

ION CHROMATOGRAPHY SYSTEM S 150^{Plus}

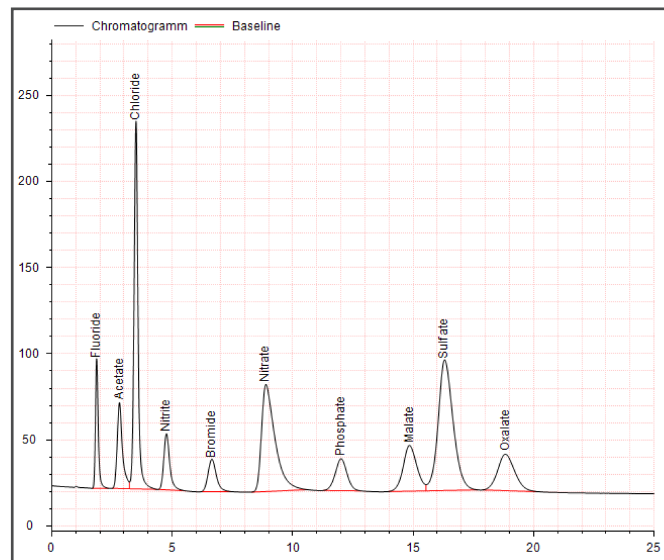
- ◆ SELF-REGENERATING SUPPRESSORS
- ◆ ANION & CATION SUPPRESSOR
- ◆ ORGANIC ACID SUPPRESSOR



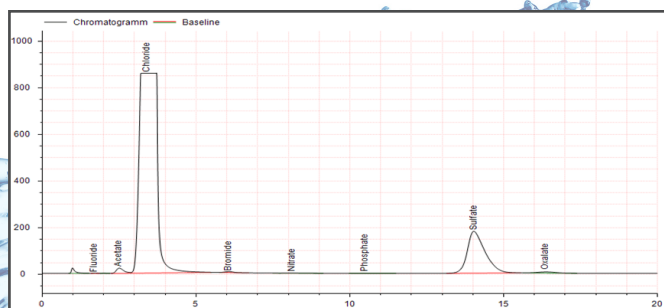
ION CHROMATOGRAPHY

Ion chromatography is an analytical separation method used in chemistry and biology. This chromatographic process is used to separate ions according to their charge. Using a liquid mobile phase, the charged analytes are passed through a stationary phase (polymer- or silicabased) modified with oppositely charged functional groups. Depending on their charge number, ion size and some non-specific interactions with the stationary phase, the ions are retarded at different rates.

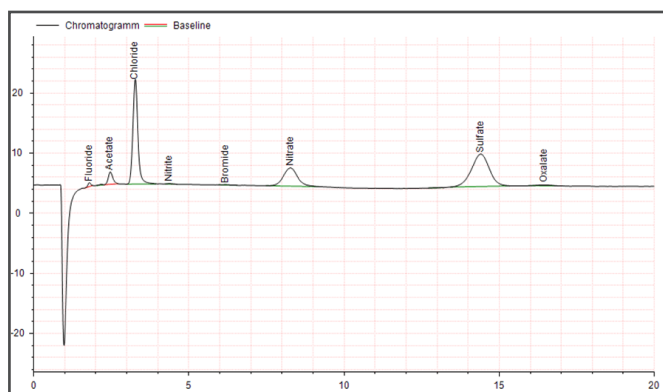
Depending on the analyte physical properties, these can then be detected and quantified by conductivity measurement, UV absorption or radiation measurement.



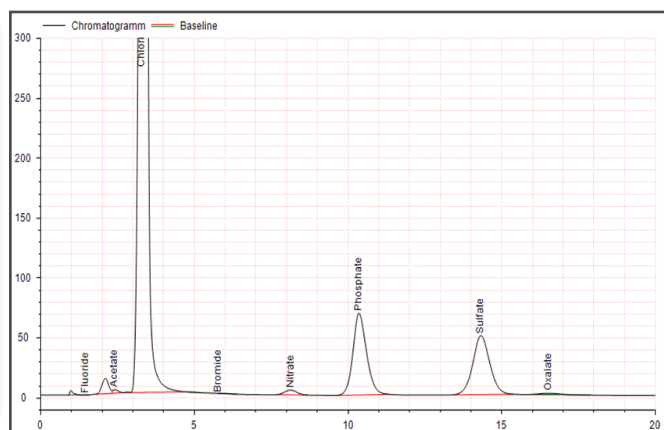
Extended Water Application (Anions)



Sea Water (Anions)



Rain Water (Anions)



Urine (Anions)

IC Applications

The fields of application of ion chromatography are manifold. One of the most important areas of application is certainly the investigation of aqueous systems such as drinking water and wastewater. It is above all fertilizers from agriculture that pollute the waters with high levels of nitrates. But also, the determination of organic acids in foods such as in wine and fruit juices or the quantification of trace elements such as iron in dietary supplements is possible.

- Parameters
 - Anions
 - Cations
 - Organic acids
 - Transition metals
 - Amines
- Typical Applications
 - Drinking water
 - Tap water
 - Sea water
 - Waste water
 - Rain water
 - Ultra-trace determination in electronic and power plants
 - Quality control and analysis of impurities
 - Elemental analysis (Wickbold & Schoeningger)
 - Pharmaceuticals
 - Urine analysis



Water analysis for water treatment plants



Cooling water control for power plants



Ground water analysis for quality control

SYKAM SELF-REGENERATING SUPPRESSOR

Suppressor Techniques

Ion chromatography offers a variety of detection methods, three of which are highlighted in the following:

The least sensitive method, is the so-called one column ion chromatography where the salts of weakly dissociated acids (e.g. phthalate, benzoate) are used as eluent. Hereby, the difference between the specific conductivity of e.g. sodium hydrogen phthalate and sodium chloride is measured.

The disadvantage of this technique is a low sensitivity. Since the base conductivity of the mobile phase, which has a high buffer concentration, is high, low analyte concentrations lead to low signals. That means low analyte concentrations cannot be detected, if the base conductivity is high.

The second method is precisely aimed to eliminate the disadvantage of the first method. Before the sample ions are measured in the detector, the base conductivity of the mobile phase is reduced by a suppressor.

This technique cannot be used with every eluent buffer. Examples for chemical compounds, which are well suited for the suppressor technique are sodium bicarbonate, sodium carbonate or sodium hydroxide in case of anion analysis as well methanesulfonic acid in case of cation analysis. After the separation on the column and before entering the detector flow cell the eluent passes a suppressor where the eluent buffer salts/acids were converted into low conductive compounds. $\text{NaHCO}_3/\text{Na}_2\text{CO}_3$ are converted into H_2CO_3 when exchanging the Na^+ with H^+ ions. NaOH is converted into H_2O . Due to the low dissociation grade of H_2CO_3 the conductivity of the mobile phase is significantly reduced.

The way, how the eluent buffer salts/acids are converted into compounds of low conductivity can be achieved using different techniques:

Column suppressor technique

Suppressor columns, which are used for anion analysis, are filled with a cation exchange resin in hydrogen form. The sodium cations of the bicarbonate and carbonate buffers are exchanged by protons. The reaction product is the low conductive H_2CO_3 (Figure 2). After the analysis, the

suppressor column has to be regenerated.

Membrane suppressor technique

A membrane suppressor is equipped with an ion selective membrane where the mobile phase is passing by. In case of an anion suppressor, the cations (e.g. Na^+ in Na_2CO_3) can pass the membrane and are exchanged by H^+ , which also pass the membrane in the reverse direction. The protons are supplied at the opposite side of the ion selective membrane either from a larger acidic reservoir (micromembrane suppressor) or by water electrolysis, that takes place at an electrode (self-regenerating suppressor). In case of a cation suppressor, anion-permeable membranes are used in the suppressor unit.

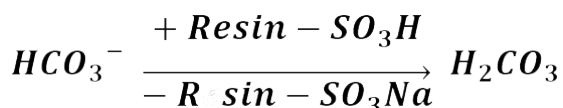
UV Detection

The third technique does not use the conductivity of the analyte ions for detection. Rather, other physical properties such as UV-absorption is used for detection. Either the analytes show a UV spectrum on their own (nitrite, nitrate, bromide) or a post column derivatization technique is used (transition metals, oxohalogenides) to transfer the analytes into UV absorbing complexes.

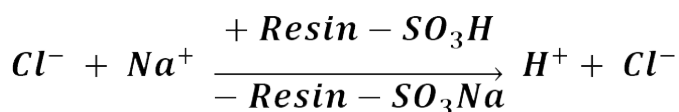
Working Principle

A membrane suppressor is equipped with an ion selective membrane where the mobile phase is passing by. In case of an anion suppressor, the cations (e.g. Na^+ in Na_2CO_3) can pass the membrane and are exchanged by H^+ , which also pass the membrane in the reverse direction. The protons are supplied at the opposite side of the ion selective membrane either from a larger acidic reservoir (micromembrane suppressor) or by water electrolysis, that takes place at an electrode (self-regenerating suppressor). In case of a cation suppressor, anion-permeable membranes are used in the suppressor unit.

Following the principle of anion suppressors, the condition of using suppressed conductivity is, that the eluent buffer salt can be converted into a low dissociated acid respectively base. Especially salts of weak acids and bases could be transferred this way. E.g. NaHCO_3 is the eluent and chloride is the analyte ion. The counter cation Na^+ will be exchanged by H^+ in the suppressor, whereas the cations move through the ion-selective membrane of the suppressor so that the eluent anion HCO_3^- will be transferred to the low dissociated H_2CO_3 and the analyte ion Cl^- to the well dissociated HCl :



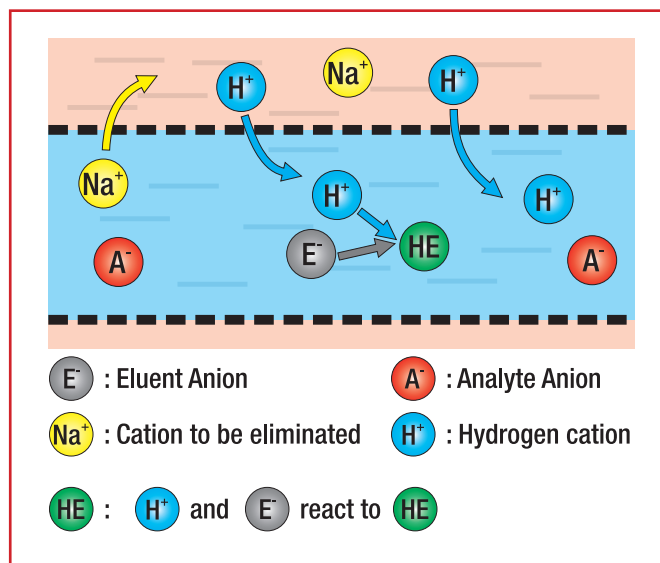
The same will happen to the analyte, e.g. NaCl :



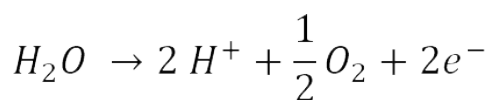
Because hydrochloric acid is a strong dissociated acid, the exchange of the sodium cation by a hydrogen cation will not have any influence on the chloride measurement.

Self-regenerating suppressors

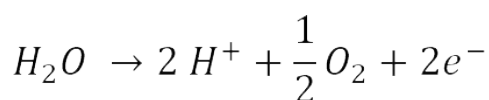
The principle of self-regenerating suppressors can either be employed for anion analysis or cation analysis. In both cases, the eluent stream is separated from the regeneration stream, whereas the eluent channel is surrounded by two regeneration channels, one on each side. Regeneration channels and eluent channels are separated by an ion-selective membrane. In case of anion self-regenerating suppressors (ASRS), the membrane is a cation exchange membrane, in case of cation self-regenerating



suppressors (CSRS), the membrane is an anion exchange membrane. In an ASRS, the protons, which pass the cation exchange membrane into the eluent channel to substitute the Na^+ -ions in the $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$ -eluent, are generated via electrolysis at the anode, which is placed in one of the regeneration channels.



The highly dissoziated $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$ -eluent with its high base conductivity (mS/cm-range) is converted into the low dissoziated H_2CO_3 , which has a low base conductivity of around 20 $\mu\text{S}/\text{cm}$. On the other hand, the Na^+ -ions from the eluent channel pass the cation exchange membrane into the second regeneration channel, where the cathode is placed. Here, water electrolysis leads to the formation of hydroxide ions. Together with the Na^+ -ion from the eluent channel, NaOH is formed, which is eluted with the regeneration stream into the liquid waste.



Working Principle

In a CSRS the same reactions take place at the electrodes. The difference here lies in the sort of membrane used. Here, an anion exchange membrane enables the anions from the eluent, e.g. methanesulfonate (MSA⁻) if methanesulfonic acid (HMSA) is used as eluent, to pass into the regeneration stream, where the anode is placed. The protons, which are formed at the anode are neutralized with the eluent anions (MSA⁻) to form HMSA, which is eluted with the regeneration stream. The hydroxide ions, which are formed at the cathode in the opposite regeneration stream pass the anion exchange membrane

into the eluent stream to neutralize the leftover protons to form H₂O. Using this principle, the base conductivity of a suppressed cation eluent drops to a very low level of <1.0 μS/cm.

In modern self-regenerating suppressor units, the eluent stream after passing the detector, is used as water source for the electrolysis, that takes place at the electrodes in the regeneration channels and therefore, no external regeneration solution supply is necessary.

SYKAM ION CHROMATOGRAPHY SYSTEMS



COMPACT ANION IC SYSTEM S 155-A/C^{Plus}

The *Compact Ion Chromatograph S 155^{Plus}* is a economic solution for low sample throughput.

The *S 155^{Plus}* is an all-in-one IC system with integrated anion or cation suppressor, column oven and 1-channel conductivity detector.

It can be upgraded with an online vacuum de-gasser, eluent selection valve or inert gas supply regulator.



