FISON

Water Bath Shaker
FM-WBS-A100

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Index

1. Safety measures

To facilitate your use, be sure to carefully read this user's manual, to operate and maintain the product according to the requirements in the manual and to properly keep the manual.

Tip for ensuring safety

Danger! (Any negligence may cause major human injury and property damage.)

- The equipment must be reliably grounded to avoid accidental electric leakage that may cause electric shock or fire.
- Repair can only be conducted by professionals. Incorrect repair may lead to damage to this instrument, fire or electric shock.
- A separate socket shall be used for this device. Insert the power plug securely for use; otherwise, overheating or fire may occur.
- Do not unplug the power plug during running; do not unplug the power plug by pulling the power cord.
- Do not use damaged, non-designated, intermediately connected or extended power cord; otherwise, electric shock or fire may occur.
- Do not use a wet hand to insert or remove the power plug. Otherwise, an electric shock may occur.
- Do not insert a finger, rod, or other foreign matter into the air feed port or air inlet. Because the inside fan runs at a high speed, if the running fan is touched by something, the instrument may be damaged or human injury may occur.
- In case of an abnormality (burning smell, etc.), immediately remove the power plug to stop the instrument or cut off the power via a circuit breaker. If the abnormality lasts, overheating may occur and cause fire or electric shock.
- Before opening the door of the instrument box, be sure that the rocking plate is in a quiescent state.
- In case of any of the following, the power plug of this instrument must be unplugged:
  a. Opening the door of the power box of the instrument under an electrified state is easy to cause electric shock.
  b. Replacing the fuse. Replacing the fuse under an electrified state is extremely easy to cause electric shock.
  c. When the instrument fails to normally operate, prevent mistakes from giving rise to further damage to the instrument or accidental human injury.
  d. When the instrument is stopped for a long time, the dust accumulating over the power plug may also lead to electric leakage and further fire.

e. Moving the instrument. Moving the instrument under an electrified state is extremely easy giving rise to an electric shock accident.

⚠ Attention! Instructions to keep the normal life and proper operations of the equipment.

- If heavy force is used to open and close the equipment case door, it will damage the equipment. The equipment must be put on a hard and rigid plane, and make sure it is kept under a level condition.
- Space between the equipment and the wall or other matter must be more than 2cm.
- Never put the equipment near a stove or in a place under the direction of sunshine.
- If the equipment refrigerates under a low temperature continuously for a long time, heating treatment to drive the humidity shall be done once every 10 days.
- To guarantee a refrigeration effect, the condensation unit must be washed once every month.
- Check the fixed screws of the flask clamp often, to prevent noise or the clamp losing.
- The case door of the equipment is not suitable to be opened at will; otherwise, it will affect the constant temperature effect.
- The equipment's surface cannot be contacted with volatilized chemicals, such as gasoline, lacquer thinner, etc.
- Keep the case in and out clean, and often clean the sundries and dirt.
- The apparatus door should not be opened frequently; otherwise, it may disrupt the efficiency of constant temperature.
- The apparatus surface should be placed away from volatile chemicals such as gasoline, lacquer thinner, etc.
- Keep the inside and outside of the box clean and regularly remove foreign bodies and smudges.

⚠ Note! In addition to the above mentioned safety warning and precautions, there are many special tips with a triangular symbol and exclamation mark in this manual. Please read and follow them. Any neglect may lead to risk, major damage or personal injury.

2. Introduction

Water Bath Shaker FM-WBS-A100 is a benchtop reciprocating water bath shaker with microprocessor PID controlled system and 45 L capacity. It has 20 to 200 rpm speed range, RT to 100 °C temperature control range, and 12 × 250 ml standard flask configuration. Designed with LCD display, drainage vale, electro-polished stainless steel lid cover and stainless steel chamber, tray, spring, flask holder. Dual over temperature functions with automatic cut-off in case of low water level or over temperature for heating parts. Used in germ culture, fermentation, hybridization, and research of biochemical reaction, enzyme, cellular tissue and all that require high temperature and oscillation frequency.

