



## DATA SHEET

# WorkBeads 100S, WorkBeads 100Q, GoBio preppacked column family

WorkBeads™ 100S and WorkBeads resins for ion exchange chromatography (IEX) are designed for industrial scale purification of proteins, peptides and oligonucleotides by utilizing the difference in their surface charge.

WorkBeads 100S resin is a strong cation exchanger derivatized with sulfonate ligands. WorkBeads 100Q resin is a strong anion exchanger derivatized with quaternary amine ligands. These resins demonstrate the property of high-resolution separation while giving low backpressure facilitate both capture and polishing purification applications in standard bioprocess columns.

These resins are also available in several different ready-to-use preppacked column sizes, such as GoBio™ Screen 7x100 (3.8 mL), GoBio Prep 16x100 (20 mL), GoBio Prep 26x100 (53 mL) and GoBio Prod columns starting from 1 L.

- High throughput and scalability
- Reliable and reproducible results
- High chemical stability for easy cleaning-in-place
- Prepacked GoBio columns for convenience and reproducibility

## Resin description

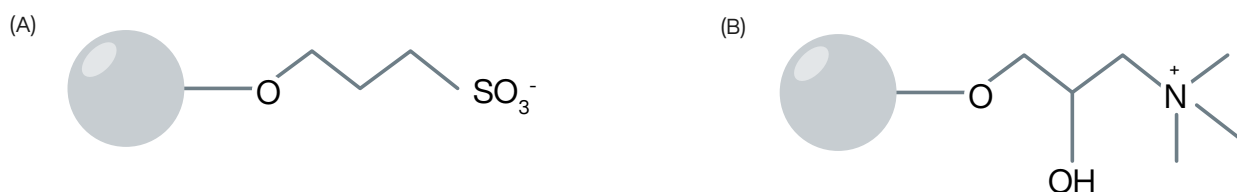
WorkBeads are agarose-based chromatographic resins manufactured using a proprietary method that results in porous beads with a tight size distribution and exceptional mechanical stability. Agarose based matrices have been successfully used for decades in biotechnology purification, from research to production scale, due to their exceptional compatibility with biomolecules including proteins, peptides, nucleic acids and carbohydrates. WorkBeads resins are designed for separations requiring optimal capacity and purity.



WorkBeads 100S is a strong cation exchange resin derivatized with sulfonates as functional groups. WorkBeads 100Q is a strong anion exchanger derivatized with quaternary amines as functional groups.

The functional groups are coupled to the resin via chemically stable linkages. The structures of the ligands used in WorkBeads 100S and WorkBeads 100Q are shown in Figure 1.

The main characteristics of WorkBeads 100S and WorkBeads 100Q resins are shown in Table 1. For more details, please see IN 10 200 010.



**Figure 1.** Structure of the ligand used in (A) WorkBeads 100S and (B) WorkBeads 100Q.

## Product description

**Table 1.** Main characteristics of WorkBeads 100S and WorkBeads 100Q resins.

	WorkBeads 100S	WorkBeads 100Q
Target substances	Proteins and peptides	Proteins, peptides and oligonucleotides
Matrix	Rigid, highly cross-linked agarose	Rigid, highly cross-linked agarose
Average particle size ( $D_{v50}$ ) <sup>1</sup>	90 – 110 $\mu\text{m}$	90 – 110 $\mu\text{m}$
Ionic group (ligand)	Sulfonate ( $-\text{SO}_3^-$ )	Quaternary amine ( $-\text{N}^+(\text{CH}_3)_3$ )
Ionic capacity	180 – 250 $\mu\text{mol H}^+/\text{mL resin}$	140 – 200 $\mu\text{mol Cl}^-/\text{mL resin}$
Dynamic binding capacity (DBC)	> 100 mg BSA/mL resin <sup>2</sup>	>40 mg BSA/mL resin <sup>3</sup>
Pressure flow characteristic	2 bar at 900 cm/h, 25 mm diameter column, 20 cm bed height	
Chemical stability <sup>4</sup>	Compatible with all standard aqueous buffers used for protein purification, 1 M NaOH, 30% isopropanol or 70% ethanol. Should not be stored at < pH 3 for prolonged time.	
Operational pH range <sup>5</sup>	3 – 12	2 – 13
CIP and screening pH range <sup>5</sup>	2 – 14	2 – 14
Storage	2 to 25°C in 20% ethanol with 0.2 M sodium acetate	2 to 25°C in 20% ethanol

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

<sup>2</sup> Dynamic binding capacity determined at 4 minutes residence time in the presence of 20 mM sodium citrate, pH 4.0.

