio Mini Dsalt 5 mL column (Figure 3). For efficient desalting using this column the sample volume should not exceed 1.5 mL.

For best dealing/buffer exchange results using GoBio Prep 16x100 Dsalt the sample volume should be  $\leq 6$  mL and for GoBio Prep 26x100 Dsalt the sample volume should be  $\leq 15$  mL.

There are five different prepacked GoBio Prod Dsalt columns available with column volumes from 1 L to 21.4 L which allow for fast, easy and efficient desalting/buffer exchange of larger sample volumes.

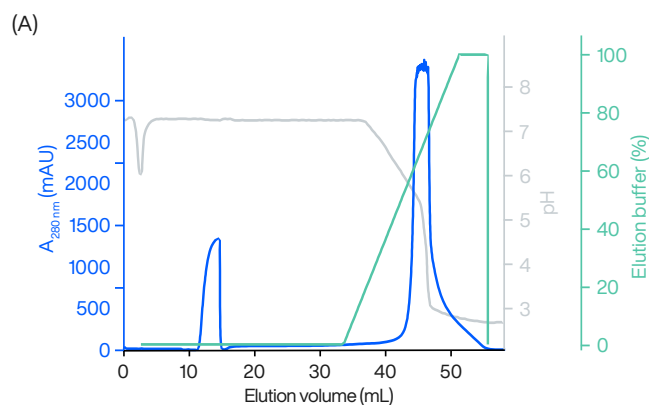
## Applications

### Buffer exchange of protein solutions

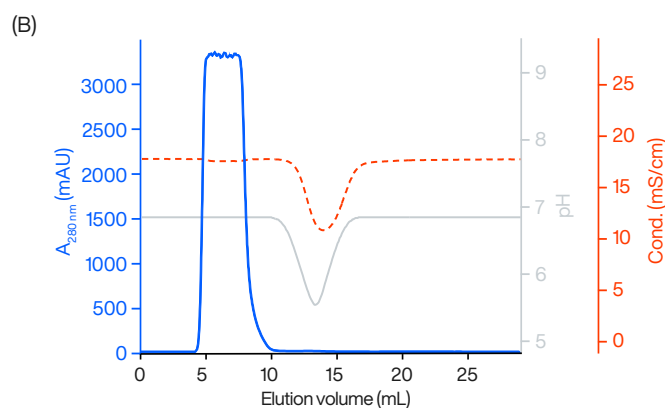
In some applications it may be necessary to expose the target protein to conditions that are not optimal for its structure, function or for further purification or use. This is exemplified by purification of IgG by protein A affinity chromatography where the elution is performed by decreasing pH. The low pH tends to cause aggregation of the purified antibodies unless the pH is quickly restored to neutral.

In Figure 1, a GoBio Mini A 1 mL column (packed with WorkBeads Protein A) was used for the purification of human polyclonal IgG. After low pH elution, the pH of the IgG fraction was rapidly restored to neutral by buffer exchange using three GoBio Mini Dsalt 5 mL connected in series.

Column: GoBio Mini A 1 mL  
 Binding buffer: PBS, pH 7.4  
 Elution buffer: 100 mM glycine-HCl, pH 2.7  
 Sample: 20 mL 1 mg/mL human polyclonal IgG in PBS, pH 7.4  
 Flow rate: 1 mL/min  
 Linear gradient: 0 – 100% elution buffer in 20 column volumes (CV)



Columns: 3 × GoBio Mini Dsalt 5 mL  
 (3 columns connected in series)  
 Running buffer: 25 mM sodium phosphate, 150 mM NaCl, pH 7.0  
 Sample: 3 mL of elution pool from GoBio Mini A 1 mL  
 Flow rate: 5 mL/min

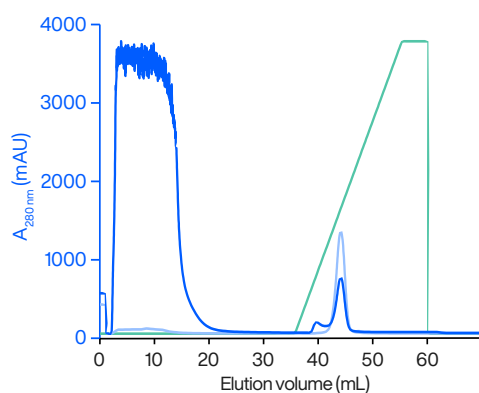


**Figure 1.** (A) Human polyclonal IgG adsorbed on a GoBio Mini A 1 mL column and eluted by low pH. (B) Buffer exchange of the eluted IgG pool applied on 3 × GoBio Mini Dsalt 5 mL. Blue: absorbance: 280 nm, grey: pH, green: concentration of elution buffer and dashed red line: conductivity.

