

Inductively Coupled Plasma Mass Spectrometer

ICPMS-2030 Series



Accelerating Reliable Performance

The first system in the industry to include functions for assisting with analytical method development and diagnostics.

Newly developed collision cell and On-Line IEC work together to eliminate spectral interference, and achieve high-sensitive and low-interference analyses.

Unique system developed by Shimadzu results in the industry's lowest running costs.

* As of April 2017, based on data obtained by Shimadzu



Designed for High Stability and Low Running Costs

More Compact Vacuum System

The smaller three-stage split-flow turbomolecular pump is especially easy to maintain, maximizing up-time of the instrument.

Secondary Electron Multiplier Tube Detector

The 9-digit dynamic range detector allows for measuring major components and trace components simultaneously with high sensitivity.

Lens System Minimizes Contamination

Located behind the newly developed collision cell, the focusing lens improves ion transmission efficiency and elimination of light emission from the plasma.

* Light emission removal is especially important when combining with Laser Ablation systems.

Newly Developed Collision Cell

The newly developed collision cell achieves superior sensitivity by providing highly efficient molecular ion removal and high elemental ion transmission using only helium gas.



Newly Designed Interface

The newly designed interface allows for easy maintainability. All parts can be removed and installed without the need for tools, which helps minimize downtime associated with cleaning and servicing.

High Stability and Flexibility New High-Frequency Power Supply

Shimadzu is the world's first ICP manufacturer to develop an all-solid-state high-frequency power supply. Due to Shimadzu's extensive experience, this free-running type high-frequency power supply unit offers the highest output stability.

* As of February 2016, based on data obtained by Shimadzu

High Stability and Low Running Costs

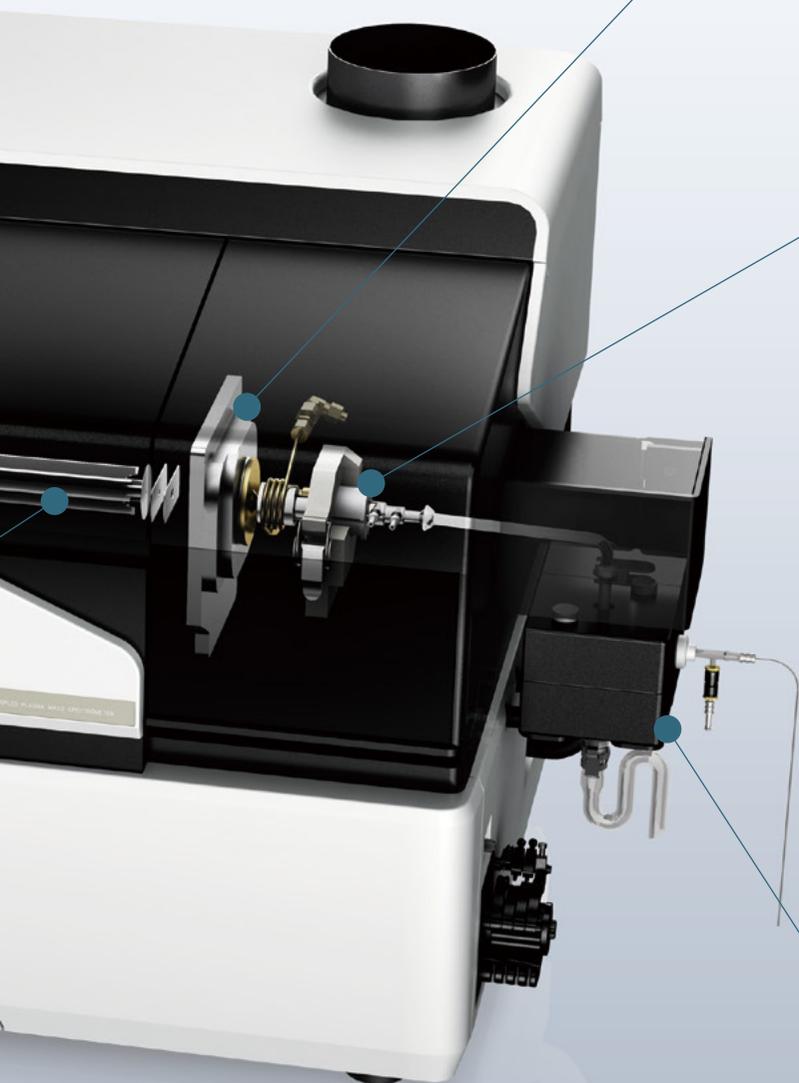
Shimadzu's Proprietary Mini-Torch Plasma System

Based on Shimadzu's extensive experience developing ICP emission spectrometers, Shimadzu's independently-developed mini-torch unit offers unrivaled performance and savings. One of the highest costs associated with ICP-MS systems is the large quantity of argon gas they consume. However, Shimadzu's proprietary mini-torch plasma system consumes two-thirds the argon gas (11 L/min) as conventional plasma torches. Furthermore, during standby when Eco mode is active, the plasma gas flow and power are reduced to 5 L/min and 0.5 kW to minimize the required gas and electricity; however, analysis can be started immediately with no loss of productivity.

