



Medical–Biological  
Research & Technologies

# Thermo-shaker for deep well plates TS-DW



**Operating Manual  
Certificate**

for version  
V.2A01



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# 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!**

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

## 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 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

Thermo-shaker TS-DW is designed for shaking deep well plates in the thermostatic regulation mode.

A distinctive feature of BioSan plate thermo-shakers is the patented two-side plate heating that allows to achieve full correspondence of the set and actual temperature in the plate wells.

Features of TS-DW 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 plates 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.

TS-DW was designed using the multi-system principle, which allows using it as three independent devices:

- Incubator
- Plate shaker
- Thermo-shaker

The device can be used in:

- cytochemistry — for *in situ* reactions;
- immunochemistry — for immunofermentative reactions;
- biochemistry — for enzyme and protein analysis;
- molecular biology — for nucleic acids isolation.

## 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-DW Thermo-Shaker for deep well plates .....1 pce
- external power supply unit .....1 pce
- power cord .....1 pce
- spare rubber belt .....2 pcs
- Operating Manual; Certificate .....1 pce

#### Optional accessories

- thermal block -2E for Eppendorf deep-well plates .....on request
- thermal block B-2S for SarstedtB deep-well plates .....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;
- connect the power cord to the external power supply unit.

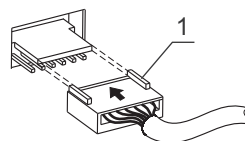
### 3.4. Thermoblock installation (if thermoblock is not installed)



#### 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 connector pins are facing the right side of the unit.
- Secure with the four knurled screws.



**Fig. 1 Thermoblock connection**

### 3.5. Changing blocks

- Disconnect the external power supply unit from the device.
- Remove the four knurled screws, lift the block without damaging the cable and disconnect the plug (fig.1/1).
- Select the new thermoblock and install it according to the point 3.4.

## 4. Operation

### Recommendations during operation

- Please check the deep well plates before using, be sure that plates are heat-resistant. Don't heat the deep well plates over the melting point of the material they are made of.
- It is recommended to fill wells up to 75% of the rated volume for efficient mixing.



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

- 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 (platform temperature °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. 2/1) set the required working time interval in hours and minutes (increment - 1 min). Pressing the key for more than 3 sec will increase the increment rate.
- 4.4. **Setting speed (RPM).** Using the ▲ and ▼ keys (Fig. 2/2) set the required speed (increment 10 rpm). Pressing the key for more than 3 sec will increase the increment rate.
- 4.5. **Setting temperature (T, °C).** Using the ▲ and ▼ keys (Fig. 2/3) set the necessary temperature (increment 0.1°C). Pressing the key for more than 3 sec will increase the increment rate.

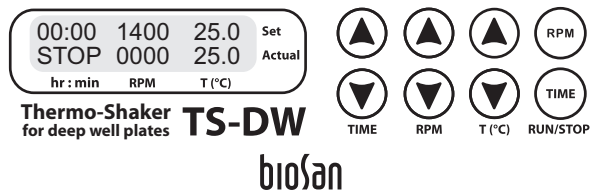


Fig. 2. Control Panel



**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 (the display will show OFF - T,°C - set point). In this mode TSDW can be used in the cold rooms as a mixing device without thermoregulation. Settings can 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. Place the deep well plate on the platform and close the lid.
- 4.7. Press the **RPM-RUN/STOP** key (Fig. 2/4). 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.

- 4.8. 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.
- 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. 2/5) to stop the timer. Press the **TIME-RUN/STOP** key again to restart the timer.
- 4.11. The platform motion can be stopped at any time by pressing the **RPM-RUN/STOP** key. In this case the program realisation 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. 2/3 - lower button) till the OFF sign appears in the upper line (Set) of the display

**Caution!**

When lid is open the platform and lid heating surfaces will remain hot. Please, take necessary care and use protective cloth gloves at temperatures over 60°C.

- 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. 2/5) pressed for more than 8 s to activate calibration mode. The calibration coefficient will be shown on the display (Fig. 4/1).
- 5.3. Set 1.000 value using the ▲ and ▼ keys (Fig. 2/3) as shown on Fig. 4/1 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 plate well placed on the platform. Close the lid.
- 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. 3). Then it is necessary to add 1°C correction.
- 5.9. Hold **TIME-RUN/STOP** key (Fig. 2/5) pressed for more than 8 s to activate calibration mode. The following parameters will be shown on the display (Fig.4):

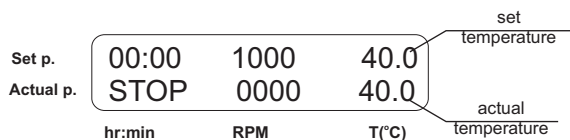


Fig. 3 Control panel in operation mode

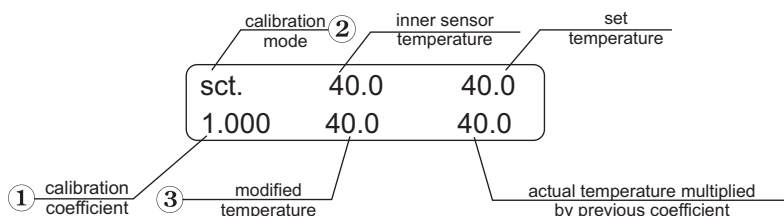
- 5.10. Use the temperature with multiplier coefficient readings to set the new temperature value.

Using the **Temp.** ▲ and ▼ keys (Fig. 2/3), change the calibration coefficient (Fig. 5A/1) so, that the new temperature value (Fig. 5A/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).

