



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.

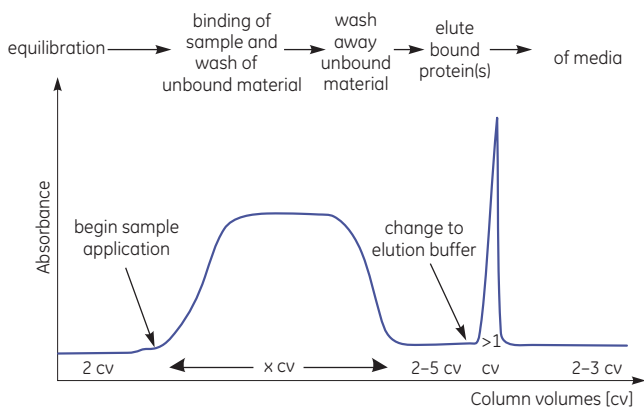


Fig 1. Typical affinity purification.

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.

HiScreen™ columns are prepacked with a range of BioProcess™ chromatography media and are designed for method optimization and parameter screening.

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 IgG₃, and mouse IgG₁ 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-mercaptopyridine coupled to Sepharose HP is designed for one-step purification protocols resulting in 80% to 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™ 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 Ni²⁺, Co²⁺, 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™ 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-, MBP-, and *Strep*-tag II-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 ÄKTA™ systems.



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 ¹	Maximum operating pressure	pH stability ²		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	0.5 MPa, 5 bar	4-12	3-13	Albumin, broad range of nucleotide-requiring enzymes, coagulation factors.
17-0413-01		1 x 5 ml			20 ml/min				
28-9782-43	HiScreen Blue FF	1 x 4.7 ml	≥ 18 mg human albumin	90	3.5 ml/min	0.15 MPa, 1.5 bar	4-12	3-13	Albumin, broad range of nucleotide-requiring enzymes, coagulation factors. Excellent for method optimization and parameter screening.
28-9924-74	HiScreen Capto™ Blue	1 x 4.7 ml	Approx. 25 mg human serum albumin	75	4.6 ml/min	0.3 MPa, 3 bar	2-13	2-13	Capto Blue is highly chemically stable and has a more rigid agarose base matrix than Blue Sepharose 6 Fast Flow. This allows the use of faster flow rates and larger sample volumes, leading to higher throughput and improved process economy. The application area is the same as for Blue Sepharose Fast Flow (e.g., purification of albumin, enzymes including NAD ⁺ and NADP ⁺ , coagulation factors, interferons, and related proteins)
17-0406-01	HiTrap Heparin HP	5 x 1 ml	3 mg antithrombin III	34	4 ml/min	0.5 MPa, 5 bar	5-10	5-10	Antithrombin III and other coagulation factors, lipoproteins, lipases, protein synthesis factors, DNA binding proteins.
17-0407-01		1 x 5 ml			20 ml/min				
17-0407-03		5 x 5 ml			20 ml/min				
17-5189-01	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	> 7 mg	34	4 ml/min	0.5 MPa, 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.
17-5281-05		100 x 1 ml [®]			4 ml/min				
17-5282-01		1 x 5 ml			20 ml/min				
17-5282-02		5 x 5 ml			20 ml/min				
17-5282-05		100 x 5 ml [®]			20 ml/min				
29-0486-09	GSTrap 4B	1 x 1 ml	> 25 mg	90	4 ml/min	0.5 MPa, 5 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.
28-4017-45		5 x 1 ml			4 ml/min				
28-4017-46		100 x 1 ml [®]			4 ml/min				
28-4017-47		1 x 5 ml			20 ml/min				
28-4017-48		5 x 5 ml			20 ml/min				
28-4017-49		100 x 5 ml [®]			20 ml/min				
17-5130-02	GSTrap FF	2 x 1 ml	> 10 mg	90	4 ml/min	0.5 MPa, 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.
17-5130-01		5 x 1 ml			4 ml/min				
17-5130-05		100 x 1 ml [®]			4 ml/min				
17-5131-01		1 x 5 ml			20 ml/min				
17-5131-02		5 x 5 ml			20 ml/min				
17-5131-05		100 x 5 ml [®]			20 ml/min				
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 (Histidine) ₆ -tagged protein (Ni ²⁺)	34	4 ml/min	0.5 MPa, 5 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		1 x 5 ml			20 ml/min				
17-0409-03		5 x 5 ml			20 ml/min				
17-0409-05		100 x 5 ml [®]			20 ml/min				
17-0920-03	HiTrap IMAC HP	5 x 1 ml	40 mg (Histidine) ₆ -tagged protein (Ni ²⁺)	34	4 ml/min	0.5 MPa, 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.
17-0920-05		5 x 5 ml			20 ml/min				
17-0921-02	HiTrap IMAC FF	5 x 1 ml	40 mg (Histidine) ₆ -tagged protein (Ni ²⁺)	90	4 ml/min	0.5 MPa, 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.
17-0921-04		5 x 5 ml	25 mg (Histidine) ₆ -tagged protein (Cu ²⁺) 15 mg (Histidine) ₆ -tagged protein (Zn ²⁺)		20 ml/min				
17-0921-06	HiPrep IMAC FF 16/10	1 x 20 ml	40 mg (Histidine) ₆ -tagged protein (Ni ²⁺) 25 mg (Histidine) ₆ -tagged protein (Cu ²⁺) 15 mg (Histidine) ₆ -tagged protein (Zn ²⁺)	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.
28-9505-17	HiScreen IMAC FF	1 x 4.7 ml	40 mg (Histidine) ₆ -tagged protein (Ni ²⁺) 25 mg (Histidine) ₆ -tagged protein (Cu ²⁺) 15 mg (Histidine) ₆ -tagged protein (Zn ²⁺)	90	3.5 ml/min	0.5 MPa, 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. Excellent for method optimization and parameter screening.
17-5112-01	HiTrap Streptavidin HP	5 x 1 ml	Biotin > 300 nmol, 6 mg biotinylated BSA	34	4 ml/min	0.5 MPa, 5 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	0.5 MPa, 5 bar	2-8	1-9	Trypsin and trypsin-like serine proteases (e.g., thrombin and factor Xa).
17-5143-01		5 x 1 ml			4 ml/min				
17-5144-01		1 x 5 ml [®]			20 ml/min				

