Contents

ThermoFisher
SCIENTIFIC

HPLC columns

HyperREZ XP
HPLC columns

Designed for carbohydrates,
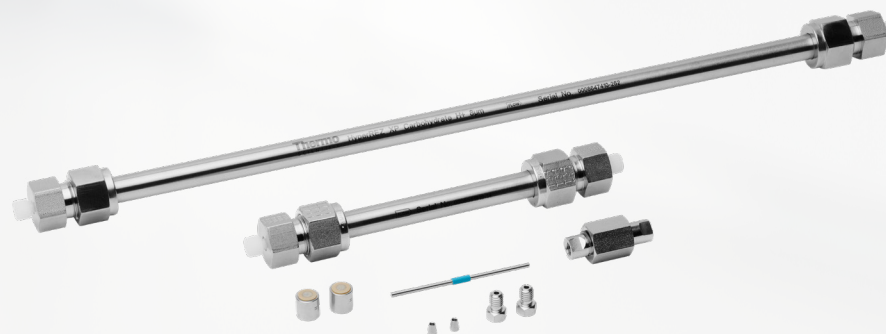organic acids, and alcohols

thermoscientific

Contents

Introducing HyperREZ XP HPLC columns

Thermo Scientific™ HyperREZ™ XP polymer-based columns are engineered to deliver efficient performance for the analysis of **carbohydrates**, **saccharides**, **organic acids**, and **alcohols**.

The **HyperREZ columns** are available in a comprehensive range of ligand-counter ions H^+, Ca^{2+}, Pb^{2+}, and Na^+ forms, enabling you to choose the appropriate counter-ion to meet your application requirements, optimum selectivity and resolution. Ligand exchange and ion-exchange are the preferred separation mechanisms for the analysis of carbohydrates, organic acids, and alcohols. The columns are **versatile** and **effective** for the analysis of sugars, with applications in a variety of fields including food science, biochemistry, and pharmaceuticals.

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Product features

Accuracy	Validity	Reproducibility	Stability	Sustainability
Designed for the accurate determination of carbohydrates, saccharides, organic acids and alcohols.	Suited for the high-performance media to stringent USP methodologies: (USP: L21, L17, L19, L34 and L58).	Created for excellent batch-to-batch reproducibility with efficiency, robustness and reproducibility to provide reliable QA/QC results.	Engineered for exceptional stability, our columns offer a prolonged lifetime, demonstrating unwavering performance even under low pH conditions and high temperatures.	Rediscover a greener and more robust technology for new challenges. Separate analytes using 100% aqueous mobile phase,promoting a shift towards environmentally sustainable and eco-friendly conditions.

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Technical details

Carbohydrates, **alcohols**, and **acids** are all common components found in both food and pharmaceuticals. They are found in a variety of foods and beverages, including fruits, vegetables, grains, beer, wine and dairy products. In pharmaceuticals, alcohols and acids are often used as preservatives, pH adjusters, and active ingredients in medications.

The design of the **HyperREZ XP columns** enables their use for a variety of samples under sustainable and eco-friendly mobile phase conditions. The use of simple mobile phase conditions enable the ease for method development of carbohydrates, organic acids and sugar alcohols separations.

The **HyperREZ XP columns** are packed with polymer resin containing a 4% or 8% divinylbenzene crosslined with ion exclusion ligands, such as H$^+$, Na$^+$ or other metals. The crosslinked gel excludes certain molecules from entering into the resin pores based on their interaction with the crosslinked ion. This exclusion interaction is the basis of the separation of the molecules in the sample. Unlike silica-based columns, surface functionality is more stable under 100% aqueous acidic conditions at elevated temperatures without risking ligand hydrolysis.

