

Agilent Inorganic Certified Reference Materials and Standards

Your essential resource for single, multi-element and metallo-organic standards for spectroscopy and IC instrumentation



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Why you need Agilent certified reference materials and solutions

Agilent is a global leader in chromatography and spectroscopy, as well as an expert in chemical standards manufacturing. All Agilent chemical standards in this catalog are certified reference materials (CRM), standards, and solutions that are manufactured in an accredited ISO 17025 and ISO 17034 facility.

ISO 17025 is the global quality standard for the management and technical requirements of testing laboratories. Establishing and maintaining this quality system can be time-consuming.

Being ISO 17034 accredited, our manufacturing facility must demonstrate that they are technically competent, use documented and validated methods, and are able to produce precise and accurate test and calibration data with known uncertainties.

With both accreditations, Agilent offers a comprehensive portfolio of certified reference materials that have been expertly designed and formulated to exacting specifications. From instrument-focused standards to application standards, our portfolio gives laboratories full workflow solutions for efficient, accurate results.

With over 50 years of technical expertise in measurement science, we provide quality products to address the entire analytical chemistry workflow for laboratories around the world. Our products are available through our global distribution channels, and with our logistic capabilities we offer rapid turnaround times on all orders. With Agilent standards, your laboratory is assured of quality, purity, and consistency.

Products

- Certified reference materials (CRM)
- Reference materials (RM)
- Calibration standards
- IQ/OQ/PQ standards
- Qualification standards
- Quality check samples and kits
- Buffers and reagents
- Tuning solutions
- Checkout standards

Markets

Environmental

- Petrochemicals
- PCB/PBB
- Halocarbons
- VOC/semi-VOC
- Pesticides
- Dioxins and furans

Food and beverages

- Allergens
- Amino and nitroaromatics
- Pharma and vet drugs
- PAHs
- Lipids
- Food authenticity
- Phenols
- Dyes

Life science

- Pharmaceutical
- Biopharma
- Academic and research
- University
- Governmental
- Industrial and mining

Petrochemical

- Matrix oils
- Metals in biodiesel
- Organometallic

Elemental analysis

- Single element
- Multi-element

Custom products

Do you need a custom reference material or other chemical solution unique to your laboratory or testing procedure?

If the product you require is not available in an Agilent catalog, we can prepare it for you on a custom basis. Custom reference materials are a fast way to meet your specific laboratory needs.

Agilent maintains an expansive compatibility database, integrating 50 years of manufacturing and quality control data to create stable and reliable custom product formulations. Choose from any of our three quality control validation levels (see **Page 4**).

Visit www.agilent.com/chem/standards to request a custom quote.

Quality control laboratory

Agilent operates an ISO 17025 accredited quality control laboratory and is accredited to ISO 17034 as a reference material producer for the manufacture of certified reference materials (CRM).

Rely on the expertise of our applications development group for:

- Method development
- Pre- and postfill analysis
- Stability testing and protocols
- Homogeneity testing



Quality control validation levels

Chemical standards manufactured by Agilent are supplied with a lot-specific certificate of analysis (C of A) that reflects the associated quality control validation level. Certificates of analysis can ship with the product and are available online. All Agilent products, unless otherwise stated, are Level II - ISO 17034 reference materials.

		Reported Value	Reported Uncertainty	Former Name	Solutions	Lead Time (Customs)
Level I	ISO 17034 RM	True (calculated)	U_{char}	Gravimetric	Y	5 business days
Level II	ISO 17034 RM	True (analytical)	U_{char}	Full validation	Y	7 to 10 business days
Level III	ISO 17034 CRM	Certified	U_{exp}	ISO 17034	Y	15 to 20 business days

Level I solution: A reference material (RM) prepared gravimetrically in accordance with ISO 17034 and under the Agilent ISO 9001 registered quality system. The neat materials used for the product are verified by an Agilent ISO 17025 laboratory and under the Agilent ISO 17034 accreditation. For each analyte, the true value, with its uncertainty value calculated at 95% confidence level, is reported.

Level II solution: RM prepared gravimetrically in accordance with ISO 17034 and under the Agilent ISO 9001 registered quality system. The neat materials used for the product are verified by an Agilent ISO 17025 laboratory and under the Agilent ISO 17034 accreditation. The analyte concentrations are verified by an Agilent ISO 17025 accredited laboratory. For each analyte, the true value, with its uncertainty value calculated at 95% confidence level, is reported.

Level III solution: RM prepared gravimetrically in accordance with ISO 17034 and under the Agilent ISO 9001 registered quality system. The neat materials used for this product are verified by an Agilent ISO 17025 laboratory and under the Agilent ISO 17034 accreditation. The analyte concentrations are verified by an Agilent ISO 17025 accredited laboratory. For each analyte, the certified value is reported with its uncertainty value calculated as the expanded uncertainty, in accordance with ISO Guide 35.

Triple certification

Agilent is committed to product integrity by offering customers the assurance of triple certification to ISO standards.

Agilent operates under an ISO 9001 registered quality management system, where an accrediting body Technischer Überwachungsverein (TÜV) attests to the quality of our methods, procedures, testing, production, and record keeping.

Our quality control laboratory is accredited to ISO 17025 ANSI National Accreditation Board (ANAB) for technical competence to perform testing of organic and inorganic materials and certified reference materials, as defined in our scope, accessible online at www.agilent.com/chem/17025.

Agilent is further accredited to ISO 17034 (ANAB) for technical competence as a reference material producer of certified reference materials. This requires Agilent to identify and document the major components of uncertainty, including homogeneity, short- and long-term stability, and uncertainty due to analytical characterization and manufacturing.

The most up-to-date Agilent certifications are accessible at www.agilent.com/quality.

Tips and tools

Need to know more about the Agilent ISO 17025 and 17034 accreditation? Go to our Agilent quality website where you can view our certifications and ask questions. www.agilent.com/quality/index.html

GHS compliance

Agilent is a certified Globally Harmonized System of Classification and Labeling of Chemicals (GHS) author for Safety Data Sheets (SDS) and GHS-compliant labeling. Chemical products manufactured and distributed by Agilent are compliant with the GHS. SDS and labels are prepared in accordance with regulations and in the following languages:

European CLP regulation

Regulation 1272/2008

- Chinese (standard Mandarin)
- Czech
- Danish
- Dutch
- English
- Estonian
- Finnish
- French
- German
- Italian
- Japanese
- Korean
- Polish
- Portuguese
- Romanian
- Russian
- Spanish
- Swedish

USA GHS-OSHA regulation

Hazcom 2012

- English
- Spanish
- French

Chinese GHS regulation

GB/T 17519-2013 and GB/T 16483-2008

- Chinese (standard Mandarin)
- English

More languages are available on request.

As regulations are updated and expanded, Agilent will maintain up-to-date records online at www.agilent.com.

Tips and tools



To view our entire portfolio of over 4,000 standards, all manufactured under ISO 17025 and in an ISO 17034 accredited facility, please visit www.agilent.com/chem/standards.

NIST methods for accuracy and traceability

All Agilent spectroscopy CRMs are certified using the high-performance spectroscopy protocol¹ developed by the National Institute of Standards and Technology (NIST). Both the certified concentration and uncertainty values are traceable to NIST Standard Reference Materials (SRM) to ensure the highest accuracy and complete traceability. NIST uses high-performance ICP-OES to certify its SRM 3100 series of spectrometric single element solution standards. NIST recommends that all manufacturers of standards use this technique to certify single element standards with high accuracy, low uncertainty, and direct traceability to the NIST SRM 3100 series.

Figure 1 shows a typical C of A for an Agilent spectroscopy CRM. This C of A highlights some of the features of our CRMs that improve quality and productivity. Agilent CRMs are manufactured in an ISO 9001, ISO 17034 facility and certified in an ISO/IEC 17025 testing laboratory. The certified concentrations are reported as both weight/volume ($\mu\text{g/mL}$) or weight/weight ($\mu\text{g/g}$) on the C of A.

The standards have a long shelf life of up 48 months, supported by long-term stability studies performed as part of the requirements for ISO 17034 accreditation.

All Agilent inorganic standards are made from high-purity raw materials, high-purity acids, and 18 M Ω deionized water. They are packed in precleaned, high-purity high-density polyethylene (HDPE) bottles before being shipped in poly-sealed bags with tamper-evident seals.


¹Salit, M. et al. Anal. Chem. 2001, 73, 4821-4829.

Tips and tools

In a matrix, trace HF refers to a small amount of hydrofluoric acid (HF) added to stabilize some elements that require it. Concentrations are usually below 0.5%. F- refers to fluoride as part of a raw material compound. These have F- at similarly low, dilute levels with no additional fluoride added.

Certified Reference Material Certificate of Analysis example

ISO 17034



Reference Material Certificate

Product Name: Chlorinated Methylated Herbicides Standard	Lot Number: 0006543710
Product Number: HBM-8151M-1	Lot Issue Date: 25-Jun-2020
Storage Conditions: Store at Room Temperature (15° to 30°C).	Expiration Date: 31-Jul-2022

Component Name	CERTIFIED VALUES		CAS#	Analyte Lot
	Concentration	Expanded Uncertainty		
acifluorfen methyl ester	100.4	± 0.5 µg/mL	050594-67-7	RM03058
bentazon methyl derivative	100.2	± 0.5 µg/mL	061592-45-8	RM13829
chloramben methyl ester	100.4	± 0.5 µg/mL	007286-84-2	RM03055
2,4-D methyl ester	100.4	± 0.5 µg/mL	001928-38-7	RM03040
dalapon methyl ester	100.4	± 0.5 µg/mL	017640-02-7	RM14219
2,4-DB methyl ester	100.1	± 0.5 µg/mL	018625-12-2	RM03029
DCPA	100.2	± 0.5 µg/mL	001861-32-1	NT01783
dicamba methyl ester	100.3	± 0.5 µg/mL	006597-78-0	RM03039
methyl-3,5-dichlorobenzoate	100.1	± 0.5 µg/mL	002905-67-1	RM03048
dichlorprop methyl ester	100.2	± 0.5 µg/mL	057153-17-0	RM00002
dinoseb methyl ether	100.3	± 0.5 µg/mL	006099-79-2	RM03051
MCPA methyl ester	10025	± 50 µg/mL	002436-73-9	RM15493
MCPP methyl ester	10030	± 50 µg/mL	023844-56-6	RM03034
4-nitroanisole	100.3	± 0.5 µg/mL	000100-17-4	RM02398
pentachloroanisole	100.3	± 0.5 µg/mL	001825-21-4	RM02457
picloram methyl ester	100.1	± 0.5 µg/mL	014143-55-6	RM03044
silvex methyl ester	100.4	± 0.5 µg/mL	004841-20-7	RM03035
2,4,5-T methyl ester	100.5	± 0.5 µg/mL	001928-37-6	RM03033

Matrix: methanol (methyl alcohol)

Description
This document is prepared in accordance with ISO 17034 and Guide 31. This analytical reference material standard was manufactured and verified in accordance with an ISO 9001 registered quality system and analyte concentrations were verified by an ISO 17025 accredited laboratory. The concentration and uncertainty value at the 95% confidence level for each analyte, determined gravimetrically, is listed above.

Traceability
The balances used for these measurements are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z540.3, ISO 9001, ISO 17025, and ISO 17034. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 1088.

Page: 1 of 2

CSD-QA-015.1

Figure 1. An example of a C of A for an Agilent reference material (page 1 of 2).

(Continued)


ISO 17034		 Agilent Trusted Answers
Homogeneity		
This analytical reference standard was unitized according to an in-house procedure and is guaranteed to be homogeneous. There is no minimum sub-sample size required.		
Instructions for Use		
Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening the container and should be processed without delay for the certified values to be valid within the stated uncertainties.		
Safety		
Refer to the Safety Data Sheet on www.agilent.com for information regarding this analytical reference material.		
Intended Use		
This analytical reference standard is intended for the preparation of working reference samples for use in routine laboratory analyses, calibration of instruments, validation of analytical methods, assessments of measurement methods, and continuing calibration verification.		
Expiration of Certification		
The certification of this analytical reference standard is valid until the expiration date specified above, provided the material is handled and stored in accordance with the instructions given in this certificate. This certification is nullified if the material is damaged, contaminated, or otherwise modified.		
Maintenance of Certification		
If substantive changes are noted that affect the certification before the expiration of this certificate, Agilent will notify the purchaser.		
Sample lot approver:  Monica Bourgeois QMS Representative		
 ISO 17034 Cert No. AR-1836	RM was produced in accordance with the TUV/SUD registered ISO 9001:2015 Quality Management System. Cert# 951215321 Page: 2 of 2 www.agilent.com/quality/ CSD-QA-015.1	 ISO 17025 Cert No. AT-

Figure 1. An example of a C of A for an Agilent reference material (page 2 of 2).

Single Element Standards

Certified reference materials (CRM)

As technology improves and regulatory bodies keep pace with the identification of new analytes and detection limits, certified reference material producers must stay ahead of the curve with better-defined standards and calibrators. In the absence of ISO 17034 CRM, laboratory technicians often undertake the time-consuming task of assessing and documenting the uncertainties of calibration standards in use.

ISO 17034 accreditation requires the CRM manufacturer to identify the major uncertainties, including homogeneity, short-term stability, long-term stability, and analytical characterization. Agilent fulfills international requirements with ISO 17034 CRMs at ideal concentrations of 10 and 1,000 ppm for a complete line of inorganic standards.

All products are provided with an ISO 17034 Certificate of Analysis, prepared according to ISO Guide 35.

AA | MP-AES 1,000 µg/mL CRM

AA | MP-AES 1,000 µg/mL CRM

Element	Matrix	Part No. 100 mL	Part No. 500 mL
Aluminum	5% HCl	5190-8256	5190-8257
Antimony	30% HCl	5190-8258	5190-8259
Arsenic	5% HNO ₃	5190-8260	5190-8261
Barium	5% HNO ₃	5190-8262	5190-8263
Beryllium	5% HNO ₃	5190-8264	5190-8265
Bismuth	5% HNO ₃	5190-8266	5190-8267
Boron	5% HNO ₃	5190-8268	5190-8269
Cadmium	5% HNO ₃	5190-8270	5190-8271
Calcium	5% HNO ₃	5190-8272	5190-8273
Cesium	5% HNO ₃	5190-8274	
Chromium	5% HCl	5190-8275	5190-8276

(Continued)

AA | MP-AES 1,000 µg/mL CRM

Element	Matrix	Part No. 100 mL	Part No. 500 mL
Chromium (IV)	H ₂ O	ICP-324A	
Cobalt	5% HNO ₃	5190-8277	5190-8278
Copper	5% HNO ₃	5190-8279	5190-8280
Gold	20% HCl	5190-8282	5190-8283
Indium	5% HNO ₃	5190-8284	
Iron	5% HNO ₃	5190-8285	5190-8286
Lead	5% HNO ₃	5190-8287	5190-8288
Lithium	5% HNO ₃	5190-8289	5190-8290
Magnesium	5% HNO ₃	5190-8291	5190-8292
Manganese	5% HNO ₃	5190-8293	5190-8294
Mercury	5% HNO ₃	5190-8295	5190-8296

(Continued)

Tips and tools

Store CRMs at controlled room temperature, as per USP 35 (10.30.60). Do not freeze, heat, or expose to direct sunlight. Minimize exposure to moisture or high humidity.

AA | MP-AES 1,000 µg/mL CRM

Element	Matrix	Part No. 100 mL	Part No. 500 mL
Molybdenum	1% HN ₄ OH	5190-8297	
Nickel	5% HNO ₃	5190-8298	5190-8299
Palladium	20% HCl	5190-8300	5190-8301
Platinum	20% HCl	5190-8302	5190-8303
Potassium	5% HNO ₃	5190-8304	5190-8305
Selenium	5% HNO ₃	5190-8306	5190-8307
Silicon	H ₂ O	5190-8308	
Silver	5% HNO ₃	5190-8309	5190-8310
Sodium	5% HNO ₃	5190-8311	5190-8312
Strontium	5% HNO ₃	5190-8313	5190-8314
Tellurium	5% HNO ₃	5190-8315	
Thallium	5% HNO ₃	5190-8316	5190-8317
Tin	20% HCl	5190-8318	5190-8319
Titanium	H ₂ O	5190-8320	5190-8321
Vanadium	5% HNO ₃	5190-8323	5190-8324
Zinc	5% HNO ₃	5190-8325	5190-8326
Zirconium	5% HNO ₃	5190-8327	5190-8328



ICP-027 / ICP-029
(see Page 16)

Tips and tools

Matrix matching of major sample components can be valuable with many spectrometric techniques. Our 1% (10,000 µg/mL) standards work well as stock materials for matrix matching.

Single Element Standards

MP-AES | ICP-OES | ICP-MS 1,000 µg/mL CRM

MP-AES | ICP-OES | ICP-MS 1,000 µg/mL CRM

Element	Matrix	Part No. 100 mL	Part No. 500 mL
Aluminum	5% HNO ₃	5190-8242	5190-8243
Antimony	1% HNO ₃ trace tartaric acid	5190-8244	5190-8245
Arsenic	5% HNO ₃	5190-8246	5190-8247
Barium	5% HNO ₃	5190-8248	5190-8249
Beryllium	5% HNO ₃	5190-8250	5190-8251
Bismuth	5% HNO ₃	5190-8252	5190-8253
Boron	H ₂ O	5190-8254	5190-8255
Cadmium	5% HNO ₃	5190-9414	5190-8328
Calcium	5% HNO ₃	5190-8329	5190-8330
Cerium	5% HNO ₃	5190-8331	5190-8332
Cesium	5% HNO ₃	5190-8333	5190-8334
Chromium	5% HNO ₃	5190-8344	5190-8345
Cobalt	5% HNO ₃	5190-8346	5190-8347
Copper	5% HNO ₃	5190-8348	5190-8349
Dysprosium	5% HNO ₃	5190-8350	
Erbium	5% HNO ₃	5190-8237	
Europium	5% HNO ₃	5190-8239	
Gadolinium	5% HNO ₃	5190-8241	5190-8456
Gallium	5% HNO ₃ tr HCl	5190-8457	5190-8460
Germanium	5% HNO ₃	5190-8459	
Gold	20% HCl	5190-8461	5190-8462
Hafnium	5% HCl	5190-8463	
Holmium	5% HNO ₃	5190-8465	
Indium	5% HNO ₃	5190-8467	5190-8468
Iridium	20% HCl	5190-8469	5190-8470
Iron	5% HNO ₃	5190-8471	5190-8472
Lanthanum	5% HNO ₃	5190-8473	5190-8474

(Continued)

MP-AES | ICP-OES | ICP-MS 1,000 µg/mL CRM

Element	Matrix	Part No. 100 mL	Part No. 500 mL
Lead	5% HNO ₃	5190-8475	5190-8476
Lithium	5% HNO ₃	5190-8477	5190-8478
Lutetium	5% HNO ₃	5190-8479	5190-8480
Magnesium	5% HNO ₃	5190-8481	5190-8482
Manganese	5% HNO ₃	5190-8483	5190-8484
Mercury	5% HNO ₃	5190-8485	5190-8486
Molybdenum	1% NH ₄ OH	5190-8487	5190-8488
Neodymium	5% HNO ₃	5190-8489	5190-8490
Nickel	5% HNO ₃	5190-8491	5190-8492
Niobium	2% HF	5190-8493	
Osmium	20% HCl	5190-8495	
Palladium	5% HNO ₃	5190-8497	5190-8498
Phosphorus	5% HNO ₃	5190-8499	5190-8500
Platinum	20% HCl	5190-8501	5190-8502
Potassium	5% HNO ₃	5190-8503	5190-8504
Praseodymium	5% HNO ₃	5190-8505	
Rhenium	5% HNO ₃	5190-8507	5190-8508
Rhodium	20% HCl	5190-8509	5190-8510
Rubidium	5% HNO ₃	5190-8511	5190-8514
Ruthenium	20% HCl	5190-8513	5190-8513
Samarium	5% HNO ₃	5190-8515	
Scandium	5% HNO ₃	5190-8517	5190-8518
Selenium	5% HNO ₃	5190-8519	5190-8520
Silicon	H ₂ O	5190-8521	5190-8522
Silver	5% HNO ₃	5190-8523	5190-8524
Sodium	5% HNO ₃	5190-8525	5190-8526
Strontium	5% HNO ₃	5190-8527	5190-8528
Sulfur	H ₂ O	5190-8529	5190-8530

(Continued)

MP-AES | ICP-OES | ICP-MS 1,000 µg/mL CRM

Element	Matrix	Part No. 100 mL	Part No. 500 mL
Tantalum	2% HF	5190-8531	5190-8532
Tellurium	30% HCl	5190-8533	5190-8534
Terbium	5% HNO ₃	5190-8535	
Thallium	5% HNO ₃	5190-8537	5190-8538
Thorium	5% HNO ₃	5190-8539	5190-8540
Thulium	5% HNO ₃	5190-8541	
Tin	20% HCl	5190-8543	5190-8544
Titanium	H ₂ O	5190-8545	5190-8546
Tungsten	5% HNO ₃ trace HF	5190-8547	5190-8548
Uranium	5% HNO ₃	5190-8549	5190-8550
Vanadium	5% HNO ₃	5190-8551	5190-8552
Ytterbium	5% HNO ₃	5190-8553	
Yttrium	5% HNO ₃	5190-8555	5190-8556
Zinc	5% HNO ₃	5190-8557	5190-8558
Zirconium	5% HCl	5190-8559	5190-8560

Tips and tools

When working with osmium, only mix the standard with water and HCl. Do not use nitric acid. Nitric acid will slowly oxidize the Os to OsO₄, which is volatile and very toxic.

