



Foresight Pro Column Product Information Sheet

Prepacked Process Chromatography Columns

- Prepacked columns available with 5–33 cm ID and 10 or 20 cm bed height
- GMP ready
- Single-source supplier — CHT Media, prepacked columns, and technical support

Foresight Pro Columns are prepacked good manufacturing practice (GMP) ready columns specifically designed to be used for the production-scale manufacturing of biologics. This includes a broad range of purification and polishing applications for vaccines, monoclonal antibodies, and recombinant proteins. These prepacked disposable columns offer a more cost-effective solution than traditional “pack in place” designs. A variety of diameters and bed heights are available to choose from. The columns have a sanitary design with minimal dead space and effective cleanability. Connections to pumping systems are made via standard 3/4" Tri-Clamp Fittings.

Foresight Pro Columns are available with inner diameters (ID) from 5 to 33 cm and column bed heights of 10 or 20 cm (Figure 1). Column design and expert packing methodology results in reproducibly packed columns. See Table 1 for available resin types, column dimensions, and column bed volumes.



Fig. 1. Foresight Pro Columns.

Table 1. Foresight Pro Column dimensions available with CHT Ceramic Hydroxyapatite Type I, CHT Type II, and CHT XT Media (40 µm particle size).

Column ID, cm	Column Bed Height, cm	Column Bed Volume, L
5	10	0.2
5	20	0.4
8	10	0.5
8	20	1
10	10	0.8
10	20	1.5
13	10	1.3
13	20	2.7
20	10	3.1
20	20	6.3
24	10	4.5
24	20	9
33	10	8.5
33	20	17

ID, inner diameter.

Column Construction Materials

Foresight Pro Columns are designed for a vast range of biopharmaceutical manufacturing applications, and are made of materials that provide optimal biological and chemical compatibility (Figure 2, Table 2).

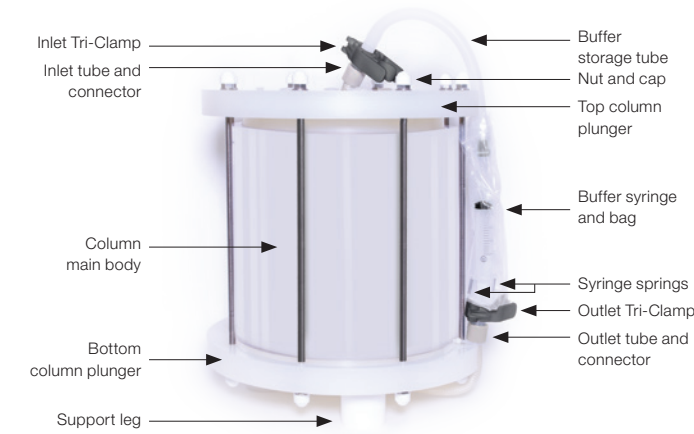


Fig. 2. Foresight Pro Column elements.

Table 2. Material contact summaries.

Nonproduct Contact Material Summary				
Element	Material			
Top and bottom column plungers	Polypropylene			
Holding bolt	Polyamide or 304 stainless steel			
Product Contact Material Summary				
Element	Material	USP <88> Biological Reactivity Test	U.S. FDA 21 CFR Part 177	Animal Origin
Column body (5 cm ID columns)	Glass	N/A	N/A	N/A
Column body (8, 10, 13, 20, 24, 33 cm ID columns)	Acrylic	Class VI	177.1010	Animal-free
Flow distributors	Polypropylene	Class VI	177.1520	Animal-free
Inlet and outlet connectors	Polypropylene	Class VI	177.1520	Animal-free
Tubing connections	Reinforced elastomer tubing	Class VI	177.2600	Animal-free
O-rings	Viton	Class VI	177.2600	Animal-free
Tri-Clamp Gasket	Ethylene propylene diene monomer (EPDM)	Class VI	177.2600	Animal-free
Bed support screens	Polyamide*	Class VI	177.1500	Animal-free

* The polyamide bed support screen is welded to the polypropylene flow distributor without using any extra chemicals.
CFR, Code of Federal Regulations; FDA, Food and Drug Administration; ID, inner diameter; N/A, not applicable; USP, United States Pharmacopeia.

Column Shelf Life

All Foresight Pro Columns have a shelf life of 2 years from the date of manufacture.

Column Performance Testing

Packing Quality

The performance of Foresight Pro Columns was evaluated before and after International Safe Transit Association (ISTA) 2A shipping tests. The column efficiency test includes the determination of the number of theoretical plates (N) per meter (Figure 3) and asymmetry factor (A_s) (Figure 4).

