

TS-100 & TS-100C

Thermo-shakers for microtubes and PCR plates



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1. About this edition of the operating manual

The manual applies to following models and versions of thermo-shakers for micro-tubes and PCR plates:

- **TS-100** version V.4AW
- **TS-100C** version V.5AW

2. 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!

Hot surface! Platform surface becomes very hot during use. Always use protective cotton gloves to install or remove samples when the temperature is set higher than 60°C.

GENERAL SAFETY

- Use only as specified in the operating manual provided.
- Save the unit from shocks or falling.
- Store and transport the unit in a horizontal position (see package label) at ambient temperatures between -20°C and +60°C and maximum relative humidity of 80%.
- After transportation or storage keep the unit under room temperature for 2-3 h before connecting it to the electric circuit.
- Use only original parts and accessories, provided by manufacturer for this product.
- Before using any cleaning or decontamination methods except those recommended by the manufacturer, check with the manufacturer that the proposed method will not damage the equipment.
- Do not make modifications to the design of the unit.

ELECTRICAL SAFETY

- Connect only to the external power supply with voltage corresponding to that on the serial number label.
- Use only the external power supply 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.
- If liquid penetrates into the unit, disconnect it from the external power supply 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.

ALARM SOUND SIGNALS

- Frequently repeating short notes after finishing the operation (see **5.6.3**).
- Infrequently repeating short notes if an error occurred (see **9.5**)

BIOLOGICAL SAFETY

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

3. General information

TS-100 and TS-100C thermo-shakers are designed for intensive mixing of samples in microtest tubes or PCR plates in a temperature controlled environment. The TS-100C model of thermo-shaker differs from TS-100 in the possibility of cooling samples down to +4°C. Features of thermo-shakers 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 block surface of thermo-shakers;
- With the help of the temperature calibration function, the user can calibrate the unit approximately $\pm 6\%$ of the selected temperature to compensate differences in the thermal behaviour of tubes from different manufacturers;
- LCD display indicates pre-set and current values of temperature, speed and time of operation;
- Quiet motor operation, compact size, prolonged service life;
- Sensor error handling and diagnostics;

Functions of heating and mixing can be performed either simultaneously or independently, that allows using the unit as three independent devices:

1. Thermostat;
2. Shaker;
3. Thermo-shaker.

We offer five heating and cooling blocks for each model, including a block with a plastic lid for PCR-plates. Within one model of thermo-shaker, the blocks are mutually interchangeable and can be easily installed.

The devices are applicable in:

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

4. Getting started

4.1. **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. Warranty covers only units transported in the original package.

4.2. **Complete sets.**

4.2.1. TS-100

- TS-100 thermo-shaker for microtubes and microplates 1 pce
- External power supply 1 pce
- Power cable 1 pce
- Spare rubber belt 2 pcs
- Operating manual, declaration of conformity 1 pce
- 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 for microplate ❺ and hex-key on request

4.2.2. TS-100C

- TS-100C thermo-shaker with cooling for microtubes and microplates 1 pce
- External power supply 1 pce
- Power cable 1 pce
- Spare rubber belt 2 pcs
- Operating manual, declaration of conformity 1 pce
- SC-18C thermoblock for microtubes ❻ on request
- SC-18/02C thermoblock for microtubes ❼ on request
- SC-24C thermoblock for microtubes ❸ on request
- SC-24NC thermoblock for microtubes ❹ on request
- SC-96AC thermoblock for microplate ❺ and hex-key on request



❶



❷



❸



❹



❺



6



7



8



9



10

4.3. Setup.

- Place the unit upon even horizontal stable non-flammable surface 30 cm away from any flammable materials, and clear 20 cm around the device on all sides for ventilation.
- Remove protective film from the display;
- Plug the external power supply into the socket at the rear side of the unit;
- Connect the power cable to the external power supply.

4.4. Thermoblock installation (if a 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.



Caution!



Thermoblocks for TS-100 and TS-100C are **not** interchangeable! Installing a thermoblock from different model will irreversibly damage both the unit and the thermoblock! TS-100C thermoblocks have an additional sticker.

- 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 (fig. 2).
- Secure with the four knurled screws (fig. 2/1) or four hex screws.

