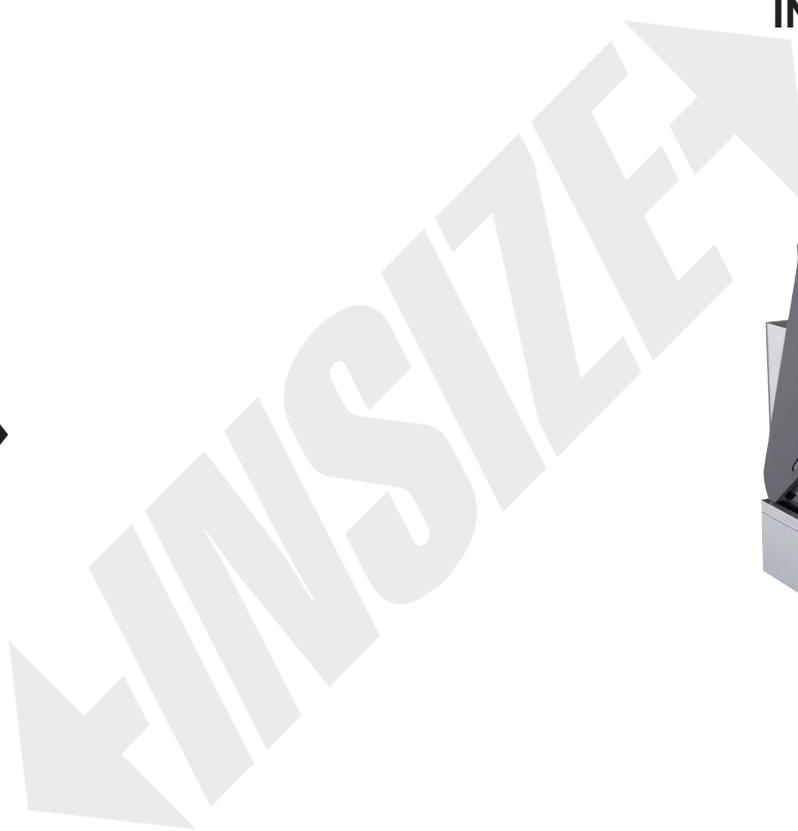


XRF-FA350

AUTOMATIC XRF PLATING THICKNESS INSTRUMENT



www.insize.cn



<https://m.insize.com/XRF-FA350.html>



EN -- Please scan the QR code or visit the website for operation manual.

IT --- Scansiona il codice QR oppure visita il sito web per il manuale d'uso.

CZ -- Pro návod prosím naskenujte QR kód nebo navštivte webovou stránku.

ES -- Por favor, escanee el código QR o visite la página web para ver el manual de instrucciones.

FR -- Veuillez scanner le QR Code ou visiter notre site web pour accéder aux manuels d'utilisation.

DE -- Bitte scannen Sie den QR-Code oder besuchen Sie die Website für die Bedienungsanleitung.

PT -- Para aceder ao manual de instruções, por favor, faça a leitura do código QR ou visite o nosso site.

MN-XRF-FA350-E

V0

Chapter 1: Symbols

1.1 Symbols



Indicates safety symbols and warning signs for the instrument or accessories, which may also signal potential danger to the operator.

★ Indicates especially important tips and notes.

• Displays the list.

'**Start Up**' refers to a specific chapter in this operation manual.

<**START**> usually refers to the operation button on the measurement head console, as well as a key on the computer keyboard.

<**HV ON**> typically refers to the indicator light on the measurement head console.

<**Z-LIMITS**↑ and **Z-LIMITS**↓> usually refer to the upward and downward movement of the Z-axis.

<**FAST**↑ and **FAST**↓> typically refer to fast upward and downward movement.

1.2 Explanation

The coating thickness, composition, or statistical results in this manual are merely examples. They may differ from the data displayed on your screen or printed by your printer, which does not indicate an error in operation.

Chapter 2: Instructions for the Operation, Maintenance, and Storage of Instruments and Accessories

2.1 Instrument Purpose

The INSIZE X-RAY instrument is suitable for testing coating thickness and material analysis.

2.2 Operator Skill Requirements

★ Personnel operating the ELITE X-RAY instrument must be trained. When using the EFP-T software, the operator should have a basic knowledge of Microsoft Windows.

★ Information on using Microsoft Windows can be obtained from the Microsoft Windows manual, Microsoft Windows online help, or reference materials.

2.3 Radiation Safety

The INSIZE X-RAY instrument produces radiation due to the use of an X-ray tube, and its measurement head design fully complies with domestic and international X-ray safety requirements:

- The high-voltage key controls the generation of X radiation by turning on or off the high voltage on the X-ray tube.
- A multi-level fail-safe interlock system controls the production of X radiation, effectively protecting the operator's safety.
- X radiation will not enter the test chamber if the test door is not fully closed. Sufficient shielding is provided to reduce external radiation levels.

To ensure the safe operation of the INSIZE X-RAY instrument, the following points must be noted:

- ★ Always operate the instrument according to the requirements of this operation manual.
- ★ Do not damage any components of the safety interlock system, such as microswitches, etc.!
- ★ Do not make any modifications to the instrument!

2.4 Electrical Safety

When used as required by INSIZE, the instrument poses no danger or harm to individuals.

2.4.1 Power Connection

To avoid damaging the instrument, the supply voltage must match the voltage indicated on the INSIZE X-RAY instrument nameplate. The instrument must be connected to a grounded socket using a three-phase plug.

2.5 Maintenance of the Instrument and Accessories

Only authorized personnel are allowed to repair the INSIZE X-RAY instrument.

2.5.1 Opening the Instrument

The instrument contains components that generate high voltage.

Only authorized personnel may open the instrument. The power supply must be disconnected before opening the instrument!

Extreme caution must be exercised when opening the instrument for maintenance!

2.6 Environmental Conditions for Operating and Storing the Instrument and Accessories

The INSIZE X-RAY instrument complies with the electromagnetic compatibility standards outlined in relevant regulations. Testing results are unaffected under maximum parameters specified in standard EN 50082-1 (referring to IEC 801 -2, 801-3, and 801-4).

Care must be taken to isolate the instrument from areas with electromagnetic interference (e.g., motors). The instrument is suitable for operation in an ambient temperature range of 15 –30°C (59–86°F) and can be stored at temperatures between 0–50°C (32–122°F).

The allowable humidity range for operation and storage is between 0–70% (non-condensing). During operation, the ambient temperature and humidity should remain constant.

When exposed to sunlight, the temperature behind the window glass can easily exceed 50°C (122°F)!

To avoid damage from high temperatures, do not operate or store the INSIZE X-RAY instrument and accessories in such environments.

To prevent short circuits, direct contact with liquids is strictly prohibited. If liquid enters the INSIZE X-RAY instrument, immediately disconnect the plug! The instrument should be thoroughly inspected by a technician before reuse. The INSIZE X-RAY instrument is not acid-resistant. Avoid operating the instrument in acidic environments (e.g., electroplating).

The INSIZE X-RAY instrument is not suitable for use in explosive environments.

