User Manual



Please read the manual before installation and operation.

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I. Safety

1. Overview

This operating manual is prepared for the laboratory device operators. Please read this manual carefully before using the device, and conduct the operation according to the manual. Personnel who are not familiar with the device operation or safety information shall not operate the device.

This device adopts the current most advanced technology for design and manufacturing. But the improper use of device will cause the potential safety hazard.

The device manufacturer has made the assessment on the possible residual hazard:

Inexperienced personnel operate the device

Failure to operate the device according to the normal regulations

There is the warning information in this operating manual, and operators shall know these residual hazards.

2. Safety

Warning: This device is only used for the laboratory. If the device is damaged due to the failure of conducting the operation according to the manual during the use, the manufacturer refuses to bear all consequences.

Warning: If the failure of using the device properly or conducting the operation according to the operating manual causes the consequences, the company will not bear the safety problem of device use.

Warning: The failure of operating the device as required by this manual will weaken the safety performance of the device.

Warning: Please conduct the treatment of various solutions used in the test according to the laboratory safety regulations. The operators shall wear the rubber gloves, lab coats and goggles.

Warning: Oral take-in of boric acid will cause the acute poisoning, which is mainly embodied in gastrointestinal symptoms, nausea, emesis, abdominal pain, diarrhea, etc., and then dehydration, shock, coma or acute renal failure, or high fever, liver and kidney damage and convulsions, and even cause death if serious. It is easily absorbed by the damaged skin and causes the poisoning. Chronic poisoning Longterm absorption of small amount of boric acid in gastrointestinal tract or skin will lead to mild digestive tract symptoms, dermatitis, baldness and liver and kidney damage.

Warning: Sodium hydroxide has intense irritation and corrosivity. The powder or smog will irritate the eyes and respiratory tract, and corrode nasal septum. Direct contact of skin or eyes with sodium hydroxide may cause burns, and accidental take-in can cause gastrointestinal burns, mucosal erosion, bleeding and shock.

Warning: Sulfuric acid (96-98%) has intense irritation and corrosive effect upon the skin, mucosa and other organs. Vapor or mist may cause conjunctivitis, conjunctival edema, and corneal opacity, and consequently blindness; it may cause respiratory irritation, and may cause dyspnea and pulmonary edema in severe cases. High concentration may cause the laryngospasm or glottic edema, and finally death by suffocation. Oral take-in may cause digestive tract burns and thus elcosis. It may cause gastric perforation, peritonitis, renal damage, shock, etc. in severe cases.

Warning: The temperature of digestive tract will reach 100°C during the experiment. After completing the distillation, take the testing tube out with test tube holder for avoiding scald.



Warning: Please use the power line provided by Hanon. Other power lines will affect the safety performance of the device.

Warning: This device is equipped with the special grounding power plug for preventing electric shock. Please use the grounding receptacle.

Warning: Electric shock hazard only professional and qualified persons are permitted to open the machine cover and the panel.

Warning: The device shall not be used under the environment with the potential explosion risk.

Warning: Paraffin or reagents containing paraffin can cause damage to equipment.

Warning: In the case of not conflicting with the local waste disposal regulations, waste liquor can be directly discharged into the sewer. Make sure that the exhaust line is not bent or doesn't keep the upward flow and is as short as possible, and the outlet end shall not be lower than the liquid level of the sewer. (Exhausting hot water below cold water will produce the noise). The pipeline shall be fixed, because the waste liquid discharged from the system has certain pressure.



Warning: The power switch in the lower right side of the device

can be reached easily at any time, making sure that the power can be turned off at any time.

Notes: Don't touch or open the protective door during the device operation.

Notes: Make sure that the liquid solution will not contact the power line and electric parts inside the device.



Notes: Stop using the device in the case of failure, and timely contact the nearby Hanon service center.

Notes: This device shall be repaired by the personnel authorized by Hanon. Hanon recommends using the original spare parts. If the spare parts from other sources are used, the quality guarantee will be invalid.

Notes: The device is designed and tested according to EU standard (CE). To guarantee the continuous conformance to the standard, the device can only be connected with the equipment meeting CE requirements.

Notes: The unboxing, assembly and installation of the device shall be completed by the personnel authorized by Hanon.

Notes: Please make sure that the water, electricity and gas sources of the instrument are turned off after the experiment is completed. (Please operate according to the actual situation!)

3. Guidance for waste disposal



It is not allowed to discard the electronic devices together with the nonclassified general waste. Improper disposal will produce the damage to the environment and human health. Please refer to the local waste disposal regulations for collection and disposal of the equipment.

4. Quality guarantee policy

The quality guarantee is generally specified in the purchasing order or contract, and is only applicable to:

The user shall abide by all written explanations and documents of Hanon. The equipment shall be installed, maintained, adjusted and calibrated according to the methods described and recommended in the documents.

The equipment is not used for other purposes beyond those specified by Hanon.

The equipment is not refitted or repaired with spare parts not from Hanon, and is not repaired by the personnel beyond those authorized by Hanon. Only use the accessories and consumables provided by Hanon for from the source recommended by Hanon.

The equipment can't be operated according to the way which is inconsistent with the ordinary practice.

Only software authorized by Hanon can be installed in the PC of the equipment.

Use the external PC meeting the requirements recommended by Hanon.

Don't play game with PC, including the game installed together with operating system.

The equipment shall conduct the correct maintenance according to the requirements recommended by Hanon.

The equipment contains some quick-wear parts, and these spare parts can be inquired in the user's manual and user's guide. The quality guarantee responsibility of quick-wear parts is only limited to the damage caused by the material defects or production problem.

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II. Summary

1.Application

Automatic Kjeldahl Analyzer is an automatic, smart device determining nitrogen content based on Kjeldahl method. It can be widely used in food processing, feed production, tobacco, livestock, soil fertility, environmental monitoring, medicine, agriculture, scientific research, teaching, quality control and other fields for the test of nitrogen or protein content with respect of macro and semimicro samples and can also be used for the test of ammonium, volatile fatty acid / alkali, and so on. Upon test of samples by using Kjeldahl method, the processes of digestion, distillation and titration are required, wherein distillation and titration are main determination processes with respect to Automatic Kjeldahl Analyzer.

Automatic Kjeldahl Analyzer is an automatic nitrogen determination system integrating distillation and titration based on classic Kjeldahl method; the device

provides great convenience for lab staff in determining nitrogen-protein. It's safe, reliable, simple for use and time-saving. A friendly user interface in English allows easy operation and displays abundant information, enabling users to quickly master the use of the device.

2.Principles

According to Kjeldahl principles, the determination requires three steps, which are digestion, distillation and titration.



Automatic Kjeldahl Analyzer can automatically complete the processes of distillation and titration. Upon the samples to be determined is fully digested, it's subjected to the following chemical reactions on the device:

[1].
$$(NH)_2 SO_4 + 2NaOH \xrightarrow{\text{high-temperature steam}} Na_2 SO_4 + 2H_2O + 2NH_3 \uparrow$$

[2].
$$2NH_3 + 4H_3BO_3 = (NH_4)_2B_4O_7 + 5H_2O$$

T [3].
$$(NH_4)_2B_4O_7 + 5H_2O + 2HCl = 4H_3BO_3 + 2NH_4Cl$$

indicator) after condensed by a condensing tube. Then the automatic titrator carries on titration and record the volume of consumed standard titration acid. Based on the volume of consumed standard titration acid, the calculating system calculates the nitrogen content and crude protein content based on the following formulae. Nitrogen content: $N(\%) = \frac{Q \times c}{W}(V - V_0)$

Crude protein content: $P(\%) = N(\%) \times F$

Wherein:

c: Molar concentration of titration acid (mol/L);

W: Sample weight (g);

V₀: Volume of consumed standard titration acid during blank sample titration (mL);

V: Volume of consumed standard titration acid during sample titration (mL);

F: Conversion coefficient for crude protein.

Q: The computing coefficient should be the hydrogen quantity equaling to the standard volumetric solution made of 1.0mL sulfuric acid $(1/2H_2SO_4=1.000mol/L)$ or 1.0mL muriatic acid (HCI=1.000mol/L) with the unit being (g).

Note: titration acid can be sulfuric acid (H_2SO_4) or hydrochloric acid(HCI). In this User Manual, titration acid concentration refers to concentration of H^+ .

3. Operation procedures







1. Technical Parameters

a. Quantity of measured samples: solid \leq 5g; liquid \leq 20mL;

- b. Measurement scope: 0.1mg~240mg of nitrogen;
- c. Measurement speed: 5~10 min;
- d. Recovery rate: ≥99.5%;
- e. Titration precision: 1.0µL/ step;
- f. Relative Standard Deviation (RSD): ≤0.5%;

g. Data storage space: 1000000 (internal storage of device); unlimited (cloud storage);

h. Consumption of condensate: 0.5L/min (with the condensate temperature is 15°C);

i. Interfaces: USB, LAN, RS232, CAN, WIFI;

- j. External dimension (L*W*H): 460mm×360mm×725mm;
- k. Net weight: 38kg.

