



Medical–Biological
Research & Technologies

PSU-20i Orbital Shaker



**Operating Manual
Certificate**

for version
V.1AW

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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.

GENERAL SAFETY

- Use only as specified in the operating instructions provided.
- The unit should not be used if dropped or damaged.
- 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

- Do not plug the unit ungrounded power socket, and do not use extension lead without grounding.
- Connect only to a power supply with voltage corresponding to that on the serial number label.
- Use only the external power supply unit provided with this product.
- Ensure that the external power supply and switch are easily accessible during use.
- Disconnect the unit from electric circuit before moving.
- Disconnect the external power supply unit from electric circuit to turn off the unit.
- 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 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 place a load exceeding the maximum load value mentioned in the Specifications section of this Manual.

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

PSU-20i is the new orbital shaker in multi-functional mixing device range. New design, direct drive system and brushless motor (service life up to 35000 hours) makes the new series even more reliable, especially for the long non-stop operation, and expands the product specifications.

PSU-20i provides: 1) orbital rotational motion, 2) reciprocal motion, 3) vibro motion of the platform according to the microprocessor protocol. The protocol allows enabling not only programs that include mixing motion of one particular type, but also programs that alternate mixing motions of different types cyclically.

Orbital rotational motion



Simple orbital motion with an option of shifting direction (clockwise/anti-clockwise) after set time. Adjustable speed from 20 to 250 rpm (increment 5 rpm). Time setting range 0–250 sec or non-stop.

Reciprocal motion



Orbital rotation with changing direction of rotation. Adjustable turning angle (from 0° to 360°, increment 30°) sets the limits for this type of motion. The speed is the same as set for rotational motion (from 20 to 250 rpm). Time setting range 0–250 sec or non-stop.

Vibro motion



Intensive mixing of samples at high speed with small amplitude - Vibro motion. Adjustable turning angle (from 0° to 5°, increment 1°) sets the limits for this type of motion. Time setting range 0–5 sec or non-stop.

Reciprocating and Vibration motion types can be replaced with a pause.

These 3 motions are combined into a cycle (Fig. 1) and can be used:

- separately (only 1; 2; or 3);
- in combinations by two (1+2; 2+3; or 1+3);
- all three in one cycle (1+2+3).

The countdown timer is used to control the operation time. The timer can be set for the period from 1 min to 96 hours.

By combining the provided types of rotational motion the researcher gets unlimited options for choosing the necessary parameters of mixing the examined materials.

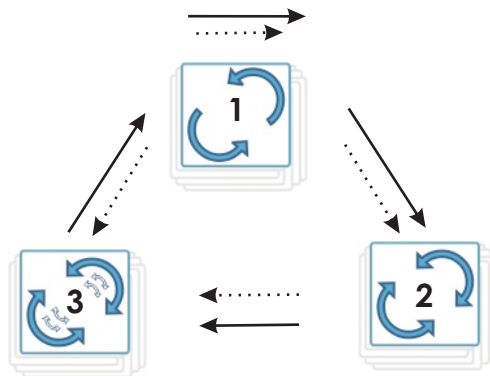


Fig.1. Innovative “mixing cycle”

Apart from the unique operation modes the PSU-20i orbital shaker possesses attractive elegant BioForm design and offers user-friendly interface, which provides options not only for changing the program during the operation, but also for simultaneous control over different steps of mixing protocol realization.

The external power supply unit (DC adapter 12V) ensures the electrical safety of the device.

Orbital Shaker PSU-20i is specially designed for gentle and intensive mixing of biological and chemical compounds in a laboratory. It is a table-top laboratory instrument applicable for:

- extracting, dissolving slow-reacting samples
- cultivation of cells
- extraction of mineral oil of soil, of tissue culture for analytical diagnostics
- deaeration of tested biodegradable materials and samples
- rotating closed containers for dialysis.

