

AxiChrom™ columns

The AxiChrom column platform is a revolutionary concept in column chromatography that simplifies column handling at all scales from process development to full-scale production. AxiChrom columns (Fig 1) introduce three key features – Intelligent Packing, Intuitive handling, and Predictable scale-up – that together make process chromatography easier, safer, and more efficient.

Intelligent Packing: Verified, preprogrammed, axial compression packing methods save time and ensure accurate and reproducible packing results. This built-in experience reduces operator-dependence and facilitates faster product change-over.

Intuitive handling: Columns are simple to operate and service. Pivot or swing-out column tubes are safer and easier to handle. AxiChrom Master and UNICORN™ wizards guide users through key process steps to save time in method creation, set-up and maintenance.

Predictable scale-up: Straightforward scale-up and tech-transfer due to a liquid distribution system designed using the same analytical and computational fluid dynamic (CFD) modeling tools. Sanitizable columns support cleaning validation. Full technical and regulatory support promote fast, trouble-free start-up.

The entire AxiChrom column line, from 50 to 1000 mm, has been verified to give superior performance with new-generation, high-flow Capto™ and MabSelect™ media families as well as with other BioProcess™ Media.

Column description

General

AxiChrom columns are low-pressure, axial compression chromatography columns for the process development and manufacturing of biopharmaceutical products. Many configuration possibilities (diameters, bed heights,



Fig 1. The AxiChrom range has a novel design that promotes easy handling and operation. This includes a swing-out column tube in larger dimensions and a pivot design for the smaller column tubes. AxiChrom Master is used to control the larger columns.

materials of construction, etc.) combined with packing and maintenance that both reduce change-over time plus a widely applicable plastic bed support make the range ideal for multipurpose facilities.

Axial compression enables more accurate and reproducible control of the packing compared to a traditional flow pack, for example.

After consolidation, the bed is compressed to the pre-determined and verified Packing Factor (PF)¹ for superior chromatographic performance. A range of column sizes is available. The smallest (50 to 200 mm i.d.) have a stand with a pivot design. In larger columns (300 mm i.d. and above), the tube swings out.

¹ Packing Factor (PF) is defined as:

Consolidated bed height/Packed bed height compared to traditional Gravity-settled bed height/Packed bed height.



The distribution system for all column dimensions is based on a design developed using analytical methods and modern CFD-modeling tools. This gives predictable results over the entire range of scales by ensuring uniform plug flow through the bed, irrespective of size.

When packing small columns, slurry is introduced by hand and adapter movement is driven by internal hydraulics. In large columns, slurry is introduced via a media valve in the center of the bottom bed support and the adapter is driven by an electric servo-motor. Control of the media valve, adapter and Intelligent Packing is done via AxiChrom Master. Intelligent Packing with preprogrammed methods supports all column sizes. The main framework specifications of large and small AxiChrom columns are given on page 9.

Materials of construction

Materials of construction are recognized for use in biopharmaceutical manufacture and fulfill the ASME Bioprocessing Equipment Standard when required. Wetted polymeric materials and elastomers meet the requirements of USP Class VI as described in USP Biological Reactivity Tests *In Vivo* <88>, 21 CFR Part 177. They are free from animal-derived components or in compliance with (EMA/410/01 Rev.2). Pressure-retaining and wetted parts are traceable to batch level. Columns with all non-metallic wetted flow-paths for potentially corrosive processes, for example, can also be supplied. A plastic bed support (Fig. 2) can be fitted for such a purpose, or as a low-cost, single-use bed support for multi-purpose facilities.



Fig 2. Single-use, low-cost plastic bed supports are ideal for processes that risk corroding metal column parts. Quick to fit, they also add extra convenience when changing to new campaigns in multi-purpose facilities.

Construction materials in AxiChrom columns (see page 8) are resistant to most chemical agents used in chromatography, including buffer solutions for adsorption, elution and washing, and to solutions effective in cleaning, sanitization and storage. Table 1 lists the general chemical resistance of AxiChrom columns.

Table 1. General guideline to chemical resistance for AxiChrom columns

Chemical ⁹	Concentration ¹	Time/cycle restrictions
Acetic acid	25%	3 h
Acetone	2%	1 h
Ammonium sulfate	2 M ²	5 h
Benzyl alcohol	2%	12 months
Ethanol	20%	12 months and max. 0.5 bar
Ethanol	70% ⁴	3 h
Ethanol/acetic acid	20%/10%	3 h
Guanidine hydrochloride	6 M ^{2,3,7}	5 h
Hydrochloric acid	0.1 M ³ (pH=1)	1 h
Isopropanol	10%/30% ⁴	1 h
Phosphoric acid	5%	8 h
Sodium chloride	0–3 M ^{2,3,6,8}	3 h
Sodium hydroxide	1 M (pH=14)	24 h, room temp. to 30°C
Sodium hydroxide	0.01 M ⁵ (pH=12)	12 months
Sodium sulfate	1 M ²	3 h
Sodium hydroxide/Ethanol	1 M/20%	3 h
Urea	8 M ²	5 h
Commonly used aqueous buffers for chromatographic use	10–250 mM, pH 3–10	24 h

¹ V/v when given as a percentage.