3. Features

- ✓ Micro-processing PID controller system
- ✓ Featured with acoustic and visual alarm
- ✓ LCD display
- ✓ Stainless steel chamber, tray, spring and flask holder
- ✓ Electro-polished stainless steel lid cover
- ✓ Anti-vibration suspension buffer ensure low noise and avoid vibration of shaker
- ✓ Drainage valve on the left side for water draining, cleaning and sterilization
- ✓ Ideal temperature controller
- ✓ Automatic recovery from power failure
- ✓ Operating parameter memory function avoids monotonous operations
- ✓ Automatic stop of heating and alarm activation for over temperature
- ✓ Dry heating prevention
- ✓ Automatic stop at end timing activating acoustic and visual alarm

4. Specifications

Model No.	FM-WBS-A100
Capacity	45 L
Control	Microprocessor PID controlled system
Speed range	20 to 200 rpm
Speed accuracy	±1 rpm
Oscillation amplitude	Φ25 mm
Convection mode	Forced convection
Oscillation mode	Linear reciprocating
Drive	Suspension orbit drive
Temperature control range	RT to 100℃
Temperature control accuracy	± 0.1℃ (constant temperature status)
Temperature uniformity	± 0.2℃
Timing range	0 to 999.59 h
Display	LCD (Simultaneous display of set and working parameters)
Flask tray size	430 × 320 mm
Tray number	1 pc
Chamber dimension (D × W × H)	510 × 380 × 240 mm
Overall dimension (D × W × H)	760 × 420 × 370 mm
Power supply	AC 200 to 240V, 50 to 60 Hz
Power	2000 W
Net weight	45 kg

5. Configuration

Specification		Capacity
Standard	Universal spring tray	430 × 320 × 60 mm
Optional	Flask tray	12 × 250 ml
		8 × 500 ml
		6 × 1000 ml
Note: Can choose either standard or optional as an option		

6. Applications

Used in germ culture, fermentation, hybridization, and research of biochemical reaction, enzyme, cellular tissue and all that require high temperature and oscillation frequency. Also has application in research of medicine, biology, numerator, pharmacy and environmental protection.

7. Installation

Preparation before use

1) The apparatus should be placed on a level of dry ground without direct sunlight.
2) The water basin attached to the apparatus should be placed in the middle of the bottom behind the apparatus. *
3) To ensure smooth running, the apparatus must be placed horizontally. Rotate the adjustable feet of the apparatus to make a smooth layout.
4) To ensure adequate cooling space and constant temperature performance, the apparatus must be kept at least 20 cm from the wall and other objects.
5) **Power connection:** Make sure the input power is no less than the specified technical parameters. The power supply is AC220V-240V/50-60Hz.
6) Check and ensure the local power supply voltage meets the requirements. 10% deviation is tolerant.

Note: Item marked with * is only available for refrigerated shaker incubator.

8. Operations

8.1 Control panel

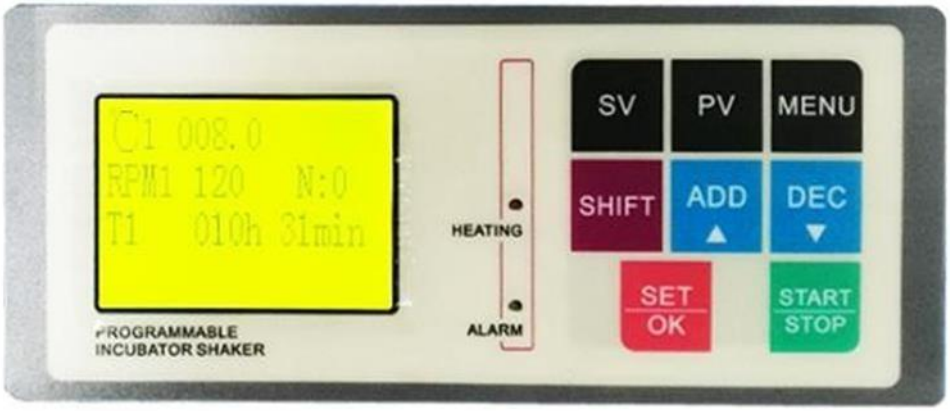
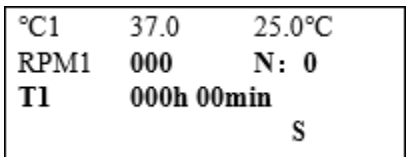


