

## ASTRA® Sugar technical specification

ASTRA® Sugar columns have been developed for fast separation of carbohydrates, oligosaccharides, organic acids and sugar alcohols. The ASTRA® Sugar columns are delivered in dimensions of 300 × 8 mm (ID) and they are packed with carefully selected ion-exchange polymer with different ionic forms. To obtain the best performance specifications, certain procedures regarding installation, operation, handling and storage should be followed carefully as explained in this technical note. This document serves as the operation manual for ASTRA® Sugar columns.

ASTRA® Sugar (S)	Ca	H	K	Na
Particle type	Phenyl-resin-SO <sub>3</sub>			
Ionic form	Ca <sup>2+</sup>	H <sup>+</sup>	K <sup>+</sup>	Na <sup>+</sup>
Crosslinking	Proprietary			
Particle size	10 µm	10 µm	10 µm	10 µm
Max. Flow rate	1.5 mL/min			
Optimum Flow rate	1.0 mL/min			
Max pressure	60 bar			
Max. temperature	90 °C			
Optimum temperature	60 to 85 °C	30 to 85 °C	60 to 85 °C	60 to 85 °C
pH range	7 to 12	1 to 7	7 to 12	7 to 12
Storage solvent	H <sub>2</sub> O / 0.05% NaN <sub>3</sub>	H <sub>2</sub> O	H <sub>2</sub> O	H <sub>2</sub> O / 0.05% NaN <sub>3</sub>
Storage temperature	4 °C			
Mobile phase	UPW*	UPW or ~0.1% H <sub>2</sub> SO <sub>4</sub> or ~0.1% HClO <sub>4</sub>	UPW	UPW
USP Code	L19	L17	-	L58

\* UPW = Ultra-Pure-Water

### General recommendations

Changing of the column temperature should be done very slowly, e.g. in 10 °C in 20 minutes. The injected samples should be free of particulate impurities.

Do not exceed maximum allowable pressure.



## ASTRA® Sugar Ca(S) use and storage

### Recommended storage

**Before weekend:** If there are no measurements to be taken and if the column is needed the following Monday, keep the temperature of the column as it was and reduce the flow rate to e.g. 0.05 mL/min for standby mode (ensuring the column will not partially dry at 80 °C during the weekend). Please, only cool the column if not needed for a longer time (end of campaign, holidays, etc.).

**If column is not used for +4 or +7 days:** You can use **0.05% NaN<sub>3</sub>** dissolved in water to rinse the column (to prevent bacterial contamination) if storage is planned for 2+ weeks. If storage is planned for 5–14 days, reduce the flow rate to 0.05 mL/min. Switch of the column oven and let the system cool down to about 20 °C while pumping eluent. Switch off eluent pump, remove the column and use delivered plastic plugs (plastic plugs must be „long enough“ to fit stably into the thread). Put the column in a cooler (dark 4 °C). After 1–4 hours, check the plastic plugs for tightness and make sure no water can evaporate from the column. Store the columns for the time you need in the cooler. Make sure the cooler is not freezing!

### Recommended cleaning procedure

Running ASTRA® Sugar Ca(S) column in water at 80 °C with 0.5 mL/min leads within some hours to the removal of dissolved decomposition products. If starting an ASTRA® Sugar Ca(S) column after a weekend and the column was running in idle mode, e.g. 0.05 mL/min 80 °C after the last measurement, column will be at lowest baseline noise after weekend and previous week measurements.

### Regeneration

Regeneration can be done by using

- 0.05M CaCl<sub>2</sub> or Ca(NO<sub>3</sub>)<sub>2</sub> solution in water
- With flow rate of 0.15 mL/min approx. 6 hours
- Followed by rinsing with 0.3 mL/min of pure water for a further 6–8 hours

The success of the regeneration is checked by comparing with the initial selectivity.

### Attention

Running HPLC for separating sugars/acids/alcohols: Please ensure that you change the ion free water regularly to prevent bacterial growth!

## ASTRA® Sugar H(S) use and storage

### Recommended storage

Store the column in the cool place (4 °C) to reduce microbial contamination. A few hours after storage in the cool place, the column plastic plugs may have become looser due to thermal expansion, so that the tightness of the caps should be checked again.

### Recommended cleaning procedure

Cleaning of the ASTRA® Sugar H(S) column from organic hydrophobic components may be done by e.g. adding up to 10% ACN to the eluent during the rinse phase. After the cleaning procedure, rinse the column with storage solvent.

### Regeneration

Regeneration can be done achieved by

- 0.025M H<sub>2</sub>SO<sub>4</sub> solution in water
- With flow rate 0.15 mL/min for approx. 6 hours
- The regeneration temperature should be 80 °C
- After the regeneration, rinse the column with 0.3 mL/min of UPW for further 6–8 hours.