<sup>3</sup> Dynamic binding capacity determined at 4 minutes residence time in the presence of 50 mM Tris-HCl, 50 mM NaCl, pH 8.0.

<sup>4</sup> See page 3 for more information.

<sup>5</sup> Within the operational pH range, the resin can be operated without significant change in function. Within the CIP (Cleaning-in-place) and screening pH range the resin can be subjected to the denoted pH range without significant change in function.

## 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 Screen and GoBio Prep columns.

	GoBio Screen 7x100	GoBio Prep 16x100	GoBio Prep 26x100
Column hardware	Acrylic	Acrylic	Acrylic
Top and bottom filters	Polyamide	Polyamide	Polyamide
Top and bottom plugs	Polypropylene	Polypropylene	Polypropylene
Connections	1/16" female (both ends)	1/16" female (both ends)	1/16" female (both ends)
Column volumes	3.8 mL	20 mL	53 mL
Column dimensions	7 × 100 mm	16 × 100 mm	26 × 100 mm
Max. column hardware pressure <sup>1</sup>	5 bar, 0.5 MPa, 70 psi	5 bar, 0.5 MPa, 70 psi	5 bar, 0.5 MPa, 70 psi
Chemical stability	1 M NaOH, 20% isopropanol, 20% ethanol	1 M NaOH, 20% isopropanol, 20% ethanol	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.

**Table 2.** Main characteristics of 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 (1L), 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.

## Applications

WorkBeads 100S and WorkBeads 100Q are designed for ion exchange chromatography (IEX). The resins can be used for industrial purification of proteins, peptides, viruses and oligonucleotides when high flow rate and low backpressure is required. The flow properties of these resins make them suitable for capture step purification where large volumes need to be processed. Following the capture step, during the enhance and polishing purification steps, there is less need for high flow rates, as the important requirement is high-resolution separation. Accordingly, it is recommended to select WorkBeads 40S and WorkBeads 40Q for these purification steps.

### Principle

Ion exchange chromatography separates biomolecules according to their surface charge. For example, proteins interact with different affinities with oppositely charged groups on the resin. This depends on the number of charges involved in the interaction and on the distribution

of the charges on the protein. The surface charge of proteins depends on the pH of their environment. When the pH is equal to the isoelectric point (pI) of the protein the net charge is zero. At pH values below the pI the net charge will be positive, and at a pH above the pI the net charge will be negative.

It should be noted that the interaction between the protein and the resin surface is dependent on the charge distribution on the surface on the protein.

A protein may therefore also interact with an ion exchange resin at the isoelectric point. The likelihood of binding to either the cation or the anion exchange resin will increase as the pH moves away from the pI.

IEX is one of the most frequently used chromatography techniques because of its versatility and ability to separate proteins even with small differences in charge and it is also used as a concentration step. It is also one of the more cost-efficient chromatography techniques and is therefore excellent for scale-up.

These resins are designed for industrial-scale purification of proteins, peptides and oligonucleotides. The particle size has been selected to enable good resolution at low backpressure with high flow rates and are therefore excellent in the capture step during purification when usually high sample volumes are handled.