4.5. Changing blocks.

- Disconnect the external power supply from the device.
- Remove the four knurled screws or four hex screws (in microplate thermoblocks).
- Lift the block without damaging the cable and disconnect the plug (fig. 1/1).
- Select the new thermoblock and install it according to 4.4.

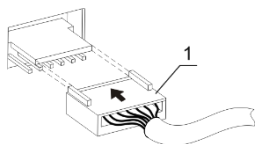


Figure 1. Thermoblock connection

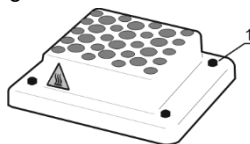


Figure 2. Thermoblock setup

5. Operation

Recommendations during operation

- Please check the tubes/microplates before using, be sure that tubes and micro plates are heat-resistant. Do not heat the microplates over the melting point of the material they are made of.
- We recommend filling tubes and plate wells up to 75% of rated volume for efficiency.



Caution!

Platform surface becomes very hot during use. Please, take necessary care and use protective cotton gloves to install or remove test samples when set temperature is higher than 60°C.

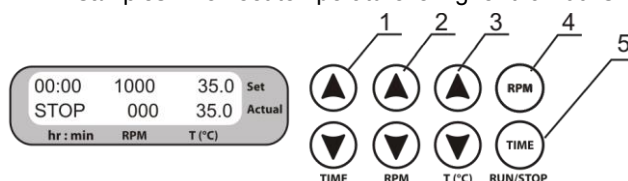


Figure 3. Control Panel

- 5.1. Connect external power supply to a grounded power socket and set the power switch, located on the rear panel of the unit, to position I (ON).
- 5.2. The display will turn on with the upper line (Set) showing time, speed and temperature set earlier and the lower line (Actual) showing current status: STOP indication, 000 rpm speed and platform temperature in °C.
 - 5.2.1. Simultaneously press and hold the **RPM RUN/STOP** and **TIME RUN/STOP** keys (fig. 3/4 and 3/5) to view the programming version (PV-XX).
- 5.3. If a temperature is set, then the platform temperature automatically changes to that temperature. The time of temperature stabilization depends on the room temperature. If the heating of is turned off by setting the temperature below 25°C (TS-100) or 4°C (TS-100C), top line shows indication OFF.
- 5.4. **Setting the parameters.** Use the readings in the upper line of the display (Set), while setting the required parameters. Pressing the key for more than 3 s will increase the increment rate. Speed and temperature can be changed during operation.
 - 5.4.1. **Setting time (TIME).** Using the ▲ and ▼ **TIME** keys (fig. 3/1) set the required working time interval in hours and minutes (increment 1 min).
 - 5.4.2. **Setting speed (RPM).** Using the ▲ and ▼ **RPM** keys (fig. 3/2) set the required speed (increment 10 rpm).

- 5.4.3. **Setting temperature (T, °C).** Using the ▲ and ▼ T, °C keys (Fig. 3/3) set the necessary temperature (increment 0.1°C).



Caution! Heating/temperature maintenance process does not stop when the timer is finished. Platform thermal regulation can be turned off only by setting the required temperature below 25°C (TS-100) or 4°C (TS-100C), top line shows indication OFF. In this mode, thermo-shaker can be used in the cold rooms as a mixing device without thermoregulation.

- 5.5. **Program execution.** After the thermal stabilization of the thermo-shaker, i.e. when the set and current temperature readings become the same:

- 5.5.1. Place samples on the platform.



Caution! Do not fill microtubes or microplates directly inside the unit.

- 5.5.2. Press the **RPM RUN/STOP** key (fig. 3/4). The platform 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 platform will not move.

- 5.5.3. After finishing the program (after the set time elapses) the platform 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.

- 5.6. 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.

- 5.7. 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.

- 5.8. The platform motion can be stopped at any time by pressing the **RPM RUN/STOP** key. In this case the program realization and the platform 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 platform 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 key) till the OFF sign appears in the upper line (Set) of the display



Caution! The platform remains hot after use. Please, take necessary care and use protective cotton gloves to install or remove test samples when set temperature is higher than 60°C.

- 5.9. 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.

