

# Affinity chromatography columns and media

## Selection Guide



# Affinity Chromatography (AC)

Affinity chromatography separates proteins on the basis of a reversible interaction between a protein (or group of proteins) and a specific ligand attached to a chromatographic matrix. The technique is well-suited for a capture or intermediate step and can be used whenever a suitable ligand is available for the protein(s) of interest. Affinity chromatography offers high selectivity, hence high resolution, and usually high capacity. Affinity chromatography is frequently used as the first step (capture step) of a two-step purification protocol, followed by a second chromatographic step (polishing step) to remove remaining impurities.

The target protein(s) is/are specifically and reversibly bound by a complementary binding substance (ligand). The sample is applied under conditions that favor specific binding to the ligand. Unbound material is washed away, and bound target protein is recovered by changing conditions to those favoring elution. Elution is performed specifically, using a competitive ligand, or non-specifically, by changing the pH, ionic strength, or polarity. Samples are concentrated during binding, and the target protein is collected in purified and concentrated form. The key stages in an affinity chromatography separation are shown in Figure 1.

Affinity chromatography is also used to remove specific contaminants. For example, Benzamidine Sepharose™ 4 Fast Flow can remove serine proteases.

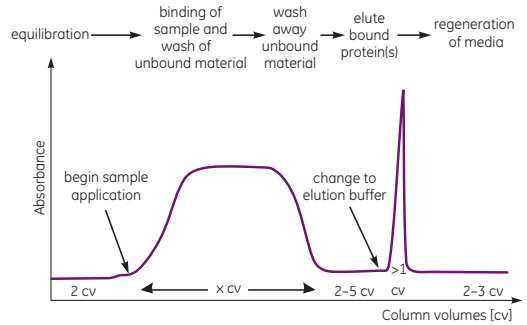


Fig 1. Typical affinity purification.

## Chromatography media selection

Parameters such as scale of purification and commercial availability of affinity matrices should be considered when selecting affinity media.

HiTrap™ affinity columns are ideal for method optimization or small scale purification of target proteins using well-established protocols.

Affinity media can be prepared by coupling a ligand to a selected matrix. HiTrap NHS-activated HP is designed specifically to facilitate this process and is supplied with a recommended coupling procedure for coupling primary amines.

For separations of glycoproteins and polysaccharides, media screening may be required to select the correct specificity.



## Immunoglobulins

While protein A and protein G affinity media are similar in many respects, their specificities for IgG differ. Protein G affinity media are the better choice for general purpose capture of antibodies since they bind IgG from a broader range of eukaryotic species and bind more subclasses of IgG. Species-specific examples include stronger binding of polyclonal IgG from cow, sheep, and horse to protein G. Polyclonal rat IgG, human IgG<sub>3</sub>, and mouse IgG<sub>1</sub> are bound by protein G but not by protein A. Generally, protein G has greater affinity for IgG and minimal binding of albumin, which results in cleaner preparations and greater yield.

Conversely, protein A may be the better choice for isolating certain subclasses of IgG or for removing cross-species IgG contaminants from horse or fetal calf serum, for example.

Purification of human and mouse IgM is possible by the use of the HiTrap IgM Purification HP 1 ml column. The thiophilic adsorption medium with 2-mercapto-pyridine coupled to Sepharose HP is designed for one-step purification protocols resulting in 80%–95% pure IgM.

Purification of IgY from egg yolk is easily performed using HiTrap IgY Purification HP 5 ml column. This specially-designed medium gives over 70% purity in one step.

## Tagged proteins

Tagged recombinant proteins present many practical advantages, the single most important being simple, one-step, high-purity affinity purifications.

Purification of tagged proteins is typically based on specific interactions between the tags and ligands. Four commonly used tags are: polyhistidine (His), glutathione-S-transferase (GST), *Strep-tag*<sup>™</sup> II, and Maltose Binding Protein (MBP). Other tags include; Protein A, calmodulin-binding peptide (CBP), and biotinylated peptide. Histidine-tagged proteins have a high selective affinity for Ni<sup>2+</sup> and a variety of other immobilized metal ions, while the GST tag binds to glutathione ligands coupled to Sepharose. Histidine-tags are small and therefore less disruptive to the proteins on which they are attached. GST tags are larger and their removal from target proteins is often necessary.

*Strep-tag* II is a small tag of only eight amino acids. The tag binds specifically to the *Strep-Tactin*<sup>™</sup> ligand immobilized on a Sepharose base matrix to yield pure target proteins. MBP-tagged proteins have high selectivity towards carbohydrates such as dextrin.

GE Healthcare offers a wide range of products for purifying histidine-, GST-, *Strep-tag* II, and MBP-tagged proteins. For example, tagged protein purification media and prepacked columns allow rapid, one-step purification of unclarified as well as pretreated cell lysates and cell-free systems. These media and prepacked columns permit manual purification with a syringe, a centrifuge, or by gravity-flow as well as automated purification with ÄKTAdesign<sup>™</sup> systems.



