NIC
A Rigaku Company

NIPPON INSTRUMENTS CORPORATION

RA-7000A

Discrete Direct Purge (DDP)
Reducing Vaporization CVAAS Mercury Analyzer

UNIQUE & UNMATCHED

RA-7000A

ANALYZER WITH SEAMLESS AUTOMATION FROM START TO FINISH

- Incorporating our flagship ultra-high sensitivity Cold-Vapor Atomic Absorption Spectrometry (CVAAS) detector.
- Comply to US EPA Methods 245.1, 245.2, & 7470A, JIS K0102, APHA 3112, EN 1483, ISO 12846, and more.

Easy Modular System

RA-7000A CVAAS Detector

- Detection limit down to 0.5ppt
- When the sample volume is 5mL
  Linear range : ~40ppb
  Measure range : ~400ppb

SANPRA™ (Autosampler)

- Autosamplers with different functions and capacities available.
- SANPRA™ 3/5/7 are available as options.

Excellence Award at the 50th Environmental Award Ceremony 2023

Practical and Functional Design

Detachable Reagent Rack for Easy, Safe Chemicals Refill

User can bring the reagent bottles away safely for wash and chemical refills, providing secured transportation and installation back to the system.

Drain Tank

Upright drain tank for secured storage of chemical waste

Reduces Environmental Burden

Much more environmental friendly compare to its predecessor 4th generation RA-4000 Series (based on RA-7000 with SANPRA™ 5 (80 position)

Save Resources • Less Waste • Save Energy
NICares Use Responsibly

About	Total of	About
50%	**2 Hr 40 Mins**	**30%**
Reduced Waste Disposal	Shortened Measurement Time	Minimized Power Consumption
1200mL ⟶ 600mL	11 hours 50 Minutes ⟶ 8 hours 30 minutes (comparison between RA-7000A with SANPRA™-5 against RA-4500)	0.34kg CO_2 reduction per measurement Assuming measurement 3 times/week (150 times a year) 51kg CO_2 reduced yearly

SANPRA™

Flexible Like You Want It To Be

SANPRA™ Concept – Flexibility of RA-7000A to use with more than one unit and type of SANPRA™ autosampler, to provide multiple possible configurations to best suit and cater to different application needs.

Key Thoughtful Design Features

- Automatic Sample Liquid Analysis Volume Adjustment
  (available in SANPRA™ 3 & 5 only)
- Auto-Lamp-Pausing After Measurement saves and extends lamp life
- Convenient Side Door Handle
- Wide Opening Frontage For Easy Sample Loading/Unloading
- Intelligent Sample Tube Existence Sensing Avoids Mis-Dispensing of Reagents
- Chamber Lighting To Allow Checking Sample Status At A Glance
  (Standard Features for SANPRA™ 5 & 7; Optional for SANPRA™ 3)

Types of SANPRA

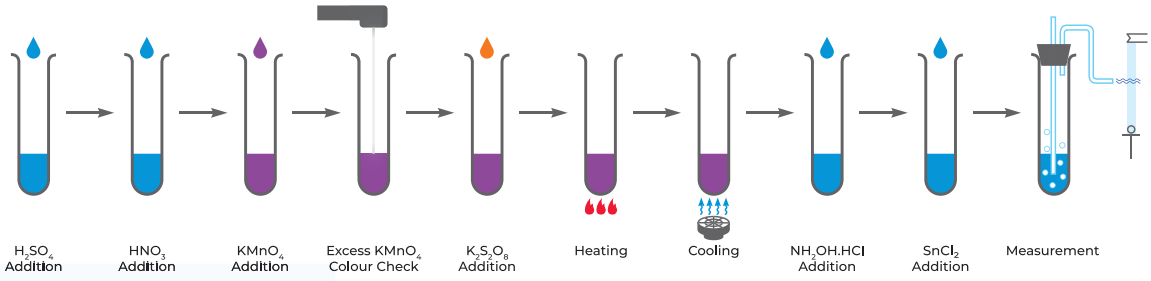
SANPRA™ 3

- 80-Positions Liquid Autosampler
- Compatible to use with Glass, Disposable Glass, Polypropylene Centrifuge Tubes

