



Medical–Biological  
Research & Technologies

# TS-100

## Thermo-Shaker

for microtubes and PCR plates



**Operating Manual  
Certificate**

for version  
V.3AW

# Contents

1. Safety Precautions
2. General Information
3. Getting Started
4. Operation
5. Calibration
6. Specifications
7. Maintenance
8. Warranty and Claims
9. Declaration of Conformity

# 1. Safety precautions

The following symbols mean:



**Caution:** Make sure you have fully read and understood the present Manual before using the equipment. Please pay special attention to sections marked by this symbol.



**Caution:** Surfaces can become hot during use!

## GENERAL SAFETY

- Use only as specified in the operating manual provided.
- The unit should be saved from shocks or falling.
- The unit must be stored and transported in a horizontal position (see package label).
- After transportation or storage keep the unit under room temperature for 2-3 hrs before connecting it to the electric circuit.
- Use only standard qualitative tubes.
- Use only cleaning and decontamination methods recommended by the manufacturer.
- Do not make modifications to the design of the unit.

## ELECTRICAL SAFETY

- Connect only to the external power supply unit with voltage corresponding to that on the serial number label.
- Use only the external power supply unit provided with this product.
- Ensure that the power switch and external power supply are easily accessible during use.
- Do not plug the unit into an ungrounded power socket, and do not use an ungrounded extension lead.
- Disconnect the unit from electric circuit before moving.
- Disconnect the external power supply unit from power socket to turn off the unit.
- If liquid penetrates into the unit, disconnect it from the external power supply unit and have it checked by a repair and maintenance technician.
- Do not operate the unit in premises where condensation can form. Operating conditions of the unit are defined in the Specifications section.

## DURING OPERATION

- Do not leave the operating unit unattended.
- Do not impede the platform motion.
- Do not operate the unit in environments with aggressive or explosive chemical mixtures. Please contact manufacturer for possible operation of the unit in specific atmospheres.
- Do not operate the unit if it is faulty or has been installed incorrectly.
- Do not use outside laboratory rooms.
- Do not check the temperature by touch. Use a thermometer.

## BIOLOGICAL SAFETY

- It is the user's responsibility to carry out appropriate decontamination if hazardous material is spilt on or penetrates into the equipment.

## 2. General Information

TS-100 Thermo-shaker provides mixing and temperature control of samples in microtest tubes or PCR plate. Features of TS-100 meet the highest expectations of users according to many parameters:

- Fast reaching of specified mixing speed and maintenance of equal amplitude of rotation throughout the Thermo-shaker block;
- Stability of maintaining the set temperature in a wide range throughout the Thermo-shaker's block surface;
- With the help of the temperature calibration function the user can calibrate the unit approx.  $\pm 6\%$  of the selected temperature to compensate differences in the thermal behaviour of tubes from different manufacturers;
- LCD display indicates set and current values of temperature, speed and time of operation;
- Quiet motor operation, compact size, prolonged service life.

Functions of heating (up to  $+100^{\circ}\text{C}$ ) and mixing can be performed both simultaneously and independently, i.e. the unit implements three devices in one:

1. Shaker;
2. Dry-block thermostat;
3. Thermo-shaker.

There are five heating and cooling blocks available, including a block with a plastic lid for PCR-plates. All blocks are mutually interchangeable and can be easily installed on thermo-shaker.

The device is applicable in:

- genetic analyses — in extraction of DNA, RNA and further sample preparation;
- biochemistry for studying of enzymatic reactions and processes;
- extraction of metabolites from cellular material.

## 3. Getting started

### 3.1. Unpacking

Remove packing materials carefully and retain for future shipment or storage of the unit.

Examine the unit carefully for any damage incurred during transit. The warranty does not cover in-transit damage.

### 3.2. Complete set

Thermo-Shaker set includes:

#### Standard set

- TS-100 Thermo-Shaker ..... 1 piece
- spare rubber belt ..... 2 pieces
- external power supply unit ..... 1 piece
- power cord ..... 1 piece
- Operating Manual; Certificate ..... 1 copy

#### Optional accessories

- SC-18 thermoblock for microtubes ❶ ..... on request
- SC-18/02 thermoblock for microtubes ❷ ..... on request
- SC-24 thermoblock for microtubes ❸ ..... on request
- SC-24N thermoblock for microtubes ❹ ..... on request
- SC-96A thermoblock ❺ and hex-key ..... on request



### 3.3. Set up:


- place the unit upon even horizontal non-flammable surface 30 cm away from any flammable materials;
- remove protective film from the display;
- plug the external power supply unit into the socket at the rear side of the unit.

