

## FEATURES

List of ZA4000 features

### [Catchphrase]

## *System Performance*

High accuracy and sensitivity by adopting the polarization Zeeman method and dual detection method.

## *New Function*

Rapid Sequential Flame Mode\* enables even higher throughput analysis. \*Support for ZA4800 only

Ultra trace analysis diagnosis system can be used to confirm contamination of cuvettes and nozzle.

## *Easy to use*

The Polarized Zeeman correction method by the DC magnetic field, a technology of Hitachi instruments, achieves “Enhanced basic performance” and “Introduction of new functions”.

While the background corrections for all elements provide the high reliability, users are strongly supported for their analysis by the software.

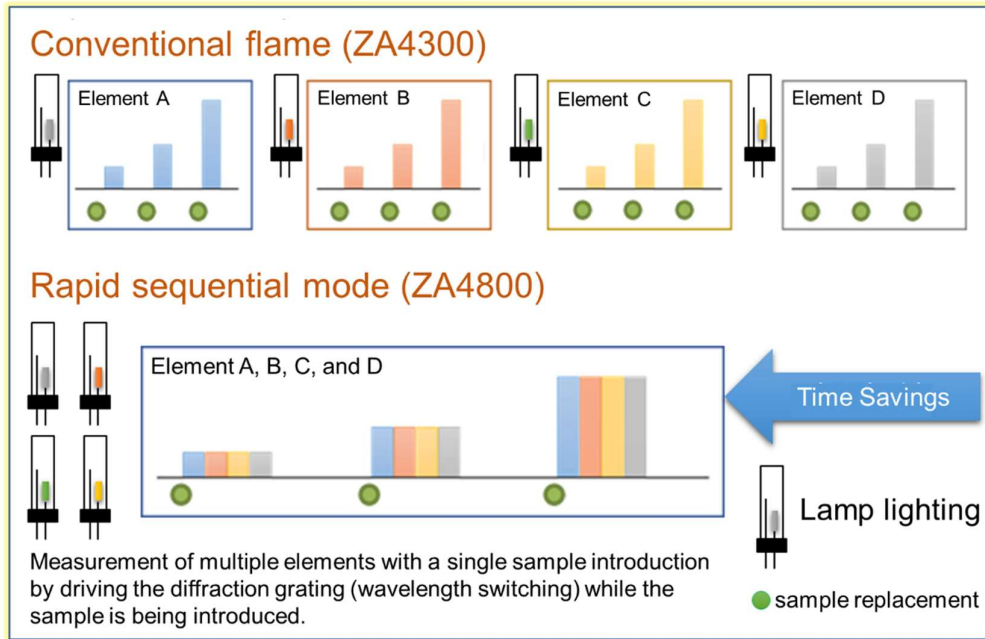
### [Main features]

1. Tandem Type [ZA4000], Rapid Sequential Flame Type [ZA4800], Flame Type [ZA4300], Furnace Type [ZA4700] --- Four models are available.



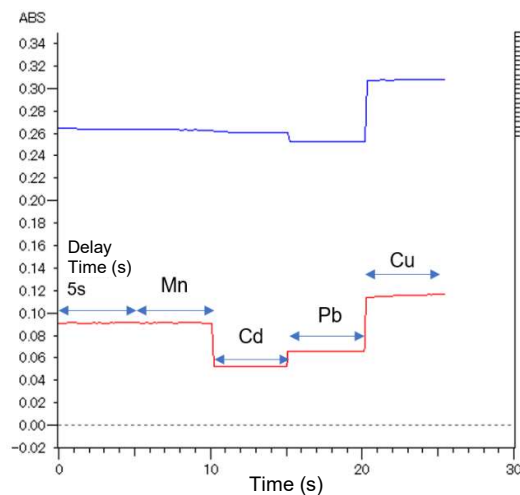
2. Rapid Sequential Flame (ZA4800)

A maximum of 12 elements can be sequentially measured by activating 4 hollow cathode lamps at the same time. Polarized Zeeman method and dual sensing method enable continuous measurement of multiple elements while changing measurement conditions.



In the case of 20 samples of 4 elements			
<Measurement time>		<Sample replacement>	
Conventional Flame	36 min	Conventional Flame	80 times
Rapid sequential	25 min	Rapid sequential	20 times
<b>Approx. 30% reduction</b>		<b>75% reduction</b>	


Example of monitor signal for rapid sequential measurement



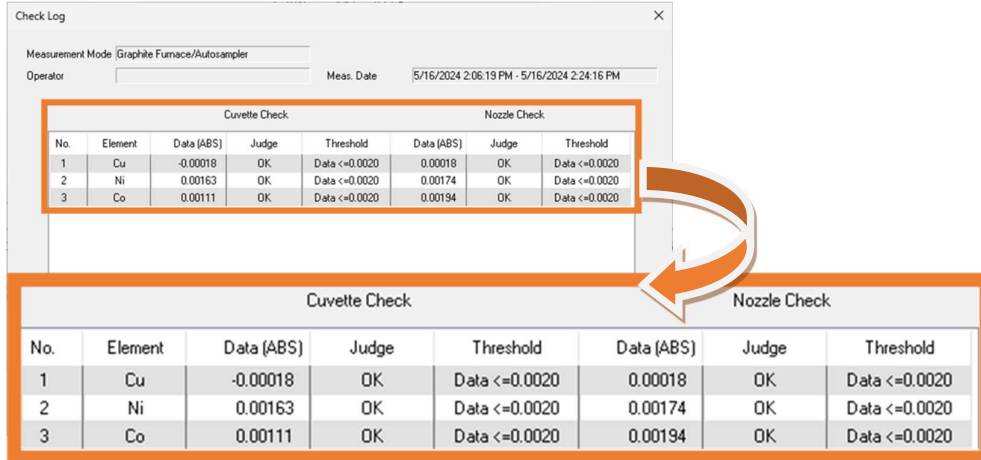
\* The display mode of the monitor screen is "Measuring".

Monitor screen during 4-element measurement

3. **New Features** Ultra trace analysis diagnosis system

Contamination can be checked for trace analysis by just clicking on the icon  .