Single Element Standards

MP-AES | ICP-OES | ICP-MS 10,000 µg/mL CRM

MP-AES | ICP-OES | ICP-MS 10,000 µg/mL CRM

Element	Matrix	Part No. 100 mL	Part No. 500 mL
Aluminum	5% HNO ₃	5190-8352	5190-8353
Antimony	1% HNO ₃ trace tartaric acid	5190-8354	5190-8355
Arsenic	5% HNO ₃	5190-8356	5190-8357
Barium	5% HNO ₃	5190-8358	5190-8359
Beryllium	5% HNO ₃	5190-8360	5190-8361
Bismuth	5% HNO ₃	5190-8362	5190-8363
Boron	1% NH ₄ OH	5190-8364	5190-8365
Cadmium	5% HNO ₃	5190-8366	5190-8367
Calcium	5% HNO ₃	5190-8368	5190-8369
Cerium	5% HNO ₃	5190-8370	5190-8371
Cesium	5% HNO ₃	5190-8372	5190-8373
Chromium	5% HNO ₃	5190-8374	5190-8375
Cobalt	5% HNO ₃	5190-8376	5190-8377
Copper	5% HNO ₃	5190-8378	5190-8379
Dysprosium	5% HNO ₃		5190-8381
Europium	5% HNO ₃		5190-8385
Gadolinium	5% HNO ₃	5190-8386	5190-8387
Gallium	5% HNO ₃	5190-8388	
Germanium	5% HNO ₃ trace HF	5190-8390	
Gold	20% HCl	5190-8392	5190-8393
Indium	5% HNO ₃	5190-8398	
Iridium	20% HCl	5190-8400	
Iron	5% HNO ₃	5190-8402	5190-8403
Lanthanum	5% HNO ₃	5190-8404	5190-8405
Lead	5% HNO ₃	5190-8406	5190-8407
Lithium	5% HNO ₃	5190-8408	5190-8409
Lutetium	5% HNO ₃	5190-8410	
Magnesium	5% HNO ₃	5190-8412	5190-8413

(Continued)

MP-AES | ICP-OES | ICP-MS 10,000 µg/mL CRM

Element	Matrix	Part No. 100 mL	Part No. 500 mL
Manganese	5% HNO ₃	5190-8414	5190-8415
Mercury	5% HNO ₃	5190-8416	5190-8417
Molybdenum	1% NH ₄ OH	5190-8418	5190-8419
Neodymium	5% HNO ₃		5190-8421
Nickel	5% HNO ₃	5190-8422	5190-8423
Niobium	2% HF	5190-8424	5190-8425
Palladium	10% HNO ₃	5190-8426	
Phosphorus	5% HNO ₃	5190-8428	5190-8429
Platinum	20% HCl	5190-8430	
Potassium	5% HNO ₃	5190-8432	5190-8433
Rubidium	5% HNO ₃	5190-8440	
Ruthenium	20% HCl	5190-8442	5190-8443
Scandium	5% HNO ₃	5190-8446	5190-8447
Selenium	5% HNO ₃	5190-8448	5190-8449
Silicon	H ₂ O	5190-8450	5190-8451
Silver	5% HNO ₃	5190-8452	5190-8453
Sodium	5% HNO ₃	5190-8454	5190-8206
Strontium	5% HNO ₃	5190-8207	5190-8208
Sulfur	H ₂ O	5190-8209	5190-8210
Tellurium	30% HCl	5190-8213	5190-8214
Terbium	5% HNO ₃		5190-8216
Thallium	5% HNO ₃	5190-8217	
Tin	20% HCl	5190-8221	5190-8222
Titanium	H ₂ O	5190-8224	5190-8225
Tungsten	5% HNO ₃ trace HF	5190-8226	5190-8227
Vanadium	5% HNO ₃	5190-8228	5190-8229
Yttrium	5% HNO ₃	5190-8232	5190-8233
Zinc	5% HNO ₃	5190-8234	5190-8235
Zirconium	5% HNO ₃	5190-8236	

ICP-MS 10 µg/mL and 100 µg/mL CRM

ICP-MS 10 µg/mL and 100 µg/mL CRM

Element	Matrix	Part No. 100 mL at 10 µg/mL	Part No. 125 mL at 100 µg/mL
Aluminum	2% HNO ₃	5190-8561	
Antimony	1% HNO ₃	5190-8562	
Arsenic	2% HNO ₃	5190-8563	
Barium	2% HNO ₃	5190-8564	
Beryllium	2% HNO ₃	5190-8565	
Bismuth	2% HNO ₃	8500-6936	IMS-111
Boron	H ₂ O	5190-8566	
Cadmium	2% HNO ₃	5190-8567	
Calcium	0.5% HNO ₃	ICP-420	
Chromium	2% HNO ₃	5190-8568	
Chromium VI	H ₂ O	ICP-424A	
Cobalt	2% HNO ₃	8500-6947	
Copper	2% HNO ₃	5190-8569	
Germanium	2% HNO ₃ trace HF	5190-8592	
Gold	2% HCl		8500-7000
Indium	2% HNO ₃	8500-6946	IMS-112
Iridium	2% HNO ₃	5190-8570	
Iron	0.5% HNO ₃	ICP-426	
Lead	2% HNO ₃	5190-8571	
Lithium	2% HNO ₃	5190-8572	
Lithium 6+	2% HNO ₃	5190-8589	
Lutetium	2% HNO ₃	5190-8573	
Magnesium	0.5% HNO ₃	ICP-412	
Manganese	2% HNO ₃	5190-8574	
Mercury	2% HNO ₃	8500-6941	
Mercury	5% HNO ₃	5190-8575	
Molybdenum	0.5% NH ₄ OH	ICP-442	
Nickel	2% HNO ₃	5190-8576	
Phosphorus	0.5% HNO ₃	ICP-415	

(Continued)

ICP-MS 10 µg/mL and 100 µg/mL CRM

Element	Matrix	Part No. 100 mL at 10 µg/mL	Part No. 125 mL at 100 µg/mL
Platinum	5% HCl	5190-8577	
Potassium	0.5% HNO ₃	ICP-419	
Rhodium	2% HCl	8500-6945	
Scandium	2% HNO ₃	5190-8578	IMS-113
Selenium	2% HNO ₃	5190-8579	
Silicon	0.5% HNO ₃ trace 0.1% HF	ICP-414	
Silver	2% HNO ₃	5190-8580	
Sodium	0.5% HNO ₃	ICP-411	
Strontium	2% HNO ₃	5190-8581	
Terbium	2% HNO ₃	5190-8582	IMS-114
Thallium	0.5% HNO ₃	ICP-481	
Tin	5% HCl	5190-8583	
Titanium	0.5% HNO ₃ trace 0.1% HF	ICP-422	
Uranium	2% HNO ₃	5190-8584	
Vanadium	5% HNO ₃	5190-8585	
Yttrium	2% HNO ₃	5190-8586	IMS-115
Zinc	2% HNO ₃	5190-8587	

ISO 17034 Reference Materials

Agilent quality

- Manufactured in accordance with ISO Guide 17034 and under our ISO 9001 registered quality system
- Analyte concentrations are verified by our ISO 17025 accredited laboratory
- Starting materials have a purity of 99.999% (ICP), wherever possible
- High-purity acids and ASTM Type I water (> 18 MΩ)
- Traceable to NIST SRM, wherever possible
- Analyzed for trace metal impurities
- Confirmed against an independent second-source standard
- Packaged in an ISO Class 7 clean room
- Assayed by NIST HP-ICP-OES method and purity confirmed by ICP-MS



ICP-027
(see **Page 16**)

AA | MP-AES | ICP-OES | ICP-MS 1,000 µg/mL RM

AA | MP-AES | ICP-OES | ICP-MS 1,000 µg/mL RM

Element	Matrix	Part No. 125 mL
Aluminum	2% HNO ₃	ICP-013
Antimony	2% HNO ₃ trace tartaric acid	ICP-051
Arsenic	H ₂ O trace HNO ₃	ICP-033
Barium	2% HNO ₃	ICP-056
Beryllium	2% HNO ₃	ICP-004
Bismuth	2% HNO ₃	ICP-083
Boron	2% NH ₄ OH	ICP-005
Cadmium	2% HNO ₃	ICP-048
Calcium	H ₂ O trace HNO ₃	ICP-020
Cerium	2% HNO ₃	ICP-058
Cesium	2% HNO ₃	ICP-055
Chromium	H ₂ O trace HNO ₃	ICP-024
Chromium IV	H ₂ O	ICP-024A
Cobalt	2% HNO ₃	ICP-027
Copper	H ₂ O trace HNO ₃	ICP-029
Dysprosium	1% HNO ₃	ICP-066

(Continued)

AA | MP-AES | ICP-OES | ICP-MS 1,000 µg/mL RM

Element	Matrix	Part No. 125 mL
Erbium	2% HNO ₃	ICP-068
Europium	1% HNO ₃	ICP-063
Gadolinium	1% HNO ₃	ICP-064
Gallium	2% HNO ₃	ICP-031
Germanium	0.8% HF	ICP-032
Gold	H ₂ O trace HCl	ICP-079
Hafnium	1% HCl trace 0.1% HF	ICP-072
Holmium	1% HNO ₃	ICP-067
Indium	1% HNO ₃	ICP-049
Iridium	5% HCl	ICP-077
Iron	H ₂ O trace HNO ₃	ICP-026
Lanthanum	1% HNO ₃	ICP-057
Lead	H ₂ O trace HNO ₃	ICP-082
Lithium	2% HNO ₃	ICP-003
Lutetium	1% HNO ₃	ICP-071
Magnesium	H ₂ O trace HNO ₃	ICP-012

(Continued)

AA | MP-AES | ICP-OES | ICP-MS 1,000 µg/mL RM

Element	Matrix	Part No. 125 mL
Manganese	H ₂ O trace HNO ₃	ICP-025
Mercury	H ₂ O trace HNO ₃	ICP-080
Molybdenum	2% NH ₄ OH	ICP-042
Neodymium	2% HNO ₃	ICP-060
Nickel	2% HNO ₃	ICP-028
Niobium	0.2% HF	ICP-041
Palladium	2% HNO ₃	ICP-046
Platinum	2% HCl	ICP-078
Potassium	2% HNO ₃	ICP-019
Praseodymium	1% HNO ₃	ICP-059
Rhenium	0.2% HNO ₃	ICP-075
Rhodium	H ₂ O trace HCl	ICP-045
Rubidium	1% HNO ₃	ICP-037
Ruthenium	5% HCl	ICP-044
Scandium	H ₂ O trace HNO ₃	ICP-021
Selenium	2% HNO ₃	ICP-034
Silica	2% NaOH	ICP-014A
Silicon	2% HNO ₃	ICP-014
Silver	2% HNO ₃	ICP-047

(Continued)

AA | MP-AES | ICP-OES | ICP-MS 1,000 µg/mL RM

Element	Matrix	Part No. 125 mL
Sodium	2% HNO ₃	ICP-011
Strontium	2% HNO ₃	ICP-038
Sulfur	H ₂ O	ICP-016
Tantalum	0.5% HF	ICP-073
Tellurium	10% HCl	ICP-052
Terbium	1% HNO ₃	ICP-065
Thallium	2% HNO ₃	ICP-081
Thorium	4% HNO ₃	ICP-090
Thulium	2% HNO ₃	ICP-069
Tin	H ₂ O trace HNO ₃ and HF	ICP-050
Titanium	2% HNO ₃	ICP-022
Tungsten	0.5% NH ₄ OH	ICP-074
Uranium	4% HNO ₃	ICP-092
Vanadium	5% HNO ₃ with 1% HF	ICP-023
Ytterbium	1% HNO ₃	ICP-070
Yttrium	5% HNO ₃	ICP-039
Zinc	H ₂ O trace HNO ₃	ICP-030
Zirconium	5% HNO ₃	ICP-040

Tips and tools

If you need to prepare your standards in an HCl matrix, remember that silver is stable in HCl up to 100 mg/L. To prepare solutions in HCl, add Ag concentrate to concentrated HCl to effect complexation, then bring to volume with dilute HCl.

Single Element Standards

AA | ICP-OES 10,000 µg/mL RM

AA | ICP-OES 10,000 µg/mL RM

Element	Matrix	Part No. 125 mL
Aluminum	2% HNO ₃	ICP-113
Antimony	2% HNO ₃ trace 0.1% HF	ICP-151
Arsenic	2% HNO ₃	ICP-133
Barium	2% HNO ₃	ICP-156
Beryllium	5% HNO ₃	ICP-104
Bismuth	4% HNO ₃	ICP-183
Boron	2% NH ₄ OH	ICP-105
Cadmium	2% HNO ₃	ICP-148
Calcium	H ₂ O trace HNO ₃	ICP-120
Cerium	2% HNO ₃	ICP-158
Cesium	1% HNO ₃	ICP-155
Chromium	2% HNO ₃	ICP-124
Cobalt	2% HNO ₃	ICP-127
Copper	2% HNO ₃	ICP-129
Dysprosium	1% HNO ₃	ICP-166
Europium	4% HNO ₃	ICP-163
Gallium	4% HNO ₃	ICP-131
Germanium	0.2% HF	ICP-132
Gold	10% HCl	ICP-179
Hafnium	0.2% HF	ICP-172
Indium	4% HNO ₃	ICP-149
Iridium	10% HCl	ICP-177
Iron	2% HNO ₃	ICP-126
Lanthanum	2% HNO ₃	ICP-157
Lead	2% HNO ₃	ICP-182
Lithium	10% HNO ₃	ICP-103
Lutetium	1% HNO ₃	ICP-171
Magnesium	H ₂ O trace HNO ₃	ICP-112
Manganese	2% HNO ₃	ICP-125

(Continued)

AA | ICP-OES 10,000 µg/mL RM

Element	Matrix	Part No. 125 mL
Mercury	2% HNO ₃	ICP-180
Molybdenum	4% NH ₄ OH	ICP-142
Neodymium	4% HNO ₃	ICP-160
Nickel	2% HNO ₃	ICP-128
Niobium	0.2% HF	ICP-141
Palladium	5% HNO ₃	ICP-146
Phosphorus	2% HNO ₃	ICP-115
Platinum	10% HCl	ICP-178
Potassium	2% HNO ₃	ICP-119
Ruthenium	10% HCl	ICP-144
Scandium	10% HNO ₃	ICP-121
Selenium	2% HNO ₃	ICP-134
Silicon	2% HNO ₃	ICP-114
Silver	2% HNO ₃	ICP-147
Sodium	H ₂ O trace HNO ₃	ICP-111
Strontium	2% HNO ₃	ICP-138
Sulfur	H ₂ O	ICP-116
Tellurium	40% HCl	ICP-152
Thallium	2% HNO ₃	ICP-181
Thorium	4% HNO ₃	ICP-190
Tin	2% HNO ₃ trace 0.1% HF	ICP-150
Titanium	2% HNO ₃ trace 0.1% HF	ICP-122
Tungsten	0.1% NH ₄ OH	ICP-174
Uranium	4% HNO ₃	ICP-192
Vanadium	10% HNO ₃ with 2% HF	ICP-123
Yttrium	5% HNO ₃	ICP-139
Zinc	2% HNO ₃	ICP-130
Zirconium	5% HNO ₃	ICP-140

AA matrix modifiers

AA matrix modifiers

Modifier	Concentration	Matrix	Part No. 50 mL	Part No. 100 mL
Palladium nitrate	0.1% Pd	5% HNO ₃		5190-8335
Palladium nitrate	1% Pd	10% HNO ₃		5190-8336
Ammonium phosphate	10% NH ₄ H ₂ PO ₄	2% HNO ₃		5190-8337
Magnesium nitrate	1% Mg(NO ₃) ₂	2% HNO ₃		5190-8338
Nickel nitrate	1% Ni(NO ₃) ₂	2% HNO ₃		5190-8339
Palladium nitrate and magnesium nitrate mix	750 µg/mL Pd and 500 µg/mL Mg(NO ₃) ₂	2% HNO ₃		5190-8340
Palladium nitrate and magnesium nitrate mix	1,000 µg/mL Pd and 600 µg/mL Mg(NO ₃) ₂	2% HNO ₃		5190-8341
Ammonium phosphate and magnesium nitrate mix	10 µg/mL NH ₄ H ₂ PO ₄ and 600 µg/mL Mg	2% HNO ₃		5190-8342
Triton X-100 surfactant	100 % C ₁₄ H ₂₂ O(C ₂ H ₄ O) _n		CP3418	
Palladium matrix modifier	2,000 µg/mL Pd	2% HNO ₃	IMM-001	
Magnesium nitrate matrix modifier	10,000 µg/mL Mg(NO ₃) ₂	2% HNO ₃	IMM-003	
Palladium matrix modifier	5,000 µg/mL Pd	2% HCl with 2% HF	IMM-002	
Phosphate matrix modifier	40,000 µg/mL P	2% HNO ₃	IMM-004	

AA buffers and ionization suppressants

AA buffers and ionization suppressants

Buffers	Concentration	Matrix	Part No. 500 mL
Cesium nitrate ionization buffer solution	10,000 µg/mL	5% HNO ₃	5190-8343
Lanthanum (La) buffer	100,000 µg/mL	10% HNO ₃	5190-8801
Strontium buffer (Sr)	100,000 µg/mL	5% HNO ₃	5190-9419
Potassium (K) buffer	100,000 µg/mL	H ₂ O	5190-9420
Cesium buffer solution, 10 pct in 500 mL	100,000 µg/mL	5% HNO ₃	5190-9421

Tips and tools

To determine the mass of matrix modifier added to the furnace, multiply the concentration of the modifier by 0.005 for 5 µL aliquots or 0.02 for 20 µL aliquots.

Multi-Element Spectroscopy Instrumentation Standards

Agilent prepares various high-quality inorganic standards and solutions used to calibrate and verify that your spectroscopy instrument is performing at the highest levels. Our catalog of unique tuning solutions were developed to work with each type of spectroscopy instrument associated with their tune mix. Application-based calibration standards and internal mixes are also included in this section to help with any method development or quality control issues.

