Packing list

Instrument Name: Closed Intelligent Microwave Digestion System

Instrument Model: MWD-800

No.	Name	Picture	Quantity
1	Main Body		1
2	Operation Manual		1
3	Touch-screen Controller		1
4	Controller Serial Cord		1
5	Controller Protective Box		1
6	Digestion Vessel		40
7	Elastomer		40
8	Sample Rotor		1
9	Auxiliary Platform		1
10	Exhaust Pipe		1
11	Inner Vessel Holder		2
12	Repair Tool		1
13	Unload Tool		1
14	Pressure Calibration Ring (PCR)		2
15	Digestion Vessel Holder		1

Inspector: **Inspection Date:**

Closed Intelligent Microwave Digestion System

MWD-800

Operation Manual

Important Statement

Please read the operation manual carefully before using the instrument, and make sure to fully understand all safety instructions for safe operation, high efficiency of the instrument.

During operation, please strictly follow the requirements in the operation manual and pay special attention to the contents begin with the mark ‘NOTE’, ‘CAUTION’, ‘WARNING’ and important warning content. This will help you to ensure that the instrument in a smooth and safe run status to avoid unnecessary loss and damage. Our company will not be responsible for any accidents caused by artificial damage.

Please put the operation manual in a convenient place for future reference. The content of the manual has the possibility to change and modify without prior notice.

Content

Important Notes 

1. DO NOT install the instrument in the fume hood to avoid any damage or problem caused by acid, alkali or corrosive gas etc.
2. Make sure there is enough space for instrument ventilation and user operation.
3. DO NOT do empty run. There must be one or more digestion vessels filled with sample solution or acid on the rotor.
4. Make sure all parts of the digestion vessel, inner vessel, outer vessel, sample rotor, auxiliary platform and inner surface of furnace chamber should be clean and dry.
5. Keep the signal monitoring surface flat and smooth without any marking and scratch on the surface.
6. Wear acid proof and heat insulation gloves during operation.
7. Reduce the sample volume appropriately according to the difficulty of the sample digestion and the viscosity of the sample.
8. Samples containing fat, oil, nitroglycerine, aromatic compounds, nitro aromatic compounds, and volatile samples must do pre-digestion before microwave digestion.
9. During pre-digestion procedure, the sealing cover of the inner vessel should be taken off to make sure the digestion procedure is under normal pressure.
10. The temperature and pressure measuring probes must be cleaned with alcohol cotton swabs.

Chapter 1 General Introduction of Microwave Digestion System

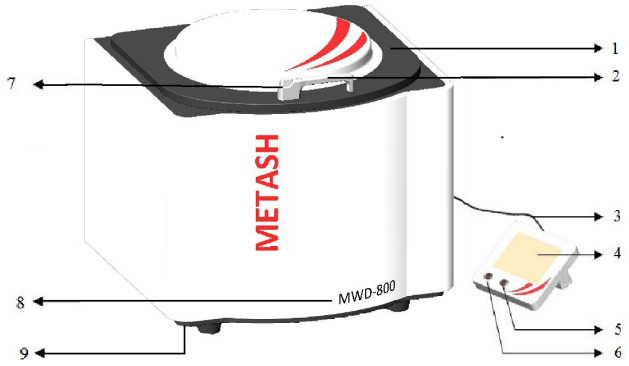
Thank you for your trust and we will try our best to keep your instrument in a stable run status. Also welcome to purchase our SPH-3 sample pretreatment system which assists our microwave digestion system.

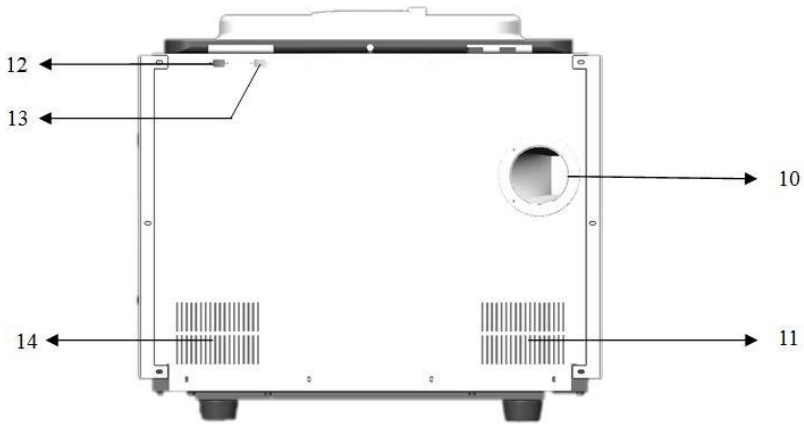
Microwave digestion technology is a highly efficient sample preparation technology that develops fast in recent years. It adopts microwave principle to pre-treat inorganic or organic samples under high pressure and high temperature in a closed vessel which makes fast and highly efficient sample preparation. Microwave digestion technology could well satisfy the requirements of modern analytical instrument for sample preparation, with the advantages of fast and uniform heating, less reagent dosage, low blank value, not easily polluted, energy efficient, etc. Especially in the analysis of volatile element, it's better to maintain sample integrity and has a higher sample rate. Microwave digestion system consists of main body, temperature monitoring system, pressure monitoring system, microwave digestion vessels, rotor and software.

This Closed Vessel Microwave Digestion System is the most cost-effective and practical instrument. Its stable performance, easy operation and simple panel and human-centered module design make it outstanding during all competitive products. It is the best choice for sample preparation in AAS, UV-VIS, ICP-AES, AFS, GFAA, XFS, ICP-MS, HPLC analysis which reduces sample preparation time and improves efficiency. Now the system is widely used in food, textile, Geology, Metallurgy, Coal, Biological, Cosmetics, Petrochemicals, Environment, waste water treatment, battery manufacturing fields, etc.

Chapter 2 Instrument Structures and Accessories

2.1 Introduction of External Structures





1 Upper Cover 2 Door Handle 3 Touch-screen Line 4 Touch-screen Controller
5 Pause Button 6 Turn Button 7 Door Switch Button 8 Instrument Model
9 Power Switch 10 Air Outlet 11 Air Intake 1 12 Touch-screen Serial Port
13 Upper Computer Serial Port 14 Air Intake 2

2.2 Instrument Accessories

2.2.1 Major Accessories

(1) Main Body

It's one of the main components of the instrument, in which the digestion experiment would be finished completely.

(2) Touch-screen Controller

It's the liaison between operator and instrument, using "man-machine conversation" control model.

(3) Pressure Control System

It monitors and controls the pressure changes in real time during the digestion process.

(4) Temperature Control System

It monitors and controls the temperature changes in real time during the digestion process.

(5) Digestion Vessel

It's combined by a sample digestion vessel and a protective outer vessel. The sample digestion vessel also known as the inner vessel used to contain the samples and acids, it provides a closed environment for the high temperature and high pressure digesting with 60 ml volume. The protective outer vessel also known as the outer vessel, it provides a protective environment for the high temperature and high pressure digesting.

(6) Rotor System

It combined by a drive motor, a sample rotor and an auxiliary platform. The sample rotor provides a space for loading the digestion vessel. The auxiliary platform provides a stable platform for monitoring the pressure. The drive motor keeps the sample rotor rotating uniformly and continuously on the auxiliary platform toward the same direction.

(7) Exhaust System

It can blow out the spilling acids from the digestion vessel in time and cool the digestion vessel or magnetron or magnetron power source.

(8) Software System & Programming

It ensures the instrument running intelligent and efficient.

2.2.2 Other Accessories

(1) Inner Vessel Holder

Users can place the inner vessel into the vessel holder.

(2) Repair Tool

Users can repair the sealing cover that not sealed very well with it. **Method of use:** press the repair tool head into the sealing cover, press and turn the repair tool 1 to 2 minutes then pull out

(3) Unload Tool

Users can take out the inner vessel that too tight to remove out from the outer vessel after digestion with it.

(4) Pressure Calibration Ring (PCR)

After a long period of running, the original output parameters of the instrument may need to be calibrated. Users can calibrate instrument pressure signal in Calibration Interface with the PCR. Each set of PCR consists of two components, the thick one is PCR-6 that is used to calibrate P6, and the thin one is PCR-3 that is used to calibrate P3. Users can refer to the operation manual or refer to the Pressure Calibration procedures in the calibration interface of Touch Screen.

(5) Sandpaper

Adjust the parameter value of Signal Board.

Chapter 3 Installation Conditions and Installation Guide

3.1 Installation Conditions

Please confirm the following conditions before installing the instrument.

3.1.1 Working Power Supply

(1) **Working Voltage:** AC 220V, ±10%, 16A.

(2) **Working Frequency:** 50 or 60Hz, ±4%.

(3) **Working Power:** Over 3600W. The power should be higher if there is any other assist device.

(4) **Earth Wire:** Please install the earth wire according to the relevant regulations. The plug must be plugged into an outlet that is properly installed and earthed.

3.1.2 Worktable

(1) The instrument must be installed on a horizontal and stabilization worktable over 700mm length and over 700mm width which could bear over 100kg weight.

(2) The bigger worktable is required if assist device is also installed on the same worktable.

(3) For correct operation, the instrument must have sufficient air flow. Allow with 200mm of space at the back and both sides of the instrument.

(4) The instrument is around 1060mm height when opening the upper cover. Please select suitable worktable for the convenience of instrument operation.

(5) It is allowed to place the worktable next to the fume hood, but it is strictly prohibited to put the instrument into the fume hood. Please avoid strong or continue vibration.

3.1.3 Installation Environment

The stand or fall of instrument working environment has a great influence for the instrument performance and service life. Please confirm the following environment of the installation place.

(1) Working environment temperature range: 5～40℃。

(2) Working environment humidity range: 45～85％。

(3) Storage environment temperature: -20～70℃。

(4) Indoor environment:

1) Make sure that there is no acidic or alkaline gas in room.
2) Make sure that there is no corrosive organic gas to etch the instrument's paint in room, especially for gases such as benzene.
3) Make sure that there is concentrated exhaust system in room. Do not use the instrument in corrosive gas environment long time which affects instrument maintenance.
4) The external surface of instrument should be kept clean.