ORDER INFORMATION

Compact IC System S 155-A^{Plus}

Catalog No	Description	consisting of:
S010100	Compact Ion Chromatography System	S 155 ^{Plus} Ion Chromatography System
	for Anion Determination	- integrated self-regenerating anion suppressor
	without data system and separation column	- integrated column oven
		- integrated manual injection valve S 6120 w. 50 µl sample loop
		- integrated 1-channel conductivity detector
		- integrated isocratic eluent pump

Compact IC System S 155-C^{Plus}

Catalog No	Description	consisting of:
S010101	Compact Ion Chromatography System	S 155 ^{Plus} Ion Chromatography System
	for Cation Determination	- integrated self-regenerating cation suppressor
	without data system and separation column	- integrated column oven
		- integrated manual injection valve S 6120 w. 50 µl sample loop
		- integrated 1-channel conductivity detector
		- integrated isocratic eluent pump

Upgrade Options

Catalog No	Description	Notes
S003581	Vacuum Degasser	Online 1-channel vacuum degasser
S008547	Eluent Selection Valve S 6131	Switching valve for 2 eluents and second 2000 ml eluent bottle
S008546	Inert Gas Supply	Gas regulator for inert gas supply and 2000 ml coated eluent bottle

MANUAL ANION IC SYSTEM S 151-M/G^{Plus}

The *Manual Anion Ion Chromatograph S 151-M / G^{Plus}* is a economic solution for low sample throughput.

The S 151-M features the anion self-regenerating suppressor for the sensitive detection of anions. It can be upgraded to an automatic system at any time.



ORDER INFORMATION

Manual Isocratic Anion IC System S 151-M^{Plus}

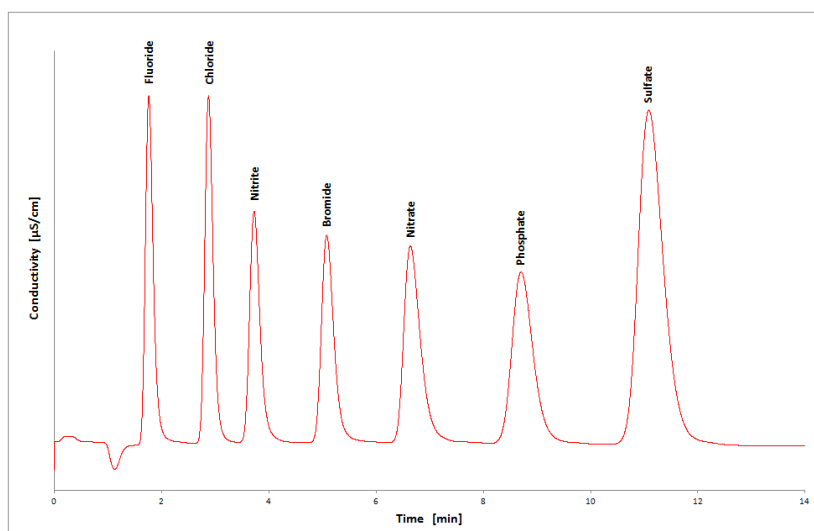
Catalog No	Description	consisting of:
S010102	Manual Isocratic IC System for Anion Determination without data system and separation column	S 150 ^{Plus} Ion Chromatography Module, including column oven; S 1130 Isocratic Pump, analytical, PEEK; including 1-channel degasser; S 6120 Injection Valve, PEEK; S 7150 Reagent Organizer, isocratic, including 1 bottle (1000 ml); without gas regulator integrated anion self-regenerating suppressor 1-channel conductivity detector

Manual Gradient Anion IC System S 151-G^{Plus}

Catalog No	Description	consisting of:
S010103	Manual Gradient IC System for Anion Determination without data system and separation column	S 150 ^{Plus} Ion Chromatography Module, including Column Oven; S 1130 Quaternary Gradient Pump, analytical, PEEK; including 4-channel degasser; S 6120 Injection Valve, PEEK; S 7150 Reagent Organizer, isocratic, including 4 bottles (1000 ml); without gas regulator integrated anion self-regenerating suppressor 1-channel conductivity detector

Upgrade Options

Catalog No	Description	Notes
S003585	Dual Channel Detector Upgrade	S 150 ^{Plus} Ion Chromatography Module (2nd detector channel)
S009687	Cation Self-Regenerating Suppressor (CSRS)	Cation suppressor (for update of anion system to cation determination)
S007037	Organic Acid Suppressor	integrated organic acid chemical suppressor
S003846	S 7155 Reagent Organizer with Gas Regulator	Analytical, incl. 4 bottles (1000 ml)
S000172	S 3250 UV/Vis Detector	Update for difficult sample matrices (e.g. high Cl ⁻ concentrations)
S000203	S 3250 Flowcell	Analytical, PEEK
var.	Integrated Switching Valve	S 150 ^{Plus} Ion Chromatography Module (integrated S6000 series switching valve)



AUTOMATIC ANION IC SYSTEM S 151-A/AG^{Plus}

The *Automatic Anion IC System S 151-A/AG^{Plus}* is a modular system which can be customized to any application needs.



ORDER INFORMATION

Automatic Isocratic Anion IC System S 151-A^{Plus}

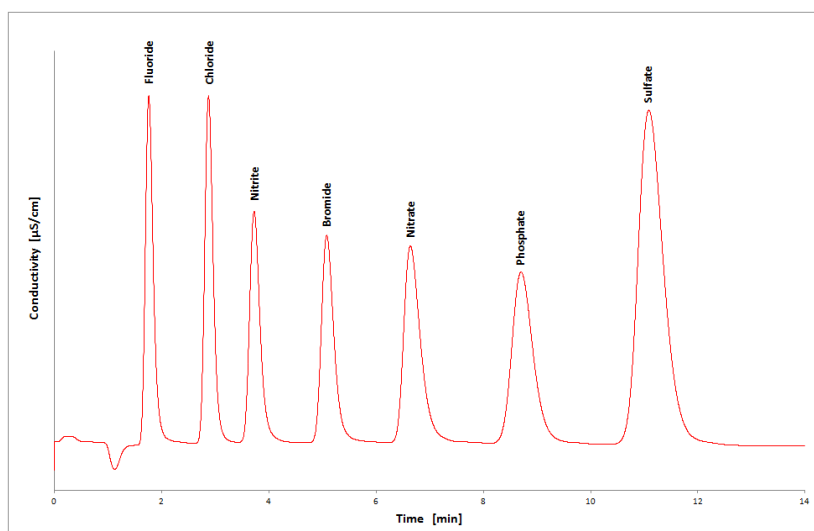
Catalog No	Description	consisting of:
S010107	Automatic Isocratic IC System	S 150 ^{Plus} Ion Chromatography Module, including column oven;
	for Anion Determination	S 1130 Isocratic Pump, analytical, PEEK; including 1-channel degasser;
	without data system and separation column	S 5300 Automatic Sample Injector with S 6115 PEEK Valve, variable volume mode
		S 7150 Reagent Organizer, isocratic, including 1 bottle (1000 ml);; without gas regulator
		integrated anion self-regenerating suppressor
		1-channel conductivity detector

Automatic Gradient Anion IC System S 151-AG^{Plus}

Catalog No	Description	consisting of:
S010108	Automatic Gradient IC System	S 150 ^{Plus} Ion Chromatography Module, including column oven;
	for Anion Determination	S 1130 Quaternary Gradient Pump, analytical, PEEK; including 4-channel degasser;
	without data system and separation column	S 5300 Automatic Sample Injector with S 6115 PEEK Valve, variable volume mode
		S 7150 Reagent Organizer, isocratic, including 4 bottles (1000 ml);; without gas regulator
		integrated electronic anion suppressor
		1-channel conductivity detector

Upgrade Options

Catalog No	Description	Notes
S003585	Dual Channel Detector Upgrade	S 150 ^{Plus} Ion Chromatography Module (2nd detector channel)
S009687	Cation Self-Regenerating Suppressor (CSRS)	Cation suppressor (for update of Anion system to Cation determination)
S007037	Organic Acid Suppressor	integrated organic acid chemical suppressor
S003846	S 7155 Reagent Organizer with Gas Regulator	Analytical, incl. 4 bottles (1000 ml)
S000172	S 3250 UV/Vis Detector	Update for difficult sample matrices (e.g. high Cl ⁻ concentrations)
S000203	S 3250 Flowcell	Analytical, PEEK
var.	Integrated Switching Valve	S 150 Ion Chromatography Module (integrated S6000 series switching valve)



MANUAL CATION IC SYSTEM S 152-M/G^{Plus}

The *Manual Cation IC System S 152-A/G^{Plus}* is a modular system which can be customized to any application needs.



ORDER INFORMATION

Manual Isocratic Cation IC System S 152-M^{Plus}

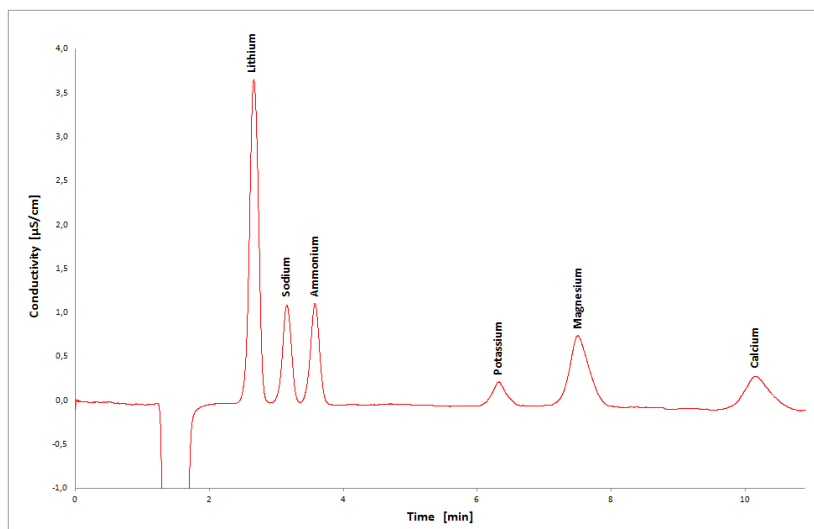
Catalog No	Description	consisting of:
S010109	Manual Isocratic IC System for Cation Determination without data system and separation column	S 150 ^{Plus} Ion Chromatography Module, including column oven; S 1130 Isocratic Pump, analytical, PEEK; including 1-channel degasser; S 6120 Injection Valve, PEEK; S 7150 Reagent Organizer, isocratic, including 1 bottle (1000 ml); without gas regulator integrated cation self-regenerating suppressor 1-channel conductivity detector

Manual Gradient Cation IC System S 152-G^{Plus}

Catalog No	Description	consisting of:
S010114	Manual Gradient IC System for Cation Determination without data system and separation column	S 150 ^{Plus} Ion Chromatography Module, including column oven; S 1130 Quaternary Gradient Pump, analytical, PEEK; including 4-channel degasser; S 6120 Injection Valve, PEEK; S 7150 Reagent Organizer, isocratic, including 4 bottles (1000 ml); without gas regulator integrated cation self-regenerating suppressor 1-channel conductivity detector

Upgrade Options

Catalog No	Description	Notes
S009686	Anion Self-Regenerating Suppressor (ASRS)	anion suppressor (for update of cation system to anion determination)
S007037	Organic Acid Suppressor	integrated organic acid chemical suppressor
S003585	Dual Channel Detector Upgrade	S 150 ^{Plus} Ion Chromatography Module (2nd detector channel)
S003846	S 7155 Reagent Organizer with Gas Regulator	Analytical, incl. 4 bottles (1000 ml)
S000172	S 3250 UV/Vis Detector	Update for difficult sample matrices (e.g. high Cl ⁻ concentrations)
S000203	S 3250 Flowcell	Analytical, PEEK
var.	Integrated Switching Valve	S 150 ^{Plus} Ion Chromatography Module (integrated S6000 series switching valve)



AUTOMATIC CATION IC SYSTEM S 152-A/AG^{Plus}

The *Automatic Anion IC System S 152-A/AG^{Plus}* is a modular system which can be customized to any application needs.



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Automatic Isocratic Cation IC System S 152-A^{Plus}

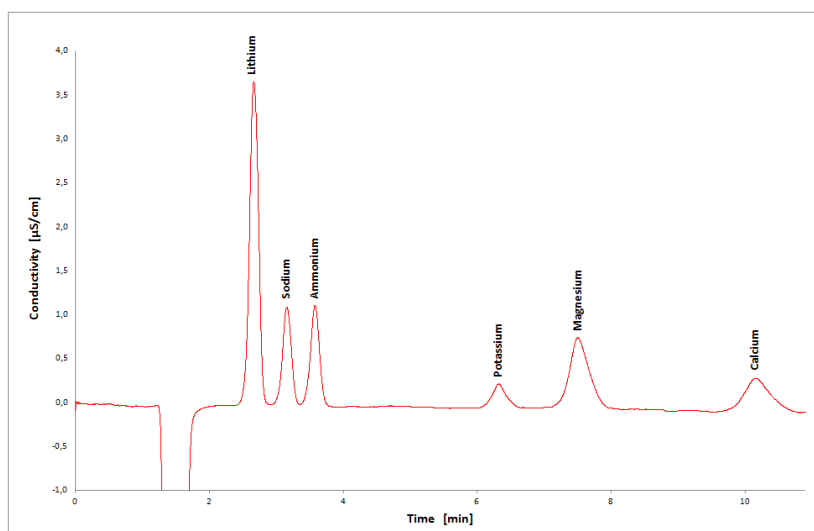
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S010115	Automatic Isocratic IC System	S 150 ^{Plus} Ion Chromatography Module, including column oven;
	for Cation Determination	S 1130 Isocratic Pump, analytical, PEEK; including 1-channel degasser;
	without data system and separation column	S 5300 Automatic Sample Injector with S 6115 PEEK Valve, variable volume mode
		S 7150 Reagent Organizer, isocratic, including 1 bottle (1000 ml); without gas regulator
		integrated cation self-regenerating suppressor
		1-channel conductivity detector

Automatic Gradient Cation IC System S 152-AG^{Plus}

Catalog No	Description	consisting of:
S010172	Automatic Gradient IC System	S 150 ^{Plus} Ion Chromatography Module, including column oven;
	for Cation Determination	S 1130 Quaternary Gradient Pump, analytical, PEEK; including 4-channel degasser;
	without data system and separation column	S 5300 Automatic Sample Injector with S 6115 PEEK Valve, variable volume mode
		S 7150 Reagent Organizer, isocratic, including 4 bottles (1000 ml); without gas regulator
		integrated cation self-regenerating suppressor
		1-channel conductivity detector

Upgrade Options

Catalog No	Description	Notes
S009686	Anion Self-Regenerating Suppressor (ASRS)	Anion suppressor (for update of cation system to anion determination)
S003585	Dual Channel Detector Upgrade	S 150 ^{Plus} Ion Chromatography Module (2nd detector channel)
S007037	Organic Acid Suppressor	integrated organic acid chemical suppressor
S003846	S 7155 Reagent Organizer with Gas Regulator	Analytical, incl. 4 bottles (1000 ml)
S000172	S 3250 UV/Vis Detector	Update for difficult sample matrices (e.g. high Cl ⁻ concentrations)
S000203	S 3250 Flowcell	Analytical, PEEK
var.	Integrated Switching Valve	S 150 ^{Plus} Ion Chromatography Module (integrated S6000 series switching valve)



AUTOMATIC DUAL IC SYSTEM S 153-A/AG DUAL^{Plus}

The *Automatic Ion Chromatograph S 153-A/AG Dual^{Plus}* is a modular system which can be customized to any application needs.