2.7 Use, Storage, and Transport of Calibration Standards.

Calibration standards are used to calibrate the INSIZE X-RAY instrument. The integrity of the calibration standards is essential for correct calibration and accurate testing. The following points help maintain the integrity of the calibration standards:

- ★ Do not damage the calibration standards! Dirt and scratches on the calibration standards can lead to erroneous readings.
- ★ Do not use cleaning materials that may cause mechanical or chemical contact with the calibration standards to remove dirt! If necessary, use a cotton swab dipped in alcohol to gently wipe away dirt.
- ★ To avoid contamination or damage to the calibration standards, they should be stored and transported in a protective case.

2.8 Disclaimer

The warranty for the instrument is void under the following conditions:

- The INSIZE X-RAY instrument or accessories are not used for their intended purpose.
- Accessories are connected to non-INSIZE recommended or approved equipment.
- Repairs or structural modifications to the INSIZE X-RAY instrument or accessories are made by unauthorized third parties.
- The INSIZE X-RAY instrument or accessories are operated incorrectly (e.g., used in explosive or corrosive environments, or in excessively high ambient temperatures).
- The instrument is not used according to the recommendations in the operation manual.

Chapter 3: Introduction to the Instrument, EFP-T Software, and Accessories

3.1 Product Overview

The XRF-FA350 is specifically designed for testing coating thickness and material analysis, based on the X-ray testing methods stipulated in the ISO 3497-2000 and ASTM B568-1998 standards.

3.2 Testing Principle

Basic Principle: When a material is irradiated by X-rays of a specific wavelength, its elements become excited and emit photons, forming characteristic X-ray fluorescence. The energy of each element corresponds uniquely, allowing the detector to perform qualitative analysis based on the photon energy received and quantitative analysis based on the photon quantity.

Principle of X-ray Fluorescence Analysis: When the atoms of elements in a sample are irradiated by high-energy X-rays, they emit characteristic X-ray spectral lines of specific wavelengths. The wavelength of these characteristic lines is related to the atomic number (Z) of the element and is independent of the energy of the exciting X-rays. Therefore, by measuring the wavelength of the spectral lines, we can determine which elements are present in the sample (i.e., qualitative analysis); by testing the intensity of the spectral lines, we can ascertain the specific content of those elements (i.e., quantitative analysis).

Working Principle of the X-RAY Instrument: The instrument's high-voltage power supply provides tube voltage and current to the X-ray tube, which excites continuous X-ray fluorescence spectral lines (i.e., primary X-rays). The primary X-rays irradiate the sample, causing it to generate characteristic X-ray fluorescence lines. After passing through the detector, these are converted into voltage signals, which are amplified and collected before being transmitted to a computer. The software processes this data to ultimately yield the test results for the sample.

3.3 Appearance of the Instrument

Description:

- 1)High Voltage Key: The switch that controls the high voltage of the X-ray tube;
- 2)Laser Positioning Light: A positioning light to assist in sample placement;
- 3)Image Zoom Knob: Adjusts the focus of the camera;
- 4) Breathing Indicator Light: Off when the instrument is not connected, solid on when connected, and blinking during testing;
- 5)Z-Axis Motor Control Buttons: The up button controls the upward movement of the Z-axis, the down button controls downward movement. Pressing the up and middle buttons together causes rapid upward movement, and pressing the down and middle buttons together causes rapid downward movement;
- 6)Instrument Status Indicator Lights: "HV ON" indicates high voltage switch, "X-RAY ON" indicates X-ray activation, "SHUTTER OPEN" indicates door open, "CONTROL" indicates fault, "POWER ON" indicates power status;
- 7)Testing Control Buttons: "START" button to begin testing, "STOP" button to end testing;.
- 8)Joystick: Controls the movement of the XY automatic platform;
- 9)XY Automatic Platform: The area within the box is the sample testing zone;
- 10)220V AC Power Input Interface;
- 11)Network port for connecting the instrument to the computer;
- 12)USB port for connecting the instrument to the computer;
- 13)Power Switch: Controls the power of the instrument.

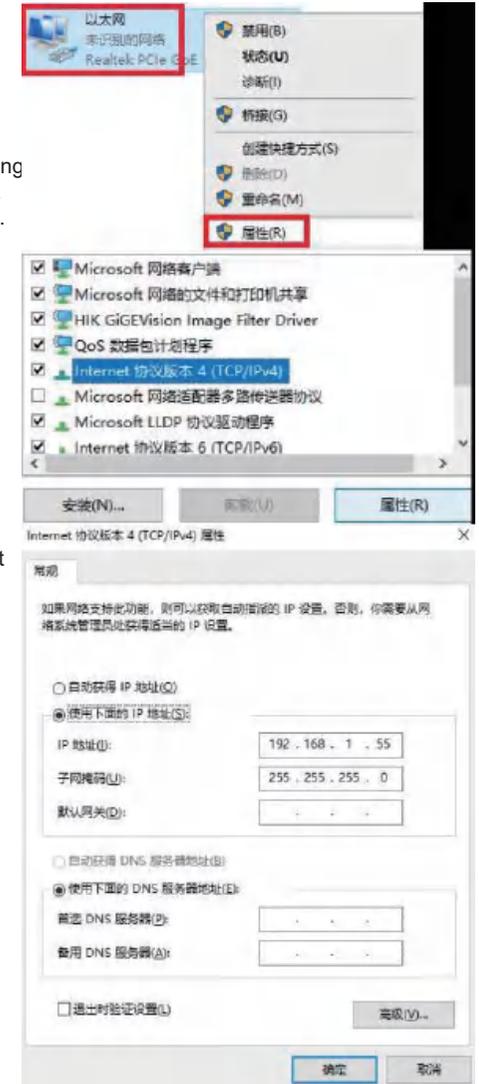


3.4 EFP-T Software

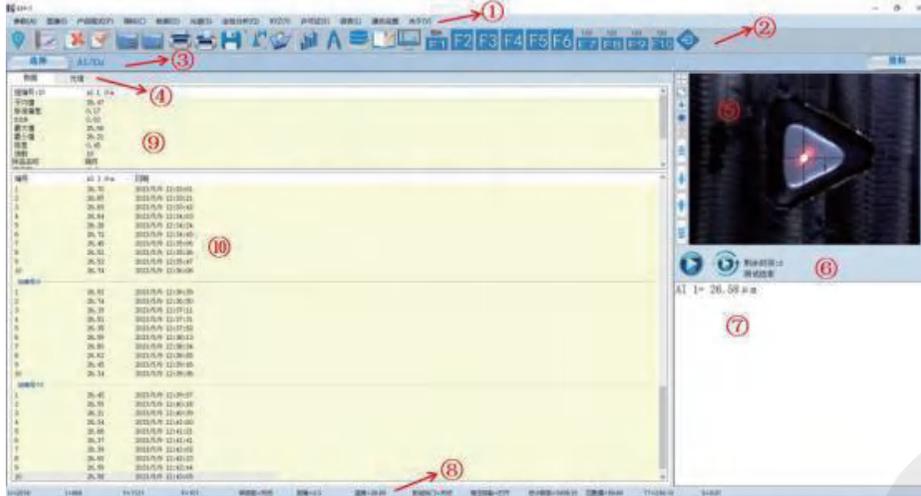
3.4.1 Preparations Before Software Installation:

Install Drivers: Camera driver, detector driver
Network Communication Settings: After connecting the instrument and the computer via the network interface, to ensure smooth communication, the computer's network IP address needs to be configured. The specific steps are as follows:

★To ensure that the EFP-T software functions properly, the corresponding driver software must be installed!



