Hitachi Polarized Zeeman Atomic
Absorption Spectrophotometer
ZA3000 Series

Hitachi High-Tech
HITACHI

ZA3000 Series
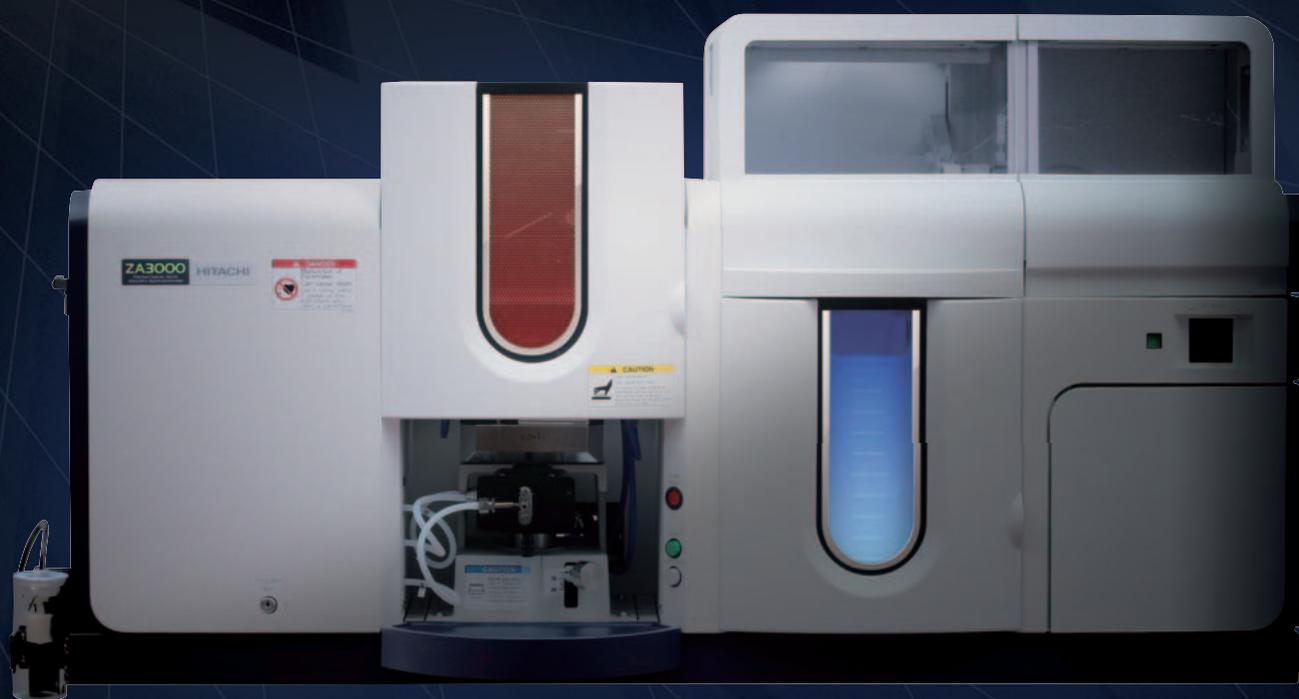
Never Ending Evolution of Hitachi Zeeman Atomic Absorption Spectrophotometer

ZA3000 Series

ZA3000 is the new elemental analyzer which continued the fundamental performance of the high precision and sensitive analysis of polarized Zeeman Atomic Absorption Spectrophotometer, and improved functionality and reliability in response to the User's needs.
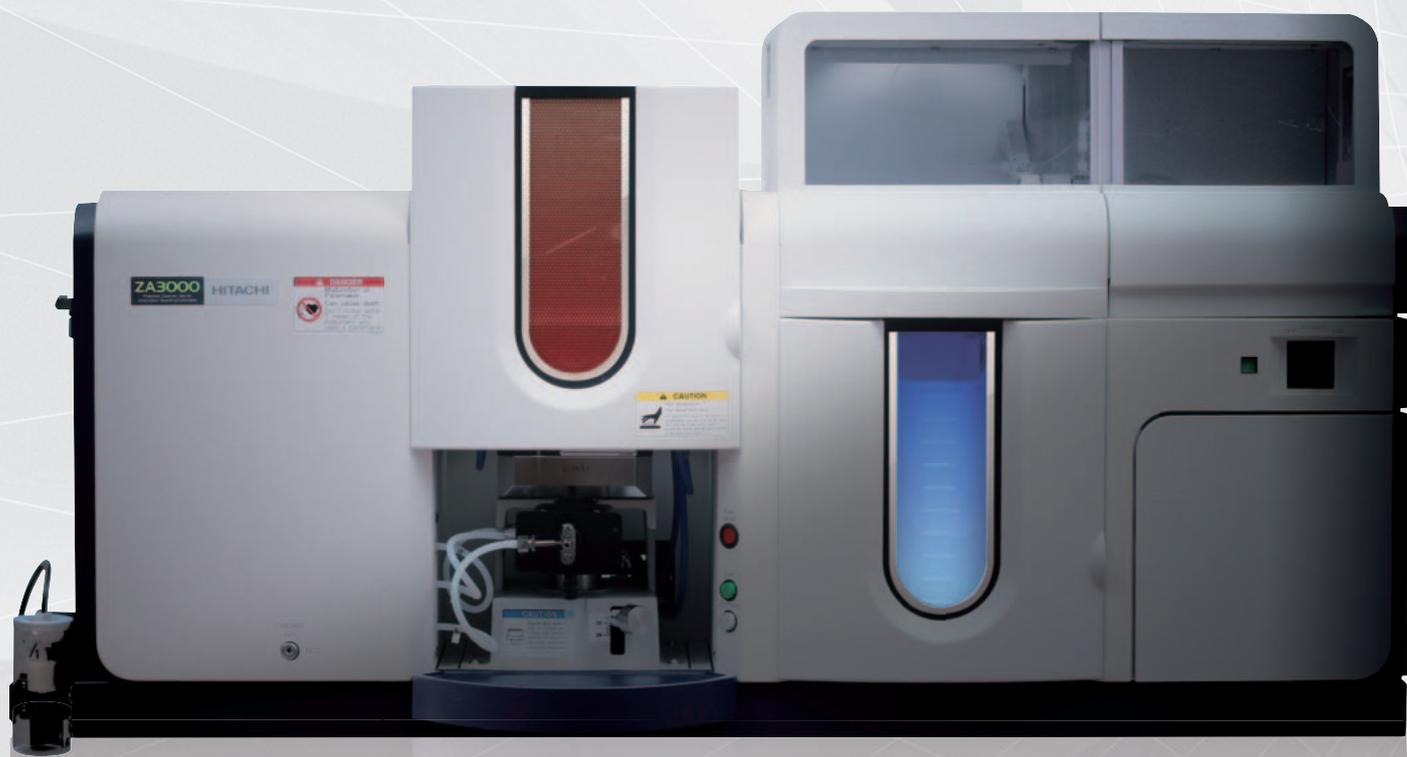
Tandem(Flame & Graphite Furnace) type AAS

ZA3000

ZA3000 Series Line-up
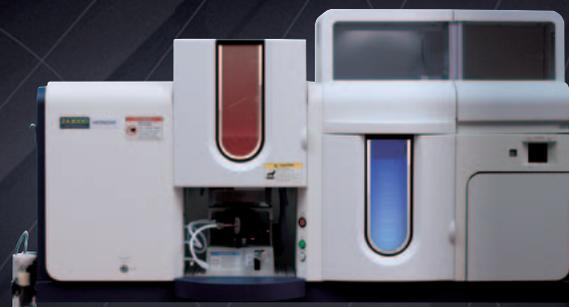
SYSTEM PERFORMANCE

