

ION CHROMATOGRAPHY

Standards and Reagents

Certified Standard Solutions (*TraceCERT*®)

Qualification Kit

Custom Standard Solutions

Certified Eluent Concentrates

Salts and Additives

Water

Sigma-Aldrich® offers a comprehensive range of reagents, eluents and standards for separation and low level (mg/L) quantification of cations and anions via IC analysis.

CERTIFIED STANDARD SOLUTIONS (*TraceCERT*®)

The selection of appropriate standards for the calibration and quality control of an IC system is of high importance. Sigma-Aldrich offers a wide range of certified reference materials for IC, starting from single-ion standards to multi-ion standards.

- **TraceCERT**® certified reference materials are produced under double-accreditation, fulfilling both ISO/IEC 17025 (General Requirements for the Competence of Testing and Calibration Laboratories) and ISO Guide 34 (General Requirements for the Competence of Reference Material Producers).
- The certified value of the reference material is directly traceable to the SI unit (kg) and is also measured against an internationally recognized reference material (from NIST, BAM or others).
- Information about traceability and uncertainty are included in the certificate according to ISO Guide 31, and the expiry date is also given. In most cases, relevant impurities are stated for the inorganic single-ion standards.
- Certificates can be accessed on the web by using product and lot numbers.

PRIMUS – Primary Multi-ion Standards

Sigma-Aldrich launched the PRIMUS standards in 2003. The development was carried out in collaboration with EMPA (former national metrological institute in chemical metrology), located in St. Gallen, Switzerland.

EMPA determined the exact content of the starting materials based on high-purity salts. The contents of these primary materials were determined by two independent methods for each salt. The analyses were done in collaboration with the German metrological institute BAM.

The primary starting materials are diluted with high-purity water using high precision weighing and an adequate cleanroom environment to develop multi-ion standards with concentrations of 10 mg/kg each. Only when sophisticated production procedures are applied is it possible to get expanded relative uncertainties of 0.2%.

To ensure the quality of the PRIMUS standards, each bottle is sealed in an aluminum bag to minimize the loss of solvent and to keep the concentration stable over an extended period of time. A printed certificate is provided with each product, which includes a detailed certification report regarding the characterization of the starting materials by EMPA and BAM, traceability of certified contents, evaluation of the measurement uncertainties and expiry date.

Did you know that ...

- Each new Metrohm IC apparatus contains a pack of our PRIMUS multi-cation or multi-anion standards?
- Metrohm highly recommends the use of PRIMUS standards for the calibration and validation of their instruments?

Sigma-Aldrich works continuously to expand our portfolio of IC standards and reagents, so visit our website to find the newest information on IC products at sigma-aldrich.com/ic

PRIMUS – 50 mL HDPE bottle

Cat. No.	Product Name	Ions	Produced from
89316	Multi-element Ion Chromatography Cation Standard Solution, certified	10 mg/kg each: Li, Na, K, Mg, Ca	Li ₂ CO ₃ , NaCl, KCl, MgO, CaCO ₃ in diluted HCl
89886	Multi-element Ion Chromatography Anion Standard Solution, certified	10 mg/kg each: F ⁻ , Cl ⁻ , Br ⁻ , NO ₃ ⁻ , PO ₄ ³⁻ , SO ₄ ²⁻	NaF, NaCl, NaBr, NaNO ₃ , Na ₂ SO ₄ , Na ₂ HPO ₄ in water

The multi-ion standards have the identical quality characteristics as our mono-ion *TraceCERT*[®] standards.

Multi-ion Standards – 100 mL HDPE bottle (2 L for MARGA)

