www. insize. com

OES-T350
SPECTROMETER
MANUAL

Preface

This user manual describes the working principle, operation and repair method, to let the user be familiar with the use of this instrument and its application. This manual contains the useful guide for using the apparatus safely, correctly and efficiently. Follow these guidelines will be beneficial for preventing the risk and reducing the repair costs. Please use the spectrometer properly based on carefully reading the User's Manual.

Notice

- Please use instruments after fully understand this manual.
- For any loss or damage to the manual, immediately obtained from Our Company

Symbols

Different symbols are used to emphasize specific safety operation in this manual. These symbols are listed below :

Symbol	Description
	Warning symbol and information——if not comply with the relevant operation rules will cause the equipment cannot work normally; severe cases may damage the apparatus and Cause bodily injury.
	Electrical dangerous——Emphasis on the dangerous behavior to body and life, need very careful and safety first procedure.
	Note symbol and information——means special or additional important information, need user attention

Summary

Spectrometer is a high-performance metal components analysis instrument. It has some excellent properties such as fast, easy to use, high reliability , low cost of operation and maintenance .It can analysis the metal components of Fe, Al, Cu etc.

The measurement principle is as follows:

The spark between electrode and previously prepared sample is generated under the drive of the light source module. Spark generated high temperature ,and the atoms in the metal sample is heated to an excited state. When the atoms back from the excited state to the ground state, it emit light with characteristic lines .The spectrometer analyze the intensity of light to quantify the content of each element.

This manual describes the principle on the installation, operation and maintenance. Please read this manual carefully and keep it properly.

Caution

- The spectrometer is a precision instrument; it should be placed in the environment that kept clean and dry, and suitable temperature. Otherwise, the instrument life will be reduced.
- The Instrument operating temperature 23±2°C. Therefore, please turn on the air conditioner in advance to keep the room temperature within the proper range before using the spectrometer.
- The computer for the spectrometer should not be free to install unrelated software, and not free to copy, modify, and delete files in the computer.
- The electrode will produce a high-frequency electric spark when working, the human body cannot contact the instrument or sample.
- The spectrometer should be equipped with a special ground wire whose resistance less than 1 ohm.
- Please contact with the company in case of instrument failure. Users may not repair the instrument; otherwise further damage to the instrument is not covered by the warranty.
- Any hardware changes of the spectrometer, such as plugging the network cable, replacing the gas line, need to power off the instrument.

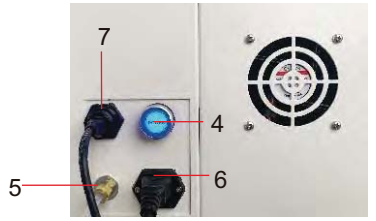
SPECIFICATION

Optical system	Optical structure	Paschen-Runge structure
	Rowland circle of diameter	350mm
	Wavelength range	160~510nm
	Detector	Multi high resolution CCD detectors
	Pixel resolution	20pm
	Full spectrum	Cover the full range of element analysis
	Light room temperature	34±0.5°C (be controlled automatically)
Spark source	Type	Digital arc and spark source/ New plasma generator
	Spark frequency	100~1000Hz
	Plasma current	1~80A
	Lgnition voltage	>7000V
Spark stand		Spray discharge electrode technology reduces argon consumption and improves argon use efficiency
		Good heat dissipation, continuous excitation for 100 times, the temperature of the excitation table does not rise more than 5°C
Others	Measurable elements	Fe base, Al base, Cu base, Zn base, etc
	Operating temperature	10~30°C, 23±2°C is recommended
	Operating humidity	20%~80%RH
	Power	AC220V/50Hz
	Power consumption	Excitation:300W, stand by:40W
	Argon quality	99.999% High purity argon, argon pressure≥4MPa
	Argon consumption	5L/min during spark mode
	Dimension(LxWxH)	700x660x340mm
	Weight	30kg

□ Installation

Instrument Components

Front Side of the Instrument



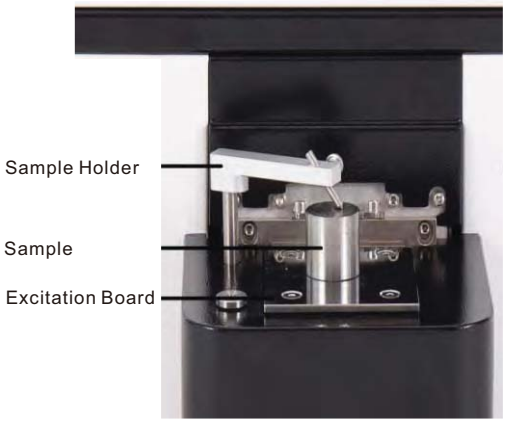
Back Side of the Instrument

Connector and Cores Parts

Item	Name	Remark
1	Excitation Stand	For details, refer to “2.2 excitation stand”
2	Sample Holder	Fix the sample
3	Indicator Light	RUN、SPARK、ALARM
4	Power Switch	Control the power of entire instrument
5	Argon Inlet	The connector of the argon tank and argon module
6	Power Input	220VAC/50Hz
7	Ethernet Connector	The standard Ethernet crystal joints

Excitation Stand

The excitation stand mainly provides the environment for sparking. It is composed by the spark panel and sample holder. Spark panel is used to place sample and be negative electrode in spark discharge. And the sample holder is used to fix the sample.



Spark Stand Photo

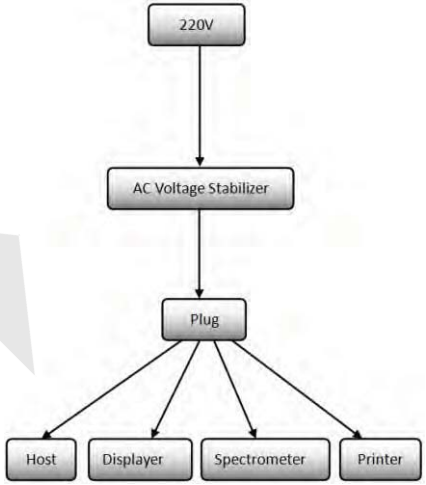
Instrument Installation

◆ Line Connection

In order to prevent the spectrometer from being affected by the excessive current at the start of the vacuum pump, our company should try to distinguish the power source of the spectrometer from the power source of the vacuum pump when installing the spectrometer. Therefore, we require that at least two power plugs of 220V ac be prepared in the laboratory. This power socket is connected to the wire drawing board equipped by the manufacturer with no protective device, and then the stabilized voltage supply is connected to the wire drawing board. The stabilized voltage supply provides working power for instruments, computers, printers, etc.

The power strip of wireless protection device

◆ Please refer to the following photo



Line connection flow chart

◆ Installation of Argon bottle

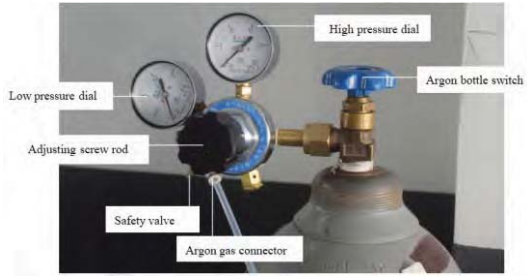
The argon gas must be high-purity, purity is 99.999%.

When the high pressure dial is below 2, argon gas needs to be replaced. When argon gas is replaced, there is no need to turn off the power button of the spectrometer.

Step 1: Turn off the argon master switch, unscrew the nut (as shown in the picture below) and replace with the new argon.

Step 2: after replacement, tighten the nut and turn on the argon master switch (the low pressure meter shows between 0.5-0.6mpa at this time), and then it can be used normally.