² Solution pH depends on the pH of the buffer, which can vary between 3–13.

³ pH below 4 is not recommended for SS.

⁴ Glass and stainless steel column.

⁵ Not glass column.

⁶ Max 1.0 M NaCl is recommended for columns containing wetted stainless steel components.

⁷ Not for use in columns containing wetted stainless steel components.

⁸ Rinse with at least five column volumes of water after NaCl exposure. Store columns in solutions free from chloride ions.

⁹ The information in Table 1 has been collected from several published sources, not from individual tests on column components. It should be used only as a guide. Maximum exposure times vary. The effect of chemicals will generally be more severe at higher temperatures. Note also that the combined effects of agents have not been taken into account in this table. The applicable chemical resistance depends on the configuration of the column and the associated materials of construction. Always refer to User Manuals or contact GE Healthcare for detailed information.

Media and system compatibility

AxiChrom columns are developed for use with high-flow agarose media such as Capto and MabSelect. This type of column/medium combination can help the drive towards lean biomanufacturing and operational excellence, where improvements bring more speed and better economy to downstream processing. AxiChrom columns are also compatible with other BioProcess Media.

Depending on column size, ÄKTA™ avant, ÄKTAexplorer™, ÄKTApilot™ or ÄKTAprocess™ will be the chromatography system of choice. Full utilization of the Intelligent Packing strategy requires one of these systems running UNICORN™ control software. For ÄKTAexplorer and ÄKTApilot, the special strategy for Intelligent Packing is delivered with the column.

Intelligent Packing

Intelligent Packing comprises UNICORN software-controlled packing of AxiChrom columns using an ÄKTAexplorer, ÄKTApilot, or ÄKTAprocess system (Fig 3). Larger columns can also be packed directly from the ÄKTA Master. For preprogrammed BioProcess media, Intelligent Packing ensures optimally-packed beds and decreases dependence on the operator. In addition, UNICORN enables online monitoring of packing progress, automatic packed bed evaluation testing, and creates result files including dates, times, operator and data that can be used with batch records.



Fig 3. Intelligent Packing greatly simplifies the packing of AxiChrom columns used with ÄKTA™ systems.

With axial compression and the Intelligent Packing user interface, customized methods for media other than BioProcess can be developed. Operator-independence in scale and location also makes packing a 'non-critical' event in tech-transfer, even when this takes place at manufacturing sites in other locations.

The operational experience built into Intelligent Packing facilitates other important aspects of production planning. For example, more accurate forecasting of media consumption eliminates undue waste and reduces the amount of safety stocks needed to be held on site. In addition, the axial compression packing technique itself has a number of inherent benefits. It gives optimally compressed beds every time, is quick to complete, and requires just one operator.

Intelligent Packing in small columns

The packing method is built by entering values for the packing variables in a UNICORN Intelligent Packing wizard, which then calculates slurry volumes. Next, the column is connected to an ÄKTA system (column dimension dependent), primed, and filled with slurry according to the created UNICORN method. This method controls the flow of hydraulic fluid to drive the adapter and pack the column.

Figure 4 illustrates this procedure. Hydraulic liquid is pumped into the hydraulic chamber to move the adapter down. Packing liquid from the slurry is forced through the bottom bed support outlet and the bed consolidates. When the adapter meets the consolidated bed surface, the operator presses a button in a UNICORN dialog. This signals the adapter to continue its movement and compress the bed according to the predetermined Packing Factor. UNICORN then stops the flow. If selected in UNICORN wizard, Intelligent Packing will automatically run a packed bed evaluation test.