2. Use conditions

- a. Power: AC 220 ±10%V (50/60±1) Hz;
- b. Rated power: 2000W;
- c. Condensate pressure: >0.02MPa; pressure>1.5L/min;
- d. Condensate temperature: ≤20°C;
- e. Ambient temperature: 10°C~35°C

IV. Name of device components

This device is designed with the system that can realize fullyautomatic distillation, titration, computation, waste discharge and cleaning of samples that have been processed, display working process, achieve result computation via microcomputer, and finally print out output data via a printer. This system mainly consists of microcomputerbased controller, steam generator, distillation system, alkali dosing system, boric acid dosing system, titration system, waste discharge system and cleaning system, etc.

The structure of the device is shown as follows:





1. Tag2. Safety valve3. Digestion tube4. Digestion tube bracket5. Display screen6. Right-hand door 7. Collecting cup8. Device model



9 Power switch 10. USB interface 11. RS232 interface 12. CAN interface 13. LAN interface 14. Power interface





15. Canister level 16. Collecting cup cleaning water 17. Boric acid canister level 18. Distillation 19. Alkali canister level
20. Boric acid 21. Waste liquid level 22. Alkali solution 23. Processing pipe waste outlet 24. Collecting cup waste outlet
25. Condensate water outlet 26. Steam generator waste outlet
27. Condensate water inlet

V. Device installation methods

1. Inspections before installation

After unpacking the device, check the complete machine and all assemblies according to the packing list attached inside the package, and then inspect to make sure if any of them is damage; if yes, please contact the manufacturer immediately. (Please keep all damaged parts well)

2. Installation conditions

a. This device should be installed in the place that is free from direct sunlight, overheat or humidity; generally, the temperature of installation site should be kept at $10^{\circ}C \sim 35^{\circ}C$.

b. This device should be installed in the workplace near the water source and drain water pond, with the power socket being provided already; in addition, the distance between the device and water supply valve / power position should be smaller than 1m, thus ensuring convenient operation.

c. The water supplied should meet requirements on water pressure and temperature.

d. The drain water pond should be under the device discharge outlet with a distance larger than 50cm, thus making sure that water can be discharged smoothly.

e. The power configuration should comply with power supply requirement. There should be earthing wire, separate power switch and safety apparatus so as to ensure the safety operators.

f. This device should be installed in the workplace far away from the largescale electrical equipment, free from vibration, corrosive liquid or intense electromagnetic interference.

3. Installation

The device should be placed on the testbed stably; the backface of the device should be kept away from the wall with a distance being over 20cm; the distance between the device and power socket should be smaller than 1m. In addition, it is also required to provide air switch, electric leakage CB and reliable earthing wire.

All pipe interfaces of the device should be connected as per the diagram attached. Condensate water inlet (16) is connected to the tap water valve; the condensate water outlet (17) and the waste discharge outlet are

connected to the water drainage pipe and waste discharge pipe respectively so as to drain water to the pond smoothly.

VI. Function introduction

1. Self-inspection during startup

The self-inspection during startup includes 4 items as collecting cup inspection, distillation inspection, condensate water inspection and titration inspection. As shown in following Figure:

Receiving Cup Detection	Passed
튨* Distillate Analysis	Passed
Condensed Water Analysis	Failed
Titrant Analysis	Waiting

Status: the item that passes the inspection is displayed as success, the item that has not been inspected is displayed as Waiting and the item that fails to pass the inspection is displayed as Failure.

Self-inspection skip: this function exists during the entire process of selfinspection and can be used to skip the self-inspection at any time. Click on this button to enter the home page directly.

If there is no abnormality after the self-inspection, the login page will be displayed. If there is any abnormality, a prompt will be prompted; then, click on the ACK button to enter the home page.

The self-inspection is default as started when the device is started (including the initial startup) unless the Administrator has canceled the self-inspection function in previous login.

2. Setup guidance

After self-inspection during initial startup, setup guidance will be popped out when logging in with Administrator's account. After the setup, the home page will be popped out. The setup guidance includes following 4 aspects of contents language setup, time setup, Internet setup and senior setup; where, the Internet setup can be skipped while the others cannot. The setup guidance will only pop out in the initial startup of the device without login with the Administrator's account. The startup guidance will be displayed as closed status after or during the guidance setup. In addition, the setup guidance will only be displayed when the Administrator's account is used to log into the platform while the account of other roles cannot make it.

2.1 Language setup

Language setup is used to set up the language for the main platform. Select the target language in the drop-down list, such a Simplified Chinese, and then finish the setup by clicking on the NEXT button. As shown in following Figure:



2.2 Time setup

Time setup is used to set up the time for main platform. Select the target time zone in the drop-down list, such as China Standard Time (Beijing Time), and then finish the setup by clicking on the NEXT button. As shown in following Figure:



2.3 Senior setup

The senior setup is mainly used to determine whether to perform selfinspection during startup or not, set up specification of the buret and printing mode. Finally, finish the setup by clicking on the NEXT button. As shown in following Figure:

	2018/12/13 15:53:54		
	Advanced Settings		
Power on Self-test			
Burette Specification		25mL >	
Printing Method		Basic Format >	
	BACK		

Self-inspection during startup: it is used to choose whether to perform self-

inspection during startup or not. When the status displayed is ON, the selfinspection function will be stopped by clicking this button; inversely, this function will be started by clicking this button when the status is displayed as OFF.

Specification of buret: there are 3 types of specifications of buret available for the test, namely, 5mL, 10mLand 25mL.

Printing mode: there are 2 types of printing mode, namely, fundamental format and standard format.

2.4 Internet setup

The Internet setup is mainly used to set up the Internet used for this platform. It is possible to determine whether the IP address could be automatically obtained in this page. In addition, the Internet setup can be skipped. As shown in following Figure:

2018/12/13 15:56:05		
		SKIP
Your Internet Connection		
Obtain IP Address Automatically		
Set IP Address Manually		
IP Address		
Subnet Mask	255.255.255.0	
Gateway	192.168.0.1	
	100 100 0 1	

In the Internet setup page, click on the OK button to complete the whole setup process so as to turn to the home page.

3. Login

Users could log into the platform successfully by inputting correct user name and password in the login page. The default login password is 12345678. As shown in following Figure:

4. Home Page

After successful login, the page will turn to the home page automatically. The home page includes 9 modules, including test, CLEANING, DATA, CLOUD SERVICE, PERSONAL INFORMATION SETUP, MESSAGE NOTIFICATION, SETUP, HELP AND EXIT module. As shown in following Figure:

TEST: the test module is mainly used to display the main functions regarding tests of this platform.

CLEANING: the cleaning module is mainly used for cleaning devices that may be used during test process.

DATA: the data module is mainly used to display the list of tests that have been carried out, as well as each test data.

CLOUD SERVICE: the cloud service is mainly used to upload the database of test methods and test data to the cloud server for the sake of download and review in the future.

4.1 Test

The test module is mainly used to display the main functions regarding tests of this platform.

The test function of this system can be realized automatically when the user clicks on RUN button after adding some information as the batch No. and sample data, as well as completing basic setup. As shown in following Figure:

	20	18/12/13 16:03:47		
$\langle \rangle$				
Sample Batch No. +Add	+Add		× CI	ear Experiment Status
Prerun >	No.	Test Type Sample Name	Testing Method	Quantity of Experiment Sample Status
Cleaning >	🗌 E1	Instrument Prerun Blank	Prerun	0.0g
Basic Sattings	🗌 E2	Instrument _{Prerun} Blank	Prerun	0.0g
Dasic Settings	🗌 E3	Instrument Prerun Blank	Prerun	0.0g
Blank Volume Last Time of Automation		Instrument Drorup	Drorun	0.00
Titration Acid Concentration 0.0mol/L		Sample Injector Rotation	n Ru	n

4.1.1. Batch of sample

The Batch of sample is mainly used to newly add batches, and also edit/delete the batches that have been input. As shown in following Figure:

	2018/12/13 16:04:43		
$\overline{\bigcirc}$			
Sample Batch No. +Add	+Add	Clear Experiment Stat	tus
> EDIT DELETE	No. Test Type Sample Nar	me Testing Quantity of Experim Method Sample Status	ent
Cleaning >	E1 Instrument Prerun Blank	Prerun 0.0g	
Papie Settings	E2 Instrument Blank	Prerun 0.0g	
Dasic Settings	E3 Instrument Prerun Blank	Prerun 0.0g	
Blank Volume Last Time of Automation	□ E4 Instrument Drarup		
Titration Acid Concentration 0.0mol/L	Sample Injector	Rotation	

Adding batch of sample: when clicking on 【+Add】, the page for adding the batch of sample will pop out. Then, input the batch name and click on OK button to finish this step.