Easy-to-Maintain Sample Injection System

Cyclone Chamber Cooled by a Peltier Element

The sample injection system features an electronically-cooled cyclone chamber utilizing a highly efficient coaxial nebulizer and unique overflow drain design. This design combines highly efficient aerosol production while reducing carryover to maximize sensitivity and throughput.



Two Assistant Functions Simplify Analysis

The Development Assistant simplifies the process of developing analytical methods. The Diagnosis Assistant automatically diagnoses spectral interference. Together, they provide analytical results with exceptionally high reliability.

Development Assistant Function Ensures Analytical Methods Can Be Developed with Confidence by Anyone.

Development Assistant

Creating analytical methods for ICPMS-2030 Series analysis involves only selecting the measured and target elements, even for samples being analyzed for the first time. Then, based on the qualitative analysis data (for all mass numbers) from a representative sample, the Development Assistant automatically selects the optimal mass numbers and internal standard elements for the target measurement elements and automatically specifies the concentration range for calibration curve samples.

Conventional Method Development Process (when analyzing a sample for the first time)

Prepare sample (pretreat sample)

Qualitatively analyze all elements

Determine optimal mass numbers for target measurement elements

- (1) Isobaric ions
- (2) Oxide ions (Check mass numbers 16 less than target mass numbers.)
- (3) Divalent ions (Check mass numbers twice the target mass numbers.)

Example: Determining optimal mass number for Cd

- (1) Select mass number from mass number list.
→ Select 111 Cd with no isobaric ions.
- (2) Check spectra for oxide ions ($111 - 16 = 95$) that might interfere with 111 Cd.
- (3) Check spectra for divalent ions ($(111 \times 2) = 222$).

Select internal standards
(Select optimal elements and mass numbers)

- Criteria for selecting internal standard elements
1. Quantity in sample is less than 1/100 of quantity added.
 2. Mass number is near target measurement element.
 3. Ionization energy is close to ionization energy of measurement element.
 4. Not easily affected by spectral interference
 5. Does not cause interference with spectra of target measurement elements.
 6. Elements and mass numbers are detectable with sufficient sensitivity.

Specify calibration curve sample

Method completed in **10 minutes**



Creating Analytical Method Using Development Assistant

Prepare sample (pretreat sample)

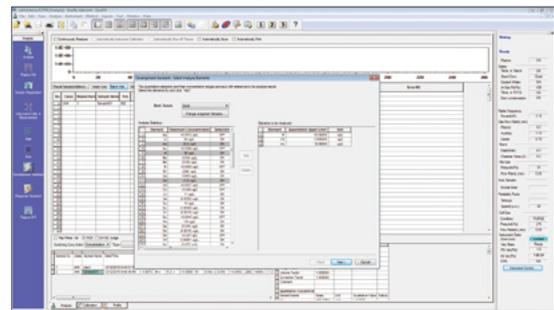
Qualitatively analyze all elements

Select target measurement elements

The Development Assistant function automatically sets the optimal mass numbers and internal standard elements for the target measurement elements, and suggests a calibration scheme.

2 min

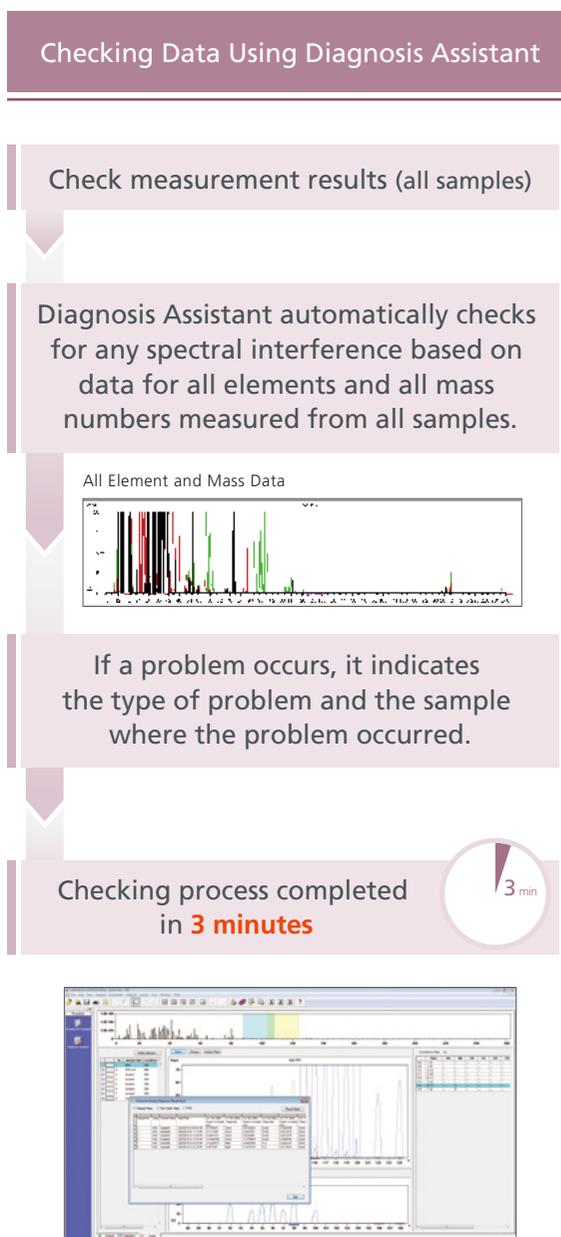
Method completed in **2 minutes**



Obtain Reliable Results Quickly with the Diagnosis Assistant Function.

