Laboratory Equipment Manufacturer
www.mrclab.com

Operation Instructions

ELAn-18 Proximate Analyzer

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MRC.VER.01-8.13

Attention

- **Please read this instruction carefully before using MRC instrument.**
- **Matters need attention when using the instrument.**
  - **Only high-temperature power cable provided with the instrument can be used.**
  - **Make sure that the electrical parameters of outlet and knife switch/air break switch meet the requirement of instrument.**
  - **Power of the instrument shall be cut off when instrument not been used for a long time.**
  - **Before using the instrument, the filling materials, such as foam, shall be taken out and instrument' cover cloth shall be taken off. It is prohibited to place any inflammable and explosive material near the instrument.**
  - **After use, cover cloth shall not be placed on instrument if instrument (inside and outside) temperature has not cooled down to room temperature.**
  - **The instrument shall be ground connected reliably.**
  - **It is not allowed to repair and dismantle the instrument if power is connected.**
  - **Vessel contained with water is prohibited to be placed on instrument.**
- **To ensure stable and reliable operation of instruments, spare parts and consumables provided by MRC shall be used. If spare parts and consumables not provided by MRC are used and result in reduction of performance, unstable test result or increase in malfunction, etc, MRC will not provide service or guarantee and will not undertake any losses.**
- **MRC shall not bear responsibilities for malfunction or damage due to auxiliary instrument and equipment not supplied by MRC and misuse, negligence of users. Purchaser, users or successor shall take all the risk of their operation and mistakes.**

Content

Chapter 1 Performance and Characteristics of the Instrument

1.1 Applications

This instrument is applicable to analyze the moisture, ash, volatile matter in the coal sample of several batches in short time and calculate the fixed carbon content and calorific value of the coal samples. The instrument can be widely used in such fields or sectors as coal, electricity, metallurgy, petrochemicals, geological exploration, environmental protection, scientific research and schools.

1.2 Performance Index

- Max power:<4.5 KW；
- Furnace temperature: room temperature ~1000℃
- Temperature control range: Low-temperature furnace: room temperature ~110℃ Combustion furnace: room temperature ~950℃
- Temperature control accuracy: Temperature control point for low-temperature furnace（105~110)℃; Combustion furnace >500℃ with temperature control point ±10℃.
- Max sample number in a single tray: Moisture/ash/volatile matter:18 samples
- Max sample number analyzed in a single tray: Moisture/ash: 18 samples /volatile matter: 10 samples.
- Max. gas flow: ISO Standard-- Nitrogen(purity:99.9%), based on change the gas 15 times every hour. ASTM Standard—flow of pure oxygen: 0.4-0.8 furnace volume/min, flow of air: 2-4 furnace volume/min, flow of nitrogen:2-4 furnace volume/min.

1.3 Characteristics of the Instrument

1. High efficiency and low labor intensity

1) Dual-furnace design is adopted for testing total indices of 18 samples at a time. When the previous batch samples are placed on the sample placing tray, the next batch samples can be weighed. After the previous batch samples are all introduced into the furnaces, the next batch samples can be placed on the tray.

The samples can be weighed, introduced and tested simultaneously without mutual interference and the moisture test and ash content test are done at the same time without mutual interference.

2) After the total index tests for the 18 samples of previous batch being completed, there is no need to wait for system cooling down. If rapid analysis method is adopted, the total index tests for three batches including 54 samples can be completed one day (8 hours).

3) For each test, after weighing and placing the moisture, ash and volatile samples, the operator can leave for other tasks until the results come out. The man-machine interaction frequency is less and the interaction time is shorter. If moisture and ash are tested continuously, it only needs to weigh and place the samples twice. So, the interaction time of man and machine is much shorter.

2. High precision and accuracy of the test results

It fully complies with Chinese standard GB/T212《Standard Test Method for Proximate Analysis of Coal》and Power Industry Standard DL/T1030《Standard Test Method for Proximate Analysis of Coal—Automatic instrument methods》and ASTM-D5142-2009。

3. Reliable and stable performance

1) CAN-USB bus interface carries out the communication between the tester and the computer. The anti-interference of the instrument is strong

2) Unique sample delivering and introducing device is applied to ensure stable performance of the instrument. Particularly, in the course of volatile sample introducing, an anti-drop-off device is provided to improve the operating stability.

4. Friendly interface and powerful functions

With whole English prompt and friendly interface, it is simple and easy to operate. And the system is provided with automatic temperature control, automatic alarm and protection function for over-heat, thermocouple disconnection, thermocouple counter-connection, data automatic conversion and storage, etc.

Chapter 2 Instrument Composition and Working Principle

2.1 Instrument Composition

ELAn-18 Proximate Analyzer consists of mainframe, gas supplying device, computer (monitor included) and printer.

2.1.1 Mainframe

It mainly consists of sample placing tray, low-temperature furnace, combustion furnace, electronic balance and sample delivering and introducing mechanism, etc.

1. Sample placing tray: it used for placing samples to be tested and sending back the tested samples.

2. Low-temperature furnace: it is used for testing moisture content of samples and insulating, cooling, weighing, calculating and discarding the samples having been burned for ash test or having been heated for volatile matter.

3. Combustion furnace: it is used for burning samples for ash test or heating samples for volatile matters.

4. Balance: The external balance with glass windshield is used to weigh crucibles and samples. And the parameters of the external balance are as follows: Model BSA124S, measuring range (0～120g), the resolution: 0.0001g. The internal balance used to weigh the cooled samples which have been heated or burned is mounted below the low-temperature furnace. The parameters are as follows: Model XX85-0001, measuring range (0～124g), the resolution 0.0001g .

5. Sample delivering and introducing mechanism: it is used for delivering samples between sample placing tray, low temperature furnace and combustion furnace.

2.1.2 Gas supplying device

1. Air pump, oxygen cylinder(self-provided) and nitrogen cylinder(self-provided)

2. Pressure-reducing valve: (measuring range of the high-pressure gauge 25Mpa, measuring range of the low-pressure gauge 0.4 MPa)

3. Gas pipes

The gas supply equipment should be equipped with standard pressure gauge

2.1.3 Printer

Laser printer

2.2 Working principle

For the testing of moisture, ash and volatile matter, ELAn-18 Proximate Analyzer works in the following 2 modes:

2.2.1 Independent mode

It is applicable for testing single index.

2.2.2 Combination mode

1. Test moisture and ash simultaneously (Take the rapid analysis for the total indices of 18 samples as an example, others are similar to it.)

The system will prompt for weighing and placing ash samples firstly. After placing ash samples, the system will prompt for weighing and placing moisture samples. After placing moisture samples, the system will prompt for weighing and placing volatility samples. After the moisture test being completed, the ash samples will be taken out into the low temperature furnace for cooling, weighing, calculating and discarding. After the ash test being completed, the system will send the volatility samples into the combustion furnace whose temperature has been constant for testing until the tests are finished. The tests, sample weighing and placing processes are done simultaneously without interference to each other. (For details, please refer to Chapter5)

2. Tested moisture and ash continuously

The system will first prompt for weighing and placing the moisture samples, then for weighing and placing volatility samples. After finishing weighing and calculating for the moisture test, the system will take the heated moisture sample to the combustion furnace for the ash test. When the ash burning duration is over,

the samples will be taken out to the low-temperature furnace for thermal insulating, cooling, weighing, calculating and discarding. After the ash test, the system will take the volatility samples to the thermostatic combustion furnace for testing until the test completed.

Chapter 3 Instrument Installation and Debugging

3.1 Environmental requirements

3.1.1 Working environment

1. Temperature: (5～35)℃;

2. Relative humidity: ≤85％;

3. Tidy, free of fume and dust (especially soot)

4. The working environment should be kept stable, free of strong magnetic field or vibration source and corrosive gas.

5. Working Power supply

1) The heating power supply for the high temperature furnace: AC (220±22) V/ (50±1) Hz, tolerating instantaneous max. power is 4.5kW and power cable (more than 4.5kW) should be adopted and knife switch should be installed for control purpose.

2) The power supply of the terminal parts such as the mainframe control and computer: AC（220±22)V/（50±1)Hz, to be phase split with the heating power supply.

3) Reliable grounding cable should be provided.

3.1.2 Software environment

1. Operating system: Windows XP /Windows 7 (English version).

2. Basic configuration:

- CPU: >3.00 GHZ; Memory: >376MB;
- Display card: standard VGA 1024×768 display mode;
- Hard disk: 80G or larger;
- Drive: double speed CD-ROM;
- Other equipment: USB interface, mouse and keyboard, etc.

3.2 Installation

3.2.1 Preparation prior to the installation

- Set up special laboratory with the environment required in 3.1.1.
- The lab table should be horizontal and stable. It is suggested to use the 2m (L) ×0.7m (W) ×0.7m (H) cement working table.
- Prepare a nitrogen cylinder (pressure ≤13Mpa) and a oxygen cylinder (pressure ≤13Mpa).

3.2.2 Instrument Installation

1. Carefully take the instrument out of the package, place the instrument onto a solid and reliable working table. Generally, the external balance is to be placed in the middle, the computer (the host, monitor and keyboard) and ELAn-18 are to be placed on the left and right respectively so as to facilitate the operation.

✧ The instrument is to be unpacked by the site debugging personnel or the authorized representative of MRC Company.

✧ After unpacking, users need to check the instrument and its spare parts and properly keep the relevant documents packages and packing protective materials of balance, computer, monitor and printer, etc.

2. Carefully check the wearing parts to see if they are in good condition.

3. Install the electronic balance.

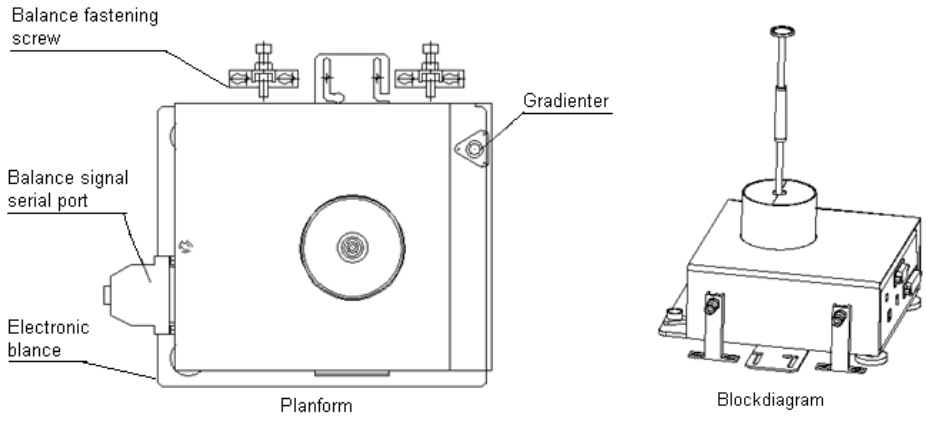


Fig.3-1

1) Properly adjust the balance to keep it horizontal provided that the lab table is

kept horizontal.

2) As shown in Fig.3-1, unloose the fastening screw and put in the balance.

3) Adjust the height of the balance foundation bolt to keep the balance horizontal.

✧ **During the test, please do not power off or tare the balance, i.e. do not press "ON/OFF" and "TARE" keys on the balance. It is suggested not to carry out other operations when users have turned on the balance, unless something goes wrong with the balance or the balance needs to be reset (For the balance error restoring or setting methods, check <Installing and Operating Manual of Sartorius Electronic Balance>).**

✧ **Properly keep the balance's packing material and accessories!**

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

● Thermocouple installation

1) Open the rear cover plate of the low-temperature furnace and the top cover of the combustion furnace and insert thermocouples into the corresponding holes respectively. Please refer to Fig.3-2 and Fig3-3.

2) Connect the red wire of the compensating conductor with the thermocouple's "+"(Positive) pole and the other wire with thermocouple's "-" （Negative ） pole.

3) Fix the thermocouple mounting position and fasten the thermocouple connecting wire.

4) Check the compensating conductor to see if it is mounted correctly and avoid burning out due to the direct contact of the conductor and the heating surface.

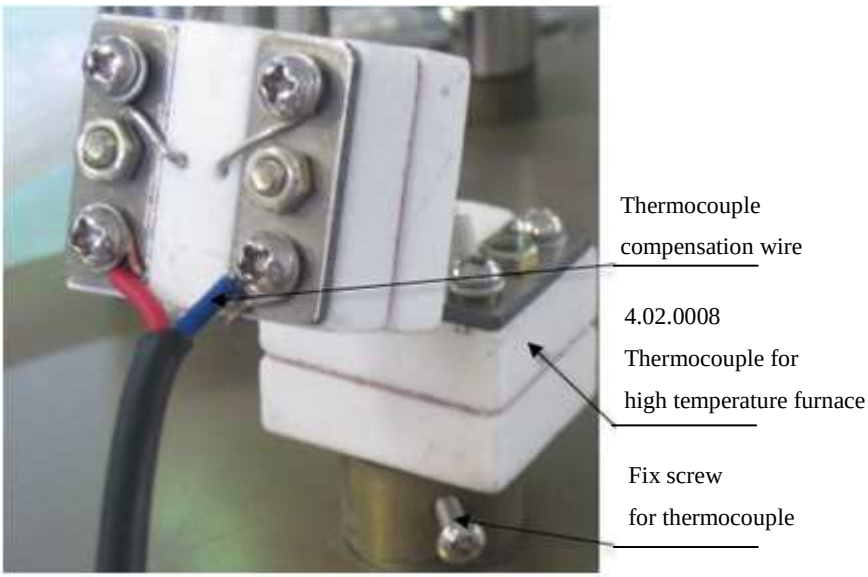


Fig.3-2

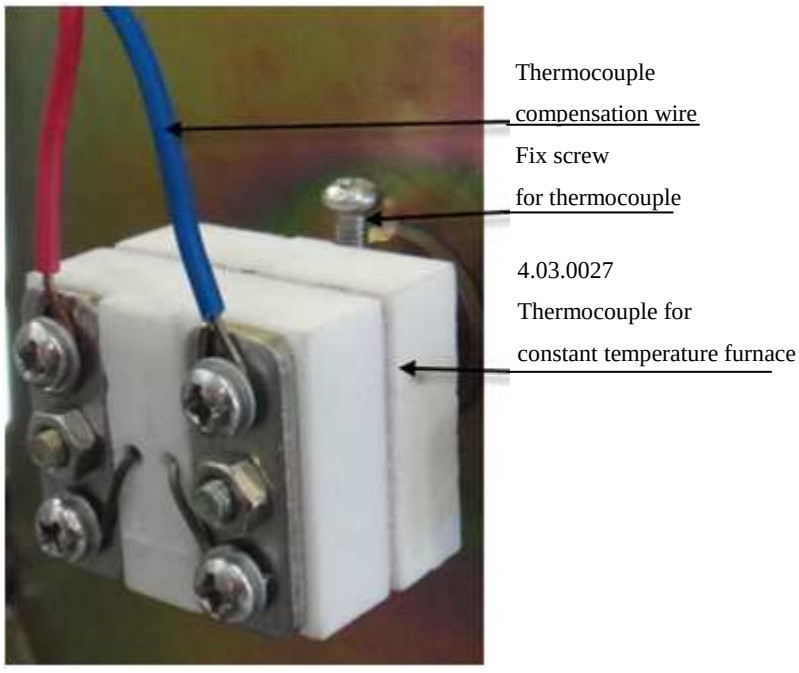


Fig.3-3

- Installation of sample weighing bar, manipulator and sample discarding bar

1) Open the rear cover plate of the low-temperature furnace, slide the wind-proof pillar fixing ring into the sample weighing bar→ put the sample weighing bar into the weighing induction frame→ match the hole positions of the low-temperature tray→ install the wind-proof pillar and fix it with fixing ring→ cover the reflector plate→ ensure the balance is horizontal, the central

position of the weighing bar conforms to that of the low-temperature tray holes→ When the low-temperature tray goes down, the weighing bar top is to be minimum (1-2)mm above the low-temperature tray surface→ tighten the balance fixing screw. Shown as Fig.3-4 and Fig.3-5.

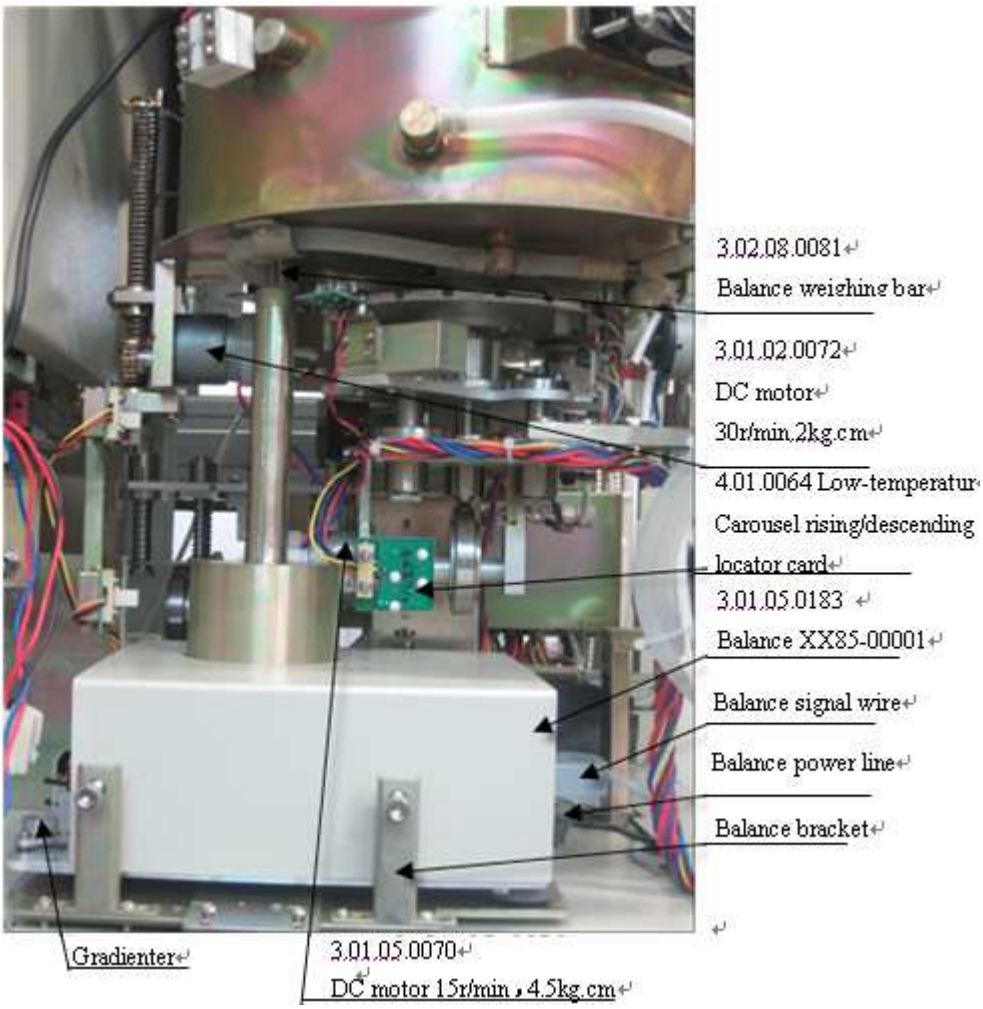


Fig.3-4

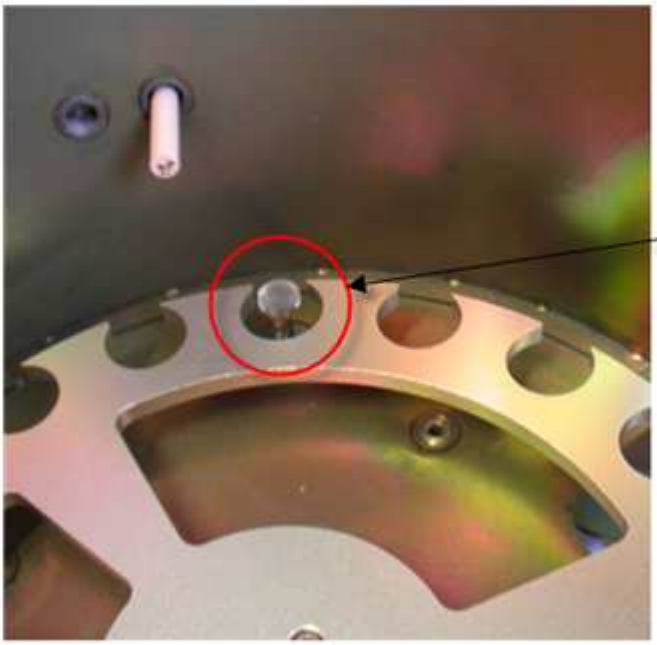


Fig.3-5

2) Install the die-pin support and cover of the manipulator. When the special instrument screw driver is used, don't screw them too tightly. They can be screwed until the top screw just in contact with the milling flat of the quartz bar of the manipulator. Shown as Fig.3-6.

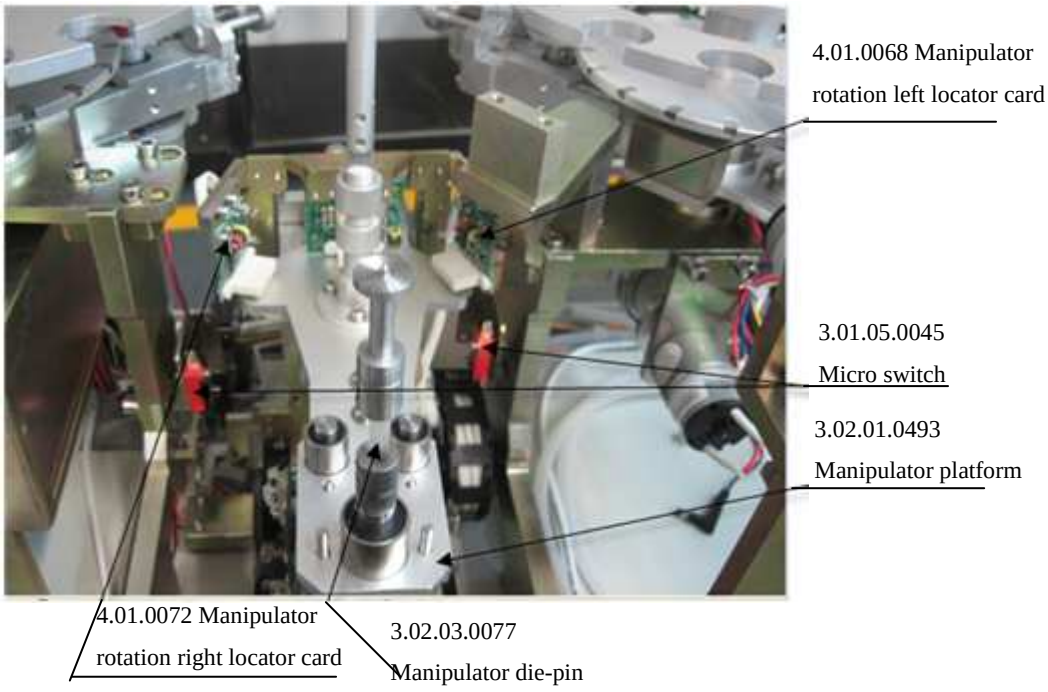


Fig.3-6

3) The installation of the sample discarding bar is similar with that of the manipulator. Shown as Fig.3-7.

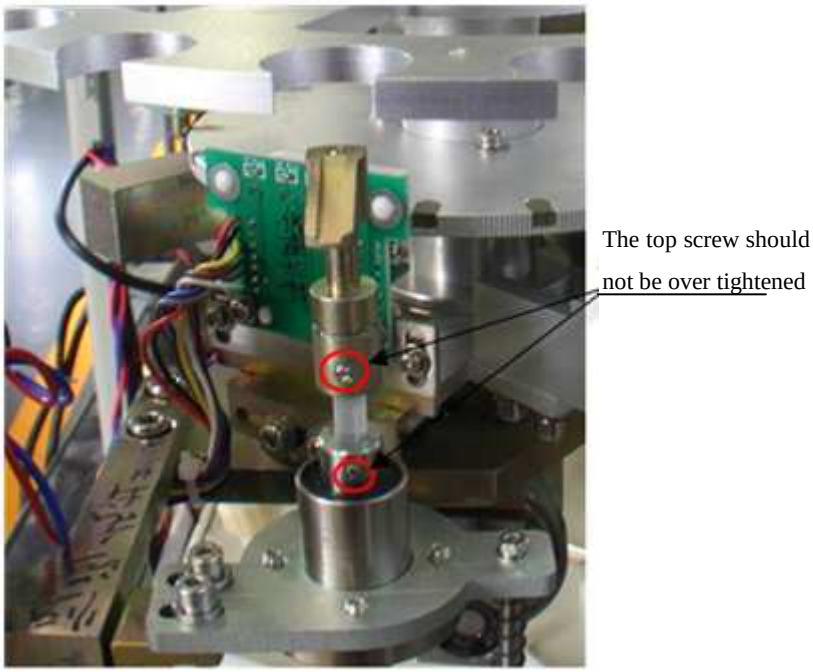


Fig.3-7

✧ **When installing the wearing parts such as sample weighing bar, manipulator and sample discarding bar, debug the hole-positions properly before the motion control so as to avoid mechanical failures.**

5. Installation of the gas supplying device and centrifugal fan

- Installation of the gas supplying device

1) Install the air supply system of the combustion furnace based on the circuit as shown in Fig.3-8 Circuit Diagram (Shown as fig.3-9):

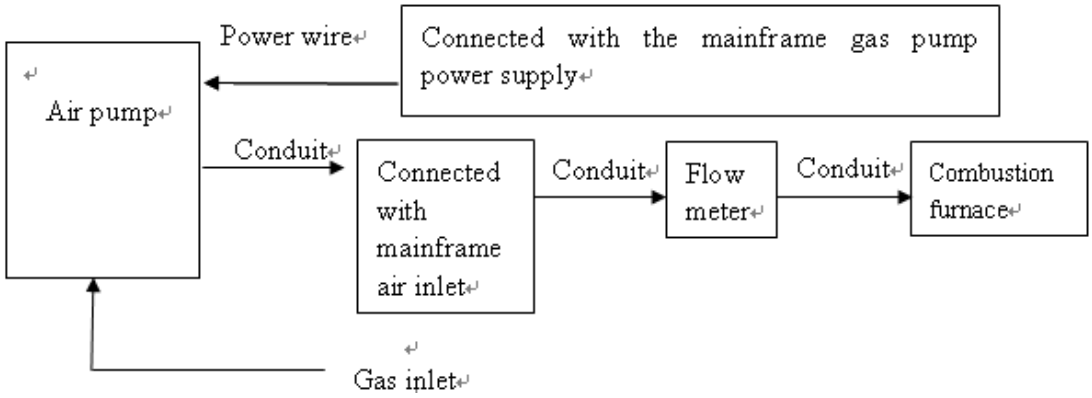


Fig. 3-8

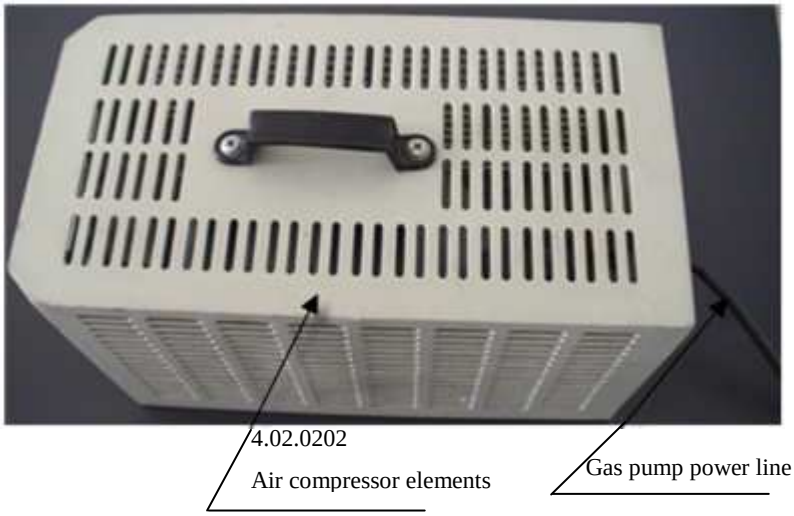


Fig. 3-9

2) Install the Combustion temperature furnace gas supplying system as shown in Fig.3-10 Circuit Diagram: This gas supplying system needs to be used when ASTM Ash test with oxygen is adopted.

