User Manual

Explorer 7000

A & E LAB (UK) CO.,LTD

Contents

1   Product Overview

1.1 Introduction

Explorer XRF portable series include harmful elements analyzer AE-Explorer 3000 XRF, alloy analyzer AE-Explorer 5000 XRF, mineral analyzer AE-Explore7000 XRF, soil heavy-metal analyzer Explorer 9000 XRF,etc.(XRF -X Ray Fluorescence- refers to X-ray fluorescence analysis). This manual takes AE-Explore7000 XRF for example.

1.2 Applications

The new generation of Explorer XRF portable X-ray fluorescence spectrometer series is mainly used for metal materials reliability identification, alloy grades rapid identification, soil heavy-metals field testing and field in situ multi-element analysis for various geological ore, fully meeting the market demand from raw materials testing, process control to field online analysis of various elemental composition in product testing.

1.3 Advantages

● The introduction of 3 core technologies, miniature low-power end-window integrated X-ray tube, large area beryllium-window silicon drift detector (SDD) and miniature multi-channel digital signal processor, has significantly saved test time, improved the detection accuracy and reduced the errors, which enables the portable analyzers possess paralleled performance to desktop analyzers.

● Small in size and easy to carry

● On-site and in situ analysis arbitrarily at any time and any place

● Non-destructive testing

● 1-2 s rapid portable analysis ,longer time fine testing by bench-top measurement

● Measurement can be directly carried out on the sample surface in field analysis, without additional sample preparation, which suits samples of any type, such as electrical and electric products, alloys, geology and mineral resources, soil, rock, residue, small solid particles, and liquid sediment.

● Built-in HD camera for ease of viewing the testing point

● The multiple measurement modes to choose from and unlimited number of modes to add at will, together with its automatic matching feature, help achieve easy one-button measurement. Its built-in intensity correction method can correct all deviations from samples of irregular geometric shape and uneven structure and density.

● Innovative software interface and core combining EC with FP software has a wider application, with high sensitivity, short test time, easy operation, less restriction for the operator.

● 12 collimator&filter combination.

● Embedded Windows CE system, high resolution LCD touch screen, digital multi-channel technology and SPI data transmission greatly raise the data transmission and data processing ability. Wherever you are, the measurement data is all at your reach.

● Triple security: auto-sensing, blank test, two-seconds auto-off X-ray tube with radiation level far below international safety standards, no radiation leakage; thicker protective wall. Protective safety hood.

● Two large-capacity 9000mAH lithium batteries can work for 8 hours continuously.
Equipped with a wide-voltage AC charger or car-loaded charger ensure test at anytime, anywhere.

● Warning indicator system. Powered, the green light is on; testing,the red light flashes to prevent error.

● The instrument is of waterproof, dustproof and works continuously in an environment of high temperature and high humidity. Its protective box uses high strength military supplies with good waterproof, shockproof, anti-pressure function.

1.4 Unpacking

Open the sealed packing case and you will see the included items.

① Hygrometer ② Release Valve

Fig.1-1

To open the case, push down the lock switch as below.

Fig.1-2

Counter-clockwise rotate the release valve to open the case, as shown below,for the case is sealed,the pressure inside sometimes lower than the outside:

Fig.1-3

Unpack it,find the following:

① Adapter; ②TF reader; ③AE-EXPLORER7000; ④Mini USB cable; ⑤ Test membrane; ⑥ Charger; ⑦ Car-loaded power cord; ⑧Car-loaded triple ⑨ Radiation shield; ⑩ Rechargeable battery × 2; ⑪ Power cord; ⑫ Bag

Fig.1-4

2   Structure and Principle

2.1 Instrument Overview

2.1.1 Front View

①PDA；②Radiation Indicator；③Power Indicator；④External power port；⑤ Power switch；⑥ PDA rotation axis

Fig 2-1

1) PDA - the embedded PDA installed with the dedicated X-ray fluorescence analytical software is used for instrument control,data processing and result display.

2) Power&Charging indicator -If powered, the power indicator is green. If unpowered, plug in the battery and adapter,in case the battery is low, the indicator flashes green; under this condition power the instrument,the power and charging indicator turn orange.

3) Radiation Indicator - when HV power is applied on the X-ray tube, the radiation indicator flashes red. Otherwise, constantly green .

4)   Power Button - turns on/off the power supply .

2.1.2 Left view

1) TF Card Slot - insert a TF card to copy, backup or update software.

2) Mini USB Port - synchronize with the PC via Mini USB cable after install the related divers.

3) Trigger - pull the trigger to start the measurement automatically when the instrument is powered.

4) Battery - power the instrument.

①TF Card Slot   ②Mini USB Port   ③Power and Charging Indicator

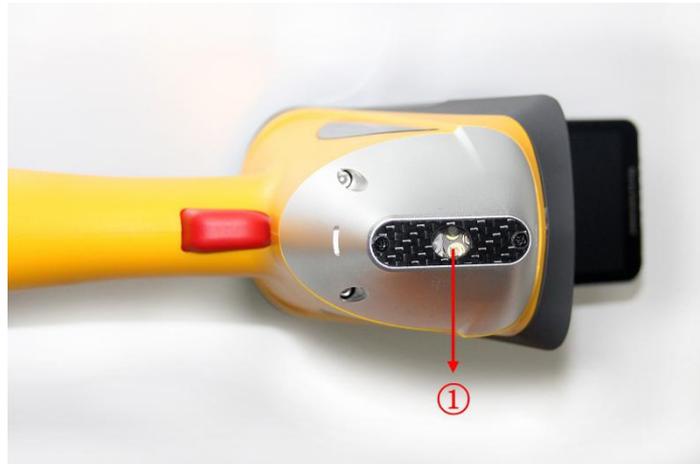④Radiation Indicator   ⑤Trigger   ⑥Battery

Fig.2-2

2.1.3 Right view

①Power & Radiation Indicator

Fig.2-3

Radiation Indicator - when HV power is applied on the X-ray tube, the radiation indicator flashes red. Otherwise, constantly green.

2.1.4　Front view

①Test window

Fig. 2-4

Test window: where sample is placed

2.1.5　Rear view

①Power Port②HV lock　③Buckle

Fig. 2-5

1) Power Port - adapter power port, for powering the instrument.

2) HV lock-unlocked,HV works properly;lock,HV is in an inactive state.

3) Buckle- for external PDA touch pen and security strap (to avoid instrument falling when testing).

2.2 Working Principle

EDX (Energy Dispersive Spectrometry) X-ray spectrometer is based on the principle of X-ray fluorescence (XRF).

XRF principle: the atoms illuminated by high-energy X-ray emit X-ray spectra with a certain characteristics, the wavelength of which is only related to the atomic number of element, not X-ray excitation energy. Therefore, by determine the wavelength, we find what contained in the sample and start the qualitative analysis; by measuring the line intensity and comparing with a known standard, we know the content of the element and start the quantitative analysis.

AE-Explore7000 working principle: Integrated miniature X-ray source provides tube voltage and tube current, the light tube emits continuous X-spectral lines, X-rays irradiating to the sample produce X-ray fluorescence with sample characteristics, transforming into voltage signals through the detector, the signal,after being amplified and data acquisition, is sent for computer processing to get the required test data.

2.3 System Components

The instrument is constructed mainly by three systems: excitation system, optics system and detection system.

2.3.1 Excitation System

The excitation system, including miniature X-ray source, filter and collimator, is used to generate X-rays.

