Laboratory Equipment Manufacturer
www.mrclab.com

Operation Manual for
Proximate Analyzer

ELan-50A

PLEASE READ THIS MANUAL CAREFULLY BEFORE OPERATION

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Chapter 1 Performance and Characteristics of the Instrument

1.1 Applications

ELan-50A Proximate Analyzer is suitable to analyze the moisture, ash and volatile matter with large quantities in short time and to calculate the content of fixed carbon content and calorific value. It can be widely used in fields such as coal, electric power, metallurgy, petrochemical processing, geological prospecting, environmental protection, scientific research and education etc.

1.2 Performance Index

Maximum power: ＜4.5kW;

Range of Furnace Temperature: Room temperature～950℃; Resolution: 1℃

Precision of Temperature Control: ≤10℃;

Maximum Sample Quantity per carousel: Moisture /Ash: 16; Volatile matter: 10

Precision: Meet the requirement of Standard ISO562-12010 and ASTM D5142-2009

1.3 Features

1. High efficiency and test speed

ELan-50A Proximate Analyzer can analyze 16 samples simultaneously. It has a remarkable advantage in large scale test, which improves the efficiency greatly.

2. High precision and accuracy of test results

3. Reliable and stable performance

1）Communications between the analyzer and the host computer through USB-CAN port, the instrument has a strong anti-interference ability.

2）Adopting the unique sample conveying device, the performance of the instrument is stable, especially it has a sample-drop preventing device during the process of sending the volatile matter samples thus to improve the stability of performance.

4. Easy and safe operations

ELan-50A Proximate Analyzer adopted the automatic sample introduction and removal, sample weighing, manual participation is not necessary, Therefore, scalded by high temperature can be avoided and operator's eyes will not be injured by the infrared ray of furnace wires. It is safe and reliable.

5. User-friendly interface and powerful function

ELan-50A Proximate Analyzer System can be run on Windows XP, Windows 7 or above operating system, there are English prompt in the whole process. With friendly interface, it is easy to learn. With a high automation level, it can automatically conduct the rising, constant, cooling, and test data storage and processing. It also has the function of automatic alarm and protecting when over heating, thermocouple disconnected or counter connected.

6. Low malfunction rate

ELan-50A Proximate Analyzer structure has an optimal structure. Compared with similar products, it

has lower malfunction rate. Product quality is greatly improved.

7. Heating Thermal-insulation Material

Adopting the new-style alloy heating material which will hardly be oxidized under high temperature, it can avoid the oxidization of common furnace wire and the temperature rises very fast.

Chapter 2 Instrument Makeup and Working Principle

2.1 Composition of the Instrument

ELan-50A Proximate Analyzer consists of the host (internally equipped with Satorius analytical balance module), gas supplying unit, computer (including display) and printer.

2.1.1 Host structure

Mainly consists of sample weighing room, combustion furnace, analytical balance module, sample introduction device etc.

1. Sample weighing room: Mainly consists of sample weighing carousel and heat preservation device. It's used for weighing, heat preserving, cooling, or discarding of the samples.

2. Combustion furnace：For the heating of moisture / volatile matter samples, and the burning of ash samples;

3.Analytical balance module：Installed under the sample weighing carousel for weighing the samples. Its parameters are as follows:

Model: XX85-001 Measuring Range: 0~ 120g

Sensitivity: 0.0001g

4. Driving mechanism：Makes the combustion carousel and sample weighing carousel rotating stably, sample weighing carousel stably moves up and down, and the manipulator moves left and right as well as up and down.

2.1.2 Gas supply equipment

1. Provide by customers: Nitrogen, Oxygen
2. Air pump
3. Pressure Reducing valve (Measuring range: High-pressure gauge: 25MPa, Low-pressure gauge: 0.4Mpa)
4. Gas tube

2.1.3 Printer

Laser printer

2.1.4 Tools

Moisture /Ash crucible, Volatile matter crucible and crucible support, Sample ladle, Brush, Tweezers.

2.2 Working Process

System temperature will automatically be controlled to the constant-temperature point and keep the thermostatic stage according to the test content and method chosen by the user. After weighing, coal sample will be introduced into the combustion furnace by the driving mechanism. After the preset time, coal samples will be transferred to the sample weighing carousel for weighing. Then the corresponding index values will be calculated automatically.

Chapter 3 Installation and Debugging

3.1 Environmental Requirement

3.1.1 Working Environment

1. Temperature:（5～35）℃；

2. Humidity:≤85%；

3. Working environment shall be clean and tidy without smoke and raise dust (especially smoke from coal), also shall be free from strong magnetic field, vibration source and corrosive gas.

4. Working power supply

1）Heating power supply for high-temperature furnace: AC（220±22）V/（50±1）Hz，Instant maximum power: 4.5kW, more than 4.5kW dynamic power wiring and knife switch are required for control purpose.

2）The working power for the control of the host and computer : AC（220±22)V/（50±1)Hz, the phase for heating and for control should be separated.

3）Reliably ground wired.

3.1.2 Software environment

1. Operating system: WindowsXP, Windows 7 English Version or above

2. Basic configurations

- CPU：≥3.00 GHZ； Internal Memory：≥512MB；
- Display card ： standard VGA 1024×768 display mode；
- HD：80G or higher-level；
- Driver：double speed CD-ROM；
- Other equipment：USB interface, mouse and keyboard, etc.

3.2 Installation

3.2.1 Preparation before the installation

1. Set up special laboratory with the environment as per the requirement in 3.1.1.

2. The lab table should be horizontal and stable , 2m(L)×0.7m(W)×0.7m(H) cement working table is recommended.

3. Prepare a nitrogen cylinder（pressure ≤13Mpa), oxygen cylinder (pressure ≤13Mpa)

※ Pressure gauge should be prepared together with the cylinder.

※ The pressure gauge reading of nitrogen and oxygen cylinder must be over 3Mpa, otherwise a new cylinders are required.

3.2.2 Process of installation

1．Carefully take the instrument out of the packing box, place it onto the solid and reliable working table. Generally, the computer (the host, monitor and keyboard) are in the middle, the printer and ELan-50A on the left and right respectively for convenient operation.

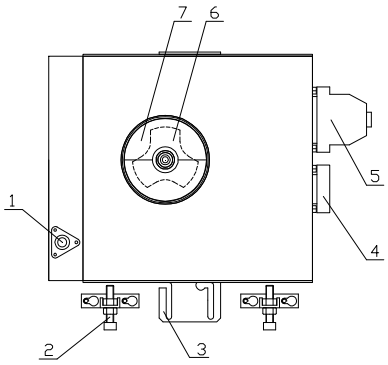
※ The instrument shall be unpacked by MRC on-site technician or MRC authorized technician.

※ After unpacking, please check the instrument and spare parts, and properly keep the documents for the balance module, computer, display, printer and other things as well as the packing materials.

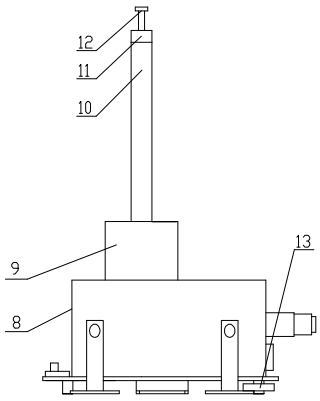
※ For the places that lack electricity, UPS is recommended.

2. Carefully check the wearing parts to see if they are intact.

3. Install the analytical balance.



（Top plan view）



（Front plan view）

1. Level Pillars
2. Tightening screw
3. Balance locating plate
4. Power port
5. Communication port
6. Sample weighing carousel
7. Balance reflex plate
8. Balance module
9. Balance Cover
10. Wind Shield Cover
11. Fixing ring
12. Sample weighing lever
13. Horizontal adjustment foundation

Fig.3-1 Balance Module Installation

a）Properly adjust the balance module to horizontal provided that the lab table is horizontal;

b）As shown in Fig.3-1, unloose the tightening screw and put in the balance module;

c）Adjust the height of the balance module Horizontal adjustment foundation to keep the balance horizontal.

※ During the test, avoid by all means to power off the balance module or tare exclude the balance module. It is suggested not to carry out any other operation after turning on the balance unless anything wrong with the balance or the balance needs to be reset (For the balance trouble shooting or setting methods, please refer to the Installation and Operation Manual of "Sartorius Electronic Balance ")

※ Properly keep the packing materials and spare parts of the balance!

4. Installation of the thermocouples, sample weighing lever, manipulator and sample discarding lever.

- Thermocouple installation

a）Open the upper cover of the combustion furnace and insert the thermocouple into the corresponding holes;

b）Connect the red wire of the compensating lead wire with the thermocouple "+" (Positive) pole with the other wire to be connected with thermocouple"-"（Negative）;

c）Fix the thermocouple mounting position and fasten the thermocouple connecting wire;

d）Check the compensating lead wire to see if it is mounted correctly and avoid direct contact with the heating furnace surface to burn out.

- Installation of the sample weighing lever, manipulator and sample discarding lever

a）Open the front cover →put the sample weighing lever into the frame → align the hole positions of the sample weighing carousel →install the balance reflex plate→ install the wind-shield cover and fix it by fixing ring →make sure the balance module keep horizontal, the weighing lever central position to be coincided with that of the sample weighing carousel → When the sample weighing carousel goes down, the weighing lever top shall be minimum (1-2)mm above the sample weighing carousel surface →fasten the balance module tightening screw.

b）Install the support rod and the protecting cover of the manipulator. When fastening the top screws, please use the special instrument screw driver, do not fasten them too tight. The best status is that the top screw just in contact with the milling flat of the quartz lever of the manipulator.

c）The installation of the sample discarding lever is similar with that of the manipulator.

※ When installing the wearing parts such as sample weighing lever, manipulator and sample discarding lever, only when the position of the holes are properly aligned can you start the motion control, or else mechanical failures can't be avoided.

5. Installation of the gas supply device and centrifugal fan

- Installation of the gas supply device

a）For ash test or moisture test by air supplying, the installation of the air supply system of the combustion furnace based on the circuit is shown in Fig.3-2：

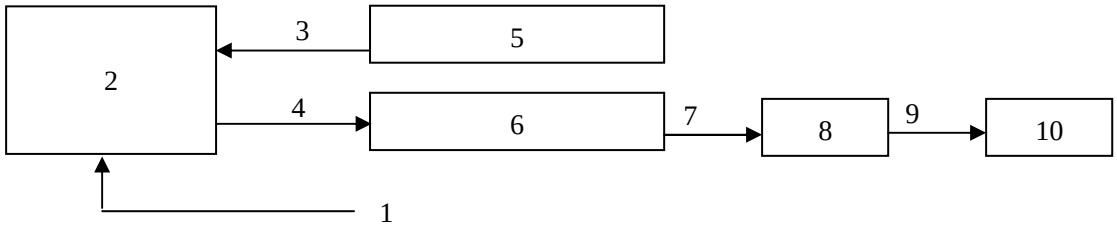


Fig. 3-2 Circuit Diagram

1 Air Inlet　　2 Air Pump　　3 Power Wire　　4 Tube

5 Connect with the pump power port of the instrument

6 Connect with the air inlet port of the instrument

7 Tube　　8 Flow Meter　　9 Tube　　10 Combustion Furnace

b）For Moisture test by nitrogen drying method and volatile matter test with ASTM standard, the installation flow chart of gas supply system of combustion furnace is shown in Fig.3-3：

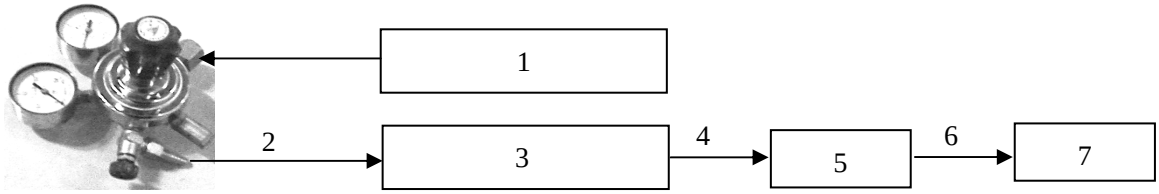


Fig.3-3

1 Connect with the nitrogen cylinder 2 Tube

3 Connect with the nitrogen inlet port of the instrument

4 Tube 5 Flow Meter 6 Tube 7 Combustion Furnace

c）For ash test with ASTM standard by oxygen supplying, the installation flow chart of gas supply system of combustion furnace is shown in Fig.3-4：

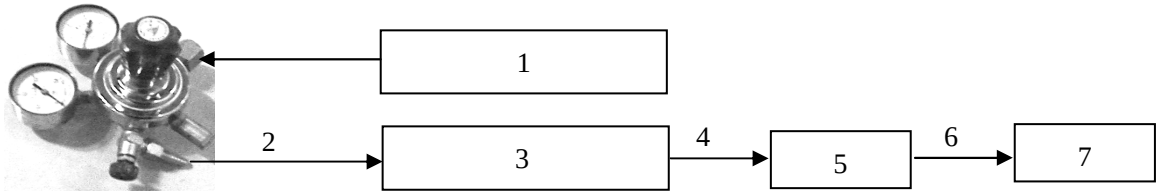


Fig.3-4

1 Connect with the oxygen cylinder 2 Tube

3 Connect with the oxygen inlet port of the instrument

4 Tube 5 Flow Meter 6 Tube 7 Combustion Furnace

※ Nitrogen and oxygen supplying devices shall be equipped with standard pressure gauge

※ Turn off the gas valve before the installation of the pressure gauge. When the gas circuit is installed, adjust the relief valve to 0.1Mpa.

