

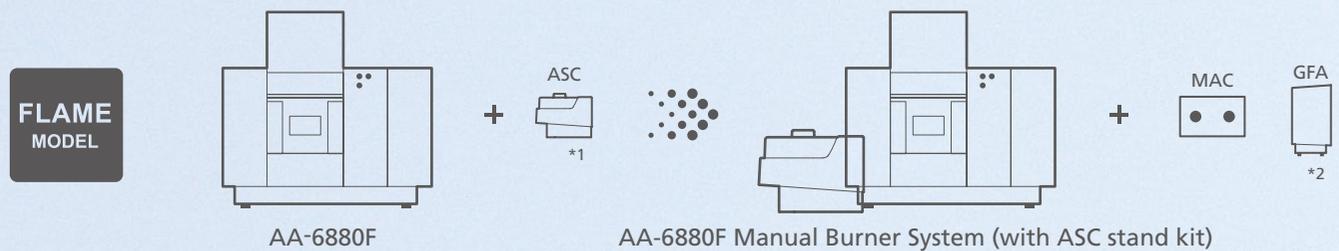
Atomic Absorption Spectrophotometers

AA-6880 Series



System Configuration Can Evolve with Your Needs

The AA-6880 Series can be upgraded by adding units to handle the analysis targets.



Major Fields of Application

AA-6880 Series supports a wide range of analysis applications.



Environment

Seawater, river water, effluent, sludge, air-borne dust



Metals, Semiconductors, Ceramics

Metals, minerals, glass, ceramics, IC chips



Petroleum, Chemicals, Polymers

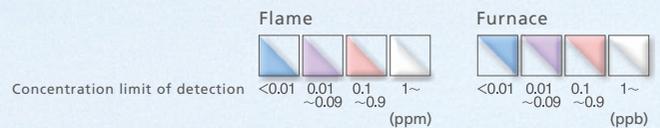
Petroleum, oil, catalysts, chemical products, biodiesel



Medical, Biology, Pharmaceuticals

Blood, animals, plants, drugs, food products

Analysis Sensitivities



H																				He				
Li	Be																		B	C	N	O	F	Ne
Na	Mg																		Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr							
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe							
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn							
Fr	Ra	Ac																						
					Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu						
					Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr						

* May differ according to coexisting substances in the sample.

AA-6880 Series

Atomic Absorption Spectrophotometers

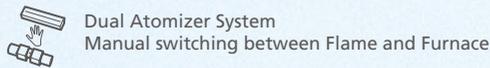
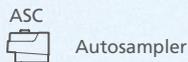
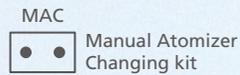
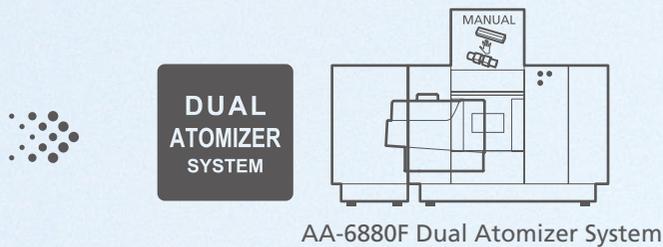
Boosting Analytical Productivity of AAS to a Higher Stage

Enhanced Flame Analysis

World-Class High-Sensitivity Furnace

Evolving System Configuration

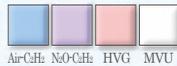
Advanced Safety Technology



*1 Requires ASC stand kit.
*2 Requires ASK-6880.

Flame Selection

Flame and Measurement Procedures



H																				He
Li	Be											B	C	N	O	F	Ne			
Na	Mg											Al	Si	P	S	Cl	Ar			
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr			
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe			
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn			
Fr	Ra	Ac																		
				Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu			
				Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr			

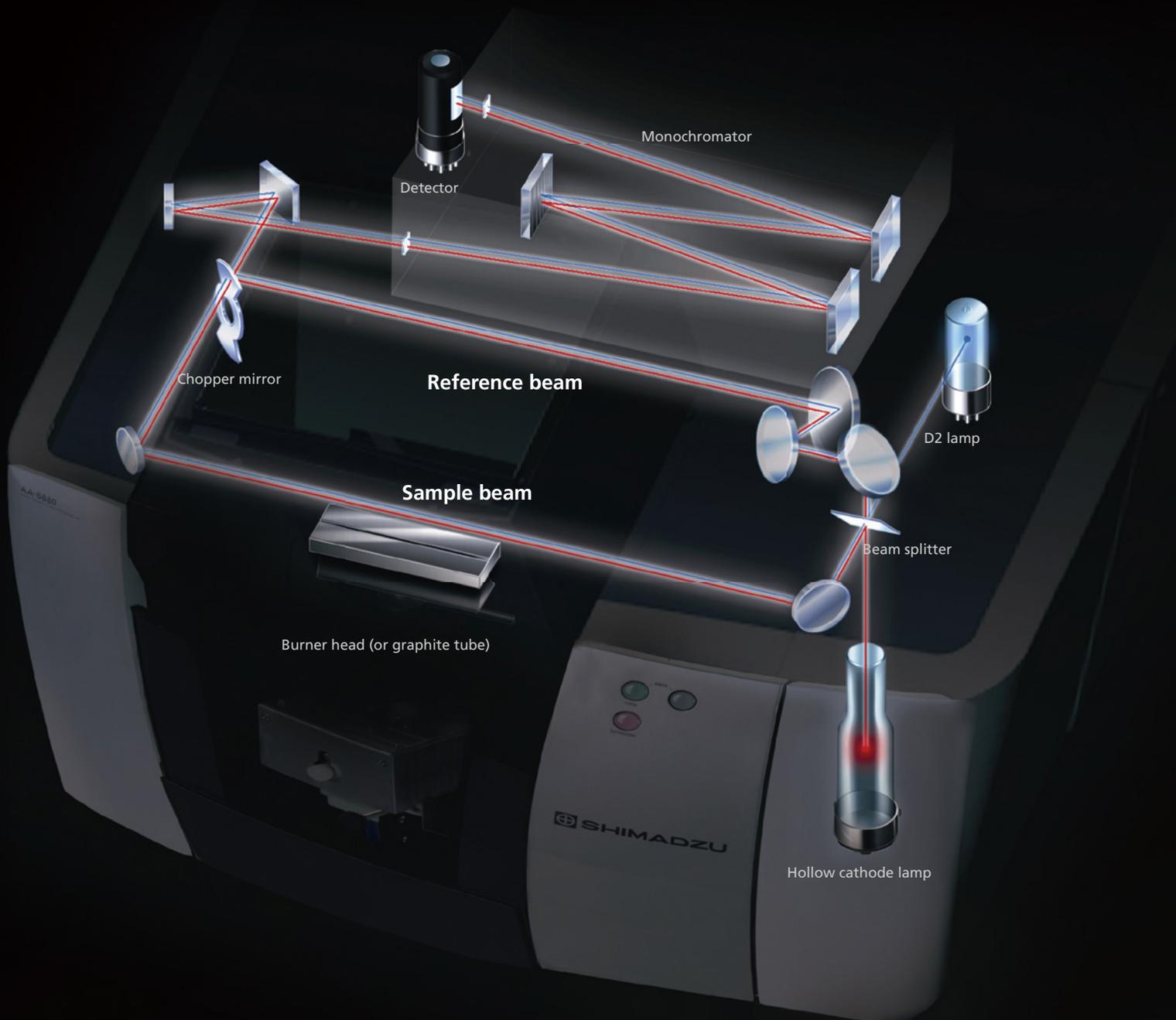


AA-6880F Flame model



AA-6880F Dual Atomizer System (with options attached)

Enhanced Flame Analysis



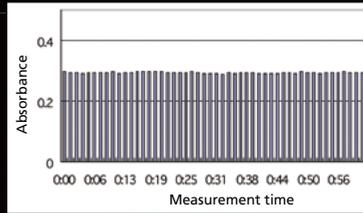
Double-Beam Optics and Stable Hardware Achieve Superior Stability

The AA-6880 Series incorporates newly developed 3D double-beam optics. The optical system has been designed to produce maximum performance for each measurement method through optimal adjustment of the light beam and light beam digital filter, and by using optical components that restrict light losses.