Cat. No.	Product Name	Ions	Produced from
69734	Multi Anion Standard 1 for IC	3 mg/L: F ⁻ 10 mg/L: Cl ⁻ 20 mg/L: Br ⁻ , NO ₃ ⁻ , SO ₄ ²⁻ 30 mg/L: PO ₄ ³⁻	NaBr, NaCl, NaF, NaNO ₃ , Na ₂ HPO ₃ , Na ₂ SO ₄ in water
53798	Multi Anion Standard 2 for IC	1000 mg/L each: F ⁻ , Cl ⁻ , Br ⁻	NaF, NaCl, NaBr in water
55698	Multi Anion Standard 3 for IC	1000 mg/L each: NO ₃ ⁻ , PO ₄ ³⁻ , SO ₄ ²⁻	NaNO ₃ , Na ₂ HPO ₃ , Na ₂ SO ₄ in water
80124	Anion Calibration Standard for MARGA (Metrohm Air Monitoring Instrument)	0.25 mg/L each: Br ⁻ , Cl ⁻ , NO ₃ ⁻ , NO ₂ ⁻ , SO ₄ ²⁻	NaBr, NaCl, NaF, NaNO ₃ , NaNO ₂ , Na ₂ SO ₄ in water
91286	Multi Cation Standard 1 for IC	50 mg/L: Li 200 mg/L: Na, K, Mg 400 mg/L: NH ₄ ⁺ 1000 mg/L: Ca	Li ₂ CO ₃ , NaNO ₃ , KNO ₃ , Mg metal, CaCO ₃ , NH ₄ Cl in ≤0.1% HNO ₃
93159	Multi Cation Standard 2 for IC	100 mg/L each: Ba, Ca, K, Li, Mg, Mn, Na, NH ₄ ⁺ , Sr	NH ₄ Cl, BaCO ₃ , CaCO ₃ , Li ₂ CO ₃ , Mg metal, Mn metal, KNO ₃ , NaNO ₃ , Sr(NO ₃) ₂ in ≤0.1% HNO ₃
73638	Cation Calibration Standard for MARGA (Metrohm Air Monitoring Instrument)	0.25 mg/L each: NH ₄ ⁺ , Ca, Li, Mg, K, Na	NH ₄ Cl, CaCO ₃ , Li ₂ CO ₃ , Mg metal, KNO ₃ , NaNO ₃ in ≤0.1% HNO ₃

Inorganic Anion Standards – 1,000 mg/L if not otherwise stated, 100 mL HDPE bottle

Cat. No.	Product Name	Composition
78476	Bromate Standard for IC	KBrO ₃ in water
43147	Bromide Standard for IC	NaBr in water
73166	Chlorate Standard for IC	KClO ₃ in water
39883	Chloride Standard for IC	NaCl in water
06740	Chloride Standard for IC (10'000 mg/L)	NaCl in water
40121	Chromate Standard for IC	KCrO ₄ in water
90157	Cyanide Standard for IC	K ₂ Zn(CN) ₄ in water/KOH
77365	Fluoride Standard for IC	NaF in water
41271	Iodide Standard for IC	KI in water
53638	Nitrate Nitrogen Standard for IC	NaNO ₃ in water
74246	Nitrate Standard for IC	NaNO ₃ in water
36427	Nitrite Nitrogen Standard for IC	NaNO ₂ in water/NaOH (pH ~11)
67276	Nitrite Standard for IC	NaNO ₂ in water/NaOH (pH ~11)
76462	Perchlorate Standard for IC	HClO ₄ in water
95924	Phosphate Phosphorous Standard for IC	Na ₂ HPO ₄ in water
38364	Phosphate Standard for IC	Na ₂ HPO ₄ in water
18895	Silicate Standard for IC	Na ₂ O ₃ Si, 9H ₂ O in water
75306	Sulfate Sulfur Standard for IC	Na ₂ SO ₄ in water
90071	Sulfate Standard for IC	Na ₂ SO ₄ in water
79735	Sulfate Standard for IC (10'000 mg/L)	Na ₂ SO ₄ in water