3.4.2 Software User Interface and Function Description :



- ① Menu Bar ② Toolbar ③ Program Bar ④ Spectrum and Data Area Toggle Options ⑤ Image Area
- ⑥ Operation Area ⑦ Test Results Display Area ⑧ Status Bar ⑨ Data Statistics Area
- ⑩ Historical Data Area

●Menu Bar

The menu bar contains all the menus, with each menu including several commands or submenus in sequence.

●Tool bar

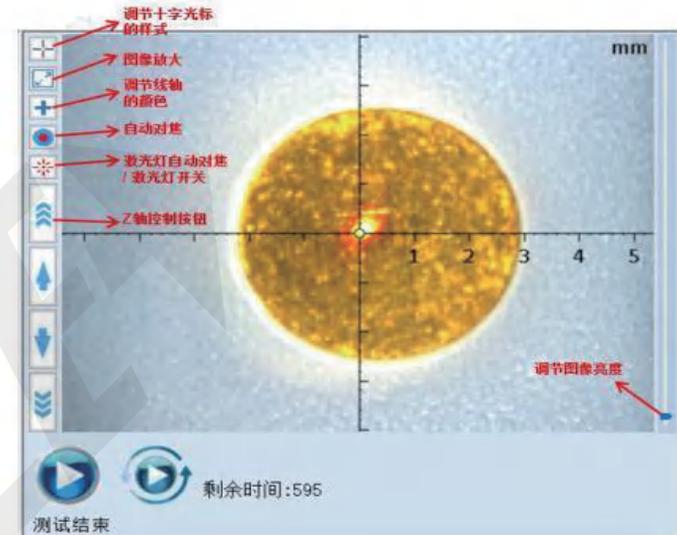
The toolbar is displayed horizontally below the menu bar at the top of the application window. It allows quick access to some common functions of the software with just a mouse click.

●Program Bar

The product bar for the selected product is displayed horizontally directly below the toolbar at the top of the application window. It contains the symbol for the current product and two command buttons: 'Select' and 'Data.' You can open the product selection dialog box by clicking the 'Select' command button or by using the 'Select' command in the 'Product Program' menu. The menu bar contains all the menus, with each menu including several commands or submenus in sequence. In the 'Data' menu, you can view the relevant testing conditions of the program and set the 'Number of Tests' and whether to 'Automatically Save Test Spectra.'

●Spectrum and Data Area Toggle Options
 Located below the 'Select' function in the program bar is the 'Data' or 'Spectrum' interface, where you can toggle between the data and spectrum interfaces by clicking 'Data' and 'Spectrum.'

●Image Area



The image area is located on the right side of the software. It allows changes to the image and cursor using the function buttons on the left, as well as control of the Z-axis motor. The sliding bar on the right can be used to adjust the brightness of the test window lighting by moving the slider to achieve the best contrast with the sample.

●Operation Area

Located below the video window. Click the command  button to initiate a single test. The remaining time indicates the time left for the current test, measured in seconds.

●Test Results Display Area

Located below the operation area, the results of the program test will be displayed here after completion.

●Status Bar

At the very bottom of the software is the instrument's status bar, which displays various status data during instrument testing.

● Data Statistics Area

The statistical data is a summary of all test results for the selected group, including 'Group Number Information,' as well as 'Mean,' 'Standard Deviation,' 'Relative Standard Deviation,' 'Maximum,' 'Minimum,' and 'Range' statistics.

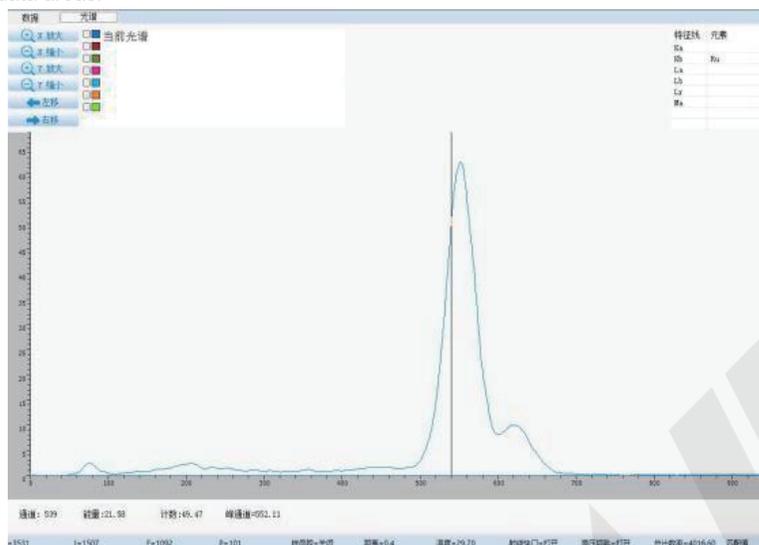
- Historical Data Area

All historical test data under the selected program is stored below the statistics block in the 'Data' interface. The data below the historical data is organized in 'Groups.' A 'Group' is a series of tests, and the data within a group consists of all test data associated with that group number.

You can delete group data or create a new group number for separate data storage using the 'Delete Group' and 'New Group' options in the toolbar, or from the submenu 'Delete Group' and 'New Group' under the 'Data' menu.

- Spectrum Interface

Select the spectrum area using the toggle options between the spectrum and data areas:



In the 'Spectrum' interface, you can view the spectrum of the tested sample, add other test spectra for comparison, and perform qualitative analysis of the test peaks.

3.5 Calibration Standards

Calibration standards obtained from INSIZE authorized agents or directly from NSIZE are used to calibrate the instrument.

Depending on the testing mode and application, there are many different calibration standards. The number and type of calibration standards depend on the testing mode and application.

Calibration standards should be placed in a dedicated packaging box, and after each use, they should be stored back in the box and kept in a dry place.

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Depending on the testing mode and application, there are many different calibration standards. The number and type of calibration standards depend on the testing mode and application.

Calibration standards should be placed in a dedicated packaging box, and after each use, they should be stored back in the box and kept in a dry place.

★ Calibration tests must use actual standard samples! Testing with plastic on the actual standard sample will result in errors.



Figure 3.3: Calibration Standards Box (Opened)



Figure 3.4: Calibration Standard (Alloy Coating Standard)

The number following the element name on the alloy coating standard sample indicates the mass percentage of each element. In Figure 3.4, the coating of the standard sample includes 85% Zn and 15% Ni. Component 1 refers to the first alloy element mentioned in the alloy name. For the alloy ZnNi/Fe, Zn is Component 1, and Ni is Component 2.

3.5.1 Calibration Standard Certificate

All new calibration standards provided by ELITE come with a valid certificate. Generally, the three-month validity period refers to the tolerance limits guaranteed by ELITE for that period. This does not mean that the standard sample must be re-inspected after this period.

However, calibration standards should be tested or inspected within the specified timeframe. If the standard sample is used for routine product control, inspecting the calibration standard within 12 months is sufficient.

However, if the calibration standard is used daily, it is recommended to inspect it approximately every 3 to 6 months.

Chapter 4: Testing

★ Please read 'Chapter 2: Instrument and Accessory Operation, Maintenance, and Storage Instructions' carefully before testing!

4.1 Preparations Before Testing

Before conducting tests, the computer, printer, instrument, and test area should be prepared as follows:

Define the effective working area according to standards: temperature 15 C-30 C, humidity: <70%, power supply: AC 220V±5V.