The Foresight Pro Columns were equilibrated in phosphate buffered saline (PBS), pH 7.2. Each column was injected with a 2% column volume (CV) of PBS containing 1.0 M NaCl. The flow rate was continued at 100 cm/hr while monitoring conductivity. N/m and A_s values were then determined. As shown in Figures 3 and 4, the columns maintained performance criteria (Table 3) with minimal changes in both N/m and A_s , indicating good stability during shipping.

Table 3. Packed column specifications.

Criterion	Value
Number of theoretical plates per meter, N/m	$\geq 4,800$
Column asymmetry, A_s	$0.80 \leq A_s \leq 2.2$
Microbial bioburden, CFU/ml	< 10
Endotoxin level, EU/ml	< 0.25

CFU, colony forming units; EU, endotoxin units.

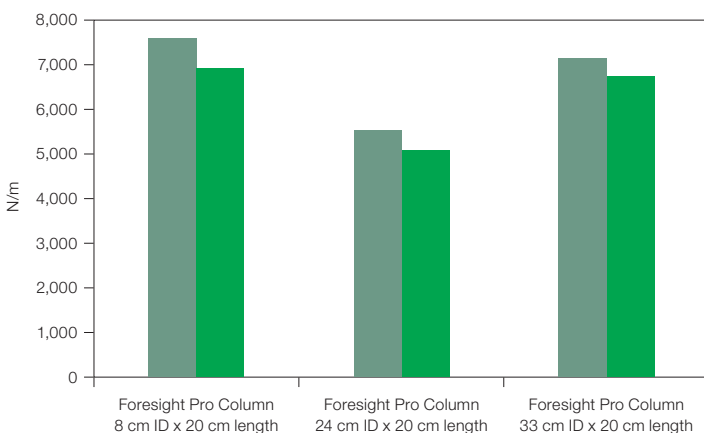


Fig. 3. Evaluation of N/m, comparing pre- and post-ISTA 2A tests. Pre-ISTA 2A (grey); post-ISTA 2A (green). ID, inner diameter; ISTA, International Safe Transit Association; N/m, number of theoretical plates per meter.

Cycling Data

Testing for flow stability is a further assurance that the column beds are stable. For this study, packed columns were put through ten cycles of increasing flow rates, in increments of 50 cm/hr up to a backpressure of 3 bar. Each flow rate was held for 2 min. This process was repeated ten times. Column efficiency was measured in terms of N/m and A_s prior to and at the end of the cycling study. All columns maintained performance criteria (Table 3) after the tenth cycle. As Figures 5 and 6 show, changes in column efficiency were minimal.

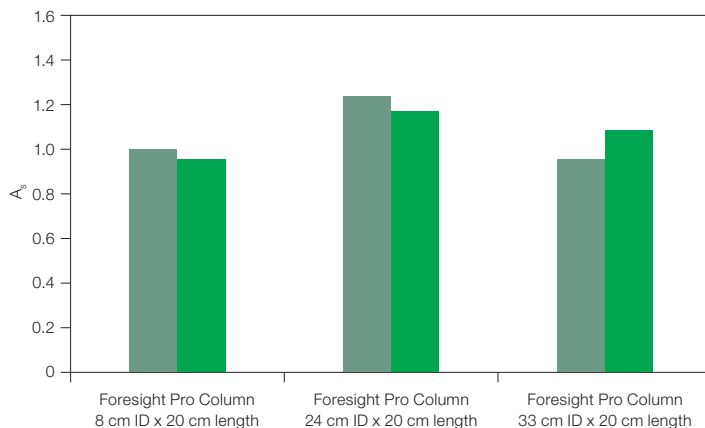


Fig. 4. Evaluation of A_s , comparing pre- and post-ISTA 2A tests. Pre-ISTA 2A (grey); post-ISTA 2A (green). A_s , asymmetry factor; ID, inner diameter; ISTA, International Safe Transit Association.