### 3.4. Thermoblock installation (if thermoblock is not installed)



#### Caution!

Thermoblock installation and replacement have to be performed only when the Power switch is turned off and external power supply is disconnect from the device.

- Choose the thermoblock, connect the plug to the contact terminal according to the scheme on Fig. 1/1 on the underside of the thermoblock. Make sure that the connector is mounted tightly.
- Align the thermoblock so that the warning label  is facing the front of the unit.
- Secure with the four knurled screws (fig.2/1).

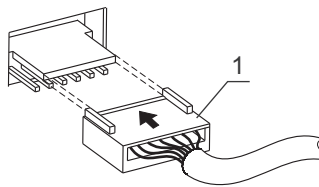


#### Note!

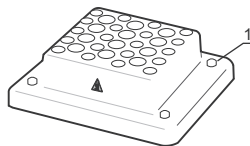
When installing **SC-96A** thermoblock, drive one by one 4 screws for several turns and fix them with a hex-key (included in SC-96A thermoblock set).

### 3.5. Changing blocks

- Disconnect the external power supply unit from the device.
- Remove the four knurled screws (fig.2/1), disconnect the plug (fig. 1/1).
- Select the new thermoblock and install it according to the point 3.4.



**Fig.1 Thermoblock connection**



**Fig.2 Thermoblock set up**

## 4. Operation

### Recommendations during operation



Please check the tubes/microwell plates before using, be sure that tubes/microwell plates are thermoresistant. Don't heat the tubes/microwell plates over the melting point of the material they are made of (use thermoresisting polypropylene tubes). Remember that thin-walled tubes have a higher thermoconducting factor.

- Tube caps can open under the action of high temperature ( $>85^{\circ}\text{C}$ ), thus causing sample volume shrinkage or potential health risk when working with infected material. To prevent such cases it is recommended to use tubes with cap lock of Safe-Lock<sup>®</sup> type.
  - It is recommended to fill test tubes up to 75% of the rated volume for efficient mixing.
- 4.1. Connect external power supply unit to a grounded power socket and set the power switch, located on the rear panel of the unit, to position I (ON).
- 4.2. The display will turn on with the upper line (Set) showing time, speed and temperature set earlier and the lower line (Actual) showing current readings of the same parameters (thermoblock temperature  $^{\circ}\text{C}$ , which automatically starts rising according to the temperature set in the upper line). The time of temperature stabilisation depends on the initial temperature.
- Setting the parameters.** Use the readings in the upper line of the display (Set), while setting the required parameters.
- 4.3. **Setting time (TIME).** Using the ▲ and ▼ keys (Fig. 3/1) set the required working time interval in hours and minutes (increment - 1 min). Pressing the key for more than 3 s will increase the increment.
- 4.4. **Setting speed (RPM).** Using the ▲ and ▼ keys (Fig. 3/2) set the required speed (increment 10 rpm). Pressing the key for more than 3 s will increase the increment.
- 4.5. **Setting temperature (T ( $^{\circ}\text{C}$ )).** Using the ▲ and ▼ keys (Fig. 3/3) set the necessary temperature (increment  $0.1^{\circ}\text{C}$ ). Pressing the key for more than 3 s will increase the increment.

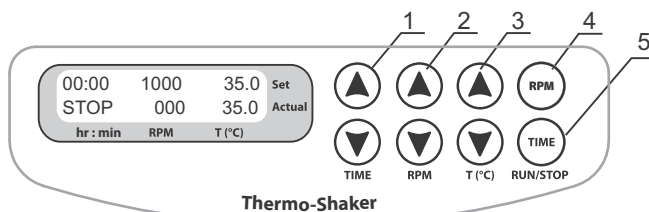


Fig. 3 Control panel



**Caution!**

Thermoblock rotation finishing does not stop the heating/temperature maintenance process. Thermoblock thermal regulation can be turned off only by setting the required temperature below 25 °C (the display will show OFF - T,°C - set point). In this mode TS-100 can be used in the cold rooms as a mixing device without thermoregulation.

The set parameters can also be changed during operation.