Ensure the working area is free from sources of interference and contamination (e.g., moisture, dust, and grease).

★ Dirt or damage on the sample can lead to erroneous test results; the sample surface must be cleaned before testing.

Connect the computer monitor, host, instrument, and printer.

★ The instrument can only be powered on after all connections are made and secured.

4.2 Powering On:

Powering on sequence:

Turn on the computer, monitor, and printer.

Press the toggle switch to power on the instrument; the 'POWER ON' indicator light on the front panel will illuminate. Wait for 5 minutes. Insert the key into the high-voltage key socket, turn it clockwise to open the high-voltage key; at this point, the 'HV ON' indicator light on the front panel will illuminate.

★ If the instrument has not been used for a long time, it should be powered on and left in standby for 1 hour before proceeding to step 3. Click the EFP-T software icon on the computer desktop and enter the initial password: INSIZE to connect the instrument with the EFP-T software.

After connecting, the 'Testing' application window of the EFP-T software will appear, and the instrument will be ready for testing. The most recent test results will be displayed automatically.

4.3 Powering Off

Powering off sequence:

1)Click the exit icon on the software interface to exit the EFP-T software.

2)Shut down the computer, monitor, and printer.

3)Turn off the high-voltage key switch (wait for 5 seconds) -- rotate counterclockwise.

4)Then turn off the instrument power.

★ To turn off the power, first switch off the high-voltage key switch, then turn off the power.

4.4 Instrument preheating

To ensure stable test results, it is recommended to preheat the instrument for half an hour after the first startup each day. You can enter the preheating process by clicking "F1 (Preheat)" in the toolbar or pressing the F1 key on the keyboard. Once in the preheating process, click the "Start Test" button to execute the preheat. The "SHUTTER OPEN" indicator on the front panel will light up, and after the test is complete, the preheating will finish. The steps are as follows:

a. Select the preheating program (F1)



b. Place the pure element silver (Ag) foil in the sample chamber and focus clearly

c. Click Start Test

(1) Once the preheating program starts, the software will count down from 1800 seconds (30 minutes), and the test will conclude when preheating is complete.

(2) Preheating is a mandatory step to be performed every time the instrument is turned on. Insufficient preheating time can lead to fluctuations in test results.

(3) When the instrument is powered off and then turned back on, peak position calibration is required, but preheating is not necessary again.

4.5 Peak position calibration

The XRF-FA350 is an energy-dispersive fluorescence spectrometer. Before daily testing, you need to calibrate the energy channels. You can do this by clicking the "Peak Position Calibration" icon in the toolbar. Enter the energy calibration interface. The steps are as follows:

a. Select the peak position calibration icon on the software

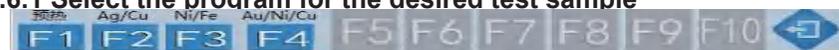


b. Ag Calibration: Place the 12-element foil on the platform, align it with the Ag element, and click "Start Test." When the test is complete, you will be prompted to place the standard element Cu.

c. Cu Calibration: Move the platform to align with the Cu element, then click "OK." At the end, you will see a message indicating that peak position calibration was successful. Note: For Cu calibration, first align with the Cu element, then click "Start Test."

4.6 Product testing

4.6.1 Select the program for the desired test sample



★ Selecting the wrong test program will have a direct impact on the test results

4.6.2 Place the sample:

a. The testing direction is from top to bottom, meaning the sample must be placed on the test platform with the test surface facing up. When placing the sample, first move the XY sample platform to the outermost position. The sample test point should be positioned slightly in front of the positioning assist laser point, then close the sample chamber. The test point will automatically move to the image test area.



b. Use the joystick to control the movement of the platform and adjust the position of the test point up, down, left, and right, ensuring that the test point is centered within the crosshairs of the software image.



Adjust the position of the sample test point up, down, left, and right.
c. Use the Z-axis motor control button or the autofocus button in the software to adjust the Z-axis, moving the measurement head up and down to ensure the test point image is in the clearest position.



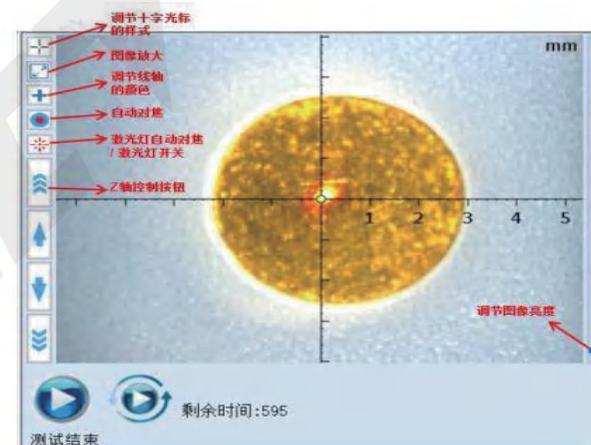
According to the installed collimator, the testing area displayed in the video is circular. The size of the displayed area depends on the installed collimator and the distance between the sample and the X-ray source and detector.

★ When placing the sample, you must follow the basic placement rules (see "4.5.2 Basic Placement Rules")! Failure to adhere to these rules will prevent correct testing.

★ If necessary, adjust the brightness of the video surface light to improve clarity.

★ The test point must be in focus! Otherwise, accurate testing cannot be performed.

d. Move the sample until the test point is centered in the crosshairs. You can enhance clarity by changing the color of the crosshairs. Use the command button in the upper left corner of the video window to change the color.



e. Close the test door.

★ Basic Placement Rules:

From the operator's perspective, the sample must be placed in front of the X-ray fluorescence detector. The test surface of the sample must face upward, and the reception angle must not be obstructed, ensuring that the X-ray fluorescence reaches the detector without interference.

For flat samples like standard foils, simply placing them face up on the test platform is sufficient. For cylindrical samples, ensure that the sample's horizontal axis is parallel to the instrument axis when placing it on the test platform. Cylindrical or curved components must have a minimum diameter or radius of curvature (for small diameter or curved components, the measured coating thickness may appear larger than it actually is. This is because at the edges of the test point, radiation passes through the coating at a certain angle, resulting in increased fluorescence intensity). To accurately measure the coating thickness, the diameter of the sample (\varnothing) should be greater than twice the testing area.

$$\varnothing > 2M$$

For the radius of curvature (r), the corresponding formula is: $r > M$.

Information about testing fine lines can be obtained from authorized agents or directly from INSIZE. Proper placement of angular or stepped samples is crucial; the samples must not obstruct the X-ray fluorescence.

4.7 Proceed with the test

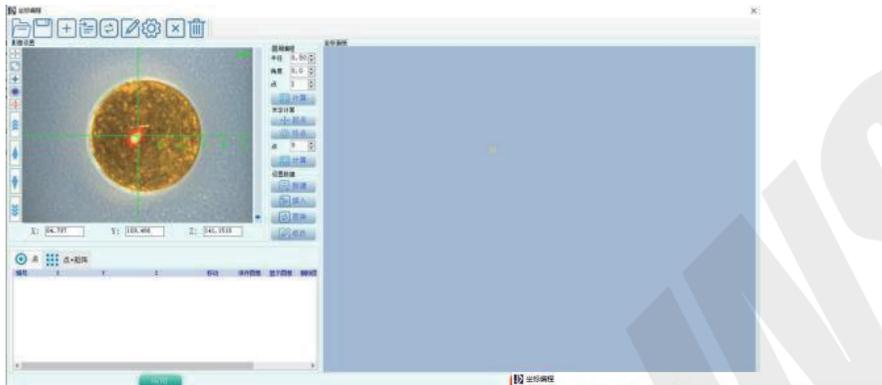
4.7.1 Single point testing

- Set the number of tests and duration in the program settings;
- Click the test icon. Alternatively, press the "START" button on the front panel to begin testing. At this point, the status bar will show "X-ray Shutter" as open. Once the tube voltage and current are set, the operating area will display the countdown for the test duration.
- After the measurement time countdown ends, the status bar will show "X-ray Shutter" as closed, and the test results will be displayed just below the operating area.