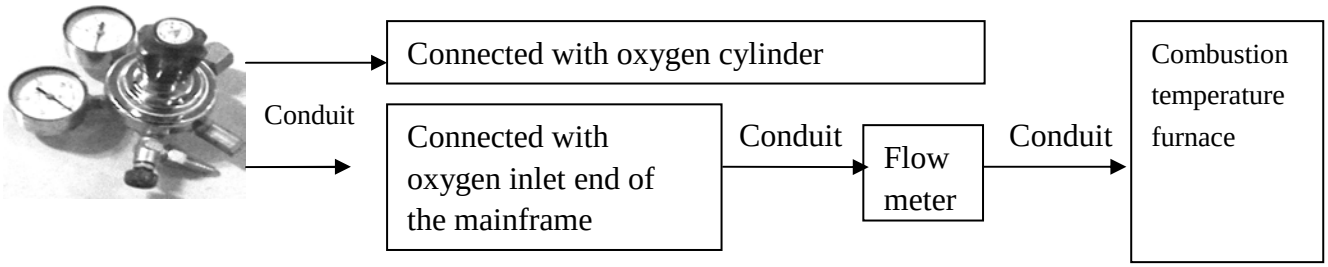


Fig. 3-10

3) Install the Combustion temperature furnace gas supplying system as shown in Fig.3-11 Circuit Diagram: This gas supplying system needs to be used when ASTM Volatile Matter test with nitrogen is adopted.

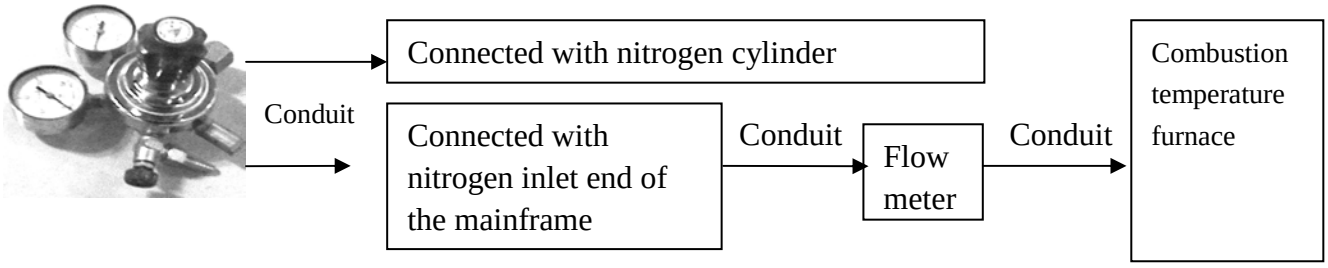


Fig. 3-11

4) Install the low temperature furnace gas supplying system as shown in Fig.3-12 Circuit Diagram: This gas supplying system needs to be used when classic moisture test with nitrogen is adopted.

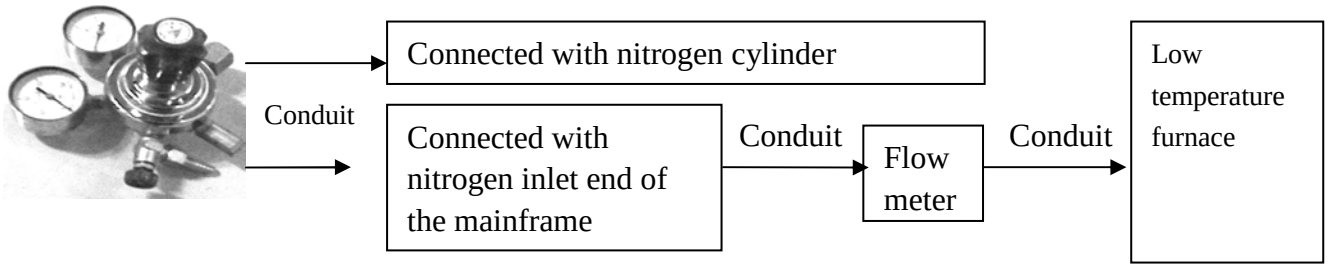


Fig 3-12

✧ **Nitrogen and oxygen charging device needs to be provided with pressure reducing valve.**

✧ **Turn off the gas valve before installing the pressure reducing valve. When the air circuit is installed, adjust the low pressure gauge of the reducing valve to 0.1Mpa.**

- Install the centrifugal fan as shown in Fig.3-13

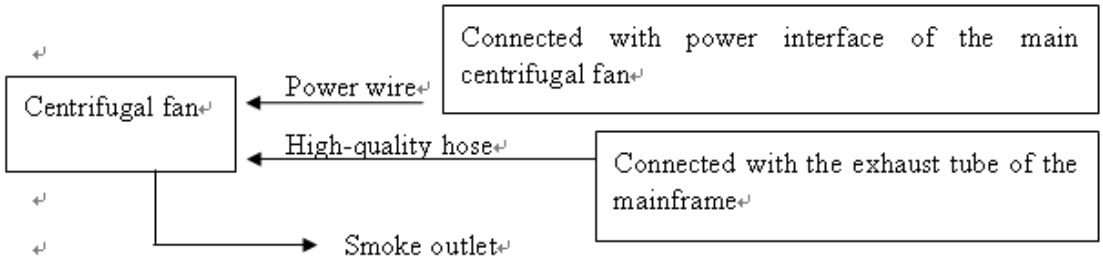


Fig.3-13

Fig.3-14

Fig.3-15 Blower

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

● Gas circuit connecting according to ASTM standard

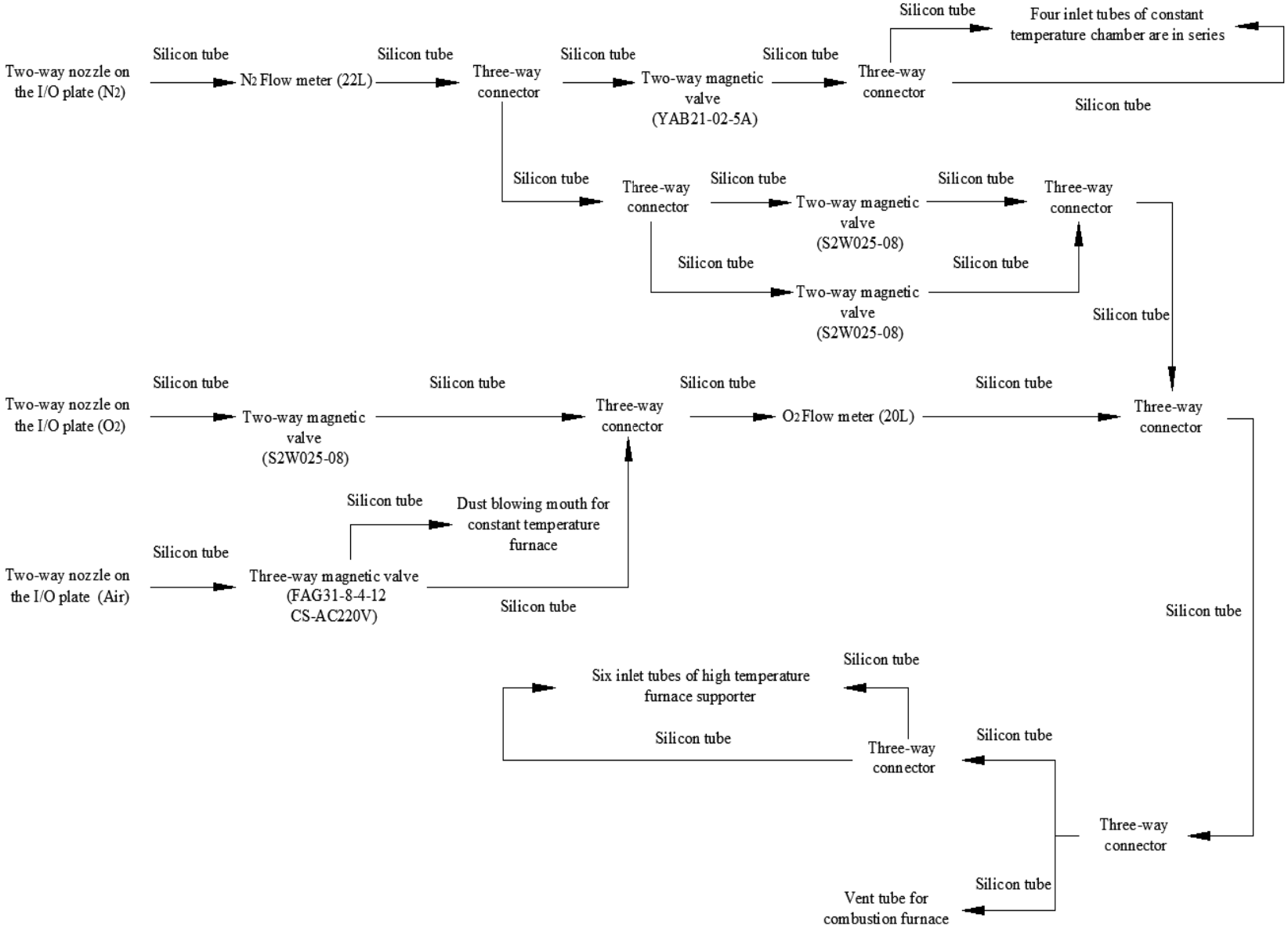

Two-way nozzle on the I/O plate (N2)
Silicon tube
N2 Flow meter (22L)
Silicon tube
Three-way connector
Silicon tube
Two-way magnetic valve (YAB21-02-5A)
Silicon tube
Three-way connector
Silicon tube
Four inlet tubes of constant temperature chamber are in series
Silicon tube
Silicon tube
Three-way connector
Silicon tube
Two-way magnetic valve (S2W025-08)
Silicon tube
Three-way connector
Silicon tube
Two-way magnetic valve (S2W025-08)
Silicon tube
Two-way nozzle on the I/O plate (O2)
Silicon tube
Two-way magnetic valve (S2W025-08)
Silicon tube
Three-way connector
Silicon tube
O2 Flow meter (20L)
Silicon tube
Three-way connector
Silicon tube
Dust blowing mouth for constant temperature furnace
Two-way nozzle on the I/O plate (Air)
Silicon tube
Three-way magnetic valve (FAG31-8-4-12 CS-AC220V)
Silicon tube
Silicon tube
Six inlet tubes of high temperature furnace supporter
Silicon tube
Three-way connector
Silicon tube
Three-way connector
Silicon tube
Vent tube for combustion furnace

Fig.3-16

7. Open the computer host cabinet and insert the balance serial port card and interface card into PCI slot and fix it properly. Shown as Fig.3-17.

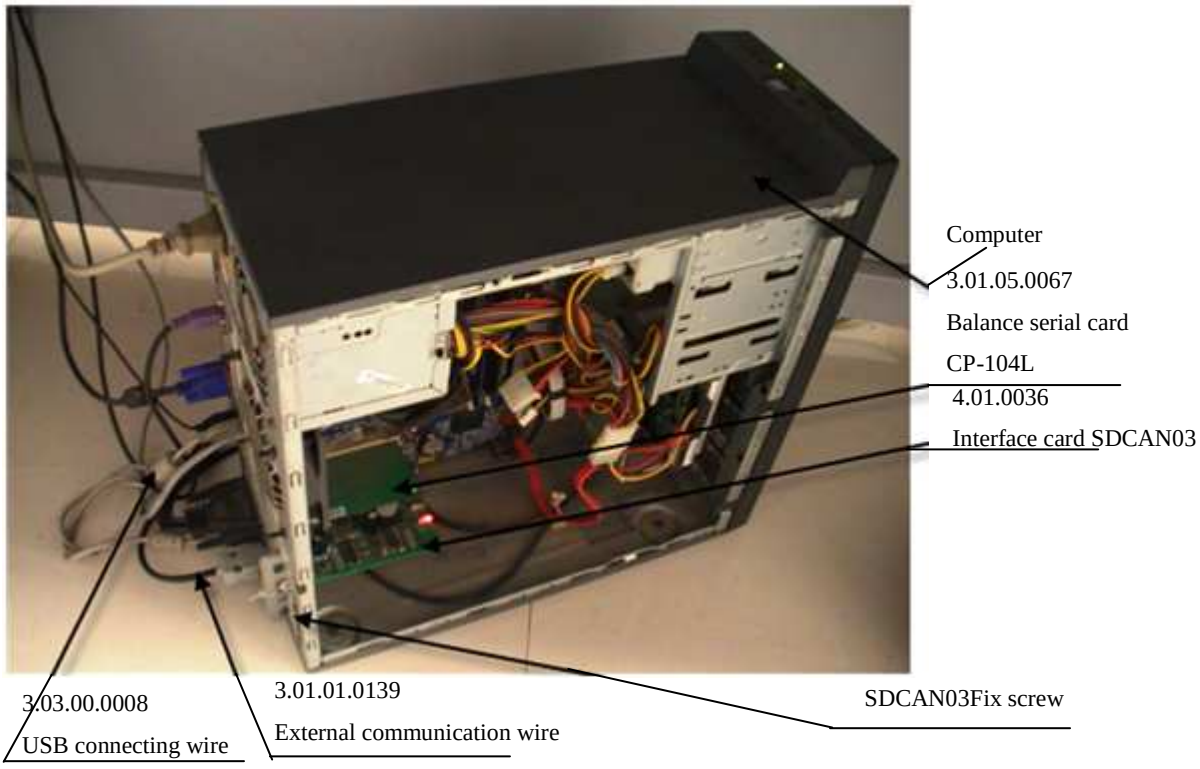


Fig.3-17

8. Connect the instrument control power cable, heating power cable, USB-CAN card communication cable and balance communication cable and check the instrument to see if it is reliably grounded. Then, turn on the computer and instrument power, install the software and authorize the system. Shown as Fig.3-18.

Fig.3-18

3.2.3 Software installation, un-installation

1. Software installation

a. The test-control software

Insert the CD marked “Set-up Disk” into the CD drive, open the folder “ELAn-18 Proximate Analyzer(English)” under the CD drive directory through the “Explorer” file, double click “Setup(ELAn-18 Proximate Analyzer).exe” to enter into the installation program, then you need only to select “Next” or “Yes” as prompt until “Finish” to complete the installation.

b. Installation of the balance drive software (The balance interface card has been installed.)

Insert the balance interface card into the CD drive, click “My Computer”→ right click “Attribute” to enter the system attribute window→ select “Hardware” Tab, click “Device Manager”→ click “”→ then find the corresponding drive program of “CP-104UL V2” according to prompts until finish the balance drive card installation, as shown in Fig.3-19.

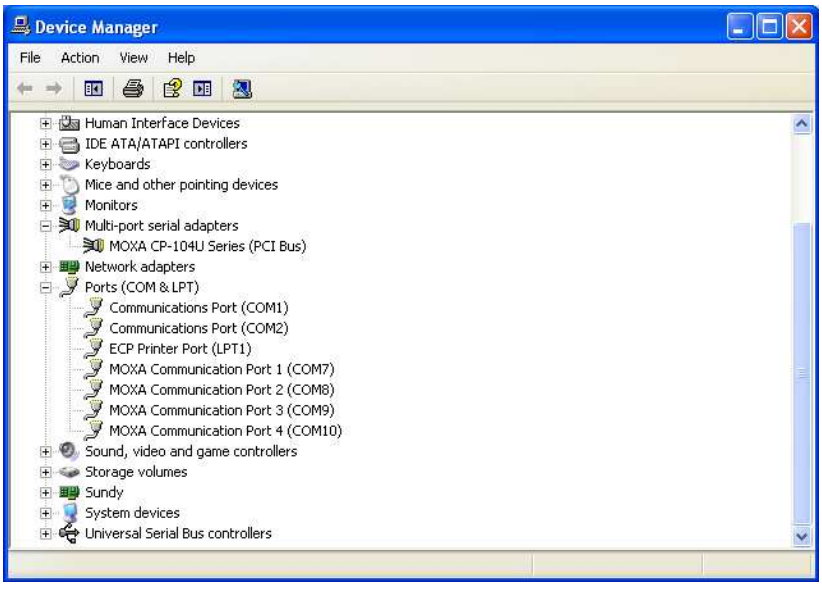


Fig.3-19

Find “Multi-serial Port” path from the “Device Manager”, select the subentry “MOXA CP-104U Series” and right click the mouse→ select “Attribute”→ click “Ports Configuration” Tab, set the balance on-line port number in the range of “COM3-COM8” through the button “Port Setting”. Otherwise, no data will be displayed when the balance is on-line.

2. The test-control software un-installation

Click “Control panel” and “Add /Delete Program” and open this window. Select “Change or Delete Program” label and click item “ELAn-18 Proximate Analyzer” in the program group. After that, click “Delete” button to perform the un-installation. You can quickly and safely delete the ELAn-18 Proximate Analyzer’s program group and shortcut of according to the prompts.

3.3 Instrument Debugging

3.3.1 Preparations

1. Check if the control line and power line is connected correctly and fastened well.

2. Test tools: moisture/ash crucibles, volatile crucibles, sample ladle, brush, and bent tweezers.

3.3.2 Debugging procedures

1. Take the front and rear, right and left covers of the instrument, enter the manual detection to detect every mechanical part to see if it works in order.

2. Holes matching:

1) Adjust the manipulator central locator card. When the manipulator is in the horizontal left position and the ascending and descending lower position, rotate the manipulator to the sample placing tray, then rotate it to the central point. When the manipulator is horizontally shifted to the combustion furnace position, observe the manipulator to see if it is located in the middle of the open slot at the inlet of the combustion furnace support. In case of any bias, adjust the left locator card (close to the low-temperature furnace) of manipulator’s the central locator until the manipulator is located in the center of the combustion furnace mouth. Adjust the right locator card (close to the sample placing tray) of the manipulator’s central locator with the same method. Rotate the manipulator from the sample placing tray and the low-temperature tray to the central point, but the manipulator can keep in the center of the open slot at the inlet of the combustion furnace support after adjusting the locator cards.

2) Adjust the locator card of the combustion tray and the horizontal right locator card of the manipulator. Shift the manipulator which is in horizontal left

position and the rising and descending lower position to the location below the combustion tray. Then, adjust the combustion tray rotation locator card and manipulator horizontal right locator card according to the offset between the manipulator and sample holes of the combustion tray to make the manipulator in the center of each sample hole on the combustion tray. Shown as Fig.3-20.

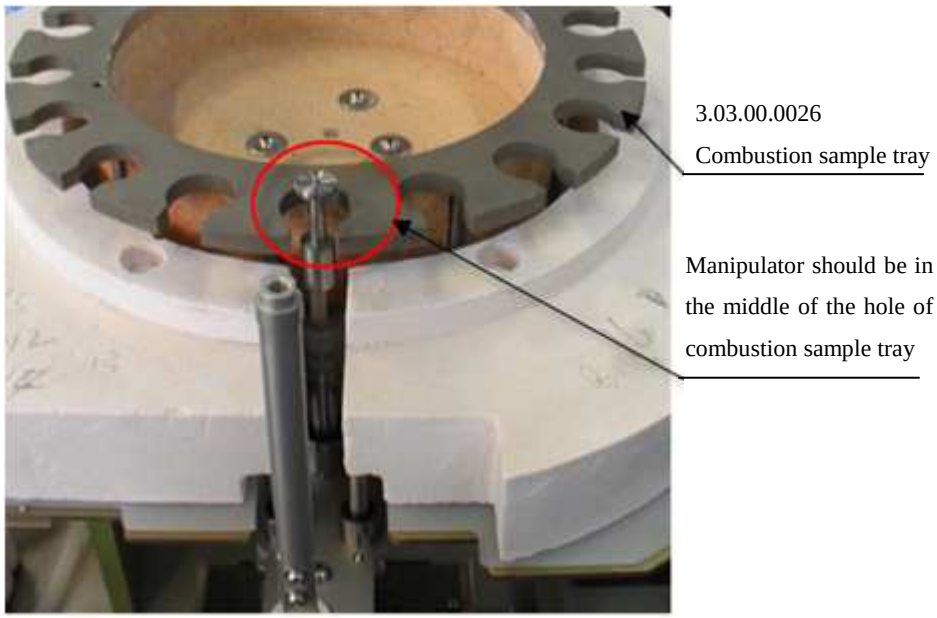


Fig.3-20

3) Adjust the manipulator horizontal left locator card to make the manipulator in the center of the open slot at the inlet of the low-temperature furnace bottom.

4) Adjust the right rotation locator card of the manipulator and the locator card of the low-temperature tray to make the manipulator in the center of each sample hole on the low-temperature tray. Shown as fig.3-21.

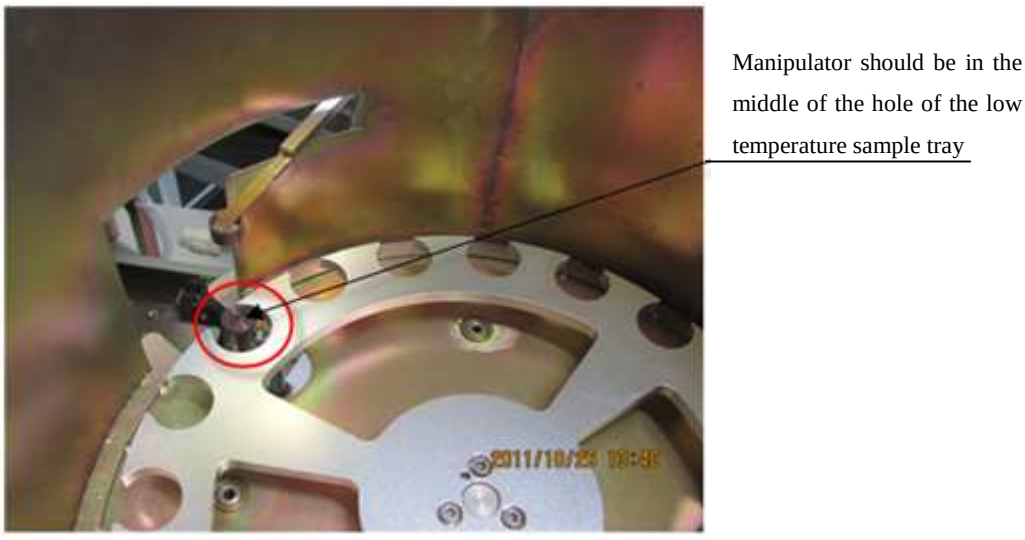


Fig.3-21

5) Adjust the left rotation locator card of the manipulator and the locator card of the sample placing tray to make the manipulator at the center of each sample hole on the sample placing tray. Shown as fig.3-22.

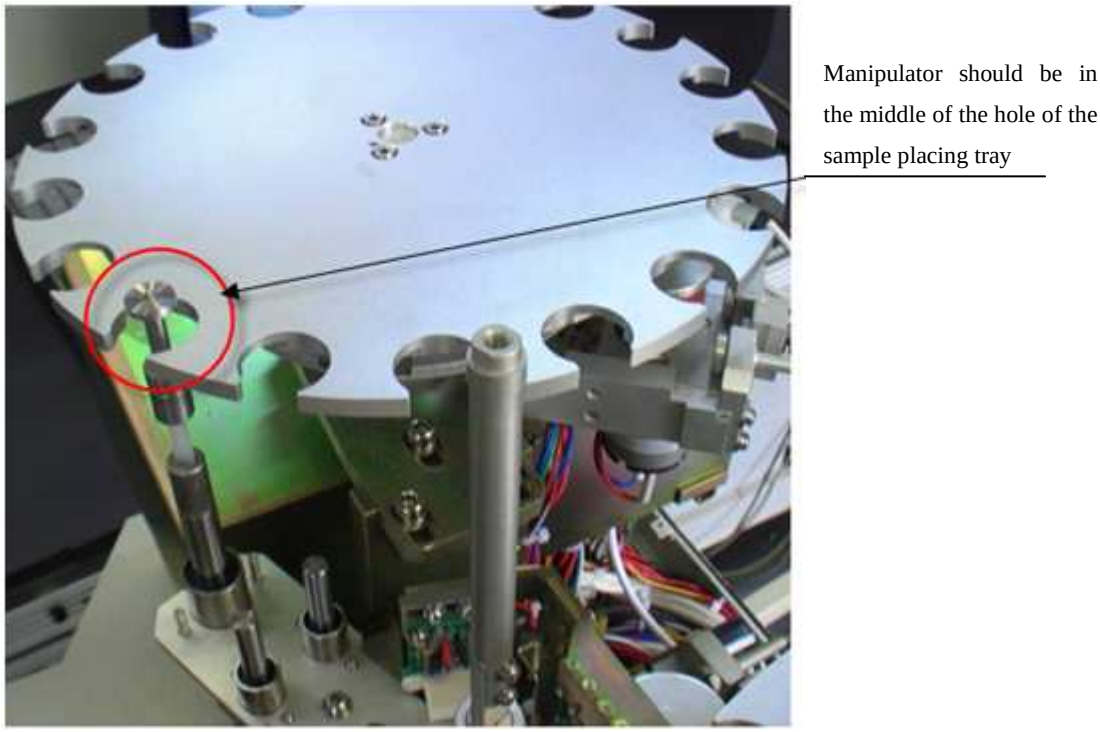


Fig.3-22

6) Adjust the height and position of the manipulator crucible holding device. When the manipulator lifts up, the hold-up tension of the volatile crucible needs to be exactly fit and the holding sheet to be located in the middle of the crucible cover. The manipulator clamping rod should be kept in the center of the sample introducing mouth of the low-temperature furnace. Shown as fig.3-23.

