



Orbital Platform Shakers **PSU-10i, PSU-20i**

Operating Manual

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1. About this edition of the manual

The current edition of the operating manual applies to the following models and versions of orbital platform shakers:

- **PSU-10i** version V.4GW
- **PSU-20i** version V.1GW

2. Safety Precautions



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.

2.1. GENERAL SAFETY

- The protection provided can be ineffective if the operation of the appliance does not comply with the manufacturer's requirements.
- 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 and before connecting it to the electric circuit, keep the unit under room temperature for 2-3 hrs.
- 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.

2.2. ELECTRICAL SAFETY

- Connect only to the mains with voltage corresponding to that on the serial number label.
- Use only the external power supply provided with this product.
- 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 impede the platform motion.
- Do not place a load exceeding the maximum load value mentioned in the **Specifications** section of the manual.
- 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.

2.4. 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

Orbital platform shakers **PSU-10i** and **PSU-20i** are benchtop multifunctional shaking units.

Shakers are designed with direct drive brushless motor, with warranted service life of 35000 hours. Units are reliable in operation and provide stable non-stop shaking for 7 days. Shakers are equipped with a liquid crystal display that shows set and current time and speed values. Variety of platforms, wide speed range and high maximum load (3 kg for **PSU-10i** model, 8 kg for **PSU-20i** model) expand the possibilities of application of orbital shakers in different laboratories.

PSU-20i model provides three types of motion, which can be performed individually, in pairs or set in a repeated cycle.



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 s or non-stop.



Reciprocal motion. Orbital rotation with changing direction of rotation. Adjustable amplitude (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 s or non-stop.



Vibro motion. Intensive mixing of samples at high speed with small amplitude - Vibro motion. Adjustable amplitude (from 0° to 5°, increment 1°) sets the limits for this type of motion. Time setting range 0 - 5 s or non-stop. Reciprocating and Vibration motion types can be replaced with a pause.

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

- separately;
- in combinations of two types;
- all three in one cycle.

By combining different types of rotational motion, the researcher gets unlimited options for mixing parameters. The countdown timer is used to control the operation time, with the period from 1 min to 96 hours.

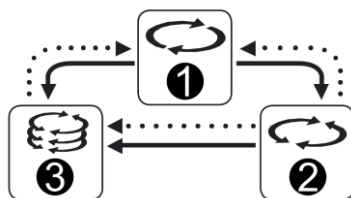


Figure 1. Innovative mixing cycle

Orbital shakers are specially designed for gentle and intensive mixing of biological and chemical compounds in a laboratory. The instrument applicable for:

Biotechnology and microbiology	For growing microorganisms and extracting biologically active material
Immunology and biochemistry	For agglutination reactions and precipitation
Molecular and cell biology	For washing of electrophoresis gels and blots
Biopharmacy and biomedicine	For cultivation and synthesis of new biological compounds

4. Getting started

- 4.1. **Unpacking.** Remove packing materials carefully and retain them 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.



Note. In **PSU-10i**, automatic ball balancing system (ABBS) produces a soft metal-like noise when moving the unit or during acceleration and deceleration of the platform. It is a normal occurrence and does not indicate a fault or a loose part.



- 4.2. **Complete set.** Package contents:

4.2.1. **PSU-10i**

- **PSU-10i** Orbital Shaker 1 pce
- External power supply 1 pce
- Operating manual, declaration of conformity.....1 copy
- PUP-12 platform on request
- Additional HB-200 holding bar for PUP-12 platform on request
- Bio PP-4 platform on request
- P16-88 platform on request
- P12-100 platform on request
- P6-250 platform on request



PUP-12



Bio PP-4



P16-88



P12-100



P6-250

4.2.2. **PSU-20i**

- **PSU-20i** Programmable Orbital Shaker 1 pce
- External power supply 1 pce
- Power cable 1 pce
- Wrench and 4 screws for platforms 1 set
- Operating manual, declaration of conformity.....1 copy
- PUP-330 platform on request
- Additional HB-330 holding bar for PUP-330 platform on request
- P30-100 platform on request
- P16-250 platform on request
- P9-500 platform on request