- Installation of the centrifugal fan is shown in Fig.3-5

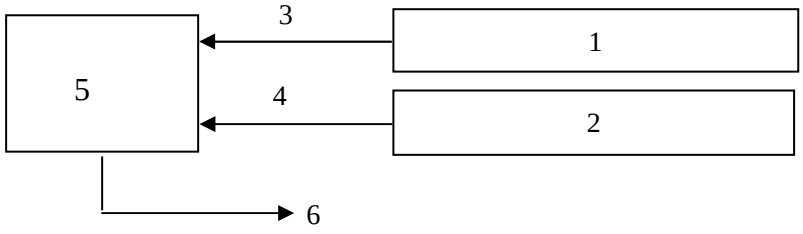


Fig. 3-5

1 Connect with the centrifugal fan power interface of the instrument

2 Connect with the smoke exhausting pipe port of the instrument

3 Power Wire 4 Superior rubber hose

5 Centrifugal fan 6 Smoke exhausting vent

6. Recheck the components to see if they are installed in right position and check the gas circuit to see if the pipes are properly connected.

7. Connect the instrument control power cable, heating power cable, USB-CAN card communication line, balance communication line, and check the instrument to see if it is reliably grounded. After that, please turn on the computer and instrument power and install the software.

3.2.3 Software installation and uninstallation

1. Software installation

a）The host software: Insert the software CD into CD-ROM drive, use the “Explorer” to open the “ELan-50A Proximate Analyzer” file under the CD-ROM drive directory, double click “setup. Exe” to enter into the installation program, then just select “Next” until “Finish” according to the prompt information, after all of that, the software has been installed.

b）Install balance module control software according to the installation instructions in the CD.

2. Uninstallation of the software

Click “Control panel”, “Program” , select “Change or Delete Program” label, click item “ELan-50A Proximate Analyzer” in the program group, then click “Delete” button to perform the uninstallation. Delete the program group and shortcut of ELan-50A Proximate Analyzer according to the prompt.

3.3 Instrument Debugging

3.3.1 Instrument debugging process

The debugging process of the instrument is as follows after successfully online:

1. Preparations

a）Check the control circuit and power circuit to see if they are connected properly.

b）Test tools: Moisture /ash crucibles, volatile crucibles, sample ladle, brush, tweezers and so on.

2. Hole alignment

a）Adjust the manipulator platform to keep the manipulator in the middle of open slot at the inlet of the combustion furnace bottom.

b）Adjust the manipulator left-right rotation position sensor to make the manipulator crucible holding device into a line with the center of manipulator support rod, combustion carousel and sample weighing carousel.

c）Adjust the manipulator middle rotation position sensor, when manipulator acts left-right rotating, the crucible holding device should not touch the furnace door or the crucibles on the sample weighing carousel.

d）Adjust the combustion carousel rotation position sensor and manipulator right rotation position sensor. When the manipulator in the middle of open slot at the inlet of the combustion furnace underpin, move the manipulator which already in the left position and lift lower position to the location below the combustion carousel. Then, adjust the combustion carousel rotation position sensor and manipulator horizontal right

position sensor based on the offset between the manipulator and combustion carousel sample hole to keep the manipulator in the middle of each sample hole of the combustion carousel.

e）Adjust the manipulator horizontal left position sensor and sample weighing carousel position sensor to keep the manipulator in the middle of each sample hole of the sample weighing carousel.

f）Adjust the height and position of the manipulator crucible holding device .When the manipulator is lifted up, the hold-up tightness of the volatile crucible shall be exactly fit and the holding sheet to be located in the middle of the crucible cover.

g）Adjust the all-around position of the balance module of sample weighing carousel to keep the sample rod under the sample hole.

h）Adjust all-around position and height of the sample discarding rod to keep it under the sample discarding hole.

i）After hole position alignment at normal temperature, heat the combustion furnace up to 920℃ before hole alignment in accordance with points（1～8) to ensure the relative positions between the various sample carousels and manipulators can meet the test requirement.

j）After hole position alignment is done, adjust the manipulator rotation and shift limit switch. When the manipulator is lifted to the higher level, rotate or shift it up to the target carousel. When it is in touch with the limit switch, the manipulator remains inside the target sample carousel hole to ensure no damage to the manipulator in abnormal condition.

3. Detect the rotation positioning state of the sample weighing carousel, combustion carousel, when the sample weighing carousel and combustion furnace are kept in normal temperature or test Max. constant temperature to ensure narrow and wide Hall positioning normally.

4. When the combustion furnace is kept in normal temperature or test Max. constant temperature, test 32 sample carousel hole positions with moisture /ash crucible and volatile crucible to avoid crucible turn over.

5. Check and calibrate the precision and accuracy of the instrument:

a）For the details of the operating procedures, please refer to Chapter 6.

b）Select 3~ 5 first-grade standard coal CRM samples, each coal sample shall be tested for 2 groups, each group of test will be repeated twice to check the test repeatability, reproducibility and accuracy. If they fail to meet the requirement, the instrument shall be rechecked and adjusted.

3.3.2 Installation and Debugging notices

1. Before the installation, take out of the instrument shock-proof sponge and masking tape, etc as prompted.

2. Before system power on, check the field power supply line to see if it is ground wired properly.

3. Before the balance module installation, check the balance module set parameters to see if they are up to instrument test requirement.

4. Before debugging with power on, if any big looseness of the installation position of any of the

mechanical parts due to transportation, fine adjustment should be done to avoid mechanical failure arising from the misoperation of manual detection.

5. When adjusting the position card, the ideal induction spacing between the Hall and magnetic steel is （2～3)mm.

6. After the complete machine is debugged, please fasten all screws and nuts.

Chapter 4 Operation of the System

4.1 The Enablement and Exit of the Measurement and Control Software

4.1.1 Enablement

Way 1: Click the Windows "Start" → "Program"→ "MRC"→ click the "ELan-50A Proximate Analyzer" to enter the main interface as shown in Figure 4-1.

Way 2: Directly double-click the shortcut icon called "ELan-50A Proximate Analyzer" on the computer desktop, you can also enter into the testing environment as shown in Figure 4-1.

4.1.2 Exit

Click the menu item "Exit system", select "Yes" to exit the measurement and control software for "ELan-50A Proximate Analyzer", and back to the Windows desktop.

※ The measurement and control software shall be shut down before exiting the Windows or turn off the computer in order to ensure the test data and parameter file not be destroyed.

4.2 Description of Functions of the Main Window

The main window of the ELan-50A Proximate Analyzer measurement and control software mainly consists of title bar, menu bar, shortcut button column, the status bar, the data filed, etc. as shown in Figure 4-1:

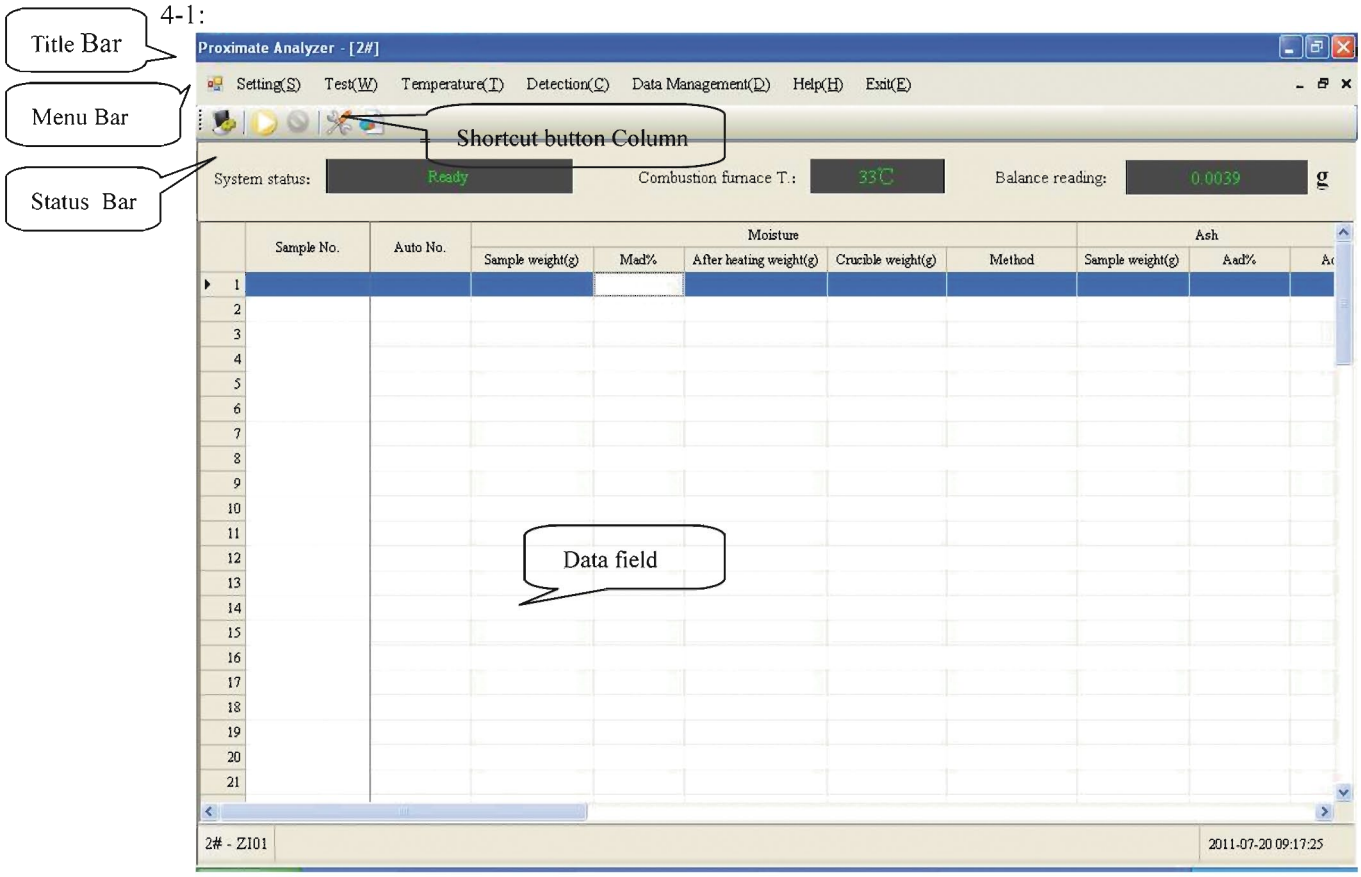


Fig.4-1

The data field is provided with column width adjustment, column hiding or display functions. When the

cursor is shifted to the data field, right click to pop up the menu as shown in Fig.4-1-1.The functions are described in details as follows:

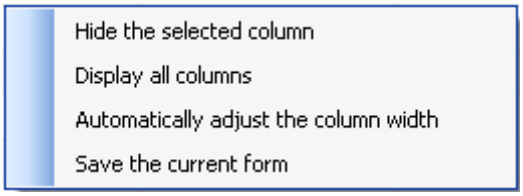


Fig.4-1-1

1. Hide the selected column: Click the cell to be hidden from the data field at the main interface, then right click to select “Hide the Selected Column” and the selected column will be immediately hidden.

2. Display all columns: Shift the mouse to the data field at the main interface, right click to select “Display All Columns”, then all hidden columns will be displayed and the data field will come back to the initial state.

3. Automatically adjust the column width: Shift the mouse to the data field at the main interface to select this item, all columns will be automatically adjusted to the proper width to solve the problem of hard to restore after manual adjustment of the column width.

4. Save the current form: Shift the mouse to the data field at the main interface and select this item, to save the position and width of the displayed column, and if restart software the form will not be changed.

Besides, you can array freely the data field at the main interface based on the actual test index by selecting the column field, such as “Mad %”, press and hold the left mouse button to shift the column to the position to be arrayed.