Agilent quality

- Manufactured in accordance with ISO Guide 17034 and under our ISO 9001 registered quality system
- Analyte concentrations are verified by our ISO 17034 accredited laboratory
- Starting materials have a purity of 99.999% (ICP) and 99.99% (AA), wherever possible
- High-purity acids and ASTM Type I water (> 18 MΩ)
- Traceable to NIST SRM, wherever possible
- Analyzed for trace metal impurities
- Confirmed against an independent second-source standard

Agilent Atomic Absorption calibration standards

Atomic Absorption multi-element standards

Description	Analyte	Matrix	Analytes and Concentration				Part No. 125 mL
Graphite furnace AA calibration standard (XVIII)	16	5% HNO ₃ trace tartaric acid	Aluminum (Al)	100 µg/mL	Copper (Cu)	50 µg/mL	ICM-150
			Antimony (Sb)	100 µg/mL	Iron (Fe)	20 µg/mL	
			Arsenic (As)	100 µg/mL	Lead (Pb)	100 µg/mL	
			Barium (Ba)	50 µg/mL	Manganese (Mn)	20 µg/mL	
			Beryllium (Be)	5 µg/mL	Nickel (Ni)	50 µg/mL	
			Cadmium (Cd)	5 µg/mL	Selenium (Se)	100 µg/mL	
			Chromium (Cr)	20 µg/mL	Silver (Ag)	10 µg/mL	
			Cobalt (Co)	50 µg/mL	Thallium (Tl)	100 µg/mL	



Agilent hollow cathode lamps
(visit agilent.com/chem/atomicsupplies)

Agilent MP-AES | ICP-OES calibration standards

MP-AES and ICP-OES wavelength calibration standards

Description	Number of Analytes	Matrix	Analytes and Concentration				Part No. 500 mL
ICP-OES and MP-AES wavelength calibration concentrate (dilute 10 times before using on Agilent instrumentation)	15	5% HNO ₃	Aluminum (Al)	50 µg/mL	Manganese (Mn)	50 µg/mL	6610030000
			Arsenic (As)	50 µg/mL	Molybdenum (Mo)	50 µg/mL	
			Barium (Ba)	50 µg/mL	Nickel (Ni)	50 µg/mL	
			Cadmium (Cd)	50 µg/mL	Lead (Pb)	50 µg/mL	
			Cobalt (Co)	50 µg/mL	Potassium (K)	500 µg/mL	
			Chromium (Cr)	50 µg/mL	Selenium (Se)	50 µg/mL	
			Copper (Cu)	50 µg/mL	Strontium (Sr)	50 µg/mL	
					Zinc (Zn)	50 µg/mL	
ICP-OES and MP-AES wavelength calibration standard (ready to use with Agilent instrumentation)	15	5% HNO ₃	Aluminum (Al)	5 µg/mL	Manganese (Mn)	5 µg/mL	6610030100
			Arsenic (As)	5 µg/mL	Molybdenum (Mo)	5 µg/mL	
			Barium (Ba)	5 µg/mL	Nickel (Ni)	5 µg/mL	
			Cadmium (Cd)	5 µg/mL	Lead (Pb)	5 µg/mL	
			Cobalt (Co)	5 µg/mL	Potassium (K)	50 µg/mL	
			Chromium (Cr)	5 µg/mL	Selenium (Se)	5 µg/mL	
			Copper (Cu)	5 µg/mL	Strontium (Sr)	5 µg/mL	
					Zinc (Zn)	5 µg/mL	
ICP-OES wavelength calibration standard (for Agilent and non-Agilent instruments)	26	5% HNO ₃ trace HF	Aluminum (Al)	20 µg/mL	Manganese (Mn)	1 µg/mL	ICM-110-5
			Arsenic (As)	20 µg/mL	Mercury (Hg)	5 µg/mL	
			Barium (Ba)	2 µg/mL	Nickel (Ni)	5 µg/mL	
			Beryllium (Be)	1 µg/mL	Phosphorus (P)	10 µg/mL	
			Boron (B)	2 µg/mL	Potassium (K)	100 µg/mL	
			Cadmium (Cd)	2 µg/mL	Scandium (Sc)	1 µg/mL	
			Calcium (Ca)	10 µg/mL	Selenium (Se)	20 µg/mL	
			Chromium (Cr)	2 µg/mL	Sodium (Na)	20 µg/mL	
			Copper (Cu)	2 µg/mL	Strontium (Sr)	1 µg/mL	
			Iron (Fe)	2 µg/mL	Tellurium (Te)	20 µg/mL	
			Lead (Pb)	20 µg/mL	Titanium (Ti)	2 µg/mL	
			Lithium (Li)	2 µg/mL	Yttrium (Y)	1 µg/mL	
			Magnesium (Mg)	1 µg/mL	Zinc (Zn)	2 µg/mL	
ICP-OES wavelength calibration standard (for Agilent and non-Agilent instruments)	11	2% HCl trace HNO ₃	Arsenic (As)	20 µg/mL	Phosphorus (P)	100 µg/mL	
			Lanthanum (La)	20 µg/mL	Potassium (K)	100 µg/mL	
			Lithium (Li)	20 µg/mL	Scandium (Sc)	20 µg/mL	
			Manganese (Mn)	20 µg/mL	Sodium (Na)	20 µg/mL	
			Molybdenum (Mo)	20 µg/mL	Sulfur (S)	100 µg/mL	
			Nickel (Ni)	20 µg/mL			
Calibration blank solution (suitable for use as a calibration blank or for dilution of the wavelength calibration concentrate; ready to use)	0	5% HNO ₃		0 µg/mL			5190-7001

Tips and tools

The shelf life defines the time that the standard can be stored without undergoing physical or chemical changes. The chemical stability and transpiration losses (water loss) determine shelf life. Replace standards well before the expiry date to ensure accuracy and minimize contamination risks.

Multi-Element Spectroscopy Instrumentation Standards

MP-AES and ICP-OES multi-element calibration standards

Description	Analyte	Matrix	Analytes and Concentration				Part No. 125 mL
Calibration mix 1 for AA and ICP-OES	4	2% HNO ₃ trace 0.5% HF	Antimony (Sb) Molybdenum (Mo)	100 µg/mL 100 µg/mL	Thallium (Tl) Tin (Sn)	100 µg/mL 100 µg/mL	6610030500
Calibration mix 2 for AA and ICP-OES	18	5% HNO ₃	Aluminum (Al) Arsenic (As) Barium (Ba) Beryllium (Be) Cadmium (Cd) Cobalt (Co) Chromium (Cr) Copper (Cu) Manganese (Mn)	100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL	Nickel (Ni) Lead (Pb) Selenium (Se) Silver (Ag) Thallium (Tl) Thorium (Th) Uranium (U) Vanadium (V) Zinc (Zn)	100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL	6610030600
Calibration mix majors for AA and ICP-OES	5	5% HNO ₃	Calcium (Ca) Iron (Fe) Magnesium (Mg)	500 µg/mL 500 µg/mL 500 µg/mL	Potassium (K) Sodium (Na)	500 µg/mL 500 µg/mL	6610030700
ICP-OES calibration standard (I)	19	5% HNO ₃	Aluminum (Al) Barium (Ba) Beryllium (Be) Bismuth (Bi) Boron (B) Barium (Ba) Chromium (Cr) Cobalt (Co) Copper (Cu) Gallium (Ga)	100 µg/mL 5 µg/mL 1 µg/mL 200 µg/mL 15 µg/mL 20 µg/mL 25 µg/mL 20 µg/mL 20 µg/mL 150 µg/mL	Indium (In) Iron (Fe) Lead (Pb) Manganese (Mn) Nickel (Ni) Silver (Ag) Strontium (Sr) Thallium (Tl) Zinc (Zn)	200 µg/mL 15 µg/mL 200 µg/mL 5 µg/mL 50 µg/mL 50 µg/mL 1 µg/mL 400 µg/mL 20 µg/mL	ICM-102
ICP-OES calibration standard (IV)	23	5% HNO ₃	Aluminum (Al) Barium (Ba) Bismuth (Bi) Boron (B) Cadmium (Cd) Calcium (Ca) Chromium (Cr) Cobalt (Co) Copper (Cu) Gallium (Ga) Indium (In) Iron (Fe)	1,000 µg/mL 1,000 µg/mL 1,000 µg/mL 1,000 µg/mL 1,000 µg/mL 1,000 µg/mL 1,000 µg/mL 1,000 µg/mL 1,000 µg/mL 1,000 µg/mL 1,000 µg/mL 1,000 µg/mL	Lead (Pb) Lithium (Li) Magnesium (Mg) Manganese (Mn) Nickel (Ni) Potassium (K) Silver (Ag) Sodium (Na) Strontium (Sr) Thallium (Tl) Zinc (Zn)	1,000 µg/mL 1,000 µg/mL 1,000 µg/mL 1,000 µg/mL 1,000 µg/mL 1,000 µg/mL 1,000 µg/mL 1,000 µg/mL 1,000 µg/mL 1,000 µg/mL 1,000 µg/mL	ICM-103
ICP-OES calibration standard (VIII)	24	5% HNO ₃ with trace HCl	Aluminum (Al) Barium (Ba) Beryllium (Be) Bismuth (Bi) Boron (B) Cadmium (Cd) Calcium (Ca) Chromium (Cr) Cobalt (Co) Copper (Cu) Gallium (Ga) Iron (Fe)	100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL	Lead (Pb) Lithium (Li) Magnesium (Mg) Manganese (Mn) Nickel (Ni) Potassium (K) Selenium (Se) Sodium (Na) Strontium (Sr) Tellurium (Te) Thallium (Tl) Zinc (Zn)	100 µg/mL 100 µg/mL 1,000 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL	ICM-101
ICP-OES calibration standard – toxic elements (IX)	9	5% HNO ₃	Arsenic (As) Beryllium (Be) Cadmium (Cd) Chromium (VI) (Cr ⁶⁺) Lead (Pb)	100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL	Mercury (Hg) Nickel (Ni) Selenium (Se) Thallium (Tl)	100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL	ICM-105

(Continued)

MP-AES and ICP-OES multi-element calibration standards

Description	Analyte	Matrix	Analytes and Concentration				Part No. 125 mL				
ICP-OES calibration standard – surface water (X)	23	5% HNO ₃ trace HF	Arsenic (As)	50 µg/mL	Magnesium (Mg)	15,000 µg/mL	ICM-106				
			Barium (Ba)	50 µg/mL	Manganese (Mn)	30 µg/mL					
			Beryllium (Be)	20 µg/mL	Molybdenum (Mo)	100 µg/mL					
			Bismuth (Bi)	10 µg/mL	Nickel (Ni)	50 µg/mL					
			Boron (B)	100 µg/mL	Potassium (K)	3,000 µg/mL					
			Cadmium (Cd)	20 µg/mL	Selenium (Se)	10 µg/mL					
			Calcium (Ca)	35,000 µg/mL	Sodium (Na)	8,000 µg/mL					
			Chromium (Cr)	20 µg/mL	Strontium (Sr)	100 µg/mL					
			Cobalt (Co)	25 µg/mL	Thallium (Tl)	10 µg/mL					
			Copper (Cu)	20 µg/mL	Vanadium (V)	50 µg/mL					
			Iron (Fe)	100 µg/mL	Zinc (Zn)	50 µg/mL					
			Lead (Pb)	25 µg/mL							
			ICP-OES calibration standard – sewage sludge (XI)	7	5% HNO ₃	Cadmium (Cd)		10 µg/mL	Mercury (Hg)	8 µg/mL	ICM-109
						Chromium (Cr)		900 µg/mL	Nickel (Ni)	200 µg/mL	
Copper (Cu)	800 µg/mL	Zinc (Zn)				2,500 µg/mL					
Lead (Pb)	900 µg/mL										
ICP-OES calibration standard – trace metals (XIII)	15	5% HNO ₃ trace HF	Aluminum (Al)	500 µg/mL	Lead (Pb)	100 µg/mL	ICM-104				
			Arsenic (As)	100 µg/mL	Manganese (Mn)	100 µg/mL					
			Beryllium (Be)	100 µg/mL	Mercury (Hg)	5 µg/mL					
			Cadmium (Cd)	25 µg/mL	Nickel (Ni)	100 µg/mL					
			Chromium (Cr)	100 µg/mL	Selenium (Se)	25 µg/mL					
			Cobalt (Co)	100 µg/mL	Vanadium (V)	250 µg/mL					
			Copper (Cu)	100 µg/mL	Zinc (Zn)	100 µg/mL					
			Iron (Fe)	100 µg/mL							
ICP-OES calibration standard – quality control (XVI)	21	5% HNO ₃ trace HF, tartaric acid	Antimony (Sb)	100 µg/mL	Magnesium (Mg)	100 µg/mL	ICM-108				
			Arsenic (As)	100 µg/mL	Manganese (Mn)	100 µg/mL					
			Beryllium (Be)	100 µg/mL	Molybdenum (Mo)	100 µg/mL					
			Cadmium (Cd)	100 µg/mL	Nickel (Ni)	100 µg/mL					
			Calcium (Ca)	100 µg/mL	Selenium (Se)	100 µg/mL					
			Chromium (Cr)	100 µg/mL	Strontium (Sr)	100 µg/mL					
			Cobalt (Co)	100 µg/mL	Thallium (Tl)	100 µg/mL					
			Copper (Cu)	100 µg/mL	Titanium (Ti)	100 µg/mL					
			Iron (Fe)	100 µg/mL	Vanadium (V)	100 µg/mL					
			Lead (Pb)	100 µg/mL	Zinc (Zn)	100 µg/mL					
			Lithium (Li)	100 µg/mL							
			ICP-OES calibration standard – earth alkali elements (III)	4	5% HNO ₃	Barium (Ba)		1,000 µg/mL	Magnesium (Mg)	1,000 µg/mL	ICM-100
						Calcium (Ca)		1,000 µg/mL	Strontium (Sr)	1,000 µg/mL	
ICP-OES calibration standard – HCl soluble elements (XVII)	7	15% HCl trace HNO ₃ , HF, tartaric acid	Antimony (Sb)	100 µg/mL	Tin (Sn)	100 µg/mL	ICM-107				
			Hafnium (Hf)	100 µg/mL	Titanium (Ti)	100 µg/mL					
			Iridium (Ir)	100 µg/mL	Zirconium (Zr)	100 µg/mL					
			Tantalum (Ta)	100 µg/mL							

Tips and tools

Stay up to date with the best ICP-OES practices for instrument maintenance and operation.

Explore the ICP-OES resource hub: <https://explore.agilent.com/icp-oes-resource>

Multi-Element Spectroscopy Instrumentation Standards

ICP-OES tuning solution

Description	Analyte	Matrix	Analytes and Concentration				Volume	Part No.
ICP-OES tuning standard (XXIV)	15	1% HNO ₃	Aluminum (Al)	50 µg/mL	Manganese (Mn)	50 µg/mL	500 mL	ICM-120
			Arsenic (As)	50 µg/mL	Molybdenum (Mo)	50 µg/mL		
			Barium (Ba)	50 µg/mL	Nickel (Ni)	50 µg/mL		
			Cadmium (Cd)	50 µg/mL	Potassium (K)	500 µg/mL		
			Chromium (Cr)	50 µg/mL	Selenium (Se)	50 µg/mL		
			Cobalt (Co)	50 µg/mL	Strontium (Sr)	50 µg/mL		
			Copper (Cu)	50 µg/mL	Zinc (Zn)	50 µg/mL		
			Lead (Pb)	50 µg/mL				

ICP-OES internal standard

Description	Analyte	Matrix	Analytes and Concentration				Volume	Part No.
ICP internal standard mix	6	5% HNO ₃	Bismuth (Bi)	100 µg/mL	Scandium (Sc)	100 µg/mL	125 mL	6610030400
			Indium (In)	100 µg/mL	Terbium (Tb)	100 µg/mL		
			Lithium (Li ⁶⁺)	100 µg/mL	Yttrium (Y)	100 µg/mL		

ICP-OES, GFAA, and ion chromatography standards

Description	Analyte	Matrix	Analytes and Concentration				Volume	Part No.
IC cations mixture (VII)	9	0.2% HNO ₃	Ammonium (NH ₄ ⁺)	100 µg/mL	Manganese (Mn)	100 µg/mL	125 mL	ICC-330
			Barium (Ba ²⁺)	100 µg/mL	Potassium (K ⁺)	100 µg/mL		
			Calcium (Ca ²⁺)	100 µg/mL	Sodium (Na ⁺)	100 µg/mL		
			Lithium (Li ⁺)	100 µg/mL	Strontium (Sr ²⁺)	100 µg/mL		
			Magnesium (Mg ²⁺)	100 µg/mL				

Tips and tools

As a rule, the total concentration of all elements (metals) in a multi-element mixture should be kept below 20,000 µg/mL (2%).

Agilent IntelliQuant ICP-OES calibration standards

While quantitative elemental analysis remains the main use of ICP-OES instrumentation, semiquantitative analysis provides extra information, allowing the analyst to learn more about their samples. However, collecting and interpreting semiquantitative data on many ICP-OES instruments can be as time-consuming as collecting fully quantitative data. Users of these types of ICP-OES instruments may not realize the full potential of semiquantitative data acquisition. The Agilent 5800 and 5900 ICP-OES instruments include IntelliQuant—a powerful, dedicated semiquantitative analysis tool that allows you to understand the elemental content of your sample better. IntelliQuant can be used to improve traditional quantitative methods or to provide standalone semiquantitative results quickly and with minimal setup.

Description	Analyte	Matrix	Analytes and Concentration				Volume	Part No.
Individual standards								
IntelliQuant standard 1	13	5% HNO ₃	Arsenic (As)	100 µg/mL	Rubidium (Rb)	100 µg/mL	100 mL	5191-3933
			Chromium (Cr)	100 µg/mL	Scandium (Sc)	100 µg/mL		
			Erbium (Er)	100 µg/mL	Silver (Ag)	100 µg/mL		
			Lead (Pb)	100 µg/mL	Thulium (Tm)	100 µg/mL		
			Lutetium (Lu)	100 µg/mL	Yttrium (Y)	100 µg/mL		
			Manganese (Mn)	100 µg/mL	Ytterbium (Yb)	100 µg/mL		
			Phosphorus (P)	100 µg/mL				
IntelliQuant standard 2	8	5% HNO ₃	Cerium (Ce)	100 µg/mL	Lanthanum (La)	100 µg/mL	100 mL	5191-3934
			Europium (Eu)	100 µg/mL	Nickel (Ni)	100 µg/mL		
			Gadolinium (Gd)	100 µg/mL	Sulfur (S)	100 µg/mL		
			Holmium (Ho)	100 µg/mL	Tellurium (Te)	100 µg/mL		
IntelliQuant standard 3	6	5% HNO ₃	Cobalt (Co)	100 µg/mL	Samarium (Sm)	100 µg/mL	100 mL	5191-3935
			Dysprosium (Dy)	100 µg/mL	Thorium (Th)	100 µg/mL		
			Rhenium (Re)	100 µg/mL	Vanadium (V)	100 µg/mL		
IntelliQuant standard 4	19	5% HNO ₃	Boron (B)	100 µg/mL	Indium (In)	100 µg/mL	100 mL	5191-3936
			Barium (Ba)	100 µg/mL	Potassium (K)	100 µg/mL		
			Beryllium (Be)	100 µg/mL	Lithium (Li)	100 µg/mL		
			Bismuth (Bi)	100 µg/mL	Magnesium (Mg)	100 µg/mL		
			Calcium (Ca)	100 µg/mL	Sodium (Na)	100 µg/mL		
			Cadmium (Cd)	100 µg/mL	Selenium (Se)	100 µg/mL		
			Caesium (Cs)	100 µg/mL	Strontium (Sr)	100 µg/mL		
			Copper (Cu)	100 µg/mL	Thallium (Tl)	100 µg/mL		
			Gallium (Ga)	100 µg/mL	Zinc (Zn)	100 µg/mL		
			Mercury (Hg)	100 µg/mL				
IntelliQuant standard 5	7	5% HNO ₃	Aluminium (Al)	100 µg/mL	Praseodymium (Pr)	100 µg/mL	100 mL	5191-3937
			Iron (Fe)	100 µg/mL	Terbium (Tb)	100 µg/mL		
			Molybdenum (Mo)	100 µg/mL	Uranium (U)	100 µg/mL		
			Neodymium (Nd)	100 µg/mL				
IntelliQuant standard 6	10	5% HNO ₃ trace HF	Antimony (Sb)	100 µg/mL	Tin (Sn)	100 µg/mL	100 mL	5191-3938
			Germanium (Ge)	100 µg/mL	Tantalum (Ta)	100 µg/mL		
			Hafnium (Hf)	100 µg/mL	Titanium (Ti)	100 µg/mL		
			Neodymium (Nb)	100 µg/mL	Tungsten (W)	100 µg/mL		
			Silicon (Si)	100 µg/mL	Zirconium (Zr)	100 µg/mL		
IntelliQuant standard 7	7	10% HCl	Gold (Au)	100 µg/mL	Platinum (Pt)	100 µg/mL	100 mL	5191-3939
			Iridium (Ir)	100 µg/mL	Rhodium (Rh)	100 µg/mL		
			Osmium (Os)	100 µg/mL	Ruthenium (Ru)	100 µg/mL		
			Palladium (Pd)	100 µg/mL				
Calibration blank solution		5% HNO ₃					500 mL	5190-7001
Kit								
IntelliQuant calibration kit (2020)			5191-3933, 5191-3934, 5191-3935, 5191-3936, 5191-3937, 5191-3938, 5191-3939, 5190-7001					5191-3932

