Operating Instructions

For Flame Photometer

（AE-FP8201//8301/8401/8501）

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I. Application:

1. Analysis and measurement of cement, glass, ceramics and heat-resisting materials;
2. Measurement of the agricultural land survey and total nitrogen contents of soil or fertilizer;
3. Product analysis and monitoring in pharmaceutical industry and beverage industry;
4. Measurement of petroleum, metallurgy, mining, and chemical products;
5. Various laboratory tests fro scientific research, health, education and other fields.

II. Working Principles:

Flame photometer applies the emission spectrum as the basic principle. The whole machine including Gas, Flame combustion part, optical part, photoelectric converter, detection and record part. According to the molecular structure theory, outer electrons of atoms always move via a trapped orbit, which they usually move out of and transit to the orbit of the excited level, if they receive the heat energy provided by a flame. At the same time, attracted by the nucleus and recovering from the excited level to the normal level, the electrons release energy which can be illustrated by the spectra that release specific wavelengths. This method, which measures the luminescence levels of the elements to be determined at specific wavelengths through qualitative and quantitative analyses, is called analysis of spectra based on flame emission, and the instrument which applies to this method is called a flame photometer.

Theoretically, the contents of the elements to be determined are proportional to the intensity of the spectra released; however, the flame photometer normally applies only to the quantitative analysis of some alkali metals and alkaline earth metals at a certain concentration range, as limited by the excitement energy.

III. Main Technical Specifications:

1). Detector: photocells;
2). Beam splitter: interference filters;
3). Stability: User keep sampling with standard solution. The maximum relative variation displayed in the instrument is not greater than 3% in 15s, with 1 measurement every minute, and the total measurement is 6. All the variations displayed in the instrument should be not greater than 15%.
4). Repeatability: Conduct 7 consecutive independent test for one standard solution, the relative standard deviation is ≤3%.
5). Linear Error: K: ≤0.005mmol/L; Na: ≤0.03mmol/L;
Li: ≤0.02mmol/L; Ca: ≤0.07mmol/L; Ba: ≤0.07mmol/L;
6). Detection limit: K: ≤0.004mmol/L; Na: ≤0.008mmol/L;
Li: ≤0.015mmol/L; Ca: ≤0.050mmol/L; Ba: ≤0.058mmol/L;
7). Suction jet of samples: <6mL/min;
8). Response time: <8s;
9). Measuring range: K: 0~3mmol/L; Na: 0~5mmol/L;
Li: 0~15mmol/L; Ca: 0~25mmol/L; Ba: 0~22mmol/L.

IV. Key Features:

1. With K, Na, Li, Ca, Ba five filters, which can detecct three kinds of elements, show three kinds of elements content simultaneous.
2. LCD display, touch panel with numeric keypad.
3. With auto correlation coefficient calculating function.
4. With pre-select function for flame size.

5. A flameout protection device.
6. With single point calibration function.
7. Calibration curve can be saved.
8. With RS232 interface, can connect with external printer.
9. With a mist separator.
10. Easy adjustable Relief valve, direct view of pressure gauge.

V. Normal Working Condition:

1). Environment temperature: 10~+35℃, relative humidity: ≤85%;
2). Products should be placed on the table with no vibration, avoiding exposure to direct light, no strong electric and magnetic field interference, strong airflow impact, or vibration affecting using;
3). No inflammable, explosive, corrosive gases at the scene and fire-fighting facilities are available;
4). Power supply voltage: (220±22)V, frequency: (50±1)Hz, with a good grounding;
5). Rated power: 250W;
6). Operating on propane or liquefied petroleum gas, which are remarkably free from impurities and burning stability.

VI. Preparation before Operation:

1). Users prepare LPG cylinders.
2). Preparation of the solution.
Different background values appear due to different types of distilled water as solvents during preparation; therefore, the distilled water from the same container is needed for preparing standard liquid and samples to avoid the difference.