4.3 Menu introduction

4.3.1 Settings

Click “System Setting” in the main menu to enter the menu as shown in Fig.4-2

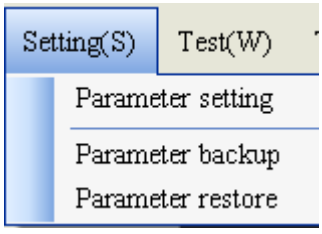


Fig.4-2

4.3.1.1 Parameter setting

Select “Parameter setting” or click “Parameter setting” button  in Shortcut bar to enter into the setting window as shown in Fig.4-2-1.

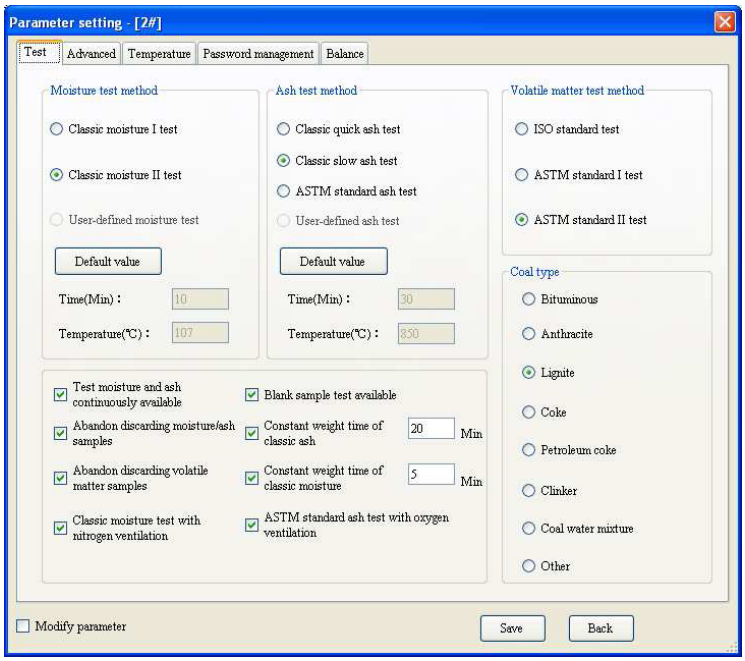


Fig.4-2-1

1. Test tab

- Moisture test method

a）Classic Moisture I: Introduce the sample at or below the constant temperature. Constant temperature is 105℃～110℃ with heating time of 60 minutes. Gases in the furnace should be nitrogen or air (Air change rate should be 15 times per hour. If the coal sample is lignite, nitrogen must be supplied.)

b）Classic Moisture II: Introduce the sample at or below the constant temperature. Constant temperature is 105℃～110℃ with heating time of 90 ~120 minutes. (Adjustable in menu “setting”, “Advanced”), Gases in the furnace should be nitrogen or air (Air change rate should be 15 times per hour. If the coal sample is lignite, nitrogen must be supplied.)

c）User-defined: Introduce the sample at or below the preset temperature. Preset temperature could be between 80℃～150℃ with heating time user- defined (which can be set between 5 ~120 minutes). Gas in the furnace is air. It is applicable for the moisture routine analysis of bituminous, the heating time can be set as required and ending of the test can be timing ending. Click the “Default Value” button, the constant temperature is set at 107℃, the heating time is set as 30 minutes.

- Ash test method

a）Classic Quick ash test: Sample introducing temperature can be set manually according to the requirement (In menu “Setting”, “Advanced”, setting range could be 100℃～815℃, samples will be introduced at or below the set value. Constant temperature should be （815±10）℃. Combustion time is 40 minutes (can also be adjusted in menu “Setting”, “Advanced”), gas in the furnace is air.

b）Classic slow ash test: Sample introduced at temperature not higher than 100℃, heat up to 500℃ in more than 30minutes, then keep for 30 minutes under temperature of 500℃, then heat up to （815±10）℃ and combust for 1 hour. Gas in the furnace is air.

c) ASTM standard ash test: Sample introduced at temperature not higher than 100℃, gas in the furnace is either pure oxygen or air (flow rate of oxygen should be 0.4 ~0.8 furnace volume / minute, flow rate of air should be 2~4 furnace volume / min), heat up to 500℃ within 1 hour, and heat up to 750℃ at the end of the second hour (950℃ for coke). The total test time can be adjusted in menu “Setting”, “Advanced”.

c）User-defined: Combustion time and constant temperature point can be set as required. Click the “Default Value” button, the user-defined ash temperature can be automatically set at 850℃ and heating time set as 30 minutes. Gas in the furnace is air.

- Volatile matter test

  a）ISO standard test: Sample introduced at 900℃, heat for 7 minutes at 900℃. During the test, no gas supplied.

  b)ASTM standard Ⅰ test：Sample introduced at（950±20）℃，heat for 7 minutes at 950℃，Gas supply in the furnace is nitrogen；

  c)ASTM standard Ⅱ test：Sample introduced at temperature below 100℃ and heat up with the rate of 25℃/min until 600℃, then at the rate of 35℃/min until（950±20）℃， heat for 6 minutes under this temperature and then take out. Gas in the furnace is nitrogen。

- Coal type

a）Lignite: Set this item, the moisture testing method will be automatically set at the “Classic Moisture Test” and “Classic Moisture with Nitrogen” option. “User-defined” for moisture and ash can’t be selected.

b）Ash: Set this item, the ash test method will be automatically set at “User-defined” and the volatile matter test method will be set as “ISO Standard test”. “ASTM standard ash test” can’t be selected.

c) Petroleum coke: Set this item, the volatile matter test method will be set as “ISO Standard test” and the test temperature will be controlled at 850℃ automatically.

d) Coal Water Slurry：If chose this item, volatile matter test method will be set as “ISO standard test”, “ASTM standard ash test” can’t be selected.

e）Other: If this item is selected, volatile matter test method will be set as “ISO standard test”, “ASTM standard ash test” can’t be selected.

- Test Moisture and Ash continuously available

When this mode is set and “User-defined” method for moisture test， “User-defined” or “Classic quick ash test” or “ASTM Standard ash test” method can only be selected for ash testing. And while “Classic

Moisture I/ Classic Moisture II" for moisture test， "Classic slow ash test ", "Classic quick ash test" or "ASTM standard ash test" method can be selected for ash test.

- Blank sample test available

Only when this tab is selected and saved can blank sample test be allowed, otherwise, the blank sample test cannot be conducted.

- Abandon discarding sample

If this tab is selected and saved, after calculating the test results of moisture, ash and volatile, the sample discarding device will not conduct the sample discarding motion.

- Classic moisture test with nitrogen ventilation

After the gas supply system is connected properly, set this tab. The system will ventilate nitrogen according to the heating time during the "Classic Moisture I" or "Classic Moisture II".

- Constant weight time of classic ash/moisture

Select this check box and set correspondingly the constant weight time. When moisture test and ash test by Classic method, the system will handle the constant weight item based on the set time.

- ASTM standard ash test with oxygen ventilation
- After the gas supply system is connected properly, if this tab is selected, when test method is "ASTM standard ash test", the test method is set with oxygen ventilation while not the defaulted air ventilation.
- Modify Parameter

Click this option, enter the password, then the parameters can be modified.

2. Advanced tab as shown in Fig.4-2-2:

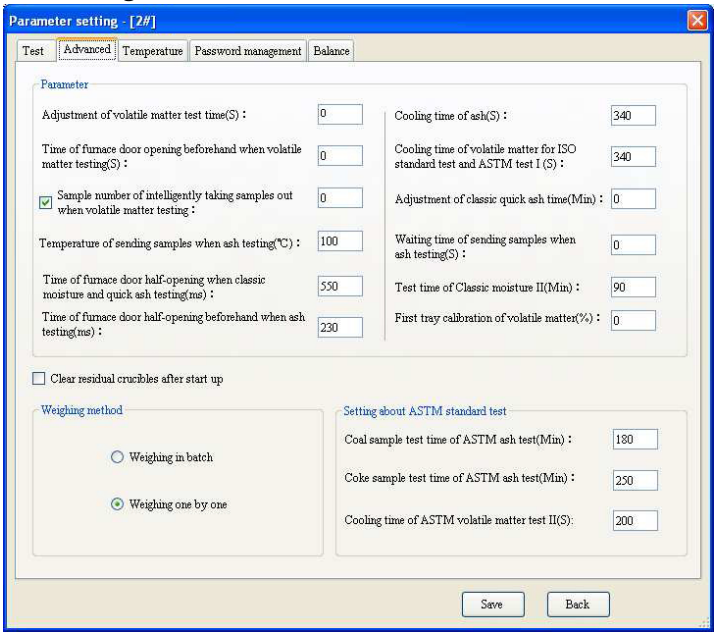


Fig.4-2-2

- Weighing method:

a）Weighing one by one: Weighing the crucible mass and sample mass one by one at current weighing position until finishing the preset number samples weighing.

b）Weighing in batch: Weighing all placed crucibles' mass at first, then weighing the sample mass one by one until finishing the weighing.

- Clear residual crucibles after start up:

If this tab is selected and saved, start the measurement and control software to enter the software main interface. If the system is under the enable status, the residual crucibles in combustion carousel and sample weighing carousel will be removed automatically.

3. Temperature tab as shown in Fig.4-2-3:

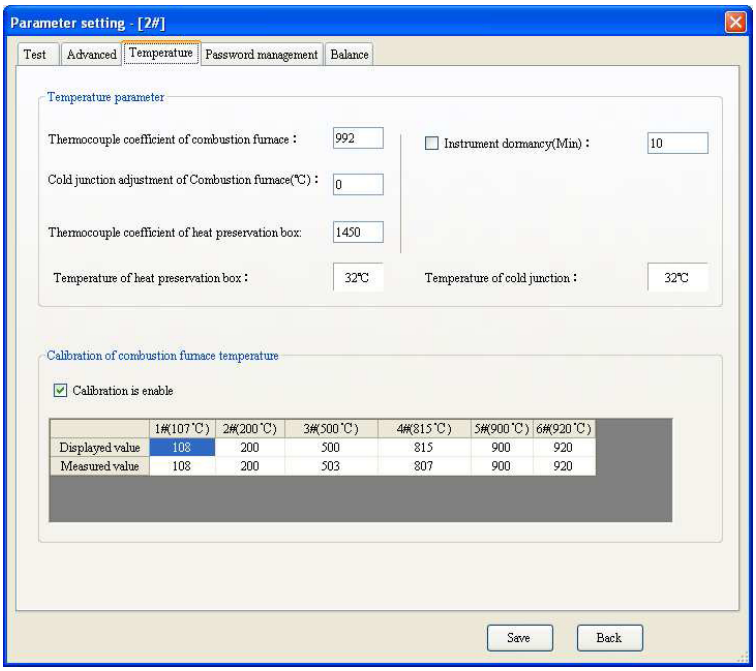


Fig.4-2-3

- Temperature parameters

a）Thermocouple coefficient of combustion furnace and heat preservation box: To adjust the deviation between the displayed temperature and actual temperature of combustion furnace or heat preservation box. If up the thermocouple coefficient, the actual temperature will drop, conversely the actual temperature will go up.

b）Cold junction adjustment of combustion furnace: The adjustment can only be done at ambient temperature. It's used for the calibration of the D-value between the tested temperature at ambient temperature and working temperature.

c）Instrument dormancy: If the instrument is in high-temperature status but not working, the system will enter into dormant status according to the presetting time to protect the combustion furnace.

d）Temperature of heat preservation box and cold junction: To display the current temperature of heat preservation box and cold junction.

- Calibration of the combustion furnace temperature:

It’s used to calibrate the deviation between the actual temperature of the combustion furnace and the tested temperature by standard thermocouple at different control temperature. The tab “Calibration enabled” will be available.