6. Calibration

- 6.1. The device is precalibrated at the factory (calibrating coefficient is 1.000) for operation with temperatures measured by a sensor in the heating block.
- 6.2. To change the calibration coefficient, hold the **TIME RUN/STOP** key pressed for more than 8 s to activate calibration mode. The calibration coefficient appears on the display (figure 4).

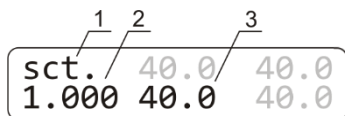


Figure 4. Display in calibration mode: 1. Calibration mode indicator; 2. Calibration coefficient; 3. Temperature with current coefficient



Note.

Values marked in grey on figures 4 and 5 are not used in calibration and are meant for service engineers.

- 6.3. **Restoring factory settings.** Set 1.000 value using the **▲** and **▼ T, °C** keys as shown on fig. 4/1 to restore the factory settings. Press the **RPM RUN/STOP** key once to save the changes and exit the calibration mode.



Note.

Coefficient value changes are recommended after the unit has reached 30°C temperature.

- 6.4. **Calibration procedure.** To calibrate the unit, use an independent sensor with 0.5°C accuracy, which can fit in the cell of a microplate on the platform.
- 6.4.1. Install the sensor into a cell of the microplate.
- 6.4.2. Set the required temperature in operation mode (e.g. 40°C).
- 6.4.3. After the unit reaches the set temperature (when the set and current temperature readings equal), leave the unit for 30 min for thermal stabilization.
- 6.4.4. Let us assume that the readings of independent sensor is 39°C, but the display's actual temperature is 40°C. Then, it is necessary to add 1°C correction.
- 6.4.5. Hold the **TIME RUN/STOP** key pressed for more than 8 s to activate calibration mode (figure 4).
- 6.4.6. Using the **▲** and **▼ T, °C** keys, change the calibration coefficient (fig. 5/1) so that the new temperature value (fig. 5/2) corresponds to the independent sensor temperature. In our example, the calibration coefficient will be 0.974.



Note.

Calibration coefficient can be changed in range from 0.936 to 1.063 (± 0.063), with increment of 0.001. This calibrating coefficient will correct temperature through all the operation range.



Note.

Coefficient value changes are recommended after the unit has reached 30°C temperature.

- 6.4.7. Press the **RPM RUN/STOP** key once to save the changes and exit the calibration.
- 6.5. The display will show calibrated temperature as shown on fig. 6/1 and the unit will continue thermal stabilization according to the previously set temperature.

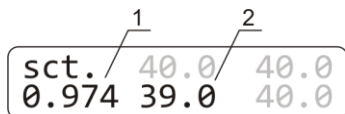


Figure 5. Changing the coefficient:

1. Calibration coefficient; 2. Temperature with current coefficient

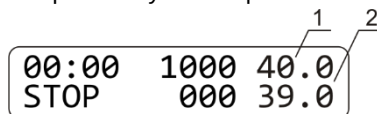


Figure 6. Display after calibration:

1. Set temperature; 2. Current calibrated temperature

7. Specifications

The unit is designed for operation in cold rooms, incubators (excluding CO₂ 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.

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

Temperature parameters		TS-100	TS-100C
Setting range		+25°C to +100°C	+4°C to +100°C
Control range		5°C above RT ¹ to +100°C	15°C below RT ¹ to +100°C
Setting resolution		0.1°C	
Stability ² , at +37°C		±0.1°C	
Maintaining accuracy ² , at +37°C		±0.5°C	
Uniformity over the platform ² ,	at +4°C	-	±0.6°C
	at +37°C	±0.2°C	±0.1°C
	at +100°C	±0.2°C	±0.3°C
Average heating speed from +25°C to +100°C		4°C/min	5°C/min
Average cooling speed	from +100°C to +25°C	-	5°C/min
	from +25°C to +4°C	-	1.8°C/min
Calibration option		yes	
Calibration coefficient range		0.936...1.063 (± 0.063)	

General parameters		TS-100	TS-100C
Speed range		250-1400 rpm	
Speed setting resolution		10 rpm	
Maximal speed deviation	for 250 rpm	2%	
	for 1400 rpm	0.7%	
Orbit		2 mm	
Digital time setting		1 min - 96 h	
Time setting and countdown resolution		1 min	
Maximal continuous operation time ³		168 h	
Display		16x2 symbols, LCD	
Dimensions	Without thermoblock, LxWxH	220x240x90 mm	
	With thermoblock, LxWxH _{max}	220x240x130 mm	
Input voltage and current / power consumption		12 V, 3.5 A / 42 W	12 V, 4.9 A / 60 W
External power supply		in AC 100-240 V, 50/60 Hz, out DC 12 V	
Weight ⁴		3.7 kg	

¹ Room temperature

² Data for 75% filled tubes or microplates

³ Recommended interval between prolonged operation sessions not less than 1 hour

⁴ Accurate within ± 10%.