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Prepacked columns and media for group-specific purification (continue)

Ordering information		Product		Binding capacity per ml chromatography medium (approx.)	Average particle diameter μm	Maximum operating flow rate ¹	Maximum operating pressure	pH stability ²		Application areas: purification, isolation or removal of the following substances
Code No.	Chromatography medium	Pack size						Long term	Short term	
17-0700-01	2'5' 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 ⁺ (e.g., glucose-6-phosphate dehydrogenase).	
17-5123-10	Benzamidine 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 ⁷	50 ml ⁶	> 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.	
17-5448-01	Capto Blue ⁷	25 ml	Approx. 25 mg human serum albumin	75	600 cm/h	0.3 MPa, 3 bar	2-13	2-13	Capto Blue is highly chemically stable and has a more rigid agarose base matrix than Blue Sepharose 6 Fast Flow. This allows the use of faster flow rates and larger sample volumes, leading to higher throughput and improved process economy. The application area is the same as for Blue Sepharose Fast Flow (e.g., purification of albumin, enzymes including NAD ⁺ and NADP ⁺ , coagulation factors, interferons, and related proteins)	
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 ⁷	50 ml ⁶	24-30 $\mu\text{mol Zn}^{2+}$	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, (Man>Glc>GlcNAc) and sterically related residues like glycoproteins, membrane proteins, glycolipids, lipoproteins, polysaccharides, hormones, α_1 -antitrypsin, interferon.	
17-0440-01		100 ml ⁶			75 cm/h					
17-0956-01	Gelatin Sepharose 4B	25 ml	61 mg plasma fibronectin	90	75 cm/h	0.02 MPa, 0.2 bar	3-10	3-10	Fibronectin.	
17-5279-01	Glutathione Sepharose HP	25 ml	> 7 mg	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		100 ml			150 cm/h					
17-5132-01	Glutathione Sepharose 4 FF	25 ml	> 10 mg	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		100 ml			450 cm/h					
17-5132-03		500 ml			450 cm/h					
17-0756-01	Glutathione Sepharose 4B	10 ml	> 25 mg	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		100 ml			75 cm/h					
17-0756-04		300 ml			75 cm/h					
17-0998-01	Heparin Sepharose 6 FF ⁷	50 ml ⁶	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 ⁶	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 (Histidine) ₆ -tagged protein (Ni ²⁺)	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		100 ml			300 cm/h					
17-0921-07	IMAC Sepharose 6 FF ⁷	25 ml	40 mg (Histidine) ₆ -tagged protein (Ni ²⁺)	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		100 ml ⁶			600 cm/h					
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-acetylglucosamine, (Man>Glc>GlcNAc) and sterically related residues like glycoproteins, membrane proteins, glycolipids, lipoproteins, polysaccharides, hormones, α_1 -antitrypsin, interferon.	
17-0690-01	Lysine Sepharose 4B	15 g ⁶	0.6-0.7 mg rRNA	90	75 cm/h	0.02 MPa, 0.2 bar	2-11	2-11	rRNA, plasminogen and plasminogen 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.	

