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HANDHELD XRF ALLOY ANALYZER OPERATION MANUAL



1. Safty guideline

1.1 Overview

Thank you very much for purchasing and using our products--HSM-A310 portable alloy analyzer. This manual mainly describes the hardware structure and software operations of the product, and includes safety instructions, installation procedures, cleaning guides, and maintenance. Basic instructions for sample preparation and analysis are also included.

This user manual is designed for product users. For the sake of safety, please read this manual carefully and operate according to it before using this product.

This product is designed and manufactured in strict accordance with the relevant standards and through rigorous testing. However, if the operator uses the product improperly, it may also cause risks to the user's personal life, property, and environment.

We believe that the following conditions may lead to potential hazards:

1) If the product is operated by a person lacking training.

2) If the product operation does not conform to the appropriate use of the product.

The warnings in this user manual are used to warn users of the following potential hazards. Please pay attention to these warnings when reading.

Safety Identification

Identification	Description
	General hazard
	Shock hazard
	Radiation hazard
	High temperature hazard

Safety term

Identification	Description
Warning	Potentially harmful to personal safety
Attention	Damage to product performance or operation
Remarks	Important additional information

1.2 Personnel security



Warning

When encountering warning signs, please refer to this user manual first to determine the nature of the potential hazard.



Warning

Please use the product strictly in accordance with the methods specified in this user manual. Otherwise, potential security risks may occur.



Warning

The disassembly and maintenance of the products can only be carried out by our company or authorized maintenance engineers. Customers are strictly prohibited to disassemble this instrument without permission, otherwise our company will not warranty.



Warning

The power supply must be disconnected first during product maintenance.



Warning

Do not use this product in an environment where there is a risk of explosion.



Warning

Modification, alteration, reconstruction, or use of unauthorized parts is a violation of the warranty policy. Our company will not be responsible for the resulting product damage or personal injury.

1.3 Product safety



Attention

This product is designed and tested according to the European (CE) standard. To ensure that these standards are always met, only CE certified devices can be connected.



Attention

It is recommended to use the original parts or consumables. If the parts consumables of other manufacturers are used, the warranty policy will be invalid.

1.4 Radiation safety

This chapter is about radiation and basic safety. For the safest operation please follow the contents of this chapter. INSIZE recommends that you undergo a radiation safety and operation training course before using the instrument.



Warning

Beware of radiation!

Do not point the instrument towards yourself or others when it is being tested. It is strictly prohibited to hold the instrument test window for testing.

1.4.1 Safety protection of X-ray tubes

This product consists of an X-ray tube, which produces rays only when the is excited. During operation, please follow the following instructions to avoid radiation damage. For any source of radiation, three factors can reduce radiation damage: time, distance, and protection.

(1) Time

The longer you are exposed to the X- rays, the more radiation you will receive.

(2) Distance

The closer you are to the source of radiation, the greater your exposure radiation. In theory, the amount of radiation is inversely proportional to the square of the distance from the source.

For example, one meter away from the source of radiation is exposed to nine times as much radiation as three meters away. Therefore, in the process of opening the X-ray tube, we should try to stay away from the front end of the instrument

(3) Protection

Protection refers to anything between the body and the source of radiation. The more material there is between the body and the source of radiation, and the denser the material, the less radiation the body will receive.



Attention

The dose of radiation to the human body is expressed in terms of rem, or mrem, where 1 rem=1,000 mrem. The other unit of dose is expressed as Sievert (Sv). 1 Sv=100 rem. The law of the United States says that the acceptable amount of radiation is: 5,000 mrem/ year for deep exposures: For skin surface limb ends, 50,000 mrem/year; Radiation to the depth, surface and extremities of the product should be less than 200 mrem/year. This exposure to radiation limit can only occur if: this product is regularly used to test samples without any protection or measures; Improper use of instruments to place body parts directly in the beam of rays.

Do not place the body part in the path of the beam or direct the instrument at the body. In addition, in consideration of the use of protective settings such as shields or other protective settings in daily operations, use them under the following conditions: Plastic (or other similar low density) samples. Thin samples (e.g., film, circuit board, cable). Samples smaller than the test window.

1.4.2 Safety instructions for different samples analysis



Warning

Never place any part of your body in an X-ray beam.