ORDER INFORMATION

Automatic Isocratic Dual IC System S 153-A Dual^{Plus}

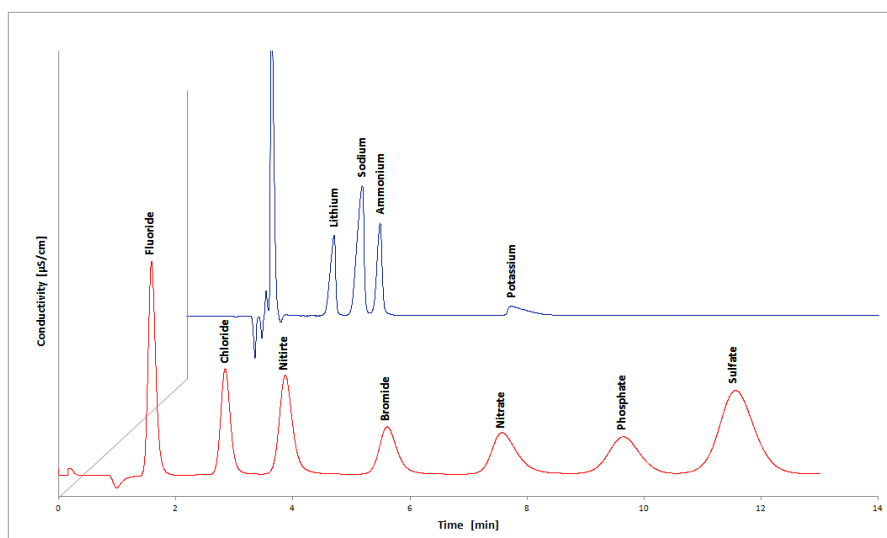
Catalog No	Description	consisting of:
S004671	Automatic Dual Isocratic IC System	S 150 ^{Plus} Ion Chromatography Module, including column oven;
	Anion & Cation simultaneous Determination	2x S 1130 Isocratic Pump, analytical, PEEK; including 1-channel degasser;
	without data system and separation column	S 5300 Automatic Sample Injector with S 6165 PEEK Valve, variable volume mode
		S 7150 Reagent Organizer, isocratic, including 2 bottles (1000 ml); without gas regulator
		integrated anion and cation self-regenerating suppressors
		2-channel conductivity detector

Automatic Gradient Dual IC System S 153-AG Dual^{Plus}

Catalog No	Description	consisting of:
S004882	Automatic Dual Gradient IC System	S 150 ^{Plus} Ion Chromatography Module, including column oven;
	Anion & Cation simultaneous Determination	1x S 1130 Quaternary Gradient Pump, analytical, PEEK; including 4-channel degasser;
	without data system and separation column	1x S 1130 Isocratic Pump, analytical, PEEK; including 1-channel degasser;
		S 5300 Automatic Sample Injector with S 6165 PEEK Valve, variable volume mode
		S 7150 Reagent Organizer, isocratic, including 4 bottles (1000 ml); without gas regulator
		integrated anion and cation self-regenerating suppressors
		2-channel conductivity detector

Upgrade Options

Catalog No	Description	Notes
S003846	S 7155 Reagent Organizer with Gas Regulator	Analytical, incl. 4 bottles (1000 ml)
S007037	Organic Acid Suppressor	integrated organic acid chemical suppressor
S000172	S 3250 UV/Vis Detector	Update for difficult sample matrices (e.g. high Cl ⁻ concentrations)
S000203	S 3250 Flowcell	Analytical, PEEK
var.	Integrated Switching Valve	S 150 ^{Plus} Ion Chromatography Module (integrated S6000 series switching valve)





TECHNICAL SPECIFICATIONS

S 150^{Plus} Ion Chromatography Module

Wetted Materials:	PEEK, PPS, PTFE, Stainless Steel ¹
Dimensions: (W x H x D)	396 x 165 x 478 mm
Power Supply:	100 - 250 ~V (47 - 63 Hz)

¹ Flowcell only

Column Oven

Temperature Range:	+30°C to +100°C ¹
Temperature Accuracy:	< 0.1 °C
Switching Valve:	optional: any S 6000 Series Valve

¹ Temperature range at 20°C ambient

Conductivity Detector

Measuring Range:	0 to 999,999 µS/cm
Flowcell Volume:	0.76 µl

Suppressor

Principle:	Anion: self-regenerating membrane Cation: self-regenerating membrane Organic Acid: chemical regenerating membrane
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S 1130 Isocratic Pump System

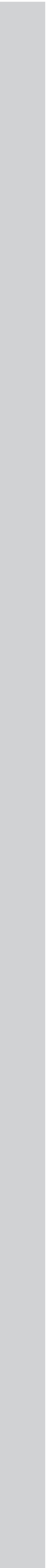
Wetted Materials:	PEEK, Teflon AF®, PVDF, Ceramics, Sapphire
Flow Rate:	Programmable Analytical: 0.001 - 10.000 ml/min
Flow Accuracy:	± 1.0 % 1.000 ml / min
Flow Precision:	± 0.1 % RSD 1.000 ml/min
Pressure Range:	0 – 40 MPa (0 – 6000 PSI)
Pressure Pulsation:	typical < 0.1 MPa or < 1.0 %
Compressibility Compensation:	user-adjustable for different solvents
Vacuum Degassing:	< 20% dissolved gases remaining in water @ 1.000 ml/min
Dimensions: (W x H x D)	396 x 165 x 478 mm
Power Supply:	100 - 250 ~V (47 - 63 Hz)

S 5300 Sample Injector System

Wetted Materials:	PEEK, PPS, PVDF
Sample Capacity:	120 (1.5 ml), 192 (microtiter plates)
Injection Volume:	Programmable 0.1 - 999.9 µl
Sample Heating/Cooling:	optional: +4 to +60 °C
Injection Precision:	< 0.5 % Variable Volume Injection (10 µl; typically ~0.25 %)
Linearity:	Correlation Factor > 0.999 (10 µl injection volume, 500 µl Syringe)
Carry Over:	< 0.05 % with wash program
Dimensions: (W x H x D)	396 x 275 x 478 mm
Power Supply:	100 - 250 ~V (47 - 63 Hz)

S 1130 Quaternary Gradient Pump System

Wetted Materials:	PEEK, Teflon AF®, PVDF, Ceramics, Sapphire
Flow Rate:	Programmable Analytical: 0.001 - 10.000 ml/min
Flow Accuracy:	± 1.0 % 1.000 ml / min
Flow Precision:	± 0.1 % RSD 1.000 ml/min
Pressure Range:	0 – 40 MPa (0 – 6000 PSI)
Pressure Pulsation:	typical < 0.1 MPa or < 1.0 %
Compressibility Compensation:	user-adjustable for different solvents
Vacuum Degassing:	< 20% dissolved gases remaining in water @ 1.000 ml/min
Gradient Range:	0.0 – 100.0 %, 4 channels
Gradient Accuracy:	< 0.50 %
Gradient Mixing:	Active
Mixer Volume:	adjustable: 100 – 500 µl
Dimensions: (W x H x D)	396 x 165 x 478 mm
Power Supply:	100 - 250 ~V (47 - 63 Hz)



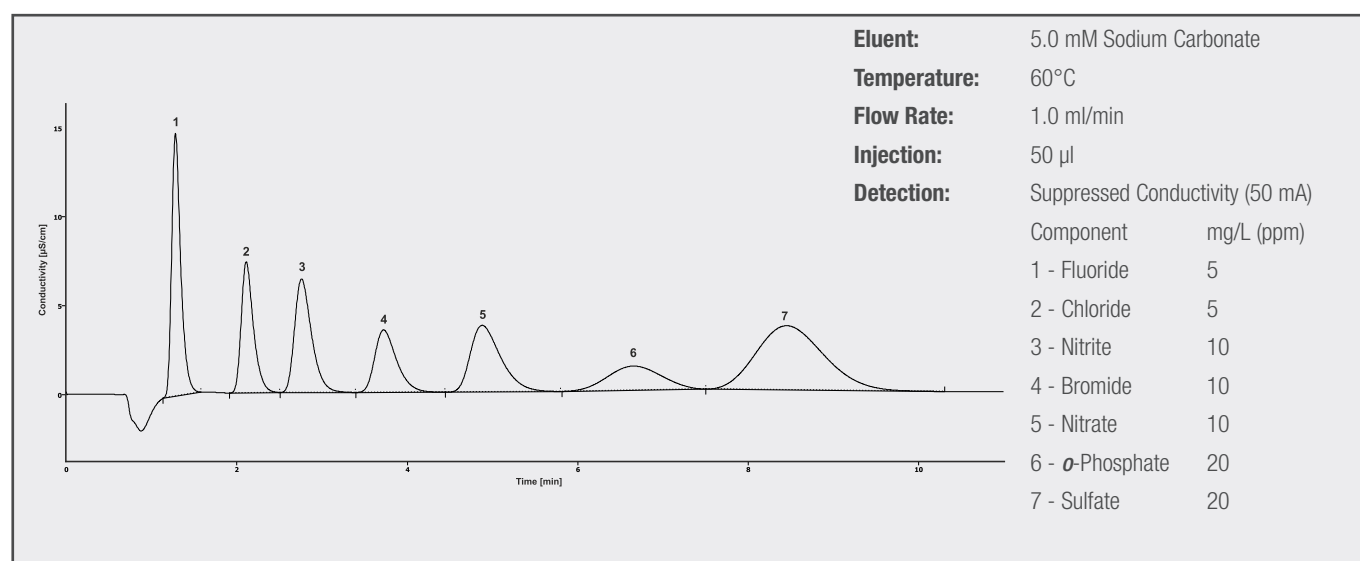
SYKAM ION CHROMATOGRAPHY SEPARATION COLUMNS



IC SEPARATION COLUMNS: ANIONS

Anion Separation Column ION A01

Determination of Standard Inorganic Anions in Aqueous Samples using Suppressed Conductivity Measurement



Separation of a low-ppm inorganic anion standard on a Sykam A01 using suppressed conductivity measurement.

Applications

- Determination of Standard Inorganic Anions in Aqueous Samples using Suppressed Conductivity Measurement
- Determination of Hexavalent Chromium in Drinking Water using UV-Detection and Post Column Derivatization

Technical Specifications

Substrate:	Polystyrene-divinylbenzene, Trimethyl ammonium
Particle Size:	10 µm
Column Dimensions:	150 x 2.6 mm
Column Material:	PEEK
Maximum Pressure:	30 MPa
pH-Range:	pH 1 - pH 13
Temperature Range:	20 - 60 °C

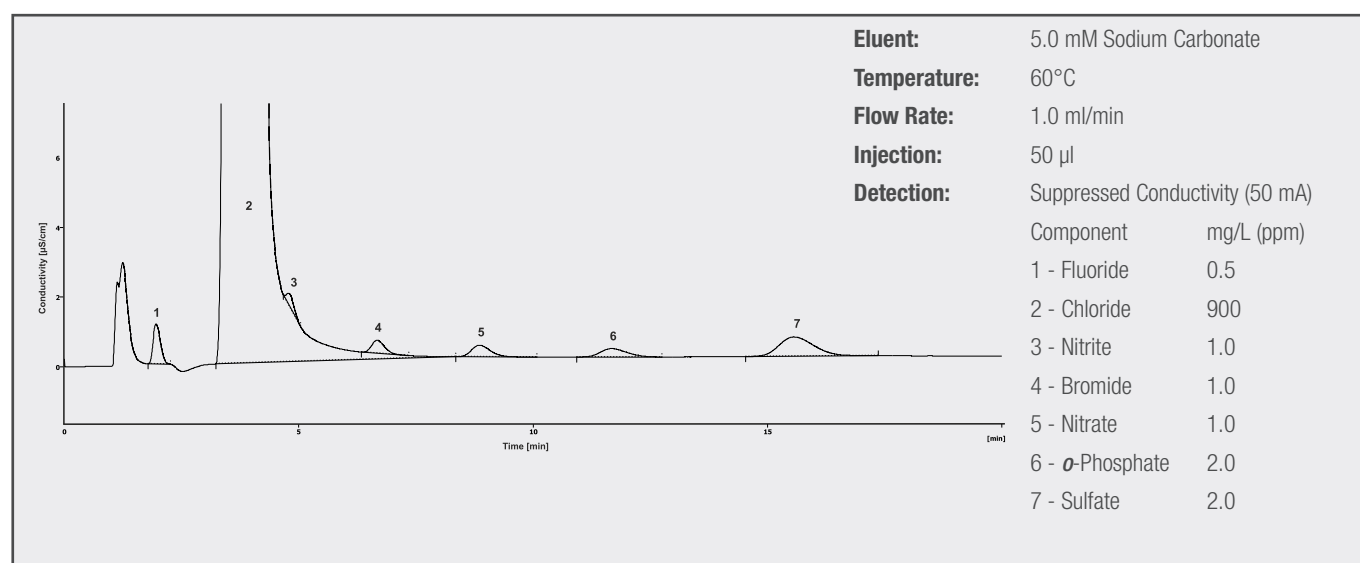
ORDER INFORMATION

Anion Separation Column ION A01

Catalog No	Description	Dimensions
S003586	Anion Separation Column ION A01	150 x 2.6 mm, 10 µm
S004732	Anion Guard Column AGC-01	20 x 2.6 mm, 15 µm

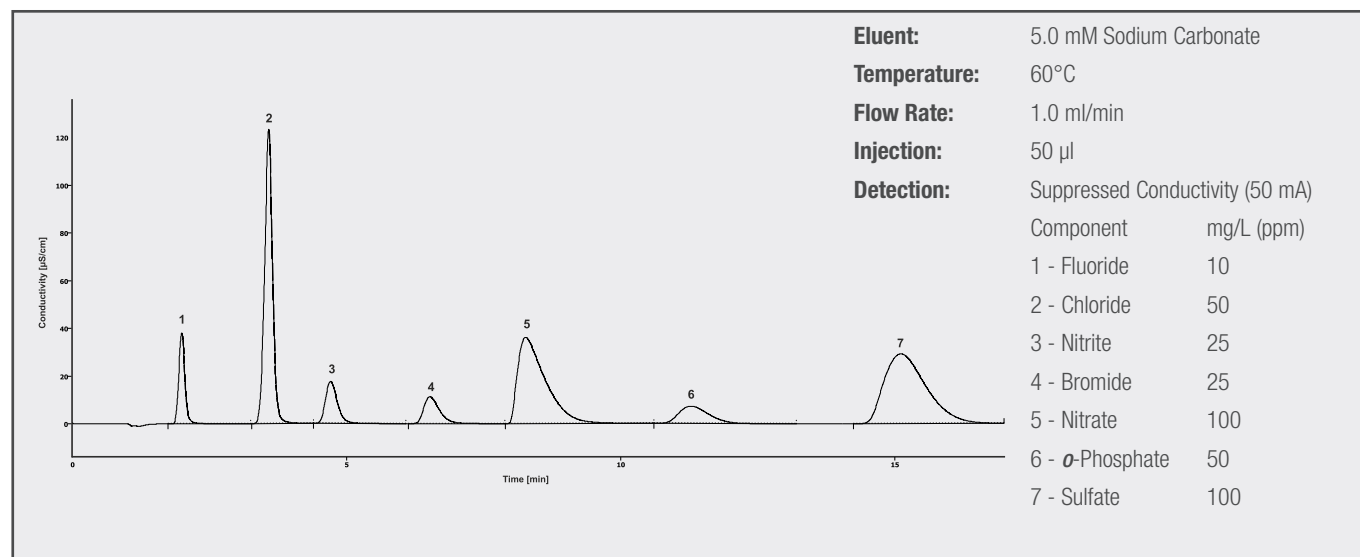
Anion Separation Column ION A02

Determination of Inorganic Anions in Industrial and Domestic Wastewater and Samples of High Chloride Concentrations using Suppressed Conductivity Measurement



Separation of a low-ppm inorganic anion standard spiked with 900 ppm Chloride on a Sykam A02 using suppressed conductivity measurement.