Before starting analysis, make sure that the cuvette nozzle is free of contamination, smooth quantitative analysis.



The screenshot shows a 'Check Log' window with two tables. The top table is a smaller version of the bottom table, which is highlighted with an orange border. An arrow points from the 'Check' icon in the text above to the top table, and another arrow points from the top table to the bottom table.

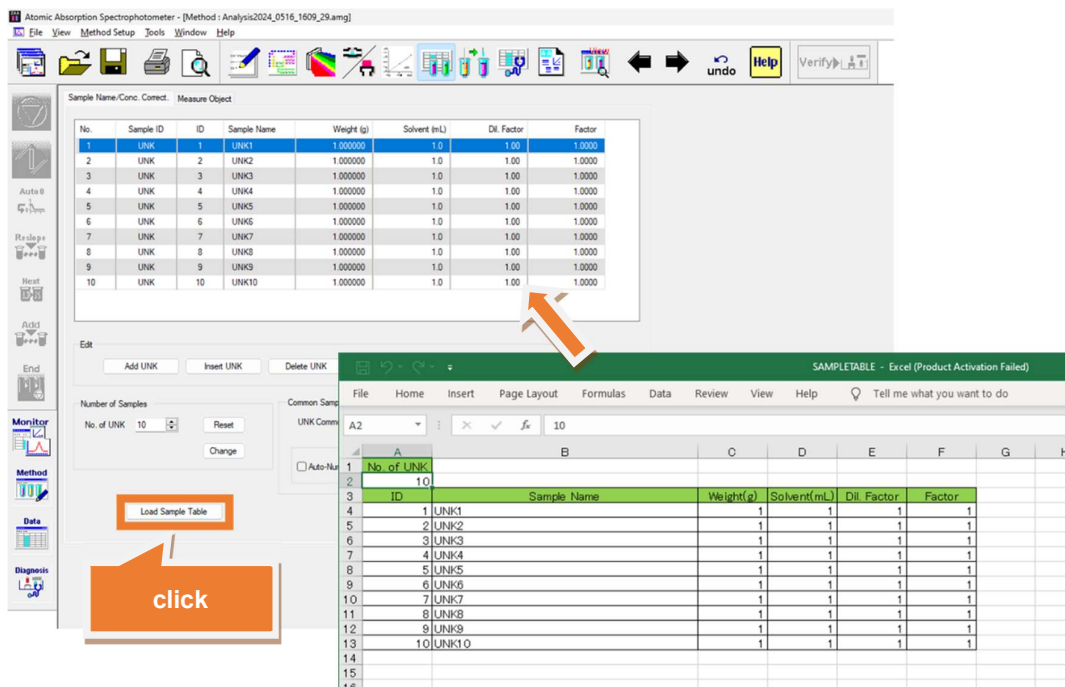
Cuvette Check				Nozzle Check			
No.	Element	Data (ABS)	Judge	Threshold	Data (ABS)	Judge	Threshold
1	Cu	-0.00018	OK	Data <=0.0020	0.00018	OK	Data <=0.0020
2	Ni	0.00163	OK	Data <=0.0020	0.00174	OK	Data <=0.0020
3	Co	0.00111	OK	Data <=0.0020	0.00194	OK	Data <=0.0020

Cuvette Check				Nozzle Check			
No.	Element	Data (ABS)	Judge	Threshold	Data (ABS)	Judge	Threshold
1	Cu	-0.00018	OK	Data <=0.0020	0.00018	OK	Data <=0.0020
2	Ni	0.00163	OK	Data <=0.0020	0.00174	OK	Data <=0.0020
3	Co	0.00111	OK	Data <=0.0020	0.00194	OK	Data <=0.0020

4. **New Features** Sample Table Read Function

Sample information entered in Excel can be loaded into the sample table at once by just clicking the “Sample Table Read” button. The items that can be read are “Sample Name,” “Weight (g),” “Solvent (mL),” “Dil. Factor,” and “Factor.”



The screenshot shows the software interface with a 'Sample Table Read' button highlighted by an orange box and a 'click' callout. An arrow points from the button to the 'Sample Table' window, which contains a table of sample information. Below the software interface, an Excel spreadsheet is shown with the same data loaded into it.

No.	Sample ID	ID	Sample Name	Weight (g)	Solvent (mL)	Dil. Factor	Factor
1	UNK	1	UNK1	1.000000	1.0	1.00	1.0000
2	UNK	2	UNK2	1.000000	1.0	1.00	1.0000
3	UNK	3	UNK3	1.000000	1.0	1.00	1.0000
4	UNK	4	UNK4	1.000000	1.0	1.00	1.0000
5	UNK	5	UNK5	1.000000	1.0	1.00	1.0000
6	UNK	6	UNK6	1.000000	1.0	1.00	1.0000
7	UNK	7	UNK7	1.000000	1.0	1.00	1.0000
8	UNK	8	UNK8	1.000000	1.0	1.00	1.0000
9	UNK	9	UNK9	1.000000	1.0	1.00	1.0000
10	UNK	10	UNK10	1.000000	1.0	1.00	1.0000