Small sample

A small sample is any sample that is smaller than the test window. Small samples can lead to some unknown radiation leakage because the sample does not fully cover the main beam path. Do not test hand-held samples or look at the main light path during testing.

X-rays are rapidly attenuated as they pass through such dense materials but less so for low-density materials, such as plastics. This may result in more scattered radiation. If you frequently test low-density samples, you should consider using test racks, scattering protection, or other corresponding measures.

1.4.3 Storage and transportation

Storage

Almost everywhere, make sure that your HSM-A310 analyzer is stored in a reliable place to prevent unauthorized individuals from accessing, using, or taking away the instrument.

Transportation

It is recommended that you put the analyzer in the special transport box when transporting this product. Do not connect the battery pack to the analyzer during transportation.

1.5 Waste disposal guidelines

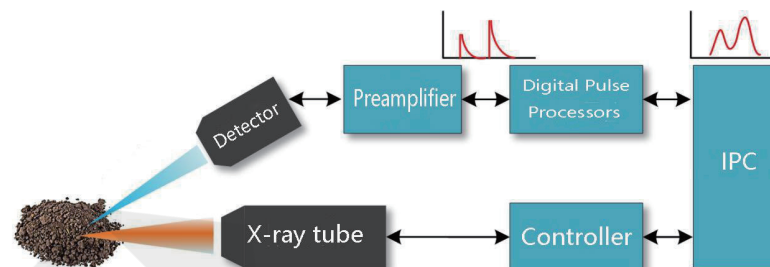


The product shall not be disposed of as unclassified household garbage. Improper disposal can be harmful to the environment and human health. Please inquire about the policy with the electronic product recycling administration.

2. Instrument introduction

2.1 Product overview

Portable alloy analyzer (XRF) adopts the principle of X-ray fluorescence spectroscopy analysis. X-ray tube generates the original X-ray beam under the excitation of NC high-voltage power supply. The X-ray beam is constrained by the carefully selected filter and optical path collimation system to form specific spectral distribution and incident sample. The elements to be measured in the sample are excited energy X-rays to generate fluorescence X-rays with characteristic wavelengths, which are received by performance detectors. After high-speed digital pulse processor, advanced algorithms and efficient analysis software combined to make the instrumental analysis faster and have ultra-high analysis accuracy. HSM-A310 meets customers' analysis of environmental protection directives such as RoHS and halogen-free.



Basic structure of energy dispersive X-ray fluorescence spectrometer

2.2 Instrument component

The instrument is stored in a special suitcase and contains the following.

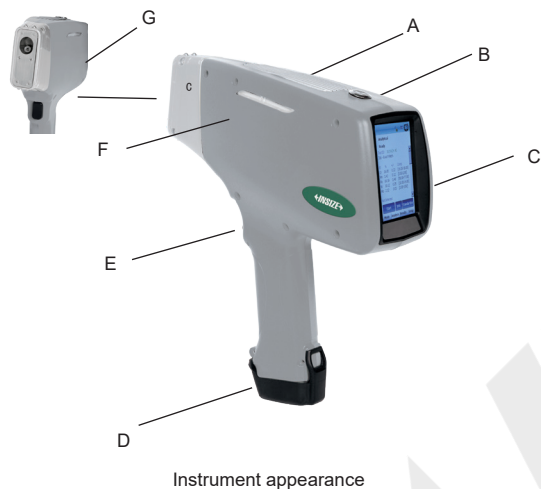


Instrument component

Instrumentcomponent

No	Component	No	Component
A	Main unit	E	Li-ion Battery
B	Window Protection Film	F	Battery Compartment
C	Touchscreen Pen	G	Power Adapter
D	316 Stainless Steel Standard Sheet		

2.3 Appearance overview



Instrumentfunction

No	Function
A	Lit. scatter heat device
B	ON/OFF switch
C	LED touch screen
D	Battery case
E	Test Trigger
F	Test Indicator Light
G	Test Head

2.4 Test Head

The test head is in front of the instrument and contains a test window, a sample sensor, and a charging head.



Test head and function

No.	Function	Description
A	Test window	The sample to be measured needs to be placed in front of the window before the sample is measured.
B	Sample sensor	Check whether there is a sample in front of the test window. If the X-ray is not cut off immediately, it will prevent the damage to human body caused by the radiation leakage.