4. Password management tabs as shown in Fig.4-2-4:

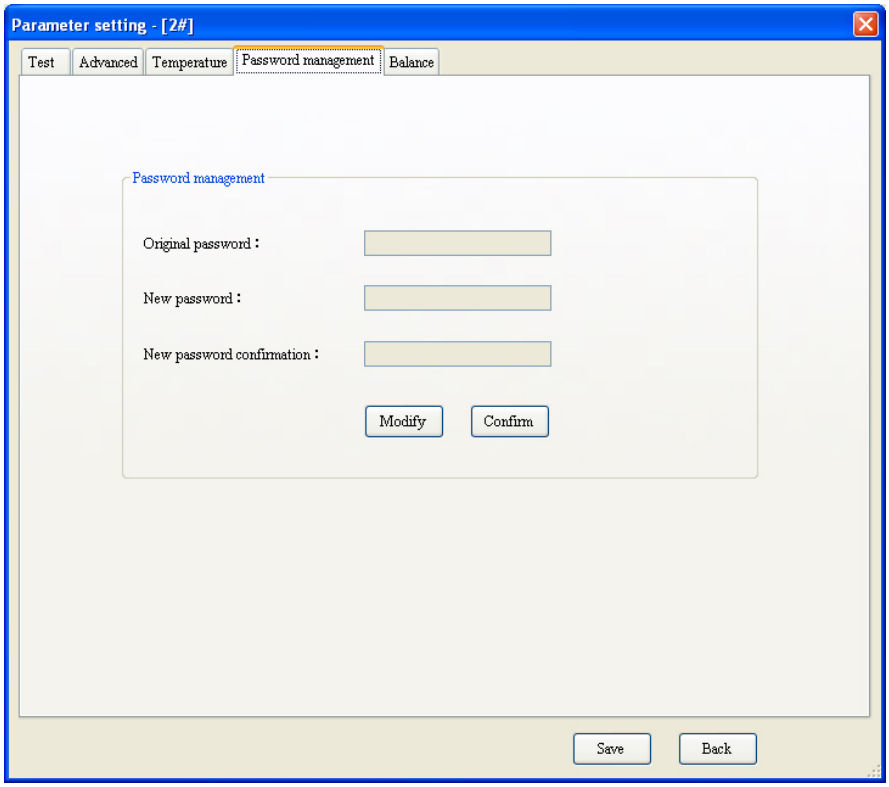


Fig.4-2-4

a）Original password: Input original password.

b）New password: Input new password.

c）New password confirmation: Input new password again.

d）Modify: Click this button to enter into the password modification status.

e）Confirm: Click this button to save the new password.

5. Balance Tabs as shown in Fig.4-2-5:

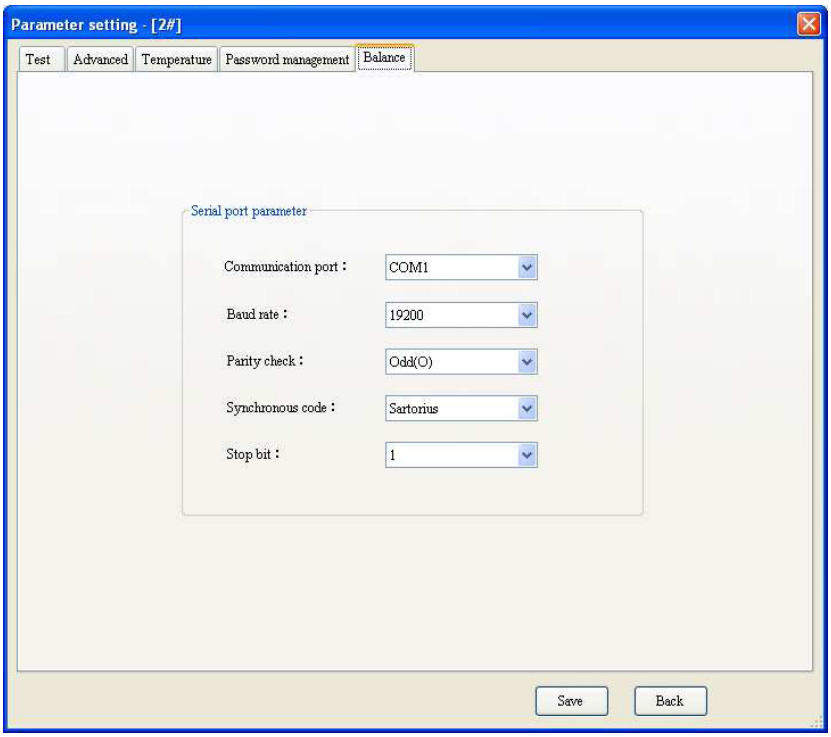


Fig.4-2-5

Serial port setting: When the connection between the balance module and computer is proper, and the communication port, baud rate, calibration, synchronous code and stop bit correspond with the actual connection of balance module and parameters of balance module, the weight of the measuring value of the balance module will be shown in the status bar of main interface, or else offline will be displayed.

4.3.1.2 Parameter backup

Click this menu item, all parameters in system setting will be backup to avoid lose.

4.3.1.3 Parameter restore

Click this menu item, the parameters in system setting will be restored to the previous backup status.

4.3.2 Test

Click “Test” in main menu, there will pop up the drop-down submenu as shown in Fig.4-3:

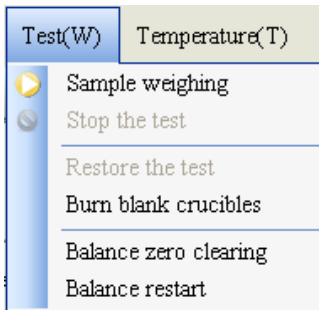


Fig.4-3

1. Sample weighing

Select this menu or click “Sample weighing” button in shortcut button to pop up the window as shown

in Fig. 4-3-1.

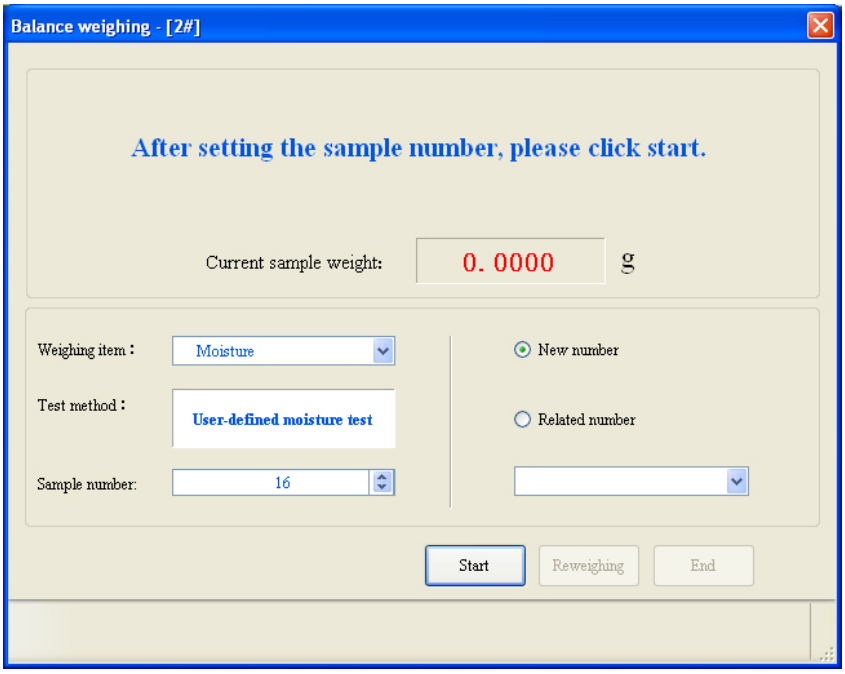


Fig.4-3-1

a）Weighing item: To set the current weighed index.

b）Test method: To display the analysis method of current weighing item.

c）Sample number: To set the total number of the current weighing samples. Directly input sample number into Edit box (Max. number for moisture or ash is 16, Max number for volatile matter is 10), or click the Up and Down buttons on the right of the Edit box to change the number of the samples.

If the samples are under weighing but not all the samples have been weighed yet, Click the Up and Down buttons on the right of the Edit box can also change the total number of the samples to add or reduce the total number of the samples.

d）New number: It will not be related with other index data number, new automatic number will be formed in the data field.

e）Related number: It will be related with the displayed data number to facilitate the conversion between the air-dry basis and dry basis. For example, when only ash is being tested, select “Related number” check box, click the pull-down button on the right of this column and select the corresponding moisture No. in the pull-down column, click “Start” and weigh the samples. Then, the weighed ash data will be displayed automatically in the corresponding moisture data field. When the test results are displayed, the ash and volatile matter values air-dry basis and dry basis will be automatically conversed.

f）Reweighing: If the samples need to be reweighed due to the wrong operation, take out the crucible and clear the sample weighing carousel, then click this button and put in the crucible and samples again as prompted.

g）End: If the weighing of specified number of samples are not finished, click this button to end the weighing ahead of schedule.

h）Click the "×" in the window to close the sample weighing window and exit the test.

Attentions:

※ During sample weighing, the moisture/ash and volatile samples and crucibles shall be placed in accordance with the prompt message.

※ During the ash or volatile test, if moisture test not done, please input moisture value in the data field manually.

※ During the test please do not turn off the balance module power.

※ During the test, to hit or beat the instrument is prohibited.

2. Stop the test

If stopping the test required due to certain reasons, select this menu item or click "Stop test" button in the shortcut button bar and prompt will be popped up as shown in Fig.4-3-2.

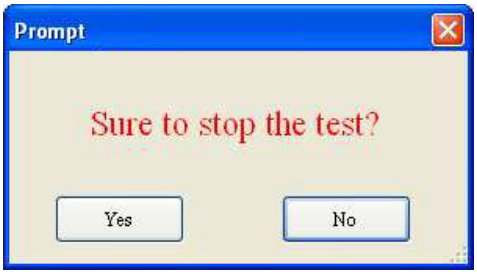


Fig.4-3-2

After click "Yes" button, the system will stop the current test immediately, and if click "No" button, the system will back to the current test status.

3. Restore the test

If samples already weighed but no put in the combustion furnace by manipulator, and samples in the sample weighing carousel are not conveyed due to the abnormal occurrence (such as power failure), restart the measurement and control software, click the submenu "Restore the test", this batch of samples can be restored to test status before abnormal occurrence.

4. Burn blank crucible

If other impurities stay in the crucible used for test and it's difficult to clear, select this item in menu to enter into the window as shown in Fig.4-3-3.

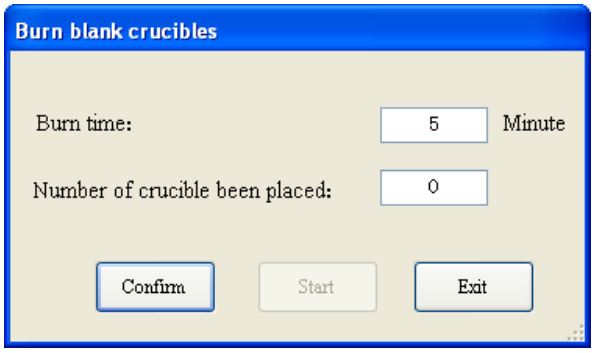


Fig.4-3-3

a）Burn time: To set the combustion time of crucible which will be burnt the combustion furnace.

b）Number of crucible been placed: When the cursor stays in the "Confirm" button, after pressing this button or the red confirm button in sample place panel of the mainframe (at most 16 crucible can be placed), the total number of crucible been placed will be displayed in this column.

c）Operation process

Place the crucibles need to be burnt to the weighing position according to the prompt message →Press the red confirm button or the "Confirm" button in "burn blank crucible" window →After placing the blank crucible need to be burnt (the total crucible number will be displayed in the column of number of crucible been placed bar), please click "Start" button in this window → the system will automatically introduce the placed crucible to the combustion furnace for burning, when the preset combustion time is up, the system will automatically send the crucibles in the combustion furnace to the sample weighing carousel and "burning is finished" will be prompted.

During the burning crucible process, if you click "Exit" button, the system will pop up "Are you sure exit the burning crucible process?", click "Yes" to exit the process, click "No" to back to the window.

5. Balance zero clearing

When the balance is on line normally, click this menu item to automatically zero clear the balance.

6. Balance restart

When the balance is on line normally, click this menu item to automatically restart the balance.

4.3.3 Temperature

Click "Temperature" main menu, drop-down submenu will be popped up as shown in Fig.4-4:

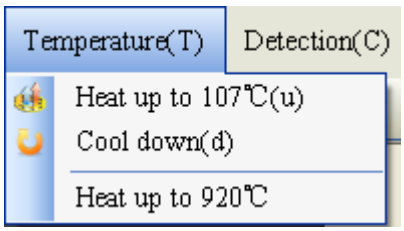


Fig.4-4

1. Heat up to 107℃

Check the heat components of combustion furnace to see if they are working normally or not. Usually, it's not needed to click this item during the test. If this item is selected, the combustion furnace will automatically be heated up to 107℃ and enter into constant temperature status.

2. Cool down

When the combustion furnace is not under testing and in "Heating /Constant temperature" status, select

this item in the menu, the combustion furnace will stop heating and be in Ready Status.

3. Heat up to 920℃

If aligning hole debugging or temperature test needed, press combination keys “Ctrl+Alt+t” to enter into the main interface of measurement and control software before the system function operation, then “Heating up to 920℃” submenu will be added automatically to “Temperature”, and click this submenu, the window popped up is as shown in Fig.4-4-1, then the target temperature can be set as required. Click “Yes” and after the combustion furnace heated up to the setting temperature, system will automatically enter into constant temperature status; Click “No”, the combustion furnace will not be heated up.