❚ Polarized Zeeman Method and Dual Detector

❚ Separated atomization compartment

❚ Environmental performance

FUNCTION

❚ Analysis Assist (voice guidance) and Real Time QC **P.8**

❚ Easy Start **P.8**

❚ Twin injection technology **P.9**

❚ Fast dispensing by graphite furnace autosampler **P.10**

EASY TO USE

❚ User assistant switches for flame analysis **P.8**

❚ Graphite furnace autosampler built in the main unit **P.10**

❚ Graphite furnace dustproof cover standard-equipped **P.10**

❚ Simple, GUI style operation **P.11**

Flame AAS

ZA3300
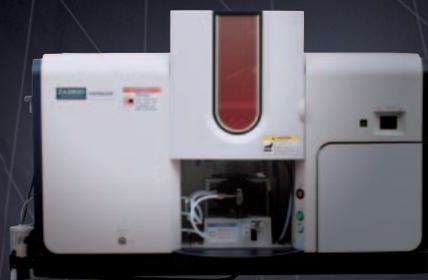
Graphite Furnace AAS

ZA3700
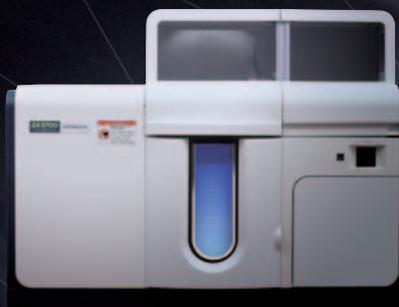
High Precision of Measurement Owing to Dual Detector Method

High Sensitivity and High Performance

A real-time background correction is realized by simultaneous measurement of sample light and reference light with two different detectors. Reproducibility and stability of analysis are improved by requiring no mechanism of switching the optical axis.
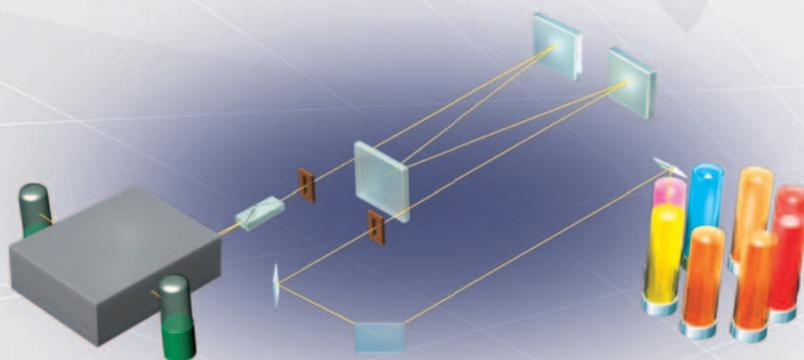
The new optical system and the improved graphite furnace power supply circuit ensure high sensitivities. Using an ordinary hollow cathode lamp, the ZA3000 Series spectrophotometer is capable of analyzing As, Se and Sb in tap water and environmental water, which previously have only been measurable using an EDL high-intensity or high-power lamp in a conventional graphite furnace analyses. This shows how noise can be reduced significantly to ensure high sensitivity.

Conventional (a high-intensity lamp required) hollow cathode lamp

ZA3000 hollow cathode lamp   As 1 µg/L
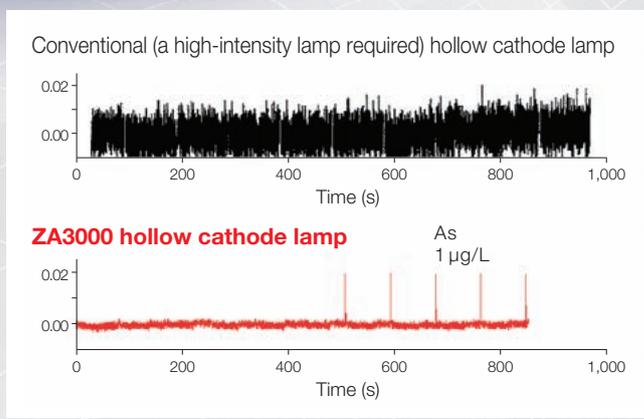
Principle of Polarized Zeeman Correction

When a magnetic field is applied to a sample, the light component polarized parallel to the magnetic field (P//) is absorbed by the atoms of the sample, while the light component polarized perpendicular to the magnetic field (P⊥) is absorbed to a small extent by the atoms of the sample. On the other hand, background components, such as molecules and particles, are not affected by the applied magnetic field. Accordingly, both the light components, P// and P⊥, are attenuated by the background components by the same amount. As a result, the background contribution of absorption can be eliminated by taking the difference between the signals of two light components, thereby the desired atomic absorption signal is obtained.

Since the same light source is used to measure both light components, P// and P⊥, full double beam photometry is obtained, and accurate background correction is obtained throughout the entire wavelength range. With a continuous spectrum light source such as the D2 lamp, molecular absorption can be corrected only within a limited wavelength region, but neighboring line absorption cannot be corrected. Further, in case of self-reverse method, there is a problem of a significant decrease in sensitivity depending on the element to be analyzed. There are other problems that the light beam is not precisely equivalent between low current and high current conditions, and that the dedicated light source lamp has heavy consumption.

● Polarized component parallel to magnetic field P//

Background
Spectrum of sample
Spectrum of light source
Wavelength
Background
Atomic absorption

● Polarized component perpendicular to magnetic field P⊥

Background
Spectrum of sample
Spectrum of light source
Wavelength
Background

Difference in absorption → Atomic absorption
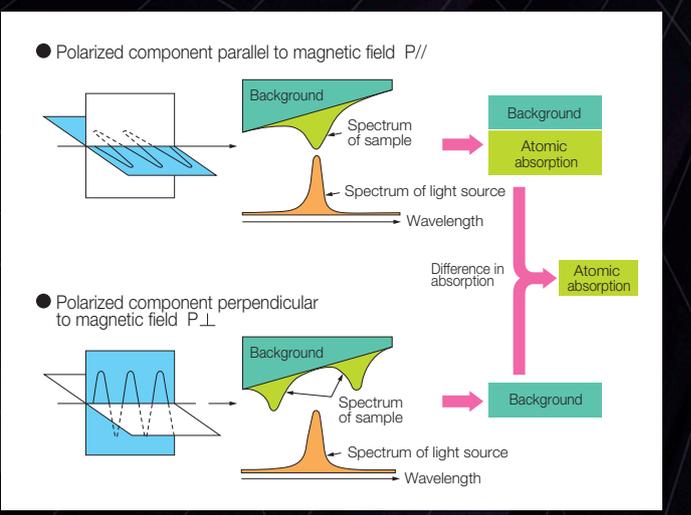
# Analysis of High Reliability Using the Polarized Zeeman Method

Baseline Stability

Analysis of high precision can be realized by means of double beam photometry. A stable baseline is provided for both flame analysis and graphite furnace analysis. The baseline stability is not affected by the introduction of an organic solvent.

Element : Cu
Wave length : 324.8 nm
Flame type : Air-acetylene
Time constant : 0.2 s

|				
1 min				MIBK
		MIBK	MIBK	
Deuterium lamp method	WATER	WATER	WATER	WATER
FUEL (ACETYLENE) FLOW	FLAME OFF	1.7 L/min	2.0 L/min	2.3 L/min	2.6 L/min
Polarized Zeeman method	WATER MIBK	WATER MIBK	WATER MIBK	WATER MIBK

Quick Start up Saves Running Cost

Ideal double beam photometry using polarized Zeeman method is provided for both flame analysis and graphite furnace analysis. In case of Pb and Zn analyses, it usually takes 10 to 25 minutes before the baseline becomes stable. In case of the polarized Zeeman method, however, the baseline is stable immediately after turning on the hollow cathode lamp. Since stabilization time is not needed for the hollow cathode lamp, most of the lamp service life can be used for the analysis, thus running cost can be saved substantially.

0.1ABS

Zn
Pb
Zn
Pb
Hg
Hg

1min

| Lamp lighting | 5 | 10 | 15 | 20 min |

Zn : 213.9 nm — Zeeman atomic absorption spectrophotometer
Pb : 283.3 nm
Hg : 253.7 nm — Conventional single-beam atomic absorption spectrophotometer
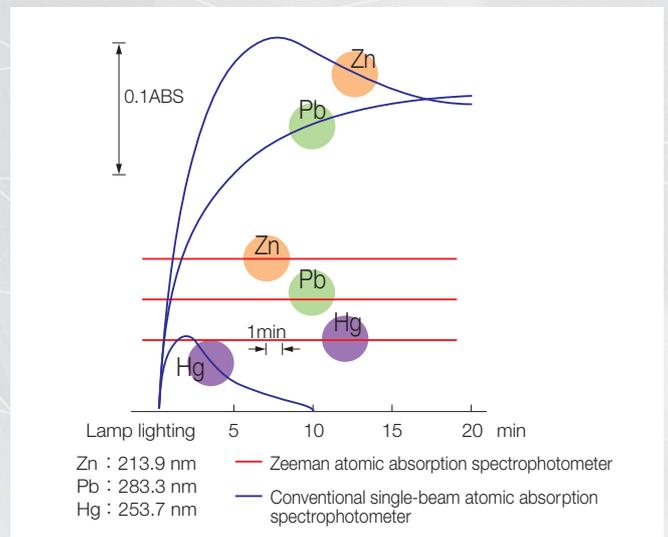
## Background Correction for Entire Wavelength Range using Only Hollow Cathode Lamp

Background correction can be carried out over the entire wavelength range using light from the hollow cathode lamp for measurement. The capability of performing atomic absorption and background correction at the same wavelength and in the same spectral width is one of the major advantages of the polarized Zeeman method.