Editing batch information of sample: the batch list of samples displays all batches of all samples. When selecting one batch, slide the screen to the left so as to show the Edit and Delete buttons. When clicking on the Edit button, the editing page will pop out so as to modify the batch information that has been saved.

Deleting batch information of sample: the batch list of samples displays all batches of all samples. When selecting one batch, slide the screen to the left so as to show the Edit and Delete buttons. When clicking on the Delete button, the page for secondary confirmation of information will pop out; then, click on the OK button to delete all data about or subject to this batch.

4.1.2. Fundamental setup

The fundamental setup is mainly used for setting empty volume and the concentration of titrable acid. As shown in following Figure:

\bigcirc	2018/12/13 16:05:47		
Sample Batch No. +Add	① Blank Volume Settings	× ci	ear Experiment Status
Prerun >	Last Time of Automation	g	Quantity of Experiment Sample Status
Cleaning >	Auto Average	1	0.0g
Basic Settings		n	0.0g
25 Blank Volume	Instrument		0.0g
Titration Acid Concentration	Sample Injector Rotation	Ru	n

	2018/12/13 16:06:01
\bigcirc	
Sample Batch No. +Add	+Add Clear Experiment Status
Prerun ① Set Acid Con	centration X ity of Experiment
Cleaning	Titration Acid Concentration
Basic Settings	Blank
Blank Volume Last Time of Automation	C EA Instrument Drarium Prarium 0.00
Titration Acid Concentration 0.0mo//L	Sample Injector Rotation Run

Empty volume: it will be automatically defaulted as that set last time. When clicking on the empty volume module, a window will pop out, in which the empty volume calculation method can be selected, including automatically defaulted as the last setup or the average value, or manual input. When choosing to input manually, it is possible to input data manually in the popout input box.

Concentration of titrable acid: it is defaulted as 0mol/L. When clicking on the titrable acid concentration module, a window will pop up, with which the concentration value of titrable acid can be input manually.

4.1.3. Sample data

The sample data is mainly used to add data for each batch of sample, including batch No., the type of test, sample name, database of selection methods, selection methods as well as sample quantity. After adding corresponding data, the system will run and display the test data accordingly. As shown in following Figure:

	201 ① Add Sample Data	8/12/12 16:06:58	~	
			^	
\bigcirc	No.	E3	Ŧ	
Sample Batch No.	Test Type	Instrument Blank	-	
				ear Experiment Statu
Deserve	Sample Name	Cleaning		
Prerun				Quantity of Experimen Sample Status
Cleaning >	Select Method Base	Instrument Test	-	oumpre outdo
oreaning				0.0g
	Select Method	Cleaning	-	
Basic Settings	Parameters of method	Sampling Unit:g Result Unit:mL Water:100.0mL Alkali:0.0mL R liquid:20.0mL Protein Coefficient Steam Flow Rate:300.0s	Dilution eceiving t:0.0	0.0g
Blank Volume Last Time of Automation	Quantity of Sample	0 g		
Titration Acid Concentration	CAI	YES		n

Adding sample data: when clicking on **【**+Add **】**, the page for adding sample data will pop out. When all the information as batch No., the type of test, sample name, database of selection methods, selection methods as well as sample quantity is input into this page accordingly, click on OK button to complete this step.

Deleting sample data: slide the display of sample data list to the left, a

DELETE button will pop out; when clicking on this button, the secondary confirmation box pops out; then, click on this box to delete corresponding data.

The added sample data is displayed in the right hand and the batch No. selected is displayed on the top. In addition, the list also displays the field, No., type of test, name of sample, test method, sample quantity and test status, etc.

Cleaning up test status: if the item "deleting sample data after test completion" is not selected in the setup part, the function of "clearing up test status" will be displayed; if this item is selected, this function will not be displayed.

Check all: select the ALL button at left hand if it is necessary to check all items; whether the function of "checking all" needs to be activated depends on the actual demands when performing setup.

Test status: " $\sqrt{}$ " represent the test completion; "!" represents test interruption due to fault; empty status represents that the test is proceeding. The completed tests or interrupted tests caused by fault cannot be edited; the "checking all" function should correspond to the test status. In addition, the completed tests or interrupted tests caused by fault cannot be performed again.

Sample injector rotation: when the item of "connecting the automatic sample injector" is selected in the setup part, the rotation function will be added; when clicking on this function button, the automatic sample injector connected to this device will start rotating; meanwhile, the function button of "sample injector rotation" will turn to "stop rotation" button, which can be used to stop the sample injector rotation.

Operation: when clicking on this button, the operation will proceed from top to bottom; if the sample injector is connected, the operation will proceed only for once. Tests that have been completed for interrupted due to fault cannot be redone again; therefore, it is only allowed to carry out the tests that have not been performed.

During the test process, the window will display the ongoing test data. As shown in following Figure:

Ongoing: this Figure displays the process and description of sample data under test, including 8 statuses as dosing receptor fluid, dosing dilution water, dosing alkali, waiting, proceeding distillation, proceeding titration, discharging waste and test end.

If the automatic sample injector is connected, two status of **[**Sample Injection **]** and **[**Digestion tube Reset **]** will be newly added, with the entire 10 status shown as follows: injecting sample, dosing receptor fluid, dosing dilution water, dosing alkali, waiting, proceeding distillation, proceeding titration, resetting digestion tube, discharging waste and test end.

Sample data can be returned during operation process, which requires secondary conformation. After returning, the results can be displayed normally and the test status will be displayed as "!", meaning uncompleted status. Moreover, "Uncompleted Test" will be displayed in the detailed data event log of data module.

The current test results will be displayed and updated by refreshing at any time in real time. The titration volume can be refreshed and updated at any time so that the titration volume of current data can be displayed.

NaOH+: it can be used to dose alkali (sodium hydroxide) at any time during the test process.

Stop: if the automatic sample injector is not connected, a window about "stop the test immediately or not" will pop out when clicking on the "Stop" button; then, click on the "Yes" button to go back to previous page. When the automatic sample injector is connected and multiple data tests need to be performed, a window for selecting stop mode will pop out: when selecting "Stop Immediately" button, the previous page will pop out; when selecting "Stop Current Test" button, the previous page will pop out as soon as current test is completed.

Event log: it can be used to check the event records of present test object instead of that of all test objects.

Titration graph: it can be used to check the change in curve graph of current test object.

Test method: it can be used to check the parameter of test method of current test object.

Test result: it can be used to check results of current test object.

This device will stop running if any individual status fault occurs and the fault will be displayed in the intermediate progress bar. Then, the "Return" button will be available.

Alarm and stop running: protection door or digestion tube fails to be in place; steam generator lacks water; steam generator or condensate water is over-temperature; the protection door of automatic sample injector fails to be in place; sample bowl or the digestion tube of automatic sample injector is in fault.

Operation in succession (with automatic sample injector unconnected): condensate water, water canister, receptor liquid canister, alkali canister,

titrable acid canister and waste liquid canister, etc.

According to relevant setup, three types of status are displayed, namely, gray status will be displayed under closed condition, normal status will be displayed under startup condition, and red status will be displayed under alarm circumstance.

If the test result is higher or lower than the upper or lower limit designed for the test, a window reading "The result is lower/higher than the threshold setup, shall it be continued or paused" will pop out.

(Both the upper and lower limit in this test is defaulted as 0; therefore, this is no threshold setup).

When stopped due to fault, this test will be regarded as paused and can be continued after troubleshooting.

Sensor status: 1. Water canister level; 2. Receptor liquid canister level; 3. alkali canister level; 4. titrable acid canister level; 5. waste liquid level; 6. protection door; 7. digestion tube; 8. Steam generator liquid level; 9. steam generator temperature; 10. Condensate water temperature. (Item 8 and 9 are called steam generator in general).

Status of sample injector: status of sample bowl, protection door and digestion tube of sample injector. The display of these three statuses will be realized via one icon, namely the icon of sample injector. If a fault occurs to any part, the corresponding part will turn red.

Operation status: dosing boric acid, dosing dilution water, dosing alkali, waiting, proceeding distillation, proceeding titration, discharging waste and test end.

4.2 Cleaning

The cleaning is mainly used for cleaning all devices that may be used during the test, including cleaning when changing acid, cleaning the whole pipeline, steam scrubbing, alkali pipeline cleaning, receptor liquid pipeline cleaning, collecting cup cleaning, digestion tube cleaning, splash-proof canister cleaning and cleaning after sample return of sample injector. As shown in following Figure:

Cleaning: click and enter the cleaning display window that displays the cleaning is proceeding; as the automatic cleaning process is completed, the prompt on "Cleaning End" will be displayed.

Stop cleaning: it is possible to stop the automatic cleaning process at any time by clicking the stop button, and then the previous level will be displayed.

