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1. Safety Measures

- Kindly pay attention to the relevant safety instructions on this page and this manual.
- These provisions can ensure that the user is not injured, and the instrument is not damaged.
- Operate and use it according to the installation and instructions in this manual.
- This instrument can only be used for design and cannot be used for other purposes.

Warning:

- Use and maintain the instrument strictly following the requirement of the "User's Manual". If the user does not operate by the operating procedures specified in the user manual, all the consequences caused shall be borne by the user.
- Note the following during the operation:
  1) Professional operation knowledge training should be carried out before use.
  2) Do not disassemble the instrument by yourself, and do not reprint the document and software.
  3) The laboratory should have the conditions to install this instrument.
  4) Do not place the instrument in a fume hood.
  5) Do not soak the outer digestion tank with acid.
  6) Do not bake sample digestion vessels.
  7) Do not use $HCI0_4$ with caution when handling organic samples.
  8) When the number of digested samples is small, the inner ring of the rotor should be filled with the digestion tank first, and then the outer ring should be placed.
  9) Note that the weight of the processed sample should be started with a small amount.
  10) When digestion starts, the operator should not face the furnace door of the digestion apparatus.
  11) The instrument should be operated by professionally trained personnel.

Note:

- No empty cans shall be put into the digester.

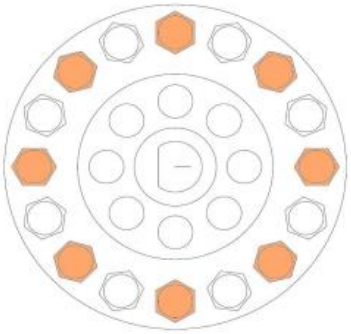

Figure-1

- The minimum number of digestion tanks shall be placed at half the number of holes in the rotary table. The minimum number of digestion tanks shall be placed at intervals while the minimum number of digestion tanks shall be placed at half the number of holes in the rotary table. When more than the minimum number of digestion tanks shall be placed at half the number of the holes in the rotary table, the minimum number of digestion tanks shall be kept symmetrical on this basis, the placement is shown in Figure 1.
- Before the experiment, the digestion tank must be dry. The digestion tank cover must be confirmed before digestion tightening (it must be used with a wrench).

If the sample is not listed in the digestion method library, select the appropriate sample size and volume of digestion liquid based on established guidelines, and set up the digestion method accordingly. After each experiment, clean the furnace chamber with a dry cloth to extend its service life.

- If you do not comply with the notice, you will be responsible for any problem.

Notice:

The hexagonal shape at the bottom between the inner tank and the outer tank should be aligned to the bottom (if the inner tank is not at the bottom, do an experiment and the inner tank will be scrapped).

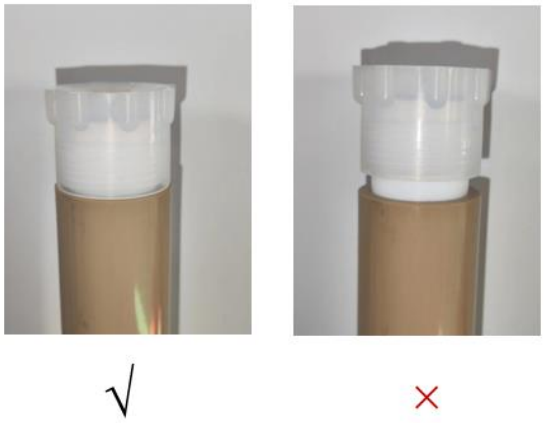

Figure-2

2. Introduction

Microwave Digestion System FM-MDS-A102 has a spacious 58 L chamber for efficient sample processing. It uses non-contact infrared temperature sensors and forced air cooling. The system ensures even microwave distribution with 360° continuous rotation. A self-locking buffer explosion-proof furnace door enhances safety. This design secures against potential abnormal reactions during operation.

