

User Manual

Portable Threats Trace Detector

Version: 1.0

Date: July 2018



Warning

ZK-E8800 detector contains a radioactive Ni^{63} source of 10 millicuries (370MBQ) strength. There is no direct radiation hazard.

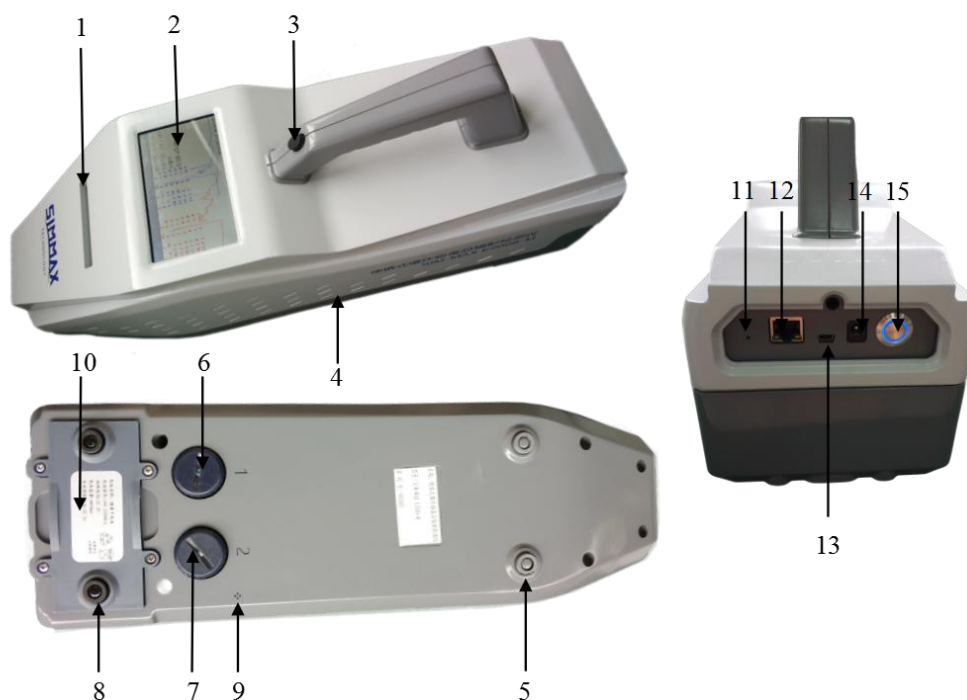
Except for this manufacturer, any person shall not dismantle the drift tube and its radioactive source of the detector. Otherwise, the company and its agents will not bear any legal or moral liability for any personal injury or material damage caused thereby.

The product shall not be transferred without authorization. After reaching the service life (20 years) or other reasons no longer used, it must be returned to our company. The radioactive source in this product shall be sent to the appointed municipal radioactive waste repository according to relevant regulations.

Warranty Information

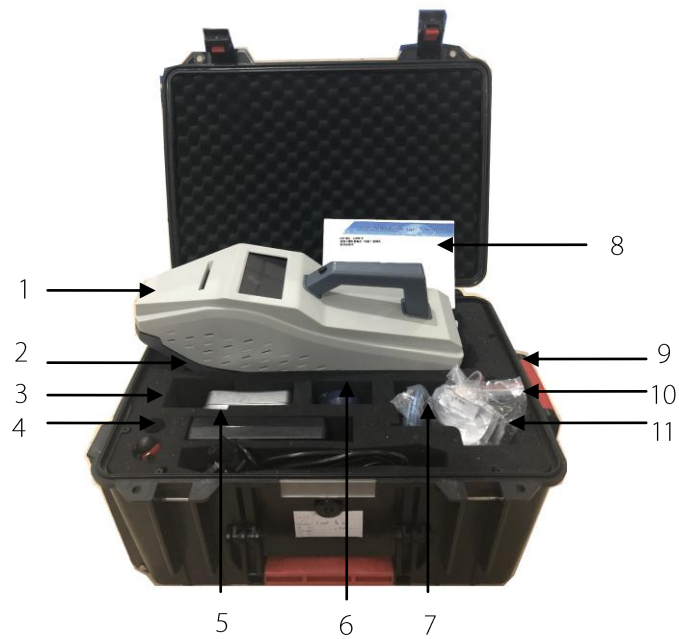
The instrument comes with a standard one-year warranty from date of issuing invoice that covers parts and labor. It is suitable for the components in this package. Expect the instrument and the components in use normal losses. User must be carefully learn the theory of operation before begin to operate the instrument. The manufacture is not responsible for damages incurred from misuse.

Appearance and Major Components of ZK-E8800



1. Sample Inlet
2. LCD
3. Software firing auxiliary button
4. Ventilation hole
5. Rubber Pads
6. 1# Air Filter
7. 2# Air Filter
8. Rubber Pads
9. Inlet hole
10. Rechargeable Lithium-ion Battery
11. Reset Button
12. Network Interface
13. USB Port
14. External Power Connector
15. Power Switch

Components in Packing Case



1. Main unit
2. Vacuum Sampling unit
3. Test Sample (Explosives)
4. Tools
5. AC/DC Adapter and cables
6. Funnel (Dedicated to Fill Sieve Materials in Air Filter)
7. Cables
8. Manual and CD
9. Sieve materials for air filter
10. Spare air filter cover
11. Battery Module

Contents

1. Preface.....	1
1.1 ZK-E8800 Introduction.....	2
1.2 Technical Specifications.....	2
2. Basic Principles of Operation	4
2.1 Dual mode Ion Mobility Spectrometry (IMS) analysis principle.....	4
2.2 The alarm substance identification.....	5
3. Use Safely and Maintenance.....	6
3.1 Environment condition and power supply	6
3.1.1 Environment condition.....	6
3.1.2 Power supply	6
3.2 Safety Warnings and Cautions	6
3.3 Using and maintenance of battery.....	7
4. Description of Working Interface	8
4.1 Display of spectrum.....	8
4.2 Operations of Menu.....	9
4.2.1 System Settings.....	9
4.2.2 System Parameters.....	10
4.2.3 Data Base	11
4.2.4 Analysis Setup.....	12
4.2.5 Facilities Maintenance.....	14
4.2.6 Spectrogram.....	15
5. Basic Workflow.....	17
5.1 Turn on.....	17
5.2 Preparation Process.....	17
5.2.1 Warm-Up.....	18
5.2.2 Calibration.....	18
5.2.3 Blank check and Standard Test.....	18
5.3 Sample Collection and Analysis	19
5.3.1 Wipe Sampling unit.....	19
5.3.2 Vacuum Sampling.....	22
5.3.3 The sample analysis	23
5.4 Turn-off	24
6. Facilities Maintenance.....	25
6.1 Routine Maintenance.....	25
6.1.1 Cleaning.....	25
6.1.2 Calibration.....	26
6.1.3 Humidity Calibration.....	26
6.1.4 Sensor repair.....	27

6.1.5 Date.....	27
6.2 Replace air filter.....	27
6.3 Replace Battery	29
6.4 Instrument Crashes	29
7. Troubleshooting & Notes.....	30
7.1 Boot failure.....	30
7.2 Gas flow anomaly	30
7.3 Temperature anomaly.....	30
7.4 Humidity anomaly	30
7.5 No response to entering a sampling paper	30
7.6 False positives	30

1. Preface

Welcome to use ZK-E8800 Portable Threats Trace Detector (referred as ZK-E8800), which is based on Ion Mobility Spectrometry (IMS) technology. It can quickly and accurately determine the trace amounts of explosives and drugs at the same time and give the types of suspicious substances also with the function of X, gamma radiation dose rate detection.