GoBio Mini Ni-NTA 1 mL column (packed with WorkBeads 40 Ni-NTA) was used for the purification of His<sub>6</sub>-GFP expressed in *E. coli* (Figure 2). After elution with high concentration of imidazole, the His<sub>6</sub>-GFP may aggregate due to the presence of high imidazole. The imidazole was therefore rapidly removed by buffer exchange using WorkBeads Dsalt packed in a 7.9 mL column.

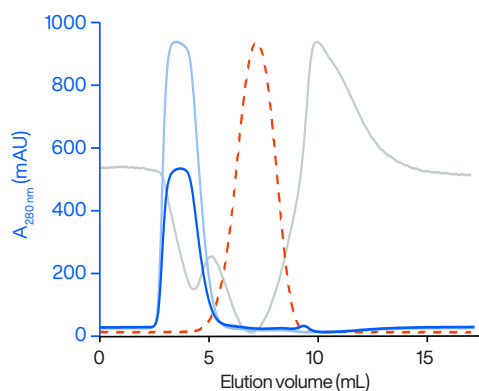
Column A: GoBio Mini Ni-NTA 1 mL  
 Binding buffer: 50 mM sodium phosphate, 300 mM NaCl, 10 mM imidazole, pH 8.0  
 Elution buffer: 50 mM sodium phosphate, 300 mM NaCl, 300 mM imidazole, pH 8.0  
 Sample: 10 mL clarified extract His<sub>6</sub>-GFP expressed in *E. coli*  
 Flow rate: 1 mL/min (150 cm/h)  
 Linear gradient: 0 – 100% elution buffer, 20 CV

(A)



Column B: WorkBeads Dsalt, 7.9 mL, 10 × 100 mm  
 Buffer: PBS, pH 7.4  
 Sample: 2 mL elution pool from GoBio Mini Ni-NTA 1 mL  
 Flow rate: 1 mL/min (75 cm/h)

(B)



**Figure 2.** (A) His<sub>6</sub>-GFP purified on GoBio Mini Ni-NTA 1 mL. (B) Desalting using WorkBeads Dsalt.

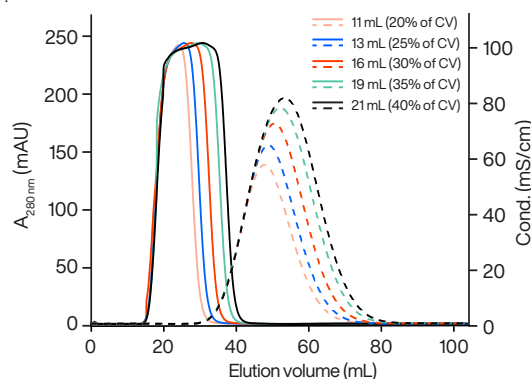
Dark blue: Absorbance 280 nm, light blue: absorbance at 465 nm, grey: pH, green: concentration of elution buffer and dashed red: conductivity.

## Influence of sample volume

WorkBeads Dsalt is used for efficient separation of high- and low-molecular weight substances. The amount of low-molecular weight substances in the sample will depend on sample volume and pooling of the eluted fraction. Figures 3-4 show a comparison of different sample loads on GoBio Mini Dsalt 5 mL and GoBio Prep 26x100 Dsalt.

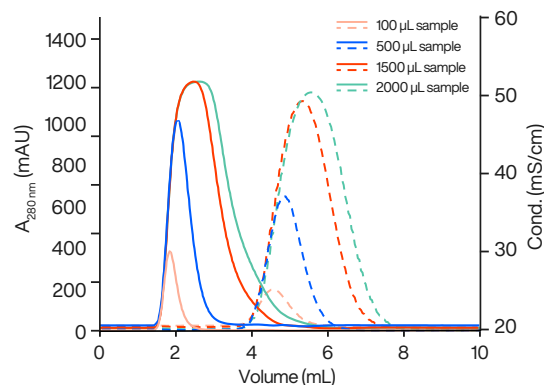
It is easy to see that the sample volume is important for how efficient the desalting will be and therefore it is important to follow the recommendations of largest sample volumes for the most efficient desalting of the sample.

Column: GoBio Mini Dsalt 5 mL  
 Sample: 2 mg/mL BSA in 20 mM sodium phosphate, 0.5 M NaCl, pH 7.0  
 Buffer: 25 mM sodium phosphate, 150 mM NaCl, pH 7.0  
 Flow rate: 5 mL/min



**Figure 3.** Desalting of 2 mg BSA/mL in 25 mM sodium phosphate, 0.5 M NaCl, pH 7.0 on GoBio Mini Dsalt 5 mL. Sample volume range of 100 – 2000 µL. The solid traces correspond to absorbance at 280 nm (protein) and the dashed traces to the conductivity (salt).