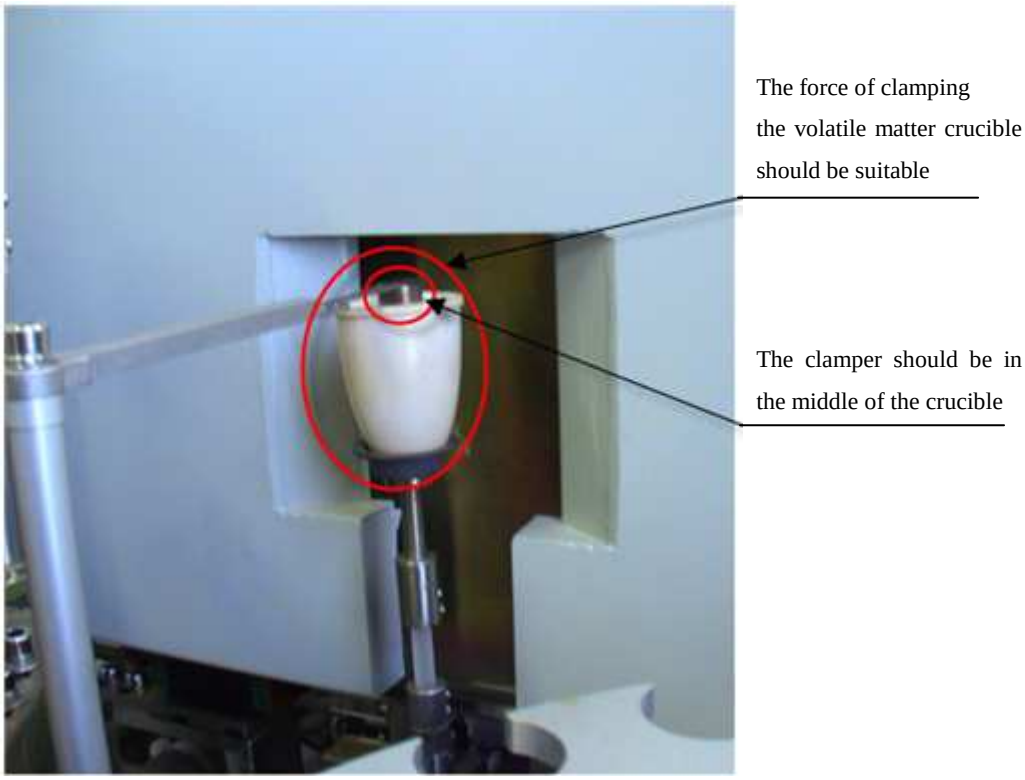


Fig.3-23

7) Adjust the all-around position of the low-temperature furnace balance to make the sample bar right under the sample holes. Shown as fig.3-24.

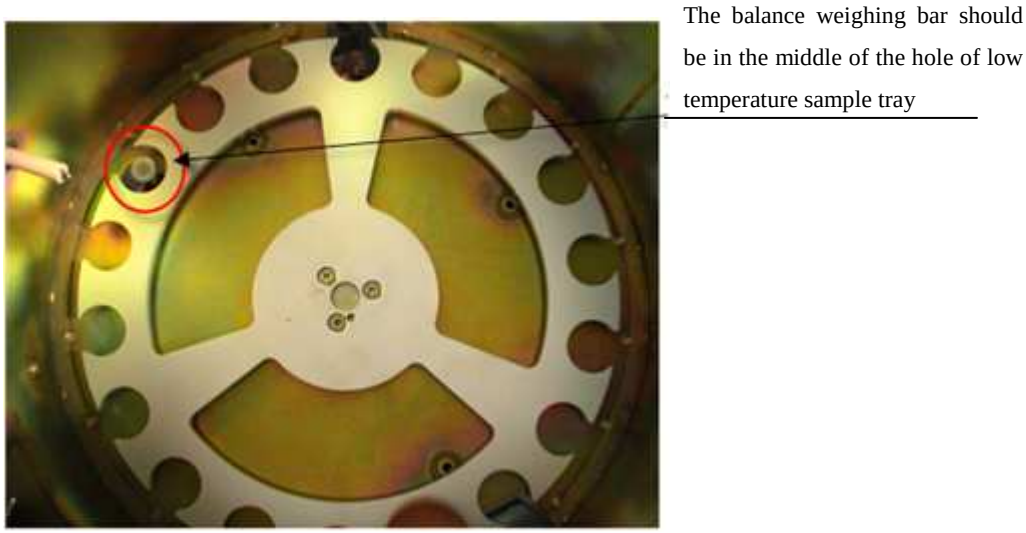


Fig.3-24

8) Adjust the all-around position and the height of the sample discarding bar to make it right under the sample discarding hole of the low-temperature tray and the space between the top point and sample hole inner side edge be (2～3)mm. Shown as fig.3-25.

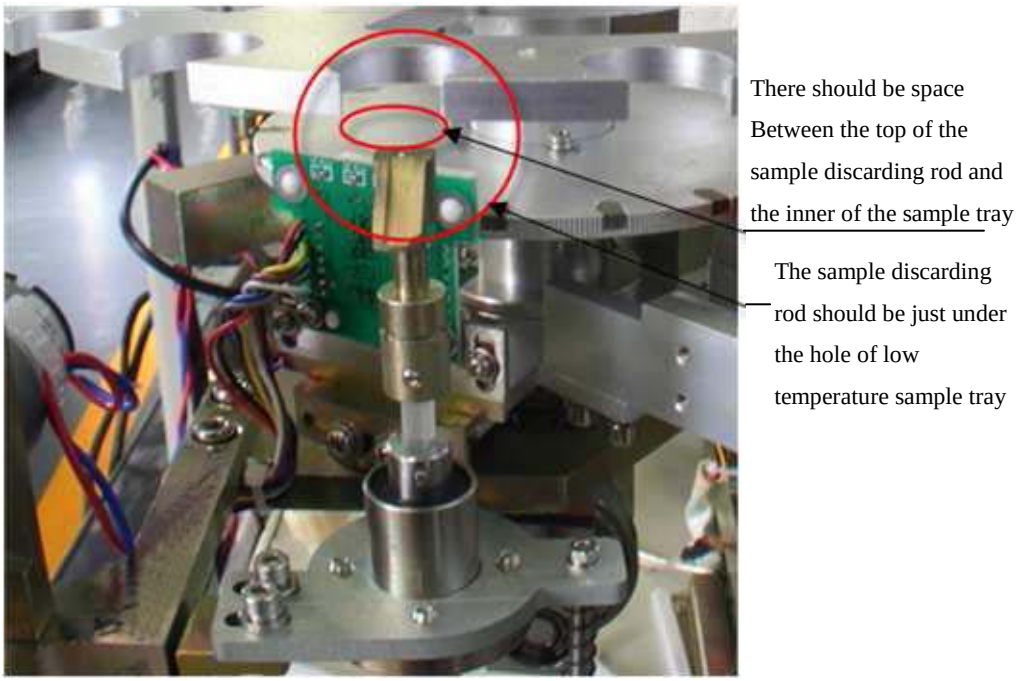


Fig.3-25

9) After matching the hole position at room temperature, heat the combustion furnace up to 920℃, then match the holes in accordance with points (1～5) again to ensure that the relative positions between each sample tray and the manipulator can meet the test requirement.

10) After matching the holes, adjust the manipulator rotation and shift limit switch. When the manipulator is lifted to the up position, rotate or shift it up to the target tray. When it is in touch with the limit switch, the manipulator should keep inside the target sample tray hole to avoid damage to the manipulator in abnormal condition.

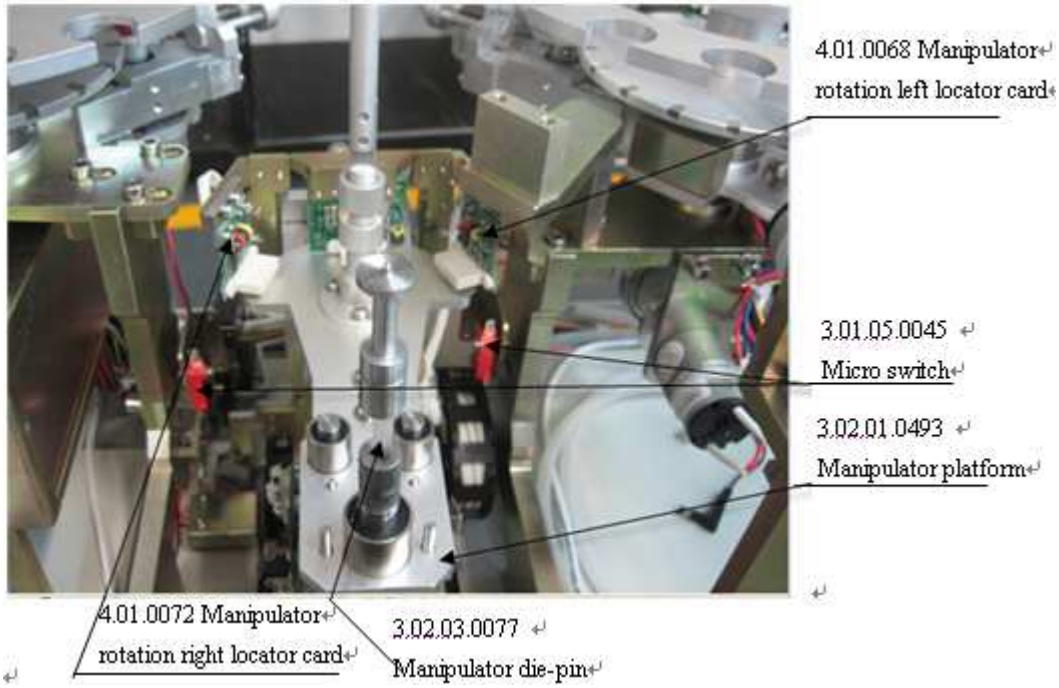


Fig.3-26

3. Detect the rotation positioning state of the combustion tray, low–temperature tray and sample placing tray when the low-temperature furnace and combustion furnace are kept in room temperature or max constant test temperature to ensure narrow and wide Hall positioning are in order.

4. When the low-temperature furnace and combustion furnace are kept in room temperature or max constant test temperature, test the 54 holes of the sample tray with moisture/ ash crucibles and volatile crucibles to avoid crucibles turning over.

5. Check and calibrate the instrument precision and accuracy.

1) For the details of the operating process, refer to Chapter 5.

2) Select 3~ 5 kinds of coal samples, each coal sample will be tested by 2 separated groups. Each group of test will be repeated twice to check the test repeatability, reproducibility and accuracy. If they failed to meet the requirement, the instrument should be examined and adjusted again.

3) Repeatability and Reproducibility should be in accordance with the following table.

Repeatability and Reproducibility of test result (Chinese standard GB/T212-2008)

	Moisture			Volatile matter			Ash		
	＜5	5～10	＞10	＜20	20～40	＞40	＜15	15～30	＞30
Repeatability (ad%)	0.20	0.30	0.40	0.30	0.50	0.80	0.20	0.30	0.50
Reproducibility (d%)	※	※	※	0.50	1.00	1.50	0.30	0.50	0.70

Precision of Ash test by ASTM standard（ASTM-D5142-2009）

Mass fraction of ash (Dry basis)/%	Repeatability/%	Reproducibility critical difference
All range	0.07+0.020X	0.14+0.023X

X is the average of test results of two times.

Precision of Volatile matter test by ASTM standard（ASTM-D5142-2009）

Mass fraction of volatile matter (Dry basis)/%	Repeatability/%	Reproducibility critical difference
All range	0.29+0.014X	0.62+0.047X

X is the average of test results of two times.

3.4 Notes for Installation and Debugging

1. Prior to the installation, take the shock-proof sponge and cable ties, etc. out of the instrument, as Attentions.

2. Prior to power on the system, check the on-site supply line to see if it is grounded properly.

3. Prior to the balance installation, check the balance setting parameters to see if they are up to the instrument’s test requirement.

4. Prior to on power on the instrument for debugging, in case of any big looseness of some mechanical parts’ installation position due to transportation, fine adjustment should be carried out to avoid mechanical failure arising from any instrument damage of manual detection.

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

6. After the complete machine is debugged, tighten all bolts and nuts.

Chapter 4 Operation of the System

4.1 The Start-up and Exit of the Test-control Software

4.1.1 Start-up

Way 1: click “Start”→ “Program”→ select “ELAn-18 Proximate Analyzer”→ click the “ELAn-18 Proximate Analyzer” to enter into the main interface as shown in Figure 4-1.

Way 2: Directly double-click the short-cut icon of “ELAn-18 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", click "Yes" button, and then you can exit the “ELAn-18 Proximate Analyzer” test-control software, and return to the desktop.

Attention: The Test-control software needs to be shut down before you exit the Windows or turn off the computer in order to ensure the test data and parameter file not to be destroyed.

4.2 Function Description of the Main Window

The main window of the ELAn-18 Proximate Analyzer test-control software mainly consists of a title bar, a menu bar, a fast button column, the state bar and the data column, etc. as shown in Figure 4-1:

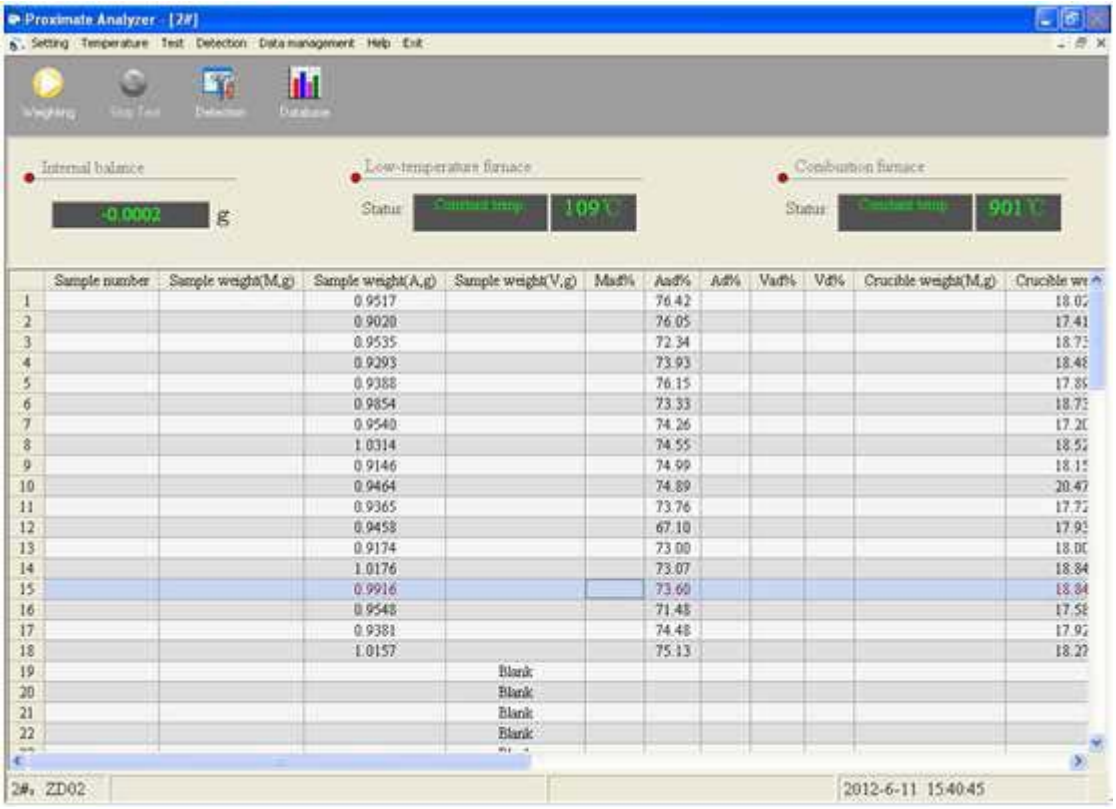


Fig.4-1

Among them, the data column is provided with column width adjustment, column hiding or display functions. When the cursor is shifted to the data column, right click the mouse to pop up the menu as shown in Fig.4-1-1. The functions are described in detail as following:

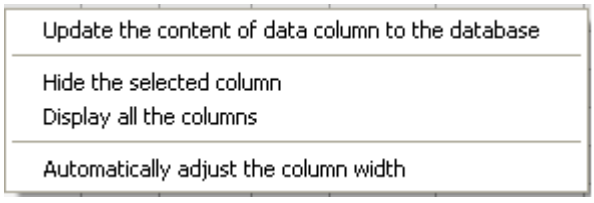


Fig.4-1-1

1. Update the content of data column to the database

a. Input moisture value to the blank data column or the recording field which is not saved in the data base, update it to the Database Save Invalid.

b. Prior to the calculation of the moisture and volatile matter, input of moisture /volatile matter value is allowed. When calculating the moisture/ volatile matter, the input values will be overwritten by the test value.

c. Moisture record enters the database for storage, and then it is not allowed to

be modified manually.

d. The amendment of the input Mad% is allowed prior to the ash and volatile calculation results. When the ash and volatile are displayed, Mad% will be incorporated into the air dried basis and dry basis calculation. Then, you can only amend Mad% after entering into the database.

2. Hide the selected column: Click the cell to be hidden from the data column at the main interface before right clicking the mouse to select “Hide the Selected Column”; and then the selected column will be immediately hidden.

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

4. Automatically adjust the column width: Shift the mouse to the data column at the main interface to select this item, all columns will be automatically adjusted to the proper width to solve the problem of the difficulty in the restoration after manual adjustment of the column width.

Besides, you can freely array the data column at the main interface according to the actual test index by selecting the column field, such as “Mad%”, pressing fixedly the left button of the mouse to shift the column to the position to be arrayed.

4.2.1 Menu setting

1. Test settings: Click “System Setting” in the main menu to enter into the Window as shown in Fig.4-2-1

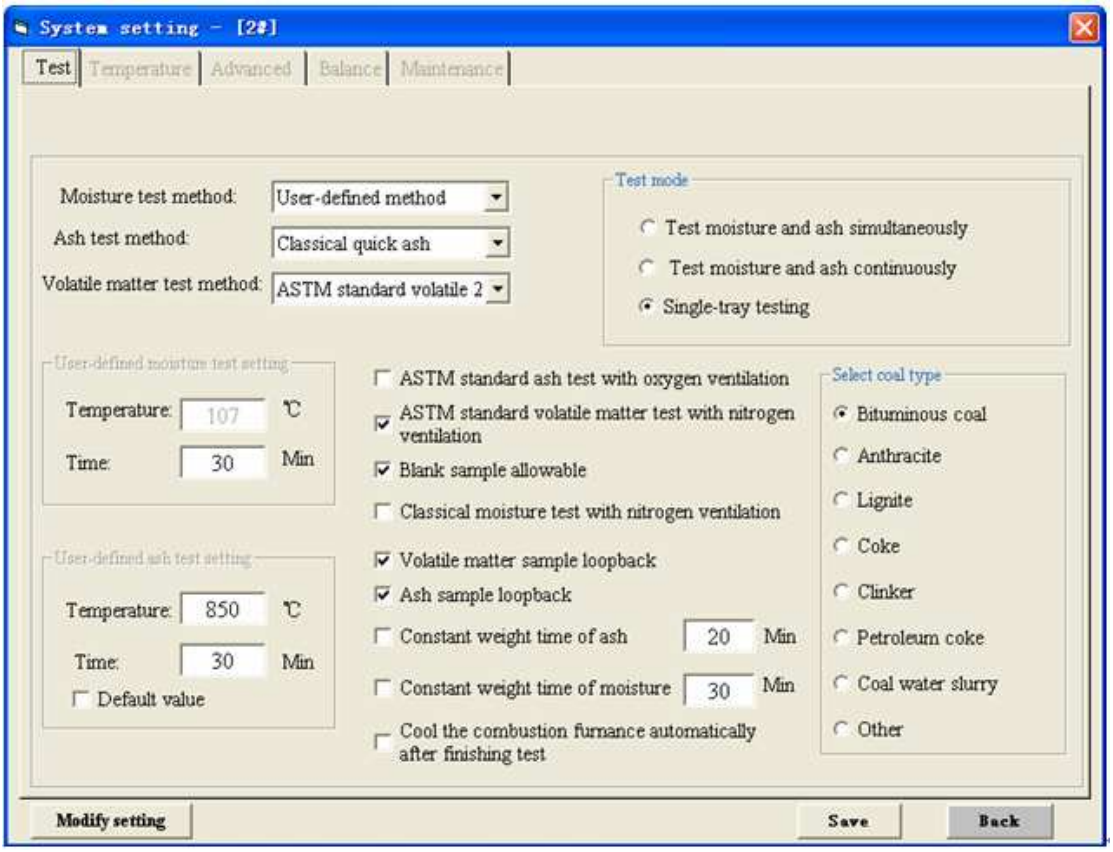


Fig.4-2-1

1) Moisture test method

a) User-defined setting: It is suitable for routine analysis of moisture content in bituminite. “Single tray testing” mode is effective, and the defaulted value of the constant temperature is 107℃. The heating time can be set by the user. Moisture test is finished by timing.

b) Classical method I: It is usually used to analyze bituminite, partial anthracite and lignite, and the heating duration is 60minutes.

c) Classical method II: It is usually used to analyze bituminite, anthracite and lignite, and the heating duration is (90-120) minutes.

2) Ash test method

a) User-defined setting: It is suitable for routine analysis of ash content in bituminite. The heating duration and constant temperature point can be set as required. Select “Default” Check Box, the user-defined ash temperature can be automatically set at 850℃ and heating duration set at 30minutes.

b) Classical quick test of the ash content: It is usually used to analyze bituminite, partial anthracite and lignite.

c) Classical slow test of the ash content: It is suitable for analysis of ash content in all kinds of coal.

d) ASTM standard ash test：Introduce the coal sample or coke confirmed to ASTM standard below 100℃. The gas in the furnace should be pure oxygen or air (the flow of pure oxygen: 0.4-0.8 furnace volume/min, the flow of air: 2-4 furnace volume/min). After that, heat the furnace up to 500℃ in an hour and heat it up to 750℃（950℃ for coke）in the end of the second hour, then continue to heat the furnace at 750℃ for coal (950℃ for coke) for two hours(Most coal samples can become incineration in 3 hours, so the heating time can be set by the user, but the heating time for coke should not be less than 4 hours.)

3） Volatile Matter test method

a）ISO standard test：It is suitable for the volatile matter test for all kinds of coal of ISO standard (Lignite and kennel coal should be compressed to pie shape beforehand and cut into small pieces with the width of 3mm). Introduce the sample at 900℃ and burn it for 7 min at 900℃.

b）ASTM standard Ⅰ test：It is suitable for most kinds of coal samples of ASTM standards which are not easy to splash. Introduce the sample at (（950±20）℃) and take the sample out after 7 min. The furnace gas is nitrogen.

c）ASTM standard Ⅱ test：It is suitable for most kinds of coal samples of ASTM standards which are easy to splash. Introduce the sample below 100℃ and heat it up to 600℃ at the speed of 25℃/min, then heat it up to （950±20）℃ at the speed of 35℃ and burn it at this temperature for 6 min before taking it out. The furnace gas is nitrogen.

4) Test mode

a) Single-tray testing: the current test is only for one index. **You can only choose this mode when testing all the indexes according to ASTM Standard.**

b) Test moisture and ash continuously: For combining test of moisture and ash continuous test and volatile test, the samples should be put twice.

When this mode is selected, “Classical ash quick test” method is set automatically for ash test in case that “User-defined setting” method is set for moisture test. And “Classical ash slow test” method is set automatically for ash test in case that “Classical Method I/ Classical Method II” is set for moisture test. Then, the “Ash loopback” setting will be shielded automatically and the ash discarding will be defaulted by the system.

c) Test moisture and ash simultaneously: For combining test of moisture and ash simultaneous test and volatile test, the samples should be put for three times.

When this mode is selected, the option “Moisture constant weight” which becomes grey automatically is not permitted to select and the “Ash loopback” setting will be shielded automatically. (The ash discarding will be defaulted.) If the “soft coal” is set, then the test method for moisture and ash will be updated to “User-defined Method” and “Classical Fast Ash” respectively. If the “anthracite” is set, you can select “Classical Method 1” or “Classical Method 2” as moisture method. If the “lignite” is set, “Classical Method 2” and “Classical Moisture via Nitrogen Method” are defaulted for moisture when “Test moisture and ash simultaneously” or “Single-tray test” are being done. For other coal types, “Classical Moisture via Nitrogen Method” can be selected.

When “User-defined Method” is set for moisture in case of “Test moisture and ash simultaneously” or “Test moisture and ash continuously”, conditions are selected to judge when the moisture test should be completed. The default heating duration for the first time is 30 minutes. After that it will continue to heat or finish the test according to the moisture content of the coal type.

5) Select coal type

a) Soft coal：Set “Classical Fast Ash” for ash content and choose “Test moisture and ash simultaneously” test mode, and then “User-defined Method” will be set for testing moisture content automatically. At the same time, condition judging method will be used for finishing the test. For details, please refer to Chapter 6.

b) Anthracite, Lignite, Coke and others: If “Classical Fast Ash” is set for ash content, then please adopt “Test moisture and ash simultaneously” test mode. And classical method should be adopted for moisture constant.

6) Constant weigh: Select time check box of moisture /ash constant weight, and set the time for the constant weight correspondingly. When moisture testing (single-tray testing) and ash testing is done by classical method, the system will handle the constant weight item based on the set time.

7) Ash/ volatile loopback: Select this check box; the system will automatically transfer the ash or volatile sample from the low-temperature tray to the sample placing tray when calculation of the ash or volatile test results is finished. If this check box is not selected, the system will default as sample discarding.

Note: The test methods of “Test moisture and ash continuously” and “Test moisture and ash simultaneously” only permit volatility samples loopback, but the ash samples discarding will be defaulted.

8) Blank sample allowed: Select this check box and the blank sample test is allowed, otherwise, the blank sample test cannot be made.