**Program execution**

After the thermal stabilisation of the Thermo-Shaker (when the set and current temperature readings become the same):

- 4.6. Insert tubes into the thermoblock sockets or place the microwell plate on the thermoblock and close the lid.
- 4.7. Press the **RPM-RUN/STOP** key (Fig. 3/4). The thermoblock will start rotating and the timer indicator will start counting up the time interval (with 1 min precision).

**Note!**

If the rotation speed is set to zero, pressing **RPM-RUN/STOP** key will start the timer but the thermoblock will not move.

- 4.8. After finishing the program (after the set time elapses) the thermoblock motion will stop and the timer will show the flashing reading STOP accompanied by the repetitive sound signal until the **RPM-RUN/STOP** key is pressed.
- 4.9. If the working time is not set (or is reset) and the timer indicator in the upper line shows 00:00, pressing the **RPM-RUN/STOP** key will start continuous operation of the device with countdown timer in the lower line (Actual) until the **RPM-RUN/STOP** key is pressed again.
- 4.10. If required, there is possibility to restart the timer when it is running. Press the **TIME-RUN/STOP** key once (Fig. 3/5) to stop the timer. Press the **TIME-RUN/STOP** key again to restart the timer.
- 4.11. The thermoblock motion can be stopped at any time by pressing the **RPM-RUN/STOP** key. In this case the program realisation and the thermoblock motion will stop and the timer will switch into the STOP mode saving previously set time. Press the **RPM-RUN/STOP** key to repeat the operation with the same time and speed.

**Caution!**

At the end of the set time period the thermoblock movement is stopped automatically, but the heating can be stopped only manually by reducing the temperature using the ▼ T,°C key (Fig. 3/3 - lower button) till the OFF sign appears in the upper line (Set) of the display.

- 4.12. After finishing the operation set the power switch, located on the rear panel of the unit, in position O (Off) and disconnect the external power supply from electric circuit.

## 5. Calibration

- 5.1. The device is pre-calibrated at the factory (calibrating coefficient is 1.00) for operation with temperatures, measured by a sensor, installed in the heating block.
- 5.2. To enter the calibration coefficient, hold the **TIME-RUN/STOP** key (Fig. 3/5) pressed for more than 8 s to activate calibration mode. The calibration coefficient will be shown on the display (Fig. 5/1).
- 5.3. Set 1.000 value using the ▲ and ▼ keys (Fig. 3/3) as shown on Fig. 5/1 to restore the factory settings.
- 5.4. Press the **RPM-RUN/STOP** key once to exit the calibration mode.

### Calibration procedure

- 5.5. Install autonomic sensor (0.5 C accuracy) into the tubes, placed into the block sockets.
- 5.6. Set the required temperature in operation mode (e.g. 40°C).
- 5.7. After the unit reaches the set temperature (when the set and current temperature readings equal) leave the unit for 30 min for thermal stabilization.
- 5.8. Let us assume that the readings of independent sensor is 39°C, but the display's actual temperature is 40 °C (Fig.4). Then it is necessary to add 1°C correction.

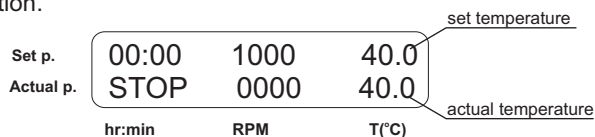


Fig.4 Control panel in operation mode

- 5.9. Hold **TIME-RUN/STOP** key (Fig. 3/5) pressed for more than 8 s to activate calibration mode. The following parameters will be shown on the display (Fig. 5).

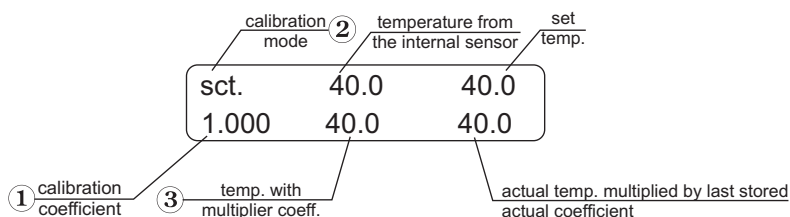
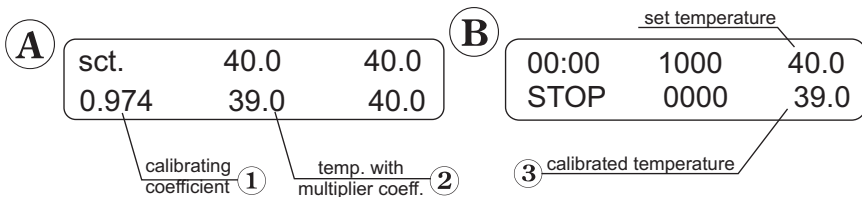