Attention

The detector inside the test head is an expensive and vulnerable component. Do not touch, wipe, solvent contact blowing, or other operations, otherwise it may cause permanent damage to the detector.

2.5 Instrument handle and battery compartment cover

The test head is located at the bottom of the instrument handle, including the battery compartment unlock button and the test trigger.



Instrument handle

(1) Battery compartment unlock button (A)

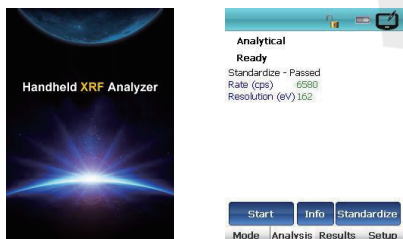
Battery protection sleeve, unlock the buckle (A) to open the battery compartment, you can remove the battery; the battery in the correct direction into the battery compartment, fully inserted will hear a "click", the battery insertion is complete. Insert the battery into the battery compartment in the correct direction, and you will hear a "click" when it is fully inserted, the battery insertion is complete. Fasten the protective cover.

(2) Test trigger (B)

Trigger On Mode, after tapping the trigger (just tap to release) the software automatically starts the sample test.

3. Software functionality

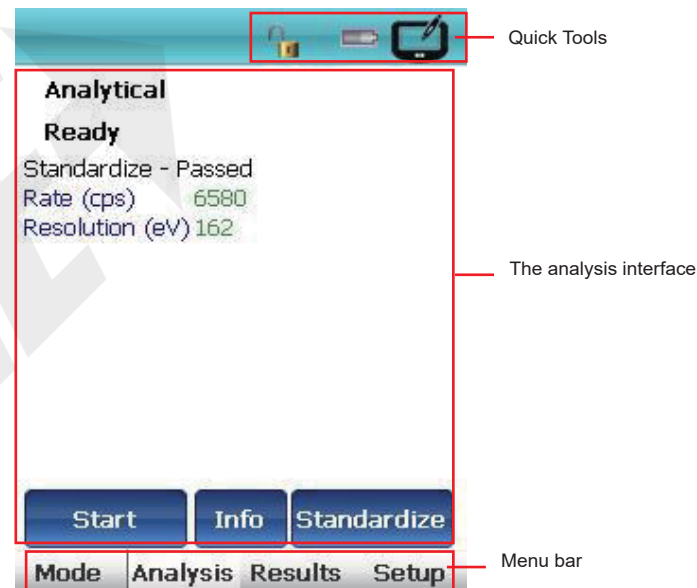
Short press the switch button to enter the power-on interface dynamic starter meter.



User interface

The instrument starts and completes the self-test.

3.1 Instrument main interface



The main screen contains shortcut tools, analysis screen and menu bar.

3.1.1 Quick Tools

The navigation menu, from left to right, is Trigger Lock, Battery Level Display, Soft Keyboard Entry.

3.1.2 The analysis interface



At the bottom of the analysis screen are three functions: "Start", "Info" and "Normalize".

1.2.1 Start: Starts the test and replaces the trigger function.

1.2.2 Information: You can enter the information of the reserved samples.

1.2.3 Standardize: calibrates the instrument.

3.1.3 Menu bar



3.1.4.1 Mode: Instrument reserved function, subsequent development.

3.1.4.2 Analysis: enter this interface automatically after power on, initialize and standardize automatically.

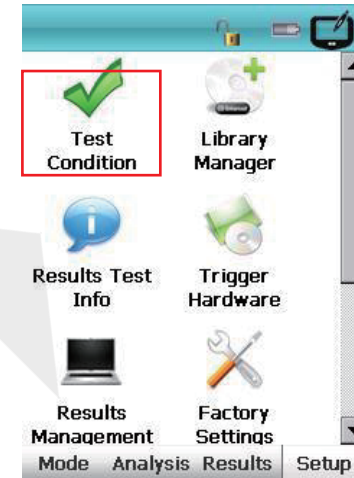
3.1.4.3 Result: display the measurement result as well as the spectral map, query the historical measurement result

3.1.4.4 Setting: parameter setting, can set the measurement time, test mode, sample result information setting, Setting up the brand library, data output, display setting, time and date setting, and leaving the measurement program.

