

XRF-VF300

VACUUM XRF PLATING THICKNESS INSTRUMENT/ROHS ANALYZER

<https://m.insize.com/XRF-VF300.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.

Chapter 1 Symbols

1.1 Instrument Symbol Identification



Indicate safety signs and warnings of potential danger to instruments or accessories, as well as to the operator themselves;



Indicates a prohibition against touching the detector or the beryllium window of the receiver;



Indicates caution regarding X-ray radiation;

<START> Typically refers to the operation key on the instrument's front control panel;

<HV ON> Typically refers to the indicator light on the measurement head's control console.

1.2 Operation Manual Content Symbol Identification

★ Indicates particularly important tips and notes;

● Indicates a primary list item;

▶ Indicates a secondary list item;

■ Indicates a tertiary list item;

○ Indicates a quaternary list item.

1.3 Explanation

The coating thickness, composition, or statistical results in this manual are for illustrative purposes only.

They may differ from the data displayed on your screen or printed by the printer; this does not indicate an operational error.

Chapter 2 Instructions for Operation, Maintenance, and Storage of Instrument and Accessories

2.1 Instrument Purpose

XRF-XF300 is suitable for testing coating thickness and material analysis.

2.2 Operator Skill Requirements

★ **Personnel operating the XRF-VF300 must be trained. When using EFP-T software, operators should possess basic knowledge of Microsoft Windows.**

★ **Information on using Microsoft Windows can be obtained from Microsoft Windows manuals, Microsoft Windows online help, or reference literature.**

2.3 Radiation Safety Aspects

1. The XRF-VF300 generates radiation due to the use of an X-ray tube. Its measurement head design fully complies with domestic and international X-ray safety requirements:

- A high-voltage key determines whether X-radiation is generated by turning the high voltage on or off at the X-ray tube.
- A multi-stage fail-safe interlock system controls the generation of X-radiation, effectively protecting the operator's safety.
- X-radiation will not enter the test chamber if the test door is not completely closed.
- Sufficient shielding is used to reduce external radiation levels.

2. To ensure safe operation of the XRF-VF300, the following points must be observed:

★ **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 Aspects

1. When the instrument is used normally according to INSIZE's requirements, it poses no electrical hazard or risk of damage to persons.

2. To avoid damaging the instrument, the supply voltage must match the voltage indicated on the INSIZE X-RAY instrument nameplate.

3. The instrument must be connected using a three-pin plug to a grounded socket.

2.5 Maintenance of Instrument and Accessories

1. Only authorized personnel may repair the XRF-VF300.

2. 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 Operation and Storage of Instrument and Accessories:

1. The XRF-VF300 complies with the indicators regarding "Electromagnetic Compatibility" in relevant regulations. Measurement results are unaffected when parameters mentioned in standard EN50082-1 (referring to standards IEC801-2, 801-3, and 801-4) are at their maximum values;

2. Particular attention should be paid to isolating the instrument from electromagnetic environments (e.g., motors). The instrument is suitable for operation at ambient temperatures between 15 °C and 30 °C (59 °F to 86 °F) and for storage at temperatures between 0 °C and 50 °C (32 °F to 122 °F). The permissible humidity range for operation and storage is between 0% and 70% (non-condensing);

3. During operation, ambient temperature and humidity should remain constant;

4. When the instrument is exposed to sunlight, the temperature behind the window glass can easily exceed 50 °C (122 °F);

5. To avoid damage to the instrument from high temperatures, do not operate or store the XRF-VF300 and accessories in such environments;

6. To prevent short circuits, avoid direct contact of the instrument with liquids;

7. If liquid enters the XRF-VF300, immediately unplug it! Before reusing it, have the instrument thoroughly inspected by a technician;

8. The XRF-VF300 is not acid-proof. Avoid operating the instrument in acidic environments (e.g., electroplating);

9. The XRF-VF300 must not be used in explosive environments.

2.7 Use, Storage, and Transport of Calibration Standards

1. Calibration standards are used to calibrate the XRF-VF300;

2. The integrity of the calibration standards is a prerequisite for correct calibration and accurate measurements. The following points help maintain the integrity of the calibration standards:

★Do not damage the calibration standards! Dirt or scratches on the standards will cause reading errors.

★Do not use cleaning agents that could cause mechanical or chemical damage to remove dirt from the standards! If necessary, gently wipe off dirt with a cotton swab moistened with alcohol.

★To avoid contamination or damage to the calibration standards, store and transport them in their protective case.

Chapter 3 Instrument, EFP-T Software, and Accessories Introduction

3.1 Product Overview

The XRF-VF300 is a device specifically designed for testing coating thickness and material analysis. It performs relevant measurements based on the X-ray testing methods specified in standards ISO 3497-2000 and ASTM B568-1998.

3.2 Testing Principle

Basic Principle: When a substance is irradiated by X-rays of a certain wavelength, its elements become excited and emit photons, forming characteristic X-ray fluorescence. The energy of each element corresponds uniquely. After the detector receives the characteristic X-ray fluorescence of an element, qualitative analysis can be performed based on the photon energy, and quantitative analysis based on the photon count.

X-ray Fluorescence Analysis Principle: When atoms of elements in a sample are irradiated by high-energy X-rays, they emit characteristic X-ray spectral lines with specific wavelengths. The wavelength of the characteristic spectral line 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 line, the elements contained in the sample can be identified (qualitative analysis); by measuring the intensity of the spectral line, the specific content of the element can be determined (quantitative analysis).

X-RAY Instrument Working Principle: The instrument's high-voltage power supply provides tube voltage and current to the X-ray tube. The tube excites a continuous X-ray fluorescence spectrum (primary X-rays). The primary X-rays irradiate the sample,

causing the sample to produce characteristic X-ray fluorescence. After passing through the detector, this signal is converted into a voltage signal. The signal is amplified, data is collected, and sent to the computer. After software processing, the final measurement result of the sample is obtained.

3.3 Instrument Appearance

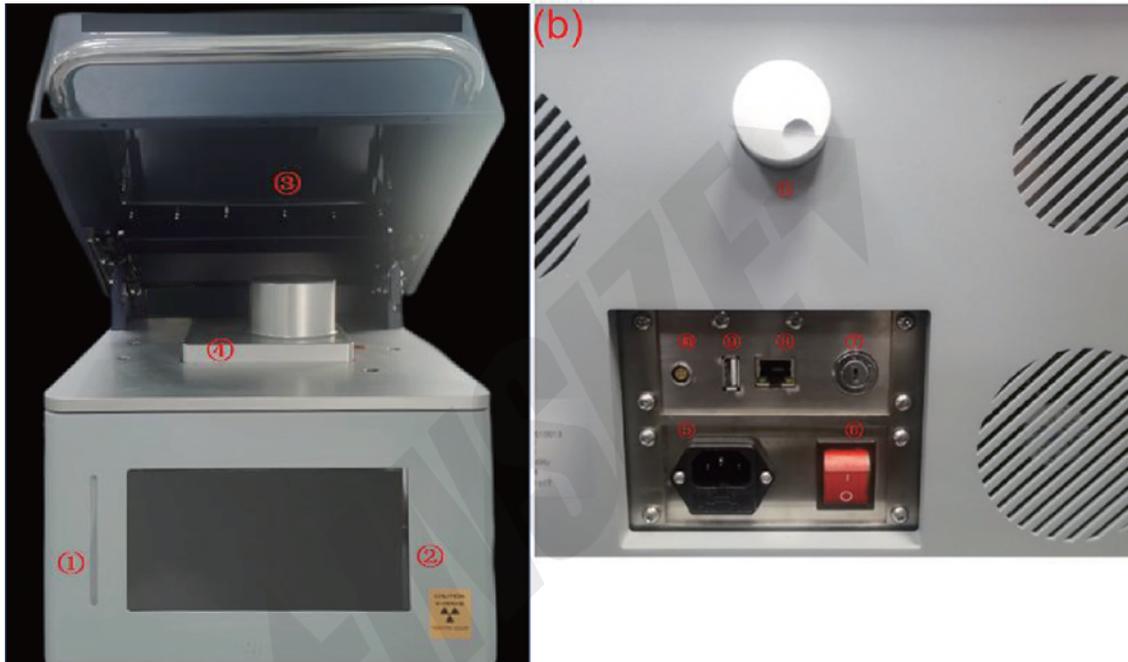


Figure 3.1 XRF-VF300, (a) Front of the instrument, (b) Plug in section. As shown in Figure 3.1, the appearance of the XRF-VF300 is shown.

Description:

① Breath Indicator Light: Off when instrument not connected; Solid on when connected; Alternates on/off during testing;

② Instrument status display screen: Tube U (tube pressure), Tube I (tube flow), Filter (filter step size), Collimator (collimator step size), Temperature (tube temperature);

③ Sample placement in the external cavity;

④ Sample placement in the inner cavity;

⑤ AC Power Input Port;

- ⑥ Power Switch: Controls instrument power on/off;
- ⑦ High Voltage Key: Controls high voltage to the tube;
- ⑧ Network Port for connecting instrument to computer host;
- ⑨ USB Port for connecting instrument to computer host;
- ⑩ Communication interface for connecting instruments and vacuum pumps;
- ⑪ Image Focus Adjustment Knob.

3.4 EFP-T Software

3.4.1 Software Pre-installation Preparations:

Install Drivers: Camera driver, Detector driver

Network Communication Settings: After connecting the instrument to the computer via the network interface, set the computer's network IP address to ensure smooth communication. The specific steps are shown in Figure 3.2.

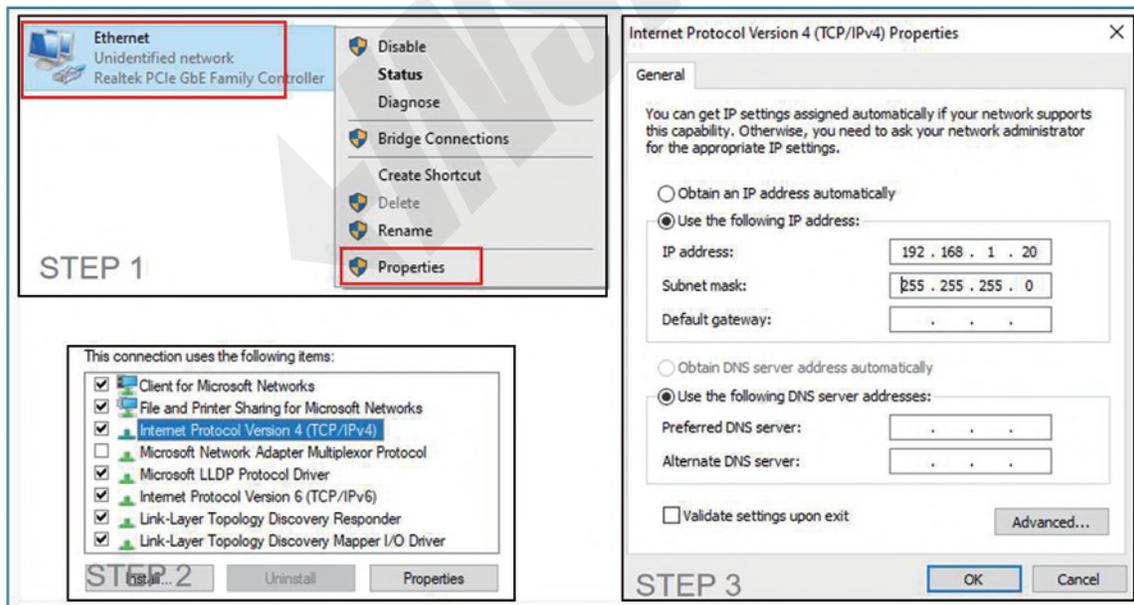


Figure 3.2 Network communication settings.