2. Temperature setting: Click “System setting” to enter into the window shown as Fig4-2-2.

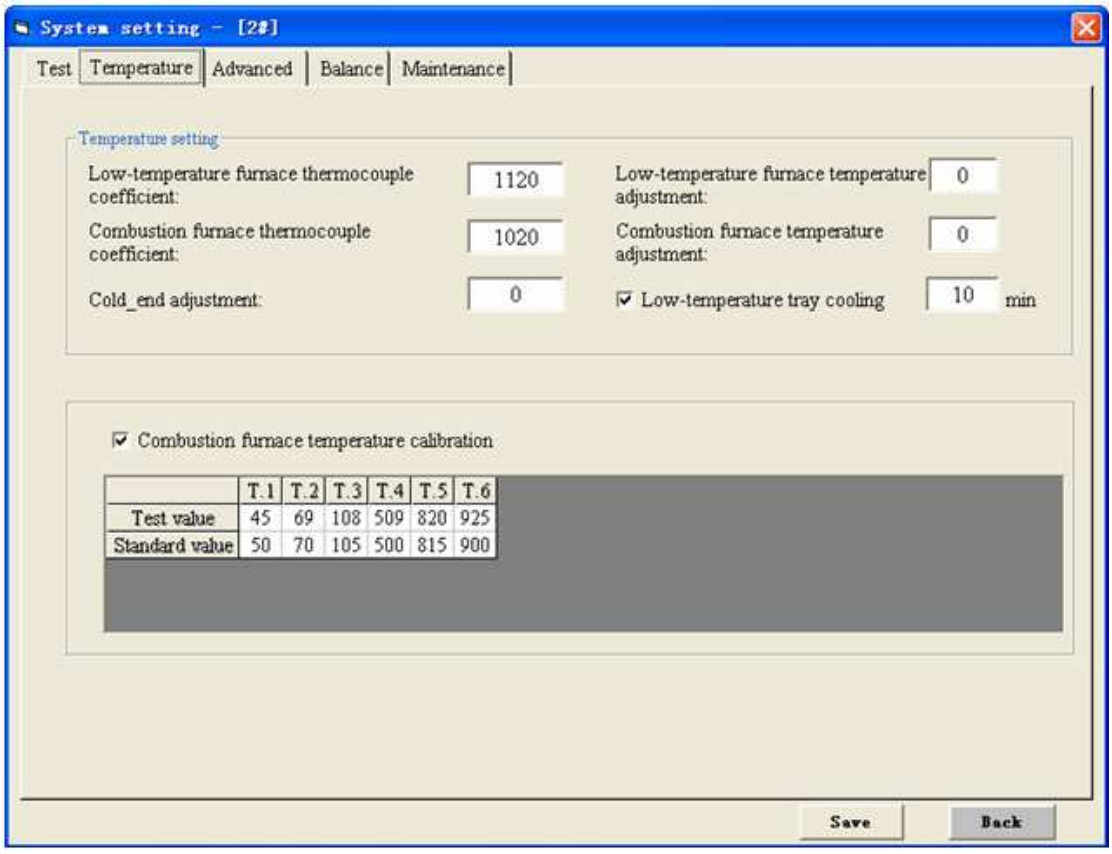


Fig.4-2-2

3、Advanced setting: Click “System setting” to enter into the window shown as Fig4-2-3.

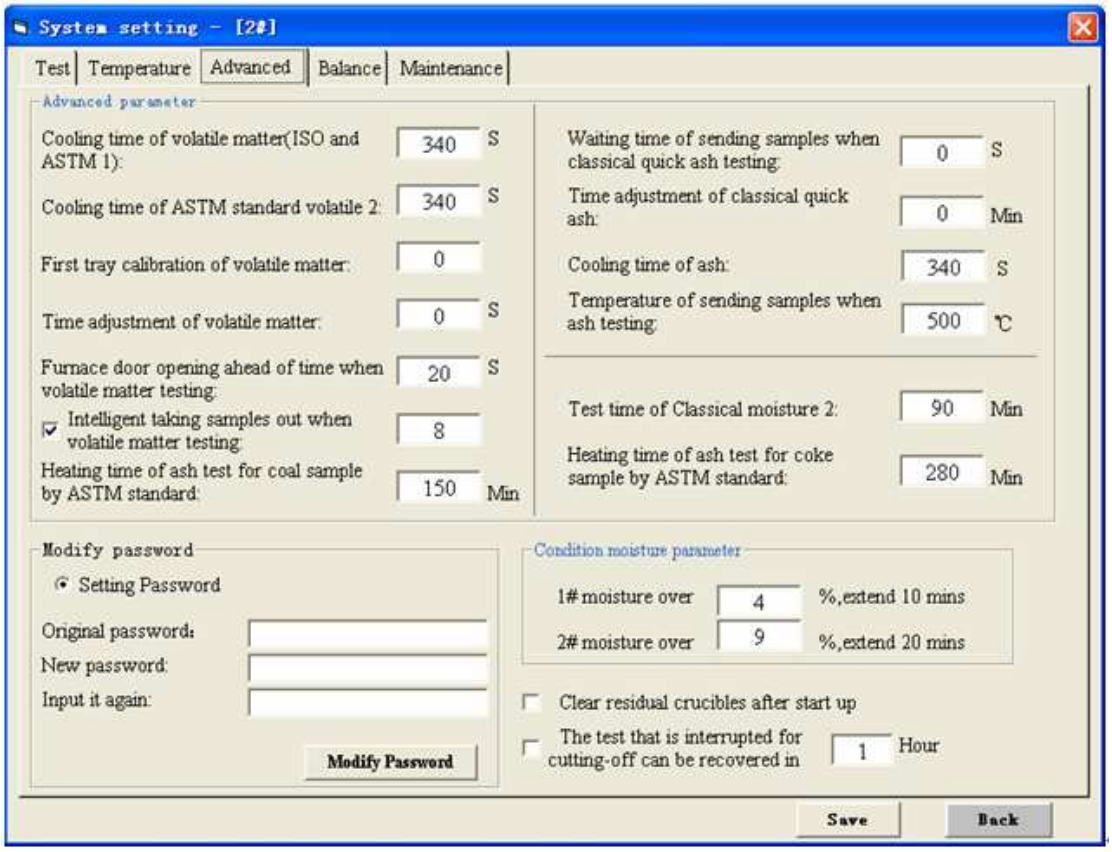


Fig.4-2-3

1） Advanced parameter: for setting relative parameters of tests.

2） Correction index: this is for correct the system bias of the instrument.

3） Condition moisture parameter: for user-defined moisture single tray test, if 4%≤Mad%＜9% , prolong the heating time by 10 min, if Mad%＞9%, prolong the heating time by 20min. These two breakpoints can be set by the user.

4、Balance setting: Click “System setting” to enter into the window shown as Fig.4-2-4.

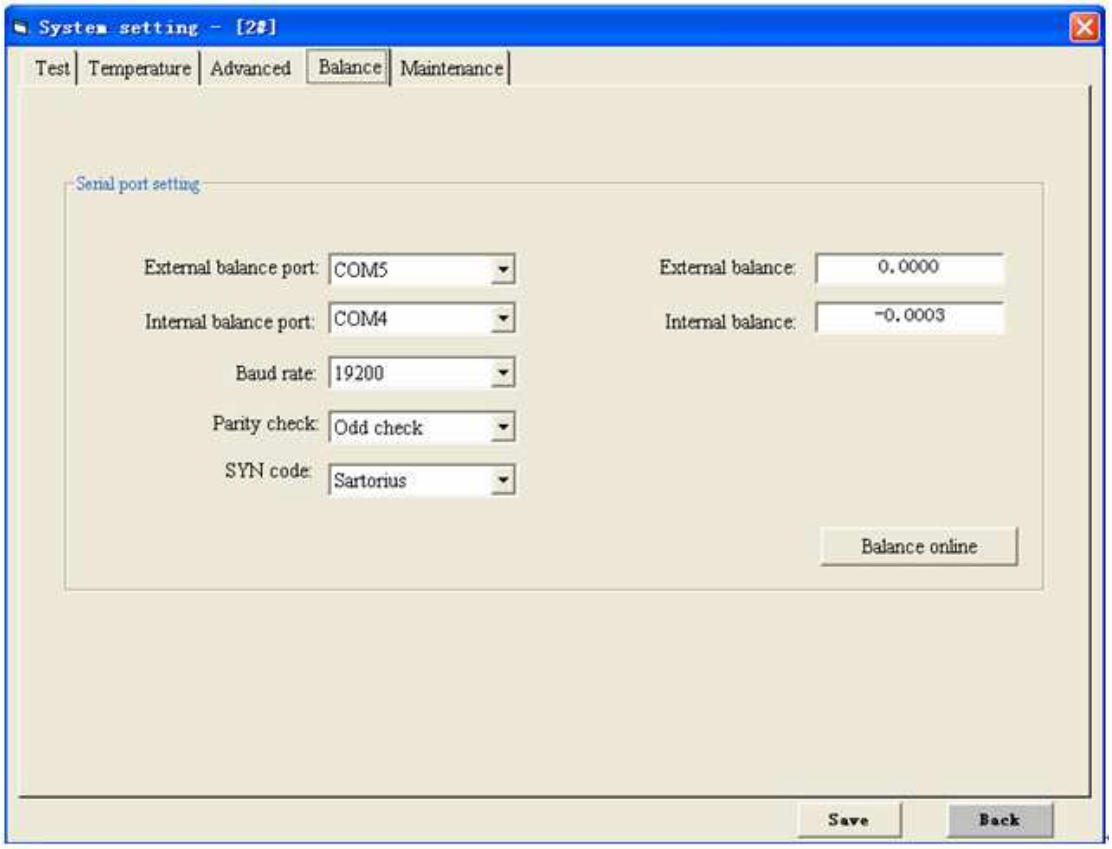


Fig.4-2-4

1） Serial port setting:

a) Serial port select: this is used to set the serial port number of the external and internal balance connected to the computer.

b) Baud rate: this is used to set the baud rate of serial port communication. It should be in accordance with that of the baud rate, the default value is 19200.

c) Verification mode: This is used to set the verification mode for serial port communication which should be in accordance with the balance connected with the computer. The default value is odd check.

d) SYN code: This used to set the type of internal balance, the default balance is Sartorius.

5、Maintenance setting: Click “System setting” to enter into the window shown as Fig4-2-5.

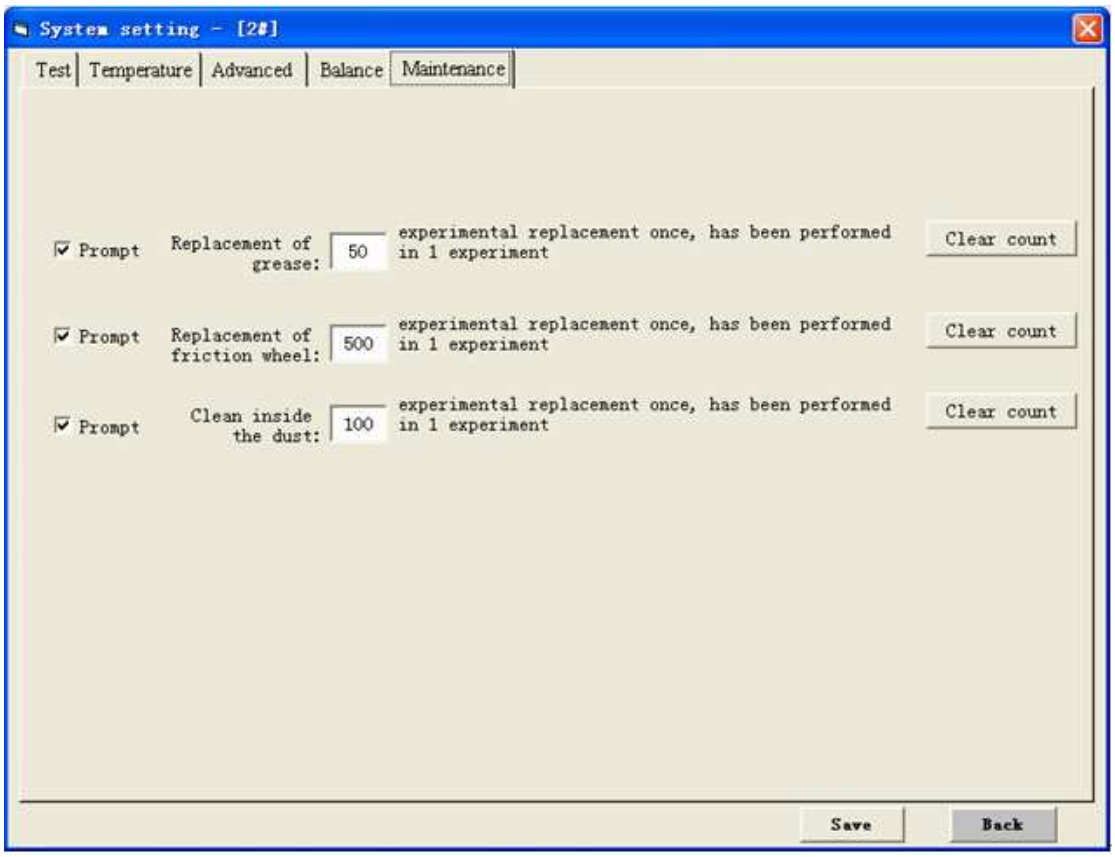


Fig.4-2-5

1） Replacement of grease: Select this item, then it will record the test time and prompt the user to replace. Click “Clear count” to restart counting.

2） Replacement of friction wheel: Select this item, then it will record the test time and prompt the user to replace. Click “Clear count” to restart counting.

3） Clean inside the dust: Select this item, then it will record the test time and prompt the user to clean. Click “Clear count” to restart counting.

4.2.2 Temperature menu, as shown in Fig. 4-3:

Fig.4-3

1. Heating: When the displayed temperature of the low-temperature furnace and combustion furnace is the same as the room temperature, click the this item and the system will prompt “Whether to carry out the ash slow test or not”. Select “Yes” and the low temperature furnace will be heated to the constant

temperature107℃. If the combustion furnace is not to be heated, select “NO”, and the combustion furnace will be heated to constant temperature 500℃.

2. Cooling: When the low temperature furnace or combustion furnace is not in tests and is kept in “Heating /Constant temperature” state, select this item in the menu, the low temperature furnace or combustion furnace will stop heating and be in Ready State.

4.2.3 Test menu, as shown in Fig.4-4:

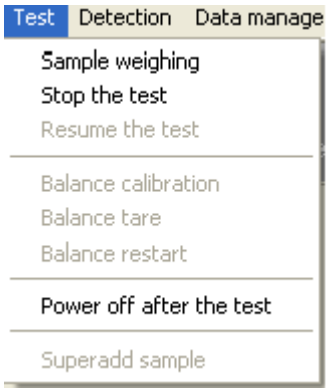


Fig.4-4

1. Sample weighing:

Select this menu item or click “Sample weighing” button in shortcut button column to pop up the window as shown in Fig.4-4-1.

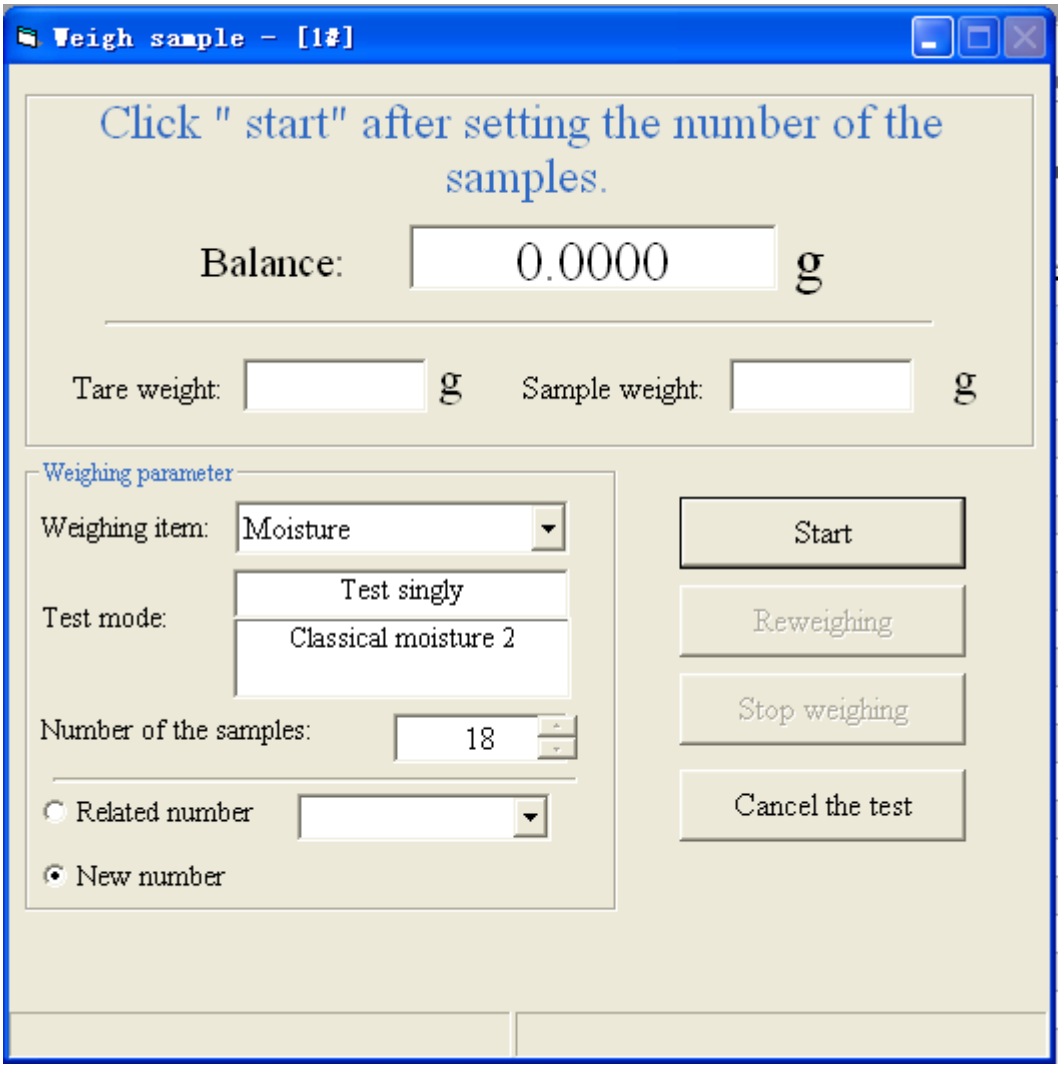


Fig.4-4-1

1) Balance: When the balance is connected, this column will display the real-time balance readings.

2) Tare weight: This column will display the last weighed stable crucible weight.

3) Sample weight: This column will display the last weighed stable sample weight.

4) Weighing item: To display the current weighed index based on the set parameters.

5) Test mode: The testing mode for the current experiment and analytical method of the current weighing samples.

6) Number of the samples: Indicate the total amount of the current weighing samples. Directly input 1~18 into the Edit box or click the Up and Down

buttons on the right of the Edit box to modify the number of the samples. If the samples are under weighing, but the weighing is not completed, the total amount of the samples can be modified by clicking the Up and Down buttons on the right of the Edit box.

7) Related number: To be related with the displayed data number to facilitate the conversion between test data of air dried-basis and dry-basis. For example, if ash is tested singly, select “Related number” check box and click the pull-down button on the right of this column, then select the corresponding moisture No. before clicking “Start” and weighing the samples. Then, the weighed ash data will be displayed automatically in the corresponding moisture data column. When the test results are displayed, the air dried basis and dry basis ash and volatile values will be conversed automatically.

8) New number: Not related with other index data, new automatic number is formed in the data column.

9) Start: Click this button to enter into the crucible and sample placing state.

10) Reweighing: When the samples are to be reweighed due to the mis-operation, take out the crucible and clear up the sample weighing tray before clicking this button and placing the crucible and samples again as prompted.

11) Stop weighing: Under single-tray testing mode, the weighing of specified number of samples is not finished, click this button to end the weighing ahead of the schedule.

12) Cancel the test: During the weighing, click this button, the system will prompt the window “Cancel the test?”, select “Yes”, this tray of samples will not enter into test; select “No” to continue weighing.

Notes:

1) When “Moisture and ash test simultaneously” or “Moisture and ash test continuously” is applied, only the input or modification of the number of samples for the first index is allowed, the number of the samples of other 2 indices (ash/moisture and volatile) will automatically be set the same as that of the first index. So there is no need to set “Related number”.

2) During sample weighing, the moisture/ash and volatile samples are to be put in accordance with the Prompt message.

3) In the course of sample weighing, only “Single testing” mode allows clicking “End the sample weighing” button to end the weighing ahead of the schedule and enter the sample placing state. When simultaneous test and continuous test methods are applied, the “End the sample weighing” button in the weighing window will be shielded automatically. If the number of the samples to be weighed needs to be changed while the current index weighing is not finished, click the Up and Down buttons on the right of the Edit box “Number of the samples” to change the total number of the weighing samples.

2. Stop the test: Select this menu item or click “Stop test” button in the short-cut button bar to pop up the window as shown in Fig.4-4-2.

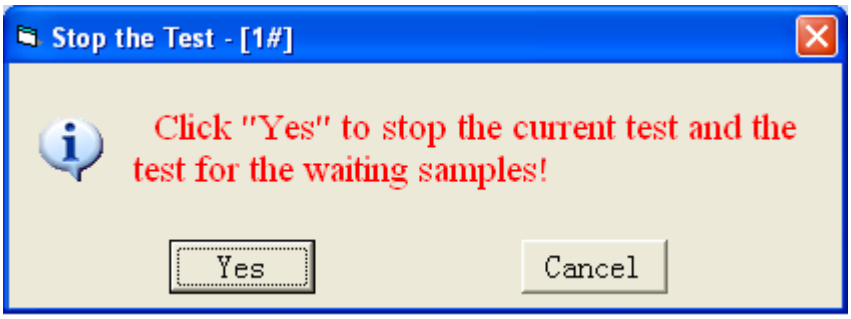


Fig.4-4-2

Select “Yes” button and the tests of the samples to be put and samples in the sample placing tray and the combustion furnaces will be stopped simultaneously and the residual crucibles in the low-temperature tray and combustion furnace is removed automatically. Select “Cancel”, the system will continue the test.

3. Restore the test: If the samples are already weighed but not in the low-temperature furnace and combustion furnace yet, and samples in the sample placing tray are not conveyed due to the abnormal occurrence (such as power failure), restart the test and control software, click the submenu “Restore the test”, then this tray of samples can be restored to the test status prior to the abnormal occurrence.

4. Balance Calibration: It is aimed to calibrate the relative error between the external balance and inner balance at room temperature. Select this submenu, the system will pop up the Window as showed in Fig.4-4-3

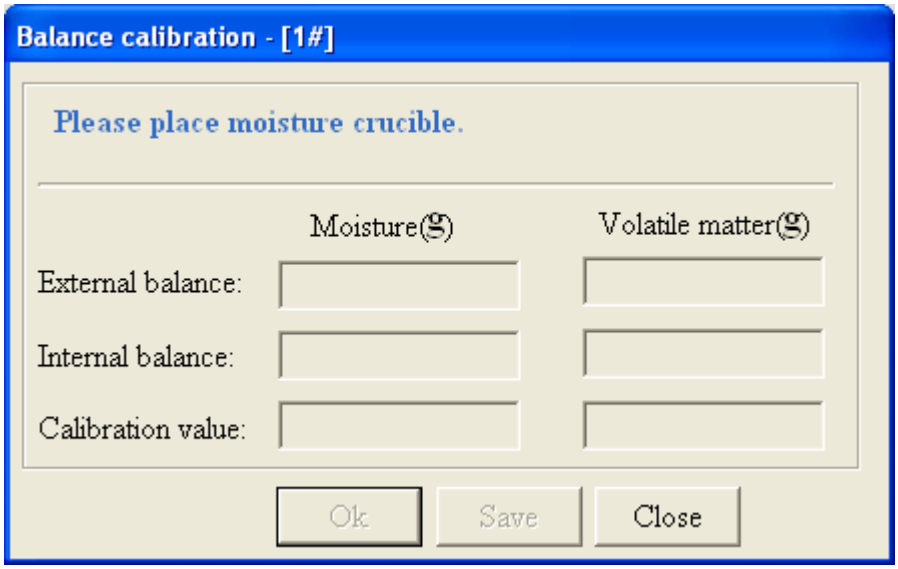


Fig.4-4-3

Calibration procedures:

a) Close the balance windshield→ click “Balance Calibration” in the “Test” menu or make good preparation in accordance with the balance Calibration window automatically popped up by the system.

b) Open the balance windshield, put a moisture crucible onto the weighing plate as prompted→ close the balance wind shield, wait for the display of moisture crucible weight in the window → take out the moisture crucible as prompted, close the balance windshield→ put a volatile crucible and the crucible supporter, close the balance wind shield. → wait for the display of volatile crucible weight in the window→ take out the volatile crucibles and crucible supporter as prompted.

c) Place the moisture crucible in the sample position of the sample placing tray→ then place the volatile crucible and crucible supporter→ Press the red “Confirm” key on the instrument panel. After the Calibration value is displayed in the balance Calibration window→ click “Save”→ click “End”, to finish the balance Calibration.

When “Calibration value” is not displayed, click “close”, then calibration will be ended; when “Calibration value” is displayed, if “Save” is not clicked, the calibrated value would be invalid; when the calibrated value is qualified, then the system will prompt, please analyze the reason before re-calibrate.

Note: In order to ensure stable weighing, please don’t power off the balance.

5. Balance reset: When the balance is connected in order, click this menu item to automatically reset the external and internal balances.

6. Balance restart: When the balance is connected in order, click this menu item to automatically restart the external and internal balances

7. Turn off the computer after the test is done: Click “Turn off the computer after the test is done”, the prompt icon and message are shown in the prompt column； Click this item again or click “Sample weighing”, the prompt icon and message will automatically disappear. After the samples are put in, select this menu item and the system will automatically exit the test and control software and turn off the computer after the sample test is finished.

4.2.4 Detection menu, as shown in Fig.4-5:

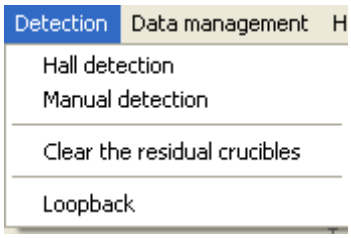


Fig.4-5

1. Hall detection

Select this item in the detection menu to enter the window shown in Fig.4-5-1. Select one-item or multi-item check box in the window, click “Start” button ,the system will separately or simultaneously detect the rotation positioning Hall status of the combustion tray, low-temperature tray and sample placing tray and the shift and rotation positioning status of the manipulator. Click “Back” button to cancel the Hall detection of the sample tray.