Column: GoBio Prep 26x100 Dsalt  
 Buffer: 20 mM PBS, pH 7.4  
 Sample: 2 mg/mL BSA in 20 mM PBS, 1 M NaCl, pH 7.4  
 Sample load: 11 mL (20% of CV), 13 mL (25% of CV), 16 mL (30% of CV), 19 mL (35% of CV), 21 mL (40% of CV)  
 Flow rate: 300 cm/h (26 mL/min)



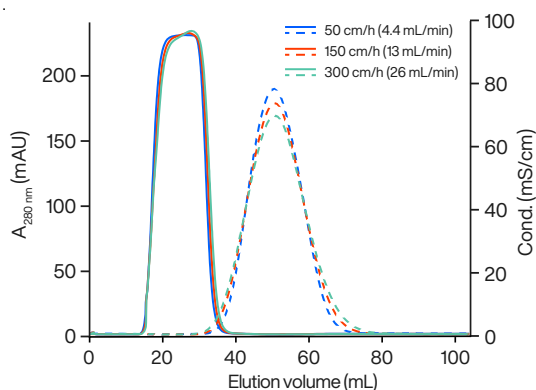
**Figure 4.** Desalting of 2 mg BSA/mL in 20 mM PBS, 1 M NaCl, pH 7.4 on GoBio Prep 26x100 Dsalt. Sample volume range of 20 – 40% of CV. The solid traces correspond to absorbance at 280 nm (protein) and the dashed traces to the conductivity (salt).

## Influence of flow rate

In figure 5 the influence of flow rate has been investigated using a GoBio Prep 26x100 Dsalt column.

As can be seen desalting can be run at higher flow rates compared to conventional size exclusion chromatography without almost no influence on the separation which makes it a very useful technique when for example there is a need for fast removal of disturbing substances for keeping the target protein in an active form.

Columns: GoBio Prep 26x100 Dsalt  
 Buffer: 20 mM PBS, pH 7.4  
 Sample: 16 mL, 2 mg/mL BSA in 20 mM PBS, 1 M NaCl, pH 7.4 (30% of CV)  
 Flow rates: 50 cm/h (4.4 mL/min)  
 150 cm/h (13 mL/min)  
 300 cm/h (26 mL/min)



**Figure 5.** Chromatograms of efficient desalting of 16 mL sample (30% of CV) on GoBio Prep 26x100 Dsalt using different flow rates. The solid traces corresponds to the absorbance at 280 nm (protein) and the red dashed traces to conductivity (salt).

## Cleaning-in-place

During purification, impurities such as cell debris, lipids, nucleic acids and protein precipitates from the samples may gradually build up in the resin. The degree to which this happens depends on the type of sample applied to the column and the pre-treatment of the sample. The impurities may reduce the performance of the column over time. Regular cleaning (Cleaning-in-place, CIP) keeps the resin clean, reduces the rate of further contamination, and prolongs the capacity, resolution and flow properties of the column.

Regular cleaning of the column is recommended, for example treatment with two column volumes of 0.2 M NaOH. Preferably this should be done using reversed flow through the column.

## Scale-up

Scale-up can conveniently be carried out from a 1 mL GoBio Mini column to GoBio Prod columns starting from 1 L. Bulk packages of WorkBeads resins can also be packed into other column formats of choice.

Prepacked columns can be used with most standard liquid chromatography equipment. Purification using GoBio Mini columns can also be carried out using a syringe connected to the column by a luer or a standard HPLC connector.

## Storage

Store at 2 to 25°C in 20% ethanol or other suitable storage solution.

For prolonged storage of the prepacked GoBio Prep columns connect the included transport syringe filled with storage solution to the bottom end of the column.

