lbx instruments

KJD10 Kjeldahl Digestion System

Please read the User Manual carefully before use and follow all operating and safety instructions!

user manual

english

User Manual

EN

KJD10 Kjeldahl Digestion System

Important notice

This instrument is designed for laboratory usage only. Please read this manual carefully before installing or operating this equipment. The instrument shall not be modified in any way. Any modification will void the warranty and may result in potential hazard. We are not responsible for any injury or damage caused by any non-intended purposes and modifying the instrument without authorization.

Service

In order to guarantee this equipment Works safely and efficiently, it must have a regular maintenance. In case of any faults, do not try to repair it yourself. If help is needed, you can always contact your dealer or Labbox via **www.labbox.com**

Please provide the customer care representative with the following information:
- Serial number
- Description of problem
- Your contact information

Warranty

This instrument is warranted to be free from defects in materials and workmanship under normal use and service, for a period of 12 months from the date of invoice. The warranty is extended only to the original purchaser. It shall not apply to any product or parts which have been damaged on account of improper installation, improper connections, misuse, accident or abnormal conditions of operation.
For claim under the warranty please contact your supplier.

 Warning: The instrument cannot provide the designed protection for operators who do not follow the right procedures and requirements given by the manufacturer.

 Warning: All solutions must be handled with care according to the lab's safety regulation. Please make a reference to the related material safety data sheet. Wear the lab-gown, goggle and rubber gloves all the time. Be care of hot reagents.

 Warning: Be aware of the risk of electric shock. Only trained professionals are permitted to open the face panel or back cover.

 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!）

Notice:

1. Do not heat the dry digestion tube.
2. If the sample is less than 20, use 100ml blank tubes for the empty positions.

1. Summary

Kjeldahl Digestor, adopted with globally advanced high temperature infra-red duct radiant heating technology and MPU control platform, is characterized by its accurate temperature control and fast temperature rise. The temperature rise, divided into linear temperature rise mode and curved temperature rise mode, allows storage of 500 digestion programs. Each digestion program has 25 temperature spots at most for control of temperature curve and even more provides PID (Proportion-Integration-Differentiation) control for more stable and accurate temperature control. The KJDF1 Exhaust and Fume Elimination System enables absorption of noxious gas, including acid and alkaline smog and the like. The product provides attractive appearance and large screen liquid crystal display. The automated design, allows safer, easier, faster and more reliable, convenient operation, making the digester ideal device for high temperature digestion.

Definition of digestion: Digestion, which is also called "wet digestion" is the decomposition of the organic matter or reducing substances in the sample by the addition of acid or alkaline liquid reagents with heating.

Principles: Put the sample and liquid reagent in the digestion tubes, and the infrared heating pipes send the heat in the form of electromagnetic wave to the graphite block, which further passes on the heat to the digestion tubes. The molecules of the sample and liquid reagent absorb the heat and move faster with increased internal energy, thus generating more heat as the molecules collide with each other. The additional heat coupled with the reagent can accelerate the digestion process and make a more effective and complete digestion.

1.1 Features:

- The heating efficiency is greatly improved by the infrared radiation and graphite block, which guarantees uniform temperature.
- Mass storage: 500 digestion programs, each of them has 25 temperature spots at most.
- Two modes of heating: straight line and curve; twenty heating programs in total; 1-99 intervals are selective in each program.
- The uniform temperature across the block can guarantee a consistent result.
- High accurate temperature sensor monitors and records the heating temperature.
- The PID temperature controlling platform improves the accuracy and stability of the temperature.
- Large LCD screen.
- The acidic or alkaline gases generated in the experiment can be eliminated by the environmental-friendly KJDF1 Exhaust and Fume Elimination System, which can be connected to the Kjeldahl Digestor.
- Offers multiple protections against overvoltage, over current and overheat; the overheating alarm system is incorporated.
- Outstanding anti-corrosion performance.
- Cooling frame with standard configuration.

