

FV-2400, FVL-2400N, MSC-3000 & MSC-6000 Minicentrifuges-Vortexes



Contents

1.	About this edition of the operating manual	3
2.	Safety precautions	4
3.	General information.....	5
4.	Getting started.....	6
5.	Operation	8
6.	Specifications	12
7.	Maintenance.....	13
8.	Warranty and Claims.....	14
9.	EU Declaration of Conformity.....	15

1. About this edition of the operating manual

The manual applies to the following versions and models of Minicentrifuges-Vortexes:

- **FV-2400** V.1AA, V.1AB, V.1AC, V.1AD
- **FVL-2400N** V.2AA, V.2AB, V.2AC, V.2A3, V.2A12
- **MSC-3000** V.3AW
- **MSC-6000** V.4AY

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.

GENERAL SAFETY

- Use only as specified in the operation manual provided.
- Save the unit from shocks and 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.

ELECTRICAL SAFETY

- Connect only to external power supply (**MSC-3000 & MSC-6000**) and electric circuit (**all models**) with voltage corresponding to that on the serial number label.
- Use only the external power supply (**MSC-3000 & MSC-6000**) provided with the unit.
- Do not use an ungrounded power socket or an ungrounded extension lead.
- Ensure that the switch and the plug are easily accessible during use.
- If liquid penetrates into the unit, disconnect it from electric circuit and have it checked by a repair and maintenance technician.
- Disconnect the unit from electric circuit before moving.
- Do not operate the unit in premises where condensation can form. Operating conditions of the unit are defined in the Specification section.

DURING OPERATION

- (**FVL-2400N & MSC-3000**) Do not open lid during work, run-up or run-down of the motor.
- Do not fill the tubes after they are inserted in the rotor.
- 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.
- According to EN 61010-2-20, people and hazardous materials must not be within a 300 mm area around the device during the centrifuge operation.
- Do not use rotors with visible signs of corrosion, wear or mechanical damage.
- Do not operate the unit if it is faulty or has been installed incorrectly.
- Do not use outside laboratory rooms.

BIOLOGICAL SAFETY

- According to EN 61010-2-20, a centrifuge without a lid gasket is not considered a biologically safe system and therefore cannot be used for centrifuging hazardous materials contaminated with toxic, radioactive or pathogenic microorganisms.
- 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

The model range of centrifuges-vortexes is designed with the ability to shake and separate samples in one device. Centrifuges-vortexes **Microspin FV-2400** and **Combi-spin FVL-2400N** are equipped with centrifugation and vortexing modules on a common spin-module. Centrifuge-vortex **Multi-spin**, models **MSC-3000** and **MSC-6000**, provides work on the original patented spin-mix-spin technology.

The spin-mix-spin technology (SMS technology) is designed to collect (or reset) micro quantitative volumes of reagents to the bottom of the tube (the first centrifugation or spin), then vortexing (mix) and re-collecting reagents (repeated spin) from the walls and cap of a micro-tube. This repetitive algorithm of operations, aimed at reducing sample preparation errors (e.g. for PCR analysis), we call the SMS algorithm (see Table 1). The patented algorithm was invented by the doctor of biology V. Bankovsky.

Table 1. Comparison of parameters of centrifuge-vortexes

Specifications		Microspin FV-2400	Combi-spin FVL-2400N	Multi-spin MSC-3000	Multi-spin MSC-6000
Maximum speed		2800 RPM		3500 RPM	6000 RPM
Relative centripetal force (RCF)		500g		800g	2350g
Tube vortexing		1 individually		12 simultaneously	
Tube protection		-	Protective lid and autostop	Lid and lock	
Time to run a Spin-Mix-Spin cycle	For 2 tubes	60 s		25 s	15 s
	For 12 tubes	5-6 min		1 min 30 s	1 min
	For 100 tubes	60 min		15 min	10 min
Price comparison		1x	1.3x	1.9x	2.1x

Manual execution of the SMS algorithm using a centrifuge-vortex requires time (up to 60 minutes for 100 tubes) and is not free of subjectivity during the centrifugation and vortexing stage. This has long been a limiting factor in the acceleration of the PCR analysis.