Agilent ICP-MS calibration standards

ICP-MS installation checkout kits

Description	Analyte	Matrix	Analytes and Concentration				Volume	Part No.
ICP-MS checkout solution kit for 7700/7800/7900/8800/8900 and 7500 ce/cx/cs							5185-5850	
ICP-MS tuning solution 3	6	2% HNO ₃	Cerium (Ce) Cobalt (Co) Lithium (Li)	1 µg/mL 1 µg/mL 1 µg/mL	Magnesium (Mg) Thallium (Tl) Yttrium (Y)	1 µg/mL 1 µg/mL 1 µg/mL	2 x 500 mL	
Dual mode 1	1	0.2% HNO ₃	Erbium (Er)	1 µg/mL			100 mL	
Dual mode 2	1	0.2% HNO ₃	Erbium (Er)	50 µg/L			100 mL	
Wash		2% HNO ₃					250 mL	
Water blank solution		H ₂ O					250 mL	
ICP-MS checkout solutions for 7500s							5184-3564	
Tuning solution	5	2% HNO ₃	Cerium (Ce) Cobalt (Co) Lithium (Li)	10 µg/L 10 µg/L 10 µg/L	Thallium (Tl) Yttrium (Y)	10 µg/L 10 µg/L	500 mL	
Dual mode 1	1	0.2% HNO ₃	Erbium (Er)	1 µg/mL			100 mL	
Dual mode 2	1	0.2% HNO ₃	Erbium (Er)	50 µg/L			100 mL	
Abundance sensitivity 1	1	2% HNO ₃	Cesium (Cs)	10 µg/L			100 mL	
Abundance sensitivity 2	1	0.5% HNO ₃	Cesium (Cs)	20 µg/mL			100 mL	
Detection limit solution	3	2% HNO ₃	Beryllium (Be) Bismuth (Bi)	1 µg/L 1 µg/L	Indium (In)	1 µg/L	100 mL	
High sensitivity tune	5	2% HNO ₃	Cerium (Ce) Lithium (Li) Magnesium (Mg)	1 µg/L 1 µg/L 1 µg/L	Thallium (Tl) Yttrium (Y)	1 µg/L 1 µg/L	500 mL	
Wash solution		2% HNO ₃					250 mL	
Blank solution		H ₂ O					250 mL	
ICP-MS checkout solutions for 7500 a/i/c							5184-3565	
Tuning solution	5	2% HNO ₃	Cerium (Ce) Cobalt (Co) Lithium (Li)	10 µg/L 10 µg/L 10 µg/L	Thallium (Tl) Yttrium (Y)	10 µg/L 10 µg/L	500 mL	
Dual mode 1	1	0.2% HNO ₃	Erbium (Er)	1 µg/mL			100 mL	
Dual mode 2	1	0.2% HNO ₃	Erbium (Er)	50 µg/L			100 mL	
Wash		2% HNO ₃					250 mL	
Water blank solution		H ₂ O					250 mL	

Multi-Element Spectroscopy Instrumentation Standards

ICP-MS tuning solutions

Description	Analyte	Matrix	Analytes and Concentration				Total Vol.	Part No.
PA tuning solution kit						2 x 100 mL	5188-6524	
Tuning 1	26	5% HNO ₃	Arsenic (As)	20 µg/mL	Magnesium (Mg)	10 µg/mL	100 mL	
			Aluminum (Al)	5 µg/mL	Manganese (Mn)	5 µg/mL		
			Barium (Ba)	5 µg/mL	Nickel (Ni)	10 µg/mL		
			Beryllium (Be)	20 µg/mL	Thallium (Tl)	5 µg/mL		
			Bismuth (Bi)	5 µg/mL	Thorium (Th)	5 µg/mL		
			Cadmium (Cd)	20 µg/mL	Strontium (Sr)	5 µg/mL		
			Chromium (Cr)	5 µg/mL	Scandium (Sc)	5 µg/mL		
			Cobalt (Co)	5 µg/mL	Sodium (Na)	5 µg/mL		
			Copper (Cu)	5 µg/mL	Uranium (U)	5 µg/mL		
			Indium (In)	5 µg/mL	Vanadium (V)	5 µg/mL		
			Lithium (Li ⁶⁺)	5 µg/mL	Yttrium (Y)	2.5 µg/mL		
			Lutetium (Lu)	5 µg/mL	Ytterbium (Yb)	2.5 µg/mL		
			Lead (Pb)	10 µg/mL	Zinc (Zn)	20 µg/mL		
Tuning 2	8	10% HCl/ 1% HNO ₃ trace HF	Antimony (Sb)	10 µg/mL	Palladium (Pd)	10 µg/mL		100 mL
			Germanium (Ge)	10 µg/mL	Ruthenium (Ru)	10 µg/mL		
			Iridium (Ir)	5 µg/mL	Titanium (Ti)	10 µg/mL		
			Molybdenum (Mo)	10 µg/mL	Tin (Sn)	10 µg/mL		
ICP-MS tuning solutions and standards								
ICP-MS stock tuning solution	5	2% HNO ₃	Cerium (Ce)	10 µg/mL	Thallium (Tl)	10 µg/mL	100 mL	5188-6564
			Cobalt (Co)	10 µg/mL	Yttrium (Y)	10 µg/mL		
			Lithium (Li)	10 µg/mL				
ICP-MS tuning solution 1	6	2% HNO ₃	Cerium (Ce)	10 µg/mL	Magnesium (Mg)	10 µg/mL	100 mL	5190-0465
			Cobalt (Co)	10 µg/mL	Thallium (Tl)	10 µg/mL		
			Lithium (Li)	10 µg/mL	Yttrium (Y)	10 µg/mL		
ICP-MS tuning solution 2	5	2% HNO ₃	Cerium (Ce)	10 µg/mL	Thallium (Tl)	10 µg/mL	2 x 500 mL	5184-3566
			Cobalt (Co)	10 µg/mL	Yttrium (Y)	10 µg/mL		
			Lithium (Li)	10 µg/mL				
ICP-MS tuning solution 3	6	2% HNO ₃	Cerium (Ce)	1 µg/mL	Magnesium (Mg)	1 µg/mL	2 x 500 mL	5185-5959
			Cobalt (Co)	1 µg/mL	Thallium (Tl)	1 µg/mL		
			Lithium (Li)	1 µg/mL	Yttrium (Y)	1 µg/mL		
ICP-MS calibration standard (VI)	30	5% HNO ₃ trace HF	Aluminum (Al)	10 µg/mL	Magnesium (Mg)	10 µg/mL	125 mL	ICM-120
			Arsenic (As)	100 µg/mL	Manganese (Mn)	10 µg/mL		
			Barium (Ba)	10 µg/mL	Molybdenum (Mo)	10 µg/mL		
			Beryllium (Be)	100 µg/mL	Nickel (Ni)	10 µg/mL		
			Bismuth (Bi)	10 µg/mL	Potassium (K)	10 µg/mL		
			Boron (B)	100 µg/mL	Rubidium (Rb)	10 µg/mL		
			Cadmium (Cd)	10 µg/mL	Selenium (Se)	100 µg/mL		
			Calcium (Ca)	1,000 µg/mL	Silver (Ag)	10 µg/mL		
			Chromium (Cr)	10 µg/mL	Sodium (Na)	10 µg/mL		
			Cobalt (Co)	10 µg/mL	Strontium (Sr)	10 µg/mL		
			Copper (Cu)	10 µg/mL	Tellurium (Te)	10 µg/mL		
			Gallium (Ga)	10 µg/mL	Thallium (Tl)	10 µg/mL		
			Iron (Fe)	100 µg/mL	Uranium (U)	10 µg/mL		
			Lead (Pb)	10 µg/mL	Vanadium (V)	10 µg/mL		
			Lithium (Li)	10 µg/mL	Zinc (Zn)	100 µg/mL		
ICP-MS mass calibration standard (XXIII)	15	5% HNO ₃ trace HCl	Barium (Ba)	1 ng/mL	Potassium (K)	1 ng/mL		
			Boron (B)	1 ng/mL	Rhodium (Rh)	1 ng/mL		
			Cobalt (Co)	1 ng/mL	Scandium (Sc)	1 ng/mL		
			Gallium (Ga)	1 ng/mL	Sodium (Na)	1 ng/mL		
			Indium (In)	1 ng/mL	Thallium (Tl)	1 ng/mL		
			Iron (Fe)	1 ng/mL	Uranium (U)	1 ng/mL		
			Lithium (Li)	1 ng/mL	Yttrium (Y)	1 ng/mL		
			Lutetium (Lu)	1 ng/mL				

Multi-Element Spectroscopy Instrumentation Standards

ICP-MS semi-quantification standards

Description	Analyte	Matrix	Analytes and Concentration				Total Vol.	Part No.
ICP-MS semi-quant standards 1	34	40% aqua regia	Aluminum (Al)	10 µg/mL	Phosphorus (P)	10 µg/mL	100 mL	5190-8594
			Arsenic (As)	10 µg/mL	Lead (Pb)	10 µg/mL		
			Barium (Ba)	10 µg/mL	Praseodymium (Pr)	10 µg/mL		
			Bismuth (Bi)	10 µg/mL	Rubidium (Rb)	10 µg/mL		
			Calcium (Ca)	10 µg/mL	Scandium (Sc)	10 µg/mL		
			Cadmium (Cd)	10 µg/mL	Selenium (Se)	10 µg/mL		
			Cerium (Ce)	10 µg/mL	Samarium (Sm)	10 µg/mL		
			Dysprosium (Dy)	10 µg/mL	Silver (Ag)	10 µg/mL		
			Erbium (Er)	10 µg/mL	Sodium (Na)	10 µg/mL		
			Europium (Eu)	10 µg/mL	Strontium (Sr)	10 µg/mL		
			Gallium (Ga)	10 µg/mL	Terbium (Tb)	10 µg/mL		
			Gadolinium (Gd)	10 µg/mL	Thorium (Th)	10 µg/mL		
			Holmium (Ho)	10 µg/mL	Thallium (Tl)	10 µg/mL		
			Lanthanum (La)	10 µg/mL	Thulium (Tm)	10 µg/mL		
			Lutetium (Lu)	10 µg/mL	Uranium (U)	10 µg/mL		
			Magnesium (Mg)	10 µg/mL	Yttrium (Y)	10 µg/mL		
			Neodymium (Nd)	10 µg/mL	Ytterbium (Yb)	10 µg/mL		
ICP-MS semi-quant standards 2	32	40% aqua regia trace HF	Antimony (Sb)	10 µg/mL	Nickel (Ni)	10 µg/mL	100 mL	5190-8595
			Boron (B)	10 µg/mL	Osmium (Os)	10 µg/mL		
			Beryllium (Be)	10 µg/mL	Palladium (Pd)	10 µg/mL		
			Cobalt (Co)	10 µg/mL	Platinum (Pt)	10 µg/mL		
			Chromium (Cr)	10 µg/mL	Rhenium (Re)	10 µg/mL		
			Copper (Cu)	10 µg/mL	Rhodium (Rh)	10 µg/mL		
			Iron (Fe)	10 µg/mL	Ruthenium (Ru)	10 µg/mL		
			Germanium (Ge)	10 µg/mL	Silicon (Si)	10 µg/mL		
			Gold (Au)	10 µg/mL	Tin (Sn)	10 µg/mL		
			Hafnium (Hf)	10 µg/mL	Tantalum (Ta)	10 µg/mL		
			Iridium (Ir)	10 µg/mL	Tellurium (Te)	10 µg/mL		
			Potassium (K)	10 µg/mL	Titanium (Ti)	10 µg/mL		
			Lithium (Li)	10 µg/mL	Vanadium (V)	10 µg/mL		
			Manganese (Mn)	10 µg/mL	Tungsten (W)	10 µg/mL		
			Molybdenum (Mo)	10 µg/mL	Zinc (Zn)	10 µg/mL		
			Neodymium (Nd)	10 µg/mL	Zirconium (Zr)	10 µg/mL		

ICP-MS multi-element calibration standards

Description	Analyte	Matrix	Analytes and Concentration				Total Vol.	Part No.
Initial calibration verification solution	26	5% HNO ₃	Antimony (Sb)	10 µg/mL	Molybdenum (Mo)	10 µg/mL	100 mL	5183-4682
			Aluminum (Al)	10 µg/mL	Nickel (Ni)	10 µg/mL		
			Arsenic (As)	10 µg/mL	Potassium (K)	1,000 µg/mL		
			Barium (Ba)	10 µg/mL	Selenium (Se)	10 µg/mL		
			Beryllium (Be)	10 µg/mL	Sodium (Na)	1,000 µg/mL		
			Cadmium (Cd)	10 µg/mL	Sodium (Na)	1,000 µg/mL		
			Calcium (Ca)	1,000 µg/mL	Strontium (Sr)	1,000 µg/mL		
			Chromium (Cr)	10 µg/mL	Silver (Ag)	1,000 µg/mL		
			Cobalt (Co)	10 µg/mL	Thallium (Tl)	10 µg/mL		
			Copper (Cu)	10 µg/mL	Vanadium (V)	10 µg/mL		
			Iron (Fe)	1,000 µg/mL	Thorium (Th)	10 µg/mL		
			Lead (Pb)	10 µg/mL	Uranium (U)	10 µg/mL		
			Manganese (Mn)	10 µg/mL	Zinc (Zn)	10 µg/mL		
			Multi-element calibration standard 1	17	5% HNO ₃	Cerium (Ce)		
Dysprosium (Dy)	10 µg/mL	Scandium (Sc)				10 µg/mL		
Erbium (Er)	10 µg/mL	Samarium (Sm)				10 µg/mL		
Europium (Eu)	10 µg/mL	Terbium (Tb)				10 µg/mL		
Gadolinium (Gd)	10 µg/mL	Thorium (Th)				10 µg/mL		
Holmium (Ho)	10 µg/mL	Thulium (Tm)				10 µg/mL		
Lanthanum (La)	10 µg/mL	Yttrium (Y)				10 µg/mL		
Lutetium (Lu)	10 µg/mL	Ytterbium (Yb)				10 µg/mL		
Neodymium (Nd)	10 µg/mL							

(Continued)

ICP-MS multi-element calibration standards

Description	Analyte	Matrix	Analytes and Concentration				Total Vol.	Part No.
Multi-element calibration standard 3	10	10% HCl/ 1% HNO ₃	Antimony (Sb)	10 µg/mL	Platinum (Pt)	10 µg/mL	100 mL	8500-6948
			Gold (Au)	10 µg/mL	Rhodium (Rh)	10 µg/mL		
			Hafnium (Hf)	10 µg/mL	Ruthenium (Ru)	10 µg/mL		
			Iridium (Ir)	10 µg/mL	Tellurium (Te)	10 µg/mL		
			Palladium (Pd)	10 µg/mL	Tin (Sn)	10 µg/mL		
Multi-element calibration standard 4	12	H ₂ O trace HF	Boron (B)	10 µg/mL	Sulfur (S)	10 µg/mL	100 mL	8500-6942
			Germanium (Ge)	10 µg/mL	Silicon (Si)	10 µg/mL		
			Molybdenum (Mo)	10 µg/mL	Tantalum (Ta)	10 µg/mL		
			Niobium (Nb)	10 µg/mL	Titanium (Ti)	10 µg/mL		
			Phosphorus (P)	10 µg/mL	Tungsten (W)	10 µg/mL		
			Rhenium (Re)	10 µg/mL	Zirconium (Zr)	10 µg/mL		
ICP-MS calibration standard (XXI)	29	5% HNO ₃	Aluminum (Al)	10 µg/mL	Lithium (Li)	10 µg/mL	125 mL	IMS-102
			Arsenic (As)	10 µg/mL	Magnesium (Mg)	10 µg/mL		
			Barium (Ba)	10 µg/mL	Manganese (Mn)	10 µg/mL		
			Beryllium (Be)	10 µg/mL	Nickel (Ni)	10 µg/mL		
			Bismuth (Bi)	10 µg/mL	Potassium (K)	10 µg/mL		
			Cadmium (Cd)	10 µg/mL	Rubidium (Rb)	10 µg/mL		
			Calcium (Ca)	10 µg/mL	Selenium (Se)	10 µg/mL		
			Cesium (Cs)	10 µg/mL	Silver (Ag)	10 µg/mL		
			Chromium (Cr)	10 µg/mL	Sodium (Na)	10 µg/mL		
			Cobalt (Co)	10 µg/mL	Strontium (Sr)	10 µg/mL		
			Copper (Cu)	10 µg/mL	Thallium (Tl)	10 µg/mL		
			Gallium (Ga)	10 µg/mL	Uranium (U)	10 µg/mL		
			Indium (In)	10 µg/mL	Vanadium (V)	10 µg/mL		
			Iron (Fe)	10 µg/mL	Zinc (Zn)	10 µg/mL		
			Lead (Pb)	10 µg/mL				
			Mercury calibration standard for ICP-MS	1	2% HNO ₃	Mercury (Hg)		
ICP-MS plasma setup solution (XX)	11	1% HNO ₃ trace HF	Barium (Ba)	10 ng/mL	Lead (Pb)	10 ng/mL	1 L	IMS-133-L
			Cerium (Ce)	10 ng/mL	Rhodium (Rh)	10 ng/mL		
			Cadmium (Cd)	10 ng/mL	Scandium (Sc)	10 ng/mL		
			Copper (Cu)	10 ng/mL	Terbium (Tb)	10 ng/mL		
			Germanium (Ge)	10 ng/mL	Thallium (Tl)	10 ng/mL		
			Magnesium (Mg)	10 ng/mL				
Multi-element calibration standard 2A						2 x 100 mL	8500-6940	
Bottle 1	27	5% HNO ₃	Aluminum (Al)	10 µg/mL	Lead (Pb)	10 µg/mL	100 mL	
			Arsenic (As)	10 µg/mL	Magnesium (Mg)	10 µg/mL		
			Barium (Ba)	10 µg/mL	Manganese (Mn)	10 µg/mL		
			Beryllium (Be)	10 µg/mL	Nickel (Ni)	10 µg/mL		
			Calcium (Ca)	10 µg/mL	Rubidium (Rb)	10 µg/mL		
			Cadmium (Cd)	10 µg/mL	Selenium (Se)	10 µg/mL		
			Cobalt (Co)	10 µg/mL	Silver (Ag)	10 µg/mL		
			Chromium (Cr)	10 µg/mL	Sodium (Na)	10 µg/mL		
			Cesium (Cs)	10 µg/mL	Strontium (Sr)	10 µg/mL		
			Copper (Cu)	10 µg/mL	Thallium (Tl)	10 µg/mL		
			Gallium (Ga)	10 µg/mL	Uranium (U)	10 µg/mL		
			Iron (Fe)	10 µg/mL	Vanadium (V)	10 µg/mL		
			Potassium (K)	10 µg/mL	Zinc (Zn)	10 µg/mL		
			Lithium (Li)	10 µg/mL				
			Bottle 2	1	5% HNO ₃	Mercury (Hg)		10 µg/mL



Agilent 7900 ICP-MS

Agilent environmental quality control standards

- NIST traceable
- Agilent Certificate of Analysis
- Starting materials are 99.999% pure, wherever possible

Quality control standards

Description	Analyte	Matrix	Analytes and Concentration				Volume	Part No.
Quality control standard 1	7	5% HNO ₃	Aluminum (Al)	100 µg/mL	Silicon (Si)	50 µg/mL	125 mL	IQC-007
			Barium (Ba)	100 µg/mL	Silver (Ag)	100 µg/mL		
			Boron (B)	100 µg/mL	Sodium (Na)	100 µg/mL		
			Potassium (K)	1,000 µg/mL				
Quality control standard 2	19	5% HNO ₃	Antimony (Sb)	Chromium (Cr)	Magnesium (Mg)	Thallium (Tl)	125 mL	IQC-019
			Arsenic (As)	Cobalt (Co)	Manganese (Mn)	Titanium (Ti)		
			Beryllium (Be)	Copper (Cu)	Molybdenum (Mo)	Vanadium (V)		
			Cadmium (Cd)	Iron (Fe)	Nickel (Ni)	Zinc (Zn)		
			Calcium (Ca)	Lead (Pb)	Selenium (Se)			
Quality control standard 3	26	5% HNO ₃	Aluminum (Al)	100 µg/mL	Magnesium (Mg)	100 µg/mL	125 mL	IQC-026
			Antimony (Sb)	100 µg/mL	Manganese (Mn)	100 µg/mL		
			Arsenic (As)	100 µg/mL	Molybdenum (Mo)	100 µg/mL		
			Barium (Ba)	100 µg/mL	Nickel (Ni)	100 µg/mL		
			Beryllium (Be)	100 µg/mL	Potassium (K)	1,000 µg/mL		
			Boron (B)	100 µg/mL	Selenium (Se)	100 µg/mL		
			Cadmium (Cd)	100 µg/mL	Silicon (Si)	50 µg/mL		
			Calcium (Ca)	100 µg/mL	Silver (Ag)	100 µg/mL		
			Chromium (Cr)	100 µg/mL	Sodium (Na)	100 µg/mL		
			Cobalt (Co)	100 µg/mL	Thallium (Tl)	100 µg/mL		
			Copper (Cu)	100 µg/mL	Titanium (Ti)	100 µg/mL		
			Iron (Fe)	100 µg/mL	Vanadium (V)	100 µg/mL		
			Lead (Pb)	100 µg/mL	Zinc (Zn)	100 µg/mL		
			QCSTD-27 quality control standard	27	5% HNO ₃ trace HF	Aluminum (Al)		
			Antimony (Sb)	100 µg/mL	Manganese (Mn)	100 µg/mL		
			Arsenic (As)	100 µg/mL	Molybdenum (Mo)	100 µg/mL		
			Boron (B)	100 µg/mL	Nickel (Ni)	100 µg/mL		
			Barium (Ba)	100 µg/mL	Silver (Ag)	100 µg/mL		
			Beryllium (Be)	100 µg/mL	Selenium (Se)	100 µg/mL		
			Cadmium (Cd)	100 µg/mL	Silicon (Si)	100 µg/mL		
			Cobalt (Co)	100 µg/mL	Sodium (Na)	100 µg/mL		
			Chromium (Cr)	100 µg/mL	Strontium (Sr)	100 µg/mL		
			Copper (Cu)	100 µg/mL	Titanium (Ti)	100 µg/mL		
			Iron (Fe)	100 µg/mL	Thallium (Tl)	100 µg/mL		
			Lead (Pb)	100 µg/mL	Vanadium (V)	100 µg/mL		
			Potassium (K)	100 µg/mL	Zinc (Zn)	100 µg/mL		

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Multi-Element Agency Method Standards

The Agilent portfolio also includes hundreds of ISO 17034 accredited reference materials that are application-based. We have mixes and kits that are formulated for various agency methods from the EPA, the Contract Laboratory Program (CLP), and United States Pharmacopeia (USP). Use these standards and mixes as part of your complete Agilent workflow solution. For more information, please see the Agilent consumable workflow solutions section of this catalog.

