Medical–Biological
Research & Technologies

ES-20/80
Orbital shaker-incubator

User instructions

Contents

1. About this edition of user instructions

The current edition of the user instructions applies to the following models and versions of Orbital shaker-incubator:

- **ES-20/80** V.1AD

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! Incubator surface and inner camera may become 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

- 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 and falling.
- After transportation or storage and before connecting it to the electric circuit, keep the unit under room temperature for 2-3 hrs.
- Store and transport the unit at ambient temperatures between -20°C and +60°C and maximum relative humidity of 80%.
- 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.

ELECTRICAL SAFETY

- Connect only to the mains with voltage corresponding to that on the serial number label.
- 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.

DURING OPERATION

- Make sure that all sample vessels are tightly sealed. Humidity caused by evaporation from unsealed vessels inside the incubator will damage the unit.
- 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

- The user is responsible to carry out appropriate decontamination if hazardous material spills on or penetrates into the equipment.

3. General information

ES-20/80 shaker-incubator for biotechnological and pharmaceutical laboratories is a professional category equipment. The typical applications include - microbial and cell culture cultivation, protein expression, solubility studies, general mixing, as well as other various applications in the fields of biology and chemistry. The unit is equipped with a newly developed triple eccentric mechanism for platform motion that provides supreme balancing characteristics, superior reliability and quiet operation. The achieved stability of the unit during vigorous mixing allows for stacking installation of up to 3 units which enables to save space.

The new display and easy to use user interface provide a clear and intuitive control of parameters and allow data logging, storage and display over time. Additional features like out of balance sensor and automatic thermostat failure detection make this shaker-incubator an advanced and safe product. Bluetooth connectivity to PC allows for data management, data logging, parameter control and profiling in a dedicated software that can be requested separately.

A built-in heat-resistant brushless fan provides precise temperature distribution inside the chamber (from 10°C above ambient up to +80°C). Additionally, excellent sample temperature uniformity of ±0.5 °C at 37 °C is achieved. The inner chamber is made of stainless steel. State-of-the-art motor, thermal insulation materials and parameter PID-control decrease the energy consumption and make the shaker-incubator highly energy efficient despite its relatively large size.

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.

Caution! Due to the high weight of the unit, its unpacking and installing must be carried out by two persons.

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

4.2.1. Standard set:

- ES-20/80, Orbital shaker-incubator ..... 1 pce.
- Power cable ..... 1 pce.
- Spare fuse (inside fuse holder) ..... 1 pce.
- Four screws and a hex driver ..... 1 set
- USB Bluetooth adapter for PC ..... 1 pce.
- USB drive with software and software manual ..... 1 pce.
- Operating instructions, declaration of conformity ..... 1 copy

4.2.2. Optional accessories:

- HSP-30/100 platform.....on request
- HSP-16/250 platform.....on request
- HSP-9/500 platform.....on request
- HSP-6/1000 platform.....on request
- PP-400 platform .....on request
- UP-168 universal platform.....on request
- HSC-50, HSC-100, HSC-250, HSC-500, HSC-1000 clamps for UP-168 ..on request
- TR-21/50 test tube rack for UP-168 .....on request
- TR-44/15 test tube rack for UP-168 .....on request
- Stacking kit for two units.....on request
- Stacking kit for three units.....on request

HSP-30/100

HSP-16/250

HSP-9/500

HSP-6/1000

PP-400

UP-168

TR-21/50

TR-44/15

4.3. **Setup**.

Note. Ensure that the unit is placed on level horizontal surface, which is able to support its weight.

- 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 the protective film from the display.
- Connect the power cable to the socket on the rear side of the unit and position it with easy access to the power switch and plug.

4.4. Platform installation.

4.4.1. Remove the silicon mat and unscrew four screws from the previous platform using a hex driver, if a platform was present. Install and secure the new platform to the moving part of the base with four screws and replace the silicone mat.

4.4.2. **UP-168** platform. The platform can be outfitted with flask clamps or a test tube rack. Arrange the components symmetrically in relation to the center of the platform. Fix them in place with screws included with components.

5. Stacking

Note. The following section applies to the optional stacking kit, to use with 2 or 3 incubator units.