- P6-1000 platform on request
- PUP-168 universal platform on request
- FC-100, FC-250, FC-500, FC-1000, FC-2000 clamps for PUP-168 on request
- TR44-15, TR21-50 angled test racks for PUP-168..... on request
- PP-20 flat one-level platform on request
- PP-20-2 two-level platform on request
- PP-20-3 three-level platform on request
- PP-20-4 four-level platform on request



PUP-330



P30-100



P16-250



P9-500



P6-1000



PUP-168



TR21-50



TR44-15



PP-20-4

- 4.3. **Setup.** Place the unit on the horizontal even working surface. Remove protective film from the display. Plug the external power supply into the 12 V socket at the rear side of the unit and position the unit so that the plug is easily accessible. For **PSU-20i**, connect the power cable to the external power supply.
- 4.4. **Platform installation.**
- 4.4.1. Model **PSU-10i**. Position the platform to the moving base. Fit the pins on the underside of the platform into the holes on the moving base.
- 4.4.2. Model **PSU-20i**. Remove the mat from the platform, if present. Secure the platform on the moving base with four screws and wrench. Replace the mat.
- 4.4.3. To assemble and install the multilevel platforms **PP-20**, **PP-20-2**, **PP-20-3** and **PP-20-4**, follow the instruction supplied with the platform.
- 4.4.4. Different clamps and racks can be installed on the optional platform **PUP-168**. For the maximum number of allowed clamps, see **Table 4** in the **Specifications** section

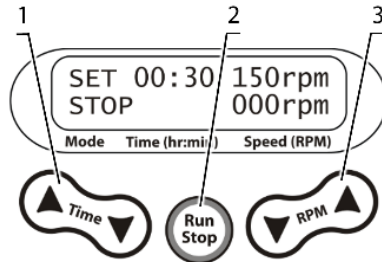


Figure 2. Control panel of PSU-10i

- 5.1. Working with model **PSU-10i**.
- 5.1.1. Connect the external power supply to the mains. Switch the power switch on the rear side of the unit into position **I** (on).
- 5.1.2. Display turns on, showing indication **SET**, set timer and set speed on the top row, and indication **STOP** and current speed on the bottom row.
- 5.1.3. Place samples on the unit platform.
- 5.1.4. Set the required operation time in hours and minutes (increment 1 min) using the ▼ and ▲ **Time** keys (fig. 2/1). Hold the key to change values faster. Set time appears on display on the top row in the middle.
- 5.1.5. Set the required shaking speed (increment 10 rpm) using the ▼ and ▲ **RPM** keys (fig. 2/3). Hold the key to change values faster. The set speed appears on display on the top row on the right.
- 5.1.6. Press the **Run Stop** key (fig. 2/3). The platform starts rotation, indication **RUN** appears on display and the elapsed time and the current speed show on display in the middle of the bottom row.



Note.

In **PSU-10i**, automatic ball balancing system (ABBS) produces a soft metal-like noise when moving the unit or during acceleration and deceleration of the platform. It is a normal occurrence and does not indicate a fault or a loose part.



- 5.1.7. After the timer reaches the set time, the platform motion will stop and the flashing indication **STOP**, accompanied by the repetitive sound signal, will appear in the lower line of the display. Press the **Run Stop** key to shut down the signal.
- 5.1.8. The unit can be stopped before the set time elapses if necessary by pressing the **Run Stop** key. Press the **Run Stop** key to repeat the operation with the same working time and speed.
- 5.1.9. If the working time is not set (or is reset) and the Time indicator on display shows **OFF**, pressing the **Run Stop** key will start continuous operation of the unit until the **Run Stop** key is pressed.
- 5.1.10. After finishing the operation, switch the power switch on the rear side of the unit into position **O** (off) and disconnect the external power supply from the mains.