Advantages of the Double-Beam System

■ Long-term stability

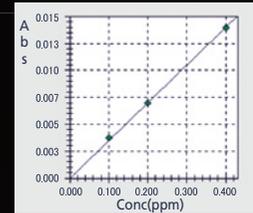
The graph shows the results of measurements on 2 ppm copper (Cu) conducted over at least one hour. (The plot shows mean values for 11 repeated measurements.) Over the course of more than 600 measurements, the instrument achieved a relative standard deviation within 1%.



Data Showing Long-Term Stability for Flame Cu Measurements

■ High sensitivity

The graph shows the direct measurement results for 0.1 ppm lead (Pb).

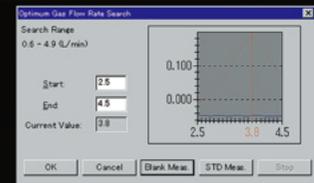


0.1 ppm to 0.4 ppm Calibration Curve for Lead (Pb)

Support for Developing Analytical Conditions

■ Automatic gas flow rate optimization

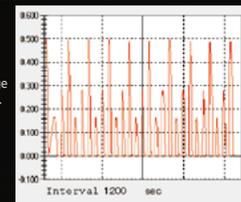
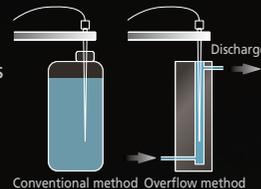
Automatic searching for optimal fuel gas flow rate (Japanese Patent 2099886). It is important to determine the optimal gas flow rate for the flame when using an organic solvent or after changing the burner height. The AA-6880F Series automatically optimizes the gas flow rate by measuring the changes in absorbance between a blank and a standard sample. The difference between the two is displayed on the screen. The gas flow rate achieving the highest sensitivity is detected and this value is automatically set as the gas flow rate value.



Optional Autosampler Reduces Analysis Workload

■ Low carryover

Great care must be taken to avoid carryover during flame analysis. The new ASC-6880 autosampler rinses the nozzle at the rinsing port on the overflow mechanism after each sample measurement is complete. This ensures 10^{-4} max. carryover during measurements of multiple samples. The graph shows the results of consecutive analyses of 10 ppm, 20 ppm, and 50 ppm sodium (Na) standard solutions in the EMISSION mode. No carryover could be detected when measuring the 10 ppm standard sample immediately after measuring the 50 ppm Na standard sample.



Data showing low carryover

Trace Sample Analysis Using Micro Sampling

■ Micro sampling

At least 1 mL (1000 μ L) volume of a liquid sample is required for the continuous intake of sample during normal flame analysis. With micro sampling, however, approximately 50 to 90 μ L of sample is injected in one shot into the flame and quantitation is based on the height and area of the peak signal obtained. This method offers the advantages listed below.

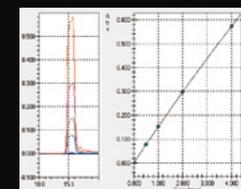
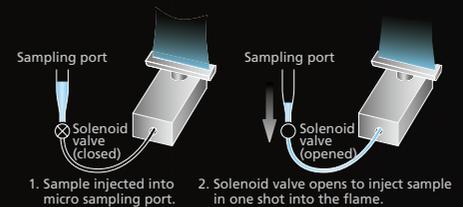
Advantages

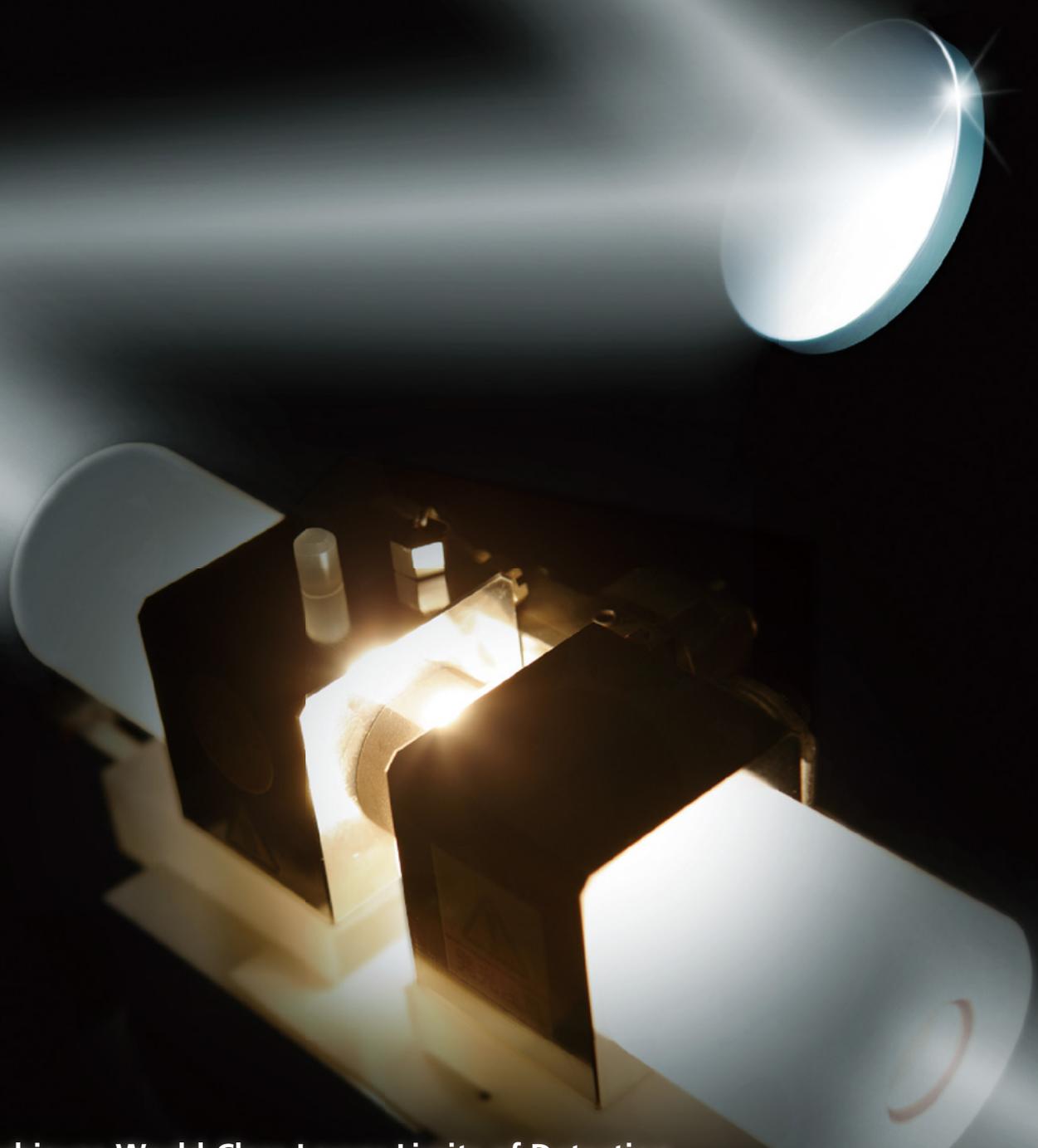
- Permits analysis of small sample volumes
- Multi-element analysis of small sample volumes
- No blockage of burner slot with samples having a high salt concentration
- Synchronized with the autosampler for auto-dilution measurements
- * Synchronization with the autosampler requires the optional micro sampling kit.