190 nm   360 nm

Deuterium lamp method

900 nm

Polarized Zeeman method

As Cd Pb   Cr Ca   Ba Na Li   K   Cs

200   400   600   800 nm

Wavelength
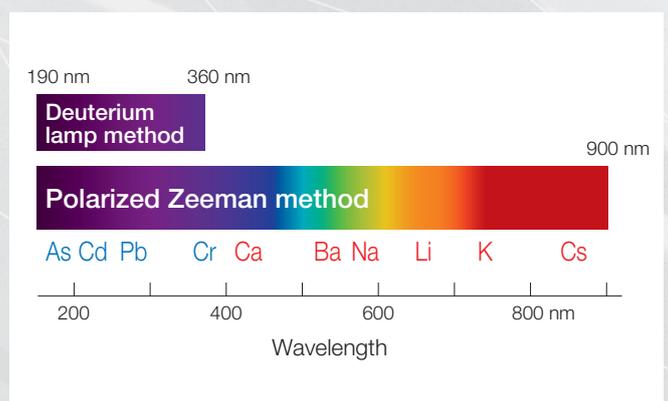
Switching the Method of Analysis is Very Simple

Stable Optical System

The simple operation of only the software on PC allows switching of the atomizer between flame analysis and graphite furnace analysis. Since atomizer replacement is unnecessary, optical axis adjustment of D_2 and hollow cathode lamp is also unnecessary. Flame analysis or graphite furnace analysis can be easily selected depending on the sample volume and the concentration.
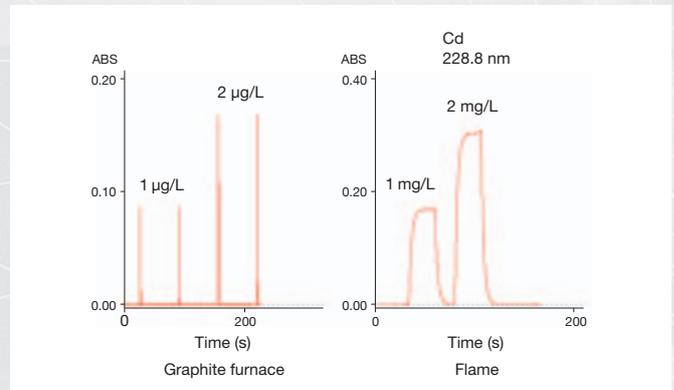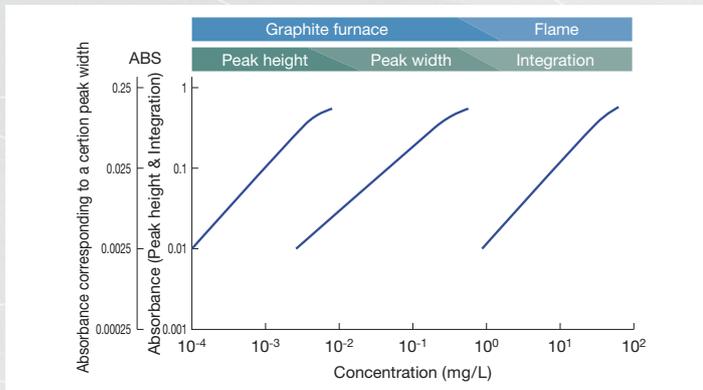
Kind to the Environment

Ecology

The consumption of cooling water and electric power is saved during stand-by of ZA3000 series spectrophotometers. They are equipped with water saving mode and power saving mode, which operate when the stand-by condition lasts for a certain period of time.

【Water saving mode】········ The feed of cooling water is stopped (model ZA3000 is equipped with it).

【Power saving mode】········ Hollow cathode lamp is turned off.
The power consumption of the autosampler is saved (Both models ZA3000 and ZA3700 are equipped with it).

＊Water saving mode and power saving mode can be enabled or disabled, as desired.

History of Hitachi Polarized Zeeman Atomic Absorption Spectrophotometers

Since the development of our first model 501 Hitachi Polarized Zeeman Atomic Absorption Spectrophotometer in 1973, before the rest of the world, many series of products have been released, and now our products are regularly used by about 9,000 customers in 25 countries all over the world.
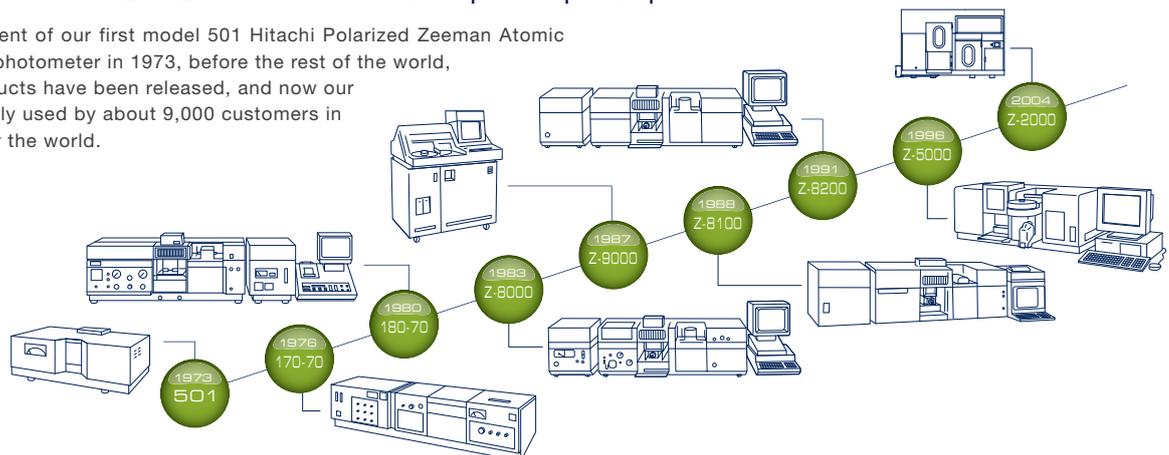
Analyses in various of Fields of Application

Applications

[Public health, environmental measurement]
River water, Seawater, Industrial wastewater, Atmospheric dust, etc.

[Petrochemical industry]
Plastics, Various kinds of oil, etc.

[Metalworking industry, metallurgy]
Steel, Nonferrous metal, Alloy, Ore, etc.

[Nonmetallic industry]
Fiber, Paper, Cement, Cosmetics, etc.
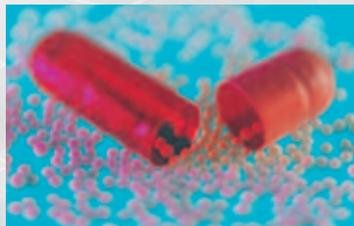
[Food industry]
Food, Food additives, etc.

[Agriculture, forestry, fisheries]
Animals, Plants, Fish, Soil, Fertilizer, etc.

[biotechnology, pharmacy]
Biochemistry, Drugs, etc.

Compatible with Many Elements

Background correction by using the combination of the polarized Zeeman method and dual detector allows accurate analysis of samples containing many matrix.

Note: The non-colored elements cannot be assayed

- ○ Graphite furnace
- N_2O C_2H_2
- AIR C_2H_2
- Hydrides

- ▌ Polarized Zeeman method is adopted, which features low noise, high stability, and high throughput
- ▌ Easy to use thanks to Analysis Assist, Real Time QC, and Easy Start functions
- ▌ Improved safety owing to computer-controlled flame ignition sequence
- ▌ Labor assistant switches convenient for "Measurement start"

● SYSTEM PERFORMANCE

Polarized Zeeman Method and Dual Detector

The Polarized Zeeman method and the dual detector allows concurrent detection of sample beam and reference beam, and a truly real-time background correction is thus realized.