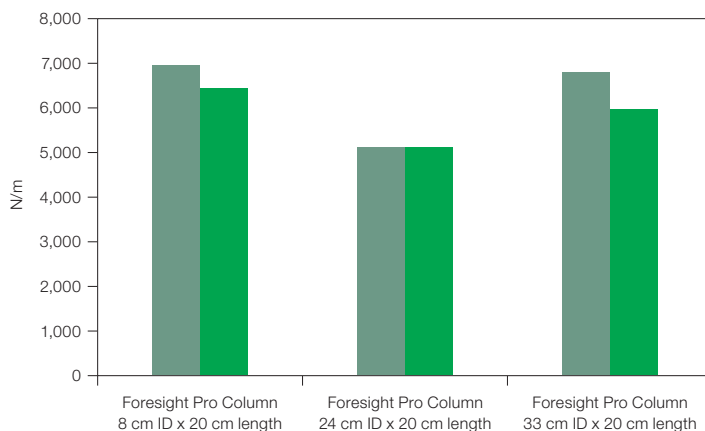


Fig. 5. Evaluation of N/m, comparing the first and tenth cycle of three Foresight Pro Columns. First cycle (grey); tenth cycle (green). ID, inner diameter; N/m, number of theoretical plates per meter.

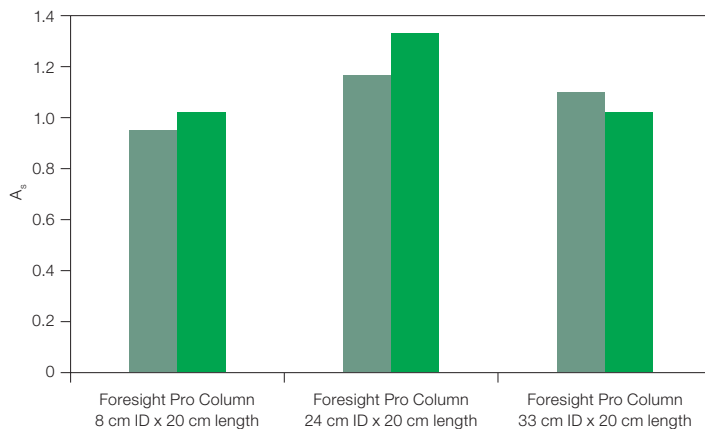


Fig. 6. Evaluation of A_s , comparing the first and tenth cycle of three Foresight Pro Columns. First cycle (grey); tenth cycle (green). A_s , asymmetry factor; ID, inner diameter.

Cleanability Testing

Endotoxin and bioburden tests are performed to ensure that columns are in a sanitized state for shipment to customers. Each column must pass the acceptance criteria for endotoxin level (<0.25 EU/ml) and microbial bioburden (<10 CFU/ml) (see Table 3 for packed column specifications). Foresight Pro Columns, prepacked with CHT Media, are shipped in 0.1 N NaOH.

Pressure/Flow Performance

Figure 7 shows an example of the linear relationship between pressure and flow rate up to 250 cm/hr on Foresight Pro Columns packed with CHT Type I Media. The data indicate that the column pressure remains below 3 bar at a linear velocity of 250 cm/hr using PBS as the mobile phase.

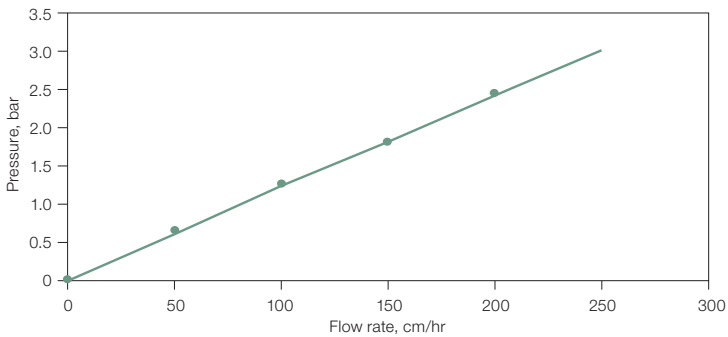


Fig. 7. Pressure/flow performance of Foresight Pro Column, CHT Type I, 40 µm (1 L, 8 cm ID x 20 cm length). ID, inner diameter.

Column Scale-Up Study

A study was performed to confirm that the same purification results are obtained irrespective of the prepacked column size. This study successfully demonstrated highly similar results as indicated by the similar elution profile on each chromatogram (Figure 8).

The columns in this study included a laboratory column (1.6 cm ID x 20 cm length), a Foresight Pro Column (8 cm ID x 20 cm length), and a Foresight Pro Column (33 cm ID x 20 cm length). Each column used in the study was prepacked with CHT Type I Media (40 µm particle size). A sample mixture containing bovine serum albumin, lysozyme, and lactoferrin was loaded to 0.8–1 mg/ml bed volume. A buffer of 5 mM sodium phosphate and 10 mM NaCl, pH 7.2, was used for equilibration. The sample mixture was eluted at 100 cm/hr in a linear gradient of 5 mM sodium phosphate, 10 mM NaCl, pH 7.2, to 400 mM sodium phosphate, pH 7.2, over 10 CV, followed by a 3 CV hold in the high phosphate buffer.

