Bio-Works

DATA SHEET

WorkBeads pre-charged IMAC resins His-tag Screening kits GoBio prepacked columns

WorkBeads 40 Ni-NTA, WorkBeads 40 Co-NTA, WorkBeads 40 Cu-NTA, WorkBeads 40 Zn-NTA, WorkBeads 40 Ni-IDA, WorkBeads 40 Co-IDA, WorkBeads 40 Cu-IDA and WorkBeads 40 Zn-IDA

These products comprise of WorkBeads™ 40 NTA and WorkBeads 40 IDA resins pre-charged with Ni^{2+}, Co^{2+}, Cu^{2+}, or Zn^{2+} ions to be used for Immobilized Metal Ion Affinity Chromatography (IMAC). These resins are designed for purification of poly-histidine tagged (His-tagged) proteins or other metal ion binding proteins. Metal ions have different affinities for these types of proteins which results in resins with slightly different selectivities. These eight different resins are available as GoBio™ Mini His-tag Screening kits for fast and convenient screening for finding optimal metal ion to use for highest purity. Every individual resin is also available in different prepacked ready-to-use GoBio column formats.

- Pre-charged resins with different metal ions for ease of use and for optimal purity of the target protein
- High binding capacity and flow properties
- Prepacked GoBio columns for convenience and reproducibility
- GoBio Mini His-tag Screening kits for finding optimal purity

Resin description

WorkBeads are agarose-based chromatographic resins manufactured using 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 research from laboratory to production scale, due to their high compatibility with biomolecules including proteins, peptides, nucleic acids, and carbohydrates. WorkBeads resins are designed for separations that requiring optimal capacity and purity.

WorkBeads 40 Ni-NTA, WorkBeads 40 Co-NTA, WorkBeads 40 Cu-NTA and WorkBeads 40 Zn-NTA are based on WorkBeads 40 NTA with a chelating ligand based on nitrilotriacetic acid (NTA).

WorkBeads 40 Ni-IDA, WorkBeads 40 Co-IDA, WorkBeads 40 Cu-IDA and WorkBeads 40 Zn-IDA are based on WorkBeads 40 IDA with a chelating ligand based on iminodiacetic acid (IDA).

The pre-charged WorkBeads 40 NTA and WorkBeads 40 IDA resins are available with four metal ions: Ni^{2+}, Co^{2+}, Cu^{2+} or Zn^{2+} as denoted in their names.

The structures of the chelating ligands used in WorkBeads 40 NTA and WorkBeads 40 IDA are shown in Figure 1.

The main characteristics of these resins are shown in Table 1 and Table 2. For more details, please see instruction IN 40 650 010.

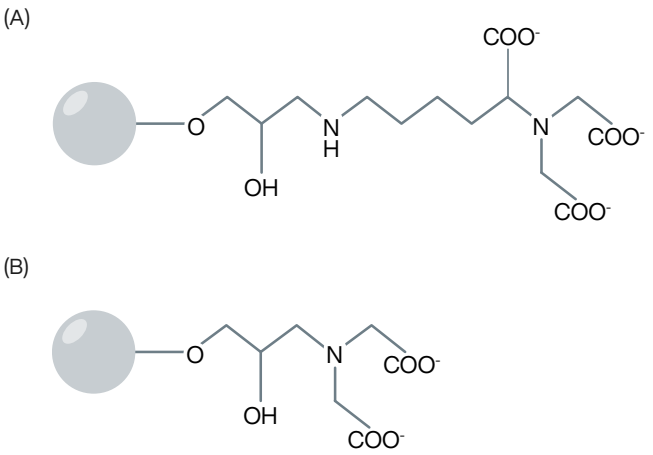

Figure 1. Structure of the chelating ligand used in WorkBeads 40 NTA (A) and WorkBeads 40 IDA (B) resins.

