

ES-20/80C

Orbital shaker-incubator



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

Manufacturer:

SIA Biosan
Ratsupites iela 7 k-2, Riga, LV-1067, Latvia

Phone: +371 674 261 37

Fax: +371 674 281 01

www.biosan.lv

Marketing: marketing@biosan.lv

Service: service@biosan.lv

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1. About this edition of user instructions

1.1 The current edition of the user instructions applies to the following models:

Model and name	Version
ES-20/80C, orbital shaker-incubator	V.1AD

1.2 Edition 1.04 – September of 2022.

2. Safety precautions

2.1 Symbols used in the user instructions:



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



Caution! Hot surface! Incubator surface and inner camera may become hot during use. Always use protective cotton gloves to install or remove samples when the temperature is set higher than 60°C.

2.2 Symbols and icons used on the unit and packaging:

	CE marking, manufacturer affirms conformity with European health, safety, and environmental protection standards, see 12.1
	WEEE directive marking, see 12.1

2.3 General safety

- The protection provided can be ineffective if the operation of the unit does not comply with the manufacturer's requirements.
- Save the unit from shocks and falling.
- After transportation, storage or in the case of condensation formation, and before connecting it to the electric circuit, keep the unit under room temperature for 2-3 hrs to dry out the unit. Without drying out, the operation of the unit may not comply with all safety requirements.
- Store and transport the unit as described in section **10. Storage and transportation**.
- 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.

2.4 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 section **7. Specifications**.

2.5 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 incubate flammable, explosive or chemically active substances. If such substance is spilled inside the incubator, it must be cleaned with a moist cloth and a mild soap solution.
- 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 section 7. **Specifications.**

2.6 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-20/80C 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.

A combination of an electric heating element and a built-in heat-resistant brushless fan provides precise temperature distribution inside the chamber up to +80 °C. Cooling of the chamber is provided by additional Peltier modules allowing to cool until 12.5 °C below the ambient temperature. Additionally, an excellent sample temperature uniformity of ± 0.2 °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 **ES-20/80C** model, its unpacking and installing must be carried out by two persons.

4.2 Complete set. Package contents:

4.2.1 Standard set:

- ES-20/80C, 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 drive with software and software manual 1 pce.
- User instructions, declaration of conformity 1 copy

4.2.2 Optional accessories – available on request:

- HSP-30/100 platform 1 pce.
- HSP-16/250 platform 1 pce.
- HSP-9/500 platform 1 pce.
- HSP-6/1000 platform 1 pce.
- PP-400 platform 1 pce.
- UP-168 universal platform 1 pce.
- HSC-50, HSC-100, HSC-250, HSC-500, HSC-1000 clamps for UP-168 1 pce.
- SPML double-sided adhesive strips 1 set of 3 pce.
- TR-21/50 test tube rack for UP-168 1 pce.
- TR-44/15 test tube rack for UP-168 1 pce.
- Stacking kit for two units 1 set
- Stacking kit for three units 1 set
- USB Bluetooth adapter for PC 1 pce.



HSP-30/100



HSP-16/250



HSP-9/500



HSP-6/1000



PP-400



UP-168



Figure 1. Select optional accessories

4.3 Setup.



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



Note. To stack two or three units, see the section **Stacking**.

- Place the unit upon even horizontal firm and stable non-flammable surface 30 cm away from any flammable materials, and clear 20 cm around the device on all sides for ventilation.
- Level the unit on the surface by adjusting the threaded legs. Rotate the legs until the unit is stable, then secure the thread with a jam nut. The unit should stand on all 4 legs, vibrations should be absent.
- 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.



Caution! After transportation, storage or in the case of condensation formation, and before connecting it to the electric circuit, keep the unit under room temperature for 2-3 hrs to dry out the unit. Without drying out, the operation of the unit may not comply with all safety requirements.

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, test tube racks or adhesive strips. Arrange the components symmetrically in relation to the centre of the platform. Clamps and racks include screws to secure them on the platform. Maximum number of components is listed in section **7. Specifications**.

4.4.3 **SPML** strips for **UP-168**.

- Remove any obstructing clamps or racks (**UP-168**).
- Degrease, clear and dry the platform as described in **9.3.1**.
- Remove protective plastic sheet from one side of the mat/strip and place it on the platform. Place up to three **SPML** strips symmetrically, in parallel to the longer edge.
- Remove the remaining protective sheet. Keep both sheets!