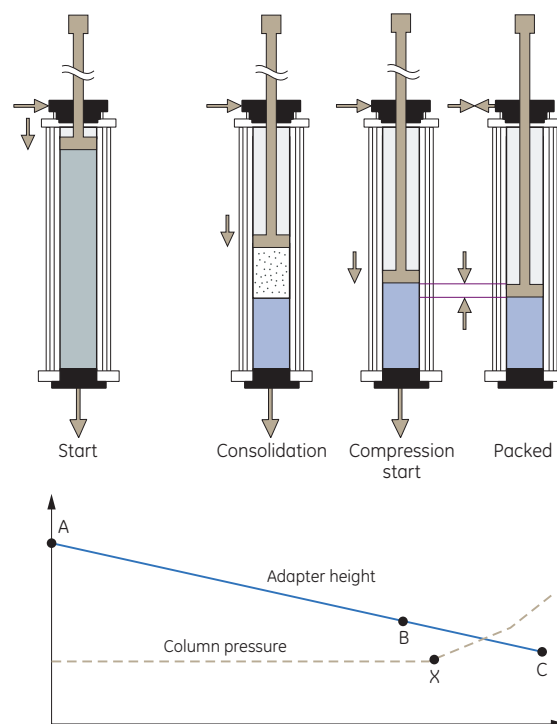


Fig 4. Intelligent Packing in small columns. **(Start)** The adapter moves down, forcing packing liquid out of the slurry. **(Consolidation)** The slurry forms a consolidated bed. **(Compression start)** When the adapter comes into contact with the consolidated bed surface, the operator initiates bed compression in the UNICORN wizard. Compression occurs according to a predetermined Packing Factor. **(Packed)** The target bed height is attained. Note: As the bed starts to compress (**B** in lower figure), an increase in pressure is seen at point **X** on the graph.

Unpacking small columns

Small AxiChrom columns are unpacked manually. The pivoting tube allows very convenient emptying. Slow upward flow is increased gradually so that the adapter rises and the packed bed successively breaks up. The flow rate is then slowed and the adapter finally stopped just below the upper flange. After removing the top plate and adapter, the column tube is tipped to empty the slurry into a container.

Intelligent Packing in larger columns

Large (300 mm and above) AxiChrom columns are controlled via AxiChrom Master, a separate unit that comprises a touch-screen operator interface (Fig 5) and a motor-drive. The same AxiChrom Master can be used for all diameters between 300 and 1000 mm. When connected to an ÄKTAprocess system, UNICORN is used as operator interface for priming, packing, and unpacking by using automated methods created with the Intelligent Packing wizard. Users only need to select the medium to pack, the slurry concentration of the medium, and the target bed height. Note that AxiChrom Master is not needed during chromatography operation, and that one unit can be used to control up to ten individual columns in the range of 300 to 1000 mm. See page 8 for more details.

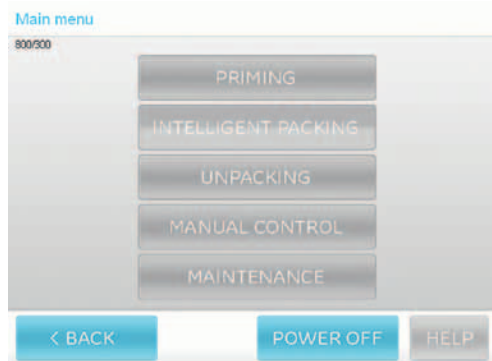


Fig 5. AxiChrom Master controls the packing, unpacking and maintenance of large AxiChrom columns via a touch-screen interface.

Large AxiChrom columns are equipped with a two-position media valve at the center of the bottom bed support. These two positions enable filling, packing, and unpacking without adjusting the assembled column.

Figure 4 also illustrates the general principles of the larger column packing procedure. The adapter rises from its lowest position and the column fills with slurry via the media valve, the volume of which is calculated automatically from the target bed height, slurry concentration and Packing Factor. Even the void volume of the hose connection between the column and slurry tank is taken into consideration. As an electric servo-motor controls the movement of the adapter, its position is monitored with millimeter accuracy.

When the correct slurry volume has been drawn into the column, the adapter starts to lower and packing buffer is forced out through the bottom bed support at a linear flow rate optimized for the medium being packed. Bed consolidation starts. The time to complete consolidation (i.e., when the adapter reaches the bed) is also automatically calculated, allowing the operator to carry out other tasks in the meantime.

The adapter hits the consolidated bed, an event monitored as a very distinct dip on the pressure curve. When this occurs, the operator confirms that the adapter has hit the bed and a graphical interface shows on the UNICORN control screen or AxiChrom Master. This graphical interface assists the operator in finishing the packing, giving a perfectly packed bed (see Fig 6 A and B). When the adapter symbol is within the range of optimal pack factors and bed height limits, the operator can end the packing. At this step, it is possible to prioritize exact Packing Factor or bed height.