Table 1. Main characteristics of WorkBeads 40 Ni-NTA, WorkBeads 40 Co-NTA, WorkBeads 40 Cu-NTA and WorkBeads 40 Zn-NTA resins.

	WorkBeads 40 Ni-NTA	**WorkBeads 40 Co-NTA**	**WorkBeads 40 Cu-NTA**	**WorkBeads 40 Zn-NTA**
Target substance	His-tagged proteins, proteins containing histidine cysteine and/or tryptophan amino acid side chains			
Matrix	Highly cross-linked agarose	Highly cross-linked agarose	Highly cross-linked agarose	Highly cross-linked agarose
Average particle size (D_{V50})[1]	45 µm	45 µm	45 µm	45 µm
Chelating ligand	Nitrilotriacetic acid (NTA)	NTA	NTA	NTA
Metal ion	Nickel (II)	Cobalt (II)	Copper (II)	Zink (II)
Metal ion capacity for the chelating ligand[2]	NA	NA	50 – 60 µmol Cu^{2+}/mL resin	NA
Dynamic binding capacity[3]	> 60 mg His_6-GFP/mL resin	NA	NA	NA
Max flow rate (20 cm bed height and 5 bar)	600 cm/h	600 cm/h	600 cm/h	600 cm/h
Chemical stability	Compatible with all standard aqueous buffers used for protein purification, 8 M urea, 6 M guanidine-HCl, non-ionic detergents, 20% ethanol. Chelating substances (e.g. EDTA) will strip off the metal ions. Stripped resin: 10 mM HCl (pH 2), 10 mM NaOH (pH 12), 10 mM sodium citrate-HCl (pH 3)			
pH stability	7 – 9 (working range) 2 – 12 cleaning (stripped resin)	7 – 9 (working range) 2 – 12 cleaning (stripped resin)	7 – 9 (working range) 2 – 12 cleaning (stripped resin)	7 – 9 (working range) 2 – 12 cleaning (stripped resin)
Storage	2 to 25 °C	2 to 25 °C	2 to 25 °C	2 to 25 °C

[1] The median particle size of the cumulative volume distribution.
[2] Metal ion capacity is determined by frontal analysis at 50% breakthrough using cupper solution.
[3] The binding capacity is determined using a GoBio Ni-NTA 1 mL. The binding capacity is dependent on the size of the target protein, and on the competition of impurities.

Table 2. Main characteristics of WorkBeads 40 Ni-IDA, WorkBeads 40 Co-IDA, WorkBeads 40 Cu-IDA and WorkBeads 40 Zn-IDA resins.

	WorkBeads 40 Ni-IDA	WorkBeads 40 Co-IDA	WorkBeads 40 Cu-IDA	WorkBeads 40 Zn-IDA
Target substance	His-tagged proteins, proteins containing histidine cysteine and/or tryptophan amino acid side chains.			
Matrix	Highly cross-linked agarose	Highly cross-linked agarose	Highly cross-linked agarose	Highly cross-linked agarose
Average particle size (D_{V50})[1]	45 µm	45 µm	45 µm	45 µm
Chelating ligand	Iminodiacetic acid (IDA)	IDA	IDA	IDA
Metal ion	Nickel (II)	Cobalt (II)	Copper (II)	Zink (II)
Metal ion capacity for the chelating ligand[2]	NA	NA	50 – 60 µmol Cu^{2+}/mL resin	NA
Dynamic binding capacity[3]	> 60 mg His_6-GFP/mL resin	NA	NA	NA
Max flow rate (20 cm bed height and 5 bar)	600 cm/h	600 cm/h	600 cm/h	600 cm/h
Chemical stability	Compatible with all standard aqueous buffers used for protein purification, 8 M urea, 6 M guanidine-HCl, non-ionic detergents, 20% ethanol. Chelating substances (e.g. EDTA) will strip off the metal ions. Stripped resin: 10 mM HCl (pH 2), 10 mM NaOH (pH 12), 10 mM sodium citrate-HCl (pH 3).			
pH stability	7 – 9 (working range) 2 – 12 cleaning (stripped resin)	7 – 9 (working range) 2 – 12 cleaning (stripped resin)	7 – 9 (working range) 2 – 12 cleaning (stripped resin)	7 – 9 (working range) 2 – 12 cleaning (stripped resin)
Storage	2 to 25 °C	2 to 25 °C	2 to 25 °C	2 to 25 °C