1.2 Operating procedures:

- Power on the instrument.
- Put the digestion tubes loaded with sample in the rack, and install the rack on the Graphite Digester, which connects the Exhaust System. Connect and start the Exhaust System to the Kjeldahl Digestor and open the condensate water switch. Check the connection and condensate water.
- Set up the instrument by choosing the heating type and the corresponding parameters.
- Put the tube rack down after the input is confirmed. Each tube shall be inserted in the corresponding heating well in the graphite block.
- The heating will automatically stop when the preset time is reached. At the end of the digestion, carefully raise the rack to allow the tubes to cool.
- When the temperature of the tubes has fallen to room temperature, open the Exhaust and Fume Elimination System and remove the tube rack.
- Check the data automatically saved in the digestion system.

2. Main Performance

2.1 Technical Specifications

- Temperature range: room temperature + 5 ℃ to 450 ℃
- Controllable temperature accuracy: ±1℃
- Heating method: infrared radiation heating and graphite conduction
- Insulation material: environmental protection fiber and unique duct insulation technology
- Digestive tube: 300 ml
- Digestion capacity: 20 samples per time
- Power supply: 220 VAC ±10% 50Hz
- Power: 3.6 KW
- Dimension: 515 mm x 458 mm x 730 mm
- Weight: 40 kg

2.2 Use conditions

- Input voltage: 220V 50Hz
- The device shall be installed at places adjacent to water source and drain tank and provided with power sockets.
- Power supply should meet the requirements of the device to avoid electric over stress; an independent switch, safety device and reliable grounding are required.
- The device should be placed away from big electric equipment to avoid strong magnetic field.
- Make sure the laboratory is sufficiently ventilated.

3. Structure

Fig. 2

1. Battery main switch 2. Shell 3. Stainless steel decorative sheet 4. Digestion duct 5. Gas collection hood 6. Cooling frame 7. Waste discharge outlet 8. Test tube rack 9. Graphite heating block 10. Operation panel

3.2 Gas collection hood

3.2.1 Operation procedure

Fix the Gas collection hood prior to digestion: Place the test-tube rack in a proper position, match the digestion duct and the seal cover with one-to-one correspondence, and put the Gas collection hood on the support (see Fig. 3).

After completion of the digestion, hold the grip on both ends of the test tube with hands, and take it out along with the Gas collection hood, then hang them on the cooling frame by the fixing leg on both ends of the test tube (see Fig. 4). Hold the grip on both ends of the Gas collection hood after complete cooling and hang the cover on the clamping position of the cooling frame. At the same time, insert the dip tray in case digestion fluid drops down.

Fig. 3

Fig. 4

Fig. 5

Dip tray mated for Gas collection hood. The mated dip tray is shown in Fig. 5.

3.3 Corollary Equipment

There are two solutions for waste gas absorption:

3.3.1 KJDF1 Exhaust and Fume Elimination System (must be purchased separately) is selective to the Kjeldahl Digestor

Being environmental-friendly, the Exhaust and Fume Elimination System is used to condensate and neutralize the acidic or alkali waste gas generated in the experiment. Kjeldahl Digestor can reach the best effect with the KJDF1 Scrubber.

Fig. 6

3.3.2 Direct connection with running water jet vacuum pump

In addition to connection with the Exhaust and Fume Elimination System, the Kjeldahl Digestor can also be connected to water jet vacuum pump for waste gas disposal. (The waste discharge outlet is required to be inserted into the PTFE adapter in advance) (see Fig. 7).

Fig. 7

4. Installation

4.1 Installation

4.1.1 Check before Installation

Open the package and check the device and its parts according to the packing list. If there is any damage, please keep the damaged parts and contact us immediately.

4.1.2 Installation steps

1. The device shall be installed at places adjacent to water source and drain tank and provided with power sockets and grounded line.
2. Connect one side of rubber pipe with the waste air discharge opening, the other side with water jet vacuum (in case you do not use the KJDF1 Exhaust and Fume Elimination System).