The HyperREZ XP columns can also be run at elevated temperatures for faster analysis and improved resolution of some closely eluting analytes. They can easily be regenerated using the appropriate nitrate salt (or 0.05M sulfuric acid in the case of hydrogen forms) and can help to regenerate the resin ionic functionality and increase column lifetime.

pH range

0   1 to 11   14

Hydrophobicity

Low   High

Particle size 8 µm, 10 µm

Applications

Carbohydrates

Sucrose, a disaccharide, is a sugar composed of glucose and fructose subunits. It is produced naturally in plants and is the main constituent of white sugar. The Thermo Scientific™ HyperREZ™ XP Carbohydrate Ca^{2+} column designed for the determination of carbohydrates.
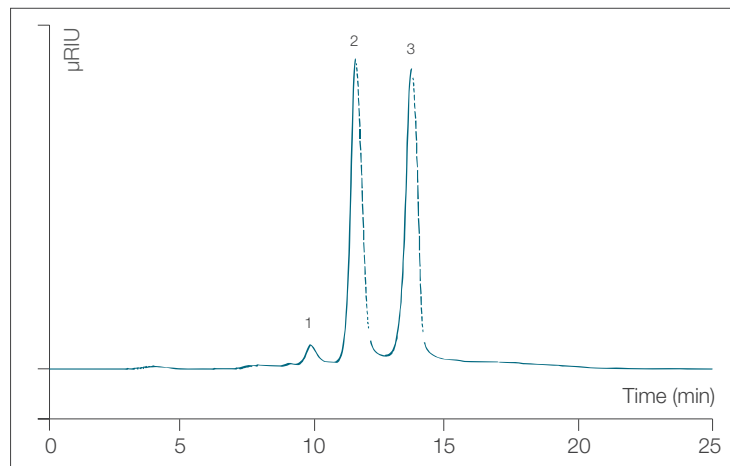

Figure 1: Monitoring the break down of sucrose to glycose and fructose

Column	HyperREZ XP Carbohydrate Ca^{2+} column
Format	7.7 × 300 mm
Cat.no	69208-307780
Mobile phase	Water
Flow rate	0.85 mL/min
Temp	60 °C
Detection	RI detector
Gradient	Isocratic
Sample	1. Sucrose
	2. Glucose
	3. Fructose

Organic acids

Organic acids are a type of organic compound commonly found in a variety of foods. They contribute to the sour or acidic taste of certain foods and can also act as preservatives to extend the shelf life of foods. The Thermo Scientific™ HyperREZ™ XP Carbohydrate H^+ column designed for the determination of organic acid using dilute acid conditions.
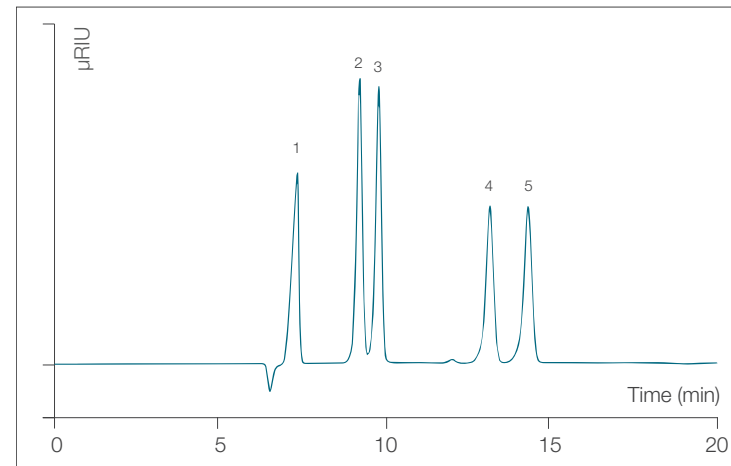

Figure 2: Organic acid separation with the HyperREZ XP H^+ column

Column	HyperREZ XP Carbohydrate H^+ column	
Format	7.7 × 300 mm	
Cat.no	69008-307780	
Mobile phase	0.005M H_2SO_4	
Flow rate	0.6 mL/min	
Temp	60 °C	
Detection	RI detector	
Gradient	Isocratic	
Sample	1. Oxalic acid	4. Succinic acid
	2. Citric acid	5. Lactic acid
	3. Tartaric acid	

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Applications (continued)