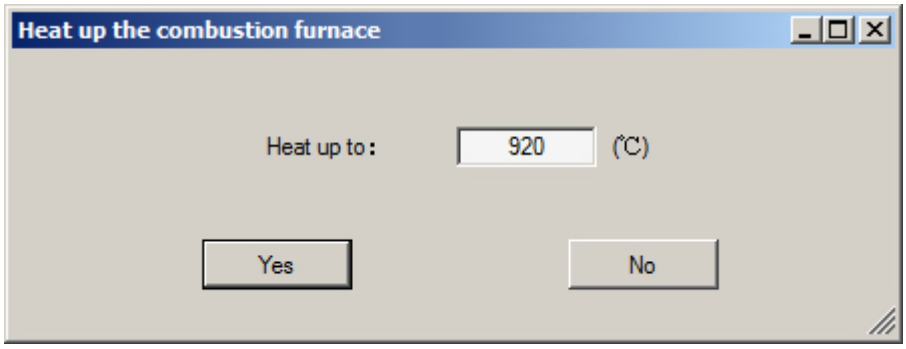


Fig.4-4-1

4.3.4 Detection

Click “Detection” menu, the drop-down submenu will be popped up as shown in Fig.4-5:

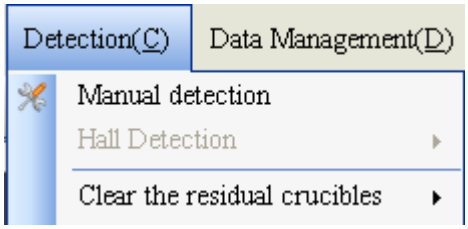


Fig.4-5

1. Manual detection

Select this menu item or click the button “Manual detection” in the shortcut button bar to enter into the manual detection window as shown in Fig. 4-5-1， where you can detect the system functional components to see if they are working normally. The kinematics of various mechanisms is described as follows:

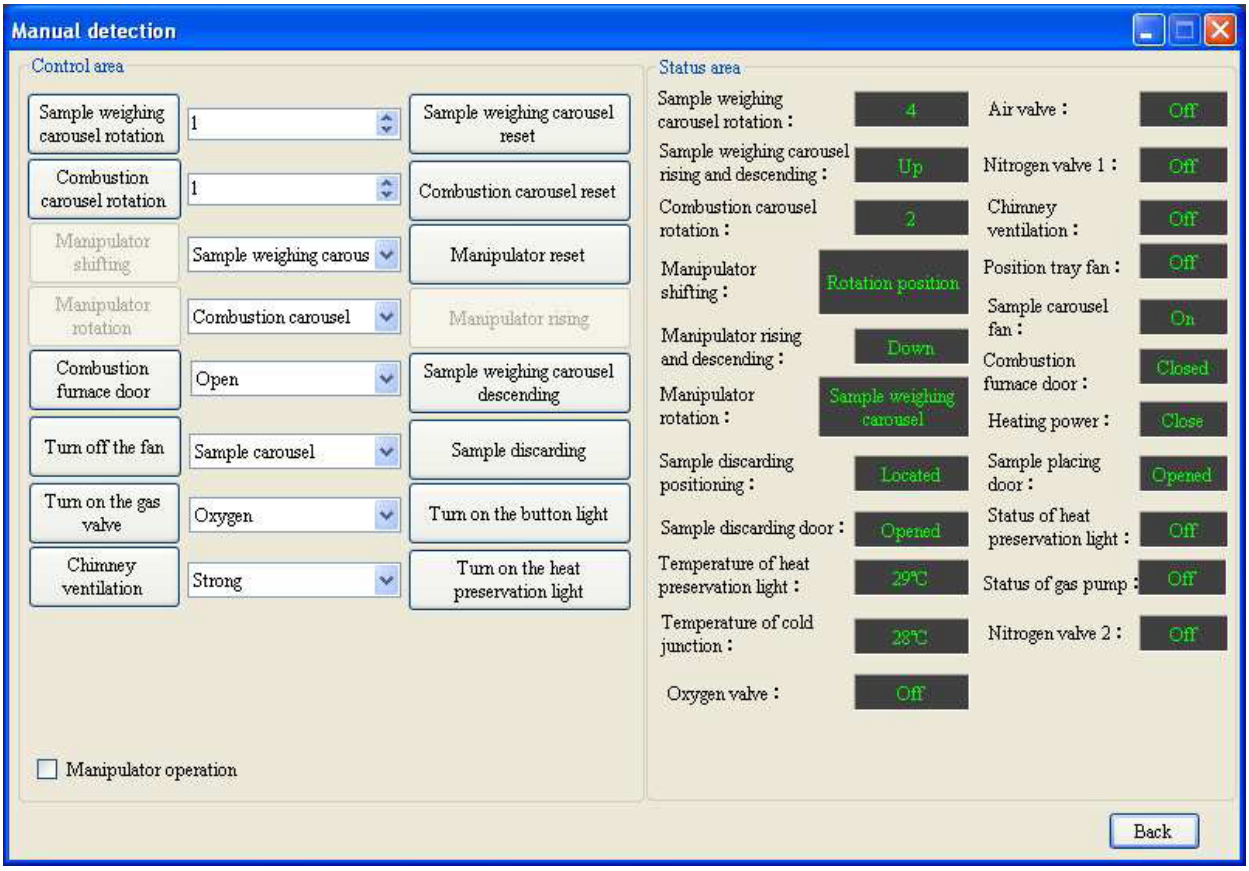


Fig.4-5-1

- Sample weighing carousel

a）Sample weighing carousel rotation: Input the number of the holes to be rotated or click on the right, and click “Sample weighing carousel rotate” and then the sample weighing carousel will be rotated clockwise to the specified number holes and then stop rotation.

b）Sample weighing carousel reset: Click this button and the sample weighing carousel will be rotated to the initial position.

c）Sample weighing carousel up/ down: Click this button, the sample weighing carousel will go up/down. When the sample weighing carousel reaching the Top position or Bottom position, it will automatically stop going up or down.

- Combustion carousel

a）Combustion carousel rotation: Input the number of the holes to be rotated or click on the right, and click “Combustion carousel rotate” and then the combustion carousel will be rotated clockwise up to the specified number of grids and then stop rotation

b）Combustion carousel reset : Click this button and the combustion carousel will be rotated to position No.1.

c）Open /Close the combustion furnace door: Click this button to open or close the combustion furnace

door until the furnace door is in the positioned status.

- Manipulator

Manipulator operation: Only after this check box is selected and correct password is input can the manipulator be operated.

a）Manipulator shift right /left: If the combustion furnace door is open to the positioned status, when the manipulator is in the rotation position or left position, select “combustion carousel” and click “Manipulator shift” and the manipulator will be horizontally shifted to the combustion furnace and will be stopped after it comes to the right position. When the manipulator is in the rotation position or right position, select “sample weighing carousel” and click “Manipulator shift”, the manipulator will be shifted to the sample weighing carousel and will be stopped when it is comes to the left position.

b）Manipulator rotate: Select the sample weighing carousel or combustion carousel and click the “Manipulator rotate”, the manipulator will move to the center, then rotate toward the direction of sample weighing carousel or combustion carousel, after the position is fixed, it will be stopped.

c）Manipulator up / down: Click this button , the manipulator will go up or down vertically； When the manipulator reached the top position or bottom position, it will stop going up or down automatically.

d）Manipulator initialization: When the system is in Enable status, click this button and the manipulator will be rotated to the central point and going down to the Bottom position.

- Others

a）Turn on / off the fan: Select “Sample carousel fan” and “Code wheel fan” switch, click “Turn on the fan” to check the combustion carousel, code wheel, cooling fan and the fan in the back cover of the instrument if they are working normally or not.

b）Chimney ventilation: Select strong/ weak or close chimney ventilation in “▼”, click the chimney ventilation button to see if the smoke exhauster controller is working normally.

c）Turn on the gas valve: Select Oxygen valve and click “Turn on the gas valve ”， then you will hear “Tang ”， and the Oxygen valve/Air valve is on, allowing the air/oxygen to be supplied to the high-temperature furnace. Click this button again to turn off the oxygen valve and stop oxygen/air supply; If nitrogen valve is select and do the same operation, the high-temperature will be filled with nitrogen.

d）Sample discarding: Click sample discarding button and the samples will be discarded.

e）Turn on /off button light：Click the “Button Light on” button，the confirmation light at the sample placing door will be on, click again this button and the confirmation light will be off.

f）Turn on/off heat preservation light: Click the “Turn on heat preservation light” button to turn on the heat preservation light which installed in the sample weighing room; And click this button again, the current status of the heat preservation light will be displayed in the right status region.

Status region: To display the current position or working status of the left components.

Back: Click this button to exit manual test interface and back to the test window.

2. Hall detection

Select the “Sample weighing carousel” or “Combustion carousel” of the “Hall detection” submenu of the “Detection” main menu, the system will separately detect the rotation position Hall status of the combustion carousel or sample weighing carousel. Select “Hall detection for all”, the system will simultaneously detect the rotation position Hall status of the combustion carousel or sample weighing carousel.

3. Clear the residual crucible

Select the “Sample weighing carousel” under the “Clear the left-over crucible” submenu of the “Detection” main menu, the system will separately clear the crucibles from the sample weighing carousel. Select the “Sample weighing carousel”, the system will separately or simultaneously clear the crucibles from the sample weighing carousel and combustion carousel.

4.3.4 Data management

“Data management” is designed for the effective management of the testing data. In the course of the test, to access and query to the database is allowed, and for the detailed functions please see Chapter 5.

4.3.5 Help

Click “Help” main menu, the window as shown in Fig.4-6 will be popped up:

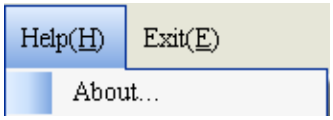


Fig.4-6

1. About: Click this item to obtain the information about the measurement and control software. Click “Yes” to come back to the main window.

4.3.6 Exit

Click this menu and the window as shown in Fig.4-7 will be popped up:

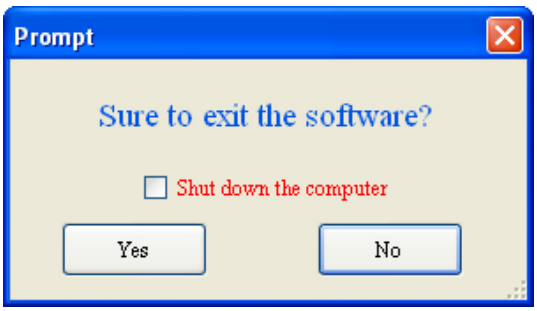


Fig.4-7

Click “Yes” to exit the measurement and control software and to come back to the computer desktop; Click “No” to come back to the main interface of measurement and control software.

Select “Shut down the computer” then click “Yes”, the system will first exit the measurement and control software, then shut down the computer automatically.

※ When the computer is power on， do not pull out the board card so as to avoid any damages to the computer and the corresponding circuit board.

Chapter 5 Data Management

5.1 Main interface

In the main interface of measurement and control software, click the “Data management” menu or the shortcut bar “Data management” button to enter into the main window as shown in Fig.5-1. It mainly consists of title bar, menu bar, shortcut button bar, data field and status bar, etc.