Diagnosis Assistant

The Diagnosis Assistant automatically diagnoses spectral interference, based on data measured from all mass numbers. Even when using an already established method for routine analysis, the software analyzes data for any spectral interference to determine if a problem occurred.



Higher Sensitivity and Lower Interference

Achieve High-Sensitivity and Low-interference Analyses Using Newly Developed Collision Cell

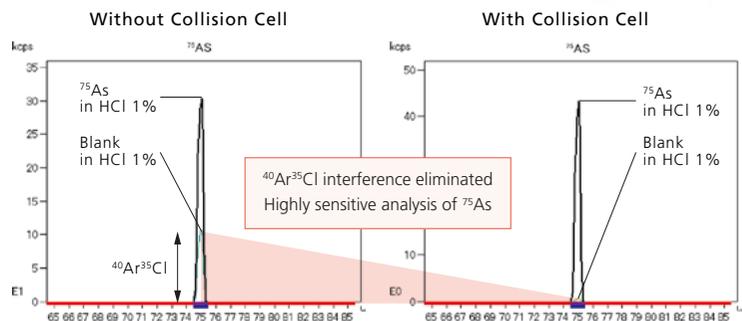
With this newly developed collision cell, polyatomic ions that previously may have been detected as spectral interference are efficiently eliminated by helium gas flowing through the cell, allowing the high-sensitivity analysis.



Quantitative Analysis of ⁷⁵As

If chlorine is in the sample when performing quantitative analysis of ⁷⁵As, ⁴⁰Ar and ³⁵Cl combine to form ⁴⁰Ar³⁵Cl, which overlaps the mass number of As, creating interference.

The collision cell eliminates the spectral interference from Cl, enabling the highly sensitive measurement of As.



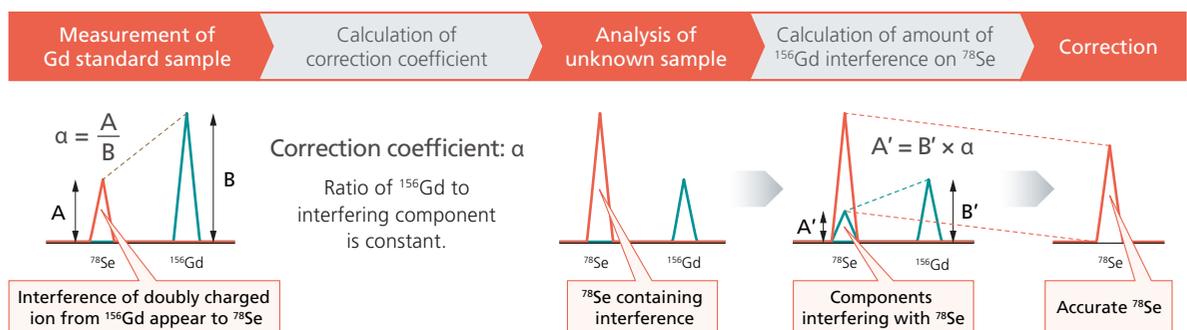
On-Line IEC (Inter-Element Correction)

Shimadzu's proprietary On-Line IEC (Inter Element Correction) provides correction for spectral interference that could not be eliminated with the collision cell. Since the interference correction coefficient can be acquired only by a single measurement of a standard sample of the interfering element, the correction can be simply and accurately made. There's no need for complicated assessments of conditions, as with reaction cell technology.

Quantitative Analysis of ⁷⁸Se

If ¹⁵⁶Gd is in the sample when performing quantitative analysis of ⁷⁸Se, spectral interference will occur with respect to ⁷⁸Se.

By measuring a standard sample of Gd, the correction coefficient can be obtained. Then, the portion where interference occurs can be corrected when measuring the unknown sample, and the accurate quantitation of ⁷⁸Se can be accomplished.



Unique Combination Eco Mode/Mini-Torch Reduces Running Cost by Dramatically Reducing Gas Consumption

In addition to lower running costs, the environmentally-friendly mini-torch plasma unit, developed by Shimadzu, minimizes the energy (electricity) consumed in producing and maintaining an argon plasma.

Three Factors That Reduce Running Costs

Mini-Torch Plasma Unit

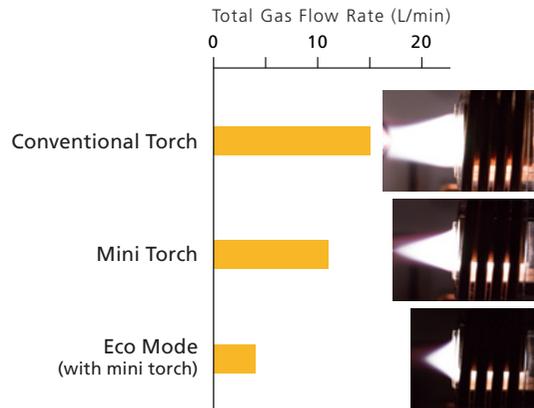
One of the highest costs associated with ICP-MS systems is the large quantity of argon gas they consume. However, Shimadzu's proprietary mini-torch plasma system consumes 2/3 the argon gas (11 L/min) as conventional plasma torches. Consequently, one gas cylinder of argon (~7,800 liters) allows for approximately ten hours of continuous operation.