# Ordering information

## Columns

Product	Pack size	Code No.
HiTrap rProtein A FF	■ 5 × 1 ml	17-5079-01
HiTrap rProtein A FF	■ 2 × 1 ml	17-5079-02
HiTrap rProtein A FF	■ 100 × 1 ml*	28-9464-89
HiTrap rProtein A FF	■ 1 × 5 ml	17-5080-01
HiTrap rProtein A FF	■ 5 × 5 ml	17-5080-02
HiTrap Protein A HP	5 × 1 ml	17-0402-01
HiTrap Protein A HP	2 × 1 ml	17-0402-03
HiTrap Protein A HP	1 × 5 ml	17-0403-01
HiTrap Protein A HP	5 × 5 ml	17-0403-03
HiTrap Protein G HP	5 × 1 ml	17-0404-01
HiTrap Protein G HP	2 × 1 ml	17-0404-03
HiTrap Protein G HP	1 × 5 ml	17-0405-01
HiTrap Protein G HP	5 × 5 ml	17-0405-03
HiTrap MabSelect™	■ 5 × 1 ml	28-4082-53
HiTrap MabSelect	■ 1 × 5 ml	28-4082-55
HiTrap MabSelect	■ 5 × 5 ml	28-4082-56
HiTrap MabSelect SuRe™	■ 5 × 1 ml	11-0034-93
HiTrap MabSelect SuRe	■ 1 × 5 ml	11-0034-94
HiTrap MabSelect SuRe	■ 5 × 5 ml	11-0034-95
HiTrap MabSelect Xtra™	■ 5 × 1 ml	28-4082-58
HiTrap MabSelect Xtra	■ 1 × 5 ml	28-4082-60
HiTrap MabSelect Xtra	■ 5 × 5 ml	28-4082-61
HiScreen™ MabSelect	■ 1 × 4.7 ml	28-9269-73
HiScreen MabSelect Xtra	■ 1 × 4.7 ml	28-9269-76
HiScreen MabSelect SuRe	■ 1 × 4.7 ml	28-9269-77
HiTrap Blue HP	5 × 1 ml	17-0412-01
HiTrap Blue HP	1 × 5 ml	17-0413-01
HiTrap Heparin HP	5 × 1 ml	17-0406-01
HiTrap Heparin HP	1 × 5 ml	17-0407-01
HiTrap Heparin HP	5 × 5 ml	17-0407-03
HiPrep™ 16/10 Heparin FF	■ 1 × 20 ml	17-5189-01
HiTrap Benzamidine FF (high sub)	5 × 1 ml	17-5143-01
HiTrap Benzamidine FF (high sub)	2 × 1 ml	17-5143-02
HiTrap Benzamidine FF (high sub)	1 × 5 ml	17-5144-01
HiTrap NHS-activated HP	5 × 1 ml	17-0716-01
HiTrap NHS-activated HP	1 × 5 ml	17-0717-01
HisTrap™ HP	5 × 1 ml	17-5247-01
HisTrap HP	100 × 1 ml*	17-5247-05
HisTrap HP	1 × 5 ml	17-5248-01
HisTrap HP	5 × 5 ml	17-5248-02
HisTrap HP	100 × 5 ml*	17-5248-05
HisTrap FF	■ 5 × 1 ml	17-5319-01
HisTrap FF	■ 100 × 1 ml*	17-5319-02
HisTrap FF	■ 5 × 5 ml	17-5255-01
HisTrap FF	■ 100 × 5 ml*	17-5255-02
HisTrap FF crude	■ 5 × 1 ml	11-0004-58
HisTrap FF crude	■ 100 × 1 ml*	11-0004-59
HisTrap FF crude	■ 5 × 5 ml	17-5286-01
HisTrap FF crude	■ 100 × 5 ml*	17-5286-02
HisPrep FF 16/10	■ 1 × 20 ml	17-5256-01
HiTrap IMAC HP	5 × 1 ml	17-0920-03
HiTrap IMAC HP	5 × 5 ml	17-0920-05
HiTrap IMAC FF	■ 5 × 1 ml	17-0921-02
HiTrap IMAC FF	■ 5 × 5 ml	17-0921-04
HiPrep IMAC FF 16/10	■ 1 × 20 ml	17-0921-06
HiTrap Chelating HP	5 × 1 ml	17-0408-01
HiTrap Chelating HP	1 × 5 ml	17-0409-01
HiTrap Chelating HP	5 × 5 ml	17-0409-03
HiTrap Chelating HP	100 × 5 ml*	17-0409-05
HiTrap Streptavidin HP	5 × 1 ml	17-5112-01
HiTrap IgM Purification HP	5 × 1 ml	17-5110-01
HiTrap IgY Purification HP	1 × 5 ml	17-5111-01