Characteristic:

- Simultaneous detection and analysis of explosives and narcotics without replacement of modules and no need for mode switching.
- Select explosives detection mode (only explosives detection) and drug detection mode (only detect drugs) according to your own needs.
- Fast response, can detect ng ~ pg class explosives and drugs.
- Distinguish the types of Narcotics and Explosives.
- Complete analysis and result within 2~10 seconds.
- Three levels of sensitivity, also with hot start and standby function.
- Environmental adaptability, work properly at highland areas.
- With the function of X, gamma radiation dose rate detection.
- Unique search alarm function; alarm threshold continuously adjustable, with sound alarm.
- Easy to use, 4.3 inch graphic touch screen.
- Lightweight and portable, the total weight less than 3.7kg.

Applications:

- Contraband security check for airports, railway stations, subway stations, prisons, seaports, customs, border defense, post office and so on.
- Prison, detention center, customs, border, court, post office, inspection and quarantine, courier companies and other contraband security checks.
- Law enforcement agencies: Public Security Bureau law enforcement, the Bureau of evidence.
- Fire, special police brigade anti-terrorism and emergency response to emergency.
- Large-scale activities, important people, building security.

1.1 ZK-E8800 Introduction

ZK-E8800 is a reliable analyzer with high sensitivity specifically designed for detecting trace explosives and drug (radiation). ZK-E8800 has many characteristics such as simple and elegant design, bright colors, easy to use, 4.3 inch graphic touch screen. The unique characteristic is the life-long use filter for air purification. In the maintenance of convenience and maintenance costs than other products have significant advantages.



Fig. 1 the Appearance of ZK-E8800

1.2 Technical Specifications

Form 1-1 Technical Specifications

Detection Technology		Ion Mobility Spectrometry (IMS)
Sample Type		particulates, liquids and vapors
Detect types of Sample		Explosive: Black power, TNT, DNT, RDX, PETN, NG, Tetryl, HMX, NH_4NO_3 , Gina, Semtex, C4, TATP, HMTD, EGDN and etc., new samples can be added if needed.
		Narcotics: Cocaine, Heroin, Methamphetamine, Morphine, Tetrahydrocannabinol (THC), Ketamine, MDMA, LSD, DOL, EPH, MDA, MDEA, Cathinone, AMPH and etc., new samples can be added if needed.
Sensitivity		ng to pg level
Warm-up Time		15 minutes (hot-start 5 minutes)
Analysis Time		2 to 10 seconds
Alarm Form		Explosives and types of drugs can be displayed with light and visual alarm or hidden alarm.
Radiation detector		CsI (TI)
Power range		33Kev ~ 3.0Mev
Measur	Dose rate	0.01uSv/h ~ 80uSv/h
	Count rate	1 ~ 9999 cps

ement range	accumulated dose	0.01uSv ~ 10Sv
Relative Error		Not exceeding + 20%.
Display		4.3 inch color LCD touch screen, Chinese and graphical interfaces.
Data store and interfaces		At least 240000 sheets of raw data, Ethernet, USB interface, and wireless export data.
Dimensions		Dimensions: L440xW140xH150 mm
Weight		3.8kg (with battery)
Power Supply		110/220VAC、 50/60Hz 24V AC/DC Adapter 22.2V re-chargeable lithium-ion battery up to 4 hours stand-by time more than 8 hours
Working Temperature		-10°C to 60°C, relative humidity≤93%

2. Basic Principles of Operation

2.1 Dual mode Ion Mobility Spectrometry (IMS) analysis principle

ZK-E8800 is designed based on a technology called Ion Mobility Spectrometry (IMS). As an online, fast, high sensitivity analysis technique, IMS analyzer can detect a variety of trace suspicious substances quickly and accurately. It is an effective method for rapid detection of trace explosives and drugs on the spot.

ZK-E8800's analysis objective is particulates, liquids and vapors. There are two essential steps in the analysis process: many explosives and drugs give off vapors or particulates that are absorbed by or cling to the surfaces of materials (they into contact with clothing, luggage, skin, containers, paper and so on). Samples of particulates are collected by wiping the surfaces of those goods with an approved sampling paper. Secondly, analyzing samples, when the instrument is in the ready state, the collected samples can be analyzed.

Fig. 2-1 shows the principle schematic diagram of IMS. After sample introduction, the parser will heat the sample and turn it into steam, then these target particles can be desorbed and be ionized by IMS ion source with the inlet airflow into the IMS region, finally, it will be an ion or ion group with specific mobility. When the shutter behind the ionization zone opens, letting negative ions of explosives or positive ions of narcotics will enter the drift region. The ions are then focused and accelerated by the electric field along the drift region of the drift tube to arrive at the collector electrode (typically in 10 to 20 milliseconds). The drift times (ion mobility) are specific for individual chemical compound ions because the size and structure are different between various ions. IMS detector with extreme selectivity can detect suspicious substance according to their ion mobility, and the whole detection only needs 2~10 seconds.

In a single analysis, there is one or more IMS workspace field polarity inversion. To detect explosives and drugs at the same time in a single analysis, there is a positive charge in drug ion detection in positive polarity and a negative charge in explosive ion detection in negative polarity.

ZK-E8800 is a very mature detector technology. Since at the same time it has the detection function of X and gamma radiation dose rate, and it uses Csl (TI) crystal and photodiode coupling components detector.

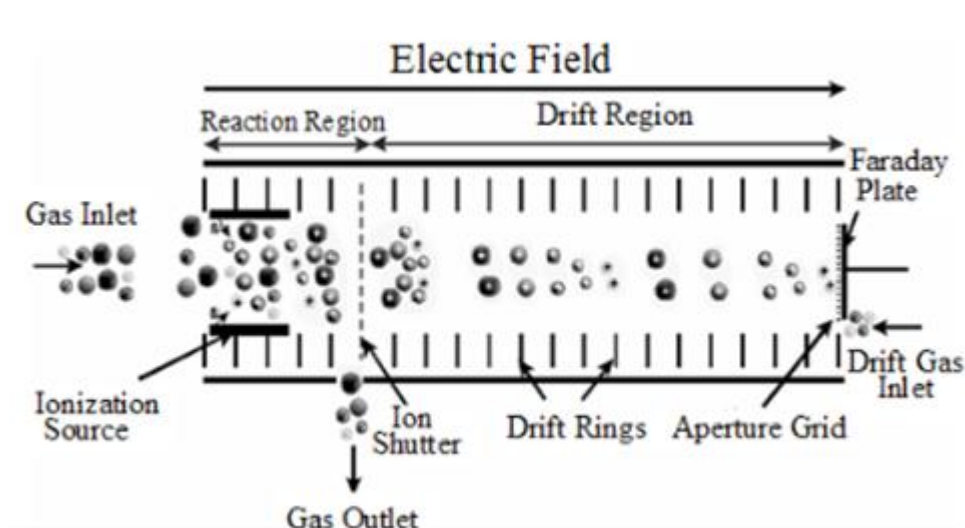


Fig. 2-1: Principle Schematic Diagram of an Ion Mobility Spectrometer

Three ions (X, Y and Z) of differing masses arrive at the collector electrode at different drift times. Thus, these three ions will produce the drift spectrum shown in Fig. 2-2.