(5) Sample Reagent

1) Please don't place the corrosive reagent such as sample reagents, acid and alkali reagent near the instrument. Also be careful when taking samples to avoid spilling out to the instrument surface or the chamber.
2) If organic reagent spilling on the instrument surface or in the chamber, please use soft paper or cloth to clean it
3) If acid or alkali spilling on the digestion vessel or rotor, please disassemble all the spare parts, clean and dry it.

(6) **Other Important Notes**

1) Make sure there is enough space for user's operation.
2) Make sure to keep the instrument avoiding the direct sunlight. Long time sunlight would lead to the pain of the instrument surface discoloration or loss.
3) Make sure to avoid the strong and continual shock or shake, which will affect instrument performance.
4) Make sure there is no any heating device near the instrument, to prevent the instrument shell temperature over 70℃.
5) It is not allowed to use the instrument together with any other high power electrical devices at the same time.
6) The instrument should be far from the water supply, to avoid the water into the instrument and cause the danger of electricity leakage.
7) The instrument should be far from the high intensity magnetic field, electric field or high frequency wave equipment to avoid disturbing the uniform distribution of the magnetic field and decrease the heating efficiency of the instrument.
8) Keep working voltage stable to avoid any noise which will affect instrument accuracy.
9) Do not turn on and off the electrical equipment that share same power supply with the instrument.

3.2 Installation Guide and Maintenance

3.2.1 The microwave digestion system should be installed by technical persons. Before installation, please make preparation.

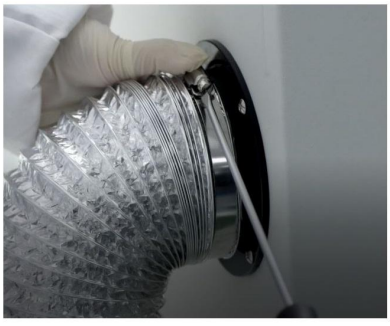
3.2.2 Instrument Installation

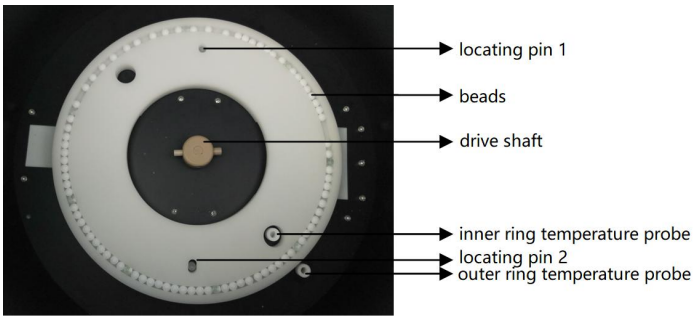
(1) Packing Opening: Please do not make the instrument upside down. Avoid knocking when opening the box. Take out the instrument and place it on the worktable carefully. Check if the appearance and the door switch are normal. **Note: Please do not throw away the packing box until the instrument running stably for 1-2 weeks to avoid any case of changing instruments due to shipping problem.**

(2) Checking: Check all the spare parts and accessories, if there is any damage or problem, please contact distributor or our company.

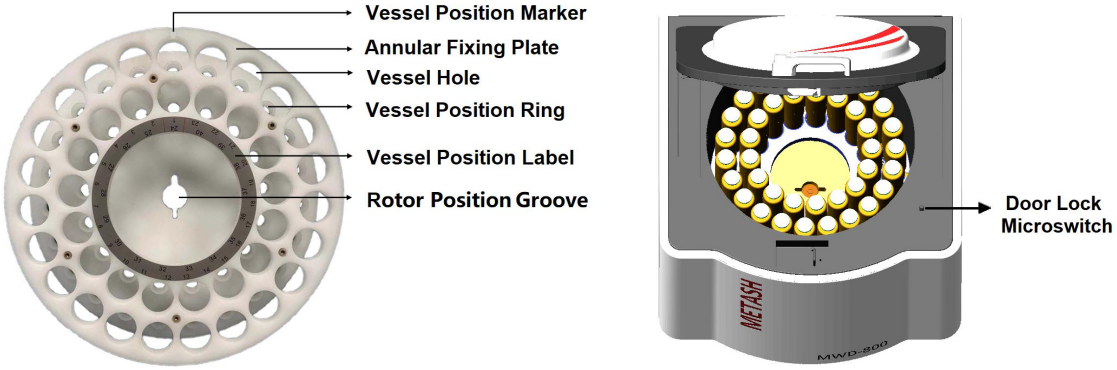
(3) Installation Procedure

WARNING: The 220V voltage may cause electrical shock hazards, please connect the power cord after finishing installation procedure.





1) Take out the exhaust pipe from the accessory box. Install the hoop side into the air outlet on the back of the instrument and tighten it. Connect the other side to the exhaust system.
2) Take out the auxiliary platform from the accessory box and fix it into the two locating pins in the furnace chamber with the beads upward.
3) Take out the sample rotor from the accessory box and fix it into drive shaft in the furnace chamber. Pay attention to the thick card slot in line with the drive shaft thickness direction. There is a label for vessel position on the sample rotor, as shown in the drawing, it is marked 1, 2, 3, 4, 5…



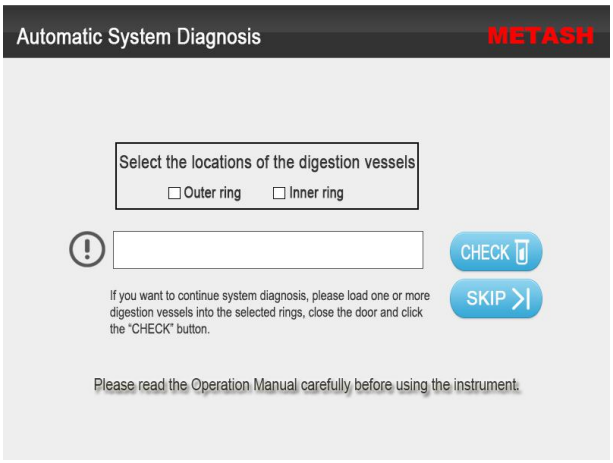
4) Put the well assembled digestion vessel into the vessel positioning slot (assembly process of digestion vessel, please refer to Chapter sixth 6.2). For multiple vessels digestion, please make the digestion vessels evenly arranged in the sample rotor.

5) Take out of the touch-screen controller from the accessory box and connect it to the touch-screen serial port on the back of the instrument.
6) The connection of the power cord and the ground wire

WARNING: The 220V voltage may cause electrical shock hazards, please make sure the power switch is in the state of closed (0) before connecting the power cord.

◆ Make sure power supply and ground wire is normal.
◆ Make sure the voltage of power supply is normal.
◆ Insert two sides of the power cord respectively into the power grid socket and the power supply socket of the instrument.

7) Make sure the connection of the power cord and the ground wire is normal. Turn on power switch and select the location of the digestion vessel, then the instrument will automatically do system diagnosis. When system diagnosis goes to “Pressure detecting…”, stops and prompts “Undetected Digestion vessel”, user can load the assembled digestion vessel, close the door and press the button [CHECK] to continue pressure checking if user forgot to load the vessels before turning on the instrument.



Chapter 4 Technical Specifications

Instrument Model	MWD-800
Digestion Vessel Quantity	40 sets
Digestion Vessel Type	TK-50
Sample digestion vessel Volume	50ml
Pressure Control Type	All vessels controlled
Pressure Monitoring Type	Contactless multiple optical fibers scanning monitoring
Working Pressure Range	0～6 MPa (0～60Bar)
Pressure Control Range	0～10 MPa (0～100Bar)
Temperature Control Type	All Vessels Controlled
Temperature Monitoring Type	Contactless IR sensor scanning monitoring
Working Temperature Range	50～250℃
Temperature Control Range	50～400℃
Sample Digestion Vessel Material	Imported TFM
Outer Protective Vessel Material	Composites of PEEK and Glass Fiber
Frame Material	Polypropylene) and Glass Fiber
Touch-screen Controller	8 Inch Color Touch Screen
Microwave Power	set from 0 to 3000W
Microwave Frequency	2450MHz
Rotation Mode	360° continuous rotation
Leakage of microwave power density	Less than 5mW/cm^2
Power Supply	AC 220V±10%，16A，50/60Hz
Size	640mm×630mm×590mm
Main Body Net Weight	75kg

Chapter 5 Safety Guide

Read the following safety guide carefully before operation. Please keep the safety guide in a convenient place for future reference.

5.1 Operation safety guide

5.1.1 **CAUTION: Do not do empty run. There must be one or more digestion vessels with sample and solution on the Sample Rotor.**

5.1.2 The instrument has high pressure microwave radiation. All users or relevant personnel should be trained and certified to avoid any problems caused by high voltage or microwave radiation.

5.1.3 It is not allowed to install the instrument in the fume hood to avoid any damage or problem caused by acid or chemical gas.

5.1.4 Please exchange the air when use sample or solution that is harmful to human being or environment. If there is no enough air exchange, it may affect normal performance of the instrument or users' safety.

5.1.5 To avoid any danger, please do not disassemble instrument or change spare parts, and do not replace the parts or take off the safety devices.

5.1.6 Make sure there is enough space for convenience of user's operation.

5.1.7 **WARNING: The 220V voltage may cause electrical shock hazards, please make sure all the power is off before connecting the power cord to avoid any injury cause by high voltage.**

5.1.8 **WARNING: Make sure all the power is off and all the power cord is disconnected before maintenance**.

5.1.9 **WARNING: The magnetron and high voltage electric parts inside will cause high temperature which may result in injury. Make sure all the power is off and the power cords are disconnected and wait for the instrument cooling down before replace any parts to avoid any injury**.