As shown in figure :



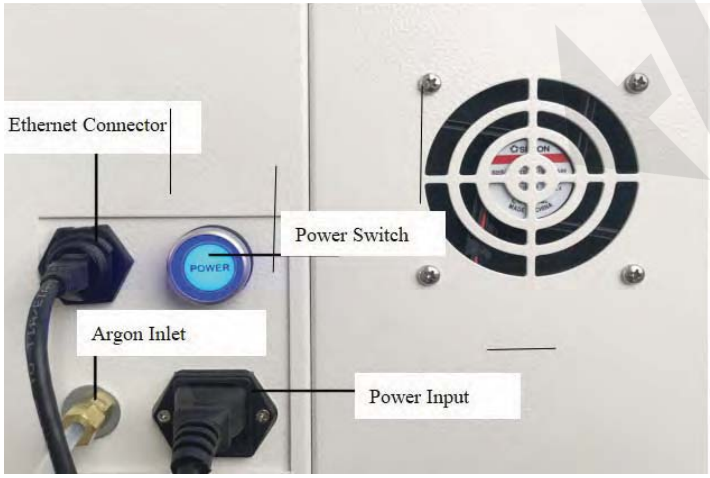
The Installation of Argon Gas Pressure Reducing Valve

⚠ Caution:

1. High pressure meter shows the gas pressure value form tank; low pressure meter shows the gas pressure after reducing value, that is the argon outlet gas value.
2. Air leakage inspection: First, open the gas tank switch before open the safety valve(Twist to left), this is for fulfilling the gas circuit module with gas; Second, turn off the gas tank switch, to check whether there is dramatic decline sign on the high pressure meter, dramatic decline sign indicate air leakage exist.
3. If air leakage happened, can spray soapy water to the connector, and then inform the after sale.
4. If do not use the gas for a long time, better to close it. The order is to close the argon gas bottle switch first before release all the gas out of reducing valve (Short key F1 is flushing, F2 is Off), and then loosen the adjusting screw rod (contra rotate) which will effectively increase the usage life of reducing valve; When using, first open the argon gas bottle switch and then turn the adjusting screw (clockwise) the low the pressure to 0.5MPa.

◆ Installation of Spectrometer

To fix the argon pipe by using open spanner to tighten the bolt near the argon gas inlet, Use the multimeter to check if short circuit exists near the power connector, the spectrometer should be connected with the outlet deviated from the voltage-stabilized source, using the cable connect the port of spectrometer to the computer host.As shown in figure:



⚠ Caution:

1. The cable port is connected with the computer host port, it is forbidden to do hot plugging air plug.
2. When pull out the cable, please note that If the cable clamp is on the outside, use screwdriver to push against the cable card buckle and then pull out it lightly.
3. When install the argon gas pipe, please use two open spanner cooperatively in order to protect the port from damage.

◆ Exhaust Gas Filtering Tank

There will be black dust generated during the sample excitation process, in order to prevent the spread of dust into the air to cause harm to human body, the dust is blown into the filtering tank through gas pipe, through filtering effect of the filter element, the dust in the exhaust gas can be effectively filtered out and the exhaust gas is discharged.

Exhaust Gas Filter

Exhaust Gas Filter and Instrument Connection

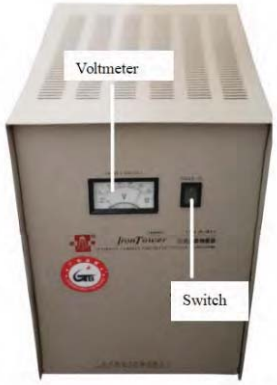
Exhaust Gas Filter Element

⚠ Caution:

1. The filter element must be changed regularly; otherwise it will affect the exhaust effect, so that the samples cannot be completely excited, excited little grey.
2. It is not allowed to change the filter element during the analysis process.

◆ Installation of Voltage-stabilized Supply

The Voltage-stabilizer is only used for computer host, computer display, spectrometer and printer, as shown in figure



Exhaust Gas Filter

The Back View of Voltage-stabilizer

⚠ Caution:

1. Connect the shielding wire and ground wire in series, and then connect them to the dedicated ground line in the laboratory.

◆ IP Address Setting

Windows 10 System:

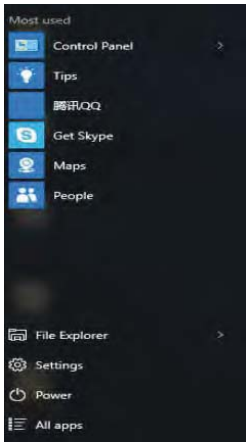
Right click the small computer icon on the bottom right corner of the desktop —>open "Network and Internet Settings" —>Ethernet —>change Adapter Settings—> Right click Ethernet "properties"—>select Internet protocol version 4 —> select Use the Following IP Address, set IP the address as 192.168.1.100, subnet mask is 255.255.255.0, others keep default.

◆ Shut down the Computer Firewall

When the computer is connected to the spectrometer , it cannot connect the network and open the firewall, which will directly lead to the phenomenon of "device unconnected". Therefore, Close the

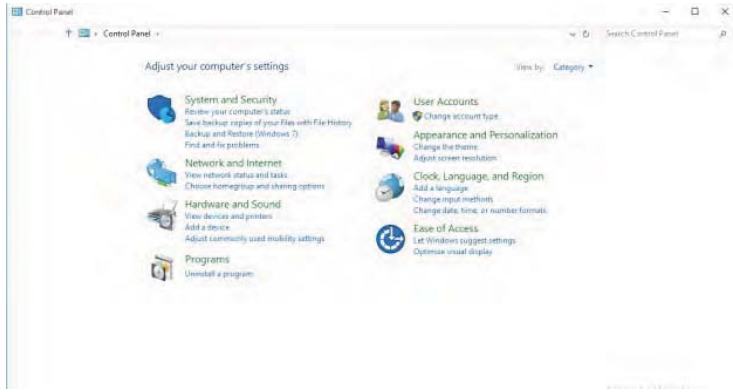
computer firewall, prohibit networking. Please refer to the detailed steps of changing IP address. The following steps are applicable to Win10 system.

(1) Open PC Control Panel



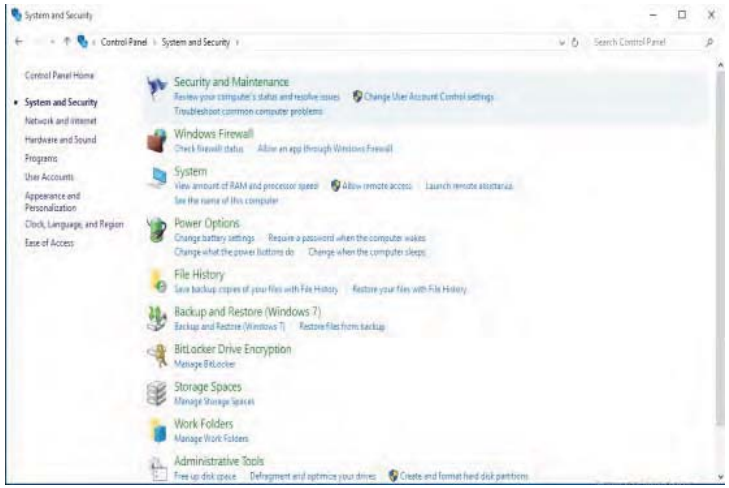
PC Control Panel Photo

(2) Click System and Security



System and Security Photo

(3) Click Windows Firewall

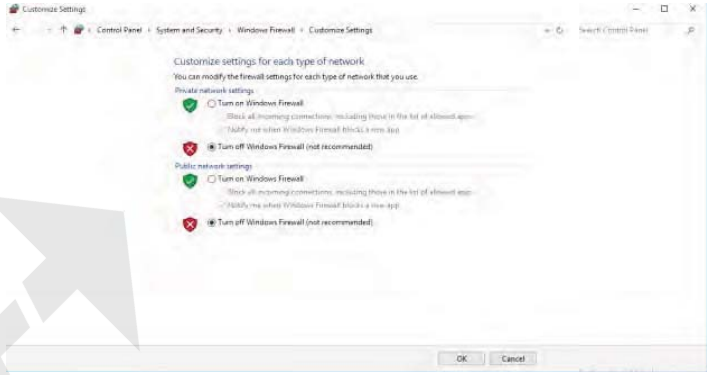


Windows Firewall Photo

(4) At this time, the Firewall is in the open state, click the right [open or close Windows Firewall]

The Firewall is in the Open State

(5) Select [close Windows Firewall]



Firewall Shutdown Photo

(6) Complete the Shutdown of Windows Firewall.