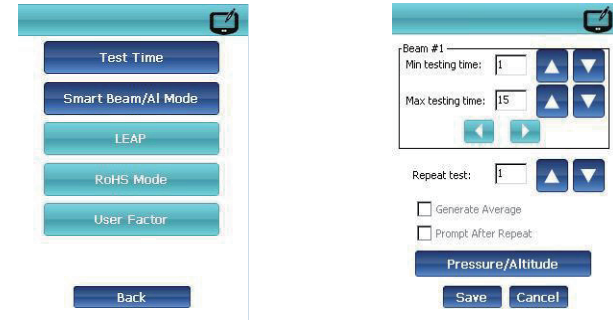
3.2 TEST CONDITION

3.2.1 "Measurement time" can be set for "Judgment condition" and "Smart beam/Aluminum alloy mode" can be set for "Measurement mode".

3.2.2 "LEAP/ROHS Mode/User Factor" is a customized function that is not yet available.



3.2.3 Setting measurement time: "Minimum test time", "Maximum test time", "Repeat test times".



3.2.3.1 "Minimum test time" is set to 0 or 1.

3.2.3.2 "Maximum test time" set the test time according to requirements (15s recommended).

3.2.3.3 Repeat test (number of tests): 1 time. (can be customized).

PS: Select more than 2 for the number of tests Generate Average: the average of the results of repeated tests is displayed Prompt After Repeat: Repeat tests require a trigger press to confirm the test.

The image shows two side-by-side screenshots from the INSIZE software interface. The left screenshot displays a vertical menu with options: 'Test Time', 'Smart Beam/Al Mode', 'LEAP', 'RoHS Mode', 'User Factor', and a 'Back' button at the bottom. The right screenshot shows the 'Smart Beam Option' settings. It includes a section for 'Smart Beam Option' with three radio buttons: 'No Smart Beam', 'QuickSort', and 'Precision'. Below this is an 'Al Mode' section with two radio buttons: 'On' and 'Off' (which is selected). At the bottom are 'Save' and 'Cancel' buttons.

3.2.4 Setting Smart Beam/Aluminum Mode.

- Smart Beam option is not yet available.
- Al mode is "off" by default, when it is on, it will determine the aluminum alloy grade by detecting elements other than aluminum by normalization method.

(Note: The standard Si-pin detector cannot measure aluminum directly, only the SDD detector can detect aluminum).

3.3 Setting up the taste database

The image shows a screenshot of the 'Min/Max' settings screen. At the top, it says 'Min/Max' and 'h (28-Oct-2024)'. Below this is a table with three columns: 'Element', 'Min %', and 'Max %'. There are five rows in the table, each with a dropdown arrow on the right. Below the table are 'Save' and 'Back' buttons.

Element	Min %	Max %
	0	0
	0	0
	0	0
	0	0
	0	0

3.3.1 Match Settings:

3.3.1.1 Match intercept value: set how many judgment plates can be displayed, the recommended setting is 3.

3.3.1.2 nsigma: set the floating value of the element judgment range, recommended setting is 2.

The image shows two side-by-side screenshots from the INSIZE software interface. The left screenshot is the 'Library Manager' screen, which has buttons for 'Match Settings', 'Load Library', 'Edit Library', 'Pass/Fail Options', and 'Back'. The 'Match Settings' button is highlighted with a red box. The right screenshot is the 'Grade Match Parameters' screen. It has two input fields: 'Match Cutoff' with a value of 3 and 'nSigma' with a value of 2. Each field has up and down arrow buttons. At the bottom are 'Save' and 'Cancel' buttons.

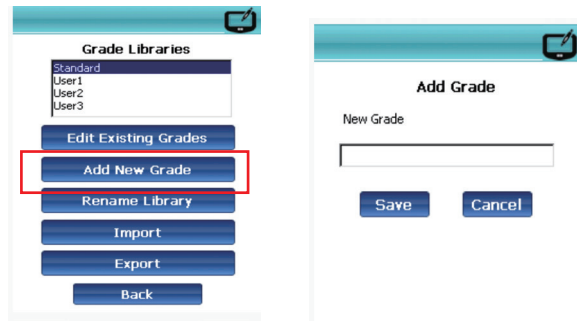
3.3.2 Load database settings: Setting the range of grade determination Standard is the system database, containing 288 common grades. User1/2/3 is the user database, you can create your own grades.