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

3.4.2 Software User Interface and Function Description:

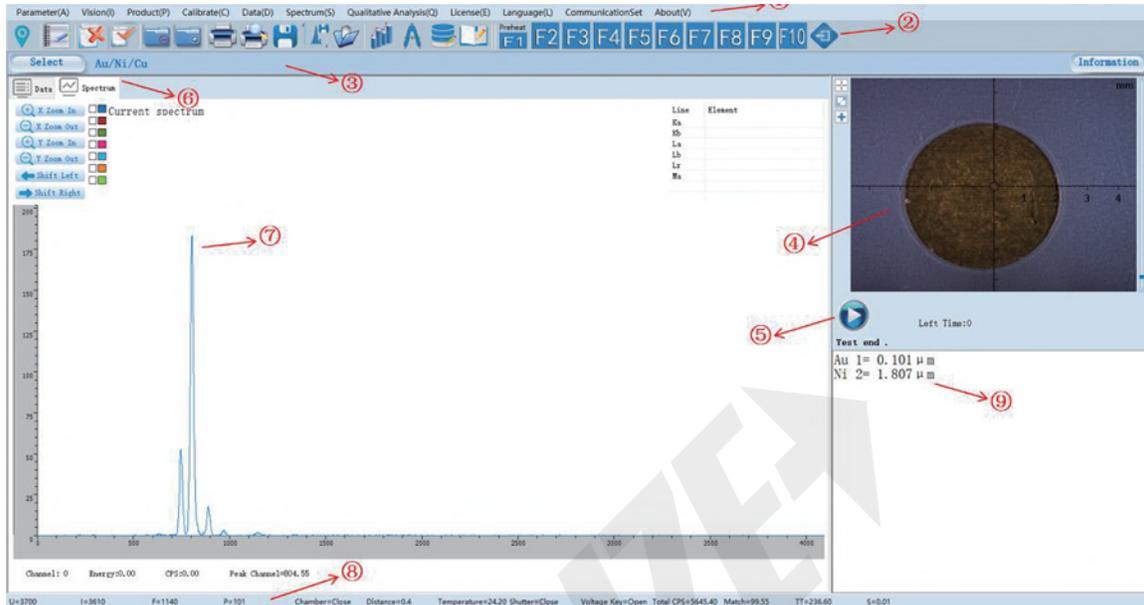


Figure 3.3 Software User Interface. ① Menu Bar, ② Toolbar, ③ Program Bar, ④ Image Area, ⑤ Operation Area, ⑥ Spectrum and Data Toggle Option, ⑦ Spectrum Display Area, ⑧ Status Bar, ⑨ Measurement Result Display Area.

●Menu Bar

As shown in Figure 3.4, it is the menu bar. The menu bar contains all menus. Each menu includes several commands or submenus.

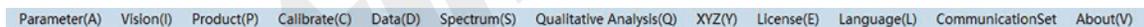


Figure 3.4 Menu Bar.

- ▶ Parameter: Mainly includes the following submenus:
 - User Management: Manage software login accounts, change, add, or delete users and passwords;
 - Change Password: Manage the software administrator account login password;
 - Measurement Head: Set basic instrument parameter configuration (e.g., tube voltage, tube current for different X-ray tube power levels, collimator model, filter type, step size, etc.);
 - Printer: Set the printer to be connected to the computer;
- ▶ Vision: Mainly includes the following submenus:
 - Spot: Set the coordinate position of the center of the X-ray spot for each collimator;
 - 100%: Enlarge image in Image Area by 1x;

- 200%: Enlarge image in Image Area by 2x;
- 300%: Enlarge image in Image Area by 3x;
- Image Heancement: Adjust the sharpness, gamma, saturation, auto gain, auto exposure of the sample image in the Image Area for optimal clarity;
- Focus Area: Options: Max, Large, Medium, Small. When using the auto-focus function, select the appropriate imaging focus area size based on the sample size to achieve the clearest image of the sample within the focus area, as shown in Figure 3.5;

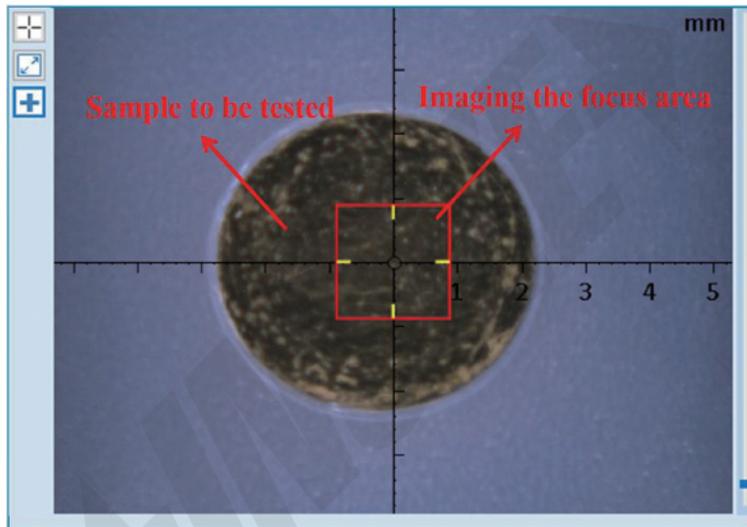


Figure 3.5 image area. “Small” corresponds to a 1x1 mm square focus area; “Medium” corresponds to a 2x2 mm square focus area; “Large” corresponds to a 3x3 mm square focus area; “Max” corresponds to a 4x4 mm square focus area.

- Light Control: Open the “Light Control” panel. Use buttons on the right to control the on/off state of each group of surface light source lamps to achieve the best sample imaging effect, As shown in Figure 3.6;



Figure 3.6 Light control.

- ▶ Product: Mainly includes the following submenus:

- Select: Choose the corresponding product program based on the sample type, as shown in Figure 3.7;

Product	Remark	Number
Preheat		32
Au/Ni/Cu		34

Figure 3.7 Product program selection.

- Edit: Edit the current product's program (e.g., coating structure, elements to be measured, calculation method, etc.);
- New: Create a new product program;
- Information: Opens the settings panel to configure the current product program's test conditions, measurement result display, etc. As shown in Figure 3.8, includes the following sub-panels:

Figure 3.8 Information.

- Product: Left panel contains basic test settings; Right panel sets units for test result display;
 - Measurement Time: Time required to measure one sample, unit: s;
 - Measurement Number: Number of times the software automatically repeats the test for each sample test point. Default is 1;

- Thickness Resolution: Number of decimal places retained for thickness display;
- Content Resolution: Number of decimal places retained for composition display;
- Match: Sets the threshold for the match between the sample test spectrum and the selected product program. If the calculated match value (see Status Bar description in 3.4.2) is below this preset value, a “Invalid Spectrum” prompt pops up. Higher match value indicates higher agreement. Range 0-100, default 96;
- Thickness: When results show thickness, select display unit: “ μm , μ ” or “Custom Unit”. In the custom unit sub-panel, set the unit name and the conversion factor from μm (e.g., set unit to nm, coefficient should be 1000), as shown in Figure 3.9;

The image shows a dialog box titled 'Unit' with two input fields. The first field, labeled 'Unit', contains the text 'μm'. The second field, labeled 'Factor', contains the text '1'. At the bottom of the dialog box, there are two buttons: 'Accept' on the left and 'Cancel' on the right.

Figure 3.9 Unit setting.

- Mass Thickness: Check this option to switch thickness units to g/cm^2 , g/m^2 .
 - Content: When results show composition, select display unit: %, ppm or “Custom Unit”. Set custom unit name and conversion factor from % similarly;
 - Auto Save Spectrum: Check to automatically save the test spectrum after each measurement. Default save path: Spectrum folder within the software folder;
 - Report Template, Save Sample Image, Show Sample Name, Save Date: See Chapter 4, Section 4.10 “Printing Reports”;
- Calibrate: This panel sets conditions for standards and sample testing, as shown in Figure 3.10;

Figure 3.10 Calibration.

- Calibration Time: Time required to measure pure elements or standards during program calibration (see Chapter 5, Section 5.10 “Calibration”), unit: s;
- Calibration Number: Number of times to measure the standard during calibration;
- Voltage: Default options: 30, 40, 50, corresponding to the tube voltage/tube current settings for 30W, 40W, 50W X-ray tube power in the Measurement Head menu. When checked, software adjusts voltage/current to the preset value for the selected power before measurement starts;
- Filter: Select appropriate filter based on sample type;
- Collimator: Select collimator size based on sample test area size;
- Current: Enter a value (0 to 1000) to adjust the test tube current as a percentage of the preset value. 1000 = 100%. E.g., preset tube current is 3600, input 500: actual tube current = $3600 * (500/1000) = 1800$. Check "Default Tube Current" to auto-fill the preset default value from the Measurement Head menu;
- Open Lid Measure: Options “Yes” and “No”. Check “Yes” to allow testing when the rotating cover or test door is not fully closed (Status Bar shows “Sample chamber = Open”). Check “No” to only allow testing when fully closed (“Sample chamber = Closed”);

★Selecting “Yes” risks X-ray radiation leakage. For safety, this option defaults to “No”!

- Vacuum setting: “Whether to evacuate” contains 2 options. Checking the “Yes” option means that the vacuum pump will evacuate the air in the sample chamber before testing begins; Check the “No” option,
 - The sample testing does not need to be conducted under vacuum conditions, and the vacuum pump will not work. In the input box after “Vacuum Degree”, you can fill in the value of atmospheric pressure after extracting air from the sample chamber. For example, if you fill in 6, it means that before testing, the vacuum pump will extract the air from the sample chamber until the atmospheric pressure inside the chamber drops to 6kPa, at which point the vacuum pump will stop pumping and the software will start testing. Check the “Default Value” option, and the input box will automatically fill in the preset vacuum degree value in the measurement head menu;
- Presentation: Settings for the software data area, as shown in Figure 3.11;

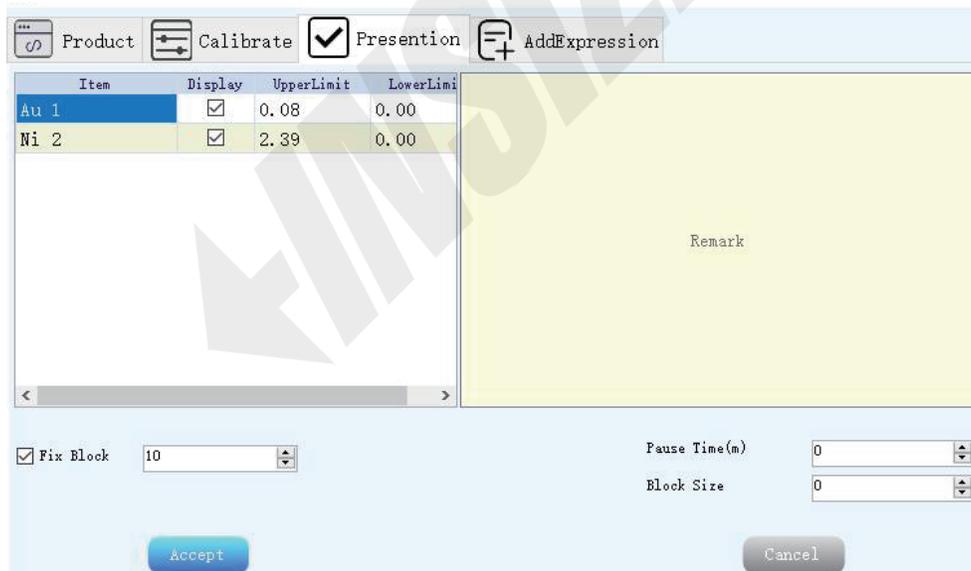


Figure 3.11 Display.