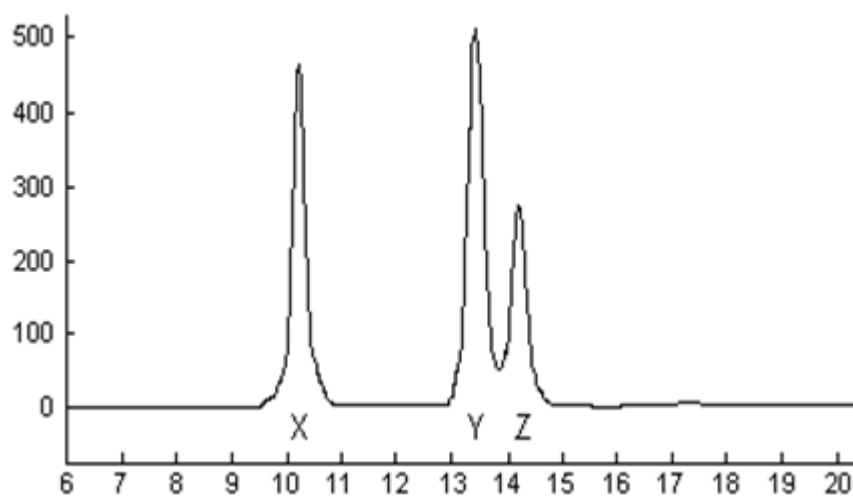


Fig. 2-2: Drift Spectrum of the IMS Detector

2.2 The alarm substance identification

The time required for ions of a specific substance to drift down the tube is precisely known and preprogrammed. When analyzing and testing, the system will monitor the dynamic changes of the spectra, as long as the position of the ion peak is found to be consistent with the characteristic peak of certain material preset in the database and achieve the preset strength, ZK-E8800 immediately will trigger an alarm to operator and show the name of the specific substance on the screen.

3. Use Safely and Maintenance

This chapter briefly describes how to use ZK-E8800 safely and the use of the related matters before and after.

3.1 Environment condition and power supply

3.1.1 Environment condition

ZK-E8800 works normally at the service condition from -10 °C to +60 °C, and the relative humidity no more than 95% non-condensing. Please don't cover it whenever it is working. It generates heat inside the instrument when it is turning on. The system will automatically shut down for self-protection if the internal temperature is too high. It will be in an abnormal state if it is isolated from the air as the carrier gas is air. Please avoid the interference of external strong electromagnetic field in the use of radiation detection.

3.1.2 Power supply

The power supply of ZK-E8800 is a 22.2V rechargeable lithium ion battery module. The battery's current voltage can be checked in the status, the instrument will prompt the user low-battery when the voltage falls below 20.4V, and it will automatically turn off when down to 20V. We can use the AC/DC adapter to provide power to the system anytime.

3.2 Safety Warnings and Cautions

The safety of users is fully taken into account in the design of all products of Technology Co., Ltd. Throughout this manual, sensible precautions are prominently displayed as WARNINGS. Some are listed here:

(1) RADIATION



ZK-E8800 contains a radioactive nickel 63 source of 10 millicuries (370MBQ) strength. The dosages emitted by the instrument meet the radiation safety requirements. But in any case, don't disassemble the instrument to prevent causing radiation damage.

(2) Do not block the Air Incoming Vent



The air source for the ZK-E8800 is very important, please do not block the air incoming vent, otherwise it will affect the normal operation of the instrument.

3.3 Using and maintenance of battery

The 22.2V rechargeable lithium-ion batteries of the ZK-E8800 can be up to 4 hours of operation when it is fully charged-up. And the battery life depends on the times of analysis.

The notes of using the battery are as follows:

- Follow with the regulations of the use of battery, use the AC/DC adapter to supply power or the charger to charge the batteries from only.
- Must use the battery module of this product to replace.
- Sure the electrode contact pad of the battery is clean and not short anytime.
- Battery charge temperature: 0 °C to 40 °C, discharge temperature: -10 °C to 60 °C.
- Battery should stay away from the fire and areas of overheated and can't be into water.

Connect the external power supply to ZK-E8800 by the power adapter, when the instrument is turned off, the battery charging icon will be displayed on the screen and show "Charge completed" after the battery is fully charged; when the instrument is turned on, the small battery icon in the lower left on the screen flashes continuously, as the icon changed green means that the battery is fully charged-up and the external power is in use.

4. Description of Working Interface

This section will describe all of the working interfaces under the main menu to users. The LCD screen is divided shown in Fig.4-1. The status bar and the page description are on the top line, the battery power and power type icon are on the right corner of the top column. Touch the screen, the hidden menu will be displayed below the status bar. The spectrum display area is at the left of the whole area, the operating time of the instrument, the current atmospheric pressure and the radiation dose rate are shown on the upper right. The current date and time are displayed in the lower right corner.

The power type icon can show whether the current adapter is powered by an adapter or a built-in lithium battery. The information displayed on the state column includes "Warm- up..., Calibrating..., Cleaning..., Mode switching..., Remove the Sample..., Ready" and so on.

4.1 Display of spectrum

The spectrum of ion migration spectrum shows the default state of shutdown, and the graph display is set to open status: When the instrument is turned on, the interface shows the baseline of ion migration spectrum; after the instrument is stable, the interface shows the ion migration spectrum. The red line on the left shows the spectrum of the positive mode (drug), and the blue line on the right shows the spectrum of the negative mode (explosive). As shown in Fig. 4-1, the horizontal axis represents drift time, and the longitudinal axis shows the signal strength. The measured radiation dose rate was showed on the right side of the spectrum. Touch the screen, the hidden menu bar shows up, and click the menu item to enter the corresponding menu interface.