2 g of sample take in vial, add 20 mL of 1 mol/L HCl solution, shake for 1 hour and pass through a 0.45 μm filter.

Results of Cd in NIES No.10

Sample	Analytical value (μg/g)	Certified value (μg/g)
No.10-a	0.025	0.023 ± 0.003
No.10-b	0.310	0.32 ± 0.02
No.10-c	1.765	1.82 ± 0.06

NIES CRM No.10 : Rice Flour Unpolished
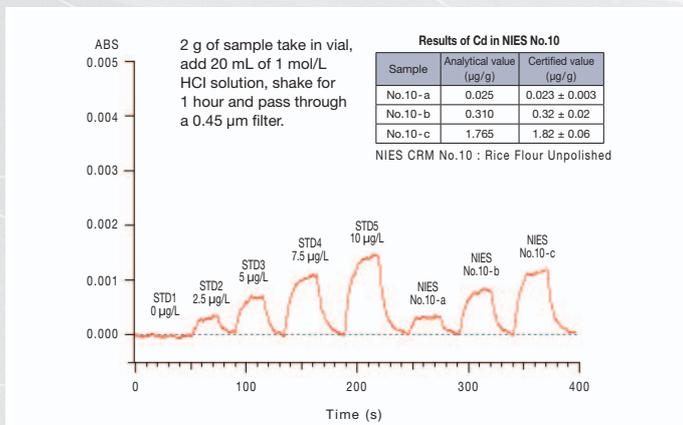
Cadmium concentration levels of μg/L can be accurately assayed.

Results of Measurement of Cesium Contained in Drain

Sample	Analytical value (mg/L)	Spike Amount (mg/L)	Spike Recovery (%)
Drain	ND	—	—
	0.96	1	96.0
	2.91	3	97.0
	5.18	5	103.6
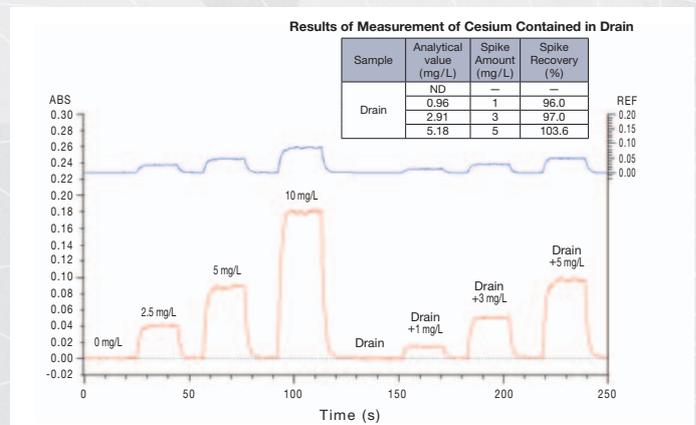
Even for cesium, which has a long absorption wavelength (852.1 nm), accurate background correction can be achieved.

Baseline Stability

A stable baseline is provided by the Polarized Zeeman method and the dual detector.

Results of Measurement of Lead Contained in River Water

Sample	Measured Value (mg/L)	Spike Recovery (%)
River water	ND	—
River water+0.05mg/L	0.053 ± 0.001	106
River water+0.1mg/L	0.103 ± 0.001	103
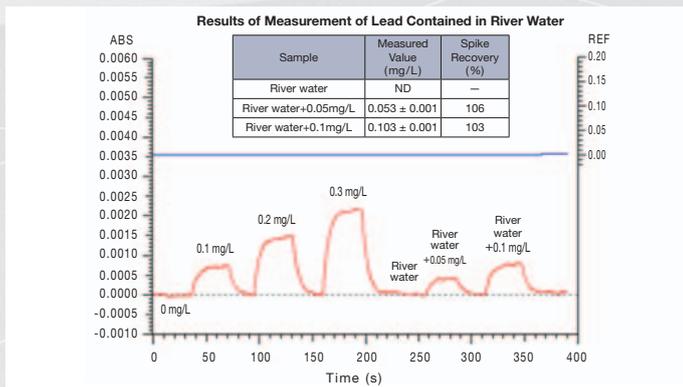
Since the baseline is stable, lead concentration levels of 0.1 mg/L can be accurately analyzed.

Conventional method	**Micro-sampling method**
Element : Cu Wavelength : 324.8 nm Time constant : 2 s	Element : Cu Wavelength : 324.8 nm Time constant : 0.2 s Sample volume : 100 μL
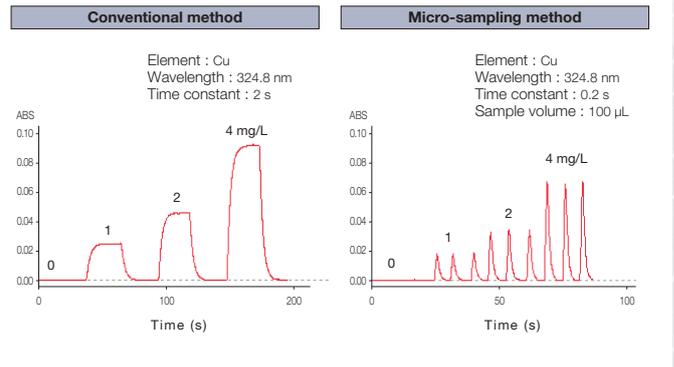
Since the baseline is stable, the method of micro sampling can be effectively carried out.

Water Saving and Power Saving [NEW]

When the stand-by condition lasts for a certain period of time, for example, after the completion of analysis, the feed of cooling water is stopped (water saving mode), and the hollow cathode lamp is turned off (power saving mode). The water saving mode and power saving mode can be enabled or disabled, as desired.

＊ The water saving mode equip with the ZA3000 only.

Safety Functions

- ● Computer-controlled flame ignition and extinguishing sequence
- ● Continuous monitoring of combustion gas pressure (upper and lower limits)
- ● Monitoring of supporting gas pressure
- ● Automatic gas feed stop at flame turning-off
- ● Interlock mechanism for dinitrogen oxide - acetylene gas burner head
- ● Monitoring of burner drain level
- ● Monitoring of cooling water flow rate
- ● Prevention of backfire caused by supporting gas buffer tank at power failure
- ● Monitoring of malfunction of solenoid valve opening and closing
- ● Monitoring of flame sensor abnormalities
- ● Gas leakage check at flame ignition


Safety-minded ignition sequence

FUNCTION

Easy Start

Measurement is automatically started at the appropriate timing which is judged by the system on sample injection.Users can carry out an experiment without forcusing their attention on the monitor.


Measurement is started.

Measurement is complete.

Aspirate next sample.
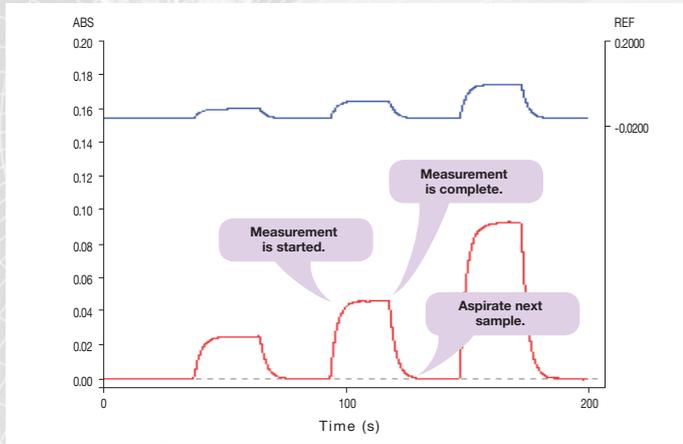
Analysis Assist Provides Simple Operation

Progress of measurement is supported by screen messages and voice guidance during analysis.

Ready for measureing. Aspirate the standard 1.

Measurement is started.

Real Time QC

QC check can be carried out in parallel with measurement, thereby securing the accuracy of measurement, not only for the analysis using an autosampler, but also for the analysis by manual operation.
● Calibration check
● Concentration/ reproducibility check
● QC sample check, etc.