Product	Pack size	Code No.
GSTrap™ HP	5 × 1 ml	17-5281-01
GSTrap HP	100 × 1 ml*	17-5281-05
GSTrap HP	1 × 5 ml	17-5282-01
GSTrap HP	5 × 5 ml	17-5282-02
GSTrap HP	100 × 5 ml*	17-5282-05
GSTrap FF	2 × 1 ml	17-5130-02
GSTrap FF	5 × 1 ml	17-5130-01
GSTrap FF	100 × 1 ml*	17-5130-05
GSTrap FF	1 × 5 ml	17-5131-01
GSTrap FF	5 × 5 ml	17-5131-02
GSTrap FF	100 × 5 ml*	17-5131-05
GSTPrep™ FF 16/10	1 × 20 ml	17-5234-01
GSTrap 4B	5 × 1 ml	28-4017-45
GSTrap 4B	100 × 1 ml*	28-4017-46
GSTrap 4B	1 × 5 ml	28-4017-47
GSTrap 4B	5 × 5 ml	28-4017-48
GSTrap 4B	100 × 5 ml*	28-4017-49
MBPTrap™ HP	5 × 1 ml	28-9187-78
MBPTrap HP	1 × 5 ml	28-9187-79
MBPTrap HP	5 × 5 ml	28-9187-80
StrepTrap™ HP	5 × 1 ml	28-9075-46
StrepTrap HP	1 × 5 ml	28-9075-47
StrepTrap HP	5 × 5 ml	28-9075-48

Kits (including buffers)	Code No.
MABTrap™ Kit	17-1128-01
HisTrap FF crude Kit	■ 28-4014-77

## Chromatography media

Product	Pack size	Code No.
Protein A Sepharose CL-4B	1.5 g	17-0780-01
Protein A Sepharose CL-4B	25 ml	17-0963-03
nProtein A Sepharose 4 FF	■ 5 ml	17-5280-01
nProtein A Sepharose 4 FF	■ 25 ml	17-5280-04
rProtein A Sepharose FF	■ 5 ml	17-1279-01
rProtein A Sepharose FF	■ 25 ml	17-1279-02
Protein G Sepharose 4 FF	■ 5 ml	17-0618-01
Protein G Sepharose 4 FF	■ 25 ml	17-0618-02
GammaBind™ G Sepharose	5 ml	17-0885-01
GammaBind G Sepharose	25 ml	17-0885-02
GammaBind Plus Sepharose	5 ml	17-0886-01
GammaBind Plus Sepharose	25 ml	17-0886-02
MabSelect	■ 25 ml	17-5199-01
MabSelect SuRe	■ 25 ml	17-5438-01
MabSelect Xtra	■ 25 ml	17-5269-07
Immunoprecipitation Starter Pack	■ 2 × 2 ml	17-6002-35
2'5' ADP Sepharose 4B	5 g	17-0700-01
Benzamidine Sepharose 4 FF (high sub)	25 ml	17-5123-01
Blue Sepharose 6 FF	■ 50 ml	17-0948-01
Calmodulin Sepharose 4B	10 ml	17-0529-01
Ni Sepharose HP	25 ml	17-5268-01
Ni Sepharose HP	100 ml	17-5268-02
Ni Sepharose 6 FF	■ 5 ml	17-5268-06
Ni Sepharose 6 FF	■ 25 ml	17-5318-01
Ni Sepharose 6 FF	■ 100 ml	17-5318-02
Ni Sepharose 6 FF	■ 500 ml	17-5318-03
IMAC Sepharose HP	25 ml	17-0920-06
IMAC Sepharose HP	100 ml	17-0920-07

\* Special pack size delivered on specific customer order

Product	Pack size	Code No.
IMAC Sepharose 6 FF	25 ml	17-0921-07
IMAC Sepharose 6 FF	100 ml	17-0921-08
Chelating Sepharose FF	50 ml	17-0575-01
Con A Sepharose 4B	5 ml	17-0440-03
Con A Sepharose 4B	100 ml	17-0440-01
Gelatin Sepharose 4B	25 ml	17-0956-01
Glutathione Sepharose HP	25 ml	17-5279-01
Glutathione Sepharose HP	100 ml	17-5279-02
Glutathione Sepharose 4 FF	25 ml	17-5132-01
Glutathione Sepharose 4 FF	100 ml	17-5132-02
Glutathione Sepharose 4 FF	500 ml	17-5132-03
Glutathione Sepharose 4B	10 ml	17-0756-01
Glutathione Sepharose 4B	100 ml	17-0756-05
Glutathione Sepharose 4B	300 ml	17-0756-04
Dextrin Sepharose HP	25 ml	28-9355-97
Dextrin Sepharose HP	100 ml	28-9355-98
StrepTactin Sepharose HP	10 ml	28-9355-99
StrepTactin Sepharose HP	50 ml	28-9356-00
Heparin Sepharose 6 FF	50 ml	17-0998-01
IgG Sepharose 6 FF	10 ml	17-0969-01
Lentil Lectin Sepharose 4B	25 ml	17-0444-01
Lysine Sepharose 4B	15 g	17-0690-01
Streptavidin Sepharose HP	5 ml	17-5113-01
Activated CH Sepharose	15 g	17-0490-01
CNBr-activated Sepharose 4B	15 g	17-0430-01
CNBr-activated Sepharose 4 FF	10 g	17-0981-01
EAH Sepharose 4B	50 ml	17-0569-01
ECH Sepharose 4B	50 ml	17-0571-01
Epoxy-activated Sepharose 6B	15 g	17-0480-01
NHS-activated Sepharose 4 FF	25 ml	17-0906-01
Activated Thiol Sepharose 4B	15 g	17-0640-01
Thiopropyl Sepharose 6B	15 g	17-0420-01