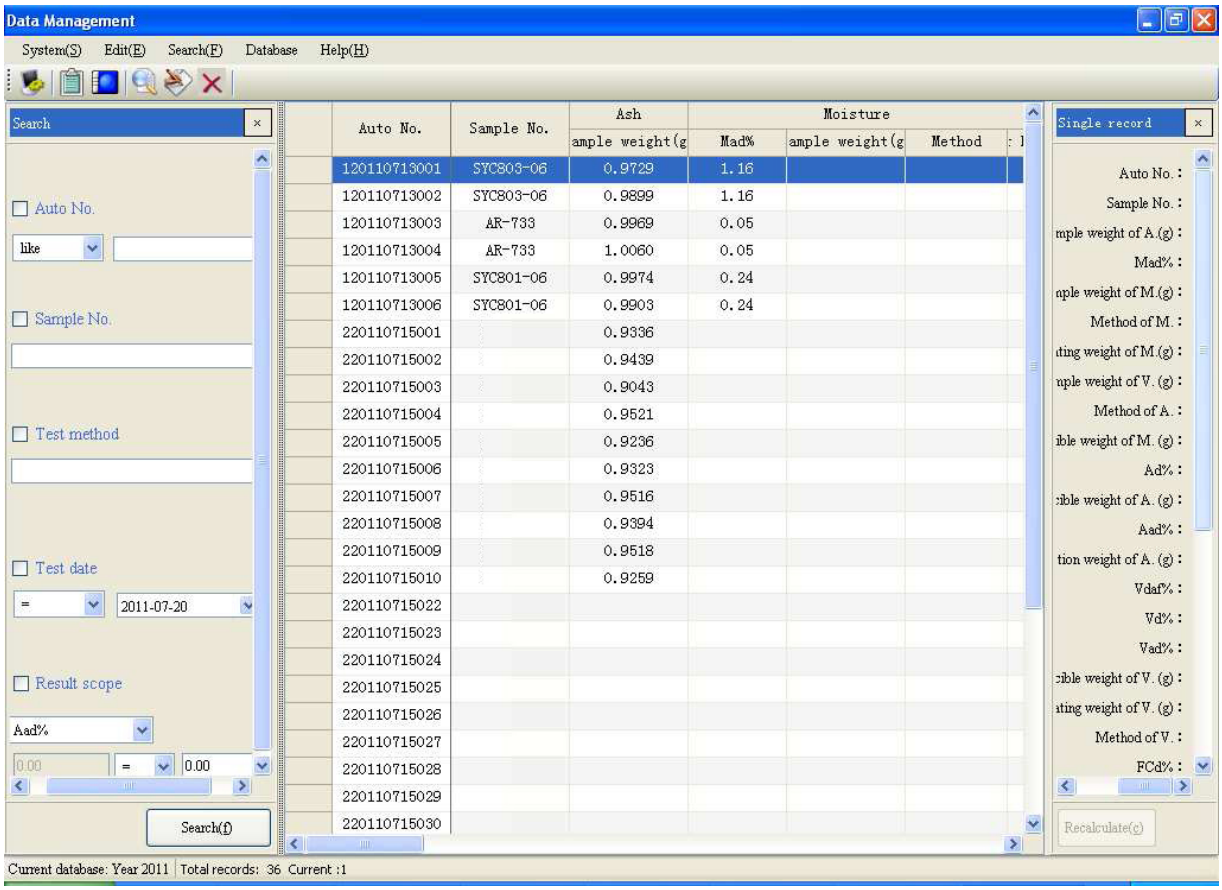


Fig.5-1

1. Title bar: To display database title;

2. Menu bar: To manage and operate each function menu of the database;

3. Shortcut button bar: To display the shortcut tools of operating the database;

4. Data field: Including auto number, sample number, each test index value, test date, test time, tester and so on;

a）The length of number: At most 12 characters are allowed to input, and the maximum length to print is 12 characters;

b）The consist of auto number: Control number 1 (bit)+ Year 4 (bits)+ Month 2 (bits)+ Day2(bits) + Sample number 3 (bits);

5. Status bar: To display the time, total number and position of the current data record.

Additionally, when the cursor moves to the data field and right click the mouse, the window as shown in Fig.5-1-1will be popped up:

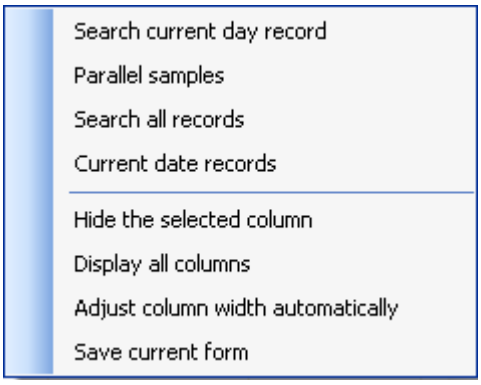


Fig.5-1-1

1. Search current day records: Click this item to display the all records saved at current day.

2. Parallel sample: Click this item to display the records in the data field which has the same sample number and test date with the selected record.

3. Search all records: Click this item, all saved records will be displayed in the data field.

4. Current date record: Click this item to display the records in the data field which has the same test date with the selected records.

5. Hide the selected column: Select the displayed column in the data field and click this menu to hide the selected column.

6. Display all columns: Click this item to display all configurated columns in the date field.

7. Automatically adjust column width: Click this item, the column width will automatically be adjusted according to the contents of each column in the data field.

8. Save current form: Click this item to save current column form in the data field.

5.2 Menu introduction

5.2.1 System (main menu), as shown in Fig.5-2:

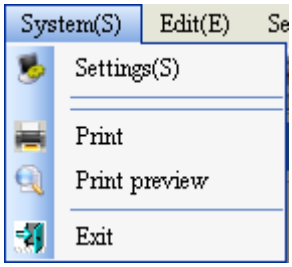


Fig.5-2

5.2.1.1 Setting

Click this menu or the “Setting” button in the shortcut bar, the setting window will be popped up as shown in Fig.5-2-1.

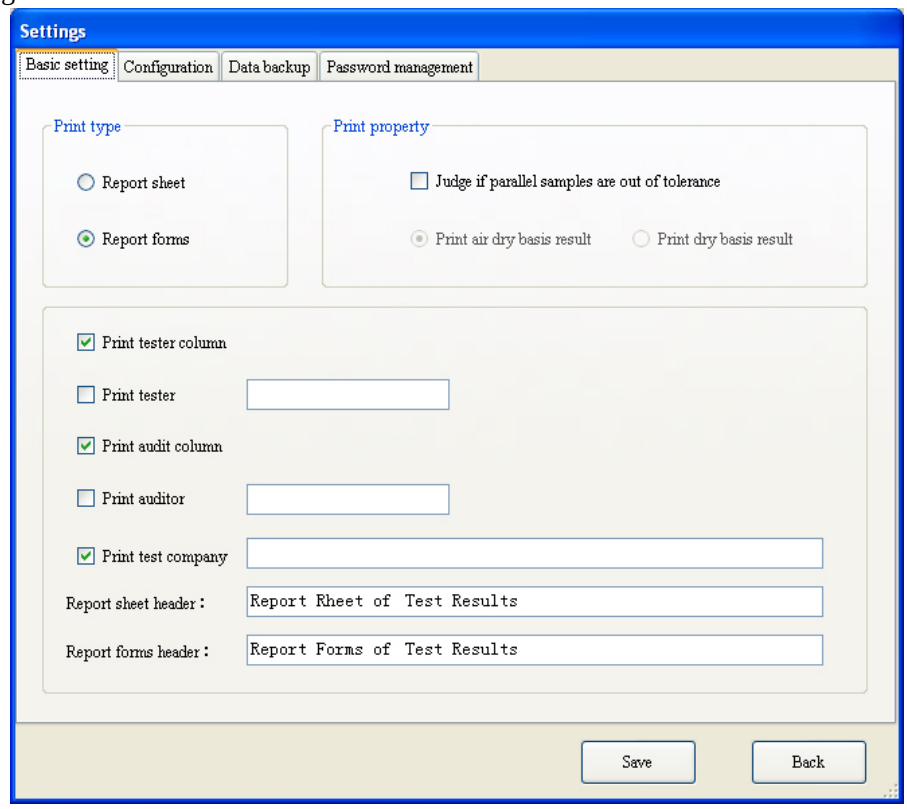


Fig.5-2-1

1. Basic setting tab

- Print type

a）Report sheet: To print the procedure parameter and average value of the parallel samples.

b）Report forms: To print several indexes of single or several records.

- Print properties

a）Judge if parallel samples are out of tolerance: Select this item, when printing the report sheet of parallel samples’ test results, the software will judge if if the parallel samples’ test results are out of tolerance based on the precision requirement of the standards.

b）Print air dry basis result: Set the “Report sheet” to be available, and the test results printed are air dry basis.

c）Print dry basis: Set the “Report sheet” to be available, and the test results printed are dry basis.

- Print optional columns

a）Print tester column: Select this item and this column will be printed at the tail of report sheet or report forms.

b）Print tester: Select this column and input the tester name in the right textbox, then the tester name will

be printed at the tail of report sheet or report forms. Attention: Only when “Print tester column” is selected can the tester be printed.

c）Print audit column: Select this item and this column will be printed at the tail of report sheet or report forms.

d)Print auditor: Select this column and input the auditor name in the right textbox, then the auditor name will be printed at the tail of report sheet or report forms. Attention: Only when “Print audit column” is selected can the auditor be printed.

e）Print test company: Select this item and input the test company information, then the test company information will be printed at the tail of report sheet or report forms.

f）Report forms header: Input the content in the right textbox, and the content will be printed at the head of report forms.

g）Report sheet header: Input the content in the right textbox, and the content will be printed at the head of report sheet.

Save: After modifying the parameters test required, click this button, then the parameters will be saved. Otherwise the parameters will not be saved.

Return: Click this button to exit the setting window and return to the database main interface.

2. Report forms configuration tab

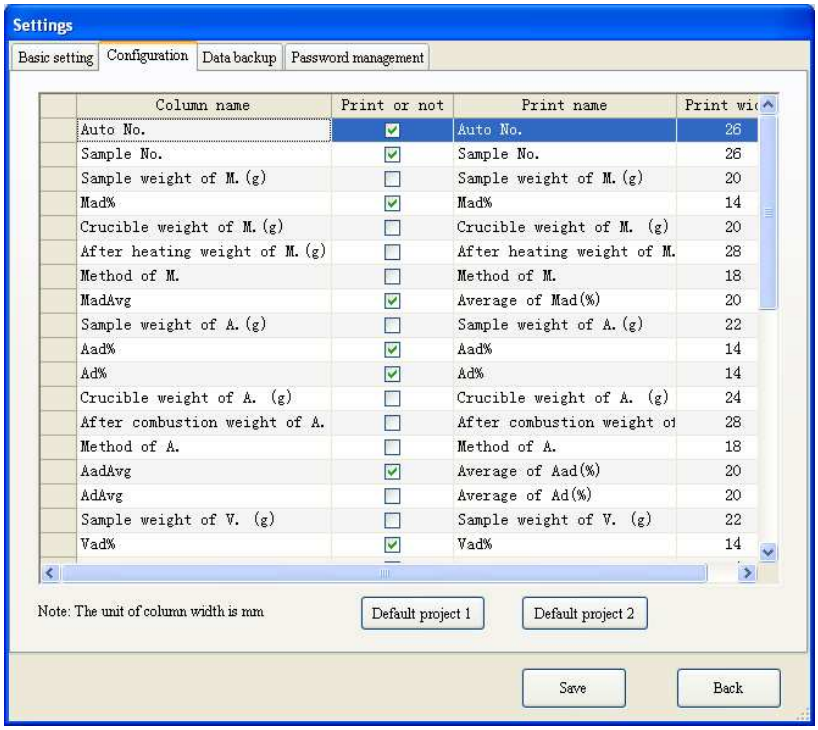


Fig.5-2-2

a）Column name: The column name corresponds with the main window.

b）Print or not: Whether to print this column in the report forms or not.

c）Print name: The column name displayed in the report forms.

d）Print width: The width of each column in the report forms, and the unit is millimeter.

e）Default selection: Select this item to print report forms based on the default setting items.

3. Data backup

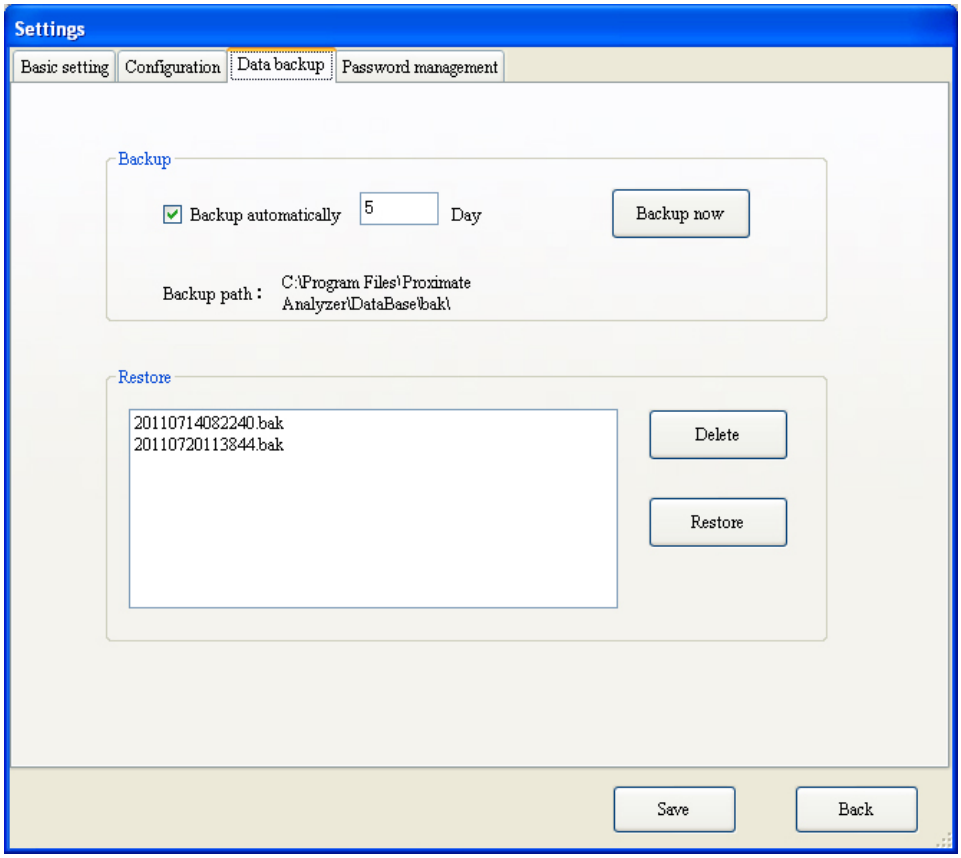


Fig.5-2-3

- Backup

To backup all data in the current database to avoid data lost. After the data backup, the backup files will automatically be generated and displayed in the file list of the window.

a）Backup automatically: Select this tab and set the backup interval. After confirmation, the data will automatically be backed up based on the set interval.

b）Backup now: Click this button to backup the current database.