8. Ordering information

8.1. Models and versions available:

Model	Version	Description	Catalogue number
TS-100	V.4AW	100-240 V, 50/60 Hz	BS-010120-AAI
TS-100C	V.5AW	100-240 V, 50/60 Hz	BS-010143-AAI

8.2. To inquire about or order the optional accessories or the replacement parts, contact Biosan or your local Biosan representative.

8.2.1. Optional thermoblocks for TS-100:

Model	Description	Weight ¹ , kg	Catalogue number
SC-18	For 20x0.5 ml + 12x1.5ml tubes	0.5	BS-010120-AK
SC-18/02	For 20x0.2 ml + 12x1.5ml tubes	0.5	BS-010120-CK
SC-24	For 24x2.0 ml microtubes	0.4	BS-010120-EK
SC-24N	For 24x1.5 ml microtubes	0.5	BS-010120-GK
SC-96A	For 96-well microplate for PCR, w/o skirt, with half skirt, low and high profile	0.5	BS-010120-FK

8.2.2. Optional thermoblocks for TS-100C:

Model	Description	Weight ¹ , kg	Catalogue number
SC-18C	For 20x0.5 ml + 12x1.5ml tubes	0.7	BS-010143-AK
SC-18/02C	For 20x0.2 ml + 12x1.5ml tubes	0.7	BS-010143-CK
SC-24C	For 24x2.0 ml microtubes	0.6	BS-010143-EK
SC-24NC	For 24x1.5 ml microtubes	0.7	BS-010143-GK
SC-96AC	For 96-well microplate for PCR, w/o skirt, with half skirt, low and high profile	0.7	BS-010143-FK



Caution!



Thermoblocks for TS-100 and TS-100C are **not** interchangeable! Installing a thermoblock from different model will irreversibly damage both the unit and the thermoblock! TS-100C thermoblocks have an additional sticker.

8.2.3. Universal replacement parts for TS-100 and TS-100C

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

¹ Accurate within $\pm 10\%$.

9. Maintenance

- 9.1. If the unit requires maintenance, disconnect the unit from the electric circuit and contact Biosan or your local Biosan representative.
- 9.2. All maintenance and repair operations must be performed only by qualified and specially trained personnel.
- 9.3. Standard ethanol (75%) or other cleaning agents recommended for cleaning of laboratory equipment can be used for cleaning and decontamination of the unit.
- 9.4. **Rubber belt replacement.** For maintenance of reliable operation of the device, the manufacturer recommends to replace rubber belts after 1.5 years or 2000 hours of operation time.
 - Disconnect the external power supply from the device.
 - Remove 4 fixation screws on the device bottom and remove the bottom plate.
 - Replace the rubber belt (Fig. 7).
 - Reassemble the device.

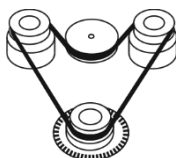


Figure 7. Rubber belt replacement

- 9.5. **Error codes in case of a defect.** Some malfunctions trigger an error code to appear on display, accompanied by a sound signal every 8 s. Press **RPM RUN/STOP** key to turn off the signal. Error code format is letters ER and a single digit. Disconnect the unit from the electric circuit and report the error code to Biosan or your local Biosan representative.