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 ¹	Maximum operating pressure	pH stability ²	Application areas		
Code No.	Prepacked columns	Column size				Long term	Short term		
29-0485-76 17-0402-01 17-0402-03 17-0403-01 17-0403-03	HiTrap Protein A HP	1 x 1 ml 5 x 1 ml 2 x 1 ml 1 x 5 ml 5 x 5 ml	20 mg human IgG	34	4 ml/min 4 ml/min 4 ml/min 20 ml/min 20 ml/min	0.5 MPa, 5 bar	3-9	2*-10	Isolation and purification of classes, subclasses and fragments of IgG from many different species.
29-0485-81 17-0404-01 17-0404-03 17-0405-01 17-0405-03	HiTrap Protein G HP	1 x 1 ml 5 x 1 ml 2 x 1 ml 1 x 5 ml 5 x 5 ml	25 mg human IgG	34	4 ml/min 4 ml/min 4 ml/min 20 ml/min 20 ml/min	0.5 MPa, 5 bar	3-9	2*-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 IgG3. Applications of protein G include practically all applications of protein A.
29-0486-65 17-5478-51 17-5478-15 17-5478-55	HiTrap Protein L	1 x 1 ml 5 x 1 ml 1 x 5 ml 5 x 5 ml	Approx. 25 mg human Fab	85	4 ml/min 4 ml/min 20 ml/min 20 ml/min	0.5 MPa, 5 bar	2-10	15 mM NaOH	Purification of antibodies and antibody fragments such as Fab fragments, scFv, and Dabs containing kappa light chains.
17-5478-14	HiScreen Capto L	1 x 4.7 ml	Approx. 25 mg human Fab	85	3.9 ml/min	0.3 MPa, 3 bar	2-10	15 mM NaOH	Optimization of chromatography conditions in process development
17-5079-01 17-5079-02 28-9464-89 17-5080-01 17-5080-02	HiTrap rProtein A FF	5 x 1 ml 2 x 1 ml 100 x 1 ml* 1 x 5 ml 5 x 5 ml	50 mg human IgG	90	4 ml/min 4 ml/min 4 ml/min 20 ml/min 20 ml/min	0.5 MPa, 5 bar	3-10	2*-11	Recombinant protein A exhibits similar Fc region specificity to that of native protein A but shows enhanced binding capacity.
28-4082-53 28-4082-55 28-4082-56	HiTrap MabSelect™	5 x 1 ml 1 x 5 ml 5 x 5 ml	min 30 mg human IgG	85	4 ml/min 20 ml/min 20 ml/min	0.5 MPa, 5 bar	3-10	2*-12	For high-throughput capture of monoclonal antibodies.
29-0491-04 11-0034-93 11-0034-94 11-0034-95	HiTrap MabSelect SuRe™	1 x 1 ml 1 x 5 ml 5 x 1 ml 5 x 5 ml	min 30 mg human IgG	85	4 ml/min 4 ml/min 20 ml/min 20 ml/min	0.5 MPa, 5 bar	3-12	2*-14	Designed to tolerate harsh cleaning-in-place protocols.
28-4082-58 28-4082-60 28-4082-61	HiTrap MabSelect Xtra™	1 x 5 ml 5 x 1 ml 5 x 5 ml	Approx. 40 mg human IgG	75	4 ml/min 20 ml/min 20 ml/min	0.5 MPa, 5 bar	3-10	2-12	For capture of high-titer monoclonal antibody feedstreams.
17-5110-01	HiTrap IgM Purification HP	5 x 1 ml	5 mg human IgM	34	4 ml/min	0.5 MPa, 5 bar	3-11	2*-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	0.5 MPa, 5 bar	3-11	2*-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*-12	Optimization of chromatography conditions in process development
28-9269-76	HiScreen MabSelect Xtra	1 x 4.7 ml	Approx. 40 mg human IgG	75	2.3 ml/min	0.3 MPa, 3 bar	3-10	2*-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*-14	Optimization of chromatography conditions in process development