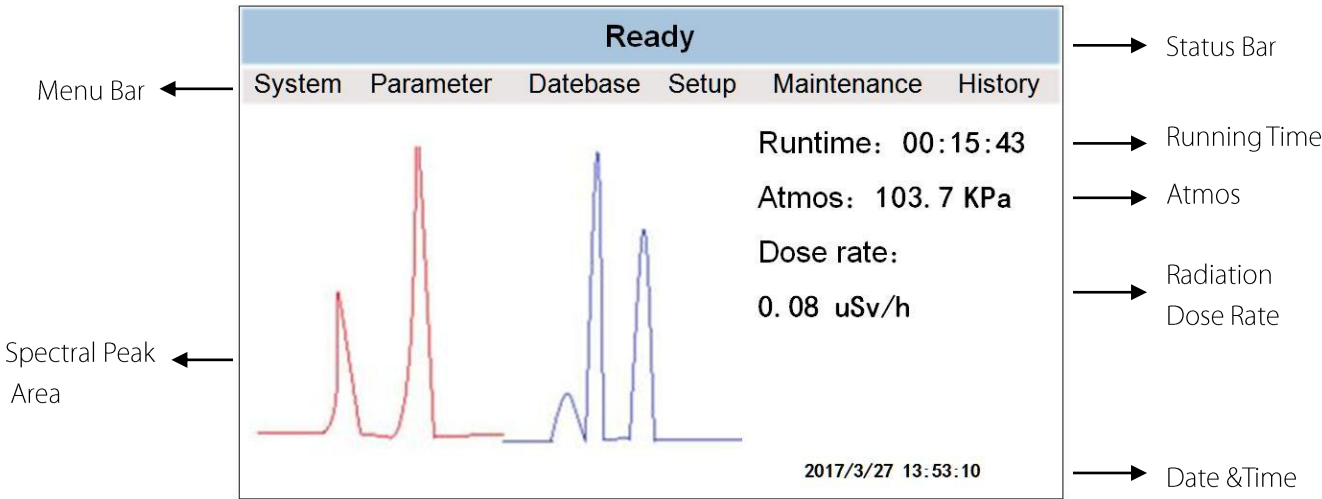


Fig. 4-1 Main Interface

4.2 Operations of Menu

4.2.1 System Settings

There are five sub menus under this menu: **Mode**、**Language**、**Privilege**、**Shut Down**、**Brightness**. They can be used to set work mode, language, privilege, shutdown and brightness. As shown in Fig. 4-2, the specific operation is as follows:

Mode→**Off**/**Drug**/**Explosive**/**Dual**

Before the machine ready to start, the working mode is **Off** and the default mode is **Explosive** (negative mode), which can be used for analysis of most commercial and military explosives. According to actual needs, customers can choose **Drug** (positive mode) to conduct the detection and analysis of illegal drug substances, and choose **Dual** to conduct the detection and analysis of both. Switching between modes takes a few seconds, and the status bar shows "mode switch..." or "switch completely".

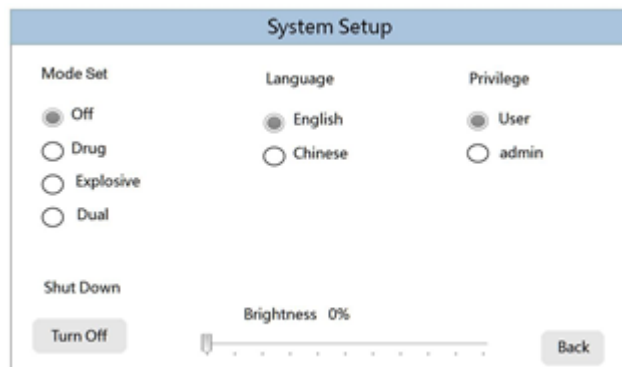


Fig. 4-2 System Settings

Language→**English**/**Chinese**

The default language for the instrument interface is **Chinese** according to the requirement, can be changed to **English**.

Privilege→**User**/**Admin**

In the use of the instrument, **User** permissions are opened to users acquiescently, or upgrade to **Admin** privileges as demand. After users obtain the administrator's authorization code, the functions such as spectrogram display, software upgrade, database update, and system work parameter can be set.

Shut Down

The instrument can be shut down directly.

Brightness

The recommended LCD brightness is 50%, users can drag the ruler to the corresponding scale to adjust the brightness of the LCD screen according to demand.

After all options are set up, press **Return** back to the main interface.

4.2.2 System Parameters

The information of the ion migration spectrum (IMS) parameters, radiation parameters, Ethernet parameters, and WIFI connections can be viewed, the first page is about the parameters of the ion migration spectrum as shown in Fig.4-3. It is required that the page parameter must reach the preset value, then the instrument can work according to the procedure, and the temperature of the heating device provides an important reference for sample. Move the scroll bar, as shown in Fig.4-4, if the humidity of the drift gas or the injection gas is more than the preset value, the instrument will pop-up dialog to remind users to turn it off and replace the packing of corresponding cleaning pipe, and other parameters detected in real time in the instrument can be viewed during operation. The temperature in the instrument is the internal temperature of the instrument, which is not suitable for long duration when the temperature is too high. This will shorten the service life of the instrument.

System Parameter					
name	current	preset	unit	state	
Desorb Temp	150	150	Celsius	OK	
Inlet Temp	90	90	Celsius	OK	
Tube Temp	100	100	Celsius	OK	
CAL Temp	65	65	Celsius	OK	
Drift Flow	200	200	Scm	OK	
Atmos	103.4	--	Kpa	OK	
WIFI Ethernet Radiation Back					

Fig.4-3 System Parameters (Page 1)

System Parameter					
name	current	preset	unit	state	
Internal Temp	24.2	--	Celsius	ok	
Front Humidity	5.9	10	%	ok	
Rear Temp	23	--	Celsius	ok	
Rear Humidity	0	1	%	ok	
Battery Voltage	22.5	--	V	ok	
WIFI Ethernet Radiation back					

Fig.4-4 System Parameters (Page 2)

Radiation			
name	current	unit	remark
alarm threshold	26	uSv/h	
count rate threshold	50	cps	
count rate	23	cps	
Total dose	24	uSv	

IMS Back

Fig.4-5. Radiation

Ethernet Parameter	
IP Address	192.168.2.200
Subnet Mask	255.255.255.0
GateWay	192.168.2.1
	Back

Fig. 4-6 Ethernet Parameter

Click the **Radiation** button on the bottom line of the first page, and it will turn to the second page, showing some important parameter information in the radiation monitoring process, as shown in Fig.4-5. Among them, you can view the radiation alarm threshold set before the instrument leaving the factory. At the same time, you can see the current radiation count rate and the cumulative dose from the instrument on to the current, while you see the radiation dose rate measurement on the main interface.

Click the **Ethernet** button on the bottom line of the first page, and it will turn to the third page, showing Ethernet parameter information, as shown in Fig.4-6.

4.2.3 Data Base

Enter the database sub menu to view the list of standard databases of detectable sample, including explosive and drug sample database. The first page is explosive database interface, as shown in Fig.4-7, swipe the scroll bar and all detectable sample types can be viewed, "√" means already being selected, users can add or delete database by PC software.

Click **Drug** button on the next line, the database interface will turn to the second page, as shown in Fig.4-8, which shows the detectable drug sample database.

Explosive Database			
name	enable	Remark	
BP	<input checked="" type="checkbox"/>		
AN	<input checked="" type="checkbox"/>		
TNT	<input checked="" type="checkbox"/>		
NG	<input checked="" type="checkbox"/>		
RDX	<input checked="" type="checkbox"/>		
TETR	<input checked="" type="checkbox"/>		

Ok Cancel Drug Back

Fig.4-7 Explosive Database

Drug Database			
name	enable	remark	
MET	<input checked="" type="checkbox"/>		
KET	<input checked="" type="checkbox"/>		
PCP	<input checked="" type="checkbox"/>		
COC	<input checked="" type="checkbox"/>		
LSD	<input checked="" type="checkbox"/>		
THC	<input checked="" type="checkbox"/>		

OK Cancel Explosive Back

Fig.4-8 Drug Database

4.2.4 Analysis Setup

This menu includes analysis settings of IMS and radiation. The first page is the ion mobility spectrum analysis setup, as shown in Figure 4-9. It includes analysis time, analysis mode, sensitivity level, sound and light alarm settings. The specific operations are as follows:

Select the appropriate analysis time in the selection box under **Analysis Time**. The analysis time defaults to 8 seconds, which corresponds to trace detection. When the customer handles the detection of a few traces of suspicious material, you can select a shorter analysis time, such as 2 seconds; Fast analysis of trace samples yields analytical results while protect the detector from contamination. The setting range is 2-12 seconds, and the interval gradient is 2 seconds; after the setting is completed, it takes effect immediately.