3. Features

- ✓ Microwave digestion under high-pressure conditions
- ✓ LED touch screen for real-time display
- ✓ Exhaust and cooling system
- ✓ Inner vessel made of TFM material
- ✓ Fault self-test system and alarms
- ✓ Easy to use

4. Specifications

Model No.	FM-MDS-A102
Capacity	58 L
Signal Frequency	2450 MHz
Highest Temperature	350℃
Display	8 TFT-LCD Touchscreen
Cooling System	Forced Air Cooling
Temperature Precision	± 0.5℃
Maximum Pressure	10 Mpa
Pressure Precision	± 0.01 Mpa
Power Output	0 To 2000W
Vessel Holding Capacity	12 Vessels
Vessel Volume	100 ml
Vessel Material	Vessel made of TFM Outer vessel is explosion-proof with PPEK aerospace composite material
Power Consumption	2600 W
Power Supply	AC 220 ± 10 % , 50/60 Hz
Standard Accessories Packing Dimension (Box 1) (W× D × H)	820 × 300 × 130 mm
Main Host Packing Dimension (Box 2) (W× D × H)	590 × 620 × 830 mm
Gross Weight (Standard Accessories)	27 Kg
Gross Weight (Main Host)	75 Kg

5. Applications

Microwave Digestion System is used in food testing, environmental analysis, pharmaceutical research, metallurgy, chemical processing, geological studies, forensic investigations, material science, and manufacturing quality control.

6. Installation

Open-box inspection

1) First, open the box and take out the disintegrator and acid catcher.
2) Turn on the power and switch on.
3) Enter the welcome screen, click on the **touch screen**, enter the password screen, click on the **password box** to enter the password, and press the **blue enter** key to confirm and enter the running screen (the touch screen is a resistor screen, kindly note when touching).
4) Press the right side of the oven door with your right hand and click the **door** button on the touch screen with your left hand to open the oven door. Remove the digestion tank and other accessories from the oven cavity.
5) After placing the turntable, press and hold the rotary button on the touch screen to see if the turntable rotates properly.

7. Operations

7.1 Operation sequential steps

7.1.1 Sample Stage

1) For example, 0.2 g of 70 ml of the sample can be digested, and 0.5 g of the sample can be digested by 100 ml of the sample can be digested by 8 ml of acid, an instrument with a method library.
2) Open the outer cover of the digestion tank, remove the inner cover, and add the sample and acid liquid. The sample should be hung on the wall of the digestion tank as far as possible, and the acid liquid should not splash into the gap between the outer cover thread and the inner and outer tank. The digestion tank must be dried before the experiment.
3) After the sample is added, the inner cover of the digestion tank is closed, and the outer cover is tightened (it must be tightened with an attached wrench).

7.1.2 Lofting Stage

1) Place the digester on a turntable. Note the symmetry.
2) The digestion tank should be placed symmetrically and evenly. If the digestion tank is placed randomly, the infrared sensor cannot measure the temperature effectively.
3) The minimum number of digesters with 20 holes in the rotary table is 10, and the minimum number of digesters with 16 holes in the rotary table is 8, the minimum number of digesters with 10 holes in the rotary table is 6, and the minimum number of digesters with 8 holes in the rotary table.
4) The empty digesters cannot be put into the furnace chamber, if the sample is not enough, do several parallel samples.
5) After all the digestion tanks are put into the furnace chamber, press the touch screen button to rotate the rotary table to observe whether the digestion tanks are placed symmetrically, whether the digestion tanks are placed firmly, and whether there are wrong digestion tanks.

7.1.3 Experimental phase

1) Close the door of the digester start setting the method and enter the number of digesters.
2) For example, the digestion of soil samples can be set to 120 degrees for two minutes, 150 degrees for five minutes, and 185 degrees for 25 minutes.
3) Digestion method according to the specific sample reference to the national standard and the instrument with the method library and consult the professionals to determine, if not consult the professional personnel to set up their digestion method, the problem responsibility for their own.
4) Click on the touch screen to start the running button, run the digestion method, and enter the running interface.

5) Due to infrared sensor characteristics. The real-time temperature will not be displayed until the temperature rises above 50 °C. Wait for some time, depending on the number of tanks and sample size.