Figure-1 Control panel

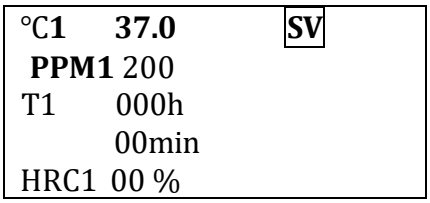
Button	Function
SV	**SV key:** When the LCD displays the PV page, press the SV key to enter the set value page. The set value of the process segment shows.
PV	**PV key:** No matter which pages the LCD displays, press the PV key to return home page (Measured value page).
MENU	**MENU key:** When LCD displays the PV page, press the MENU key to display the menu page.
SHIFT	**Shift key:** Shifting key
ADD▲	**↑key:** Up key or press the key to remove the alarm sounds of the buzzer.
DEC▼	**↓key:** Down key or press the key to change the running state.
SET OK	**SET/OK key:** Select the item to be changed and confirm after reset.
START	**START/STOP:** START/STOP key
STOP	After powering up the equipment, press the key to stop or start the motor.

8.2 Operation

1) **Starting up**
   Find the power switch on the right to power on the equipment, the microcontroller enters the self-inspect procedure, and the LCD displays "Inspecting ...", the program inspects the buzzer and LEDs: all LED indicators flash for 3 times and the buzzer sounds once.
2) **Display the home page (PV page)**
   The LCD displays the currently measured temperature, ambient temperature, measured speed, the current step of the multi-step circle and reciprocating running, total oscillation time, and measured humidity (if a humidity measurement function is available).



3) **Set value (SV page)**
   That means it is displaying the set value currently.



   a. **°C# set temperature**
      SET/OK →°C1 37.0→ ↑ ， adjust with ↓

   b. **PRM# set the rotation speed**
      SET/OK → → →PPM1 200→ ↑, adjust with ↓

   c. **T# Setting the timing**
      SET/OK → → → → →T1 000h 00min→ ↑, adjust the number of hours with ↓ , adjust the number of minutes by → → T1 000h00min,
      After all the settings, press SET/OK to confirm.
   d. If the timer display displays all 0, the motor would run continuously, unless shut down manually.

4) Multi-step sequential program

Constantly press the shifting key → …. → in the set value SV page can shift from Step 1 to Step 8 page, set the parameters in the order of SV1 to SV8, and the equipment will run into the next step automatically after the previous step finished during the run-time. If the rotation speed of a step is set to 0, and the temperature and timing set, the equipment will remain at a constant temperature stop oscillation, and then run the next step at the end of time. If the rotation speed is set and time is set to 0, then the step would run nonstop, unless shut down manually.

5) Circle or reciprocating run the program

Press →key 8 times, then press → to enter the Circle page, the LCD displays:

Circle
Step: 0 <- -> 0
Times: 0
Cleanup Reset

SET/OK →step: The following 0 <- -> 0 becomes a white character on a black background and is adjustable (ranged from 1-7), the second digit in →→ 0 <- -> 0 becomes a white character on a black background and is adjustable (ranging from 2-8), the number must be larger than the first digit (automatically limited by the program). Cycled running among multi-segments is available, and two serial digits can set up repeated running.