5.2 Accessories Safety Guide

5.2.1 **NOTE: Please wear acid proof gloves when assemble or disassemble digestion vessels.**

5.2.2 **CAUTION**: Make sure all parts of the digestion vessel, inner vessel (sample digestion vessel) or outer vessel (outer protective vessel) are dry and clean. The sample rotor, auxiliary platform, frame and inner surface of furnace chamber should also be clean and dry.

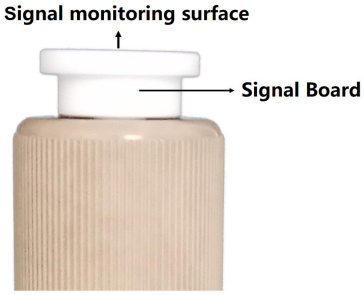
5.2.3 **NOTE: Pay attention to the tightness when tightening the outer vessel, it's better to rotate the vessel cover until it meets resistance, and then tighten it for about 30 °.**

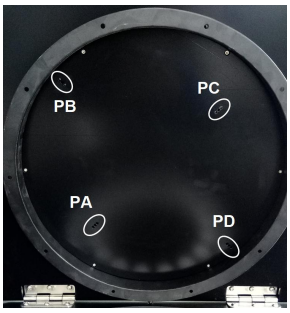
5.2.4 **CAUTION: Please wear acid proof and heat insulation gloves and hold the cover to take the vessels out due to high temperature after digestion.**

5.2.5 The inner wall of the inner vessel could be cleaned with soft sponge brash instead of brash with hard materials. If there is something attached on the inner wall, please put it into 25% of the dilute nitric acid (HNO_3) for more than 12 hours, and then clean it three times with distilled water or deionized water, or add 10ml concentrated nitric acid and clean it on the instrument, the program method is: Pressure 20 Bar, Temperature 180℃, Power 2000W, Heat-Time 300s and Hold-Time 600s.

5.3 Pressure Module Safety Guide

5.3.1 Please clean elastomer immediately after digestion and do regular check. If there is any crack, get rusted or the thickness is lower than 14mm, please change it immediately to avoid any explosion.





5.3.2 The signal board is a high precision part of the pressure module. Please make sure the signal monitoring surface is flat and smooth and there is no scratch on it. It is not allowed to do any marking on this surface.

5.3.3 **After using the instrument every time, please wipe the pressure measuring probe with alcohol cotton swabs.**

5.4 Temperature Module Safety Guide

5.4.1 **After using the instrument every time, please wipe the temperature measuring probe with alcohol cotton swabs**.

5.4.2 If the value of temperature needs to be calibrated please contact with our company, and recalibrate the parameters' values of the temperature control device under the engineer direction.

5.5 Sample & Acid Solution Safety Guide

5.5.1 **General sample volume:** If the sample is solid, it should less than 0.5g; if liquid, it should be less than 10ml. **NOTE: Please reduce the sample volume appropriately according to the difficulty of the sample digestion and the viscosity of the sample.** The ideal volume in the inner vessel is between 8ml and 15ml, no less than 7 ml and no more than 20ml. The sample volume, measuring volume and acid volume shall be the same.

5.5.2 For unknown samples and samples that will generate much gas, or contain much oil, or with complex components, the best sample volume is 0.1g and it should be not over 0.3g. Also, it needs pre-digestion at least for 15-30 minutes (Please choose SPH-3 Sample Pretreatment Heating Equipment). **During pre-digestion procedure, the sealing cover of the inner vessel shall be taken off to make sure the digestion procedure is under normal pressure**.

5.5.3 There is no limitation for HNO_3, HCl, HF under 200℃. H_2O_2 can be added proper to improve the efficiency of digestion, but it should do pre-digestion. **High boiling acid, such as H_2SO_4, H_3PO_4 and F_4B_2, can't be used alone, and the amount of use above 200 degrees centigrade should be restricted according to the actual conditions. $HClO_4$ is strictly prohibited to use.** The acid reagent in each inner vessel should be the same volume and type.

5.5.4 **The samples containing fat, sugar, oil, nitroglycerine, aromatic compounds, nitro aromatic compounds, organic solvent or volatile samples must be fully pre digestion before the microwave digestion.**

5.5.5 **It is forbidden to directly digest the sample containing ethanol. The sample should be dried by the water bath and then do microwave digestion.**

5.5.6 **When the sample of the same batch is digested, please make sure that same volume sample, with the same type, digest in same volume of acid.**

5.5.7 Corrosive reagents, acid and alkali reagents please don't place near the instrument. Also, users must be careful when taking the samples t to avoid spattering on the instrument. Please immediately wipe clean with a soft cloth or paper if there are any drops on the instrument.

5.5.8 WARNNING: The following samples cannot be digested in the instrument. Some samples we did not list here. But it does not mean that users can use the instrument to digest these samples under any condition.

(1) Explosive samples (TNT, Cellulose nitrate etc.);
(2) Propellant (hydrazine, hydrazinium, ammonium perchlorate etc.);
(3) Flammable samples; Nitroglycerin, nitroglycerin or other organic nitro compound;
(4) Two samples that mixed together can be flammable (nitric acid & phenol, nitric acid & triethylamine, nitric acid & acetone;
(5) Aircraft fuel (JP-1 etc.);
(6) Acetylene compound;
(7) Diol (e.g., ethylene glycol, propylene glycol, ethylene glycol, propylene glycol);
(8) Perchlorate (Ammonium perchlorate，Potassium perchlorate etc.);
(9) ether compounds;
(10) Paint samples;
(11) Alkanes;

(12) Ketones;

(13) Pure fat in animals.

5.6 Other Considerations

5.6.1 About the Operation Manual

(1) This operation manual has the possibility to change without prior notice.

(2) This operation manual copyright belongs to the technology department of the company.

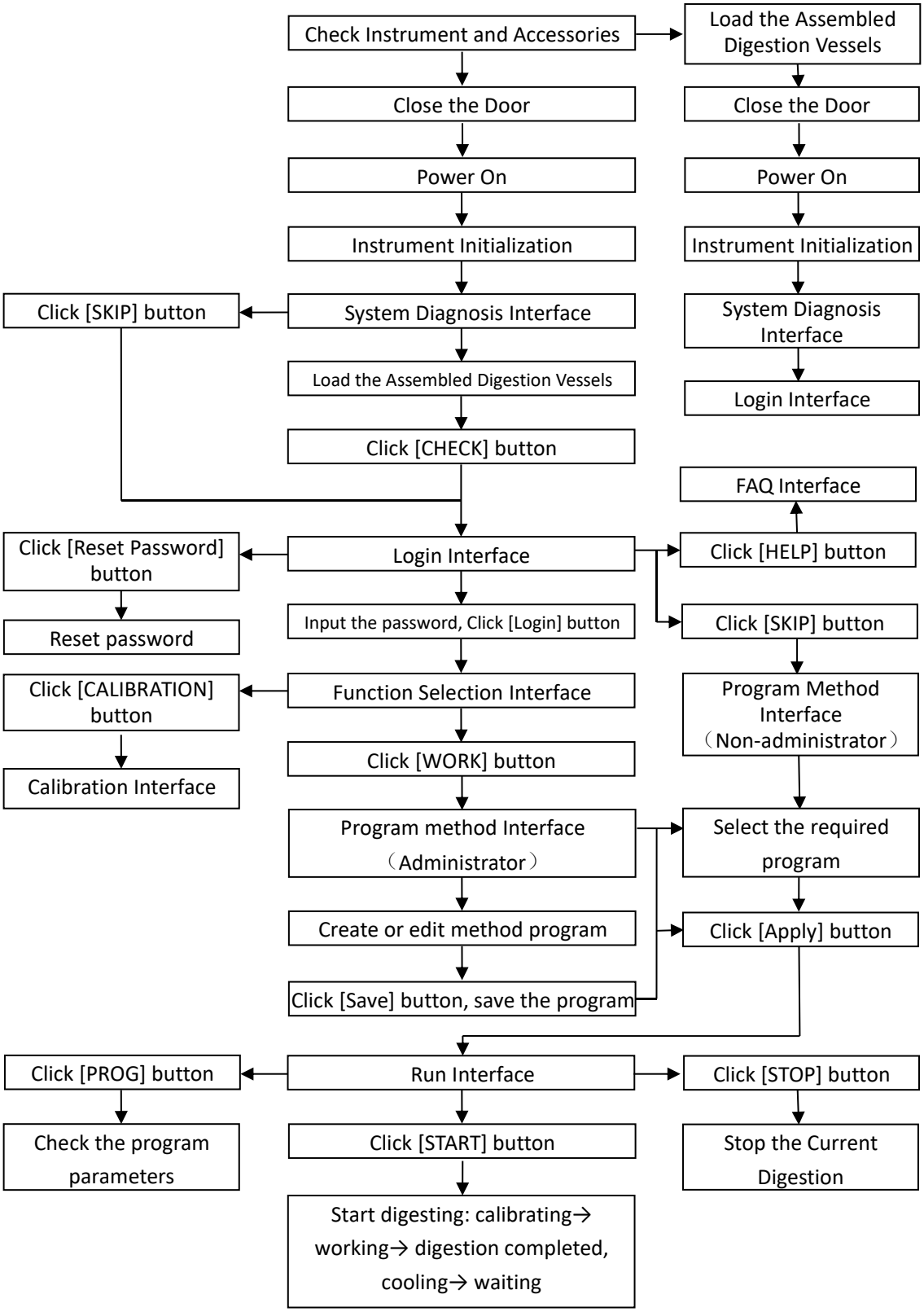
5.6.2 Please be sure to comply with the instrument and operation manual on prompt attention. Neglect of these considerations, there may be a risk of injury or equipment damage.

5.6.3 Please don’t do the operation that outside the operation manual. If there is a problem, please contact the seller or our company.

5.6.4 Although the attentions of instrument or operation have gone by full research, but the events occur beyond the expected also not impossible. So, during the instrument operation, please not only in accordance with the operation manual mentioned matters needing attention, but also the operator himself should be careful at any time, pay attention to safety, avoid accident happening.