4.3 Data

Data module mainly displays the list of all tests that have been performed, as well as the data of each test, including test No., sample name, sample quantity, test result, tester and test time, etc. Moreover, the data can be printed, exported or deleted. As shown in following Figure:

Search: it is possible to search test data by inputting sample name, tester or the time range of corresponding test.

No.: it displays the test No.

Sample name: it displays the name of all samples that have been tested; the part that is beyond the space will be replaced by an ellipsis. For test data generated under manual mode, the sample name should be input with manual mode.

Sample quantity: it displays the data as quantity and unit of all samples that have been tested.

Test result: it displays the data of all samples that have been tested.

Tester: it displays the operator who performs test to the sample.

Test time: it displays the time for testing the sample, which can be specific to the second.

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Other operations: there are other operations as data printing, exporting and deleting, which can be realized by clicking on the Print, Export or Delete button accordingly. In addition, if any item in current page is selected, it should be saved before moving on to the next page.

Slide one entry of data to the left to display all operations; then, click on each operation button to check all data information accordingly.

Slide one entry of data to the left to display all operations; then, click on each operation button to check all data information accordingly.

Check certain item of data in the list, and check it again to cancel the selection.

Simple reports and detailed reports can be printed out according to the printing setup. When clicking on the Print button, the data report of tests performed with different methods cannot be printed out the same time. To print out multiple event logs, commas should be adopted.

Print: the printing mode can be selected in the setup part. When clicking on the Print button, it is required to determine whether the printer should be connected; if it has been connected, the reports would be printed out directly. The printing contents should be determined by the printing mode. If printer has not been connected, a prompt reading "Please check if the printer has been connected or not. Try again later after completing the connection" will pop out. Click on the button - "I know" to close this prompt. Export: when clicking on the Export button, the window of export mode (XML or PDF) will pop out. It is necessary to determine whether an USB flash should be inserted. After inserting an USB flash, a window for selecting exporting mode will pop out, with which multiple entries of data can be exported out in one file that will be named with the exporting date. For files exported in PDF format, they should be named with the title used in printing setup (printed title) + HH:MM:SS/DD/MM/YY. During the export process, a progress bar will be displayed, and the cancellation of export process requires secondary confirmation. As the export process is completed, a weak prompt reading "Export Successfully" will pop out, which will conceal automatically after displaying for 3min.

Delete: data deleting can only be performed by personnel with the Administrator authority.

Authority: all testers can only review all data of tests performed by themselves; however, administrative personnel and higher-level personnel have the right to check all testers and all of their test data.

View Data: it displays the brief information of certain data, including the data No., sample name and all results corresponding to the test. Specifically, it also includes type of test, sample quantity, empty volume, concentration of titrable acid, titration volume, results, tester and test time, etc. Manual Mode: sample name is displayed in manual mode; the sample quantity is 0g; the type of test is displayed in manual mode instead of the three types displayed under auto mode; the name of method is displayed in manual mode, the unit of result is mL, and the titration is an outer result. The sample quantity is saved in the form with 6 decimal places; however, the result is displayed in the form with 4 decimal places as the result of rounding it down.

View the parameter and method: when clicking on this button, a window will pop out for checking the method and parameters used for this entry of data.

View event log: when clicking on this button, a window showing all event records related to this entry of data will pop out.

4.4. Cloud service

The cloud service is mainly used to upload the database of test methods and test data to the cloud server for the sake of download and review in the future. (In case of the web sever location, the cloud service maybe not available in some countries.)

4.4.1 Cloud service login

Users could log into the platform successfully by inputting correct user name and password in the login page. Where, the account of cloud service system should be independent and non-interfering with that of Hanon Devices platform. As shown in following Figure:

4.5 Personal information setup

Personal information setup includes three items, including modification of theme, image and password.

4.5.1 Modification of theme

At present, the page of theme modification only displays three themes and currently selected theme. The User could randomly select one theme to be the theme for the entire platform of this system. As shown in following Figure:

4.5.2 Modification of image

The page of image modification displays the optional images as well as the image already used in this system. User could randomly select one image to be the user image. As shown in following Figure:

	2018/12/13 16:09:19
$\langle \rangle$	
Personal Information Settings	Change Profile Photo
CHANGE THEME >	
CHANGE PROFILE PHOTO> CHANGE PASSWORD >	

4.5.3 Modification of password

In the page for password modification, the User should input original password for once, and the new passwords twice; then, click on the OK button, showing the modification of password is completed successfully. As shown in following Figure:

$\langle \rangle$	2018/12	2/13 16:09:29
Personal Information Settings	Change Password	1
CHANGE THEME >	Old Password	Please enter your old password
CHANGE PROFILE PHOTO >	New Password	Please enter your new password
CHANGE PASSWORD >	Confirm Password	Please enter your new password again
		YES

4.6 Message notification

The message notification displays all messages received in this platform, including read/unread ones, which can be checked for details by clicking on each message. Moreover, it is also possible to delete individual message, or clean them up once for all. As shown in following Figure:

$\langle \rangle$	2018/12/13 16:09:44	
Message	All Messages	🗙 Clear All
ALL MESSAGES >		
READ MESSAGES >		
UNREAD MESSAGES >		

All messages: this part displays all of read and unread messages. The User could check details about all messages by clicking on each of them. Read message: this part displays the list of read messages, and clicking on each entry of message will enable the User to get details therein.

Unread message: this part displays the list of unread messages, and clicking on each entry of message will enable the User to get details therein. Delete: check on one entry of message in the list, and then slide the window to the left so as delete individual message.

Remove All: when clicking on the "Remove All" button on the window of message list, it is possible to delete all messages of the same sort.

4.7 Setup

The setup module is mainly used to set up the Hanon device platform, including method editing, account, commissioning, device calibration, senior setup, cloud setup, system updating, Internet setup, auditing and tracing and about device. As shown in following Figure:



4.7.1 Method editing

The method editing is mainly used for managing the method database, test

methods as well as parameters of test method. The method database in the left hand is defaulted as that of Hanon Device, in the right hand of which the built-in test methods and parameter of Hanon Devices are displayed. As shown in following Figure:

$\langle \rangle$		2018/12/	/13 16:10:50
Method Base	+Add	Experiment Method	+Add
nstrument Test	>	Prerun	>
Standard Method	>	Cleaning	>
		(NH4)2SO4	>

Method database: this part displays all test methods available. Before performing the test, it is required to select one test method by clicking on the Add button, inputting the name of method database and clicking on the OK button in the pop-out window. It is also possible to add new method database, and also delete or edit a database by clicking on and holding the name of method database, and then sliding to the left.

Test method: the list of test methods mainly displays the data of test methods. Click on the Add button to complete corresponding test method parameters in the right side. When adding a new method, it is defaulted that the parameters of previous test methods are copied, thus making the method parameters unified with the parameter values defaulted as follows: the unit of sample and result is g and mL respectively, the coefficient of protein is 0, and the quantity of receptor, alkali and distillation liquid is 0. It is possible to set up more method parameters by clicking on the Senior Setup button, with the default values shown as follows: the computing

coefficient is defaulted as 1.400; both the upper and lower limit of result alarm threshold is defaulted as 0; the titration mode is defaulted as "performing distillation while making titration"; the alkali dosing method is defaulted as "alkali dosing followed by distillation" and the distillation flow is defaulted as 100%; all of functions as waste discharge of digestion tube, as well as the cleaning of digestion tube and collecting cup are closed; the time for preheating and waiting is defaulted as 0; the terminus determination is defaulted as "turning into red from blue"; the test method is defaulted as "Kjeldahl Method". In addition, when "direct distillation method" is selected, both the slope and intercept will be displayed and defaulted as 0.

Operation: slide the list of method database to the left so as to edit or delete the database; the right side displays the method parameters that can be used to modify or delete this method. The deleting operation requires an Administration authority, and the executive personnel only have the right to edit and add the methods. In addition, the deleting operation requires a secondary confirmation. As a method is added successfully, it can be used in test function under auto mode by adding sample data.

4.7.2 Account

Account module is mainly used to add, edit and delete Administrator accounts. As shown in following Figure:

	2018/12/13 16:12:05	
\bigcirc		
Account +Add	Account Information	Unlock the Account
Admin >	Ad	min
	Creation Time: 2	018-12-13 06:19:05
	Authority : A	Administrator
	Default Log	jin : Allowed
	Change A	coount

Add: when clicking on Add button, an add page will pop out in the right hand where it is available to upload image, input user name and password, confirm the password, set up authority and determine whether to make the login defaulted; then, click on the Save button to complete adding account. Where, the authority refers to the identity as an Administrator, director or tester.

View: click on the User button on the left, the user information will pop out in the right side, including user image, user name, establishment time, authority as well as default login or not.

Change account information: when clicking on the "Change Account Information" button in the window of user information displayed in the right, a page for changing information as image, password, authority and default login will pop. Then, click on the "Save" button to save all changes.