Note. Consult the manual enclosed with the **SPML** for recommendations on sample vessel choice, and for maintenance beyond stated in **9.3.3**

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
Catalogue number	BS-0101670-OK	BS-0101670-PK
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 **Acquiring 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 support at least 150 kg_F/m² (for 2 units) or 200 kg_F/m² (for 3 units). Laminated or rubberized flooring is not recommended since it may reduce overall stability.

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):

5.5.2 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.

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

5.5.4 Middle unit (figure 5):

5.5.5 Set the middle unit atop of the base unit.

5.5.6 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.

5.5.7 Top unit (figure 6):

5.5.8 Set the top unit atop of the middle unit.

5.5.9 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.

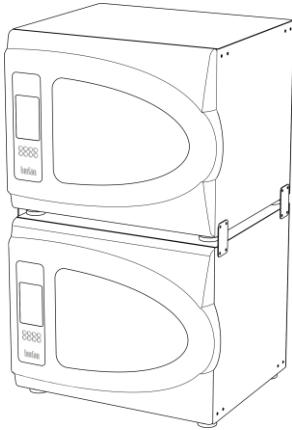


Figure 2. Stacking two units

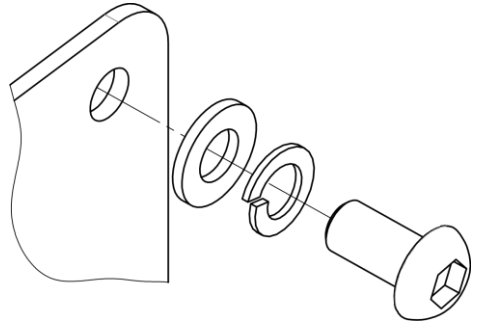


Figure 3. Washers on the screw

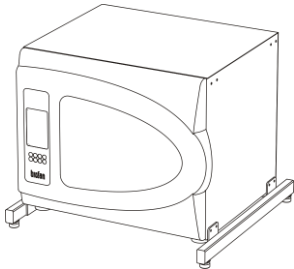


Figure 4. Stacking three units, base level

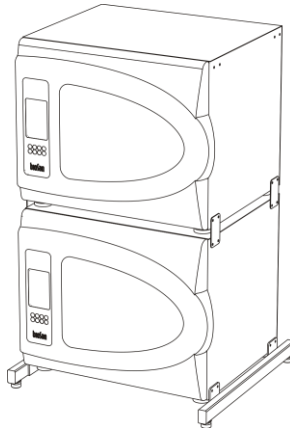


Figure 5. Stacking three units, middle level

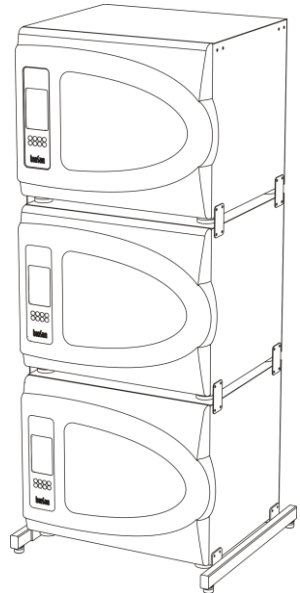


Figure 6. Stacking three units, top level

6. Operation



Caution! After transportation, storage or in the case of condensation formation, and before connecting it to the electric circuit, keep the unit under room temperature for 2-3 hrs to dry out the unit. Without drying out, the operation of the unit may not comply with all safety requirements.

- 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.