Fig.5 Control panel in calibration mode



**Fig.6 Control panel in calibration and operation mode**

- 5.10. Using the **Temp.** ▲ and ▼ keys (Fig.3/3), change the calibration coefficient (Fig.6A/1) so, that the new temperature value (Fig.6A/2) corresponds to the autonomic sensor temperature. In our example the calibration coefficient will be 0.974 (in range: 0.936 up to 1.063; increment 0.001).



**Caution!** This calibrating coefficient will correct temperature through all the operation range.

- 5.11. After finishing the calibration press the **RPM-RUN/STOP** key (Fig.3/4) once to save the changes and exit the calibration mode.
- 5.12. The display will show calibrated temperature as shown on fig.6B/3 and the unit will continue thermal stabilization according to the previously set temperature.

## 6. Specifications

The unit is designed for operation in cold rooms, incubators and closed laboratory rooms at ambient temperature from +4°C to +40°C in a non-condensing atmosphere and maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C.

### 6.1. Temperature specifications

|   |                           |
|---|---------------------------|
| Setting range .....                                   | +25 to +100°C             |
| Control range .....                                   | 5 above RT to +100°C      |
| Setting resolution .....                              | 0.1°C                     |
| Stability .....                                       | ±0.1°C                    |
| Accuracy at +37°C .....                               | ±0.5°C                    |
| Uniformity over the thermoblock at + 37°C .....       | ±0.1°C                    |
| Average heating speed from +25°C to +100°C.....       | 4°C/min                   |
| Time of thermoblock heating from +25°C to +37°C ..... | 6 min                     |
| Temperature calibration option                        |                           |
| Calibration coefficient range .....                   | 0.936 ... 1.063 (± 0.063) |

### 6.2. General specifications

|  |                    |
|--|--------------------|
| Speed setting range .....  | 250–1400 rpm       |
| Speed setting resolution .....   | 10 rpm             |
| Acceleration time until max. speed, not more than .....                    | 3 s                |
| Maximal speed deviation  |                    |
| for 250 rpm .....  | 2%                 |
| for 1400 rpm.....  | 0.7 %              |
| Digital time setting.....  | 1 min–96 hrs       |
| Time setting resolution .....  | 1 min              |
| Maximum continuous operation time .....                                    | 96 hours           |
| (recommended interval between operation sessions not less than 8 hours)    |                    |
| Orbit .....  | 2 mm               |
| Display .....  | 16x2 signs, LCD    |
| Dimensions .....   | 205x230x130 mm     |
| Input current/power consumption .....                                      | 12 V, 3.5 A / 42 W |
| External power supply unit ... input AC 100–240 V 50/60 Hz, output DC 12 V |                    |
| Weight* .....  | 3.2 kg             |

\* Accurate within ±10%.

| Optional accessories | Description   | Mass*, kg | Catalogue number |
|----------------------|---|-----------|------------------|
| SC-18                | for 20x0,5ml and 12x1,5ml tubes   | 0.5       | BS-010120-AK     |
| SC-18/02             | for 20x0,2ml and 12x1,5ml tubes   | 0.5       | BS-010120-CK     |
| SC-24                | for 24x2,0ml tubes  | 0.4       | BS-010120-EK     |
| SC-24N               | for 24x1,5ml tubes  | 0.5       | BS-010120-GK     |
| SC-96A               | Thermoblock for 96-well microplate for PCR (without skirt or with half skirt, low and high profile) | 0.5       | BS-010120-AK     |

| Replacement parts | Description  | Catalogue number |
|-------------------|--------------|------------------|
| Rubber belt       | 122x6x0.6 mm | BS-000000-S18    |

\* Accurate within  $\pm 10\%$ .



**Note.** TS-100 blocks and TS-100C blocks are not interchangeable, i.e. TS-100C blocks cannot be used on TS-100 and vice versa.

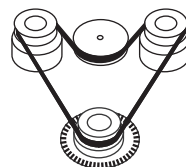
Biosan is committed to a continuous programme of improvement and reserves the right to alter design and specifications of the equipment without additional notice.