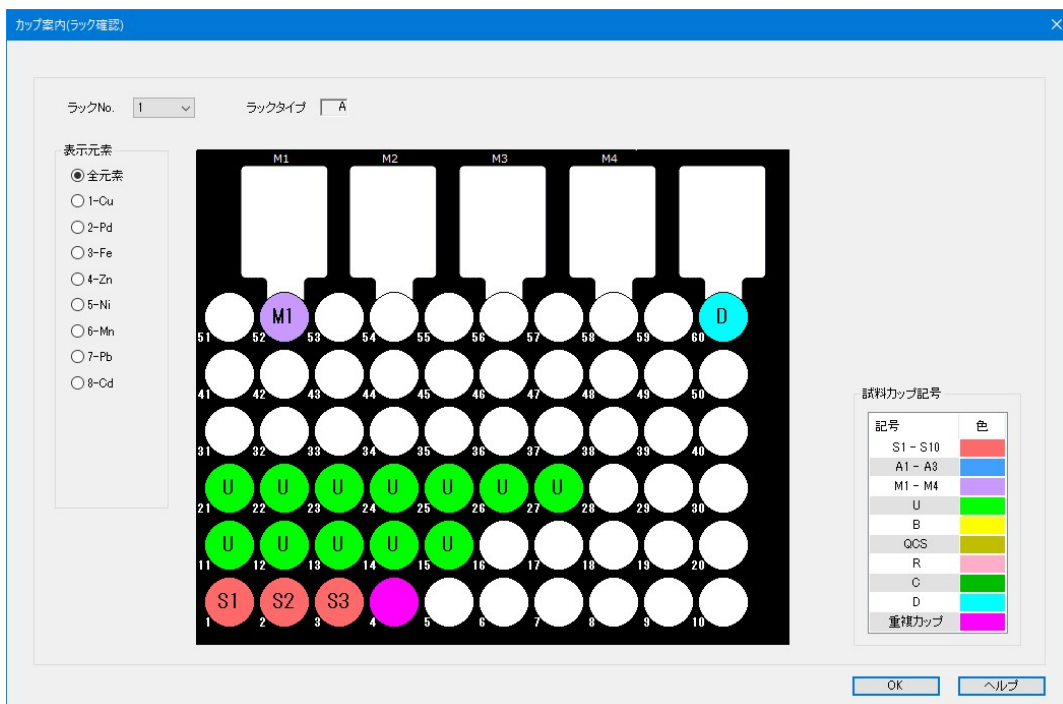
No.	Sample Name	Weight(g)	Solvent(mL)	Dil. Factor	Factor
1	UNK1	1	1	1	1
2	UNK2	1	1	1	1
3	UNK3	1	1	1	1
4	UNK4	1	1	1	1
5	UNK5	1	1	1	1
6	UNK6	1	1	1	1
7	UNK7	1	1	1	1
8	UNK8	1	1	1	1
9	UNK9	1	1	1	1
10	UNK10	1	1	1	1

5. **New function** Auto sampler cup placement guide

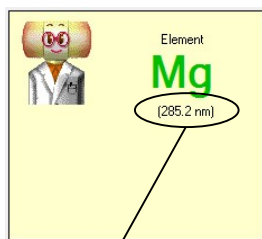
Sample placement at a glance

The color changes according to the sample such as standard solution or chemical modifier.

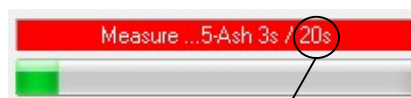
The risk of misplacement is reduced by installing the sample while comparing with the sample rack.



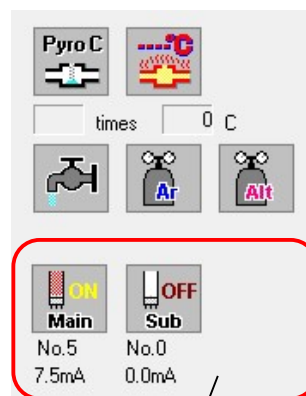
6. **New function** Adding each status display in the monitor screen



Displays the measured wavelength (nm)



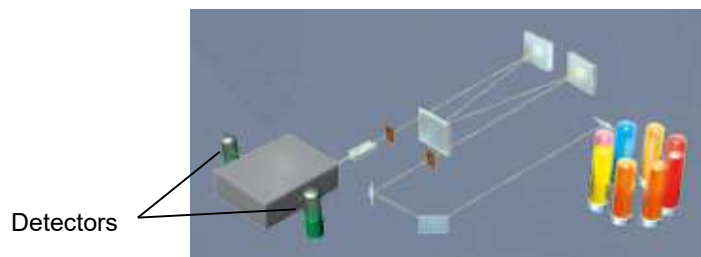
Show Set Time (s)



Indicate lighting status, current value, and usage time

7. Polarized Zeeman method enabling correction over the full wavelength range is adopted and dual

detectors will bring high accuracy and sensitivity.

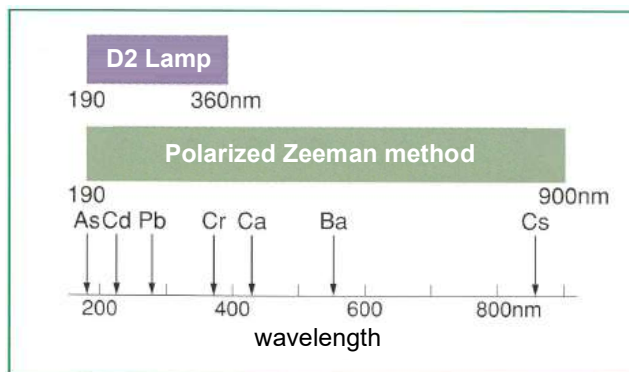


**Figure of Dual Detector Optics**

### **Background correction by the Polarized Zeeman method.**

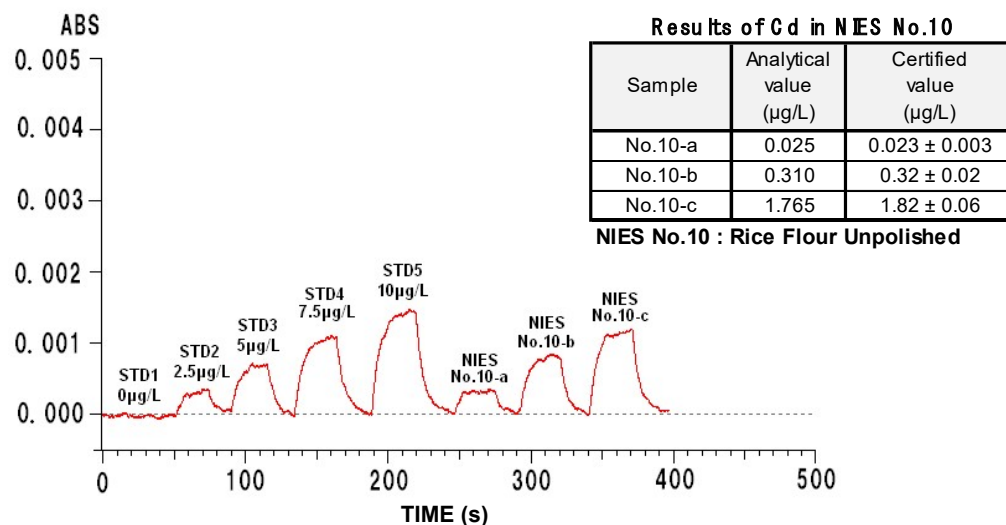
The Hollow Cathode Lamp used for measurement can perform background correction over a full wavelength range.