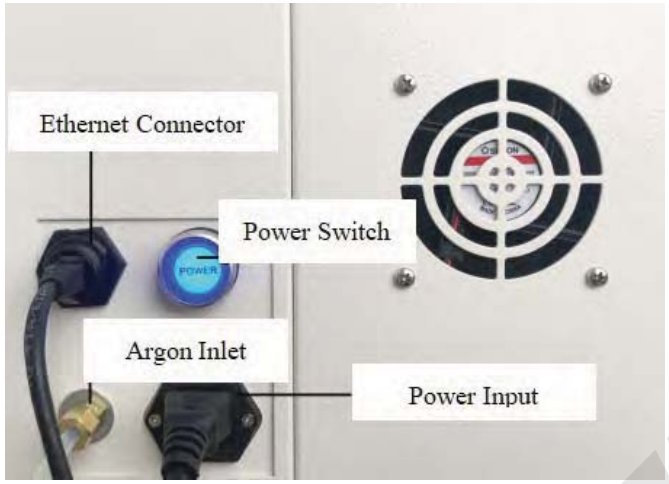
Firewall Shutdown Photo

□ Daily Operation

On/Off Instrument

◆ Turn on Instrument

The power switch is on the back of the instrument. And turn on the power switch before trun on the instrument.



Instrument Switch Photo

⚠ **Caution:**

1. Before turn on the general power, first turn on the power of voltage-stabilizer, and make sure the voltage is 220V.

◆ Turn off Instrument

If not use the instrument for a long time, please shut down the instrument as following order:

(1) Close the argon tank switch, release the extra gas out through the analysis software, refer to [2.4.2 Installation of Argon Bottle]

(2) Turn off the general power

⚠ Warning:

1.After turning off the above switches, please also shut off the power of voltage-stabilizer.

2.When the instrument is not in use , please cover the excitation hole with a smooth surface sample and press the sample with

sample holder, to make sure the excitation chamber cleaning and less incoming air. Never allow compliance with the pole pitch as an alternative to cover the excitation hole, leading to dramatic damage to the instrument caused by short circuit when excitation started by mistaken.

Sample Preparation

To obtain accurate results, it requires that the sample surface should be smooth, clean; requires that the sample cannot have trachoma, pores; the samples surface must be flat, can completely cover the excitation porosity; the samples surface must be clean, with no other substances, hand touch, otherwise you cannot get the correct results of the analysis.

(1) If the sample is steel or other ferrous metals, surface analysis need to be polished by prototype

(2) If the sample is copper, aluminum and other nonferrous metals, surface analysis need to be grinded by lathe.

(3) If the sample is iron casting, it must be whitened correctly.

Changing Spark Point

Normally, a sample can be sparked more times to select which averages 5-8 or more sets of data block as an analytical value of the this sample, in order to improve the reliability of the analysis. After getting one data for one analysis, to change the point and start another analysis. Before changing the point, clean the electrode using electrode brush; in order to less the incoming air, try to speed up the time for changing the spark points.

Spark Point Check

Spark Point Photo(From left to right:Alloy Steel, Aluminum Alloy ,Iron Casting)

Notice:

1. To check the excitation points after every excitation, if the excitation point is not good, the data need to be deleted and start a new excitation.

□ Analysis Software

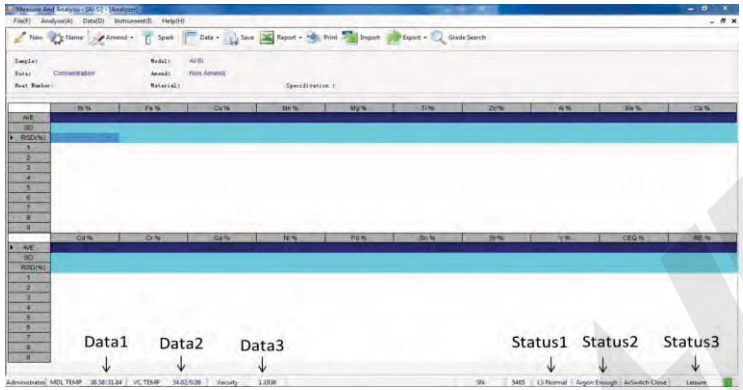
Software Login

Double click the software icon; open the login interface, as shown in the following photo, the password for operator is 6666, and the password for administrator is 8888.

⚠ **Caution:**

1. Turn off the firewall of the computer before login the software.
2. Open the OES-T350 spectrometer first before login the software, otherwise you cannot login.

Condition Monitoring



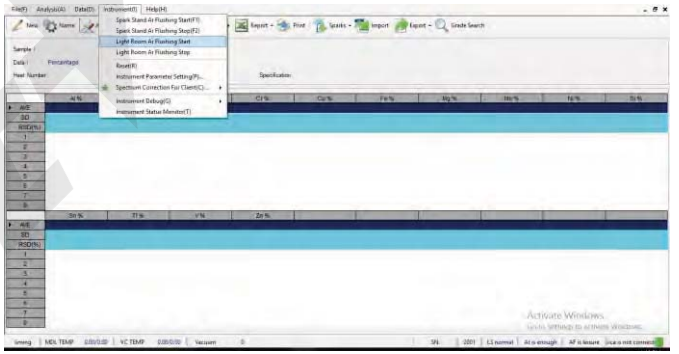
Data one is the temperature for system control panel and light source module; Data two is the temperature for optical chamber, it need 2-3 hours for the temperature reach ing34℃ after turn on the power; Data three is the vacuum value for the optical chamber, but OES-T350 is not vacuum model, so data three can be ignored.

After login the software successfully, check the above conditions and data to see if they are in the right range: Data one: <60℃; Data two: 34±0.2℃; Data three: no request; Status one: Optical normal; Status two: Gas pressure sufficient; Status three: Spare time.

