Operating Conditions (Revised 04/17/19)

Unless otherwise noted, your column has been shipped containing eluent from the QC test. Please refer to the **General Operating Conditions Chart** below for the operation of your particular column.

Selectivity

Selectivity is normally controlled by changing column type as opposed to changing eluent. Retention times increase in the following sequence: $Pb^{++} > Ca^{++} > Ag^{+} > K^{+} > Na^{+} > H^{+} > Li^{+}$. Retention times of polar samples may be increased and non-polar interactions reduced with the addition of organic solvents. However, due to low cross-linking of the resin, Benson Polymeric does not recommend the use of organic solvents. If your application calls for the addition of organic solvents, please contact the company for assistance.

Eluent

The recommended mobile phase is listed on the test chromatogram included with your new column. Column performance and lifetime are greatly affected by the composition of the mobile phase. As a result, only the highest grade, pre-filtered, degassed mobile phases should be used for HPLC applications. All mobile phases should be filtered (0.45 µm or smaller) and degassed prior to use.

Temperature

For most separations of carbohydrates, 80-85ºC is the recommended operating temperature. However, temperature can be an effective tool for maximizing the separation of certain compounds. If a lower temperature improves the separation of certain compounds caution must be used to not exceed the recommended maximum pressure limitation for the column. Column back pressure is a function of flow rate and temperature. **ALWAYS**, pre-heat the column and stabilize the temperature prior to pumping mobile phase. For the best possible results, we recommend the use of our column pre-heat, BP-PH, Part Number xxxx-0, to minimize longitudinal and radial thermal gradients.

Sample Preparation

Samples may contain precipitates or other contaminates such as metal compounds which bind with the resin. Contaminates change the column chemistry, resulting in a decrease in the effective surface area of the column and decreasing sample retention. Pre-filter all samples through a 0.45 µm or smaller filter membrane prior to injection. Compounds which may bind irreversibly with the resins should be removed using solid phase extraction (SPE) procedures.

Pre-Columns

To provide maximum protection for the analytical column, Benson Polymeric recommends the use of our pre-column (guard).

Cleaning and Regeneration

Metal or other contamination is indicated by a change in retention times, pressure increase, and broadened or skewed peaks. To restore column performance, reverse the column and refer to the **Column Cleaning and Regeneration Chart** below. If the column back pressure is also high, the flow rate can be reduced until the column back pressure drops (indicating removal of contaminates or particulates). Restore the column to original flow direction and equilibrate with eluent for one hour.

To remove organic contamination, pump the columns in reverse flow at 0.1mL/min. with 5/95 acetonitrile/water at 25°C for 4 hours. Restore the column to original flow direction and equilibrate with eluent for one hour.

No regeneration procedure is available if the column has bacterial growth.

Column Storage

Columns may be stored in the recommended eluent for several days. Long term storage should be in distilled de-ionized water. Storage in other mobile phases may support bacterial growth leading to reduced capacity and/or high back pressure. Do not let the columns dry out. Replace and tighten end plugs when storing. Columns may be refrigerated but do not freeze.

Thank You

Thank you for purchasing a Benson Polymeric column. With over 35 years of experience in resin manufacturing, column packing and applications development, we are highly qualified to assist you in achieving optimum chromatographic results. As our customer, you deserve the highest quality products and service available in the industry.

General Operating Conditions Chart

Part #	1000-0	1010-0	1020-0	1030-0	1040-0	1050-0	1060-0
X-Link (%) / Form	6 / Ca	6 / Ca	6 / Ca	6 / Ca	6 / Ca	6 / Ca	6 / Ca
Dimensions (mm)	300 x 7.8	250 x 7.8	100 x 7.8	250 x 4.6	250 x 4.0	200 x 4.6	250 x 10.0
Max Pressure (psi)	1000	1000	1000	1000	1000	1000	1000
Max. Temperature (ºC)	90	90	90	90	90	90	90
Max. Flow Rate (mL/min)	0.8 at 90ºC	0.8 at 90ºC	0.8 at 90ºC	0.4 at 90ºC	0.4 at 90ºC	0.4 at 90ºC	1.0 at 90ºC

Part #	1100-0	1110-0	1120-0	1130-0
X-Link (%) / Form	6 / H	6 / H	6 / H	6 / H
Dimensions (mm)	300 x 7.8	150 x 7.8	150 x 4.6	150 x 2.0
Max Pressure (psi)	1000	1000	1000	1000
Max. Temperature (ºC)	90	90	90	90
Max. Flow Rate (mL/min)	0.7 at 90ºC	0.7 at 90ºC	0.4 at 90ºC	0.4 at 90ºC

Part #	1200-0	1210-0	1220-0	1230-0
X-Link (%) / Form	6 / Pb	6 / Pb	6 / Pb	6 / Pb
Dimensions (mm)	300 x 7.8	250 x 7.8	100 x 7.8	250 x 4.6
Max Pressure (psi)	1000	1000	1000	1000
Max. Temperature (ºC)	90	90	90	90
Max. Flow Rate (mL/min)	0.8 at 90ºC	0.8 at 90ºC	0.8 at 90ºC	0.4 at 90ºC