It is the feature of the Polarized Zeeman method that atomic absorption and background correction can be performed with the same wavelength and the same spectral band width.



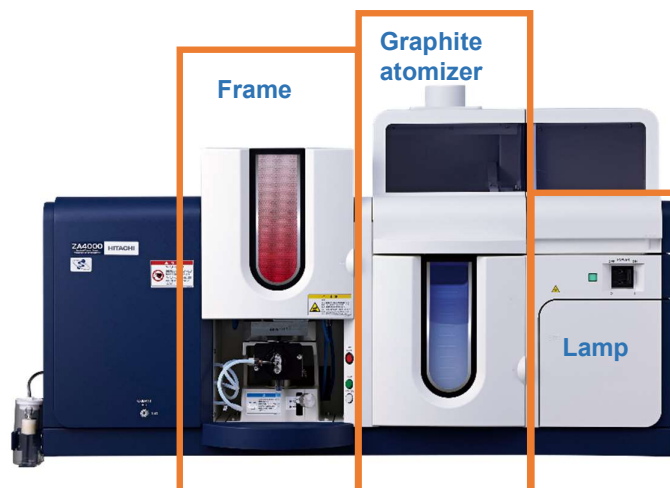
### **Stable baseline**

By using the Polarized Zeeman correction method which provides a baseline which has high stability, the analysis of Cd in brown rice at a level significantly lower than 0.4 ppm is possible even by flame analysis.



8. Flame analyses and graphite furnace analyses can be done without replacing the atomizer.

- Atomizer selection can be made simply through the software. It is not necessary to replace the atomizer unit nor adjust the optical axis.
- The flame method is suitable for mg/L-level analyses, and the graphite furnace method is applicable to µg/L-level analyses and samples in small quantity. Depending on the concentration of analyte and the quantity of sample, you can choose a suitable analytical method.

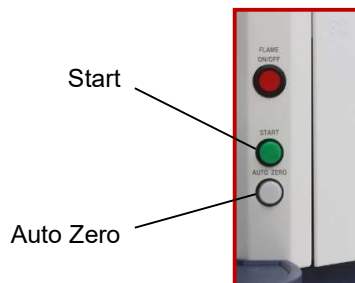


9. Dedicated the Flame/Furnace model can achieve a compact size.

	ZA4300	ZA4800	ZA4700
Dimensions (W) × (D) × (H)	800×650×567mm	800×650×567mm	800 × 650 × 637mm

10. Operating efficiency has been further enhanced by flame 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.



11. Autosampler for graphite furnace is embedded in the main unit and dust cover is a standard feature. Improved operability of sample rack unit, which is accessed frequently, by dividing dustproof cover into two parts.



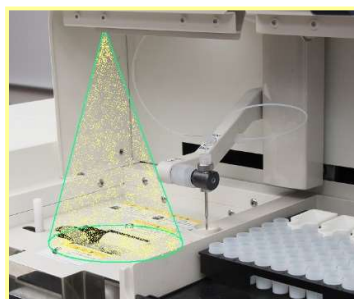
Autosampler



Dustproof cover [Open the side of the sample rack]



12. Improved visibility of atomization unit by means of LED lighting.



LED lighting

13. Twin injection technology

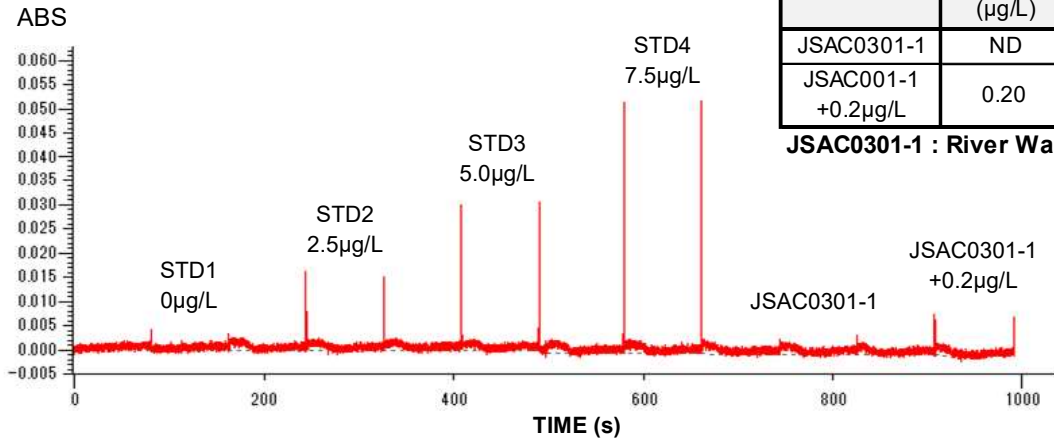
Twin injection technology can measure the Sb in environmental water (0.2µg/L) without in-furnace concentration.

\* Pyrotube-D HR is required to use the twin injection function.