Analysis Setup		
Analysis Time 8 s ▼	Analysis Mode <input checked="" type="radio"/> Complete <input type="radio"/> Fast	Level of sensitivity <input checked="" type="radio"/> Low <input type="radio"/> Normal <input type="radio"/> High
Sound <input checked="" type="radio"/> Off <input type="radio"/> On	Light <input checked="" type="radio"/> Off <input type="radio"/> On	Radiation Back

Fig.4-9 Analysis Setup (first page)

The full mode and fast mode are included under the **Analysis Mode** option. The complete model is used to report the prohibited substances or suspicious test objects that have been detected after the completion of one sample analysis. This takes a relatively long time and is particularly suitable for the detection of mixed explosives. The quick mode is to stop the analysis and alarm when a suspicious contraband is detected during an injection analysis. The response is quick and short.

Sensitivity Level options are divided into three levels: low, medium and high. The default is medium. Customers can choose to set the required sensitivity of the instrument in practical applications.

The alarm mode includes sound, text, and light alarms. When the customer needs a hidden alarm mode, the **Sound** or **Light** can be set to be off.

Click the Radiation Settings button, then the analysis settings interface will jump to the second page, that is, radiation settings as shown in Figure 4-10. Including alarm mode, Storage mode, alarm threshold, cumulative dose removal, etc. The specific operations are as follows:

The image shows a 'Radiation Setup' interface with the following controls:

- Alarm Mode:** Two radio buttons, 'Safe mode' (selected) and 'search mode'.
- Storage Mode:** Two radio buttons, 'Trigger' (selected) and 'Continue'.
- Storage Interval (s):** A numeric input field showing '000' with up and down arrow buttons.
- Alarm Threshold uSv/h:** A numeric input field showing '000' with up and down arrow buttons.
- Clear total does:** A button labeled 'Clear'.
- Bottom Buttons:** 'OK', 'Cancel', 'IMS', and 'Back'.

Fig.4-10 Radiation Setup (second page)

The dose equivalent rate value displayed by this instrument is calibrated under the standard source field. The background value shown in the natural environment without radioactive source is between 0.05uSv/h and 0.2uSv/h, which can be based on the user's specific needs. Users can set the alarm threshold and enter the setting in the **Alarm Threshold** box, and press the **OK** button to complete the setting. The unit of alarm threshold is uSv/h, and the setting range is 1uSv/h—100uSv/h.

Alarm mode is divided into **Safe Mode** and **Search Mode**. The safety alarm mode is selected and the alarm is triggered when the radioactivity by the detector exceeds the set alarm threshold. The set alarm threshold can be viewed through the radiation parameters in Section 4.2.2 System Parameters. In the search mode, the alarm threshold of the instrument is calculated based on the background. Because of the different environments in different places, the background values measured in the natural environment without radioactive sources are

different. To quickly detect the radioactive substances in the environment, we can use a certain multiple than the environmental background value. The method distinguishes whether it is a radioactive substance with a certain hazard. This is the function of search mode. Example description: First switch the alarm mode to the search mode. The count rate (cps) of the background measurement result is viewed through the **Radiation Parameters** in section 4.2.2 **System Parameters**.

The alarm threshold is calculated as follows:

$$\text{alarm threshold} = N_b \times T_c + n \times \sigma$$

$\sigma = \sqrt{N \cdot T_c}$, n is alarm search factor, The system default setting is 5.5, and can be adjusted according to the actual application; N_b : background count rate, can be viewed from the **Radiation**; T_c is default 1 second.

Radiation detection data storage includes trigger mode and continuous mode. The stored data can be viewed through the radiation record under the interface menu (see section 4.2.6 for details). It can also be exported via dedicated online software.

The **trigger mode** only saves the data per second during the alarming process and is the default save mode. Select the **continuous mode** and save the data continuously according to the setting **save interval**. The default storage interval is 10 seconds.

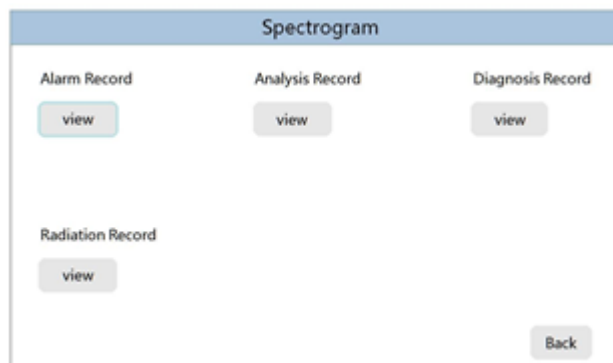


Fig.4-11 Spectrogram

The total dose of this instrument starts from the instrument on. If you need to restart the accumulation during usage, you can click the **clear** under **clear total dose**.

4.2.5 Facilities Maintenance

For details, check Chapter 6, Device Maintenance.

4.2.6 Spectrogram

Spectrogram includes four parts of the alarm record, analysis record, diagnostic record of IMS detection, and radiation record, as shown in Figure 4-11.

The alarm record can provide the alarm time and alarm substance name. In the alarm record page, as shown in Figure 4-12, each page saves 9 records. You can view all the alarm records by page up or page down. You can click view to check the historical spectrum of alarm substances, such as Figure 4-13.

Alarm Record		
NO.	data	suspicious object
1	17/03/07 11:12:13	TNT
2	17/03/07 12:13:46	NG
Delete All view Page Up Page Down Back		

Fig.4-12 Alarm Record

Click Delete All to remove all records of IMS detection; Analysis Record saves the spectrum data and analysis time of the last injection test result but it does not provide the name of the alarm substance; click view to check the Analysis record, as shown in Figure 4-13. By clicking on the forward or backward arrow, you can view the front or back spectrum data when adding a new database. The record may be wrote by rolling and is automatically deleted after shutdown.

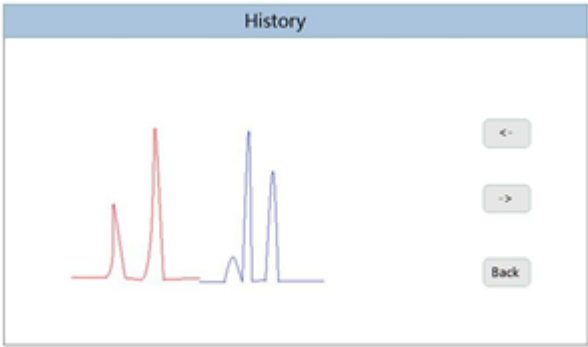


Fig. 4-13 History

The Diagnostic Record records the minor faults or abnormalities that occur during the operation of the instrument, as shown in Figure 4-14, which is for maintenance personnel to view and do not require much attention.