17-5474-15	HiScreen MabSelect SuRe LX	1 x 4.7 ml	Approx. 60 mg human IgG	85	3.9 ml/min	0.3 MPa, 3 bar	3-12	2*-14	Optimized for high binding capacity at long residence time.
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	0.5 MPa, 5 bar	3-9	2*-9	MabTrap Kit includes all necessary buffers for ten purifications using a syringe.
Code No.	Chromatography medium	Pack size							
17-0780-01 17-0963-03	Protein A Sepharose CL-4B	1.5 g 25 ml ⁶	16-25 mg human IgG, 2 mg mouse IgG	90	150 cm/h 150 cm/h	0.02 MPa, 0.2 bar	3-9	2*-10	Isolation and purification of classes, subclasses and fragments of IgG from many different species.
17-5280-01 17-5280-04	nProtein A Sepharose 4 FF ⁷	5 ml 25 ml ⁶	35 mg human IgG, 3-10 mg mouse IgG	90	400 cm/h 400 cm/h	0.1 MPa, 1 bar	3-9	2*-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.
17-1279-01 17-1279-02	rProtein A Sepharose FF ⁷	5 ml 25 ml ⁶	50 mg human IgG, 8-20 mg mouse IgG	90	400 cm/h 400 cm/h	0.1 MPa, 1 bar	3-10	2*-11	Recombinant protein A exhibits similar Fc region specificity to that of native protein A but shows enhanced binding capacity.
17-0618-01 17-0618-02	Protein G Sepharose 4 FF ⁷	5 ml 25 ml ⁶	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 400 cm/h	0.1 MPa, 1 bar	3-9	2*-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 IgG3. Applications of protein G include practically all applications of protein A.
17-0885-01 17-0885-02	GammaBind™ G Sepharose	5 ml 25 ml ⁶	> 17 mg human IgG	90	75 cm/h 75 cm/h	0.015 MPa, 0.15 bar	3-9	2*-9	Binds to all IgG subclasses from human, mouse, and rat; binds total IgG from guinea pig, goat, cow, sheep, and horse.
17-0886-01 17-0886-02	GammaBind Plus Sepharose	5 ml 25 ml ⁶	> 20 mg human IgG	90	150 cm/h 150 cm/h	0.015 MPa, 0.15 bar	3-9	2*-9	Enhanced binding capabilities for mouse and rat monoclonals (also human, cow, sheep, horse, rabbit, and goat).
17-6002-35	Immunoprecipitation Starter Pack	2 x 2 ml	See nProtein A Sepharose 4 FF See Protein G Sepharose 4 FF	90 90	400 cm/h 400 cm/h	0.1 MPa, 1 bar	3-9 2*-9	2*-10 2*-10	Immunoprecipitation Starter Pack includes 2 ml nProtein A Sepharose 4 FF and 2 ml of Protein G Sepharose 4 FF.
17-5478-06 ⁷ 17-5478-01	Capto L	5 ml 25 ml ⁶	Approx. 25 mg human Fab	85	500 cm/h 500 cm/h	0.1 MPa, 1 bar	2-10	15 mM NaOH	Purification of antibodies and antibody fragments such as Fab fragments, scFv, and Dabs containing kappa light chains.
17-5199-01	MabSelect ⁷	25 ml ⁶	min 30 mg human IgG	85	500 cm/h**	0.2 MPa, 2 bar	3-10	2*-12	For high-throughput capture of monoclonal antibodies.
17-5269-07 17-5438-01	MabSelect Xtra ⁷ MabSelect SuRe ⁷	25 ml ⁶ 25 ml ⁶	Approx. 41 mg human IgG min 30 mg human IgG	75 85	300 cm/h** 500 cm/h**	0.15 MPa, 1.5 bar 0.2 MPa, 2 bar	3-10 3-12	2*-12 2*-14	For capture of high-titer feedstreams. Designed to tolerate harsh cleaning-in-place protocols.
17-5474-01	MabSelect SuRe LX ⁷	25 ml ⁶	Approx. 60 mg human IgG	85	500 cm/h**	0.2 MPa, 2 bar	3-12	2*-14	Optimized for high binding capacity at long residence time.