7.1.4 Cooling phase

After the digestion process, enter the exhaust air cooling process. For safety reasons, the furnace door cannot be opened until the digestion tank is cooled to 50 °C. Kindly, wait patiently. When the digester is cooled to 50 degrees Celsius, the cooling fan will continue to work for 10 minutes to vent any acid gas and continue to cool to near room temperature, at which point the door of the instrument can be opened.

7.1.5 Acid phase

1) Remove the digester from the furnace cavity and place it in the fume hood. Put on protective gloves and turn the digester into the fume hood. Slowly unscrew it with a wrench.
2) After opening the digestion tank, take out the outer cover and the inner cover in turn, remove the inner tank, put it into the graphite acid catcher in the fume hood, and begin to remove the acid.
3) Set the highest temperature of the graphite acid catcher, generally 120-170 degrees Celsius, and begin to catch acid, catch acid time of half an hour to an hour or so.
4) When the contents of the digestion tank are close to the consistency of milk, it is considered that the acid removal is complete.

7.1.6 Constant volume stage

1) Rinse the inner wall of the digestion tank with pure water and transfer the contents to the volumetric flask.
2) Rinse the inner cover of the digestion tank with pure water and transfer the rinsed liquid to the volumetric flask.
3) The above operation can be completed after several times of constant volumes.

7.2 Instrument Operation

7.2.1 Sample

1) Take an appropriate amount of samples (inorganic samples no more than 1.0 g, organic samples no more than 0.5 g) into the inner tank TFM, add the digestion liquid according to the amount needed, and cover the inner tank lid.
2) Cover the outer jar lid, tighten it by hand and place the inner jar into the outer jar.
3) Place the sample pot symmetrically on the rotor.
4) Close the oven door.

7.2.2 Set control

Turn on the power and now the system interface is as follows:

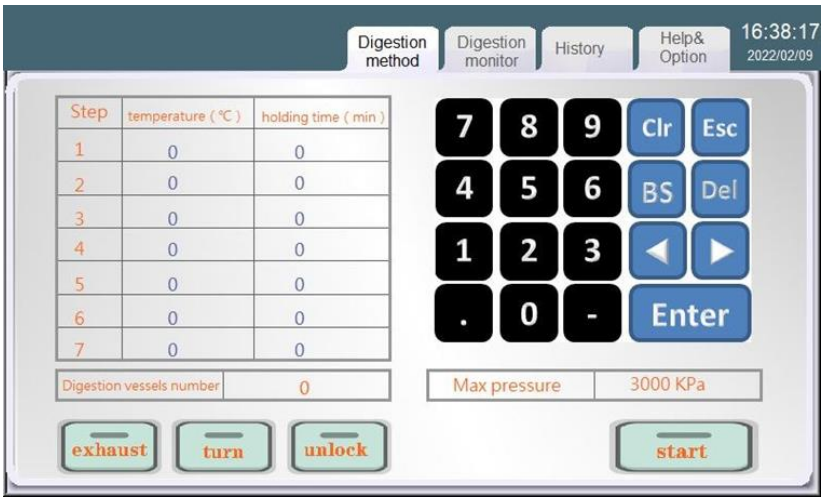

Figure-3

1) Click on the **blank space** below the temperature behind "No.1", as shown in the figure.
2) Enter "working temperature" → "holding time" → "number of digestion tanks" in turn After entering the temperature, press the **Enter** key to confirm the input result.
3) The maximum number of digestion tanks is 20.
4) The lower limit of the number of digestion tanks is 10 and the upper limit of temperature is 240℃.
5) The upper limit of pressure is 3000Kpa. After the parameters are set.