SANPRA™ 5

- 80-Positions Liquid Autosampler (Glass/Disposable Glass Tubes)
- Equipped with Fully Automated Acid Digestion Functions & Operation

Mercury Analysis in Aqueous Matrices is accomplished in 10 Fully Automated Steps using RA-7000A SANPRA™ 5



SANPRA™ 7

World's First Autosampler for Solid Matrices

- 29-Positions Solid Matrix Acid-Digestion Autosampler (50mL Polypropylene Centrifuge Tubes)
- Automate the pretreatment for solid sample such as thimble filter and others.**

Auto-Digest on SANPRA™ 5 & 7 includes:

- Reliable Infrared Heating technology and Sensing provide rapid uniform heating with precise temperature control.
- Durable acid-resistant Aluminum block is protected with an Over-Temperature Circuitry for safety operation
- Includes NIST-Traceable Temperature Calibration protocol
- Automated Dispensing reagents: H_2SO_4, HNO_3, $KMnO_4$, $K_2S_2O_8$, $NH_2OH.HCl$, $SnCl_2$

RA7000AWin – Intuitive & Practical Software

Benefits of RA7000AWin Software

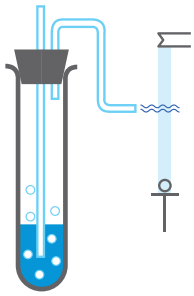
- Capable to control up to 3 units of SANPRA™ with 1 PC Software Workstation
- Brand new interface with Easy-to-Understand graphics
- Live animation to display instrument operating status
- Dilution tabulation of sample and standards solution
- Easy access of System Log Files for prompt troubleshooting
- Data file can be saved as CSV format for LIMS export compatibility

Featuring EPA 245.1 QC Validation (Optional)

Each laboratory using this method is required to operate a formal quality control (QC) program. RA7000AWin Software can perform the stringent requirements of method EPA 245.1 that includes:

- Instrument Performance Check (Blank)
- Laboratory Reagent Blank
- Instrument Performance Check (After Calibration)
- Continuing Calibration Verification
- Laboratory Fortified Blank
- Laboratory Fortified Matrix
- Quality Control Sample
- Unknown sample
- Linear Dynamic Range
- Method Detection Limit

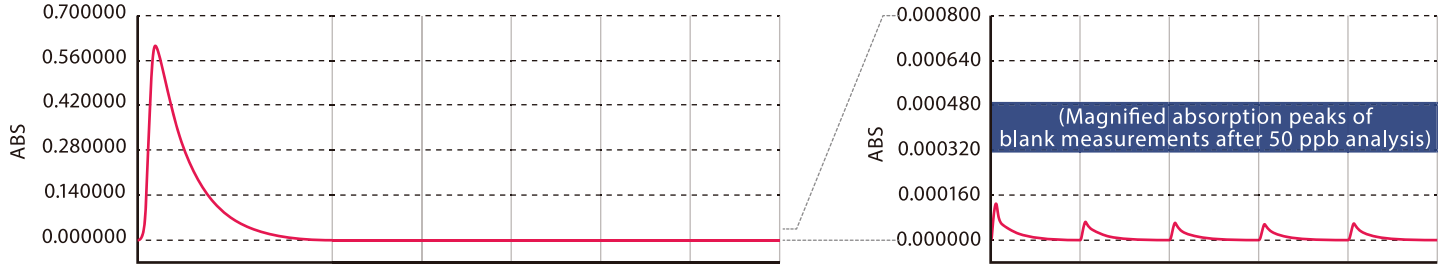
With DDP Technique, Mercury Memory Effect Is Not A Concern



Discrete-Direct-Purge (DDP) technique extracts and transfers the reduced Hg^0 from each sample tube into the detector for measurement. Only mercury vapor flows and contacts the flow path, sample-to-sample memory effects and carryover from over-range samples are virtually eliminated.