Agilent quality

- Manufactured in accordance with ISO 17034 and under our ISO 9001 registered quality system
- Analyte concentrations are verified by our ISO 17034 accredited laboratory
- Starting materials have a purity of 99.999% (ICP) and 99.99% (AA), wherever possible
- High-purity acids and ASTM Type I water (> 18 MΩ)
- Traceable to NIST SRM, wherever possible
- Analyzed for trace metal impurities
- Confirmed against an independent second-source standard

EPA Method 200.7 standards

Determination of metals and trace elements in water and wastes by ICP-OES and MP-AES

This guideline sets the method detection limit (MDL) for 31 different elements, along with preferred wavelengths and calibration, and quality control standards.

EPA 200.7 calibration standards – Revisions 4.4 and 3.3

Description	Analyte	Matrix	Analytes and Concentration				Volume	Part No.
Mixed calibration standard (CAL I)	10	2% HNO ₃	Antimony (Sb) Arsenic (As) Barium (Ba) Boron (B) Cadmium (Cd)	5 µg/mL 10 µg/mL 1 µg/mL 1 µg/mL 2 µg/mL	Calcium (Ca) Copper (Cu) Manganese (Mn) Selenium (Se) Silver (Ag)	10 µg/mL 2 µg/mL 2 µg/mL 5 µg/mL 0.5 µg/mL	125 mL	ICM-231
Mixed calibration standard (CAL II)	5	2% HNO ₃	Lithium (Li) Molybdenum (Mo) Potassium (K)	50 µg/mL 100 µg/mL 200 µg/mL	Sodium (Na) Strontium (Sr)	100 µg/mL 10 µg/mL	125 mL	ICM-232
Mixed calibration standard (CAL III)	3	2% HNO ₃	Cobalt (Co) Phosphorus (P)	20 µg/mL 100 µg/mL	Vanadium (V)	20 µg/mL	125 mL	ICM-233
Mixed calibration standard (CAL IV)	5	2% HNO ₃	Aluminum (Al) Chromium (Cr) Silicon (Si)	100 µg/mL 50 µg/mL 100 µg/mL	Tin (Sn) Zinc (Zn)	40 µg/mL 50 µg/mL	125 mL	ICM-234
Mercury standard (CAL IVa)	1	2% HNO ₃	Mercury (Hg)	20 µg/mL			125 mL	ICM-235
Mixed calibration standard (CAL V)	6	2% HNO ₃	Beryllium (Be) Iron (Fe) Lead (Pb)	10 µg/mL 100 µg/mL 100 µg/mL	Magnesium (Mg) Nickel (Ni) Thallium (Tl)	100 µg/mL 20 µg/mL 50 µg/mL	125 mL	ICM-642

EPA 200.7 calibration standards kit – Revisions 4.4 and 3.3

Description	Standards and Volume				Part No.
Kit, 6 bottles	ICM-231	125 mL	ICM-234	125 mL	ICK-230A
	ICM-232	125 mL	ICM-235	125 mL	
	ICM-233	125 mL	ICM-642	125 mL	

EPA 200.7 additional calibration standards

Description	Analyte	Matrix	Analytes and Concentration			Volume	Part No.	
EPA 200.7 calibration standard 1	5	5% HNO ₃	Arsenic (As) Cadmium (Cd) Lead (Pb)	1,000 µg/mL 500 µg/mL 1,000 µg/mL	Selenium (Se) Thallium (Tl)	500 µg/mL 1,000 µg/mL	125 mL	ICM-202
EPA 200.7 calibration standard 2	7	2% HNO ₃	Barium (Ba) Beryllium (Be) Cobalt (Co) Copper (Cu)	100 µg/mL 100 µg/mL 200 µg/mL 100 µg/mL	Iron (Fe) Manganese (Mn) Vanadium (V)	1,000 µg/mL 100 µg/mL 100 µg/mL	125 mL	ICM-203
EPA 200.7 calibration standard 3	3	H ₂ O	Boron (B) Molybdenum (Mo)	100 µg/mL 1,000 µg/mL	Silicon (Si)	1,000 µg/mL	125 mL	ICM-204
EPA 200.7 calibration standard 4	9	5% HNO ₃	Aluminum (Al) Calcium (Ca) Chromium (Cr) Magnesium (Mg) Nickel (Ni)	1,000 µg/mL 1,000 µg/mL 500 µg/mL 1,000 µg/mL 500 µg/mL	Potassium (K) Silver (Ag) Sodium (Na) Zinc (Zn)	1,000 µg/mL 500 µg/mL 1,000 µg/mL 500 µg/mL	125 mL	ICM-205
Antimony standard	1	2% HNO ₃ trace tartaric acid	Antimony (Sb)	1,000 µg/mL			125 mL	ICP-051

EPA 200.7 additional calibration kit

Description	Standards and Volume				Part No.
Kit, 5 bottles	ICM-202	125 mL	ICM-205	125 mL	ICK-200A
	ICM-203	125 mL	ICP-051	125 mL	
	ICM-204	125 mL			

Tips and tools

To view our entire portfolio of over 4,000 standards, all manufactured under ISO Guide 17034, visit www.agilent.com/chem/standards.

Multi-Element Agency Method Standards

EPA 200.7 spectral interference check standards

Description	Analyte	Matrix	Analytes and Concentration			Volume	Part No.	
Spectral interference check (SIC I)	1	2% HNO ₃	Molybdenum (Mo)	50 µg/mL		125 mL	ICM-241	
Spectral interference check (SIC II)	5	2% HNO ₃	Chromium (Cr)	50 µg/mL	Manganese (Mn)	50 µg/mL	125 mL	ICM-242
			Cobalt (Co)	50 µg/mL	Vanadium (V)	50 µg/mL		
			Copper (Cu)	50 µg/mL				
Spectral interference check (SIC III)	3	2% HNO ₃	Aluminum (Al)	200 µg/mL	Nickel (Ni)	50 µg/mL	125 mL	ICM-243
			Iron (Fe)	300 µg/mL				

EPA 200.7 quality control standards

Description	Analyte	Matrix	Analytes and Concentration			Volume	Part No.			
Laboratory performance check solution (LPC) A	27	2% HNO ₃	Aluminum (Al)	200 µg/mL	Magnesium (Mg)	200 µg/mL	125 mL	ICM-240A		
			Arsenic (As)	200 µg/mL	Manganese (Mn)	200 µg/mL				
			Barium (Ba)	200 µg/mL	Mercury (Hg)	200 µg/mL				
			Beryllium (Be)	200 µg/mL	Nickel (Ni)	1,000 µg/mL				
			Boron (B)	200 µg/mL	Phosphorus (P)	1,000 µg/mL				
			Cadmium (Cd)	200 µg/mL	Potassium (K)	200 µg/mL				
			Calcium (Ca)	200 µg/mL	Selenium (Se)	25 µg/mL				
			Chromium (Cr)	200 µg/mL	Silver (Ag)	200 µg/mL				
			Cerium (Ce)	200 µg/mL	Sodium (Na)	200 µg/mL				
			Cobalt (Co)	200 µg/mL	Strontium (Sr)	200 µg/mL				
			Copper (Cu)	200 µg/mL	Thallium (Tl)	200 µg/mL				
			Iron (Fe)	200 µg/mL	Vanadium (V)	200 µg/mL				
			Lead (Pb)	200 µg/mL	Zinc (Zn)	200 µg/mL				
			Lithium (Li)	200 µg/mL						
Laboratory performance check solution (LPC) B	5	2% HNO ₃	Antimony (Sb)	200 µg/mL	Tin (Sn)	200 µg/mL			125 mL	ICM-240B
			Molybdenum (Mo)	200 µg/mL	Titanium (Ti)	200 µg/mL				
			Silicon (Si)	1,000 µg/mL						
Laboratory performance check solution (LPC) C	25	2% HNO ₃	Aluminum (Al)	200 µg/mL	Magnesium (Mg)	200 µg/mL	125 mL	ICM-240C		
			Arsenic (As)	200 µg/mL	Manganese (Mn)	200 µg/mL				
			Barium (Ba)	200 µg/mL	Nickel (Ni)	200 µg/mL				
			Beryllium (Be)	200 µg/mL	Phosphorus (P)	1,000 µg/mL				
			Boron (B)	200 µg/mL	Potassium (K)	1,000 µg/mL				
			Cadmium (Cd)	200 µg/mL	Selenium (Se)	200 µg/mL				
			Calcium (Ca)	200 µg/mL	Silver (Ag)	25 µg/mL				
			Chromium (Cr)	200 µg/mL	Sodium (Na)	200 µg/mL				
			Cobalt (Co)	200 µg/mL	Strontium (Sr)	200 µg/mL				
			Copper (Cu)	200 µg/mL	Thallium (Tl)	200 µg/mL				
			Iron (Fe)	200 µg/mL	Vanadium (V)	200 µg/mL				
			Lead (Pb)	200 µg/mL	Zinc (Zn)	200 µg/mL				
			Lithium (Li)	200 µg/mL						
Plasma solution	4	2% HNO ₃	Arsenic (As)	10 µg/mL	Selenium (Se)	10 µg/mL			125 mL	ICM-237
			Lead (Pb)	10 µg/mL	Thallium (Tl)	10 µg/mL				
Tuning solution	2	2% HNO ₃	Copper (Cu)	10 µg/mL	Lead (Pb)	10 µg/mL			125 mL	ICM-238

EPA 200.7 quality control standards kit

Description	Analyte	Matrix	Analytes and Concentration				Part No.
Kit, 2 x 125 mL							ICM-245-KIT
Solution 1	26	2% HNO ₃	Aluminum (Al)	25 µg/mL	Manganese (Mn)	25 µg/mL	
			Antimony (Sb)	25 µg/mL	Molybdenum (Mo)	10 µg/mL	
			Arsenic (As)	25 µg/mL	Nickel (Ni)	25 µg/mL	
			Barium (Ba)	25 µg/mL	Phosphorus (P)	50 µg/mL	
			Beryllium (Be)	5 µg/mL	Selenium (Se)	25 µg/mL	
			Boron (B)	25 µg/mL	Silicon (Si)	25 µg/mL	
			Cadmium (Cd)	10 µg/mL	Silver (Ag)	2.5 µg/mL	
			Chromium (Cr)	25 µg/mL	Strontium (Sr)	25 µg/mL	
			Cobalt (Co)	10 µg/mL	Thallium (Tl)	25 µg/mL	
			Copper (Cu)	25 µg/mL	Tin (Sn)	10 µg/mL	
			Iron (Fe)	25 µg/mL	Vanadium (V)	10 µg/mL	
			Lead (Pb)	25 µg/mL	Zinc (Zn)	25 µg/mL	
			Lithium (Li)	25 µg/mL			
Solution 2	1	2% HNO ₃	Mercury (Hg)	5 µg/mL			

EPA Method 200.7 interference check standards

Description	Analyte	Matrix	Analytes and Concentration			Volume	Part No.	
Interference check standard 1	4	H ₂ O	Boron (B)	500 µg/mL	Silicon (Si)	230 µg/mL	50 mL	ICM-221
			Molybdenum (Mo)	300 µg/mL	Titanium (Ti)	1,000 µg/mL		
Interference check standard 3	16	5% HNO ₃	Arsenic (As)	1,000 µg/mL	Manganese (Mn)	200 µg/mL	50 mL	ICM-223
			Barium (Ba)	300 µg/mL	Nickel (Ni)	300 µg/mL		
			Beryllium (Be)	100 µg/mL	Potassium (K)	20,000 µg/mL		
			Cadmium (Cd)	300 µg/mL	Selenium (Se)	500 µg/mL		
			Chromium (Cr)	300 µg/mL	Silver (Ag)	300 µg/mL		
			Cobalt (Co)	300 µg/mL	Thallium (Tl)	1,000 µg/mL		
			Copper (Cu)	300 µg/mL	Vanadium (V)	300 µg/mL		
			Lead (Pb)	1,000 µg/mL	Zinc (Zn)	300 µg/mL		
Antimony standard (ICS 2)	1	2% HNO ₃ trace tartaric acid	Antimony (Sb)	1,000 µg/mL			125 mL	ICP-051
Interference check standard 4	5	2% HNO ₃	Aluminum (Al)	3,000 µg/mL	Magnesium (Mg)	7,500 µg/mL	125 mL	ICM-224
			Calcium (Ca)	15,000 µg/mL	Sodium (Na)	2,500 µg/mL		
			Iron (Fe)	12,500 µg/mL				
ICS Interf A	4	20% HCl	Aluminum (Al)	5,000 µg/mL	Magnesium (Mg)	5,000 µg/mL	500 mL	5190-8599
			Calcium (Ca)	5,000 µg/mL	Iron (Fe)	2,000 µg/mL		

EPA Method 200.7 interference check standards kit

Description	Standards and Volume				Part No.
Kit, 4 bottles	ICM-221	50 mL	ICP-051	125 mL	ICK-220A
	ICM-223	50 mL	ICM-224	125 mL	

Multi-Element Agency Method Standards

EPA Method 200.7 spiking addition standards

Description	Analyte	Matrix	Analytes and Concentration				Volume	Part No.
Spiking addition standard	12	5% HNO ₃	Aluminum (Al)	2,000 µg/mL	Iron (Fe)	1,000 µg/mL	50 mL	ICM-213
			Barium (Ba)	2,000 µg/mL	Manganese (Mn)	500 µg/mL		
			Beryllium (Be)	50 µg/mL	Nickel (Ni)	500 µg/mL		
			Chromium (Cr)	200 µg/mL	Silver (Ag)	50 µg/mL		
			Cobalt (Co)	500 µg/mL	Vanadium (V)	500 µg/mL		
			Copper (Cu)	250 µg/mL	Zinc (Zn)	500 µg/mL		
Spiking addition standard	4	5% HNO ₃	Calcium (Ca)	1,000 µg/mL	Potassium (K)	10,000 µg/mL	50 mL	ICM-212
			Magnesium (Mg)	2,000 µg/mL	Sodium (Na)	3,000 µg/mL		
Spiking addition standard	3	5% HNO ₃ , trace HF	Boron (B)	500 µg/mL	Silicon (Si)	2,000 µg/mL	50 mL	ICM-211
			Molybdenum (Mo)	500 µg/mL				
Antimony standard	1	2% HNO ₃ trace tartaric acid	Antimony (Sb)	1,000 µg/mL			125 mL	ICP-051
Spiking addition standard	5	5% HNO ₃	Arsenic (As)	800 µg/mL	Selenium (Se)	1,000 µg/mL	50 mL	ICM-215
			Cadmium (Cd)	100 µg/mL	Thallium (Tl)	1,000 µg/mL		
			Lead (Pb)	1,000 µg/mL				



Agilent 5900 ICP-OES can be used to run EPA 200.7 methods

EPA Method 200.8 standards

Determination of trace elements in water and wastes by ICP-MS

This method is for analysis of 21 trace metal elements in drinking, surface, and ground waters, and can also be used for solid waste samples.

EPA Method 200.8 calibration standards

Description	Analyte	Matrix	Analytes and Concentration				Volume	Part No.
Standard solution A	18	2% HNO ₃ trace tartaric acid	Aluminum (Al)	10 µg/mL	Manganese (Mn)	10 µg/mL	125 mL	ICM-801
			Antimony (Sb)	10 µg/mL	Molybdenum (Mo)	10 µg/mL		
			Arsenic (As)	10 µg/mL	Nickel (Ni)	10 µg/mL		
			Beryllium (Be)	10 µg/mL	Selenium (Se)	50 µg/mL		
			Cadmium (Cd)	10 µg/mL	Thallium (Tl)	10 µg/mL		
			Chromium (Cr)	10 µg/mL	Thorium (Th)	10 µg/mL		
			Cobalt (Co)	10 µg/mL	Uranium (U)	10 µg/mL		
			Copper (Cu)	10 µg/mL	Vanadium (V)	10 µg/mL		
			Lead (Pb)	10 µg/mL	Zinc (Zn)	10 µg/mL		
			Standard solution B	2	2% HNO ₃	Barium (Ba)		
Mercury standard	1	5% HNO ₃	Mercury (Hg)	10 µg/mL			100 mL	5190-8575
Tuning standard	5	2% HNO ₃	Beryllium (Be)	100 µg/mL	Indium (In)	100 µg/mL	125 mL	ICM-820
			Magnesium (Mg)	100 µg/mL	Lead (Pb)	100 µg/mL		
			Cobalt (Co)	100 µg/mL				
Gold stock standard for Hg analysis	1	Dilute HNO ₃	Gold (Au)	1,000 µg/mL			125 mL	ICP-079
Internal standard mix	5	2% HNO ₃	Bismuth (Bi)	100 µg/mL	Terbium (Tb)	100 µg/mL	125 mL	ICM-810
			Indium (In)	100 µg/mL	Yttrium (Y)	100 µg/mL		
			Scandium (Sc)	100 µg/mL				

EPA Method 200.8 internal standards

Description	Matrix	Concentration	Volume	Part No.
Bismuth (Bi)	2% HNO ₃	100 µg/mL	125 mL	IMS-111
Indium (In)	2% HNO ₃	100 µg/mL	125 mL	IMS-112
Scandium (Sc)	2% HNO ₃	100 µg/mL	125 mL	IMS-113
Terbium (Tb)	2% HNO ₃	100 µg/mL	125 mL	IMS-114
Yttrium (Y)	2% HNO ₃	100 µg/mL	125 mL	IMS-115

Multi-Element Agency Method Standards

EPA Method 200.8 additional calibration standards

Description	Analyte	Matrix	Analytes and Concentration		Volume	Part No.		
EPA 200.8 tuning standard	5	5% HNO ₃	Beryllium (Be) Cobalt (Co) Indium (In)	10 µg/mL 10 µg/mL 10 µg/mL	Magnesium (Mg) Lead (Pb)	10 µg/mL 10 µg/mL	100 mL	5190-8596
ICP-MS verification standard	9	2% HNO ₃	Beryllium (Be) Bismuth (Bi) Cerium (Ce) Cobalt (Co) Indium (In)	10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL	Lead (Pb) Magnesium (Mg) Nickel (Ni) Uranium (U)	10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL	125 mL	IMS-100
ICP-MS calibration standard	17	5% HNO ₃	Cerium (Ce) Dysprosium (Dy) Erbium (Er) Europium (Eu) Gadolinium (Gd) Holmium (Ho) Lanthanum (La) Lutetium (Lu) Neodymium (Nd)	10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL	Praseodymium (Pr) Samarium (Sm) Scandium (Sc) Terbium (Tb) Thorium (Th) Thulium (Tm) Ytterbium (Yb) Yttrium (Y)	10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL	125 mL	IMS-101
ICP-MS calibration standard	29	5% HNO ₃	Aluminum (Al) Arsenic (As) Barium (Ba) Beryllium (Be) Bismuth (Bi) Cadmium (Cd) Calcium (Ca) Cesium (Cs) Chromium (Cr) Cobalt (Co) Copper (Cu) Gallium (Ga) Indium (In) Iron (Fe) Lead (Pb)	10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL	Lithium (Li) Magnesium (Mg) Manganese (Mn) Nickel (Ni) Potassium (K) Rubidium (Rb) Selenium (Se) Silver (Ag) Sodium (Na) Strontium (Sr) Thallium (Tl) Uranium (U) Vanadium (V) Zinc (Zn)	10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL	125 mL	IMS-102
ICP-MS calibration standard	10	10% HCl	Antimony (Sb) Gold (Au) Hafnium (Hf) Iridium (Ir) Palladium (Pd)	10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL	Platinum (Pt) Rhodium (Rh) Ruthenium (Ru) Tellurium (Te) Tin (Sn)	10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL	125 mL	IMS-103
ICP-MS calibration standard	12	H ₂ O	Boron (B) Germanium (Ge) Molybdenum (Mo) Niobium (Nb) Phosphorus (P) Rhenium (Re)	10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL	Silicon (Si) Sulfur (S) Tantalum (Ta) Titanium (Ti) Tungsten (W) Zirconium (Zr)	10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL	125 mL	IMS-104
Mercury ICP-MS standard	1	5% HNO ₃	Mercury (Hg)	10 µg/mL			100 mL	5190-8575
ICP-MS tuning solution	5	2% HNO ₃	Beryllium (Be) Cobalt (Co) Indium (In)	10 µg/mL 10 µg/mL 10 µg/mL	Lead (Pb) Magnesium (Mg)	10 µg/mL 10 µg/mL	125 mL	IMS-110

ICP-MS calibration kit

Description	Standards and Volume				Part No.
Kit, 5 bottles	IMS-101	125 mL	IMS-104	125 mL	IMK-109
	IMS-102	125 mL	IMS-105	125 mL	
	IMS-103	125 mL			

EPA Method 6010 and 6020 standards

EPA 6010 and 6020 are widely used performance-based guidelines for the analysis of 31 trace elements in ground water, soil, sediment, and solid waste. Waste and soil are often highly contaminated with multiple pollutants and significant spectral overlaps can occur when using ICP-OES for element analysis.