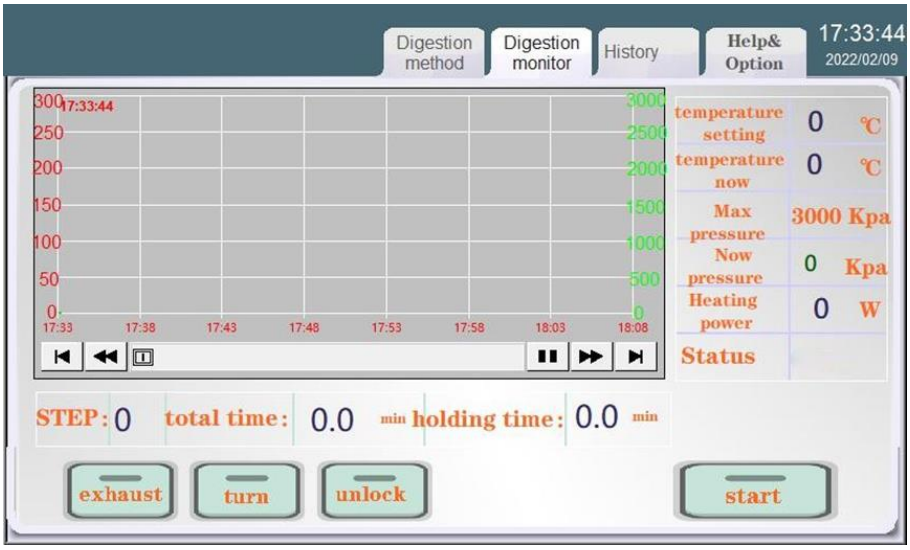

Figure-4

6) Click the **"History"** button to enter the history.
7) The history record will store the temperature and pressure curves of the experiments performed that day in units of days.

7.2.3 Running

1) Connect the power supply on the microwave digestion instrument chassis to the **ON** state.
2) Confirm that the furnace door is closed.
3) Click the **Start Run** button on the screen.

7.2.4 Cooling

1) After the heating program is completed, it will automatically stop and enter the automatic cooling state. When the temperature is continuously lower than 50°C and the pressure is lower than 500KPa, the door can be opened, and the digestion tank can be taken out after the door is opened. Place the digestion vessel in a sink to cool to room temperature.
2) The digestion vessel was opened and cooled to room temperature. The digestion experiment is completed.

Note: Do not pour cold water on the locking lid of the inner tank from top to bottom, so as not to break it due to the heat and cold.

8. Maintenance

8.1 Cleaning of inner and outer tanks

1) Observe before and after use, if there are cracks or other defects, it must be replaced in time.
2) Frequent cleaning- The inner tank of TFM can be soaked in 5% dilute nitric acid to reduce residual adsorption.
3) If the tanks can be used separately according to the types of commonly used acids, some cross-contamination can be reduced.
4) When the sample processing is incomplete, some oil or debris will remain in the inner tank. The dirt on the inner wall can be removed with absorbent cotton lint paper.
5) The inner tank material does not dissolve in any organic solvent, so any organic solvent can be effectively cleaned. Liquid cleaners and a soft cleaning brush can also be used.

8.2 Nitric acid treatment process

The method of cleaning with nitric acid or a 1:1 mixture of nitric acid and hydrochloric acid, sealed and heated, is described as follows:

1) Add 10mL of acid or acid mixture to the inner tank, put it into the outer tank, and tighten the pressure cap.
2) No less than 8 cans should be cleaned each time.
3) Put the microwave-sealed jar on the turntable, put it into the oven cavity, set the temperature to 150℃, and keep it for 10 minutes.
4) Take out the microwave-sealed jar and cool to room temperature. Open the locking lid and pour out the acid in the inner tank.
5) Rinse each inner can and gland with distilled water and air dry in a clean place.
6) Frequent immersion in 5% dilute nitric acid can reduce the residual effect.

Note: The above operations must be carried out in a fume hood.

a. The operator must wear safety gloves.
b. Do not point the mouth of the can at yourself or others.

8.3 Clean Up after use

1) After the digestion tank is used up, clean it with pure water. The inner tank and the inner cover need to be soaked in an acid tank for one hour for cleaning. The acid tank uses 5% to 10% dilute nitric acid.
2) Clean the furnace chamber with a dry cloth to extend service life.

9. Accessories

S. No	Accessory Name
1	Turntable Bracket
2	12 PEEK Explosion-Proof Outer Vessels
3	12 TFM Inner Vessels
4	Infrared Temperature Sensor
5	Graphite Acid Evaporator