Chapter 6 Instrument Operation Guide

6.1 Operation Flowchart



6.2 Assembly of Digestion Vessel

NOTE: Please wear acid proof gloves when assemble or disassemble digestion vessels.

6.2.1 Structure of the Digestion Vessel

(1) The Digestion Vessel consists of a Sample Digestion Vessel (Inner Vessel) and an Outer Protective Vessel (Outer Vessel).

(2) The Inner Vessel consists of an inner vessel body (cup body) and a sealing cover.

(3) The Outer Vessel consists of a vessel body and a vessel cover assembly.

(4) The vessel cover assembly is assembled with a vessel cover and a pressure sensing module.

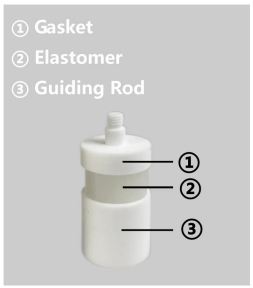
(5) The pressure sensing module consists of a signal board, a guiding rod, an elastomer and a gasket.

Digestion Vessel

Inner Vessel

Outer Vessel

Cover as-outer



Pressure Sensing module

6.2.2 Assembly process of Cover Assembly

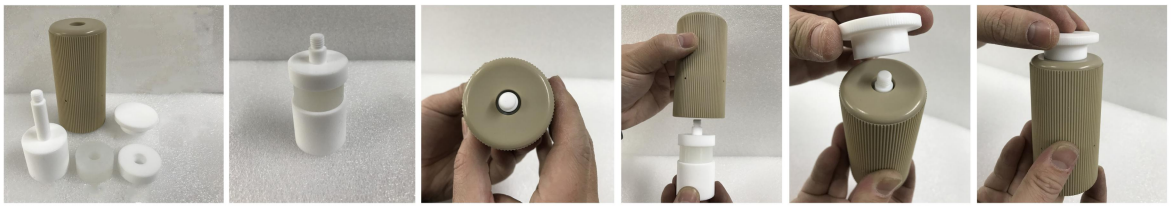
(1) Insert the elastomer into the guiding rod.

(2) Insert the gasket into the guiding rod.

(3) Insert the guiding rod into the vessel cover.

(4) Screw the signal board into the guiding rod, and then screw more with a little force to avoid the signal board loose.

(5) Then the Vessel Cover is assembled.



6.2.3 The assembly process of the Digestion Vessel

(1) **Preparation work：**

- **Check the gas leakage of the inner vessel:** When slowly coving the sealing cover into the cup body there is a friction; when quick pull out the sealing cover from the cup body there should be a sound. Before using the sample digestion vessel, please match the cup body and the sealing cover first, so as to ensure that it does not leak. Digestion vessel with leakage can use repair tool to improve it. Method of use: press the repair tool head into the sealing cover, press and turn the repair tool 1 to 2 minutes then pull out.

- Check whether the signal board is clean, loose, or scratched.

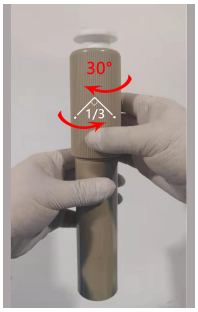
(2) **Load the sample:** Load the weighed sample to a clean inner vessel, and make sure there is no sample suspended on the vessel wall.

(3) **Add acids:** Choose suitable acids. If there is sample on the wall you can carefully rinse the sample to the bottom with acids.

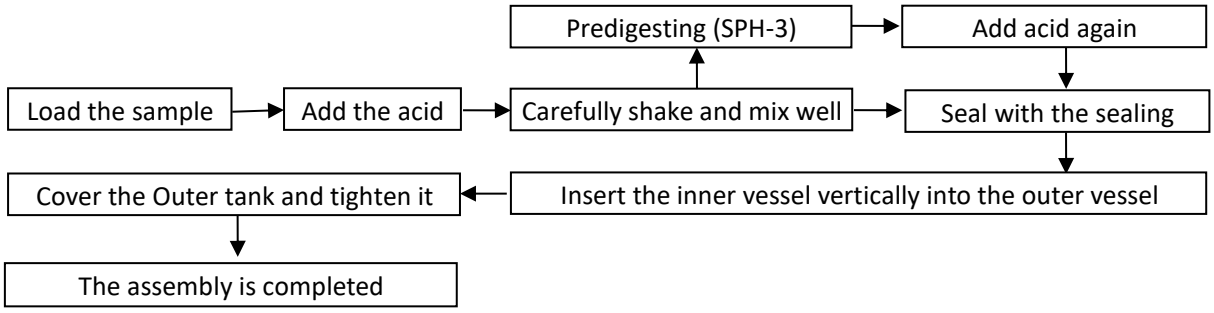
(4) **Mix:** Carefully shake the inner vessel to mix the sample and the acids well, and remove the gas off the vessel as much as possible. Please be careful to avoid acid spatter which might cause any injury.

(5) **Seal:** Seal the inner vessel with the sealing cover. **Note: For unknown samples and samples that will generate much gas, or contain much oil, or with complex components, users shall predigest them and then add acids again before sealing** (Please choose SPH-3 Sample Pretreatment Heating Equipment). **After sealing, pay attention to the finger gesture: one finger presses the sealing cover; the remaining four fingers hold the inner vessel body.**

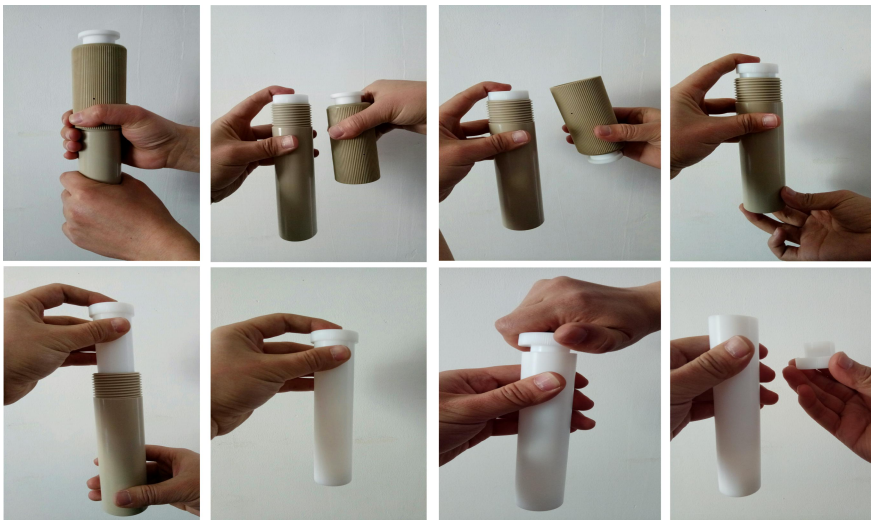
(6) **Tighten:** Insert the sealed inner vessel gently and vertically into the outer vessel carefully. Cover the outer vessel and tighten it. Then the Digestion Vessel is assembled. **Note: Put the inner vessel gently into the outer vessel; Keep finger gesture that mentioned above; Don't screw the outer vessel too tightly, it's better to rotate the vessel cover until it meets resistance, and then screw more with a little force to avoid loose (about 30 °).**



(7) Assembly process of the Digestion Vessel flowchart



6.2.4 The disassembly process of Digestion Vessel



(1) When digestion completes and vessels cool down, open the door and hold the cover of the outer vessel with gloves and take it out. Put the digestion vessels into the fume hood for 10 minutes.

(2) One hand holds the outer vessel cover and the other hand hold the vessel body, loosen and then stop.

(3) Gently and slowly open the outer vessel cover, stop when there is a sound of air blow out or brown air blow out, wait for the air blown sound or the brown air disappeared. Repeat this operation until the pressure released.

(4) While removing the outer vessel cover, **pay attention to the finger gesture: one finger pressing the sealing cover, the remaining four fingers holding the outer vessel body to prevent the sealing cover pop-up**.

(5) Use a finger to upward the inner vessel through the hole of bottom of outer vessel. Please use the unload tool if use finger cannot remove the inner vessel: Put the unload tool on the fume hood table, put the bottom of inner vessel on the unload tool through the hole of bottom of outer vessel, pull the outer vessel body downward with force, then take out the inner vessel. **Attention to the finger gesture: one finger pressing the sealing cover, the remaining four fingers hold the inner vessel body.**

(6) Cover the sealing cover with one hand, fingers pressing on the peripheral surface of the sealing cover, the other hand hold the inner vessel body; spin up and pull out the sealing cover. **Note: Be sure to spin up and pull out, only spin up not pull out cannot open the inner vessel. only pull out not spin up may cause the reagent in the inner vessel shake and spill out to cause loss of elements or burn other people**.

(7) While removing the sealing cover, quickly put the sealing cover upward to avoid reagent loss which suspends on the sealing cover. Gently shake the inner vessel body to accelerate the gas flow out**.**

(8) Heat the inner vessel using heating instrument to drive the acid until the reagent left about 1-2ml**.**

(9) Transfer the reagent to the volumetric flask, rinse the inner vessel and the sealing cover 2-3 times and transfer the rinse-reagent into the volumetric flask. Wait the reagent temperature to the room temperature, and then prepare the liquid**.**

6.3 Important notes of using Digestion Vessels

6.3.1 Make sure the sealing parts of the inner vessel are in good conditions, without any scratches or damage.

6.3.2 Make sure each part of digestion vessel except the inner wall of the vessel dry and clean.

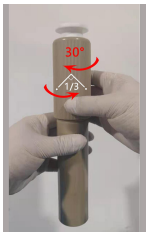
6.3.3 Please clean the elastomer in time with room temperature water after each experiment to extend the service life.

6.3.4 Please check the status of the elastomer before using. If there is any crack, get rusted or the thickness is lower than 13mm, please change it immediately to avoid any explosion.