Eco Mode (5 L/min of Plasma)

During standby when Eco mode is active, the plasma gas flow and power are reduced to 5 L/min and 0.5 kW to minimize the required gas and electricity; however, analysis can be started immediately with no loss of productivity.

Low-Purity Argon Compatible

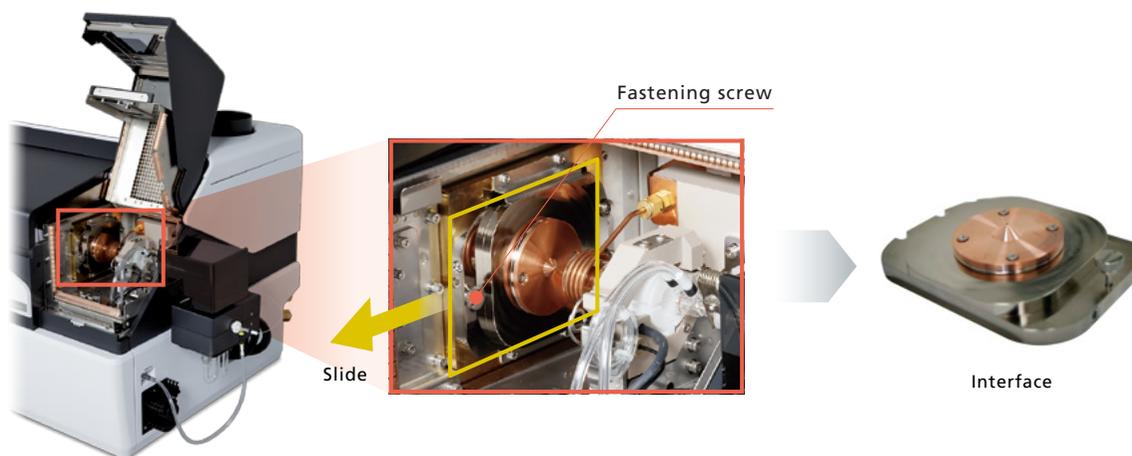
High-purity argon gas required by conventional systems is no longer necessary. Using less expensive argon gas (99.95%) can reduce costs.



This product is certified as Shimadzu's Eco-Products Plus. Reduced argon gas consumption by 27% compared with general products of the same class.

Enhanced Maintenance Features

The opening to the plasma stand is wide, allowing easy access to the plasma torch and interface unit. The interface can be easily removed by loosening captive screws by hand.



Plasma Stand with Wide Opening Allowing Easy Access

Trace Element Analysis Applications for Today's Demands

Environmental, Drinking Water, and Wastewater Analysis



Natural resources such as rivers, oceans, and soil are limited and we all share an obligation to preserve them for our future generations. In the world we live in today, we continue to place a burden on those resources through such practices as industrial manufacturing. It is essential that we preserve and protect our environment and our resources through reuse, recycling resources and reducing pollution. These can only be accomplished through monitoring by conducting massive amounts of measurements. To this end, Shimadzu provides a simple and accurate means of measuring samples so that recycling processes and manufacturing processes can be managed properly and responsibly.

Analytical Results of River Water

Element	Japanese Water Supply Act Standard	EPA Max. Limit Value for Drinking Water	Samples: JSAC0301-3		Samples: JSAC0302-3	
			Quantitation Value	Certified Value	Quantitation Value	Certified Value
Unit: µg/L						
Al	200	200	15.2	15 ± 1	66.9	66 ± 1
As	10	—	0.21	0.20 ± 0.01	5.27	5.2 ± 0.1
B	1000	—	8.3	8.2 ± 0.3	58.4	59 ± 1
Ba	700 **	2000	0.52	0.53 ± 0.01	0.52	0.52 ± 0.01
Cd	3	5	0.0018	0.0018 †	1.01	1.00 ± 0.02
Cr	20 ***	100	0.17	0.16 ± 0.01	10.0	10.0 ± 0.2
Cu	1000	1300	0.38	0.37 ± 0.03	10.0	9.9 ± 0.1
Fe	300	300	6.2	6.4 ± 0.2	58.7	58 ± 1
Mn	50	50 ****	0.20	0.2 ± 0.01	5.0	5.1 ± 0.1
Mo	70 **	—	0.286	0.290 ± 0.004	0.286	0.290 ± 0.004
Ni	10 *	—			9.65	9.5 ± 0.3
Pb	10	15	0.007	0.007 †	10.0	9.9 ± 0.2
Se	10	—	0.04	0.08 †	5.0	5.0 ± 0.2
Zn	1000	5000 ****	0.16	0.17 ± 0.04	9.7	9.8 ± 0.2
U	2 *	—	0.0030	0.0030 ± 0.0001	0.0032	0.0031 ± 0.0001
Unit: mg/L						
K		—	0.47	0.47 ± 0.02	0.48	0.48 ± 0.02
Na	200	—	4.32	4.34 ± 0.07	4.31	4.32 ± 0.07
Mg	Hardness: 300	—	3.34	3.34 ± 0.07	3.36	3.32 ± 0.06
Ca		250 ****	13.0	13.0 ± 0.2	13.0	13.0 ± 0.1