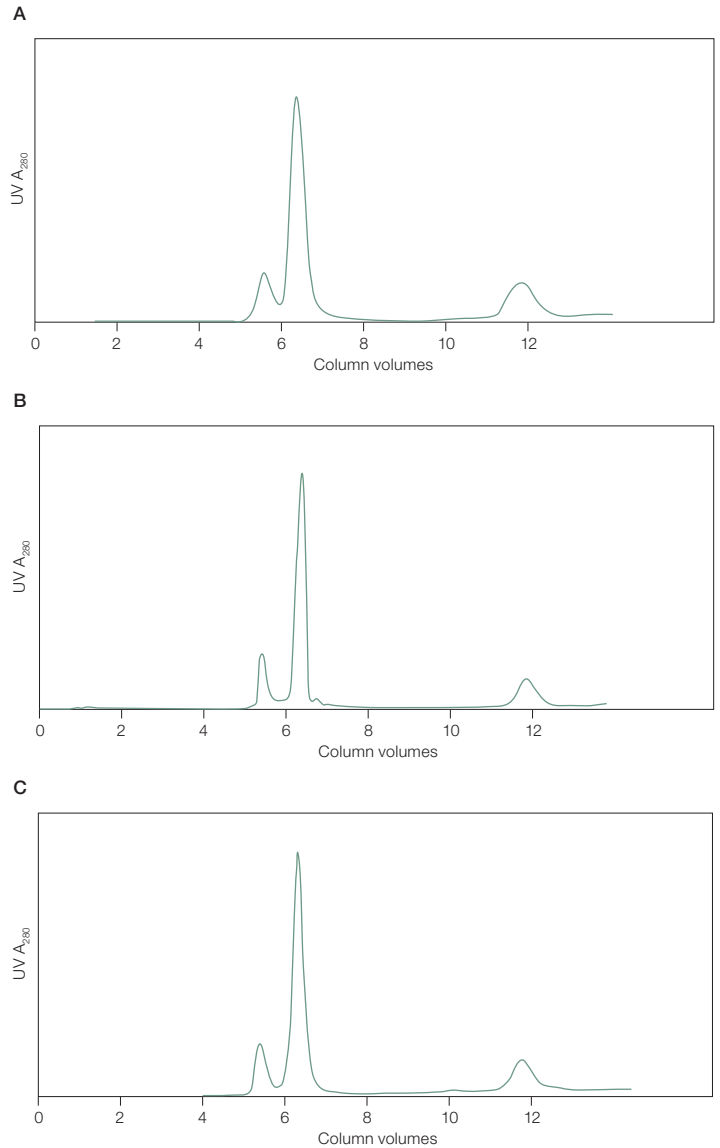


Fig. 8. Comparative purification results. **A**, laboratory column, CHT Type I, 40 µm, 1.6 x 20 cm; **B**, Foresight Pro Column, CHT Type I, 40 µm, 8 x 20 cm; **C**, Foresight Pro Column, CHT Type I, 40 µm, 33 x 20 cm. UV, ultraviolet.

Ordering Information

Catalog # Description

Foresight Pro Column, CHT Type I, 40 µm

12014659	Foresight Pro Column , CHT Type I, 40 µm, 0.2 L, 5 cm ID x 10 cm length
12014660	Foresight Pro Column , CHT Type I, 40 µm, 0.4 L, 5 cm ID x 20 cm length
12014671	Foresight Pro Column , CHT Type I, 40 µm, 0.5 L, 8 cm ID x 10 cm length
12014672	Foresight Pro Column , CHT Type I, 40 µm, 1.0 L, 8 cm ID x 20 cm length
12014673	Foresight Pro Column , CHT Type I, 40 µm, 0.8 L, 10 cm ID x 10 cm length
12014674	Foresight Pro Column , CHT Type I, 40 µm, 1.5 L, 10 cm ID x 20 cm length
12014675	Foresight Pro Column , CHT Type I, 40 µm, 1.3 L, 13 cm ID x 10 cm length
12014676	Foresight Pro Column , CHT Type I, 40 µm, 2.7 L, 13 cm ID x 20 cm length
12014677	Foresight Pro Column , CHT Type I, 40 µm, 3.1 L, 20 cm ID x 10 cm length
12014678	Foresight Pro Column , CHT Type I, 40 µm, 6.3 L, 20 cm ID x 20 cm length
12014679	Foresight Pro Column , CHT Type I, 40 µm, 4.5 L, 24 cm ID x 10 cm length
12014680	Foresight Pro Column , CHT Type I, 40 µm, 9.0 L, 24 cm ID x 20 cm length
12014681	Foresight Pro Column , CHT Type I, 40 µm, 8.5 L, 33 cm ID x 10 cm length
12014682	Foresight Pro Column , CHT Type I, 40 µm, 17 L, 33 cm ID x 20 cm length