Diagnosis Record			
NO.	data	error code	remark
Delete All		Page UP	Page Down Back

Fig. 4-14 Diagnosis Record

The radiation record provides information such as alarm time, dose rate, total dose, alarm threshold, count rate, count rate alarm threshold, and alarm mode. As shown in Figure 4-15, all information can be viewed by sliding the scroll bar. Each page saves 9 records. You can view all radiation alarm records by **page up** or **page down**. Click **Delete All** to clear all records of radiation alarms.

Radiation Record				
NO.	data	dose rate	total does	alarm threshold
1	17/03/07 11:12:13	32uSv/h	21uSv	24uSv/h
2	17/03/07 12:13:46	32uSv/h	21uSv	24uSv/h
Delete ALL		Page UP	Page Down	Back

Fig. 4-15 Radiation Record

5. Basic Workflow

This chapter introduces to the user of the necessary knowledge for the correct operation of ZK-E8800, including: operation control, status screens, and routine procedures for performing analysis tasks.

5.1 Turn on

Plug in to the power adapter (or if the battery is powered on, supplied by it directly), Press the power switch on the back of the instrument. After the welcome screen and parser self-test completing, the instrument enters the main interface (Figure 5-1). The LCD touch screen displays information such as the warm-up status, startup time, current air pressure, and radiation dose rate. When the instrument is left for a long time and then used, please turn it on 24 hours in advance.

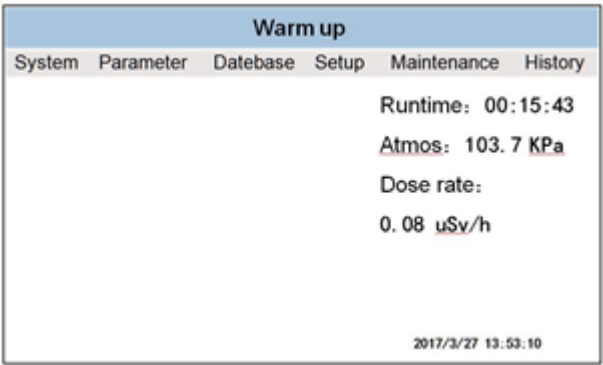


Fig. 5-1 Warm up

5.2 Preparation Process

After the normal start-up, the instrument must go through two preparatory work process of "Warm up" (this process includes temperature adjustment, drift gas flow adjustment, high-pressure on) and "calibration..." to enter the ready state. As shown in Figure 5-2, the status bar shows "Ready" when it is OK.

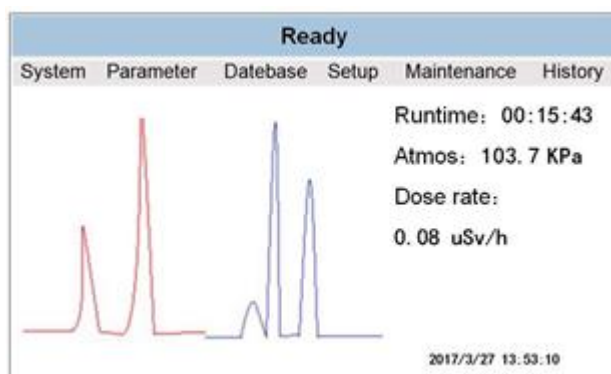


Fig. 5-2 Ready

5.2.1 Warm-Up

The state bar will display 'Warm-up...', and in this process, it indicates heating and adjusting, when the drift tube temperature, inlet temperature, the calibrator temperature, drift gas flow, air humidity, all the above satisfies the working standard, the instrument will automatically turn on the high voltage supply.

5.2.2 Calibration

The instrument performs auto-calibration process after the Warm-up process completing, the status bar will show 'Calibrating...', the instrument interface will display "Calibration Completed" after it is finished, the dialog disappears after 2 seconds automatically. Then the system is ready for the next step.

If air pressure changes, for example, below the standard atmospheric pressure, the instrument triggers an automatic calibration function, executes the calibration process, and automatically converts the database without manual operation.

5.2.3 Blank check and Standard Test

Be sure to perform blank check using new clean sampling paper three times or more each time when the instrument is ready or when the user suspects the instrument with residual contamination. If no positive alarm of all blank check, the instrument is in a normal state and can be used to analyze samples. If there is false alarm frequently, users need to perform a cleaning process, see details in Chapter 6.1.1. After cleaning, please perform the blank check and the standard test in sequence.

Test standard is specially designed for ZK-E8800 by SIM-MAX TNT for explosive detector, to make it easier for the user to verify the performance of the instrument. The active ingredient of the explosive test standard is TNT, which

is filled in a yellow lipstick tube, as shown in Figure 5-3. In order to ensure accurate alarming of the instrument, the instrument-equipped standards can be used to further verify the performance of the instrument after verification of the clean sampling paper. The user can check the test standard after the instrument is ready.



Fig. 5-3 Test Standard

The procedure of performing standard test are as follows: Coat amount of standard on a clean sampling paper in the sampling region. Then, insert it into the sample inlet with the side coated standard toward the handle. When analysis is completed, the instrument gives a right alarm, indicating that the instrument is in a normal state and can be carried out sampling and analysis. If not alarm, increase the amount of standard appropriately and perform the process of analysis, if not alarm again, performing cleaning is needed for the equipment, and carry out standard test again when cleaning is finished. If the instrument can't give an alarm still, please contact customer service of the manufacturer:

5.3 Sample Collection and Analysis

5.3.1 Wipe Sampling unit

Make sure the sampling paper is clean before sampling. You can use the ZK-E8800 to analyze the sampling paper if in doubt. Samples collected in the sampling region (round mark, at the junction of the horizontal V-notch and vertical V-notch intersection center, diameter 2cm area), as shown in Fig. 5-4. Figure 5-5 is a special Wipe sampling unit designed by SIM-MAX (optional accessories, contact us if necessary). Its usage is as follows:

- a) Open the two magnetic covers to 30-degree angle, as shown in Fig. 5-6;
- b) Take a clean sampling paper and put it at the suitable place, then close the covers, as shown in Fig. 5-7, Fig5-8 and Fig5-9;
- c) Then hold the Wipe Sampling unit, wipe the surface of the object, such as documents, suitcases (especially the handles, locks and shipping labels), door handles, clothing, skin, etc., as shown in Fig. 5-10;
- d) Complete sampling, take out the sampling paper, as shown in Fig. 5-11;

e) Also, you can use the sampling paper by hand to wipe target region directly, as shown in Fig. 5-12.

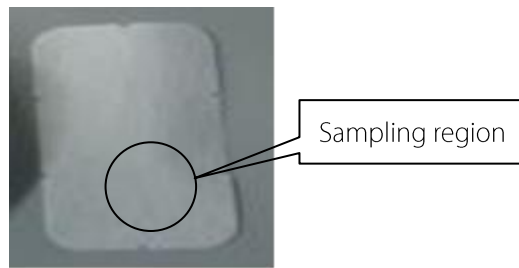


Fig. 5-4 Wipe sampling paper



Fig. 5-5 Wipe Sampling unit



Fig. 5-6 Open magnetic covers



Fig. 5-7 Place sampling paper



Fig. 5-8 Fixed sampling paper



Fig. 5-9 Wipe sampling unit with paper



Fig. 5-10 Wipe sampling



Fig. 5-11 Take out sampling paper



Fig. 5-12 Wipe sampling by hand

5.3.2 Vacuum Sampling

The Vacuum Sampling unit as shown in Fig. 5-14, open the front lid and put in a vacuum sampling paper, and sure the junction of three V-notch with many meshes under the big hole of the lid, hold it close to objectives, press the button continuously as long as your need to gather sample as shown in Fig. 5-14 to Fig. 5-17. When complete sampling, remove the paper and put it into the instrument for analysis.