* 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, and 28-9870-62.

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 ¹	Maximum operating pressure	pH stability ²		Application areas	
						Long term	Short term		
Code No.	Prepacked columns	Column size							
29-0510-21 17-5247-01 17-5247-05 17-5248-01 17-5284-02 17-5248-05	HisTrap™ HP	1 × 1 ml 5 × 1 ml 100 × 1 ml [®] 1 × 5 ml 5 × 5 ml 100 × 5 ml [®]	At least 40 mg (Histidine) ₆ -tagged protein	34	4 ml/min 4 ml/min 4 ml/min 20 ml/min 20 ml/min 20 ml/min	0.5 MPa, 5 bar	3-12	2-14	Histidine-tagged proteins. HisTrap HP columns are prepacked with Ni Sepharose High Performance.
17-5319-01 17-5319-02 17-5255-01 17-5255-02	HisTrap FF	5 × 1 ml 100 × 1 ml [®] 5 × 5 ml 100 × 5 ml [®]	Approx. 40 mg (Histidine) ₆ -tagged protein	90	4 ml/min 4 ml/min 20 ml/min 20 ml/min	0.5 MPa, 5 bar	3-12	2-14	Histidine-tagged proteins. HisTrap FF columns are prepacked with Ni Sepharose 6 Fast Flow (ideal for scale-up).
29-0486-31 11-0004-58 11-0004-59 17-5286-01 17-5286-02	HisTrap FF crude	1 × 1 ml 5 × 1 ml 100 × 1 ml [®] 5 × 5 ml 100 × 5 ml [®]	Approx. 40 mg (Histidine) ₆ -tagged protein	90	4 ml/min 4 ml/min 4 ml/min 20 ml/min 20 ml/min	0.5 MPa, 5 bar	3-12	2-14	Histidine-tagged proteins. HisTrap FF crude columns are prepacked with Ni Sepharose 6 Fast Flow and optimized for direct loading of sonicated unclarified cell lysate without any sample pretreatment such as centrifugation and filtration.
17-5256-01	HisPrep™ FF 16/10	1 × 20 ml	See HisTrap FF	90	10 ml/min	0.15 MPa, 1.5 bar	3-12	2-14	Histidine-tagged proteins. HisPrep FF columns are prepacked with Ni Sepharose 6 Fast Flow (ideal for scale-up).
28-9782-44	HiScreen Ni FF	1 × 4.7 ml	See HisTrap FF	90	3.5 ml/min	0.3 MPa, 3 bar	3-12	2-14	Histidine-tagged proteins. Excellent for method optimization and parameter screening
29-0485-86 17-3712-05 17-3712-06	HisTrap excel	1 × 1 ml 5 × 1 ml 5 × 5 ml	At least 10 mg (Histidine) ₆ -tagged protein	90	4 ml/min 4 ml/min 20 ml/min	0.5 MPa, 5 bar	2-12	2-14	Capture and purification of histidine-tagged proteins secreted into eukaryotic cell culture supernatants
29-0485-65 28-9537-66 28-9538-05 28-9537-67 28-9538-09	HiTrap TALON [®] crude	1 × 1 ml 5 × 1 ml 100 × 1 ml* 5 × 5 ml 100 × 5 ml*	up to 20 mg (Histidine) ₆ -tagged protein	60-160	4 ml/min 4 ml/min 4 ml/min 20 ml/min 20 ml/min	0.5 MPa, 5 bar	3-12	2-14	Histidine-tagged proteins. HiTrap TALON crude is packed with TALON Superflow™ which is a cobalt-based IMAC medium offering a different selectivity compared to nickel-charged media pretreatment such as centrifugation and filtration. Optimized for direct loading of sonicated unclarified cell lysate without any sample pretreatment such as centrifugation and filtration.
29-0486-53 28-9075-46 28-9075-47 28-9075-48	StrepTrap™ HP	1 × 1 ml 5 × 1 ml 1 × 5 ml 5 × 5 ml	Approx. 6 mg Strep-tag II protein	34	4 ml/min 4 ml/min 20 ml/min 20 ml/min	0.5 MPa, 5 bar	> 7	> 7	Strep-tag II fusion proteins. StrepTrap HP columns are prepacked with StrepTactin Sepharose High Performance.
29-0486-41 28-9187-78 28-9187-79 28-9187-80	MBPTrap™ HP	1 × 1 ml 5 × 1 ml 1 × 5 ml 5 × 5 ml	Approx. 10 mg MBP-tagged -protein	34	4 ml/min 4 ml/min 20 ml/min 20 ml/min	0.5 MPa, 5 bar	> 7	2-13	MBP-tagged proteins. MBPTrap HP columns are prepacked with Dextrin Sepharose High Performance.
17-5281-01 17-5281-05 17-5282-01 17-5282-02 17-5282-05	GSTrap HP	5 × 1 ml 100 × 1 ml [®] 1 × 5 ml 5 × 5 ml 100 × 5 ml [®]	Approx. 10 mg GST-tagged protein	34	4 ml/min 4 ml/min 20 ml/min 20 ml/min 20 ml/min	0.5 MPa, 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.
29-0486-09 28-4017-45 28-4017-46 28-4017-47 28-4017-48 28-4017-49	GSTrap 4B	1 × 1 ml 5 × 1 ml 100 × 1 ml [®] 1 × 5 ml 5 × 5 ml 100 × 5 ml [®]	> 5 mg horse liver GST	90	4 ml/min 4 ml/min 4 ml/min 20 ml/min 20 ml/min 20 ml/min	0.5 MPa, 5 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.
17-5130-02 17-5130-01 17-5130-05 17-5131-01 17-5131-02	GSTrap FF	2 × 1 ml 5 × 1 ml 100 × 1 ml [®] 1 × 5 ml 5 × 5 ml	10 mg recombinant GST	90	4 ml/min 4 ml/min 4 ml/min 20 ml/min 20 ml/min	0.5 MPa, 5 bar	3-12	3-12	Glutathione S-transferase (GST) tagged proteins produced using the pGEX series of expression GST-tagged protein ⁺ vectors, other glutathione S-transferases and glutathione-dependent proteins.
17-5234-01	GSTPrep FF 16/10	1 × 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 17-0409-01 17-0409-03 17-0409-05	HiTrap Chelating HP	5 × 1 ml 1 × 5 ml 5 × 5 ml 100 × 5 ml [®]	12 mg (Histidine) ₆ -tagged protein (Ni ²⁺) 20 ml/min	34	4 ml/min 4 ml/min 4 ml/min 4 ml/min	0.5 MPa, 5 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.
17-0920-03 17-0920-05	HiTrap IMAC HP	5 × 1 ml 5 × 5 ml	40 mg (Histidine) ₆ -tagged protein (Ni ²⁺)	34	4 ml/min 20 ml/min	0.5 MPa, 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.
17-0921-02 17-0921-04	HiTrap IMAC FF	5 × 1 ml 5 × 5 ml	40 mg (Histidine) ₆ -tagged protein (Ni ²⁺) 25 mg (Histidine) ₆ -tagged protein (Cu ²⁺) 15 mg (Histidine) ₆ -tagged protein (Zn ²⁺)	90	4 ml/min 20 ml/min	0.5 MPa, 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.
17-0921-06	HiPrep IMAC FF 16/10	1 × 20 ml	40 mg (Histidine) ₆ -tagged protein (Ni ²⁺) 25 mg (Histidine) ₆ -tagged protein (Cu ²⁺) 15 mg (Histidine) ₆ -tagged protein (Zn ²⁺)	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.
17-5112-01	HiTrap Streptavidin HP	5 × 1 ml	Biotin > 300 nmol, 6 mg biotinylated BSA	34	4 ml/min	0.5 MPa, 5 bar	4-9	2-10.5	Biotinylated substances, such as biotin-tagged proteins.