Determination of Inorganic Anions in Drinking and Natural Waters using Suppressed Conductivity Measurement



Separation of an inorganic anion standard for drinking and waste water analysis on a Sykam A02 using suppressed conductivity measurement.

IC SEPARATION COLUMNS: ANIONS

Anion Separation Column ION A02

Applications

- Determination of Inorganic Anions in Industrial and Domestic Wastewater using Suppressed Conductivity Measurement
- Determination of Inorganic Anions in Drinking and Natural Waters using Suppressed Conductivity Measurement
- Determination of Inorganic Anions in High Chloride Containing Samples (optimized resolution) using Suppressed Conductivity Measurement
- Determination of Sulfite in Drinking Water using Suppressed Conductivity Measurement
- Determination of Hexavalent Chromium in Drinking Water using UV-Detection and Post Column Derivatization

Technical Specifications

Substrate:	Polystyrene-divinylbenzene, Trimethyl ammonium
Particle Size:	10 µm
Column Dimensions:	250 x 2.6 mm
Column Material:	PEEK
Maximum Pressure:	30 MPa
pH-Range:	pH 1 - pH 13
Temperature Range:	20 - 60 °C

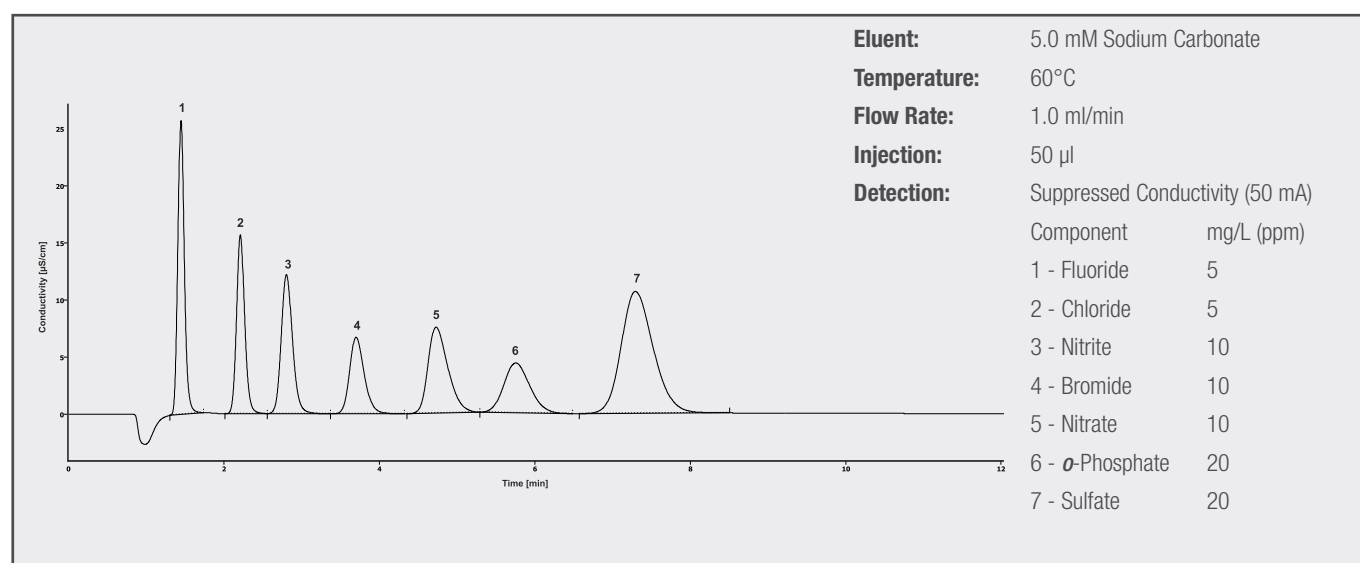
ORDER INFORMATION

Anion Separation Column ION A02

Catalog No	Description	Dimensions
S003796	Anion Separation Column ION A02	250 x 2.6 mm, 10 µm
S004732	Anion Guard Column AGC-01	20 x 2.6 mm

Anion Separation Column ION A03

Determination of Inorganic Anions in Drinking and Natural Waters using Suppressed Conductivity Measurement



Separation of a low-ppm inorganic anion standard on a Sykam A03 using suppressed conductivity measurement.

Applications

- Determination of Inorganic Anions in Drinking and Natural Waters using Suppressed Conductivity Measurement
- Determination of Hexavalent Chromium in Drinking Water using UV-Detection and Post Column Derivatization

Technical Specifications

Substrate:	Polystyrene-divinylbenzene, Trimethyl ammonium
Particle Size:	15 µm
Column Dimensions:	200 x 2.6 mm
Column Material:	PEEK
Maximum Pressure:	30 MPa
pH-Range:	pH 1 - pH 13
Temperature Range:	20 - 60 °C

ORDER INFORMATION

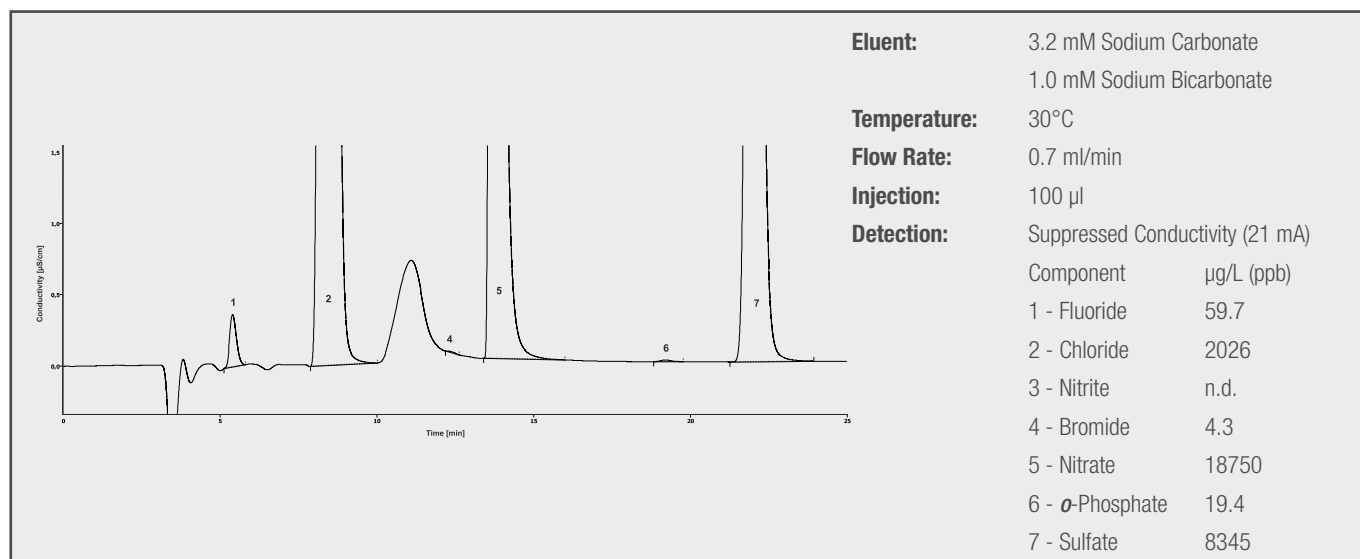
Anion Separation Column ION A03

Catalog No	Description	Dimensions
S005171	Anion Separation Column ION A03	200 x 2.6 mm, 10 µm
S004732	Anion Guard Column AGC-01	20 x 2.6 mm

IC SEPARATION COLUMNS: ANIONS

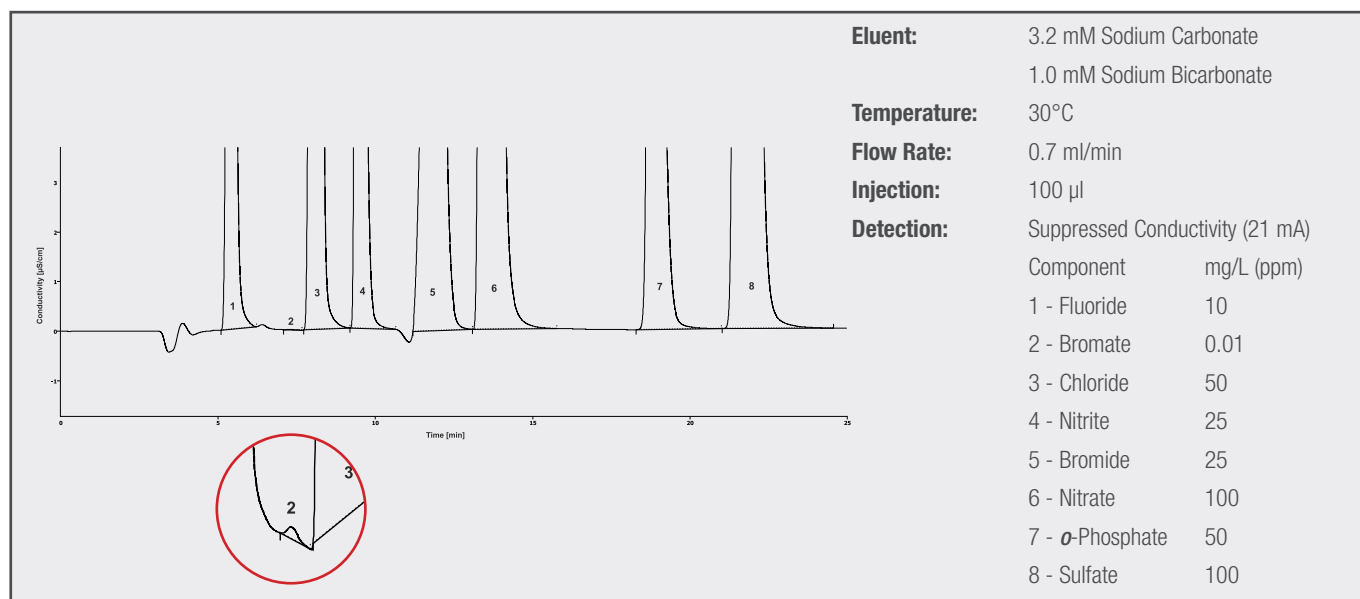
Anion Separation Column ION A04

Determination of Inorganic Anions in Drinking and Natural Waters using Suppressed Conductivity Measurement



Determination of inorganic anions in a drinking water sample on a Sykam A04 using suppressed conductivity measurement.

Determination of Bromate in Drinking Water and Bottled Natural Waters using Suppressed Conductivity Measurement



Separation of an inorganic anion standard for drinking water analysis spiked with 10ppb Bromate on a Sykam A04 using suppressed conductivity measurement.