*: Target setting item, **: Required test item, †: Reference value
 ***: Levels of hexavalent chromium,
 ****: National Secondary Drinking Water Regulations

Food Products/Agriculture



We rely on foods to provide necessary elements and minerals required for supporting life. However, if food contains hazardous elements, they can be harmful to our health. Therefore, analyzing food has become increasingly important in recent years for ensuring the safety of food. One example of this is powdered infant formula which is made with a healthy balance of minerals necessary for infant growth. Regulatory requirements specify the amounts of calcium (Ca), iron (Fe), copper (Cu), and other essential minerals and while limiting hazardous elements like arsenic (As), which has detrimental effects on child development. ICPMS-2030 Series is able to quickly measure a wide variety of elements in powdered milk products and other foods, including raw ingredient and finished products.

Analytical Results of Powdered Milk

Element	Analytical Value (in the powder)	NMIJ Certification Value	Expanded Measurement Uncertainty	Recovery Rate
Unit: g/kg				Unit: %
Ca	8.5	8.65	0.38	—
Fe	0.102	0.104	0.007	—
K	8.3	8.41	0.33	—
Mg	0.82	0.819	0.024	—
Na	1.81	1.87	0.09	—
P	5.4	5.62	0.23	—
Unit: mg/kg				Unit: %
Mn	0.91	0.931	0.032	—
Mo	0.23	0.223	0.012	—
Sr	5.7	5.88	0.2	—
Zn	41	41.3	1.4	—
Cd	<0.005	—	—	100
Cr	<0.06	—	—	101
Pb	<0.03	—	—	100
As	<0.03	—	—	108

Recovery Rate (%): (Analytical Value in Recovery Test – Analytical Value) / Additive Concentration × 100

■ Pharmaceuticals/Pharmacopoeia



Many of the pharmaceuticals, food products, and other products we encounter can contain harmful elements, either introduced from natural sources or manufacturing processes. ICPMS-2030 are able to quickly measure harmful elements with high sensitivity, making them ideal for monitoring such substances and ensuring the safety and security of pharmaceuticals, foods, and other products. Additionally, pharmaceuticals must satisfy the allowable limits specified by ICH Q3D guidelines, where the measurement methods used are specified in the pharmacopoeia of respective countries. The system must also be compliant with quality control standards specified by the FDA and Japanese Ministry of Health, Labour and Welfare.

Analytical Results of Tablet

Class	Element	Oral Drug PDE µg	Max Permitted Concentration *1 µg/g	Equivalent Tablet Dose DL (3σ) *2 µg/g	Measurable Value in Tablet µg/g	Additive Con- centration in Tablet µg/g	Recovery Rate %
1	As	15	75	0.002	N.D.	0.2	101
	Cd	5	25	0.003	N.D.	0.2	96
	Hg	30	150	0.006	N.D.	0.2	100
	Pb	5	25	0.001	0.003	0.2	105
2A	Co	50	250	0.0006	N.D.	0.4	101
	Ni	200	1000	0.003	0.156	0.4	101
	V	100	500	0.002	N.D.	0.4	100
2B	Ag	150	750	0.001	N.D.	0.1	107
	Au	100	500	0.001	N.D.	0.2	91
	Ir	100	500	0.0005	N.D.	0.2	98
	Os	100	500	0.007	N.D.	0.2	92
	Pd	100	500	0.006	N.D.	0.2	104
	Pt	100	500	0.003	N.D.	0.2	99
	Se	150	750	0.01	N.D.	0.2	98
	Rh	100	500	0.0008	0.003	0.2	101
	Ru	100	500	0.002	N.D.	0.2	98
	Tl	8	40	0.0005	N.D.	0.2	103
3	Ba	1400	7000	0.002	0.013	0.2	96
	Cr	11000	55000	0.003	0.017	0.4	104
	Cu	3000	15000	0.04	0.15	0.4	102
	Li	550	2750	0.01	N.D.	0.2	93
	Mo	3000	15000	0.001	N.D.	0.2	107
	Sb	1200	6000	0.0009	0.007	0.2	98
	Sn	6000	30000	0.002	N.D.	0.2	98