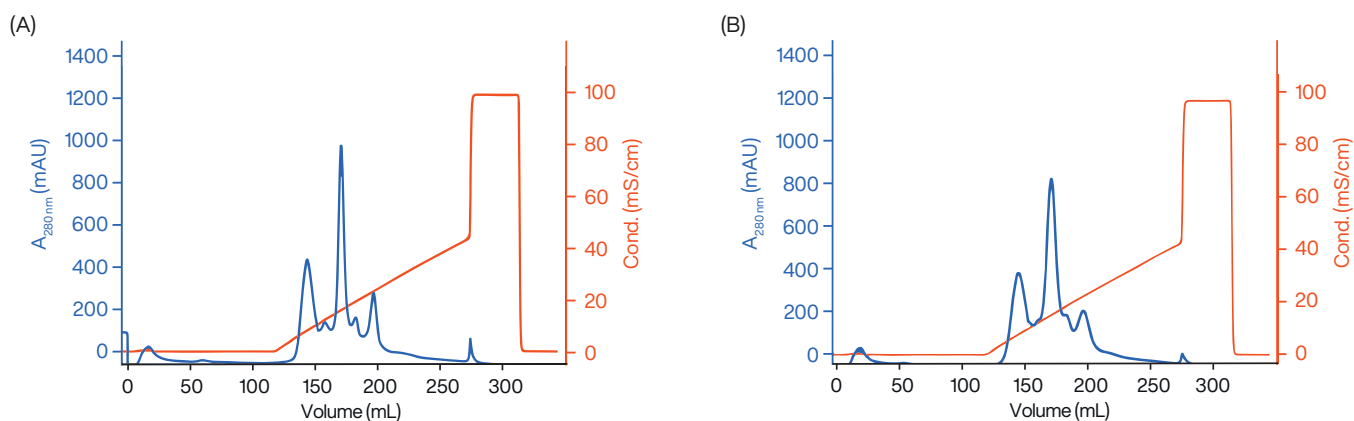
### Protein resolution

A comparison between WorkBeads 40Q and WorkBeads 100Q resolution shows a similar selectivity pattern with an improved resolution for WorkBeads 40Q (see Figure 2). Corresponding chromatograms for WorkBeads 100S compared to WorkBeads 40S is shown in Figure 3. This is due to the different size of the beads.

The larger WorkBeads 100 resins are designed for capture steps where the focus is rapid enrichment of the target substance, rather than high resolution. Elution is routinely carried out using step gradients. Further enhancement and polishing of the pure target protein can be optimized as required using WorkBeads 40 resins designed for higher resolution.

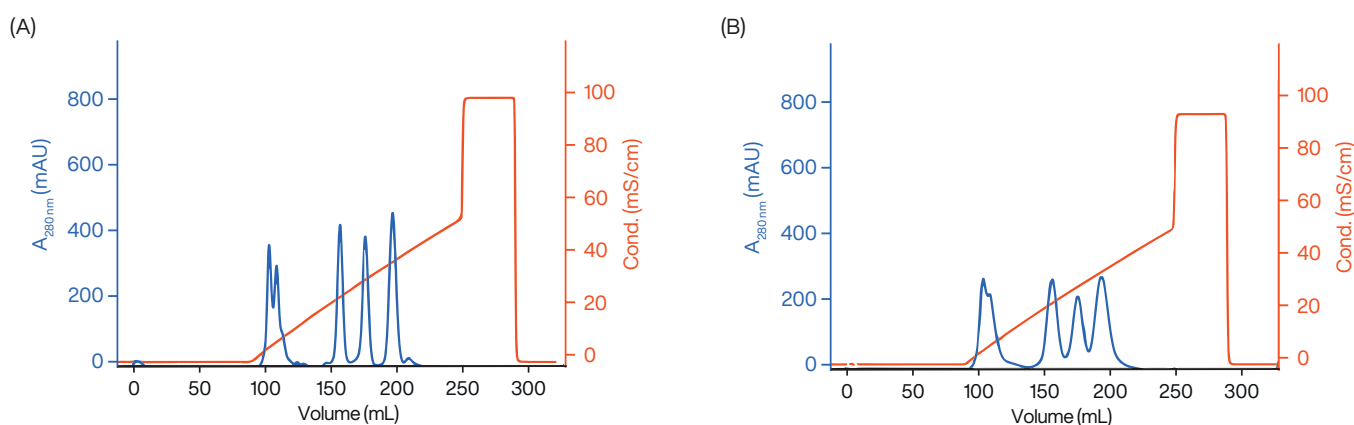
The smaller bead size of WorkBeads 40 resins gives higher resolution and more narrow peaks, whereas WorkBeads 100 resins gives the same selectivity but broader peaks. The advantage of WorkBeads 100 resins is their low backpressure allowing higher flow rates and longer columns.