2.3.2 Optics System

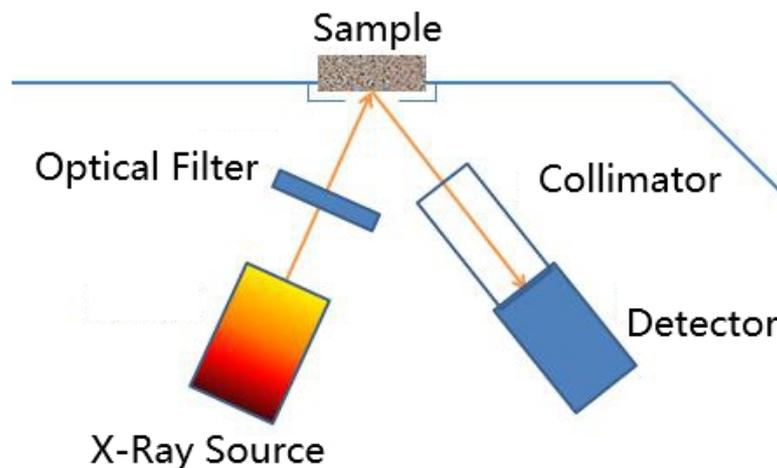Here is the schematic diagram of optics system.

Fig.2-6

Switch the combination of filter and collimator by software.

2.3.3 Detection System

Mainly include:

1) AMP and digital multi-channel data acquisition system - Get the signal and digitalize it by amplifying the counter.

2) Embedded PDA - Equipped with dedicated X-ray fluorescence analytical software, it can control the instrument operations, process info. and display results.

7

3   Technical Specifications

3.1 Standard configuration

1) AMP and digital multi-channel system

2) Power and control system

3) Embedded PDA

4) Dedicated XRF analytical software(PDA version)

5) Laboratory test bracket (optional)

6) 110V/220V universal adapter

7) 2× 9000mAh li-ion battery, 1 li-ion charger(27000mAh large-capacity battery is optional)

8) Large-capacity TF storage card and TF reader

9) Anti-shock, anti-pressure, water-proof lockable portable case

3.2 Specification

- Analysis method: ED-XRF

- Detector: 25mm^2 , 0.3mil，SDD, resolution≥139eV

- Excitation source: 50KV/200uA micro-Ag target and end-window integrated X-ray tube and HV power supply

- Element range: all elements from Mg to U

- Measurement time:1-60 s

- Sample type: solid, liquid, powder

- Detection limit: down to ppm level

- Concentration range: 1ppm～99.99%

- Calibration method: Ag

- CPU:1 GHz

- Memory:1G, extended memory for 32G max. (standard 4G)

- Control:One-touch test,no need to select a specific test mode

- Ambient humidity: ≤90%

- Ambient temperature: -20℃～+50℃

3.3 Parameters

No.	Item	Parameter
1	Weight	1.7kg
2	Size	244mm(L)×90mm(W)×330mm(H)
3	Excitation Source	X-ray tube (Ag target),max. 50kV,200μA
4	Detector	SDD, 25 mm^2, 0.3mil, resolution<150eV
5	OS	Windows CE 7.0, embedded PDA
6	Software	Brand new FP and EC software
7	GPS, WiFi	Inbuilt

8	Video	HD CMOS camera
9	Power Consumption	DC9V 12W Max (working) 8W Max (standby) 2W Max (sleep)
10	Power Source	Chargeable li-ion battery, 9000mAH, 12 hours continuous running 110V/220V universal adapter for AC power
11	Charger	DC charger: car charger AC charger: 110/220V, 50/60HZ
12	Monitor	Transflective LCD touch screen (resolution 1080 × 720 or higher)
13	Collimator and Filter	Φ 4.0/2.0 mm collimator, 6 kinds of filters, 12 switchable combinations, for various samples test
14	Data Transmission	Digital multi-channel technology, SPI data transmission, fast analysis, high count rate, waterproof mini-USB, external PC
16	Storage Card	4G
17	Safety	auto-sensing; no sample, no work; max. radiation <5μSv/hr.
18	Warnings	Powered,the green indicator is on; testing, red radiation warning indicator flashes .
20	Package	Vacuum packing, lockable anti-pressure, waterproof, shock absorption
21	Applications	Alloy qualitative analysis

4 Basic operations

4.1 Battery

4.1.1 Assembly

Take the instrument out of the packing case. Insert the battery into the handle of the instrument as below.

Fig.4-1

Fig.4-2

4.1.2 Charging

To charge the battery when out of power:

1）Take out the battery charger.

Fig.4-3

2) Insert the battery

Fig. 4-4

3) Connect the charger and adapter, and connect to the utility power to charge power (red light is on).

① To utility power socket (AC 110 / 220V)

Fig.4-5

11

4.2 Use of adapter

Adapter is optional for powering the instrument,connected as below.

① To utility power socket (AC 110 / 220V)

Fig.4-6

⚠ For security, be sure to use the supplied adapter and battery charger. Using a different power cord or battery charger could cause malfunctions or danger.

4.3 ON/OFF

Before turn on the instrument, please make sure the instrument has been properly connected to battery or A/C adapter. By pressing the power button for about 3s, the green power indicator is on, then enter the login interface.

Similarly, to turn off the instrument, press the power button for about 3s and release, the green power indicator turns off.

In case the instrument is turned on, idle the instrument for 5 minutes, the instrument will enter Sleep state.

①Power Button   ②Power Indicator

Fig.4-7

NOTE: Gently press the power button. Do not force too much to avoid damaging the button.

4.4 Conditions

1) Ambient temperature& humidity requirements:

Operating temperature: -20C ~ + 50C

Operating humidity: ≤90% (non-condensing)

2) Keep the installation, use environment clean to prevent corrosive gas;

3) Prevent static damage and strong electromagnetic interference on the instrument.

4.5 Sample Preparation

For qualitative analysis of the elements in the sample ,whether it is a natural one or in strange shape, this instrument can be directly used for test. But for accurate quantitative analysis, we need to do some sample processing.

X-ray fluorescence analysis is sort of a comparative measurement which needs standard sample as reference, the geometry conditions of both need to be consistent. Therefore, the measurement for the natural sample in the field will be comparatively less accurate,while in the lab, we get better results.

Sample Shape	Main Factors Leading to Measurement Errors
Solid	A. Segregation inside the sample B. Rough surface C. Sample surface deterioration (e.g. oxidation)
Powder	A. Coarse Particles B. Sample changes (e.g. oxidation and moisture adsorption)
Liquid	A. Concentration changes due to precipitation and crystallization B. Bubbles

1. Solid Sample

To make solid samples, such as steel, copper alloys, aluminum alloys and precious metals, the method is to lathe them to cylinders and have one end polished

Before analysis, do not touch the polished surface to avoid oil stains which would affect the accuracy of measurement. If it has been stained, wipe it clean with a soft clean cloth.

2. Powder Sample

Including slag, dust, ash, cement and lime,etc.. Typical sample preparation order: Batch -> Multiple particles ->Bulks -> Pulverization and splitting -> Sample preparation -> Measurement. For optimum measurement results, the size of powder samples should be preferably below 200 Mesh..

Generally, directly place the powder sample in the cups for analysis. Another method is to make tablets, which will bring accurate results.

3. Liquid Sample

There are three preparation methods for liquid samples.

1)   Direct - pour liquid samples directly into the cups for analysis.

2)   Enrichment - enrich the elements to be analyzed by using copper reagent or ion-exchange resin method,etc.

3)   Drip - drip drops of liquid sample on the filter paper for analysis.

We sometimes intentionally add some element into the sample as an internal standard, which is known as internal standard method.