Organic acids

The HyperREZ XP Carbohydrate H+ column can resolve sugars maltose and maltotriose which are present in beer fermentation, including organic acid and alcohols can be separated in less than 10 minutes. The use of isocratic conditions allows samples to be analysed one after another without waiting for column re-equilibration.
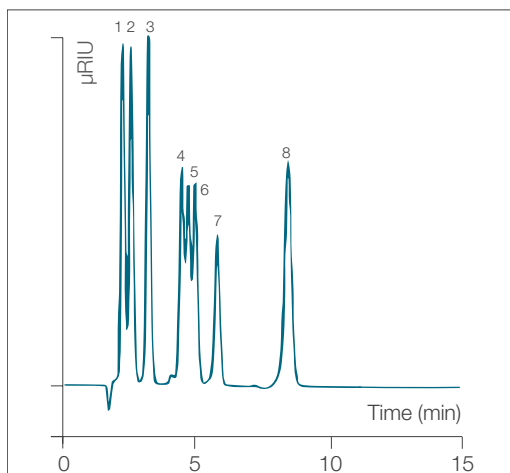

Figure 3: Products of fermentation: organic acids, sugars and alcohols

Column	HyperREZ XP Carbohydrate H+ column	
Format	7.7 × 100 mm	
Cat.no	69608-107780	
Mobile phase	0.00001 mM H_2SO_4	
Flow rate	0.7 mL/min	
Temp	57 °C	
Detection	RI detector	
Gradient	Isocratic	
Sample	1. Maltotriose	5. Lactic acid
	2. Maltose	6. Glycerol
	3. Glucose	7. Acetic acid
	4. Succinic acid	8. Ethanol

Fatty acids

The Thermo Scientific™ HyperREZ™ XP RP column can be used for the separation of long chain fatty acids. Lauric acid, myristic acid, linolenic acid, linoleic acid, palmitic acid, and stearic acid are chains of carbon atoms commonly found in coconut oil, palm oil, and cocoa butter. The HyperREZ RP column is capable of resolving long chain fatty acids according to increase hydrophobicity and any variation in the degree of saturation.
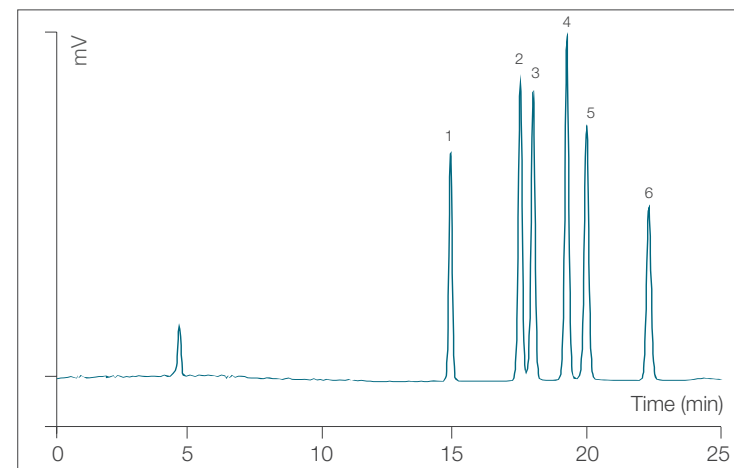

Figure 4: Long chain fatty acid separation with the HyperREZ XP RP column

Column	HyperREZ XP RP column	
Format	4.0 × 250 mm	
Cat.no	69708-254080	
Mobile phase	A: 60mM Acetic acid B: Acetonitrile C: THF	
Flow rate	0.5 mL/min	
Temp	80 °C	
Detection	PL-ELS	
Gradient	Isocratic	
Sample	1. Lauric acid	4. Linoleic acid
	2. Myristic acid	6. Palmitic acid
	3. Linolenic acid	6. Stearic acid

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Applications (continued)

Sugar and sugar alcohols

Sugar and sugar alcohols are types of carbohydrates that are commonly found in many foods and drinks. The HyperREZ XP Carbohydrate Ca^{2+} column offers confident capabilities of analysing a complex mixture of sugar and sugar alcohols.
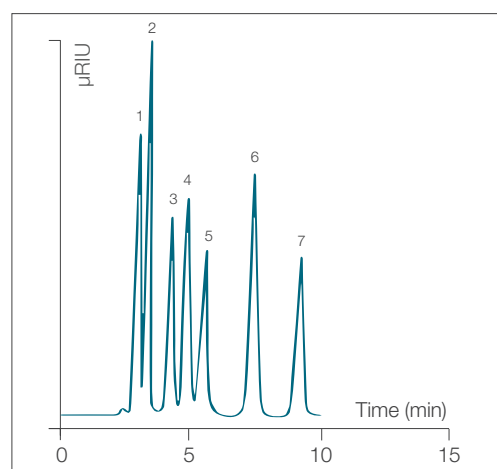