[1] The median particle size of the cumulative volume distribution.
[2] Metal ion capacity is determined by frontal analysis at 50% breakthrough using cupper solution.
[3] The binding capacity is determined using a GoBio Ni-NTA 1 mL, equal value is expected for IDA resins.

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.

GoBio Mini His-tag NTA Screening kit
GoBio Mini His-tag IDA Screening kit

The two different GoBio Mini His-tag Screening kits contain one 1 mL or 5 mL of each of the four GoBio Mini columns prepacked with WorkBeads NTA and WorkBeads IDA charged with Ni^{2+}, Co^{2+}, Cu^{2+} or Zn^{2+} ions. The kits are excellent tools for screening combinations of metal ions and chelating ligand (NTA or IDA) to optimize purity and yield when purifying polyhistidine-tagged (His-tagged) proteins. Other native proteins containing histidine, cysteine and tryptophan residues may also bind and can therefore be purified using these columns.

The main characteristics of GoBio Mini His-tag Screening kit columns are shown in Table 3. For more details, please see instructions IN 45 700 010.

Table 3. Main characteristics of GoBio Mini, GoBio Screen and GoBio Prep columns.

	GoBio Mini 1 mL & 5 mL	GoBio Screen 7x100	GoBio Prep 16x100	GoBio Prep 26x100
Column hardware	Polypropylene	Acrylic	Acrylic	Acrylic
Top and bottom filters	Polyethylene	Polyamide	Polyamide	Polyamide
Top and bottom plugs	Polypropylene	Polypropylene	Polypropylene	Polypropylene
Connections	1/16" female (top) 1/16" male (bottom)	1/16" female (both ends)	1/16" female (both ends)	1/16" female (both ends)
Column volumes	1 mL and 5 mL	3.8 mL	20 mL	53 mL
Column dimensions	7 × 28 mm (1 mL) 13 × 38 mm (5 mL)	7 × 100 mm	16 × 100 mm	26 × 100 mm
Max. column hardware pressure[1]	0.3 MPa, 3 bar, 43 psi	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, 30% isopropanol, 70% ethanol	1 M NaOH, 20% isopropanol, 20% ethanol	1 M NaOH, 20% isopropanol, 20% ethanol	1 M NaOH, 20% isopropanol, 20% ethanol

[1] 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 4. 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 (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[1]	5 bar, 0.5 MPa, 70 psi
Chemical stability	1 M NaOH, 20% isopropanol, 20 % ethanol

[1] 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

Metal ion charged WorkBeads 40 NTA and WorkBeads 40 IDA resins are designed to be used in Immobilized Metal Ion Affinity Chromatography (IMAC).

Principle

IMAC utilizes the affinity of histidine, cysteine, and tryptophan amino acid side chains on the protein surface for transition metal ions, such as Ni^{2+}, Co^{2+}, Cu^{2+} and Zn^{2+}, immobilized via a metal chelating ligand on the chromatography resin.

IMAC is commonly used for purification of recombinant His-tagged proteins. The His-tag is usually composed of six to ten histidyl groups and is typically placed at the N- or C-terminus of the target protein, although other positions are possible. His-tagged proteins will bind to the chelating ligand (through the metal ion) and the unbound material will pass through the column. The bound proteins are desorbed by stepwise or gradient elution, using a competing agent, such as imidazole or lower pH.

Imidazole is recommended for elution. This is the most common used competing agent but histidine, ammonium chloride or histamine can also be used. Before sample application the resin should be equilibrated with a low concentration of the competing agent to prevent non-specific binding of endogenous proteins that may bind via histidine clusters for example. This is done easily by using the recommended binding buffer.