4.6 Sample handling

You can measure directly by placing the nosepiece near the sample during mobile operation (ie, real-time mobile detection by holding the instrument in hand) But be careful not let the irregular barbed samples pierce the test film, which may cause damage to the beryllium window.

During stationary operation (i.e. install the instrument on a bracket), note the following points:

1) Avoid splashing liquid or dropping foreign objects into the instrument. Otherwise, it might cause inaccuracies, even malfunctions.

2) Handle gently. Better use tools(e.g. tweezer) to avoid damaging the test film

5 Software introduction

Software interface appears after booting. AE-Explore7000 software is fitted in the embedded PDA, bind with WIN CE 7.0 platform, no need for installation.

5.1 Power on

Press switch button for 3 seconds to enter Starting interface, the interfaces switching as shown in Figure 5-1. After booting, the software automatically starts and enters the software user mode (Figure 5-2).
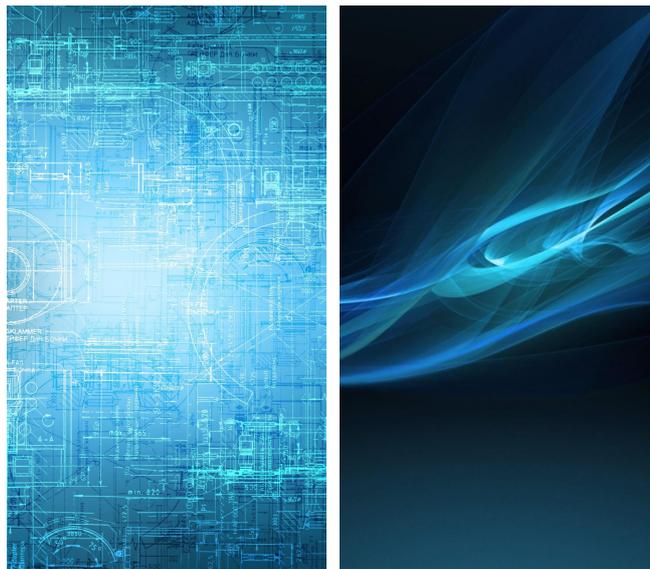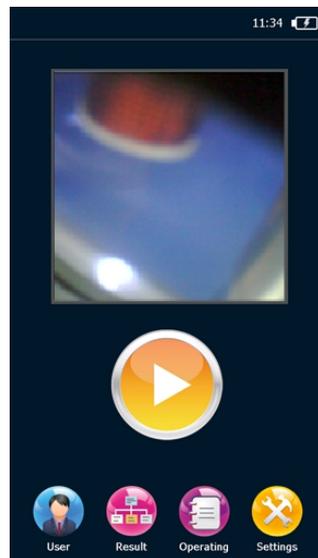

Fig.5-1

Fig.5-2

5.2 User mode interface

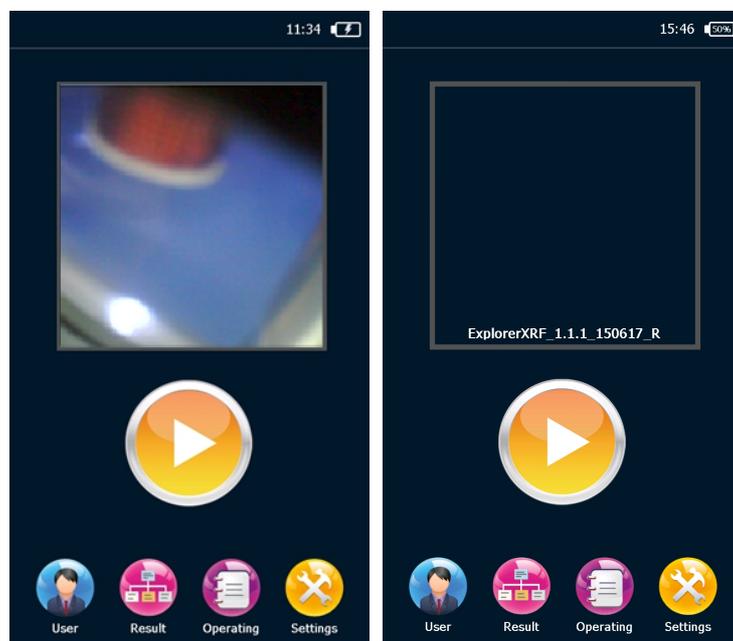Enter user mode interface, as shown in Figure 5-3, icon functions are listed in Table 5-1.

ExplorerXRF_1.1.1_150617_R

Fig.5-3

Icon	Function
25%	Display the remaining power
21:49	View the current time, double-click to change the date and time
	Camera area, double click to control the camera switch

	Click Start Test button to test the samples
	Test interface button, click to enter the Test result interface to view the element contents of the current test sample.
	Operation Interface button, click to enter Operation interface; include open spectrum, history, database switching, report export, report printing and other functions.
	Set interface button, click to enter System setup interface; include screen settings, trigger mode, interface language and other functions.

Table 5-1

Date &Time settings is as shown in Figure 5-4, slide the Date & Time display column to change value, then click OK .
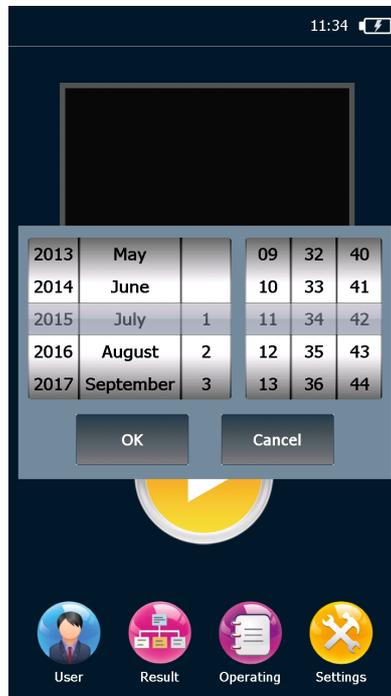
Fig. 5-4

5.3 Test result

The Test results interface displays the test values, mineral types,etc.. (Figure 5-5). Icon functions are listed in Table 5-2.
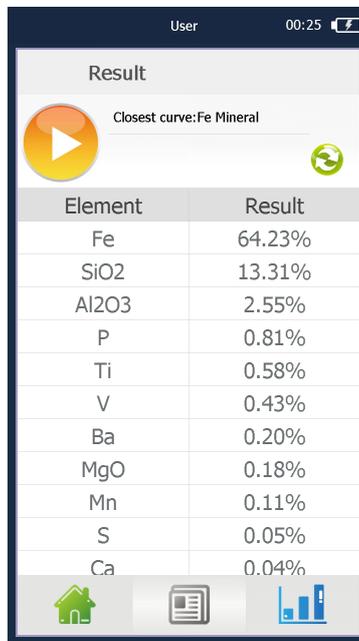
Fig. 5-5

Icon	Function
	Initialization button, click to start initialization
Closest curve:Fe Mineral	Display mineral types
	User mode main interface
	View statistics
	Start test button,click to test the sample

Table 5-2

5.4 Operation

As shown in Figure 5-6, the module contains open spectrum, history, export report, database switching and Bluetooth printing functions, listed in Table 5-3.
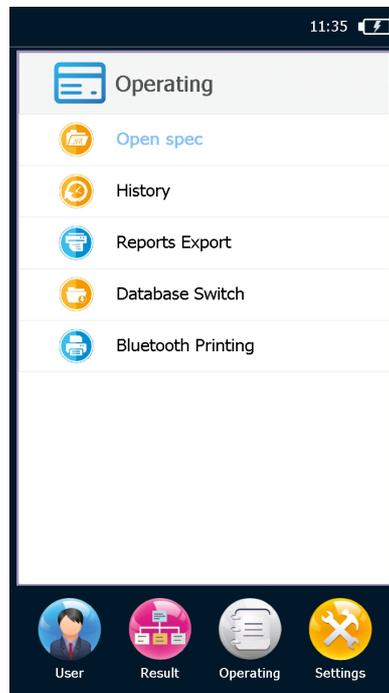
Fig. 5-6

Icon	Function
	Open spectrum: In this interface, open, delete, and clear the spectrum. Include pure element spectra and impure element spectra, as shown in Fig.5-7
	History: by scan the spectra and open the spectra (Note: Before the test,save the spectrum, then the history will be generated),as shown in Fig.5-9
	Report export:export the report to TF card,as shown in Fig.5-9
	Database switching for alloy, mining, RoHS, soil and plating, as shown in Fig.5-10
	Bluetooth print: print the latest measurement result, or take out the spectrum and print the results.