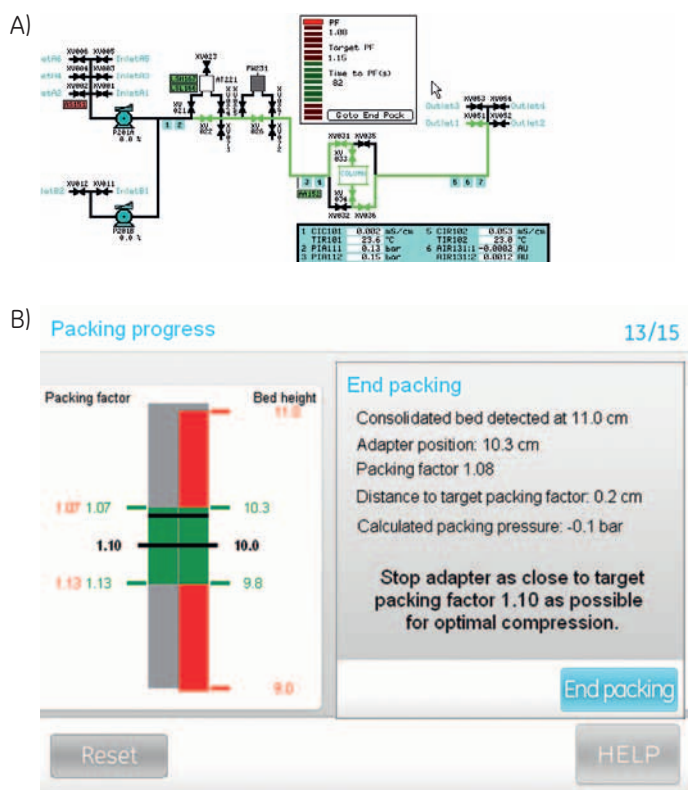


Fig 6. UNICORN (A) and AxiChrom Master (B) graphical interfaces at the end of the packing. When the compression of the bed has started, the accepted Packing Factors and bed height are shown. The area in which the criteria for packing factor and bed height overlap and where an approved packed bed can be achieved, is shown as green. The adapter, highlighted in the graphics, should be stopped as close to the target Packing Factor as possible.

Unpacking large columns

Large AxiChrom columns unpack easily at high slurry concentrations. This reduces the volume to handle and thereby the need for costly storage. Unpacking methods for preprogrammed media are available via the UNCORN wizard or AxiChrom Master.

Figure 7 summarizes the procedure. The motor lifts the adapter at the same time that upward flow is applied, causing the packed bed to rise (A). When a liquid space is created underneath the bed, and the flow is stopped, the bed eventually collapses and falls to the bottom (B). With flow back in the upward direction, the bottom media valve open, and the top mobile phase valve closed, the medium is kept resuspended while the adapter moves back down to its lowest position. Medium is pushed out of the column and collected in a slurry tank.

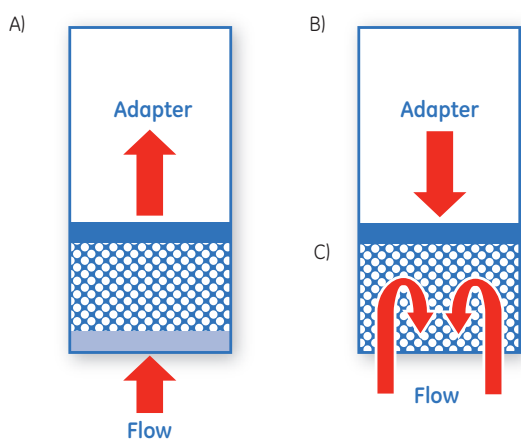


Fig 7. Unpacking large columns. **(A)** The adapter rises (motor driven) with the applied upward flow. **(B)** The adapter movement is stopped and the bed collapses and falls to the bottom. **(C)** Upward flow with an open media valve and a closed top mobile phase valve resuspends the medium and the adapter pushes it out through the bottom valve.

Intuitive handling

AxiChrom columns are easy to operate. Even the largest sizes can be handled safely by just a single operator. Step-by-step interfaces guide users through key packing, unpacking and maintenance steps. Previous experience or extensive training is not necessary, which makes it easy to quickly move columns between projects and/or locations. As well as helping avoid operator-error, these intuitive aids also reduce downtime and maximize column use.

Small columns feature a simple pivot design that eliminates lifting and promotes safer operation. Emptying is simple and accomplished without unnecessary waste of medium. Access to bed supports and O-rings is straightforward and most maintenance can be performed without disassembling the whole column.

The swing-out, hoist-free design of large AxiChrom columns (Fig 8) has many practical advantages. As there is no need to move it from the production site for maintenance, it requires less space than a conventional column, and as no hoists are needed, it provides a safer working environment as well. Furthermore, access to all relevant parts is easy. Together with clear and concise interactive instructions from AxiChrom Master, this reduces downtime to a minimum. For example, disassembly, changing all wetted parts, and reassembly takes about one hour.

AxiChrom columns are delivered with a comprehensive documentation package comprising spare parts and accessories lists, materials certificates, assembly drawings, User Manual, etc. The number of spare parts needed to be kept in stock is low compared to other column series.



Fig 8. AxiChrom column in swing-out mode provides easy access to bed supports and O-rings. In multi-purpose facilities, changing plastic bed supports for a new campaign is done very quickly.