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Prepacked columns and media for recombinant tagged proteins (continue)

Ordering information	Product	Binding capacity per ml chromatography medium (approx.)		Average particle diameter μm	Maximum operating flow rate ¹	Maximum operating pressure	pH stability ²		Application areas
Code No.	Kit (including buffers)	Included column					Long term	Short term	
28-4014-77	HisTrap FF crude Kit	HisTrap FF crude 3 x 1 ml	Approx. 40 mg (Histidine) ₆ -tagged protein	34	4 ml/min	0.5 MPa, 5 bar	3-12	2-14	See HisTrap FF crude. Includes all necessary buffers for 10-12 purifications using a syringe.
Code No.	Chromatography medium	Pack size							
17-5268-01	Ni Sepharose HP	25 ml	At least 40 mg (Histidine) ₆ -tagged protein	34	150 cm/h	0.3 MPa, 3 bar	3-12	2-14	Histidine-tagged proteins.
17-5268-02		100 ml			150 cm/h				
17-5318-06	Ni Sepharose 6 FF ⁷	5 ml	Approx. 40 mg (Histidine) ₆ -tagged protein	90	600 cm/h	0.1 MPa, 1 bar	3-12	2-14	Histidine-tagged proteins. Ni Sepharose 6 FF is ideal for scale-up, batch and gravity-flow column usage as well as screening of expression levels using multiwell plate format.
17-5318-01		25 ml			600 cm/h				
17-5318-02		100 ml			600 cm/h				
17-5318-03		500 ml ⁶			600 cm/h				
17-3712-02	Ni Sepharose excel	100 ml	At least 10 mg (Histidine) ₆ -tagged protein	90	600 cm/h	0.1 MPa, 1 bar	2-12	2-14	Capture and purification of histidine-tagged proteins secreted into eukaryotic cell culture supernatants
17-3712-03		500 ml			600 cm/h				
28-9574-99	TALON Superflow	10 ml	up to 20 mg (Histidine) ₆ -tagged protein	60-160	2000 cm/h		3-12	2-14	Histidine-tagged proteins. TALON Superflow which is a cobalt-based IMAC medium offering a different selectivity compared to nickel-charged media
28-9575-02		50 ml			2000 cm/h				
17-5279-01	Glutathione Sepharose HP	25 ml	> 7 mg	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		100 ml			150 cm/h				
17-5132-01	Glutathione Sepharose 4 FF	25 ml	> 10 mg	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		100 ml			450 cm/h				
17-5132-03		500 ml			450 cm/h				
17-0756-01	Glutathione Sepharose 4B	10 ml	> 25 mg	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		100 ml			75 cm/h				
17-0756-04		300 ml			75 cm/h				
17-0575-01	Chelating Sepharose FF ⁷	50 ml ⁶	24-30 $\mu\text{mol Zn}^{2+}$	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.
17-0920-06	IMAC Sepharose HP	25 ml	40 mg (Histidine) ₆ -tagged protein (Ni ²⁺)	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		100 ml			300 cm/h				
28-9355-99	StrepTactin™ Sepharose HP	10 ml	Approx. 6 mg Strep-tag II protein	34	150 cm/h	0.3 MPa, 3 bar	> 7	> 7	Strep-tag II fusion proteins
28-9356-00		50 ml			150 cm/h				
28-9355-97	Dextrin Sepharose HP	25 ml	Approx. 10 mg MBP-tagged protein	34	150 cm/h	0.3 MPa, 3 bar	> 7	2-13	MBP-tagged proteins
28-9355-98		100 ml			150 cm/h				
17-0921-07	IMAC Sepharose 6 FF ⁷	25 ml	40 mg (Histidine) ₆ -tagged protein (Ni ²⁺)	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		100 ml ⁶			600 cm/h				
17-0969-01	IgG Sepharose 6 FF	10 ml ⁶	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. Tandem affinity purification (TAP) in combination with Calmodulin Sepharose 4B of protein complexes
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.
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. Tandem affinity purification (TAP) in combination with IgG Sepharose FF of protein complexes.