- Item: Names of the items calculated by the current program. E.g., in “Cu-Ni-Au”, “Au 1” is the first Au layer, “Ni 2” is the second Ni layer;
- Display: Check boxes below to set which item names are displayed in the “Test Result Area” and “History Data Area”. Checked = Display, Unchecked = Hide;

- Upper Limit, Lower Limit: Enter control standard values. Data exceeding the upper limit or below the lower limit in the History Data Area will be marked red for easy identification of anomalies, as shown in Figure 3.12;

Number	Au 1 μm	Ni 2 μm	Date
No: 1			
1	0.08	2.39	8/7/2025 7:05:13 PM
2	0.08	2.40	8/7/2025 7:06:00 PM
3	0.08	2.36	8/7/2025 7:06:32 PM
4	0.09	2.37	8/7/2025 7:07:03 PM
5	0.08	2.39	8/7/2025 7:07:34 PM
6	0.08	2.39	8/7/2025 7:08:06 PM

Figure 3.12 Abnormal data.

- Fix Block: Check box to enable grouping of test data in the History Data Area. Unchecked: all data in one group. Checked and enter a number: data will be grouped automatically. E.g., enter “10”, each group will display 10 readings; exceeding 10 creates a new group;
- Pause Time, Block size: Enter values. E.g., “5” and “1” means the software pauses for 1 minute after every 5 automatic repeat tests, then continues;
- Add expression: as shown in Figure 3.13, create custom algorithms to calculate results for each test item. Enter item name in Label column. Check the Display box to show the name in the History Data Area. Edit calculation expressions in the Expression column; rules are described below the panel;

Product
Calibrate
 Presentation
 AddExpression

Label	Display	Expression
Ni	<input checked="" type="checkbox"/>	Ni 1+10
	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	

Note: In the expression column, the element name must be filled in completely, which is consistent with the report header symbol on the main interface; For example, Au/Ni/Cu, multiply the Au element by 3, write "Au 1 * 3" (Au:[element] 1:[layer number] * 3), or multiply the Ni element by 3, write "Ni 2 * 3" (Ni:[element] 2:[layer number] * 3)

Accept
Cancel

Figure 3.13 Custom item page.

- Element Intensity: Opens panel showing the relative intensity value of each element edited in this program;
- Compute: With a spectrum present in the Spectrum Area, click to calculate results directly from the current spectrum;
- Hot Key: Create shortcuts for frequently used programs on the Toolbar. Open Shortcut panel, check “Activate”, enter a name in Name column, click Product Program column to select the corresponding program, click “OK”. The shortcut button will appear on the Toolbar, as shown in Figure 3.14.



Figure 3.14 Hot key settings.

- Calibration: Mainly includes the following submenus:
 - Standard Set: Opens “Standards” panel. Click “New”, enter values labeled on calibrated, valid standards (see Section 3.5) into corresponding fields, click “OK” to save, as shown in Figure 3.15;



Figure 3.15 Standard set.

- Calibrate: Calibrate the current product program (see Section 5.10);
- Normalize: Normalize the current product program (see Section 5.9);
- Substrate Correction: Perform substrate correction for the current program (see Section 5.8);
- Distance Calibration: Calibrate the distance value shown in the Status Bar;
- Performance Testing: Opens performance test interface to evaluate overall instrument performance;
- Spectrum Library: Opens “Spectrum Library” panel. Check relevant test conditions, click “OK”. Follow prompts to place the corresponding 12-element standard in the test area for scanning and saving, as shown in Figure 3.16;

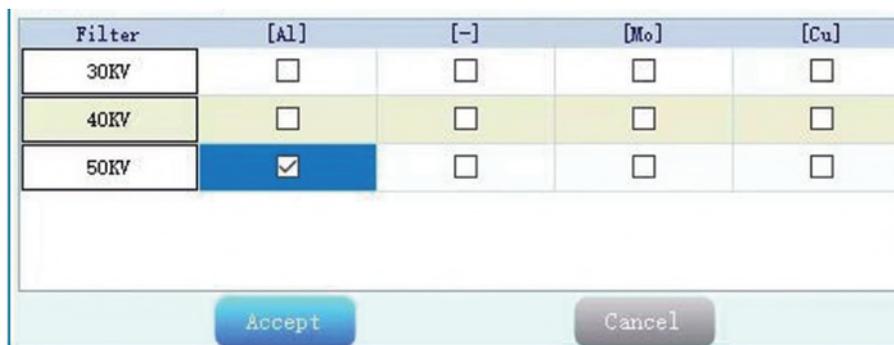


Figure 3.16 Spectrum library.

- ▶ Data: Mainly includes the following submenus:
 - Replace, Delete Group, New Group: See Section 4.10 Data Processing;

- Clear: Clears all data in the current program's History Data Area;
- Print Report, Report Path, Save Report: See Section 4.10 Report Printing;
- Preview Report: Preview the report for the selected group data;
- Label: Edit information for tested group data. Open “Label” panel, enter information in the “Value” column, click “OK” to save. Information will display below the Data Statistics Area, as shown in Figure 3.17;

Key	Value
Sample name	Copper alloy
Supplier	A
Operator	B

Figure 3.17 Label.

- File Export, File Import: Export/Import software parameter configuration files;
- Group Data Edit, Data Edit: Opens “Group Data” panel. Select a group number on the right (Figure 3.18). Click “Data Graph” below to view graph statistics for each test item in that group (Figure 3.19). Click “Readings” to view individual test data within the group. Click “Copy” to save the group's data to a text editor document. Click “Data Edit” to open the text editor interface where you can view, edit, save, and print data from multiple groups (Figure 3.20);



Figure 3.18 Group data.



Figure 3.19 Group graph.

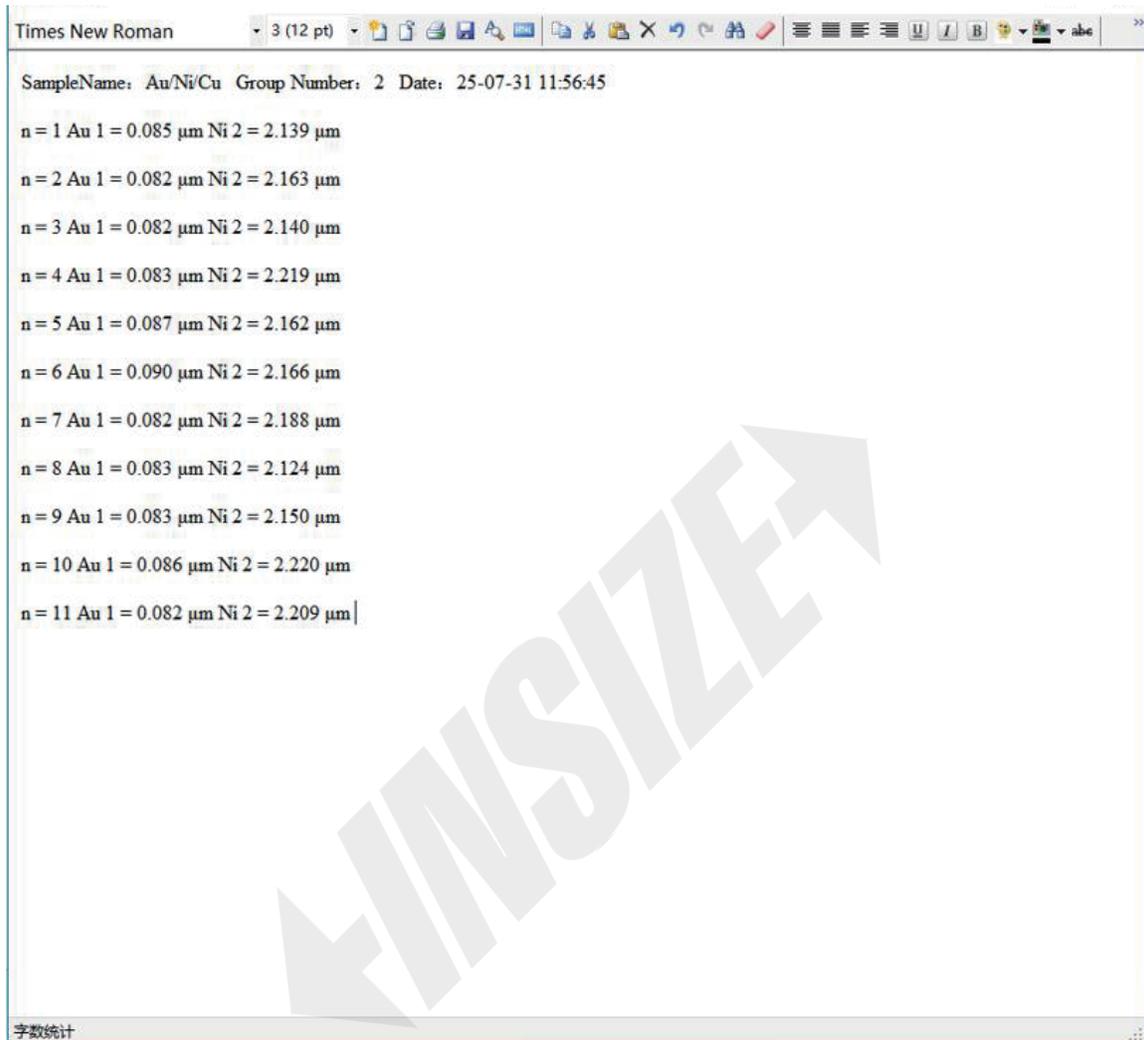


Figure 3.20 Text editing.