## 7. Maintenance

- 7.1. If the unit requires maintenance, disconnect the unit from the electric circuit and contact Biosan or your local Biosan representative.
- 7.2. All maintenance and repair operations must be performed only by qualified and specially trained personnel.
- 7.3. Standard ethanol (75%) or other cleaning agents recommended for cleaning of laboratory equipment can be used for cleaning and decontamination of the unit.
- 7.4. Rubber belt replacement.

For maintenance of reliable operation of the device the producer recommends to replace rubber belts after 1.5 years or 2000 hours of operation time.

- Disconnect the external power supply unit from the device.
- Remove 4 fixation screws on the device bottom and remove the bottom plate. Replace the rubber belt (fig.7).
- Re-assemble the device.



**Fig.7 Rubber belt replacement**

## 8. Warranty and Claims

- 8.1. The Manufacturer guarantees the compliance of the unit with the requirements of Specifications, provided the Customer follows the operation, storage and transportation instructions.
- 8.2. The warranted service life of the unit from the date of its delivery to the Customer is 24 months. Contact to your local distributor to check availability of extended warranty.
- 8.3. If any manufacturing defects are discovered by the Customer, an unsatisfactory equipment claim shall be compiled, certified and sent to the local distributor address. Please visit [www.biosan.lv](http://www.biosan.lv), Technical support section to obtain the claim form.
- 8.4. The following information will be required in the event that warranty or post-warranty service comes necessary. Complete the table below and retain for your records.

|               |  |
|---------------|--|
| Model         | TS-100 Thermo-Shaker for microtubes and PCR plates |
| Serial number |  |
| Date of sale  |  |

## 9. Declaration of Conformity

### Declaration of Conformity

|                           |  |
|---------------------------|--|
| <b>Equipment name:</b>    | TS-100   |
| <b>Type of equipment:</b> | Thermo-Shaker  |
| <b>Directive:</b>         | EMC Directive 2004/108/EC<br>Low Voltage Directive 2006/95/EC<br>RoHS 2011/65/EC<br>WEEE 2002/96/EC & 2012/19/EU   |
| <b>Manufacturer:</b>      | SIA BIOSAN<br>Ratsupites 7, build.2, Riga, LV-1067, Latvia   |
| <b>Applied Standards:</b> | <b>EN 61326-1:</b><br>Electrical equipment for measurement, control and laboratory use EMC requirements. General requirements<br><b>EN 61010-1:</b><br>Safety requirements for electrical equipment for measurement, control and laboratory use. General requirements<br><b>EN 61010-2-010:</b><br>Particular requirements for laboratory equipment for the heating of materials<br><b>EN 61010-2-051:</b><br>Particular requirements for laboratory equipment for mixing and stirring |

We declare that this product conforms to the requirements of the above Directive(s)

  
\_\_\_\_\_  
Signature  
Svetlana Bankovska  
Managing director

12.06.2013  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Signature  
Aleksandr Shevchik  
Engineer of R&D

12.06.2013  
\_\_\_\_\_  
Date

# How to choose a proper Shaker, Rocker, Vortex



PSU-20i

ES-20/60  
(with heating)

- Applications:
- Microbiology
  - Extraction
  - Cell growing



PSU-10i



ES-20  
(with heating)



MR-12



## Volume of liquids

$10^3 \dots 10^2$  ml

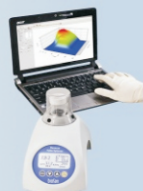
Erlenmeyer flasks, Cultivation flasks  
and 50 ml tubes



Multi RS-60



RTS-1



MR-1

- Applications:
- Agglutination
  - Extraction
  - Gel staining/  
destaining



Multi Bio 3D

- Applications:
- Agglutination
  - Extraction
  - Blot hybridisation
  - Gel staining/destaining



$10^1$  ml

Petri dishes, vacutainers  
and tubes up to 15 ml



Multi Bio RS-24

- Applications:
- Microbiology
  - Extraction
  - Cell growing



V-1

- Applications:
- DNA-analysis
  - Genome sequence



PSU-2T

PST-60HL-4  
(with heating)



PST-60HL  
PST-100HL  
(with heating)

- Applications:
- ELISA analysis
  - Hybridization

MPS-3500



TS-100 (with heating)  
TS-100C (with heating  
and cooling)



V-32



$10^0 \dots 10^{-3}$  ml

PCR plates, microtest plates  
and Eppendorf type tubes