Prepacked columns and media for metal chelate chromatography

Ordering information	Product	Binding capacity per ml chromatography medium (approx.)		Average particle diameter μm	Maximum operating flow rate ¹	Maximum operating pressure	pH stability ²		Application areas
Code No.	Prepacked columns	Column size					Long term	Short term	
17-0408-01	HiTrap Chelating HP	5 x 1 ml	12 mg (Histidine) ₆ -tagged protein (Ni ²⁺)	34	4 ml/min	0.5 MPa, 5 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		1 x 5 ml			20 ml/min				
17-0409-03		5 x 5 ml			20 ml/min				
17-0409-05		100 x 5 ml ⁸			20 ml/min				
17-0920-03	HiTrap IMAC HP	5 x 1 ml ⁸	40 mg (Histidine) ₆ -tagged protein (Ni ²⁺)	34	4 ml/min	0.5 MPa, 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.
17-0920-05		5 x 5 ml			20 ml/min				
17-0921-02	HiTrap IMAC FF	5 x 1 ml	40 mg (Histidine) ₆ -tagged protein (Ni ²⁺) 25 mg (Histidine) ₆ -tagged protein (Cu ²⁺)	90	4 ml/min	0.5 MPa, 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.
17-0921-04		5 x 5 ml	15 mg (Histidine) ₆ -tagged protein (Zn ²⁺)		20 ml/min				
17-0921-06	HiPrep IMAC FF 16/10	1 x 20 ml	40 mg (Histidine) ₆ -tagged protein (Ni ²⁺) 25 mg (Histidine) ₆ -tagged protein (Cu ²⁺) 15 mg (Histidine) ₆ -tagged protein (Zn ²⁺)	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.

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Prepacked columns and media for metal chelate chromatography (continue)

Ordering information	Product	Binding capacity per ml chromatography medium (approx.)		Average particle diameter μm	Maximum operating flow rate ¹	Maximum operating pressure	pH stability ²		Application areas
		Code No.	Chromatography medium				Pack size	Long term	
17-0921-01	Chelating Sepharose FF ⁷	50 ml ⁶	24–30 $\mu\text{mol Zn}^{6}$	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.
17-0920-06 17-0920-07	IMAC Sepharose HP	25 ml 100 ml	40 mg (Histidine) ₆ -tagged protein (Ni ²⁺)	34	300 cm/h 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.
17-0921-07 17-0921-08	IMAC Sepharose 6 FF ⁷	25 ml 100 ml ⁶	40 mg (Histidine) ₆ -tagged protein (Ni ²⁺)	90	600 cm/h 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.

Prepacked columns and media for coupling ligands

Ordering information	Product	Average particle diameter μm	Capacity/substation per ml media	Coupling conditions	Maximum operating flow rate ¹	Maximum operating pressure	pH stability ²		Spacer ⁶	Group to be coupled	
							Code No.	Prepacked columns			Column size
17-0716-01 17-0717-01	HiTrap NHS-activated HP	5 × 1 ml 1 × 5 ml	34	10 $\mu\text{mol NHS groups}$	pH 6.5–9, 15–30 min, 4°C to room temperature	4 ml/min 20 ml/min	0.5 MPa, 5 bar	3–12	3–12	10-atom	-NH ₂
17-0906-01	NHS-activated Sepharose 4 FF ⁷	25 ml ⁶	90	Approx. 18 $\mu\text{mol NHS groups}$	pH 6–8, 2–16 h, 4°C to room temperature	400 cm/h	0.1 MPa, 1 bar	3–13	3–13	14-atom	-NH ₂
17-0981-01	CNBr-activated Sepharose 4 FF ⁷	10 g ⁶	90	13–26 mg α -chymotrypsinogen	pH 7–9, 2–16 h, 4°C to room temperature	400 cm/h	0.1 MPa, 1 bar	3–11	3–11	None	-NH ₂
17-0430-01	CNBr-activated Sepharose 4B	15 g ⁶	90	25–60 mg α -chymotrypsinogen	pH 8–10, 2–16 h, 4°C to room temperature	75 cm/h	0.02 MPa, 0.2 bar	3–11	3–11	None	-NH ₂
17-0490-01	Activated CH Sepharose 4B	15 g	90	> 8 $\mu\text{mol glycyl-leucine}$	pH 5–10, 1–4 h, 4°C to room temperature	75 cm/h	0.02 MPa, 0.2 bar	2–11	2–11	8-atom	-NH ₂
17-0571-01	ECH Sepharose 4B	50 ml	90	12–16 $\mu\text{mol carboxyl groups}$	pH 4.5–6, 1.5–24 h, 4°C to room temperature	75 cm/h	0.02 MPa, 0.2 bar	3–14	3–14	10-atom	-NH ₂
17-0480-01	Epoxy-activated Sepharose 6B	15 g ⁶	90	19–40 $\mu\text{mol epoxy groups}$	pH 9–13, 16 h to several days, 20°C to 40°C	75 cm/h	0.03 MPa, 0.3 bar	2–14	2–14	12-atom	-NH ₂ , -OH, -SH
17-0569-01	EAH Sepharose 4B	50 ml ⁶	90	7–11 $\mu\text{mol amino groups}$	pH 4.5–6, 1.5–24 h, 4°C to room temperature	75 cm/h	0.02 MPa, 0.2 bar	3–14	3–14	11-atom	-COOH, CHO
17-0640-01	Activated Thiol Sepharose 4B	15 g	90	1 $\mu\text{mol activated thiol groups}$	pH 4–8, 3–16 h, 4°C to room temperature	75 cm/h	0.02 MPa, 0.2 bar	2–8	2–8	9-atom	-SH
17-0420-01	Thiopropyl Sepharose 6B	15 g	90	Approx. 20 $\mu\text{mol activated thiol groups}$	pH 4–8, 3–16 h, 4°C to room temperature	75 cm/h	0.03 MPa, 0.3 bar	2–8	2–8	4-atom	-SH