- Data Export: Options “All Data” and “Data After”. Print reports for all data under the current program, or for the selected group and subsequent groups;
- ▶ Spectrum: Mainly includes the following submenus:
 - Open: Open a saved spectrum file for viewing. Opens in the Spectrum Area;
 - Save: Save the current test spectrum or the last opened spectrum to a specified folder. Default save format: “txt”;
 - Simulate Spectrum: Opens “Periodic Table” panel. Select an element (only one at a time), click “OK”. The simulated spectrum of the selected element displays in the Spectrum Area;

- Auto Save Standard Spectrum to Library: Check to automatically save scanned spectra of pure elements and standards during program calibration or normalization. Default save path: Spectrum folder;
- Y Zoom In, Y Zoom Out: Scale the Y-axis (Counts) in the Spectrum Area;
- X Zoom In, X Zoom Out: Scale the X-axis (Peak Channel/Energy) in the Spectrum Area;
- Shift Left, Shift Right: Move the spectrum horizontally along the X-axis after zooming in;
- ▶ Qualitative Analysis: Mainly includes the following submenus:
 - Periodic Table: Opens “Periodic Table” panel. Select elements (multiple possible), click “OK”. Characteristic peaks of selected elements are marked on the spectrum at their corresponding channel positions, as shown in Figure 3.21;

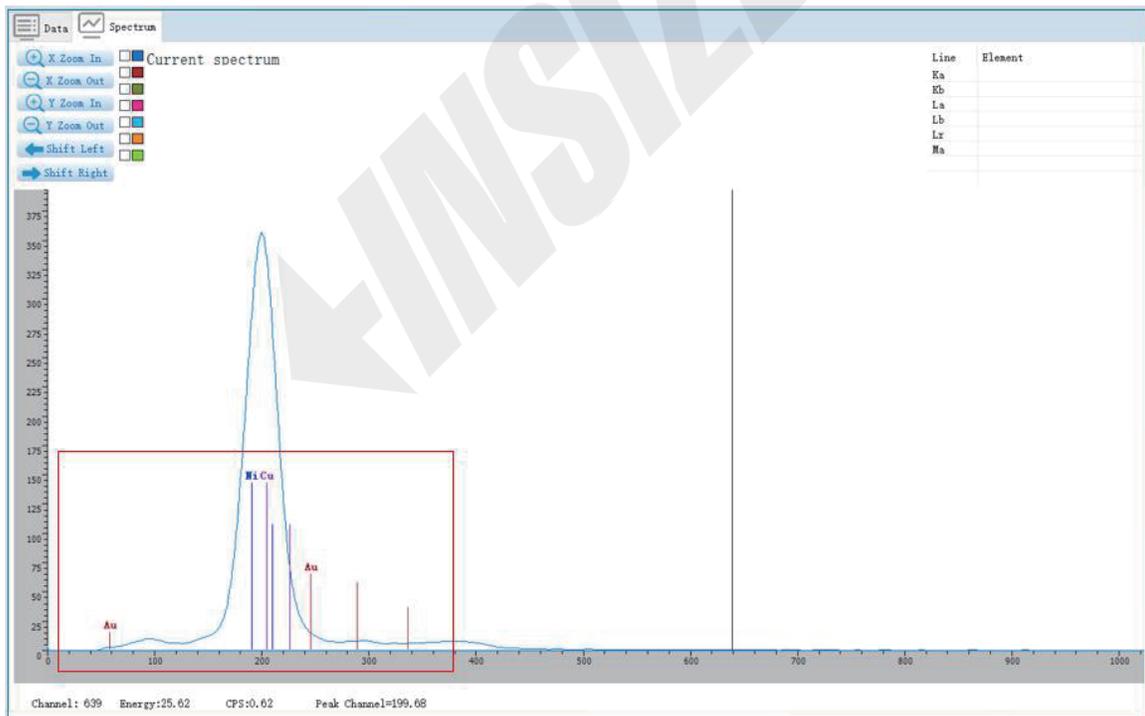


Figure 3.21 Software spectrum area.

- Analysis: Opens “Analysis” panel. Software calculates component ratios from the current spectrum. Clicking the “Report” button below allows you to save the calculation results in a report format. The save path should match the “Report Save Path” submenu in the “Data” menu bar, as shown in Figure 3.22;

Element	Content%
Ni	49.96
Cu	50.04
Au	0.00

Figure 3.22 Analysis.

★Elements must be selected in the Periodic Table first to perform analysis!

- Identify Elements, Identify Elements Parameters: Click “Identify Elements Parameters” to set qualitative sensitivity, minimum confidence, and elements to ignore. Click “OK”, then click “Identify Elements” to have software label elements based on peaks in the current spectrum, as shown in Figure 3.23;

Threshold(0~10) Confidence(1~100)

IgnoreElement

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	71 Hf	72 Ta	73 W	74 Re	75 Os	76 Ir	77 Pt	78 Au	79 Hg	80 Tl	81 Pb	82 Bi	83 Po	84 At	85 Rn	86
87 Fr	88 Ra	89 Ac	90 Th	91 Pa	92 U												
57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu			

Figure 3.23 Identify Elements.

- License: Mainly includes the following submenus:

- Authorize: Opens “License” panel. Follow steps on this interface to send a request file to our company to obtain an authorization file to extend the software license validity period before it expires, as shown in Figure 3.24;

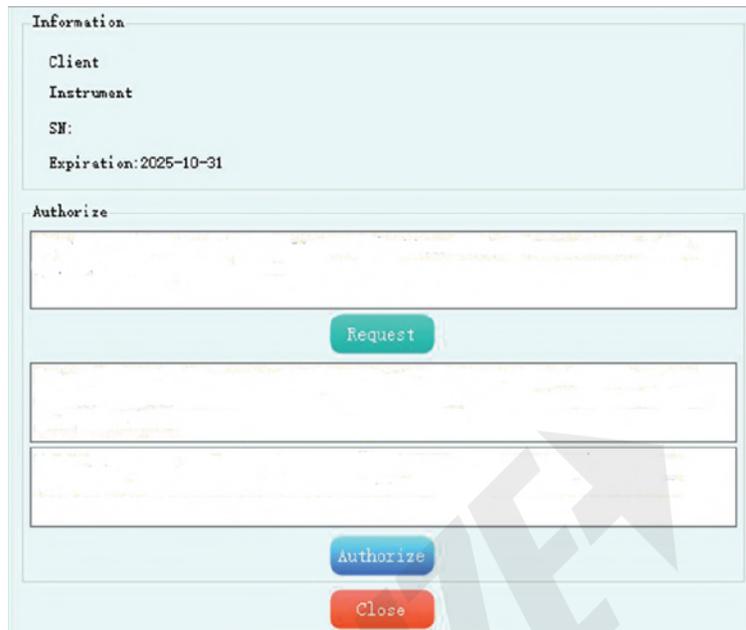


Figure 3.24 License.

- ▶ Language: Mainly includes the following submenus:
 - En(Kr): Switch software display language to Korean;
 - En: Switch software display language to English;
 - 中文: Switch software display language to Chinese;
- ▶ Communication Set: Mainly includes the following submenus:
 - Serial Port Set: Opens “Serial Port Set” panel for remote data transmission, as shown in Figure 3.25;

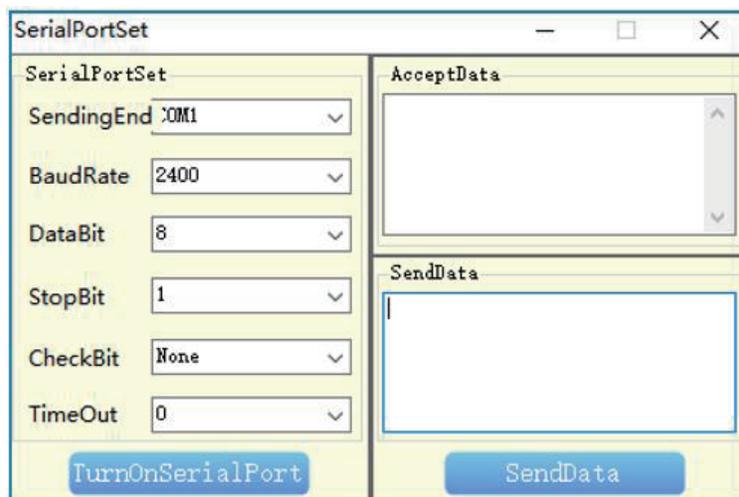


Figure 3.25 Serial port settings.

- ▶  : “Delete Group” menu shortcut (refer to “Delete Group” in the “Data” menu bar for details). Select one or more groups in the Data Area (hold down the keyboard Ctrl or Shift key to select multiple groups), click “Delete Group” to clear the data in those groups;
- ▶  : “New Group” menu shortcut (refer to “New Group” in the “Data” menu bar for details). Click “New Group”; the next measurement result will be displayed in a newly created group;
- ▶  : “Print Report” menu shortcut (refer to “Print Report” in the “Data” menu bar for details). Click to directly print the test report for the currently selected data;
- ▶  : “Preview Report” menu shortcut (refer to “Preview Report” in the “Data” menu bar for details). Click to preview the test report for the currently selected data;
- ▶  : “Save Report” menu shortcut (refer to “Save Report” in the “Data” menu bar for details). Click to save the test report for the currently selected data to a specified path;
- ▶  : “Save” menu shortcut (refer to “Save” in the “Spectrum” menu bar for details). Click to save the test spectrum to a specified location
- ▶  : “Open” menu shortcut (refer to “Open” in the “Spectrum” menu bar for details). Click to open a saved spectrum file for viewing;
- ▶  : “Data Graph” menu shortcut (refer to “Data Chart” under the “Group Data” submenu in the “Data” menu bar for details). Select a group of data in the Data Area, click to view graph statistics for each test item in that group;

- ▶  : “Normalize” menu shortcut (refer to “Normalize” in the “Calibration” menu bar for details). Click to normalize the current program;
- ▶  : “Substrate Correction” menu shortcut (refer to “Substrate Correction” in the “Calibration” menu bar for details). Click to perform substrate correction for the current program;
- ▶  : “Adjustment” menu shortcut (refer to “Calibration” in the menu bar “Calibration” for details). Click to calibrate the current program;
- ▶  : Program hot keys (refer to “Hot Key” in the “Product” menu bar for details). E.g., “Preheat” is the program name, “F1” is the hot key name. Pressing “F1” on the keyboard quickly switches to the “Preheat Program”;
- ▶  : “Close” button. Closes the current sub-interface and returns to the main software interface. Closes the software when clicked on the main interface;

●Program Bar

The selected product's program bar 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 “Information”, as shown in Figure 3.27.



Figure 3.27 Program bar.

You can open the product program selection dialog window by clicking the “Select” command button or using the “Select” command in the “Product” menu.

Under the “Information” menu (see Menu Bar > Product > Information), you can view the program's related measurement conditions and set the “Measurement Count”, whether to “Auto Save Test Spectrum”.

●Image Area

As shown in Figure 3.28, it is the image area. The video image includes a scaled, electronically generated crosshair. A box (round or rectangular) at the crosshair center

indicates the actual shape and size of the measurement point cursor, corresponding to the installed or selected collimator.

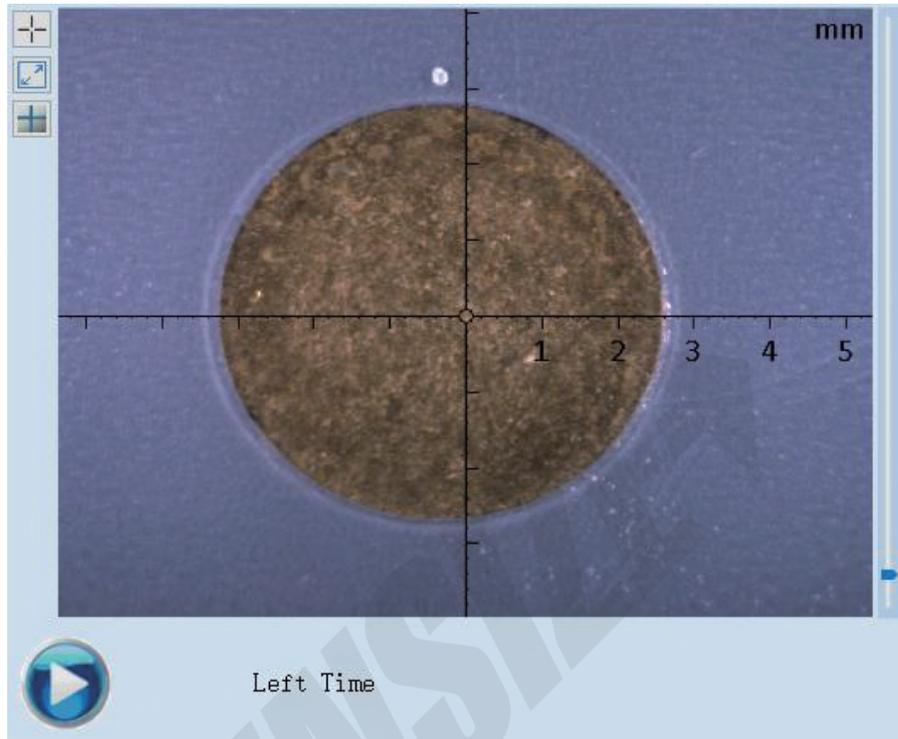


Figure 3.28 Image area.