EPA Method 6010C calibration standards

Description	Analyte	Matrix	Analytes and Concentration			Volume	Part No.	
Mixed standard solution I	6	2% HNO ₃	Beryllium (Be) Cadmium (Cd) Lead (Pb)	50 µg/mL 150 µg/mL 500 µg/mL	Manganese (Mn) Selenium (Se) Zinc (Zn)	100 µg/mL 200 µg/mL 150 µg/mL	125 mL	ICM-601
Mixed standard solution II	5	2% HNO ₃	Barium (Ba) Cobalt (Co) Copper (Cu)	100 µg/mL 100 µg/mL 100 µg/mL	Iron (Fe) Vanadium (V)	10,000 µg/mL 100 µg/mL	125 mL	ICM-602
Mixed standard solution III	2	2% HNO ₃	Arsenic (As)	500 µg/mL	Molybdenum (Mo)	100 µg/mL	125 mL	ICM-603
Mixed standard solution IV	8	2% HNO ₃	Aluminum (Al) Calcium (Ca) Chromium (Cr) Lithium (Li)	200 µg/mL 1,000 µg/mL 20 µg/mL 1,000 µg/mL	Nickel (Ni) Potassium (K) Sodium (Na) Strontium (Sr)	20 µg/mL 400 µg/mL 200 µg/mL 10 µg/mL	125 mL	ICM-604
Mixed standard solution V	4	2% HNO ₃	Antimony (Sb) Magnesium (Mg)	200 µg/mL 1,000 µg/mL	Silver (Ag) Thallium (Tl)	50 µg/mL 200 µg/mL	125 mL	ICM-605
Mixed standard solution VI	1	2% HNO ₃	Phosphorus (P)	1,000 µg/mL			125 mL	ICP-015
Mixed standard solution IIa	5	2% HNO ₃	Barium (Ba) Cobalt (Co) Copper (Cu)	100 µg/mL 100 µg/mL 100 µg/mL	Iron (Fe) Vanadium (V)	1,000 µg/mL 100 µg/mL	125 mL	ICM-607

Tips and tools

Stay up to date with the best ICP-MS practices for instrument maintenance and operation. Explore the ICP-MS resource hub: <https://explore.agilent.com/icp-ms-resource>.

Multi-Element Agency Method Standards

EPA Method 6010C interference check standards

Description	Analyte	Matrix	Analytes and Concentration				Volume	Part No.
Interference check standard	5	2% HNO ₃	Lithium (Li)	300 µg/mL	Strontium (Sr)	200 µg/mL	125 mL	ICM-611
			Molybdenum (Mo)	300 µg/mL	Titanium (Ti)	1,000 µg/mL		
			Phosphorus (P)	1,000 µg/mL				
Interference check standard	16	5% HNO ₃	Arsenic (As)	1,000 µg/mL	Manganese (Mn)	200 µg/mL	50 mL	ICM-223
			Barium (Ba)	300 µg/mL	Nickel (Ni)	300 µg/mL		
			Beryllium (Be)	100 µg/mL	Potassium (K)	20,000 µg/mL		
			Cadmium (Cd)	300 µg/mL	Selenium (Se)	500 µg/mL		
			Chromium (Cr)	300 µg/mL	Silver (Ag)	300 µg/mL		
			Cobalt (Co)	300 µg/mL	Thallium (Tl)	1,000 µg/mL		
			Copper (Cu)	300 µg/mL	Vanadium (V)	300 µg/mL		
			Lead (Pb)	1,000 µg/mL	Zinc (Zn)	300 µg/mL		
Interference check standard	5	2% HNO ₃	Aluminum (Al)	3,000 µg/mL	Magnesium (Mg)	7,500 µg/mL	125 mL	ICM-224
			Calcium (Ca)	15,000 µg/mL	Sodium (Na)	2,500 µg/mL		
			Iron (Fe)	12,500 µg/mL				
Interference check standard	1	2% HNO ₃ , trace tartaric acid	Antimony (Sb)	1,000 µg/mL			125 mL	ICP-051

EPA Method 6020 interference check standards

Description	Analyte	Matrix	Analytes and Concentration				Volume	Part No.
6020 Interference check solution A	12	5% HNO ₃ , trace HF	Aluminum (Al)	1,000 µg/mL	Molybdenum (Mo)	20 µg/mL	100 mL	5188-6526
			Calcium (Ca)	3,000 µg/mL	Potassium (K)	1,000 µg/mL		
			Carbon (C)	2,000 µg/mL	Phosphorus (P)	1,000 µg/mL		
			Chloride (Cl)	20,000 µg/mL	Sodium (Na)	2,500 µg/mL		
			Iron (Fe)	2,500 µg/mL	Sulfur (S)	1,000 µg/mL		
			Magnesium (Mg)	1,000 µg/mL	Titanium (Ti)	20 µg/mL		
6020 Interference check solution B	11	5% HNO ₃	Arsenic (As)	10 µg/mL	Nickel (Ni)	20 µg/mL	100 mL	5188-6527
			Cadmium (Cd)	10 µg/mL	Selenium (Se)	10 µg/mL		
			Chromium (Cr)	20 µg/mL	Silver (Ag)	5 µg/mL		
			Cobalt (Co)	20 µg/mL	Vanadium (V)	20 µg/mL		
			Copper (Cu)	20 µg/mL	Zinc (Zn)	10 µg/mL		
			Manganese (Mn)	20 µg/mL				

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Contract laboratory program (CLP) standards

The primary service of the Contract Laboratory Program (CLP) is the provision of analytical data of known and documented quality to CLP customers. The CLP provides data through its chemical analytical service, and has implemented supporting services. Because of its supportive infrastructure, the CLP is able to provide all services in a cost-effective and efficient manner.

All analytical services are performed by EPA-approved contract laboratories who meet stringent requirements and standards to be part of the CLP. Each sample processed by the CLP is properly documented to ensure timely and accurate analysis for all requested parameters. This process creates sample data that can be used in potential enforcement actions.

CLP data is used for various purposes, such as defining the nature and extent of contamination at Superfund sites, determining appropriate cleanup actions, determining emergency response and remedial actions, and enforcement or litigation activities. The data may also be used in all stages of hazardous waste site investigations, including site inspections, Hazardous Ranking System (HRS) scoring, remedial investigation/feasibility studies, and remedial design.

Agilent has assembled all the necessary elemental standards required for Contract Laboratory Program (CLP) work. Each element is Agilent quality and traceable to a NIST SRM.

CLP ICP calibration standards

Description	Analyte	Matrix	Analytes and Concentration			Volume	Part No.
CLP ICP calibration verification standard 3	1	1% HNO ₃ trace tartaric acid	Antimony (Sb)	1,000 µg/mL		100 mL	5190-8244
CLP ICP calibration standard	5	5% HNO ₃	Arsenic (As) Cadmium (Cd) Lead (Pb)	1,000 µg/mL 500 µg/mL 1,000 µg/mL	Selenium (Se) Thallium (Tl)	1,000 µg/mL 1,000 µg/mL	125 mL ICM-413
CLP ICP calibration verification standard 5	4		Calcium (Ca) Magnesium (Mg)	5,000 µg/mL 5,000 µg/mL	Potassium (K) Sodium (Na)	5,000 µg/mL 5,000 µg/mL	125 mL 5190-9409
CLP ICP calibration verification standard 6	5	5% HNO ₃	Arsenic (As) Cadmium (Cd) Lead (Pb)	100 µg/mL 50 µg/mL 30 µg/mL	Selenium (Se) Thallium (Tl)	50 µg/mL 100 µg/mL	125 mL 5190-9412
CLP ICP verification standard *	16	5% HNO ₃	Aluminum (Al) Barium (Ba) Beryllium (Be) Calcium (Ca) Chromium (Cr) Cobalt (Co) Copper (Cu) Iron (Fe)	1,000 µg/mL 1,000 µg/mL 25 µg/mL 2,500 µg/mL 100 µg/mL 250 µg/mL 125 µg/mL 500 µg/mL	Magnesium (Mg) Manganese (Mn) Nickel (Ni) Potassium (K) Silver (Ag) Sodium (Na) Vanadium (V) Zinc (Zn)	2,500 µg/mL 250 µg/mL 250 µg/mL 2,500 µg/mL 125 µg/mL 2,500 µg/mL 250 µg/mL 250 µg/mL	125 mL ICM-431
CLP ICP verification standard *	5	5% HNO ₃	Arsenic (As) Cadmium (Cd) Lead (Pb)	500 µg/mL 250 µg/mL 500 µg/mL	Selenium (Se) Thallium (Tl)	500 µg/mL 500 µg/mL	125 mL ICM-433

* Meets CLP OA second-source requirements.

Tips and tools

Find more EPA Method standards online at www.agilent.com/chem/standards.

Multi-Element Agency Method Standards

CLP ICP spike standards

Description	Analyte	Matrix	Analytes and Concentration				Volume	Part No.
CLP ICP spike standard	12	5% HNO ₃	Aluminum (Al)	2,000 µg/mL	Iron (Fe)	1,000 µg/mL	125 mL	ICM-451
			Barium (Ba)	2,000 µg/mL	Manganese (Mn)	500 µg/mL		
			Beryllium (Be)	50 µg/mL	Nickel (Ni)	500 µg/mL		
			Chromium (Cr)	200 µg/mL	Silver (Ag)	50 µg/mL		
			Cobalt (Co)	500 µg/mL	Vanadium (V)	500 µg/mL		
			Copper (Cu)	250 µg/mL	Zinc (Zn)	500 µg/mL		
CLP ICP spike standard	1	Dilute HNO ₃	Antimony (Sb)	500 µg/mL			125 mL	ICM-452
CLP ICP spike standard	5	5% HNO ₃	Arsenic (As)	2,000 µg/mL	Selenium (Se)	2,000 µg/mL	125 mL	ICM-453
			Cadmium (Cd)	50 µg/mL	Thallium (Tl)	2,000 µg/mL		
			Lead (Pb)	500 µg/mL				

CLP ICP interference check standards

Description	Analyte	Matrix	Analytes and Concentration				Volume	Part No.		
CLP ICP interference check standard	4	5% HNO ₃	Aluminum (Al)	5,000 µg/mL	Iron (Fe)	2,000 µg/mL	500 mL	ICM-441		
			Calcium (Ca)	5,000 µg/mL	Magnesium (Mg)	5,000 µg/mL				
CLP ICP interference check standard	12	5% HNO ₃	Barium (Ba)	50 µg/mL	Lead (Pb)	100 µg/mL	50 mL	ICM-442		
			Beryllium (Be)	50 µg/mL	Manganese (Mn)	50 µg/mL				
			Cadmium (Cd)	100 µg/mL	Nickel (Ni)	100 µg/mL				
			Chromium (Cr)	50 µg/mL	Silver (Ag)	100 µg/mL				
			Cobalt (Co)	50 µg/mL	Vanadium (V)	50 µg/mL				
			Copper (Cu)	50 µg/mL	Zinc (Zn)	100 µg/mL				
CLP ILM-4.0 interference check analytes standard	16	2% HNO ₃	Antimony (Sb)	60 µg/mL	Lead (Pb)	5 µg/mL	125 mL	ICM-443		
			Arsenic (As)	10 µg/mL	Manganese (Mn)	50 µg/mL				
			Barium (Ba)	50 µg/mL	Nickel (Ni)	100 µg/mL				
			Beryllium (Be)	50 µg/mL	Selenium (Se)	5 µg/mL				
			Cadmium (Cd)	100 µg/mL	Silver (Ag)	20 µg/mL				
			Chromium (Cr)	50 µg/mL	Thallium (Tl)	10 µg/mL				
			Cobalt (Co)	50 µg/mL	Vanadium (V)	50 µg/mL				
			Copper (Cu)	50 µg/mL	Zinc (Zn)	100 µg/mL				

Single element kit for the CLP

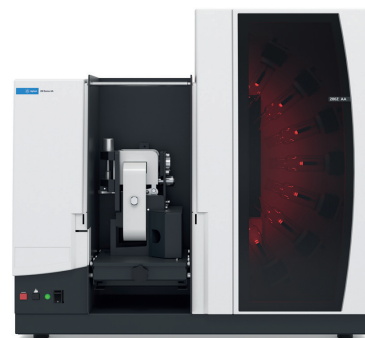
Description	Elements					Part No.
Kit, 23 bottles, at 1,000 µg/mL	Aluminum (Al)	Calcium (Ca)	Magnesium (Mg)	Silver (Ag)		ICPK-3
	Antimony (Sb)	Chromium (Cr)	Manganese (Mn)	Sodium (Na)		
	Arsenic (As)	Cobalt (Co)	Mercury (Hg)	Thallium (Tl)		
	Barium (Ba)	Copper (Cu)	Nickel (Ni)	Vanadium (V)		
	Beryllium (Be)	Iron (Fe)	Potassium (K)	Zinc (Zn)		
	Cadmium (Cd)	Lead (Pb)	Selenium (Se)			

CLP Graphite Furnace (GFAA) standards

Description	Analyte	Matrix	Analytes and Concentration				Volume	Part No.
CLP GFAA standard	6	5% HNO ₃	Antimony (Sb)	100 µg/mL	Lead (Pb)	50 µg/mL	50 mL	ICM-461
			Arsenic (As)	50 µg/mL	Selenium (Se)	100 µg/mL		
			Cadmium (Cd)	10 µg/mL	Thallium (Tl)	50 µg/mL		
CLP GFAA standard (calibration verification)	6	5% HNO ₃	Antimony (Sb)	50 µg/mL	Lead (Pb)	25 µg/mL	50 mL	ICM-462
			Arsenic (As)	25 µg/mL	Selenium (Se)	50 µg/mL		
			Cadmium (Cd)	5 µg/mL	Thallium (Tl)	25 µg/mL		
CLP GFAA standard	6	5% HNO ₃	Antimony (Sb)	120 µg/mL	Lead (Pb)	20 µg/mL	50 mL	ICM-464
			Arsenic (As)	20 µg/mL	Selenium (Se)	10 µg/mL		
			Cadmium (Cd)	10 µg/mL	Thallium (Tl)	20 µg/mL		
CLP GFAA standard	1	2% HNO ₃	Mercury (Hg)	100 µg/mL			125 mL	ICM-303

Tips and tools

Stay up to date with the best AAS practices for instrument maintenance and operation. Explore the AAS resource hub, visit [explore.agilent.com/aas-resource](https://www.agilent.com/aas-resource).



Agilent 280Z-AA instrument

Cannabis

Countries and U.S. states that have permitted the use of medicinal and recreational marijuana have set guidelines on the amount of contaminants allowed during cultivation. Contamination with heavy metals like arsenic, lead, cadmium, and mercury poses a danger to health, so thorough testing of heavy metals is essential.

The analysis of minerals and additional trace elements provides labeling information that is required when these products are used as nutritional supplements. Since contamination can occur during the manufacturing process, analysis is necessary at all stages of production.

You can maximize confidence in your heavy metal testing with single and multi-element certified reference materials (CRMs) from Agilent. They are rigorously tested and manufactured using ISO 17025 and 17034 accreditations, and enable you to calibrate and quantify with confidence using Agilent verified methods and workflows.

Single element cannabis heavy metals

Element	Matrix	Concentration	Part No. 100 mL	Part No. 500 mL
Antimony (Sb)	1% HNO ₃	10 µg/mL	5190-8562	
	1% HNO ₃ tr tartaric acid	1,000 µg/mL	5190-8244	5190-8245
	30% HCl (for AA)	1,000 µg/mL	5190-8258	5190-8259
	1% HNO ₃ tr tartaric acid	10,000 µg/mL	5190-8354	5190-8355
Arsenic (As)	2% HNO ₃	10 µg/mL	5190-8563	
	5% HNO ₃	1,000 µg/mL	5190-8246	5190-8247
	5% HNO ₃	10,000 µg/mL	5190-8356	5190-8357
Barium (Ba)	2% HNO ₃	10 µg/mL	5190-8564	
	5% HNO ₃	1,000 µg/mL	5190-8248	5190-8249
	5% HNO ₃	10,000 µg/mL	5190-8358	5190-8359
Cadmium (Cd)	2% HNO ₃	10 µg/mL	5190-8567	
	5% HNO ₃	1,000 µg/mL	5190-9414	5190-8328
	5% HNO ₃	10,000 µg/mL	5190-8366	5190-8367
Calcium (Ca)	0.5% HNO ₃	10 µg/mL	ICP-420	
	5% HNO ₃	1,000 µg/mL	5190-8329	5190-8330
	5% HNO ₃	10,000 µg/mL	5190-8368	5190-8369
Chromium (Cr)	2% HNO ₃	10 µg/mL	5190-8568	
	5% HCl (for AA)	1,000 µg/mL	5190-8275	5190-8276
	5% HNO ₃	1,000 µg/mL	5190-8344	5190-8345
	5% HNO ₃	10,000 µg/mL	5190-8374	5190-8375
Chromium (Cr ⁶⁺)	H ₂ O	10 µg/mL	ICP-424A	
	H ₂ O	1,000 µg/mL	ICP-324A	
Cobalt (Co)	2% HNO ₃	10 µg/mL	8500-6947	
	5% HNO ₃	1,000 µg/mL	5190-8346	5190-8347
	5% HNO ₃	10,000 µg/mL	5190-8376	5190-8377

Single element cannabis heavy metals

Element	Matrix	Concentration	Part No. 100 mL	Part No. 500 mL
Copper (Cu)	2% HNO ₃	10 µg/mL	5190-8569	
	5% HNO ₃	1,000 µg/mL	5190-8348	5190-8349
	5% HNO ₃	10,000 µg/mL	5190-8378	5190-8379
Gold (Au) (stabilizer for Mercury)	2% HCl	100 µg/mL	8500-7000	
	20% HCl	1,000 µg/mL	5190-8461	5190-8462
	20% HCl	10,000 µg/mL	5190-8392	5190-8393
Lead (Pb)	2% HNO ₃	10 µg/mL	5190-8571	
	5% HNO ₃	1,000 µg/mL	5190-8475	5190-8476
	5% HNO ₃	10,000 µg/mL	5190-8406	5190-8407
Lithium (Li)	2% HNO ₃	10 µg/mL	5190-8572	
	5% HNO ₃	1,000 µg/mL	5190-8477	5190-8478
	5% HNO ₃	10,000 µg/mL	5190-8408	5190-8409
Lithium (Li ⁶⁺)	2% HNO ₃	10 µg/mL	5190-8589	
Mercury (Hg) (Gold stabilizer recommended)	2% HNO ₃	10 µg/mL	8500-6941	
	5% HNO ₃	10 µg/mL	5190-8575	
	5% HNO ₃	1,000 µg/mL	5190-8485	5190-8486
	5% HNO ₃	10,000 µg/mL	5190-8416	5190-8417
Molybdenum (Mo)	0.5% NH ₄ OH	10 µg/mL	ICP-442	
	1% NH ₄ OH	1,000 µg/mL	5190-8487	5190-8488
	1% NH ₄ OH	10,000 µg/mL	5190-8418	5190-8419
Nickel (Ni)	2% HNO ₃	10 µg/mL	5190-8576	
	5% HNO ₃	1,000 µg/mL	5190-8491	5190-8492
	5% HNO ₃	10,000 µg/mL	5190-8422	5190-8423
Selenium (Se)	2% HNO ₃	10 µg/mL	5190-8579	
	5% HNO ₃	1,000 µg/mL	5190-8519	5190-8520
	5% HNO ₃	10,000 µg/mL	5190-8448	5190-8449
Silver (Ag)	2% HNO ₃	10 µg/mL	5190-8580	
	5% HNO ₃	1,000 µg/mL	5190-8523	5190-8524
	5% HNO ₃	10,000 µg/mL	5190-8452	5190-8453
Thallium (Tl)	0.5% HNO ₃	10 µg/mL	ICP-481	
	5% HNO ₃	1,000 µg/mL	5190-8537	5190-8538
	5% HNO ₃	10,000 µg/mL	5190-8217	