Figure 5: Separation of sugar and sugar alcohols

Column	HyperREZ XP Carbohydrate Ca^{2+} column	
Format	4 × 250 mm	
Cat.no	69708-254080	
Mobile phase	Water	
Flow rate	0.8 mL/min	
Temp	90 °C	
Detection	RI detector	
Gradient	Isocratic	
Sample	1. Maltotriose	5. Fructose
	2. Cucrose	6. Mannitol
	3. Glucose	7. Sorbitol
	4. Galactose	
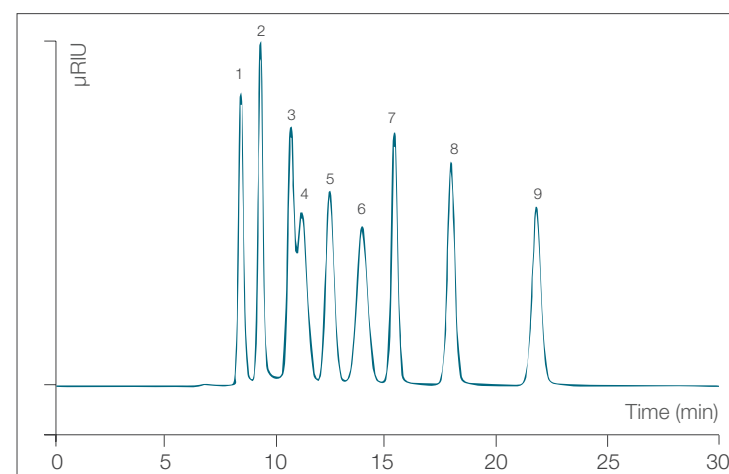
Figure 6: Separation of sugar and sugar alcohols

Column	HyperREZ XP Carbohydrate Ca^{2+} column	
Format	7.8 × 300 mm	
Cat.no	69208-307780	
Mobile phase	DI water	
Flow rate	0.6 mL/min	
Temp	85 °C	
Detection	RI detector	
Gradient	Isocratic	
Sample	1. Raffinose	6. Frutose
	2. Sucrose	7. Ribitol
	3. Lactulose	8. Mannitol
	4. Glucose	9. Sorbitol
	5. Galactose	

Applications (continued)

Domestic beer

The product of fermentation run time can be reduced using the HyperREZ XP Carbohydrate Na$^+$ organic acid column. It can resolve sugars maltose and maltotriose which are present in beer fermentation, including organic acid and alcohols, which can be separated in less than 10 minutes. The use of isocratic conditions allows samples to be analyzed one after another without waiting for column re-equilibration.
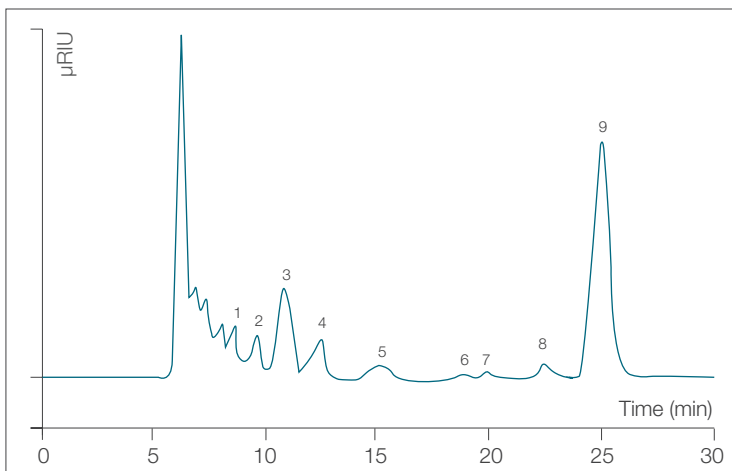

Figure 7: Separation of oligosaccharides, sugars and sugar alcohols

Column	HyperREZ XP Carbohydrate Na$^+$ column	
Format	7.7 × 300 mm	
Cat.no	69310-307780	
Mobile phase	Water	
Flow rate	0.3 mL/min	
Temp	90 °C	
Detection	RI detector	
Gradient	Isocratic	
Sample	1. DP-6	6. Glucose
	2. DP-5	7. Fructose
	3. DP-4	8. Glycerol
	4. Maltotriose	9. Ethanol
	5. Maltose	