Part #	1300-0	1400-0	1700-0	1500-0	1550-0	1600-0
X-Link (%) / Form	6 / K	6 / Ag	6 / Na	4 / Ca	4 / Na	4 / Ag
Dimensions (mm)	300 x 7.8	300 x 7.8	300 x 7.8	300 x 7.8	300 x 7.8	300 x 7.8
Max Pressure (psi)	1500	1000	1000	800	800	800
Max. Temperature (ºC)	90	90	90	90	90	90
Max. Flow Rate (mL/min)	0.7 at 90ºC	0.5 at 90ºC	0.7 at 90ºC	0.5 at 90ºC	0.6 at 90ºC	0.7 at 90ºC

General Operating Conditions Chart

Part #	2000-0	2010-0	2020-0	2030-0	2040-0	2050-0
X-Link (%) / Form	8 / H	8 / H	8 / H	8 / H	8 / H	8 / H
Dimensions (mm)	300 x 7.8	250 x 7.8	100 x 7.8	250 x 4.6	150 x 4.6	220 x 4.6
Max Pressure (psi)	1000	1000	1000	1000	1000	1000
Max. Temperature (ºC)	90	90	90	90	90	90
Max. Flow Rate (mL/min)	0.8 at 90ºC	0.8 at 90ºC	1.0 at 90ºC	0.6 at 90ºC	0.6 at 90ºC	0.6 at 90ºC

General Operating Conditions Chart

Part #	8000-0	8010-0	8020-0	8030-0	8040-0	8050-0	8060-0
X-Link (%) / Form	8 / Ca	8 / Ca	8 / Ca	8 / Ca	8 / Ca	8 / Ca	8 / Ca
Dimensions (mm)	300 x 7.8	250 x 7.8	100 x 7.8	250 x 4.6	250 x 4.0	200 x 4.6	250 x 10.0
Max Pressure (psi)	1000	1000	1000	1000	1000	1000	1000
Max. Temperature (ºC)	90	90	90	90	90	90	90
Max. Flow Rate (mL/min)	0.8 at 90ºC	0.8 at 90ºC	0.8 at 90ºC	0.6 at 90ºC	0.6 at 90ºC	0.6 at 90ºC	1.0 at 90ºC

Part #	8100-0	8110-0	8120-0	8130-0
X-Link (%) / Form	8 / H	8 / H	8 / H	8 / H
Dimensions (mm)	300 x 7.8	150 x 7.8	150 x 4.6	150 x 2.0
Max Pressure (psi)	1000	1000	1000	1000
Max. Temperature (ºC)	90	90	90	90
Max. Flow Rate (mL/min)	0.8 at 90ºC	0.8 at 90ºC	0.6 at 90ºC	0.4 at 90ºC

Part #	8200-0	8210-0	8220-0	8230-0
X-Link (%) / Form	8 / Pb	8 / Pb	8 / Pb	8 / Pb
Dimensions (mm)	300 x 7.8	250 x 7.8	100 x 7.8	250 x 4.6
Max Pressure (psi)	1000	1000	1000	1000
Max. Temperature (ºC)	90	90	90	90
Max. Flow Rate (mL/min)	0.8 at 90ºC	0.8 at 90ºC	1.2 at 90ºC	0.6 at 90ºC

Part #	8300-0	8700-0	8900-0
X-Link (%) / Form	8 / K	8 / Na	8 / Mix
Dimensions (mm)	300 x 7.8	300 x 7.8	300 x 7.8
Max Pressure (psi)	1500	1500	1000
Max. Temperature (ºC)	90	90	90
Max. Flow Rate (mL/min)	0.7 at 90ºC	0.7 at 90ºC	0.8 at 90ºC

Cleaning and Regeneration Chart

Part #	1000-0	1010-0	1020-0	1030-0	1040-0	1050-0	1060-0
X-Link (%) / Form	6 / Ca	6 / Ca	6 / Ca	6 / Ca	6 / Ca	6 / Ca	6 / Ca
Dimensions (mm)	300 x 7.8	250 x 7.8	100 x 7.8	250 x 4.6	250 x 4.0	200 x 4.6	250 x 10.0
Metal Contamination							
Solvent - Calcium Disodium EDTA	50 mg/L	50 mg/L	50 mg/L	50 mg/L	50 mg/L	50 mg/L	50 mg/L
Flow Rate (mL/min) Reverse Flow	0.4	0.4	0.4	0.3	0.3	0.3	0.4
Temperature ºC	85	85	85	85	85	85	85
Duration (Hours)	2	2	2	2	2	2	2

Part #	1100-0	1110-0	1120-0	1130-0
X-Link (%) / Form	6 / H	6 / H	6 / H	6 / H
Dimensions (mm)	300 x 7.8	150 x 7.8	150 x 4.6	150 x 2.0
Metal Contamination				
Solvent H_2SO_4	0.1M	0.1M	0.1M	0.1M
Flow Rate (mL/min) Reverse Flow	0.4	0.4	0.3	0.2
Temperature ºC	25	25	25	25
Duration (Hours)	6	6	6	6