Anion Separation Column ION A04

Applications

- Determination of Inorganic Anions in Drinking and Natural Waters using Suppressed Conductivity Measurement
- Determination of Bromate in Drinking Water and Bottled Natural Waters using Suppressed Conductivity Measurement

Technical Specifications

Substrate:	Polyvinyl alcohol, Quaternary ammonium
Particle Size:	5 µm
Column Dimensions:	250 x 4.0 mm
Column Material:	PEEK
Maximum Pressure:	20 MPa
pH-Range:	pH 1 - pH 13
Temperature Range:	20 - 50 °C

ORDER INFORMATION

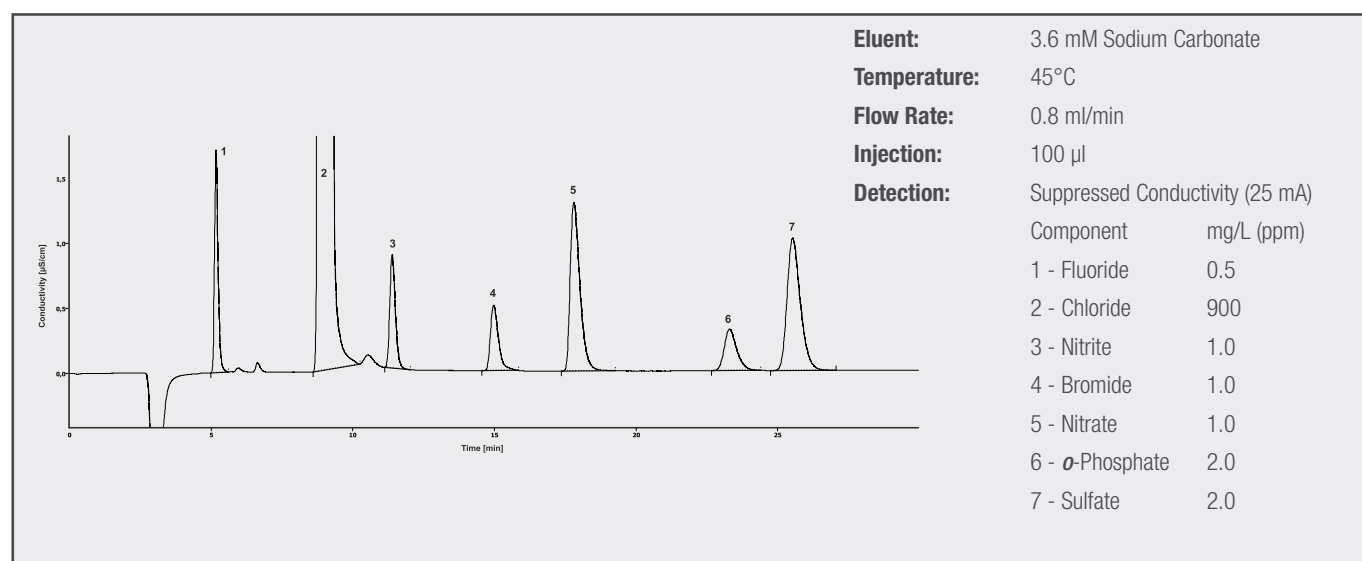
Anion Separation Column ION A04

Catalog No	Description	Dimensions
S004593	Anion Separation Column ION A04	250 x 4.0 mm, 5 µm
S008037	Anion Guard Column AGC-02	10 x 4.6 mm

IC SEPARATION COLUMNS: ANIONS

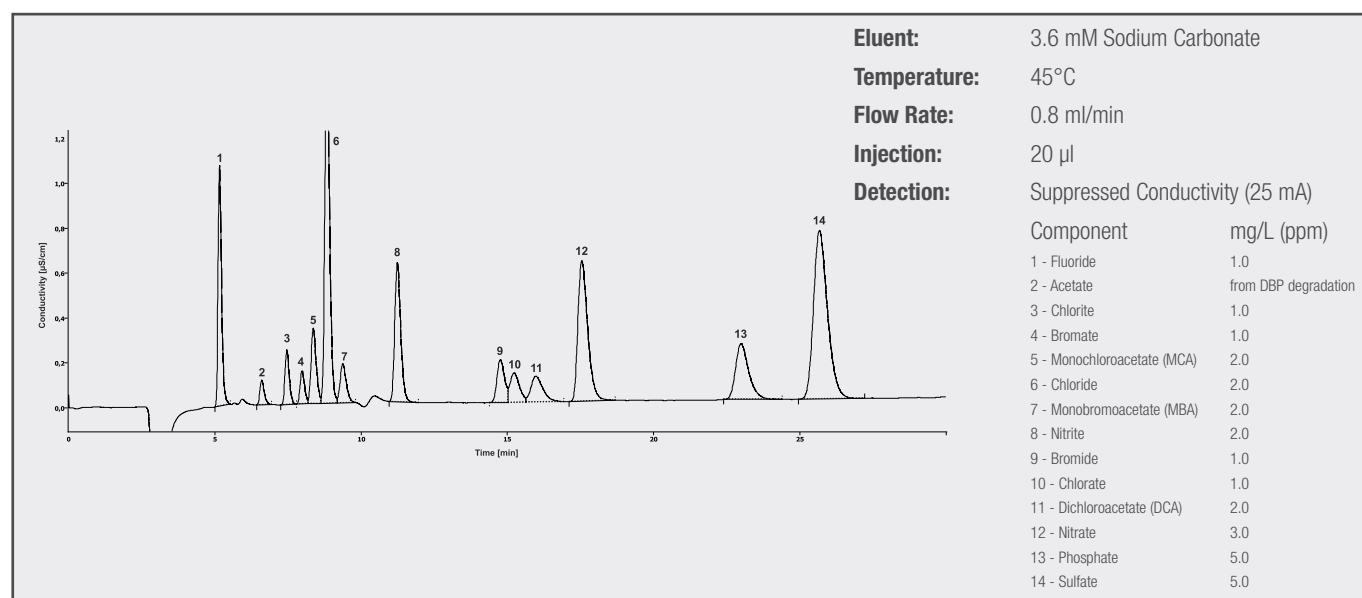
Anion Separation Column ION A05

Determination of Inorganic Anions in Industrial and Domestic Wastewater and Samples of High Chloride Concentrations using Suppressed Conductivity Measurement



Separation of a low-ppm inorganic anion standard spiked with 900 ppm Chloride on a Sykam A05 using suppressed conductivity measurement.

Determination of Disinfection Byproducts Chlorite, Chlorate, Bromate and Haloacetic acids in Drinking Water and Bottled Natural Waters



Determination of disinfection byproducts in a low-ppm inorganic anion standard for drinking water analysis on a Sykam A05 using suppressed conductivity.

Anion Separation Column ION A05

Applications

- Determination of Disinfection byproducts in Drinking Water and Bottled Natural Waters using Suppressed Conductivity Measurement
- Determination of Inorganic Anions in Industrial and Domestic Wastewater using Suppressed Conductivity Measurement
- Determination of Inorganic Anions in Drinking Water and Natural Waters using Suppressed Conductivity Measurement
- Determination of Inorganic Anions in Samples of High Chloride Concentrations (optimized resolution) using Suppressed Conductivity Measurement

Technical Specifications

Substrate:	Polyvinyl alcohol, Quaternary ammonium
Particle Size:	5 µm
Column Dimensions:	250 x 4.0 mm
Column Material:	PEEK
Maximum Pressure:	20 MPa
pH-Range:	pH 1 - pH 13
Temperature Range:	20 - 50 °C

ORDER INFORMATION

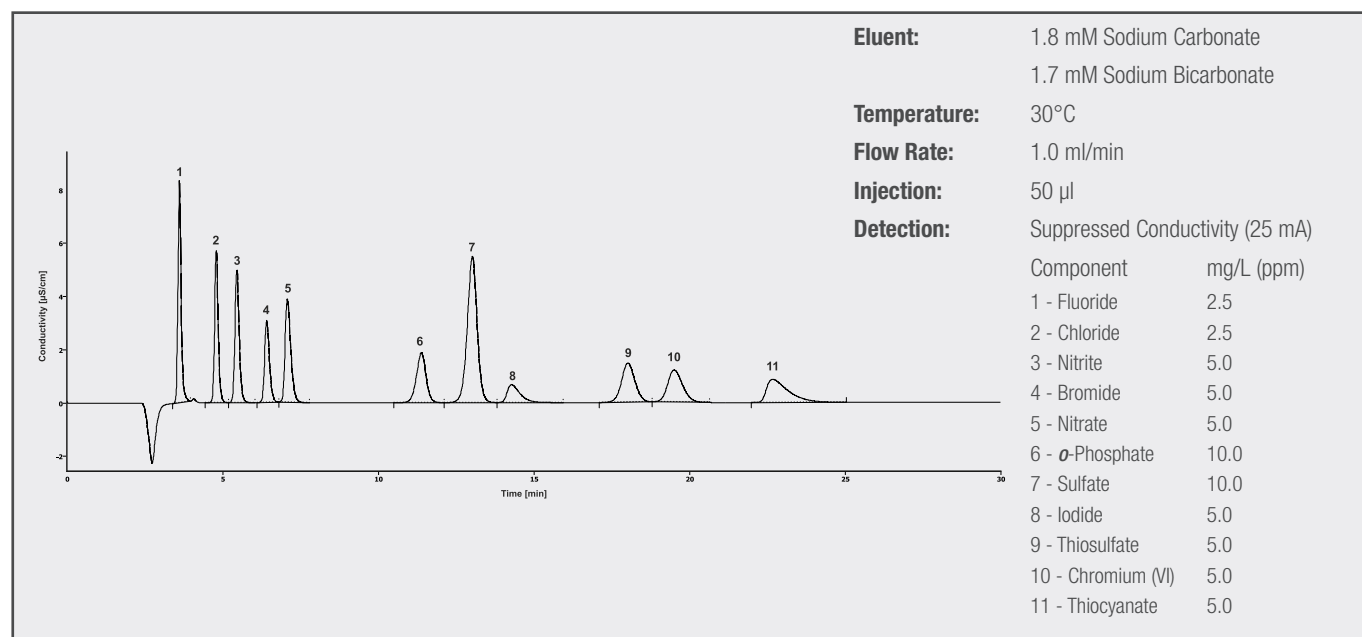
Anion Separation Column ION A05

Catalog No	Description	Dimensions
S006790	Anion Separation Column ION A05	250 x 4.0 mm, 5 µm
S008037	Anion Guard Column AGC-02	10 x 4.6 mm

IC SEPARATION COLUMNS: ANIONS

Anion Separation Column ION A06

Determination of Standard Anions and Iodide, Thiosulfate, Thiocyanate and Cr(VI) in Aqueous Samples using Suppressed Conductivity Measurement



Determination of iodide, thiosulfate, thiocyanate and Cr(VI) together with the standard inorganic anions in a low-ppm inorganic anion standard on a Sykam A04 using Suppressed Conductivity Measurement.

Applications

- Determination of Standard Anions and Iodide, Thiosulfate, Thiocyanate and Cr(VI) in aqueous samples using Suppressed Conductivity Measurement
- Determination of Inorganic Anions in Drinking and Natural Waters using Suppressed Conductivity Measurement
- Determination of Phosphite and Hypophosphite in a Chloride-Sulfate-Oxalate-Matrix using Suppressed Conductivity Measurement

Technical Specifications

Substrate:	Polyvinyl alcohol, Quaternary ammonium
Particle Size:	9 µm
Column Dimensions:	250 x 4.0 mm
Column Material:	PEEK
Maximum Pressure:	20 MPa
pH-Range:	pH 1 - pH 13
Temperature Range:	20 - 50 °C

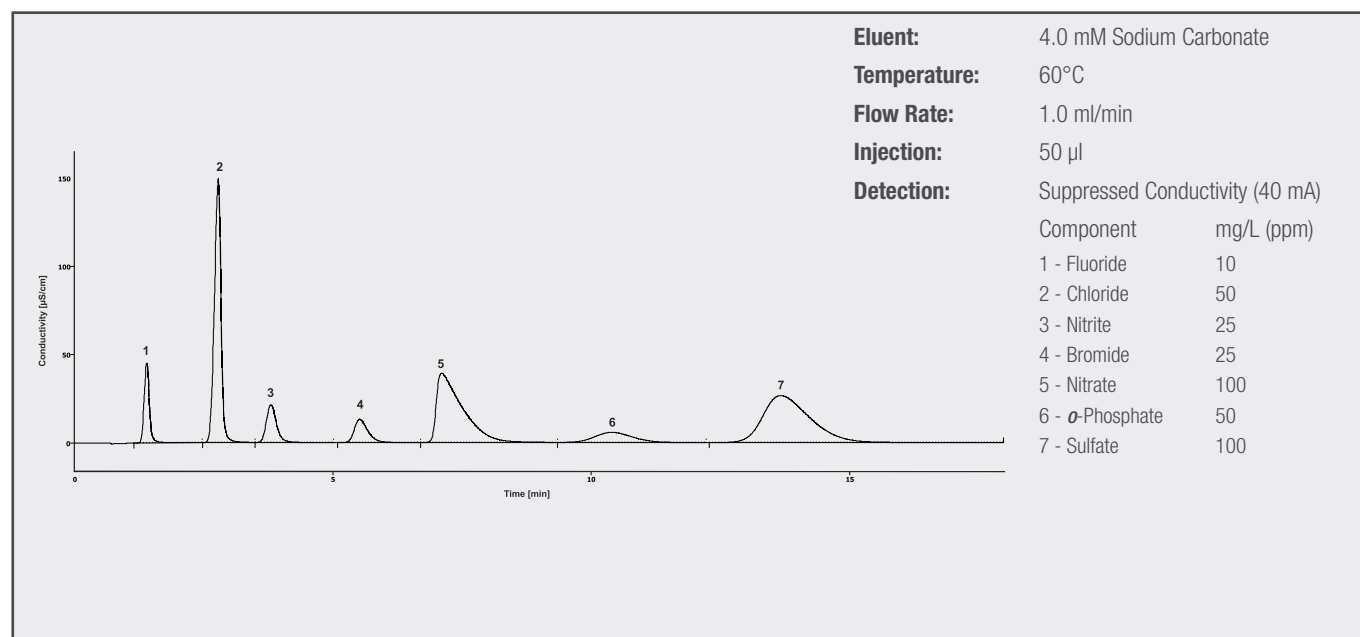
ORDER INFORMATION

Anion Separation Column ION A06

Catalog No	Description	Dimensions
S007270	Anion Separation Column ION A06	250 x 4.0 mm, 10 µm
S008037	Anion Guard Column AGC-02	10 x 4.6 mm

Anion Separation Column ION A07

Determination of Inorganic Anions in Drinking Water and Natural Waters using Suppressed Conductivity Measurement



Separation of an inorganic anion standard for drinking and waste water analysis on a Sykam A07 using Suppressed Conductivity Measurement

Applications

- Determination of Inorganic Anions in Drinking and Natural Waters using Suppressed Conductivity Measurement
- Determination of Inorganic Anions in Industrial and Domestic Wastewater using Suppressed Conductivity Measurement
- Determination of Sulfite in Drinking Water using Suppressed Conductivity Measurement
- Determination of Hexavalent Chromium in Drinking Water using UV-Detection and Post Column Derivatization

Technical Specifications

Substrate:	Polystyrene-divinylbenzene, Trimethyl ammonium
Particle Size:	10 µm
Column Dimensions:	150 x 2.6 mm
Column Material:	PEEK
Maximum Pressure:	30 MPa
pH-Range:	pH 1 - pH 13
Temperature Range:	20 - 60 °C