4.2 Operation

4.2.1 Introduction of the operation panel

a. Picture of the operation panel

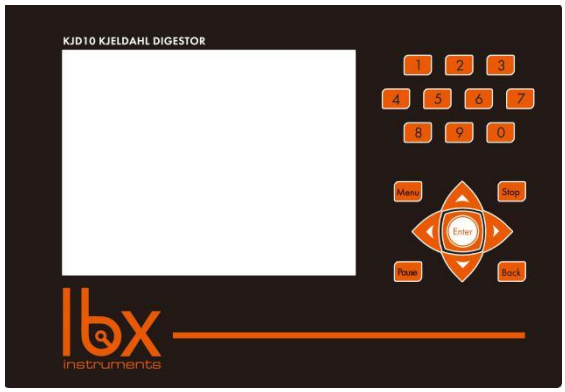


Fig. 8 Operation panel

Features: Membrane keypads, 5.6 inches True-Color screen

b. Function of the Keys:

【 Stop 】 : If an emergent stop is needed due to operation error or system failure, press this key to end heating, and then the system returns to the former interface.

【Enter】: Confirm the task or operation.

【Back】: Return to the former interface.

【Menu】: Return to the main interface on any condition (except interface of heating).

【←】: Cursor moves leftwards.

【→】: Cursor moves rightwards.

【↑】: Cursor moves upwards.

【↓】: Cursor moves downwards.

【0-9】: These keys are used for setting in parameters.

【Pause】: Stop the heating process temporarily. Press again to restart.

The additional Function icon indication:

Indication of heating state: enlarging (heating on), normal (heating off).

Indication of the heating duct state.

Indication of timing state: enlarging (timing on), normal (timing off).

Indication of reaching the set temperature: enlarging (already reached), normal (not reached yet).

Indication of the overheating state: enlarging (overheating by 10 degrees), normal (no overheating).

Indication of the heating suspension state: enlarging (heating suspended), normal (heating continued).

4.2.2 Sample Digestion Process

1 Put the sample, chemical catalyst and liquid reagent into the tube; put the tube into the digestion rack.

2. Put the digestion rack on the device; put the Scrubber in the right place and open condensate water valve.

3. Time, heating mode and PID parameters can be set up firstly. If there is no need, choose one of the saved heating programs.

4. Linear heating for common samples and curve heating for bubbling samples.

5. Digestion process will be done automatically according to the selective mode. After digestion, the heating process will follow to stop.

6. After the sample cools down to room temperature, turn off the condensate water valve, disconnect the Scrubber upper cover and remove the digestion tube rack.

Note: Clean the digestion liquid reagent left on the tap of the tube; get everything ready for the next test.