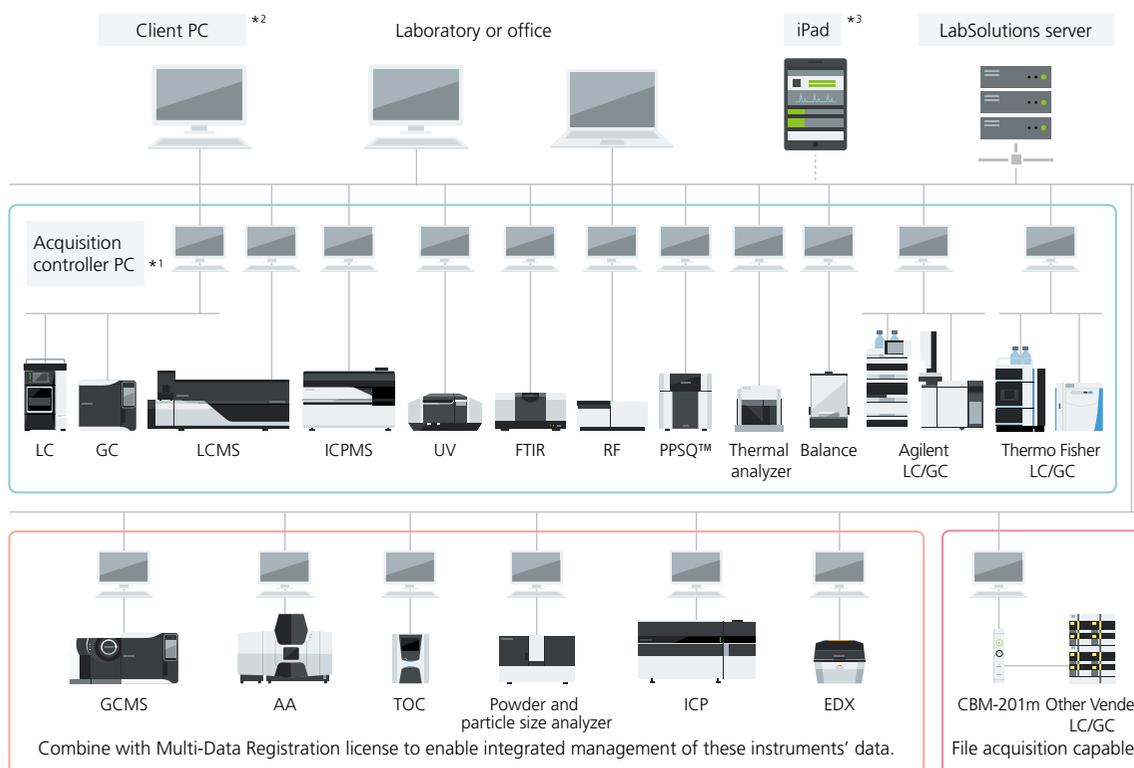
*1 Permitted concentration at 0.2 g daily intake (Used option 3 for converting concentration)

*2 Limit of detection in solution (3σ) × dilution ratio (100)

N.D.: Not Detected



LabSolutions™ CS/DB for ICPMS-2030 Series Supports Laboratory Networking and FDA 21 CFR Part 11 Compliance.



- *1 The acquisition control PC controls analytical instruments.
It can also be used to send analytical instructions and perform postrun analysis, just like a client PC.
- *2 If a terminal service is used, then LabSolutions software does not need to be installed on client PCs.
- *3 If an iPad is used, then XenApp from Citrix must be installed.

LabSolutions CS/DB ICPMS provides compliance for regulations concerning electronic record keeping and electronic signatures required by FDA 21 CFR Part 11 and other regulations stipulated by Japan's Ministry of Health, Labour and Welfare (ER/ES regulations).

Additionally, since the software supports laboratory networking, analytical results from a broad variety of analytical instruments used in the laboratory, including LC, LCMS, GC, GCMS, UV, FTIR, RF, EDX, TOC, and PPSQ, can be managed centrally from a server.

Two Data Management Methods Available Depending on the System

■ Network System: LabSolutions CS

LabSolutions CS can freely access all instruments on the analytical network, so that all analytical data is managed on the network server and the data can be loaded to any computer connected to the network. This is especially recommended for customers that have many users and want to manage data on a server together with LC, GC, FTIR, UV, RF, EDX, TOC, PPSQ, and other data for ER/ES compliance.

■ Standalone Database System: LabSolutions DB

This configuration does not require a network connection and is ideal for customers that want to manage all data on one computer for ER/ES compliance only for a standalone system.

System Contents

Network system LabSolutions CS	LabSolutions ICPMS, LabSolutions CS Connection Kit, LabSolutions CS
Standalone database system LabSolutions DB	LabSolutions ICPMS, LabSolutions DB Connection Kit

Peripheral Equipment / Application Systems

For automatic analysis of 60 samples AS-10 Autosampler (P/N 211-93680-58)

Multiple samples can be analyzed successively. The turntable results in a short path length for sample injection, which can reduce the rinse time.

Vials: 60 15-mL vials
8 50-mL vials

Size: W290 × D508 × H300 mm (excluding arm)

Power supply: Single-phase 100–240 V, 50/60 Hz, 50 VA

Note: Requires a Power Cord.

Note: An additional rinsing port is optional (There is no automatic solvent supply).
Rinsing Port Expansion Kit for AS-10 (P/N 211-94072-41).



Cooling Water Circulator Set (P/N 211-92962-41)

Size: W377 × D500 × H615 mm

Power supply: Single-phase 200 V, 50/60 Hz, 2 kVA

Weight: 43 kg

Note: Used to cool the main unit.