VII. Operating Instructions

1. Switch on the Instrument

Connect the interfaces of air output and the LPG cylinder on the air compressor with the instrument. Then put on a glass shield, on which the stainless steel mesh and follower ring are installed, in the combustion chamber. Before connecting the instrument with the power supply for operation, users should put the cover on the chimney. Press on the power switch to turn in the air compressor, the reading on the pressure gauge rises to around 0.12MPa. After that, the output pressure falls slightly to about 0.12MPa with the valve core on the air compressor sliding, and finally reaches a balance (This is a normal phenomenon).The output pressure remaining the same, users insert through the sampling tube. And then users may see the misty flow at the nozzle on the combustion chamber. Meanwhile, users need to check if the waste solution is flowing into the cap for it. If the waste solution flows at a uniform speed, users ought to find out if air exists in the latex tube under the atomizer, and press the latex tube and remove the air if this happens. Switch on the LPD cylinder. 8s later, users press the ignition switch for autoignition. If it doesn't work, then Substantially contrarotate to the gas valve, until ignited. Observe the flame through the window, and adjust the size of flame after burning few minutes, the flame should be cone-shaped, pure blue.

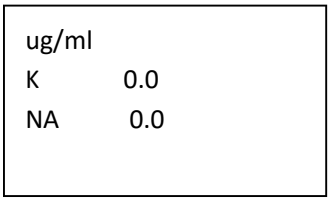
2. Warming up

Instilling the samples is a dynamic process due to the flame's combustion: first it's at the normal temperature, then the temperature rises. When the gas and sampling quantity are set, the flame temperature rises. When the gas and sampling quantity are set, the flame reaches a heat balance and becomes stable. The excitement energy is stable. The preheating procedure takes 20 minutes. Sampling with distill water is a good method as it stimulates as the actual sampling condition.

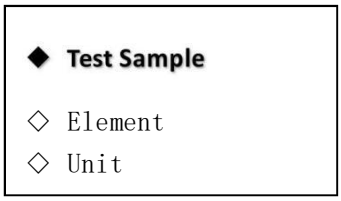
3. Testing

1) Turn on the device

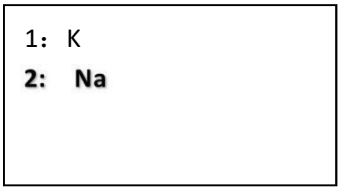
Press the switch, and the screen on the instrument displays.



Press “ESC”, and the testing menu is displayed on the instrument.

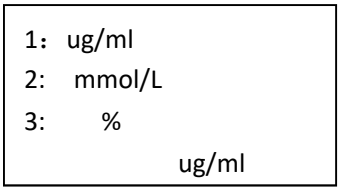


Adjust the key “ ▲ ” and “ ▼ ”, and make the shadow area on “Element”, then press “ENT” into the menu of Elements.



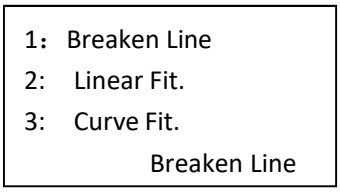
Now users press the number keys on the keyboard, and select corresponding units, and the screen displays shadow area on corresponding elements. Then press “ENT” or “ESC” to go back to the setting.

Adjust the key “ ▲ ” and “ ▼ ”, and make the shadow area on “Unit”, then press “ENT” into the units setting interface.



Now users press the number keys on the keyboard, and select corresponding units. Then press “ENT” or “ESC” to go back to the setting menu.

Adjust the key “▲” and “▼”, and make the shadow area on “Curve Type”, then press “ENT” into the curve setting interface.

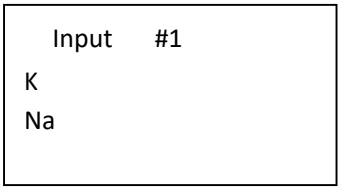


Users press the number keys on the keyboard, and select corresponding curve. Then press “ENT” or “ESC” to the menu interface.

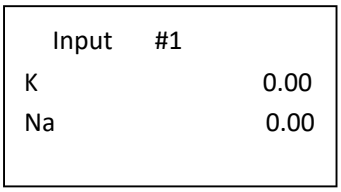
Now users select unit and element to be measured, then select the curve type needed for the measurement.