4.2.3 Detailed Explanation of each interface

4.2.3.1. After starting the equipment, the waiting interface will be shown. See Fig.9.

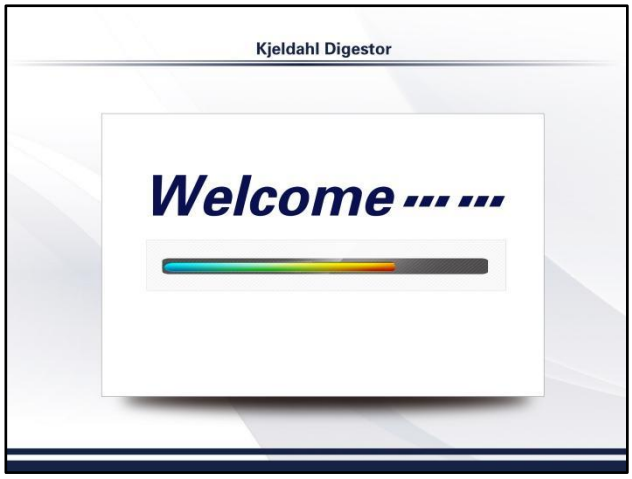


Fig.9

4.2.3.2 After 5 seconds, the main interface is shown, including linear heating and curve heating as show in Fig. 10.

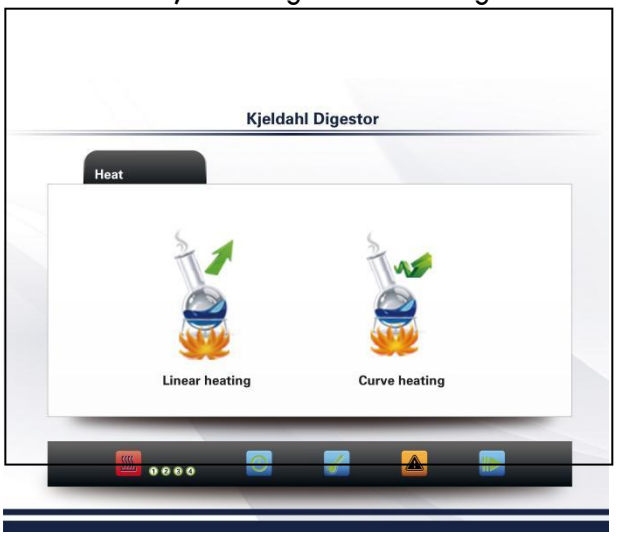


Fig. 10

1) Linear heating:

Press 【Enter】to enter the setup interface, setting temperature and time and press 【Enter】start heating and timing.

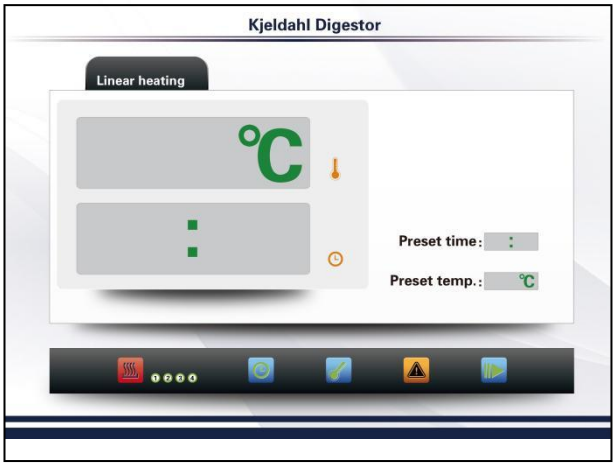


Fig. 11

2) Curve heating:

Select curve heating (shown in the figure 12), press 【Enter】and enter curve heating interface.

The system has automatic memory of the last setting. Press【Enter】for heating according to the curve set last time.

Fig. 12

The interface comes as follows on completion of heating:

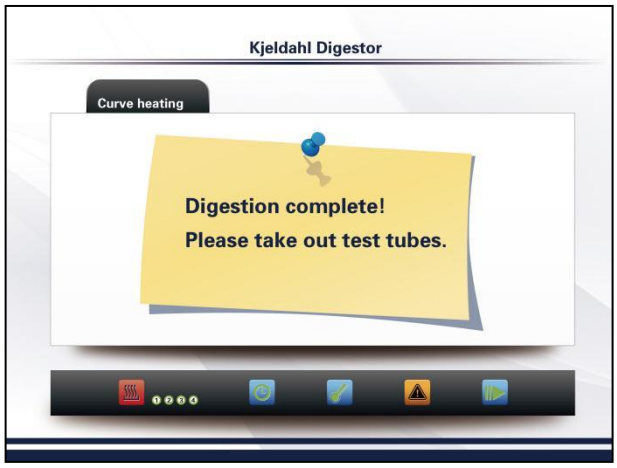


Fig. 13

Heating is forced to stop: press 【 Stop 】when heating is on, and the interface will show:

Fig. 14

4.2.3.3 Press【Menu】on the main interface for setting module, including system parameter setting and heating curve setting.