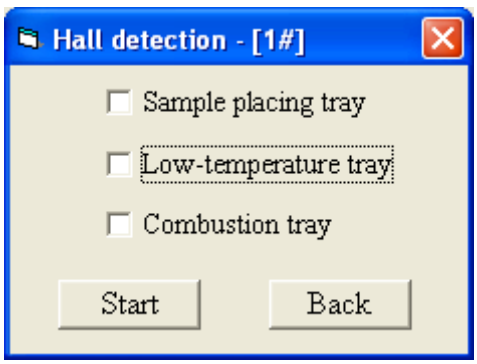


Fig.4-5-1

2. Manual detection

Select this menu item or click the button “Manual detection” in the shortcut button bar to enter the manual detection window shown in Fig. 4-5-2, where you can detect the system functional components to see if they are working in order. The kinematics of various mechanisms is described as follows:

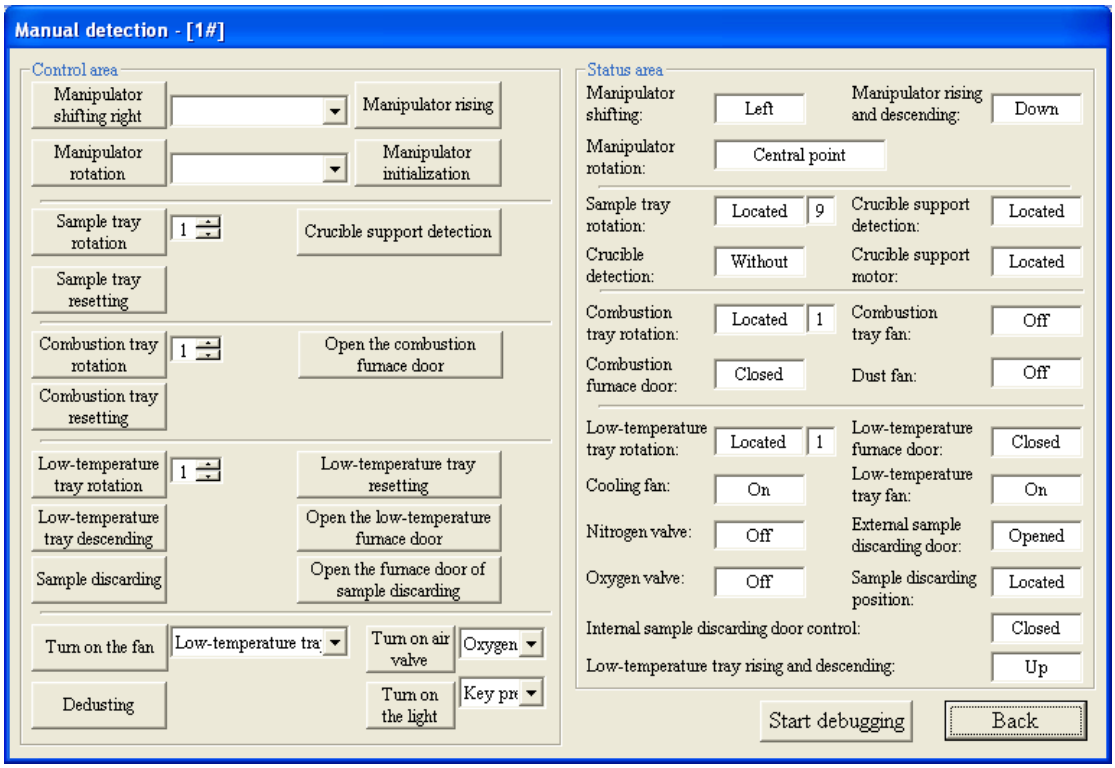


Fig.4-5-2

- Manipulator

1) Manipulator shifting right /left:

a) The combustion furnace door is open. When the manipulator is in the left position, click “Manipulator shift right” and the manipulator will be horizontally shifted to the combustion furnace. When it comes to the right position, it will stop shifting automatically； Click this button again and the manipulator will stop shifting when it is up to the left position.

b) When the manipulator is not positioned due to power failure in the course of the movement, click “▼”in the option box on the right of this button. Select “Shift right” or “Shift left” before clicking this button to enable the manipulator to come to the right position or left position.

2) Manipulator rotation:

a) Rotate toward the target tray: In case the manipulator is in the central point, the low-temperature furnace door is open and target sample tray is kept in the up position, click "▼"in the option box on the right of this button and select sample placing tray/ low-temperature tray and click "Manipulator rotation". Then the manipulator will be rotated from the current position to the sample placing tray/ low-temperature tray and will stop rotating automatically when it comes to the preset position. Meanwhile its rotation status will be displayed in the right status area.

b) Rotate toward the central point: When the manipulator is in the sample weighing tray /low-temperature tray, click "▼"in the option box on the right of this button, select Central Point and click "Manipulator Rotation". Then the manipulator will be rotated to the central point before stop rotation.

Note: If the manipulator is already in the target position, it is invalid to select "Rotate toward the central point".

3) Manipulator rising and descending: Click this button, the manipulator will go up or down vertically; When the manipulator has come up to the up position or down position, it will stop rising or descending automatically.

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

- Sample tray

1) Sample placing tray rotation: Input the number of the grids to be rotated or click  on the right, and click "Sample placing tray rotation" and then the sample placing tray will be rotated clockwise up to the specified number of grids (the permissible input of rotation grids is 50) and then stop rotating.

2) Sample placing tray resetting: Click this button and the sample placing tray will be rotated to 1# position.

- Combustion tray

1) Combustion tray rotation

Input the number of the grids to be rotated or click  on the right, and click "Combustion tray rotate" and then the combustion tray will be rotated clockwise

up to the specified number of grids(the permissible input of rotation grids is 50) and then stop rotating.

2) Combustion tray resetting: Click this button and the combustion tray will be rotated to 1# position.

3) Open/Close the combustion furnace door: Click this button to open or close the combustion furnace door until the furnace door is kept in positioning status.

- Low-temperature tray

1) Low-temperature tray rotation: Input the number of the grids to be rotated or click  on the right, and click “Low-temperature tray rotate” and then the low-temperature tray will be rotated clockwise up to the specified number of grids (the permissible input of rotation grids is 50) and then stop rotating.

2) Low-temperature tray resetting: Click this button and the low-temperature tray will be rotated to 1# position.

3) Low-temperature tray rising/descending: Click this button, the low-temperature tray will go up or go down. When it comes to the up position or down position, it will automatically stop rising or descending.

4) Open /Close the low-temperature furnace door: Click this button to open or close the low-temperature furnace door until the furnace door is kept in positioning status.

5) Sample discarding: Open the external and internal sample discarding doors, click this button and the system will start to discard the sample.

6) Open/Close the furnace door of sample discarding: Click this button to open or close sample discarding door until it is kept in positioning status.

- Others

1) Turn on /turn off the fan: Click “▼”on the right of this button to pop up the option shown in Fig. 4-5-3, select Low-temperature tray/ System radiation/ combustion code wheel/ Dust (strong)/ Dust (weak), click “Turn on the fan” to check the strong (weak)-grade control of the low-temperature furnace fan/ radiant fan of the dust hose system/ cooling fan of the combustion code wheel/ dust exhauster to see if they are working in order.

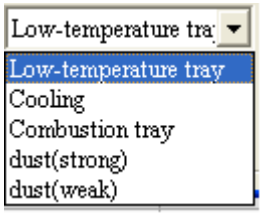


Fig. 4-5-3

2) Turn on/ off air valve: Click "▼"on the right of this button, select Oxygen/ Nitrogen and click "Open the gas valve". Then yon will hear "Tang", and the system will open the Oxygen valve/ Nitrogen valve, allowing for air/ oxygen blowing to the high-temperature furnace and nitrogen blowing to the low-temperature furnace. Click "Close the gas valve" to stop air feeding.

3) Start/Close Dedusting: Click "Start dedusting" button, gas will be automatically blown into the furnace to remove the dust from the tray surface, click again this button to stop dedusting.

4) Turn on /Turn off the light: Click "▼"on the right of this button, select "Buttons", click "Turn on the light", the alarm lamp at the sample placing door will lit up, click again this button and the alarm lamp will blackout. Select "Lighting", click "Turn on the light", all lamps erected inside the instrument for debugging will be turned on, click again this button to turn off the lighting lamps.

5) Status area: To display the current positioning status of the left components.

3. Clear the residual crucibles

Select this item in the menu to enter the window as shown in Fig. 4-5-4. Select single or several check boxes in the window and click "Start" button, the system can clear the crucibles from the combustion tray (incl. manipulator) and low-temperature tray respectively or simultaneously. Click "Back" to cancel this function.

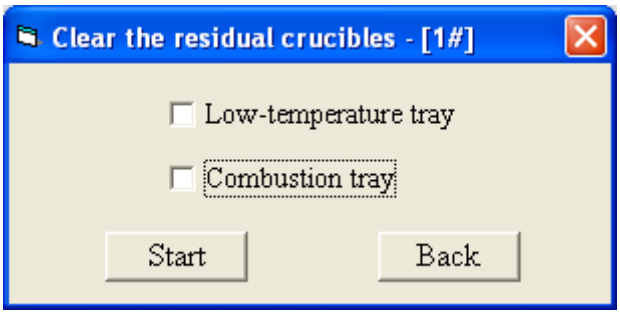


Fig. 4-5-4

4. Loopback: Click this menu item to pop up the window shown in Fig. 4-5-5:

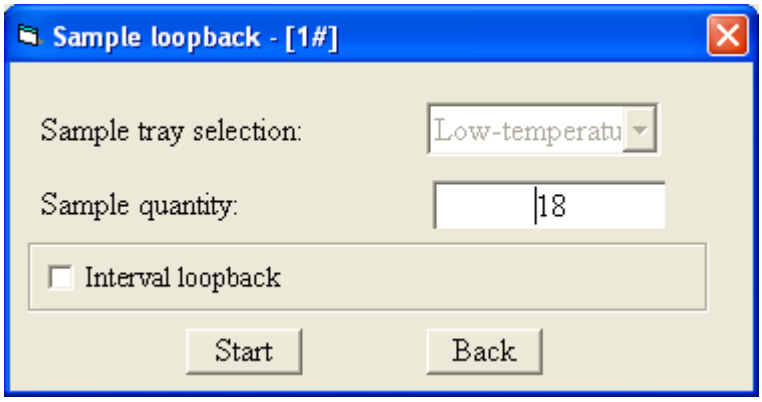


Fig.4-5-5

After the number of the loopback samples is set in the window, click "Start" button, the system will automatically transfer the samples from the low-temperature tray to the sample placing tray according to the set sample number.

4.2.5 Data management menu:

"Data management" is designed for effective management of test data. During test, the database can be interviewed or inquired, for more details, please refer to Chapter 5.

4.2.6 Help menu, as shown in Fig. 4-7:

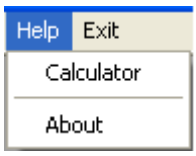


Fig.4-7

1. Help: Click this item to obtain on-line help file of SELAn-18 Proximate Analyzer

2. Calculator: Click this item, the screen will show calculator window, which can be used to perform calculations.

3. About: Click this item to obtain the information on the version of the

test-control software. Click “Yes” to return to the main window.

4.2.7 Exit the menu

Click this option; the system will pop up the window as shown in Fig.4-8.

Fig.4-8

Click “Yes” to exit the Test-control software and return to the computer desktop; click “No” to return to the main interface of the Test-control software.

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

Attention: When the computer is in “Boot-up” state, don’t pull out the plug-board card so as to avoid any damages to the computer and the corresponding circuit CRD card.

Chapter5 Data Management

5.1 Main interface

Click on “Data Management” on the main interface menu or the shortcut button of “Data management”, the window as Fig 5-1 will popup. The window consists of title bar, Menu bar, Shortcut button, data sheet, status bar.

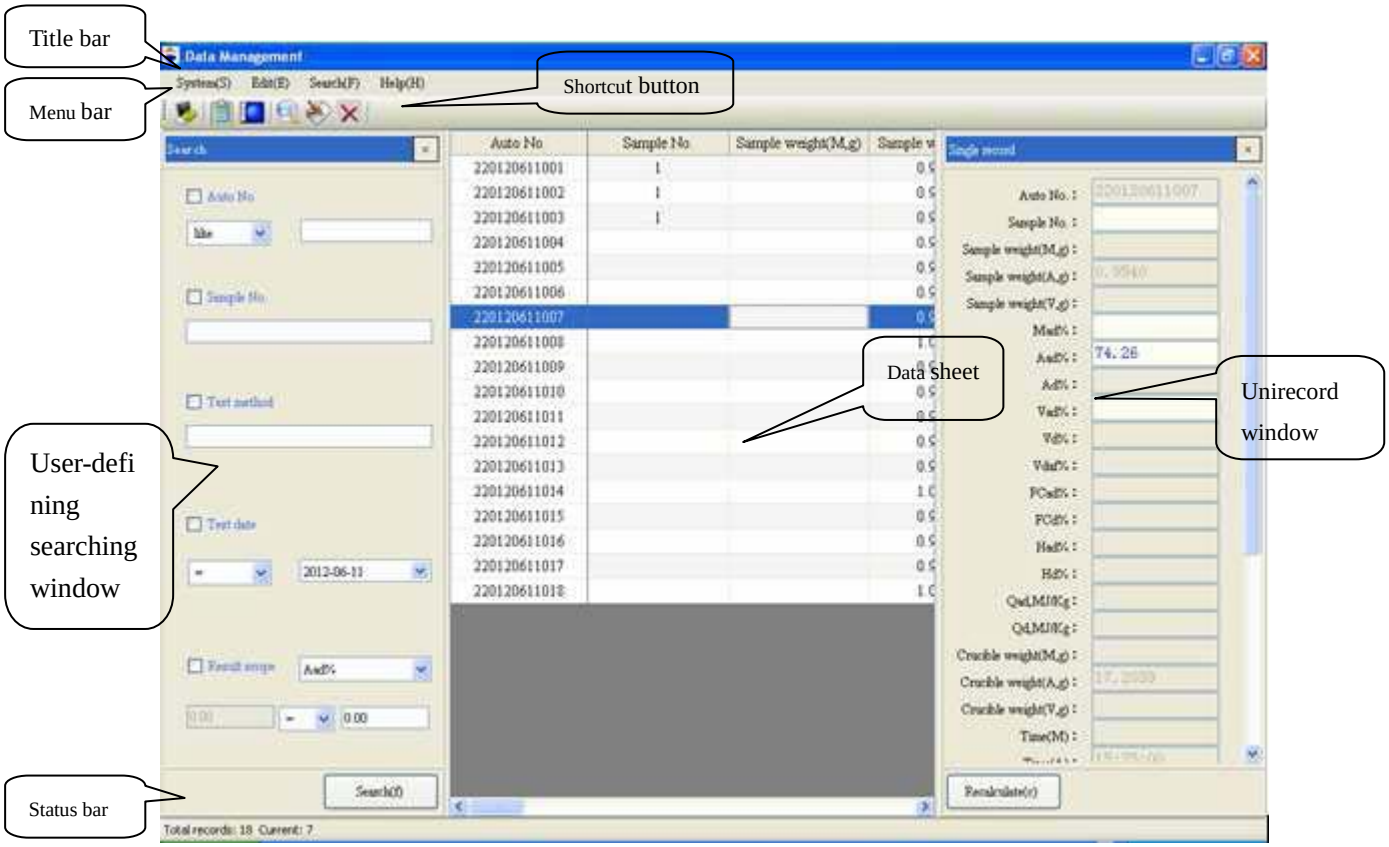


Fig. 5-1-1

1、Title bar: It is used to display the title of the data base.

2、Menu bar: It is used to manage and operate all functions of the data base.

3、Shortcut button: It is used to display all shortcut buttons of data base.

4、Data sheet: It includes Auto number, sample number, all test index values, test date, test time, tester.

a）Length of number: the max.qty of characters that can be input is 12 and the max. printed length is 12 characters.

b）The composition of auto number: instrument control number(1 digit)+year(4

digits)+month(2 digits)+day(2 digits)+sample number(3 digits)

5、Status bar: It is used to display the test time of the current record, the total qty and its position.

Otherwise, move the cursor to the data column and right click the mouse, then the following menu as Fig.2 will popup. For the details of the function, please refer to the follows.

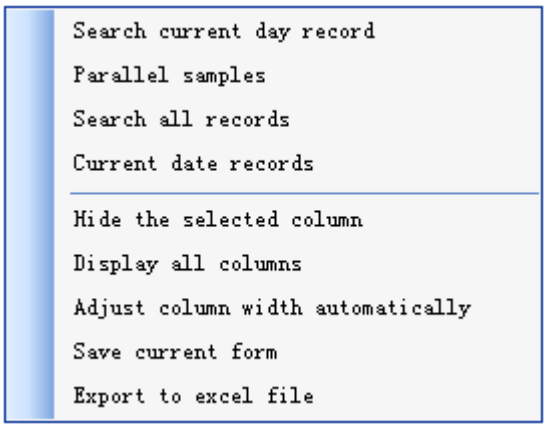


Fig. 5-1-2

1、Searching today's records: Click this item to display all records that are saved by the current day.

2、Parallel sample: Click this item to display all records whose sample number and test date are the same with the selected record.

3、Searching all records: Click this item to display all saved records.

4、Searching the selected date's record: Click this item to display all records whose date is the same with the selected record.

5、Hide the selected column: Select on column and click this item to hide it.

6、Display all columns: Click this item to display all columns in the data sheet.

7、Automatically adjust column width: Click this item to adjust the width of the data sheet automatically according to the content.

8、Save the current model: Click this item to save the current format of all columns displayed in the data sheet.。

9、Export Excel file: Click this item to export the data as the excel files from the data base.

5.2 Introduction for menu

5.2.1 System(Main menu）

Shown as fig.5-2-1

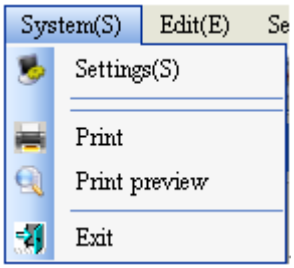


Fig.5-2-1

5.2.1.1 Setting

Click this item or “Setting” button on the shortcut bar, window shown as Fig.5-2-2 will popup automatically.

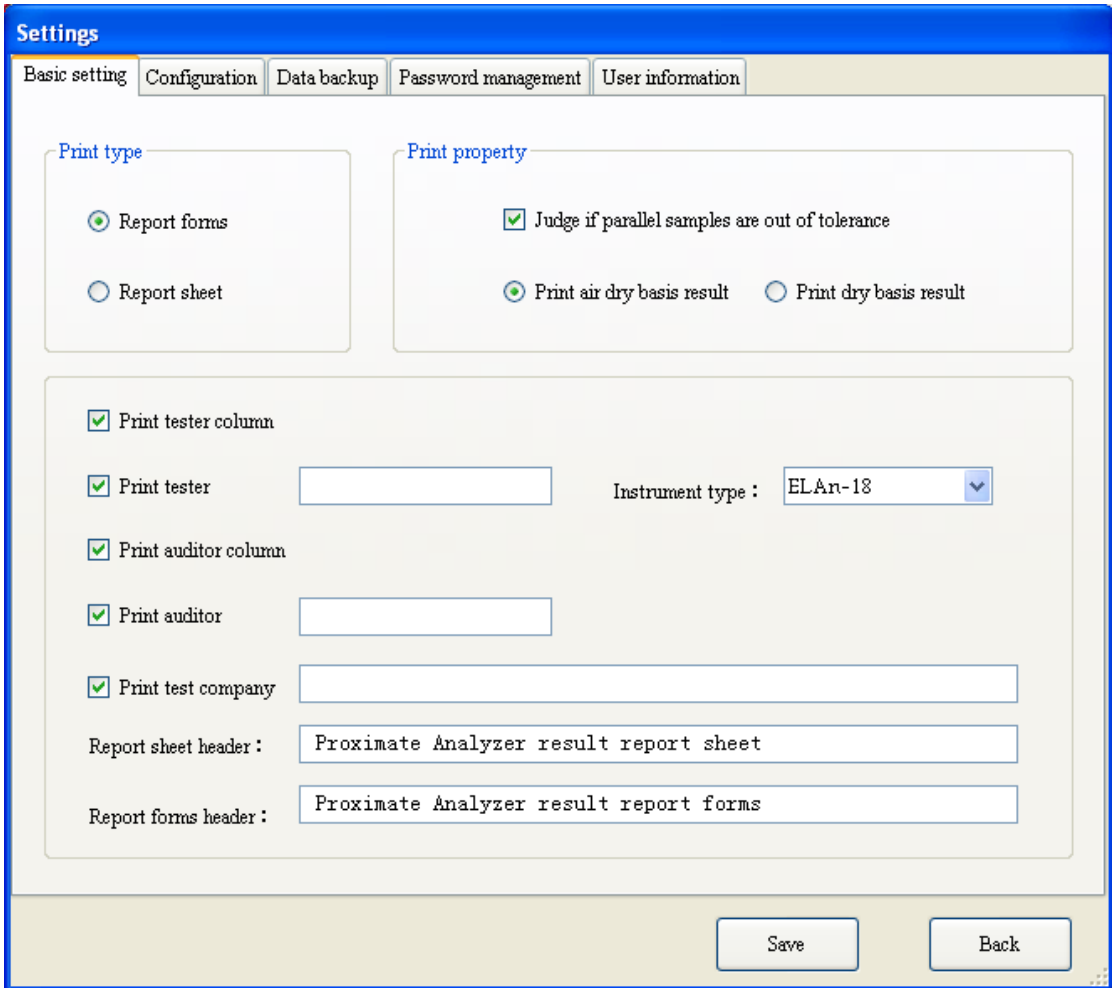


Fig. 5-2-2

1、Basic item

- Print form

a）Report: Select this item to print the procedure parameter and average of the parallel sample.

b）Report form: Select this item to print multi-indexes of single record or several records.

- Print type

a）Judge if the parallel sample is more than the standard deviation：If this item is selected, the software will judge if the parallel sample is more than the standard deviation according to the precision stipulated by the Chinese standard when printing the test results of the parallel samples.

b）Print air dried basis: Set the “Report form” valid, then the printed test results will be air dried basis.

c）Print dry basis: Set the “Report form” valid, then the printed test results will

be dry basis.

- Selectable items

a）Print tester line: Select this item, then this column will be printed at the end of the report or report form.

b）Print the tester: Select this item and input the name of the tester on the right textbox, then the tester name will be printed at the end of the report or report form. Note: Only when the “Print tester line” is selected, the tester can be printed.

c）Print the audit line: Select this item, then this column will be printed at the end of the report or report form.

d）Print the auditor: Select this item and input the name of the auditor on the right textbox, then the auditor name will be printed at the end of the report or report form. Note: Only when the “Print audit line” is selected, the auditor can be printed.

e）Print test company：Select this item and input the company name, then the company information will be printed at the end of the report or report form.

f）Content of report header: Input the content on the right textbox, and then the content will be printed on the report form header.

g）Content of report form header: Input the content on the right textbox, and then the content will be printed on the report form header.

h) Instrument type：Select the type from the right textbox, then the instrument type will be displayed on the main interface of the data base.

Save: After modifying related parameters, click on the button, then the parameters can be saved; otherwise, the parameters cannot be saved.

Back: Click on the button to quit the window and back to the main interface of the data base.

2、Report form configuration

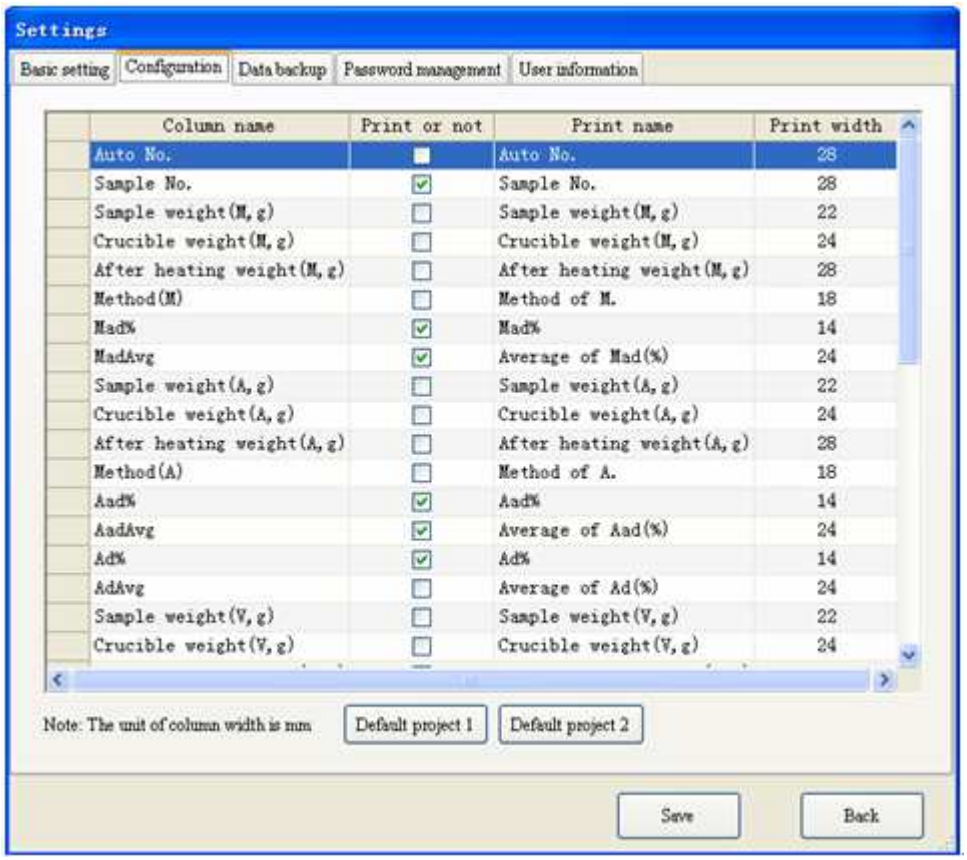


Fig. 5-2-3

a）Name: This is the name of the column corresponding with the main form.

b）Print or not: Weather this column is printed on the report.

c）Print Name: The name displayed on the report.

d）Print width: The width of the column in the report, the unit is mm.

e）Default version1, Default version2: Select this item, the report will be printed according to default settings.