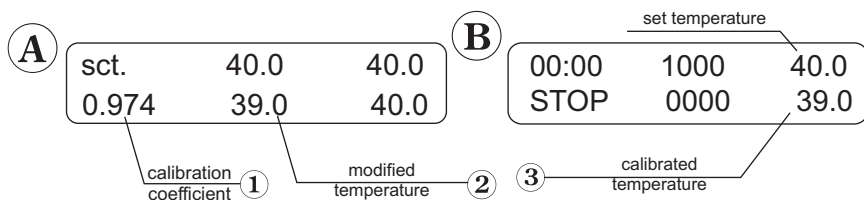


**Caution!** This calibrating coefficient will correct temperature through all the operation range.

- 5.11. After finishing the calibration press the **RPM-RUN/STOP** key (Fig. 2/4) once to save the changes and exit the calibration mode.
- 5.12. The display will show calibrated temperature as shown on Fig. 5B/3 and the unit will continue thermal stabilization according to the previously set temperature.



**Fig. 4 Control panel in calibration mode**



**Fig. 5 Control pane and corrected values**

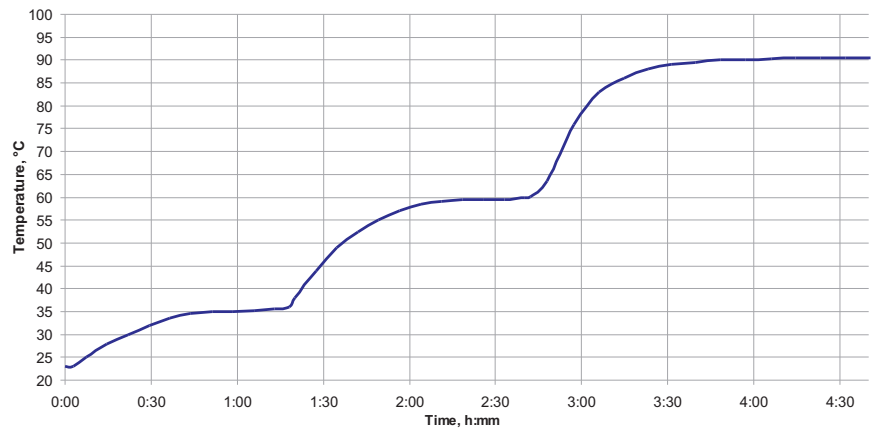
# 6. Specifications

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°C to +100°C
- Control range .....5°C above RT to +100°C
- Setting resolution .....0,1°C
- Stability\*, at +37°C.....±0.1°C\*\*
- Maintaining accuracy\*, at +37°C.....±0.5°C\*\*
- Uniformity over the platform\*, at +37°C .....±0.1°C\*\*
- Average heating speed from +25°C to +100°C.....4°C/min
- Time of platform heating from +25°C to +37°C .....4 min
- Temperature calibration option
- Calibration coefficient range .....0.936...1.063 (± 0.063)

\* Data for 75% filled microplates  
\*\* For **B-2E** Eppendorf thermoblock. Other block specifications are different.



**Fig. 6. Kinetics of liquid heating inside a single cell in a plate, total volume 1000 mcl**

## 6.2. General specifications

- 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 resolution ..... 1 min
- Maximal continuous operation time.....96 h  
recommended interval between operation sessions not less than 8 hours
- Display..... 16x2 symbols, LCD
- Dimensions .....240x260x160 mm
- Input current/power consumption ..... 12 V, 3,7 A/45 W
- External power supply unit .....in AC 100-240 V 50/60 Hz, out DC 12 V
- Weight\* .....5.1 kg

Thermoblock model	Thermoblock description	Catalogue number
<b>B-2E</b>	for <b>Eppendorf deep well 96/1000 µl</b> microplates	BS-010159-AK
Block parameters is in section 6. specification.		
<b>B-2S</b>	for <b>Sarstedt MegaBlock</b> deep-well microplates, 96 x 2,2 ml wells	BS-010159-CK
Temperature maintenance stability, at +37°C		±0,1°C
Temperature maintenance precision, at +37°C		±1,0°C
Uniformity over the platform, at+37°C		±0,2°C

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

\* Accurate within ± 10%.

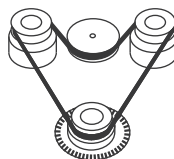
Biosan is committed to a continuous programme of improvement and reserves the right to alter design and specifications of the equipment without additional notice.

## 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-DW Thermo-shaker for deep well plates
Serial number	
Date of sale	

## 9. Declaration of conformity

# Declaration of Conformity

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

12.05.2014  
\_\_\_\_\_  
Date

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

12.05.2014  
\_\_\_\_\_  
Date

ES-20/60  
(with heating)



PSU-20i

- Applications:
- Microbiology
  - Extraction
  - Cell growing



PSU-10i

ES-20  
(with heating)



MR-12



Multi RS-60

Bio RS-24



NEW

RTS-1C



Multi Bio RS-24

- Applications:
- Microbiology
  - Extraction
  - Cell growing



MSV-3500

- Applications:
- DNA-analysis
  - Genome sequence



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 50 ml



PST-60HL-4  
(with heating)



PST-100HL  
(with heating)



NEW  
TS-DW



PST-60HL  
(with heating)

- Applications:
- ELISA analysis
  - Hybridization



NEW  
MPS-1



PSU-2T

NEW

CVP-2



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

## Level of liquid

$10^3 \dots 10^2$  ml

Erlenmeyer flasks and  
Cultivation flasks