Column: (A) WorkBeads 40Q, (B) WorkBeads 100Q, 7.9 mL  
 Binding buffer: 50 mM Tris-HCl, pH 7.4  
 Elution buffer: 50 mM Tris HCl, 1 M NaCl, pH 7.4  
 Sample: 10 mL 0.45 mg/mL apo-transferrin, 0.7 mg/mL  $\alpha$ -lactalbumin, 1.4 mg/mL soybean trypsin inhibitor in binding buffer  
 Flow rate: 2.0 mL/min (150 cm/h), 4 minutes residence time  
 Gradient: 0 - 40% elution buffer, 20 column volume (CV)



**Figure 2.** Chromatogram from resolution comparison between WorkBeads 40Q (A) and WorkBeads 100Q (B).

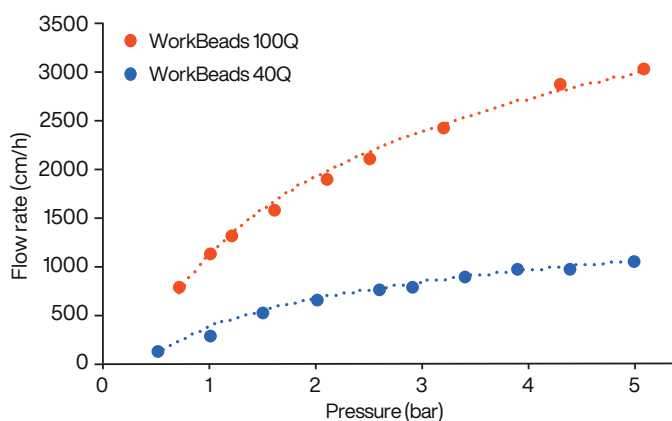
Column: (A) WorkBeads 40S, (B) WorkBeads 100S, 7.9 mL  
 Binding buffer: 50 mM MES, pH 6.0  
 Elution buffer: 50 mM MES, 1 M NaCl, pH 6.0  
 Sample: 2.5 mL 15 mg/mL concanavalin A, 15 mg/mL  $\alpha$ -chymotrypsinogen A, 1.5 mg/mL ribonuclease A, 0.5 mg/mL lysozyme in binding buffer  
 Flow rate: 2.0 mL/min (150 cm/h), 4 min residence time  
 Gradient: 0 - 50% elution buffer, 20 CV



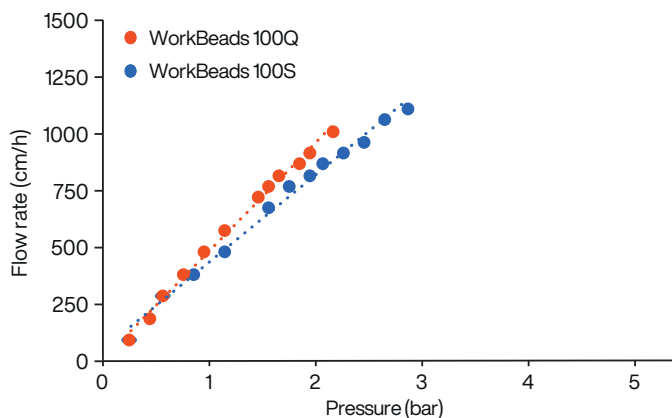
**Figure 3.** Chromatogram of selectivity on two different cation exchange resins, WorkBeads 40S (A) and WorkBeads 100S (B).

## Large sample loading and volume

The WorkBeads 100 resins have very strong mechanical resistance and generate low backpressure due to the relatively large particle size (see Figures 4 and 5). The resins therefore represent an excellent choice for purification when high flow rate is required to handle large sample volumes and to minimise processing time. Increasing the flow rate means that the contact time is reduced. To adjust for this a longer column can be used while keeping the backpressure acceptably low. This is a critical feature for large processes where short cycle times are important.



**Figure 4.** Pressure-flow properties of WorkBeads 100Q and WorkBeads 40Q. The data was obtained using distilled water passed through a 10 mm (i.d.) × 200 mm bed of resin in a glass column. The bed was open, i.e., the top adaptor was not pushed towards the chromatography bed.



**Figure 5.** Pressure to flow rate properties of WorkBeads 100Q and WorkBeads 100S. Pressure-flow properties obtained in distilled water, glass column dimension of 20 cm bed height, diameter 25 mm.

## 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 bed. Fouling is typical even for well-clarified samples. The severity of this process depends on the composition of sample applied to the column. These adsorbed impurities will reduce the performance of the column over time.

Regular cleaning (Cleaning-in-place, CIP) keeps the resin clean, reduces the rate of further fouling, and maintains the capacity, resolution and flow properties of the column. Cleaning of a column using 1 M NaOH using a low reversed flow for 2 hours or overnight is often sufficient.

Sanitization (reduction of microorganisms) can be carried out using combinations of NaOH and ethanol (e.g., incubation with a mixture of 0.5 M NaOH and 40% ethanol for 3 hours). The sanitization procedure and its effectiveness will depend on the microorganisms to be sanitized and needs to be evaluated for each case.