Inorganic Cation Standards – 1,000 mg/L, 100 mL HDPE bottles

Cat. No.	Product Name	Composition
89503	Ammonium Nitrogen Standard for IC	NH ₄ Cl in water
59755	Ammonium Standard for IC	NH ₄ Cl in water
87142	Barium Standard for IC	BaCO ₃ in ≤0.1% HNO ₃
69679	Cadmium Standard for IC	Cd metal in ≤0.1% HNO ₃
39865	Calcium Standard for IC	CaCO ₃ in ≤0.1% HNO ₃
49594	Cobalt Standard for IC	Co metal in ≤0.1% HNO ₃
40786	Copper Standard for IC	Cu metal in ≤0.1% HNO ₃
51777	Lead Standard for IC	Pb(NO ₃) ₂ in ≤0.1% HNO ₃
59878	Lithium Standard for IC	Li ₂ CO ₃ in ≤0.1% HNO ₃
89441	Magnesium Standard for IC	Mg metal in ≤0.1% HNO ₃
51439	Manganese Standard for IC	Mn metal in ≤0.1% HNO ₃
42637	Nickel Standard for IC	Ni metal in ≤0.1% HNO ₃
53337	Potassium Standard for IC	KNO ₃ in water
43492	Sodium Standard for IC	NaNO ₃ in water
42151	Strontium Standard for IC	Sr(NO ₃) ₂ in ≤0.1% HNO ₃
67902	Zinc Standard for IC	Zn metal in ≤0.1% HNO ₃

Organic Anion Standards – 1,000 mg/L, 100 mL HDPE bottle, stabilized by sodium azide

Cat. No.	Product Name	Composition
51791	Acetate Standard for IC	CH ₃ CO ₂ H and NaOH in water
40968	Adipate Standard for IC	HOOC(CH ₂) ₄ COOH in water
40497	Benzoate Standard for IC	C ₇ H ₆ O ₂ in water
08089	Butyrate Standard for IC	CH ₃ CH ₂ CH ₂ COONa in water
96068	Citrate Standard for IC	HOC(COOH)(CH ₂ COOH) ₂ in water
44293	Formate Standard for IC	(HCOO) ₂ Ca in water
74549	Gluconate Standard for IC	C ₆ H ₁₁ NaO ₇ in water
07438	Glutarate Standard for IC	HOOC(CH ₂) ₃ COOH in water
07391	Glycolate Standard for IC	HOCH ₂ COOH in water
07096	Lactate Standard for IC	[CH ₃ CH(OH)COO] ₂ Mg · xH ₂ O in water
06994	Malate Standard for IC	HO ₂ CCH ₂ CH(OH)CO ₂ H in water
06908	Maleate Standard for IC	HO ₂ CCH=CHCO ₂ H in water
42412	Malonate Standard for IC	CH ₂ (COOH) ₂ in water
42735	Methanesulfonate Standard for IC	CH ₃ SO ₃ H in water
73139	Oxalate Standard for IC	NaOCCOONa in water
90677	Phthalate Standard for IC	HOCC ₆ H ₄ COOK in water
51716	Propionate Standard for IC	CH ₃ CH ₂ COONa in water
43057	Succinate Standard for IC	HOCC ₂ H ₂ COOH in water
43484	Tartrate Standard for IC	HO ₂ CCH(OH)CH(OH)CO ₂ H in water

QUALIFICATION KIT

This kit is intended for testing detection linearity, injector precision and injector carry-over. The 50 mg/kg standard is used for repeatability tests (injector precision), and the maximum carry-over during injection is verified with the 1000 mg/kg standard. The 5 to 100 mg/kg standards are used to prove the detector linearity. It is a special advantage that the certified bromide standards (produced in a double accredited laboratory fulfilling ISO/IEC 17025 and ISO Guide 34) can be used for conductivity, UV/Vis and electrochemical detectors in the following qualifications:

- **Installation Qualification (IQ)** – completeness and operability of the newly installed system
- **Operational Qualification (OQ)** – test according to manufacturer's specifications in user's environment
- **Performance Qualification (PQ)** – verification of system performance according to its intended use

Cat. No.	Product Name	Composition
12674	IQ/OQ/PQ Kit for Ion Chromatography	Six bromide standards with nominal concentrations of 5, 10, 20, 50, 100 and 1000 mg/kg, produced from high-purity NaBr and water

CUSTOM STANDARD SOLUTIONS



An Interactive Online Platform

If you cannot find the standard you need in our portfolio, you can request a quotation for customized standard solutions for IC using our online custom standards platform, sigma-aldrich.com/csp

It is possible to create your single- or multi-ion analytes from the list of inorganic anions and cations with desired concentration and volume, also in special bottle designed for Metrohm autosampler.