Table 2. Verification of small and large diameter AxiChrom columns (50 to 1000 mm) with three commonly-used BioProcess Media platforms (Capto™, MabSelect™ and Sepharose™). Plate number and asymmetry results (average of three to five packings) are well within specifications, confirming the success of the column design

Medium	Column diameter (mm)	Bed height (cm)	Average (N/m)	Average (h)	Average (As)
Capto Q	50	20	6900	1.6	1.2
Capto Q	50	40	7100	1.6	1.0
Capto Q	70	20	6600	1.7	1.2
Capto Q	70	30	6200	1.8	1.3
Capto Q	100	20	7200	1.5	1.0
Capto Q	100	40	7300	1.5	1.1
Capto Q	140	20	6400	1.7	1.2
Capto Q	140	40	6700	1.7	1.0
Capto Q	200	20	7800	1.4	1.0
Capto Q	200	40	7600	1.5	1.0
Capto Q	400	20	7500	1.6	1.2
Capto Q	400	40	7200	1.6	1.1
Capto Q	1000	10	7500	1.6	1.3
Capto S	400	10	5300	2.1	1.3
Capto S	1000	15	7000	1.5	1.2
Capto DEAE	600	20	7200	1.6	1.2
Capto Adhere	600	20	8900	1.5	1.2
Capto Adhere	600	35	7700	1.5	1.1
Capto MMC	400	40	8300	1.2	1.2
Capto MMC	600	35	9500	1.4	1.1
Capto MMC	600	20	8800	1.5	1.3
Capto MMC	1000	20	7800	1.7	1.3
MabSelect	50	20	7900	1.5	1.1
MabSelect	100	20	8200	1.4	1.0
MabSelect	140	20	7900	1.5	1.2
MabSelect Xtra™	400	20	7400	1.7	1.2
MabSelect Xtra	600	20	8100	1.7	1.2
MabSelect SuRe™	400	20	8300	1.4	1.1
MabSelect SuRe	400	35	8200	1.4	1.1
MabSelect SuRe	600	20	8200	1.4	1.2
SP Sepharose Fast Flow	50	10	6600	1.7	1.3
SP Sepharose Fast Flow	70	10	7100	1.6	1.3
SP Sepharose Fast Flow	70	30	7200	1.5	1.0
SP Sepharose Fast Flow	100	10	7600	1.4	1.1
SP Sepharose Fast Flow	100	30	7700	1.4	1.0
SP Sepharose Fast Flow	140	10	6100	1.8	ND
SP Sepharose Fast Flow	140	30	6400	1.6	1.1
SP Sepharose Fast Flow	200	10	7000	1.5	1.2
SP Sepharose Fast Flow	200	30	7000	1.5	1.1
SP Sepharose™ High Performance	400	10	15900	1.9	1.4
SP Sepharose High Performance	600	10	12000	2.4	1.3
SP Sepharose High Performance	1000	10	16800	1.8	1.4
Sepharose Big Beads	1000	10	2700	1.9	1.3
Sepharose Big Beads	1000	30	3500	1.5	1.1
Phenyl Sepharose Fast Flow (high sub)	600	20	6700	1.7	1.3
SP Sepharose Fast Flow	400	10	5500	2.0	1.4
SP Sepharose Fast Flow	400	30	7100	1.6	1.2
SP Sepharose Fast Flow	1000	30	6000	1.9	1.2
SP Sepharose Fast Flow	1000	10	5500	2.0	1.3

Predictable scale-up

To secure scalable and predictable performance, an analytical method for computing the mathematical residence-time distribution of the liquid distribution system was applied during column design. CFD methods were then used to validate the analytical results, as well as for detailed studies analyzing more complicated geometries.

The impact of distributor design on separation efficiency was predicted as a function of media properties and packed bed dimensions. Efficiency loss caused by the distributor when increasing column diameter during scale-up was quantified. It was concluded that by selecting an appropriate distributor design with optimized dimensions, separations can be scaled up without any significant loss of chromatographic efficiency due to the distribution system. This design was then verified experimentally by HETP and asymmetry testing from small to large column diameters (Table 2).

The range of modeled mobile phase distribution systems ensures uniform plug flow through the bed, irrespective of size, thereby promoting reproducible results over the entire column range. Irrespective of experience or location, users can thus expect the same good separation efficiency when scaling up (or down). Together with Intelligent Packing, this promotes smooth and predictable tech-transfer between departments and sites or to CMOs (Fig 9). Model protein elution and HETP tests confirm this consistent chromatographic performance (Figs 10 and 11).