Part #	1200-0	1210-0	1220-0	1230-0
X-Link (%) / Form	6 / Pb	6 / Pb	6 / Pb	6 / Pb
Dimensions (mm)	300 x 7.8	250 x 7.8	100 x 7.8	250 x 4.6
Metal Contamination				
Solvent $Pb(NO_3)_2$	0.4M	0.4M	0.4M	0.4M
Flow Rate (mL/min) Reverse Flow	0.4	0.4	0.4	0.2
Temperature ºC	85	85	85	85
Duration (Hours)	4-16	4-16	4-16	4-16

Part #	1300-0	1400-0	1700-0	1500-0	1550-0	1600-0
X-Link (%) / Form	6 / K	6 / Ag	6 / Na	4 / Ca	4 / Na	4 / Ag
Dimensions (mm)	300 x 7.8	300 x 7.8	300 x 7.8	300 x 7.8	300 x 7.8	300 x 7.8
Metal Contamination						
Solvent	0.1M K_2HPO_4	0.1M $AgNO_3$	0.1M $NaOH_2$	0.1M $Ca(NO_3)_2$	0.1M $NaOH_2$	0.1M $AgNO_3$
Flow Rate (mL/min) Reverse Flow	0.2	0.2	0.2	0.2	0.2	0.2
Temperature ºC	85	85	85	85	85	85
Duration (Hours)	4-16	4-16	4-16	4-16	4-16	4-16

Cleaning and Regeneration Chart

Part #	2000-0	2010-0	2020-0	2030-0	2040-0	2050-0	2060-0
X-Link (%) / Form	8 / H	8 / H	8 / H	8 / H	8 / H	8 / H	8 / H
Dimensions (mm)	300 x 7.8	250 x 7.8	100 x 7.8	250 x 4.6	250 x 4.0	200 x 4.6	250 x 10.0
Metal Contamination							
Solvent H_2SO_4	0.1M	0.1M	0.1M	0.1M	0.1M	0.1M	0.1M
Flow Rate (mL/min) Reverse Flow	0.4	0.4	0.4	0.2	0.2	0.2	0.5
Temperature ºC	25	25	25	25	25	25	25
Duration (Hours)	4	4	4	4	4	4	4

Cleaning and Regeneration Chart

Part #	8000-0	8010-0	8020-0	8030-0	8040-0	8050-0	8060-0
X-Link (%) / Form	8 / Ca	8 / Ca	8 / Ca	8 / Ca	8 / Ca	8 / Ca	8 / Ca
Dimensions (mm)	300 x 7.8	250 x 7.8	100 x 7.8	250 x 4.6	250 x 4.0	200 x 4.6	250 x 10.0
Metal Contamination							
Solvent - Calcium Disodium EDTA	50 mg/L	50 mg/L	50 mg/L	50 mg/L	50 mg/L	50 mg/L	50 mg/L
Flow Rate (mL/min) Reverse Flow	0.4	0.4	0.4	0.2	0.2	0.2	0.5
Temperature ºC	85	85	85	85	85	85	85
Duration (Hours)	2	2	2	2	2	2	2

Part #	8100-0	8110-0	8120-0	8130-0
X-Link (%) / Form	8 / H	8 / H	8 / H	8 / H
Dimensions (mm)	300 x 7.8	150 x 7.8	150 x 4.6	150 x 2.0
Metal Contamination				
Solvent H_2SO_4	0.1M	0.1M	0.1M	0.1M
Flow Rate (mL/min) Reverse Flow	0.4	0.4	0.2	0.2
Temperature ºC	25	25	25	25
Duration (Hours)	4	4	4	4

Part #	8200-0	8210-0	8220-0	8230-0
X-Link (%) / Form	8 / Pb	8 / Pb	8 / Pb	8 / Pb
Dimensions (mm)	300 x 7.8	250 x 7.8	100 x 7.8	250 x 4.6
Metal Contamination				
Solvent $Pb(NO_3)_2$	0.1M	0.1M	0.1M	0.1M
Flow Rate (mL/min) Reverse Flow	0.4	0.4	0.4	0.2
Temperature ºC	85	85	85	85
Duration (Hours)	4-16	4-16	4-16	4-16

Cleaning and Regeneration Chart

Part #	8300-0	8700-0	8900-0
X-Link (%) / Form	8 / K	8 / Na	8 / Mix
Dimensions (mm)	300 x 7.8	300 x 7.8	300 x 7.8
Metal Contamination			
Solvent	0.1M K_2HPO_4	0.1M $NaOH_2$	50mg/L Calcium Disodium EDTA
Flow Rate (mL/min) Reverse Flow	0.1	0.1	0.4
Temperature ºC	85	85	85
Duration (Hours)	4-16	4-16	2