CERTIFIED ELUENT CONCENTRATES

Typically, IC eluents (mobile phases) are dilute solutions of acids, bases or salts. The certified eluent concentrates for ion chromatography are traceable by potentiometric titration to NIST Standard Reference Materials and certified in accordance with ISO Guide 31. All details about exact content, uncertainty, traceability and expiry date are described in the certificate.

Single Concentrates

Cat. No.	Product Name	Concentration, Pack Size	Composition
50972	2,6-Pyridinedicarboxylic acid concentrate	20 mM, 1 L	C ₇ H ₅ NO ₄ in water
50433	DL-Tartaric acid concentrate	100 mM, 1 L	HOOC(CHOH) ₂ COOH in water
55517	Methanesulfonic acid concentrate	100 mM, 1 L	CH ₃ SO ₃ H (99%) in water
16355	Nitric acid concentrate	100 mM, 1 L	HNO ₃ in water
68487	Oxalic acid concentrate	100 mM, 1 L	HOOC-COOH in water
50439	Perchloric acid concentrate	10 mM, 1 L	HClO ₄ in water
61699	Potassium hydroxide concentrate	100 mM, 1 L	KOH in water
36486	Sodium bicarbonate concentrate	100 mM, 1 L	NaHCO ₃ in water
72784	Sodium carbonate concentrate ¹	72 mM, 1 L, 2.5 L	Na ₂ CO ₃ in water
56169	Sodium carbonate concentrate	100 mM, 1 L	Na ₂ CO ₃ in water
43617	Sodium hydroxide concentrate	100 mM, 1 L	NaOH in water
72064	Sodium hydroxide solution ²	50-52%, 500 mL	NaOH in water
68279	Sulfuric acid concentrate	100 mM, 1 L	H ₂ SO ₄ in water
86854	Tetrabutylammonium hydroxide solution ²	~40%, 100 mL, 500 mL, 2.5 L	(CH ₃ CH ₂ CH ₂ CH ₂) ₄ N(OH) in water

¹20-fold concentration for Metrohm's Metrosep A Supp 7 column

²standard CoA available

Binary Concentrates

In an effort to expand the selection of well-characterized eluent concentrates, a novel group of binary concentrates (20-fold concentration) was introduced. The key features are:

- Application tested using Metrohm's Metrosep columns
- Certificate according to ISO Guide 31
- High-purity starting materials
- All details about the exact content, specifications, and expiry date are described in the certificate
- Packaging: 1 L and 2.5 L HDPE bottles with 45 mm screw thread

Cat. No.	Product Name	Concentration	Application
61905	Nitric acid/Dipicolinic acid concentrate	14 mM C ₇ H ₅ NO ₄ and 34 mM HNO ₃	Metrosep C 4
62414	Sodium bicarbonate/Sodium carbonate concentrate	64 mM Na ₂ CO ₃ and 20 mM NaHCO ₃	Metrosep A Supp 5
75335	Sodium bicarbonate/Sodium carbonate concentrate	100 mM Na ₂ CO ₃ and 100 mM NaHCO ₃	Metrosep A Supp 10
38302	Sodium carbonate/Sodium hydroxide concentrate	150 mM Na ₂ CO ₃ and 15 mM NaOH	Metrosep A Supp 16
19399*	Nitric acid/Dipicolinic acid concentrate	17 mM HNO ₃ and 17 mM C ₇ H ₅ NO ₄	Metrosep C 6
69523	Sodium bicarbonate/Sodium carbonate concentrate	36 mM Na ₂ CO ₃ and 34 mM NaHCO ₃	Metrosep A Supp 4