10. Warranty

- 10.1. The manufacturer guarantees the compliance of unit with the requirements of specifications, if the customer follows the operation, storage and transportation instructions.
- 10.2. The warranted service life of unit from date of delivery to the customer is 24 months. For extended warranty, register the unit, see **10.5**.
- 10.3. Warranty covers only the units transported in the original package.
- 10.4. If any manufacturing defects are discovered by the Customer, an unsatisfactory equipment report shall be compiled, certified and sent to the local distributor address. To obtain the claim form, visit section **Technical support** on our website at link below.
- 10.5. Extended warranty. For **TS-100** and **TS-100C**, the *Premium* class models, one year of extended warranty is available free of charge after registration, during 6 months from the date of sale. Online registration form can be found in section **Warranty registration** on our website at the link below.
- 10.6. Description of the classes of our products is available in the **Product class description** section on our website at the link below.

Technical support



biosan.lv/en/support

Warranty registration



biosan.lv/register-en

Product class description



biosan.lv/classes-en

- 10.7. 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 / TS-100C Thermo-shaker for microtubes and microplates
Serial number	
Date of sale	

11. EU declaration of conformity

EU Declaration of Conformity

Unit type	Thermo-shakers
Models	TS-100, TS-100C, TS-DW, PST-60HL, PST-60HL-4, PST-100HL
Serial number	14 digits styled XXXXXXYYMMZZZZ, where XXXXXX is model code, YY and MM – year and month of production, ZZZZ – unit number.
Manufacturer	SIA BIOSAN Latvia, LV-1067, Riga, Ratsupites str. 7/2
Applicable Directives	EMC Directive 2014/30/EU LVD Directive 2014/35/EU RoHS2 2011/65/EU WEEE 2012/19/EU
Applicable Standards	<u>LVS EN 61326-1: 2013</u> Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements. <u>LVS EN 61010-1: 2011</u> Safety requirements for electrical equipment for measurement, control, and laboratory use. General requirements. <u>LVS EN 61010-2-010: 2015</u> Particular requirements for laboratory equipment for the heating of materials. <u>LVS EN 61010-2-051: 2015</u> Particular requirements for laboratory equipment for mixing and stirring.

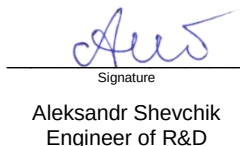
We declare that this product conforms to the requirements of the above Directives



Signature
Svetlana Bankovska
Managing director

19.07.2016.

Date



Signature
Aleksandr Shevchik
Engineer of R&D

19.07.2016

Date

HOW TO CHOOSE

A PROPER SHAKER, ROCKER, VORTEX

biosan

Medical-Biological
Research & Technologies

Sample volume $10^3 \dots 10^2$ ml

Erlenmeyer flasks and
Cultivation flasks



Sample volume 10^1 ml

Petri dishes, vacutainers
and tubes up to 50 ml



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

PCR plates, microtest plates
and Eppendorf type tubes



PSU-20i, Orbital Shaker

ES-20/60, Orbital
Shaker-Incubator



PSU-10i,
Orbital Shaker



ES-20, Orbital
Shaker-Incubator



MR-12,
Rocker-Shaker

Applications:
Microbiology
Extraction
Cell cultivation



Multi RS-60,
Programmable rotator

Bio RS-24,
Mini-Rotator



Multi Bio RS-24,
Programmable
rotator

Applications:
Microbiology
Extraction
Cell cultivation
Hematology



V-1 plus,
Vortex

NEW

RTS-1 and RTS-1C,
Personal bioreactors



MSV-3500,
Multi Speed Vortex

Applications:
Nucleic acid Analysis
Molecular Analysis
Protein Analysis
Genomic Analysis



MR-1,
Mini Rocker-Shaker

Applications:
Agglutination
Gel staining/
destaining



Multi Bio 3D, Mini Shaker

Applications:
Agglutination
Extraction
Blot hybridisation
Gel staining/destaining



PST-60HL-4,
Thermo-Shaker

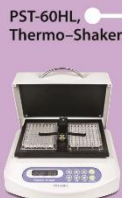


PST-100HL,
Thermo-Shaker

TS-DW, Thermo-
Shaker for deep
well plates



NEW



PST-60HL,
Thermo-Shaker

Applications:
ELISA Analysis
Genomic Analysis
Hybridization
Immunology



MPS-1,
Multi Plate Shaker



PSU-2T,
Mini-Shaker

NEW

CVP-2, Centrifuge
vortex for PCR
plates



TS-100, TS-100C, Thermo-Shakers



V-32, Multi-Vortex



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