Times: number of operations. →→ Times: The following "0" becomes a white character with a black background and it is adjustable (ranging from 1-8). Exit the circle and enter the next program after all the running is completed.

6) Clean up (Delete) all the set parameters:

SET/OK → →, →, → →Clean-up →SET/OK

7) Reset

SET/OK → →, →, → →Reset →SET/OK

a. In the procedure without timing, the timing number would continuously increase after starting the oscillation, press "Reset" to eliminate the timing values.

b. In a multi-step program, cancel the performed procedure.

8) MENU

V.OUT
Alarm
SC
In.Set.

a. Parameters

V.OUT: Store the rotation output voltage
Alarm: Alarm range
SC (Serial Communication): Serial communication
In. Set. (Internal Setting): Internal setting

b. V.OUT Rotation output signal storage

MENU → → V.OUT →SET/OK LCD displays:

V.OUT
SV1 055 rpm
PV1 000 rpm

→ → SV1 055 rpm， is the default value, press the ↑ or ↓ to adjust.
→ → SV2 100 rpm， ……， and 150， 200， 250， 300， 350， 400 in sequence.
The corresponding speed voltage value has been stored at the factory before shipment.
If the speed-measuring photoelectric switch is damaged or the connector receiving the photoelectric signal on the microcontroller is in poor contact, the microcontroller will not receive the speed signal after running for 6 seconds. The microcontroller will select a stored voltage output internally stored equal to or closest to the current speed. At this moment, the lower right corner of the LCD PV menu displays the letter “S” which means there is no feedback signal of the measured speed, the actual speed will occur with some fluctuations, the user should carry out repairs as soon as possible.

If the user needs to save the required speed signal, select the closest sequential default value to the required speed, press the ↑ or ↓ key to adjust it to the required value, and then start the motor.
When the measured speed PV1 is equal to the setting speed SV1, press the SET / OK key to confirm, that the buzzer sounds once, and the corresponding digital value of the microcontroller voltage output is saved. If PV1 ≠ SV1, it’s invalid to press the SET / OK key.

c. Alarm range

MENU → →→ → Alarm →SET/OK LCD displays:

Alarm
Temperature ： ±3 ℃
Speed ： ±30 rpm
RFS ： OFF

d. Over-temperature alarm:

The optional range of temperature alarm is from 1 to 9, it will trigger the alarm if exceeding the limitation in the operation, the buzzer sounds intermittently, and the yellow LED light on the panel is on. Press the "Up" key on the PV menu to stop the buzzer from sounding, but the yellow light remains on. The alarm stops when the temperature returns to the normal level.

In the multi-step running process, the over-temperature alarm is unavailable during temperature rise/fall and defrosting of each processing step.

e. Over-speed alarm:

The limit range of rotation speed is 5-50rpm. The alarm is unavailable during the rotation speed-changing stage of starting or multi-step running. After starting, the rotation speed remains stable at ± 5rpm for 1 minute, only the acoustic alarm will be activated again if the rotation speed exceeds the alarming range for 3 seconds. If the rotation speed exceeds the maximum speed of the internal setting for 3 seconds, the buzzer sounds and the voltage controlling speed will drop to zero and oscillating is stopped.

RFS Restore (Factory Settings):

→ →→ →→ → RFS OFF →SET/OK→ ON, the buzzer sounds once, meanwhile, the internal set temperature calibration parameters would be reset to the factory default setting.

9) Start and Shutdown

a. After completion of the above settings, press the "start/stop" key and the apparatus will work according to the set procedure.
b. During running, press the "start / stop" key to stop the rotation of the tray. The remaining time would be maintained.
c. Press the "start / stop" key again to enter the running state, and the remaining time will count down.
d. The power switch on the right side of the apparatus must be turned off and unplugged after use.

9. Accessories

Accessories no.	Accessories name	Dimension	Unit
1	Stainless steel universal spring tray	430 × 320 × 80 mm	1
2	Stainless steel flask tray	430 × 300 × 80 mm	1

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