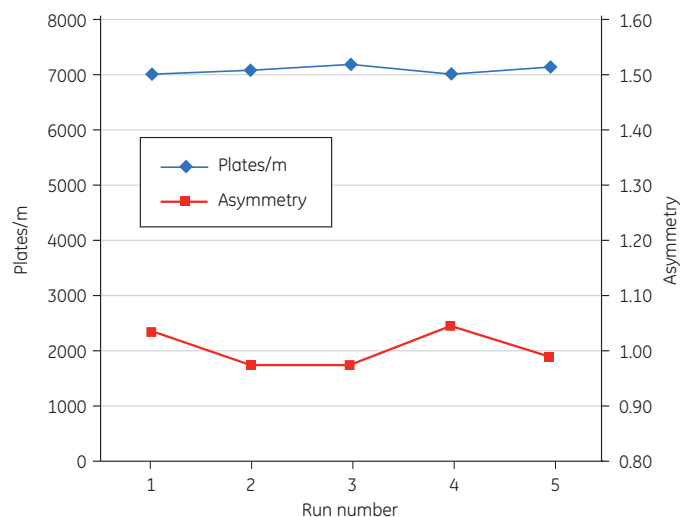


Fig 9. Minimizing operator influence greatly improves reproducibility. Repeated packings of Capto Q in AxiChrom 50 at 40 cm bed height show practically no variation in plate height plus asymmetries that only vary between 0.98 and 1.07.

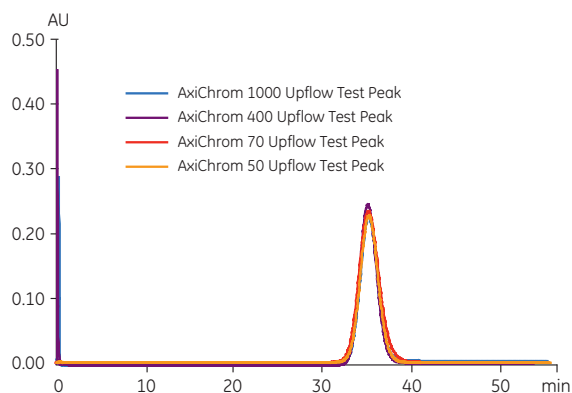


Fig 10. HETP tests on SP Sepharose Fast Flow packed to 20 cm bed heights in different AxiChrom column dimensions.

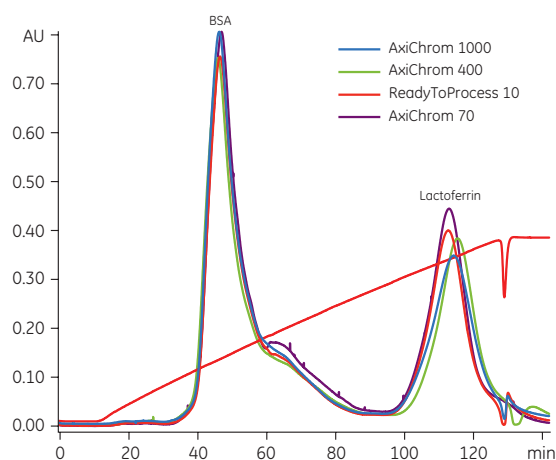


Fig 11. Separation of BSA and Lactoferrin on SP Sepharose Fast Flow in different AxiChrom and ReadyToProcess™ columns.

Documentation and traceability

Comprehensive documentation (including IQ/OQ documents) simplifies validation, thereby reducing start-up time. The same level of documentation is available for all column sizes. In addition, traceability to batch level for wetted polymeric materials and elastomers meets the requirements of USP Class VI, as well as 21 CFR Part 177. Both of these regulatory support measures speed up planning and implementing the cGMP production of biopharmaceuticals.

High standards of sanitary design

One key aspect of cGMP production is operation at hygienic standards. AxiChrom columns have been demonstrated to meet high standards of sanitary design, both for columns with stainless steel beds as well as plastic bed supports. For example, the efficiency of microbial sanitization and endotoxin clearance has been investigated by challenge testing. Columns packed with Sepharose™ Fast Flow media were challenged with *E. coli* and endotoxins and incubated for 16 to 20 h at room temperature before being treated with 1 M sodium hydroxide (NaOH) and then sampled.

The results of both studies fulfilled the set acceptance criteria proving sanitization with 1 M NaOH to be effective. Despite high levels of microbial contamination, no challenging organisms were found after treatment. In addition, 1 M NaOH gave a 6-log reduction of endotoxin concentration. The final level in the column flowthrough was less than 0.05 EU/ml, which is below the USP recommendation for water for injection (WFI). Full study details are described in Application Note 'Sanitization and endotoxin clearance in AxiChrom columns' (28-9290-42).

Summary

AxiChrom columns help implement the philosophy of lean manufacturing in downstream processing by bringing new levels of simplicity, efficiency, and economy to process chromatography.