- Restore

a）Restore : Select a file in the file list box, click “Restore” button and the database will be restored to the data as backed up in the current selected file.

b）Delete : After selecting one or several backup files in the file list box, click this button, when the system prompts whether to delete backup file, select “Yes” to delete the selected data backup files. Otherwise, the backup files will not be deleted.

- Password management

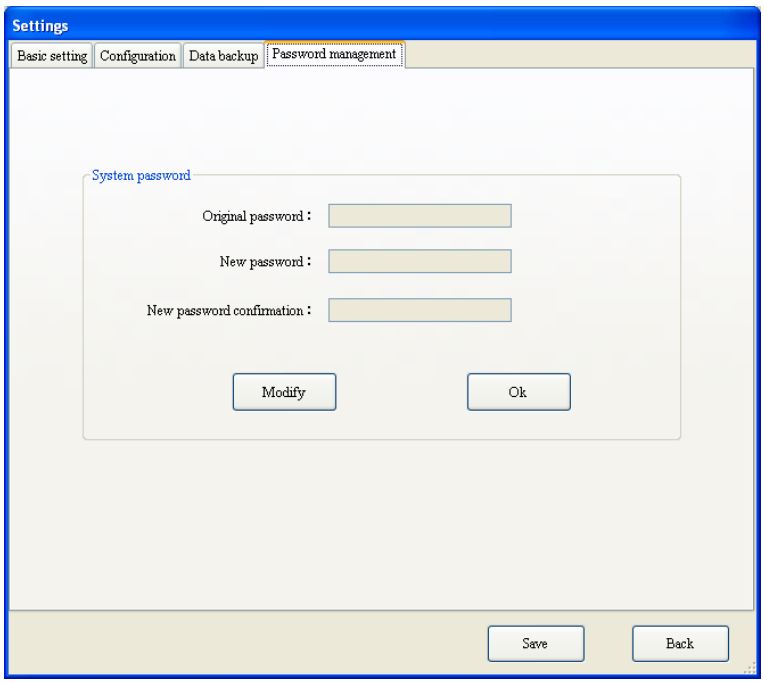


Fig.5-2-4

a）Original password: Input original password.

b）New password: Input new password.

c）Confirm new password： Input new password again.

d）Modify: Click this button to enter into the password modification status.

e）OK: Click this button to save the new password.

5.2.1.2 Print:

Select this item in menu, and the report sheet or report forms will be printed according to the print setting parameters.

5.2.1.3 Print preview:

Select this item in the menu to enter into the preview window and browse the to-be-printed data.

5.2.1.4 Exit

Select this item in the menu or click “X” in the upper right corner of main interface window, then the window as shown in Fig.5-2-5will be popped up:

Fig.5-2-5

Click “Yes” to exit the database and return to the ELan-50A Proximate Analyzer main interface.

Click “No” to return to the database main interface.

5.2.2 Edit (main menu) as shown in Fig.5-3:

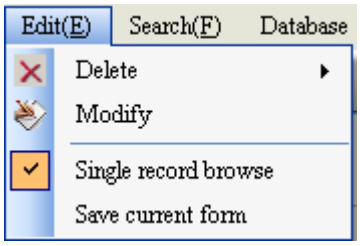


Fig.5-3

1. Delete: Select one or several records, click this button and the Delete prompt window will be popped up, select “Confirm” to delete the selected records, otherwise, the Delete operation will be cancelled.

2. Modify: Click this button and the landing window will be popped up. After inputting the correct password, click “Modify” again or double-click data column, the Modify Window will be displayed. Modify the parameters such as sample No. according to the actual conditions. Click “Recalculate” to finish the modification, otherwise the modification is invalid.

3. Single record browse: Click this item in the menu and the single record browse window will be displayed in the right of data displaying bar.

4. Save current form: Click this item in menu and the current columns status in the data field will be saved automatically.

5.2.3 Search (main menu) as shown in Fig.5-4:

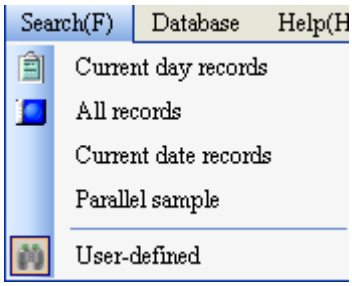


Fig.5-4

1. Current day records: Click this item in the menu or click the “The current day records” button in shortcut bar to display all records saved in the current day.

2. All records: Click this item in menu or click “All records” button in shortcut bar, all saved records will be displayed in the data field.

3. Current date record: Click this item to display records in the data field, and the records which have the same test date with the selected records will be displayed.

4. Parallel samples: Click this item to display the records which have same sample number, test date with the selected records in the data field.

5. User-defined: Click this item in the menu and the Search Window as shown in Fig.5-1 will be displayed.

Five methods of data search: Auto-number, sample number (manual number), test method, test date and test results scope. Search by one or several conditions, select the search method at first, then select the search condition and input corresponding conditions in the condition box, at last, click “Search” button, and all records which meets the conditions will be displayed in the data field. Take the searching according to auto-number as example and the steps are as follows:

a）Set search method: Click “Auto-number” check box, make it to the selected status.

b）Set search condition: Click “▼” and select one item as required (such as “like”), and then input the date (201004) in the right box.

c）Search: Click this button, all the test records with the auto number 201004 will be displayed in the data management window.

5.2.4 Database（main menu），as shown in Fig.5-5:

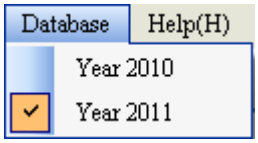


Fig.5-5

Select one year, all records saved in this year will be displayed in the data field.

5.2.5 Help（main menu），as shown in Fig.5-6:

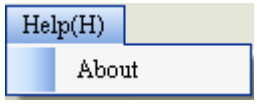


Fig.5-6

1. About: Click this item in menu to obtain the versions information of ELan-50A Proximate Analyzer data management program. And click “Yes” to back to the main window.

Chapter 6 Instrument using and operating rules

In this chapter, relevant using and operating rules of the instrument stipulations are made in the form of flow chart. Users should read it carefully and operate accordingly.

1. Moisture test process

1. Preparation before the test

1）Prepare moisture/ash crucibles after burning to constant weight, samples and dried sample spoon; 2） Prepare the nitrogen cylinder ; 3）Check the tightness of the control and power circuits.

↓

2. Start the computer

First turn on the display, then turn on the computer host, wait the system to enter Windows interface automatically.

↓

3. Start the measurement and control program

Double click “ELan-50A” icon on desktop of Windows XP to enter into the software of the proximate analysis system. Or click【Start】in the Windows and shift the mouse to point to the「Program」item and click “Software of ELan-50A Proximate Analyzer ” in the「Program 」submenu to enter into the software.

↓

4. Parameter setting process

Click【Setting】menu to enter parameter setting window.

↓

Select in the「Test 」tab, set「user-defined moisture /Classic I/ Classic II」 to choose classic test method, “Abandon discarding moisture/Ash Samples can be set; 「moisture constant weight」 and「Classic moisture with nitrogen」(Adjust the flow rate to the range. Reference for Nitrogen is 7L/Min and air is 13L/min.

Click the “Modify parameters” check box in setting window, after input the right password, and in the「Advanced」 tab, select「Weighing one by one/ Weighing in batch 」method.

↓

After setting the test parameters, click「Save」, and then click「Back」. Otherwise the modification is invalid.

↓

Click「Sample weighing 」shortcut button or「Sample weighing 」in 【Test】 menu item and “ Sample weighing ” window will be popped up.

↓

5. Sample weighing and placing process

In Sample Weighing window, click the “▼” on the right of「Weighing item」, and select Moisture，then set「New No. 」or「Related No.」, shift the cursor to「Sample numbers」and input total number of samples to be weighed (Max. single-carousel weighing number : 16)

After setting the sample weighing parameters , click 「Start 」 and combustion furnace will automatically be heated up to the constant temperature of moisture test.

After sample weighing carousel and combustion carousel automatically been reset, “Please place crucibles” will be prompted, please place a crucible in the sample weighing position of the sample weighing carousel, and close the sample placing door, then enter into the weighing process by press the red button on the mainframe or click the “Confirm” in the sample weighing window.

After weighing the crucible, the system will prompt “Please add in samples” message.

Add in suitable sample according to the displayed sample weight at the prompt box, then close the sample placing door and press the mainframe’s red button or click the “Confirm” in the sample weighing window, at this time, the main interface data field will display the sample weight; If not add in sample, the main interface will display blank sample (“Allow blank sample test” has been set before weighing).

Shake up the weighted sample. When all samples have been weighted, the system will prompt “Weighing finished, please confirm”, at this time, please close the sample placing door and press the mainframe red button or click the “Confirm” in the sample weighing window again, the system will enter into the test status. (If samples have been added but not confirmed, please click “Re-weighing” to resolve the misoperation; Click “End” can enter the test in advance; Click the “X” in the sample placing window to cancel the current test.)

6. Moisture testing process

1# sample comes to the sample introduction position, at this time, the combustion displayed temperature ≤ moisture constant temperature point, sample introduction will begin. After that, the system will finish the sample introduction automatically throught controling furnace door ON and OFF, sample tray rotation, manipulator going up and down and rotation.

After sample introduction, the system will automatically analysis the sample according to the set moisture test method. And during the test process, select nitrogen ventilation or air according to different coal sample. The gas flow should be controlled manually at 10L

15 minutes before the samples out, the system will automatically turn on the heat preservation light. If the constant weight test needs, after weighing and calculating, the system will send the sample to furnace again and analysis it until the moisture values of the two comparisons meets the requirements.

After cooling timing over, the system will automatically weigh the sample and calculate the moisture value, and display the results in the data field of main interface. When the weighted samples rotate to the sample discarding door, the sample discarding device will do the discarding action.

After the test over, the system will enter to “Constant temperature” status .

7. Exit the measurement and control environment

In case the experiment is not required, click 「Exit」menu item. The system will pop up "Sure to exit the system?" dialogue box, click「Yes」to exit the measurement and control program, and back to the Windows XP desktop; click 「No」to return to the program main interface .

8. Turn off the computer

After back to the Windows desktop, please click 【Start】button in the Windows, select " Shut down the computer" .

2. Ash test process

1. Preparation before the test

1）Prepare moisture /ash crucibles at constant weight; 2) Prepare samples and pre-dried sample spoon; 3） Prepare the air pump and oxygen cylinder ; 4）Check the control and power circuits for tightness.

2. Start the computer

First turn on the display, then the computer host, waiting for the system automatically entering Windows interface.

3. Start the measurement and control program

Double click "ELan-50A" icon on the Windows XP desktop to enter into the measurement and control environment of the proximate analysis system. Or click【Start】in the Windows and shift the mouse to point to the「Program」item and click "Measurement and control software of ELan-50A Proximate Analyzer " in the「Program 」submenu to enter the measurement and control environment.

4. Parameter setting process

Click【Setting】menu to enter parameter setting window.

Select in the「Test 」tab, set「user-defined ash / Classic quick ash/ Classic slow ash /ASTM ash test method」, also to abandon moisture /ash samples can be set according to the test. If classic method or ASTM ash test method is selected,「Ash constant weight」can be set. When ASTM ash test method is selected, to ventilate oxygen or not can also be selected. Adjust the flowrate in the range manually.（Reference: Oxygen 2L/MIN, Air 13L/min.）

Please select the weighing method「Weighing one by one/ Weighing in batch 」method in the「Advanced」tab,

After the test parameters are set , click「Save」, and then click「Back」. Otherwise the changed item is invalid.

Click「Sample weighing 」shortcut button or「Sample weighing 」in 【Test】 menu item will pop up the "Sample weighing " window.

5. Sample weighing and placing process

In the Sample Weighing window, click the "▼" on the right of「Weighing item, and select Ash, then set「New No. 」or「Related No. 」, shift the cursor to「Sample number 」 item to input total numbers of weighed samples (Max. single-carousel weighing number : 16)

After the sample weighing parameters are set , click「Start 」and combustion furnace will automatically be heated up to the ash sample injection temperature.