Coefficient of working curve is not valid.Most distant standard will be measured again. Aspirate standard 3.
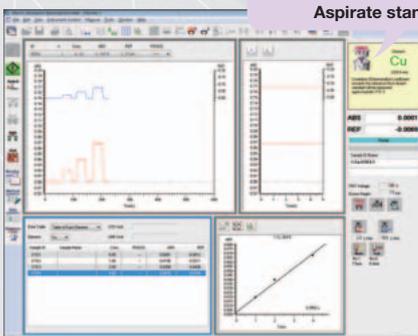
EASY TO USE

Automatic Setting of Analytical Conditions

Equipped with a large turret-type lamp holder, on which 8 hollow cathode lamps can be mounted. Lamp positioning, fine adjustment, and lamp current setting are all carried out automatically for the element to be measured. Spectral peaks can be located accurately owing to the micro-drive spectrum search function. The spectral profile is displayed on the screen, along with useful information, such as neighboring spectral lines.

Improved Operability thanks to User assistant Switches

The remote-control switches previously available at option are now replaced with ones standard-equipped on the main unit. Manual analysis can be carried out by switch operation on the instrument front.


Hydride Generating Unit (option)

Also for measurement using the hydride generating unit (HFS-3), a stable baseline can be achieved with measurement by the Polarized Zeeman method. There is no need for troublesome waiting time for lamp stabilization.
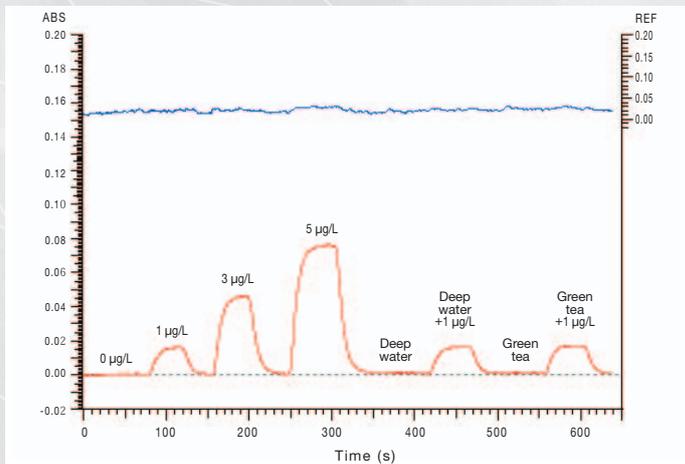
The baseline is stable immediately after turning on the hollow cathode lamp, and an arsenic concentration levels of 1 µg/L can be readily measured.

GRAPHITE FURNACE

▌ High accuracy background correction is available owing to the use of the DC polarized Zeeman method

▌ Main body integral standardly equipped with autosampler and graphite furnace dustproof cover

▌ Improved accuracy of measurement for large volume samples owing to twin injection technology

▌ Automatic bumping detection function allows detection of sample bumping during drying process

● SYSTEM PERFORMANCE

### Polarized Zeeman Method and Dual Detector Method

The combined method of the Polarized Zeeman method and the dual detector allows concurrent detection of sample beam and reference beam, and a truly real-time background correction is realized.
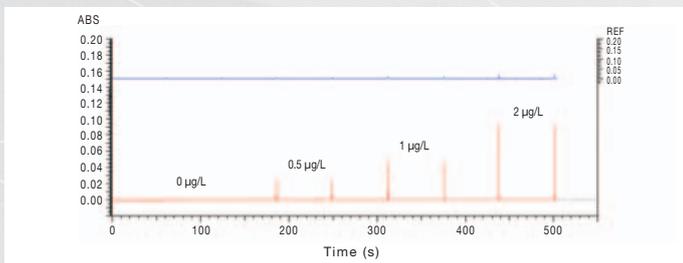
Low concentration levels of cadmium can be measured with a high reproducibility.

### Water Saving and Power Saving **NEW**

When the stand-by condition lasts for a certain period of time, for example, after the completion of the analysis, the feed of cooling water is stopped (water saving mode), and the hollow cathode lamp is turned off and the autosampler power consumption is reduced (power saving mode). The water saving mode and power saving mode can be enabled or disabled, as desired.

＊ The water saving mode equip with the ZA3000 only.
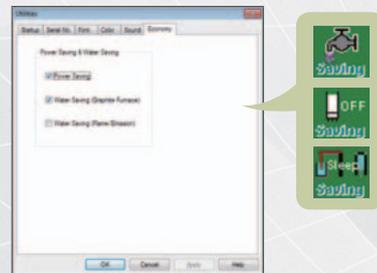
● FUNCTION

Twin Injection Technology **NEW**

Sensitivity can be improved readily by injecting a large volume of sample. There are two sample injection holes in the cuvette. By preparing two sample injection holes, the contact area between sample and cuvette becomes larger, thereby the efficiency of heat conduction to the sample is improved. Consequently, a shorter duration of drying process is allowed even for the analysis of a sample with a large volume.

Pyro tube D HR 【7J1-8500】

Inject half of the sample into one hole

Inject the remaining sample into the other hole
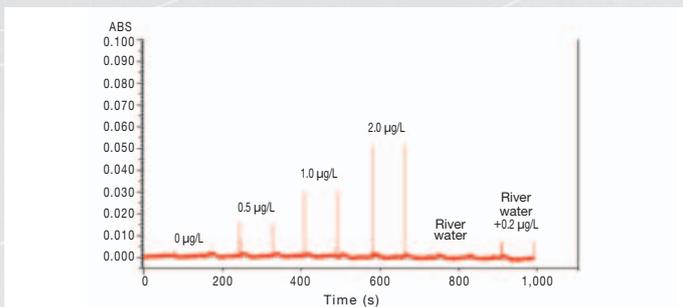
Antimony concentration levels of 0.2 µg/L contained in river water can be measured without concentrating by heating.
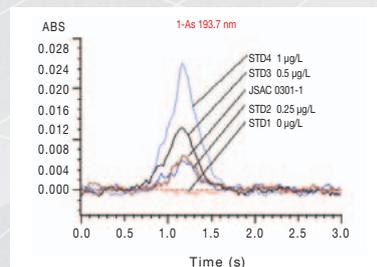
*JSAC 0301-1 は（公社）日本分析化学会が頒布する河川認証標準物質
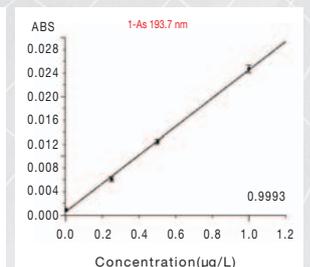
Arsenic concentration levels of 0.2 µg/L contained in river water can be measured without concentrating by heating.

Temperature Program Development Function

A temperature program, by which the maximum absorbance or the minimum RSD can be achieved, can be generated automatically by carrying out test cycles with step-wise incremental temperature parameters for drying, ashing, and atomization.
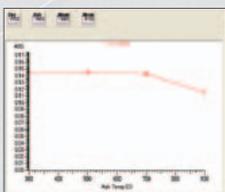
Ashing Temperature Graph
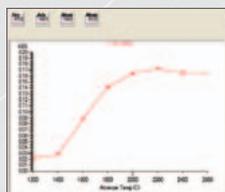
Atomization Temperature Graph

Cuvette Cleaning **NEW**

This function minimizes memory effects of high melting point elements, which may be left in the cuvette after previous measurement, by heating the cuvette before subsequent measurement. There are two ways of heating treatment: One is "Heating" mode, in which the duration of maximum heating is specified, and the other is "Temperature Program" mode, in which a desired cleaning temperature program is specified.

ZA3000 ZA3700
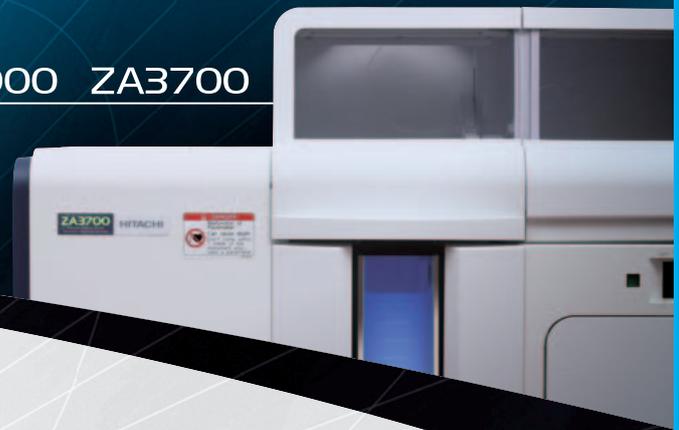
● FUNCTION

Four Kinds of Matrix Modifiers Can Be Applied

Addition of appropriate reagent(s) to the sample can lead to interference suppression and sensitivity improvement. Further, since the ashing temperature is increased, the reagent addition is effective for the removal of organic substances and other coexisting substances, possibly leading to the improvement of spike recovery of the target element, the improvement of the limit of detection, and the removal of background components. The appropriate matrix modifiers depend on the element of analysis, and up to four kinds of matrix modifiers can be applied.