5.1. Stacking kit contains:

Component	Kit for 2 units	Kit for 3 units
Side legs	–	2
Holder plate	4	8
Hex screw (4 mm)	16	40
Washer	16	40
Lock washer	16	40
Hex driver	1	1

5.2. **Aquiring a kit**. To purchase the kit, contact Biosan or your local Biosan representative, with information from the section **Ordering information**.

5.3. **Getting started**.

5.3.1. Unpack the kit. Unpower the units and disconnect the power cables.

5.3.2. Prepare the working space. Ensure that the floor and the desk supports at least 150 kg_F/m^2 (for 2 units) or 200 kg_F/m^2 (for 3 units). Laminate or rubber flooring may reduce overall stability and are generally not recommended.

5.3.3. Position the units so that the access to the mains plugs, the sockets and the power switches is unobstructed.

5.4. **Stacking two units** (figure 2).

5.4.1. Set one unit atop the other.

5.4.2. Connect the units with four plates. A plate requires four screws, each with a washer and a lock washer on it (fig. 3). Fix the screws tightly.

5.5. **Stacking three units**.

5.5.1. Base unit (figure 4):

5.5.1.1 Attach the left and the right legs to the base unit. A leg requires four screws, each with a washer and a lock washer on it (fig. 3). Fix the screws tightly.

5.5.1.2 Regulate the rubber parts of the legs so that the base unit is stable and level.

5.5.2. Middle unit (figure 5):

5.5.2.1 Set the middle unit atop of the base unit.

5.5.2.2 Connect the units with four plates. A plate requires four screws, each with a washer and a lock washer on it (fig. 3). Fix the screws tightly.

5.5.3. Top unit (figure 6):

5.5.3.1 Set the top unit atop of the middle unit.

5.5.3.2 Connect the units with four plates. A plate requires four screws, each with a washer and a lock washer on it (fig. 3). Fix the screws tightly.

5.6. Connect the power cables to the units and to grounded mains sockets.

5.7. **Maintenance**. Check the screw fixation and unit stack stability once a month.