After set all parameters in the sample weighing window, please click the "Start" button or "Enter" key to enter into the sample placing window. And after the sample weighing tray and combustion tray reset automatically, the system will prompt "Please place crucibles", now please place a crucible in the sample weighing position of the sample weighing tray, and close the sample placing door, then enter into the weighing process by press the red button of the mainframe or click the "Confirm" in the sample weighing window.

After weighing the crucible, the system will prompt "Please add in samples" message.

Add in suitable sample according to the displayed sample weight at the prompt box, then close the sample placing door and press the mainframe's red button or click the "Confirm" in the sample weighing window, at this time, the main interface data field will display the sample weight; If not add in sample, the main interface will display blank sample ("Allow blank sample test" has been set before weighing).

Shake up the weighted sample. When all samples have been weighted, the system will prompt "Weighing finished, please confirm", at this time, please close the sample placing door and press the mainframe red button or click the "Confirm" in the sample weighing window again, the system will enter into the test status. (If samples need to be added but not confirmed, please click "Re-weighing" to resolve the misoperation; Click "End" can enter the test in advance; Click the "X" in the sample placing window to cancel the current test.)

6. Ash testing process

1# sample comes to the sample introduction position, at this time, the combustion furnace displayed temperature ≤ ash sample introduction temperature, then the system will finish the sample introduction by automatically controlling furnace door ON and OFF, sample tray rotation, manipulator going up and down and rotation.

After sample introduction, the system will automatically finish the test according to the sett ash test method. And during the test process, select air ventilation. The gas flow should be controlled manually at 10L; If moisture test not finished, please input the sample moisture value in the data field manually.

15 minutes before the sample out, the system will automatically turn on the heat preservation light. After the samples out, the prompt bar will display “Ash cooling down” message.

After cooling timing over, the system will automatically weighing the sample and calculating the ash value, and display the results in the data field of main interface. When the weighted samples rotate to the sample discarding door, the sample discarding device will conduct the discarding action. If constant weight needed, the system will continue to heat up according to the set time until the ash values of the two comparisons meet the requirements.

When the test is over, the system will enter to “Cooling” status .

7. Exit the measurement and control environment

In case the experiment is not required, click 「Exit」menu item. The system will pop up “Sure to exit the system?” dialogue box, click「Yes」to exit the measurement and control program, and back to the Windows XP desktop; click 「No」to return to the program main interface .

8. Shut down the computer

After back to the Windows desktop, please click 【Start】button in the Windows, select “ Shut down the computer” .

3. Volatile matter test process

1. Preparation before the test

1）Prepare volatile matter crucibles, crucible cover and crucible support which are at constant weight; 2） Prepare the samples and pre-dried sample spoon; ; 3）Check the control and power circuits for tightness.

2. Start the computer

First turn on the display, then the computer host, waiting for the system automatically entering Windows interface.

3. Start the measurement and control program

Double click “ELan-50A” icon on the Windows XP desktop to enter into the measurement and control environment of the proximate analysis system. Or click【Start】 in the Windows and shift the mouse to point to the「Program」item and click “Measurement and control software of ELan-50A Proximate Analyzer ” in the「Program 」submenu to enter the measurement and control environment.

4. Parameter setting process

Click【Setting 】menu to enter parameter setting window.

In the「Test 」tab, set 「ISO standard test/ ASTM standardⅠtest/ ASTM standardⅡtest」and set「Abandon to discard the volatile matter sample」according to the test needs.

Click the "Modify parameters" check box in setting window, after input the right password, and in the「Advanced」tab, please select the「Weighing one by one/ Weighing in batch 」method. And you can modify the temperature parameters in the 「Temperature」tab.

After the test parameters are set , click「Save」, and then click「Back」. Otherwise the changed item is invalid.

Click「Sample weighing 」shortcut button or「Sample weighing 」in 【Test】 menu item will pop up the "Sample weighing " window.

5. Sample weighing and placing process

In the Sample Weighing window, click the "▼" on the right of「Weighing item, and select Volatile matter, then set「New No. 」or「Related No.」, shift the cursor to「Sample number」 item to input total numbers of weighed samples (Max. single-carousel weighing number : 10)

After the sample weighing parameters are set , click「Start 」and the combustion furnace will automatically be heated up to the volatile matter sample introduction temperature.

After the sample weighing carousel and combustion carousel reset automatically, the system will prompt "Please place crucibles", now please place a crucible in the sample weighing position of the sample weighing carousel, and close the sample placing door, then enter into the weighing process by press the red button of the mainframe or click the "Confirm" in the sample weighing window.

After weighing the crucible, the system will prompt "Please add in samples" message.

Add in suitable sample according to the displayed sample weight at the prompt box, then close the sample placing door and press the mainframe's red button or click the "Confirm" in the sample weighing window, at this time, the main interface data field will display the sample weight; If not add in sample, the main interface will display blank sample ("Allow blank sample test" has been set before weighing).

After the added sample passed, please according to the prompt message to cover the crucible cover and close the furnace door; After press the red button of the mainframe or click the "Confirm" in the sample weighing window, the system will to confirm the weight of crucible cover and the sample weight will be displayed in the data field of main interface.

Shake up the weighted sample. When all samples have been weighted, the system will prompt “Weighing finished, please confirm”, at this time, please close the sample placing door and press the mainframe red button or click the “Confirm” in the sample weighing window again, the system will enter into the test status. (If the samples have been added but not confirmed, please click “Re-weighing” to resolve the misoperation; Click “End” can enter the test in advance; Click the “X” in the sample placing window to cancel the current test.)

6. Volatile matter test process

After placing the sample, the system will automatically judge if nitrogen ventilation is necessary or not according to the test method selected. Before the test, adjust the flowrate of nitrogen to the range (Referrence: ASTM standard I test 7L/min, ASTM standard II test 20L/min.)

After sample introduction, the heat preservation light will be automatically turned on and the system will automatically analyze the sample; If moisture test not conducted, please input the sample moisture value in the data field manually.

During the sample out, the prompt bar will display the “sample out”. After the sample be sent our, the prompt bar will display the “Volatile matter cooling down” message.

After cooling timing over, the system will automatically weigh the sample and calculating the volatile matter value, and display the results in the data field of main interface. When the weighted samples rotate to the sample discarding door, the sample discarding device will conduct the discarding action. If select the “Abandon to discard volatile matter sample” before the test, after the system calculated all samples, it will not conduct the discarding action.

When the test is over, the system will enter to “Cooling” status .

7. Exit the measurement and control environment

In case the experiment is not required, click 「Exit」menu item. The system will pop up “Sure to exit the system?” dialogue box, click「Yes」to exit the measurement and control program, and back to the Windows XP desktop; click 「No」to return to the program main interface .

8. Shut down the computer

After back to the Windows desktop, please click 【Start】button in the Windows, select “ Shut down the computer” .

4. Moisture –Ash Test Continuously Process

1. Preparation before the test

1）Prepare moisture /ash ignition crucibles at constant weight; 2) Prepare samples and pre-dried sample spoon; 3）Prepare the nitrogen cylinder, oxygen cylinder and air pump; 4）Check the control and power circuits for tightness.

2. Start the computer

First turn on the display, then the computer host, waiting for the system automatically entering Windows XP interface.

3. Start the measurement and control program

Double click “ELan-50A” icon on the Windows XP desktop to enter into the measurement and control environment of the proximate analysis system. Or click【Start】 in the Windows and shift the mouse to point to the「Program」item and click “Measurement and control software of ELan-50A Proximate Analyzer ” in the「Program」submenu to enter the measurement and control environment.

4. Parameter setting process

Click【Setting】menu bar to enter into the parameter setting window, and select the「Moisture-Ash Continuous Test available」in the test setting tab. If select the「User-defined Method 」for moisture test, the ash test should select the 「Classic Quick ash/ASTM ash test/ User-defined Ash」; If select the 「Classic Moisture I/ Classic Moisture II 」for moisture test, the ash test should select the 「Classic Quick ash/ Classic Slow Ash/ASTM ash test 」.

After the test parameters are set, please click「Save」, and then click「Back」. Otherwise the changed item is invalid.

Click the「Sample weighing」

5. Sample weighing, placing and testing process

Setting「New No. 」or「Related No. 」 under the sample weighing window, and shift the cursor to「Sample numbers 」item to input total numbers of weighed samples (Max. single-carousel weighing number : 16)

After setting the parameters, please click「Start 」and weigh the moisture sample according to the prompt. And the furnace will automatically be heated up to the target temperature according to the set test method.

After the moisture test, when the furnace displayed temperature≤ Ash sample introduction temperature, please start the ash sample introduction until the test finished.

6. Exit the measurement and control environment

In case the test is not required, click「Exit」menu item. The system will pop up “Sure to exit the system?” dialogue box, click「Yes」to exit the measurement and control program, and back to the Windows XP desktop; click「No」to return to the program main interface .

7. Shut down the computer

After back to the Windows desktop, please click 【Start】button in the Windows, select “ Shut down the computer” .

Chapter 7 Instrument Maintenance

The maintenance of an equipment is very important, which has a direct influence to the equipment accuracy, precision, fault rate and service life. In order to ensure the normal service of the ELan-50A Proximate Analyzer, please read this chapter carefully.

1. Computer and printer equipped for this instrument should be maintained and serviced according to their operating manuals. During usage, pay attention to virus intrusion. Virus scanning should be done at regular time.

2. Dust or corrosive gas intrusion shall be prevented. Instrument shall be placed in dry environment. If it is not used for a long time, cover it by a special dust-proof cover. When it is used again, make the system temperature rise up to 105 ℃ and keep this temperature for over 60 minutes.

3. Persons except the operators shall not operate this instrument so as to avoid troubles due to incorrect operation. It is not allowed to dismantle the instrument to avoid failure.

4. Avoid the direct flow from air conditioner and fan toward the instrument.

5. Sample shall be placed and taken away very carefully to avoid affecting the weighing of balance module.

6. During the test, please strictly follow the steps in “Operating Manual”.

7. After the test begins, surfing the internet or playing games are prohibited to avoid impact to the normal working of the system. If the computer has installed antivirus, please close the firewall and real-time virus scanning function. Otherwise this will lead to the un-normal test performance.

8. Check the gas charging equipment regularly to see if there is air leakage. If air leakage, please handle it immediately.

9. It is forbidden to adjust the pressure reducing valve, low-pressure gauge and gas flowmeter freely. If high-pressure is not high enough, it should be replaced in time.

10. Special care shall be taken during moving this instrument to avoid the damage to the balance module. After moving, the levelness, furnace hole position and manipulator travel must be re-adjusted. Accuracy of instrument must be checked and calibrated.

Chapter 8 Troubles and Trouble Shootings

Faults	Reasons and Remedies
1.The system display not on-line	1. System not authorized. Ask the professionals from MRC Company; 2. USB-CAN card not properly connected; 3. The mainframe power is not on. Turn on the power; 4. USB-CAN card drive not installed. Install the drive and restart the computer; 5. Abnormal communication. Please ask the professionals for the repairing.
2. No balance value displayed in the main interface	1. The mainframe power is not turned on. Turn on the instrument power; 2.The system set balance parameters (incl. connection serial port No) not in line with the balance parameters, check or reset the balance parameters; 3. Balance on-line signal wire not connected properly or with poor contact. Switch off all the power and reconnect balance on-line signal wire; 4. Ask the professionals for the repair.
3. Prompt “Heating power not switched on or power failure”	1. The heating power is not switched on or not properly connected; 2. The instrument fuse burnt, replace the fuse; 3. The control card failure. Ask the professionals for the repairing.
4. Prompt “Balance Weighing Abnormal”	1. Balance power not switched on due to the loose power wire of the internal balance; 2. Sample weighing rod in touch with the foreign matter, i.e. the weighing rod is in touch with the sample hole of the sample carousel. Readjust the weighing rod position or length (by the professionals)
5. The ash test results are on the higher side or lower side.	1. Blank sample test is not done; 2. Ash burning is done without air ventilation, check the

	flowmeter to see if the flowrate is sufficient, and adjust the flowrate; Open the back cover to check the furnace air inlet. If it is not properly connected, solve the problem; 3. The quick ash testing is not suitable, slow ash testing method should be adopted instead.
6.The printer failed to work or printing error	1. Check if the printer signal line is properly connected or not. Or is it disconnected? 2. Printer program failure, please reset the printer; 3. The measurement and control software failure, please replace it; 4. The printer failure, please take the Warranty to the local service center.
7. Computer crash	1. Check and modify computer CONFIG.SYS setting. Reinstall the measure and control software; 2. Computer virus attacked, please kill the virus; 3. The measurement and control software has been destroyed; 4. The computer failure, take the Warranty to the local service center.