Effect of each matrix modifier for Sn

Sn 100 µg/L
- ● Not added
- ✕ Palladium nitrate   500 mg/L added
- ○ Nickel nitrate   1,000 mg/L added
- △ Magnesium nitrate 1,000 mg/L added
- □ Aluminum nitrate   1% added
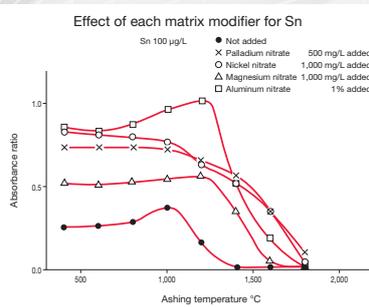
Bumping Detection of the Sample   **NEW**

If sample bumping occurs during the drying process, the accuracy of measurement would be compromised. Sample bumping is monitored during measurement, and the "P" label is attached to the measured value when sample bumping is suspected during measurement. Accordingly, the possible occurrence of sample bumping can be checked after the measurement, and this information is useful for the analysis of factors responsible for poor reproducibility.
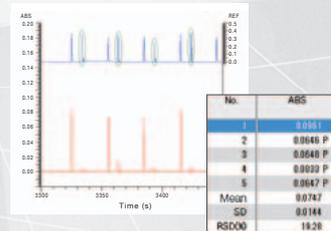
High-performance Omega Platform Cuvette

High accuracy analysis of samples containing a lot of coexisting substances is possible. By carrying out the sample atomization when thermal equilibrium within the cuvette is achieved, interference caused by the coexisting substances can be reduced. Interference caused by the matrix can be reduced, and high accuracy analysis is possible.

Sample	Measured Value (ng/g)	Certified Value (ng/g)
INCT-SBF-4	132.3	129.1 ± 4.3

Soybean sample +20 µg/L
Soybean sample +10 µg/L
Soybean sample +5 µg/L
Soybean sample +0 µg/L
Blank
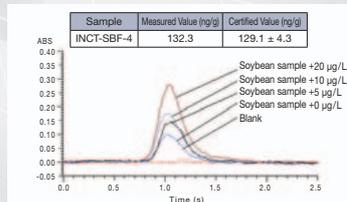
Measurement of Cs in soybean.

Alternate Gas is Available (optional)

An alternate gas, other than Ar gas, can be used during the ashing process. By the use of Ar gas containing 5 to 10% of oxygen, interference caused by background or coexisting substances can be reduced.
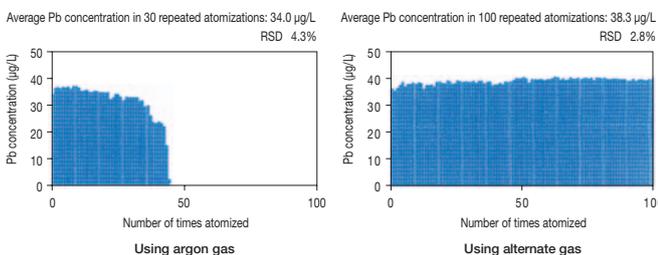
Average Pb concentration in 30 repeated atomizations: 34.0 µg/L
RSD 4.3%

Using argon gas

Average Pb concentration in 100 repeated atomizations: 38.3 µg/L
RSD 2.8%

Using alternate gas

● EASY TO USE

Automatic Setting of Analytical Conditions

Equipped with a large turret-type lamp holder, on which 8 hollow cathode lamps can be mounted. Lamp positioning, fine adjustment, and lamp current setting are all carried out automatically for the element to be measured. Spectral peaks can be located accurately owing to the micro-drive spectrum search function. The spectral profile is displayed on the screen, along with useful information, such as neighboring spectral lines. The carrier gas flow rate at each stage of heating to specified temperatures is under automatic control by computer. Optical temperature control is utilized for atomization heating. Analyses of high sensitivity and high accuracy can be accomplished.

High-performance Autosampler Built in the Main Body

- Up to 60 samples can be loaded.
- Only the specified samples can be measured by the use of random-access function.
- Sample injection volume can be specified up to 100 µL in increments of 1 µL.
- Sample injection speed can be selected among 5 speeds depending on the liquid characteristics of sample.
- An appropriate concentration of the sample can be achieved by the use of either the inner-furnace concentrating or the inner-furnace dilution mode.
- Methanol, ethanol, MIBK, and other organic solvent samples can be measured.
- 96 Micro-plates (optional) can be used for sample injection.

Fast Dispensing by Autosampler (Contiguous Injection)   **NEW**

When multiple solutions of sample and matrix modifiers are injected into the cuvette, the first solution is sucked, then air, then another solution, then air, and so on. Finally, the multiple solutions that are sucked are injected all together into the cuvette. The vigorous injection facilitates the mixing of the sample with matrix modifiers. Due to this mixing effect, the concentration or the addition volume of matrix modifiers may be lowered. In the case of dispensing 20 µL of a sample plus 10 µL of a matrix modifier, the dispensing time can be reduced by about 40% compared with the usual dispensing method.

Dustproof Cover

A dustproof cover is standardly mounted above the graphite furnace and autosampler to prevent the ingress of dust in the laboratory. In addition, since the cover facing the autosampler can be opened separately to allow frequent access to the autosampler for sample replacement, the atomization section is constructed to be more resistant to pollution.

Standard solution

Unknown sample

Superior reproducibility
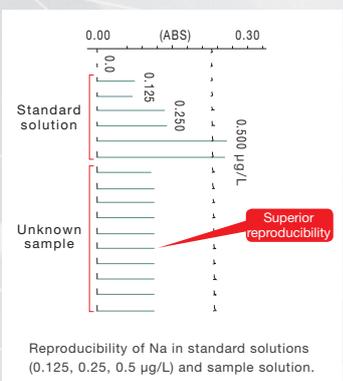
Reproducibility of Na in standard solutions (0.125, 0.25, 0.5 µg/L) and sample solution.

LED for Illuminating Graphite Furnace   **NEW**

LED is incorporated to illuminate the graphite furnace section. As a result, the visibility during position adjustment of the autosampler nozzle or cuvette replacement is improved, also facilitating maintenance works.

USER INTERFACE

- In addition to full-content functions, simple, improved GUI style operation is offered
- All the information during measurement is put together on the Monitor Screen
- Custom report generation function using Excel® (Report Generator) is incorporated
- Measurement parameters can be specified readily in a sequential manner

Monitor Screen
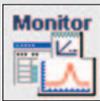
Signals during measurement (Zeeman correction signal and background signal) are displayed in a real-time manner. This screen displays measurement and atomization profiles, results of measurement, calibration curve, and other pertinent information, that are definitely useful for check the status of measurement.

Measurement profile

Atomization profile

A character corresponding to the method of analysis is shown here

Target element and wavelength are shown here

ABS and REF values are shown here

Status of apparatus is shown here

Results of measurement

Calibration curve

Get wanted information on sight.

Data Processing Screen

Operation and data processing regarding multiple elements can be readily carried out. This screen displays results of measurement, atomization profile, calibration curve, and other pertinent information, facilitating your desired operations. Data processing operation is also available even during measurement owing to multi tasking. Regarding report output after data processing, Report Generator is offered; Report Generator allows you to generate your custom reports using Excel® in the desired format in addition to the incorporated existing formats.