Elution with a decrease of pH is also an option. At pH 3 – 5, the histidine residues (pK_a approx. 6) are protonated which leads to the loss of affinity for the metal ion and thus to the release of the protein. However, it is important to consider the target protein stability at low pH.

For more detailed description of the IMAC principle, see instruction IN 40 650 010.

Purification of His-tagged proteins

Figure 2 shows an example of purification of clarified histidine-tagged Green Fluorescent Protein (His_6-GFP) expressed in *E. coli* using GoBio Mini Ni-NTA 1 mL column.

GoBio Mini Ni-NTA 1 mL and 5 mL columns can be used to purify up to 70 mg or 350 mg of proteins, respectively. Similar capacities can be expected for the other GoBio IMAC columns.

The purity that can be obtained depends on several factors. A sample including impurities that can bind to the resin may reduce the purity of the target protein. Proteins expressed in *E. coli* are usually easier to purify than proteins expressed in eukaryotic systems (e.g., yeast or mammalian cells) when instead the specific developed WorkBeads NiMAC resin usually performs better, see DS 40 653 010. The purification result also depends on the structure of the chelating ligand and the nature of the immobilized metal ion.

The broad selection of GoBio IMAC columns offers many possibilities. Choosing between two different ligands, NTA or IDA, charged with either Ni^{2+}, Co^{2+}, Cu^{2+} or Zn^{2+} metal ions.

GoBio Mini Ni-NTA is recommended as the starting point for His-tagged protein purification as it in many cases will give excellent purification results. For more difficult purifications, a screening is recommended with the different GoBio Mini IMAC columns to find the optimal combination of ligand and metal ion. For very high purity requirements, it is common to add a second purification step to remove the final impurities and for buffer exchange and salt removal. This can be done by using size exclusion chromatography (gel filtration), such as WorkBeads SEC resins, also available in GoBio Prep columns.

Screening for optimal purification of His-tagged proteins

An example of a screening using the eight different precharged GoBio Mini IMAC columns for purification of a recombinant His_6-tagged Green Fluorescent Protein (His_6-GFP) expressed in *E. coli* is shown in Figure 3.

Column:	GoBio Mini Ni-NTA 1 mL
Sample:	40 mL His_6-GFP in binding buffer
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
Elution:	100% elution buffer in 5 CV
Elution flow rate:	0.5 mL/min (78 cm/h)

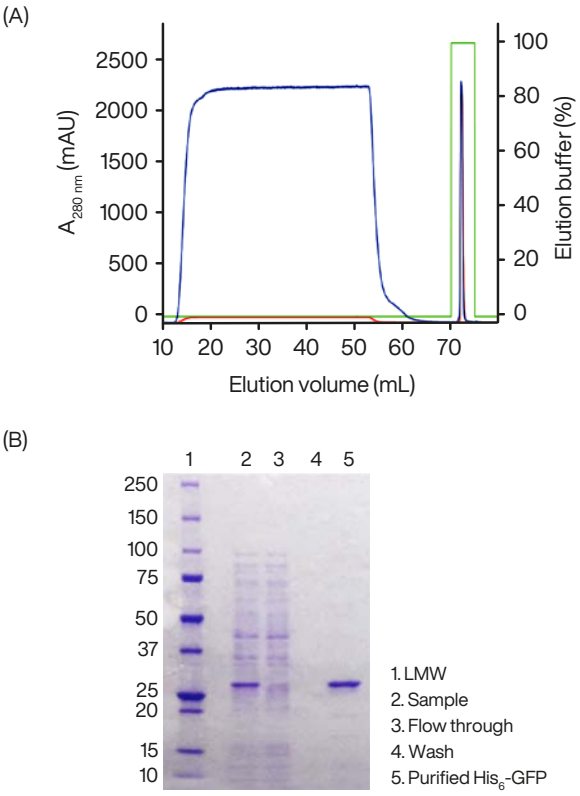

Figure 2. Purification of clarified His_6-GFP on WorkBeads 40 Ni-NTA packed into a GoBio Mini 1 mL column. (A) Chromatogram of the capture and elution of His_6-GFP. Absorbance at 280 nm (blue), absorbance at 490 nm (red) and percentage of elution buffer (green). (B) SDS-PAGE analysis of sample, flow through, wash and eluted peak