## Technical information<sup>†</sup>

Documentation	Code No.
<i>Handbooks and guides with detailed technical information:</i>	
Affinity Chromatography Handbook, Principles and Methods	18-1022-29
Antibody Purification Handbook	18-1037-46
Recombinant Protein Purification Handbook, Principles and Methods	18-1142-75
GST Gene Fusion System Handbook	18-1157-58
Convenient Protein Purification HiTrap Column Guide	18-1129-81
Prepacked Chromatography Columns for AKTAdesign Systems, Selection Guide	28-9317-78
Ni Sepharose and IMAC Sepharose Selection Guide	28-4070-92
Glutathione Sepharose Selection Guide	28-9168-33
Solutions For Antibody Purification Selection Guide	28-9351-97

<sup>†</sup> Technical information can be downloaded from [www.gelifesciences.com/protein-purification](http://www.gelifesciences.com/protein-purification)

■ BioProcess™ Media

## BioProcess Media

This label designates our media that have been specifically designed to meet the demands of industrial biotechnology:

- Scalable from lab to production
- With comprehensive documentation
- Meeting productivity requirements
- Having validated manufacturing procedures
- With developed CIP and sanitization-in-place procedures
- Offering security of supply





# Affinity chromatography – Prepacked columns and media for group-specific purification

Ordering information	Product	Binding capacity per ml chromatography medium (approx)	Average particle diameter µm	Maximum operating flow rate	Maximum operating pressure	pH stability*	Application areas: purification, isolation or removal of the following substances		
Code No.	Prepacked columns	Column size				Long term	Short term		
17-0412-01	HiTrap™ Blue HP	5 x 1 ml	20 mg human albumin	34	4 ml/min 20 ml/min	0.3 MPa, 3 bar	4-12	3-13	Albumin, broad range of nucleotide-requiring enzymes, coagulation factors.
17-0413-01	HiTrap Blue HP	1 x 5 ml							
17-0406-01	HiTrap Heparin HP	5 x 1 ml	3 mg antithrombin III	34	4 ml/min 20 ml/min	0.3 MPa, 3 bar	5-10	5-10	Antithrombin III and other coagulation factors, lipoproteins, lipases, protein synthesis factors, DNA binding proteins.
17-0407-03	HiTrap Heparin HP	1 x 5 ml							
17-5181-01	HiPrep™ 16/10 Heparin FF	1 x 20 ml	2 mg bovine antithrombin III	90	10 ml/min	0.15 MPa, 1.5 bar	4-12	4-13	Antithrombin III and other coagulation factors, lipoproteins, lipases, protein synthesis factors, DNA binding proteins.
17-5281-01	GSTrap™ HP	5 x 1 ml	>10 mg GST-tagged protein	34	4 ml/min	0.3 MPa, 3 bar	3-12	3-12	Glutathione S-transferase (GST) tagged proteins produced using the pGEX series of expression vectors, other glutathione S-transferases and glutathione-dependent proteins.
17-5281-05	GSTrap HP	100 x 1 ml*							
17-5282-01	GSTrap HP	1 x 5 ml							
17-5282-02	GSTrap HP	5 x 5 ml							
17-5282-05	GSTrap HP	100 x 5 ml*							
28-4017-45	GSTrap 4B	5 x 1 ml	> 5 mg horse liver GST	90	4 ml/min	0.3 MPa, 3 bar	4-13	4-13	Glutathione S-transferase (GST) tagged proteins produced using the pGEX series of expression vectors, other glutathione S-transferases and glutathione-dependent proteins.
28-4017-46	GSTrap 4B	100 x 1 ml*							
28-4017-47	GSTrap 4B	1 x 5 ml							
28-4017-48	GSTrap 4B	5 x 5 ml							
28-4017-49	GSTrap 4B	100 x 5 ml*							
17-5132-02	GSTrap FF	2 x 1 ml	10 mg recombinant GST or 11 mg GST-tagged protein	90	4 ml/min	0.3 MPa, 3 bar	3-12	3-12	Glutathione S-transferase (GST) tagged proteins produced using the pGEX series of expression vectors, other glutathione S-transferases and glutathione-dependent proteins.
17-5130-01	GSTrap FF	5 x 1 ml							