4.7.2 Multi-point testing

- We can access the "Coordinate Programming" option under "XYZ (Y)" in the menu bar or select the icon in the toolbar to open the coordinate programming interface. On the left side is the coordinate programming area, where you can edit on the sample image

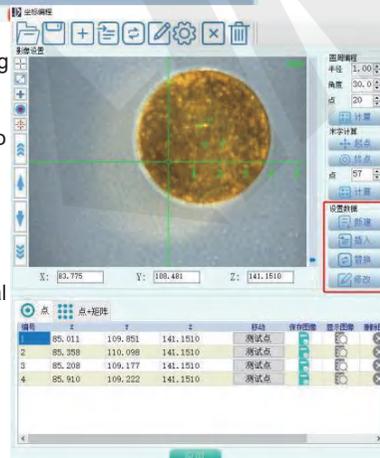
The points to be tested are displayed on the right in the coordinate panel area, showing their general positions within the instrument's entire measurement area.



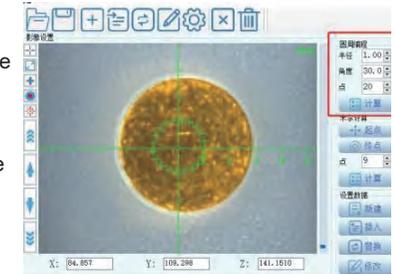
- We have multiple ways to add test points, such as manual addition, circular programming, cross programming and matrix programming.

- Manual Addition: Left-click on any position in the sample image area, and the XY platform will automatically move to the clicked test point. Then click the "New" button below "Set Data" on the right side of the image area, This will allow you to add the test coordinate point;

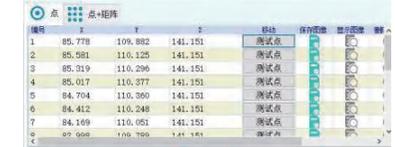
● Circular Programming: To add test points in a circular arrangement, click on the circular programming section below. Set the radius of the circular arrangement, the initial angular position of the first test point, and the number of test points. Then click "Calculate" below to automatically generate the corresponding circular test points.



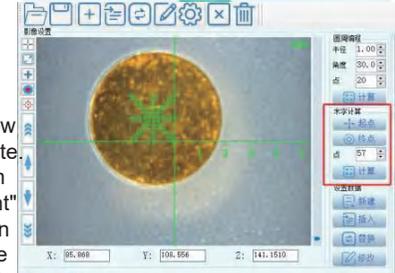
● Cross Programming: To add test points in a cross arrangement, leftclick on any position in the sample image area under the cross calculation section and click the "Starting Point" button. Then, click another position in the sample image area and click the "Ending Point" button. Finally, set the number of test points needed and click the "Calculate" button to generate the corresponding cross test points.



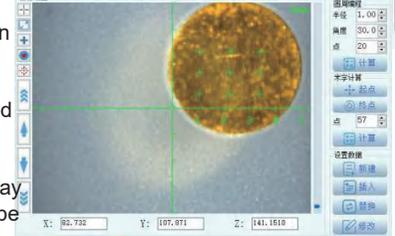
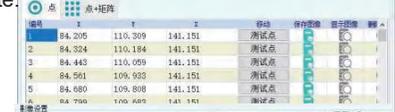
● Matrix Programming: Click the "Point + Matrix" button to switch to the matrix point settings panel. Left-click on any position in the sample image area, then click the box below "Starting Point" to automatically fill in the current coordinate. Next, click another position in the horizontal direction from the starting point and click the box below "X Farthest Point" to fill in the current coordinate. Then, click another position in the vertical direction from the starting point and click the box below "Y Farthest Point" to fill in the current coordinate. Finally, set the number of rows and columns for the test points and the inspection method, then click "Apply" to generate the rectangular test points.



c. After editing the test coordinates, click the "Apply" button at the bottom of the panel, Close the coordinate editing interface and click the automatic testing icon. The XY platform will move to the previously set points and proceed with the testing sequentially;



★ If the sample chamber is opened during testing, the X-ray shutter will immediately close, and the measurement will be interrupted. The software will display a prompt saying, "Please close the sample chamber." After closing the sample chamber, click "OK" to restart the measurement.



4.8 Terminate the measurement

Ongoing measurements can be terminated by the following methods:

- Press the <STOP> button on the measurement head control panel.
- Select the stop icon in the "Measuring" window 

4.9 Spectrum processing

During sample testing, the instrument will receive test spectra containing information about the sample. We can save, open, or compare these spectra to obtain insights about the sample based on the test spectrum data.

a. Save the spectrum

After testing is complete, we can click the "Save" icon for the spectrum in the toolbar . Alternatively, you can save the test spectrum by selecting "Save" under the "Spectrum" menu in the menu bar.

You can also enable the automatic saving of test spectra by clicking on the "Data" section in the program selection block. In the sub-interface that appears, check the "Auto Save Spectrum" option. The saved spectra will be named using the current test program's name, group number, and sequence number within the group.

b. Open the spectrum

We can open the spectrum by clicking the "Open" icon in the toolbar . Alternatively, you can retrieve previously saved spectra by selecting "Open" under the "Spectrum" menu in the menu bar.

d. Spectrum comparison

In the "Spectrum" interface, the different colored checkboxes in the middle can be used to call up test spectra from different measured samples, making it easy to compare spectra of similar samples. Typically, blue represents the default color for the most recent test sample's spectrum. You can select different "color blocks" by clicking on them; once selected, a blue bar will be displayed behind the color block to indicate that it is selected.