Results of measurement

Atomization profile

Calibration curve
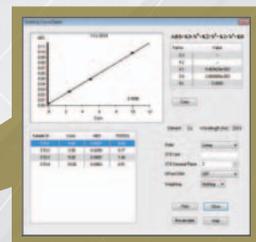
Even during measurement, previously acquired data can be checked or edited.
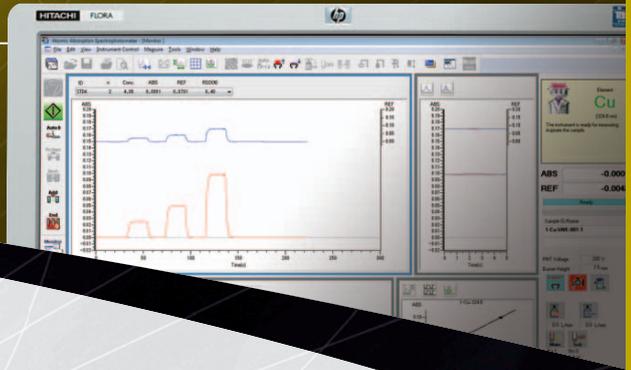
Parameters Setting Screen

On this screen, you can select the element to be analyzed and specify parameters of measurement. To do this, you just follow the prompts displayed on the screen. Up to 12 elements can be measured when a composite lamp is used. In case of sequential analysis of multiple elements, parameters of measurement for each kind of element can be specified together. You can also check the information of analysis for a specified element.
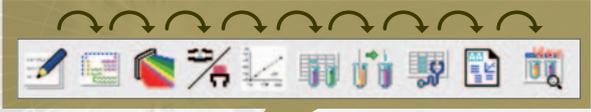
Since specified parameters of measurement can be saved.
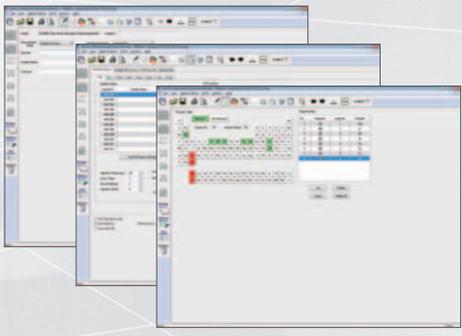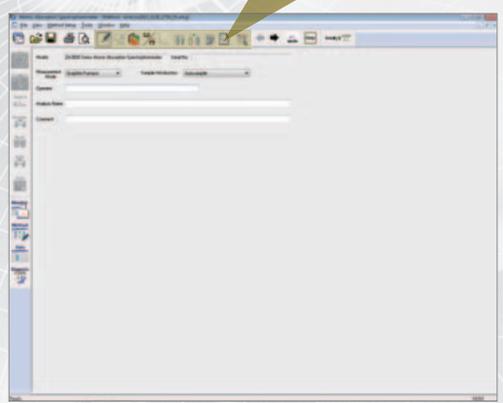
Even a beginner can readily specify parameters of measurement by following the sequence of workflow.

Element Selection Screen
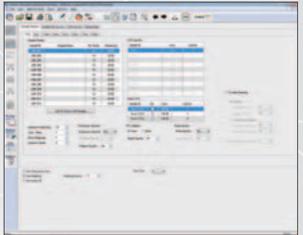
Autosampler Setting Screen

Diagnosis Function

A diagnosis function is incorporated in the ZA3000 series spectrophotometer. Since the wavelength accuracy, baseline stability, sensitivity, and reproducibility are checked automatically, you can verify the precision, accuracy, and stability of the apparatus.
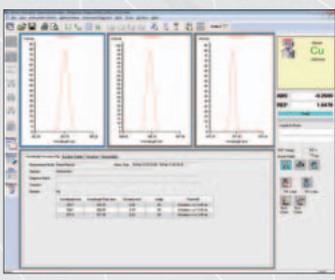
The status of the apparatus can easily be checked.

Help Function

Help function is offered for each screen. The features of topic search and key-word search are available, and it is helpful in clarifying ambiguities about how to operate. On the Analytical Information Screen, you can check the information related to each element.
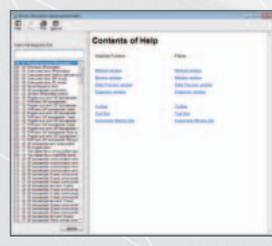
Help Screen

Analytical Information Screen

Full-content Help function is helpful to solve your worries about measurement.

ACCESSORY

SSC-230 Flame Autosampler

Target sample solutions are sampled by means of random-access function, thereby measurement time being reduced, and sample consumption being minimized.
● Up to 80 samples can be loaded.
● Random-access target samples can be specified for each element, and automatic multiple-element analysis including up to 12 elements is available.
● After the completion of measurement, the burner chamber is washed, and the flame is extinguished automatically.

HFS-3 Hydride Generating Unit

● This unit uses sodium borohydride, and enables high sensitivity assay of elements such as As and Se.
● Efficient analysis is provided because sensitivity is high and measurement is fast. High accuracy analysis is possible because measurement is made consistently under identical conditions by using continuous flow based on JIS standards.
Assay-applicable elements: As, Sb, and Se
The use of Heating Absorption Cell (separately supplied) is required.

Mercury Analysis Accessory Unit

With this accessory unit, a reducing agent can be added to the sample solution to vaporize mercury, leading to a high sensitivity analysis.
The use of reaction reagent of $SnCl_2$ is required.
＊Drying agent dehumidification type

Heating Absorption Cell for HFS-3

When equipped with the HFS-3 Hydride Generating Unit, this cell is mounted above the burner, and is heated by air - acetylene gas flame (cell holder supplied).
＊ Heating Absorption Cell without a cell holder

High Temperature Burner Head

This burner is used for the measurement of elements, such as Al, B, Be, Ge, La, Nb, Si, Ta, Ti, V, W, and Zr, of which dissociation energy is high. The use of a dinitrogen oxide - acetylene gas flame is required.
Optical path length: 5 cm, Material: Titanium

High Salt-Burner Head

This burner is used for the measurement of high salt-content samples. The use of air - acetylene gas flame is required.
Optical path length: 10 cm, Material: Titanium

Micro-Sampling Kit

Samples of 0.5 mL or less can be measured by flame analysis.
This accessory kit prevents the burner slot from clogging caused by sample solutions.

Glass Atomizer

This atomizer is used for the analysis of sample solutions that contain acids that can dissolve metals.
Even samples that contain aqua regia can be measured without erosion.
Material: Fully made of glass

PEEK Nozzle for Furnace Autosampler

The material PEEK, which is bend-resistant, is used for the nozzle end.
Note that this nozzle cannot be used for samples such as concentrated nitric acid, which can dissolve the PEEK.

Alternate Gas Unit

This unit accelerates the decomposition of organic substances during ashing by switching argon gas and oxygen-mixed argon gas.

HLA-4 Hollow Cathode Lamp

Element	Ag, Al, As, Au, B, Ba, Be, Bi, Ca
	Cd, Co, Cr, Cu, Fe, Ga, Ge, Hf, Hg
	In, Ir, K, La, Li, Mg, Mn, Mo, Na
	Nb, Ni, Pb, Pd, Pt, Rh, Ru, Sb, Sc
	Se, Si, Sn, Sr, Ta, Te, Ti, Tl, V
	W, Y, Yb, Zn, Zr

For Graphite Furnace

Cuvettes

Cuvettes	Purpose, temperature, injection volume	Configuration	Features	Suitable fields
Pyro tube C HR	Element analyses with low vapor pressure to 2,800°C to 100 µL 10 pieces/pack		● Generation of carbide can be reduced. Applicable elements: Ba, Ca, Co, Cr, Mn, Mo, Ni, Pd, Pt, Sr, Ti, V	Applicable to analyses of samples in any field. Particularly suitable for high-sensitivity analyses.
Pyro tube D HR	For twin-injection analysis. Element analyses with low vapor pressure to 2,800°C to 80 µL 10 pieces/pack		● By carrying out decentration injection, diffusion of the sample solution can besuppressed. Measurement accuracy can be improved. ● The atomizing temperature is high and general purpose cuvette. ● Generation of carbide can be reduced.	Applicable to general purpose analyses in any field.
Graphite tube HR	Element analyses with high vapor pressure to 2,800°C to 50 µL 10 pieces/pack		● The atomizing temperature is high.	Applicable to general purpose analyses in any field.
Cup-type cuvette HR	Element analyses with high vapor pressure to 2,100°C to 50 µL 10 pieces/pack		● The sample injection port is large, and diffusion of sample solution can be prevented. ● Suitable for analyses of a sample having high concentration of organic components, such as blood and urine. ● Useful for a sample that will bubble at the drying stage. ● Reproducibility can be enhanced.	Samples of high organic substance content.
OMEGA Platform Tube HR	For reduction of chemical interference to 2,600°C to 100 µL 10 pieces/pack	Platform	● The sample is heated by radiating heat. Atomization is made at a thermal equilibrium level of gas temperature. ● Re-combination of coexistent sustances and analyte element in the tube can be prevented. Also, inter-ference by matrix can be reduced. ● The platform is preinserted and fixed in the cuvette.	Samples of high matrix content.
Ring	Ring for mounting cuvette on electrode part 4pieces/pack		● Support	

* The following tubes are also available: Inexpensive graphite tube CHR, which can be used for high concentration samples and is less sensitive than the graphite tube HR; and conventional-type Pyro tube HR.