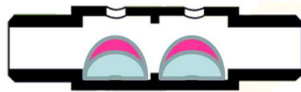
Results of Sb in JSAC 0301-1

Sample	Analytical value (µg/L)	Recovery (%)
JSAC0301-1	ND	-
JSAC001-1 +0.2µg/L	0.20	100

Furnace Analysis of Sb in River Water

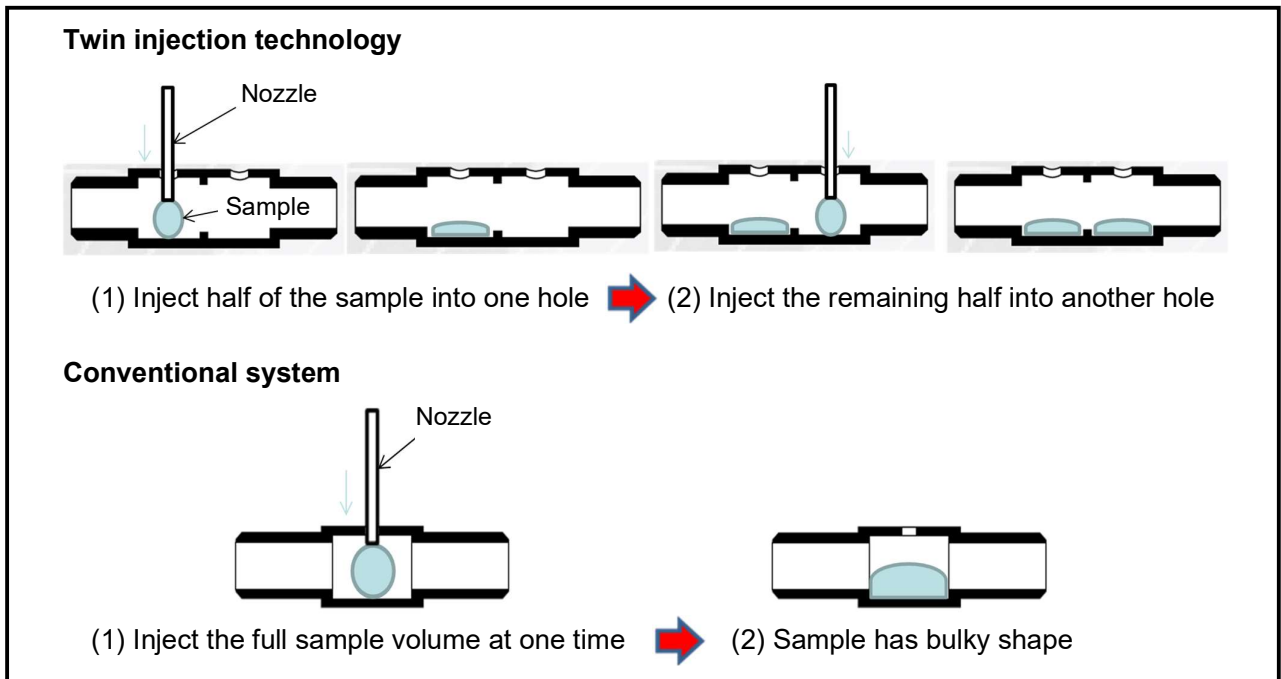


JSAC0301-1 : River Water



- : Matrix modifier (each 5 µL)
- : Sample (each 35 µL)

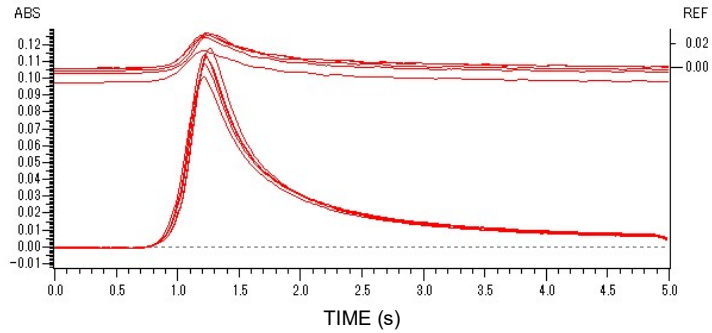
Sampling Image of twin injection





14. Cuvette Memory Suppression Function

In measurement of a high melting point element, in order to remove the bad influence to the next measurement by the memory effect, the temperature program for cleaning can be automatically run between sample measurement.



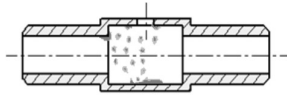
15. Automatic Bumping Detection Function

Bumping of the sample in a dry stage which worsens measurement accuracy is detected, and the "P" mark is attached to the measurement result of the possible sample of bumping.

By this function, the possibility of bumping can be checked also after measurement.

It is information effective in the factor analysis of fault measurement reproducibility.

In addition users can create the drying condition which controlled bumping by using together with a temperature program automatic creation function.



The sample bumping image inside cuvette

Absorbance of Cu in sea water (n=5)

No.	ABS
1	0.0961
2	0.0646 P
3	0.0648 P
4	0.0833 P
5	0.0647 P
<b>Ave</b>	0.0747
<b>SD</b>	0.0144
<b>RSD(%)</b>	19.28

The "P" mark is displayed. Bumping can be checked also after measurement.

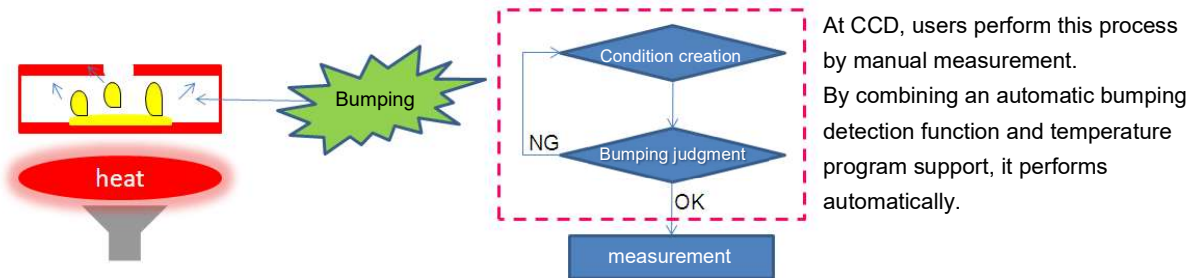
**Automatic Bumping Detection Function** is Bumping of a sample is automatically judged from the signal at the time of dryness.

**[ The demerit of CCD ]**

1. Judgment of bumping is not in agreement when two or more users check the same phenomenon.
2. At the time of the conditions of the limit to bump, judgment visually is difficult.
3. In order to check bumping, it is necessary to continue surveillance.