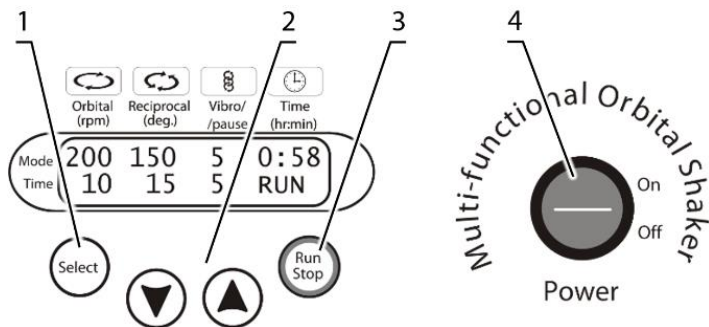


Figure 3. Control panel of PSU-20i

- 5.2. Working with model **PSU-20i**.
 - 5.2.1. Connect the external power supply to the mains and switch on the **Power** switch (fig. 3/4).
 - 5.2.2. Place samples on the unit platform.
 - 5.2.3. Setup the appropriate program and operation time, see section **6. Program Setting**.
 - 5.2.4. Press the **Run Stop** key (fig. 3/3) to start the program. The platform motion starts, the indication RUN and the changing time values are shown on the display.
 - 5.2.5. If the operation time is set, the unit stops after the set time interval expires. Flashing indication STOP appears on the display, and an audible signal starts, indicating the end of operation. Press the **Run Stop** key to stop the signal.
 - 5.2.6. If the operation time is not set and the timer shows indication OFF instead of hours and minutes, pressing the **Run Stop** key causes the unit to operate continuously until the **Run Stop** key is pressed again.
 - 5.2.7. The rotator can be stopped at any time during operation before the set time expires if necessary by pressing the **Run Stop** key.
 - 5.2.8. Press the **Run Stop** key to repeat the set program.
 - 5.2.9. At the end of operation switch off the unit using the **Power** switch and unplug the external power supply from the mains.

6. Program setting



Note. This section is only for model **PSU-20i**.

- 6.1. The program consists of cycles. Each cycle includes up to 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.
- 6.2. It is necessary to set speed, amplitude, time for each motion type and the overall operation time.
- 6.3. Press the **Select** key (fig. 3/1) 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. 3/2) to set the necessary value. Hold the key to change values faster.
- 6.4. Saving the program does not require additional operations, because the microprocessor saves the last parameter changes as the working program automatically.
- 6.5. If the time for a motion is set to 0 s (indication OFF), this type of motion will be skipped in the cycle.
- 6.6. It is possible to set a pause instead of Reciprocal (0–250 s) or Vibro (0–5 s) motion. For a pause, set the amplitude 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.
- 6.7. The timer is used to control the overall 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.

- 6.8. Table below shows different cycle variants:

Table 1. Cycle variants for PSU-20i

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

- 6.9. Further examples illustrate program setting for four different cycle variants.
- 6.9.1. **Orbital motion.** Set the speed (fig. 4/A, 20–250 rpm) and time (fig. 4/B, 1–250 s) of Orbital motion. Turn off Reciprocal motion (fig. 4/C) by setting time of the cycle to zero (OFF). Turn off Vibro motion (fig. 4/D) by setting time of the cycle 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 s then the direction of orbital rotation will be changed every 30 s (fig. 5).

If Orbital motion time is set to 0 s, shaker will perform simple orbital rotation in one direction (fig. 6). In this mode, Reciprocal and Vibro motion cannot be added to the cycle.

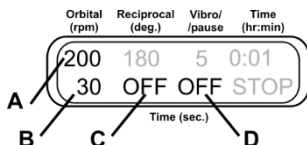


Figure 4.

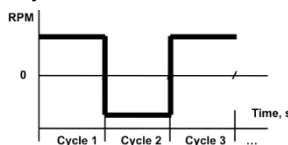


Figure 5.