Installation conditions

Hole diameter: 6.4 mm
Terminal:
Brown (HOT)
Blue (COMMON)
Green/Yellow (GROUND)
Power cord (5 m)
use for ZA3000, ZA3700

φ 150 ～ 200 * With an adjuster
450
approx. 600 (W) × approx. 400 (D)
φ 75 (inner diameter) * With an adjuster
920 ～ 1,000
637
1,100
ZA3000

410
approx. 400 × approx. 400
920 ～ 1,000
480
800
ZA3300

φ 100 ～ 150 * With an adjuster
410
φ 75 (inner diameter) * With an adjuster
920 ～ 1,000
637
800
ZA3700

Unit : mm

* Please make arrangements for an installation table, which can withstand the weight of all of the main body, PC, and printer.

Water supply /drain	Cooling water	12 mm chemical fluid tap (outer diameter)
	Cooling Capacity	900 kcal/h or more
	Water flow rate	Flow rate: 0.8 L/min (flame)
		Flow rate 2.0 L/min (graphite furnace)
	Water pressure	35 to 150 kPa
	Water supply port	Within 4 m
	Water drain port	Height : 100 mm or less
		Opening diameter : 50 mm or more
Gas Supplied pressure (Secondary pressure setting)	Argon	500 kpa
	Acetylene	90 kpa
	Dinitrogen oxide	400 kpa
	Air	500 kpa
Room temperature		15 to 35°C
Humidity		45 to 65%RH

* Install the gas cylinders at a dedicated storage place, provide metallic piping from the gas cylinder storage place to the installation location, and attach a stop valve at each end of pipe.

Duct	Material	Stainless steel
	Dimensions	Approx. 600 (W) × 400 (D) mm (ZA3000)
		Approx. 400 (W) × 400 (D) mm (ZA3300)
		φ 100 to φ 150 mm (ZA3700)
	Suction	600 to 1,200 m³/hr (frame)
		10 to 25 m³/hr (graphite furnace)
Power supply	Model	Main unit (without PC)
	ZA3000	220/230/240 V ±5% 7.5 kVA (Power consumption under 4.3 kw) Single phase
	ZA3300	115/220/230/240 V ±10% 0.2 kVA (Power consumption under 0.1 kw) Single phase
	ZA3700	220/230/240 V ±5% 7.5 kVA (Power consumption under 4.3 kw) Single phase

* Acetylene gas cylinder that is using DMF as the solvent can not be used.
* For acetylene piping, use stainless steel piping of 5 mm or larger id. Do not use copper piping.
* Provide a backfire preventive device for the acetylene gas facilities.
* Supply of cooling water recommends the recirculating chiller.
* In the case of the cooling water pressure exceeding 150 kPa, prepare and attach a decompression valve.

Model	ZA3000	ZA3300	ZA3700
Analytical method	Flame/ Graphite furnace	Flame	Graphite furnace
Measurement mode	Atomic absorption and flame photometry		Atomic absorption analyses
Optics	Double-beam method (Polarized Zeeman method)		
Background correction	Polarized Zeeman method		
Sample chamber switching	Shifting of atomization section is unnecessary		—
Monochromator			
Mount, diffraction grating	Czerny-Turner mount, 1800 Lines/mm, Blazed at 200 nm		
Wavelength range, setting	190 to 900 nm, Automatic spectral peak setting		
Focal length, reciprocal dispersion	400 mm, 1.3 nm/mm		
Slit width	4 steps (0.2, 0.4, 1.3, 2.6 nm)		
Detector	Photomultiplier × 2 pieces		
Light source			
Number of lamps, turn-on current	8 Lamps (turret), 2 Lamps simultaneous lightning, 1.0 to 20 mA (average amperage)		
Flame section			
Zeeman-effect magnet	0.9 Tesla permanent magnet *		—
Burner	Pre-mix fish-tail type		
Burning condition setting	Automatic flow rate setting of combustion gas		
Safety monitoring function	Optical flame monitoring, flame sensor error detection, fuel/auxiliary gas pressure monitoring, drain liquid monitoring, cooling water flow monitoring, flash-back shock absorption, safety fire extinguishing at power failure (buffer tank method), flow stop check at flame turnoff, prevention of restart at reconnection of power, N_2O select safety mechanism		—
Graphite furnace section			
Zeeman-effect magnet	1.0 Tesla permanent magnet *		1.0 Tesla permanent magnet *
Temperature control	50 to 2,800°C, overcurrent prevention Cleaning stage: 50 to 3,000°C (Pyro tube C HR, Pyro tube D HR)	—	50 to 2,800°C, overcurrent prevention Cleaning stage: 50 to 3,000°C (Pyro tube C HR, Pyro tube D HR)
Heating current control	Optical temperature control, constant current control		Optical temperature control, constant current control
Gas flow rate control	Sheath gas: Ar gas, 3 L/min, Carrier gas: Ar gas 0, 10, 30, 200 mL/min. (4 steps)		Sheath gas: Ar gas, 3 L/min, Carrier gas: Ar gas 0, 10, 30, 200 mL/min. (4 steps)
Safety monitoring control	Ar gas pressure monitoring, cooling water flow monitoring, heating furnace temperature monitoring		Ar gas pressure monitoring, cooling water flow monitoring, heating furnace temperature monitoring
Graphite autosampler			
Number of sample containers	60 pcs (1.5 mL container), 96 micro plate [option]		60 pcs (1.5 mL container), 96 micro plate [option]
Autosampler sample dispensing	Dispensing by each sample, contiguous dispensing		Dispensing by each sample, contiguous dispensing
Sample injection volume	1 to 100 μL		1 to 100 μL
Sample injection speed	Selectable in 5 steps	—	Selectable in 5 steps
Applicable solvents	Aqueous solution, ethanol, methanol, acetone, MIBK		Aqueous solution, ethanol, methanol, acetone, MIBK
Carry-over	10^{-5} or less (for standard aqueous solution sample)		10^{-5} or less (for standard aqueous solution sample)
Heating injection function	Yes		Yes
Sample concentrating (in furnace)	1 to 25 times		1 to 25 times
Sample dilution (in furnace)	1 to 10 fold		1 to 10 fold
Data processing			
Computer	OS: Windows® 7 Professional, 64 bit version		
Kinds of signals	Zeeman AA, sample, reference, and emission intensity		
Calibration curve	Standard sample: Up to 10 points, Calibration curve preparation: Least-squares method and Newton method, Approximation function: 3 kinds, Sensitivity correction function, standard addition method, simple standard addition method		
Data processing	Calculation mode, peal width cut-off height specifiable, removal/restoration/replacement of measurement result, change of order number of calibration curve, sample blank processing, zero correction of calibration curve, Baseline correction, Statistical calculation (mean value, standard deviation, relative standard deviation, determination coefficient), detection limit, measuring time window setting		
Quality Control function	Sample check (Detection limit), STD check, Quality Control sample check, calibration curve check, recovery check		
Parameter/data saving, Help function	Measurement result and measurement signal, instrument status/error information, Instruction message for preventing errors, analytical information		
Dimensions (main body, W×D×H)/weight	1,100 × 650 × 637 mm/184 kg	800 × 650 × 480 mm/101 kg	800 × 650 × 637 mm/137 kg
Power	220/230/240 V, 7.5 kVA, 50/60 Hz	115/220/230/240 V, 0.2 kVA, 50/60 Hz	220/230/240 V, 7.5 kVA, 50/60 Hz
Power consumption	4.3 kW or less	0.1 kW or less	4.3 kW or less

* Please ensure that pacemaker implanted persons will not approach this apparatus closer than one meter, or will not handle this apparatus.

* Windows® is a registered trademark of Microsoft Corporation in the USA and other countries.

* This product is not approved as a medical device under the Pharmaceutical Affairs Law.

CAUTION: For correct operation, follow the instruction manual when using the instrument.

Specifications in this catalog are subject to change with or without notice, as Hitachi High-Tech Science Corporation continues to develop the latest technologies and products for our customers.

NOTICE: The system is For Research Use Only, and is not intended for any animal or human therapeutic or diagnostic use.

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