Fig.5-13Suction sampling paper (left) and Vacuum Sampling unit (right)

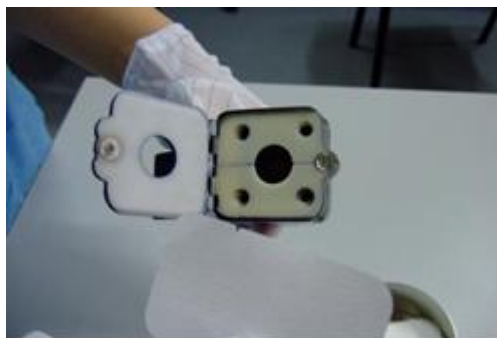


Fig.5-14 Open the front lid



Fig.5-15 Place the paper



Fig.5-16 Fixed the sampling paper



Fig. 5-17 Vacuum Sampling

5.3.3 The sample analysis

The instrument can analysis sample after Ready. Insert the sampling paper to the inlet slot, shown as Fig.5-18. The state bar display “Analyzing...”, the instrument alarms immediately if the suspicious substance is detected which is contained in the database.



Fig. 5-18 Insert the sampling paper to the slot

The screen displays the type of suspicious substance, and prompts “Remove the paper”, seen in Fig.5-19.

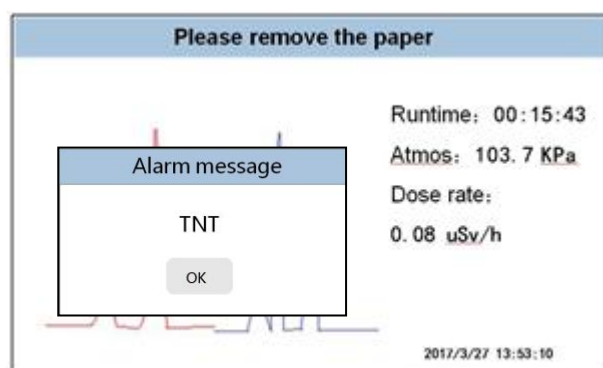


Fig. 5-19 Alarm Interface

At this point, the sampling paper should be taken out and the instrument automatically enters into self-cleaning. After more than ten seconds, perform the next analysis until the state bar showing "Ready".

If no suspicious substance is detected, the instrument will give a prompt dialog, as shown in Fig. 5-20. Taking out the sampling paper, the dialog will auto-disappear in 3 seconds. Carry on the next analysis when the state bar is "Ready".

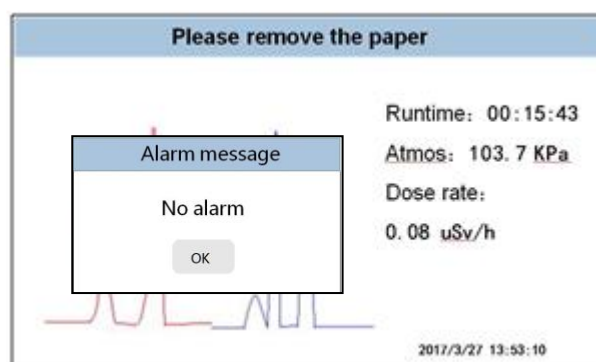


Fig. 5-20 No Alarm

5.4 Turn-off

Click System Setup → Turn off, the screen displays 'POWER OFF'. At last, plug out the external power supply after the screen turn into black.

6. Facilities Maintenance

This chapter describes the routine maintenance of ZK-E8800, it is designed for the operator to ensure the instrument functioning properly and help to solve the simple faults.

The routine maintenance such as most of the calibration and cleaning routines is done by the operator. Troubles moreover than the following maintenance and simple faults, please don't hesitate to contact with SIM-MAX or the authorized distributor of SIM-MAX.

6.1 Routine Maintenance

Routine maintenance includes four submenus, such as cleaning, calibration, humidity correction, and time set, as shown in Figure 6-1.

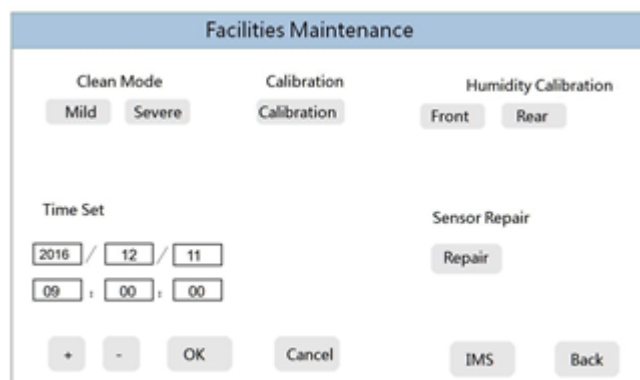


Fig.6-1 Facilities Maintenance

6.1.1 Cleaning

Clean is used to remove the contamination that may have accumulated during extensive usage or from a strong alarm in the system. A cleaning operation need to be done when false alarms occurred frequently or to use the instrument after laying aside for a long time. There are two choices for cleaning as follows: **Mild** and **Severe**

Mild: when the system is lightly polluted, it needs about 17 minutes;

Severe: when the system is heavily polluted, it needs about 45 minutes.

The cleaning is a process that use a high clean air flow directly blew into the system and rose the temperature of the inlet and drift tube higher than normal operation, To make the system "clean", this process continues for some time to clean out the contamination that may have accumulated during extensive usage or from a strong alarm in

the system. The temperature of light cleaning and deep cleaning is different, and the effect is different, so is the cleaning time required. To achieve the desired effect of cleaning and to clear away the contaminant rapidly, deep cleaning is the first choice.

After the cleaning program is started, if the user wants to terminate cleaning, he can enter the instrument maintenance interface at any time and click the **Mild** or **Severe** button to stop the cleaning. During the operation, the interface will have relevant prompts and can be selected according to the need.

6.1.2 Calibration

When the environmental condition that instrument is used in significantly changed, a manual calibration can be performed. To do this, micro- changes of the parameters caused by environmental conditions will be reasonably compensated as the alarm control system can adjust the database parameters correspondingly.

6.1.3 Humidity Calibration

Humidity correction is divided into front and rear. If the packing is replaced already, but the instrument cannot be ready and the message 'please replace packing No. 1' is displayed, please replace it again. Then restart it, in the warm-up state, check the drift humidity under the state parameters. If it is found that $1 < \text{drift humidity} \leq 10$, 'Humidity calibration' is required.

In the warm-up state, click on the **rear** under the maintenance menu to calibrate, the instrument will automatically pop up "Interrupt to rear humidity correction", click 'OK' button, the instrument performs 'humidity correction', the humidity parameter changes from 0 to "Drift air humidity current value" and humidity correction is completed.