Use argon gas to flush the optical chamber

The short wavelength like C, S, P will be absorbed by the air, so before do the calibration,we need to flush the optical chamber with argon gas, the detail step is as belows:

Click Instrument - then Click Light Room Ar Flushing Start(About 30 mins) - Then click Light Room Ar Flushing Stop - Then we need to wait about 2 hours to let the argon gas filled with the optical chamber .Then do the calibration

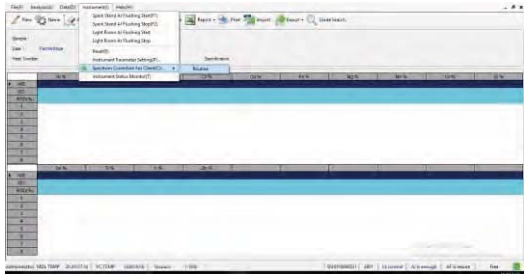


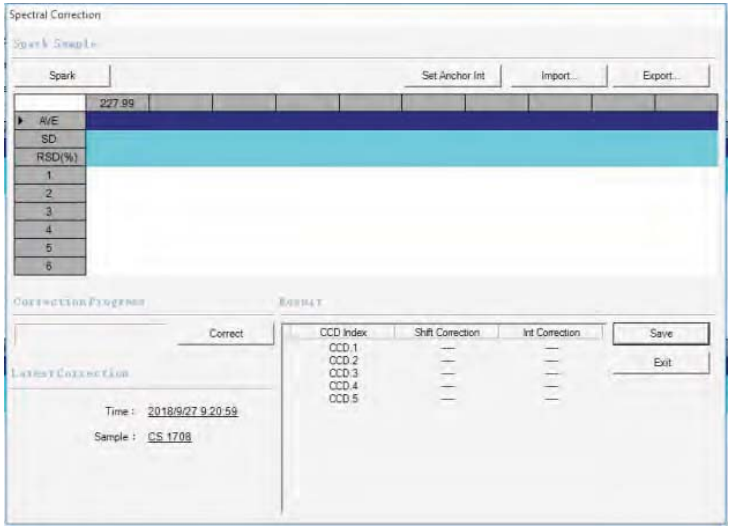
Software Calibration

Software Calibration mainly contains three steps: Spectrum Correction for Client, Intensity Standardize and Type Sample Calibration. Every step need use corresponding standard samples. Please do not change the sample or the testing result will inaccurate.

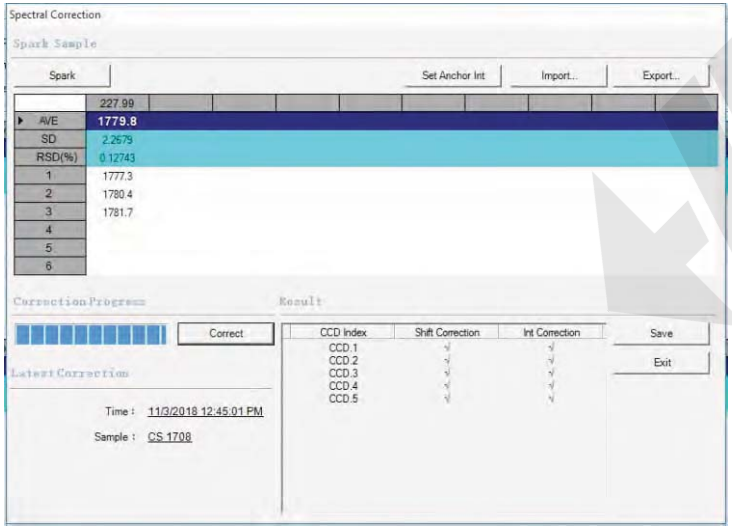
◆ Spectrum Correction for Client

（1）Instrument - Spectrum Correction for Client - Routine





（2）Use the correct sample to spark 4 - 5 times and save the stable 3 datas, Click Correct



（3）Click the Save to save the data, then Click ok.

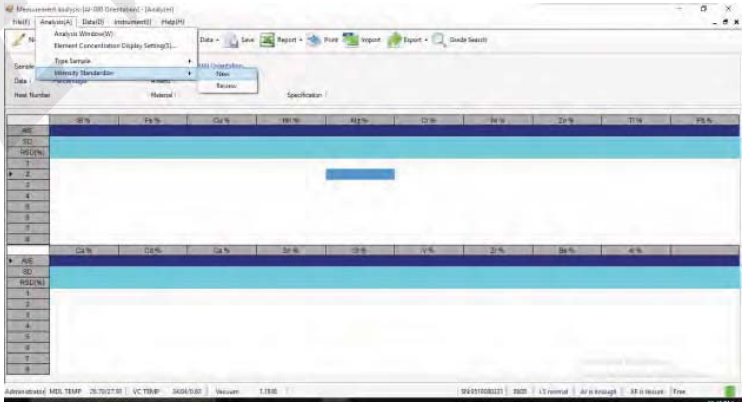
⚠ Caution:

1. During using the instrument, if the absolute intensity is significantly reduced or enhanced, then use the “Spectrum Correction for Client” function. If the software cannot be prompted to this function, please contact our customer service department, please refer to contact information in technical support part of this Manual.

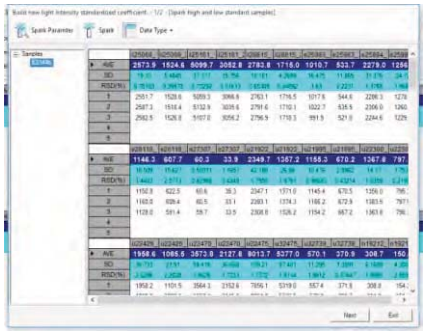
◆ Intensity Standardize

Intensity Standardize is designed to calibrate the drifting of spectrometer, correct the drifting to ensure the precision of analysis result and the specific sample must be used for this calibration.

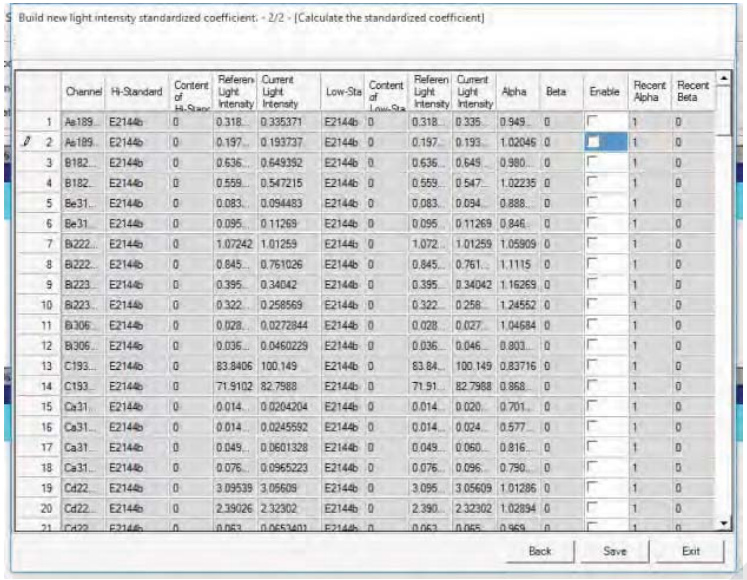
（1）Analysis - Intensity Standardize - New



（2）Single click the left “sample", put the corresponding sample on the excitation stand, spark 4 to 5 times, delete the bad data and save 3 datas, single click next step and save it.