6.3.5 Please clean up the acid from the digestion vessel in time after each experiment. **Note: The inner vessel should be cleaned and steeped in diluted nitric acid. However, it is prohibited to clean the outer vessel with any acid solution or organic solution. Please use clean and wet cloth to wipe the outer vessel, and then dry it naturally; if there attached too much digestion acids, rinse with water first, then use clean cloth to wipe and clean, and dry it naturally.**

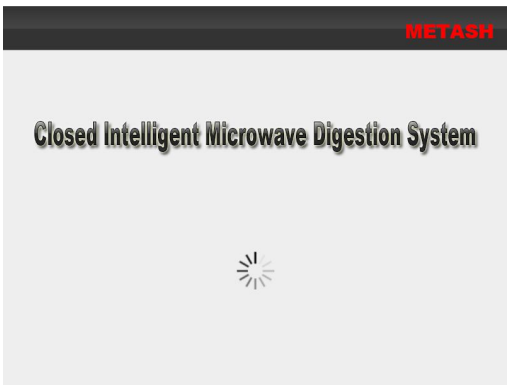
6.3.6 Please always keep the signal board of the pressure control device flat, smooth, dry and clean.

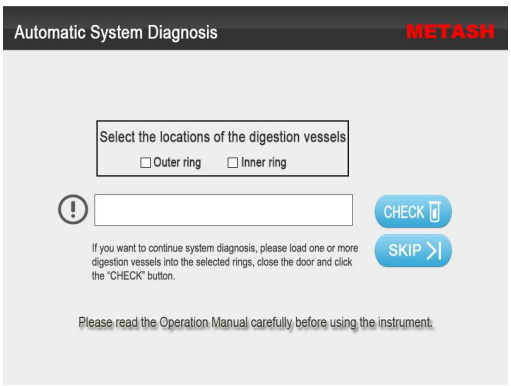
6.3.7 **Note: During the assembling, make sure the signal board of pressure sensing module is no loose. Pay attention to the tightness when tightening, it's better to rotate the vessel cover until it meets resistance, and then screw more with a little force to avoid the signal board loose (about 30 °).**



6.4 Introduction of the operation interfaces

6.4.1 Instrument Initialization and Automatic System Diagnosis Interface





(1) Before power-on and using, please check all wires to ensure all wires have been connected properly.

(2) Check the furnace chamber, ensure the auxiliary platform and the sample rotor are installed normally, and close the door.

(3) Turn on the power, the instrument starts to initialize.

(4) When system finishes the initialization, it jumps to Automatic System Diagnosis Interface.

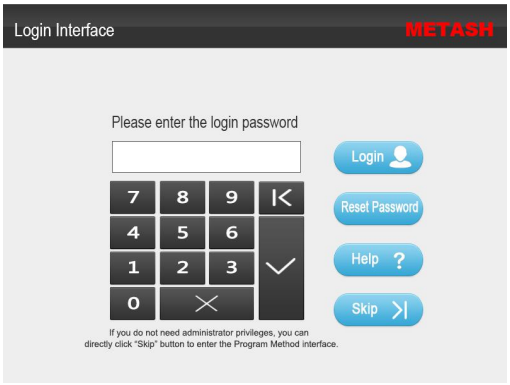
6.4.2 Automatic System Diagnosis Interface

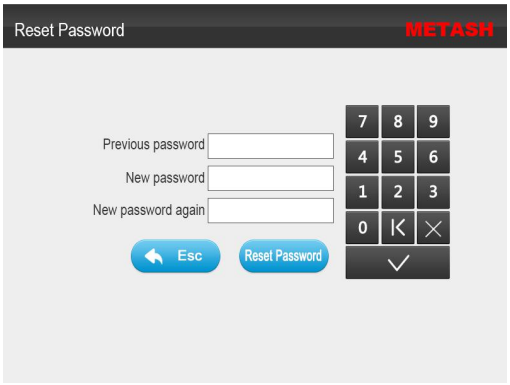
(1) For the first time of using the instrument or do instrument regular check, please load the assembled digestion vessels according to the requirements and select their locations, then click the button of [CHECK] to continue system diagnosis.

(2) Any problem found during the Automatic System Diagnosis will be prompted to display in the long text frame of the interface. Click [SKIP] button to enter the Login Interface. In the Login Interface, click [Help] button to enter the Help Interface and you can consult related questions and analysis (FAQ).

(3) After System Diagnosis, system will enter directly Login Interface.

6.4.3 Login Interface





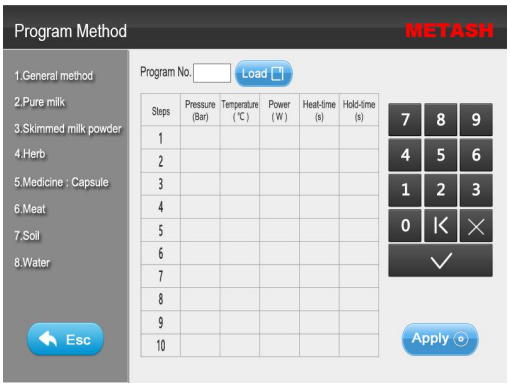
(1) Click the password display frame, enter the login password (Initial password: 1234), click [√] to confirm. Then click on the [login] button to enter the Function Selection Interface (administrator).

(2) Click [Reset Password] button and enter Reset Password Interface. The administrator can modify the login password (four digits) on this interface.

(3) Click [Help] button to enter the Help Interface and users can check related questions and analysis (FAQ)

(4) Click [Skip] button to enter the Program Method Interface (Non-administrator).

6.4.4 Program Method Interface (Non-administrator)



(1) Enter the Program Method Interface, the system will load digestion system that used last time automatically.

(2) The system can set 1-255 kinds of program methods. There are 8 preset program methods in the Program Method Interface, which can facilitate users to enter the digestion process conveniently and quickly.

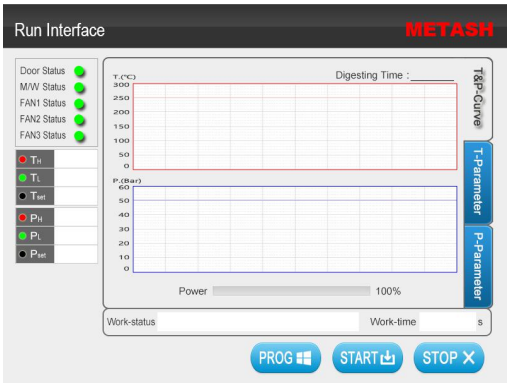
(3) Click left program methods to load the corresponding program. If you need to load NO.9-255 program section, please input the corresponding number into the text box of the program No. and click the [Load] button.

(4) Only administrator can modify related parameters in the program or create a new digestion program. Please enter the administrator's Program Method Interface, and then create or edit the method program. Please refer to the Chapter 6.4.7.

(5) Click [Esc] button to enter the [Login Interface].

(6) Click [Apply] button to enter the [Run Interface].

6.4.5 Run Interface



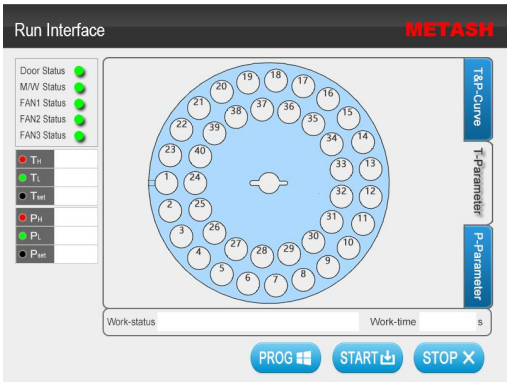
(1) On the left side of the Run Interface, it showed real-time working parameters.

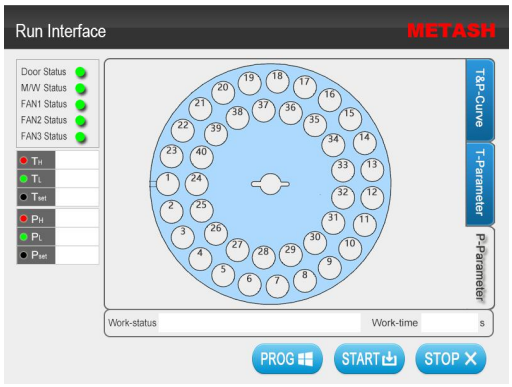
- **Door:** It means the door closed safely when the door status light is green. User can click [START] to start the application program for sample digestion. It means the door closed unsafely when the door status light is gray, and then the button of [START] is invalid. Please check whether the door is closed safely or not.
- **M/W:** When microwave status light is green, it means the instrument in working status. Do not lean on the instrument to avoid microwave irradiation.
- **FANX:** The status lights are green when the fanX work normally.
- **T display frame:** Display in real time the highest temperature value (T_H), the lowest temperature value (T_L) of the solution in all digestion vessels and the program setting temperature value (T_{Set}).
- **P display frame:** Display in real time the highest pressure value (P_H), the lowest pressure value (P_L) of the solution in all digestion vessels and the program setting pressure value (P_{Set}).

(2) On the right side of the Run Interface there are three tabs: T&P-Curve, T-Parameter and T-Parameter.

- **T&P-Curve:** The red is the temperature curve frame, which shows the change of the temperature in the digestion vessel in real time. The blue is the pressure curve frame, which shows the change of the pressure in the digestion vessel in real time. The digestion time between the red curve frame and the blue curve frame is the total time of the effective digestion. The combination of charts can more easily show the status of sample digestion.

- **Microwave power progress bar:** Display the output status of microwave power in real time.
- **T-Parameter and P-Parameter:** Display the temperature and the pressure changes of each digestion vessel in real-time.





(3) Under the taps:
- **Working-time**: Shows the time used in each stage of digestion in real-time.
- **Working-status**: Display current status or failure problems in the operation of the instrument.