Wine

The HyperREZ XP Carbohydrate H$^+$ column can be used to quantify the levels of sugars, alcohols and organic acids in wines made from fermented fruit juices. Tartaric acid, lactic acid, succinic acid, malic acid, and citric acid are the main organic acids which gives wine its characteristic taste. The presence and concentration of specific acids can be important as it which contribute to the sourness and acidity of the wine.
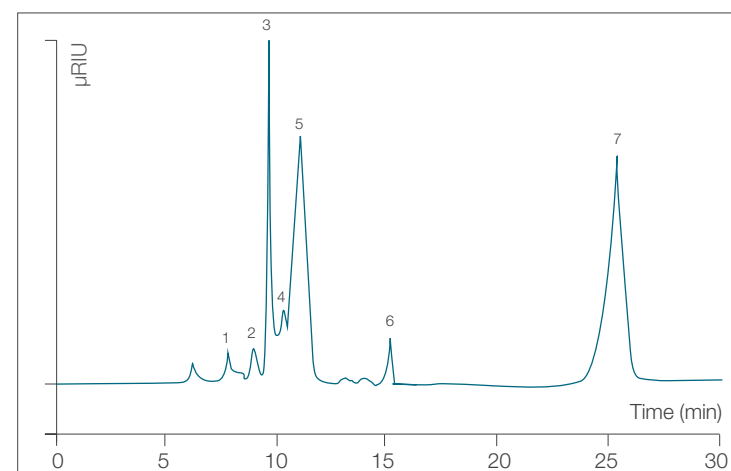

Figure 8: The analysis of domestic wine using HyperREZ H$^+$ column

Column	HyperREZ XP Carbohydrate H$^+$ column	
Format	7.7 × 300 mm	
Cat.no	69008-307780	
Mobile phase	2.5 mM H$_2$SO$_4$	
Flow rate	0.4 mL/min	
Temp	60 °C	
Detection	RI detector	
Gradient	Isocratic	
Sample	1. Citric acid	5. Fructose
	2. Tartaric acid	6. Glycerin
	3. Glucose	7. Ethanol
	4. Malic acid	

Contents

Four reasons why

Quality control	Process monitoring	Product development	Regulatory compliance
Determine the concentration and purity of carbohydrates, alcohols, and organic acids in various samples. This is important for quality control in the production of foods, pharmaceuticals, and other products.	Monitor fermentation processes and other biological processes that produce carbohydrates, alcohols, and organic acids. This can help to optimize the process and ensure consistent product quality.	Identify and quantify carbohydrates, alcohols, and organic acids in various samples, which can help in the development of new products and formulations.	Ensure compliance as required by regulatory agencies to ensure the safety and efficacy of drugs, foods, and other products.

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Column selection guide

Column type	Application areas	USP code	Links
HyperREZ XP RP columns	Hydrophobic separation of non-polar compounds, polar compounds	L21	→
HyperREZ XP Ca^{2+} columns	Adulteration of food and beverages, confectionary, mono- and disaccharides, food additives, alcohols, dairy products, fermentation products, wine, anomer separation	L19	→
HyperREZ XP Pb^{2+} columns	Fruit juice, mono- and disaccharides, alcohols, wood pulp hydrolysates (cellulose/hemicellulose), dairy products, food additives, adulteration of food and beverages	L34	→
HyperREZ XP H^{+} columns	Alcohols, dairy products, wine, oligosaccharides, glycoprotein constituents, organic acids, fermentation products	L17	→
HyperREZ XP Na^{+} columns	Corn syrup, organic acid, oligosaccharides	L58	→