Next, you can click the "Open" icon for the spectrum in the toolbar . In the dropdown menu, select the name of the test sample you wish to compare, then choose "Open" to load the desired spectrum;

4.10 Data processing

a. Data viewing

数据	光谱		
组编号:1	Ni 1 %	Fe 1 %	
平均值	64.37	35.63	
标准偏差	4.00	4.00	
RSD%	6.22	11.24	
最大值	67.20	38.46	
最小值	61.54	32.80	
极差	5.66	5.66	
读数	2		
样品名称	铜件		
编号	Ni 1 %	Fe 1 %	日期
组编号: 1			
1	61.54	38.46	2023/4/20 9:06:20
2	67.20	32.80	2023/5/6 14:10:03

b. Data deletion or replacement



Click the icon in the toolbar . You can clear the data from this measurement; Click the "Data" option in the menu bar _____ then select "Replace.", or click the icon in the toolbar . Replace the currently selected data with the next measurement data;

c. Create and delete groups;

Click on "Data" in the menu bar. Select the "Delete" option. Or click the icon in the toolbar . You can clear the data of the selected group: Click on "Data" in the menu bar. Select the "New" option. Or click the icon in the toolbar . The next measurement results will be displayed in the newly created group;

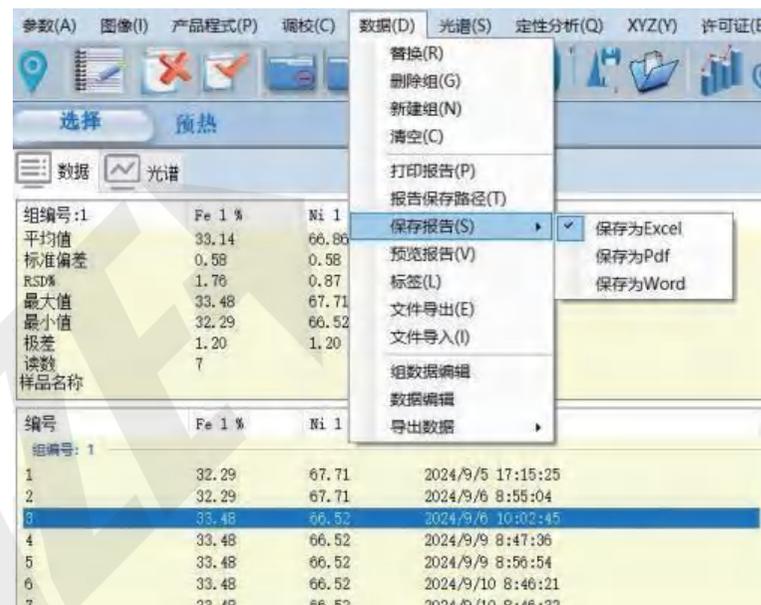


d. Print the report;

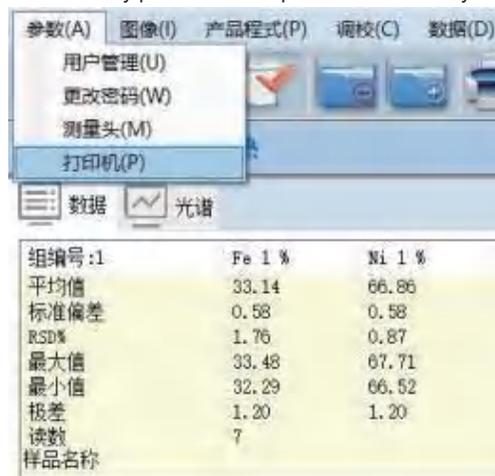


First, click on "Data" to open the panel, where you can select the items to display in the report as needed;

- Report Template: Click the report template button to choose a suitable print template;
- Save Sample Image: Check this option to save the image of the current test point after the sample test is complete, allowing images to display in the selected report template;
- Display Sample Name: By checking this option, the edited sample name will show next to each group number in the software data area and will also appear in the saved report;
- Save Coordinates: Checking this option will display the corresponding coordinate location next to each data point in the saved report;
- Save Date: Checking this option will show the corresponding test time next to each data point in the saved report.



Then, click on "Data" in the menu bar and select "Save Report." Choose the desired report format, then click the "Report Save Path" button to set the location for saving the report. Finally, click on "Printer" in the "Data" menu to select the printer you want to connect to. Click on the group data you wish to print, then select "Print Report" from the "Data" menu or click the "Print Report" icon in the toolbar. You can directly print the test report for the currently selected data;



Chapter 5: Product Program, Substrate Correction, Normalization, Calibration.

To ensure the accuracy of the instrument's test results, the product program must be set up according to different samples before testing. The product program includes:

- Editing product program information
- Editing standard sample information
- Setting data parameters

5.1 Import the product program

If the product program we need to add is available in the existing product program library, it can be imported directly using the following steps:

- a. Select "Product Program" in the menu bar and choose "New." In the pop-up program window, click "Read File."
- b. Select the product program corresponding to the sample. For example, if the selected product program is Zn/Fe, find the Zn/Fe file in the program library.
- c. Once selected, click "OK."

The new product program is now set up and can be chosen for normalization or calibration as needed.

- d. After calibrating the program, the instrument will be ready for testing.

5.2 Backup the product program

Product programs can be backed up by copying them to another folder on the hard drive, network, or floppy disk. The steps are as follows:

1. Select "Product Program" in the menu bar and choose "Edit."
2. Edit the required program.
3. Click "Save to File" (specify a folder) to perform the backup.

5.3 Create a new product program

Click on "Product Program" in the menu bar and select "New" to set up the product information and test parameters.

- a. Set the product program name, layer, composition, characteristic lines, and other information.
- b. Configure parameters such as test time, number of tests, decimal places, test conditions, and display array size.

5.4 Delete the product program

Unneeded product programs can be deleted using the following steps:

- a. Select "Product Program" in the menu and choose "Select."
- b. In the pop-up product program dialog, select the program to delete, rightclick to delete, and enter the password **INSIZE** to confirm.

5.5 Set up the product program

Setting up the product program involves the following steps:

- a. Select "Product Program" in the menu and click "New" to open the new product program window;
- b. Enter the product program name, layer, composition, characteristic lines, and other settings;
- c. Set the test conditions in the data;

- d. Normalize or calibrate the product program;
- e. Once calibration is complete, the instrument can proceed with testing.

5.6 Select the calibration standard sample

Before testing, the product program is calibrated using pure element samples. Generally, testing can be performed without standard samples, but to achieve more accurate results, multiple standard samples can be used for calibration. The steps are as follows:

- a. Select "Calibration" in the menu and click "Edit Standard Samples."
 - b. In the pop-up dialog, enter the information for the standard sample and click "OK" to save;
 - c. Click "Calibration" in the menu and follow the prompts to place the standard samples for testing.
- ★ The thickness or composition of the selected standard samples should be similar to that of the samples being tested. If using multiple standard samples, they should be evenly distributed within the testing range.

5.7 Standard samples

Standard samples (working standard samples) are clearly defined samples with known coating thickness or composition. These samples may be obtained from either your own or others' products that have been appropriately tested with a calibration instrument. Standard samples are used for instrument calibration. The coating thickness or composition in the test area should be relatively uniform. The standard samples set in the product program should have the same characteristics as the samples being tested (substrate, coating, or substrate composition, etc.).

5.8 Substrate correction

If the substrate of the sample being tested differs from previously tested samples, substrate correction should be performed, meaning that the readings on the substrate deviate from the zero point. If the substrate is a pure element, substrate correction is not necessary. The material underneath the coating of the sample is referred to as the substrate, which is the material on which the coating is applied. Additionally, if the intermediate layer is not tested, it may also be part of the substrate. Requirements for Substrate Correction:

- The substrate must be a sample without the coating to be tested.

- Before performing substrate correction, the instrument should be preheated for at least 30 minutes to stabilize its performance.
- Substrate correction is only valid for the current application program and does not apply to other programs.

Steps for Substrate Correction:

- a. Select "Product Program" from the menu and click on "Calibration" then "Substrate Correction." The software interface will prompt you to place the substrate sample.
- b. Place the substrate and select [OK] to begin testing.
- c. Once the substrate correction is complete, the instrument will be ready for testing.