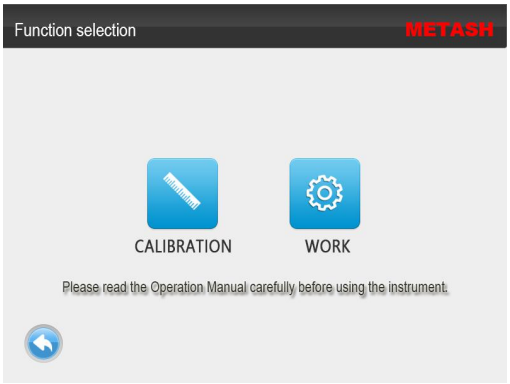
(4) Click the button of [PROG] to return to the Program Method Interface (non-administrator). User can look up the parameters' values.

(5) Click the button of [START] to enter the digestion process, and the Working-status display frame in turn displaying: **Adjusting→ Digesting→ Digesting completed, cooling (buzzer sound) → waiting (buzzer sound)**. Until then the digestion process completes. If abnormal situation occurs during the digestion process, the Working-status display frame will display prompts such as "Warning: Zero", "Door Unlock", and so on. Please refer to the corresponding common problems in the Help Interface.
- For the first time to enter the Run Interface, the Working-status display frame displays with "Waiting".
- After clicking the button of [START], the Working-status display frame displaying with "Adjusting".
- After "Adjusting", the rotor positions that do not load the digestion vessels, the values of temperature and pressure in "T-Parameter" and "P-Parameter" will display 0, and the Working-status display frame displaying with "Digesting".
- When the working-status enters "Digesting", check whether the exhaust fan is ventilated or not, if not, please check it.
- If abnormal situation occurs, the Working-status display frame will display prompts such as "Zero Warning", "Door Unlocked", and so on. Please refer to the corresponding common problems in the Help Interface.

- After “Digesting”, working-status display frame will show “Digesting completed, cooling” with the buzzer sound and the digestion vessel will begin air cooling automatically, please don’t open the door until the working-status shows “waiting”, and then take out the vessels to the fume hood. This can avoid accident due to higher temperature of the outer vessels without cooling. **NOTE: The temperature of the outer vessel will be very high after digestion, please hold the cover of the outer vessel with acid proof and heat insulation gloves while taking out the digestion vessels to avoid getting burnt. Cooling stop conditions: The temperature in all the digestion vessels is below 100℃ and the pressure in all the digestion vessels is no more than 4 Bar; Or the cooling time reached 3000 seconds.**

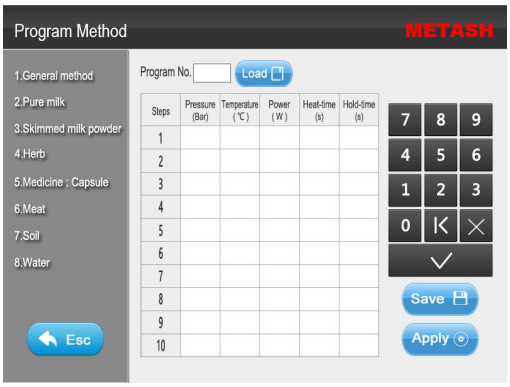
(6) Click the button of [STOP] to stop the current application procedure. **Note: Please operate carefully,** because after clicking [STOP], user can’t click [START] to start the current program again until the pressure in all loaded digestion vessels changes to zero**.** If you want to use the pause function, please press the mechanical button [ ] which is next to the touch-screen. After pressing [ ], you can click [START] to continue the current program at any time.

6.4.6 Function Selection Interface (Administrator)



(1) Click the button of [WORK] to enter the Program Method Interface.
(2) Click the button of [CALIBRATION] to enter the Calibration Interface.
(3) Click the button of [ ] to return the Login Interface.

6.4.7 Program Method Interface (Administrator)



(1) There are 8 preset digestion programs in the Program Method Interface, which can facilitate users to enter the digestion process conveniently and quickly. The users can modify the program steps or edit the parameters' values such as Pressure, Temperature, Power, Heat-time and Hold-time.

(2) Click the button of [Save] to save the current modification, Click the button of [Apply] to go to the current program and apply it to the Run Interface, click the button of [Esc] to return the previous interface that is Function Selection Interface.

(3) Users can click the program name on the left and load the corresponding program. Or input 1-255 into "Program No." display frame and click the button of [Load] to load the corresponding program.

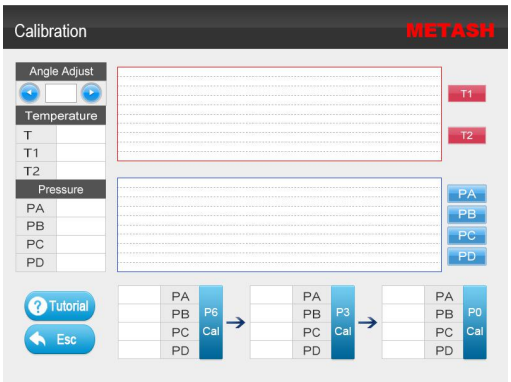
(4) Each digestion program consists of 10 working steps; each working step consists of a heat-time step and a hold-time step. That means, each digestion program consists of 20 digestion steps; it is enough to meet all kinds of complicated samples in the control process of digestion.

(5) In the process of digestion, steps that did not set parameters or steps parameter value of heat-time and hold-time are all "0", the system will automatically check and regard all the following steps invalid. The instrument system runs only effective steps and will stop when meet the invalid steps.

(6) Click the parameter in the display frame, edit or modify it use the "editing keyboard". For example, click the program No. display frame, the background color become blue, when the click is finished the background recover as before and there is a black cursor on the right of the display frame. Input the new program No. value using the "editing keyboard", the new program No. value is blue and on the right side of the display frame, click [←] to delete the recently input value, click [×] to cancel the modified editor, click [√] to replace the original black value with the blue value, and the blue value will be saved and turned to black.

(7) Pressure setting range is 0~60Bar; Temperature setting range is 50-250℃; Power setting range is 0~3000W; Time setting range is 0~9999s. All parameters should not exceed the setting range. Otherwise, the button of [√] is invalid and all the values cannot be saved and user has to edit input value again.

6.4.8 Calibration Interface (Administrator)



(1) In the Function Selection Interface, click the button of [CALIBRATION] to enter the Calibration Interface.

(2) **WARNNING: The Calibration Interface is only for internal parameters calibration. Personnel without training are not allowed to operate in [CALIBRATION] interface.**

(3) Click [Tutorial] to enter the interface for detail introduction of the instrument calibration procedures.

(4) Click [Esc] to return to the Function Selection Interface.

(5) **Instrument calibration Tutorial:**

- **Note: Calibration period generally is one week, but shall be adjusted according to instrument condition and using frequency. Please calibrate instrument if user restart instrument after long time.**
- **Calibration Principle and Sequence:** Angle Adjust → Pressure Calibration → Temperature and Pressure Verification**.** Users must follow above calibration sequence and cannot skip any calibration steps.
- **Calibration Procedure:**

A. Assemble two sets of vessels (no sample or liquid inside) and put them on position 2 and 25 on the rotor, select the inner ring and the outer ring, close door and press [].

B. Calibrate instrument angle according to Angle Adjust instructions.

C. Calibrate pressure in sequence according to Pressure Calibration (P-Calibration) instructions.

D. After finishing step B and step C, return to Function Selection Interface, and press [Work] to enter Program Method Interface.

E. Set temperature and pressure verification parameters: Pressure 20 Bar, Temperature 180℃, Power 2000W, Heat-Time 300s and Hold-Time 600s.

F. Put 10ml purified water into a clean set of vessels and seal it. Run digestion and after 180℃ hold-time, pressure inside vessel shall be around 10 Bar.

G. Instrument calibration finished.

H. **Note:** Calibration period generally is one week, but shall be adjusted according to instrument condition and using frequency. Please calibrate instrument if user restart instrument after long time.

(6) **Angle Adjust instructions：**

A. Click the [PA], [PB], [PC] and [PD] buttons on the right side of pressure monitoring frame for several times respectively until a smooth signal peak appears.

B. Observe if the vertical line appeared in the frame is in the middle of the signal peak. If yes, please go directly to “Pressure Calibration (P-Calibration)”. If not, please follow steps below to do Angle Adjust.

C. Click the [PA] button several times until a smooth signal peak appears.

D. Click the [] or [] button in the “Angle Adjust” frame to adjust the angle value. Click [PA] again to see if the vertical line is in the middle of the signal peak or not.

E. Repeat **step D** until vertical line is in the middle of the signal peak.

F. According to the method shown in **step C** to **step E**, adjust the positions of PB, PC and PD signal peaks respectively. **Note:** PA, PB, PC and PD signal peaks need to be adjusted in coordination. You can roughly adjust the position of PA signal peak first, then look at the actual positions of PB, PC and PD signal peaks, and then fine tune them.

G. Angle Adjust finished.

(7) **P-Calibration instructions：**

- **Calibration Principle: Place the same digestion vessel at the same vessel position and cannot be interchanged; and make sure calibration sequence: P6→P3→P0**.
- **P6 calibration**

  Select two well assembled digestion vessels as vessel A and vessel B, select a fixed vessel position respectively from the inner ring and outer ring of the Sample Rotor as position A and position B. First, put the PCR-6 into the position A and position B, then load the vessel A and vessel B into the position A and position B, at last close the door. The Sample Rotor starts to rotate and the calibration begins after clicking [P6 Cal] button, the signal values in the “Pressure” frame are detected. P6 Cal is completed after the Sample Rotor stops moving, and the signal values will be updated and saved to “P6 Cal” frame automatically.