*10-fold concentration

SALTS AND ADDITIVES

Cat. No.	Product Name	Pack Size	Grade
05878	L-Ascorbic acid	100 g	C ₆ H ₈ O ₆ , TraceSELECT®, ≥99.9998% (metals basis)
94068	Citric acid monohydrate	100 g	HOC(COOH)(CH ₂ COOH) · H ₂ O, TraceSELECT®, ≥99.9998% (metals basis)
07673	18-Crown-6	500 mg, 5 g, 10 g	C ₁₂ H ₂₄ O ₆ ≥99.0% (GC)
39692	Ethylenediaminetetraacetic acid	25 g	(HO ₂ CCH ₂) ₂ NCH ₂ CH ₂ N(CH ₂ CO ₂ H) ₂ , TraceSELECT®, ≥99.995%
52411	Heptafluorobutyric acid	5 mL, 25 mL	CF ₃ CF ₂ CF ₂ COOH ≥99.5% (GC)
78513	D-Mannitol	50 g	C ₆ H ₁₄ O ₆ , TraceSELECT®, ≥99.9999% (metals basis)
17834	Methanesulfonic acid solution	10 mL, 100 mL, 1 L	CH ₃ SO ₃ H ~1 M in water
93722	Oxalic acid dihydrate	100 g	HO ₂ CCO ₂ H · 2H ₂ O, TraceSELECT®, ≥99.9999% (metals basis)
02321	2,6-Pyridinedicarboxylic acid	5 g, 10 g	C ₇ H ₅ NO ₄ ≥99.5% (T)
59929	Sodium acetate	25 g, 100 g	CH ₃ COONa, TraceSELECT®, for trace analysis, ≥99.999% (metals basis), anhydrous
71347	Sodium carbonate	25 g, 100 g	Na ₂ CO ₃ , TraceSELECT®, for trace analysis, ≥99.9999% (metals basis), anhydrous
03918	DL-Tartaric acid	5 g	HOOC(CHOH) ₂ COOH, anhydrous, ≥99.5% (T)
12819	DL-Tartaric acid	25 g	HOOC(CHOH) ₂ COOH, TraceSELECT®, ≥99.9995% (metals basis)

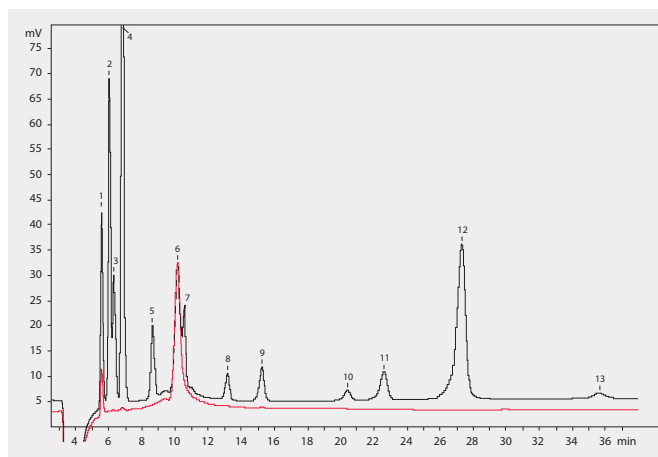
WATER

Sigma-Aldrich has developed a water quality especially for the needs of ion chromatography. This water is also suitable for trace analysis of anions, cations and also some organics, which are usually analyzed by IC. The product is delivered in HDPE bottles with 45 mm thread.

Specifications

Organic traces	≤ 10 µg/kg each: acetate, formate, glycolate, oxalate
Cation traces	≤ 5 µg/kg each: Al, Ba, Bi, Cd, Co, Cr, Cu, Fe, Li, Mg, Mn, Mo, Ni, Pb, Sr, Zn ≤ 10 µg/kg each: Ca, K, Na, NH ₄ ⁺
Anion traces	≤ 1 µg/kg each: bromide, bromate, chlorate, chloride, chlorite, fluoride, iodide, nitrate, nitrite, phosphate, sulfate
Conductivity	≤ 2 µS/cm

Cat. No.	Product Name	Pack Size
00612	Water for Ion Chromatography	2.5 L, 5 L



- | | | |
|--------------|-------------------------------------|---------------|
| 1. fluoride | 6. system peak from carbonate eluen | 10. phosphate |
| 2. glycolate | 7. nitrite | 11. sulfate |
| 3. acetate | 8. bromide | 12. oxalate |
| 4. formate | 9. nitrate | 13. iodide |

Long-term product stability and quality of IC grade water

Red line: Anion chromatogram from a 4-month leaching test of a 2.5 L HDPE bottle

Black Line: Anion and organics concentrated within specification limits

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