Columns:	GoBio Mini Ni-NTA 1 mL, GoBio Mini Co-NTA 1 mL, GoBio Mini Zn-NTA 1 mL, GoBio Mini Cu-NTA 1 mL, GoBio Mini Ni-IDA 1 mL, GoBio Mini Co-IDA 1 mL, GoBio Mini Zn-IDA 1 mL, GoBio Mini Cu-IDA 1 mL
Sample:	10 mL clarified extract with His-tagged Green Fluorescent Protein (His_6-GFP) expressed in *E. coli*
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 with His-tagged Green Fluorescent Protein (His_6-GFP) expressed in *E. coli*
Flow rate:	1 mL/min (150 cm/h)
Gradient:	0 – 100% elution buffer, 20 CV

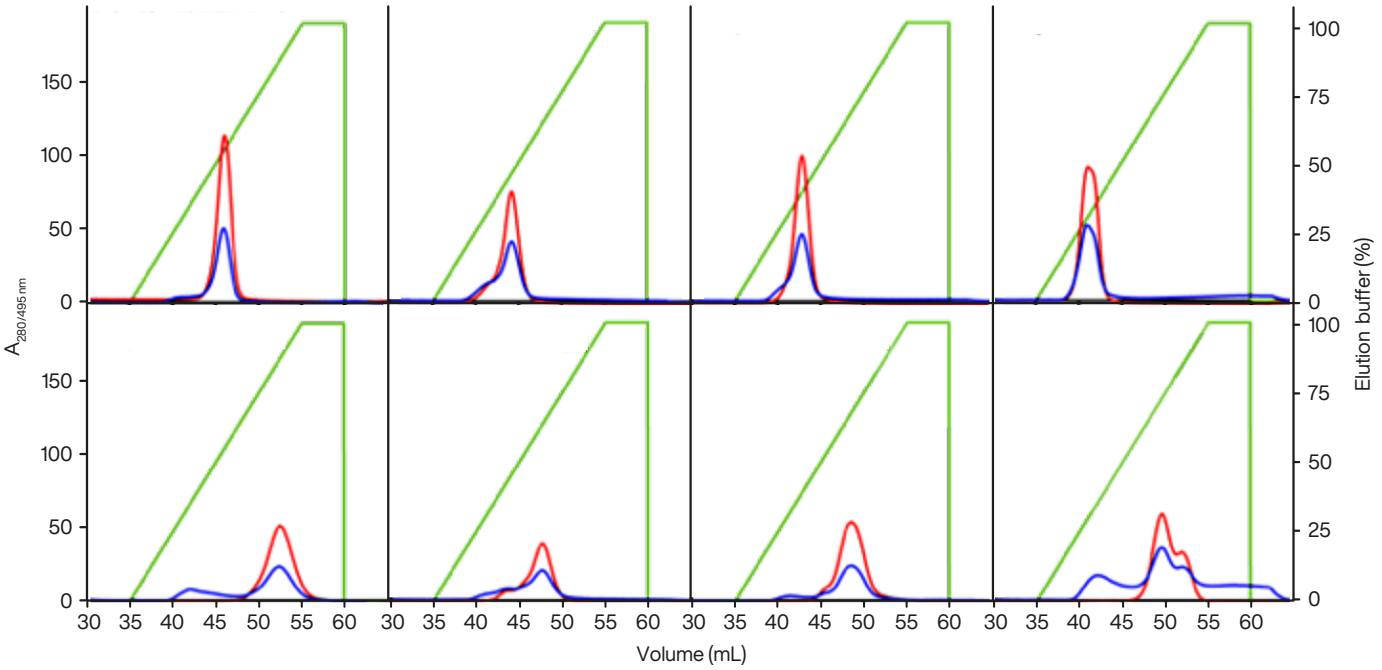

Figure 3. Comparison of purifications of His_6-GFP on NTA 1 GoBio Mini and GoBio Mini IDA 1 mL charged with Ni^{2+}, Co^{2+}, Cu^{2+} and Zn^{2+}
Blue line: absorbance at 280 nm. Red line: absorbance at 495 nm (specific for His_6-GFP). Green line: elution buffer, %.

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 severity of this process 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.

Cleaning with 1 M NaOH applied by a low reversed flow for 2 hours or overnight is often sufficient. Before cleaning of IMAC resins the metal ions must be removed from the resin using, for example, 50 mM Na_2EDTA, pH 8.5. After the cleaning, the resin can be re-charged with fresh metal ions, see the Instructions for details.