Now we take testing Potassium Oxide (KCl) and Sodium Oxide (NaCl) as example:

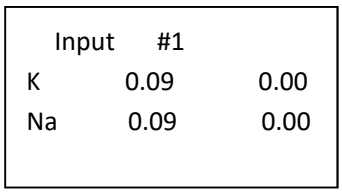
Prepare standard solutions: mixed solutions of 0, 5, 10, 20, 40ppm, and adjust the key “▲” and “▼”, and make the shadow area on “Curve Type”, then press “ENT” into the curve setting interface.



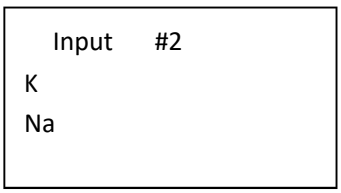
Now please insert the sampling capillary into the blank solution. Then press “ENT” by inputting “0”, and input the standard values of “K” and “Na” into the screen.



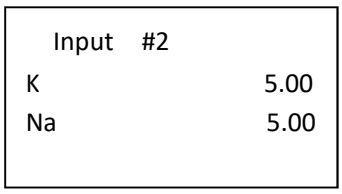
Now press “CAL” and the instrument starts reading data of this 2 elements.



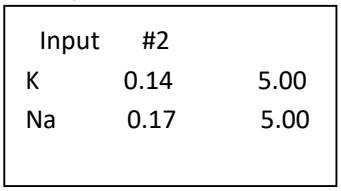
Count down for 10 seconds, and the instrument reads the data, and input interface of sample #2 automatically displays on the screen.



After that, insert the sampling capillary into the sample #2, 5ppm standard solution. Press “5”, and “ENT” to input the standard values of “K” and “Na” into the screen.

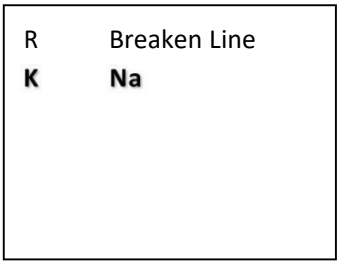


Now press “CAL”, and the instrument starts reading data of this two elements.

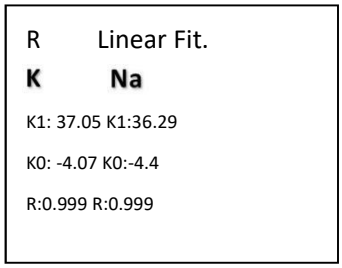


Count down for 10 seconds, the screen automatically displays the input interface for sample #3. Then insert the sampling capillary into 10ppm standard solution of sample #3. Keep doing this by the same token until 40ppm sample, the last one, is inserted. Then press “ESC”, screen display

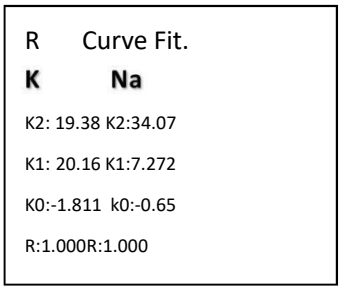
a). If select “Breaken Line” under “Curve Type” , then the screen displays as following:



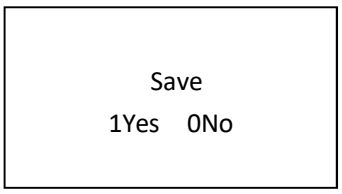
b). If select “Linear Fit” under “Curve Type”, then the screen displays as following:



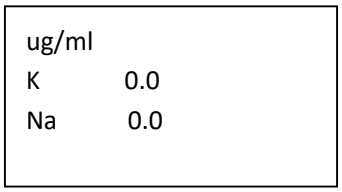
c). If select “Curve Fit” under “Curve Type”, then the screen displays as following:



Now press “ESC”, the screen displays as following:



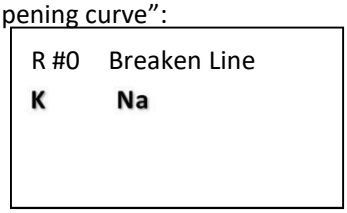
Now press “1”to save, and press “0” to not to save. Generally, save and press “1” and the instrument will go into testing interface, which displays as following:



Once under measuring interface, press “PRT”, a printer automatically prints current results.