ORDER INFORMATION

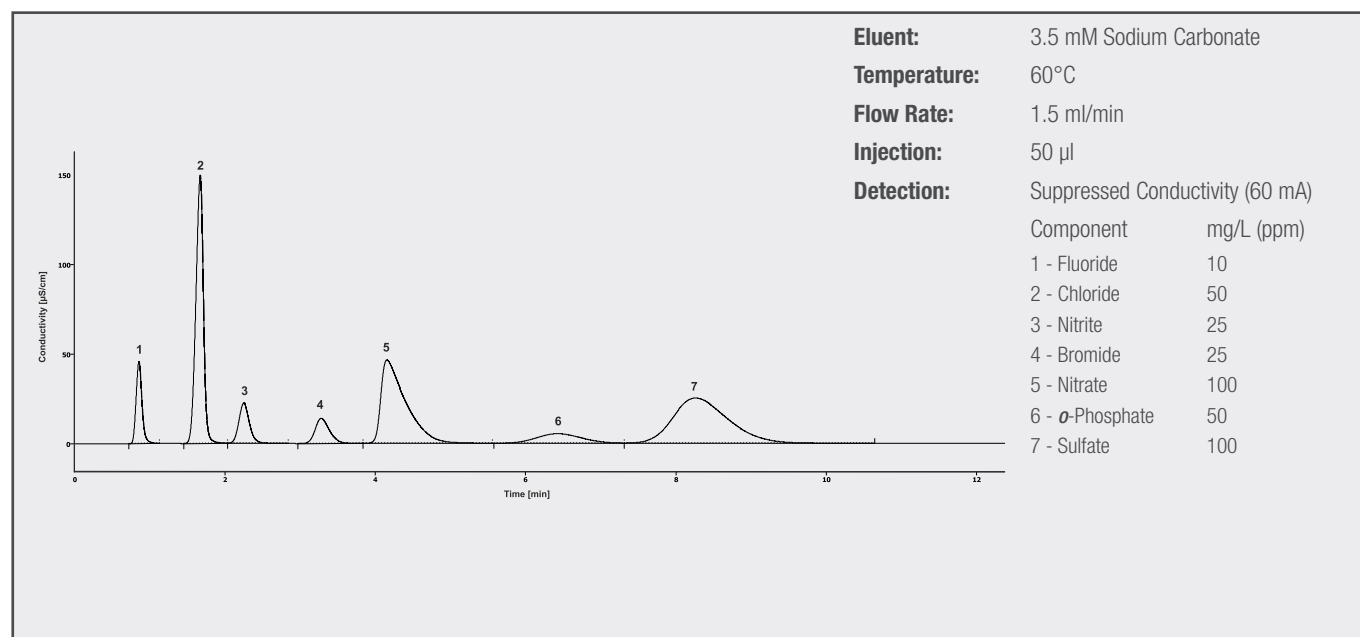
Anion Separation Column ION A07

Catalog No	Description	Dimensions
S010863	Anion Separation Column ION A07	150 x 2.6 mm, 10 µm
S004732	Anion Guard Column AGC-01	20 x 2.6 mm

IC SEPARATION COLUMNS: ANIONS

Anion Separation Column ION A08

Determination of Inorganic Anions in Drinking and Natural Waters using Suppressed Conductivity Measurement



Separation of an inorganic anion standard for drinking and waste water analysis on a Sykam A08 using Suppressed Conductivity Measurement

Applications

- Determination of Inorganic Anions in Drinking and Natural Waters using Suppressed Conductivity Measurement
- Determination of Inorganic Anions in Industrial and Domestic Wastewater using Suppressed Conductivity Measurement
- Determination of Hexavalent Chromium in Drinking Water using UV-Detection and Post Column Derivatization

Technical Specifications

Substrate:	Polystyrene-divinylbenzene, Trimethyl ammonium
Particle Size:	10 µm
Column Dimensions:	125 x 2.6 mm
Column Material:	PEEK
Maximum Pressure:	30 MPa
pH-Range:	pH 1 - pH 13
Temperature Range:	20 - 60 °C

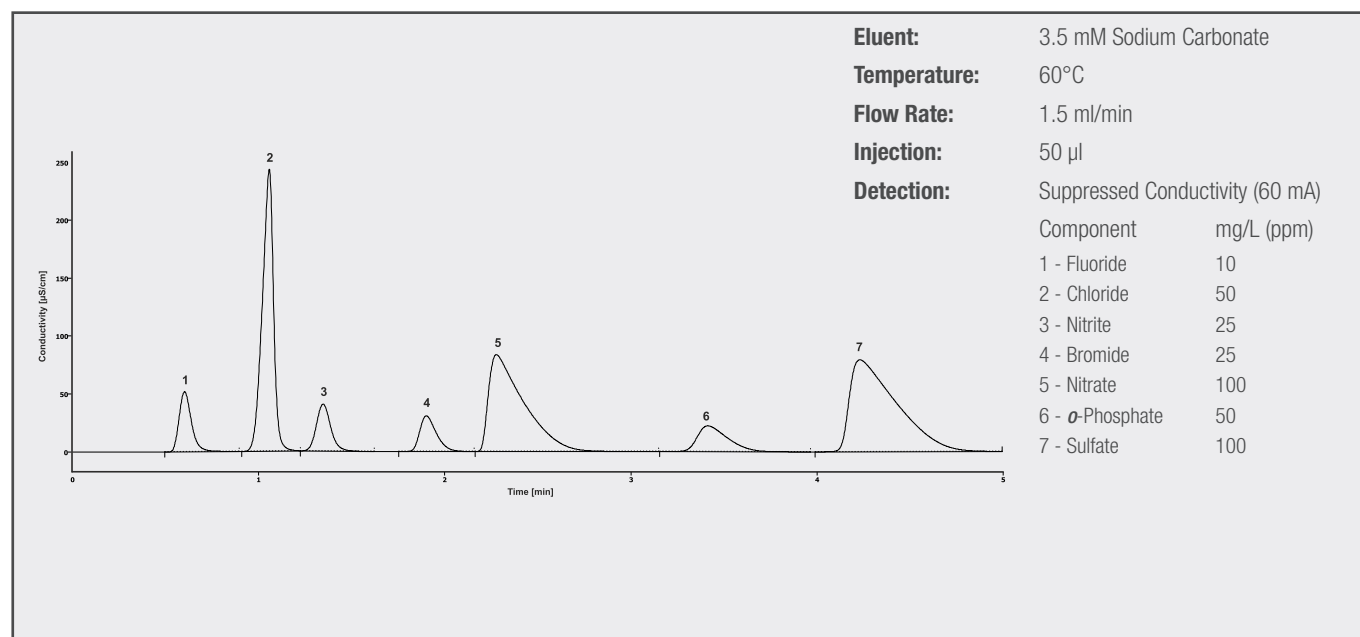
ORDER INFORMATION

Anion Separation Column ION A08

Catalog No	Description	Dimensions
S011007	Anion Separation Column ION A08	125 x 2.6 mm, 10 µm
S004732	Anion Guard Column AGC-01	20 x 2.6 mm

Anion Separation Column ION A09

Rapid Determination of Inorganic Anions in Drinking and Natural Waters using Suppressed Conductivity Measurement



Separation of an inorganic anion standard for drinking and waste water analysis on a Sykam A09 using suppressed conductivity measurement.

Applications

- Rapid Determination of Inorganic Anions in Drinking Water and Natural Waters
- Rapid Determination of Inorganic Anions in Industrial and Domestic Wastewater

Technical Specifications

Substrate:	Polystyrene-divinylbenzene, Trimethyl ammonium
Particle Size:	5 µm
Column Dimensions:	75 x 2.6 mm
Column Material:	PEEK
Maximum Pressure:	30 MPa
pH-Range:	pH 1 - pH 13
Temperature Range:	20 - 60 °C

ORDER INFORMATION

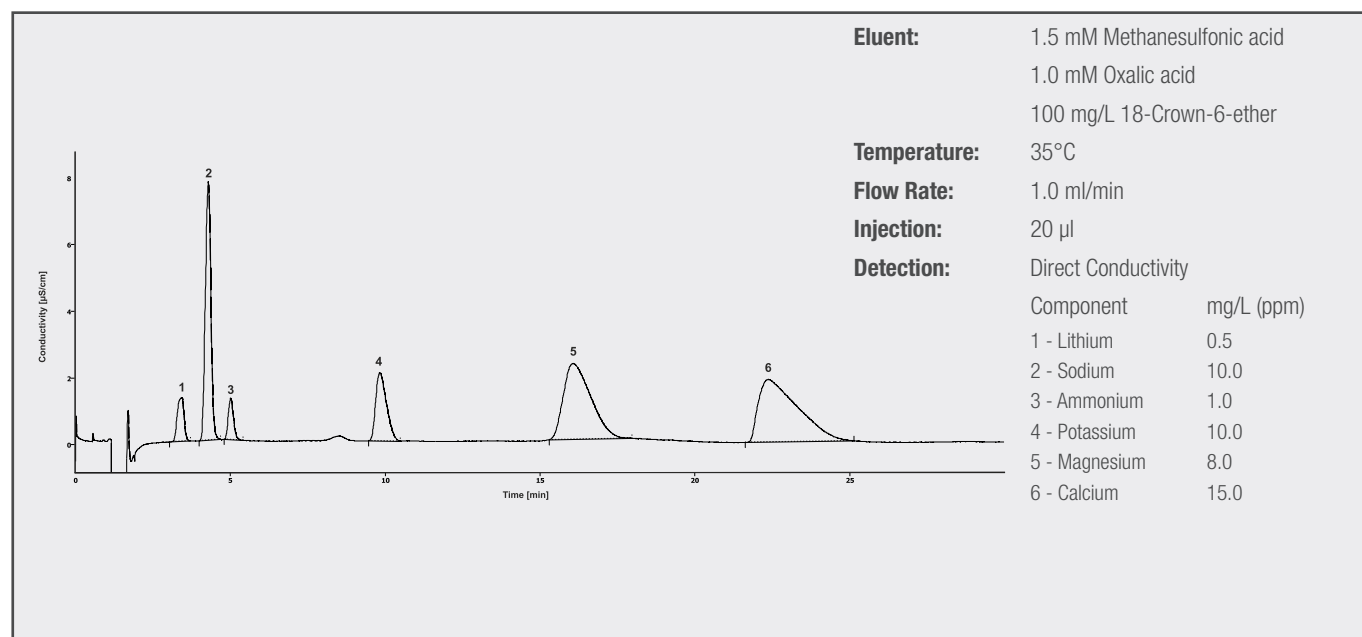
Anion Separation Column ION A09

Catalog No	Description	Dimensions
S011070	Anion Separation Column ION A09	75 x 2.6 mm, 10 µm
S004732	Anion Guard Column AGC-01	20 x 2.6 mm

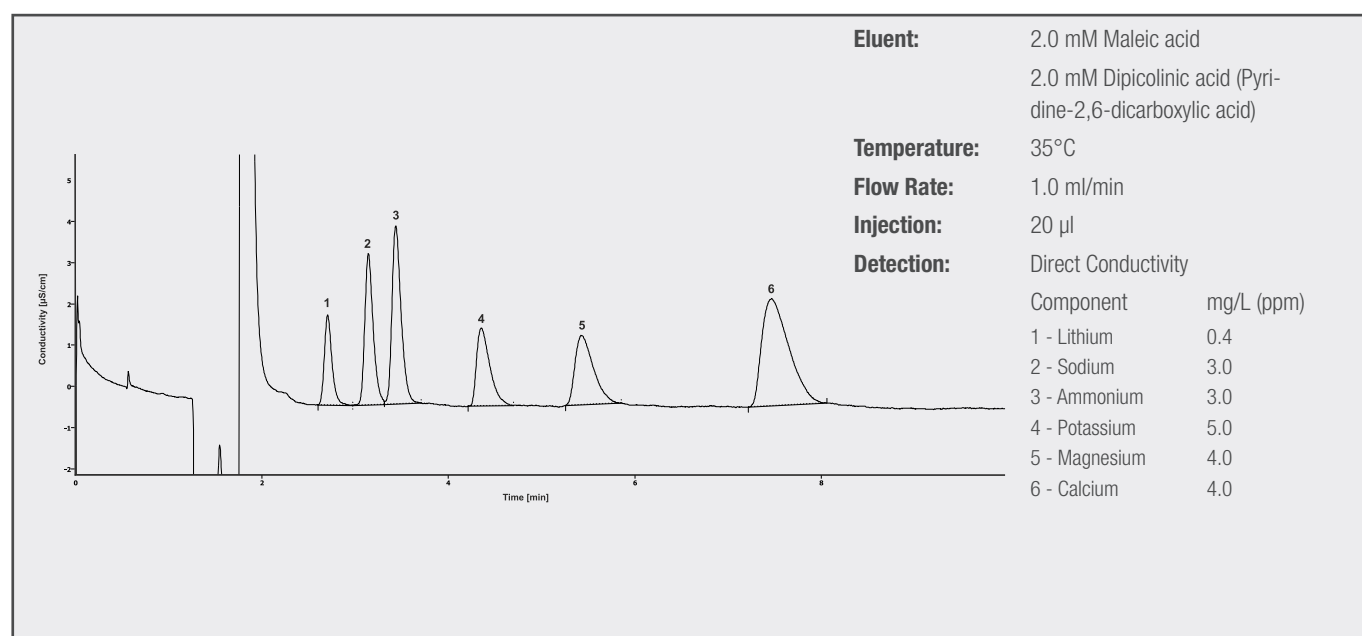
IC SEPARATION COLUMNS: CATIONS

Cation Separation Column ION C01

Rapid Determination of Alkali and Alkaline Earth Metals in Drinking and Natural Waters using Direct Conductivity Measurement



Separation of a low-ppm cation standard for drinking and natural water analysis on a Sykam C01 using direct conductivity measurement.



Fast Separation of a low-ppm cation standard for drinking and natural water analysis on a Sykam C01 using direct conductivity measurement.