17-5130-05	GSTrap FF	100 x 1 ml*							
17-5131-01	GSTrap FF	1 x 5 ml							
17-5131-02	GSTrap FF	5 x 5 ml							
17-5131-05	GSTrap FF	100 x 5 ml*							
17-5234-01	GSTPrep™ FF 16/10	1 x 20 ml	See GSTrap FF	90	10 ml/min	0.15 MPa, 1.5 bar	3-12	3-12	Glutathione S-transferase (GST) tagged proteins produced using the pGEX series of expression vectors, other glutathione S-transferases and glutathione-dependent proteins.
17-0408-01	HiTrap Chelating HP	5 x 1 ml	12 mg l-histidine,-tagged protein (Ni <sup>2+</sup> )	34	4 ml/min	0.3 MPa, 3 bar	3-13	2-14	Proteins with complex-forming amino acids such as His, Cys, Trp on the protein surface. Optimizes purification of histidine-tagged proteins by allowing charging with different metal ions.
17-0409-01	HiTrap Chelating HP	1 x 5 ml							
17-0409-03	HiTrap Chelating HP	5 x 5 ml							
17-0409-05	HiTrap Chelating HP	100 x 5 ml*							
17-0920-03	HiTrap IMAC HP	5 x 1 ml	40 mg l-histidine,-tagged protein (Ni <sup>2+</sup> )	34	4 ml/min	0.3 MPa, 3 bar	3-12	2-14	Proteins with complex-forming amino acids such as His, Cys, Trp on the protein surface. Optimizes purification of histidine-tagged proteins by allowing charging with different metal ions.
17-0920-05	HiTrap IMAC HP	5 x 5 ml							
17-0921-02	HiTrap IMAC FF	5 x 1 ml	40 mg l-histidine,-tagged protein (Ni <sup>2+</sup> )	90	4 ml/min	0.3 MPa, 3 bar	3-12	2-14	Proteins with complex-forming amino acids such as His, Cys, Trp on the protein surface. Optimizes purification of histidine-tagged proteins by allowing charging with different metal ions.
17-0921-04	HiTrap IMAC FF	5 x 5 ml							
17-0921-06	HiPrep IMAC FF 16/10	1 x 20 ml	40 mg l-histidine,-tagged protein (Ni <sup>2+</sup> ) 25 mg l-histidine,-tagged protein (Cu <sup>2+</sup> ) 15 mg l-histidine,-tagged protein (Zn <sup>2+</sup> )	90	10 ml/min	0.15 MPa, 1.5 bar	3-12	2-14	Proteins with complex-forming amino acids such as His, Cys, Trp on the protein surface. Optimizes purification of histidine-tagged proteins by allowing charging with different metal ions.
17-1112-01	HiTrap Streptavidin HP	5 x 1 ml	Biotin >300 nmol, 6 mg biotinylated BSA	34	4 ml/min	0.3 MPa, 3 bar	4-9	2-10.5	Biotinylated substances, such as biotin-tagged proteins.
17-5143-02	HiTrap Benzamide FF (high sub)	2 x 1 ml	≥ 35 mg trypsin	90	4 ml/min	0.3 MPa, 3 bar	2-8	1-9	Trypsin and trypsin-like serine proteases (e.g., thrombin and factor Xa).
17-5143-01	HiTrap Benzamide FF (high sub)	5 x 1 ml							
17-5144-01	HiTrap Benzamide FF (high sub)	1 x 5 ml							
Code No.	Chromatography medium	Pack size							
17-0700-01	2 <sup>S</sup> ADP Sepharose™ 4B	5 g	0.4 mg glucose-6-phosphate dehydrogenase	90	75 cm/h	0.02 MPa, 0.2 bar	4-10	4-10	NADP-dependent dehydrogenases and other enzymes which have affinity for NADP <sup>+</sup> (e.g., glucose-6-phosphate dehydrogenase).
17-5123-10	Benzamide Sepharose 4 FF (high sub)	25 ml	≥ 35 mg trypsin	90	400 cm/h	0.1 MPa, 1 bar	2-8	1-9	Trypsin and trypsin-like serine proteases (e.g., thrombin and factor Xa).
17-0948-01	Blue Sepharose 6 FF*	50 ml	≥18 mg human albumin	90	400 cm/h	0.1 MPa, 1 bar	4-12	3-13	Albumin, broad range of nucleotide-requiring enzymes, coagulation factors. Ideal for scale up applications.
17-0529-01	Calmodulin Sepharose 4B	10 ml	Ligand concentration 1 mg/ml	90	75 cm/h	0.02 MPa, 0.2 bar	4-9	4-9	ATPases, protein kinases, phosphodiesterases, neurotransmitters, interferon, calmodulin-binding peptide (CBP) tagged protein.
17-0575-01	Chelating Sepharose FF	50 ml*	24–30 µmole Zn <sup>2+</sup>	90	600 cm/h	0.1 MPa, 1 bar	3-13	2-14	Proteins with complex-forming amino acids such as His, Cys, Trp on the protein surface. Optimizes purification of histidine-tagged proteins by allowing charging with different metal ions.