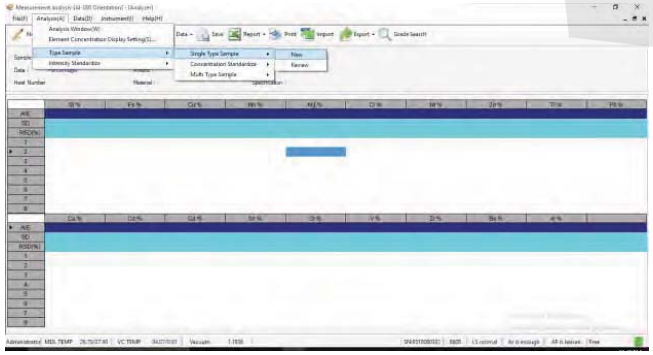
（3）Save



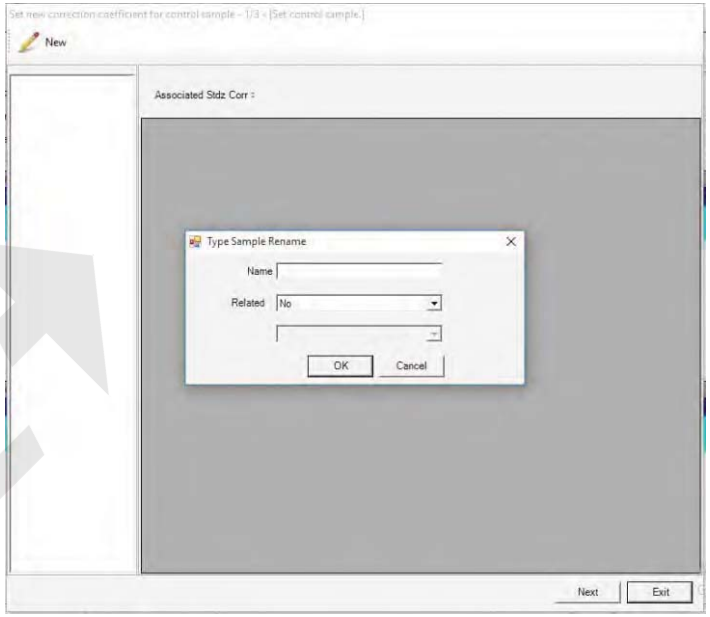
◆ Type Sample Calibration

Type sample calibration can correct the deviation of spectral analysis system; it is corrected in accordance with the control sample content analysis of a sample or more elements. Due to the different elements content of the control samples, the control sample will be different when analyze different material when do calibration.

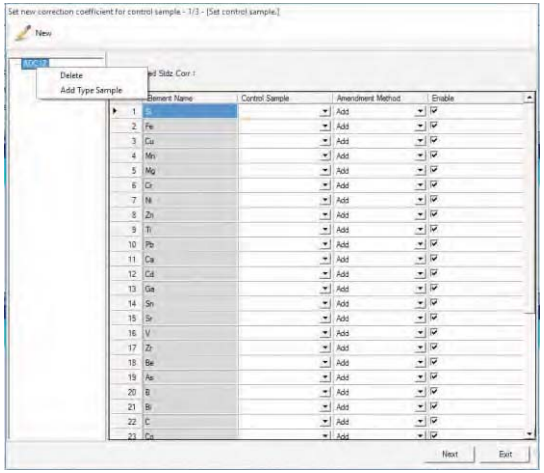
（1） Analysis - Type Sample - Single Type Sample - New



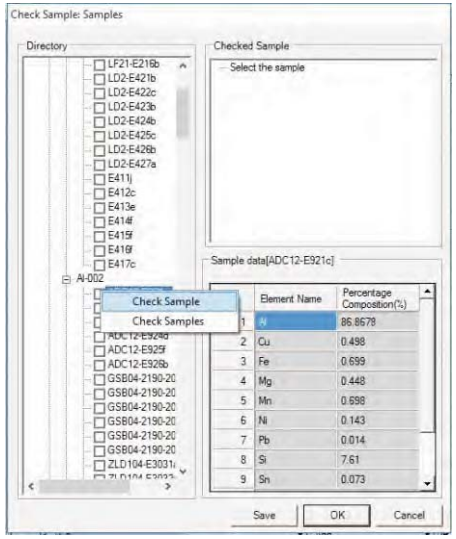
（2）Click New, and type in the sample name and then Click ok.



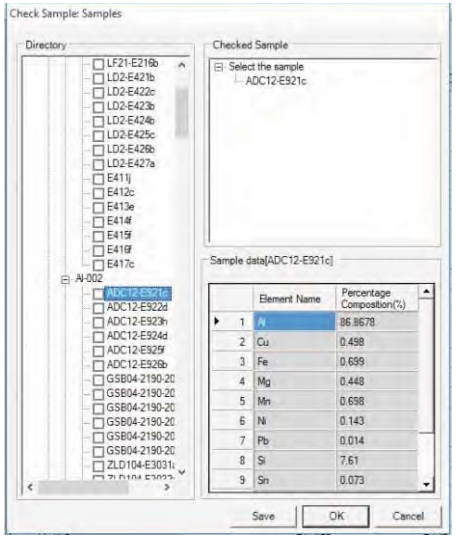
（3）Right click “Sample Name” which you just type into, and then click “Add Type Sample”, you need to type in the content of every elements of the sample in the new tooltip.



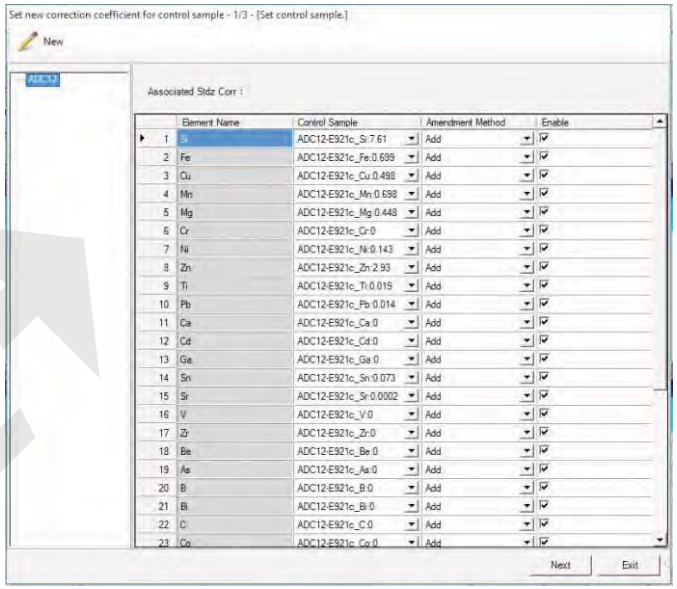
（4）According to your needs to find the control name of the sample you need in the sample library, right-click the name to select “Check Sample”.



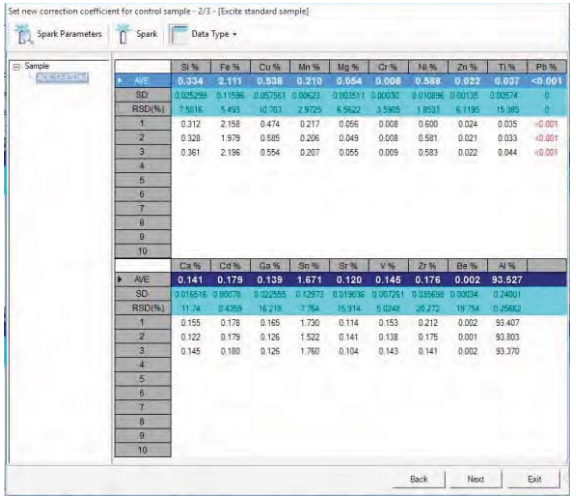
（5）Click OK to add the selected sample



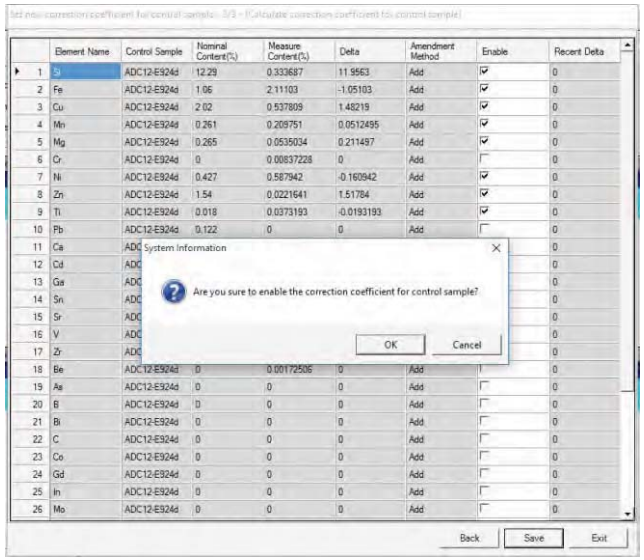
（6）Click "Next" to enter the spark interface.