Cation Separation Column ION C01

Applications

- Determination of Alkali Metals, Alkaline Earth Metals and Ammonia in Drinking and Natural Waters using Direct Conductivity Measurement
- Rapid Determination of Alkali and Alkaline Earth Metals in Drinking and Natural Waters using Direct Conductivity Measurement

Technical Specifications

Substrate:	Spherical Silica, Polybutadiene-maleic acid coated
Particle Size:	5 µm
Column Dimensions:	125 x 4.6 mm
Column Material:	Stainless Steel
Maximum Pressure:	20 MPa
pH-Range:	pH 1 - pH 8
Temperature Range:	20 - 40 °C

ORDER INFORMATION

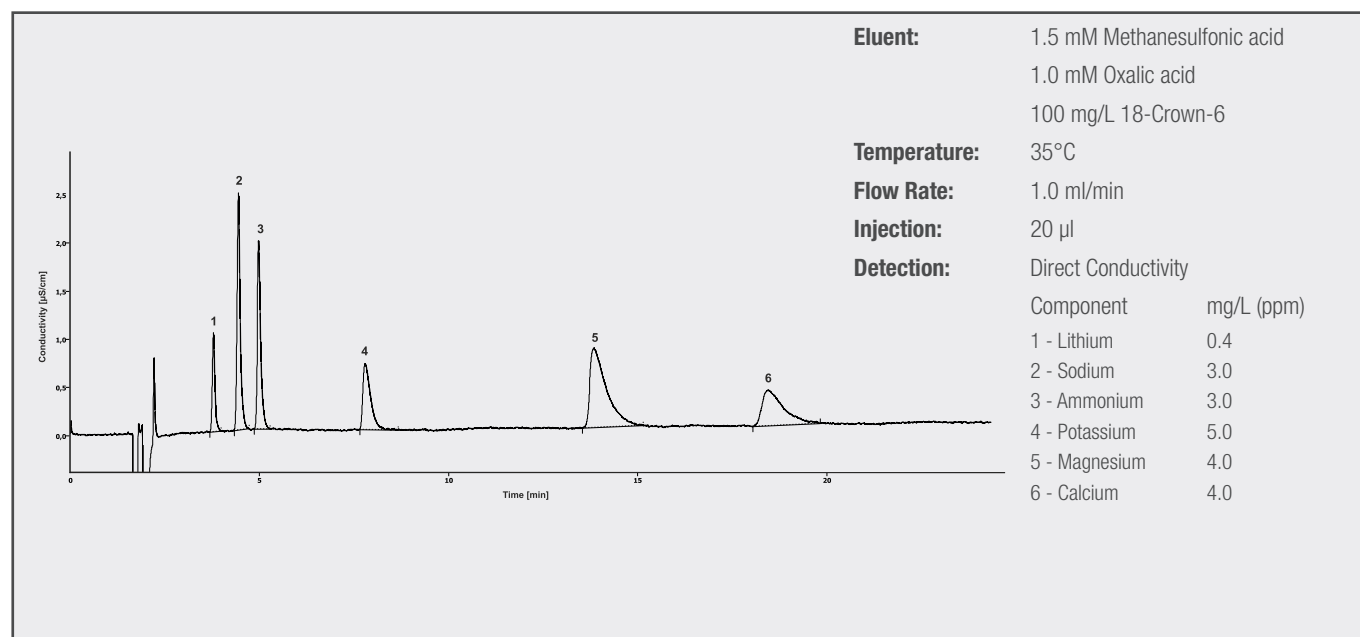
Cation Separation Column ION C01

Catalog No	Description	Dimensions
S004193	Cation Separation Column ION C01	125 x 4.6 mm, 5 µm
S004741	Cation Guard Column CGC-01	20 x 3.0 mm

IC SEPARATION COLUMNS: CATIONS

Cation Separation Column ION C02

Determination of Alkali Metals, Alkaline Earth metals and Ammonia in Drinking and Natural Waters using Direct Conductivity Measurement (Enhanced Resolution)



Separation of a low-ppm cation standard for drinking and natural water analysis on a Sykam C02 using direct conductivity measurement.

Applications

- Determination of Standard Cations in Drinking Water and Natural Waters with Direct Conductivity Measurement (Enhanced Resolution)

Technical Specifications

Substrate:	Spherical Silica, Polybutadiene-maleic acid coated
Particle Size:	5 µm
Column Dimensions:	250 x 4.6 mm
Column Material:	Stainless Steel
Maximum Pressure:	20 MPa
pH-Range:	pH 1 - pH 8
Temperature Range:	20 - 40 °C

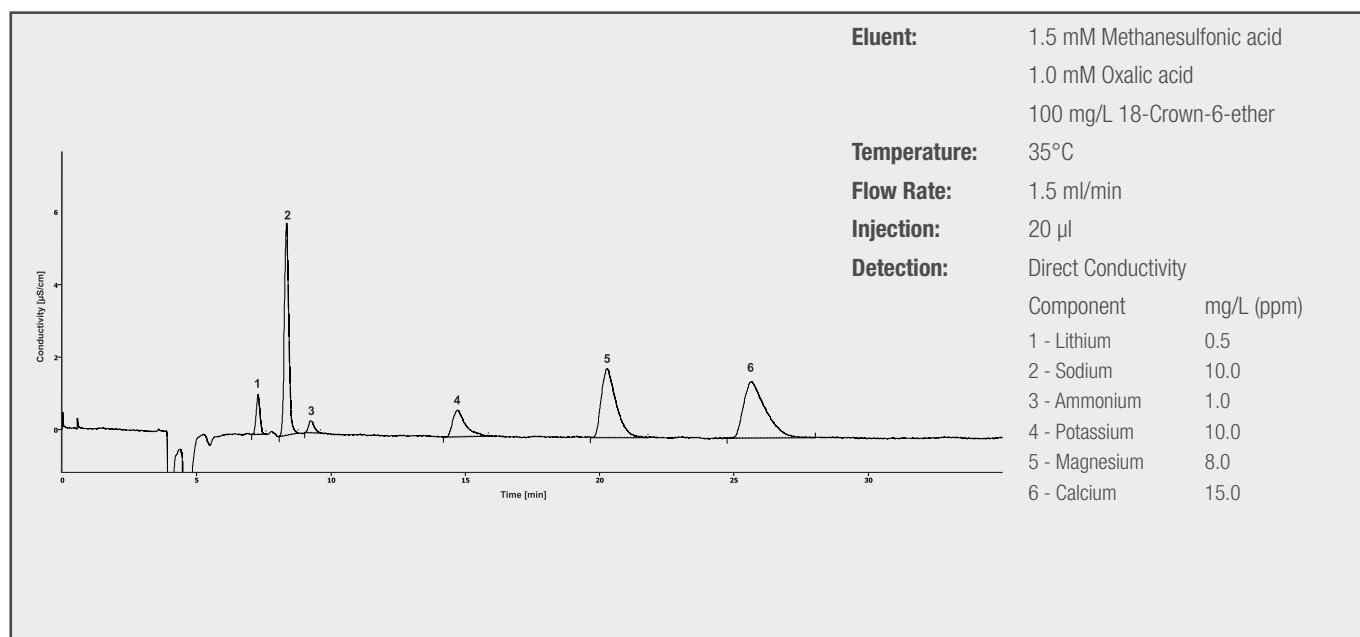
ORDER INFORMATION

Cation Separation Column ION C02

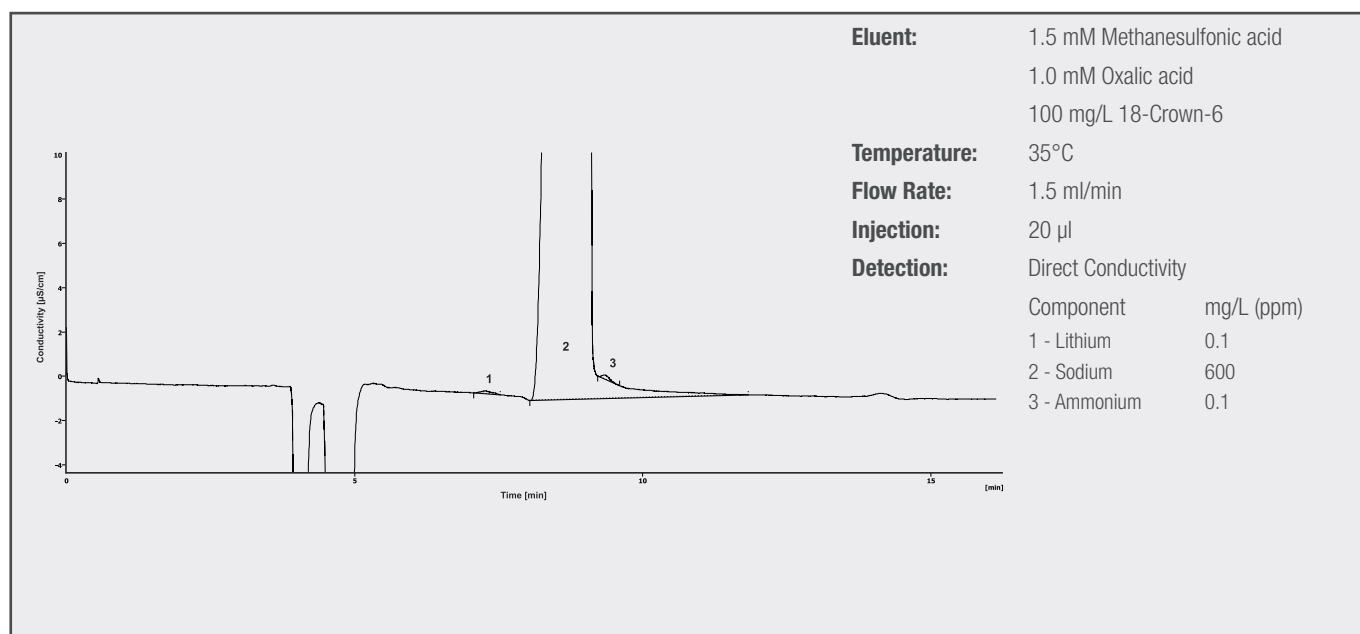
Catalog No	Description	Dimensions
S005349	Cation Separation Column ION C02	250 x 4.6 mm, 5 µm
S004741	Cation Guard Column CGC-01	20 x 3.0 mm

Cation Separation Column ION C05

Determination of Alkali Metals, Alkaline Earth Metals and Ammonia in Drinking and Natural Waters using Direct Conductivity Measurement (Enhanced Resolution)



Separation of a low-ppm cation standard for drinking and natural water analysis on a Sykam C05 using direct conductivity measurement.



Determination of 100ppb ammonium in a sample spiked with 600ppm sodium on a Sykam C05 using direct conductivity measurement.

IC SEPARATION COLUMNS: CATIONS

Cation Separation Column ION C05

Applications

- Determination of Standard Cations in Drinking Water and Natural Waters with Direct Conductivity Measurement (Enhanced Resolution)
- Determination of Ammonium in Presence of High Sodium Concentrations

Technical Specifications

Substrate:	Spherical Silica, Polybutadiene-maleic acid coated
Particle Size:	5 µm
Column Dimensions:	250 x 8.0 mm
Column Material:	Stainless Steel
Maximum Pressure:	20 MPa
pH-Range:	pH 1 - pH 8
Temperature Range:	20 - 40 °C

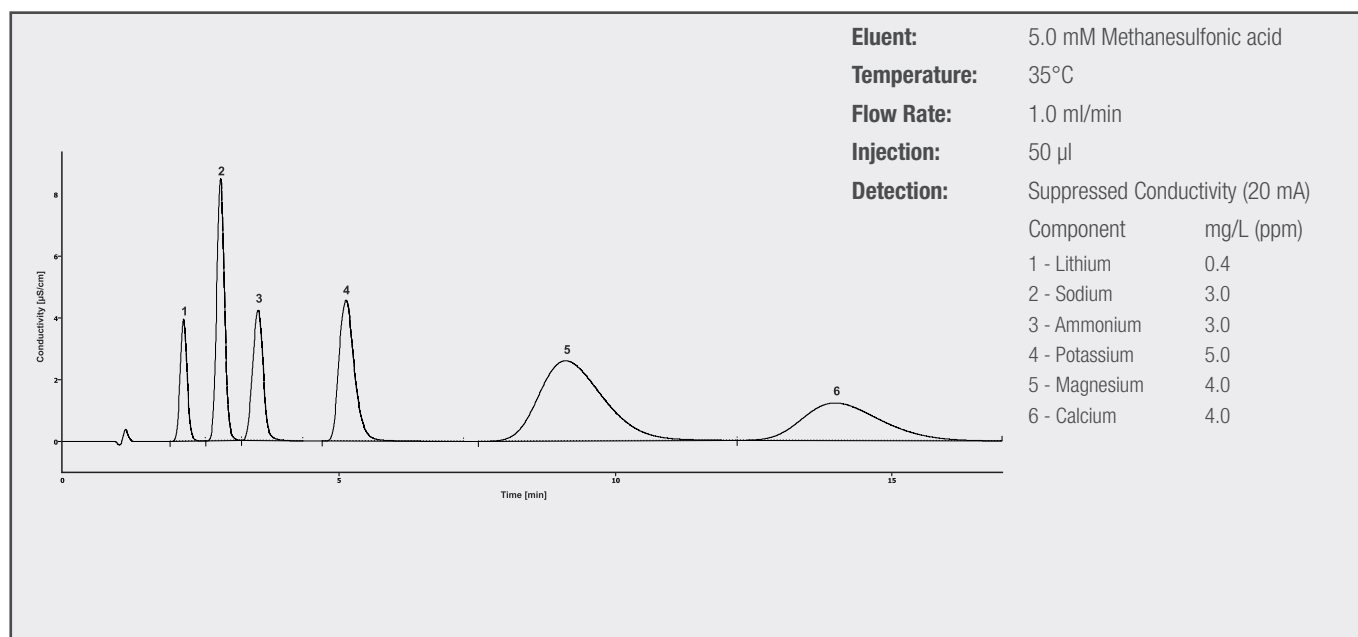
ORDER INFORMATION

Cation Separation Column ION C05

Catalog No	Description	Dimensions
S007000	Cation Separation Column ION C05	250 x 8.0 mm, 5 µm
S011251	Cation Guard Column CGC-05	20 x 8.0 mm

Cation Separation Column ION C06

Determination of Alkali Metals, Alkaline Earth Metals and Ammonia in Drinking and Natural Waters using Suppressed Conductivity Measurement (Enhanced Resolution)



Separation of a low-ppm cation standard for drinking and natural water analysis on a Sykam C06 using suppressed conductivity measurement.