Carryover evaluation of DDP Technique with post high-concentration measurement

50 ppb (high concentration) measurement



Sample name	250ng	Blank	Blank	Blank	Blank	Blank
Measured value [ng]	252.625	0.0230	0.0093	0.0020	0.0026	0.0026
Concentration [µg/L]	50.525	0.0046	0.0019	0.0004	0.0005	0.0005

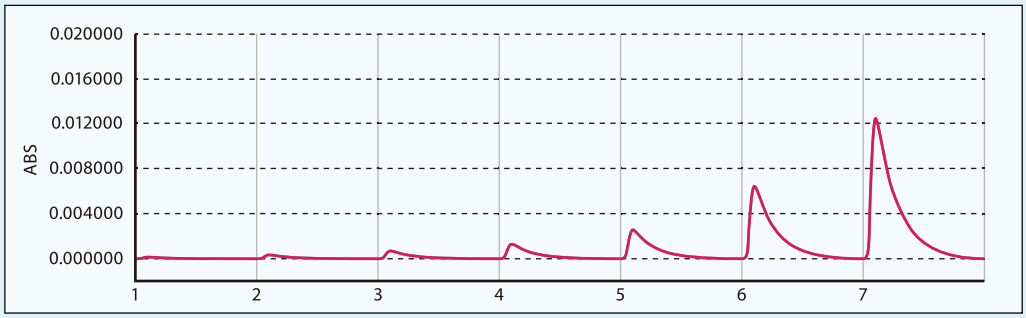
Achieves stable measurement with minimal memory effect on measurement even after high-concentration detection.

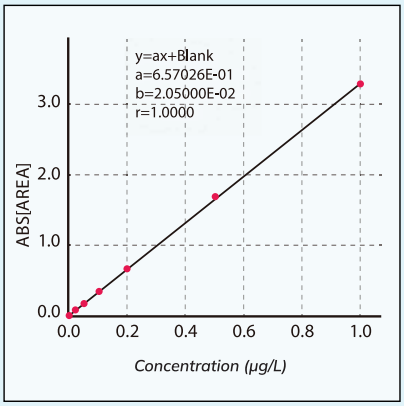
Best-In-Class Engineering and Performance

Better optics, better components, better design and automation are the hallmarks of all Nippon Instruments Corporation (NIC) products

Unparalleled Stability Even Down to Sub-PPB Levels

Calibration curve (conditions: sample volume 5 mL, with pretreatment)



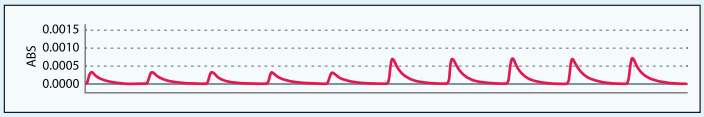


Standard Solutions [µg/L]	Blank	0.02	0.05	0.10	0.20	0.50	1.00
ABS (AREA)	0.0205	0.0879	0.1880	0.3552	0.67800	0.6887	3.2919
Measured Concentration [µg/L]	0	0.021	0.051	0.102	0.200	0.508	0.996
Deviation [%]	-	2.6	2.0	1.9	0.1	1.6	0.4

Uncompromised Accuracy and Precision

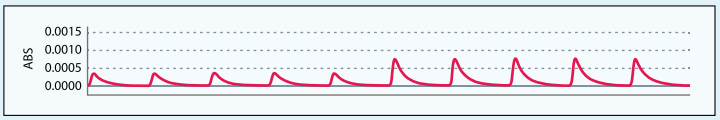
Mercury Chloride Reproducibility (n=5)

Pre-treatment	Sample	Average	RSD	Recovery
(None) Measurement with H_2SO_4 and $SnCl_2$	0.020 µg/L	0.0202 µg/L	1.6 %	101 %
	0.050 µg/L	0.0505 µg/L	0.6 %	101 %
Yes	0.020 µg/L	0.0200 µg/L	3.8 %	100 %
	0.050 µg/L	0.0501µg/L	0.6 %	100 %