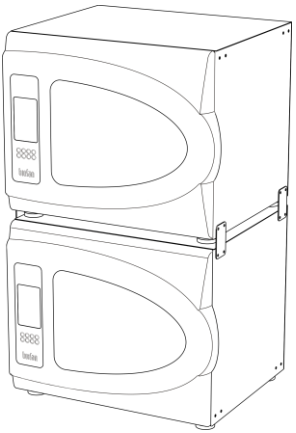


Figure 2. Stacking two units

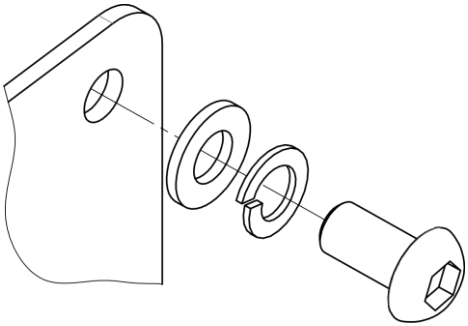


Figure 3. Washers on the screw

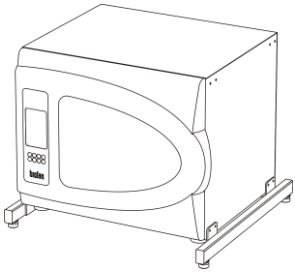


Figure 4. Stacking three units, base level

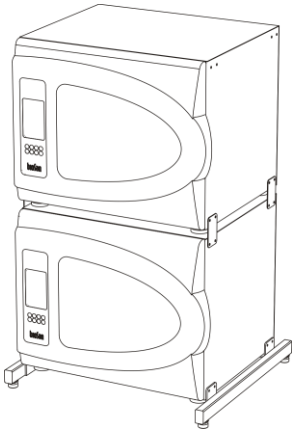


Figure 5. Stacking three units, middle level

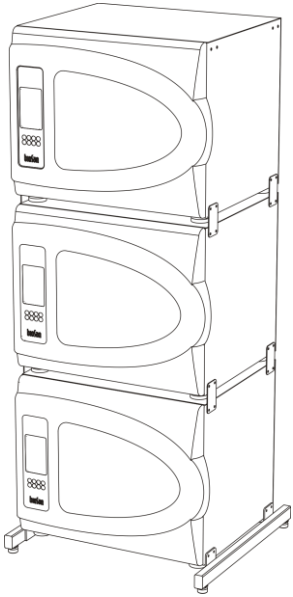
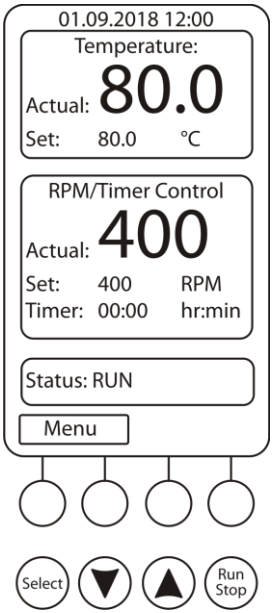


Figure 6. Stacking three units, top level

6. Operation



6.1. Connect the unit to a grounded power socket. Set the **Power** switch on the rear panel to position **I** (on).

6.2. The display turns on. From top to bottom, display shows:
- Current date and time;
- Actual and set temperatures;
- Actual RPM, set RPM and timer;
- Status bar;
- Context buttons, corresponding to unmarked keys below the display.

6.2.1. Below the display:
- Four unmarked keys, corresponding to context buttons on the display;
- The **Select**, ▲, ▼ and **Run Stop** keys.

6.3. **Setting the parameters**. Press the **Select** key to select the parameter to change. Use the ▲ and ▼ keys to adjust the parameter. Pressing the key for longer than 2 s increases changing speed. Press the **Select** key again to select the next parameter. Changes are saved automatically.

6.3.1. **Setting temperature**. Temperature starts changing according to set value. Increment is 0.1ºC. Values can be changed anytime.

6.3.2. **Setting speed (RPM)**. Increment is 10 RPM. Speed can be adjusted anytime.

6.3.3. **Setting time**. Time is set separately for hours and minutes, with increment of 1 minute.

6.4. **Program execution**.

6.4.1. When the actual temperature in the incubator reaches set values, open the door and place samples on the platform.

Caution! Place the samples symmetrically in relation to the center of the platform to avoid imbalance errors.

Caution! Do not fill the vessels inside the incubator. Please make sure that all vessels are tightly sealed. Humidity caused by evaporation from unsealed vessels inside the incubator will damage the unit!

6.4.2. Press the **Run Stop** key. The platform will start rotating and the timer indicator will start counting the time interval.

Note. If the speed is set to zero, pressing the **Run Stop** key will start the timer, but the platform will not move.

6.5. After finishing the program (after the set time elapses), the platform motion stops and the status bar shows STOP accompanied by the repetitive sound signal. Press any key to stop the signal.

Caution! The chamber heating can only be stopped manually by reducing the temperature.

6.6. If the time is not set (set time is 00:00), the **Run Stop** key will start continuous operation of the unit until the **Run Stop** key is pressed again.

6.7. The platform motion can be stopped at any time by pressing the **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 **Run Stop** key to restart the operation with the same time and speed.

6.8. **Incubator menu**. The **Menu** button opens incubator's menu. Use ▲ and ▼ buttons to navigate and **Enter** button to select. While browsing in the menu, select the topmost **Quit** option in order to return from sub-menu to menu.

6.8.1. **Incubator ID**. Option **GetID** shows the serial number and name of the incubator and its Bluetooth module MAC address, as well as remote PC Bluetooth module MAC address.

6.8.2. **Date & Time**. To set date and time in this submenu, press **Enter** button to select the parameter, then ▲ and ▼ buttons to change the value and **Enter** button to confirm changes.

6.8.3. **Service**. This submenu has following options: **Current Errors** and **Settings**.

6.8.3.1 **Current Errors**. This option allows user to view and reset the list of active errors.

6.8.3.2 **Settings**. This option has two suboptions available – **Alarm Setting** and **Start mode**.

- **Alarm Setting**. User can set the alarm settings based on values of temperature and RPM. All alarms are working on the following principle, temperature taken as an example:

  If $T_{act} < T_{thr.low}$ or $T_{act} > T_{thr.high}$ for t_{delay} minutes, then an alarm will be triggered.