17-0440-03	Con A Sepharose 4B	5 ml	20–45 mg thyroglobulin	90	75 cm/h	0.02 MPa, 0.2 bar	4-9	4-9	Molecules containing branched mannoses, carbohydrates with terminal mannose or glucose. (Mans)-Glc-GlcNAc and sterically related residues like glycoproteins, membrane proteins, glycolipids, lipoproteins, polysaccharides, hormones, α-antitrypsin, interferon.
17-0440-01	Con A Sepharose 4B	100 ml*							
17-0956-01	Gelatin Sepharose 4B	25 ml*	1 mg plasma fibronectin	90	75 cm/h	0.02 MPa, 0.2 bar	3-10	3-10	Fibrinectin.
17-5279-01	Glutathione Sepharose HP	25 ml*	>10 mg GST-tagged protein	34	150 cm/h	0.3 MPa, 3 bar	3-12	3-12	Glutathione S-transferase (GST) tagged proteins produced using the pGEX series of expression vectors, other glutathione S-transferases and glutathione-dependent proteins.
17-5279-02	Glutathione Sepharose HP	100 ml							
17-5132-01	Glutathione Sepharose 4 FF	25 ml	10 mg recombinant GST or 11 mg GST-tagged protein	90	450 cm/h	0.1 MPa, 1 bar	3-12	3-12	Glutathione S-transferase (GST) tagged proteins produced using the pGEX series of expression vectors, other glutathione S-transferases and glutathione-dependent proteins.
17-5132-02	Glutathione Sepharose 4 FF	100 ml							
17-5132-03	Glutathione Sepharose 4 FF	500 ml							
17-0756-01	Glutathione Sepharose 4B	10 ml	> 5 mg horse liver GST	90	75 cm/h	0.02 MPa, 0.2 bar	4-13	4-13	Glutathione S-transferase (GST) tagged proteins produced using the pGEX series of expression vectors, other glutathione S-transferases and glutathione-dependent proteins.
17-0756-05	Glutathione Sepharose 4B	100 ml							
17-0756-04	Glutathione Sepharose 4B	300 ml							
17-0990-01	Heparin Sepharose 6 FF*	50 ml*	2 mg bovine antithrombin III	90	400 cm/h	0.1 MPa, 1 bar	4-12	4-13	Antithrombin III and other coagulation factors, lipoproteins, lipases, protein synthesis factors, DNA binding proteins.
17-0969-01	IgG Sepharose 6 FF	10 ml*	2 mg protein A	90	400 cm/h	0.1 MPa, 1 bar	3-10	3-10	Recombinant tagged proteins containing a protein A tag.
17-0920-06	IMAC Sepharose HP	25 ml	40 mg l-histidine,-tagged protein (Ni <sup>2+</sup> )	34	300 cm/h	0.3 MPa, 3 bar	3-12	2-14	Proteins with complex-forming amino acids such as His, Cys, Trp on the protein surface. Optimizes purification of histidine-tagged proteins by allowing charging with different metal ions.
17-0920-07	IMAC Sepharose HP	100 ml							
17-0921-07	IMAC Sepharose 6 FF*	25 ml	40 mg l-histidine,-tagged protein (Ni <sup>2+</sup> )	90	600 cm/h	0.1 MPa, 1 bar	3-12	2-14	Proteins with complex-forming amino acids such as His, Cys, Trp on the protein surface. Optimizes purification of histidine-tagged proteins by allowing charging with different metal ions.
17-0921-08	IMAC Sepharose 6 FF*	100 ml*							
17-0444-01	Lentil Lectin Sepharose 4B	25 ml	16–35 mg thyroglobulin	90	75 cm/h	0.02 MPa, 0.2 bar	3-10	3-10	Molecules containing branched mannoses with fucose linked [1,6] to the N-acetyl-glucosamine. (Mans)-Glc-GlcNAc and sterically related residues like glycoproteins, membrane proteins, glycolipids, lipoproteins, polysaccharides, hormones, α-antitrypsin, interferon.
17-0690-01	Lysine Sepharose 4B	15 g*	0.6–0.7 mg rRNA	90	75 cm/h	0.02 MPa, 0.2 bar	2-11	2-11	rRNA, plasmidogen and plasmidogen activator.
17-5113-01	Streptavidin Sepharose HP	5 ml	Biotin >300 nmol, 6 mg biotinylated BSA	34	150 cm/h	0.3 MPa, 3 bar	4-9	2-10.5	Biotinylated substances, such as biotin-tagged proteins and biotin-tagged DNA.