3、Data backup

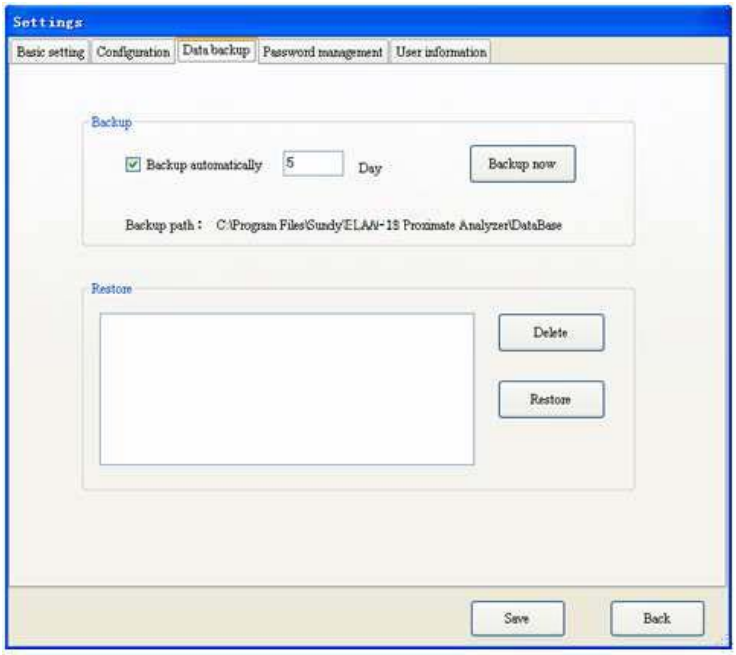


Fig. 5-2-4

- Backup

Back up all the data of the current data base. After backup, backup files will be generated automatically and displayed in the listed file of the window.

a）Automatic backup: Input the content on the right textbox and select this item, then the program will automatically back up the data base based on the set condition

b）Backup now: Click on the button, the current data base be backed up

- Restore

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

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

4、 Password management

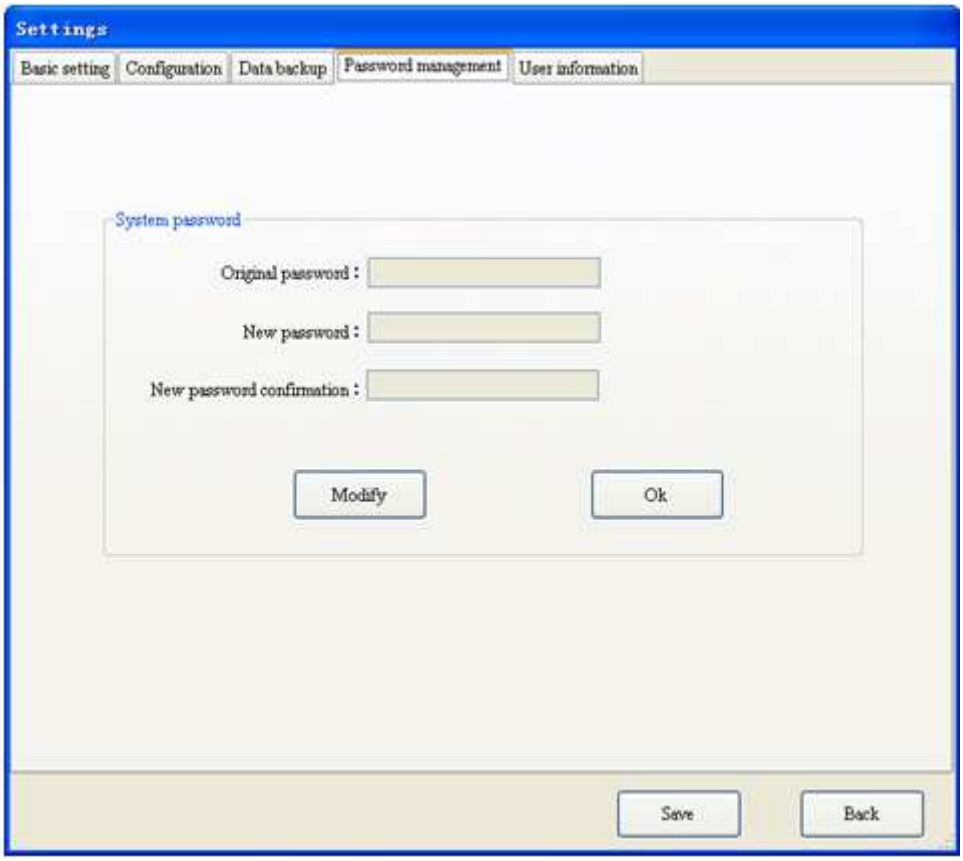


Fig.5-2-5

a）Original password: input original password.

b）New password: input new password.

c）New password confirm: confirm new password.

d）Modify: click on the button, and the left textbox can be activated and then it can be modified.

e）Yes: click on the button, and then save the new password.

5、User information tab

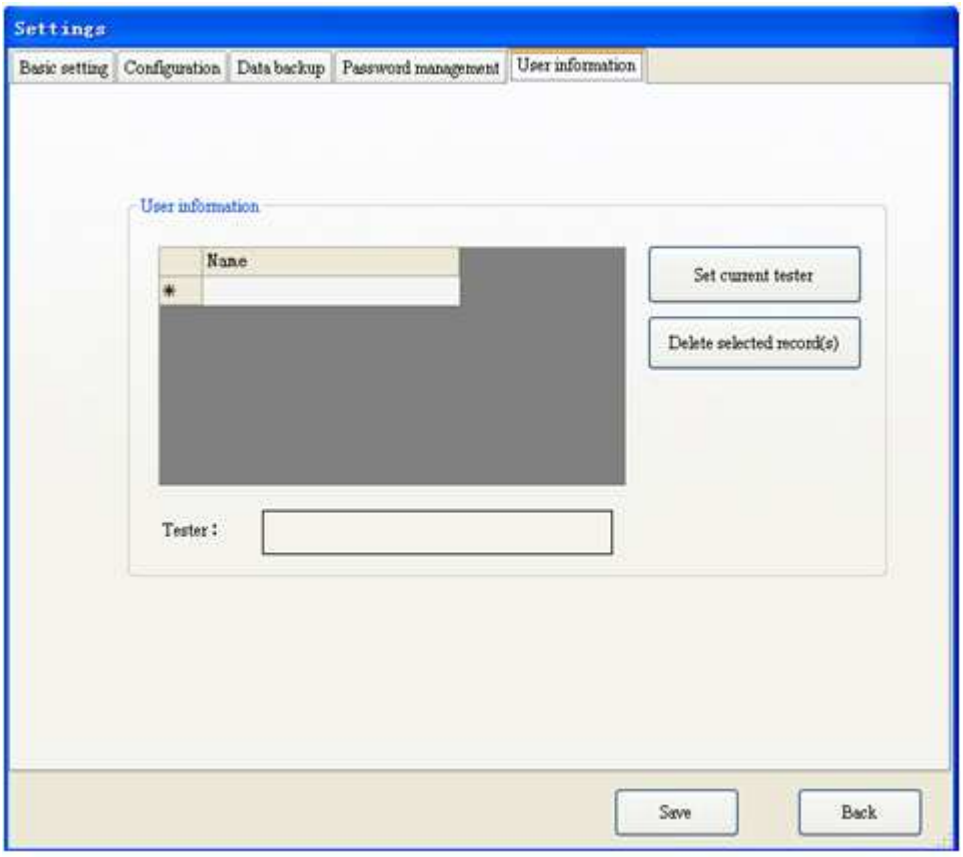


Fig.5-2-6

a）Set as the current tester: Select the tester from the left textbox and click this button, then the selected tester will be displayed in the textbox of the tester.

b）Delete the selected tester: Select the tester from the left textbox and click this button, then the selected tester will not be displayed.

5.2.1.2 Print: Select this item from the menu, then the system will print the report or the report form according to the parameter setting.

5.2.1.3 Print preview: Select this item from the menu to enter into the preview window and preview the data to be printed.

5.2.1.4 Exit

Select this item from the menu or click “X” on the top right of the data base, then the system will popup the window as Fig.5-2-8.

Fig.5-2-7

Click “Yes”, then you can exit the data base and return to the main interface of ELAn-18..

Click “No”, then you will return back to the data base.

5.2.2 Edit Menu

Shown as Fig.5-2-8.

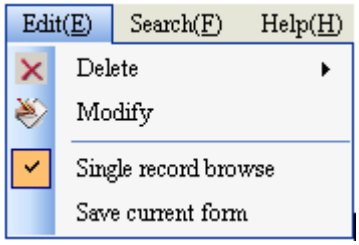


Fig.5-2-8

1、Delete: Select one or several records and click this button, then the prompt will popup, select “Confirm” to delete the selected records, otherwise, the records will not be deleted.

2、Modify: Click this button, the login window will popup, input the passwords to enter into the data modification status. After that, click “Modify” again or double click the data row to display single record browse window. Modify the parameters such as sample number and so on according to the actual situation and then click “Recalculate” to finish the modification, otherwise, the modification is invalid.

3、Single record preview: Click this button in the menu to display the single record browse window on the right of the data display field.

4、Save current model: Click this item in the menu to serve the current status of all rows in the data display field.

5.2.3Search menu

Shown as Fig.5-2-9

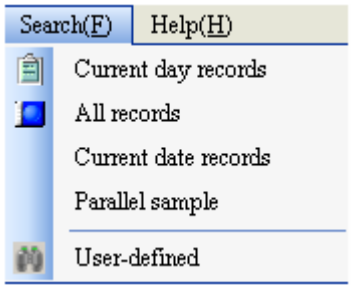


Fig.5-2-9

1、Searching current date records: Click on this item or the shortcut button of "current date records" to display the records whose date is the same as the computer system date in the data display column.

2、Searching all records: Click on this item or the shortcut button of "all records" to display all records of the data base in the data display column.

3、Searching the same day records: Click on this item to display the records whose date is the same as that of the selected records in the data display column.

4、Searching parallel sample: Click on this item to display all records whose test day and sample number are the same as that of the selected records.

5、User-defined searching: Click on this item to popup the displayed window as Fig. 5-1.

There are 5 methods for data query: automatic number, sample number, test method, test date, and range of results.

Query based on one or more conditions: the first is to select query method and then select the query condition; input related condition in condition box and then click on "Searching" button, all records that satisfy the condition will display in the data column, such as the query steps of automatic numbering:

- Setting up searching method: click on automatic number check box, making it in selected state.
- Setting up searching condition: click on "v" button and select one item (such as "Like"), and then input the date in the right box (such as 200908).
- Searching: click on this button, the system will automatically display all test

records whose automatic numbers contain 200908 in the data display column.

5.2.4 Help menu

Shown as Fig5-2-10

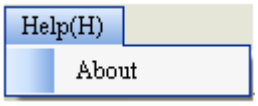


Fig.5-2-10

About: Click this item. Then you can get the version information of ELAn-18 proximate analyzer. Click “Yes” to back to the main interface of the data management.

Chapter 6 Operating Rules

This chapter illustrates test procedures and stipulations in the form of flow chart. The user should read carefully and operate in accordance with the requirement.

6.1 Single-tray Test Procedure

6.1.1 Moisture

1. Preparations

1) Prepare clean, dry moisture/ash crucibles, samples, and dry sample ladle; 2) Prepare the nitrogen cylinder; 3) Check the control circuit and power circuit; 4) The external balance is stably placed.

2. Start the computer

Turn on the display, computer, and enters the Windows XP operating interface.

3. Start the Test and Control program

Double click on “ELAn-18 Proximate Analyzer” shortcut icon on the Windows XP desktop, or click on the “Start – Program -- ELAn-18 Proximate Analyzer” menu item.

4. Parameter setting

Click on “System Setting” menu to enter parameter setting window.

Select “Test -- Single-tray testing”, then click on “▼” on the right of “Moisture test method”, to select the test method. “Moisture constant weight” and “Classical moisture test with nitrogen ventilation” can be set up under the classical methods.

Click on “Save – Back” to save the parameter setting. Otherwise the modification is invalid.

↓

Click on “Sample weighing” shortcut icon or “Test -- Sample weighing” menu item, to pop up the “Sample weighing” window.

5. Sample weighing and placing

↓

Click on the “▼” on the right of “Weighing item”, select Moisture, then set up “New number.” or “Related Number”, and then shift the cursor to “Number of Samples” box to input total number of weighed samples (Max samples: 18)

↓

Click on “Start”, and the low-temperature furnace will automatically be heated up to the moisture constant temperature.

↓

Close the balance glass wind shield→ wait for balance reset→ put moisture crucible as prompted→ Close wind shield→ when weighing crucible weight is stable, the system will tweet and prompt “Add in samples …”. Crucible weight is displayed in the “Tare” column and the tare is excluded automatically.

↓

Add samples→ close balance wind shield→ when sample weight is correct and sable, system will tweet and prompt “Take away sample …” Meanwhile, sample weight is displayed in “Sample weight” column. When no samples are added, click on “Blank sample” button in the weighing window or take out the crucible, wait until the balance reading is stable, then press “Tare” key to handle blank samples (“Blank sample allowed” is set prior to weighing).

↓

Open balance glass wind shield→ take out sample, the data column of the main interface will display crucible weight and sample weight→ flatten the sample→ place the samples in the special sample box orderly.

↓

After all moisture samples are weighed, the system will prompt “Place 1# moisture sample”.

↓

1# sample in the sample box is put in the specified position, and then the samples will be placed continuously one by one. When the system has detected samples in the sample put position, the sample tray will be automatically rotated one grid. Otherwise, it has to wait until the operator placed the sample properly. After samples are put, the system will allow weighing of the next tray of the samples.

6. Moisture test

1# sample comes to the sample introduction area, and there are no samples in the low-temperature furnace, where the temperature displayed is ≤ the constant temperature point, start the sample introduction. Then, the system will finish the sample introduction by automatically control of furnace door ON and OFF, sample tray rotation, manipulator rising and descending and shifting.

After sample introduction, the system will test the air dried basis moisture based on the setting method. Nitrogen is added when the moisture is heated. The gas flow should be controlled manually at 3~6L (When the sample placing tray contains no sample or Loopback function is not selected, the system allows for sample placing operation).

After heating finishes, the system will automatically weigh the sample, calculate, display the result in the data field at the main interface, and store the data to the database. After all samples are weighed and calculated, the sample discarding device will work. If constant weight is required, after weighing and moisture calculation, the system will continue heating based on the set time or program defaulted time (select soft coal, user-define moisture test is based on conditional criterion) until the moisture values of the two comparisons are up to the ISO or ASTM standards.

After the experiment, the low-temperature furnace will come to “Constant temperature” state.

7. Exit the test and control program

In case no experiment is required, click on “Exit” menu. The system will pop up “ Sure to exit the system?” dialogue box, click “Yes” to exit the test and control program, and go back to Windows XP desktop. Or click on “Cancel” to return to the program main interface.

8. Turn off the computer

After come back to Windows desktop, click on “Start” button in the Windows, select “Turn off the computer”.

6.1.2 Ash Content

1. Preparation

1) Prepare clean, dry moisture/ash crucibles, samples, and dry sample ladle; 2) Prepare the oxygen cylinder (It is used for ASTM standard ash test via oxygen ventilation); 3) Check the control circuit and power circuit; 4) The external balance is stably placed.

2. Start the computer

Turn on the display, computer, and enters the Windows XP or Windows 7 operating interface.

3. Start the Test and Control program

Double click on “ELAn-18 Proximate Analyzer” shortcut icon on the Windows XP desktop, or click on the “Start – Program -- ELAn-18 Proximate Analyzer” menu item.

4. Parameter setting

Click on “Setting” menu to enter parameter setting window.

Select “Test -- Single-tray testing”, then click on “▼” on the right of “Ash test method”, to select the test method. “Ash constant weight” can be set up under the classic method. For ASTM ash test method, you can choose whether to vent oxygen.

Click on “Save – Back” to save the parameter setting. Otherwise the modification is invalid.

Click on “Sample weighing” shortcut icon or “Test -- Sample weighing” menu item, to pop up the “Sample weighing” window.

5. Sample weighing and placing

Click on the “▼” on the right of “Weighing item”, select Moisture, then set up “New Number” or “Related Number”, and then shift the cursor to “Number of Samples” box to input total number of weighed samples (Max samples: 18)

Click on “Start”, and the low-temperature furnace will automatically be heated up to the moisture constant temperature. The combustion furnace will automatically be heated up to the ash sample introducing temperature.

Close the balance glass wind shield→ wait for balance reset→ put moisture crucible as prompted→ Close wind shield→ when weighing crucible weight is stable, the system will tweet and prompt “Add in samples …”. Crucible weight is displayed in the “Tare” column and the tare is excluded automatically.

Add samples→ close balance wind shield→ when sample weight is correct and sable, system will tweet and prompt “Take away sample …” Meanwhile, sample weight is displayed in “Sample weight” column. When no samples are added, click on “Blank sample” button in the weighing window or take out the crucible, wait until the balance reading is stable, then press “Tare” key to handle blank samples (“Blank sample allowed” is set prior to weighing).

Open balance glass wind shield→ take out sample, in the data field of the main interface will display crucible weight and sample weight→ flatten the sample→ place the samples in order in the special sample box.

After all ash samples are weighed, the system will prompt “Place 1# ash sample”.

1# sample in the sample box is put in the specified position, and then the samples will be placed continuously one by one. When the system has detected samples in the sample placing position, the sample tray will be automatically rotated one grid. Otherwise, it has to wait until the operator has placed the sample properly. After samples are placed, the system will allow weighing of the next tray of the samples.

6. Ash test

1# sample comes to the sampling area, and there are no samples in the low-temperature furnace, where the temperature displayed is ≤ the constant temperature point, start the sample introduction. Then, the system will finish the sampling by automatically control of furnace door ON and OFF, sample tray rotation, manipulator rising and descending and rotating (The sample output process is similar).

After sample introduction, the system will test the samples automatically as the reset conditions based on the set method. During the test, provide air and keep the air flow 12L manually. (Sample placing is permitted if there is no sample on the sample tray or loopback function is not selected.)

After ash burning duration is over, samples will automatically go through the combustion tray to the thermostatic low-temperature furnace. After samples are put out, the “Cooling message” is displayed in the low-temperature status bar.

If the cooling time is over, the system will automatically weigh the samples and calculate ash values with the calculation results displayed in the data field at the main interface and input to the data management and saved .When the weighed samples are rotated to sample discarding door, the sample discarding unit will work. If constant weight is required, after weighing and moisture calculation, the system will continue heating based on the set time until the ash values of the two comparisons are up to the ISO or ASTM standards.

After the test, if there is no ash or volatile samples in the sample placing tray, the combustion furnace will automatically enter “Cooling” status.

7. Exit the Test and Control program

In case there are no tests to do, click on “Exit” menu. The system will pop up “ Sure to exit the system?” dialogue box, click “Yes” to exit the test and control program, and go back to Windows XP desktop. Or click on “Cancel” to return to the program main interface.

After come back to Windows desktop, click on “Start” button in the Windows, select “Turn off the computer”.

6.1.3 Volatile Matter

1. Preparation

1) Prepare clean, dry moisture/ash crucibles, samples, and dry sample ladle; 2) Prepare the nitrogen cylinder, which is used for ASTM standard volatile test via nitrogen ventilation. 3) Check the control circuit and power circuit; 4) The external balance is stably placed;

2. Start the computer

Turn on the display, computer, and enters the Windows XP or Windows 7 operating interface.

3. Start the Test and Control program

Double click on “ELAn-18 Proximate Analyzer” shortcut icon on the Windows XP desktop, or click on the “Start – Program -- ELAn-18 Proximate Analyzer” menu item.

4. Parameter setting

Click on “System Setting” menu to enter parameter setting window.

Click “▼” on the right of the volatile matter method option box and set「ISO standard volatile/ASTM standard volatile 1/ASTM standard volatile 2」, then you can set “Volatile matter sample loopback ”,”ASTM volatile matter nitrogen venting” and so on according to the test requirements.

Click on “Save – Back” to save the parameter setting. Otherwise the modification is invalid.

Click on “Sample weighing” shortcut icon or “Test -- Sample weighing” menu item, to pop up the “Sample weighing” window.

5. Sample weighing and sample placing

Click on the “▼” on the right of “Weighing item”, select Moisture, then set up “New Number.” or “Related Number.”, and then shift the cursor to “Number of Samples” box to input total number of weighed samples (Max samples: 18)

Click on “Start”, and the low-temperature furnace will automatically be heated up to the moisture constant temperature, and the combustion furnace will automatically be heated up to the volatile sample introducing temperature.

Close the balance glass wind shield→ wait for balance reset→ put moisture crucible as prompted→ Close wind shield→ when weighing crucible weight is stable, the system will tweet and prompt “Add in samples …”. Crucible weight is displayed in the “Tare” column and the tare is excluded automatically.

Add samples→ close balance wind shield→ when sample weight is correct and sable, system will tweet and prompt “Take away sample …” Meanwhile, sample weight is displayed in “Sample weight” column. When no samples are added, click on “Blank sample” button in the weighing window or take out the crucible, wait until the balance reading is stable, then press “Tare” key to handle blank samples (“Blank sample allowed” is set prior to weighing).

Open balance glass wind shield→ take out sample, the data column of the main interface will display crucible weight and sample weight→ flatten the sample→ place the samples in the special sample box orderly.

After all moisture samples are weighed, the system will prompt “Place 1# moisture sample”.

6. Volatile matter test

After sample discarding, the system will select nitrogen venting or not according to the volatile matter test method. Before tests, the nitrogen flow should be controlled in the standard range manually. (Nitrogen flow for ASTM standard Ⅰ test should be 10L/min, Nitrogen flow for ASTM standard II test should be 20L/min).

After volatile heating finishes, samples will be transferred to the thermostatic low-temperature furnace. After samples are put out, the “Cooling” message is displayed in the low-temperature status bar.

After heating finishes, the system will automatically weigh the sample, calculate, display the result in the data field at the main interface, and store the data to the database. After all samples are weighed and calculated, the sample discarding device will work. If “Volatile loopback” is selected before the test, after weighing and calculation, the system will automatically transfer the samples through low-temperature furnace to the sample loading carousel. If the number of samples exceeds 10 and “Volatile loopback” is selected, the samples will stay in the low-temperature furnace, and be transferred to the sample loading carousel together will the second tray of samples.

After the experiment, if there is no ash or volatile sample in the sample loading carousel, the combustion furnace will automatically enter “Cooling” status.

7. Exit the Test and Control environment

In case there are no tests to do, click on “Exit” menu. The system will pop up “ Sure to exit the system?” dialogue box, click “Yes” to exit the test and control program, and go back to Windows XP desktop. Or click on “Cancel” to return to the program main interface.

8. Turn off the computer

After come back to Windows desktop, click on “Start” button in the Windows, select “Turn off the computer”.

6.2 Combined Experiment Process

6.2.1 Test Moisture and Ash simultaneously + Volatile Matter

1. Preparation

1) Prepare clean, dry moisture/ash crucibles, samples, and dry sample ladle; 2) Prepare the nitrogen cylinder and air pump; 3) Check the control circuit and power circuit; 4) The external balance is stably placed.

2. Start the computer

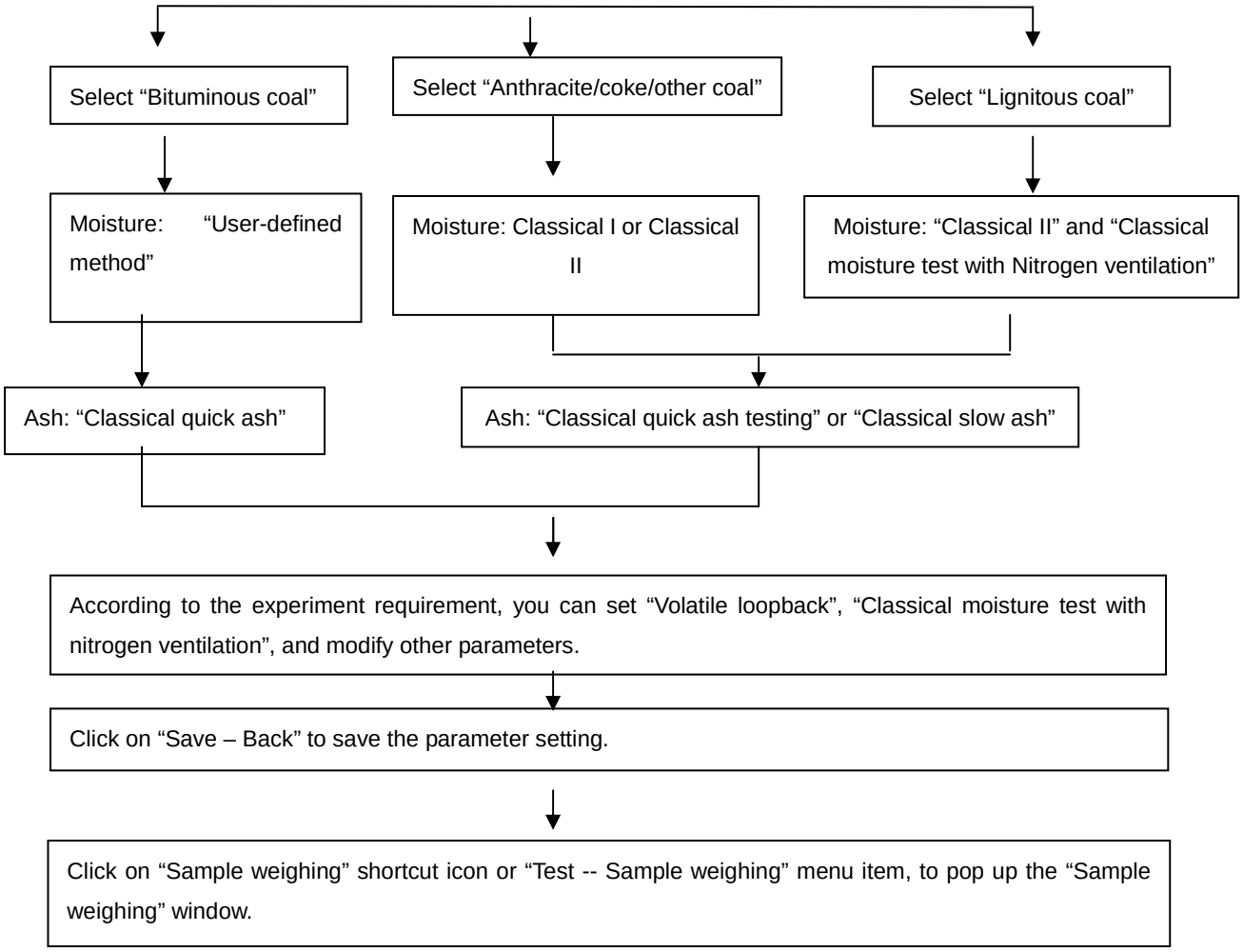
Turn on the display, computer, and enters the Windows XP operating interface.