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. Package contents:

Standard set:

- PSU-20i Orbital Shaker 1 pce
- external power supply unit 1 pce
- power cord 1 pce
- four screws and a wrench 1 set
- Operating Manual; Certificate 1 copy

Optional accessories:

- UP-330 platform ❶ on request
- P-30/100 platform ❷ on request
- P-16/250 platform ❸ on request
- P-9/500 platform ❹ on request
- P-6/1000 platform ❺ on request
- PP-20 flat one-level platform A on request
- PP-20-2 two-level platform B on request
- PP-20-3 three-level flat platform C on request
- PP-20-4 four-level flat platform D on request
- HB-330 additional holding bar (for UP-330) on request

❶ UP-330



❸ P-16/250



❺ P-6/1000



❷ P-30/100



❹ P-9/500



D PP-20-4

C PP-20-3

B PP-20-2

A PP-20



3.3. Set up:

- place the unit on the horizontal even working surface;
- remove protective film from the display;
- plug the external power supply unit into the 12 V socket at the rear side of the unit.

3.4. Platform installation:

- remove the rubber mat from the platform;
- secure the platform on the stands on top of the unit with the four screws using the provided hex driver;
- cover the platform with the rubber mat.

3.5. To assemble and install the multi-level platform follow the instruction supplied with the platform.

4. Operation

- 4.1. Connect the external power supply to electric circuit and switch **On** the **Power** switch (Fig.2/6).
- 4.2. Place samples on the platform.
- 4.3. Set the appropriate program and operation time (see part 5. Program Setting) according to the methodical prescriptions.
- 4.4. Press the **Run Stop** key (Fig.2/5) to start the program. The platform motion starts and the corresponding indication “RUN” (Fig.2/2) and the changing time values are shown on the display.
- 4.5. If the operation time is not set and the timer indicator (Fig.2/1) shows “OFF”, pressing the **Run Stop** key will cause the unit to operate continuously until the **Run Stop** key is pressed again.
- 4.6. If the operation time is , the unit will stop after the set time interval expires (flashing indication “STOP” will be shown on the display) and will start giving a sound signal about the end of operation (press the **Run Stop** key to stop the signal).
- 4.7. Press the **Run/Stop** key to repeat the set program.
- 4.8. The rotator can be stopped at any time during operation before the set time expires if necessary by pressing the **Run Stop** key. Pressing the **Run Stop** key again will start the program from the beginning (timer will be restarted).
- 4.9. At the end of operation switch **Off** the unit using the **Power** switch and unplug the external power supply unit from electric circuit.

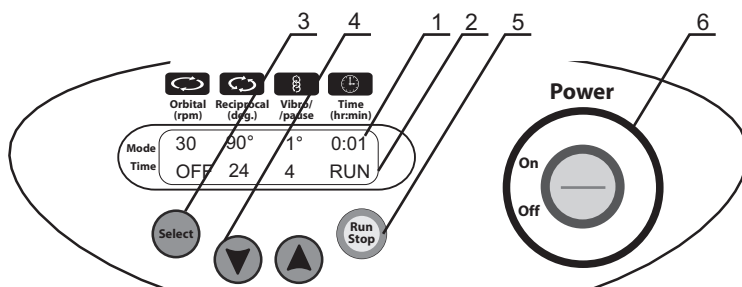


Fig.2. Front panel

5. Program setting

The program consists of cycles. Each cycle includes three different types of platform motion (Orbital, Reciprocal and Vibro) set one after another with the duration from 0 to 250 seconds for Orbital and Reciprocal motion types and from 0 to 5 seconds for Vibrating motion.

- 5.1. Press the **Select** key (Fig.2/3) to choose the parameter to change (each pressing of the **Select** key consecutively activates the parameters). The active parameter is flashing. Use the **▲** and **▼** keys (Fig.2/4) to set the necessary value (note: pressing the key for more than 2 s will increase the values change speed).
- 5.2. Saving the program doesn't require additional operations: the microprocessor saves the last parameter changes as the working program automatically.
- 5.3. It is necessary to set speed, turning angle, time for each motion type and the overall operation time.
- 5.4. If the time for a motion is not set (indication "OFF"), this type of motion will be skipped in the cycle.
- 5.5. It is possible to set a pause instead of Reciprocal (0–250 s) or Vibro (0–5 s) motion. To set a pause set the turning angle of Reciprocal or Vibro motion to zero and set the time for this motion, which will be the time of pause duration. During the operation the platform will not move in this mode but the time will be counted down.
- 5.6. The countdown timer is used to control the operation time. The timer can be set for the period from 1 min to 96 hours (timer increment 1 min) (note: the set time cannot be changed during operation).
- 5.7. Table below shows different cycle variants:

Nr.	Orbital	Reciprocal	Vibro	Nr.	Orbital	Reciprocal	Vibro
1	On	On	On	8	On	On	Off
2	On	Off	On	9	On	On	Pause
3	On	Pause	On	10	Off	On	On
4	On	Off	Off	11	Off	Pause	On
5	On	Pause	Off	12	Off	On	Pause
6	On	Off	Pause	13	Off	Off	On
7	On	Pause	Pause	14	Off	Off	Off

- 5.8. Further examples illustrate program setting for four different cycle variants.

5.8.1. Orbital motion

Set the speed (fig. 3/A) (20–250 rpm) and time (fig. 3/B) (1–250 s) of Orbital motion. Turn off Reciprocal motion (fig. 3/C) by setting time of Reciprocal motion to zero (OFF). Turn off Vibro motion (fig. 3/D) by setting time of Vibrating motion to zero (OFF).

Note: The unit is programmed to change the rotation direction each time when a motion timer is started, i.e. if the Orbital motion time is set to 30 sec then the direction of orbital rotation will be changed every 30 sec (fig.4).

If Orbital motion time is set to “00”, shaker will perform simple orbital rotation in one direction. In this mode Reciprocal and Vibro motion cannot be added to the cycle (fig.5).

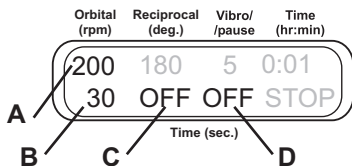


Fig.3.

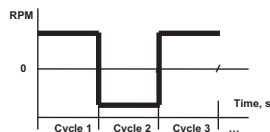


Fig.4.

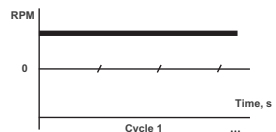


Fig.5. Orbital motion

5.8.2. Orbital + Reciprocal + Vibro motion

Set the speed (fig. 6/A) (20–250 rpm) and time (fig. 6/D) (1–250 s) of Orbital motion. Set the angle (fig. 6/B) (0–360°) and time (fig. 6/E) (1–250 s) for Reciprocal motion. It is performed at the same speed as the Orbital motion. Set the turning angle (fig. 6/C) (0–5°) and time (fig. 6/F) (1–5 s) for Vibro motion.

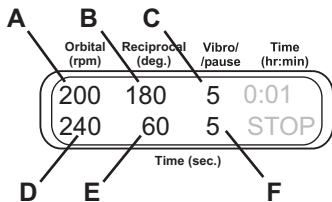


Fig.6.

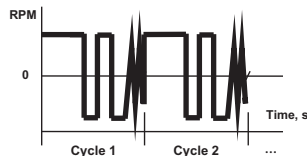


Fig.7. Orbital, Reciprocal and Vibro motions run one after another in cycles

5.8.3. Orbital + Reciprocal + Pause

Set the speed (fig. 8/A) (20–250 rpm) and time (fig. 8/D) (1–250 s) of Orbital motion. Set the turning angle (fig. 8/B) (0–360°) and time (fig. 8/E) (1–250 s) for Reciprocal motion.

Set the angle (fig. 8/C) of Vibro motion to zero. Set the time for Vibro motion (fig. 8/F) (1–5 s) - this is the time of pause duration.

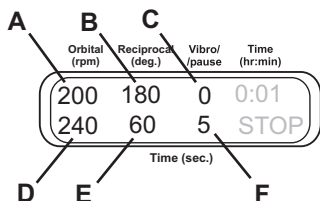


Fig.8.

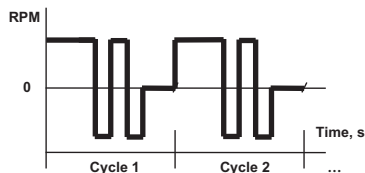


Fig.9.