Table 5-3
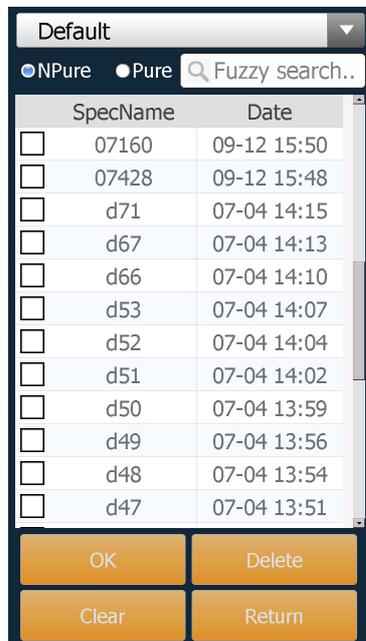
Fig. 5-7
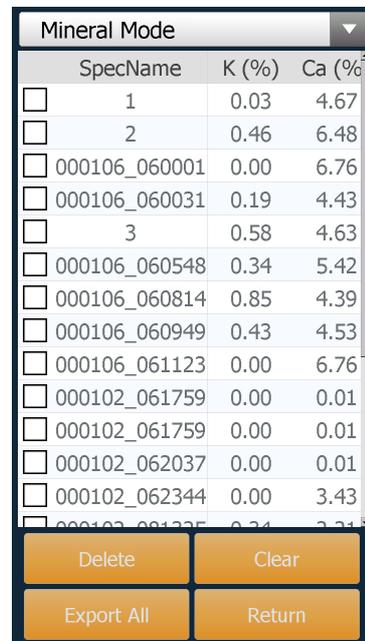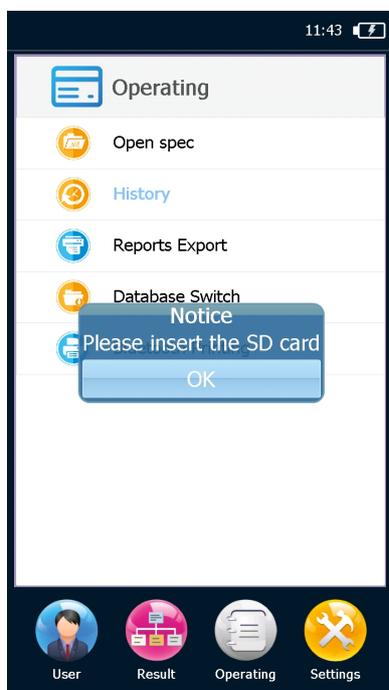

Fig. 5-8

Fig. 5-9
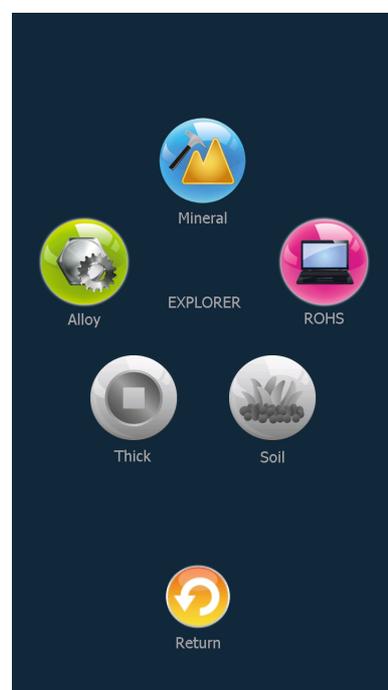

Fig. 5-10

5.5 Setup

Start routine functional test in the Test interface (Figure 5-11) , such as sample name,test times,interface settings and language settings,etc... Detailed info. is listed in Table 5-4
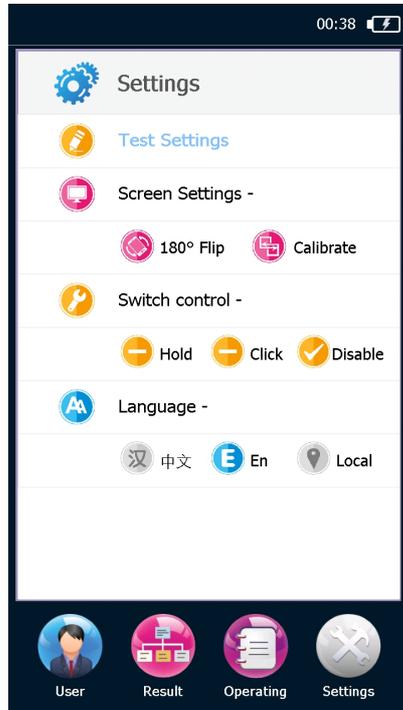
19

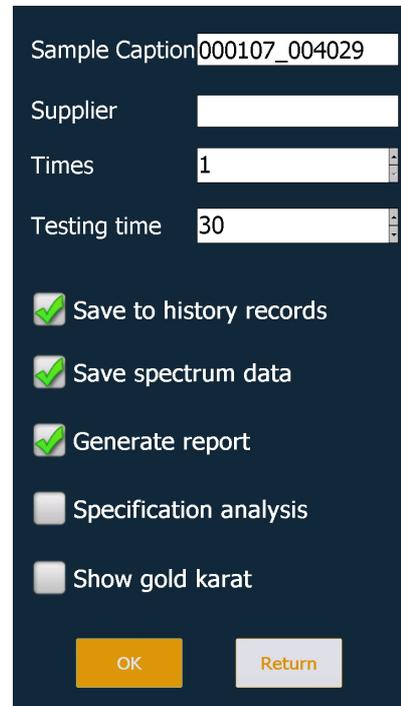|	
Fig.5-11	Fig.5-12

Icon	Function
	Pre-test: set the test times, time, save the report,etc..
	Interface settings: 180 ° rotation, easy operation under specific test environment.
	Interface settings: correction(contact point) .
	Trigger mode: long-press to start the pull-the-trigger test function, release the trigger to stop the test .
	Trigger mode: press to start the pull-the-trigger test function, pull the trigger for 3s, then release to start the test;press Stop button in the software interface to stop the test .
	Trigger mode: Disabled the trigger mode function, click Start to test
	Language:Chinese, switch to Chinese
	Language:En,switch to English
	Language: Local, switch software language to the local language, such as Korean, Japanese, Russian,etc.(a local language library is required).

Table 5-4

6   Sample measurement

6.1 Initialize

Generally, start the initialization for the first use of the instrument or the initialization conditions

are changed. Enter Test Results (Fig.6-1)-> click   ,the system initialization takes 3-10 seconds (Fig. 6-2), please be patient, pop-up Initialization succeed after the initialization(Fig. 6-3).