Fig. 15

Press 【←】【→】key for selection of system parameter setting or curve setting, and press 【Enter】for setting interface.

1) Setting for heating curve:

Fig. 16

2) Setting for system parameters:

Fig. 17

Function introduction

Actual temperature: input the measured standard temperature (temperature stable). Sensor temperature: temperature measured by the sensor.

Timing mode: count up timing and count down timing.

Timing point: start of heating and reaching set temperature.

Restore factory setting: restore parameter setting for delivery, wipe customer storage schemes.

4.2.3.4 Press 【Enter】 on the main interface for help module:

Fig. 18

5. Maintenance and Repair

5.1. Maintenance:

5.1.1. Check the power cord and power supply regularly. Replace the damaged and aging components timely.

5.1.2 Check the air pipelines, valves and connectors regularly. If air leakage or loose connection occur, or any damaged or aging components are found, replace them timely.

5.1.3 Clean the Scrubber upper cover regularly (once a week will be the best). The specific cleaning steps:

5.1.3.1 Feed about 100ml distilled water into the digestion tube.

5.1.3.2 Put the digestion tube on the rack. Set up the exhaust receiver. Open the condensed water.

5.1.3.3 Choose the linear heating mode. Set the temperature between 120℃-150℃.

(The temperature may vary with the altitude and atmospheric pressure. It should make sure that the water does not boil intensely.)

5.1.3.4 It should distill about 30 minutes. This process may repeat several times according to the degree of contamination.

5.2. Common Faults Treatment

Number	Source of trouble	Causes	Solutions
1	No power	a. The fuse is burnt b. Power line not properly connected	a. Replace the fuses b. Properly connect the power line
2	Slow heating	a. The infrared radiation heating pipe is damaged b. Low or instable voltage	a. Replace the infrared radiation heating pipe b. Use stable AC220V voltage
3	Gas leakage	a. The digestion duct orifice is not sealed tight by the annular cover at the bottom of the Gas collection hood. b. Suction of the water jet vacuum pump reduces	a. Adjust the annular cover and seal the digestion duct orifice b. Increase flow of the running water
4	The LCD screen does not work	a. The screen is damaged b.The fuse is burnt	Replace the fuses
5	Unrecognizable code on the screen	The sensor is interfered or damaged	Professionals to solve

6. Appendix

6.1. Common Acidic and Alkaline Liquid Reagents

Acidic liquid system: Nitric-Sulphuric acid, Nitric-Perchloric acid, Hydrofluoric acid and Peroxide, etc. These chemicals can completely destroy the organics and reducing substances, such as cyanide, nitrite, sulphide, sulphite, thiosulfate and the thermally labile thiocyanate.

Alkaline liquid system: caustic soda, etc.

6.2. Problems to be noted in the digestion

6.2.1 The component of sample under test should not suffer losses.

6.2.2 Introducing interfering substances is not allowed.

6.2.3 The process must be safe and fast.

6.2.4 The liquid made from the digestion must suit the selected monitoring method.

7. Experiment Example

Oxidizing acids and mixed acids are often used in wet digestion, such as concentrated sulfuric acid, nitric-sulphuric acid, nitric-perchloric acid and hydrofluoric acid, etc.

The following example shows how to determine the protein in food with sulphuric acid.

7.1 Measure 0.2-2.00 g pre-processed solid sample and put the sample in a tube; add 0.2g $CuSO_4$, 3g K_2SO_4 and 20 ml concentrated H_2SO_4.

7.2 Put the digestion rack in the device, cover the exhaust hood and set in the parameters.

7.3 Connect the scrubber to the device and start the scrubber or water jet vacuum.

7.4 After finishing the above-mentioned steps, choose linear heating or curve heating.

The linear heating mode is often used for common samples. Put in the preset temperature at 380 ℃and digest for 2h.

For sparging samples the curve heating mode is often used. In this case, the following parameters can be a reference.