Delete Account Information: when deleting any account information, click on the "Delete Account Information" button in the window of user information displayed in the right and confirm it in the newly pop-out window to complete the deleting operation.

Unlock account: when the account is set as default login, an "Unlock

Account" button will be displayed in the top right corner. Click on this button, a secondary confirmation box will pop up; then, click on the OK button on the box to unlock the account successfully.

Only the Admin has the right to get access to this function and distribute authorities of executive personnel and tester. The Administrator may have many authorities while there is only one Admin account.

Only one account can be set as default login. When the default login of an account is set, a corresponding mark will be displayed in the left-hand account list; when another account is set as default login, the first one will be covered and the second one will be set as default login.

4.7.3 Commissioning

The Commissioning part is mainly used to commission all parameters of the device; where, roles with the authorities of an executive personnel or above will have the right to get access to this operation. The Commissioning includes 6 parts, namely, parameter commissioning, color sensor, titrator commissioning, automatic sample injector commissioning, real-time status of device and manual mode.

1.Parameter commissioning

The parameter commissioning part is mainly used to commission all parameters of this device; namely, it can be used for on/off operations of all parameters. When clicking on the Parameter Commissioning On button under the condition where all parameters are defaulted as off status, a commissioning command will be sent to the device. When returning to the setup function, all parameters are turned into off status. (When leaving the commissioning interface and all commands sent are in default status, all commissioning parameters apart from that of pinch valve are off). As shown in following Figure:

	2018/12/13 16:13:02	
\bigcirc		
Commissioning Settings	Commissioning Parameters	
Parameters >	Steam Generator/Dilution Water Feed Pump	
Color Sensor >	Steam Generator/Dilution Water Feed T-valve	
Titrator >	Cleaning Pump of Receiving Cup	
Auto Sample Injector > Instruments Status >	Receiving Liquid Pump	
Manual Mode >	Waste Discharge Pipes & Valves	
	Pipe Clamping Valve	

2. Color sensor

The color sensor is mainly used for checking all parameters about color of the sensor. As shown in following Figure:

	2018/12/13 16:13:12	
\bigcirc		
Commissioning Settings	Color Sensor	
Peremeters	R	
Color Sensor >	G	
Titrator >	В	
Auto Sample Injector >	С	
Instruments Status >		
Manual Mode >		

3. Titrator commissioning

The titrator commissioning is mainly used to commission the titrator,

including whether the three-way valve is open, the plunger pump rises or descends. Where, it is defaulted that the three-way valve of the titration is closed, and it is possible to commission the three-way valve by rising or descending it. As shown in following Figure:

	2018/12/13 16:13:23	
$\langle \rangle$		
Commissioning Settings	Titrator Commissioning	
Parameters >	Titrating T-valve	
Color Sensor >	Plunger Pump Lift	
Titrator >	Plunger Pump Down	•
Auto Sample Injector >		
Instruments Status >		
Manual Mode >		

4. Autosampler

The autosampler is mainly used to set up the autosampler, including whether the rotation of autosampler should be turned on, selecting the hole position of the autosampler, as well as the rising and descending of digestion tube. As shown in following Figure:

	2018/12/13 16:14:03	
\bigcirc		
Commissioning Settings	Auto Sample Injector Commissioning	
Parameters >	Auto Sample Injector Rotating	
Color Sensor >	Select Hole of Auto Sample Injector	-
Titrator >	Processing Pipe Lift	100 %
Auto Sample Injector 🕞	Processing Pipe Down	
Instruments Status >		
Manual Mode >		

5. Real-time status of device

Real-time status of device is mainly used to check whether all parameters of the device are normal. The device status includes a status for adding a dedicated sample injector: the two different statuses for "protection door" and "sample bowl" will not be displayed when the sample injector is not connected; when there is any fault, the status will be displayed in red; if the device is normal or turned off, the status will display normally. (For realtime data, there is no closed status, which is only designed for test state). As shown in following Figure:

\frown				
Commissioning Settings	Real Time Status o	f Instruments		
Parameters > Color Sensor >	ine.	00	kati	31℃
Titrator > Auto Sample Injector >		88°C		
Instruments Status > Manual Mode >				

6. Manual mode

The manual mode is designed for User to manually set up and save test methods, including manually selecting the hole position of sample injector, selecting operation, inputting data and selecting the liquid used for the test, etc. As shown in following Figure:



Select the hole position of automatic sample injector

When the automatic sample injector is connected, the button "Select Hole Position of Automatic Sample Injector" will be displayed, in which there are 24 hole position Nos for option. Default E1: if the automatic sample injector is not connected, this control will not be displayed; when the hole position is changed, the new data result will be displayed while that of the old one will be cleared up. The test method will be named in "manual mode", which is only for displaying instead of being saved.

Operation option

For receptor liquid, the maximum injection quantity should be 150mL, namely, the value in textbox displayed in the right hand should be limited within 150. The default prompt of this input box is "Value over 150 is not available".

For dilution water, the maximum injection quantity should be 150mL, namely, the value in textbox displayed in the right hand should be limited within 150. The default prompt of this input box is "Value over 150 is not available".

For alkali, the maximum injection quantity should be 150mL, namely, the value in textbox displayed in the right hand should be limited within 150. The default prompt of this input box is "Value over 150 is not available".

For distillation, the maximum operation period or volume should be 720s (the unit is second) or 420mL (the unit is mL), namely, the value input according to the given unit, which is defaulted as mL; therefore, the value in textbox should be no larger than 420.

Titration: there is no value limit, and the unit is microliter.

Waste discharge: click on the Waste Discharge button to drain out waste liquid inside the tube; however, the data records will not be cleared up.

Data input

The textbox prompts the value limit corresponding to each individual

operation; the numeric keyboard is customized; when clicking on the Clear button in the left hand, the value will be cleared up; when clicking on the Delete button in the right hand, one digital will be deleted; when clicking on the Run button, the manually set operations and reference values will start running.

Operation records

It displays the test operation records, which will be cleared up as the hole position is changed.

Clear Test Data: click on this button to clear up certain test data, which requires a secondary confirmation. As the test data is cleared up, the data result needs to be displayed in the data column.

Save Test Method: only the executive personnel and higher-level personnel have the right to save the test method, and the other roles cannot.

Rules

1. Select the second method in the method database by default since the first one is a built-in method of Hanon Device and can neither be deleted nor changed, input the method name, select the unit of sample, which is defaulted as g; select the result unit, which is defaulted as milliliter; the protein coefficient is defaulted as 0;

2. Click on the Senior Setup, a pop-out window will displays following contents:

The computing coefficient is defaulted as 0.014000; both the upper and lower limit of result alarm threshold is defaulted as 0; the titration mode is defaulted as "performing distillation while making titration"; the alkali dosing method is defaulted as "alkali dosing followed by distillation" and the distillation flow is defaulted as 100%; all of functions as waste discharge of digestion tube, as well as the cleaning of digestion tube and collecting cup are closed; the time for preheating and waiting is defaulted as 0; the terminus determination is defaulted as "turning into red from blue";

the test method is defaulted as "Kjeldahl Method". In addition, when "direct distillation method" is selected, both the slope and intercept will be displayed and defaulted as 0.

3. Click on the Save button to return to manual mode.

Status

See introduction to auto mode for details about the status.

4.7.4 Device calibration

Device calibration is mainly used for calibrating partial functions of the device, including plunger pump calibration, receptor liquid, alkali pump calibration, dilution water pump calibration and color adjustment. Where, roles with the authorities of executive personnel or above will have access to this operation.