The image shows two side-by-side screenshots from the INSIZE software interface. The left screenshot is the 'Library Manager' screen, which has buttons for 'Match Settings', 'Load Library', 'Edit Library', 'Pass/Fail Options', and 'Back'. The 'Load Library' button is highlighted with a red box. The right screenshot is the 'Grade Libraries' screen. It shows a list of libraries: 'Standard', 'User1', 'User2', and 'User3'. Below the list are buttons for 'Edit Existing Grades', 'Add New Grade', 'Rename Library', 'Import', 'Export', and 'Back'.

3.3.3 Edit the database:
Add the license plate.

3.3.3.1 Select the database: use1. b Add a new database.

3.3.3.2 Enter the name of the plate number as "h".



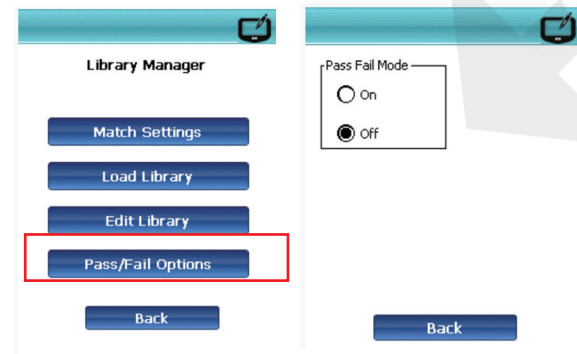
3.3.3.4 When the input is completed and saved, the plate number creation is completed.

3.3.3.5 Rename database: rename the license plate number.

3.3.3.6 Import/export: engineers call the database to use, not yet open to users.

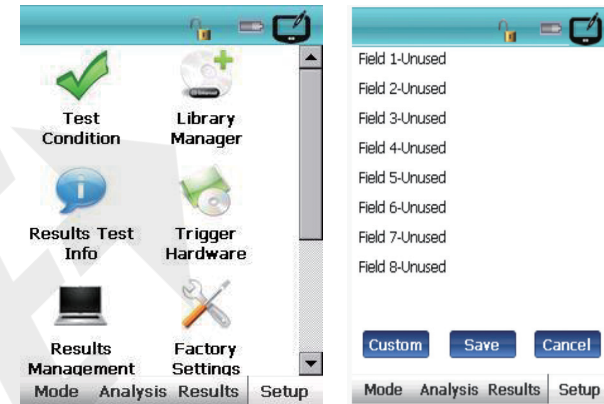
3.3.4 Pass/Fail option:

Determines if the sample number is in the loaded database.



3.4 Results Information info

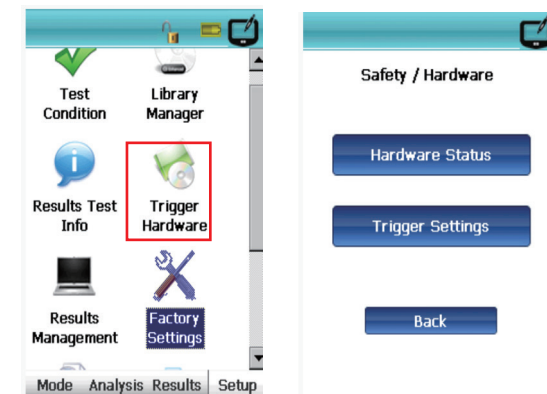
Batch edit sample information

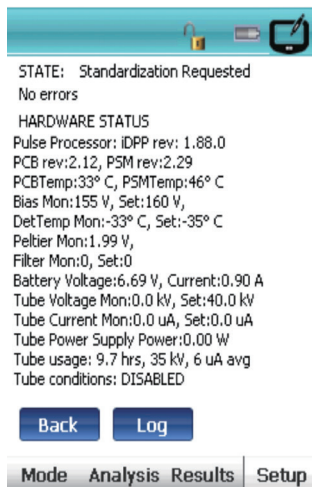


3.5 Trigger hardware

3.5.1 Hardware Status: Displays hardware parameter information and operational logs.

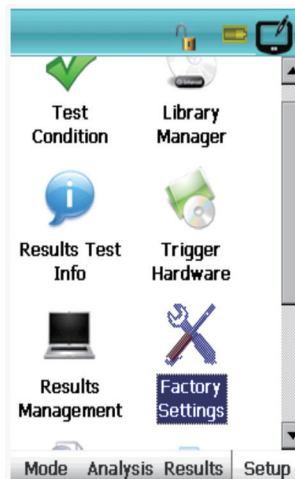
3.5.2 Trigger Settings: Lock/Activation settings for the trigger. After entering, please input the password "z".