Note: Requires a Chiller Connection Kit (P/N 211-93827-41).



For automatic analysis of 240 samples ASX-560 Autosampler (P/N 211-94230-01)

Vials:

10 50-mL vials (standard samples) or 240 14-mL vials

160 20-mL vials (rack sold separately)

84 50-mL vials (rack sold separately)

Size: W580 × D550 × H620 mm

(include sample probe)

W90 × D180 × H60 mm

(rough dimensions of power supply unit)

Power supply: 100–240 V AC, 47–63 Hz, 1.9 A

Weight: 11.7 kg (main unit)

Note: Requires an ASX Connection Kit ICPMS-2030 (P/N 211-94476-41).



Tap Water Connection Kit (P/N 211-90558-41)

This is required if using tap water to cool the main ICPMS-2030.

Note: Requires a Copler for Tap Water (P/N 035-60942-15).

Noise Absorbing Box, SV65 Large (P/N 225-27850-07)

Note: Requires Noise Reduction Box Connection Kit (P/N 211-93825-41) for Noise Reduction Box for Rotary Pumps.

Exhaust Duct Connection Adapter (P/N 211-93832-41)

Needed when connecting a flexible duct made of stainless steel having an internal diameter of 100 mm to the exhaust duct of the plasma stand. For details, please refer to the "Pre-Installation Requirements."

For automatic analysis of 120 samples ASX-280 Autosampler (P/N 211-94412)

Vials:

10 50-mL vials (standard samples) or 120 14-mL vials

80 20-mL vials (rack sold separately)

42 50-mL vials (rack sold separately)

Size: W360 × D550 × H660 mm

(include sample probe)

W90 × D180 × H60 mm

(rough dimensions of power supply unit)

Power supply: 100–240 V AC, 47–63 Hz, 1.9A

Weight: 8.1 kg (main unit)

Note: Requires an ASX Connection Kit ICPMS-2030 (P/N 211-94476-41).



HFS-5 Hydrofluoric Acid Sample Injection System (P/N 211-93828-41)

This system includes a torch, chamber, extension tube, nebulizer, drain, and their corresponding accessory parts.

Used to directly inject samples that contain hydrofluoric acid. The nebulizer, chamber, and drain system are made using fluoropolymer materials and the injector unit on the torch is made using alumina.

Organic Solvent Injection System

To introduce organic solvents, a mixture of argon and oxygen gases (70% Ar and 30% O₂) is injected into the interface unit to prevent precipitation of carbon (C) by the organic solvent. This system includes a Quadruple Torch for Organic Solvents, ICPMS, drain, and their corresponding accessory parts. Please inquire about the type of organic solvent supporting this system.

Automatic Internal Standard Addition Kit (P/N 211-95010-41)

This kit is used for in-line mixing of measurement sample and internal standard solutions and introducing the mixtures into the ICP system.

LC-ICP-MS System

It can be used as the LC-ICP-MS system by connecting the ICPMS-2030 and the Prominence™ inert LC system online.
Please contact us for details.



LA-ICP-MS System (Laser Ablation ICP-MS System)

The LA-ICP-MS system can be set by combining the ICPMS-2030 and other companies' laser ablation equipment.
Please contact us for details.

Accessories

	Standard Set	For Organic Solvents	For Hydrofluoric Acid Resistance
Examples of Samples	Environmental water, effluent water, water with dissolved pharmaceutical or food substances, or other acid decomposition solutions	Organic solvents	Solutions with residual hydrofluoric acid
Torches	Mini Torch, 1.1 (P/N 211-94446) Shield Screen (P/N 211-93819) 	Torch for Organic Solvents, ICPMS (P/N 211-94021-41) Bonnet for Organic Solvents (P/N 211-94047) Torch Adapter for Organic Solvents (P/N 211-93780-41) Shield Screen for Organic Solvents (P/N 211-93820) 	Demountable Torch for Hydrofluoric Acid (P/N 211-94095-41) Shield Screen (P/N 211-93819) 
Interfaces	Sampling Cone, Copper (P/N 211-90190-41)  Skimmer Cone, Copper (P/N 211-90200-41) 		
Chambers	Cyclone Chamber (P/N 211-93578) Torch Extension Pipe (P/N 211-93728) 	<ul style="list-style-type: none"> • Locking Screw, 0152 (P/N 046-00093-92) • Seal, 0237 (P/N 046-00093-93) Includes the above.	Cyclone Chamber for Hydrofluoric Acid (P/N 211-93579)  Torch Extension Pipe for HF (P/N 211-94097)  Clamp, CW30014 (P/N 037-60091-03)
Nebulizers	Nebulizer, 07UES (P/N 046-00092-21) 	<ul style="list-style-type: none"> • Suction Tube, NFTS-075 (P/N 046-00092-18) • Connector, QSM (P/N 046-00092-09) • Tube adapter, 0735 (P/N 046-00092-10) • Clamp, SNP-1 (P/N 037-6113-01) Includes the above. 	Nebulizer, PFA15 (P/N 046-00092-17) 
Drains	Drain Trap, 8214 (P/N 046-00093-01) 	Drain Trap for Organic Solvents (P/N 211-93814-01) 	Hydrofluoric Acid Resistant Drain (P/N 046-00093-06) 
Peristaltic Pump Tubes	Peristaltic Pump Tube (P/N 018-31558-44)	Peristaltic Pump Tube for Organic Solvents The parts configuration differs depending on the type of organic solvent. Please inquire about the details.	Peristaltic Pump Tube (P/N 018-31558-44)
Others	Nickel Sampling Cone (P/N 211-90190-42) Nickel Skimmer Cone (P/N 211-90200-42)	Organic Solvent System This system includes a Quadruple Torch for Organic Solvents, ICPMS, drain, and their corresponding accessory parts. Please inquire about the type of organic solvent supporting this system.	HFS-5 Hydrofluoric Acid Sample Injection System (P/N 211-93828-41) This system includes a torch, chamber, extension tube, nebulizer, drain, and their corresponding accessory parts.