## Related products

| Product name                                           | Pack size <sup>1</sup> | Article number |
|--------------------------------------------------------|------------------------|----------------|
| <b>Prepacked columns</b>                               |                        |                |
| GoBio Mini IEX Screening kit <sup>2</sup>              | 1 mL × 4               | 45 900 001     |
| GoBio Mini S 5 mL                                      | 5 mL × 5               | 45 200 107     |
| GoBio Mini Q 5 mL                                      | 5 mL × 5               | 45 100 107     |
| GoBio Mini DEAE 5 mL                                   | 5 mL × 5               | 45 150 107     |
| GoBio Mini TREN 5 mL                                   | 5 mL × 5               | 45 655 217     |
| GoBio Mini affimAb 5 mL                                | 5 mL × 5               | 45 800 107     |
| GoBio Mini NiMAC 5 mL                                  | 5 mL × 5               | 45 655 317     |
| GoBio Mini NTA His-tag screening kit 1 mL <sup>3</sup> | 1 mL × 4               | 45 700 101     |
| GoBio Mini NTA His-tag Screening kit 5 mL <sup>3</sup> | 5 mL × 4               | 45 700 102     |
| GoBio Mini IDA His-tag Screening kit 1 mL <sup>3</sup> | 1 mL × 4               | 45 700 001     |
| GoBio Mini IDA His-tag Screening kit 5 mL <sup>3</sup> | 5 mL × 4               | 45 700 002     |
| GoBio Prep 16x100 40S                                  | 20 mL × 1              | 55 420 021     |
| GoBio Prep 16x100 40Q                                  | 20 mL × 1              | 55 410 021     |
| GoBio Prep 16x100 40 DEAE <sup>4</sup>                 | 20 mL × 1              | 55 415 021     |
| GoBio Prep 16x100 40 TREN                              | 20 mL × 1              | 55 463 021     |
| GoBio Prep 16x100 affimAb                              | 20 mL × 1              | 55 800 021     |
| GoBio Prep 16x100 NiMAC <sup>4</sup>                   | 20 mL × 1              | 55 653 021     |
| GoBio Prep 26x100 40S                                  | 53 mL × 1              | 55 420 031     |
| GoBio Prep 26x100 40Q                                  | 53 mL × 1              | 55 410 031     |
| GoBio Prep 26x100 40 DEAE <sup>4</sup>                 | 53 mL × 1              | 55 415 031     |
| GoBio Prep 26x100 40 TREN <sup>4</sup>                 | 53 mL × 1              | 55 463 031     |
| GoBio Prep 26x100 affimAb                              | 53 mL × 1              | 55 800 031     |
| GoBio Prep 26x100 NiMAC <sup>4</sup>                   | 53 mL × 1              | 55 653 031     |

<sup>1</sup> Other pack sizes can be found in the complete product list on [www.bio-works.com](http://www.bio-works.com)

<sup>2</sup> GoBio Mini IEX Screening Kit includes one of each: GoBio Mini S 1 mL, GoBio Mini Q 1 mL, GoBio Mini DEAE 1 mL and GoBio Mini TREN 1 mL.

<sup>3</sup> Includes one column each charged with Ni<sup>2+</sup>, Co<sup>2+</sup>, Cu<sup>2+</sup> or Zn<sup>2+</sup>

<sup>4</sup> Packed on request.

## Ordering information

| Product name                          | Pack size  | Article number |
|---------------------------------------|------------|----------------|
| <b>Prepacked columns</b>              |            |                |
| GoBio Mini Dsalt 1 mL                 | 1 mL × 1   | 45 360 101     |
|                                       | 1 mL × 5   | 45 360 103     |
|                                       | 1 mL × 10  | 45 360 104     |
|                                       | 1 mL × 100 | 45 360 110     |
| GoBio Mini Dsalt 5 mL                 | 5 mL × 1   | 45 360 105     |
|                                       | 5 mL × 5   | 45 360 107     |
|                                       | 5 mL × 10  | 45 360 108     |
|                                       | 5 mL × 100 | 45 360 109     |
| GoBio Prep 16x100 Dsalt <sup>1</sup>  | 20 mL × 1  | 55 700 021     |
| GoBio Prep 26x100 Dsalt               | 53 mL × 1  | 55 700 031     |
| GoBio Prod 80x200 Dsalt <sup>1</sup>  | 1 L        | 55 700 042     |
| GoBio Prod 130x200 Dsalt <sup>1</sup> | 2.7 L      | 55 700 062     |
| GoBio Prod 200x200 Dsalt <sup>1</sup> | 6 L        | 55 700 072     |
| GoBio Prod 240x200 Dsalt <sup>1</sup> | 9 L        | 55 700 082     |
| GoBio Prod 330x250 Dsalt <sup>1</sup> | 21.4 L     | 55 700 094     |
| <b>Bulk resin</b>                     |            |                |
| WorkBeads Dsalt                       | 300 mL     | 40 360 003     |
|                                       | 1 L        | 40 360 010     |
|                                       | 5 L        | 40 360 050     |
|                                       | 10 L       | 40 360 060     |

<sup>1</sup> Packed on request.

Orders: [sales@bio-works.com](mailto:sales@bio-works.com) or contact your local distributor.

For more information about local distributor and products visit [www.bio-works.com](http://www.bio-works.com) or contact us at [info@bio-works.com](mailto:info@bio-works.com)

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