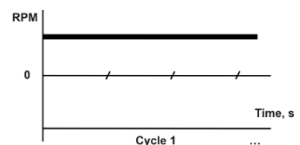


Figure 6.

6.9.2. **Orbital + Reciprocal + Vibro motion.** Set the speed (fig. 7/A, 20–250 rpm) and time (fig. 7/D, 1–250 s) of Orbital motion. Set the amplitude (fig. 7/B, 0–360°) and time (fig. 7/E, 1–250 s) for Reciprocal motion. It is performed at the same speed as the Orbital motion (fig. 8). Set the amplitude (fig. 7/C, 0–5°) and time (fig. 7/F, 1–5 s) for Vibro motion.

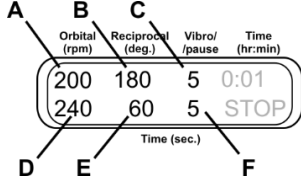


Figure 7.

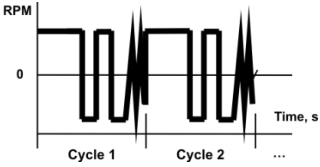


Figure 8.

6.9.3. **Orbital + Reciprocal + Pause.** Set the speed (fig. 9/A, 20–250 rpm) and time (fig. 9/D, 1–250 s) of Orbital motion. Set the amplitude (fig. 9/B, 0–360°) and time (fig. 9/E, 1–250 s) for Reciprocal motion. It is performed at the same speed as the Orbital motion. Set the amplitude (fig. 9/C) of Vibro motion to zero. Set the time for Vibro motion (fig. 9/F, 1–5 s), this is the time of pause duration (fig. 10).

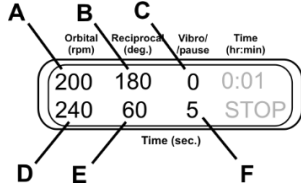


Figure 9.

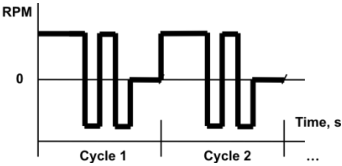


Figure 10.

6.9.4. **Vibration + Pause.** Turn off Orbital motion by setting time of Orbital motion below zero (fig. 11/D, OFF). Set the amplitude of Reciprocal motion (fig. 11/B) to zero. Set the time for Reciprocal motion (fig. 11/E, 1–250 s), this is the time of pause duration. Set the amplitude (fig. 11/C, 0–5°) and time (fig. 11/F, 1–5 s) for Vibro motion. See figure 12 for process visualization.

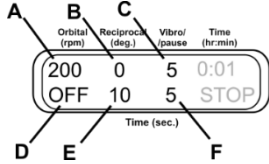


Figure 11.

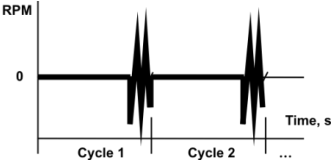


Figure 12.

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.

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

Table 2. Specifications

Model	PSU-10i	PSU-20i
Orbital rotation		
Speed control range	50–450 RPM	20–250 RPM
Increment	10 RPM	5 RPM
Time setting range	–	0–250 s per cycle
Reciprocal motion		
Amplitude range	–	0–360°
Increment	–	30°
Time setting range	–	0–250 s per cycle
Vibro motion		
Amplitude range	–	0–5°
Increment	–	1°
Time setting range	–	0–5 s per cycle
General specifications		
Digital time setting	1 min – 96 h or non-stop	
Increment	1 minute	
Maximum continuous operation time ¹	168 hours	
Orbit	10 mm	20 mm
Device dimensions w/o platforms, WxDxH	255x255x100 mm	410x410x130 mm
Input current	12 V, 470 mA	12 V, 3.2 A
Power consumption	5.7 W	40 W
External power supply	input AC 100–240 V, 50/60 Hz, output DC 12 V	
Weight ²	3.4 kg	11.7 kg