3. Start the Test and Control program

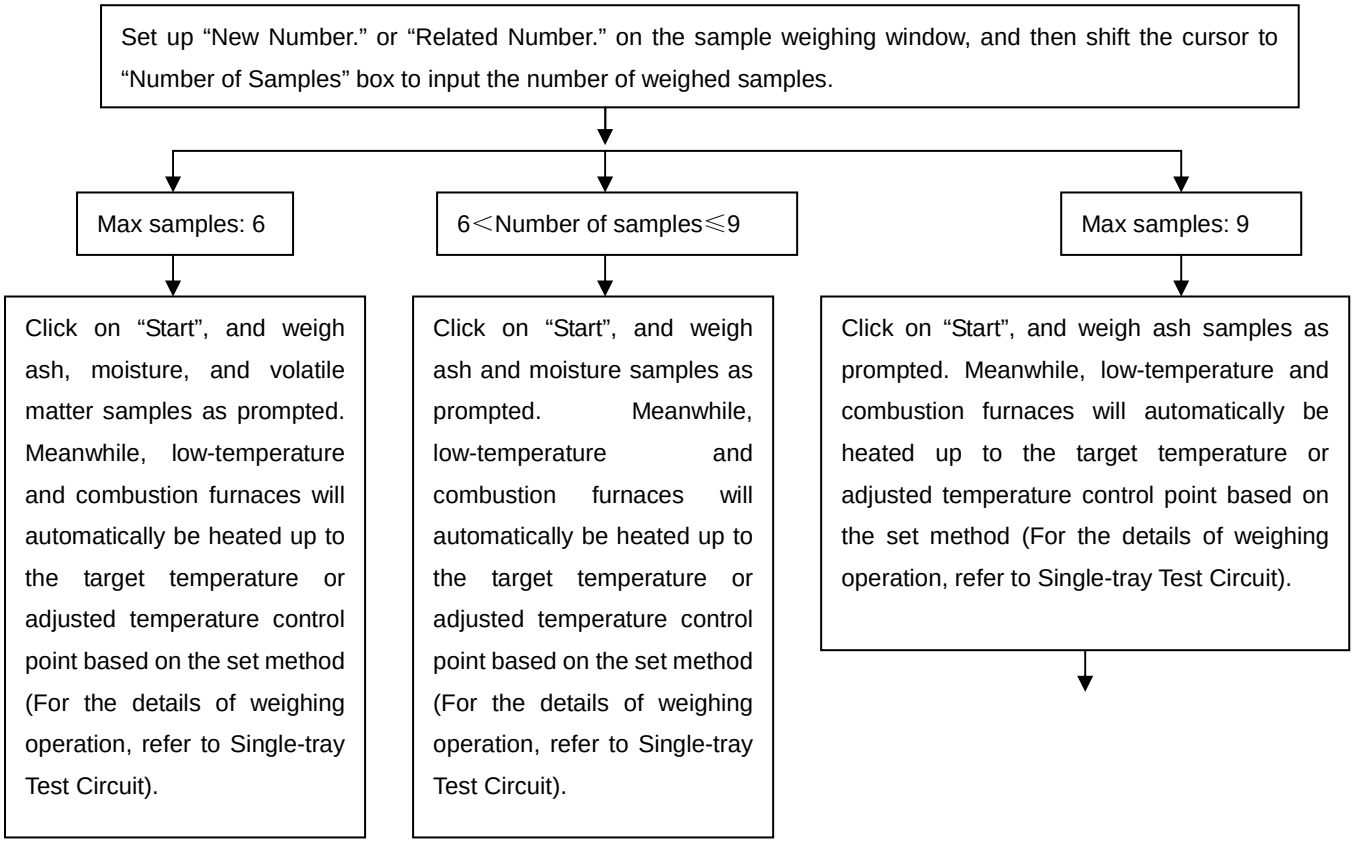
Double click on “ELAn-18 Proximate Analyzer” shortcut icon on the Windows XP desktop, or click on the “Start – Program -- ELAn-18 Proximate Analyzer” menu item.

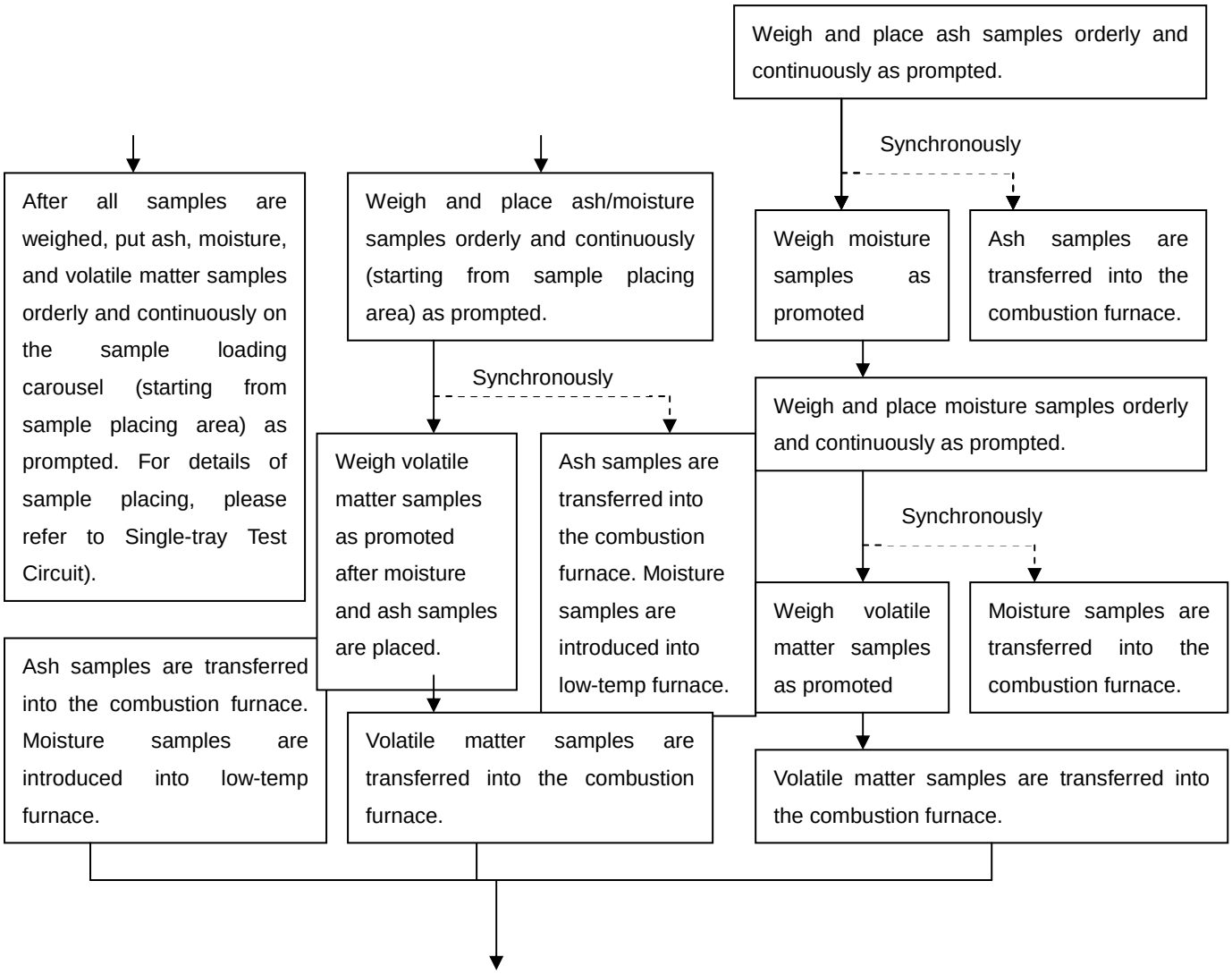
4. Parameter setting

Click on “System Setting” menu to enter parameter setting window.



5. Sample weighing, placing and testing (Take User-defined moisture and classical fast ash simultaneous test as an example, others are similar)





After moisture test is finished, the system will automatically enter ash test mode. When the sample introducing temperature is attained, the system will automatically transfer samples from low-temperature furnace to the combustion furnace. (The process of sample introducing and discarding, and heating/burning for moisture/ash and volatile is similar to the Single-tray Testing Circuit).

6. Exit the Test and Control environment

In case no experiment is required, click on “Exit” menu. The system will pop up “ Sure to exit the system?” dialogue box, click “Yes” to exit the test and control program, and go back to Windows XP desktop. Or click on “Cancel” to return to the program main interface.

7. Turn off the computer

After come back to Windows desktop, click on “Start” button in the Windows, select “Turn off the computer”.

6.2.2 Moisture and Ash Continuous test +Volatile Matter

1. Preparation

1) Prepare clean, dry moisture/ash crucibles, samples, and dry sample ladle; 2) Prepare the nitrogen cylinder and air pump; 3) Check the control circuit and power circuit; 4) The external balance is stably placed.

2. Start the computer

Turn on the display, computer, and enters the Windows XP operating interface.

3. Start the Test and Control program

Double click on “ELAn-18 Proximate Analyzer” shortcut icon on the Windows XP desktop, or click on the “Start – Program -- ELAn-18 Proximate Analyzer” menu item.

4. Parameter setting

Click on “Setting -- Test moisture and ash continuously”, and then click on “▼” on the right of “Moisture test method” to select “User-defined method”, and “Classical quick ash testing” for ash test. If “Classical method I/ Classical method II” is selected for moisture test, ash test method will automatically be set as “Classical slow ash test”.

Click on “Save – Back” to save the parameter setting.

Click on “Sample weighing” shortcut icon or “Test -- Sample weighing” menu item, to pop up the “Sample weighing” window.

5. Sample weighing and placing

Set in the Sample Weighing window “New Number.” or “Related Number.”, and then shift the cursor to “Number of Samples” box to input total number of weighed samples (Max samples: 18)

After the sample weighing parameters are set, click on “Start” and weigh moisture sample as prompted (For weighing operation details, refer to Single-tray Test Circuit). Then, low-temperature and combustion furnaces will automatically be heated up to the target temperature or adjusted temperature control point based on the set test method.

↓

After moisture samples are weighed, place in the moisture samples orderly and continuously on the sample tray as prompted.

Synchronously

Weigh volatile samples as prompted.

When1# moisture sample rotated to sample introduction position and temperature conforms to sample introduction, automatically start sample introducing.

After volatile samples are weighed, place in the volatile samples orderly and continuously on the sample tray as prompted (For sample placing operation details, refer to Single-tray Testing Circuit).

↓

After moisture test is finished, the system will automatically enter ash test mode. When the sample introducing temperature is attained, the system will automatically transfer samples from low-temperature furnace to the combustion furnace. After the ash test is finished, the system will start volatile sample introducing when combustion furnace temperature is attained. (The process of sample introducing and discarding, and heating/burning for moisture/ash and volatile is similar to the Single-tray Testing Circuit).

6. Exit the Test and Control environment

↓

In case no experiment is required, click on “Exit” menu. The system will pop up “ Sure to exit the system?” dialogue box, click “Yes” to exit the test and control program, and go back to Windows XP desktop. Or click on “Cancel” to return to the program main interface.

7. Turn off the computer

↓

After come back to Windows desktop, click on “Start” button in the Windows, select “Turn off the computer”.

6.3 Attention

1. To conduct startup calibration every workday at ambient temperature.

2. Do not move the external balance after “Balance calibration” is normal; otherwise, weighing results will be affected.

3. During the weighing, do not move the balance and keep it free from wind source or vibrating source. After the crucible is placed and samples are added, close the wind shield immediately. After the crucible is weighed, don't take out it to add in the sample, to avoid any possible mistake.

4. Place the crucible, and add the sample evenly as prompted. 1# sample is to be put at the specified position. Samples should be placed continuously according to the weighing sequence. **In case of simultaneous-test mode of moisture and ash under the classical moisture test method and slow ash test method, weigh and place samples continuously as prompted. After ash samples introduced, properly take out the weighed moisture samples and place them as prompted. The improper operation will result in too long hold-up time of the slow ash and test results might be affected.**

5. The sample tray shall not be manually pulled. The user is responsible for any failure caused. When a tray of samples are already put on the sample tray, the next tray of weighed samples cannot be put on the sample placing tray.

6. Clear the crucible from the crucible collector once a batch of samples is tested. Generally, after 54 samples are tested, the system will prompt “Clear the crucible from the crucible collector”. If the crucibles are cleared, click “Ok” button in the prompt window.

Note: During the experiment, don’t drag the collector so as to avoid the crucible slide dragged.

7. After the test, the moisture/ ash and volatile crucibles and crucible supports are to be put into the Muffle furnace for burning and cleaning, then cooled down to the room temperature and placed into the drying tower for future use. The moisture cleaned crucibles are to be dried before the test; otherwise, it may cause damages to the crucibles.

8. **In case that no stand-by power for balance is provided, only to power off the computer and the instrument. The separate power supply for balance should keep ON after work. Otherwise, you have to wait 30 minutes for balance preheating the next morning. If balance stand-by power is provided, there is no need to provide separate power for the balance. The balance will be powered on based on the preset power-on time.**

9. It is suggested to clean the sample placing tray regularly and keep it tidy.

10. After volatile test, check the crucibles to see if they are cracked or not. In case of any cracks, please add a new sample and test.

11. In the balance is moved to another place, it needs to be readjusted to the horizontal state and balance calibration is needed.

12. When power supply is resumed after the abnormal power failure in the course of the experiment, start the Test and Control software, click on “Sample weighing -- Start” menu item, or directly click on the submenu “Clear the residual crucible” in the detection main menu to clear the crucibles from the low-temperature furnace and combustion furnace.

13. Others

    1) The balance print method should be set as “614”, otherwise, the transfer speed of the data will be influenced.
    2) The range of the communication port number set in the device manager

should be in accordance with the range of the balance port in the test set of the test-control software. And the range of the balance port in the test set should be the same with the actual balance connecting port number.

3) For moisture, the flow should be controlled at 3L to 6L if nitrogen is used.

4) For ash, the flow should be 12L if air is used. If oxygen is used, the flow should be controlled at 6L to 9L.

5) For the volatile matter of lignite and kennel coal, the weighted sample should be compressed to biscuits shape and cut it into small particles.

6）After every test, the crucibles should be baked at the temperature of 900℃ and cooled down to the room temperature before putting it into the drying tower.

7) The crucibles cleaned by water should be dried before tests, otherwise, the crucibles would be damaged.

Chapter 7 Instrument Maintenance

The maintenance of the instrument is very important, as it directly affects the degree of accuracy, precision, and fault, and also its service life. The operator is supposed to read this chapter carefully, to conduct daily maintenance properly and ensure good performance of ELAn-18 Proximate Analyzer.

1. The maintenance of the accessory computer and printer should follow the service manual. Special care is required to prevent virus attack, which will affect the normal operation of the instrument. Thus, Regular anti-virus operation is required.

2. Take care to avoid dust or corrosive gas entry, the instrument should be placed and used in the dry surroundings. In case of long-time out-of-service, special dust-proof shroud is to be used to protect the instrument. When the instrument is to be reused, the heating furnace should be heated up to 105 ℃ with constant temperature kept for over 60 minutes.

3. Don't operate the instrument unless you are the operator of the instrument so as to avoid any fault arising from mis-operation. The instrument mainframe or other equipment shall not be dismantled randomly or collided.

4. During the test, avoid the air flow from the air conditioner and fan directly blowing to the instrument.

5. When weighing handle the sample crucible carefully to ensure stable performance of balance.

6. Strictly follow test procedures described in the *Operating Instructions*.

7. Upon the start of the test, stop other unrelated operation in the computer so as to avoid any conflict operation of the computer which may affect the normal

operation of the system. In case with anti-virus software installed in the computer, please close firewall and real time virus scanning functions, otherwise, it will lead to abnormal tests.

8. Check the air charging apparatus regularly. In case of any leakage, please solve the problem in time.

9. Once the air relief valve, low-pressure gauge and gas flow meter are calibrated properly, do not adjust them deliberately again.

10. Handle with care when move the instrument so as to avoid damage to the balance. After movement, the instrument levelness, furnace hole position and manipulator movement need to be readjusted, the instrument precision to be checked and adjusted.

Chapter 8 Common Fault and Remedies

Faults	Reasons and Remedy
1. Off-line.	1. USB-CAN card is not properly connected; 2. The instrument is not turned on. Switch on the instrument; 3. USB-CAN card driver not installed. Install the driver and restart the PC; 4. Abnormal communication. Ask the professionals for repair.
2. No balance value displayed in the main interface	1. The instrument is not turned on; 2. Balance interface card not connected; 3. The drive of balance interface card is not installed; 4. The system balance parameters (incl. connection serial port No.) not in line with the balance parameters, check or reset the balance parameters; 5. Balance on-line signal wire not connected properly or with poor contact. Switch off all the power and reconnect balance on-line signal wire; 6. Ask the professionals for repair.
3. It is prompted “Heating power supply not on or power supply error”	1. The heating power is not switched on or not properly connected; 2. Fuse burnt, replace the fuse； 3. Control card failure. Ask the professionals for repair.
4. It is prompted “Balance weighing Abnormal”	1. Balance power not switched on due to the loose power wire of the built-in balance. 2. Sample weighing bar in touch with the external matter, i.e. the weighing bar is in touch with the sample holes of the sample tray. Readjust the weighing bar position or length (by the professionals).

5. It is prompted “movement Overtime ”	1. The card is not installed properly, and the positioning signal is not sensed. adjust the space between the Hall and the magnetic steel by 2~3mm; 2. The locator card is damaged, and needs to be replaced; (Note: The door motion Overtime will not affect the experiment.)
6. It is prompted “…motion Overdone”	1. Mechanical motion overdone arising from the improper installation of the locator card, adjust the space between the Hall and the magnetic steel by 2~3mm; 2. Other failures. Ask the professionals for repair.
7. The ash test results are on the high side or low side	1. Blank sample test is not done; 2. Ash ignition is done without air blowing in. Check and adjust the flow rate; open the back cover to check the air inlet connection. 3. The quick ash test is not suitable, slow ash test method is to be adopted instead.
8. The printer failed to work or printing Error	1. Check if the printer signal line is properly connected or if it is disconnected; 2. Printer program Error. Reset the printer; 3. The Test & Control software error, replace it; 4. Printer problem. Go to the local service center with the Warranty.
9. Computer crashed	1. Check and modify CONFIG.SYS setting. Reinstall the Test & Control software; 2. Computer virus attack. Kill the virus; 3. The Test & Control software is destroyed; 4. Computer fault, go to the local service center with the Warranty bill.