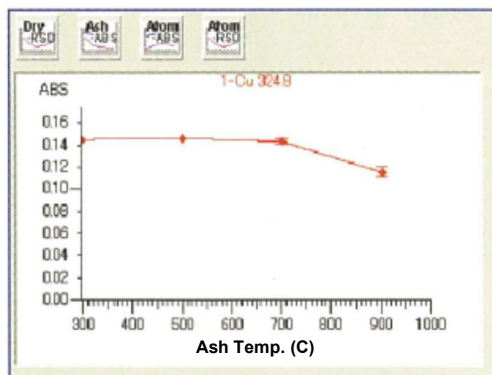
**[ Automatic Bumping Detection Function ]**

1. Since instrument may judge automatically from REF signal and ABS signal, two or more persons judgment corresponds.
2. Instrument judges automatically also on condition of a limit.
3. Since measurement data has bumping mark "P", it can check even afterwards.

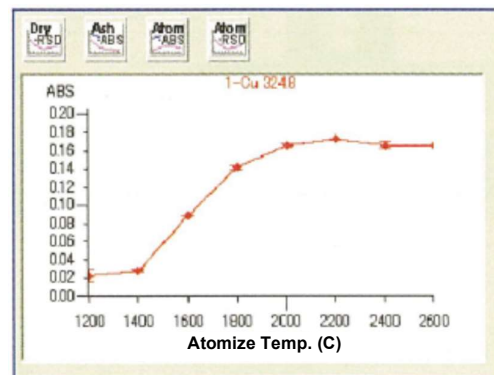


16. Automatic Creation of Temperature Program Support Function

Dry, Ash and Atom temperature are changed in each stage, automatic measurement is performed, and the temperature program from which the maximum ABS or the minimum RSD is obtained is created.



Ashing temperature graph



Atomization temperature graph

17. Speedy dispensing by the Auto Sampler.

When you inject multiple samples into a cuvette to use, for example, matrix modifiers for a single measurement, the first sample is aspirated by the autosampler nozzle, followed by the next sample by the force of air. After the samples are aspirated, all the samples are injected into the cuvette. You can save the measurement time as the sample pipetting time is faster than the measurement with no sequential injection. You can improve the mixture of samples and matrix modifiers because of the strong discharging pressure by using this function including the matrix modifiers. Thus, you can reduce the volume of the matrix modifiers compared with the measurement with no sequential injection. You can also expect the similar effect by reducing the concentration.

**Furnace Analysis of Se (40ppb 20 $\mu$ L) + PdMg (1000mg/L 10 $\mu$ L)**

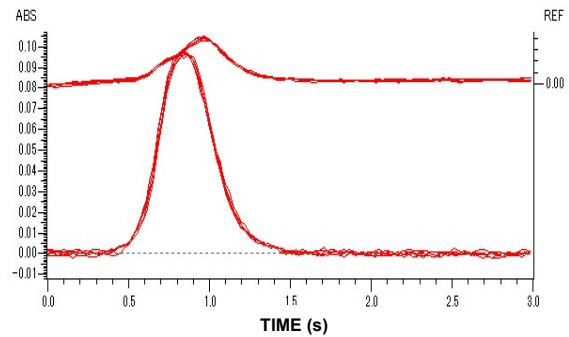
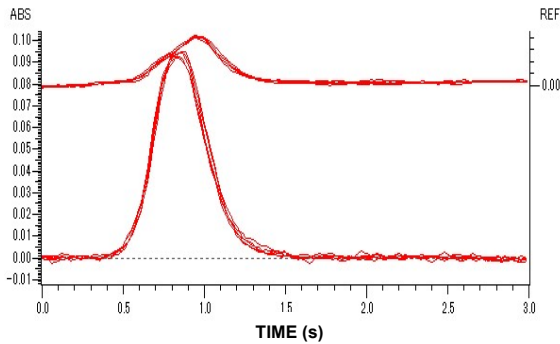
Conventional system

No.	ABS	REF
1	0.0942	0.0406
2	0.0922	0.0404
3	0.0949	0.0410
4	0.0941	0.0417
5	0.0925	0.0397
Ave	0.0936	0.0407
SD	0.0012	0.0007
RSD(%)	1.28	1.72

Sequential Injection

No.	ABS	REF
1	0.0957	0.0409
2	0.0964	0.0398
3	0.0973	0.0419
4	0.0969	0.0397
5	0.0967	0.0381
Ave	0.0967	0.0401
SD	0.0007	0.0014
RSD(%)	0.72	3.49

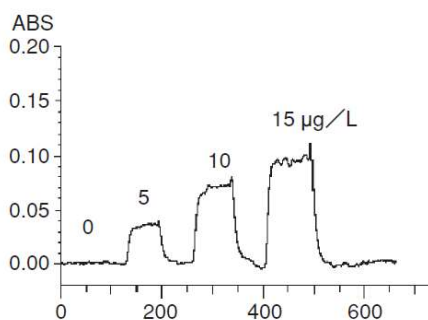
Improvement in reproducibility



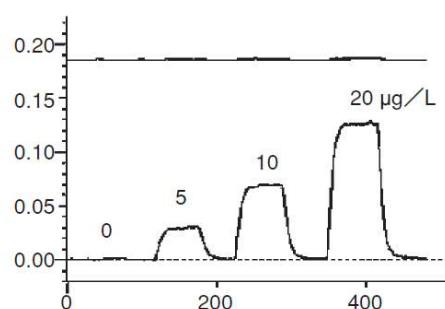
## 18. Apply the Zeeman effect to the hydride generation method.

After Z-4000 series Hitachi Zeeman Atomic Absorption Spectrophotometer applies the Zeeman effects to heating quartz - hydride generation method.

Because each light path to correct the lamp drift and back ground pass through heating quartz cell as same light axis, hydride generation atomic absorption spectrometry is stable baseline and low noise level analysis.



The single beam method

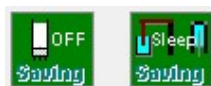


The Zeeman correction method

## 19. Standby power consumption saving setup

- Power saving mode

The Hollow Cathode Lamp is turned off automatically when device operation is not operated for 1 hour. The motor of the autosampler for Graphite Furnace is also turned off.