HiTrap columns are ready to use prepacked 1 ml and 5 ml columns in a convenient format for laboratory scale preparative purifications. They can be operated with a syringe, peristaltic pump, or liquid chromatography system such as ÄKTA.

HP = Sepharose High Performance
FF = Sepharose Fast Flow

- Maximum linear operating flow rate is calculated from measurement in packed columns with a bed height of 10 cm and i.d. of 5 cm.
- The ranges given are estimates based on our knowledge and experience. Please note the following:
 - pH stability, long term refers to the pH interval where the medium is stable over a long period of time without adverse effects on its subsequent chromatographic performance.
 - pH stability, short term refers to the pH interval for regeneration, cleaning-in-place and sanitization procedures.
 - Protein A and protein G may hydrolyze at low pH. Complete data on the stability of protein A and protein G as a function of pH are not available.
- Data refer to the coupled product, provided that the ligand can withstand the pH.
- The binding capacity values listed above are typical for the given species. However, there might be considerable deviations in binding capacity for different immunoglobulins derived from the same species, even if they are of the same subclass.
- Spacer arms are used when coupling small molecules ($M_r < 1000$). Spacer arms are generally not used for larger molecules ($M_r > 5000$).
- Process scale quantities are available. Please contact GE Healthcare for further information.
- BioProcess Media
- Special pack size delivered on specific customer order.

Ordering information

Product	Pack size	Code number
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	1 × 1 ml	29-0485-76
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	1 × 1 ml	29-0485-81
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 Protein L	1 × 1 ml	29-0486-65
HiTrap Protein L	5 × 1 ml	17-5478-51
HiTrap Protein L	1 × 5 ml	17-5478-15
HiTrap Protein L	5 × 5 ml	17-5478-55
HiScreen Capto L	1 × 4.7 ml	17-5478-14
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	1 × 1 ml	29-0491-04
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
HiScreen MabSelect SuRe LX	1 × 4.7 ml	17-5474-15
HiTrap Blue HP	5 × 1 ml	17-0412-01
HiTrap Blue HP	1 × 5 ml	17-0413-01
HiScreen Blue FF	1 × 4.7 ml	28-9782-43
HiScreen Capto Blue	1 × 4.7 ml	28-9924-74
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
HiTrap TALON crude	1 × 1 ml	29-0485-65
HiTrap TALON crude	5 × 1 ml	28-9537-66
HiTrap TALON crude	100 × 1 ml*	28-9538-05
HiTrap TALON crude	5 × 5 ml	28-9537-67
HiTrap TALON crude	100 × 5 ml*	28-9538-09
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	1 × 1 ml	29-0510-21
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

* Special pack size delivered on specific customer order

Product	Pack size	Code number
HisTrap FF crude	1 × 1 ml	29-0486-31
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
HiScreen Ni FF	1 × 4.7 ml	28-9798-44
HisTrap excel	1 × 1 ml	29-0485-86
HisTrap excel	5 × 1 ml	17-3712-05
HisTrap excel	5 × 5 ml	17-3212-06
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
HiScreen IMAC FF	1 × 4.7 ml	28-9505-17
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
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	1 × 1 ml	29-0486-09
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	1 × 1 ml	29-0486-41
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	1 × 1 ml	29-0486-53
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 number
MABTrap Kit	17-1128-01
HisTrap FF crude Kit	28-4014-77

Chromatography media

Product	Pack size	Code number
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

Product	Pack size	Code number
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 SuRe LX	25 ml	17-5474-01
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
Capto Blue	25 ml	17-5448-01
Capto L	5 ml	17-5478-06
Capto L	25 ml	17-5478-01
Calmodulin Sepharose 4B	10 ml	17-0529-01
TALON Superflow	10 ml	28-9574-99
TALON Superflow	50 ml	28-9575-02
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
Ni Sepharose excel	100 ml	17-3712-02
Ni Sepharose excel	500 ml	17-3212-03
IMAC Sepharose HP	25 ml	17-0920-06
IMAC Sepharose HP	100 ml	17-0920-07
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*

Documentation	Code number
<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
Prepacked Chromatography Columns for ÄKTA systems, Selection guide	28-9317-78
Total solutions for preparation of histidine-tagged proteins, Selection guide	28-4070-92
Solutions for protein preparation and detection of GST-tagged proteins	28-9168-33
Solutions For Antibody Purification Selection guide	28-9351-97

* Technical information can be downloaded from www.gelifesciences.com

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