1. Plunger pump calibration

Plunger pump calibration includes three steps, and it should be performed as per the boot prompt. As the calibration is finished, the device can be recalibrated again. As shown in following Figure:

	2018/12/13 16:15:19	
\bigcirc		
Instrument Calibration	Calibration of Burette	
Calibration of Burette >	1、 Make sure there's no bubble in the plunger pump and the	
Receiving liquid >	liquid in titration acid bucket is more than 500mL. Click NEXT after completion. If there's bubble, exit and carry out acid	
Alkali Pump Calibration>	changeover cleaning for once.	
Calibration of Dilution >	Cleaning for Acid Next	
Adjust Color >	Changeover	

2. Receptor liquid

Receptor liquid includes two steps, and it should be performed as per the boot prompt. As the calibration is finished, the device can be re-calibrated again. As shown in following Figure:

	2010/12/13 10.15.27
Instrument Calibration	Calibration of Receiving Liquid Pump
Calibration of Burette > Receiving liquid >	 Prepare a beaker with the volume more than 500mL. Make sure the intake pipeline is full of liquid. Put the stirring instruments into the beaker. Then click NEXT.
Alkali Pump Calibration> Calibration of Dilution > Adjust Color >	NEXT

3. Alkali pump calibration

Alkali pump calibration includes two steps, and it should be performed as per the boot prompt. As the calibration is finished, the device can be recalibrated again. As shown in following Figure:

	2018/12/13 16:15:37
\bigcirc	
Instrument Calibration	Alkali Pump Calibration
Calibration of Burette > Receiving liquid >	 Put the empty digesting pipe on the instruments and make sure the alkali pipeline is full of liquid. Then click NEXT.
Alkali Pump Calibration	Next
Calibration of Dilution >	
Adjust Color >	

4. Dilution water pump calibration

Dilution water calibration includes two steps, and it should be performed as per the boot prompt. As the calibration is finished, the device can be recalibrated again. As shown in following Figure:

	2018/12/13 16:15:46
Instrument CalibrationCalibration of BuretteReceiving liquidAlkali Pump Calibration>Calibration of Dilution	Calibration of Dilution 1. Put the empty digesting pipe on the instruments and make sure the dilution water pipeline is full of liquid. Then click NEXT. Next
Adjust Color >	

5. Color adjustment

Color adjustment is mainly designed for calibrate the color and it consists

of three steps, namely, turning from blue into red, turning green into red, and turning yellow into red. As shown in following Figure:

	2018/12/13 16:15:55	
Instrument Calibration	Adjust Color	
Calibration of Burette >	WHITE В	ALANCE
Receiving liquid >	Adjust from blue to red	230
Alkali Pump Calibration>		
Calibration of Dilution >	Adjust from green to red	260
Adjust Color >	-	
	Adjust from yellow to red	260
	-	Č

4.7.5 Senior setup

Senior setup consists of 11 items of setup, including startup guidance, selfinspection during startup, automatic sample injector, factory setting reset, time setup, language setup, test setup, security setup, buret specification, cleaning setup and printing setup.

1. Startup guidance

Only the Administrator and executive personnel have the authority to operate the startup guidance. As the startup guidance function is started, only the executive personnel and higher-level roles have the right to reset the startup when logging in with their account while testers cannot. As the guidance setup is completed, the status will be closed automatically. As shown in following Figure:

	2018/12/13 16:16:51
$\langle \rangle$	
Advanced Settings	Auto Sample Injector
Power on Wizard	Use Autosampler
Power on Self- test	
Auto Sample Injector >	
Cleaning Settings >	
Printing Settings >	
Time Settings >	
Select Language >	
Test Settings >	

2. Self-inspection during startup

The function of self-inspection during startup can only be activated by roles with the authorities of Administrator and executive personnel; where, the self-inspection during startup is set as default. The self-inspection during startup includes 4 items as collecting cup inspection, distillation inspection, condensate water inspection and titration inspection. As shown in following Figure:

	2018/12/13 16:16:59
\bigcirc	
Advanced Settings	Auto Sample Injector
Power on Wizard	Use Autosampler
Power on Self- test	
Auto Sample Injector >	
Cleaning Settings >	
Printing Settings >	
Time Settings >	
Select Language >	
Test Settings >	

3. Automatic sample injector

The switch of automatic sample injector can only be activated controlled by roles with the authorities of Administrator and executive personnel; where, the sample injector is defaulted as closed. As shown in following Figure:

	2018/12/13 16:17:08
$\langle \rangle$	
Advanced Settings	Auto Sample Injector
Power on Wizard	Use Autosampler
Power on Self- test	Autosampler Ascent Percentage 0% >
Auto Sample Injector >	Steam Time for Automatic Sample Withdrawal 0Seconds >
Cleaning Settings >	
Printing Settings >	
Time Settings >	
Select Language >	
Test Settings	

4. Factory setting reset

Click on the factory setting reset button on the window, a prompt on resetting the factory setting will pop out in the right hand. When clicking on the OK in this prompt, the factory setting will be reset immediately and successfully, along with which all data will be cleared up. As shown in following Figure:



5. Time setup

When clicking on the time setup button in the window, a time setup display will pop out in the right hand, in which it is possible to automatically or manually select the time zone and time. As shown in following Figure:

Time Settings Auto Settings Time Zone	China Standard Time (Beijing) 👻 >
Time Settings Auto Settings Time Zone	China Standard Time (Beijing) 👻 >
Auto Settings Time Zone	China Standard Time (Beijing) 👻 >
Time Zone	China Standard Time (Beijing) 👻 >
Set time manually.	>
In 24-hour Time System	
an er noar nine oyotalli	

6. Language setup

When clicking on the language setup button in the window, a language setup display will pop out in the right hand, in which there are 6 kinds of language available. Then, select the target language. As the language setup is completed, all contents in this platform will be displayed in the selected language. As shown in following Figure:

	2018/12/13 16:18:34
$\langle \rangle$	
Advanced Settings	Select Language
Power on Wizard	English
Power on Self- test	русский
Auto Sample Injector >	Français
Cleaning Settings >	español
Printing Settings > Time Settings >	简体中文
Select Language >	中文繁体
Test Settings >	

7. Test setup

When clicking on the test setup button in the window, a test setup display will pop out in the right hand, which represents following contents as whether the function of deleting data after completing batch tests should be activated, or whether the function of displaying multiple selections of batch tests should be activated. As shown in following Figure:

	2018/12/13 16:21:04
\bigcirc	
Advanced Settings	Test Settings
	Delete data after batch testing
Auto Sample Injector >	Patah taat ahawa multi ahajaa
Cleaning Settings >	Batch test shows multi-choice
Printing Settings >	Automatic lock screen time
Time Settings >	0 min
Select Language >	
Test Settings >	· · · · · · · · · · · · · · · · · · ·
Safety Settings >	
Select Burette >	

8 Security setup

When clicking on the security setup button in the window, a security setup display will pop out in the right hand, which represents whether the setup of 8 types of test should be activated. As shown in following Figure:

		2018/12/13 16:21:17	
Advanced Settings		Safety Settings	
	_	Detection of Liquid Level in Bucket	
Auto Sample Injector	>	Level Detection of Receiving Liquid Bucket	
Cleaning Settings	>		
Printing Settings	>	Liquid Level Detection of Alkali Bucket	
Time Settings	>	Liquid Level Detection of Waste Liquid Bucket	
Select Language	>	Liquid Level Detection of Titration Acid Bucket	
Test Settings	>		
Safety Settings	>	Detection of Protection Valve in Position	
Select Burette	>		

9. Buret specification

When clicking on the buret specification button in the window, a buret specification display will pop out in the right hand, in which it is possible to select different specifications as 25mL, 10mL and 5mL. As shown in following Figure:

		2018/12/13 16:21:29
\bigcirc		
Advanced Settings		Select Burette
Cleaning Settings		25mL 🗸
Disting Octions		10mL
Printing Settings	>	5mL
Time Settings	>	
Select Language	>	
Test Settings	>	
Safety Settings	>	
Select Burette	>	
Factory Reset	>	

10. Cleaning setup

When clicking on the cleaning setup button in the window, a cleaning setup display will pop out in the right hand, in which it is possible to select the cleaning times and time of 6 types of cleaning. As shown in following Figure:

		2018/12/13 16:22:19	
$\langle \rangle$		Oleaning Cattings	
Advanced Settings		Cleaning Settings	
	_	Dispensing Time After Distillation	3Seconds
Power on Self- test		Waste Discharging Time of Processing Tube	15Seconds
Auto Sample Injecto	n. >	Cleaning Time of Processing Tube	5Seconds
Cleaning Settings	>	Waste Discharging Time of Receiving Cup	30Seconds
Printing Settings	>	c c c c	
Time Settings	>	Cleaning Time of Receiving Cup	5Seconds
Select Language	>	Cleaning Time of Alkali Pipeline	10Seconds
Test Settings	>	Cleaning Time of Receiving Pipeline	10Seconds
0-1-1-0-11			

11. Printing setup

When clicking on the printing setup button in the window, a printing setup display will pop out in the right hand, in which it is possible to set up title content, title in header and footer, as well as the printing mode. As shown in following Figure:

Advanced Settings	Printing Settings	
	Title	
ower on Self-	Header Title	
uto Sample Injector >	Footer Title	
leaning Settings >	Printing Mothod	Paeio Format
inting Settings >	Basic format only prints the te	sting result. Standard format prints
me Settings >	all	oung result standard format print
elect Language >		
est Settings >		

4.7.6 Cloud setup

The cloud setup is mainly used to set up cloud parameters, including whether the automatic synchronization function of test results should be activated, whether the automatic synchronization function of method database should be activated, or whether the message notification function should be activated. As shown in following Figure:

	2018/12/13 16:22:51	
$\langle \rangle$		
Cloud Settings	Parameter of Cloud Settings	
Cloud Settings >	Auto Sync of Testing Result	
	Auto Sync of Method Base	
	Push Messages	

4.7.7 System upgrading

System upgrading is mainly used to inspect the version information of systems in Hanon platform, to confirm whether the newest versions and version parameters are displayed; if not, a prompt on system upgrading, which can be realized manually, will pop out. As shown in following Figure:



4.7.8 Internet setup

The Internet setup including 3 items, including local computer name, WLAN and IP address setup.