If initialization fails, prompt Initialization fails. Many reasons cause initialization failure. The most common approach is to check the tube voltage, tube current for initialization, which is modifiable for re-initialization till it succeeds.
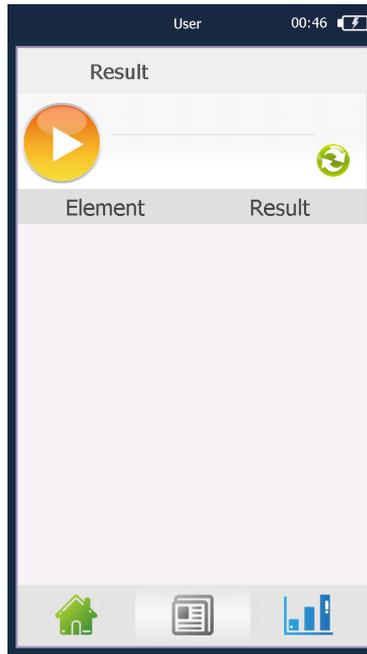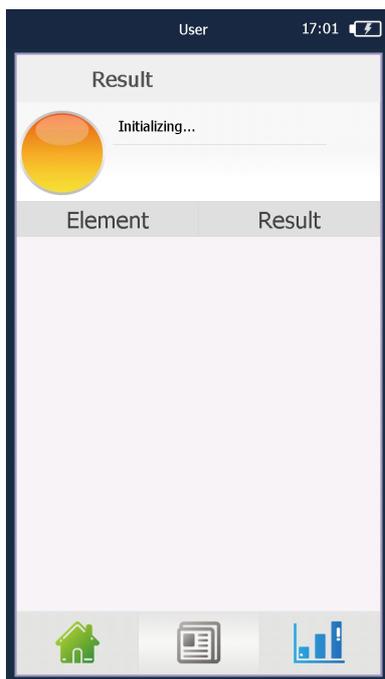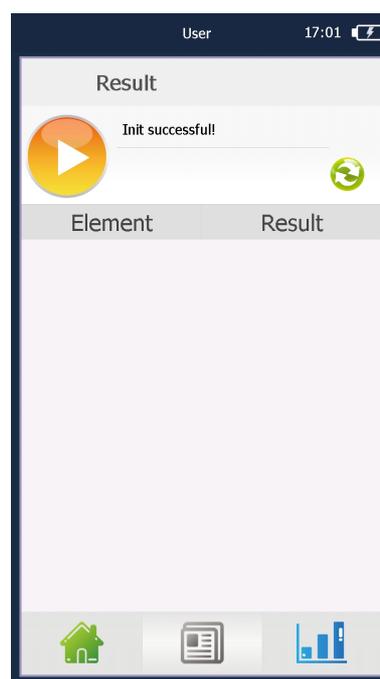

Fig.6-1

Fig.6-2   Fig.6-3

6.2 Test

1. Enter the user mode after boot. Put the sample in the test window, click [▶] Fig.6-4 left is schematic of the measurement interface, the right is schematic of the measurement results. If start the test with no sample, the instrument will remind you Place the sample.
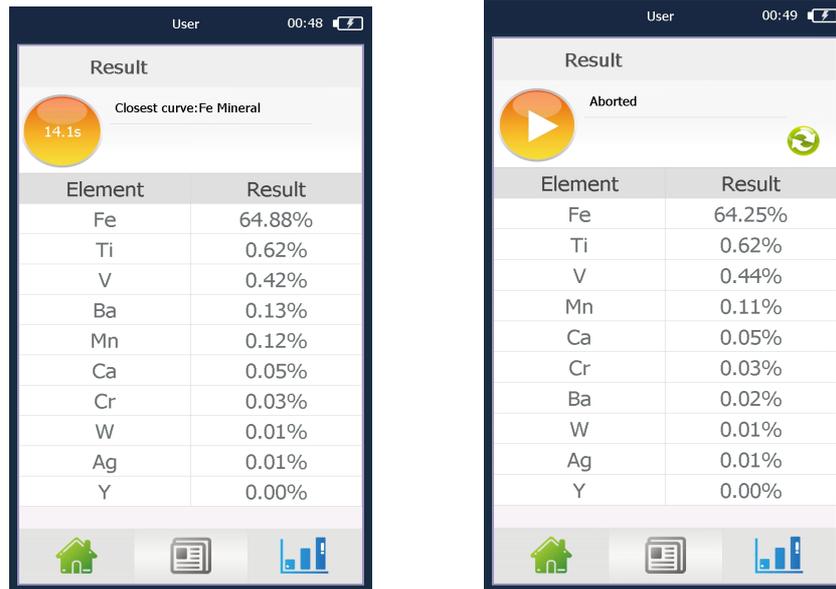
Element	Result
Fe	64.88%
Ti	0.62%
V	0.42%
Ba	0.13%
Mn	0.12%
Ca	0.05%
Cr	0.03%
W	0.01%
Ag	0.01%
Y	0.00%

Element	Result
Fe	64.25%
Ti	0.62%
V	0.44%
Mn	0.11%
Ca	0.05%
Cr	0.03%
Ba	0.02%
W	0.01%
Ag	0.01%
Y	0.00%

Fig. 6-4

Note:

● Portable X-ray fluorescence analyzer is applied for surface detection and analysis, the surface coverings of the test objects may affect the detection accuracy;

● Portable X-ray fluorescence analyzer detection range covers about Φ5mm , any unevenness or incompleteness may affect the detection accuracy.

6.3 Result analysis

After the measurement, data interface appears, including Element, Content, Unit, as shown in Figure 6-5.

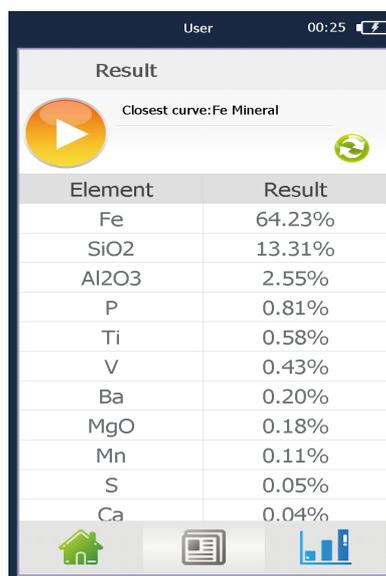| Element	Result
Fe	64.23%
SiO2	13.31%
Al2O3	2.55%
P	0.81%
Ti	0.58%
V	0.43%
Ba	0.20%
MgO	0.18%
Mn	0.11%
S	0.05%
Ca	0.04%

Fig.6-5

6.4 Print

Bluetooth-print the latest measurement result,or take out the spectrum and print the results. First start the Bluetooth printer, as shown in Figure 6-6, push the switch button in the middle to start it.

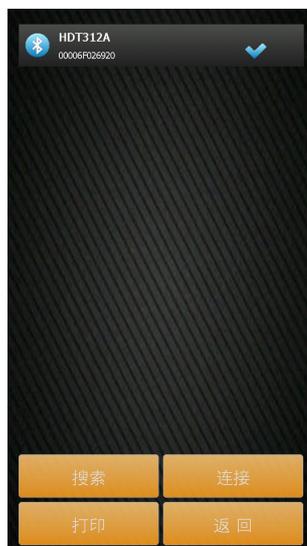| Fig.6-6 | Fig.6-7 | Fig.6-8 |

| Fig.6-9 | Fig.6-10 | Fig.6-11 |

Enter Operation interface, select Bluetooth Print->Search as shown in Figure 6-7.

Search the Bluetooth printer, as shown in Figure 6-8 left. Select the printer name,click Connect as shown in Figure 6-9, connect succeed is as shown in Figure 6-10 . Select Print to print the corresponding report as shown in Figure 6-11.