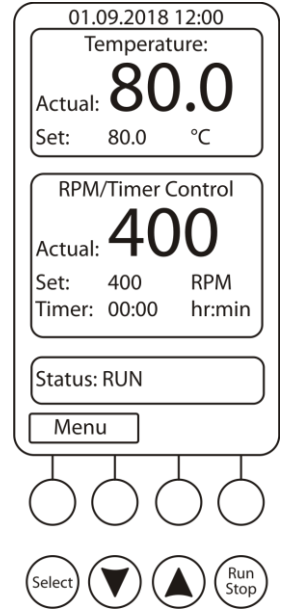





Figure 7. Control panel

- 6.3.1 **Setting temperature.** Temperature starts changing according to set value. Increment is 0.1°C. 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 centre 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. Additionally, if the door is opened the platform will stop, after closing the door, platform will reinitiate motion automatically.
- 6.8 **Power interruption.** In case of mains/power failure the unit is equipped with automatic restart function which will reinitiate the platform motion with previously set parameters.
- 6.9 **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 top-most **Quit** option in order to return from sub-menu to menu.
- 6.9.1 **Incubator ID.** Option **GetID** shows the serial number, name of the incubator and its Bluetooth module MAC address, as well as remote PC Bluetooth module MAC address.
- 6.9.2 **Date & Time.** To set the 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.
- 6.9.3 **Service.** This submenu has following options: **Current Errors** and **Settings**.
- 6.9.3.1 **Current Errors.** This option allows user to view and reset the list of active errors.
- 6.9.3.2 **Settings.** This option has two sub-options 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.

- 6.9.4 **Active Alarms.** This option allows user to view and reset the list of active alarms.
- 6.9.5 **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.**
- 6.9.5.1 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.
- 6.9.5.2 **Clear Log** button clears the logger's data.
- 6.9.5.3 **Logger On/Off** button toggles the automatic logging of the data.
- 6.9.5.4 **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.
- 6.10 At the end of operation, set the **Power** switch in position O (off). Disconnect the power cable from electric circuit.



Note. Frequently check condensation accumulation in the condensation tray (see **9.1.5** and figure **8**), discard if necessary.

7. Specifications

The unit is designed for operation in cold rooms and closed laboratory rooms at ambient temperature from +4°C to +40°C, altitude up to 2000 m, in a non-condensing atmosphere, maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C, transient overvoltages up to the II category and pollution degree 2.

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	+4°C ... +80°C (increment 0.1°C)
Control range	12.5°C below ambient ... +80°C
Uniformity ¹	±0.2°C
Control accuracy	±0.1°C
Heat up time to +80°C inside the chamber	70 min

7.2 Dimension specifications

Weight, accurate within ±10%	50 kg
Dimensions, WxDxH	620x620x510 mm
Dimensions of the inner chamber, WxDxH.....	460x400x325 mm



Note. Inner chamber height is measured from the shaking platform. Ensure that the vessels in use can be installed and removed from the current platform.

Stacking..... up to 3 units



Note. Stacking possible only with the stacking kit installed. Base side-mounted leg parts are required for third level stacking.

7.3 Electrical specifications

Operating voltage	220–240 V~
Operating frequency.....	50/60 Hz
Operating current	3.7 A
Maximum power consumption.....	810 W

¹ Data for liquid temperature, at 37°C and 240 RPM
Edition 1.04

7.4 General specifications

Speed control range 50–400 RPM (increment 10 RPM)
 Digital time setting 1 min - 96 hrs (increment 1 min) / non-stop
 Maximum load 10.6 kg
 Orbit 20 mm
 Display TFT LCD
 Data transfer Bluetooth

7.5 Maximum number of holders that can be fitted onto **UP-168** platform:

HSC-50	36	HSC-1000	5
HSC-100	16	SPML	3
HSC-250	11	TR-44/15	2
HSC-500	9	TR-21/50	

7.6 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		

8. Ordering information

8.1 Models and versions available:

Model	Version	Description	Catalogue number
ES-20/80C	V.1AD	220–240 V, 50/60 Hz, no platforms	BS-010173-A01

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

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

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	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
SPML	Set of 3 double-sided adhesive strips for UP-168, dimensions 390x80x3 mm	BS-010135-MK
TR-21/50	Variable angle test tube rack for 21 tubes of 50 ml for UP-168	BS-010135-KK
TR-44/15	Variable angle test tube rack for 44 tubes of 15 ml for UP-168	BS-010135-LK
	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 Service and maintenance.

- 9.1.1 If the unit is disabled (e.g., not incubating, no reaction on key and switch presses) 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 follows the procedure described in section Operation, then no additional checks are required.
- 9.1.4 If a stacking kit is used, check the screw fixation and unit stack stability once a month. See section 5. **Stacking** for additional information.
- 9.1.5 Frequently check condensation accumulation in the condensation tray (fig. 8), discard if necessary.