1. Local computer name

When clicking on the local computer name button in the window, the name of this Hanon device will be displayed in the right hand. As shown in following Figure:

		2018/12/13 16:23:56	
\bigcirc			
Network Settings		Equipment Name	
	_	Equipment Name	Hanon-K1160 >
Equipment Name	>		
WLAN	>		
IP Address Settings	>		

2. WLAN

When clicking on WLAN button in the window, all wireless networks available will be displayed in the right hand, any of which can be connected and used by selecting one network and input corresponding password. As shown in following Figure:

	2018/12/13 16:24:09	
Network Settings Equipment Name	WLAN	
WLAN >		
IP Address Settings >		

3. IP address setup

When clicking on the IP address setup button in the window, the IP address information will be displayed in the right hand, in which it is possible to set up whether the IP address needs to be obtained automatically; if yes, the system can obtain the IP address automatically; if not, it is required to input and save relevant information. As shown in following Figure:

Network Settings	IP Address Settings	
Network Settings		
Equipment Name >	Obtain IP Address Automatically	
WLAN >	IP Address	0.0.0.0
IP Address Settings >	Subnet Mask	0.0.0.0
	Gateway	0.0.0.0
	DNS	0.0.0.0

4.7.9 Auditing and tracing

Auditing and tracing also refers to operation log. It displays the operation list of the Users in this platform, including operator, operation time and operating instructions. Moreover, it also can be used for operations as inquiry, exporting and printing. As shown in following Figure:

			2018/12/13 16:24:44		6
R)		Please enter key words of operator's Q	SELECT DATE	PRINT EXPORT
	/				
		No.	Operation Manual	Operator	Operation Time
		1	WLAN of WLAN is set to 【Close】	Admin	2018/12/13 16:24:06
		2	Printing Method of Printing Settings is set to 【Basic Format】	Admin	2018/12/13 16:22:28
		3	Printing Method of Printing Settings is set to 【Basic Format】	Admin	2018/12/13 16:22:16
		4	Delete data after batch testing of Test Settings is set to 【Open】	Admin	2018/12/13 16:19:41
		5	Delete data after batch testing of Test Settings is set to 【Close】	Admin	2018/12/13 16:19:40
		e.	Datah taat ahawa multi ahaina af Taat Cattinan in ant ta 🕇 (Anan T	A dania	0010/10/10 16-10-40
	Pagel	page ,	in total13page JUMP		NEXT PAGE

Search: it is used to filtrate corresponding operation information by

inputting the operator's User Name and clicking on the Search button; in addition, it also can be used to filtrate corresponding operation information by inputting the operation time.

Export: it is used to export operation log information into local PDF file for reviewing. If there is no external media connected, an error will be reported when clicking on this button.

Print: it is used to export all or partial operation logs while free from the restriction of printing mode; meanwhile, the tile as well as header and footer setup can be printed out accordingly. If the printer is not connected, an error will be reported when clicking on this button.

4.7.10 About device

The "About Device" part mainly displays some information of this device, including model, device No., software version, CPU version, titrator version and serial No., etc. Where, a neutral interface is required when logging with manufacturer's commissioning password, and the normal interface will be displayed when click on the neutral one again. As shown in following Figure:



4.8 Help

This part helps to manage and display operation manual of this platform. As shown in following Figure:

$\langle \rangle$	2018/12/17 09:03:57	6.
Help	Help	
Help >	Contents	
	L Safety	
	II. Summary	
	3. Operation procedures	

4.9 Exit

Click on the Exit button on the top right corner to exit the system safely.

VII. Usage and setting of K1124 Autosampler

K1160 automatic nitrogen analyzer is equipped with K1124 autosampler (hereinafter referred to as autosampler), which can realize one-button full autosampler, distillation, titration and sample-removal. Autosampler standard configuration has 24 digestion holes, a one-time titration of 24 samples and data automatic saving. And no independent power supply, directly connected to K1160 automatic nitrogen analyzer, and the whole system is more energy-saving. Thus, manpower is liberated and efficiency is promoted



1.The names of instrument components



1: PC plate 2: sample tray 3: PC cover 4: rotary bottom plate 5: desktop board 6: LOGO 7: drawer handle 8: instrument model 9: universal caster

2. Technical data

- a. The input voltage: DC $24 \pm 10\%$ V
- b. Rated power: 48 W
- c. Communication interface: CAN
- d. Rotary speed: ≥0.04r/s
- e. Speed of ejection of digestive tube jacking rod: ≥40mm/s
- f. Sample capacity: 24x300mL
- g. Automatic samplers and injector built-in solution tank volume: 4x15L
- h. Dimensions (length X width X height): 923mmx618mmx894mm
- i. The net weight: 100kg

3. Instructions for use

Make sure the reagents in the solution tank are completely added before use, and the sample digestive tube is placed correctly; the pipelines of receiving cup cleaning water, distilled water, boric acid, alkali and waste liquid are connected correctly; the water tank liquid level sensor, the boric acid barrel liquid level sensor, the alkali barrel liquid level sensor and the waste liquid level sensor are connected correctly.

Make sure that the power communication cable is connected correctly before use. First, you need to turn on usage switch of the autosampler on the K1160 automatic instrument operation interface, and then turn on the power switch of autosampler. The specific operation is as follows: Settings - Advanced Settings - Autosampler, turn on the autosampler, and its related functions and settings will be turned on accordingly. For details, see VI.4.7.5.3.

Simple functional tests can be carried out on the autosampler to ensure its normal operation. The specific operations are as follows: setup -commissioning -- commissioning of the autosampler. The autosampler can be ordered to rotate and selected the designated hole position to rise or fall, See VI.4.7.3.4 for details.

The built-in ARM processor defines a specific time window and mechanical motion range for each injection. If a specific step cannot be successfully completed in the injection process, the corresponding fault information will be generated and displayed on the display screen of K1160 automatic nitrogen analyzer, which is convenient for users to check and diagnose.

After titration, the autosampler removes the digestive tube that completed the analysis and feeds it to the next digestive tube. During the whole process of analysis, there was no transfer of digestive tubes and samples so as to ensure the accuracy of analysis.

4. The operation procedures:

Step 1: Remove the PC plate and PC cover, rotate the sample tray and put them into the sample digestive tube successively (up to 24 sample digestive tubes can be placed at a time). After the placement, put the PC plate and PC cover back into the base plate of the rotary plate.

Step 2: Set up the method library on K1160 analyzer, edit and add the corresponding digestive tube sample quality, number, titration acid concentration, blank volume, select the digestive tube sample number to be analyzed, and click to run, It will automatically complete the injection, distillation, titration, and sample removal. After the whole experiment is completed, the autosampler will automatically stop the experiment and the experimental data will be saved automatically.

Step 3: After the completion of the experiment and the cooling of the digestive tube, remove the PC cover and PC plate, put the digestive tube into the digestive pool for cleaning and preparing the next experiment, and turn off the power of the autosampler and K116 nitrogen analyzer for wiping, so as to keep the surface of the instrument clean.

VIII. Automatic test of sample

1. Reagent preparation

(1) Boric acid solution (20g/L): weigh and dissolve 20.00g boric acid in distilled water, with volume defined in a 1,000mL measuring flask; shake it till evenly

mixed. Add 100:1 mixture of methyl red and bromcresol green and make it uniformly mixed.

(2) Sodium hydroxide solution (400g/L): weigh and dissolve 400.00g sodium hydroxide in distilled water, with volume defined in a 1,000mL measuring flask; shake it till evenly mixed.

(3) Standard titration solution

a) Standard titration solution of sulfuric acid $[c(1/2H_2SO_4)=0.1000 \text{ mol/L}]$: take and dilute 2.73mL concentrated sulfuric acid (density: 1.8419g/mL) with distilled water, with volume defined in a 1,000mL measuring flask; shake it till evenly mixed, and calibrate.

b) Standard titration solution of hydrochloric acid: take and dilute 8.30mL concentrated hydrochloric acid (concentration: 36%-38%) with distilled water, with

volume defined in a 1,000mL measuring flask; shake it till evenly mixed, and calibrate.

(4) Standard solution of ammonium sulfate: take and dissolve 6.6065g dried ammonium sulfate (G/R) with distilled water, with volume defined in a 1,000mL measuring flask; shake it till evenly mixed.

(5) Mixing 1 part of methyl red was dissolved in 0.1% ethanol solution of 95% ethanol (1g / L) and 5 parts was dissolved in 0.1% bromocresol green ethanol solution of 95% ethanol (1g / L), please make it just before use.