Cross-range features such as Intelligent Packing, intuitive handling and predictable scale-up save time and costs all the way from column preparation and packing through operation to unpacking and maintenance. AxiChrom makes column packing an operation that no longer needs to be regarded as an uncertain element on the 'critical' list of scale-up and tech-transfer tasks. Compatibility with new-generation, high-flow agarose separation media is excellent and materials of construction fulfill stringent regulatory requirements. A wide range of configurations also promotes flexibility. Finally, AxiChrom columns operate at the high standards of hygiene required by cGMP.

Materials of construction

Component	< 300 mm id	≥ 300 mm id
Column tube	Glass, borosilicate 3.3 ¹	PMMA Cast cross-linked acrylic or stainless steel ASTM 316L
Seals	EPDM, FPM ³ , and UHMWPE ³	UHMWPE (adapter), FPM (dynamic), and EPDM (static) ³
Distributor	—	Polypropylene
Adapter	Stainless steel ASTM 316L ² and Polypropylene	Stainless steel ASTM 316 ⁵
Bottom plate	Stainless steel ASTM 316L ²	Stainless steel ASTM 316 ⁵
Top plate/top lid	Stainless steel ASTM 316L ²	Stainless steel ASTM 316 ⁵
Connection tube material	—	Stainless steel ASTM 316L or Polypropylene
Media valve body	—	Polypropylene
Tubing	PVDF ³ or Polypropylene	—
Bed support ring	PEEK ³ or PTFE/PEEK	Stainless steel ASTM S32205 or UHMWPE
Bed support net	Stainless steel ASTM 316L ² , Polyethylene, or UHMWPE ⁶	Stainless steel ASTM 316L, Polyethylene, or UHMWPE ⁶
Stand	Stainless steel ASTM 316L ⁴ and POM-C ³	Stainless steel ASTM 316
AxiChrom foot	PS ³	—

¹ Glass according to EU standard EN 1595

² EN 1.4404, EN 1.4432 or 1.4435 may be used. All materials are to standard EN 10028-7 and EN 10272

³ PEEK=PolyEtherEtherKetone, EPDM=Ethylene Propylene Diene Monomer rubber, FKM/FPM=FluoroCarbon rubber, UHMWPE=Ultra High Molecular Weight Polyethylene, PS=Polystyrene, PVDF=PolyvinylideneDiFluoride, POM-C=PolyOxyMethylene, PMMA=Poly Methyl Meth Acrylat, FPM=FullFluorinatedPolypropyleneMonomer

⁴ EN 1.4404 or EN 1.4436 (316) may have been used

⁵ Not wetted material

⁶ Polyethylene for 20 µm and UHMWPE for 10 µm bed supports

Installation specifications

AxiChrom Master

Height (mm)	1090
Footprint (mm)	670 x 590
Weight (kg)	75
Supply voltage (VAC)	380–400
Max voltage (North America)	480Y/277 VAC
Frequency (Hz)	50–60
Max power consumption (VA)	2400
Air supply (bar g)	5.5–7 (clean dry air)

Framework specifications

¹ Weight includes stainless steel bed support

² 20 µm supports are standard; 10 µm can be special ordered

AxiChrom columns	300		400		450		600		800		1000											
Inner column diameter (mm)	300		400		450		600		800		1000											
Column type	300/300	300/500	400/300	400/500	450/300	450/500	600/300	600/500	800/300	800/500	1000/300	1000/500										
Bed height (cm)	10–30	10–50	10–30	10–50	10–30	10–50	10–30	10–50	10–30	10–50	10–30	10–50										
Weight, empty column ¹ (kg)	420	440	460	480	710	760	835	900	2150	2240	2560	2680										
Min height (mm)	1450	1710	1455	1715	1500	1760	1600	1860	1750	2010	1905	2165										
Max. operating work height (mm)	2060	2580	2060	2580	2080	2600	2190	2710	2480	3000	2490	3010										
Max. height for maintenance (mm)	2200	2720	2200	2720	2230	2750	2340	2860	2630	3150	2650	3170										
Max. operating pressure (bar g)	4																					
Footprint foot (mm × mm)	520 × 1110		600 × 1110		620 × 1110		780 × 1180		1080 × 1470		1300 × 1720											
Operating temperature (°C)	2–30																					
Adapter movement	Servo motor																					
Bed support (µm)	10, 20																					

¹ Weights are for PMMA column tube and stainless steel bed support

AxiChrom columns	50			70			100			140			200		
Bed height (cm)	10	30	50	10	30	50	10	30	50	10	30	50	10	30	50
Column volume* (L)	0.2	0.6	1.0	0.4	1.2	1.9	0.8	2.4	3.9	1.5	4.6	7.7	3.1	9.4	15.7