（7）Select the sample name and click "Spark". Spark 3 to 5 points, remove the bad points and Save 3 of the stable datas . Click Next to enter the coefficient saving interface.



（8）Click Next and save the data of type sample calibration., then click OK.



⚠ Caution:

1. Intensity Standardize and Type Sample calibration are all operations on the current model, while spectral correction is performed on the entire instrument. Therefore, the intensity normalization and sample calibration should be repeated before using a different model.

◆ Relationship between these 3 calibrations

（1）Type Sample Calibration

After type sample calibration is done, the standard sample need to be sparked five times in the analysis window under the analysis menu. To compare the average values of the five groups with the standard values, if the data is normal, then it is ready to stimulate your samples. If the difference between the excitation standard sample data and the standard average deviation value is too large, then return to do intensity standardize.

（2）Intensity Standardize

The intensity standardize must be done under the following two conditions

a. After Spectrum Correction for Client

b. The testing result is not stable or accurate after type sample calibration

Please note that after the intensity standardize, we must do the type sample calibration.

（3）Spectrum Correction for Client

It must be done under the following conditions.

a. After cleaning the lens

b. The machine has been used for long time (about 7 days)

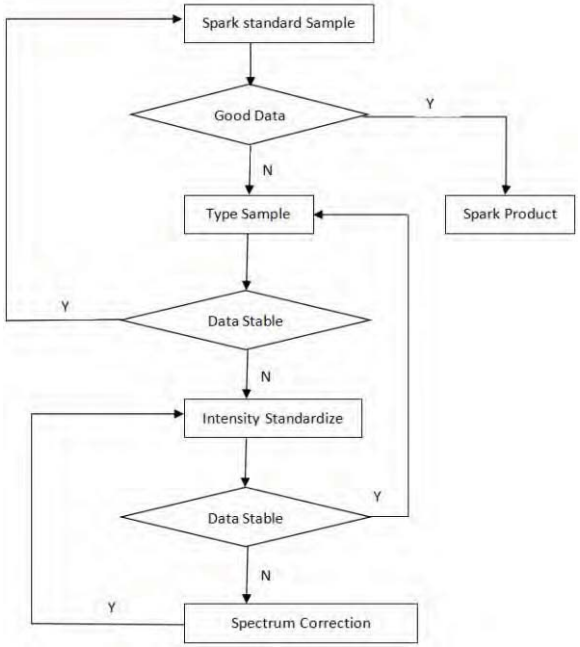
c. The operation environment is changed(Move to other places)

d. The analyzed data cannot match the standard value even after type sample calibration and instensity standardize.

Notice:

1.When doing the type sample calibration, intensity standardize and the spectrum correction, it is better to excite the sample more times and then delete the bad points in order to get more stable data.

◆ In daily operation, we need to well know the relationship of the Spectrum correction, standardize and type sample calibration, the relationship can be found in the below chat:

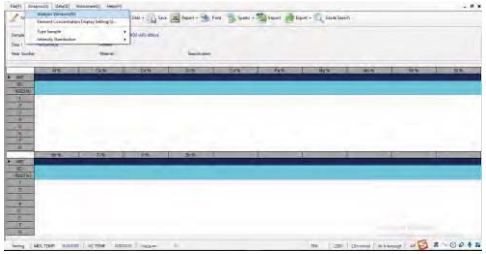


Daily Analysis

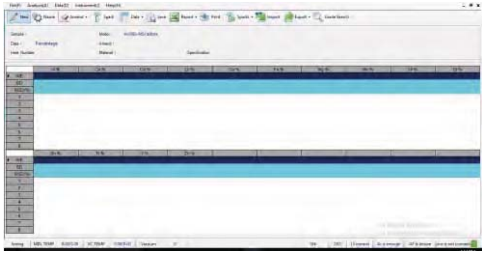
◆ Sample Sparking

Step1: Put the same on the spark stand, adjust the position of the sample holder to fix the sample.

Step 2: Analysis - Analysis Window

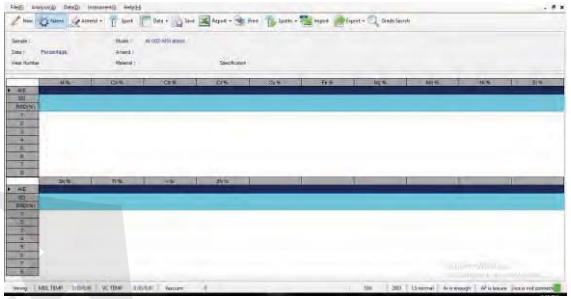


Step 3:Click New to open a new interface.



◆ Save Data

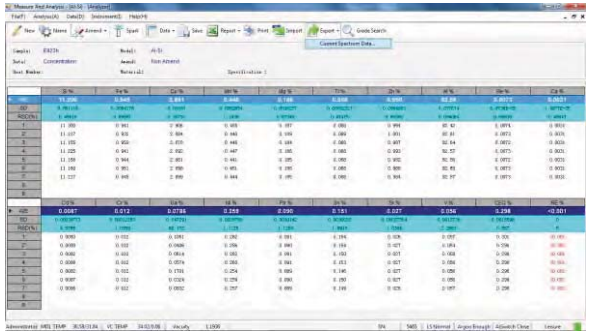
Step1: Click Name and type in the name of your sample and other informaiton. Click Ok then.



Step 2: After spark the sample, click the Save to save the testing result.

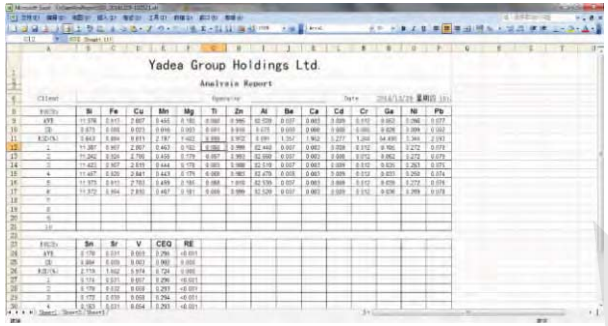
Step 3: In the "Report" to find "Statistics" click, get Excel format table.

Step 4: In the "Export" click "Current Spectrum Data", the excitation spectrum data is exported to a specific folder for easy access to the instrument for performance evaluation, troubleshooting and so on.



◆ Data Printing

Print out the Excel spreadsheet generated by Step 3 above. Click the location indicated in the follwing Figure , or click File to locate Print to complete printing.