■ Example of micro sampling analysis

Examples of the measured waveforms (overlaid) and calibration curve for micro sampling analysis are shown to the right.

A 2-ppm Cu standard solution was prepared by auto-dilution using the autosampler. The autosampler can also be used to conduct dilution measurements of the sample. (Injection volume: 90 μ L)





Achieves World-Class Lower Limits of Detection

Advances in optics and a new graphite furnace design achieve improved lower limits of detection for furnace analysis (comparison with previous Shimadzu models).

This superb analysis performance is possible in all fields.

Enhanced Sensitivity due to Graphite Furnace

Previous		New
Pb 0.08ppb	➤	0.05ppb
Mn 0.02ppb	➤	0.01ppb

High-Performance Autosampler

- Mix and inject up to four sample types (diluted solution, standard solution, sample, matrix modifier, etc.). (Unmixed samples can also be injected.)
- Select a fluororesin tube or pipette tip as the injection nozzle.
- Automatic dilution and re-analysis if the calibration curve concentration is exceeded.



Example of Automatic Dilution and Re-Analysis

Analysis of cadmium (Cd): The maximum concentration of the calibration curve has been set to 1ppb. At 1.8ppb, the sample of [003] has exceeded the maximum concentration. As a result, it has been automatically diluted by four times and re-measured.

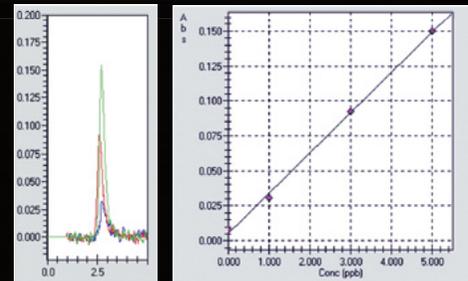
Action	Sample ID	True Value (ppb)	Conc. (ppb)	Abs.	Pos.	VOL	Diluent R1	Reagent R2	Total Volume	ASC DF	Actual Conc.	Actual Conc. Unit	Out of Control Remark
19	SPIKE1-2 001+@	0.2500	0.7661	0.3089	4	10	5	5	20		0.7661	ppb	
20	SPIKE1-A 001+@	0.2500	0.7558	0.3048	4	10	5	5	20		0.7558	ppb	
21	UNK2-1 003		1.8246	0.7296	5	20	0	0	20		1.8246	ppb	
22	UNK2-2 003		1.7900	0.7118	5	20	0	0	20		1.7900	ppb	
23	UNK2-AV 003				5	20	0	0	20			ppb	LINK > 1.0000
24	UNK3-1 003		0.5231	0.2123	5	5	15	0	20	4.0000	2.0924	ppb	
25	UNK3-2 003		0.5047	0.2030	5	5	15	0	20	4.0000	2.0188	ppb	
26	UNK3-AV 003		0.5138	0.2086	5	5	15	0	20	4.000	2.0552	ppb	

High-Sensitivity Application Data (Analysis of Selenium (Se))

- Independent control of the gas flow through the graphite tube during atomization achieves extremely high-sensitivity measurements. (Japanese Patent 2067563)

Measurement Example Showing High Sensitivity

Analysis of 0 to 5 ppb selenium (Se): Sensitivity is adequate for 1 ppb measurements. (20 µL injected volume, Pd modifier, pyro-coated graphite tube)

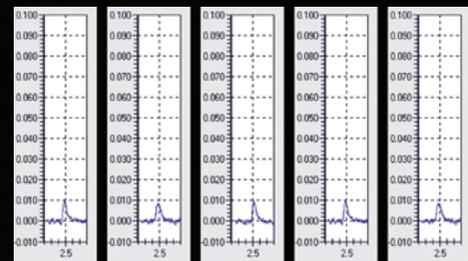


- Digital temperature control and electronic gas flow control enhance stability

Combination of a high-sensitivity optical sensor and unique digital temperature control technology achieves highly accurate temperature control in all temperature regions from drying to atomization. An electronic flow controller can precisely control the inner gas flow rate in 0.01 L/min units. These control techniques significantly enhance both the sensitivity and the data stability.

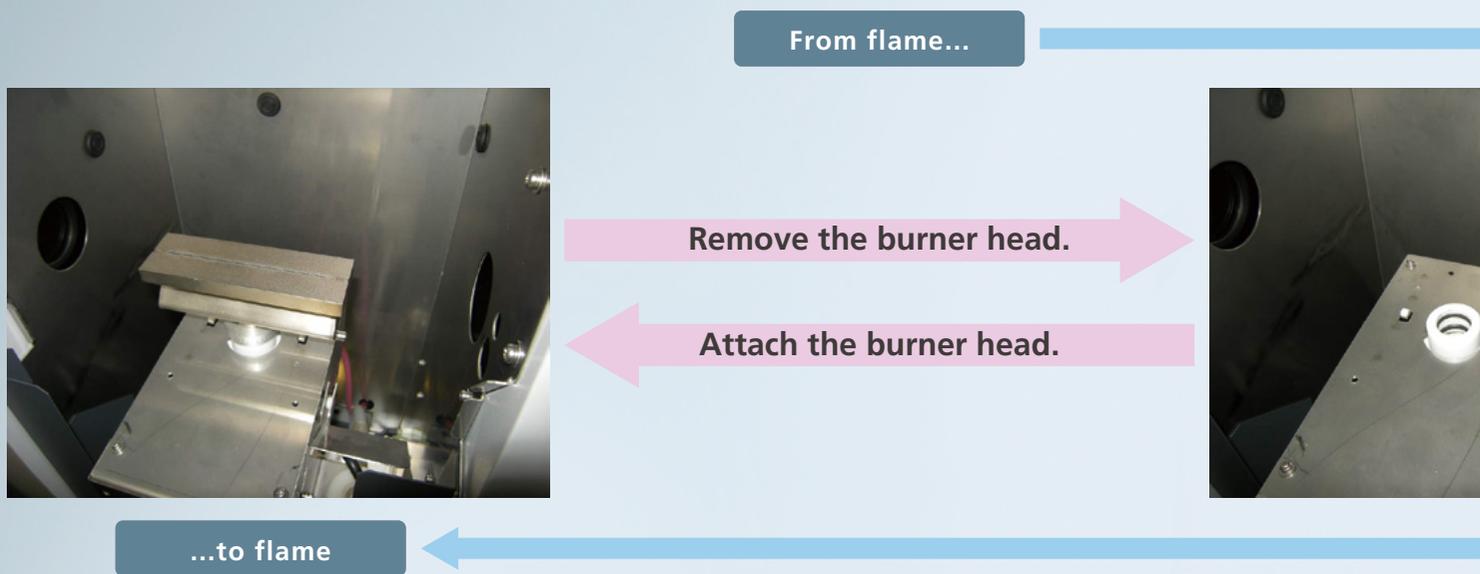
Measurement Example Showing High Stability

Analysis of 0.5 ppb lead (Pb): Approx. 5% relative standard deviation after five repeated measurements is adequate for quantitative analysis.