Sanitization (reduction of microorganisms) is done by 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 removed and needs to be evaluated for each case.

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.

Equilibrate the prepacked columns with 20% ethanol and close it securely. Store the column at 2 to 25°C.

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[1]	Article number
Prepacked columns		
GoBio Mini NTA 1 mL	1 mL × 5	45 655 113
GoBio Mini NTA 5 mL	5 mL × 5	45 655 117
GoBio Mini IDA 1 mL	1 mL × 5	45 655 013
GoBio Mini IDA 5 mL	5 mL × 5	45 655 017
GoBio Mini Dsalt 1 mL	1 mL × 5	45 360 103
GoBio Mini Dsalt 5 mL	5 mL × 5	45 360 107
GoBio Screen 7x100 NTA	3.8 mL × 1	55 602 001
GoBio Screen 7x100 IDA[2]	3.8 mL × 1	55 601 001
GoBio Prep 16x100 NTA[2]	20 mL × 1	55 602 021
GoBio Prep 16x100 IDA[2]	20 mL × 1	55 601 021
GoBio Prep 16x100 Dsalt[2]	20 mL × 1	55 700 021
GoBio Prep 26x100 NTA[2]	53 mL × 1	55 602 031
GoBio Prep 26x100 IDA[2]	53 mL × 1	55 601 031
GoBio Prep 26x100 Dsalt	53 mL × 1	55 700 031
Bulk resins		
WorkBeads 40 NTA	25 mL 150 mL	40 602 001 40 602 003
WorkBeads 40 IDA	25 mL 150 mL	40 601 001 40 601 003
WorkBeads Dsalt	300 mL	40 360 003

[1] Other pack sizes can be found in the complete product list on www.bio-works.com
[2] Packed on request.