AxiChrom columns	300			400			450			600			800			1000		
Bed height (cm)	10	30	50	10	30	50	10	30	50	10	30	50	10	30	50	10	30	50
Column volume* (L)	7	21	35	13	38	63	16	48	80	28	85	141	50	151	251	79	236	393

* Column volumes do not take medium compression into consideration

Ordering information

Columns	Code no.
AxiChrom 50/300/Glass/20SS	28-9018-31
AxiChrom 50/500/Glass/20SS	28-9018-41
AxiChrom 70/300/Glass/20SS	28-9018-40
AxiChrom 70/500/Glass/20SS	28-9018-47
AxiChrom 100/300/Glass/20SS	28-9032-74
AxiChrom 100/500/Glass/20SS	28-9032-76
AxiChrom 140/300/Glass/20SS	28-9077-02
AxiChrom 140/500/Glass/20SS	28-9439-27
AxiChrom 200/300/Glass/20SS	28-9077-03
AxiChrom 200/500/Glass/20SS	28-9439-28

AxiChrom 50, AxiChrom 70, and AxiChrom 100

Parts/Accessories	Quantity	Code no.
Pivot stand 50/70/100-300	1	28-4017-09
Pivot stand 50/70/100-500	1	28-4017-10
AxiChrom foot 70	1	28-4019-37
Mechanical locking 50	1	28-4018-39
Mechanical locking 70	1	28-4018-40
Mechanical locking 100	1	28-4018-41
Tool kit small AxiChrom	1	28-9361-36
Tool kit complete AxiChrom	1	28-9442-61
Torque wrench kit AxiChrom	1	28-9361-37
Torque driver kit	1	28-9361-39
Tubing kit AxiChrom 50 ÄKTAexplorer / desk	1	28-9055-41
Tubing kit AxiChrom 50 ÄKTAexplorer / floor	1	28-9056-03
Tubing kit AxiChrom 50 ÄKTApilot / desk	1	28-9056-76
Tubing kit AxiChrom 50 ÄKTApilot / floor	1	28-9136-13
Tubing kit AxiChrom 70 ÄKTApilot / floor	1	28-9136-14
Media stirrer (40 mm, for AxiChrom 50/70)	1	28-9231-80
Media stirrer (80 mm, for AxiChrom 100/140)	1	28-9191-03

AxiChrom 140 and AxiChrom 200

Parts/Accessories	Quantity	Code no.
Mechanical locking 140	1	28-9433-88
Mechanical locking 200	1	28-9433-53
Silicone tubing kit AxiChrom 140, i.d. 3.2 (ÄKTAprocess)	1	28-9429-86
Silicone tubing kit AxiChrom 140, i.d. 4.8 (ÄKTAprocess)	1	28-9429-93
Silicone tubing kit AxiChrom 140, i.d. 6.4 (ÄKTAprocess)	1	28-9430-20
TC 25 Clamp SS	5	28-4043-38
TC gasket 25/6.5	10	28-4034-13
TC end cap TC 25	1	28-4043-39
Media stirrer (80 mm)	1	28-9191-03
Media stirrer (150 mm)	1	28-9191-04
User Manual AxiChrom 140 and 200	1	28-9489-52
Tool kit small AxiChrom	1	28-9361-36
Tool kit large AxiChrom	1	28-9442-61
Torque wrench kit AxiChrom	1	28-9361-37
Torque driver kit AxiChrom	1	28-9361-39
Outlet tubing kit AxiChrom 140, 200	1	28-9430-41

Configurable, larger AxiChrom columns, parts, and accessories

Smaller columns without standard code numbers and all larger columns with diameters of 300 mm and larger, are configurable and ordered via a sales configurator. Columns can be tailored to requirements using this configurator. The configurator also creates an extensive documentation package including General Specification, Bill of Materials, Assembly Drawing, Spare Parts List, Site Preparation Guide, as well as a price quotation. Via the sales configurator, dynamic wizards for accessories and spare parts recommend a number of accessories and spare parts exactly matching the column and interface to a chromatography system. This facilitates easy, fast and correct selection, all fulfilling the same standards as the column.

Examples of accessories: tubings, T-junctions, reducers, gaskets and clamps, casters, safety valves, manual valves, tool kit, and media stirrer.

The sales configurator is also used to recommend upgrade kits for ÄKTApocess systems that were delivered prior to Intelligent Packing being available. By entering the ÄKTApocess system serial number, the applicable kit(s) for that system is given.

Please contact a GE Healthcare sales representative for assistance in configuring your column and system.

Related literature

	Code no.
Sanitization and endotoxin clearance in AxiChrom columns	28-9290-42
Column efficiency testing	28-9372-07
Handling of stainless steel column parts in sensitive environments	28-9433-77

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