

TS-DW

Thermo-shaker for deep well plates



If you have any feedback on our products or services, we would like to hear from you.
Please send all feedback to:

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1 About this edition of user instructions

The current edition of the user instructions applies to the following model and version:

Model	Version
TS-DW, Thermo-shaker for deep well plates	V.3A01

2 Safety precautions



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



Caution! Platform becomes very hot during use. Always use protective gloves to install or remove the plate when temperature is higher than 60°C.

2.1 General safety

- The protection provided by the equipment may be impaired if the equipment is used with accessories (thermoblocks) not provided or recommended by the manufacturer, or used in a manner not specified by the manufacturer.
- Save the unit from shocks and falling.
- Do not use the unit if it has visible mechanical damage.
- Store and transport the unit as described in the **Storage and transportation** section.
- 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 in design of the unit.
- When handling hazardous substances, follow the instructions contained in the safety data sheets for the individual substances that are used and observe the relevant accident prevention regulations.

2.2 Electrical safety

- Connect only to the mains with voltage corresponding to that on the label.
- Use only the external power supply provided with this product.
- Do not plug the unit into an ungrounded power socket, and do not use an ungrounded extension lead.
- Ensure that the power plug is easily accessible during use.
- Disconnect the unit from the mains before moving.
- If liquid penetrates into the unit, disconnect it from the mains 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.

2.3 During operation

- 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 leave the operating unit unattended.
- Do not check the temperature by touch. Use a thermometer.

2.4 Biological safety

- The user is responsible to carry out appropriate decontamination if hazardous material spills on or penetrates into the equipment.
- The user is responsible for decontamination of the unit before its decommissioning and utilization.

3 General information

TS-DW Thermo-Shaker is designed for shaking and incubating deep well plates.

A multisystem principle, used in the design of the Thermo-Shaker, allows operating it as 3 independent devices: Incubator, Plate shaker and Thermo-Shaker.

TS-DW provides excellent temperature uniformity across the plate due to patented two-sided heating of the block and the lid, contour heating of the block and close proximity of heating elements to plate walls.

There is a number of interchangeable blocks to suit different plates such as Eppendorf® 96/1000 µl, Sarstedt® Megablock 96/2200 µl, Porvair® 96/2000 µl, Axygen® 96/2200 µl. Also, we can manufacture a customized block on request.

Deep Well Plate Thermo-Shaker provides:

- Soft or intensive sample shaking
- Rotation speed regulation, stabilization and indication
- Even rotation amplitude throughout the Thermo-Shaker platform
- Exceptional temperature uniformity across the plate
- Required operation time setting and indication
- Automatic stopping of the platform movement after expiration of the set time
- Setting and indication of the required temperature on the platform
- A variety of changeable blocks that can accommodate most popular deepwell plates
- Automatic fault diagnostics (temperature sensor, platform heating, lid heating etc.)

Application fields:

- Cytochemistry — for in situ reactions
- Immunochemistry — for immunofermentative reactions
- Biochemistry — for enzyme and protein analysis
- Molecular biology — for nucleic acid extraction

Separate blocks to accommodate different deepwell plates will be released, e.g.:

- Deep Well Plates NUNC® 96/2000 µl
- Deep Well Eppendorf® 96/0.5 ml

The block for deepwell plate is mountable, thus a custom plate module can be manufactured on request.

Temperature Calibration Function – 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.

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 the units transported in the original package.

4.2 **Complete set.** Package contains:

4.2.1 Standard set

- TS-DW, thermo-shaker for deep well plates..... 1 pce
- External power supply 1 pce
- Power cable 1 pce
- Spare rubber belt 2 pcs
- User instructions, declaration of conformity..... 1 copy

4.2.2 Optional accessories, on request

- B-2E block for one deep well plate Eppendorf® 96/1000 µl
- B-2S block for one deep well plate Sarstedt® Megablock 96/2200 µl
- B-2P Block for one deep well plate Porvair® 96/2000 µl
- B-2A Block for one deep well plate Axygen® 96/2200 µl
- B-06A block for one deep well plate Axygen® 96/600 µl

4.3 Setup:

- 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 into the socket at the rear side of the unit.
- Connect the power cord to the external power supply.

4.4 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.

4.5 Changing blocks

- Disconnect the external power supply 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 4.4.

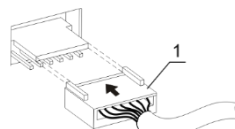


Figure 1. Thermoblock connection

5 Operation

5.1 Recommendations during operation

- Please check the deep well plates before using, be sure that plates are heat-resistant resistant. Do not 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.