## Storage

Store at 2 to 25°C in 20% ethanol.

For WorkBeads 100S it is recommended to include 0.2 M sodium acetate in the storage solution.

For prolonged storage of the prepacked GoBio Screen and 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 S 1 mL	1 mL × 5	45 200 103
GoBio Mini Q 1 mL	1 mL × 5	45 100 103
GoBio Mini Dsalt 1 mL	1 mL × 5	45 360 103
GoBio Mini S 5 mL	5 mL × 5	45 200 107
GoBio Mini Q 5 mL	5 mL × 5	45 100 107
GoBio Mini Dsalt 5 mL	5 mL × 5	45 360 107
GoBio Prep 16x100 40S	20 mL × 1	55 420 021
GoBio Prep 16x100 40Q	20 mL × 1	55 410 021
GoBio Prep 16x100 Dsalt <sup>2</sup>	20 mL × 1	55 700 021
GoBio Prep 26x100 40S	53 mL × 1	55 420 031
GoBio Prep 26x100 40Q	53 mL × 1	55 410 031
GoBio Prep 26x100 Dsalt	53 mL × 1	55 700 031
GoBio Prod 80x200 40S <sup>2</sup>	1 L	55 420 042
GoBio Prod 80x200 40Q <sup>2</sup>	1 L	55 410 042
GoBio Prod 130x200 40S <sup>2</sup>	2.7 L	55 420 062
GoBio Prod 130x200 40Q <sup>2</sup>	2.7 L	55 410 062
GoBio Prod 200x200 40S <sup>2</sup>	6 L	55 420 072
GoBio Prod 200x200 40Q <sup>2</sup>	6 L	55 410 072
GoBio Prod 240x200 40S <sup>2</sup>	9 L	55 420 082
GoBio Prod 240x200 40Q <sup>2</sup>	9 L	55 410 082
GoBio Prod 330x250 40S <sup>2</sup>	21.4 L	55 420 093
GoBio Prod 330x250 40Q <sup>2</sup>	21.4 L	55 410 093
<b>Bulk resins</b>		
WorkBeads 40S	25 mL	40 200 001
	200 mL	40 200 002
	1 L	40 200 010
WorkBeads 40Q	25 mL	40 100 001
	200 mL	40 100 002
	1 L	40 100 010
WorkBeads Dsalt	300 mL	40 360 003
	1 L	40 360 010

<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> Packed on request.

## Ordering information

Product name	Pack size	Article number
<b>Prepacked columns</b>		
GoBio Screen 7x100 100S <sup>1</sup>	3.8 mL × 1	55 120 001
GoBio Screen 7x100 100Q <sup>1</sup>	3.8 mL × 1	55 110 001
GoBio Prep 16x100 100S <sup>1</sup>	20 mL × 1	55 120 021
GoBio Prep 16x100 100Q <sup>1</sup>	20 mL × 1	55 110 021
GoBio Prep 26x100 100S <sup>1</sup>	53 mL × 1	55 120 031
GoBio Prep 26x100 100Q <sup>1</sup>	53 mL × 1	55 110 031
GoBio Prod 80x200 100S <sup>1</sup>	1 L	55 120 042
GoBio Prod 80x200 100Q <sup>1</sup>	1 L	55 110 042
GoBio Prod 130x200 100S <sup>1</sup>	2.7 L	55 120 052
GoBio Prod 130x200 100Q <sup>1</sup>	2.7 L	55 110 062
GoBio Prod 200x200 100S <sup>1</sup>	6 L	55 120 072
GoBio Prod 200x200 100Q <sup>1</sup>	6 L	55 110 072
GoBio Prod 240x200 100S <sup>1</sup>	9 L	55 120 082
GoBio Prod 240x200 100Q <sup>1</sup>	9 L	55 110 082
GoBio Prod 330x250 100S <sup>1</sup>	21.4 L	55 120 093
GoBio Prod 330x250 100Q <sup>1</sup>	21.4 L	55 110 093
<b>Bulk resins</b>		
WorkBeads 100S	25 mL	10 200 001
	200 mL	10 200 002
	1 L	10 200 010
	5 L	10 200 050
	10 L	10 200 060
WorkBeads 100Q	25 mL	10 100 001
	200 mL	10 100 002
	1 L	10 100 010
	5 L	10 100 050
	10 L	10 100 060

<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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