◆ Report Setting

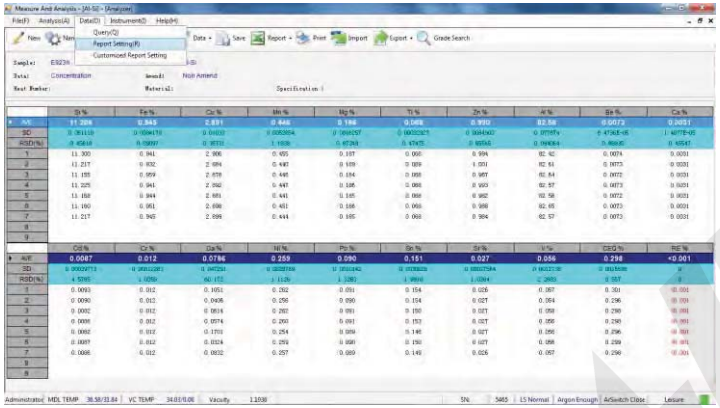
The following table is the field used in the process of making the form by our technician as the requirement of customer; the program 1 is for the software form of information to set the steps, the program 2 is for calling steps in making form.

Analysis Report		
Field	Description	Remark
SRN_1	Sample Name	
ECT_C_AVE_F3_1	C average value	C is Carbon element, same symbols are on other elements, F3 is format output, the last three decimal places
ECT_C_SD_F3_1	Carbon SD	
ECT_C_RSD_F3_1	Carbon RSD	
ECT_C_MEA_F3_X	Carbon content of a single analysis	X is incremented from 1, corresponding to the analysis number
		A1 cell of the report must set the number of report template lines, and A2 grid must set the number of report template columns
Historical data report		
Field	Description	Remark
SRN_X	Sample Name	X corresponds to the data record serial number, starting from 1 increments
ECT_C_AVE_F3_X	Carbon Average Value	C corresponds to the carbon element, same symbols are to the other elements, such as analogy; F3 is format output, the last three decimal places

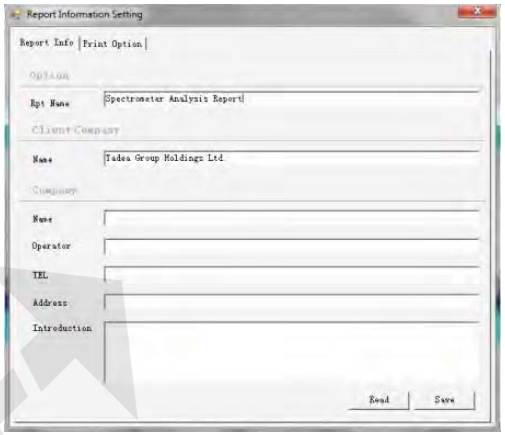
ECT_C_SD_F3_X	Carbon SDCarbon Carbon SD	
ECT_C_RSD_F3_X	Carbon RSD	
		A1 cell of the report must set the number of report template lines, and A2 grid must set the number of report template columns

Common fields

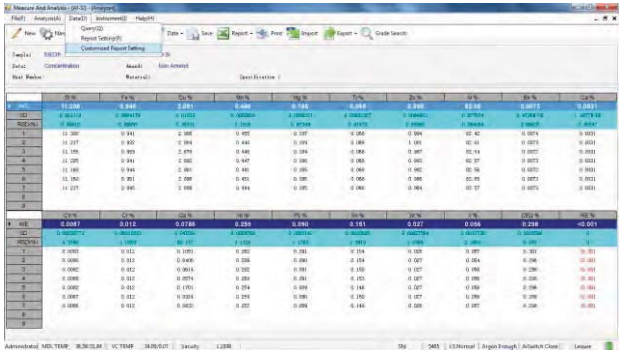
Program 1 :
Step 1: In the Analysis interface, locate "Data" and find the "Report Setting" in the drop-down menu



Step 2: In the pop-up report information settings window, you can set the "report name", "sample unit name", "test unit name", "inspector", "unit phone", "unit address", "unit brief" and so on, after you make your changes according to their own requirements, click Save to complete the modifications to the settings.

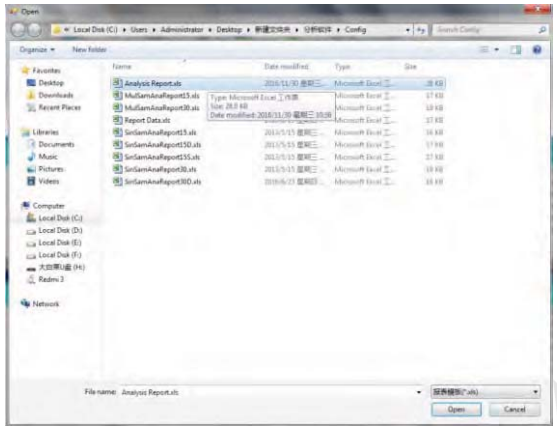


Program 2 :
Step 1: Place the completed table in the "Config" folder under the software folder of the direct reading spectrometer.
Step 2 : In the analysis window of software analysis interface, locate the "data" and in the drop-down menu, find the "Customized Report Setting" click.



Step 3 : In the pop-up dialog box, click the icon of "..." in the analysis sample report template in the Formatting Report Module Settings window.

Step4: Find the completed Excel file in “Config “folder in the pop-up window, then select, open and operate.

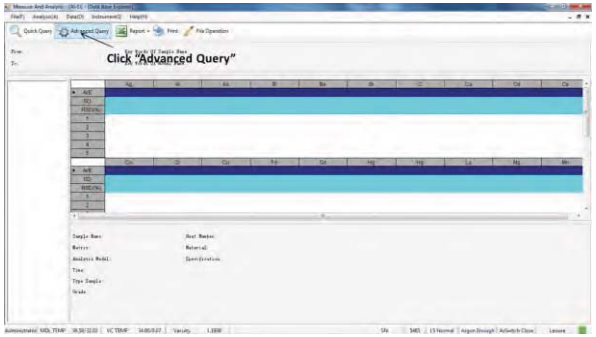


Step5: Return the software interfaces as the figure shows, click ok and the interface will be changed as figure shows. Click ok to make sure the revised report format has been saved.

Step6: Name and save excitation data, click “Customize…” And the report will be created according to

◆ Query Data

Step1: Click “Advanced Query” under query analysis data interface.



Step2: Set time and sample name you need in query window, click confirm and then the data will be displayed.

□ Maintenance

Clean the Spark Stand

Due to the sample surface attachments (slag, rust, etc.) and the black metal dust generated by the sample excitation, using spark stand for a long time will lead to the accumulation of gas chamber inside the spark stand, and a long time without cleaning will directly lead to abnormal discharge, so the spark stand needs to be cleaned regularly.

⚠ Caution

1.Use tissue paper to wipe the dust toward the exhaust exit when clean the dust tank. It is not allowed to blow by mouth, or the lens will be polluted.

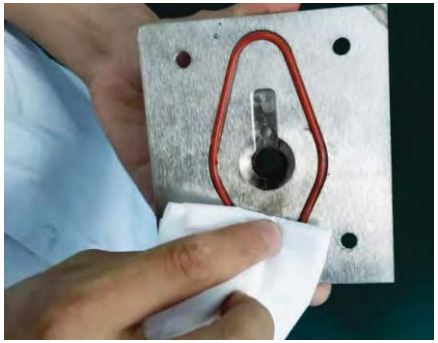
Cleaning period: once every three days

Steps:

(1)Turn off SOURCE button before clean the spark stand.

(1)Use the hexagon socket wrench to unscrew the 4 countersunk head screws and remove the spark stand board (as shown in the following figure).

(3)Use tissue to wipe the spark stand board.

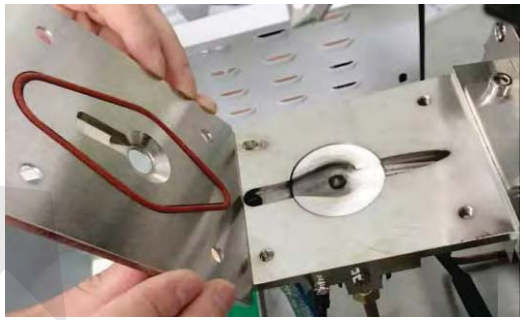


Wipe the Spark Stand Board.