Quickly and easily switch between flame and

Employs a quick, tool-less switching mechanism, making it as easy and effortless as shown in the photo.



Switch smoothly between Flame and Furnace

- All that is involved in switching from flame to furnace is to remove the burner head and put in place the furnace section. No tools are needed, making this a quick, easy process.
- Furthermore, one autosampler can be used for both flame and furnace, which negates the need to prepare the autosampler for each analysis method.

Selecting the Graphite Tube



High-density graphite tube
(P/N 206-50587-11)
Can be used for all elements. Especially effective for low-boiling point elements (Cd, Pb, Na, K, Zn, Mg, etc.).



Pyro-coated graphite tube
(P/N 206-50588-11)
Effective for elements that readily form carbides (Ni, Fe, Cu, Ca, Ti, Si, V, Mo, etc.).

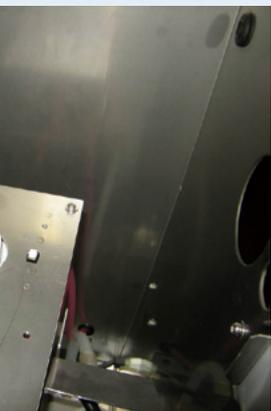


Platform tube
(P/N 206-50887-02)
Restricts chemical interference due to coexisting substances. Effective for the analysis of environmental samples and biosamples, such as sea water and industrial waste.

* Depending on the state of the sample, some other combinations may be appropriate.

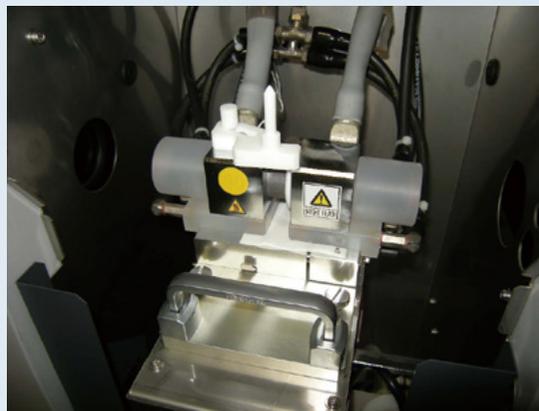
furnace

... to furnace



Attach the furnace.

Remove the furnace.

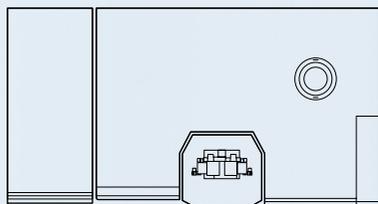


From furnace...

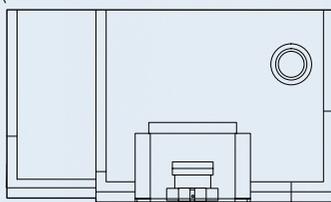
Slim, Easy-to-Use Design

■ Smallest footprint for a full system

The system with a dual atomizer fits into a 960 mm width (including power supply for the graphite furnace atomizer).



AA-6300
1080mm(W) x 545(D) x 460(H)

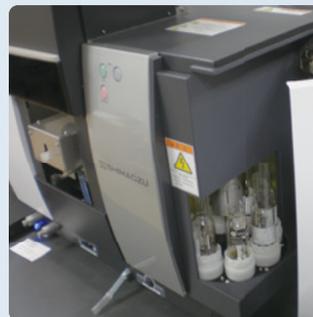


AA-6880F Dual Atomizer System
960mm(W) x 590(D) x 702(H)

* Dimensions do not include the ASC-6880. Height (H) does not include protrusions.

■ Lamp house

Just slide the cover to the side for easy replacement of the hollow cathode lamps through the large opening.



Power Supply, for Unique High-Performance Boosted Hollow Cathode Lamp Included as Standard

Excellent Lamp Sockets Design

The AA-6880 lamp house has an 8 lamp turret with an automatic switching function, where the No. 7 and No. 8 lamp holders can be used for both an ordinary hollow cathode lamp and a high-performance boosted hollow cathode lamp. The AA-6880 can simultaneously light any two hollow cathode lamps.

For the high-performance boosted hollow cathode lamp, an auxiliary cathode electrode is added based on two ordinary hollow cathode lamps. The atoms will be produced under the sputtering action in the hollow cathode due to discharging between the hollow cathode and the anode. The low-voltage high current between the anode and the auxiliary cathode provides excitation energy for the atoms, and such sputtering action and excitation action will be respectively controlled by two separate discharge processes. This greatly improves the excitation efficiency of the atomic spectrum. The high-performance hollow cathode lamp requires a dedicated power supply.

Unique Lamp Power Design

- The AA-6880 main unit has a built-in high-performance boosted hollow cathode lamp power supply. Two high-performance hollow cathode lamps can be simultaneously illuminated without any external power supply.
- An auxiliary cathode current can be automatically scanned, which only requires optimizing the test conditions.

Main Features of High-Performance Boosted Hollow Cathode Lamps (as Compared with Ordinary Lamps):

- High emission intensity and good stability
- High measurement sensitivity and low detection limit
- Expanded calibration curve linear range
- Reduced spectrum interference from adjacent lines, so a larger spectral bandwidth can be used to further improve the energy. In general, the electrodes of the high-performance boosted hollow cathode lamp, made by low-melting-point and volatile elements, such as As, Bi, Pb, Sb, Se, Zn, etc., show better application results..

Element	Air-Acetylene Flame Analysis	Air-Acetylene Flame Analysis	Graphite Furnace Analysis	Graphite Furnace Analysis
	Ordinary Hollow Cathode Lamp	High-Performance Hollow Cathode Lamp	Ordinary Hollow Cathode Lamp	High-Performance Hollow Cathode Lamp
	Detection Limit ($\mu\text{g/mL}$)	Detection Limit ($\mu\text{g/mL}$)	Detection Limit (pg)	Detection Limit (pg)
Pb	0.0279	0.0149	0.68 (10 μL)	0.42 (10 μL)
Zn	0.0019	0.0010	0.055 (20 μL)	0.025 (20 μL)

Pb and Zn: Comparison Table for Typical Detection Limits of the High-Performance Boosted Hollow Cathode Lamp and the Ordinary Hollow Cathode Lamp

Advanced Safety Technology

Comprehensive Safety Functions in Every System

Safety is an extremely important consideration for flame atomic absorption spectrophotometers using acetylene gas.

The AA-6880 Series instruments incorporate a comprehensive range of safety mechanisms, including gas leak detectors.



Safety Functions for Flame-Specification Instruments

■ Multimode automatic gas leak check

The fuel gas pipes inside the instrument gas controller are automatically checked for gas leaks when the power is turned on and when the flame is extinguished. Should a gas leak be detected, a warning buzzer sounds and a warning is displayed on the screen.