Ordering information

Product name	Pack size	Article number
Prepacked column		
GoBio Mini NTA His-tag Screening kit 1 mL[1]	1 mL × 4	45 700 101
GoBio Mini NTA His-tag Screening kit 5 mL[1]	5 mL × 4	45 700 102
GoBio Mini IDA His-tag Screening kit 1 mL[1]	1 mL × 4	45 700 001
GoBio Mini IDA His-tag Screening kit 5 mL[1]	5 mL × 4	45 700 002
GoBio Mini Ni-NTA 1 mL	1 mL × 5	45 655 103
GoBio Mini Ni-NTA 5 mL	5 mL × 5	45 655 107
GoBio Mini Co-NTA 1 mL	1 mL × 5	45 655 133
GoBio Mini Co-NTA 5 mL	5 mL × 5	45 655 137
GoBio Mini Cu-NTA 1 mL	1 mL × 5	45 655 123
GoBio Mini Cu-NTA 5 mL	5 mL × 5	45 655 127
GoBio Mini Zn-NTA 1 mL	1 mL × 5	45 655 143
GoBio Mini Zn-NTA 5 mL	5 mL × 5	45 655 147
GoBio Mini Ni-IDA 1 mL	1 mL × 5	45 655 003
GoBio Mini Ni-IDA 5 mL	5 mL × 5	45 655 007
GoBio Mini Co-IDA 1 mL	1 mL × 5	45 655 033
GoBio Mini Co-IDA 5 mL	5 mL × 5	45 655 037
GoBio Mini Cu-IDA 1 mL	1 mL × 5	45 655 023
GoBio Mini Cu-IDA 5 mL	5 mL × 5	45 655 027
GoBio Mini Zn-IDA 1 mL	1 mL × 5	45 655 043
GoBio Mini Zn-IDA 5 mL	5 mL × 5	45 655 047
GoBio Screen 7x100 Ni-NTA[2]	3.8 mL × 1	55 651 001
GoBio Screen 7x100 Co-NTA[2]	3.8 mL × 1	55 651 401
GoBio Screen 7x100 Cu-NTA[2]	3.8 mL × 1	55 651 301
GoBio Screen 7x100 Zn-NTA[2]	3.8 mL × 1	55 651 501
GoBio Screen 7x100 Ni-IDA[2]	3.8 mL × 1	55 650 001
GoBio Screen 7x100 Co-IDA[2]	3.8 mL × 1	55 650 401
GoBio Screen 7x100 Cu-IDA[2]	3.8 mL × 1	55 650 301
GoBio Screen 7x100 Zn-IDA[2]	3.8 mL × 1	55 650 501
GoBio Prep 16x100 Ni-NTA[2]	20 mL × 1	55 651 021
GoBio Prep 16x100 Co-NTA[2]	20 mL × 1	55 651 421
GoBio Prep 16x100 Cu-NTA[2]	20 mL × 1	55 651 321
GoBio Prep 16x100 Zn-NTA[2]	20 mL × 1	55 651 521
GoBio Prep 16x100 Ni-IDA[2]	20 mL × 1	55 650 021