Methylmercury Chloride Reproducibility (n=5)

Pre-treatment	Sample	Average	RSD	Recovery
Yes	0.021 µg/L	0.0215 µg/L	4.2 %	102 %
	0.052 µg/L	0.0535 µg/L	2.0 %	103 %



Dependable and Well-Proven Performance

Sample

Seawater Reproducibility (n=5)

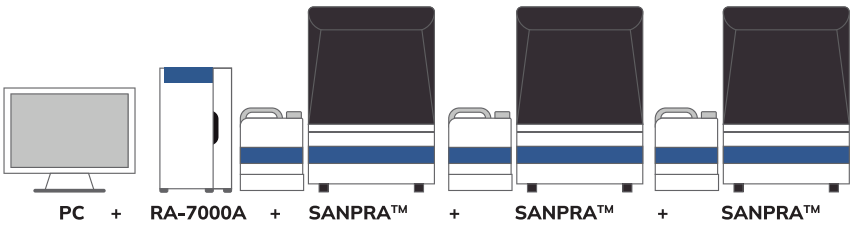
Sample	Average Value	RSD	Spiked Mercury Standard Recovery
Seawater	(0.0005 µg/L)*	-	-
Seawater + $HgCl_2$ 0.02 µg/L	0.0213 µg/L	1.9 %	104 %
Seawater + $HgCl_2$ 0.05 µg/L	0.0497 µg/L	2.5 %	98 %
Seawater + CH_3HgCl 0.05 µg/L	0.0509 µg/L	1.3 %	101 %

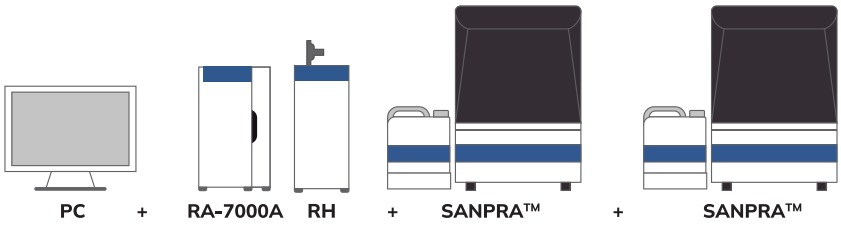
Below detection limit

Wastewater Reproducibility (n=5) JIS K0102

Sample	Average Value	RSD	Spiked Mercury Standard Recovery
Waste water 1	0.0248 µg/L	5.3 %	99 %
Waste water 2	2.52 µg/L	2.1 %	100 %

Versatile High Sample Throughput Configurations of RA-7000A with SANPRA™





Productivity Up to 240 Samples Per Batch

3 units of SANPRA™ can be used with one (1) unit of RA-7000A at the same time

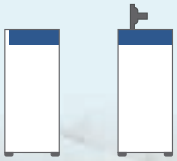
Increase Functionality/Scope of Sample Matrices

RA-7000A can control a combination of 2 units of SANPRA™ and 1 RH Gas Module

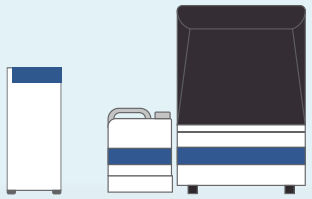
Or, you can start with the basic - Flexible as you want it to be

Start using RA-7000A with a basic reducing vaporization/Impinger apparatus, RH Gas Module or a SANPRA™ of your choice. Scale up or upgrade only when you need to.

Start using RA-7000A with a basic impinger unit (5/20/100/250mL)



Use with a RH Gas Module to start analyzing Gaseous Elemental Mercury trapped using Mercury Collector Tube.
(GEM sampling kit, SK-1000A is available)



Use RA-7000A with 1 unit of SANPRA™ and upscale it when necessary

Product images are for illustrative purposes only and may differ from the actual product

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