  The signal value range of P6 is 200±20. If the calibrated signal value is not in the range, the alarm will be off. In this case, please re-calibrate the pressure signals according to the calibration sequence: P6→P3→P0, or refer to the Help Interface of P6 Warning.
- **P3 calibration**

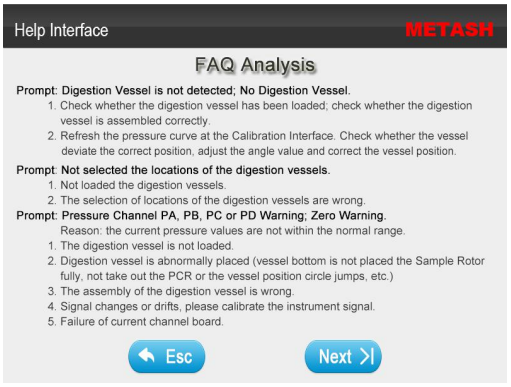
  Take out of the vessel A, vessel B and the PCR-6 after opening the instrument door, and put the PCR-3 into the position A, position B, then load the vessel A, vessel B into the position A, position B, at last close the door. The Sample Rotor starts to rotate and the calibration starts after clicking [P3 Cal] button, the signal values in the "Pressure" frame are detected. The P3 Cal is completed after the Sample Rotor stops moving, and the signal values will be updated and saved to “P3 Cal” frame automatically.

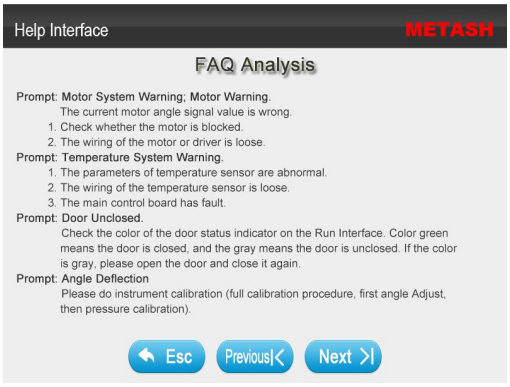
  The difference between the corresponding values of P6 and P3 must be more than 20. If the difference is smaller than 20, the alarm will be off. In this case, please re-calibrate the pressure signals according to the calibration sequence: P6→P3→P0, or referring to the Help Interface of Calibration Warning.
- **P0 calibration**

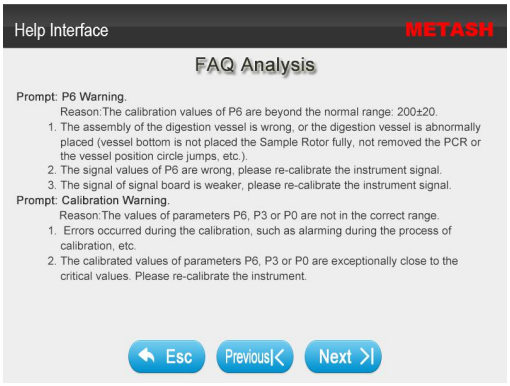
  Open the door and take out of the vessel A, vessel B and the PCR-3, load the vessel A, vessel B directly into the position A, position B, and then close the door. The Sample Rotor starts to rotate and the calibration starts after clicking [P0 Cal] button. The signal values in the "Pressure" frame are detected. The P0 Cal is completed after the Sample Rotor stops moving, the new signal values will be updated and saved to "P0 Cal" frame automatically.

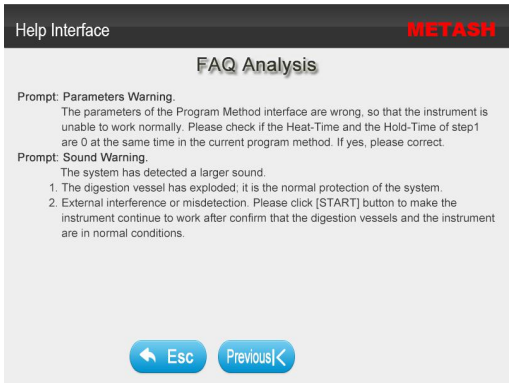
  The difference between the corresponding value of P3 and P0 must be more than 20. If not, the alarm will be off. In this case, please re-calibrate the pressure signals according to the calibration sequence: P6→P3→P0, or referring to the Help Interface of Calibration Warning.
- Pressure Calibration finished.

6.4.9 Help Interface









(1) On the Login Interface, click [Help] button to enter the Help Interface and users can check related questions and analysis (FAQ).

(2) Click the [Previous] and [Next] button to view the whole listing of FAQ.

(3) Click the [Esc] button and return the Login Interface.

Chapter 7 Discussion on Microwave Digestion and Methods

7.1 Discussion on Microwave Digestion

7.1.1 As a new sample pretreatment technology, microwave digestion has attracted more and more people's attention. The advantages of microwave digestion technology to digest samples include **shorter digestion time, more simple operation, less use of solvent and less environment pollution, etc.**

7.1.2 Digesting samples by microwave equipment:

- **Key factors:** the digestion temperature, digestion time and digestion reagent. Proper digestion reagent and proper digestion temperature ensure that the samples can react with chemicals, thus being digested. The Digestion time ensure that the samples can be digested completely.
- **Digestion Principle:** digesting the sample under the program with small but enough power, multistep heating up the temperature and multistep boosting up the pressure.
- The ideal microwave digestion program is the one that can completely digest the most important component in the sample matrix as far as possible at the minimum required temperature. It is necessary to know the components of the sample matrix for determining the most effective temperature of the digestion. Understanding the digestion characteristics and the interaction between the sample components and the different reagents can make it easier for the analyst to control the digestion process of the sample. For different organic or inorganic samples, the changes in the intensity and physical volume of the chemical reaction at each temperature point are different during microwave digesting.

7.1.3 Organic samples of carbohydrates, proteins and lipids are the three matrix components of the animal and plant samples. In the microwave digestion of the animal and plant samples, high pressure can be produced by the gas by-products such as CO_2 and NO_2. In general, the critical temperature of the organic sample is digesting by nitric acid (HNO_3) as follows:

- Carbohydrates, such as starch, >140℃;
- Proteins, >145-150℃;
- Sugars, >150℃;
- Lipids and fats,> 160-165℃;
- Heavy oil and petroleum bitumen, >180-185℃.

7.1.4 The digestion of inorganic samples needs to be reacted with the corrosive mixed acid at high temperature to achieve complete digestion. The pressure of the inorganic sample is lower than that of organic samples, most inorganic samples without CO_3^{2-} can be digested completely around 185℃, and can digest under the program only one step.

7.1.5 For microwave digestion, the selection of reagents is very important. The digestion of organic samples needs to maintain the acid condition of strong oxidizing, mixed digestion reagents are commonly used, such as HNO_3/H_2O_2、$HNO_3/H_2O_2/HF$、HNO_3/HCl, etc.

7.1.6 HNO_3, H_2SO_4 and HCl are commonly used in wet digestion method. This is due to sulfate and chloride of some metals are insoluble or slightly soluble, and boiling point for H_2SO_4 is high which will easily cause damage to digestion vessel because of too high temperature, so microwave digestion mostly uses HNO_3. Advantage for$HNO_3$is that all nitrate is soluble to water and strong oxidants which makes organics easy to digest. Moreover, boiling point for HNO_3（120℃）is low which is in safe temperature range (≤250℃). HF makes soil and sediments easy to digest and has little effect on bio-samples. H_2O_2, as weak acid oxidizer which resolve into high energy state reactive oxygen can degrade some organics like humic acid. If user use H_2O_2 and HNO_3 together can improve oxidizing ability and damage organics which results in easy digestion and little effect on reaction matrix.

7.1.7 It is common to use HNO_3/H_2O_2 for food and cosmetics samples; HNO_3/HF， HNO_3/HCl/HF for environment samples; HNO_3/H_2O_2， HNO_3/HF， HNO_3/HCl for bio and phrenetical samples;HNO_3/HF， HNO_3/HCl， HNO_3/HCl/HF for geological mineral samples or industrial samples.

7.2 Microwave Digestion Methods

7.2.1 Some of the following samples need to be predigested before microwave digestion. For example, paint.

NOTE 1: The methods in the table are **only suitable for microwave digestion under both control of temperature and pressure; please don't use them to the microwave equipment which only has pressure control system.**

NOTE 2: The table only lists the temperature, pressure and hold-time of the last step of the program method. Please complete the previous procedure steps before using the corresponding methods.

Sample name		Sample Quantity	Reagents (mL)	P_H (Bar)	T_H (℃)	Holding Time(s)
Food Samples	Flour	0.50g	$4HNO_3$, $1H_2O_2$	30	185	600
	Orange juice	5.00ml	$6HNO_3$, $1H_2O_2$	30	185	600
	Edible oil	0.50ml	$8HNO_3$, $2H_2O_2$	40	190	900
	Chocolates	0.30g	$5HNO_3$, $1H_2O_2$	30	195	900
Cosmetics Samples	Toner (ml)	3.00ml	$4HNO_3$, $2H_2O_2$	30	180	600
	Face ream	0.50g	$3HNO_3$, $2H_2O_2$, 0.5HF	30	185	600
	Soap	0.20g	$5HNO_3$, 2HF	35	190	900
Environmental Samples	Soil 1	0.20g	$6HNO_3$, 2HCl, 2HF	40	195	900
	Soil2	0.20g	$6HNO_3$, 2HCl	40	195	900
	Domestic Sewage	5.00ml	$6HNO_3$, $2H_2O_2$, 1HF	40	190	600
Biopharmaceu-ticals Samples	Hair	0.20g	$1HNO_3$, $4H_2O_2$	25	185	600
	Animal liver	0.30g	$10HNO_3$	30	190	600
	Capsule	0.50g	$5HNO_3$, 1HF	40	190	900
	Chinese herb	0.30g	$5HNO_3$, $1H_2O_2$	30	190	900
Geological Mineral	Rutile	0.10g	$2HNO_3$, 6HF	45	235	1200
	Alumina	0.10g	$4H_2SO_4$, 4HCl, 2HF	35	195	1200
	Tantalum ore	0.10g	$1HNO_3$, 5HF	40	210	1200
	Boron Carbide	0.10g	$5HNO_3$, 5HF	45	240	1800
Industrial Materials	Crude Oil	0.50g	$8HNO_3$, $1H_2O_2$	50	210	600
	Cement	0.20g	$8HNO_3$	30	195	900
	Textile Dyestuffs	0.30g	$6HNO_3$, $1H_2O_2$	40	195	1200
	Paint	0.10g	$6HNO_3$, $3H_2SO_4$	35	205	1200

Note: Unit for solid sample is gram; Unit for liquid sample is ml.