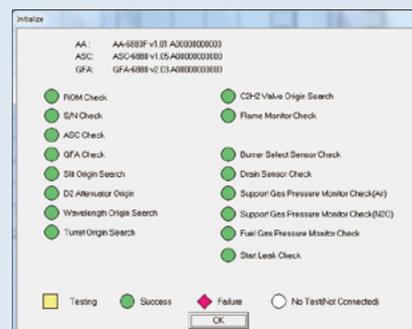
■ Automatic flame ignition and extinguishing

Flame ignition and extinguishing operations are extremely simple. The Air-C₂H₂ flame priority ignition mechanism prevents flashback.

■ Automatic Air-N₂O switching system with acetylene flow-rate monitor

After the ignition of an Air-C₂H₂ flame, the flame automatically switches to an N₂O-C₂H₂ flame.

If the C₂H₂ flow rate does not increase due to solenoid valve trouble, for example, switching to the support gas is disabled to prevent flashback.



■ Pressure monitor prevents flashback

■ Automatic gas shut-off by flame monitor

■ Sudden power interruption detection and re-ignition safety measures

■ Mechanism to prevent misuse of the burner

■ Drain tank level monitor

Safety Functions for Furnace-Specification Instruments

■ Cooling water flow rate monitor

■ Argon gas pressure monitor

■ Furnace cooling check

■ Overcurrent protection unit (double-checked by circuit protector and optical sensor)

■ Design for preventing miss-ignition

Safety-Conscious Design

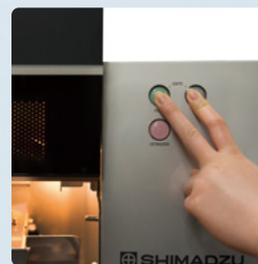
■ Flame-retardant materials

UL 94V-0-rated flame-retardant materials are used for the instrument external covers and atomizer unit. This superior design pays due consideration to safety.

■ Safe ignition switches

The switches perfectly fit finger contours and are positioned near the window.

To prevent inadvertent operation, both switches must be pressed simultaneously to start ignition.



■ Durable pipes and reliable couplings

All pipes are selected for durability and used with highly reliable couplings.

■ Clear window

The large window permits observation of the flame, and the burner can be easily accessed through the large opening.

The window closes when released to eliminate the chance of it being left open.



The optimal background correction methods are installed as standard: high-speed self-reversal method (SR method) and deuterium lamp method (D₂ method).

These functions can correct for spectral interference in flame measurement. Selecting the optimal background correction method for each sample ensures accurate and reliable analysis results.

Samples suitable for the SR method

Samples with a complex matrix
(Containing a large quantity of a specific element as the main component)

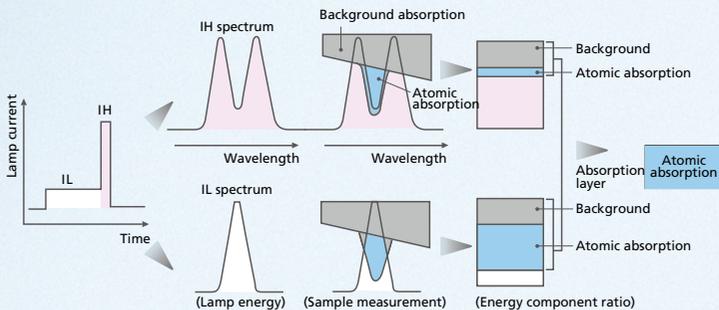
Samples suitable for the D₂ method

Purified water, tap water, environmental water, etc.
Samples with a relatively simple matrix

SR (high-speed self-reversal) method — accurate background correction over a wide range

Features

1. High-speed self-reversal (SR) correction is generally more accurate than deuterium lamp (D₂) correction. As both atomic absorption and background absorption can be measured using a single lamp, the correction errors due to light-axis misalignment are extremely small. This is ideal for the quantitation of trace components in a matrix exhibiting complex background absorption, such as bio-samples and metals.
 2. Permits background correction over the entire wavelength range from 185 nm to 900 nm.
 3. This method can correct for spectral interference due to neighboring lines that can occur when a resonance line for another element exists near the analytical line for the target element. (See table on next page.)
 4. As no polarizer is used, measurements are possible with low light losses and a high S/N ratio.
 5. The rapid lamp lighting permits accurate measurement unaffected by emission noise in the atomizer.
- * Hollow cathode lamp L-2433 is required to use the SR method. It can also be used for the D₂ method.



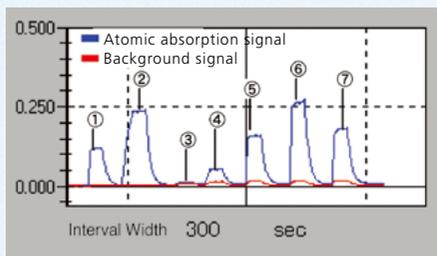
Principle

A small current IL (approx. 10 mA) and a large current IH (approx. 500 mA) are alternately passed through the hollow cathode lamp. The lamp emission spectrum when the large current flows has a depression in the center (self-reverse), due to self-absorption of the large number of sputtered atoms in the atom cloud, as shown in the diagram to the left. No significant atomic absorption is apparent and background absorption mainly occurs. Conversely, the lamp emission spectrum when the small current flows comprises a single narrow peak resulting from both atomic absorption and background absorption. By determining the difference between the two types of absorption, it is possible to accurately correct for the background absorption and measure the true atomic absorption.

Examples suitable for SR method (where differences result between SR and D₂ methods)

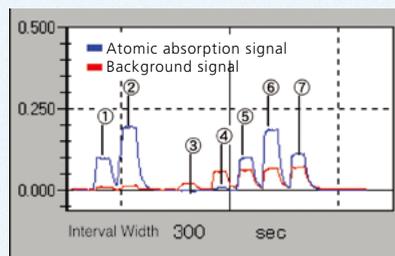
Example: Measurement of trace levels of zinc in iron (analysis of Zn in Fe solution)

BGC-SR method



The identical 0.5 ppm Zn solution is accurately corrected to the same absorbance at (2) and (6).

BGC-D₂ method



Due to inadequate correction, the absorbance is higher at (6) than at (2) for the identical 0.5 ppm Zn solution.

- ① Zn 0.25ppm
- ② Zn 0.50ppm
- ③ Fe 0.1%
- ④ Fe 0.5%
- ⑤ Fe 0.5% + Zn 0.25ppm
- ⑥ Fe 0.5% + Zn 0.5ppm
- ⑦ Fe 0.75% + Zn 0.3ppm

Examples of elements and wavelengths causing spectral interference problems due to neighboring lines

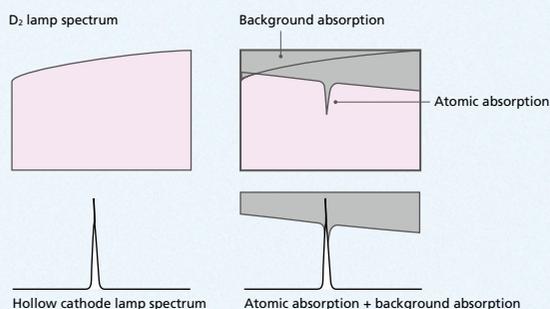
Measured Element	Analytical Line (nm)	Coexisting Element	Absorption Line (nm)
Al	309.28	Mg	309.30
As	193.76	Fe	193.73
Ca	422.67	Fe	422.64
Cd	228.80	Ni	228.84
Cu	324.75	Fe	324.73
Ga	294.36	Ni	294.39
Mg	285.21	Fe	285.18
Ni	232.00	Fe	232.04
Pb	217.00	Fe	216.95
Sb	217.58	Fe	217.55
Se	196.03	Fe	196.05
Si	251.61	Fe	251.69
Zn	213.856	Fe	213.8589

The SR method is suitable for samples containing elements that cause problems with spectral interference, as shown in the table to the left.