Crosshair Color

You can change the crosshair color using the icon in the top-left corner of the video window for best contrast with the sample. Default settings provide 4 colors: Black, White, Red, Green.

Illumination Brightness Adjustment

A slider on the right side of the image window allows up/down movement to adjust the brightness of the test window illumination lights for optimal sample contrast.

●Operation Area

Located below the video window. Click the command button : to start a single measurement. “Remaining Time” shows seconds left in the current test.

●Spectrum and Data Toggle Option



Below the “Select” function in the Program Bar is the “Data” or “Spectrum” interface. Toggle between Data and Spectrum views by clicking “Data” and “Spectrum”.

- Data Interface

Statistics provide summary information (Average, Std Dev, RSD, Max, Min, Range, etc.) for all test results within the selected group area. “Group Number Info” is also shown.

All your test data is saved in the “History Data Area” interface below the statistics block. History data is displayed in “Groups”. You can view the time for each test. Right-click a test data point; if “Save Image” was checked during testing (For details, please refer to “Data” in “Product” in the menu bar), clicking “Show Image” displays the corresponding sample image, As shown in Figure 3.29.

Number	Au 1 μm	Ni 2 μm	Date
No: 1			
1	0.101	1.919	2025/7/25 16:11:51
2	0.104	1.935	2025/7/25 16:12:21
3	0.100	1.916	2025/7/25 16:12:52
4	0.104	1.911	2025/7/25 16:13:23
5	0.102	1.938	2025/7/25 16:13:54
6	0.101	1.935	2025/7/25 16:14:25
7	0.104	1.919	2025/7/25 16:14:56
8	0.099	1.914	2025/7/25 16:15:26
9	0.103	1.911	2025/7/25 16:15:57
10	0.097	1.919	2025/7/25 16:16:28

Figure 3.29 Data interface.

- Spectrum Interface

Switch to the Spectrum view using the toggle option:

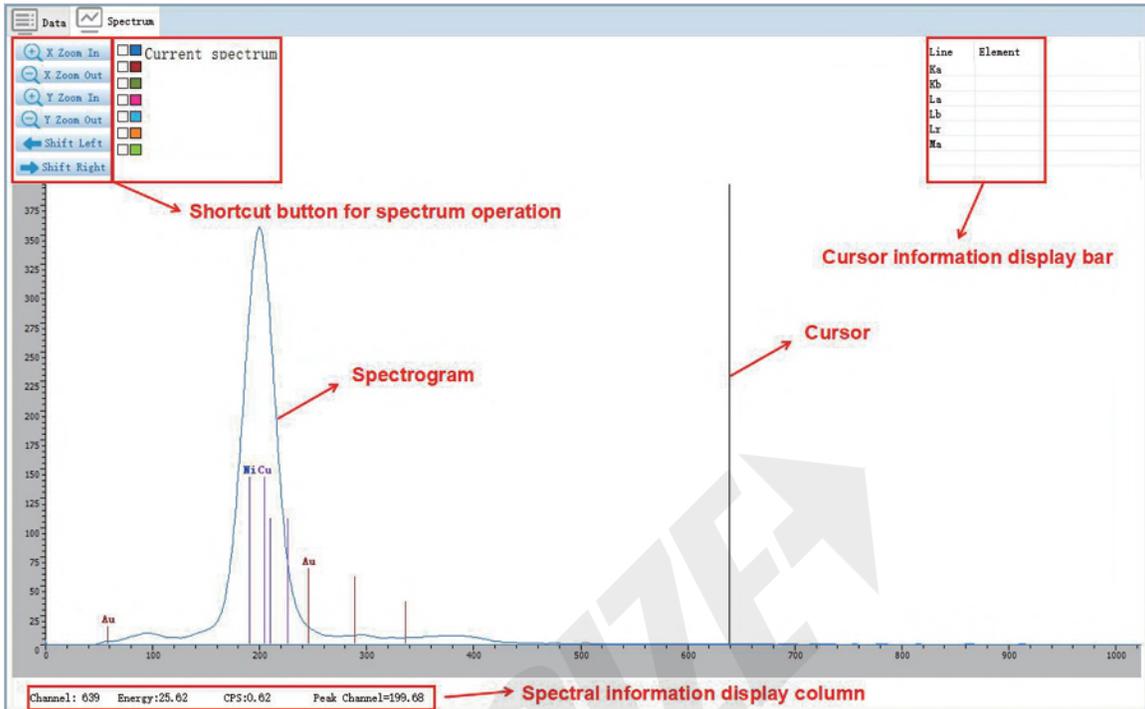
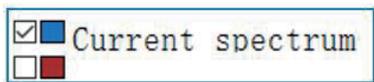


Figure 3.30 Spectrum interface.

In the “Spectrum” interface, you can view the sample test spectrum, add other test spectra for comparison, and perform qualitative analysis on test peaks, As shown in Figure 3.30.

X-axis represents Channel (Energy), Y-axis represents Photon Count;

Use the shortcut buttons on the left (“X Zoom In”, “X Zoom Out”, etc.) to zoom the spectrum as needed (For details, refer to the submenu in the “Spectrum” menu bar);



, Color Area: Click on a color block to open other spectra for overlay (see Section 4.9).

The Cursor Info display on the right shows the element and its characteristic peak corresponding to the X-axis channel (energy) at the current cursor position;

In the Spectrum Info display, “Channel”: Current cursor X-axis channel position; “Energy”: Current cursor X-axis energy; “Count”: Y-axis count value for the current spectrum at the cursor position; “Peak Channel”: X-axis channel position of the current spectrum's peak top.

- Status Bar

The bottom of the software displays the instrument's status bar, showing various real-time status data during testing, as shown in Figure 3.31.

U=3489 I=1476 F=1109 P=101 Chamber=0 Distance=0.5 Temperature=27.40 Shutter=0 Voltage Key=1 Total CPS=6964.68 Match=99.46 TT=0.00 S=-1.00

Figure 3.31 Status Bar.

- ▶ U: Current tube voltage of the X-ray tube;
 - ▶ I: Current tube current of the X-ray tube;
 - ▶ F: Current filament current of the X-ray tube;
 - ▶ P: Pressure value inside the instrument sample chamber (kPa);
 - ▶ Sample chamber: Status of the sample test chamber. “Sample chamber = Closed” means the test door is securely closed, no X-ray leakage risk; testing can proceed. “Sample chamber = Open” means the door is open or not fully closed;
 - ▶ Distance: Distance from the detector (or receiver) to the sample test area during measurement;
 - ▶ Temperature: Current temperature of the X-ray tube (°C);
 - ▶ X-ray Shutter: Status of the X-ray shutter. “X-ray Shutter = Closed” means the shutter is closed, no X-ray leakage risk. “X-ray Shutter = Open” means the shutter is open, allowing X-rays to pass through to the sample chamber.
 - ▶ High Voltage Key: Status of the instrument's high voltage key (see Section 3.3). “High Voltage Key = Closed” means the key is not inserted or not turned clockwise to open (key vertical); U, I, F values should be 0. “High Voltage Key = Open” means the key is open (key at 60° to vertical); U, I, F values will not be 0;
 - ▶ Total Count Rate: Ratio of cumulative total counts during spectrum acquisition to the test time (counts/second);
 - ▶ Match Value: Indicates the match degree between the test spectrum result and the current product program (see Menu Bar > Product > Information);
 - ▶ TT: Detector probe temperature (K);
 - ▶ S: Detector dead time (maximum 1). Generally, higher count rates lead to higher dead time, affecting results more. During normal testing, dead time should not exceed 0.5.
- Measurement Result Display Area

Au	1=	0.086 μm
Ni	2=	1.991 μm

Located directly below the Image Area. The product's test results are displayed here.

3.5 Calibration Standards

Calibration standards, obtained from an INSIZE authorized distributor or directly from INSIZE, are used to calibrate the instrument.

Depending on the measurement mode and application, there are many different calibration standards. The number and type of standards also depend on the measurement mode and application, As shown in Figure 3.32.

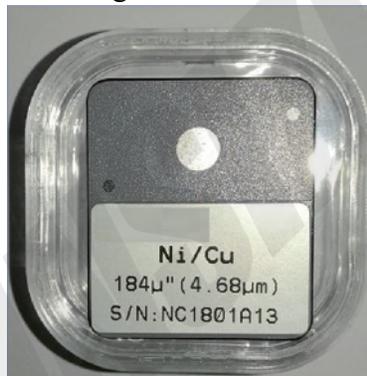


Figure 3.32 Calibration Standard Case (Open).



Figure 3.33 Calibration Standard (Alloy Coating Standard).

★ Calibration measurements must be performed with the actual physical standard! Measurement errors will occur if plastic is present on the actual standard.

The number following the element name on alloy coating standards indicates the mass percentage of each element. In Figure 3.33, the coating consists of 85% Zn and 15%

Ni.Component 1 refers to the first alloy element mentioned in the alloy name. For example, for alloy ZnNi/Fe, Zn is component 1, Ni is component 2.

3.5.1 Calibration Standard Certificate

All new calibration standards provided by INSIZE have valid certificates. Typically, a three-month validity period means INSIZE guarantees the standard's tolerance limits during this period. This does not mean the standard must be re-inspected after this period.

However, calibration standards should be tested or inspected within specified timeframes. If standards are used for routine product control, inspection within 12 months is usually sufficient. If standards are used daily, it is recommended to inspect them at least every 3 to 6 months.

Chapter 4 Measurement

★ Please read “Chapter 2 Instructions for Operation, Maintenance, and Storage of Instrument and Accessories” carefully before measurement!

4.1 Measurement Preparations

Before performing measurements, the computer, printer, instrument, and test area should be prepared as follows:

1. Establish a valid working area according to standards: Temperature 15 °C ~ 30 °C, Humidity <70%, Power Supply: AC 105V ~ 230V, ±3%.

2. Ensure the work area is free from interference sources and contaminants (e.g., moisture, dust, grease);

★Dirt or damage on the sample will cause measurement errors. The sample surface must be cleaned before measurement.

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

★The instrument should only be turned on after all cables are connected and secured!

4.2 Power On

Power On Sequence:

1. Press the bistable switch to turn on the instrument. Wait 5 minutes;

2. Insert the key into the high-voltage key slot. Turn clockwise to open the high voltage. Wait 5 minutes;

3. Turn on the computer, vacuum pump, monitor, and printer;

★ If unused for a long time, turn on the power and let it idle for 1 hour before performing step 3.

4. Click the EFP-T software icon on the computer desktop. Enter the initial password: “INSIZE”. Establish connection between the instrument and EFP-T software;

5. After connection, the EFP-T software “Measurement” application window appears. The instrument is ready to measure. The most recent measurement result is automatically displayed.

4.3 Power Off

Power Off Sequence:

- 1.Exit the EFP-T software by clicking the Exit icon in the software interface;
- 2.Turn off the computer, vacuum pump, monitor, and printer;
- 3.Turn off the high voltage key switch (wait 5 seconds) – Turn counterclockwise;
- 4.Then turn off the instrument power.