Multi-Element Agency Method Standards

Single element cannabis heavy metals

Element	Matrix	Concentration	Part No. 100 mL	Part No. 500 mL
Tin (Sn)	5% HCl	10 µg/mL	5190-8583	
	20% HCl	1,000 µg/mL	5190-8543	5190-8544
	20% HCl	10,000 µg/mL	5190-8221	5190-8222
Zinc (Zn)	2% HNO ₃	10 µg/mL	5190-8587	
	5% HNO ₃	1,000 µg/mL	5190-8557	5190-8558
	5% HNO ₃	10,000 µg/mL	5190-8234	5190-8235

Multi-element cannabis heavy metals

Description	Analyte	Matrix	Analytes and Concentration			Volume	Part No.
Pharma internal standard 1	6	2% HNO ₃ trace HF	Bismuth (Bi) Germanium (Ge) Indium (In)	5 µg/mL 5 µg/mL 5 µg/mL	Lutetium (Lu) Scandium (Sc) Tellurium (Te)	5 µg/mL 10 µg/mL 25 µg/mL	100 mL 5190-9770
ICP calibration standard – Toxic elements (IX)	9	5% HNO ₃	Arsenic (As) Beryllium (Be) Cadmium (Cd) Chromium (Cr ⁶⁺) Lead (Pb)	100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL	Mercury (Hg) Nickel (Ni) Selenium (Se) Thorium (Th)	100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL	125 mL ICM-105

Tips and tools

Agilent also provides a range of kits, columns, supplies, and standards to help you perform complete cannabis testing, including testing for potency, pesticides and mycotoxins, residual solvents, and terpene analysis. See the Agilent Cannabis Flower and Hemp website for further details.

www.agilent.com/en/solutions/cannabis-hemp-testing

USP | ICH 232 standards

The Agilent ICH Q3D and USP 232 orals and parenteral kits consists of five CRMs that sort elements by ICH/USP class, chemical compatibility, and the relative mandated concentrations. This eliminates the need for analysts to prepare their own calibration standards from single element standards, reducing preparation time and minimizing errors. These kits include:

- A balanced range of elemental impurity CRMs to meet the method's oral or parenteral permitted daily exposure (PDE) levels
- An internal standard solution, which is optimized for best ICP-MS/ICP-OES results with common pharmaceutical sample types
- Manufactured in an ISO 17034 accredited facility and certified in an ISO/IEC 17025 testing laboratory
- A Certificate of Analysis confirming actual concentrations, measurement uncertainty, and NIST traceability

USP | ICH 232 oral standards

Description	Analytes	Matrix	Analytes and Concentration				Volume	Part No.
Individual solutions								
ICH/USP target elements standard A	4	2% HNO ₃	Arsenic (As) Cadmium (Cd)	15 µg/mL 5 µg/mL	Lead (Pb) Mercury (Hg)	5 µg/mL 30 µg/mL	100 mL	5190-9766
ICH/USP oral target elements standard B	6	2% HNO ₃	Cobalt (Co) Nickel (Ni) Silver (Ag)	50 µg/mL 200 µg/mL 150 µg/mL	Selenium (Se) Thallium (Tl) Vanadium (V)	150 µg/mL 8 µg/mL 100 µg/mL	100 mL	5190-9767
ICH/USP oral target elements standard C	7	15% HCl	Gold (Au) Iridium (Ir) Osmium (Os) Palladium (Pd)	100 µg/mL 100 µg/mL 100 µg/mL 100 µg/mL	Platinum (Pt) Rhodium (Rh) Ruthenium (Ru)	100 µg/mL 100 µg/mL 100 µg/mL	100 mL	5190-9768
ICH/USP oral target elements standard D	7	5% HNO ₃ trace HF	Antimony (Sb) Barium (Ba) Chromium (Cr) Copper (Cu)	1,200 µg/mL 1,400 µg/mL 11,000 µg/mL 3,000 µg/mL	Lithium (Li) Molybdenum (Mo) Tin (Sn)	550 µg/L 3,000 µg/mL 6,000 µg/mL	100 mL	5190-9769
Pharma internal standard 1	6	2% HNO ₃ trace HF	Bismuth (Bi) Germanium (Ge) Indium (In)	5 µg/mL 5 µg/mL 5 µg/mL	Lutetium (Lu) Scandium (Sc) Tellurium (Te)	5 µg/mL 10 µg/mL 25 µg/mL	100 mL	5190-9770
Kits								
ICH Q3D and USP 232 orals kit			5190-9769, 5190-9768, 5190-9767, 5190-9766, 5190-9770				5 x 100 mL	5190-9771

Multi-Element Agency Method Standards

USP | ICH 232 parenteral standards

Description	Analytes	Matrix	Analytes and Concentration				Volume	Part No.
Individual solutions								
ICH/USP 232 class 1 and 2 parenteral elements	7	2% HNO ₃	Arsenic (As) Cadmium (Cd) Cobalt (Co) Lead (Pb)	15 µg/mL 2 µg/mL 5 µg/mL 5 µg/mL	Mercury (Hg) Nickel (Ni) Vanadium (V)	3 µg/mL 20 µg/mL 10 µg/mL	100 mL	5191-4533
ICH/USP 232 parenteral combined 1	10	5% HNO ₃ trace HF	Antimony (Sb) Barium (Ba) Chromium (Cr) Copper (Cu) Lithium (Li)	90 µg/mL 700 µg/mL 1,100 µg/mL 300 µg/mL 250 µg/mL	Molybdenum (Mo) Silver (Ag) Selenium (Se) Thallium (Tl) Tin (Sn)	1,500 µg/mL 10 µg/mL 80 µg/mL 8 µg/mL 600 µg/mL	100 mL	5191-4534
ICH/USP 232 parenteral combined 2	7	15% HCl	Gold (Au) Iridium (Ir) Osmium (Os) Palladium (Pd)	10 µg/mL 10 µg/mL 10 µg/mL 10 µg/mL	Platinum (Pt) Rhodium (Rh) Ruthenium (Ru)	10 µg/mL 10 µg/mL 10 µg/mL	100 mL	5191-4535
Pharma internal standard 1	6	2% HNO ₃ trace HF	Bismuth (Bi) Germanium (Ge) Indium (In)	5 µg/mL 5 µg/mL 5 µg/mL	Lutetium (Lu) Scandium (Sc) Tellurium (Te)	5 µg/mL 10 µg/mL 25 µg/mL	100 mL	5190-9770
Kits								
ICH/USP 232 parenteral kit	5191-4533, 5191-4534, 5191-4535, 5191-9770						4 x 100 mL	5191-4536



USP/ICH 232 parenteral standards

PerkinElmer wavelength and calibration environmental standards

- Performance validated directly on PerkinElmer systems
- Supplied with SDS and Certificate of Analysis for complete assurance
- Packed in preleached HDPE bottles, secured with tamper-evident seal
- ISO 17034 Certified Reference Materials

Wavecal calibration solutions

Description	Matrix	Analytes and Concentration				Volume	Similar to PerkinElmer Part No.	Part No.
UV Wavecal calibration solution	5% HCl	Arsenic (As)	20 µg/mL	Nickel (Ni)	20 µg/mL	500 mL	N0582152	5190-9410
		Calcium (Ca)	1 µg/mL	Potassium (K)	100 µg/mL			
		Lanthanum (La)	20 µg/mL	Phosphorus (P)	100 µg/mL			
		Lithium (Li)	20 µg/mL	Sodium (Na)	20 µg/mL			
		Manganese (Mn)	20 µg/mL	Scandium (Sc)	20 µg/mL			
		Molybdenum (Mo)	20 µg/mL	Sulfur (S)	100 µg/mL			
		Vis Wavecal calibration solution	2% HNO ₃	Barium (Ba)	1 µg/mL			
		Calcium (Ca)	1 µg/mL	Potassium (K)	50 µg/mL			
		Lanthanum (La)	10 µg/mL	Sodium (Na)	10 µg/mL			
		Lithium (Li)	10 µg/mL	Strontium (Sr)	10 µg/mL			

Mixed calibration standards

Description	Matrix	Analytes and Concentration				Volume	Similar to PerkinElmer Part No.	Part No.					
Mixed calibration standard for ICP-OES	2% HNO ₃	Arsenic (As)	50 µg/mL	Nickel (Ni)	10 µg/mL	500 mL	N0691579	5190-9413					
		Barium (Ba)	1 µg/mL	Magnesium (Mg)	1 µg/mL								
		Lanthanum (La)	10 µg/mL	Potassium (K)	50 µg/mL								
		Lithium (Li)	10 µg/mL	Strontium (Sr)	10 µg/mL								
		Manganese (Mn)	10 µg/mL	Zinc (Zn)	10 µg/mL								
PE internal calibration verification std	5% HNO ₃ trace tartaric acid	Aluminum (Al)	200 µg/mL	Magnesium (Mg)	500 µg/mL	500 mL	N9300224	5190-9408					
		Antimony (Sb)	60 µg/mL	Manganese (Mn)	15 µg/mL								
		Arsenic (As)	10 µg/mL	Nickel (Ni)	40 µg/mL								
		Barium (Ba)	200 µg/mL	Palladium (Pd)	3 µg/mL								
		Beryllium (Be)	5 µg/mL	Potassium (K)	500 µg/mL								
		Cadmium (Cd)	5 µg/mL	Silver (Ag)	10 µg/mL								
		Calcium (Ca)	500 µg/mL	Selenium (Se)	5 µg/mL								
		Chromium (Cr)	10 µg/mL	Sodium (Na)	500 µg/mL								
		Cobalt (Co)	50 µg/mL	Thallium (Tl)	10 µg/mL								
		Copper (Cu)	25 µg/mL	Vanadium (V)	50 µg/mL								
		Iron (Fe)	100 µg/mL	Zinc (Zn)	20 µg/mL								
		PE CLP calibration solution 1	5% HNO ₃	Calcium (Ca)	5,000 µg/mL				Potassium (K)	5,000 µg/mL	125 mL	N9300218	5190-9409
				Magnesium (Mg)	5,000 µg/mL				Sodium (Na)	5,000 µg/mL			
PE alternate trace metals 1	2% HNO ₃	Aluminum (Al)	20 µg/mL	Manganese (Mn)	10 µg/mL	100 mL	N9300214	5190-9406					
		Antimony (Sb)	5 µg/mL	Nickel (Ni)	10 µg/mL								
		Beryllium (Be)	5 µg/mL	Thallium (Tl)	5 µg/mL								
		Cobalt (Co)	10 µg/mL	Vanadium (V)	20 µg/mL								
		Copper (Cu)	10 µg/mL	Zinc (Zn)	10 µg/mL								
		Iron (Fe)	20 µg/mL										
PE alternate trace metals 2	2% HNO ₃	Calcium (Ca)	500 µg/mL	Magnesium (Mg)	100 µg/mL	100 mL	N9300215	5190-9407					
		Sodium (Na)	500 µg/mL	Potassium (K)	100 µg/mL								
PE CLP instrument calibration mix 4	5% HNO ₃	Arsenic (As)	10 µg/mL	Selenium (Se)	50 µg/mL	125 mL	N9300221	5190-9412					
		Cadmium (Cd)	50 µg/mL	Thallium (Tl)	10 µg/mL								
		Lead (Pb)	30 µg/mL										

Proof of equivalency

We demonstrated equivalency between Agilent and PerkinElmer Wavecal Calibration Standards required to complete wavelength calibration on the PerkinElmer Optima Series ICP-OES. The analysis was performed on an Agilent 5100 ICP-OES in axial/radial view and aims to show equivalence in concentration (instrument response) and sample matrix (instrument signal). Figures 2 and 3 show that the signal for the selected element in the Agilent and PerkinElmer standards is almost identical and the baseline is free from unwanted components. This confirms that the Agilent standard is "clean" and equivalent to the PerkinElmer OEM Wavecal standard.

UV Wavecal calibration solution

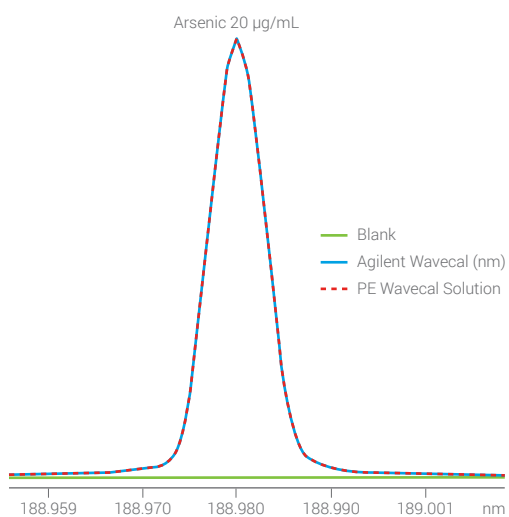


Figure 2. Comparison of Agilent and PerkinElmer UV Wavecal calibration solution for arsenic at 1 mg/mL (396.847 nm) shows nearly identical traces (Agilent p/n: 5190-9410).

Vis Wavecal calibration solution

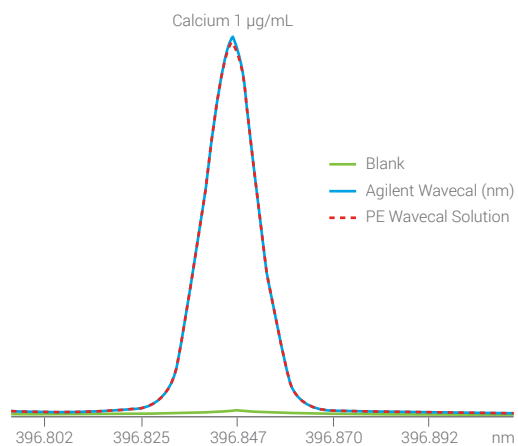


Figure 3. Comparison of Agilent and PerkinElmer Vis Wavecal calibration solution for calcium at 1 mg/mL (396.847 nm) shows nearly identical traces (Agilent p/n: 5190-9411).

Agilent UV-Vis calibration standards

Description	Analyte	Matrix	Analytes and Concentration	Volume	Part No.	
OQ/PV standards kit 1 for UV-Vis kit	6	0.01N H ₂ SO ₄	Potassium dichromate (K ₂ Cr ₂ O ₇)	600.6 mg/L	2 x 10 mL	5063-6503
		0.01N H ₂ SO ₄	Potassium dichromate (K ₂ Cr ₂ O ₇)	60.06 mg/L	2 x 10 mL	
		H ₂ O	Sodium nitrite (NaNO ₂)	50 g/L	10 mL	
		H ₂ O	Sodium iodide (NaI)	10 g/L	10 mL	
		H ₂ O	Potassium chloride (KCl)	12 g/L	10 mL	
		n-hexane	Toluene	0.02%	10 mL	
OQ/PV standards kit 2 for UV-Vis	2		Holmium oxide perchloric acid	40 g/L	1 x 10 mL 1 x 10 mL	5063-6521
IQ test sample for UV-Vis	1	+/- 2% in H ₂ O	Caffeine solution	10 mg/L		5063-6524



Cary 6000i UV-Vis instrument

Tips and tools

Don't underestimate the importance of good mixing when preparing standards. A simple swirl is not enough. Make a habit of inverting and shaking the container several times.

Metallo-Organic and Biodiesel Standards

- Highest quality metallo-organic mixes in the industry, manufactured in accordance with the requirements of ISO 17034 and ISO 17025
- Accuracy ensured by quality testing with NIST Standard Reference Materials
- Certificate of Analysis shows certified, not nominal, concentrations
- For use in blending and preparation of calibration standards for spectrometric analysis of metals in hydrocarbon/petrochemical samples

Wear metals

Wear metal and metallo-organic standards

100 g

Description	Contains			Matrix	Nominal Conc.	Part No.
A21 Wear metal standards	Aluminium (Al)	Iron (Fe)	Phosphorus (P)	75 cSt hydrocarbon oil	100 µg/g	5190-8603
	Boron (B)	Magnesium (Mg)	Lead (Pb)	75 cSt hydrocarbon oil	300 µg/g	5190-8604
	Barium (Ba)	Manganese (Mn)	Silicon (Si)			
	Calcium (Ca)	Molybdenum (Mo)	Tin (Sn)	75 cSt hydrocarbon oil	500 µg/g	5190-8605
	Cadmium (Cd)	Silver (Ag)	Titanium (Ti)			
	Chromium (Cr)	Sodium (Na)	Vanadium (V)			
Copper (Cu)	Nickel (Ni)	Zinc (Zn)	75 cSt hydrocarbon oil	900 µg/g	5190-8706	
A21+ K Wear metal standards	Aluminium (Al)	Iron (Fe)	Silicon (Si)	75 cSt hydrocarbon oil	100 µg/g	5190-8710
	Boron (B)	Magnesium (Mg)	Silver (Ag)	75 cSt hydrocarbon oil	300 µg/g	5190-8711
	Barium (Ba)	Manganese (Mn)	Sodium (Na)			
	Calcium (Ca)	Molybdenum (Mo)	Tin (Sn)	75 cSt hydrocarbon oil	500 µg/g	5190-8712
	Cadmium (Cd)	Nickel (Ni)	Titanium (Ti)			
	Chromium (Cr)	Phosphorus (P)	Vanadium (V)			
	Copper (Cu)	Potassium (K)	Zinc (Zn)	75 cSt hydrocarbon oil	900 µg/g	5190-8713
			Lead (Pb)			

Tips and tools

Thorough mixing is especially important when using oil-based standards. Due to their viscosity, they are difficult to homogenize. For best results, always mix the standard by vigorously shaking the container for at least a few minutes. Alternatively, shake the container and sonicate the standard in an ultrasonic bath for several minutes.

Single element oil standards

- Highest quality metallo-organic mixes in the industry, manufactured in accordance with the requirements of ISO 17034 and ISO 17025
- Accuracy ensured by quality testing with NIST Standard Reference Materials
- Certificate of Analysis includes trace metal concentrations confirmed by ICP-OES

Single element standards in hydrocarbon oil

50 g			
Description	Matrix	Nominal Conc.	Part No.
Aluminum (Al)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8731
		5,000 µg/g	5190-8732
Antimony (Sb)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8733
		5,000 µg/g	5190-8734
Arsenic (As)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8735
Barium (Ba)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8736
		5,000 µg/g	5190-8736
Beryllium (Be)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8738
Bismuth (Bi)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8739
Boron (B)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8740
		5,000 µg/g	5190-8741
Cadmium (Cd)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8742
		5,000 µg/g	5190-8743
Calcium (Ca)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8744
		5,000 µg/g	5190-8745
Cerium (Ce)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8746
		5,000 µg/g	5190-8747
Chromium (Cr)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8748
		5,000 µg/g	5190-8749
Cobalt (Co)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8750
		5,000 µg/g	5190-8751

(Continued)

Single element standards in hydrocarbon oil

50 g			
Description	Matrix	Nominal Conc.	Part No.
Copper (Cu)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8752
		5,000 µg/g	5190-8753
Iron (Fe)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8754
		5,000 µg/g	5190-8755
Lanthanum (La)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8756
		5,000 µg/g	5190-8757
Lead (Pb)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8758
		5,000 µg/g	5190-8759
Lithium (Li)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8760
		5,000 µg/g	5190-8761
Magnesium (Mg)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8762
		5,000 µg/g	5190-8763
Manganese (Mn)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8764
		5,000 µg/g	5190-8765
Mercury (Hg)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8766
Molybdenum (Mo)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8767
		5,000 µg/g	5190-8768
Nickel (Ni)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8769
		5,000 µg/g	5190-8770
Phosphorus (P)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8771
		5,000 µg/g	5190-8772

(Continued)

Tips and tools

Many of these compounds are sulfonate-based and therefore contain high levels of sulfur. If the absence of sulfur is important for your application, use sulfur-free standards.