6.5 Create a new work curve

Note: For curve calibration, press and hold the "user" icon to enter the administrator mode.
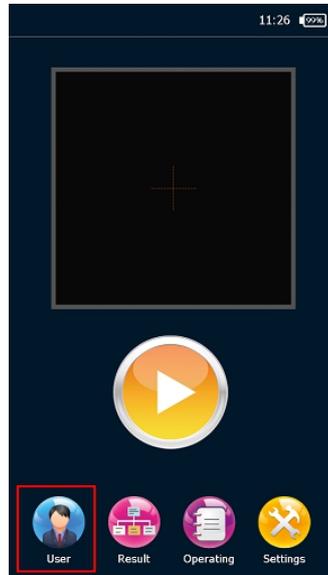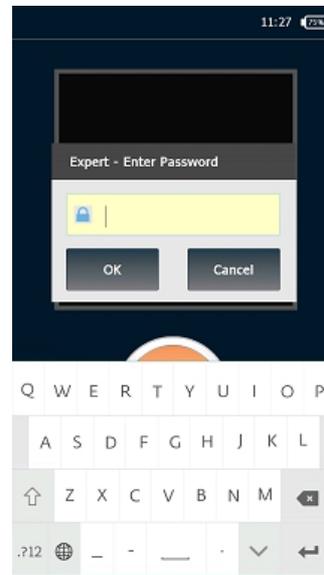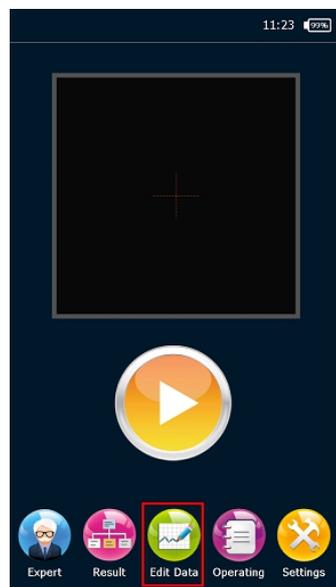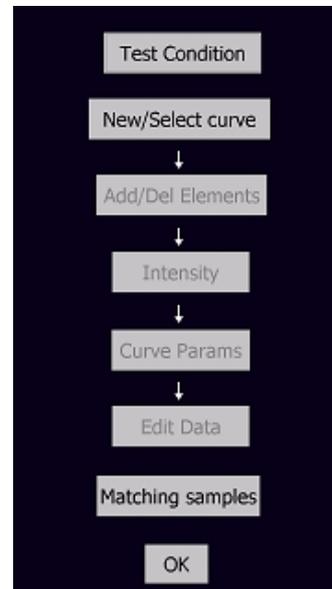
Fig. 6-12

Fig. 6-13

Fig. 6-14

Fig. 6-15

Set new test conditions

There are two sets of conditions, initialization conditions and test conditions.

Initializations conditions: 1. Pipe pressure (0~45);

2. Pipe flow (0~100);

3. Element (Default is Ag);

4. Channel 2210;

5. Fine gain code (0.78);

6. Filter (Based on the card equipped);

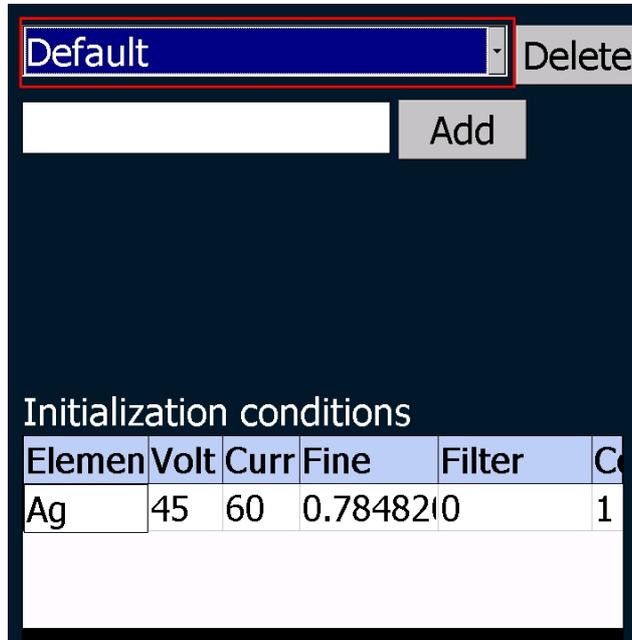7. Collimator (Based on counting rate, as needed).

24

Fig. 6-16

Note: There is "Initialization Conditions" under each test condition. However, the software actually runs the "Initialization Conditions" under "Default".

Test conditions: 1. Test time (Default is 60s);

2. Pipe pressure (Based on the nature of sample to be tested, as needed);

3. Pipe flow (Based on counting rate, as needed);

4. Filter;

5. Collimator (Based on counting rate, as needed);
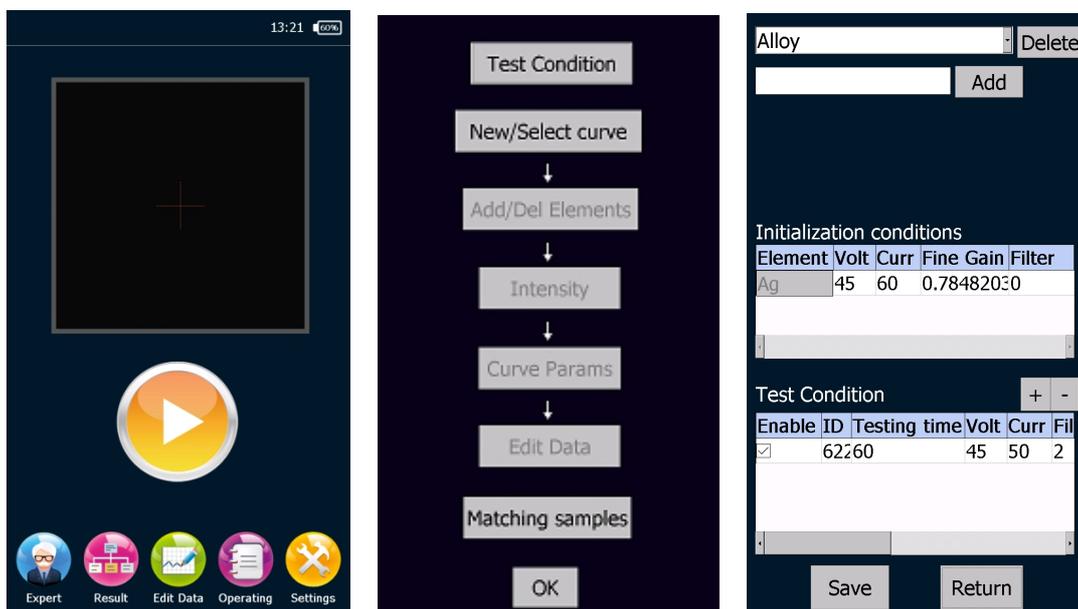
Other parameters can be selected as needed.

Fig. 6-17   Fig. 6-18   Fig. 6-19

Spectra scanning: (for pure element and standard sample) Select "Pure element spectra" to scan the spectra of pure element; select "standard sample spectra" to scan the spectra of standard sample.

Create a new work curve

(Calibration instrument) Used for quantitative analysis, and is a tool and scale for analysis on the sample to be tested. Major methods are Fundamental Parameter method (FP) and Empirical Coefficient method (EC).