★When turning off the power, turn off the high voltage key switch first, then the main power.

4.4 Instrument Preheat

To ensure stable test results, it is recommended to preheat the instrument for half an hour after the first power-on each day. You can enter the preheat process by clicking the “F1 (Preheat)” button on the toolbar or pressing the F1 key. After entering the preheat process, click the “Start Test” button to execute preheat. The preheat ends when the test is complete. Steps:

- a.Select the Preheat Program (F1) (Figure 4.1);



Figure 4.1 Preheat Program.

- b.Place the pure element Ag standard in the sample chamber. Focus clearly;
- c.Click Start Measurement.

★ 1) After the preheat program starts, the software counts down 1800 seconds (30 minutes). Test completion indicates preheat is done;
2) Preheat is mandatory daily after power-on. Insufficient preheat time will cause measurement result fluctuations;

3 After instrument power is cut and restarted, peak position calibration is needed, but preheat is not required again.

4.5 Peak Position Calibration

The XRF-VF300 is an energy-dispersive fluorescence spectrometer. Energy channel calibration is required before testing each day. You can enter the energy calibration

interface by clicking the “Calibration Peak” icon  on the toolbar. Steps:

a. Select the Calibration Peak icon in the software (Figure 4.2);



Figure 4.2 Peak Calibration.

b. Ag Calibration: Place the 12-element standard in the sample chamber, align with element Ag, click Start Measurement. When measurement ends, the prompt instructs to place standard element Cu;

c. Cu Calibration: Move the slide rail to align with element Cu, click OK. When measurement ends, the prompt “Peak Calibration Successful” appears;

d. After the test, “Peak Calibration Successful” appears in the Operation Area.

4.6 Product Testing

4.6.1 Selecting the Required Measurement Program for the Sample (Figure 4.3)



Figure 4.3 Product program.

★ Selecting the wrong test program will directly affect test results.

4.6.2 Sample Placement

a. Open the sample chamber (Status Bar shows “Sample chamber = Open”). Place the sample on the mesh ring over the test window. Since X-rays travel upwards, the surface to be measured must face down, as shown in Figure 4.4;



Figure 4.4 Test window.

b. Adjust the knobs on the XY moving stage to move the test point to the crosshair position in the Image Area, as shown in Figure 4.5.

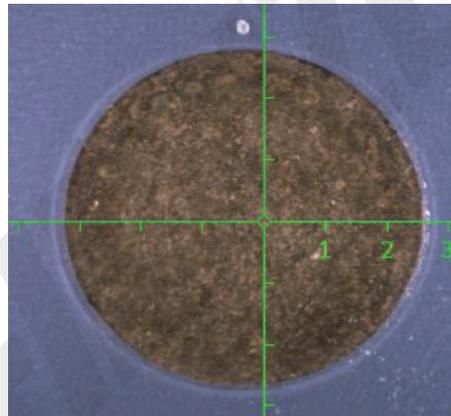


Figure 4.5 Image area.

c. Use the image focus adjustment knob to bring the image at the crosshair into sharpest focus;

★ **The measurement point must be in focus for a clear image! Otherwise, measurement results will be inaccurate!**

d. Close the sample chamber (Status Bar shows “Sample chamber = Closed”).

★ **Basic Placement Rules**

Because the X-ray detector is located below the placed sample, the sample must be positioned correctly to ensure the excited X-rays can reach the detector unobstructed.

For flat-surfaced samples like standards, place them horizontally on the measurement stage.

For rod-shaped cylindrical samples, place them so the sample's longitudinal axis on the stage is parallel to the instrument axis.

Cylindrical or curved parts must have a minimum diameter or radius of curvature (for small diameters or sharp curves, the measured coating thickness will be greater than actual. This is because radiation passes through the coating at an angle near the edge of the measurement point, increasing fluorescence intensity).

To measure coating thickness correctly, sample diameter (\emptyset) should be greater than twice the test area: $\emptyset > 2M$.

For radius of curvature (r), the corresponding formula is: $r > M$.
Information on measuring thin lines can be obtained from an authorized distributor or directly from INSIZE.

Placement of angular or stepped samples is critical; the sample should not obstruct the detector's reception of X-ray fluorescence.

4.6.3 Measurement

- a. Set the test count and time in the Program Bar > Information;
- b. Click the Test icon , to start the test. The vacuum pump starts working and stops when the air pressure inside the sample chamber drops to the set value. The Status Bar shows "X-ray Shutter = Open". After tube voltage/current and collimator/filter adjustments are complete, the Operation Area shows the test time countdown;
- c. When the countdown ends, the Status Bar shows "X-ray Shutter = Closed". Test results are displayed below the Operation Area.

★If the sample chamber is opened during testing, the X-ray shutter will close immediately, measurement will stop, and the software will display: "Please close the sample chamber". After securely closing the chamber, click "OK" to restart the measurement.

4.6.4 Stopping a Test

Click the Stop icon in the Operation Area during “Measuring”  , The Status Bar will switch to “X-ray Shutter = Closed” and the test will stop.

4.6.5 Spectrum Processing

When testing a sample, the instrument receives a test spectrum containing information about that sample. You can save, open, or compare these spectra to gain information about the sample.

a. Saving Spectra

After testing, save the spectrum by clicking the Spectrum “Save” icon on the toolbar  , or via Menu Bar > Spectrum > Save.

You can also enable automatic spectrum saving by clicking “Information” in the Program Bar, entering the sub-interface, and checking “Auto Save Spectrum”. Saved spectra are named: [Current Program Name] + [Group Number] + [Sequence Number in Group].

b. Opening Spectra

Open previously saved spectra by clicking the Spectrum “Open” icon on the toolbar  , or or you can access the previously saved spectrum by clicking “Open” under “Spectrum” in the menu bar;

d. Spectrum Comparison

In the “Spectrum” interface, the different colored check boxes in the middle can be used to call up spectra from different measurement samples, allowing comparison of spectra for similar samples.

Typically, blue is the default color for the last tested sample's spectrum. Click on different “color blocks”. A blue bar behind the block indicates it is selected  .

Then, click the Spectrum “Open” icon , select the name of the test sample you want to open for comparison from the dropdown menu, and choose “Open” for the required spectrum.

4.6.6 Data Processing

a. Data Viewing (Figure 4.6)

Data		Spectrum	
No:1	Au 1 μm	Ni 2 μm	
Mean	0.08	2.39	
SD	0.00	0.01	
RSD%	4.67	0.56	
Max	0.09	2.40	
Min	0.08	2.36	
Range	0.01	0.04	
Count	6		
Sample name			

Number	Au 1 μm	Ni 2 μm	Date
No:1			
1	0.08	2.39	8/7/2025 7:05:13 PM
2	0.08	2.40	8/7/2025 7:06:00 PM
3	0.08	2.36	8/7/2025 7:06:32 PM
4	0.09	2.37	8/7/2025 7:07:03 PM
5	0.08	2.39	8/7/2025 7:07:34 PM
6	0.08	2.39	8/7/2025 7:08:06 PM

Figure 4.6 Data viewing.

b. Data Deletion or Replacement

Click the toolbar icon , to delete the current measurement data;

Select “Replace” from the Menu Bar > Data, or click the toolbar icon  to replace the currently selected data point with the next measurement result, as shown in Figure 4.7;

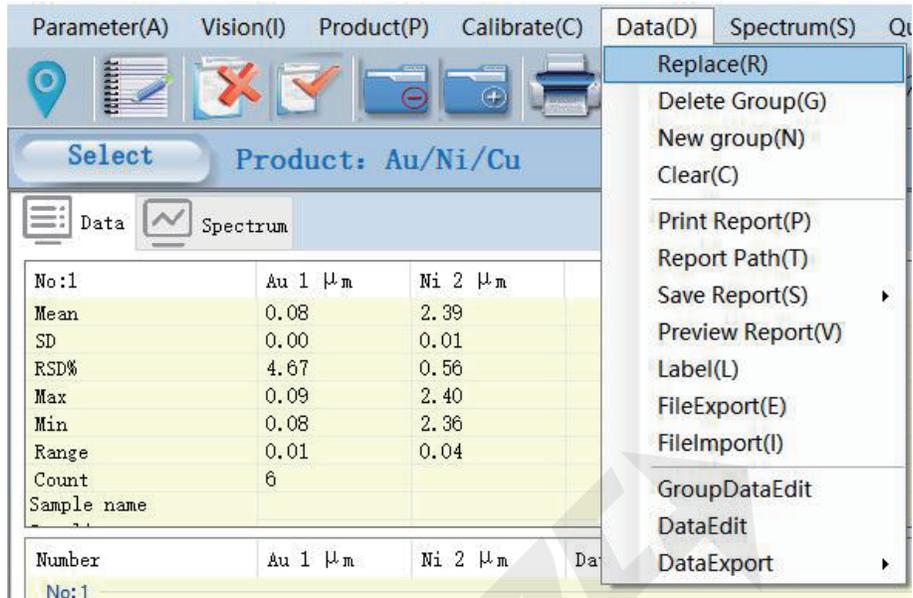


Figure 4.7 Data deletion or replacement.

c. Creating, Deleting Groups

Select “Delete Group” from Menu Bar > Data, or click the toolbar icon , to delete the data in the selected group(s);

Select “New Group” from Menu Bar > Data, or click the toolbar icon , the next measurement result will be displayed in a newly created group, as shown in Figure 4.8;

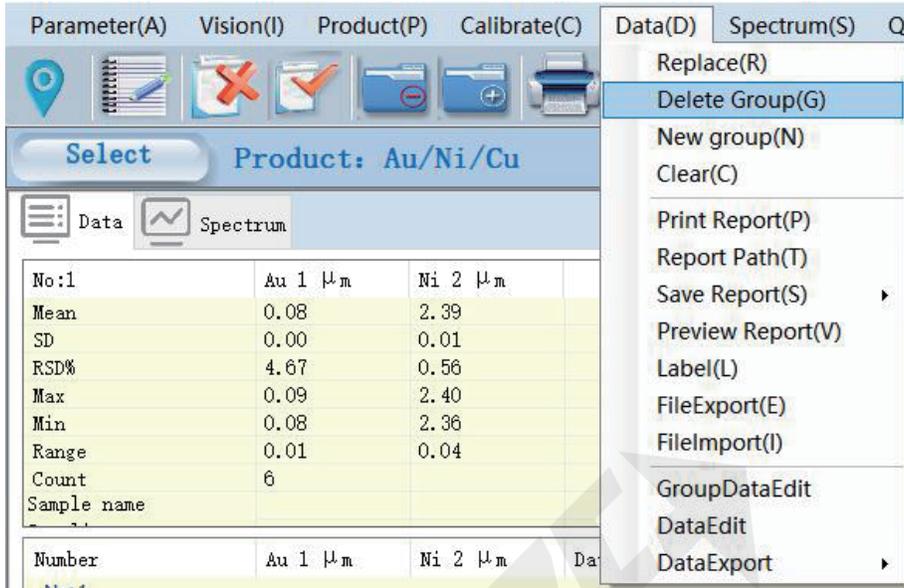


Figure 4.8 Creating, deleting groups.

d.Report Printing

First, click “Information” to open the panel. Check the items you want to appear in the report as needed, as shown in Figure 4.9;