5.9 Normalization.

If the calibration verification shows a deviation four times the standard deviation, the normalization requirements are as follows:

- a. Substrate (sample without the coating to be tested; not needed if the substrate is a pure element).
- b. Standard sample substrate (not needed if the substrate is a pure element).
- c. Pure element standard sample.

d. Materials that interfere with the test spectrum (e.g., bromine on printed circuit boards).

★ After powering on, the instrument should be preheated for a while before performing substrate correction.

★ Normalization is only applicable to the current application program and does not apply to others.

Normalization Steps:

a. Select "Calibration" and then "Normalization" from the menu to open the normalization application window. An instruction window will appear with the next operational steps.

b. Follow the prompts in the instruction window for testing. If testing a pure element standard sample or substrate multiple times, gently move the standard sample or substrate to equalize the potential unevenness on the material.

c. When normalization is complete, a dialog box will appear indicating completion; click "OK." The instrument will then be ready for testing..

5.10 Calibration

If, after normalization, the calibration verification shows a deviation greater than four times the standard deviation (S), calibration must be performed.

Calibration Requirements:

- Substrate (sample without the coating to be tested; not needed if the substrate is a pure element).
- Standard sample substrate (not needed if the substrate is a pure element).
- Pure element standard sample.
- Materials that interfere with the test spectrum (e.g., bromine on printed circuit boards).
- Standard sample (if testing requires a standard sample).

★ After powering on, the instrument should be preheated for a while before performing substrate correction.

★ Calibration is only applicable to the current application program and does not apply to others.

Calibration Steps:

a. Select "Product Program" in the menu and click "Edit." Enter the values for the standard samples you need to add.

b. Click on "Calibration," and the operation interface will pop up;

c. Follow the prompts on the interface to sequentially test the substrate, pure elements, or standard samples;

d. When calibration is complete, a message will appear indicating that calibration has finished, and the instrument will be ready for testing.

Chapter 6: Installing the Instrument.

6.1 Safety Warnings

★ You must follow the recommendations outlined in Chapter 2: Operating, Maintenance, and Storage Guidelines for the Instrument and Accessories.

6.2 Installation Steps

Generally, INSIZE will install the X-RAY instrument for you and debug it until it is operational.

(1) Installation Steps:

- 1) Open the packaging box and position the computer, printer, and X-RAY instrument. Remove any transportation securing devices (if applicable). The instrument is secured with screws during transport, which must be removed before connecting the power supply.
- 2) First, remove the top cover of the instrument by unscrewing the eight screws at the back. Then, remove one screw from each side (left and right). After that, take off the top cover.
- 3) From the back, there are two securing screws on each side; remove these screws as well.
- 4) Reattach the top cover and secure it by tightening the screws on the sides and the back.



Remove the screws from the back and sides of the top cover.



Remove the securing screws on both the left and right sides.

★ If the temperature of the instrument differs significantly from the ambient temperature (e.g., after low-temperature transport or storage), allow the machine to acclimate to the room environment before operation.

(2) Check the voltage of the power supply and connect the power cables of the computer and X-RAY instrument to the socket.

(3) Connect the wiring between the computer and the X-RAY instrument.

(4) Connect the printer to the computer.

(5) Power on the computer and install the EFP-T software (if it is not already installed).

(6) Turn on the instrument to establish a connection between the X-RAY instrument and the EFP-T software.

(7) Preheat for more than half an hour, and then perform peak position calibration.

6.3 Choose an appropriate location

When selecting the placement for the instrument, you must follow the recommendations in the section on "Environmental Conditions for Operating and Storing the Instrument and Accessories." The instrument, computer, monitor, and printer should be placed on a sturdy table. The left side of the instrument should be easily accessible, where the power switch, ports, and power socket are located.

6.4 Wiring



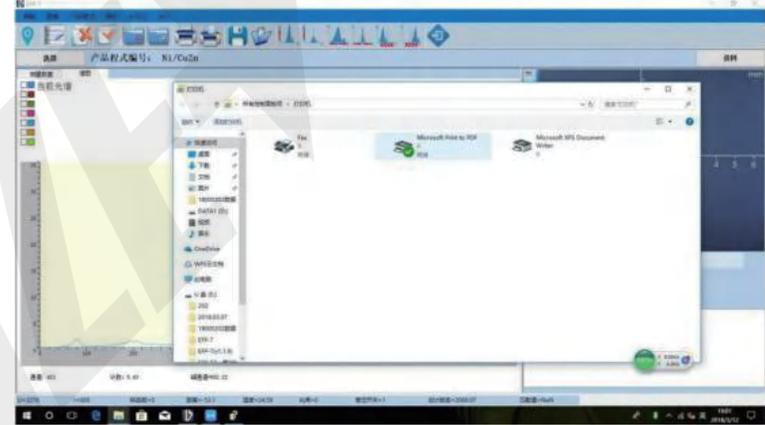
6.5 Printer Selection and Page Setup

6.5.1 Printer Selection

To ensure proper communication between the computer and printer for printing the desired test data and calculation results, you must select the appropriate printer in the EFP-T software.

Selecting the Printer in EFP-T Software:

1. In the EFP-T software, go to the menu and select Parameters → Printer. This will bring up the window of available connected printers. (Refer to Figure 6.2: "Printer Selection" Window)



2. Select the appropriate printer and make any necessary settings (such as page orientation—portrait or landscape, etc.).

★ If your printer model is not listed, you must install it in Microsoft Windows. Installation instructions can be found in the relevant manual, online help, or documentation.

3. Click [OK] to confirm your selection.

4. After selecting [OK], the application window of the EFP-T software will reappear.

Chapter 7: Purification and Maintenance

Before starting purification or maintenance, check that the power connection of the instrument is unplugged.

This will ensure that the instrument does not accidentally power on during purification or maintenance.

7.1 Purification and Maintenance

7.1.1 Cleaning the Instrument

If the instrument is dirty, use a damp cloth with alcohol to clean it.

★ Do not pour any liquids onto the instrument to prevent liquid from entering its interior, and do not immerse the instrument in liquid! Otherwise, it may cause a power short circuit!

7.1.2 Purifying Standard Samples

Dirt or scratches on the testing surface can lead to inaccurate results. When cleaning standard samples, do not use any methods that could cause mechanical or chemical damage! Use a soft, lint-free cloth to wipe away contaminants.

7.2 Maintenance

7.2.1 Replacing the Fuse

The circuit fuse is 3A/250V and can be replaced if necessary. The fuse is located at the power connection terminal on the left side of the instrument. To replace the fuse:

- 1) Turn off the instrument and unplug the power cord.
- 2) Carefully remove the fuse holder with a screwdriver, being cautious not to injure yourself or others (e.g., the screwdriver may slip when lifting the fuse holder)!
- 3) Remove the faulty fuse and replace it with a new one.
- 4) Return the fuse holder to its original position.