Applications

- Determination of Standard Cations in Drinking Water and Natural Waters with Suppressed Conductivity Measurement (Enhanced Resolution)

Technical Specifications

Substrate:	Ethylvinylbenzene-Divinylbenzene, weak carbonic acid grafted
Particle Size:	9 µm
Column Dimensions:	100 x 4.6 mm
Column Material:	Stainless Steel
Maximum Pressure:	12 MPa
pH-Range:	pH 1 - pH 14
Temperature Range:	20 - 50 °C

ORDER INFORMATION

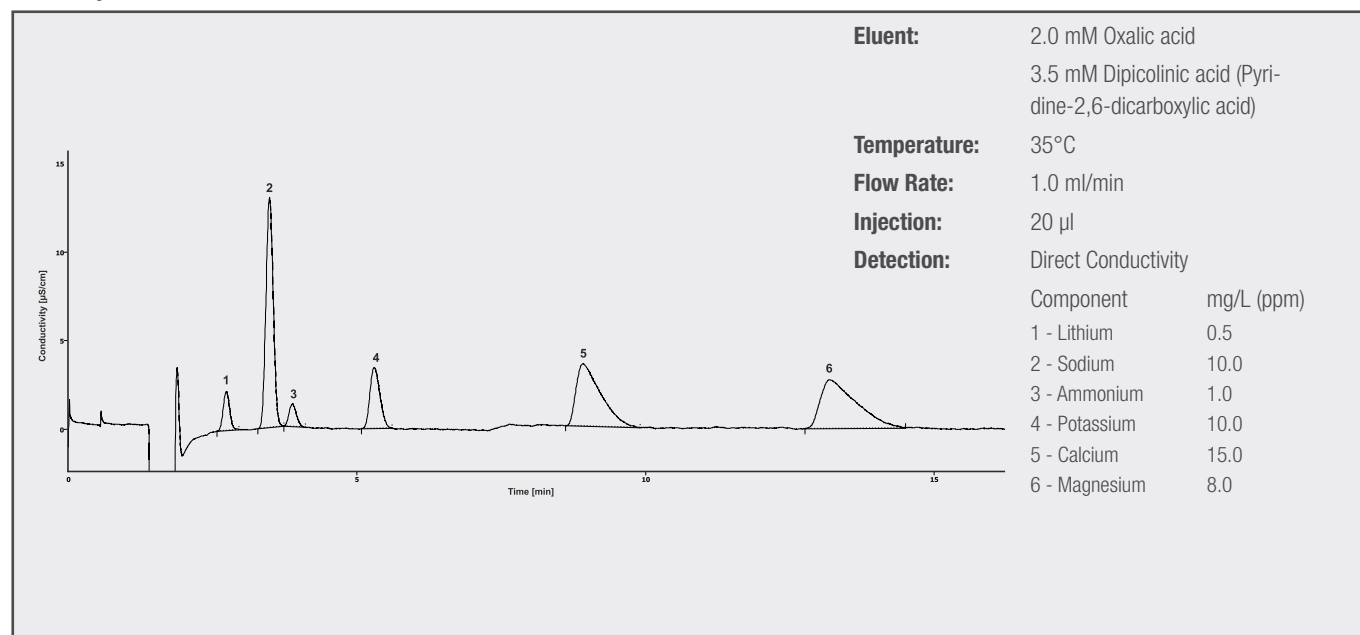
Cation Separation Column ION C06

Catalog No	Description	Dimensions
S010182	Cation Separation Column ION C06	100 x 4.6 mm, 9 µm
S011249	Cation Guard Column CGC-03	50 x 4.6 mm

IC SEPARATION COLUMNS: CATIONS

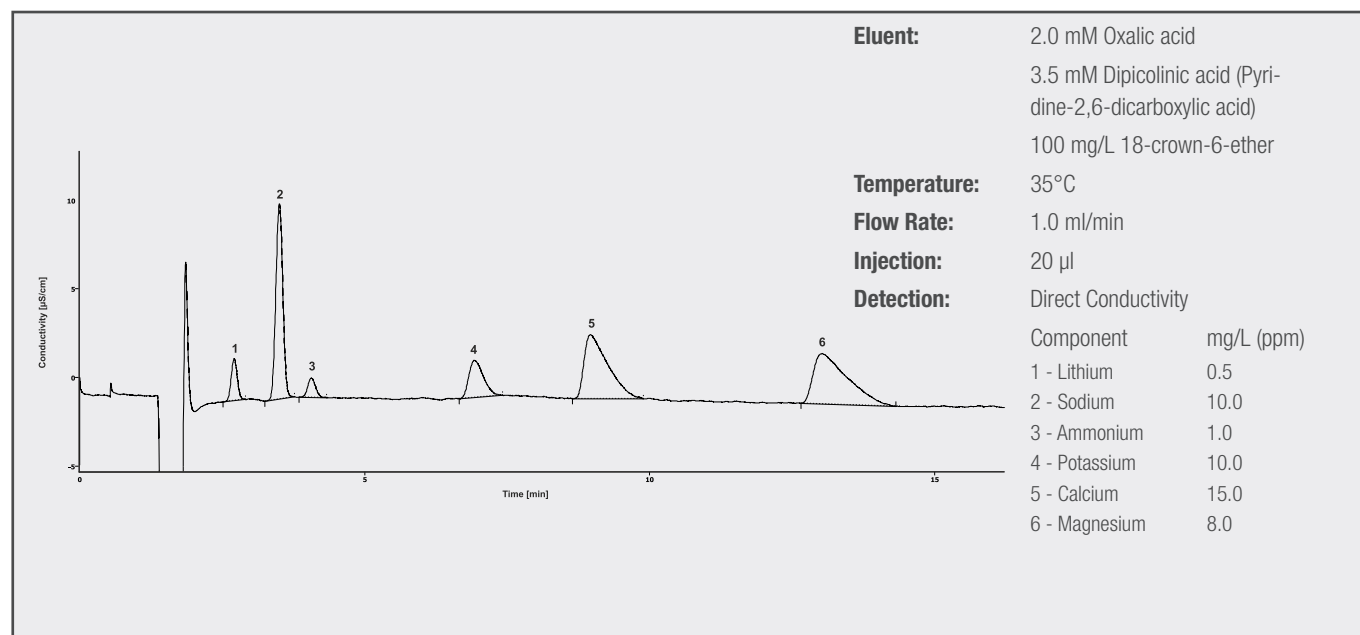
Cation Separation Column ION C07

Determination of Alkali Metals, Alkaline Earth Metals and Ammonia in Drinking and Natural Waters using Direct Conductivity Measurement



Separation of a low-ppm cation standard used for drinking and natural water analysis on a Sykam C07 using direct conductivity measurement.

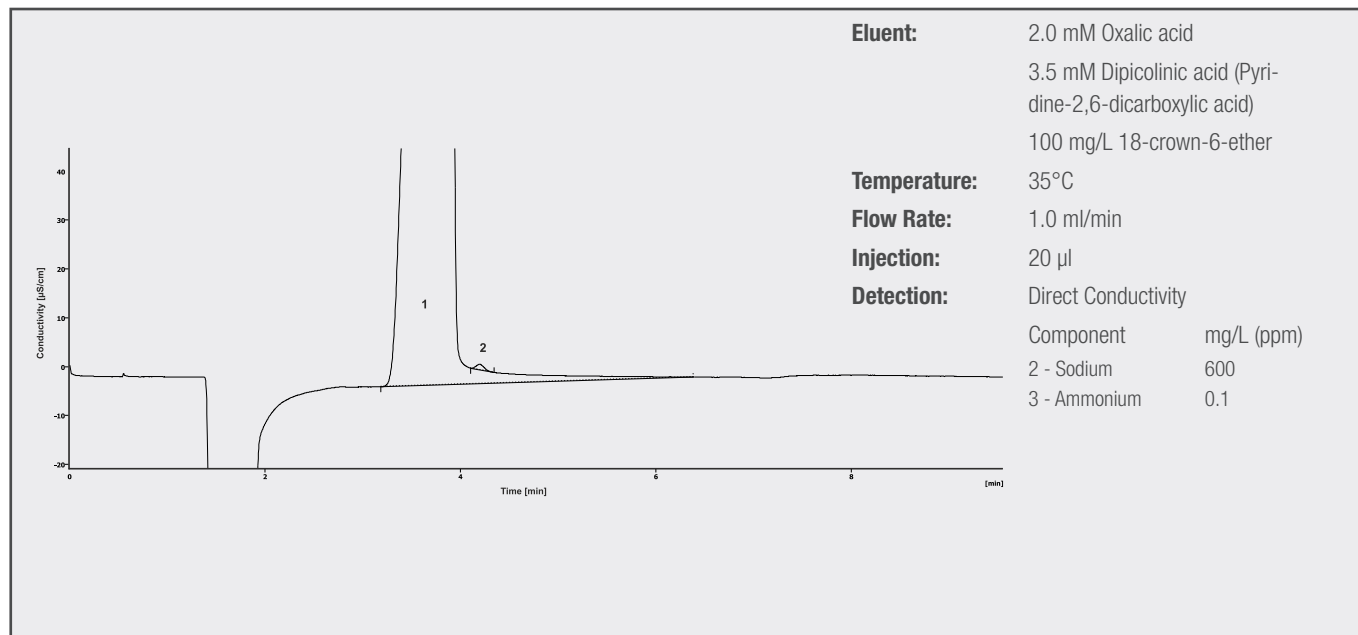
Determination of Alkali Metals, Alkaline Earth Metals and Ammonia in Drinking and Natural Waters using Direct Conductivity Measurement (Enhanced Resolution)



Separation of a low-ppm cation standard used for drinking and natural water analysis on a Sykam C07 using direct conductivity measurement with enhanced resolution of Na⁺ and NH₄⁺.

Cation Separation Column ION C07

Determination of Ammonium in Presence of High Sodium Concentrations using Direct Conductivity Measurement (Enhanced Resolution)



Determination of 100ppb ammonium in a sample spiked with 600ppm sodium on a Sykam C07 using direct conductivity measurement with enhanced resolution of Na⁺ and NH₄⁺.

Applications

- Determination of Alkali Metals, Alkaline Earth Metals and Ammonia in Drinking and Natural Waters using Direct Conductivity Measurement
- Determination of Alkali Metals, Alkaline Earth Metals and Ammonia in Drinking and Natural Waters using Direct Conductivity Measurement (Enhanced Resolution)
- Determination of Ammonium in Presence of High Sodium Concentrations using Direct Conductivity Measurement

Technical Specifications

Substrate:	Ethylvinylbenzene-Divinylbenzene, weak carbonic acid grafted
Particle Size:	7 µm
Column Dimensions:	200 x 4.0 mm
Column Material:	Stainless Steel
Maximum Pressure:	16 MPa
pH-Range:	pH 1 - pH 14
Temperature Range:	20 - 50 °C

ORDER INFORMATION

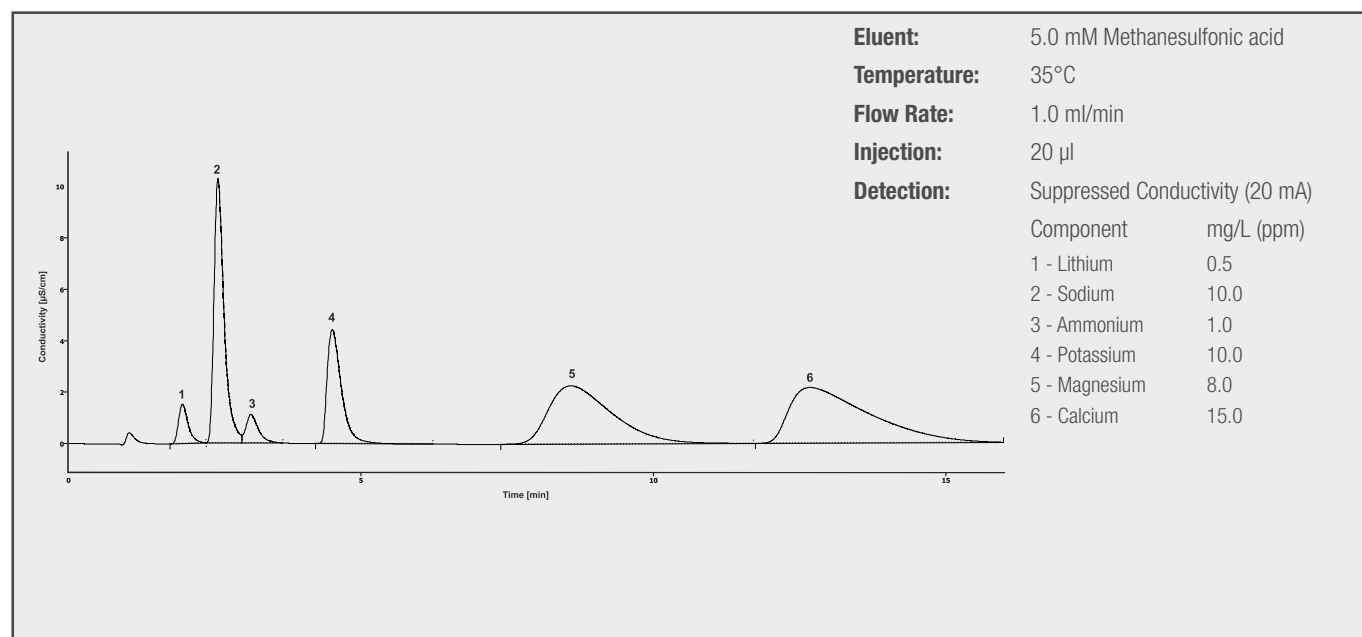
Cation Separation Column ION C07

Catalog No	Description	Dimensions
S010183	Cation Separation Column ION C07	200 x 4.0 mm, 7 µm
S011249	Cation Guard Column CGC-03	50 x 4.6 mm

IC SEPARATION COLUMNS: CATIONS

Cation Separation Column ION C08

Determination of Alkali Metals, Alkaline Earth Metals and Ammonia in Drinking and Natural Waters using Suppressed Conductivity Measurement



Separation of a low-ppm cation standard for drinking and natural water analysis on a Sykam C08 using suppressed conductivity measurement.

Applications

- Determination of Alkali Metals, Alkaline Earth Metals and Ammonia in Drinking and Natural Waters using Suppressed Conductivity Measurement

Technical Specifications

Substrate:	Ethylvinylbenzene-Divinylbenzene, weak carbonic acid grafted
Particle Size:	9 µm
Column Dimensions:	250 x 2.6 mm
Column Material:	PEEK
Maximum Pressure:	20 MPa
pH-Range:	pH 1 - pH 14
Temperature Range:	20 - 50 °C

ORDER INFORMATION

Cation Separation Column ION C08

Catalog No	Description	Dimensions
S011248	Cation Separation Column ION C08	250 x 2.6 mm, 9 µm
S011250	Cation Guard Column CGC-04	20 x 2.6 mm



SYKAM PRODUCTS

S 500 Series HPLC Systems



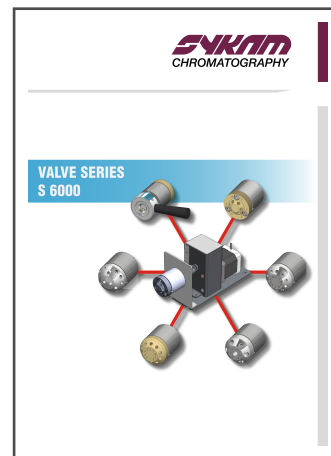
S 600 Series HPLC Systems



S 433 Amino Acid Analyzer



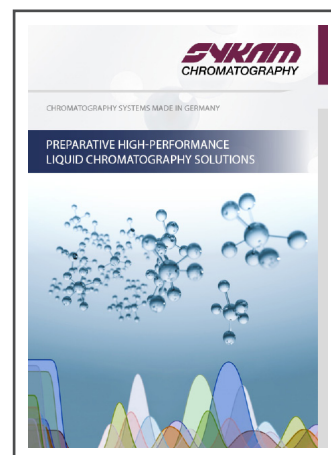
S 6000 Valve Series



Sykam OEM Solutions



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