D₂ (deuterium lamp) method — highly sensitive background correction

Features

1. Detection sensitivity is superior to the SR method. Therefore, this method is suitable for the analysis of samples with a simple matrix requiring high sensitivity, such as the measurement of trace levels of impurities in ultrapure water or environmental analyses.
2. As the lighting frequency is higher than with the SR method, it can eliminate noise due to emission components of the flame or graphite tube to permit accurate atomic absorption measurements.
3. The original hollow cathode lamp can be used.

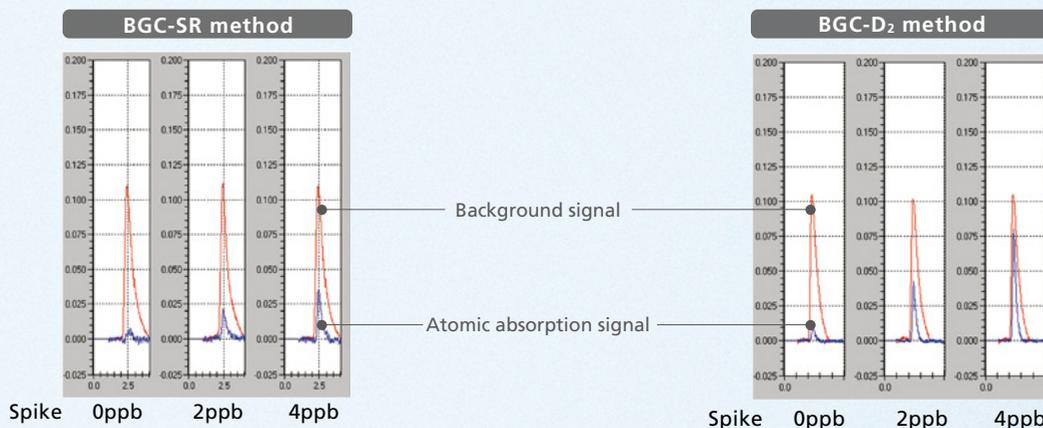


Principle

The deuterium lamp method involves lighting the hollow cathode lamp and the deuterium lamp alternately at high speed. After separation by the monochromator, the light from the deuterium lamp has a bandwidth from 0.1 to 5 nm. Therefore, an atomic absorption with a line width of only about 1/1000 nm is almost unobservable compared to the background absorption due to wide-bandwidth molecular absorption. However, as the light from the hollow cathode lamp has approximately the same bandwidth as the atomic absorption band, the total of the atomic absorption and the background absorption can be observed. With the deuterium lamp (D₂) method, light from both sources passes through the atomizer. The difference in absorbance is determined to conduct background correction.

Examples suitable for D₂ method (where no difference results between SR and D₂ methods)

Example: Measurement of trace levels of lead in 2% NaCl solution by molecular absorption (analysis of Pb in 2% NaCl solution)



It can be seen that the sensitivity is higher with the BGC-D₂ method.

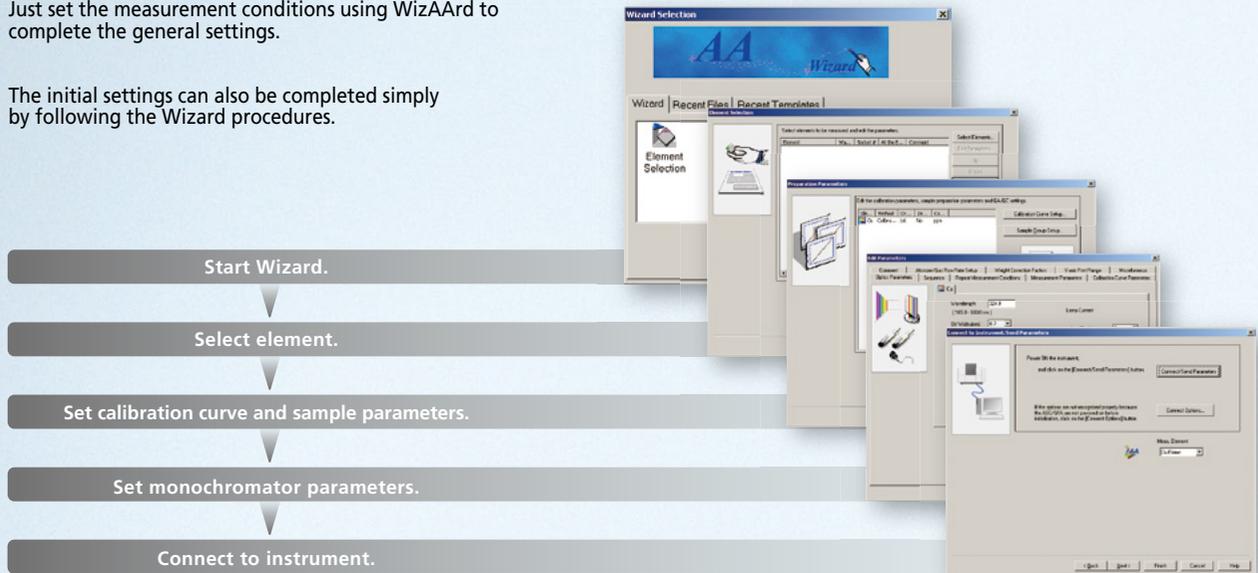
Features of the WizAard Software

The WizAard software used with the AA-6880 runs under Windows 7.

Wizard Functions Make Setting the Conditions So Simple That Even a Novice Can Do It.

Just set the measurement conditions using WizAard to complete the general settings.

The initial settings can also be completed simply by following the Wizard procedures.



Measurement Screen Layout Shows Measurement Status at a Glance

Measured element

Real-time signal monitor

MRT (Measured Results Table)
The worksheet shows sample names, absorbance, concentrations, and correction calibration results.

Signal profile display

Calibration curve display

Lamp History Function Assists with Lamp Management

The accumulated operation time for each lamp displayed on the lamp registration screen assists with lamp service life management. Multiple lamps for the same element are differentiated using lamp IDs.

Lamp ID	Element	Lamp Type	Life Time	Used Time	Unit	Judge	Comment	Lock
1	D2	D2	500	0.0	hrs	OK		
2	Ag-1	Ag	Normal	5000	0.0	mATrs	OK	
3	Al-1	Al	Normal	5000	0.0	mATrs	OK	
4	As-1	As	Normal	3000	0.0	mATrs	OK	
5	Au-1	Au	Normal	5000	0.0	mATrs	OK	
6	B-1	B	Normal	5000	0.0	mATrs	OK	
7	Ba-1	Ba	Normal	5000	0.0	mATrs	OK	
8	Be-1	Be	Normal	5000	0.0	mATrs	OK	
9	Bi-1	Bi	Normal	5000	0.0	mATrs	OK	
10	Ca-1	Ca	Normal	5000	0.0	mATrs	OK	
11	Cd-1	Cd	Normal	5000	0.0	mATrs	OK	
12	Co-1	Co	Normal	5000	0.0	mATrs	OK	
13	Cr-1	Cr	Normal	5000	0.0	mATrs	OK	
14	Cs-1	Cs	Normal	5000	0.0	mATrs	OK	
15	Cu-1	Cu	Normal	5000	0.0	mATrs	OK	

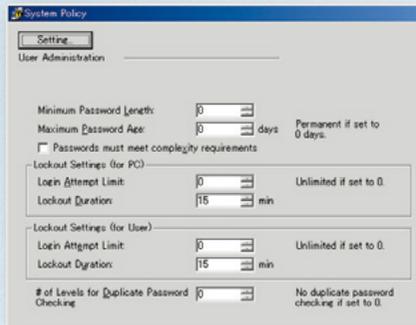
FDA 21 CFR Part 11 Compliance

- A combination of enhanced WizAard software with Shimadzu's network-compatible CLASS-Agent data management software supports FDA 21 CFR Part 11 compliance.
- WizAard used alone provides comprehensive system policy settings, as well as user management, log browser, audit trail, and electronic signature system management functions.
- Hardware validation software installed as standard.