Foresight Pro Column, CHT Type II, 40 µm

12014697	Foresight Pro Column , CHT Type II, 40 µm, 0.2 L, 5 cm ID x 10 cm length
12014698	Foresight Pro Column , CHT Type II, 40 µm, 0.4 L, 5 cm ID x 20 cm length
12014699	Foresight Pro Column , CHT Type II, 40 µm, 0.5 L, 8 cm ID x 10 cm length
12014700	Foresight Pro Column , CHT Type II, 40 µm, 1.0 L, 8 cm ID x 20 cm length
12014701	Foresight Pro Column , CHT Type II, 40 µm, 0.8 L, 10 cm ID x 10 cm length
12014702	Foresight Pro Column , CHT Type II, 40 µm, 1.5 L, 10 cm ID x 20 cm length
12014703	Foresight Pro Column , CHT Type II, 40 µm, 1.3 L, 13 cm ID x 10 cm length
12014704	Foresight Pro Column , CHT Type II, 40 µm, 2.7 L, 13 cm ID x 20 cm length
12014705	Foresight Pro Column , CHT Type II, 40 µm, 3.1 L, 20 cm ID x 10 cm length
12014706	Foresight Pro Column , CHT Type II, 40 µm, 6.3 L, 20 cm ID x 20 cm length
12014707	Foresight Pro Column , CHT Type II, 40 µm, 4.5 L, 24 cm ID x 10 cm length
12014708	Foresight Pro Column , CHT Type II, 40 µm, 9.0 L, 24 cm ID x 20 cm length
12014709	Foresight Pro Column , CHT Type II, 40 µm, 8.5 L, 33 cm ID x 10 cm length
12014710	Foresight Pro Column , CHT Type II, 40 µm, 17 L, 33 cm ID x 20 cm length

Catalog # Description

Foresight Pro Column, CHT XT, 40 µm

12014725	Foresight Pro Column , CHT XT, 40 µm, 0.2 L, 5 cm ID x 10 cm length
12014726	Foresight Pro Column , CHT XT, 40 µm, 0.4 L, 5 cm ID x 20 cm length
12014727	Foresight Pro Column , CHT XT, 40 µm, 0.5 L, 8 cm ID x 10 cm length
12014728	Foresight Pro Column , CHT XT, 40 µm, 1.0 L, 8 cm ID x 20 cm length
12014729	Foresight Pro Column , CHT XT, 40 µm, 0.8 L, 10 cm ID x 10 cm length
12014730	Foresight Pro Column , CHT XT, 40 µm, 1.5 L, 10 cm ID x 20 cm length
12014731	Foresight Pro Column , CHT XT, 40 µm, 1.3 L, 13 cm ID x 10 cm length
12014732	Foresight Pro Column , CHT XT, 40 µm, 2.7 L, 13 cm ID x 20 cm length
12014733	Foresight Pro Column , CHT XT, 40 µm, 3.1 L, 20 cm ID x 10 cm length
12014734	Foresight Pro Column , CHT XT, 40 µm, 6.3 L, 20 cm ID x 20 cm length
12014735	Foresight Pro Column , CHT XT, 40 µm, 4.5 L, 24 cm ID x 10 cm length
12014736	Foresight Pro Column , CHT XT, 40 µm, 9.0 L, 24 cm ID x 20 cm length
12014737	Foresight Pro Column , CHT XT, 40 µm, 8.5 L, 33 cm ID x 10 cm length
12014738	Foresight Pro Column , CHT XT, 40 µm, 17 L, 33 cm ID x 20 cm length

Visit bio-rad.com/ForesightProGuide for the user guide.

Visit bio-rad.com/ForesightProColumn for more information on Foresight Pro Columns.

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