Eco Status (Power Saving Mode)

- Water saving mode [Only ZA4000]

The cooling water is stopped automatically when device operation is not operated for 10 minutes except in the case of Frame burning.



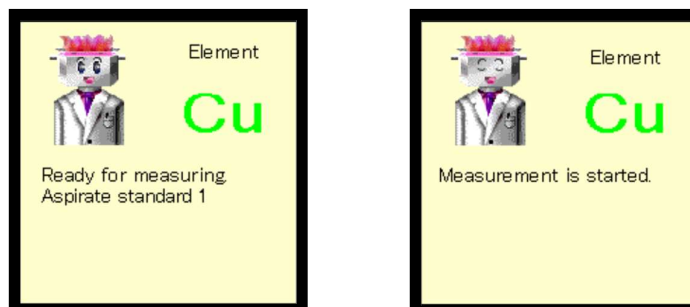
Eco Status (Water Saving Mode)

20. Analysis assist, real-time QC and Easy Start functions assure ease of use.

\* This feature is only for flame AAS manual analysis mode.

### Analysis Assist

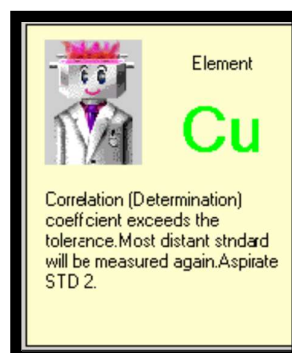
Progress of measurement is supported by screen messages and voice guidance during analysis.



### Real-time QC

QC (Quality Control) function works in parallel with manual flame analysis. The measurement sequence need not be repeated.

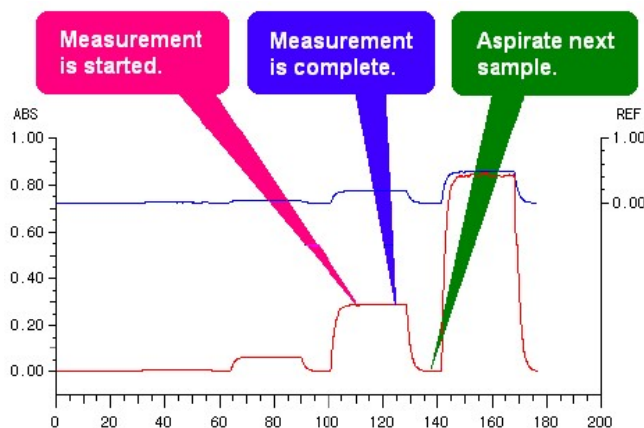
- Check of Working curve
- Check of Sample concentration
- Check of QC sample



### Easy Start

Measurement is automatically started at the appropriate timing which is judged by the system on sample injection.

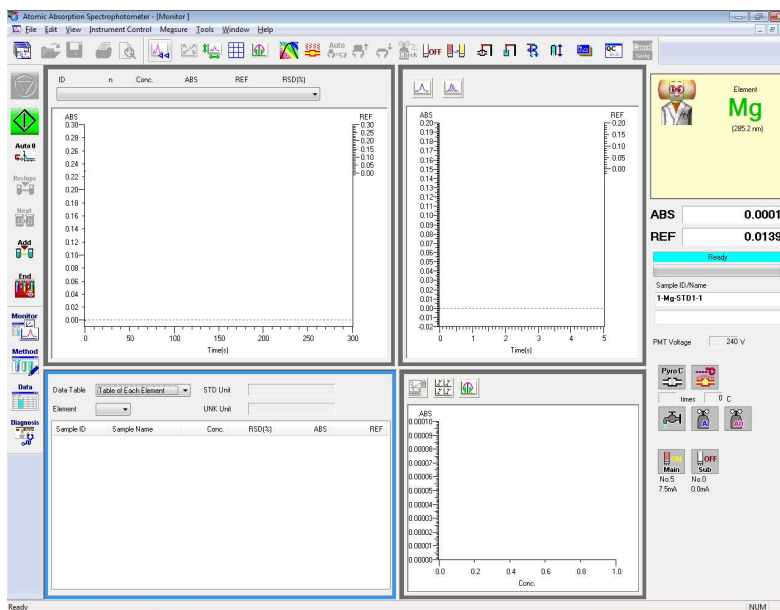
Users can carry out an experiment without focusing their attention on the monitor.



21. Z4000 software comes with rich features and easy operation by an improved GUI.

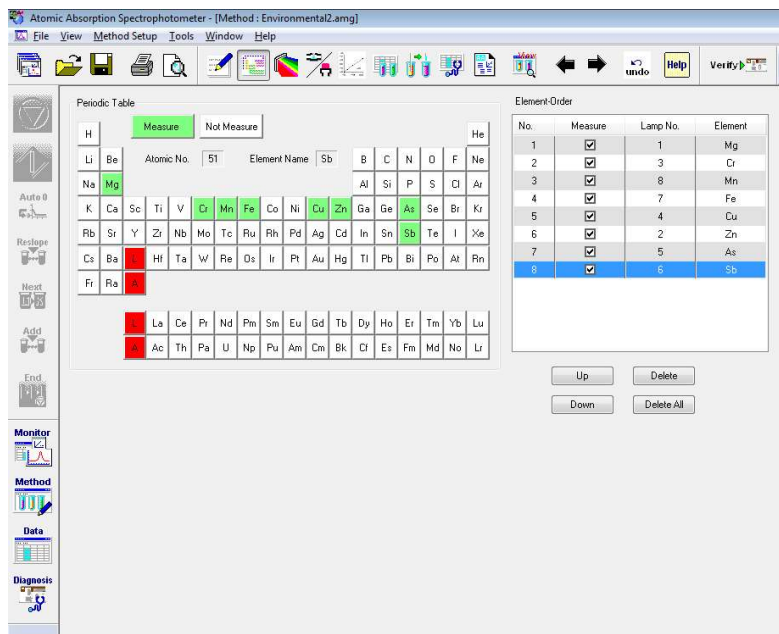
### Monitor Window

The signals during measurement (Zeeman correction and background signal) are monitored in real-time. One screen can display real-time monitor, data and working curve. Thus, data recognition is easy.