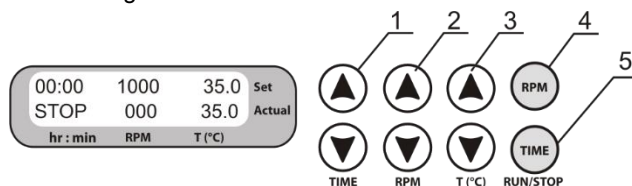






Figure 2. Control panel

- 5.2 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).
- 5.3 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 stabilization depends on the initial temperature.
- 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. RPM and temperature settings can be changed during operation.
- 5.4.1 **Setting time (TIME).** Using the ▲ and ▼ TIME keys (fig. 2/1) 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. 2/2) set the required speed (increment 10 rpm).
- 5.4.3 **Setting temperature (T, °C).** Using the ▲ and ▼ T (°C) keys (fig. 2/3) 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 (the display will show OFF - T, °C - set point). In this mode, TS-DW 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 (when the set and current temperature readings become the same):
- 5.5.1 Place the deep well plate on the platform and close the lid.
-  **Caution!** Do not fill the plate inside the unit.
- 5.5.2 Press the **RPM RUN/STOP** key (fig. 2/4). The platform will start rotating and the timer indicator will start counting 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.
- 5.6 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.
- 5.7 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.
- 5.8 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.
- 5.9 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. 2/3 - lower button) till the OFF sign appears in the upper line (Set) of the display
-  **Caution!** When lid is open, the block and lid heating surfaces will remain hot. Please, take necessary care and use protective cloth gloves at temperatures over 60°C.
- 5.10 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 3).

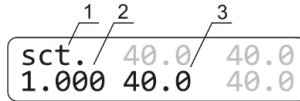




Figure 3. Display in calibration mode: 1. Calibration mode indicator; 2. Calibration coefficient; 3. Temperature with current coefficient


 **Note.** Values marked in grey on figures 3 and 4 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. 3/1 to restore the factory settings. Press the ►/■ **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 well of the plate on the platform.

- 6.4.1 Install the sensor into a well.
- 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 3).
- 6.4.6 Using the ▲ and ▼ T, °C keys, change the calibration coefficient (fig. 4/1) so that the new temperature value (fig. 4/2) 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 ►/■ **RUN/STOP** key once to save the changes and exit the calibration.
- 6.5 The display will show calibrated temperature as shown on fig. 5/1 and the unit will continue thermal stabilization according to the previously set temperature.

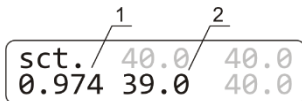


Figure 4. Changing the coefficient:
1. Calibration coefficient; 2. Temperature with current coefficient

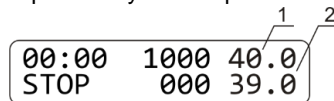


Figure 5. Display after calibration:
1. Set temperature; 2. Current calibrated temperature

7 Specifications

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

7.1 Temperature specifications

Setting range	+25°C to +100°C
Control range	5°C above RT to +100°C
Setting resolution	0,1°C
Stability ¹ , at +37°C	±0.1°C
Maintaining accuracy ¹ , at +37°C	±0.5°C ²
Uniformity over the platform ¹ , at +37°C	±0.1°C ²
Average heating speed from +25°C to +100°C	2.4°C/min
Time of platform heating from +25°C to +37°C	12 min
Temperature calibration option	
Calibration coefficient range	0.936–1.063 (± 0.063)

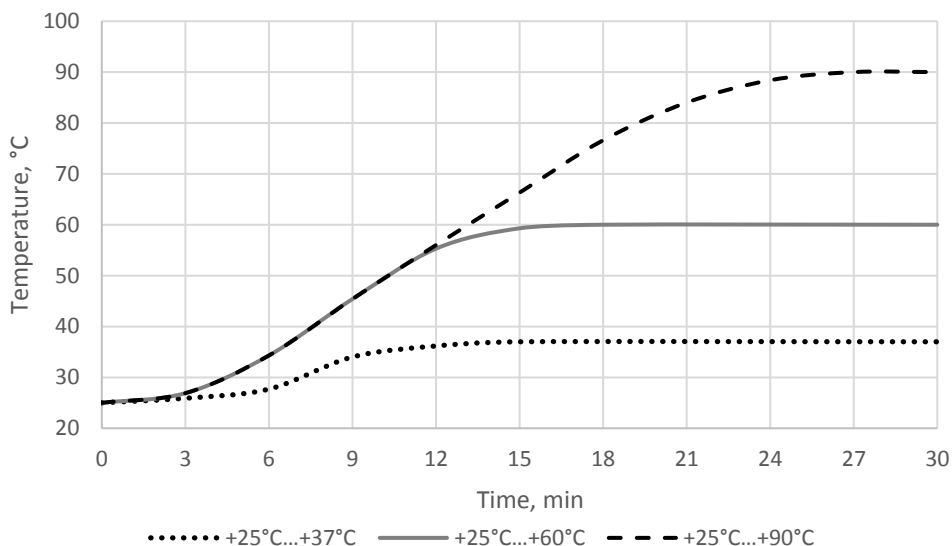


Figure 6. Kinetics of liquid heating inside a single cell in a plate, total volume 1000 µl

¹ Data for 75% filled microplates

² For **B-2E** Eppendorf thermoblock. Other block specifications are different

7.2	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, 4.8 A / 58 W
	External power supply	in AC 100–240 V 50/60 Hz, out DC 12 V
	Weight, within ±10%.....	5.1 kg