Table 3. Maximum load on the platform

Model PSU-10i		Model PSU-20i	
Speed	Load	Speed	Load
Below 250 rpm	3 kg	Below 150 rpm	8 kg
250 – 350 rpm	2 kg	150 – 200 rpm	5 kg
350 – 450 rpm	0.5 kg	200 – 250 rpm	2.5 kg

Table 4. Maximum number of clamps or racks on PUP-168 platform for PSU-20i

Clamp / rack	Count	Clamp / rack	Count
FC-100	23	FC-1000	6
FC-250	13	FC-2000	4
FC-500	9	TR44-15, TR21-50	2

¹ Recommended interval between operation sessions not less than 8 hours

² Accurate within ±10%

8. Ordering information

8.1. Models and versions available:

Model	Version
PSU-10i , orbital shaker	V.4GW
PSU-20i , programmable orbital shaker	V.1GW

8.2. To inquire about or order the optional accessories, contact Grant or your local Grant representative.

8.2.1. Optional accessories for PSU-10i

Accessory	Description
PUP-12	Universal platform with bars and non-slip rubber mat (285x215 mm)
Bio PP-4	Flat platform with non-slip silicone mat (255x255 mm, work area 230x230 mm)
P12-100	12 clamps for 100 ml flasks (250x190 mm)
P-6-250	6 clamps for 250 ml flasks (250x190 mm)
P16-88	Spring holder for 88 of 10 to 50 ml tubes
HB-200	Additional holding bar for PUP-12

8.2.2. Optional accessories for PSU-20i:

Accessory	Description
PUP-330	Universal platform (345x430x105 mm)
HB-330	Additional holding bar for PUP-330
P30-100	30 clamps x 100 ml flasks (360x400 mm)
P16-250	16 clamps x 250 ml flasks (360x400 mm)
P9-500	9 clamps x 500 ml flasks (360x400 mm)
P6-1000	6 clamps x 1000 ml flasks (360x400 mm)
PUP-168	Universal platform for different clamps
FC-100	Clamp for 100 ml flask for PUP-168 (ø 65 mm)
FC-250	Clamp for 250 ml flask for PUP-168 (ø 85 mm)
FC-500	Clamp for 500 ml flask for PUP-168 (ø 105 mm)
FC-1000	Clamp for 1000 ml flask for PUP-168 (ø 130 mm)
TR44-15	Adjustable angle 15 ml test tube rack for UP-168, 44 places
TR21-50	Adjustable angle 50 ml test tube rack for UP-168, 21 place
PP-20	One-level platform with non-slip rubber mat (480x380 mm)
PP-20-2	Two-level platform with non-slip rubber mats (480x380x170 mm)
PP-20-3	Three-level platform with non-slip rubber mats (480x380x340 mm)
PP-20-4	Four-level platform with non-slip rubber mats (480x380x510 mm)

9. Guarantee and Service

- 9.1. **Guarantee.** When used in laboratory conditions and according to these working instructions, this product is guaranteed for TWO YEARS against faulty materials or workmanship. For full Details of the Grant Bio Warranty policy, please contact Grant Instruments.
- 9.2. **Service.** For service, return for repair to our Service Department in the UK or, in other countries, to our distributor.
- 9.3. **Cleaning & disinfection.** Standard ethanol (75%) or other cleaning agents recommended for cleaning of laboratory equipment can be used for cleaning and disinfection of the unit.

EU Declaration of Conformity

Unit type Rockers, shakers, rotators, vortexes

Models **PMR-30, PMR-100;**
PS-3D, PS-M3D, PSU-10i, PSU-20i, MPS-1, PMS-1000i;
PTR-25, PTR-35, PTR-60;
PV-1, V-32, MSV-3500

Serial number 14 digits styled XXXXXYYMMZZZZ, 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 61010-2-051:2015 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

Grant-bio

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