Note: sulfuric acid (H_2SO_4), copper sulfate (CuSO₄), potassium sulfate (K_2SO_4) shall be prepared for the digested sample.

Tips: Weigh 0.5-1g sample; add in 8mL-10mL concentrated sulfuric acid; and add in copper sulfate: 3.2g potassium sulfate of 1:15 mixture. (Refer to national standard and relevant industry standards for specific dosage)

When using Kjeldahl Analyzer, it is suggested as follows in order to reduce the measurement error of the device to the greatest extent:

(1) The pH of 2% boric acid absorption solution shall be regulated to 4.5;

(2) The reaction between strong acid and strong base is vigorous, thus it's
suggested to dilute it by first adding 10-20 mL distilled water;

(3) The volume of 40% or approximate concentration of sodium hydroxide to be added is advantageously 4 times of that of concentrated sulfuric acid;

(4) Upon distillation, the total volume of liquid in the digestion tube is advantageously kept below 1/3 of the capacity of the digestion tube;

2. Reference value for test

The nitrogen content in the sample shall be considered in weighing sample. Where sample features high nitrogen content, fewer samples shall be taken provided the weighing error is reduced to the greatest extent. In case of low nitrogen content in sample, more samples shall be weighed. It can be generally advantageous that the weighed sample contains 15-50mg nitrogen.

Upon digestion of sample, add 10mL distilled water to dilute the digested sample. After it is fully cooled and leave it for measurement. Generally 0.1mol/L standard acid is taken as titration acid.

Table I Relationship between standard titration acid to be chosen and nitrogen content in sample to be measured

Molar concentration of standard titrable acid (mol/L)	Nitrogen content in tested sample (mg)	
0.02	0.1~10	
0.10	5~50	
0.20	30~150	
0.50	100~210	

3. Test parameter setup

(1) Install the device, and properly connect the pipeline.

(2) Turn on the condensate water; place an empty digestion tube, start the device to vaporize water for 5-10 min in order to clean the pipeline and stabilize the steam flow.

(3) Put the digestion tube containing digested sample in place and close the security

door. Set up corresponding parameters and functions to start the test. The device simultaneously starts the real-time test function. Add boric acid absorption solution, diluting water and concentrated alkali solution in the device. Ammonia gas emitted from distillation of steam is absorbed via condensate boric acid; and then standard acid is used for titration.

(4) After completion of the test, the result is displayed. Printing, automatic discharge and automatic cleaning are attainable. It returns to initial parameter input interface after completion of the test.

(5) The test result can be printed out and exported in XML or PDF format.

4. Device calibration

Ammonium sulfate (level: analytical pure and above) can be selected as the standard sample for device calibration, which can be in both of liquid and solid states.

Solid sample: weigh and put 0.1-0.2g ammonium sulfate into the digestion tube for direct measurement on the device.

Liquid sample: weigh 6.6065g ammonium sulfate and define its volume to 1,000mL with distilled water, producing a standard solution with 1.4mg/mL nitrogen content. Use a volumetric pipette to take a standard sample with nitrogen content close to that of the actually-measured sample.

IX. Search of test record

The memory space for this device is 8G, with which the User could review record of tests performed in the past. As a sample test is completed, sample No. will be added automatically. Test records can be reserved for long time, generally longer than 10 years, for the sake of User reviewing and printing.

X. Routine maintenance of device

1. The device socket shall be kept clean and dry and away from acid and alkali

solution to ensure insulation high input impedance performance.

2. The alkali solution tank, boric acid solution tank, distilled water tank, titration acid tank shall be cleaned on a regular basis.

3. In case any liquid remains in the waste receiver tank at the bottom of security door of the device, please immediately clear it way.

4. There will be scale deposit in the distillation bottle after the device is used for a long period, which will affect heating efficiency (it's suggested to clean for every 6 months). The cleaning frequency may be increased in case of frequent use. The scale deposit is removed by introducing a detergent or a certain concentration of weak acid solution in through distilled water pipeline and discharged via the distilled water drain valve. Then the pipeline will be properly connected following several flushing using the distilled water.

5. When the titration acid concentration is modified, the titration acid in the pipeline and the titrator is fully discharged by manual titration, and new acid is used to flush for at least 6 times and discharged immediately.

6. In order to prolong the service life of the glass components, please clean it at least once after completion of work every day, i.e., 100mL water is added and evaporated for 5 min.

7. There may be bubbles in the pipeline of the piston pump, please remove it before experiment.

8. It is advantageous to calibrate the titrator at least once a year.

9. Fix the pipeline connected to the discharge ports of the steam generator and the digestion tube to prevent splash of high temperature corrosive liquid.

10. The receiving cup and alkali pump shall be cleaned after completion of experiment.

11. When the device is heated with full power and sufficient condensate water, the liquid discharged shall not be less than 150mL for discharge time of 5 min.

12. Wear protective glasses and gloves upon maintenance on the device. $\ \ \textbf{XI}$.

Common fault anf Troubleshooting of device

K1160 Operation Instructions V3.1

Serial	Failure	Cause	Solution
<u>No.</u>	The device can not be powered on	 Shortage of power supply ; power line not properly connected; Fuse is broken. 	 Cheak the power supply; Properly connect the power line; Change the fuse.
2	There's no steam when distillation	 Steam generator water shortage; The heating controller fails; The conductor wire between the heating controller and the distillation bottle is not well connected; Heating tube fails; Pressure-head switch fails; Temperature protection switch fails; Steam valve fails. 	 Add water to bucket, then press "continue"; Change the heating controller; Check whether the conductor wire is loosened; Change heating tube; Change pressure- head switch; Change temperature protection switch; Change steam valve.
3	Alkali, boric acid and dilution water can not be added properly	 Insufficient solution in the solution tank, and the pipette is located above the level; The solution adding pipeline is not air-tight; The alkali adding pump can not work in order; can not be started; the pipeline is blocked; The pump can not work Solution tank is damaged. 	 Add solution in the solution tank; Check the connectors for the pipeline are sealed; Clean the solution pump; Change the pump; Change solenoid valve.
4	Titration can not be carried out	 Insufficient titration acid; Failure in titration system; Clogging of titration electromagnetic valve. 	 Add titration acid; Change the titration system; Change electromagnetic valve.
5	Unstable measurement data	 The receiving cup is not clean; The steam generator is not clean; The position of burette is not installed correctly. Too much liquid in the digestion tube; 	 Clean receiving cup; Clean steam generator Install burette correctly; Reduce liquid in the digestion tube; Add sufficient alkali; Calibrate the color

		 5. Insufficient alkali; 6. Titration color error. 	again.
6	Wrong measurement data	 Wrong input of titration acid concentration; Inaccurate device calibration. 	 Input hydrogen ion concentration as titration acid concentration; Recalibrate the device.
7	The test is paused	 The door is not closed well; Digestion tube is not put well; Insufficient condensate water; Insufficient liquid in steam generator; Overtemperature of steam generator; Overflow of receiving cup; Overtemperature of receiving liquid. 	 Close the door well; Fixed the digestion tube well; Check condensate water; Check steam generator; Cheek receiving cup; Check condensate water.

XII. Supplements

The device is warranted for a year from the date of purchase (subject to the date on the issued invoice) except for the following conditions:

- 1. The warranty period expires;
- 2. Damage caused by misuse;
- 3. Damage caused by disassembly unauthorized by the manufacturer;
- 4. Damage caused by improper transportation and custody.

XIII. Cautions

1. Make sure there's sufficient water in the distilled water tank before using the device to ensure normal operation of the device. The manufacturer will not be responsible for device failure caused by insufficient distilled water.

2. The interior storage of the device stores data based on sample No.. Notice

the

setting of sample No.; the storage is reusable, with a sample No. ranging from 1 to 1800. The user shall not be free to modify the sample No..

3. The preparation of alkali solution and acid solution requires careful operation to avoid being burnt by chemical reagent.

4. The device contains glassware, which requires careful handling during conveyance.

5. Upon repairing internal components of the device, make sure to turn off the device and plug off the power line and wait for the cooling down of the distillation system.

6. The outlet of the discharge pipe shall be located below the installation location of the device to ensure smooth discharge.

7. Upon the device is left unused for a long period, the alkali solution in the alkali solution tank shall be replaced with distilled water; the digestion tube is put in place; the alkali is added manually to remove the alkali solution in the pipeline and the pipeline is cleaned to prevent crystallization clogging.

8. A blank test shall be carried out before start-up to clean the pipeline of the device in order to ensure accurate test results.

9. The device has been subject to test before delivery, thus it's normal for presence of residual solution.

10. It is suggested that the maximum solution volume in the digestion tube shall not exceed 2/3 of the capacity of the digestion tube.

Note: before using the device, please turn on the condensate water and examine whether solutions in each solution tank (alkali solution tank, boric acid solution tank, distilled water tank and titration acid tank) meet the requirements of the test, or otherwise, add immediately.

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