  Where T_{act} is the actual temperature inside the incubator, $T_{thr.low}$ is the lower threshold limit value, $T_{thr.high}$ is the higher threshold limit value and t_{delay} is the time delay in minutes. Time delay is used in order to avoid false triggering of the alarms.

  RPM alarm is operated using the same principle.

- **Start Mode**. User can change the acceleration mode of the unit. In **Start Mode Slow** the unit picks up speed gently to reduce the possibility of spilling. In **Start Mode Fast** the unit rapidly gains speed and set RPM rate.

6.8.4. **Active Alarms**. This option allows user to view and reset the list of active alarms.

6.8.5. **Data Logger**. Data logger features following options: **View Plot T(t)**, **View Plot RPM(t)**, **View Plot T(t)+RPM(t)**, **Clear log**, **Logger on/off**.

6.8.5.1 All View Plot options use the same interface. Use **Left** and **Right** buttons to move the plot along the x axis. Use **Up** and **Down** buttons to move the plot along the y axis. Use **<-xx->** button to choose the x axis navigational scale. Available scales are 15 minutes, 1 hour, 1 day, 1 week and 1 month.

6.8.5.2 **Clear Log** button clears the logger's data.

6.8.5.3 **Logger On/Off** button toggles the automatic logging of the data.

6.8.5.4 **Available memory indicator**. When the data logger uses up all available memory, it begins overwriting data from beginning. 100% of memory is used up in approximately 1 month.

6.9. At the end of operation, set the **Power** switch in position O (off). Disconnect the power cable from electric circuit.

7. Specifications

The unit is designed for operation in cold rooms 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 specification

Setting range ..... +25°C ... +80°C (increment 0.1°C)
Control range ..... 5°C above ambient ... +80°C
Uniformity[1] ..... ±0.3°C
Accuracy[1] ..... ±0.1°C
Stability[1] ..... ±0.1°C
Heat up time to +80°C inside the chamber ..... 75 min

7.2. General specification

Speed control range ..... 50 - 400 RPM (increment 10 RPM)
Digital time setting ..... 1 min - 96 hrs (increment 1 min) / non-stop
Maximum continuous operation time[2] ..... 30 days
Maximum load ..... 10.6 kg
Orbit ..... 20 mm
Display ..... TFT LCD
PC software ..... on request
Data transfer ..... Bluetooth
Dimensions ..... 620x530x510 mm
Dimensions of the inner chamber ..... 460x350x400 mm
Stacking ..... up to 3 units[3]
Operating voltage/ power consumption ..... 230 V, 50/60 Hz / 500 W (2.2 A)
Weight[4] ..... 48 kg

Table 1. Recommended maximum speed for UP-168 platform with fully loaded TR-21/50 or TR-44/15, depending on the set angle.

Set angle	Speed, in RPM			
	200	**250**	**350**	**400**
0°	OK			
15°	OK			
30°	OK			
45°	OK			Not recommended
60°	OK		Not recommended	
75°	OK	Not recommended		

[1] Data for samples, at 37°C and 240 RPM

[2] Recommended interval between prolonged operations – not less than 8 hours

[3] Only with the stacking kit installed. Base side-mounted leg parts are required for third level stacking

[4] Accurate within ±10%

8. Ordering information

8.1. Models and versions available:

Model	Version	Description	Catalogue number
ES-20/80	V.1AD	230 V, 50/60 Hz, no platforms	BS-010167-A05