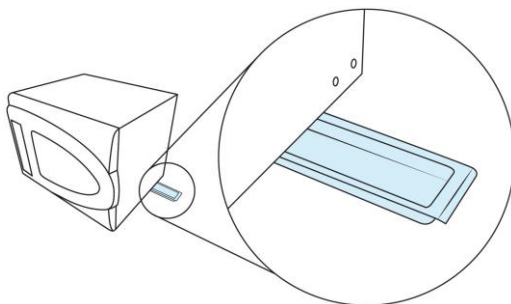


Figure 8. Condensation tray

9.2 Cleaning and disinfection.

- 9.2.1 Use mild soap and water with a soft cloth or sponge for cleaning the exterior. Rinse remaining washing solution with distilled water. Wipe dry the excess water with clean, soft cloth or sponge.
- 9.2.2 Standard ethanol (75%) or other cleaning agents recommended for cleaning of laboratory equipment can be used for cleaning and decontamination of the steel surfaces.
- 9.2.3 For decontamination, it is recommended to use a special DNA/RNA removing solution (e.g., Biosan PDS-250, DNA-Exitus Plus™, RNase-Exitus Plus™).
- 9.2.4 **SPML** adhesive material maintenance. Clean the adhesive surfaces with water or mild soap solution, rinse and air dry before reattaching. Adhesive properties work only when the surface is clean, dry and dust-free. Do not subject to UV radiation, do not place in high humidity (i.e., do not autoclave). Read the enclosed manual for additional info.

- 9.3 **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 (figure 9). Check and replace with a correct fuse, if necessary, see table below:

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

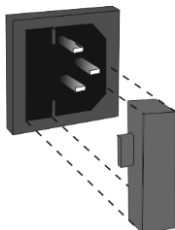


Figure 9. Fuse holder

- 9.4 **Disposal.** Disposal of the appliance requires special precautions and must be carried out at an appropriate disposal site, separate from normal household waste. To prevent pollution of the environment, all waste resulting from the disposal of the product must be collected and disposed of in the country of use, in accordance with the applicable requirements for the handling of electronic waste.

10. Storage and transportation

- 10.1 Store and transport the unit in a horizontal position (see package label) at ambient temperatures between -20°C and $+60^{\circ}\text{C}$ and maximum relative humidity of 80%.
- 10.2 After transportation, storage or in the case of condensation formation, and before connecting it to the electric circuit, keep the unit under room temperature for 2-3 hrs to dry out the unit. Without drying out, the operation of the unit may not comply with all safety requirements.
- 10.3 For extended storage, check condensation accumulation, see **9.1.5**. No further actions are necessary.

¹ Fuse type M - time lag Medium

11. Warranty

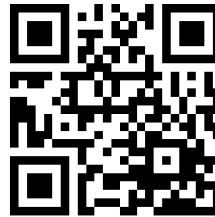
- 11.1 The Manufacturer guarantees the compliance of the unit with the requirements of Specifications, provided the Customer follows the operation, storage and transportation instructions.
- 11.2 The warranted service life of the unit from the date of its delivery to the Customer is 24 months, excluding optional accessories mentioned in the section **Ordering information**. For extended warranty, see **11.5**.
- 11.3 Warranty covers only the units transported in the original package.
- 11.4 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.
- 11.5 **Extended warranty**. For **ES-20/80C**, 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.
- 11.6 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

- 11.7 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-20/80C , Orbital shaker-incubator		

- 11.8 **Production date**. Production date is placed in the serial number, on the label of the unit. Serial number consists of 14 digits styled XXXXXYYMMZZZZ, where XXXXXX is model code, YY and MM – year and month of production, ZZZZ – unit number.
- 11.9 The Bluetooth® logo and name are registered trademarks of Bluetooth SIG, Inc. and any use by Biosan is under licence.

12. EU Declaration of conformity

12.1 Orbital shaker-incubator **ES-20/80C** is in conformity with the following relevant Union 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 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.

12.2 Declaration of Conformity is available for download on the page for the relevant model on our website by links below, in the **Downloads** section:



ES-20/80C

Biosan SIA

Ratsupites 7 k-2, Riga, LV-1067, Latvia

Phone: +371 67426137 Fax: +371 67428101

Edition 1.04 – September of 2022