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Retention time selectivity

Analytes	HyperREZ XP H$^+$ column	HyperREZ XP Ca^{2+} column	HyperREZ XP Pb^{2+} columns
Adonitol	11.5	14.9	20.4
Arabinose	11.4	13.6	19.4
Erythritol	12.7	15.6	20.3
Fructose	10.6	13.5	19.3
Fucose	12.2	13.7	17.1
Galactose	10.7	12.2	15.6
Glucose	9.9	11.1	13.9
Glycerol	14.1	16.1	19.5
Lactose	8.6	9.7	12.8
Maltose	8.4	9.5	12.5
Maltotriose	7.7	8.7	11.9
Mannitol	11.0	17.3	28.9
Mannose	10.5	12.5	16.7
Raffinose	8.2*	8.6	11.4
Rhamnose	11.6	12.7	18.0
Sorbitol	11.1	20.7	NA
Stachyose	7.4	8.2	10.8
Sucrose	9.8*	9.4	11.0
Xylose	10.6	12.0	15.0

* Partial hydrolysis

Dimensions: 7.7 x 300 mm

Mobile phase: water

Flow rate: 0.6 mL/min

Detection: RI

Temperature:

Ca^{2+} at 85°C,

Pb^{2+} at 80°C,

H$^+$ at 75°C

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Related products for enhanced reproducibility

Experience the Thermo Scientific™ Vanquish™ HPLC systems featuring the integrated Thermo Scientific™ Vanquish™ Refractive Index Detector (RID)

The Thermo Scientific Vanquish Refractive Index Detector (RID) is a universal detector for routine isocratic analysis of substances that lack UV chromophores, such as carbohydrates, lipids, and polymers. The Vanquish RID can be easily integrated into Vanquish HPLC and UHPLC systems working with analytical flow while saving bench space and simplifying the overall instrument handling. The detector enables sample throughput by supporting fast separations with high data collection rates. It features excellent reproducibility.

Learn more at

- Stable baselines with low baseline drift (0.2 µRIU/h) and noise (≤2.5 nRIU)

- Thermostatted optical bench and active flow cell heating for high reproducibility

- Extended flow rate range (up to 10 mL/min) and operating range (1.00–1.75 RIU) ensuring compatibility with a wide range of applications

- Smart start-up function automates purging, equilibration, autozero, and the control of baseline stability and noise

- Full compatibility with reversed and normal phase solvents

- Vanquish HPLC and UHPLC systems with Vanquish RID provide a highly integrated solution with optimized fluidic connections using Thermo Scientific™ Viper™ Fingertight Fitting systems and single-point intelligent control through Thermo Scientific™ Chromeleon™ Chromatography Data System (CDS) Software
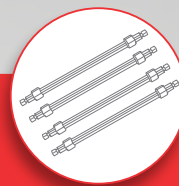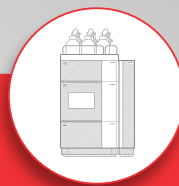
Ordering information
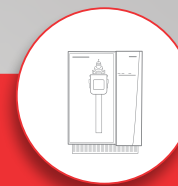
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Sample preparation · Vials and caps · LC columns · LC chromatography · Mass spectrometry · Data management

Ordering information

Description	Particle size (μl)	ID (mm)	Length (mm)	Cat. no
Analytical columns				
HyperREZ XP RP 100	5	4.6	250	68005-254680
HyperREZ XP RP 100	8	4.6	250	68008-254680
HyperREZ XP Carbohydrate H$^+$	8	7.7	300	69008-307780
HyperREZ XP Carbohydrate Ca^{2+}	8	7.7	300	69208-307780
HyperREZ XP Carbohydrate Pb^{2+}	8	7.7	300	69108-307780
HyperREZ XP Carbohydrate Na$^+$	10	7.7	300	69310-307780
HyperREZ XP Organic Acid	8	7.7	100	69608-107780
HyperREZ XP Sugar Alcohols	8	4.0	250	69708-254080
Guard columns				
Guard cartridge holder for HyperREZ XP guard cartridge holder	–	3	5	60002-354
HyperREZ XP Carbohydrate H$^+$ guard	8	7.7	50	69008-057726
HyperREZ XP Carbohydrate H$^+$ guard cartridge	8	3	5	69008-903027
HyperREZ XP Carbohydrate Ca^{2+} guard	8	7.7	50	69208-057726
HyperREZ XP Carbohydrate Ca^{2+} guard cartridge	8	3	5	69208-903027
HyperREZ XP Carbohydrate Pb^{2+} guard cartridge	8	3	5	69108-903027
HyperREZ XP Carbohydrate Na$^+$ guard	10	7.7	50	69608-107780

Learn more at **thermofisher.com/lccolumns**

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