If press “0” instead of “1”, then it will not save the standard curve, and the instrument will go into menu interface.

Adjust the key “ ▲” and “▼”, and make the shadow area on “Open Curve”, then press “ENT” into the interface of “Opening curve”:

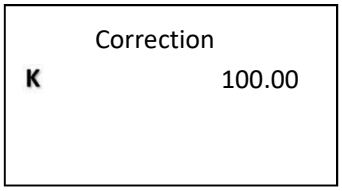


Adjust the key “▲” and “▼”, select 1 curve from the latest stored 5pcs standard curves (#0~#4). Then press “ENT” to select this curve, then go into the testing interface:

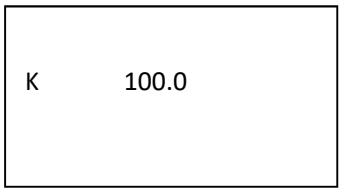
Notice: The flame combustion state should be same as the one which is under selecting standard curves.

Once after a long time testing, the flame combustion state changed, and lead the change of testing results. Now can adjust the key “ ▲” and “ ▼” on the setting menu interface, to make the shadow area on “Correction”, then press

“ENT” into the interface of “Single Calibration”:



Insert the the capillary into the solution to be tested, Press “ENT” start to calibrating, count down for 12 seconds, it go into testing interface.



If the flame size has been adjusted, then please re-calibrate.

4. Switch off

When switching off, shut off the switch for LP before shutting the power, the flame will burn out after the residual petroleum gas in the pipe burned-out. Before shutdown, wash with distilled water for 5 min, then shut down the power of air compressor at first, then shut down the power of the instrument. The gas valve needs not to be turned when switching off, as the combustion will not change much until the next usage. Therefore, it’s not necessary to adjust the flame for the next switching on. If it is hard to ignite next time, users turn up the gas. As it ignites, only need to adjust a little , then it will work.

VIII. Maintenance Notice

1. After each test, users keep instilling the distill water for 5 minutes to clean up the inside of the atomizer.
2. When pressure reducing valve for filtering of the air compressor works, water in the air is suppressed and condensed within it. This long-time standing water influences the normal operation of the instruments. Therefore, after using pressure reducing valve for filtering for a period of time, users should lift the instrument and turn the left valve at the back. Pushed by the compressed air, standing water automatically releases. Users need to turn at the opposite direction when all the water is gone.

IX. Points for Attention

LPG is combustible and explosive gas, once the leakage reached to a certain concentration, it will easily explode after touching kindling. To ensure safety, users should follow below instructions when running the machine:

1. Strictly according to operational manual when operating this machine.
2. LPG tank should be appropriately away from the machine, and be away from place with naked light. It should be placed in cool, well-ventilated environment.
3. Check the LPG tank, and pipeline to the input port of the instrument before each use, checking whether there is gas leakage. If yes, should repair before using.
4. When switching off, shut off the switch for LPG before shutting off the power. Make sure the the residual petroleum gas in the pipe burned-out so as to avoid accidents. Next then shut down the power of air compressor and instruments.
5. Every three months, users should check whether there is gas leakage for the LPG tank and pipeline. The method is: Smear the soapy water on each valve, interfaces of each input port of machine, then watch about 1 minute, checking whether there is bubble. If yes, then tighten or replace the corresponding interfaces. If necessary, connect professional man to work on the repair.

6. Users should not go away from the site when machine is working. If unknown leakage of LPG occurs, users must immediately switch off cylinders, and open doors and windows. Do not switch on/off electrical appliances, and try to find the leakage points.

X. Volume, Weight, Complete Set

1. Volume: 400x275x460mm;
2. Weight: 10.0kg;
3. Complete set: a main machine, an air compressor, accessories and spare parts, etc.

Item	Name	Q'ty	Remark
1	Main device	1unit	
2	Operating manual	1pc	
3	Air compressor	1unit	
4	PU pipe for air road	2.5m	
5	Silicone tube (spare)	0.6m	
6	Funnel parts	1pc	
7	Glass cylinder	1pc	
8	Capillary	1pc	
9	Fuse	2pcs	
10	Power cable	1pc	
12	Micro-printer	1set	

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