Comprehensive Data Management Functions

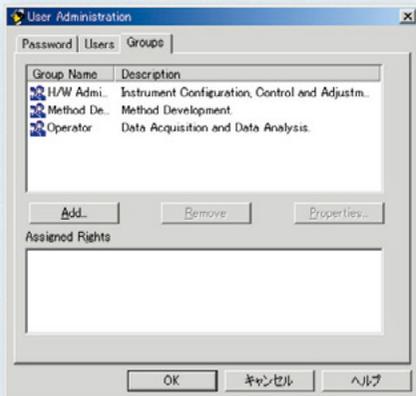
System Policy

The system policy settings allow advanced password and lockout settings. The levels can be set in stages from "unrestricted" to "Part 11 compatible".



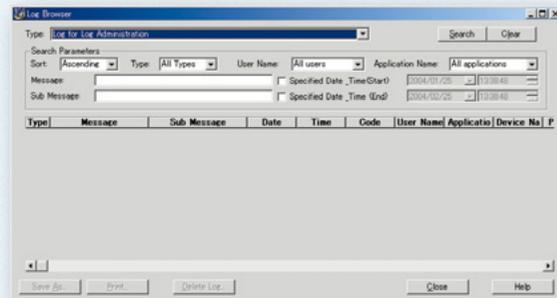
CLASS-Agent (Option)

Connection to CLASS-Agent permits efficient, long-term database management of large amounts of analysis data.



User Management

User management restricts the users of the system. It registers each user to determine how each one uses the software.



Log Browser

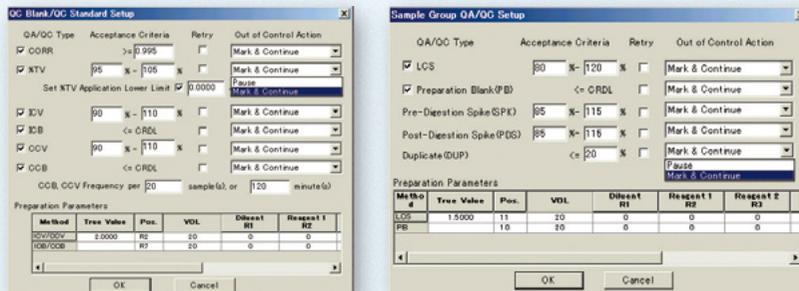
The log browser easily displays a variety of logs to check the system modification history and other log information.

Management

Accuracy Management (QA/QC) Functions Permit User Level Management, Audit Trail, and Electronic Signatures

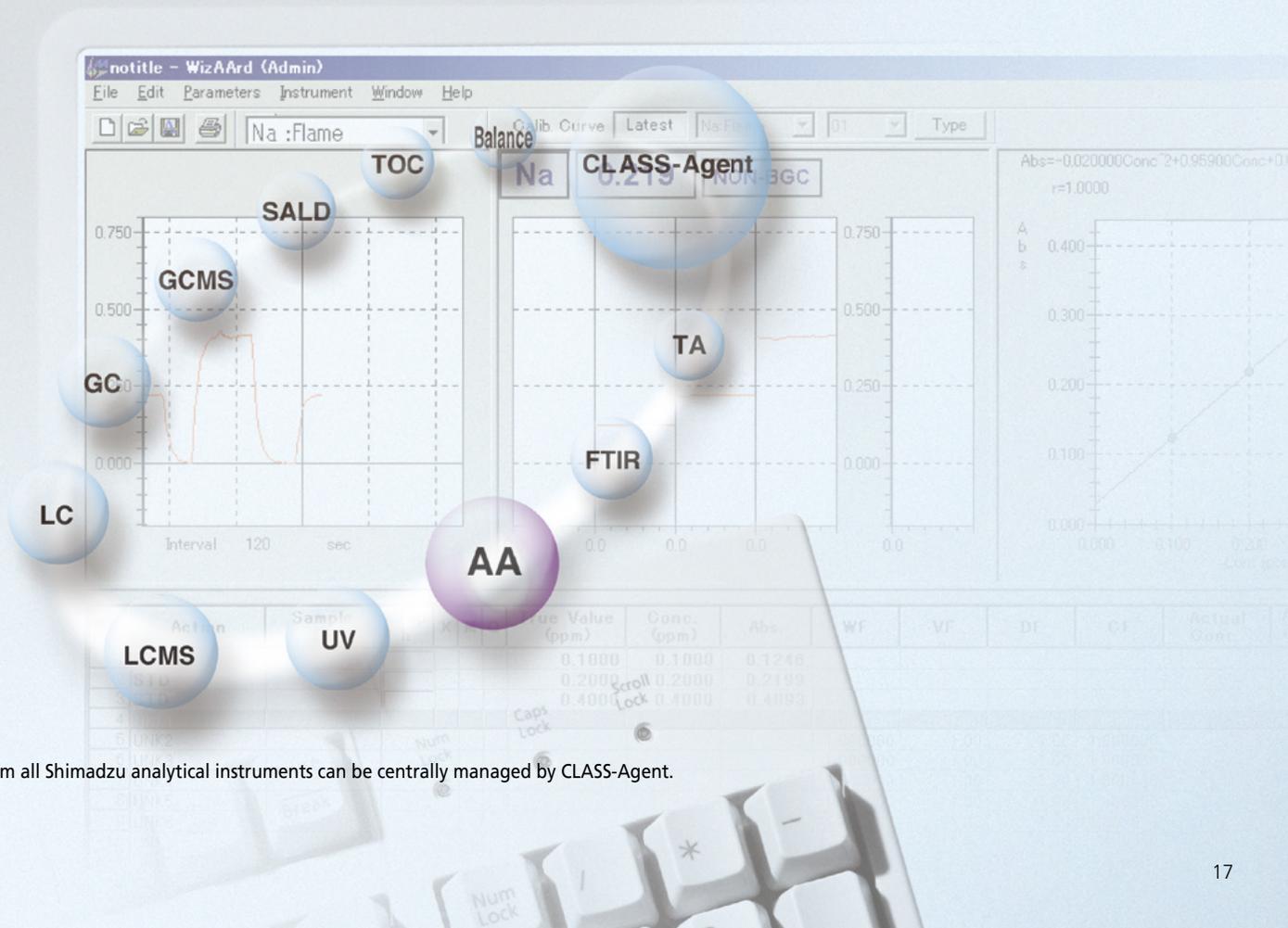
■ QA/QC compatibility

The QA/QC functions permit accuracy management.