Metallo-Organic and Biodiesel Standards

Single element standards in hydrocarbon oil

50 g			
Description	Matrix	Nominal Conc.	Part No.
Potassium (K)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8773
		5,000 µg/g	5190-8774
Scandium (Sc)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8775
Selenium (Se)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8776
Silicon (Si)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8777
		5,000 µg/g	5190-8778
Silver (Ag)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8779
		5,000 µg/g	5190-8780
Sodium (Na)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8781
		5,000 µg/g	5190-8782
Strontium (Sr)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8783
Sulfur (S)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8784
		5,000 µg/g	5190-8785
Thallium (Tl)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8786

(Continued)

Single element standards in hydrocarbon oil

50 g			
Description	Matrix	Nominal Conc.	Part No.
Tin (Sn)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8787
		5,000 µg/g	5190-8788
Titanium (Ti)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8789
		5,000 µg/g	5190-8790
Tungsten (W)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8791
		5,000 µg/g	5190-8792
Vanadium (V)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8793
		5,000 µg/g	5190-8794
Yttrium (Y)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8795
		5,000 µg/g	5190-8796
Zinc (Zn)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8797
		5,000 µg/g	5190-8798
Zirconium (Zr)	75 cSt hydrocarbon oil	1,000 µg/g	5190-8799
		5,000 µg/g	5190-8800

Tips and tools

Store metallo-organic standards in a cool, dry place away from moisture.

Base oil and solvents

- Highest quality metallo-organic mixes in the industry, manufactured in accordance with the requirements of ISO 17034 and ISO 17025
- Traceable to NIST SRM 1085b to ensure highest accuracy
- C of A includes trace metal concentrations confirmed by ICP-OES
- For use in blending and preparation of calibration standards for spectrometric analysis of metals in hydrocarbon/petrochemical samples

Base oil and solvents

Description	Matrix	Quantity	Part No.
Base mineral oil, <1 µg/g Used for blending and preparation of calibration standards for spectrometric analysis of metals in hydrocarbon/petrochemical samples	75 cSt mineral oil	500 mL	5190-8715
		1/2 gal	5190-8716
A-solv solvent Used for diluting metallo-organic standards, oils, and other organic solutions when preparing for spectrometric analysis of metals in hydrocarbon/petrochemical samples. Use as a matrix blank and as a diluent.	Proprietary solvent	1 gal	5190-8717
Biodiesel blank Excellent matrix match for almost all biodiesel fuels. Use as a calibration blank for analysis of metals or sulfur in biodiesel.	B100 biodiesel	100 mL	5190-8718
		500 mL	5190-8719

Internal standard for oil analysis

- Corrects for wide variations in sample viscosity or oil composition
- Easy to use when added to the diluent before sample preparation

Base oil and solvents

200 g				
Description	Matrix	Analytes and Concentration		Part No.
Cobalt internal standard	Hydrocarbon oil	Cobalt (Co)	5,000 µg/g	5190-8714

Proof of equivalency

We demonstrated the quality of Agilent standards by comparing them with industry-leading Conostan metallo-organic multi-element oil and biodiesel standards. Conostan standards are the benchmark for metallo-organic analysis, in particular for customers performing wear metal analysis in lubricating oils and biodiesel.

The analyses were performed on an Agilent 5100 ICP-OES in radial view. The signals in Figures 4, 5, and 6 reveal an excellent match between the wear metal standards from Agilent and Conostan. We analyzed phosphorus, sodium, and boron because the industry regards these elements as more difficult to measure. There were no differences in matrix background or response when comparing Agilent A21+K and Conostan S21+K wear metal standards. In addition, there was no significant change in the emission spectrum on either side of the analytical wavelength. The baseline indicates that the standard is free from unwanted components, which would increase the background. The traces in Figures 4, 5, and 6 confirm that the Agilent standard is “clean” and analytically equivalent to the Conostan standard.

Wear metal and metallo-organic standards

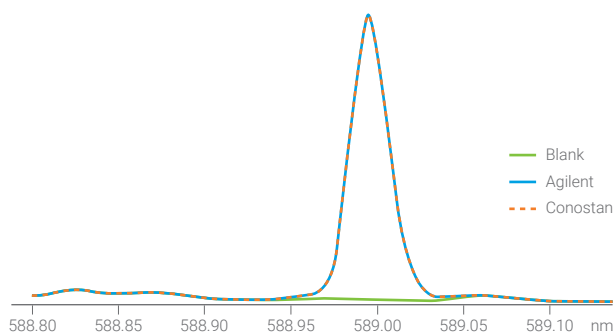


Figure 4. Comparison of Agilent and Conostan wear metal standards for 50 µg/g sodium in hydrocarbon oil at 588.995 nm. Na is an element prone to contamination. The traces are identical, demonstrating excellent agreement (Agilent p/n: 5190-8712).

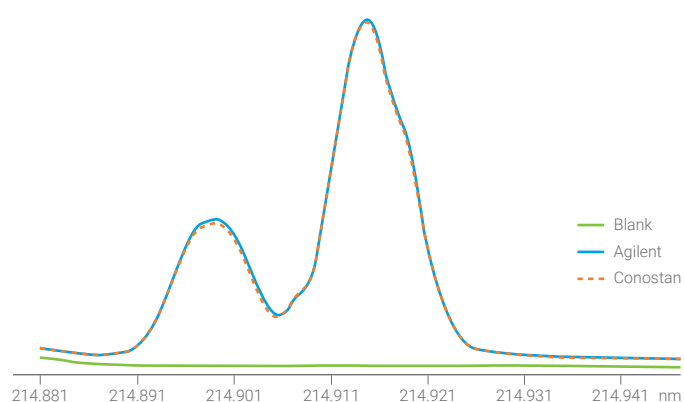


Figure 5. Comparison of Agilent and Conostan wear metal standards for 50 µg/g phosphorus in hydrocarbon oil at 214.914 nm. The traces are virtually identical, demonstrating excellent agreement (Agilent p/n: 5190-8712).

Single element oil standards

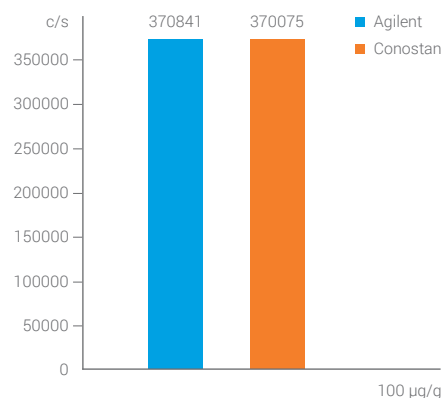
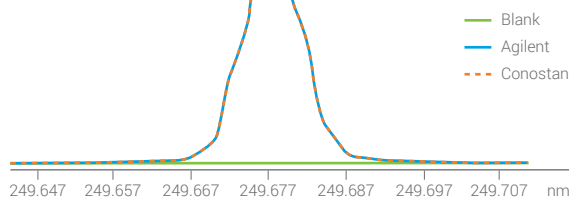


Figure 6. Boron is reputedly difficult to quantify due to its instability in hydrocarbon matrices. A comparison of Agilent and Conostan single element 100 µg/g standards for boron at 249.679 nm shows nearly identical traces with no differences in matrix background. The measured signal intensity is also comparable, confirming again that the Agilent standard is “clean” and equivalent to the Conostan standard (Agilent p/n 5190-8740).



Biodiesel standards

Metals in biodiesel standards

- Formulated specifically for analysis of metals in biodiesel fuel to ASTM D6751 and EN14214
- Matrix is 100% biodiesel to eliminate matrix variations
- Made from soybean oil, which is an excellent matrix match for most biodiesels

Metals in biodiesel standards

Description	Contains	Matrix	Conc.	Part No.
Metal additives standard, MA5	Barium (Ba) Calcium (Ca) Magnesium (Mg) Phosphorus (P) Zinc (Zn)	75 cSt hydrocarbon oil	900 µg/g	5190-8720
Metals in biodiesel standard	Calcium (Ca) Potassium (K) Magnesium (Mg) Sodium (Na) Phosphorus (P)	B100 biodiesel	5 µg/g	5190-8717
			10 µg/g	5190-8722
			20 µg/g	5190-8723

Sulfur in biodiesel standards

- Formulated specifically for analysis of sulfur in biodiesel fuel to ASTM D2622, D4294, D5453, D6751 and others
- Matrix is 100% biodiesel to eliminate matrix variations
- Made from soybean oil, which is an excellent matrix match for most biodiesels

Sulfur in biodiesel standards

Supplied in 100 mL bottles				
Description	Contains	Matrix	Conc.	Part No.
Sulfur in biodiesel standard	Sulfur (S)	B100 biodiesel	10 µg/g	5190-8724
			15 µg/g	5190-8725
			20 µg/g	5190-8726
			25 µg/g	5190-8727
			50 µg/g	5190-8728
			100 µg/g	5190-8729
			500 µg/g	5190-8730

Proof of equivalency

We demonstrated the quality of Agilent biodiesel standards by comparing them with industry-leading Conostan biodiesel standards. The signals in Figures 7, 8, and 9 reveal an excellent match between the biodiesel standards from Agilent and Conostan. We analyzed phosphorus, sulfur, and potassium because the industry regards these elements as more difficult to measure in biodiesel. The signals for the Agilent and Conostan standards are virtually identical for the nominated elements. In addition, there is no significant change in the emission spectrum on either side of the analytical wavelength. This baseline indicates that the standard is free from unwanted components that would increase the background. The traces in Figures 7, 8, and 9 confirm that the Agilent standard is “clean” and equivalent to the Conostan standard.

Biodiesel standards

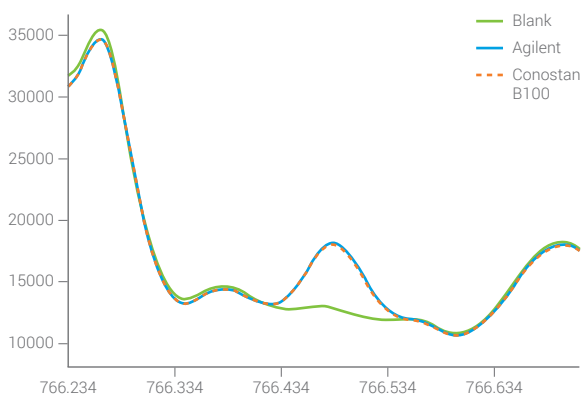


Figure 7. Comparison of Agilent and Conostan Biodiesel B100 standards for potassium at 2 µg/g (766.491 nm) shows nearly identical traces (Agilent p/n: 5190-8723).

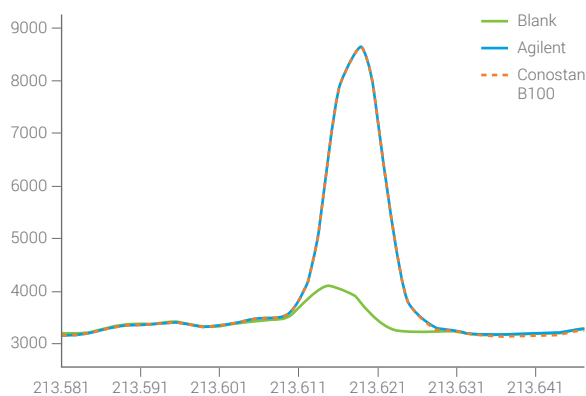


Figure 8. Comparison of Agilent and Conostan Biodiesel B100 standards for phosphorus at 2 µg/g (213.618 nm) demonstrates excellent agreement (Agilent p/n: 5190-8723).

Sulfur in biodiesel standards

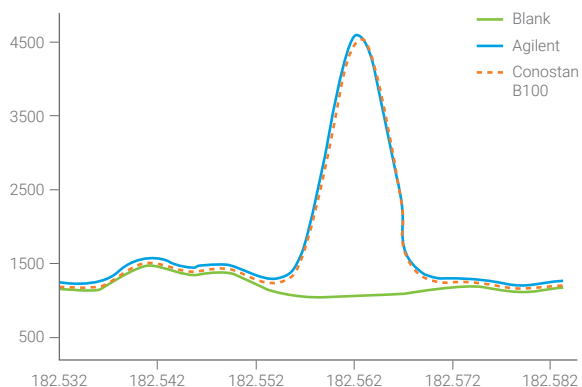


Figure 9. Comparison of Agilent and Conostan Biodiesel B100 standards for sulfur at 50 µg/g (182.562 nm) shows nearly identical traces (Agilent p/n: 5190-8730).

Ion Chromatography Standards

Anion standards for ion chromatography

Agilent offers various anion and cation single and multi-element standards for ion chromatography analysis. All reference materials are manufactured in an accredited ISO 17025 and 17034 facility with high-purity chemicals and water. Our comprehensive portfolio can be used for various routine anion and cation analyses.

Anion standards for ion chromatography

Ion	Volume	Part No. 1,000 µg/mL
Acetate	125 mL	ICC-014
Bromate	125 mL	ICC-010
Bromide	125 mL	ICC-001
Chlorate	125 mL	ICC-011
Chloride	125 mL	ICC-002
Chlorite	125 mL	ICC-012
Chromate	125 mL	ICC-016
Citrate	125 mL	ICC-017
Fluoride	125 mL	ICC-003
Formate	125 mL	ICC-018
Iodide	125 mL	ICC-020
Lactate	125 mL	ICC-021

(Continued)

Anion standards for ion chromatography

Ion	Volume	Part No. 1,000 µg/mL
Nitrate	125 mL	ICC-004
Nitrate (as N)	125 mL	ICC-004A
Nitrite	125 mL	ICC-007
Nitrite (as N)	125 mL	ICC-007A
Oxalate	125 mL	ICC-026
Perchlorate	125 mL	ICC-013
Phosphate	125 mL	ICC-005
Orthophosphate (as P)	125 mL	ICC-005A
Propionate	125 mL	ICC-028
Sulfate	125 mL	ICC-006
Thiosulfate	125 mL	ICC-032

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Anion mixtures for ion chromatography

IC anion mixtures

Description	Analyte	Matrix	Analytes and Concentration			Total Vol.	Part No.	
IC anions mixture 1	5	H ₂ O	Chloride (Cl ⁻)	30 µg/mL	Phosphate (PO ₄ ³⁻)	150 µg/mL	125 mL	ICC-200
			Fluoride (F ⁻)	20 µg/mL	Sulfate (SO ₄ ²⁻)	150 µg/mL		
			Nitrate (NO ₃ ⁻)	100 µg/mL				
IC anions mixture 2	6	H ₂ O	Bromide (Br ⁻)	400 µg/mL	Nitrate (NO ₃ ⁻)	400 µg/mL	125 mL	ICC-210
			Chloride (Cl ⁻)	200 µg/mL	Phosphate (PO ₄ ³⁻)	600 µg/mL		
			Fluoride (F ⁻)	100 µg/mL	Sulfate (SO ₄ ²⁻)	400 µg/mL		

Cation standards for chromatography and ion chromatography

Chromatography cation standards

Ion	Matrix	Volume	Part No. 1,000 µg/mL
Ammonium (NH ₄ ⁺)	H ₂ O	125 mL	ICC-101
Calcium (Ca ²⁺)	0.2% HNO ₃	125 mL	ICC-103
Lithium (Li ⁺)	0.2% HNO ₃	125 mL	ICC-104
Magnesium (Mg ²⁺)	0.2% HNO ₃	125 mL	ICC-105
Potassium (K ⁺)	0.2% HNO ₃	125 mL	ICC-106
Sodium (Na ⁺)	0.1% HNO ₃	125 mL	ICC-107
Strontium (Sr ²⁺)	0.2% HNO ₃	125 mL	ICC-108

Cation mixtures for ion chromatography

IC cations mixtures

Description	Analyte	Matrix	Analytes and Concentration			Total Vol.	Part No.	
IC cations mixture 1	6	0.2% HNO ₃	Ammonium (NH ₄ ⁺)	400 µg/mL	Magnesium (Mg ²⁺)	200 µg/mL	125 mL	ICC-300
			Calcium (Ca ²⁺)	1,000 µg/mL	Potassium (K ⁺)	200 µg/mL		
			Lithium (Li ⁺)	50 µg/mL	Sodium (Na ⁺)	200 µg/mL		
IC cations mixture 2	4	0.2% HNO ₃	Ammonium (NH ₄ ⁺)	100 µg/mL	Potassium (K ⁺)	50 µg/mL	125 mL	ICC-310
			Lithium (Li ⁺)	10 µg/mL	Sodium (Na ⁺)	1,000 µg/mL		
IC cations mixture 3	4	0.2% HNO ₃	Barium (Ba ²⁺)	1,600 µg/mL	Magnesium (Mg ²⁺)	200 µg/mL	125 mL	ICC-320
			Calcium (Ca ²⁺)	400 µg/mL	Strontium (Sr ²⁺)	600 µg/mL		

Troubleshooting Tips and Tricks

Standard solutions are manufactured following strict procedures. They must be handled with care, as they are highly valuable assets when kept in good condition. Observing the following recommendations will help save time, money, and troubleshooting.

- Use only deionized water and high-purity acids or reagents to prepare calibration standards and samples. Your data is only as good as your lowest blank.
- Avoid pipetting directly from the original CRM container – always pour a small amount into a different, clean container and take your aliquot from there.
- Never return unused standard to the original Agilent container.
- Don't neglect preventive or routine maintenance. Most instrument problems are preventable.
- Replace pump tubing frequently to ensure consistent, reliable data.
- Preclean all labware and avoid use of glassware where possible, especially for trace-level applications.
- At the end of each working day, always rinse the sample delivery lines and the sample introduction system thoroughly before shutting off the instrument. The rinse solution should be prepared in the same solvent as the samples being analyzed.
- If at all possible, include both nitric acid (HNO_3) and hydrochloric acid (HCl) in standards and samples. The oxidizing power of HNO_3 will help decompose your samples, while the complexing power of HCl will minimize carryover and help solubilize many analytes, such as mercury and tin.
- Run as many blanks as possible (at least two or three) to establish the lowest possible background.
- Use aseptic techniques to prevent contamination. Remember, some gloves contain a high concentration of zinc.
- Always run daily instrument performance checks using the appropriate instrument tuning solution.
- When in doubt, consult your Agilent application engineer regarding any analytical questions that you may have.

Operational tips

- Always prepare your calibration standards from Certified Reference Materials manufactured in an ISO 9001, ISO 17034 facility and certified in an ISO/IEC 17025 testing lab. Certification ensures the highest levels of purity and quality with known uncertainties for precise, accurate calibration data and consistent performance, leading to greater productivity.
- Always try to matrix match your calibration standards to your samples. Matrix matching is easier if you use 1% (10,000 $\mu\text{g}/\text{mL}$) standards as stock materials for major sample components and keep the total concentration of all elements below 20,000 $\mu\text{g}/\text{mL}$ (2%).
- Verify instrument performance before analysis.
- Do not overtighten the pressure bar on any peristaltic pump tubing.
- Always detach the peristaltic pump tubing from the holder after use.
- Always rinse between samples and after analysis.
- Routinely clean the nebulizer by reverse-flushing.
- Soak the spray chamber overnight in 25% detergent to restore performance.
- Clean the torch by soaking in aqua regia and rinse afterwards.
- Ensure the torch is dry before re-installing.

Agilent consumable workflow solutions

Need a complete list of consumables (standards, sample preparation products, chromatography columns, and supplies) based on regulatory methods and your analytical instrument?

Agilent consumable workflow ordering guides provide application-specific product recommendations for environmental, food, pharmaceutical, and cannabis method workflows in an easy-to-order format. Each ordering guide includes links to the relevant application note with method protocols, parameters, and chromatograms.



Heavy metals testing in cannabis using ICP-MS

The cannabis consumable workflow ordering guide provides a list of ICP-MS supplies and standards required for analyzing 25 elements in cannabis and hemp using the Agilent 7800 ICP-MS system.

See the ordering guide at: <https://agilent.com/chem/cannabistesting-ordering-guide>



Trace metals in water and waste samples using ICP-MS

The consumable workflow ordering guide for EPA 200.8, EPA 6020A, and ISO 17294-2 methods offers a list of ICP-MS supplies and standards required to analyze trace metals in water and waste samples using an Agilent 7850 or 7900 ICP-MS system.

See the ordering guide at: <https://agilent.com/chem/tracemetals-ordering-guide>



Trace metals in water and waste samples using ICP-OES

If you need ICP-OES supplies and standards to analyze trace metals in water samples, the EPA 200.7 method ordering guide provides a full list for use with the Agilent 5000 series ICP-OES systems, based on EPA 200.7 methods.

See the selection guide at: <https://agilent.com/chem/metalsinwater-icp-oes>

To find ICP-OES supplies and standards for EPA 6010D methods, see our consumable workflow ordering guide for EPA 6010D methods.

Read the selection guide at: <https://agilent.com/chem/metalsinwaste-ordering-guide>

To learn more visit: www.agilent.com/chem/ordering-guides

Technical support at work for you

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