Fig. 6-20   Fig. 6-21

Add—Modify the Curve name—Select working conditions—Default or no. If "Default" is selected, the default conditions will always be used for test under User mode, and the work curve will not be automatically matched to sample characteristics.

6.5.1 Create EC curve

1. Set the curve type as EC when create a new curve.

Fig. 6-22

2. Select required element to be tested through adding and removing operations.

Fig. 6-23

3. Edit the element of interest. Slide the scroll bar at the bottom of the screen to see the below table and set as you need.

Elemen	Line	PeakLel	PeakRigl	Inten.	Intensit	Fit	Elements	PeakDivBa	BaseLel	BaseRigl	Color	Interfering	Interfering
Fe	Ka	622	658	0	Fit		Fe,Co,Ni,Cu,Zn,A	None	0	0		0	
Co	Ka	673	712	0	Fit		Fe,Co,Ni,Cu,Zn,A	None	0	0		0	
Ni	Ka	726	769	0	Fit		Fe,Co,Ni,Cu,Zn,A	None	0	0		0	
Cu	Ka	781	827	0	Fit		Fe,Co,Zn,Cu,Ni,A	None	0	0		0	
Zn	Ka	838	888	0	Fit		Fe,Co,Ni,Cu,Zn,A	None	0	0		0	
Ag	Ka	2146	2274	0	Fit		Fe,Co,Ni,Cu,Zn,A	None	0	0		0	
Cd	Ka	2244	2378	0	Fit		Fe,Co,Ni,Cu,Zn,A	None	0	0		0	

Fig. 6-24

Elemen	Unit	Type	Cont.
Fe	%	Calculated	
Co	%	Calculated	
Ni	%	Calculated	
Cu	%	Calculated	
Zn	%	Calculated	
Ag	%	MainElem	
Cd	%	Calculated	

United way Deduct 99.99

Pure   Optimizer

Processing | Save | Back | Next | Return

Fig. 6-25

4. Edit the data, create a new standard sample spectrum, and enter the corresponding content value of each standard sample spectra according to the content table and apply it. Switch to the "Chart" interface after editing completed, and select the appropriate regression equation. Now the EC work curve has been well edited.

Fe
Co
Ni
Cu
Zn
Ag
Cd

Data | Graphics

Sample	Intensit	Content	Enable
Ag001	0	0	☑
Ag003	0	0	☑
Ag005	0	0	☑
Ag007	0	0	☑
Ag008	0	0	☑
Ag009	0	0	☑
Ag010	0	0	☑
Ag011	0	0	☑
Ag012	0	0	☑
Ag013	0	0	☑
Ag014	0	0	☑
Ag015	0	0	☑
Ag017	0	0	☑
fe	13407.4	99.99	☑
co	0.00024	0	☑
cd	15.5161	0	☑
Ag016	0	0	☑

Add | Delete | Save | Return

Fig. 6-26

Fe
Co
Ni
Cu
Zn
Ag
Cd

Data | Graphics

○ Linear   ○ Cont. correct
◉ Insert   ○ Inten. correct
○ Squre   R²=1.0000

89.2
76.5
63.7
51.0
38.2
25.5
12.7
0.0
0.0   2735.1   5470.2   8205.4   10940.5
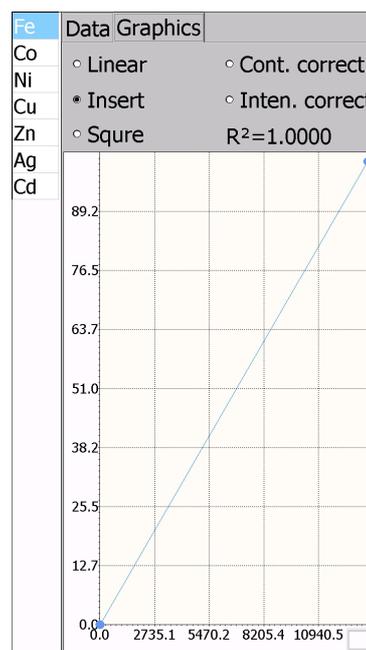
Fig. 6-27

6.5.2 Create FP curve

1、Set the curve type as FP when create a new curve.

28

Fig. 6-28

2、Select required element to be tested through adding and removing operations.

Fig. 6-29

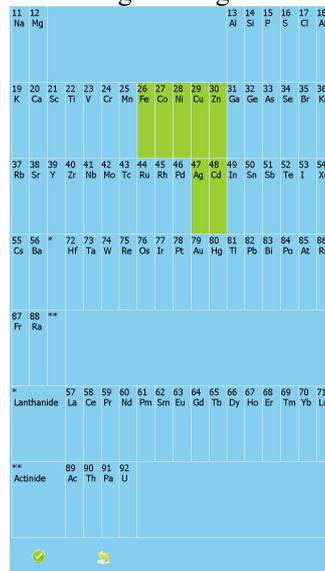3、Edit the element of interest and set the calculation method of intensity and others. Slide the scroll bar at the bottom of the screen to see the below table and set as you need.

Element	Line	PeakLeft	PeakRight	Inten. correct	Intensity Fit	Elements	PeakDivBase	BaseLeft	BaseRight	Color	Interfering
Fe	Ka	622	658	50	FPGauss		None	0	0		
Co	Ka	673	712	100	FPGauss		None	0	0		
Ni	Ka	726	769	50	FPGauss		None	0	0		
Cu	Ka	781	827	45	FPGauss		None	0	0		
Zn	Ka	838	888	40	FPGauss		None	0	0		
Ru	Ka	1868	1979	100	FPGauss		None	0	0		
Rh	Ka	1959	2075	100	FPGauss		None	0	0		
Pd	Ka	2051	2173	100	FPGauss		None	0	0		
Ag	Ka	2146	2274	95	FPGauss		None	0	0		
Cd	Ka	2244	2378	50	FPGauss		None	0	0		
In	Ka	2344	2484	50	FPGauss		None	0	0		
Os	Lb	1006	1065	125	FPGauss		None	0	0		
Ir	Lb	1040	1101	50	FPGauss		None	0	0		
Pt	Lb	1075	1139	185	FPGauss		None	0	0		
Au	Lb	1111	1177	100	FPGauss		None	0	0		

Fig. 6-30

4、Curve parameters. Units can be set as "%" or "ppm". Select "Pure element spectra" and add the corresponding spectra file for each element according to the list.

Fig. 6-31

5、Edit the data, create a new standard sample spectrum, and enter the corresponding content value of each standard sample spectra according to the content table and apply it. Switch to the "Chart" interface after editing completed, and select the appropriate regression equation. Now the FP work curve has been well edited.