Product name	Pack size	Article number
GoBio Prep 16x100 Co-IDA[2]	20 mL × 1	55 650 421
GoBio Prep 16x100 Cu-IDA[2]	20 mL × 1	55 650 321
GoBio Prep 16x100 Zn-IDA[2]	20 mL × 1	55 650 521
GoBio Prep 26x100 Ni-NTA[2]	53 mL × 1	55 651 031
GoBio Prep 26x100 Co-NTA[2]	53 mL × 1	55 651 431
GoBio Prep 26x100 Cu-NTA[2]	53 mL × 1	55 651 331
GoBio Prep 26x100 Zn-NTA[2]	53 mL × 1	55 651 531
GoBio Prep 26x100 Ni-IDA[2]	53 mL × 1	55 650 031
GoBio Prep 26x100 Co-IDA[2]	53 mL × 1	55 650 431
GoBio Prep 26x100 Cu-IDA[2]	53 mL × 1	55 650 331
GoBio Prep 26x100 Zn-IDA[2]	53 mL × 1	55 650 531
GoBio Prod 80x200 Ni-NTA[2]	1 L	55 651 041
GoBio Prod 130x200 Ni-NTA[2]	2.7 L	55 651 062
GoBio Prod 200x200 Ni-NTA[2]	6 L	55 651 072
GoBio Prod 240x200 Ni-NTA[2]	9 L	55 651 082
GoBio Prod 330x250 Ni-NTA[2]	21.4 L	55 651 093
GoBio Prod 80x200 Co-NTA[2]	1 L	55 651 442
GoBio Prod 130x200 Co-NTA[2]	2.7 L	55 651 462
GoBio Prod 200x200 Co-NTA[2]	6 L	55 651 472
GoBio Prod 240x200 Co-NTA[2]	9 L	55 651 482
GoBio Prod 330x250 Co-NTA[2]	21.4 L	55 651 493
GoBio Prod 80x200 Cu-NTA[2]	1 L	55 651 342
GoBio Prod 130x200 Cu-NTA[2]	2.7 L	55 651 362
GoBio Prod 200x200 Cu-NTA[2]	6 L	55 651 372
GoBio Prod 240x200 Cu-NTA[2]	9 L	55 651 382
GoBio Prod 330x250 Cu-NTA[2]	21.4 L	55 651 393
GoBio Prod 80x200 Zn-NTA[2]	1 L	55 651 542
GoBio Prod 130x200 Zn-NTA[2]	2.7 L	55 651 562
GoBio Prod 200x200 Zn-NTA[2]	6 L	55 651 572
GoBio Prod 240x200 Zn-NTA[2]	9 L	55 651 582
GoBio Prod 330x250 Zn-NTA[2]	21.4 L	55 655 193
GoBio Prod 80x200 Ni-IDA[2]	1 L	55 650 042
GoBio Prod 130x200 Ni-IDA[2]	2.7 L	55 650 062
GoBio Prod 200x200 Ni-IDA[2]	6 L	55 650 072
GoBio Prod 240x200 Ni-IDA[2]	9 L	55 650 082
GoBio Prod 330x250 Ni-IDA[2]	21.4 L	55 650 093
GoBio Prod 80x200 Co-IDA[2]	1 L	55 650 442
GoBio Prod 130x200 Co-IDA[2]	2.7 L	55 650 462
GoBio Prod 200x200 Co-IDA[2]	6 L	55 650 472
GoBio Prod 240x200 Co-IDA[2]	9 L	55 650 482
GoBio Prod 330x250 Co-IDA[2]	21.4 L	55 650 493
GoBio Prod 80x200 Cu-IDA[2]	1 L	55 650 342
GoBio Prod 130x200 Cu-IDA[2]	2.7 L	55 650 362
GoBio Prod 200x200 Cu-IDA[2]	6 L	55 650 372
GoBio Prod 240x200 Cu-IDA[2]	9 L	55 650 382
GoBio Prod 330x250 Cu-IDA[2]	21.4 L	55 650 393
GoBio Prod 80x200 Zn-IDA[2]	1 L	55 650 542
GoBio Prod 130x200 Zn-IDA[2]	2.7 L	55 650 562
GoBio Prod 200x200 Zn-IDA[2]	6 L	55 650 572
GoBio Prod 240x200 Zn-IDA[2]	9 L	55 650 582
GoBio Prod 330x250 Zn-IDA[2]	21.4 L	55 650 593
Bulk resin		
WorkBeads 40 Ni-NTA	25 ml 150 ml 1 L	40 651 001 40 651 003 40 651 010
WorkBeads 40 Co-NTA	25 ml 150 ml 1 L	40 651 401 40 651 403 40 651 410
WorkBeads 40 Cu-NTA	25 ml 150 ml 1 L	40 651 301 40 651 303 40 651 310
WorkBeads 40 Zn-NTA	25 ml 150 ml 1 L	40 651 501 40 651 503 40 651 510
WorkBeads 40 Ni-IDA	25 ml 150 ml 1 L	40 650 001 40 650 003 40 650 010
WorkBeads 40 Co-IDA	25 ml 150 ml 1 L	40 650 401 40 650 403 40 650 410
WorkBeads 40 Cu-IDA	25 ml 150 ml 1 L	40 650 301 40 650 303 40 650 310
WorkBeads 40 Zn-IDA	25 ml 150 ml 1 L	40 650 501 40 650 503 40 650 510

[1] Includes one column each charged with Ni^{2+}, Co^{2+}, Cu^{2+} or Zn^{2+}.
[2] Packed on request.

Orders: sales@bio-works.com or contact your local distributor.

For more information about local distributor and products visit www.bio-works.com or contact us at info@bio-works.com

bio-works.com

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