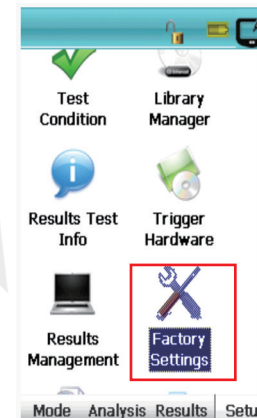
3.6 Results Management

Export data to the hardware memory and then retrieve it via the mobile app.



3.7 Factory Settings

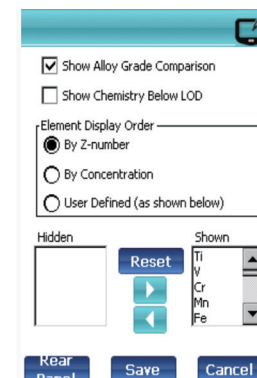
Note: Please do not use this feature. It is reserved exclusively for engineers.



3.8 Customized Display

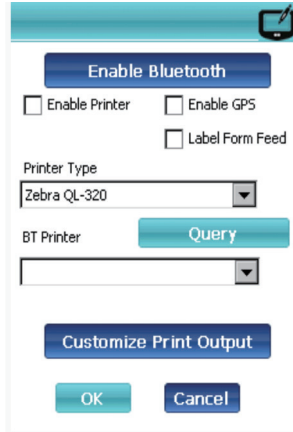
3.8.1 Show Alloy Grade comparison: Display the determination range for grade and element.

3.8.2 Show Chemistry Below LOD: Display chemical values below the detection limit.



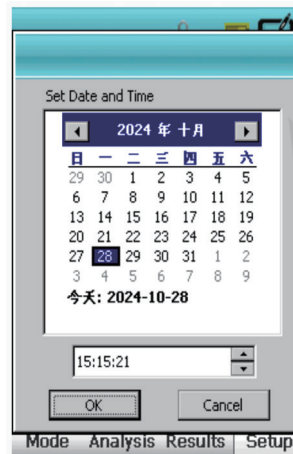
3.9 Printer

This function is not yet available.



3.10 Date Time

Set the current test time.



3.11 EXIT

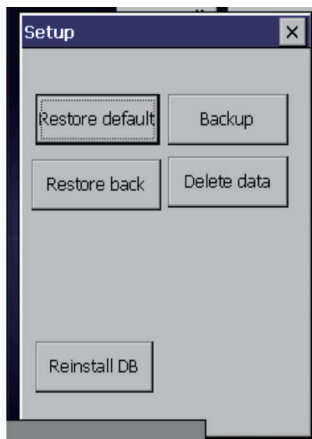
Click "Settings" in the lower right corner, click the "Leave option and exit".



The screen shown is the screen saver interface. (At this time, you can operate the network settings, generate reports, or press the power button to shut down).

3.12 Settings: (Use with caution)

Restore default, backup data, restore backed-up data, Delete data Reinstall database.



3.13 Report

Select a date and export all reports for that day.



3.14 WIFI



1. Select the network you want to connect to (find your phone's shared hotspot). If it's not available, add a new network.
2. Example: Network name: "OPPO Reno".
3. Enter the password and click "OK".
4. As shown in the figure: indicates that the instrument and mobilephone have been successfully connected.

Note: Please set your phone's hotspot AP band to 2.4GHz.

3.15 Installation Notes for Mobile App:

3.15.1 It must be installed on an Android system.

The IOS system is currently under development. Load the apk file from the included USB drive onto your phone and install it.

Please make sure to turn off your phone's Pure Mode (apps cannot be installed in Pure Mode).

Please grant the necessary permissions for the app.

After installation, please ensure that the device is connected to your phone (such as through wireless settings).

3.15.2 Introduction to Mobile App Interface:

Live Screen: Allows you to control the instrument online via your phone.

Download All: Downloads all data reports for a specific day.

Enter Date: Queries all detection data for a specific date. The input format is like 2010-9-10.

Open: opens a single report.

Del: Deletes a specific detection data entry.