Chapter 8: Fault Handling

hitch	Possible cause	resolvent
The monitor is not displayed	Screen protection	Move the mouse (remove the screen saver)
	The display is not open	Turn on the monitor
	The computer is not turned on	Open the computer
	The power management function is activated	Interrupt the power management function
Frequency shows no focus	Incorrect focus	Turn the focus knob until the test area is focused on the screen
The video is blurred	The surface light light is not on or not bright enough	Adjust the brightness of the surface light source lamp
	No sample display in the video window	Place the sample correctly
No sample display in the video window	Samples were placed improperly	Place the sample correctly
	Instrument interrupted with EFP-T software	The instrument was linked with the EFP-T software
	The USB cable is not connected	Connect the USB cable to the USB socket of the instrument and the computer
	The USB line is damaged	Replace the video cable
<<CONTROL>> The light flashes	Software error	Turn off the instrument and restart the EFP-T software
	The test door was not completely closed	Close the test door
The instrument is not on when pressing the switch to open the instrument	Safety interlock system fault (if test closed, <<CONTROL>> still not	Notify the ELITE Corporation
	The instrument is not connected to the power supply	Turn off the instrument and plug the plug into the socket
	Power socket switch is turned off	Turn on the power socket switch
The printer prints out the useless data	blown fuse	Determine the cause of the fuse, and replace the fuse after handling the fault
	Printer driver error	Install the correct printer driver
The printer prints out the useless data	Printer cable failure	Replace the cable
	No print output	Open the printer
No print output	The printer is not turned on	Open the printer

	The printer is not properly connected to the computer	Turn off the computer, the instrument and printer check the cable again
	The printer is not connected to the computer	Connect the printer to the computer
	Printer cable use error	Use the correct printer cable
	The printer or the printer cable is damaged	Replace the printer and printer cables
	The printer is connected to a faulty printer port	Handling port failure
Error testing data	The product program selected does not agree with the sample	Select or set the correct product program
	Normalization or tuning errors	Correct normalization or tuning
	Peak position correction error	Peak-position correction was repeated
	No peak-position correction was performed	Peak position correction was performed
The connection of the EFP-T software to the instrument was interrupted	The instrument is not properly connected to the computer	Turn off the instrument and check the wiring before turning on the instrument
	The instrument was not connected to the computer	Connect the instrument to the computer
	The installation process is wrong	Correct installed capacity
	Connecting cable or interface fault	Resolve the connecting cable and interface faults
The XY platform cannot be moved	XY platform has moved to top (bottom, right or left)	Move the XY platform in the opposite direction
	Insurance device constraint, that is, the test platform is blocked by the outside	Remove obstacles

9. Operating procedure for XRF-FA350

I Instrument use

XRF-FA350 is used to test the thickness and composition of the coating layer, analyze the alloy composition, and test the concentration of the main salt ions of the coating solution.

II Start-up and shutdown steps

- 1) Boot up steps
 - (1) Turn on the instrument power supply
 - (2) Open the high-pressure key
 - (3) Turn on the printer
 - (4) Turn on the computer
 - (5) Open the EFP-T software, connect the instrument with the software, and complete the startup step.
- 2) Shutdown steps
 - (1) Close the EFP-T software
 - (2) Turn off the computer and the printer
 - (3) Close the high-pressure key
 - (4) Close the instrument

III Test preparation

1. Preheat the instrument

In order to ensure the accuracy and stability of the test, the instrument must be fully heated after opening. The preheating method is as follows:
After completing the normal startup step, open the warm-up program and click the start icon to start the test. After 30 minutes, click to complete the test to complete the preheating process.
2. Peak position correction

Note: This step is very important.
Note: The instrument must be preheated before performing the peak position correction. Because the instrument is corrected against the element Ag, the position of the element Ag must be precisely located and cannot be offset.
Peak position correction steps are as follows:

 - 1) Raise the Z axis to the appropriate height, pull out the test platform, place the element Ag on the workbench to align with the laser point, push the platform, close the sample cavity, adjust the height of the Z axis or adjust the focal length to the focus clearly, so that it is clearly displayed in the center of the cross line of the video window.
 - 2) Select the peak position correction icon in the upper left corner, and the software prompt to put the pure element tablet Ag, start correction, Ag. After the peak correction, put Cu tablet according to the software prompt.
 - 3) At the end of the peak position correction, the software prompts the success information of the peak position correction.

IV test

1. After completing the startup step and preheating and peak position correction, the test sample can start.
2. The test steps are as follows:
 - 1) According to the coating condition of the sample to be tested, click the menu "Product program-select...".
 - 2) Raise the Z axis to an appropriate height, pull out the test platform, place the sample on the workbench to align with the laser point, push the platform, close the sample cavity, adjust the height of the Z axis, or adjust the focus distance until the focus is clear
Is clearly displayed in the center of the video window cross.
 - 3) Press the start button in the lower right corner of the display screen or the "START" button on the console in front of the instrument to start the test. The test will be completed once after the countdown ends.
3. Test precautions
 - 1) Selection of test time.
The longer the test time, the better the stability. Generally speaking, the single plating time is not less than 15 seconds, the double plating and alloy ratio test time is not less than 30 seconds, the three plating test time is not less than 45 seconds, the plating main salt away Subconcentration was tested between 30 and 60s.
 - 2) Principles of sample placement
From the front, the X-ray fluorescence receiver is on the upper left of the placed sample, and the sample must be correctly placed, to ensure that the X-ray fluorescence reaches the detector without interference.
 - 3) If "invalid spectrum, untested and other information appears after the test, the following operations should be performed:
A: Check whether the coating condition of the measured sample is consistent with the selected product program.
B: Make the substrate correction.
C: Peak-position correction was performed.
- 4) Before testing, check whether the substrate composition of the sample to be tested is consistent with the set substrate.

V Print the report

- A. Select the test group to print
- B. Print (print preview)



VI Adjust the product program

Correct adjustment is a necessary condition to ensure the accuracy of the instrument test. The instrument must be fully preheated and the peak position corrected before adjustment.

This is very important.

Determine whether it should be adjusted, which can be tested by testing the adjusted standard sheet. Place the standard on the bench and move the standard several times. If the difference between the mean test data and the standard does not meet the standard.

The precision can be "normalized". If the normalization still does not meet the accuracy of the standard sheet, it should be adjusted.

Tuning steps:

- 1) Select the product program to be adjusted
- 2) Select the menu "Adjustment-Adjustment" to start "Adjustment".

The next step appears in the instructions window on the screen. Test the appropriate material and sheets as instructed. If a pure element or substrate should be tested several times, gently move the standard sheet or substrate several times.

VII matters need attention

1. The power supply voltage of the instrument must be consistent with the voltage on the instrument nameplate. The instrument must be connected to a grounded socket using a three-wire plug.
2. This instrument is a precision instrument, and it is recommended to provide a high-precision voltage stabilizing power supply. The computer shall be equipped with an uninterruptible power supply (UPS)
3. The instrument should pay special attention to the isolation from the presence of electromagnetic conditions.
4. The instrument is suitable for operation at the ambient temperature of 15~30 C (59~86 F), at 0~50 C (32~122 F) Store at the temperature of. The allowable humidity range for operation and storage is between 0 and 70% (non-condensing). The ambient temperature and humidity shall be kept constant during the operation.
5. When the instrument is exposed to the sun, the temperature behind the window glass is easy to exceed 50 C. Therefore, please do not operate and store the instrument in such an environment to avoid the damage to the instrument caused by the high temperature.
6. To avoid short circuit, strictly prohibit the direct contact between the instrument and the liquid. If the liquid enters the instrument, please turn off the instrument immediately! And ask the technician to check the instrument before reuse.
7. This instrument shall not be used in acidic environment and explosive situations.
8. Don't get dirty and scratch the standard sheet! Otherwise, it will cause a reading error!
9. Do not use any mechanical or chemical methods to remove the dirt from the calibration standard sheet! If necessary, gently wipe out the dirt with a barren cloth.