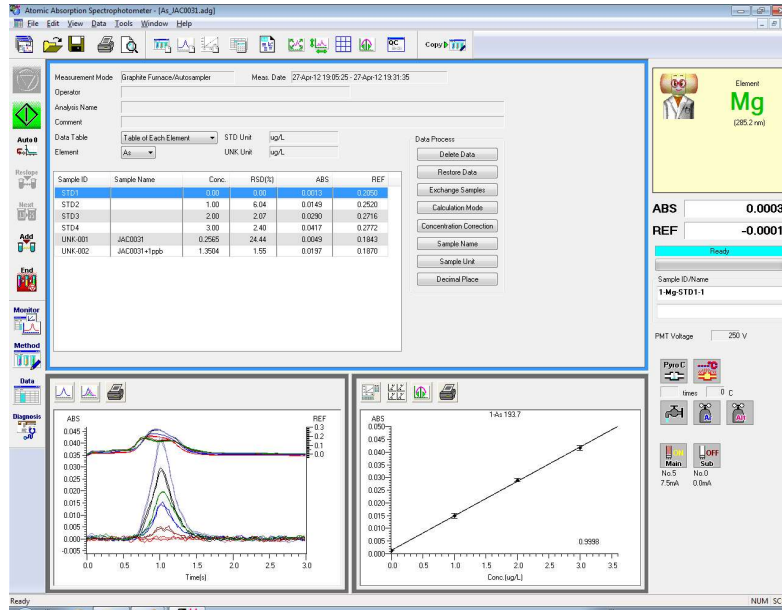
### Method Window

Allows easy setting of analytical conditions just by clicking icons at the top of the window in order starting from the left, and then entering your desired parameters.



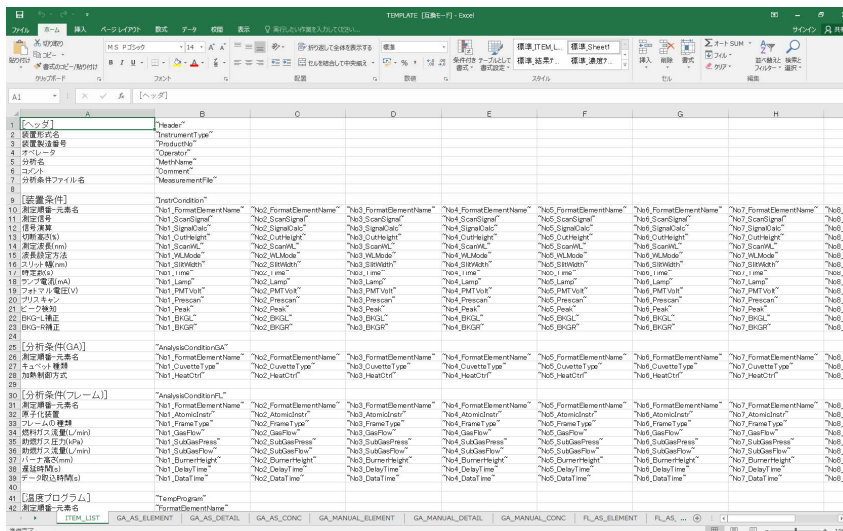
### Data Process Window

Analysis of multi-elements and data processing are easily performed. Result data, profile and working curve are shown in one window. Thus, the operation is very easy. Output data after data processing is used in a report generator as well as in a regular format. By this, the data can be customized freely using Excel® format.



- For making a report, ZA4000 software comes with a customization feature (Report Generator) using Microsoft® Excel®. You can output to Excel in an image similar to printing to a printer, and you can rearrange the layout of the output items.

Excel template for creating reports.



239. A variety of safety functions are incorporated.

- Full time monitoring of the maximum and minimum pressure of acetylene gas
- Auxiliary gas pressure monitoring
- Automatic gas supply shut-off at turn-off of flame
- Interlock mechanism for nitrous oxide - acetylene gas burner head
- Burner drain liquid level monitoring
- Cooling water flow rate monitoring
- Flashback prevention using auxiliary gas buffer tank at power failure
- Valve error monitoring
- Flame sensor error monitoring
- Gas leakage check at flame turn-on



20. Feature functions

- Measurement monitor screen  
ABS values and REF values monitored on the window can be saved in a designated file as the monitor measurement result data (in frame/manual analysis). The monitor measurement time range is from 21 to 3600 seconds (set by the second). Files are saved in the text format (\*.txt). This function is convenient when numeric data are necessary for a long time
- Automatic dilution setup (in the Graphite Furnace/Autosampler analysis)  
At the Check Sample of QC functions, the dilution is calculated automatically from measurement results at the time of exceeding the tolerance.
- "Diluting Cup No." designation for each element (in the Graphite Furnace/Autosampler analysis)  
Z-4000 series use No.60 Diluting cup commonly. This function can setup the diluting cup No. individually.
- The temperature of the clean stage is raised from 2800(C) to 3000(C).  
The temperature of the clean stage is raised 3000(C) only the Pyro Tube C HR and the Pyro Tube D HR.  
This function prevents the balefulness of memory effect and advantages the measurement of high melting point element.
- [Data file name] Add to a "header".  
Even if the paper after printing is shuffled, a [Data file name] is added and printed to a header (upper right portion) so that it can identify which data the paper after 2 page is.

- "Weighting" of an analytical curve is added to the Data Process.  
Depending on the range of the working curve, the results of measuring low concentration may be affected by the absorption level of the highly-concentrated standard solution. To reduce such impact, you can use a working curve calculation formula suitable for low concentration.
- "Processing time" is added to the Data Process.  
The time range (Start Time and Completed Time) which processes data is specified and the re-calculation becomes possible.
- "Edit & Modifier Name" of data compilation is possible after measurement.  
The Modifier name can be edited also after measurement.