■ Hardware validation software installed as standard

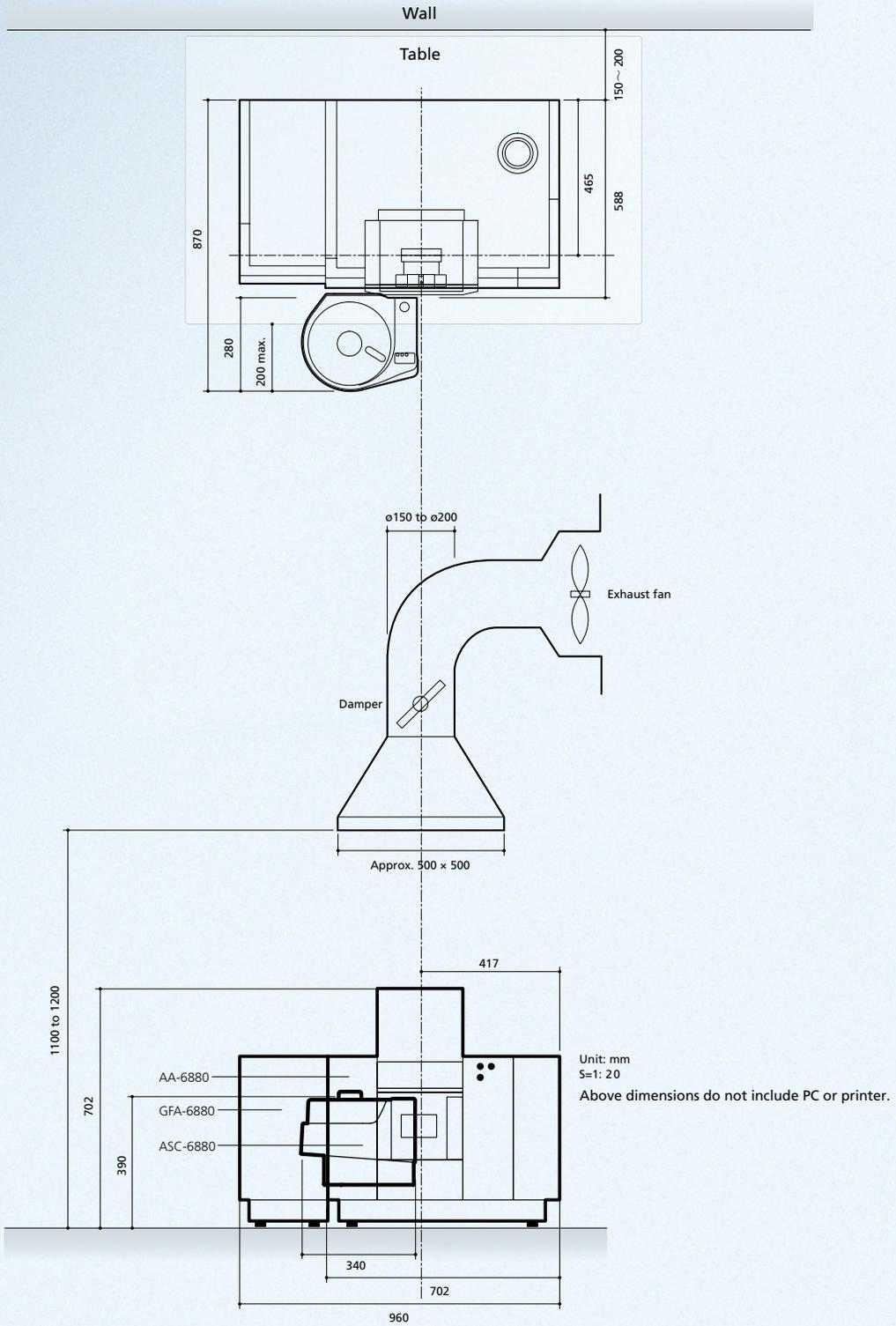
The hardware validation software makes it simple to evaluate the instrument performance. When combined with the autosampler, it automatically determines the wavelength accuracy, noise level, baseline drift, absorbance and repeatability, and prints out the results for comparison with the pass criteria.



* Data from all Shimadzu analytical instruments can be centrally managed by CLASS-Agent.

Installation Conditions

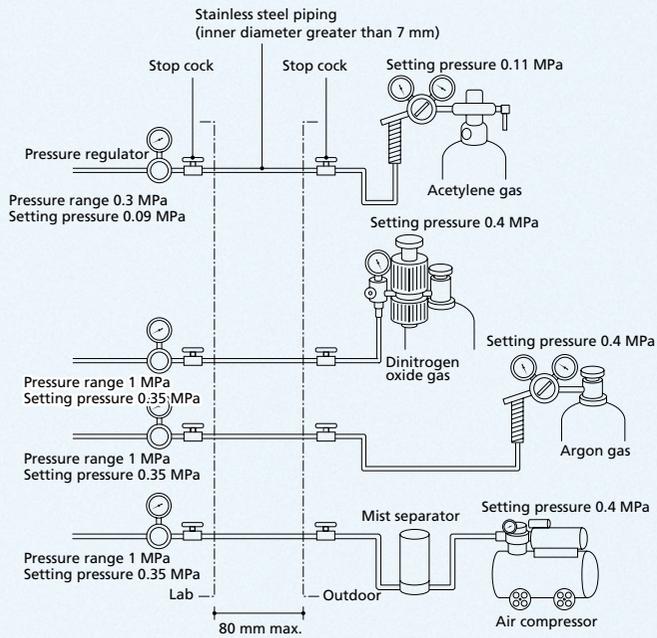
Dimensions



Both for flame analysis and furnace analysis

Make sure all required equipment is available before starting instrument installation. See the installation guidelines for details.

Example of recommended piping for the atomic absorption system



Operating environment	Temperature range	10 to 35 °C
	Humidity range	20 to 80% (less than 70% when temperature is higher than 30 °C)
Testing bench		1500 mm min. (W) × 700 mm min. (D) Withstand load: 200 kg ^{*1,2}
Gas tube	Material	Stainless ^{*3}
	Dimensions	7 mm min. I.D. × 80 mm min. (L)
Gas supply pressure (set secondary pressure)	Acetylene	Cylinder: 0.11 MPa Lab: 0.09 MPa
	Air	Compressor: 0.4 MPa Lab: 0.35 MPa
	Dinitrogen oxide	Cylinder: 0.4 MPa Lab: 0.35 MPa
	Argon	Cylinder: 0.4 MPa Lab: 0.35 MPa
Exhaust duct	Material	Stainless
	Dimensions	For flame: Approx. 500 mm W × 500 mm D For furnace: ø150 mm to ø200 mm
	Intake capacity	For flame: 600 to 1200 m ³ /hr For furnace: 10 to 180 m ³ /hr
Cooling water (GFA-6880)		Cooling water circulation unit or tap-water equipment ^{*4}

*1 Atomic absorption spectrophotometer stand recommended
 *2 Maintain a free maintenance space of 150 to 200 mm to the sides and rear of the instrument.
 *3 Do not use pipes containing copper, silver, gold, or mercury (or alloys containing these metals) as pipes for acetylene.

*4 If tap-water equipment is used, ensure that it meets the specifications below.

Compatible faucet	Faucet 13 or 12 to 15 mm O.D. rimmed faucet
Water temperature	10 to 30 °C
Water flow rate	0.6 to 1.5 L/min
Supply pressure	0.08 to 0.15 MPa ^{*5}
Supply port	7 mm min.

*5 If the supply pressure exceeds 0.17 MPa, use the optional Regulator ASSY.





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