# Affinity chromatography – Prepacked columns and media for isolation and purification of immunoglobulins

Ordering information	Product	Binding capacity per ml chromatography medium (approx.)	Average particle diameter µm	Maximum operating flow rate*	Maximum operating pressure	pH stability*	Application areas		
Code No.	Prepacked columns	Column size				Long term	Short term		
17-0402-01	HiTrap Protein A HP	5 x 1 ml	20 mg human IgG	34	4 ml/min	0.3 MPa, 3 bar	3-9	2 <sup>+</sup> -10	Isolation and purification of classes, subclasses and fragments of IgG from many different species.
17-0402-03	HiTrap Protein A HP	2 x 1 ml							
17-0403-01	HiTrap Protein A HP	1 x 5 ml							
17-0403-03	HiTrap Protein A HP	5 x 5 ml							
17-0404-01	HiTrap Protein G HP	5 x 1 ml	25 mg human IgG	34	4 ml/min	0.3 MPa, 3 bar	3-9	2 <sup>+</sup> -10	Protein G and protein A have different IgG binding specificities, dependent on the origin of the IgG. Binds to all IgG subclasses from human, mouse, and rat; binds total IgG from guinea pig, goat, cow, sheep, and horse. Unlike protein A, protein G binds human IgG. Applications of protein G include practically all applications of protein A.
17-0405-01	HiTrap Protein G HP	2 x 1 ml							
17-0405-03	HiTrap Protein G HP	1 x 5 ml							
17-5079-01	HiTrap rProtein A FF	5 x 1 ml	50 mg human IgG	90	4 ml/min	0.3 MPa, 3 bar	3-10	2 <sup>+</sup> -11	Recombinant protein A exhibits similar Fc region specificity to that of native protein A but shows enhanced binding capacity.
17-5079-02	HiTrap rProtein A FF	2 x 1 ml							
28-9464-89	HiTrap rProtein A FF	100 x 1 ml*							
17-5080-01	HiTrap rProtein A FF	1 x 5 ml							
17-5080-02	HiTrap rProtein A FF	5 x 5 ml							
28-4082-53	HiTrap MabSelect™	5 x 1 ml	min 30 mg human IgG	85	4 ml/min	0.3 MPa, 3 bar	3-10	2 <sup>+</sup> -12	Fast purification of monoclonal antibodies from large sample volumes due to compatibility with high flow rates and high pressure when scaling up.
28-4082-55	HiTrap MabSelect™	1 x 5 ml							
28-4082-56	HiTrap MabSelect™	5 x 5 ml							
11-0034-93	HiTrap MabSelect SuRe™	1 x 5 ml	min 30 mg human IgG	85	4 ml/min	0.3 MPa, 3 bar	3-12	2 <sup>+</sup> -14	Preparative purification of monoclonal antibodies when cleaning the medium between purifications is important.
11-0034-94	HiTrap MabSelect SuRe™	5 x 1 ml							
11-0034-95	HiTrap MabSelect SuRe™	5 x 5 ml							
28-4082-58	HiTrap MabSelect Xtra™	1 x 5 ml	~40 mg human IgG	75	4 ml/min	0.3 MPa, 3 bar	3-10	2-12	Maximum binding capacity, which allows binding from samples with high expression levels of the monoclonal antibody.
28-4082-60	HiTrap MabSelect Xtra™	5 x 1 ml							
28-4082-61	HiTrap MabSelect Xtra™	5 x 5 ml							
17-5110-01	HiTrap IgM Purification HP	5 x 1 ml	5 mg human IgM	34	4 ml/min	0.3 MPa, 3 bar	3-11	2 <sup>+</sup> -13	Purification of monoclonal IgM from hybridoma cell culture and human IgM.
17-5115-01	HiTrap IgY Purification HP	1 x 5 ml	20 mg pure IgY/ml medium or 1/4 egg yolk/5 ml medium	34	20 ml/min	0.3 MPa, 3 bar	3-11	2 <sup>+</sup> -13	Purification of IgY from egg yolk.
28-9269-73	HiScreen™ MabSelect	1 x 4.7 ml	min 30 mg human IgG	85	3.9 ml/min	0.3 MPa, 3 bar	3-10	2 <sup>+</sup> -12	Optimization of chromatography conditions in process development
28-9269-76	HiScreen MabSelect Xtra	1 x 4.7 ml	~40 mg human IgG	75	2.3 ml/min	0.3 MPa, 3 bar	3-10	2 <sup>+</sup> -12	Optimization of chromatography conditions in process development
28-9269-77	HiScreen MabSelect SuRe	1 x 4.7 ml	min 30 mg human IgG	85	3.9 ml/min	0.3 MPa, 3 bar	3-12	2 <sup>+</sup> -14	Optimization of chromatography conditions in process development
Code No.	Kit (including buffers)	Included column							
17-1128-01	MABTrap™ Kit	HiTrap Protein G HP 1 ml	25 mg human IgG	34	4 ml/min	0.3 MPa, 3 bar	3-9	2 <sup>+</sup> -9	MABTrap Kit includes all necessary buffers for ten purifications using a syringe.
Code No.	Chromatography medium	Pack size							
17-0780-01	Protein A Sepharose CL-4B	15 g	16–25 mg human IgG, 2 mg mouse IgG	90	150 cm/h	0.02 MPa, 0.2 bar	3-9	2 <sup>+</sup> -10	Isolation and purification of classes, subclasses and fragments of IgG from many different species.