（4）Wipe the black dust in the dust tank from inside to outside with a cotton swab or tissue and clean the filter hole. It is forbidden to blow in (with a lens inside), as shown in the figure below:

Cleaning Up the Insulator Sleeve of the Spark Stand

（5）Reinstall the spark stand board. In addition to paying attention to the shedding of the sealing ring, align the excitation hole with the electrode and tighten the screw.



Install Spark Stand Board

（6）Turn on the power button after cleaning, make 《Intensity Standardize》 and 《Type Sample Calibration》 as required.

Clean the Lens

When the instrument is frequently used or not used for a long time, the light intensity will decline, which will affect the accuracy of the analysis data. Therefore, it is necessary to clean the lens in time. Cleaning period: once a month, time can be relatively shortened according to the frequency of utilization.

Steps:

(1)use hexagon socket wrench and long-handle slotted screwdriver to remove the two hexagon socket screws and one slotted ball screw respectively

remove the hexagon socket screw

remove the one slotted ball screw

(2)Insert the two holes on the lens with the minimum number of Hexagon socket wrench, and gently pull out the lens about 5mm , and then gently pull the lens toward the direction of our chest with our hand, the sealing ring is inward when removed.

remove the lens

(3)After removing the lens, remove the sealing ring, put it in the container and soak it with anhydrous ethanol for five minutes, then wipe the lens gently with absorbent cotton and ethanol. and finally dry the lens with absorbent cotton and ethanol until it is clean and dust-free.

anhydrous ethanol and absorbent cotton

soak the lens with anhydrous ethanol

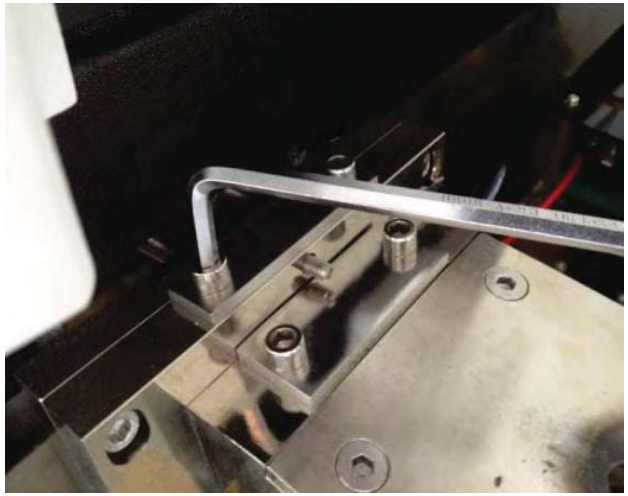
wipe the lens with absorbent cotton

(4)Put the clean lens into lens room (seal ring facing inward) , use left hand to press, right hand to tighten the screw

The Seal Ring of Lens Facing Inward

The Installation of Lens Photo

(5)Tighten the tableting on the lens with hexagon socket screws, and then open the SOURCE button.



(6)After cleaning, do 《Spectrum Correction》,《Intensity Standardize》 and 《Type Sample Calibration》 as required.

⚠ **Caution:**

1.Confirm power off again before pull the lens out.

2.Use absorbent cotton with anhydrous ethanol to wipe both sides of the lens.

3.When the ophthalmic lens is put back into the lens room, pay attention to the direction of the lens. The side with O-ring is towards the optical chamber.

4.When the lens is put back into the lens room, adopt tooling for installation to ensure the reliability and consistency of installation position.

Replace the Filter Element

Due to the accumulation of dust, the filter element in the filter tank needs to be replaced once every two months. It is recommended to wear a mask to prevent dust during the replacement.

Recommended replacement period: once every 2 months
Open the filter tank, remove the filter element and replace it with a new filter cotton. It is recommended to wash the filter tank and filter pipe with water and dry before using them.

Replace the filter element

Replace the Reducing Valve

(1) The purity of argon
The purity of argon shall be 99.999%, and the bottle must be certified (as shown in 5-17) to ensure the purity of the gas. If the purity is not enough, it cannot be normally excited.

(2) The function of argon

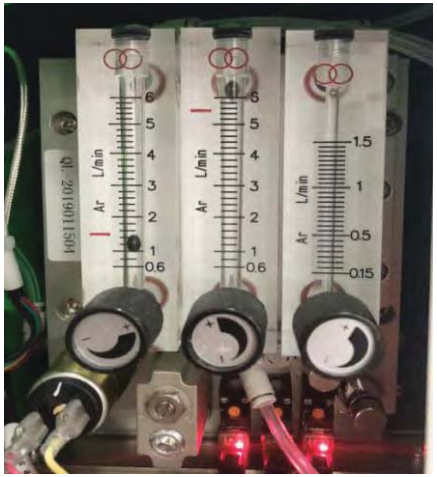
① anti-oxidation

② to ensure the spark stand to perform effective spark discharge on the sample

③ let the spectrum produced by excitation into the spectral system effectively

(3) The daily use of argon
Open the argon switch, observe the status bar of the analysis software, and the argon pressure is sufficient , then start daily operation.
Argon shortcut key: F1 argon on, F2 argon off.

(3) Argon flow meter
The adjustment coefficient of argon flow meter is 1.5L/min on the left, 5.5L/min in the middle, and 0.15L-1.5L light-chamber flow meter (argon filled) on the right is 0.2L /min.After [Ar flushing stop], the right light chamber flowmeter will decline with the stability of argon inside, showing 0.2L/min and reaching the normal analysis state.



Argon State Bar and Argon Adjustment Photo

□ Operation of theSpectrometer

Account:
Administrator: Password:8888
Operator: Password: 6666

Instrument Status:
MDL TEMP: blue is normal, < 60 degree;
VC: blue is normal, 34±0.5;
Argon is enough / not enough: check whether there is gas in the bottle or whether the outlet of the pressure reducing valve is opened. The low pressure table is 0.5-0.6mpa. (Working pressure of the spectrometer)
F1(Fn+F1): Turn on argon gas and flush,**F2** (**Fn+F2) :**Turn off argon gas and flush, if the sparking point is not good, turn on argon gas to flush at the beginning of working, and the time lasts 2-3 minutes;
Before Analysis: Click Light Room Ar Flushing Start for about 10 - 15mins, during flushing period, please do not close the argon bottle.

Software Operation Steps:
A. Spectrum Correction for Client: Instrument - Spectrum Correction for Client - Routine.Use the correct sample to spark 4 - 5 times and save the stable 3 datas, single click correct and save it.
B. Intensity Standardize: Analysis - Intensity Standardize - New. Use the correct sample to spark 4 to 5 times and save the stable 3 datas, single click next step and save it.
C. Type Sample Calibration: Analysis - Type Sample Calibration - Single Type Sample - New-Next Step.Use the standard sample to spark 4 to 5 times and save the stable 3 datas, single click next step - save - ok (recommended do it everyday before analyze).

Hardware Maintenance :
A. Lens: Cleaning once every 2 months or so, and no more than once a month if pre – reflow inspection; After Cleaning the lens, do Spectrum Correction for Client-Intensity Standardize -Type Sample Calibration.
B. Spark Stand : Cleaning once every 7 days, and no more than 3 days if pre – reflow inspection; After cleaning the spark stand, do Intensity Standardize -Type Sample Calibration.
C. Exhaust gas filter element: replace it about 2 months, and replace it 2 weeks if pre – reflow inspection.