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

8.3. Optional accessories for **ES-20/80**:

Model	Description	Catalogue number
HSP-30/100	Platform with clamps for 30 flasks of 100 ml	BS-010167-KK
HSP-16/250	Platform with clamps for 16 flasks of 250 ml	BS-010167-MK
HSP-9/500	Platform with clamps for 9 flasks of 500 ml	BS-010167-NK
HSP-6/1000	Platform with clamps for 6 flasks of 1000 ml	BS-010167-LK
PP-400	Flat platform with non-slip silicone mat. Working dimensions 360x400 mm	BS-010135-FK
UP-168	Universal platform for different flasks	BS-010135-JK
HSC-50	Clamp for 50 ml flask for UP-168 platform (ø 50 mm)	BS-010167-DK
HSC-100	Clamp for 100 ml flask for UP-168 platform (ø 65 mm)	BS-010167-EK
HSC-250	Clamp for 250 ml flask for UP-168 platform (ø 85 mm)	BS-010167-FK
HSC-500	Clamp for 500 ml flask for UP-168 platform (ø 105 mm)	BS-010167-JK
HSC-1000	Clamp for 1000 ml flask for UP-168 platform (ø 130 mm)	BS-010167-IK
TR-21/50	Variable angle test tube rack for 21 tubes of 50 ml for UP-168 platform	BS-010135-KK
TR-44/15	Variable angle test tube rack for 44 tubes of 15 ml for UP-168 platform	BS-010135-LK
	PC software and Bluetooth adapter	BS-010167-CK
	Stacking kit for two units	BS-010167-OK
	Stacking kit for three units	BS-010167-PK

9. Care and maintenance

9.1. If the unit requires maintenance, disconnect the unit from the mains 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.

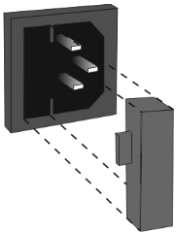
9.3. Cleaning and desinfection.

9.3.1. Standard ethanol (75%) or other cleaning agents recommended for cleaning of laboratory equipment can be used for cleaning and decontamination of the steel surfaces.

9.3.2. For decontamination, it is recommended to use a special DNA/RNA removing solution (e.g. Biosan PDS-250, DNA-Exitus Plus™, RNase-Exitus Plus™).

9.4. **Fuse replacement**. Disconnect the power cable from the mains. Disconnect the power cable from the socket on the rear of the unit. Open the fuse holder, located near the socket. Check and replace with a correct fuse if necessary, see table below:

Model & version	**Fuse**[1]
ES-20/80 **V.1AD** (230 V)	M 4 A



[1] Fuse type M - time lag Medium

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, 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 **Technical support** page on our website at link below.

10.5. Extended warranty. For **ES-20/80**, the *Smart* class model, extended warranty is a paid service. Contact your local Biosan representative or our service department through the **Technical support** section 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

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
ES-20/80, Orbital shaker-incubator		

11. EU Declaration of conformity

EU Declaration of Conformity

Unit type	Shakers-incubators
Models	**ES-20, ES-20/60, ES-20/80**
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	LVS EN 61326-1: 2013 Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements. 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.

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

Signature	Signature
Svetlana Bankovska Managing director	Aleksandr Shevchik Engineer of R&D
07.05.2018 Date	07.05.2018 Date

Edition 1.01 – July of 2019

how to choose
A PROPER SHAKER, ROCKER, VORTEX

biosan
Medical–Biological Research & Technologies

Sample volume 10^3 ... 10^2 ml
Erlenmeyer flask and Cultivation flask

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

Sample volume 10^1 ml
Petri dishes, vacutainers and tubes up to 50 ml

Multi Bio RS-24, Programmable rotator

Multi RS-60, Programmable rotator

Bio RS-24, Mini-Rotator

Applications:
- *Microbiology*
- *Extraction*
- *Cell cultivation*
- *Hematology*

V-1 plus, Vortex

RTS-1 and RTS-1C, Personal bioreactor

MSV-3500, Multi Speed Vortex

MR-1, Mini Rocker-Shaker

Multi Bio 3D, Mini Shaker

Applications:
- *Agglutination*
- *Extraction*
- *Blot hybridisation*
- *Gel staining/destaining*

Sample volume 10^0 ... 10^{-3} ml
PCR plates, microtest plates and Eppendorf type tubes

PST-100HL, Thermo-Shaker

PST-60HL-4, Thermo-Shaker

TS-DW, Thermo-Shaker for deep well plates

PST-60HL, Thermo-Shaker

Applications:
- *ELISA Analysis*
- *Genomic Analysis*
- *Hybridization*
- *Immunology*

Applications:
- *Nucleic acid Analysis*
- *Molecular Analysis*
- *Protein Analysis*
- *Genomic Analysis*

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

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