Areas of use:

- Reproducible vortexing of samples in test tubes;
- Centrifugation of samples;
- Reproducible realization of spin-mix-spin cycles;
- Sample preparation before enzymatic reactions;
- Collection of micro quantities of samples before PCR reactions;
- Permeabilization of cells with chelating or hydrophobic substances for *in situ* reactions;
- Testing of difficultly soluble components;
- Washing of cells from culture medium after fermentation;
- Preparation of samples before immersion in gel for electrophoresis;
- Technology of utilizing magnetic particles with different coatings.

Ideal for the treatment of small amounts of liquid (precipitation / vortexing of micro-quantities of the mixture in Eppendorf tubes with enzyme reactions before thermal incubation in heating / cooling thermostats such as dry-block, thermal cyclers, etc.). Saves working space in laminar and PCR boxes by combining 2 instruments in one.

Automatic shutdown of the rotor when opening the cover (models **FVL-2400N** and **MSC-3000**) and locking the cover during the operation of the **MSC-6000** model guarantee the safe operation of centrifuges.

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.

4.2. Complete set. Package contents:

4.2.1. Standard set for **FV-2400** or **FVL-2400N**

- Minicentrifuge-vortex 1 piece
- Spare fuse..... 1 piece
- (only **FV-2400**) R-0.5/0.2M rotor ❶ 1 piece
- (only **FV-2400**) R-1.5M rotor ❷ 1 piece
- (only **FVL-2400N**) R-0.5/0.2 rotor ❸ 1 piece
- (only **FVL-2400N**) R-1.5 rotor ❹ 1 piece
- Vortex head with 2 mm eccentric ❺ 1 piece
- Operating manual, declaration of conformity 1 copy

4.2.2. Standard set for **MSC-3000** or **MSC-6000**

- Minicentrifuge-vortex 1 piece
- External power supply and power cable..... 1 piece
- R-0.5/0.2 rotor ❸ 1 piece
- R-1.5 rotor ❹ 1 piece
- Pin for rotor removal..... 1 piece
- Operating manual, declaration of conformity 1 copy

4.2.3. Optional accessories:

- R-2/0.5 rotor ❻on request
- R-2/0.5/0.2 rotor ❼on request
- SR-16 rotor ❽on request
- SR-32 rotor ❾on request
- (only **FV-2400**) SR-64 rotor ❿on request

4.3. Setup.

- Place the unit on horizontal even working surface;



Caution! Regularly clean **MSC-3000** support suction feet for improvement of adhesion to desk surface.

- Ensure that there is unobstructed area at least a 300 mm wide around the device.
- Position the unit so that the access to the mains plug is unobstructed;
- Remove the protective film from the display (**MSC-3000 & MSC-6000**);
- Connect the external power supply cable to the port on the rear panel of the unit. (**MSC-3000 & MSC-6000**).

4.4. Rotor replacement.

4.4.1. **FV-2400 & FVL-2400N.** To change a rotor (fig. 1/2 or 2/3), hold it with one hand and turn the vortex head (fig. 1/1 or 2/2) counter clockwise to set rotor free. Change the rotor and secure the vortex head.

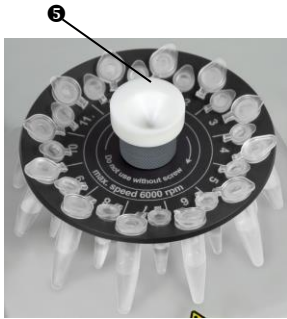
4.4.2. **MSC-3000 & MSC-6000.** To change a rotor (fig. 3/3), open the lid.



Note.

In model **MSC-6000**, lid is unlocked only when the unit is powered. Connect the external power supply to the grounded mains socket to switch on the unit. Do not force the lid open.

Insert the pin for rotor removal into the opening in the fixation head (fig. 3/2). Hold the rotor with one hand and turn the fixation head (using the pin as a lever) counter clockwise to set rotor free. Change the rotor and fix it in place in reverse order. Close the lid and disconnect the external power supply from the mains.