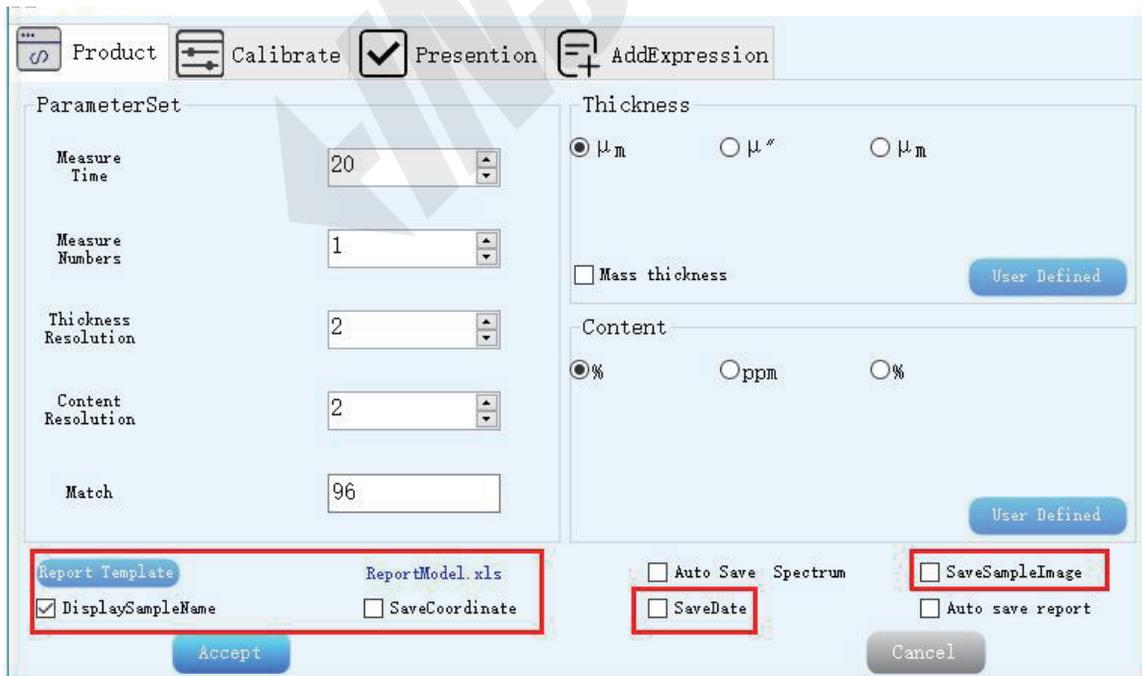


Figure 4.9 Report printing.

- Report Template: Click the Report Template button to select a suitable print template;

- Save Sample Image: Check to save the image of the current test point after each measurement. Selecting a corresponding report template allows the image to display in the report for each data point;
- Show Sample Name: Check to display the edited sample name next to each group number in the Data Area. The sample name will also appear in saved reports;
- Save Date: Check to include the corresponding test time next to each data point in saved reports, as shown in Figure 4.10;

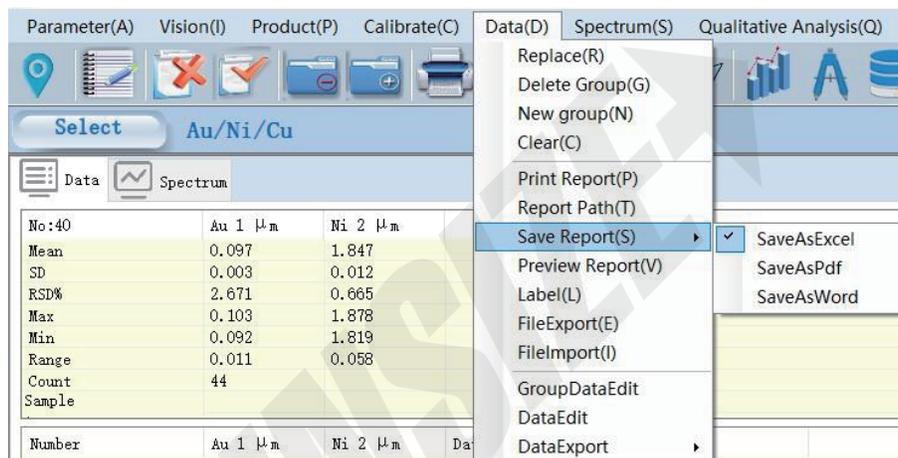


Figure 4.10 Report printing.

Then, select “Save Report” from Menu Bar > Data. Choose the desired report format. Click the “Report Save Path” button to set the save location;

Finally, select “Printer” from Menu Bar > Data to choose the connected printer. Select the group data you want to print. Select “Print Report” from Menu Bar > Data, or

click the “Print Report” icon  , on the toolbar to directly print the test report for the currently selected data.

Chapter 5 Product Programs, Substrate Correction, Normalization, Calibration

To perform measurements, the instrument needs specific information defined in the product program. Therefore, the product program must be set up and selected before measurement.

A product program includes:

- Measurement Data
- Specific Product Settings

5.1 Importing Product Programs

If the desired product program already exists in a previous program library, it can be imported directly. Method to import a product program:

1. Select Menu Product- New, click Load from File;
2. Select the new product program file;

For example, if selecting the program "Zn/Fe", find the Zn/Fe file in the library.

3. After selection, click "OK";
4. The new product program is set up. It can be selected and normalized or calibrated as needed;
5. After program calibration, the instrument is ready for measurement.

5.1.1 Backing Up Product Programs

Product programs can be backed up by copying them to other folders on the hard drive, network, or external media.

Backing up a product program:

1. Select "Product" from the menu and then click "Edit";
2. Edit the desired program;
3. Click "Save to File" (specify a folder) to save the backup.

5.2 Modifying Product Programs

The following settings are used when creating a new product program, specific to the product:

- Product Program Name
- Measurement Time
- Measurement Unit
- Display Precision
- Fixed Array Size (Group size created automatically after a set number of measurements)

5.3 Deleting Product Programs

Unneeded product programs can be deleted.

You cannot delete a program currently in use. When attempting to delete an active program, the software will display a prompt. Confirm the message by clicking \[OK\].

Deleting a product program :

1. Select the product program from the menu, click on “New”, and the software will pop up a window for creating a new product program;
2. Select the program to be deleted;
3. Choose the “Delete” option. The message “Attention: Confirm deletion of program?” appears;
4. Select \[Yes\] to confirm deletion. Select \[Cancel\] to abort;
5. The EFP-T software measurement window reappears; the instrument is ready for measurement.

5.4 Setting Up Product Programs

Setting up a product program:

1. Select Menu > Product > New. The New Product Program window opens;
2. Create the product program;

3. Use the right-side panels (Coating, Composition, Characteristic Line) and follow prompts in the lower boxes to complete program editing;
4. Calibrate the product program via Normalization or Calibration;
5. After calibration, the instrument is ready for measurement.

5.5 Selecting Calibration Standards

Typically, pure element standards are used for calibration in all measurement modes, considering measurements should also be possible without physical standards.

Calibration adjustments can be made using multiple standards. After calibration, measurements can proceed.

The coating thickness or composition of the standards used should be similar to the samples to be measured. If using several standards, they should be evenly distributed across the expected measurement range.

5.6 Standards

Standards are samples with clearly defined measurement areas where the coating thickness or composition is known. Standards may be suitable components taken from your own or others' products and measured on a calibrated instrument.

Standards are used for instrument calibration control.

The coating thickness or composition in the test area should be relatively uniform. The standard set for the product program should have the same characteristics (substrate, coating or substrate composition, etc.) as the samples to be measured.

5.7 Substrate Correction

Substrate correction should be performed if the measured substrate differs from previously measured samples, meaning the reading on the substrate deviates from zero. If the substrate is a pure element, substrate correction is not necessary.

The material beneath the coating being measured on a sample is called the substrate.

Therefore, the substrate is the material on which the coating to be measured is deposited. On the other hand, if intermediate layers are not measured, it might also be part of the substrate.

Substrate Correction Requirements:

- Substrate (sample without the coating to be measured)

★ **After powering on, the X-RAY instrument should preheat for a while before performing substrate correction. This is achieved through at least half an hour of measurement using the preheat program.**

★ **Substrate correction is only valid for the current application program. It is ineffective for other programs.**

Performing Substrate Correction:

1. According to the product selection menu product program, click on the substrate correction in the calibration. The prompt "Please place substrate sample" appears;
2. Place the substrate, select \[OK\] to start measurement;
3. Substrate correction ends. The instrument is ready for measurement.

5.8 Normalization

Perform normalization if a calibration check measurement shows a deviation four times the standard deviation.

Normalization Requirements:

1. Substrate (if substrate is pure element, not needed) ;
2. Standard Substrate (if substrate is pure element, not needed);
3. Pure Element Standard;
4. Material for measuring interference spectrum (e.g., Bromine on PCB).

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

★ **Normalization is only valid for the current application program. It is ineffective for other programs.**

Performing Normalization:

1. Select the menu “Calibration”, “Normalization” to open the “Normalization” application window. An instruction window appears indicating the next steps;

2. Perform measurements according to the prompts in the instruction window. If a pure element standard or substrate needs to be measured several times, gently move the standard or substrate slightly each time. This averages out potential inhomogeneities on the material;

3. At the end of normalization, a dialog “Normalization Complete” appears. Click “OK”. The instrument is ready for measurement.

5.9 Calibration

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

Calibration Requirements:

- Substrate (sample without coating to be measured, if substrate is pure element, not needed);
- Standard Substrate (if substrate is pure element, not needed) ;
- Pure Element Standards;
- Material for measuring interference spectrum (e.g., Bromine on PCB);
- Standards (if measurement requires standards).

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

★ Calibration is only valid for the current application program. It is ineffective for other programs.

Performing Calibration:

1. Select menu product program, edit. Enter the required standard values;
2. Click Calibration, the operation interface pops up;
3. Follow the interface prompts for substrate, pure element, or standard, and start testing sequentially;
4. When calibration ends, “Calibration Complete” appears. The instrument is ready for measurement.

Chapter 6 Instrument Installation

6.1 Safety Warnings

★ The recommendations in “Chapter 2: Instructions for Operation, Maintenance, and Storage of Instrument and Accessories” must be followed.

6.2 Installation Steps

Generally, INSIEZ installs the X-RAY instrument for you, commissioning it until it is operational.

Installing the instrument:

1. Unpack the box. Position the computer, printer, and X-RAY instrument. Remove any shipping restraints (if present). Instruments may have restraint screws installed before shipping; these must be removed before connecting power;

★ **If the instrument's temperature differs significantly from the ambient temperature (e.g., after cold transport or storage), let the machine acclimate to room temperature before operation.**

2. Check the line voltage. Connect the computer and X-RAY instrument power cables to sockets;

3. Connect the computer to the X-RAY instrument cable;

4. Connect the printer to the computer;

5. Turn on the computer. Install the EFP-T software (if not already installed);

6. Turn on the instrument. Establish connection between the X-RAY instrument and EFP-T software;

7. Preheat for over half an hour, then perform peak position calibration.

6.3 Selecting a Suitable Location

When selecting the instrument placement location, the recommendations in “Environmental Conditions for Operation and Storage of Instrument and Accessories” must be followed.

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 On/Off bistable switch, ports, and power plug are located.

6.4 Cable Connections



Figure 6.1 Cable connections.

6.5 Printer Selection and Page Setup

6.5.1 Printer Selection

To ensure normal communication between the computer and printer and to print the expected measurement data and calculation results, a suitable printer must be selected within the EFP-T software.