Specifications

Please refer to the specification sheet for each model.

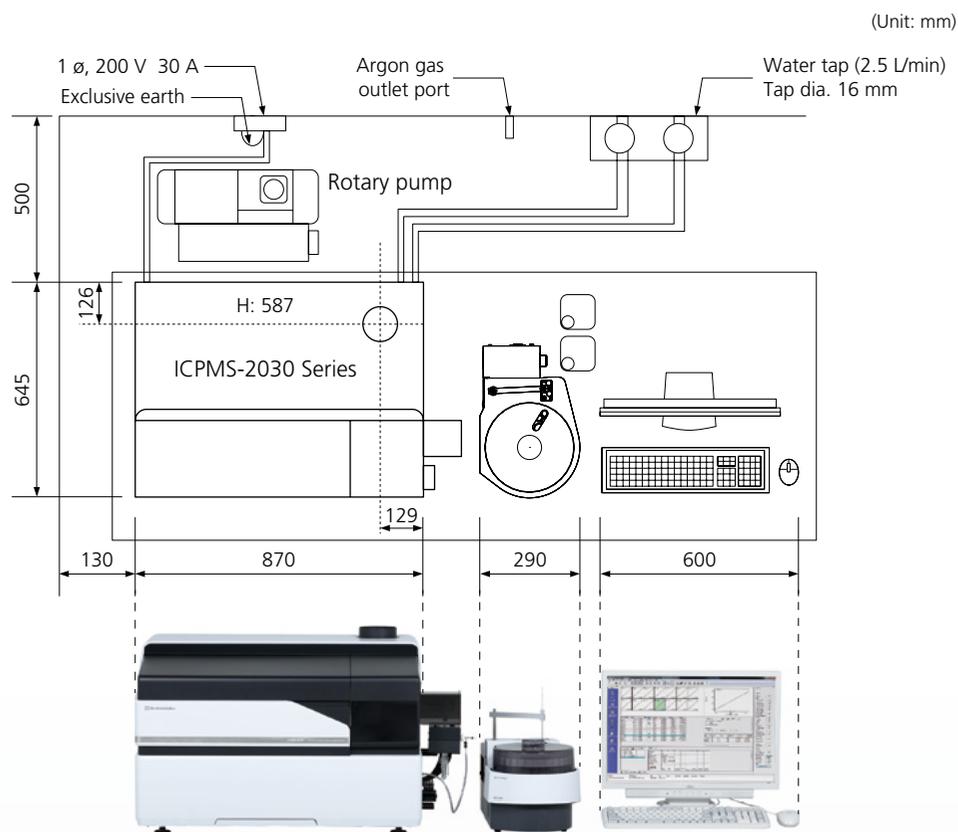
Specification Sheet ICPMS-2030 C113-E029
 Specification Sheet ICPMS-2030LF C113-E030

Installation Requirements

1. Installation Site Environment	Temperature within 18 to 28°C (max. 2°C/h temperature change) Humidity within 20 to 70% RH Avoid using the system in locations with significant vibration or dust.
2. Power Supply	Main Unit Single-phase 200 to 240 V ± 10 %, 50/60 Hz, 6 kVA Options Cooling Water Circulator Single-phase 200 to 230 V, 50/60 Hz, 2 kVA Data processing and power supply for printer are required separately.
3. Grounding	Should be grounded independently with a maximum resistance of 30.
4. Gas Supply	Type: Argon gas with 99.95% purity Helium gas with 99.999% purity Adjust the argon gas supply pressure to 450 ± 10 kPa. For 7 m ³ gas cylinders, one cylinder is required approximately every ten hours of operation. Adjust the helium gas supply pressure to 150 ± 20 kPa.
5. Cooling Water	Main unit cooling water temperature 5 to 30°C and minimum flow rate of 1 L/min
6. Exhaust Duct	Exhaust gas from the plasma stand is mostly argon, but also includes some metal vapors and solvent. Therefore, install exhaust ducting.
7. Dimensions	W 870 × D 645 × H 587 mm (excluding protrusion)
8. Weight	140 kg

Note: Refer to the "Pre-Installation Requirements" for more details.

Installation Example



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