Chapter 8 Questions and Analysis (FAQ)

FAQ Table 1:

Prompt	Analysis
Digestion vessel is not detected	1. Check whether the digestion vessel has been loaded; check whether the digestion vessel is assembled correctly. 2. Refresh the pressure curve at the Calibration Interface. Check whether the vessel deviate the correct position, adjust the angle value and correct the vessel position.
No Digestion vessel	
Not selected the locations of the digestion vessels	1. Not loaded the digestion vessels. 2. The selection of locations of the digestion vessels are wrong.
Angle Deflection	Calibrate the instrument: Angle Calibration→Pressure Calibration.
Fan X Warning	May be the fan has problem, contact distributor or factory for maintenance.
Pressure Channel PX Warning	Reason: the current pressure values are not within the normal range. 1. The digestion vessel is not loaded. 2. Digestion vessel is abnormally placed (vessel bottom is not placed the sample rotor fully, not take out the PCR or the vessel position circle jumps, etc.) 3. The assembly of the digestion vessel is wrong. 4. Signal changes or drifts, please calibrate the pressure signal. 5. Failure of current channel board.
Zero warning	
Motor System Warning	The current motor angle signal value is wrong. 1. Check whether the motor is blocked. 2. The wiring of the motor or driver is loose.
Motor Warning	
Temperature System Warning	1. The parameters of temperature sensor are abnormal. 2. The wiring of the temperature sensor is loose. 3. The main control board has fault.
Door Unclosed	Check the color of the door status indicator on the Run Interface. Color green means the door is closed, and the gray means the door is unclosed. If the color is gray or red, please open the door and close it again.
P6 Warning	The calibration values of P6 are beyond the normal range: 200±20. 1. The assembly of the digestion vessel is wrong, or the digestion vessel is abnormally placed (vessel bottom is not placed the sample rotor fully, not removed the PCR or the vessel position circle jumps, etc.). 2. The signal values of P6 are wrong, please re-calibrate the pressure signal. 3. The signal of signal board is weaker, please re-calibrate the pressure signal.

FAQ Table 2:

Calibration Warning	The values of parameters P6, P3 or P0 are not in the correct range. 1. Errors occurred during the calibration, such as alarming during the process of calibration, etc. 2. The calibrated values of parameters P6, P3 or P0 are exceptionally close to the critical state. Please re-calibrate the instrument.
Parameters Warning	The parameters of the Program Method interface are wrong, so that the instrument is unable to work normally. Please check if the Heat-Time and the Hold-Time of step1 are 0 at the same time in the current program method. If yes, please correct.
Sound Warning	The system has detected a larger sound. 1. The digestion vessel has exploded; it is the normal protection of the system. 2. External interference or misdetection. Please click [START] button to make the instrument continue to work after confirm that the digestion vessel and the instrument are in normal condition

Chapter 9 Instrument Quality Guarantee

9.1 The instrument quality guarantee is in accordance with the operation manual recorded contents and the correct operation.

9.1.1 Warranty Range

(1) Our company will be responsible for the instrument failure caused by manufacturing defects.

(2) When repair, we may use the spare parts to replace the original parts, also may use the same component to replace the damaged parts.

(3) Abandoned instruments or resold instruments are not in warranty range.

9.1.2 Warranty Period

Since the sale date:

(1) One Year: Main body (including the internal parts)**.**

(2) Instrument Accessories and consumables are not in warranty range.

9.1.3 Conditions with No Warranty

The following conditions even during the warranty period also cannot be free warranty.

(1) Any damage or problem caused by operation environment that is not allowed.

(2) Any damage or problem caused by operations that do not follow the voltage and power using instructions.

(3) Any damage or problem caused by corrosive gases that have nothing to do with the instrument, which affect the spare parts, circuit elements and optical parts.

(4) Any damage or problem caused by improper operation or maintenance.

(5) Any damage or problem caused by improper repair of untrained technical persons.

(6) Abandoned instrument or second-handed instrument.

(7) Any damage or problem caused by disassembly without permission of our company.

(8) Consumables and spare parts that not in warranty period.

(9) Problems caused by spare parts which not in the Warranty Range.

(10) Any problem or damage caused by force majeure, such as earthquake, typhoon, flood, fire, lightning, riots, unrest, crime, terrorism, war, radioactive pollution, the pollution of harmful substances etc.

(11) Problem caused by thunder or unexpected power outage.

9.1.4 The Warranty Limits

(1) That out of the warranty are not in warranty range.

(2) Commercial implied warranties as well as the appropriateness of a particular purpose cannot be warranted. The direct or indirect damage resulting from the express or implied guarantee cannot be compensated.

(3) The information assured in oral or written by sellers who is not accredited by our company cannot be warranty.

(4) The information that inconsistent with the instrument technical specifications assured in oral or written by our company’s sellers cannot be warranty.

Chapter 10 Instrument Maintenance

Users should pay great attention to routine maintenance of the instrument which not only keeps it in stable and highly efficient conditions, but also prolongs its service life.

10.1 Please do maintenance regularly depending on instrument condition. It is suggested to do once a week. **Note: Please calibrate instrument if user restart instrument after long time.**

10.2 Routine Maintenance

After every day's digestion:

10.2.1 Inner Vessel: Disassemble the Inner Vessels and wash the sealing covers and inner vessel bodies with flowing water first, and then put them in 25% of the dilute nitric acid (HNO_3) for more than 12 hours, clean them three times with distilled water or deionized water, then dry them naturally or at 50℃ in the special drying oven.

10.2.2 Outer Vessel： Disassemble the Outer Vessel and the Vessel Cover assembly, clean every part with flowing water first, and then wipe them with clean cloth or dry them naturally. **Note: The Elastomer must be washed with room temperature water; and then dry it naturally without sunshine. Please keep the spare elastomer in the sealed and cool place**.

10.2.3 Repair tool: Please clean it according to the way of cleaning the sample digestion vessel (refer to 10. 2.1).

10.2.4 Signal Board: Please clean it in time, and keep the signal monitoring surface dry and clean.

10.2.5 Make sure all parts of the digestion vessel, sample digestion vessel or outer protective vessel are dry and clean. The sample rotor, auxiliary platform and inner surface of furnace chamber should also be clean and dry.

10.2.6 Please use alcohol cotton swab to clean pressure and temperature monitoring sensors slightly after each use.

10.3 Not using in long time

10.3.1 Pull out the power from the mains network.

10.3.2 Do not place the instrument in the place with vibrating or temperature higher than 40℃ or lower than -20℃ or humidity over 85%.

10.3.3 Do not place the instrument in the place with acidic and alkaline gas.

10.3.4 Do not place the instrument in the place with much dust.

10.3.5 Do not place the instrument in a place under direct sunshine.

Certificate

Instrument Name: Closed Intelligent Microwave Digestion System
Instrument Model:
Production No:

Inspection Items	Inspection Requirements		Results
Appearance	The plastic casing, plating surface and other coating of the product should be uniform in color, no peeling, obvious scratch, exposed base, crackle and blister. The rigid connection parts should not be loose. The movement of movable parts should be smooth, flexible, and positioned correctly, without getting stuck, jumping or obvious lost motion. The connection of exposed parts should be smooth, without burrs, sharp edges and roughnesses. The words, symbols and signs should be clear and firm.		■ Pass □ Fail
Pressure System	1. The internal pressure control range of the instrument should be in the range of 0-10 MPa. 2. The control range of the working pressure is 0-6 MPa.		■ Pass □ Fail
Temperature System	1. The internal temperature control range of the instrument should be in the range of 50～400℃. 2. The control range of the working temperature is 50～250℃.		■ Pass □ Fail
Instrumental Error	The value of the signal relative standard deviation is less than 5%.		■ Pass □ Fail
Safety Requirement	Leakage of microwave power density	At 2450 MHz the value is not more than 5mW/cm^2 at the operation station.	■ Pass □ Fail
	Insulation resistance	Insulation resistance ≥ 1kΩ/V measurement position.	■ Pass □ Fail
	Ac leakage current	Under normal conditions: ≤0.5mA	■ Pass □ Fail
	Dielectric Strength	Does not appear flashover or breakdown under the 1250V, within 1 minute.	■ Pass □ Fail
	Protective Impedance	Have a good grounding protection, Protective Impedance: ≤0.1Ω	■ Pass □ Fail
Conclusion	The instrument is in line with the product standards and specified technical requirements. **Inspector:** **Inspection Date:**		

Equipment Warranty

<table>
<tr><td>Instrument Model</td><td></td><td>Instrument No.</td><td></td></tr>
<tr><td>Warranty Scope</td><td>Complete Machine</td><td>Warranty Status</td><td>□ Warranty Period
□ After Warranty</td></tr>
<tr><td>Sales Company</td><td></td><td>Sell Date</td><td></td></tr>
<tr><td>Receipt Date</td><td></td><td>Consignee</td><td></td></tr>
<tr><td>Date of Repair</td><td></td><td>Service Person</td><td></td></tr>
<tr><td>Date of Review</td><td></td><td>Reviewer</td><td></td></tr>
<tr><td rowspan="10">Inspection Project</td><td>Items</td><td colspan="2">Content of Maintenance</td></tr>
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<tr><td colspan="4">Guarantee:
1. The instrument enjoys the service of quality three guarantees for a year since the sell date. If the instrument goes wrong, please contact with our company or the distributor with both the instrument warranty and the instrument invoice.
2. After the warranty period, it will not charge the cost of inspection in principle and only charges the cost price of the items using in maintenance, but the users must charge the freight charge back and forth.</td></tr>
<tr><td colspan="4">Remark:</td></tr>
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