Chapter 9 Installation Diagram

9.1 Front side of the instrument

Fig.9-1

9.2 Front lower side of the instrument (Inner)

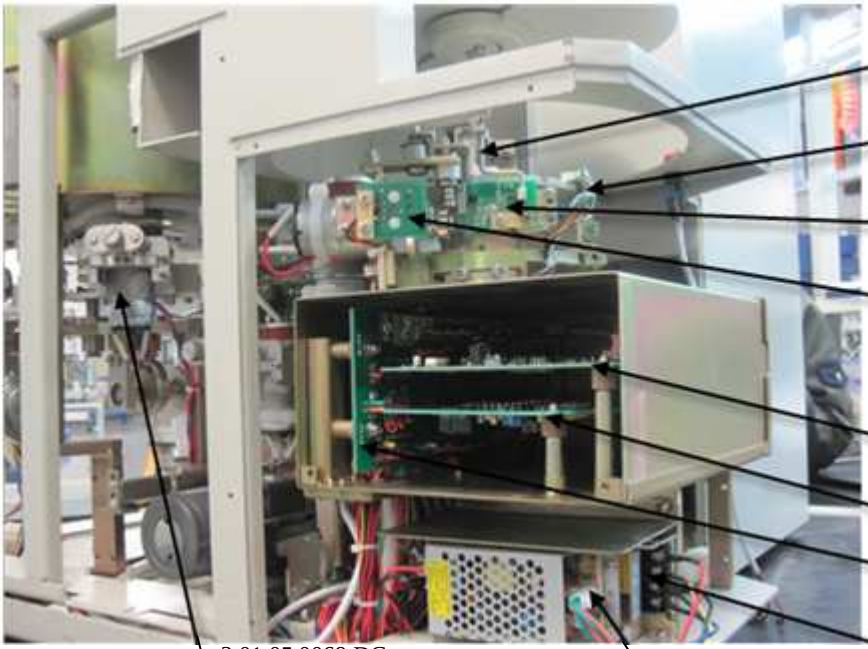


Fig.9-2

9.3 Sample placing tray (Inner)

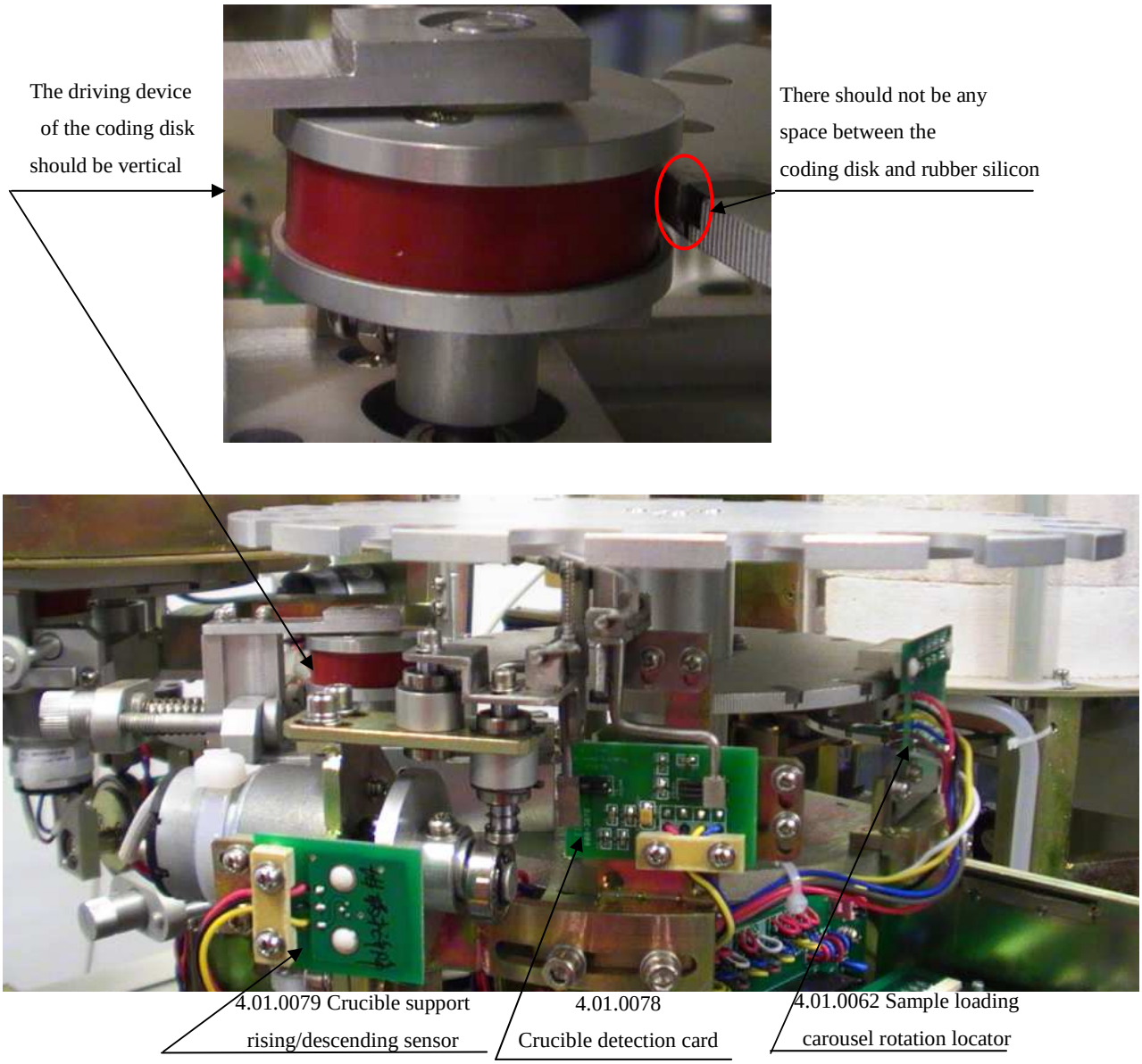


Fig.9-3

9.4 Left rear side of the instrument (Inner)

Fig.9-4

9.5 Right side of the instrument

Fig.9-5

9.6 Right side of the instrument (Inner)

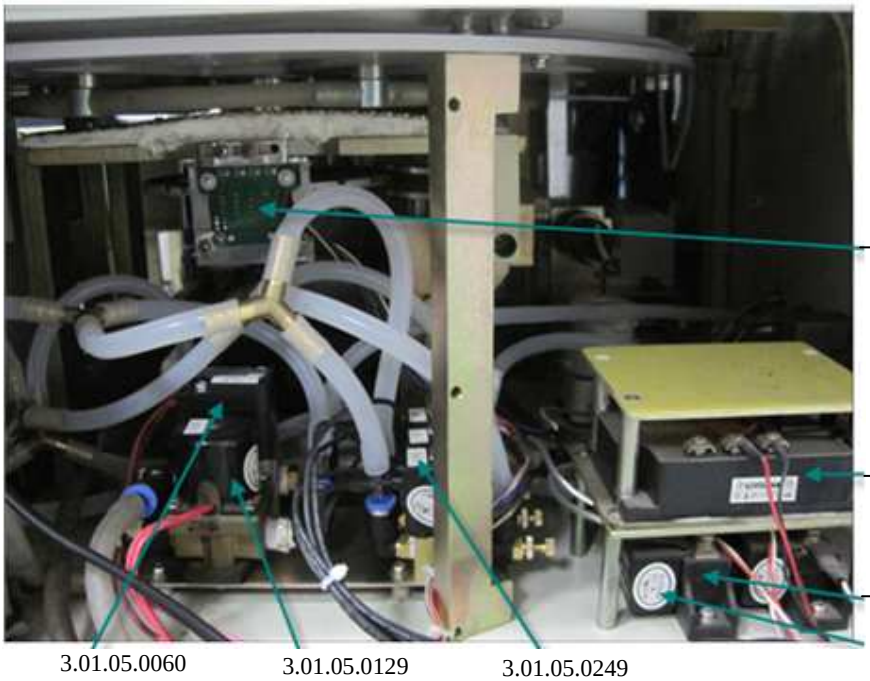


Fig.9-6

9.7 Rear side of the instrument

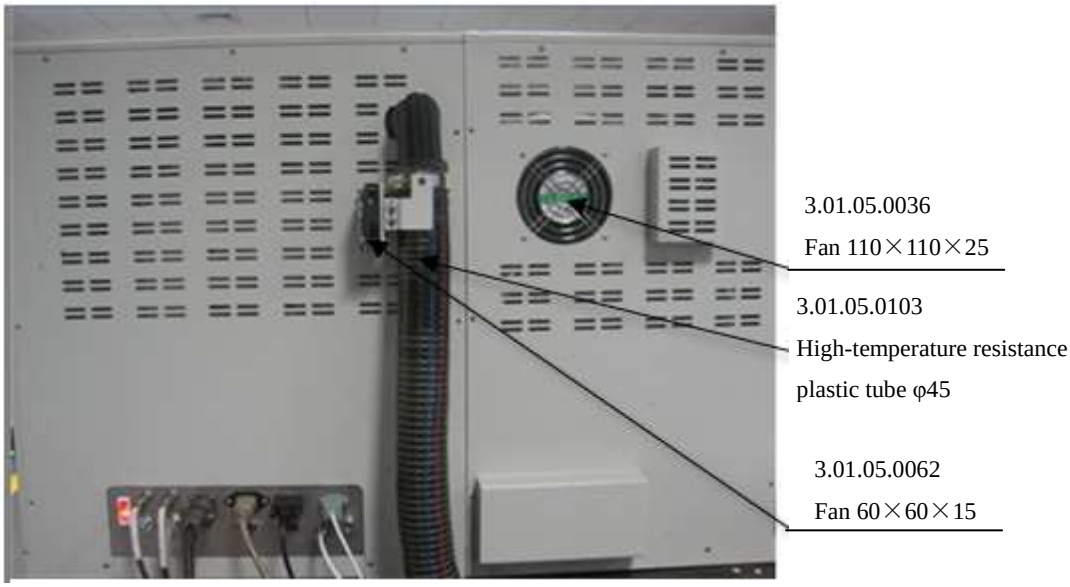


Fig.9-7

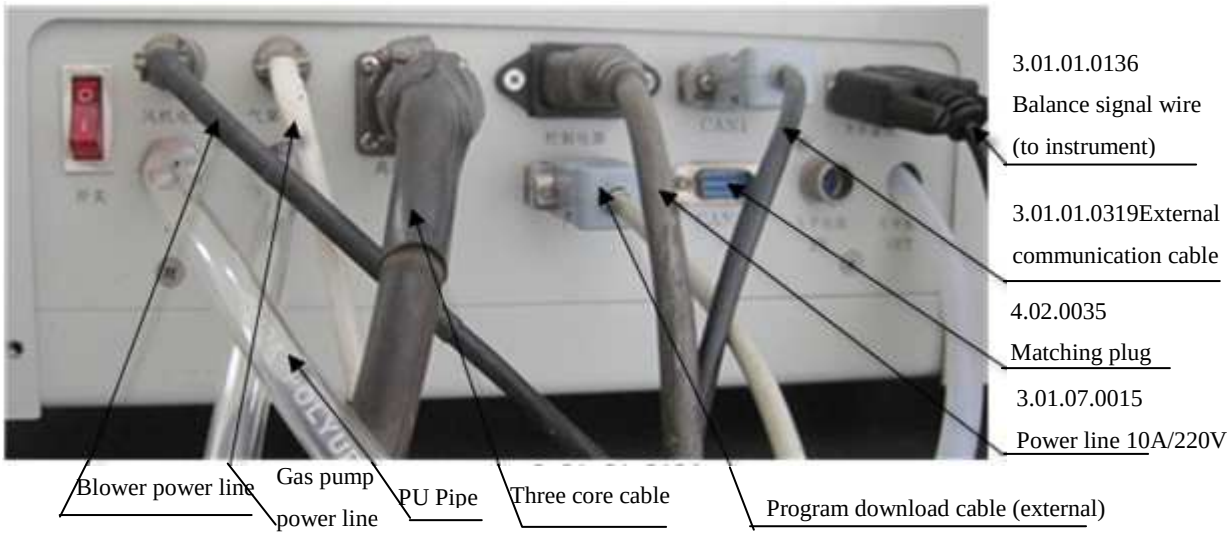


Fig.9-8

9.8 Low temperature tray

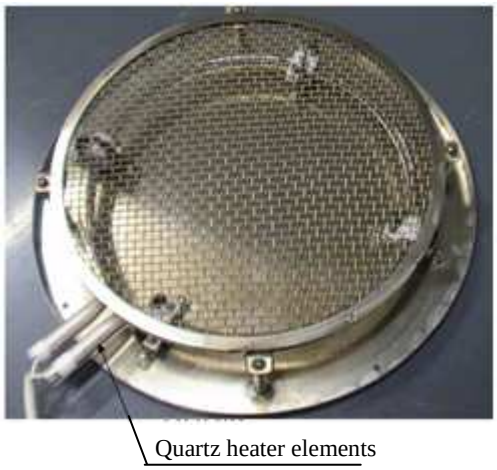


Fig.9-9

Fig.9-10

Fig.9-11

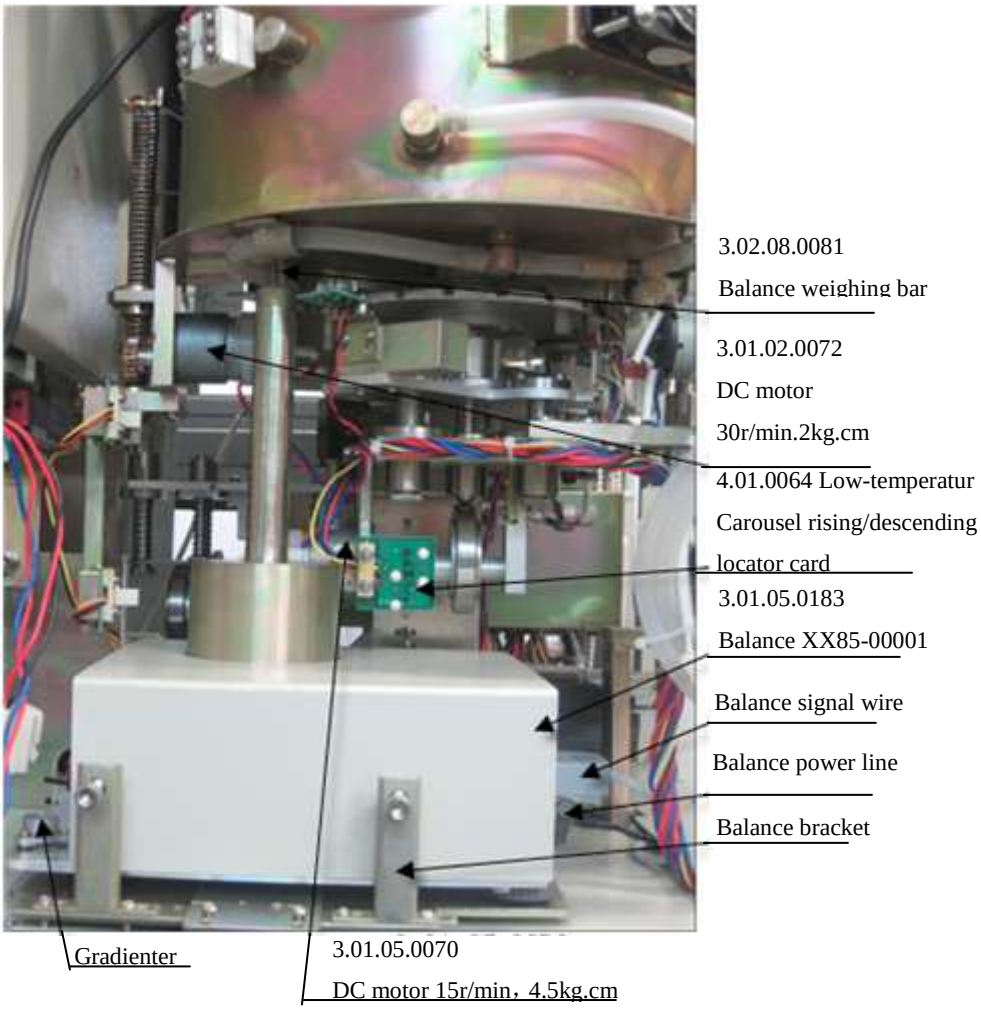


Fig.9-12

9.9 Combustion furnace (Inner)

Fig.9-13

Fig.9-14

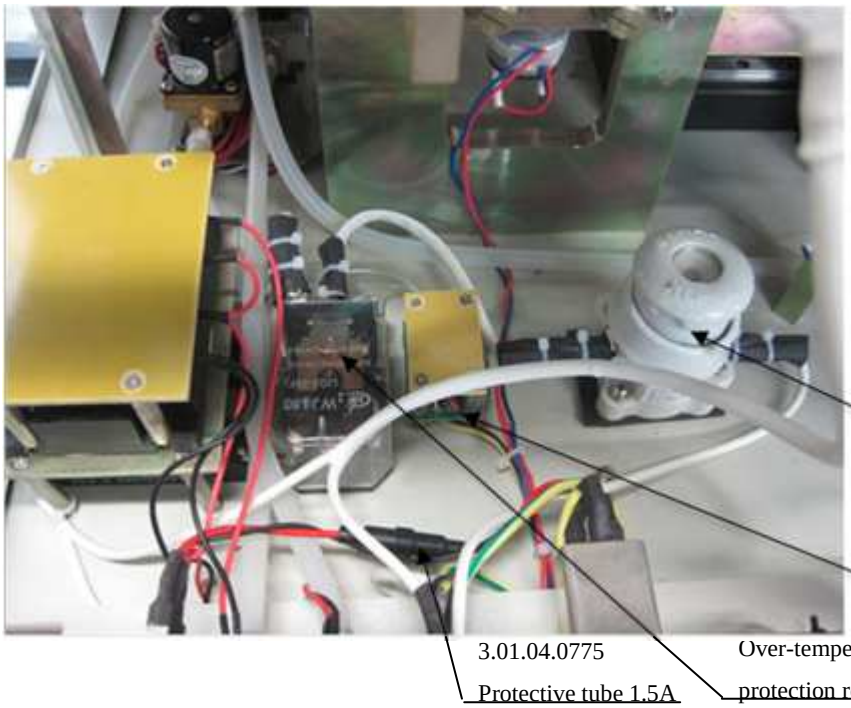


Fig.9-15

9.10 The rear and middle side of the combustion furnace (Inner)

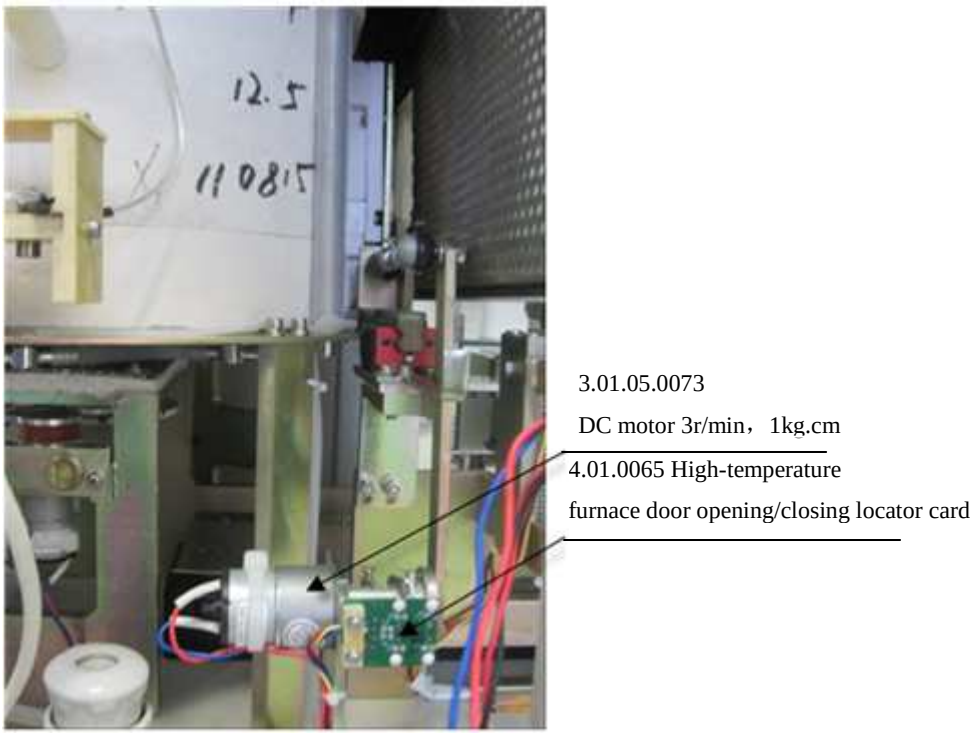


Fig.9-16

9.11 Manipulator (Inner)

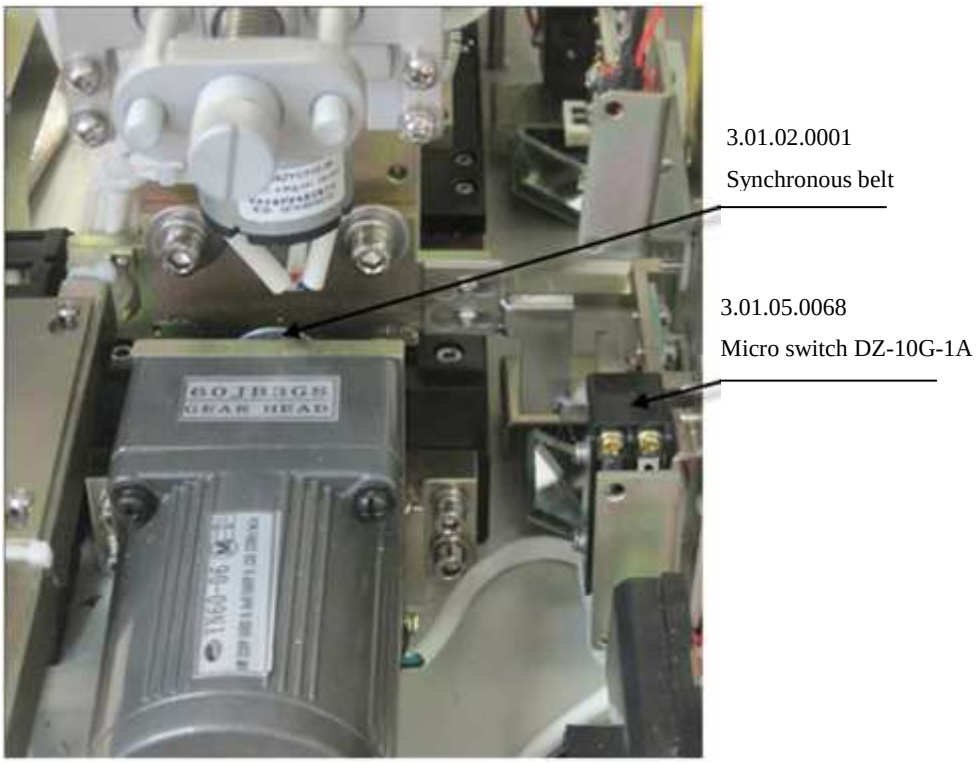


Fig.9-17

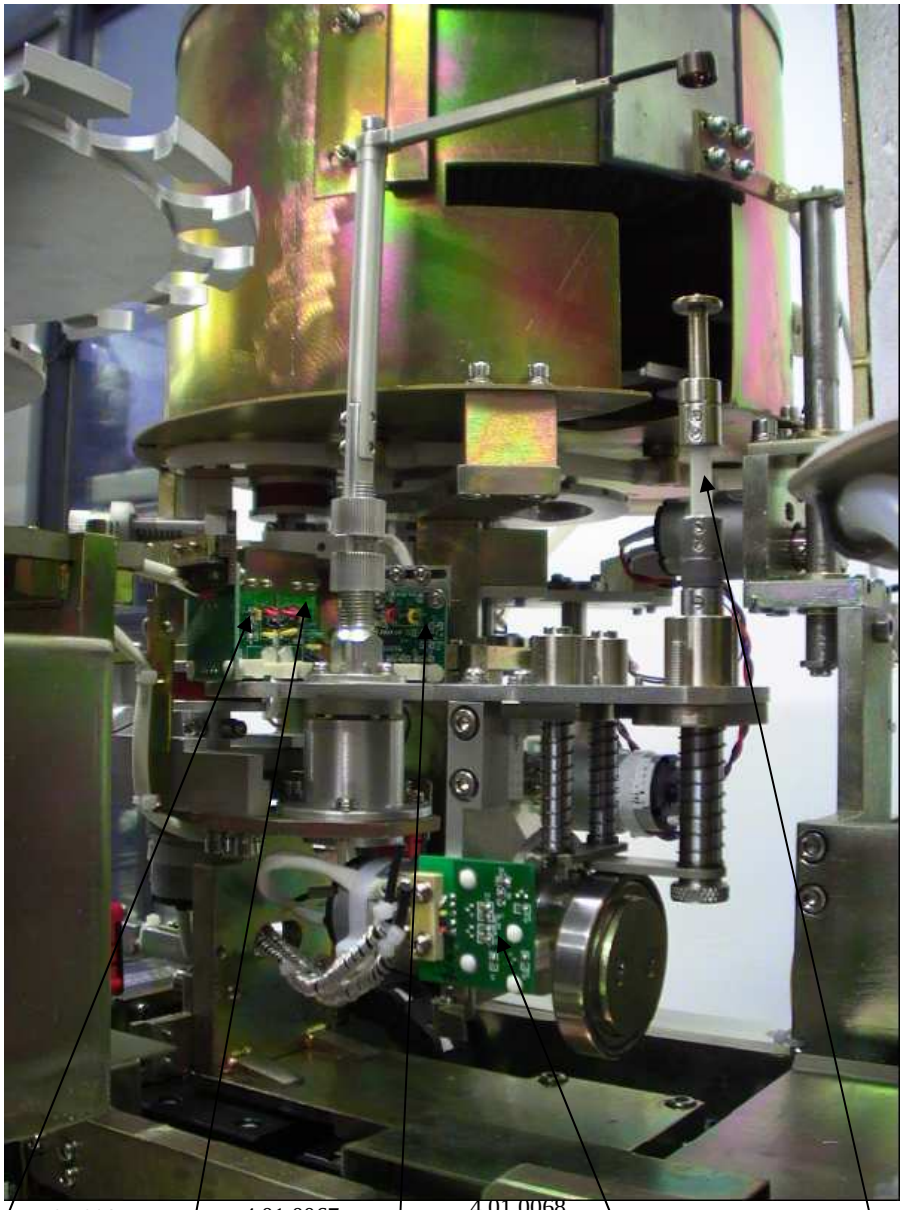

4.01.0087
Manipulator body
left locator card
4.01.0067
Manipulator body
right locator card
4.01.0068
Combustion carousel
rotation locator card
4.01.0066 Manipulator
rising/descending sensor
3.02.03.0077
Manipulator die-pin

Fig.9-18

9.12 Others

Fig.9-19 Outer balance

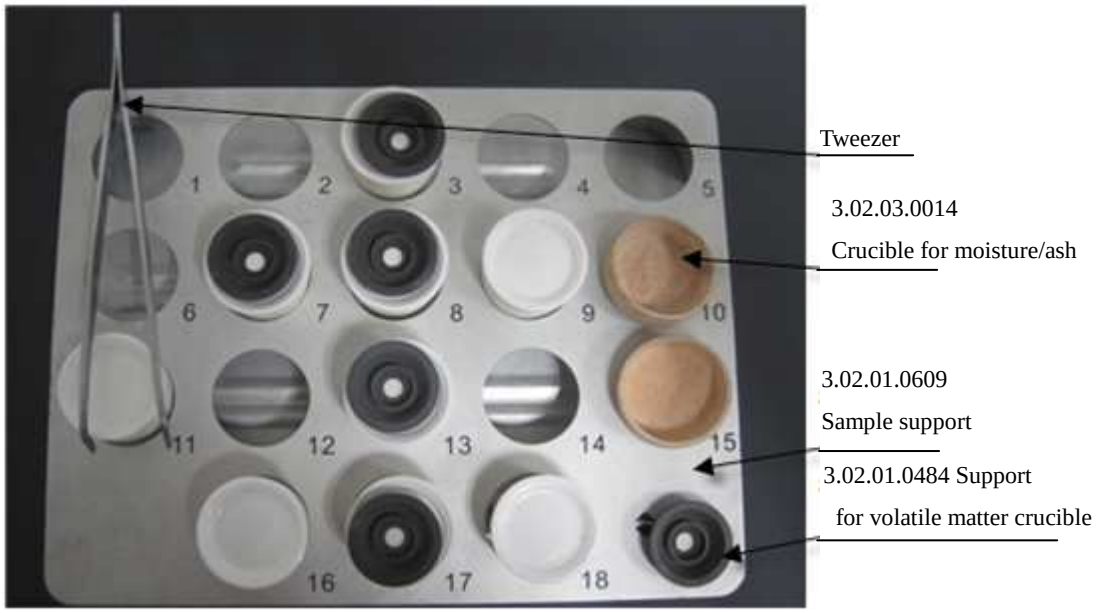


Fig.9-20

Appendix:

List of Spare Parts of ELAn-18 proximate analyzer

No.	Code	Name
1	4.02.0202	Air compressor elements
2	4.02.0201	Blower elements
3	3.02.01.0493	Manipulator platform
4	3.03.00.0026	Combustion sample tray
5	3.01.01.0020	Linear positioning platform LS1004C-150-F1
6	3.02.01.0430	Elements for sample loading detector
7	4.02.0158	High-temperature furnace
8	3.03.00.0027	Thermocouple (uniform temperature chamber)
9	4.02.0008	Thermocouple (high temperature furnace)
10	3.01.03.0065	Flow meter (N2, 22L)
11	3.01.03.0064	Flow meter (O2, 20L)
12	3.03.00.0028	Quartz heater elements
13	3.02.03.0063	Quartz die-pin
14	3.02.03.0077	Manipulator die-pin
15	3.02.03.0081	Balance weighing bar
16	3.02.01.0609	Sample support
17	3.02.01.0484	Support for volatile matter crucible
18	3.02.03.0012	Crucible for volatile matter
19	3.02.03.0014	Crucible for moisture/ash
20	3.02.02.0016	Smoke tube fixing ring
21	3.01.02.0103	High-temperature resistance plastic tube φ45
22	3.01.02.0001	Synchronous belt 129-3M
23	3.01.02.0151	Superior rubble tube φ6×φ9
24	3.01.02.0163	Silastic tube φ6×φ9
25	3.01.02.0020	Silicon rubber ring
26	3.01.02.0014	O ring φ2.65×φ58
27	3.01.07.0284	Lubricating grease 500ml
28	3.01.05.0183	Balance XX85-00001
29	3.04.05.0112	Balance BSA124S
30	3.01.05.0129	Magnetic Valve YAB21-02-5A
31	3.01.05.0249	Magnetic Valve S2W250-08
32	3.01.05.0060	Magnetic Valve FAG31-8-4-12C
33	3.01.05.0068	Micro switch DZ-10G-1A
34	3.01.05.0045	Micro switch
35	3.01.05.0064	Switching power supply GZM-H20T5+12R-5R
36	3.01.05.0065	Switching power supply LPC-H20S12
37	3.01.05.0003	Bi-directional silicon controlled rectifier
38	3.01.05.0004	Bi-directional silicon controlled rectifier triggering module
39	3.01.05.0013	Pressure adjusting module
40	3.01.05.0062	Fan 60×60×15
41	3.01.05.0048	Fan 80×80×25
42	3.01.05.0036	Fan 110×110×25
43	3.01.05.0061	Fan 120×120×38
44	3.01.05.0066	AC motor 60YN06-2CJ/JB3
45	3.01.05.0073	DC motor 3r/min,1kg.cm
46	3.01.05.0069	DC motor 10r/min,3.5kg.cm
47	3.01.05.0070	DC motor 15r/min,4.5kg.cm
48	3.01.05.0071	DC motor 20r/min,1kg.cm
49	3.01.02.0072	DC motor 30r/min,2kg.cm
50	3.01.05.0033	Ceramic protective tube 30A

No.	Code	Name
51	3.01.04.0775	Protective tube 1.5A
52	3.01.01.0134	Three-core cable
53	3.01.07.0015	Power line 10A/220V
54	4.02.0035	Matching plug
55	3.01.01.0139	External communication cable
56	3.03.00.0008	USB cable
57	3.01.01.0135	Balance signal wire (balance)
58	3.01.01.0136	Balance signal wire (instrument)
59	3.01.07.0018	Program download cable (external)
60	3.01.05.0067	Balance serial port card CP-104L
61	4.01.0036	Interface card SDCAN03
62	4.01.0082	Main control card
63	4.01.0081	Drive card
64	4.01.0083	Riser card
65	4.01.0054	Heating protection card
66	4.01.0078	Crucible detection card
67	4.01.0069	Low-temperature furnace door closing locator card
68	4.01.0070	Low-temperature furnace door opening locator card
69	4.01.0064	Low-temperature carousel rising/descending locator card

No.	Code	Name
71	4.01.0077	Sample discarding off locator card
70	4.01.0061	Low-temperature carousel rotation locator card
72	4.01.0071	Sample discarding on locator card
73	4.01.0073	Sample discarding rising/descending locator card
74	4.01.0062	Sample loading carousel rotation locator card
75	4.01.0079	Crucible support rising/descending sensor
76	4.01.0075	Manipulator out locator card
77	4.01.0074	Manipulator in locator card
78	4.01.0066	Manipulator rising/descending sensor
79	4.01.0072	Manipulator rotation right locator card
80	4.01.0068	Manipulator rotation left locator card
81	4.01.0067	Manipulator body right locator card
82	4.01.0080	Manipulator body left locator card
83	4.01.0081	Combustion carousel rotation locator card
84	4.01.0065	High-temperature furnace door opening/closing locator card
85	4.01.0060	External sample discarding door closing locator card

Periodic Maintenance Schedule

Maintenance Item	Maintenance Period	Position	Operating method
Crucible for moisture/ash	After every test		Clean the crucibles after every test to avoid scaling and replace it when it is wearing or broken.
Support for volatile matter crucible	After every test		
Support for volatile matter crucible	After every test		
Quartz die-pin		Manipulator	Replace it when it is broken or wearing
Manipulator die-pin		Sample discarding position	Replace it when it is broken or wearing.
Balance weighing bar		Balance	Replace it when it is broken or wearing.
Smoke tube fixing ring	Two year Note	The smoke mouth	Replace it when it is aging.
Silastic tube	One year Note	Inside the instrument	Replace it when it is aging or broken.
Fluorine rubber tube	One year Note	On the top of high temperature furnace	Replace it when it is aging or broken.
Quartz heater elements	One year Note	On the cover of the constant temperature chamber	Replace it when it cannot heat up or the quartz heater is broken.
High-temperature furnace		Inside the instrument	Replace it when it cannot heat up.
Ceramic protective tube 30A		Behind the I/O plate	Replace it when it is burnt out.
Protective tube 1.5A		On the I/O plate	Replace it when it is burnt out.
Thermocouple	Three year Note	On the top of high temperature furnace	Replace it when the thermocouple wire is broken.
Silicon rubber ring	Half a year Note	In the rotating machines	Replace it when it is aging, wearing or of gross distortion.
Damping column	One year Note	In the rotating machines	Replace it when it is aging or wearing.
Lubricating grease	Three months	In the rotating machines	Add lubricating grease to every motions regularly.
Dust cleaning	Three months	Inside the instrument	Clean the inner of the instrument regularly.

Note: Based on working 8 hours each day.