1) 160℃~200℃ heating temperature between this interval 20min.
2) 260℃~300℃ heating temperature between this interval 25min.
3) 380℃~390℃heating temperature between this interval 90min.

Note that different samples will require different parameters.

7.5 Raise the digestion rack to the digestion rack and allow the samples to cool without disconnecting the Exhaust and Fume Elimination System.

7.6 When the samples have cooled down, take off the extraction hood, remove the digestion rack and move the samples to the next experiment.

8. Announcement and Safety

8.1. Announcement

The one-year warranty for the whole device is valid from the purchase date, but not in the following cases:

1. Any damage if the warranty expires.
2. Any damage caused by inappropriate operation.
3. Any damage caused by the unauthorized disassembly.
4. Any damage caused by the improper transportation or storage.

8.2. Safety Tips

This section is about the safe use of the device. The following instructions must be read carefully by all persons who have or will have the responsibility for using or serving the device. Any consequence caused by misuse of the device should be taken by the user.

8.2.1 Requirements for the Operator

The shell of the device will be hot during the process and the strong acids and highly-corrosive liquid are dangerous, so the device should only be operated by the laboratory professionals and experienced staff with training. The operator must follow all instructions.

8.2.2 Cautions during the Operation

1. During digestion, the temperature of the digestion tubes is very high, so be careful not to burn the hand or any parts of the body.
2. Be cautious with flammable reagents in the tubes.
3. Protective clothing and eye protection must be worn.
4. If there is any problem during the operation, the electricity must be cut off immediately. No further operation.

8.2.3 For the device safety

1. Keep the electric parts of the device (such as electricity socket and main switch) dry.
2. Don't remove the insulation cover on the surface of the device.
3. Don't use damaged or broken digestion tubes.

Nota importante para los aparatos electrónicos vendidos en España

Instrucciones sobre la protección del medio ambiente y la eliminación de aparatos electrónicos:

Los aparatos eléctricos y electrónicos marcados con este símbolo no pueden ser eliminados en forma de residuos urbanos.

De conformidad con la Directiva 2012/19/UE, los usuarios de la Unión Europea de aparatos eléctricos y electrónicos, tienen la posibilidad de devolver sus RAEE para su eliminación al distribuidor o fabricante del equipo después de la compra de uno nuevo. La eliminación ilegal de aparatos eléctricos y electrónicos es castigada con multa administrativa.

Remarque importante pour les appareils électroniques vendus en France

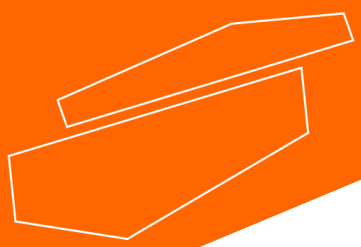
Informations sur la protection du milieu environnemental et élimination des déchets électroniques :

Les appareils électriques et électroniques portant ce symbole ne peuvent pas être jetés dans les décharges.
En réponse à la règlementation, Labbox remplit ses obligations relatives à la fin de vie des équipements électriques de laboratoire qu'il met sur le marché en finançant la filière de recyclage de ecosystem dédiée aux DEEE Pro qui les reprend gratuitement (plus d'informations sur www.ecosystem.eco).
L'élimination illégale d'appareils électriques et électroniques est punie d'amende administrative.

Nota importante per le apparecchiature elettroniche vendute in Italia

Istruzioni sulla protezione ambientale e sullo smaltimento dei dispositivi elettronici:

Le apparecchiature elettriche ed elettroniche contrassegnate con questo simbolo non possono essere smaltite come rifiuti urbani.
In conformità con la Direttiva 2012/19 / UE, gli utenti dell'Unione Europea di apparecchiature elettriche ed elettroniche hanno la possibilità di restituire i propri RAEE per lo smaltimento al distributore o al produttore di apparecchiature dopo averne acquistato uno nuovo. La rimozione illegale di apparecchiature elettriche ed elettroniche è punibile con una sanzione amministrativa.



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