Selecting a printer in EFP-T software:

1. In the EFP-T software, select the menu parameter - Printer, and a window for connectable printers will appear, as shown in Figure 6.2;

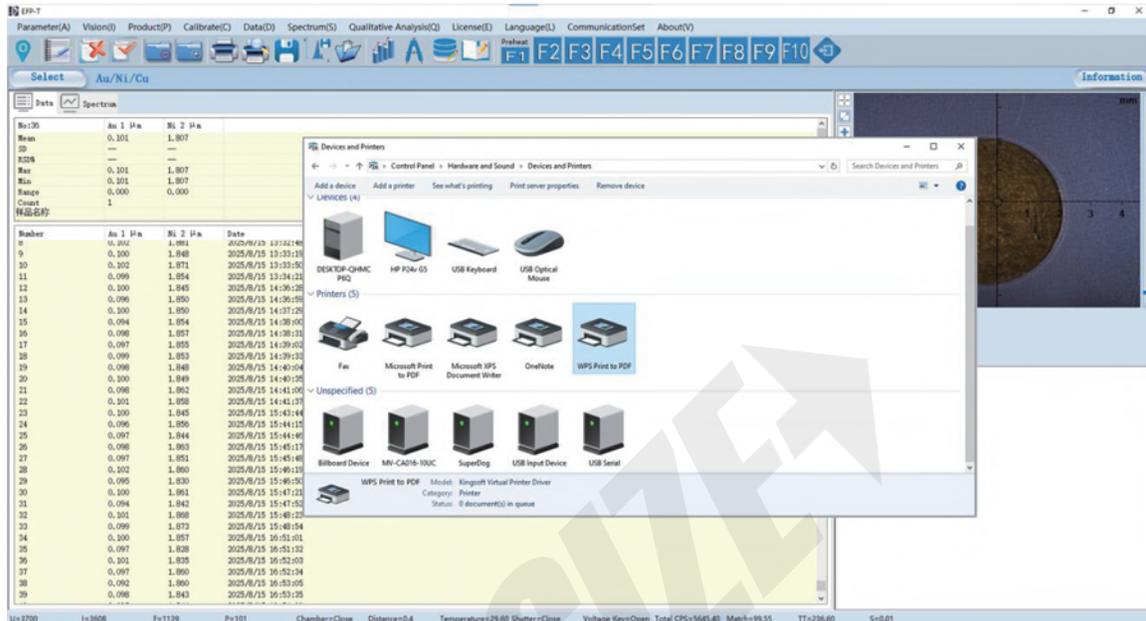


Figure 6.2 Printer Selection Window

2. Select the appropriate printer. Make necessary settings (e.g., page orientation portrait or landscape, etc.);

★If the current printer model is not in the list, it must be installed in Microsoft Windows. Installation methods can be found in the relevant manual, online help, or references.

3. Select \[OK\] to confirm your choice;

4. After selecting \[OK\], the EFP-T software application window reappears.

Chapter 7 Cleaning and Maintenance

7.1 Cleaning and Maintenance

Before starting cleaning or maintenance, verify that the instrument's power cable is disconnected.

This ensures the instrument cannot be accidentally turned on during cleaning or maintenance.

7.1.1 Cleaning the Instrument

If the instrument is dirty, use a cloth moistened with alcohol to clean and remove dirt.

★ Do not pour any liquid onto the instrument to prevent liquid from entering the interior. Do not immerse the instrument in liquid! This could cause a short circuit!

7.1.2 Cleaning Standards

Dirt or scratches on the test surface of standards will cause measurement errors.

When cleaning standards, do not use any method that could cause mechanical or chemical damage! Use a soft, lint-free cloth to wipe off dirt!

7.2 Maintenance

7.2.1 Replacing the Fuse

The line fuse is 3A/250V. Replace if necessary. The line fuse is located on the power terminal block on the left side of the instrument.

Replacing the fuse requires:

- A 3A/250V fuse
- A screwdriver

Replacing the Fuse:

- a. Turn off the instrument and unplug the power cord;
- b. Carefully remove the fuse holder using the screwdriver;
- c. Be careful not to injure yourself or others (e.g., the screwdriver may slip when lifting the fuse holder)!
- d. Remove the blown fuse and replace it with a new one;
- e. Replace the fuse holder.

Chapter 8 Troubleshooting

Fault	Possible Cause	Solution
Display shows nothing	Screen saver active	Move the mouse (deactivates screen saver)
	Monitor not turned on	Turn on the monitor
	Computer not turned on	Turn on the computer
	Power management function activated	Deactivate power management function
Image area display blurred/unclear	Incorrect focus	Turn focus knob until test area is focused on screen
	Surface light source not on or brightness too low	Adjust surface light source brightness
No sample display in image area	Sample placed incorrectly	Place sample correctly
	Instrument-EFP-T software connection lost	Re-establish connection between instrument and EFP-T software
	USB cable not connected	Connect USB cable to instrument and computer USB ports
	USB cable damaged	Replace USB cable
	Software error	Turn off instrument, close EFP-T software, then restart
<<CONTROL>> light blinking	Circuit system fault	Notify insize company
Instrument does not turn on when switch pressed	Instrument not connected to power	Turn off instrument, plug cable into socket
	Power socket switch off	Turn on power socket switch
	Fuse blown	Determine cause of blown fuse, resolve fault, then replace fuse
Printer prints useless data	Incorrect printer driver	Install correct printer driver
	Printer cable fault	Replace cable
No print output	Printer not turned on	Turn on printer
	Printer not correctly connected to computer	Turn off computer, instrument, printer; check connections; restart
	Printer not connected to computer	Connect printer to computer
	Wrong printer cable used	Use correct printer cable
	Printer or printer cable damaged	Replace printer and printer cable
	Printer connected to faulty printer port	Resolve port fault
Measurement data error	Selected product program does not match sample	Select or set up correct product program for sample
	Normalization or calibration	Perform normalization or

	error	calibration correctly
	Peak calibration error	Re-perform peak calibration
	Peak calibration not performed	Perform peak calibration
EFP-T software - instrument connection lost	Instrument not correctly connected to computer	Turn off instrument, check cables, turn on instrument
	Instrument not connected to computer	Connect instrument to computer
	Installation process error	Perform correct installation
	Connection cable or interface fault	Resolve connection cable and interface fault
XY stage cannot move	XY stage moved to top/bottom/right/left limit	Move XY stage in opposite direction
	Safety restraint - stage blocked by external object/Anti pinch device malfunction	Remove obstacle/Notify INSIZE company



XRF-VF300 Plating Thickness Gauge Operating Procedure

1. Instrument Purpose

The XRF-VF300 plating thickness gauge is used to measure coating thickness and composition, analyze alloy composition, and measure the concentration of main salt ions in plating solutions.

2. Power On/Off Procedure

2.1. Power On Steps

- 1) Press the bistable switch to turn on the instrument. Wait 5 minutes;
- 2) Insert the key into the high-voltage key slot. Turn clockwise to open the high voltage. Wait 5 minutes;
- 3) Turn on the computer, vacuum pump, monitor, and printer;
- 4) Open the EFP-T software. Establish connection between the instrument and software. Power on complete.

2.2. Power Off Steps

- 1) Close the EFP-T software;
- 2) Turn off the computer, vacuum pump and printer;
- 3) Turn off the high voltage key;
- 4) Turn off the instrument.

3. Measurement Preparation

3.1. Preheat the instrument

To ensure measurement accuracy and stability, the instrument must be adequately warmed up after startup. Method:

After normal startup steps, open the Preheat Program, click the Start icon to begin measurement. After 30 minutes, click Complete Measurement to finish preheat.

3.2. Peak Position Calibration

Note: This step is very important.

Note: Instrument must be preheated before performing peak position calibration.

Because the instrument uses element Ag as the reference for calibration, the Ag position must be precisely located without offset.

Peak calibration steps:

- 1) Place element Ag on the stage. Adjust its position and focus clearly so it appears centered on the crosshair in the video window;
- 2) Select the Peak Calibration icon in the top-left corner. Software prompts to place pure element Ag. Press OK to start calibration. After Ag peak calibration completes, software prompts to place Cu standard;
- 3) When peak calibration ends, software prompts "Peak Calibration Successful".

4. Performing Measurement

4.1. After completing startup steps, preheat, and peak calibration, you can begin measuring samples;

4.2. Measurement steps:

- 1) According to the coating condition of the test sample, click on the corresponding product program in the menu "Product - Select...";
- 2) Place the sample on the stage. Adjust its position and focus clearly on the crosshair;
- 3) Press the Start button in the lower right corner of the display or the "START" key on the instrument control console to start measurement. The measurement is complete when the countdown ends.

4.3. Measurement Precautions

1) Selection of measurement time

Longer times yield better stability. Typically: Single coating ≥ 15 sec, Dual coating/alloy ratio ≥ 30 sec, Triple coating ≥ 45 sec, Plating solution main salt ion concentration: 30-60 sec.

2) Sample placement principle

Viewed from the front, the X-ray fluorescence receiver is in front of the placed sample. Place the sample correctly to ensure X-ray fluorescence reaches the detector unimpeded.

3) If “Invalid spectrum”, “Cannot measure” messages appear after measurement:

A: Check if sample coating matches selected program;

B: Perform Substrate Correction;

C: Perform Peak Position Calibration.

4) Before measurement, check if the substrate composition matches the set substrate.

5. Printing Reports

5.1. Select the test group to print;

5.2. Print (or Preview Report) (Figure 7.1).



Figure 7.1 Print (or preview report).

6. Calibrating Product Programs

Correct calibration is essential for ensuring instrument measurement accuracy. The instrument must be fully warmed up and peak calibrated before calibration. This is very important.

Determine if calibration is needed by measuring a calibration standard. Place the standard on the stage, measure several times moving it slightly. If the average

measurement differs from the standard value beyond the standard's tolerance, perform “Normalization”. If it still exceeds tolerance after normalization, perform Calibration.

Calibration Steps:

1) Select the product program to calibrate;

2) Select the menu “Calibration – Calibration” to start the “Calibration” process. The instruction window shows the next steps. Place the corresponding materials and standards as indicated and perform measurements. If a pure element or substrate needs multiple measurements, gently move it slightly each time.

7. Precautions

7.1. Instrument supply voltage must match the voltage on the instrument nameplate. The instrument must use a three-wire plug connected to a grounded socket.

7.2. This is a precision instrument; a high-precision voltage stabilizer is recommended. The computer should be equipped with a UPS (Uninterruptible Power Supply).

7.3. The instrument should be specifically isolated from electromagnetic environments.

7.4. The instrument is suitable for operation at ambient temperatures between 15 °C ~ 30 °C (59 °F ~ 86 °F) and for storage at temperatures between 0 °C ~ 50 °C (32 °F ~ 122 °F). Permissible humidity range for operation and storage is 0% ~ 70% (non-condensing). Ambient temperature and humidity should remain constant during operation.

7.5. When exposed to sunlight, the temperature behind the window glass can easily exceed 50 °C. Therefore, do not operate or store the instrument in such environments to avoid high-temperature damage.

7.6. To prevent short circuits, avoid direct contact of the instrument with liquids. If liquid enters the instrument, turn it off immediately! Have it fully inspected by a technician before reuse.

7.7. This instrument must not be used in acidic environments or explosive situations.

7.8. Do not dirty or scratch calibration standards! This will cause reading errors!

7.9. Do not use any mechanical or chemical methods to remove dirt from standards! If necessary, gently wipe off dirt with a lint-free cloth.



www.insize.com