Calibration of sample gas is when message again "please replace the No. 2 filler", replace it again. Then restart it, in the warm-up state, wait for the peak appearing on the main interface, and check up front humidity under the state parameter. If the humidity of the sample gas is found to be less than 15, the humidity correction is required.

Specific operation is the same as above.

When the humidity is corrected once, after each replacing of 1# or 2 # packing, during the warm-up process, the peak appearing on the main interface, check the current humidity value of the front gas or the rear gas, if that the parameters on the spectrum interface parameters are more than the current value of the front gas, humidity should be immediately re-executed by the "Humidity Correction", so that the parameter of humidity displayed on the trace interface is consistent with the current rear humidity.

6.1.4 Sensor repair

When the instrument is lay up for a long time and then turned on again, the humidity of the front gas will be very high, and it will not be able to be put down after continuously replacement of the filler. At this time, the humidity value can be lowered by the sensor self-repairing. The complete repair process takes a long time, usually 4-5 hours; when the humidity reaches zero, it automatically exits the program and adjusts to the ready state. When the humidity has not dropped to zero after the repair process, you can perform it again. If the humidity is close to zero after the repair and there is a certain offset, it can be used with moderate correction.

6.1.5 Date

When the system's date and time are different, the customer can correct the display time of the instrument, directly click on the selected year, month, day, hour, minute, and second, and edit it with the plus or minus sign of the next line, and finally press to confirm the change.

6.2 Replace air filter

Air filter (Figure 6-2) is used to remove moisture and organic molecules from the air. In order to save the cost of consumables in the daily maintenance of users and avoid material waste, the purification device of the instrument adopts a design method integrated with the housing and can be used for a lifetime. The user only needs to replace the packing in the purification tube as needed. SIM-MAX prepared a separately packaged purge tube packing for users (Figure 6-3). The air purification tubes are divided into two, namely No. 1 and No. 2 (marked on the bottom of the instrument), and a full bag of filler is required to be filled in each chamber during the replacement.



Fig. 6-2 air filter

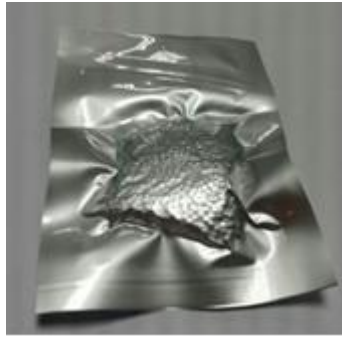


Fig. 6-3 Sieve material

When the humidity in the instrument ZK-E8800 exceeds the preset value, a prompt interface will appear indicating the replacement of the corresponding packing in purifying tube, as shown in Figure 6-4. After clicking the OK button, the instrument will shut down and stop working. In order to let the instrument work properly, it is necessary to replace the packing in time.

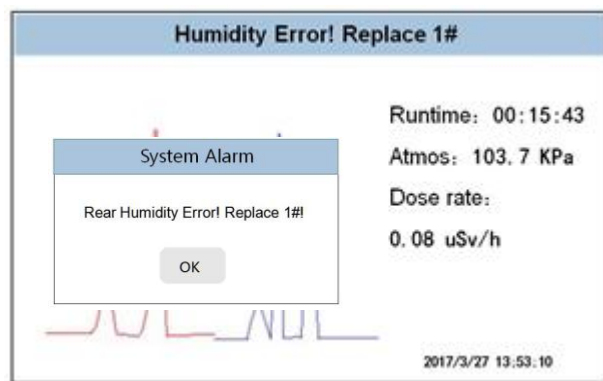


Fig. 6-4 Humidity error replace

The frequency of replacement of the packing varies depending on the time of using the instrument and the ambient humidity. If the instrument has not been used for a period of time, replace the packing before turning on the instrument. Especially to perform emergency tasks, be sure to replace the packing before turning on the instrument to save time.

Steps of replacing material in the air filter:

- a. Turn off the instrument.
- b. Using the special small wrench unscrew the cap of air filter, see Fig. 6-5.
- c. Discard the material in the air filter to a waste storage, see Fig. 6-6.
- d. Filling the new sieve material into the corresponding chamber with the special funnel, see Fig. 6-7.
- e. Tighten the air filter cap.



Fig. 6-5 Unscrew the air filter cap



Fig. 6-6 Discarding the filled material



Fig. 6-7 Fill the sieve material with the funnel

6.3 Replace Battery

Replace a new full battery when the system's power is too low, otherwise, it will turn off automatically. Use the battery module provided for ZK-E8800 only from the manufacture.

When replacing the battery, turn over the unit and put the bottom up, unscrew the two screws of the battery box, remove the old battery module, put in the new battery module and tighten the screw.

6.4 Instrument Crashes

When the instrument is in a state of crash or not being turned on (as the power supply is normal) or being turned off properly, remove the rubber cover and touch the reset button with the equipped tweezers, the instrument will resume normal operation.

7. Troubleshooting & Notes

7.1 Boot failure

- a. Check the external power supply, sure the socket is plugged in firmly and the instrument in power.
- b. Press the reset button with the tweezers and then turn on the instrument again.

7.2 Gas flow anomaly

After turning off the instrument, turn the instrument upside down. Use a small wrench to unscrew the purge tube cover to see if there is any residual packing in the seal groove of the purge tube. Check whether the O-ring used in the seal of the purge tube cover falls off. This will affect the seal. Tighten the cap and start the instrument.

7.3 Temperature anomaly

If the instrument gives out a prompt box of temperature anomal on the screen, click on the "ok" button and the instrument will turn of f, then turn it on again.

7.4 Humidity anomaly

If the instrument cannot be ready after the normal replacement of sieve material and prompt "Humidity Too HIGH, replace 1 # SM". Click **Maint.** → **Hum-COR**, details refers to Chapter 6.1.3 of user's Manual.

7.5 No response to entering a sampling paper

- a. Insert the sampling paper again, or use a new one;
- b. If the test paper cannot be entered into the right place, please restart the instrument.

7.6 False positives

Run **Mild** or **Severe** according to the actual situation.

Notes:

1. Do not open the air filter cap when the instrument is working.
2. When an alarm happened, remove the sample and discard it.
3. When the sampling paper severely deformed or discolored, do not re-use it.
4. When changing the sieve material, ensure the seal O-shape ring is not off and do not drain any sieve material in the seal tank of the air filters, if there are something of sieve material in the seal tank, please remove them out carefully with the tweezers.
5. After the instrument is in a state of ready each time, in the first, check if there is any contamination in it by using a new sampling paper for three times , if there are no false positives, it will be able to work properly.

Certificate

Certificate: Portable Threats Trace Detector

Product Model: ZK-E8800

Serial Number: _____

Manufacturer:

ZKTECO CO., LTD.

Implementation of Standards:

Inspection Conclusion:

Inspector and Inspection date:

Acceptance Card

Certificate: Portable Threats Trace Detector

Product Model: ZK-E8800

Serial Number: _____

Agents:

Purchasers:

Contact:

TEL:

Acceptance Conclusion:

Acceptance Person / Date:

Dear users:

Please fax or mail this card to the manufacturer in order to provide you better service.

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