Enter ID: Enter the serial number located on the instrument. A gray indicator in the bottom right corner means the instrument is not connected.



3.15.3 Enter the serial number of the instrument.

4. Maintenance

4.1 Battery and battery charging

Each HSM-A310 portable analyzer is equipped with two lithium batteries. When fully charged, the battery can be used for 6, 8 or 12 hours.



Attention
Make sure the battery has sufficient power before test.



Warning
When the instrument is fully charged (the indicator on the charger turns green), do not charge the device for a long time; otherwise, the battery life will be reduced.



Warning
Keep chargers and batteries in a cool environment and keep away from direct sunlight.



Attention
If the instrument is not used for a long time, please start-up operation at least once a month for no less than 2 hours.

(1) Battery replacement

1. Push back the button at the bottom of the handle of the instrument and the battery will slide out into your hand.
2. Put the battery aside and load the new battery up into the cavity below the handle of the instrument. The battery only has one install direction.
3. Push forward the button at the lower end of the battery, and the battery will be locked in the hole of the handle.
4. Press the button below the battery repeatedly to ensure that the battery is properly installed.

(2) Battery charging

1. It takes about 2 hours to fully charge.

2. Remove the battery from the instrument.

3. Place the battery head down in the charger. Batteries are oriented, and there only one angle to fit into the charger. If the battery is inverted, take out the battery and place it again.

4.2 Maintenance, cleaning, and repair

Regular maintenance and cleaning are essential for the long-term reliability of the instrument. Please keep it clean, especially the test film in front of the test window. Please gently wipe the test film with a cotton cloth and the body of the instrument with a soft cloth. Do not wipe the instrument with detergent or solvents or immerse the instrument in water. If the test film is worn or damaged, or there is metal powder contamination, e replace the new test film in time. Touch screen also needs cleaning after a long time. It is recommended that you use a soft cloth to clean the touch screen by wiping the lens. Do not use water during this process.



Attention

The detector is a high value and vulnerable component. Do not touch, wipe, solvent contact, blowing, or other operations, otherwise it may cause permanent damage to the detector.



Attention

Do not pollute the test window by using other properties of solution and solvent, otherwise it will cause a large deviation of test results.



Attention

Test film is a special material that can protect the test port from contamination and ensure the test accuracy. Do not use other materials to replace plastic films.



Attention

The test film must be replaced immediately after it is damaged. During the forage, handling and use of the instrument, no foreign matter should damage the test film or fall into the window. When replacing the test film, do not touch the precision components such as beryllium windows inside the instrument with hands or any other objects.



Warning

The damaged detector head caused by the replacement of test film or other bad operation is not within the scope of our warranty. Please note that our company will not be responsible for all the losses caused.



Warning

Please do not disassemble the instrument without permission, otherwise there will be no warranty. Our company will not be responsible for all the consequences caused by disassembling the machine without permission.

4.3 Relace the test film



Instrument test window

- (1) Loose the six screws of the test window.
- (2) Remove the front protection cover.
- (3) Remove the old test film.
- (4) Clean the back of the front protection cover and replace it with a new test film.
- (5) Reinstall the front protective cover of the instrument.
- (6) Fasten the four screws.

5. Routine troubleshooting

Failure	Possible cause	Corrective action
The test data is not accurate.	Instrument is not calibrated.	Recalibrate the instrument.
	Sample position may deviate from test window.	Adjust the sample to cover the entire test window as much as possible.
	The filter position is incorrect.	Please feedback the problem to us, we will solve it for you as soon as possible.
	Low power.	Replace the battery or connect the power adapter.
	There is strong interference or strong vibration around.	Avoid strong interference and strong vibration environment.
The indicator light is off during test.	There may be a hardware connection problem.	Please feedback the problem to us, we will solve it for you as soon as possible.
Time does not go or go fast.	When there is strong interference. around, it will interfere with thenormal operation of the instrument hardware and software, and makes the time stop.	When other reasons that may lead to the time do not go are eliminated, please check whether there is strong electromagnetic interference around, such as high-voltage lines, high-power electrical equipment, etc. Try to stay away from such magnetic fields before test.
System time incorrect.	The instrument has not been used for a long time.	Please modify System Time in System Settings.

If the problem is persisting, please feedback the problem to after-sales technical support in time.