17-0963-03	nProtein A Sepharose 4 FF*	25 ml*							
17-5280-01	nProtein A Sepharose 4 FF*	5 ml	35 mg human IgG, 3-10 mg mouse IgG	90	400 cm/h	0.1 MPa, 1 bar	3-9	2 <sup>+</sup> -10	nProtein A Sepharose 4 FF is ideal for recovery and purification of antibodies from cell culture at both laboratory and process scale. nProtein A Sepharose 4 FF is manufactured without using any animal-derived components.
17-5280-04	nProtein A Sepharose 4 FF*	25 ml*							
17-1279-01	rProtein A Sepharose FF*	5 ml	50 mg human IgG, 8-20 mg mouse IgG	90	400 cm/h	0.1 MPa, 1 bar	3-10	2 <sup>+</sup> -11	Recombinant protein A exhibits similar Fc region specificity to that of native protein A but shows enhanced binding capacity.
17-1279-02	rProtein A Sepharose FF*	25 ml*							
17-0618-01	Protein G Sepharose 4 FF*	5 ml	24 mg human IgG, 23 mg cow IgG, 19 mg goat IgG, 17 mg guinea pig IgG, 10 mg mouse IgG, 7 mg rat IgG	90	400 cm/h	0.1 MPa, 1 bar	3-9	2 <sup>+</sup> -10	Protein G and protein A have different IgG binding specificities, dependent on the origin of the IgG. Binds to all IgG subclasses from human, mouse, and rat; binds total IgG from guinea pig, goat, cow, sheep, and horse. Unlike protein A, protein G binds human IgG. Applications of protein G include practically all applications of protein A.
17-0618-02	Protein G Sepharose 4 FF*	25 ml*							
17-0885-01	GammaBind™ G Sepharose	5 ml	>17 mg human IgG	90	75 cm/h	0.015 MPa, 0.15 bar	3-9	2 <sup>+</sup> -9	Binds to all IgG subclasses from human, mouse, and rat; binds total IgG from guinea pig, goat, cow, sheep, and horse.
17-0885-02	GammaBind G Sepharose	25 ml*							
17-0886-01	GammaBind Plus Sepharose	5 ml	>20 mg human IgG	90	150 cm/h	0.015 MPa, 0.15 bar	3-9	2 <sup>+</sup> -9	Enhanced binding capabilities for mouse and rat monoclonals (also human, cow, sheep, horse, rabbit, and goat).
17-0886-02	GammaBind Plus Sepharose	25 ml*							
17-6002-35	Immunoprecipitation Starter Pack	2 x 2 ml	See nProtein A Sepharose 4 FF and Protein G Sepharose 4 FF	90	400 cm/h	0.1 MPa, 1 bar	3-9	2 <sup>+</sup> -10	Immunoprecipitation Starter Pack includes 2 ml Protein A Sepharose 4 FF and 2 ml of Protein G Sepharose 4 FF.
17-5199-01	MabSelect™	25 ml*	min 30 mg human IgG	85	500 cm/h**	0.2 MPa, 2 bar	3-10	2 <sup>+</sup> -12	MabSelect is used for high-throughput capture of monoclonal antibodies.
17-5438-01	MabSelect SuRe™	25 ml*	min 30 mg human IgG	85	500 cm/h**	0.2 MPa, 2 bar	3-12	2 <sup>+</sup> -14	MabSelect SuRe is used when harsh and cost-effective CIP protocols with industry-standard reagents (e.g., 0.1–0.5 M NaOH) are needed.
17-5269-07	MabSelect Xtra™	25 ml*	~41 mg human IgG	75	300 cm/h**	0.15 MPa, 1.5 bar	3-10	2 <sup>+</sup> -12	MabSelect Xtra is used for capture of high titer feedstreams requiring greater capacity.
**	pH below 3 is sometimes required to elute strongly bound immunoglobulins. However, protein ligands may hydrolyse at very low pH.								
†	At large scale, see Data Files 18-1149-94, 11-0011-65, 11-0011-57.								

# Affinity chromatography – Prepacked columns and media for recombinant tagged proteins

Ordering information	Product	Binding capacity per ml chromatography medium (approx.)	Average particle diameter µm	Maximum operating flow rate*	Maximum operating pressure	pH stability*	Application areas		
Code No.	Prepacked columns	Column size				Long term	Short term		
17-5247-01	HiTrap™ HP	5 x 1 ml	At least 40 mg l-histidine,-tagged protein	34	4 ml/min	0.3 MPa, 3 bar	3-12	2-14	Histidine-tagged proteins. HiTrap HP columns are prepacked with Ni Sepharose High Performance.
17-5247-05	HiTrap HP	100 x 1 ml*							
17-5248-01	HiTrap HP	1 x 5 ml							
17-5284-02	HiTrap HP	5 x 5 ml							
17-5248-05	HiTrap HP	100 x 5 ml*							
17-5131-01	HisTrap FF	5 x 1 ml	~40 mg l-histidine,-tagged protein	90	4 ml/min	0.3 MPa, 3 bar	3-12	2-14	Histidine-tagged proteins. HisTrap FF columns are prepacked with Ni Sepharose 6 Fast Flow (ideal for scale-up).

For contact information for your local office,  
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