**Orbital and Reciprocal motions
and pause run one after another in cycles**

5.8.4. Vibration + Pause

Turn off Orbital motion by setting time of Orbital motion below zero (fig. 10/D) (OFF). Set the angle of Reciprocal motion (fig. 10/B) to zero. Set the time for Reciprocal motion (fig. 10/E) (1–250 s) – this is the time of pause duration. Set the turning angle (fig. 10/C) (0–5°) and time (fig. 10/F) (1–5 s) for Vibro motion.

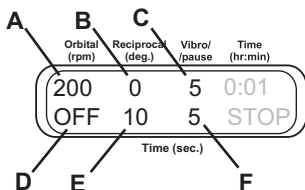


Fig.10.

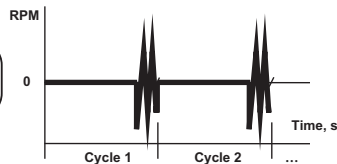


Fig.11.

**Vibro motion and pause
run one after another in cycles**

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. Orbital rotational motion mode

Speed control range 20–250 rpm (increment 5 rpm)
max. speed depends on the shaking load and flask shape
Time setting range0–250 s

6.2. Reciprocal motion mode

Angle range0°–360°(increment 30°)
Time setting range0–250 s

6.3. Vibro motion mode

Angle range0°–5° (increment 1°)
Time setting range0–5 s

6.4. Digital time setting.....1 min – 96 hrs (increment 1 min) / non-stop

6.5. Maximum continuous operation time168 hrs

6.6. Orbit20 mm

6.7. Maximum load.....8 kg

6.8. Device dimensions (w/out platform)410 x 410 x 130 mm

6.9. Input current/power consumption12 V, 3.2 A / 40 W

6.10. External power supply unit ... input AC 100–240 V 50/60 Hz, output DC 12 V

6.11. Weight*11.7 kg

* Accurate within ±10%.

Optional accessories	Description	Catalogue number
UP-330	Universal platform (345x430x105 mm)	BS-010145-AK
HB-330	Additional holding bar for UP-330	BS-010145-BK
P-30/100	30 clamps for 100 ml flasks (360x400 mm)	BS-010135-BK
P-16/250	16 clamps for 250 ml flasks (360x400 mm)	BS-010135-CK
P-9/500	9 clamps for 500 ml flasks (360x400 mm)	BS-010135-AK
P-6/1000	6 clamps for 1000 ml flasks (360x400 mm)	BS-010135-DK
PP-20	Single level platform with non-slip rubber mat (480x380 mm)	BS-010126-BK
PP-20-2	Two-level platform with non-slip rubber mat (480x380 mm)	BS-010126-CK
PP-20-3	Three-level platform with non-slip rubber mat (480x380 mm)	BS-010126-DK
PP-20-4	Four-level platform with non-slip rubber mat (480x380 mm)	BS-010126-EK

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 mains 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.

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, 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	PSU-20i Orbital Shaker
Serial Number	
Date of sale	

9. Declaration of Conformity

Declaration of Conformity

Equipment name:	PSU-20i
Type of equipment:	Orbital Shaker
Directive:	EMC Directive 2004/108/EC Low Voltage Directive 2006/95/EC RoHS 2011/65/EC WEEE 2002/96/EC & 2012/19/EU
Manufacturer:	SIA BIOSAN Ratsupites 7, build.2, Riga, LV-1067, Latvia
Applied Standards:	EN 61326-1: Electrical equipment for measurement, control and laboratory use EMC requirements. General requirements EN 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use. General requirements EN 61010-2-051: 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



Signature
Aleksandr Shevchik
Engineer of R&D

12.06.2013

Date

12.06.2013

Date

How to choose a proper Shaker, Rocker, Vortex

biosan

Medical-Biological
Research & Technologies



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

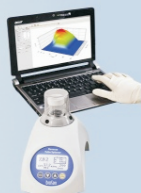


Multi Bio RS-24

Applications:
• Microbiology
• Extraction
• Cell growing



RTS-1



V-1

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 15 ml



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

PST-60HL-4
(with heating)



PSU-2T

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



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