A & E LAB (UK) CO.,LTD

Fig. 6-32 (Data)

Fe Co Ni Cu Zn Ru Rh Pd Ag Cd In Os Ir Pt Au

Sample	Intensity	Content	Enable
ru	14.5097	0	☑
rh	13.0965	0	☑
ir	8.05471	0	☑
os	9.99928	0	☑
cd	19.1043	0	☑
in	23.7356	0	☑
pt	10.9702	0	☑
fe	13586.3	99.99	☑
pd	15.5599	0	☑
co	25.6213	0	☑
au18	9.24166	0	☑
au19	6.24937	0	☑
au20	6.50549	0	☑
au22	5.88426	0	☑
au21	6.39394	0	☑
au23	8.15059	0	☑
au24	7.17660	0	☑
au01	10.5879	0	☑
au05	11.3948	0	☑

Add   Delete   Save   Return

Fig. 6-33 (Graphics)

Linear(origin)
Linear(not origin)
Conic(origin)
Conic(not origin) $R^2=0.99$

Fig. 6-34 (Graphics)

Linear(origin)
Linear(not origin)
Conic(origin)
Conic(not origin) $R^2=1.00$

$y=1.030722x$
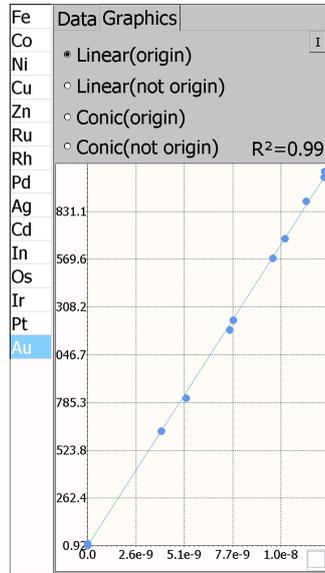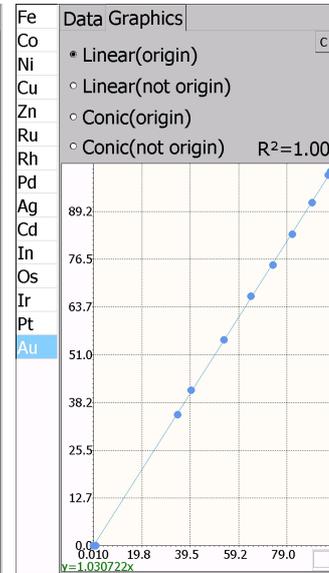
7　　Care and Maintenance

7.1 Daily Maintenance

XRF analyzers are precision instruments which require close attention to the maintenance. Here are some suggestions to help you prolong the service life.

1)　The instrument should be operated and kept by the specialized personnel. Any other person cannot access, operate or move the instrument without permission.

2)　Do not attempt to make disassemble or modify this instrument. Unauthorized servicing may damage the instrument.

3)　During uses, storage and transport of the instrument, be especially careful to avoid knocking, and damages to the surface or internal wiring.

4)　During measurement, avoid interferences from electric motor, shocking, electric welding equipment, electromagnetic, high voltage and other sources.

5)　Keep the instrument away from dust, dirt or extreme temperatures which may cause poor performance or internal damage.

6)　Keep the instrument dry. Minerals in rain, humidity and liquid can corrode electronic circuits.

7)　Do not use harsh chemicals or strong detergents to clean the instrument. Wipe dust off the cover with soft cloth. Clean dirt gently with cotton balls dampened with alcohol.

8)　When the instrument will not be used for a period, cover it with dust cover and place it in a dry and well ventilated safe place.

9)　For long-term normal operation, the parameters need to be tested regularly and make adjustments.

7.2 Periodic Maintenance

Followings are items require periodic maintenance.

Maintenance	Frequency
Clean and dry the cover and nosepiece	Once a week
Peak drift correction (Initialization)	Once a week

7.3 Storage

●　The instrument should be placed in an environment free of accumulated dust, as the dust may pollute the optics system and thereby lead to inaccurate outcome even out of service.

●　The instrument cannot be stored in a place of extremely high temperature. Otherwise, it will shorten the service life of electronic parts.

●　The instrument cannot be stored in a place of extremely low temperature. Otherwise, when the surrounding temperature rises, humid gas will be produced inside the instrument which may damage the electronic boards.

7.4 Transportation

During transportation, please separate the instrument and the battery and have the instrument and all its accessories placed in the vacuum carrying case to protect them from water, pressure and shock.

8   Safety

1. Do not attempt to make disassemble or modify this instrument. Unauthorized servicing may damage the instrument.

2. Avoid splashing liquid or dropping foreign objects into the instrument. If a foreign object comes into contact with electrical parts inside the machine, it might cause a short circuit and result in a fire or electrical shock.

3. Do not point the measurement window of the analyzer at any person.

4. Be careful not let irregular barbed samples pierce the test film, which may cause further damage to the beryllium window.

5. Secure the safety strap in case of falls.

6. If there is smoke, or unusual noise, immediately turn the main power switch OFF, disconnect the power cord from the power outlet. Using the instrument in this state may cause a fire or electrical shock. Also, avoid placing objects around the power plug so as to disconnect the power in emergency.

7. For safety reasons, turn off the power switch of the machine when it will not be used for a long period of time, such as overnight. As an added safety measure, turn off the main power switch, disconnect the power supply, cover it with dust cover and place in a dry and well ventilated safe place when the machine will not be used for an extended period of time, such as during consecutive holidays.

8. Use the power cord other than the one that came with the instrument may cause damage or compromise your safety. Followings may cause a fire or electric shock.

- ■ The power cord is not fully plugged into the power outlet.

- ■ Power cord near a heat source may cause melting surface.

- ■ Disassemble or modify the instrument.

- ■ Damage or modify the power cord.

- ■ Place heavy objects on the power cord.

- ■ Have the power cord tied or knotted. Pull hard or excessively bend the power cord.

- ■ Insert or pull out the plug with wet hands.

9   Troubleshooting

Failure is unavoidable for complicated spectrometers. Here are some tips for analysis and troubleshooting of some common anomalies.

9.1 Radiation indicator off or not flashing during measurement

Under normal circumstances, the radiation indicator keeps flashing the entire measurement process.The indicator off or not flashing maybe caused by the followings reasons:

1. The power supply is not turned on

Cause: If the power button is not turned on, the instrument will not start work, the radiation indicator light will not be illuminated or flashing.

Correction: Turn on the power supply before proceeding.

2. Abnormal X-ray protection system

To prevent X-ray leakage, the HV generator works only when the radiation protection system works normally. For radiation protection system works properly, check the following:

A) Set "Auto-sensing" state. Infrared sensor switch should be located at the nosepiece, if set to the "Auto-sensing" status, infrared sensor switch and radiation indicator will be linked, only when the sample is located within 15mm directly in front of the infrared sensor switch, the radiation indicator will work properly;

B) Put sample in the instrument nosepiece. Without a sample in place, the radiation indicators will not work normally. In this case, the indicator light will be off, or go off automatically after flashing for one second for low blank count rate.

3. Abnormal X-ray tube HV

Cause: Unspecified operations may lead to too high tube voltage and current. When it goes far enough, the discharge even damage may occur. After other possible causes have been ruled out, abnormal X-ray tube HV may be the reason.

9.2 Smoke or Unusual Noise

The smoke may be produced by damaged parts burned out by short circuits. Unusual noise may come from discharged HV supply, if it is not the buzzer alarm of low battery. Using the instrument in this state may cause a fire or electrical shock.

Correction: Immediately turn off the main power, plug out the battery from the instrument handle and disconnect the power cord from the power outlet.

9.3 Others

If a failure occurs, we recommend that you consult the troubleshooting information included here. If after using the above troubleshooting techniques your instrument is still not performing properly, please do not open the instrument for internal inspection, which may damage the components inside or even compromise your safety.

NOTE:The display part of the machine is not removable, the center part will be connected by a line.

Dont turn the left side more than 90 degrees, don't turn the right side more than 180 degrees,

otherwise the line will be broken, the line is broken after the instrument can't be turned on.

Appendix

Packing list

Category	Item	Quan.	Note
Standard	X-ray Spectrometer	1	AE-Explore7000
	Documentation	1	Warranty / Certificate card
	CD-ROM	1	
	Lithium Battery	2	9000mAh
	Adapter	1	
	Power Cord	1	
	Battery Charger	1	
	Mini USB Extension Cable	1	
	TF Card	1	
	Card Reader	1	
	PDA Stylus	1	
	3-Way Car Cigarette Lighter Socket Splitter	1	
	Car Power Cord	1	
	Bag	1	
	Packing box	1	