## ASTRA® Sugar K(S) use and storage

### Recommended storage

Store the column in the cool place (4 °C) to reduce microbial contamination. A few hours after storage in the cool place, the column plastic plugs may have become looser due to thermal expansion, so that the tightness of the caps should be checked again.

### Regeneration

Regeneration can be done achieved by

- 0.05M KNO<sub>3</sub> solution in water
- With flow rate 0.15 mL/min for approx. 6 hours
- The regeneration temperature should be 80 °C
- After the regeneration, rinse the column with 0.3 mL/min of UPW for further 6–8 hours.



## ASTRA® Sugar Na(S) use and storage

### Recommended storage

Store the column in the cool place (4 °C) to reduce microbial contamination. A few hours after storage in the cool place, the column plastic plugs may have become looser due to thermal expansion, so that the tightness of the caps should be checked again.

### Regeneration

Regeneration can be done achieved by

- 0.05M NaNO<sub>3</sub> solution in water
- With flow rate 0.15 mL/min for approx. 6 hours
- The regeneration temperature should be 80 °C
- After the regeneration, rinse the column with 0.3 mL/min of UPW for further 6–8 hours.



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### Retention times for some saccharides, sugar alcohols and organic acids

#### 1.0 mL/min

Counter Ion	Ca <sup>2+</sup>	H <sup>+</sup>	Na <sup>+</sup>	K <sup>+</sup>	Pb <sup>2+</sup>
Melezitose	5.760	n/a	5.130	5.184	n/a
Sucrose	6.174	n/a	5.670	5.763	n/a
Maltose	6.260	5.331	5.738	5.976	n/a
Lactose	6.375	5.428	5.763	6.008	n/a
Glucose	7.095	6.177	6.857	7.243	n/a
Galactose	7.707	6.472	7.225	7.682	n/a
Mannose	8.089	6.476	7.304	7.923	
Xylose	7.671	6.537	7.397	7.837	n/a
Maltitol	7.743	5.601	5.806	5.817	n/a
Fructose	8.517	6.577	7.369	7.779	n/a
Manitol	10.202	6.839	6.883	6.861	n/a
Glycerol	10.047	8.585	8.182	8.006	n/a
Methanol	10.659	12.185	n/a	n/a	
Ethanol	10.842	14.406	10.295	10.004	n/a
Isopropanol	12.397	16.742	n/a	n/a	
Xylitol	12.217	7.498	7.585	7.563	n/a
Sorbitol	12.178	7.001	7.153	7.167	n/a
Citric acid	n/a	5.641	n/a	n/a	
Tartaric acid	n/a	5.954	n/a	n/a	
Lactic acid	n/a	8.387	n/a	n/a	
Formic acid	n/a	8.744	n/a	n/a	
Acetic acid	n/a	9.492	n/a	n/a	
Glutamic acid	n/a	n/a	n/a	n/a	

#### Conditions

<b>Dimensions</b>	300 × 8.0 mm
<b>Mobile phase</b>	UPW
<b>Flow rate</b>	1.0 mL/min
<b>Temperature</b>	80 °C (70 °C for Ca <sup>2+</sup> )
<b>Detection</b>	RID @ 55 °C

Note: Retention times on reversed phase columns are shown on the respective chromatograms.



## ASTRA® Sugar technical specification

### Retention times for some saccharides, sugar alcohols and organic acids

#### 0.5 mL/min

Counter Ion	Ca <sup>2+</sup>	H <sup>+</sup>	Na <sup>+</sup>	K <sup>+</sup>	Pb <sup>2+</sup>
Melezitose	11.375	n/a	10.234	10.353	n/a
Sucrose	12.189	n/a	11.317	11.519	n/a
Maltose	12.340	10.616	11.458	11.951	n/a
Lactose	12.552	10.799	11.505	12.005	n/a
Glucose	13.985	12.282	13.675	14.482	n/a
Galactose	15.187	12.876	14.428	15.371	n/a
Xylose	15.151	12.995	14.766	15.666	n/a
Maltitol	15.148	11.152	11.609	11.631	n/a
Mannose	16.210	12.883	14.579	15.860	
Fructose	16.677	13.099	14.723	15.576	n/a
Manitol	19.798	13.614	13.747	13.711	n/a
Glycerol	20.104	17.113	16.339	16.008	n/a
Methanol	21.303	24.327	n/a	n/a	
Ethanol	21.663	28.837	20.572	20.004	n/a
Isopropanol	24.791	33.603	n/a	n/a	
Xylitol	23.704	14.939	15.151	15.133	n/a
Sorbitol	23.452	13.952	14.276	14.341	n/a
Citric acid	n/a	11.260	n/a	n/a	n/a
Tartaric acid	n/a	11.879	n/a	n/a	n/a
Lactic acid	n/a	16.775	n/a	n/a	n/a
Formic acid	n/a	17.480	n/a	n/a	n/a
Acetic acid	n/a	19.028	n/a	n/a	n/a
Glutamic acid	n/a	n/a	n/a	n/a	n/a

#### Conditions

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