8 Ordering information

8.1 Models and versions available:

Model	Version	Catalogue number
TS-DW , thermo-shaker for deep well plates	V.3A01	BS-010159-A02

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

8.2.1 Optional accessories:

Thermoblock	Catalogue number
B-2E, for one deep well plate Eppendorf® 96/1000 µl	BS-010159-AK
Block parameters in 7.1.	
B-2S, for one deep well plate Sarstedt® Megablock 96/2200 µl	BS-010159-CK
B-2P, for one deep well plate Porvair® 96/2000 µl	BS-010159-EK
B-2A, for one deep well plate Axygen® 96/2200 µl	BS-010159-FK
B-06A, for one deep well plate Axygen® 96/600 µl	BS-010159-KK
Temperature maintenance stability ¹ , at +37°C	±0.1°C
Temperature maintenance precision ¹ , at +37°C	±1.0°C
Uniformity over the platform ¹ , at+37°C	±0.2°C

8.2.2 Replacement parts:

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

¹ Data for 75% filled microplates

9 Maintenance

9.1 Service.

9.1.1 If the unit is disabled (e.g., platform does not shake or maintain temperature, no reaction on key and switch presses, etc.) or requires maintenance, disconnect the unit from the mains and contact Biosan or your local Biosan representative.

9.1.2 All maintenance and repair operations (except listed below) must be performed only by qualified and specially trained personnel.

9.1.3 Operating integrity check. If the unit follow the procedure described in sections **Operation** and **Calibration**, then no additional checks are required.

9.2 **Cleaning and decontamination.** Disconnect from the mains before cleaning.

9.2.1 Use mild soap and water with a soft cloth or sponge for cleaning the unit. Rinse remaining washing solution with distilled water. Wipe dry the excess water with clean soft cloth or sponge.

9.2.2 For decontamination, we recommend using a special DNA/RNA removing solution (e.g. Biosan PDS-250). After decontamination, wipe dry the excess with clean soft cloth or sponge.

9.2.3 Unit and its accessories are not autoclavable.

9.3 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 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.

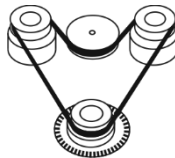


Figure 7. Rubber belt replacement

9.4 **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 the unit with the requirements of Specifications, provided the Customer follows the operation, storage and transportation instructions.
- 10.2 The warranted service life of the unit from the date of its delivery to the Customer is 24 months. For extended warranty register the unit, see p. 8.5.
- 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 claim 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-DW**, a *Premium* class model, 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	Serial number	Date of sale
TS-DW Thermo-shaker for deep well plates		

11 EU Declaration of conformity

EU Declaration of Conformity

Unit type Thermo-Shakers

Models **TS-100, TS-100C, TS-100C Smart, 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 7 k-2

The objects of the declaration described above is in conformity with the following relevant Union harmonization legislations:

LVD 2014/35/EU	LVS EN 61010-1:2011 Safety requirements for electrical equipment for measurement, control, and laboratory use. General requirements. LVS EN 61010-2-010:2015 Particular requirements for laboratory equipment for the heating of materials. LVS EN 61010-2-051:2015 Particular requirements for laboratory equipment for mixing and stirring.
EMC 2014/30/EU	LVS EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements.
RoHS3 2015/863/EU	Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment.
WEEE 2012/19/EU	Directive on waste electrical and electronic equipment.

I declare that the Declaration of Conformity is issued under sole responsibility of the manufacturer and belongs to the above-mentioned objects of the declaration.

Svetlana Bankovska
Managing director



Signature

07.02.2020.

Date

how to choose

A PROPER SHAKER, ROCKER, VORTEX

bioSan

Medical-Biological
Research & Technologies

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

Erlenmeyer flask
and Cultivation flask



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-20/80,
Orbital Shaker-Incubator



Applications:

- Microbiology
- Extraction
- Cell cultivation



PSU-10i,
Orbital Shaker



ES-20,
Orbital
Shaker-Incubator

Applications:

- Agglutination
- Gel staining/destaining



MR-12,
Rocker-Shaker



Multi RS-60,
Programmable rotator

Bio RS-24,
Mini-Rotator



RTS-1 and RTS-1C,
Personal bioreactor



MR-1,
Mini Rocker-Shaker



Multi Bio 3D,
Mini Shaker

Applications:

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



Multi Bio RS-24,
Programmable rotator

Applications:

- Microbiology
- Extraction
- Cell cultivation
- Hematology



V-1 plus,
Vortex



MSV-3500,
Multi Speed Vortex

Applications:

- Nucleic acid Analysis
- Molecular Analysis
- Protein Analysis
- Genomic Analysis



PST-60HL-4,
Thermo-Shaker

PST-60HL,
Thermo-Shaker



PST-100HL,
Thermo-Shaker

TS-DW,
Thermo-Shaker
for deep well
plates



Applications:

- ELISA Analysis
- Genomic Analysis
- Hybridization
- Immunology



MPS-1,
Multi Plate Shaker



PSU-2T,
Mini-Shaker



CVP-2,
Centrifuge vortex for PCR plates

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



V-32,
Multi-Vortex