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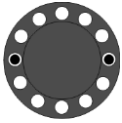


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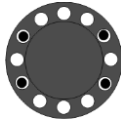
5. Operation

Recommendation during operation

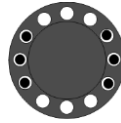
- Check the rotor for any signs of wear and replace if necessary.
- Insert tubes in the rotor sockets, maintaining balance as shown below. The opposite tubes must be filled equally.
- Do not fill the tubes in the rotor.



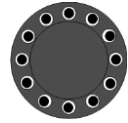
2 tube arrangement



4 tube arrangement



6 tube arrangement



Full arrangement

5.1. Working with FV-2400.

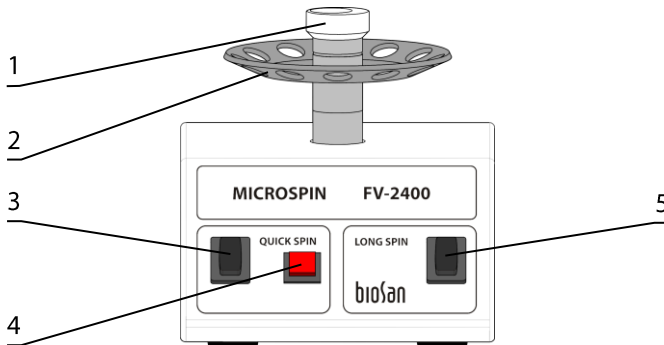



Figure 1. FV-2400

- 5.1.1. Connect the unit to a properly grounded mains socket.
- 5.1.2. **Operation in the quick centrifugation mode.** Insert tubes in the rotor sockets, maintaining balance. Switch the **QUICK SPIN** switch (fig. 1/3) into position **I** (on). Press and hold the red key (fig. 1/4) for quick mixing. After releasing the key, the rotor stops automatically. Switch the **QUICK SPIN** switch into position **O** (off) and remove the tubes.
- 5.1.3. **Operation in the vortexing mode.** Empty the rotor. Switch the **QUICK SPIN** switch into position **I**. While gently holding the tube, press the bottom part of the tube in the vortex head cavity (fig. 1/1). Press and hold the red key for vortexing. After releasing the key, the rotor stops automatically. Switch the **QUICK SPIN** switch into position **O**.
-  **Note.** Remember that the angle of hydrodynamic shift as well as the force of pressing to the vortex head are decisive factors of sediment dissolution effectiveness.
- 5.1.4. **Operation in the long centrifugation mode.** Insert tubes in the rotor sockets, maintaining balance. Switch the **LONG SPIN** switch (fig. 1/5) into position **I** (on). The rotor starts the movement. Switch the **LONG SPIN** switch into position **O** (off), wait until the rotor stops and remove the tubes.
- 5.1.5. After operation, disconnect the unit from the mains

5.2. Working with **FVL-2400N**

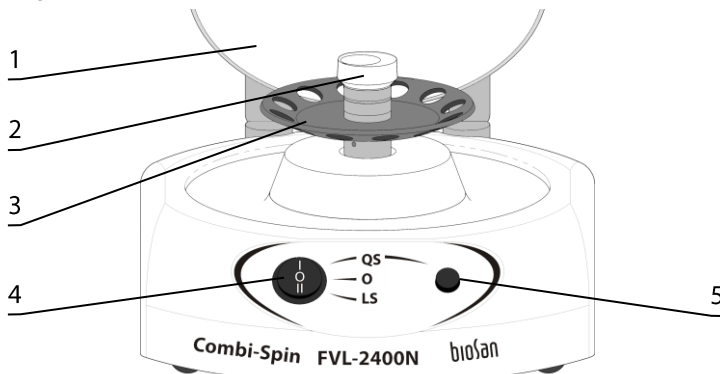


Figure 2. FVL-2400N

5.2.1. Connect the unit to a properly grounded mains socket.

5.2.2. **Operation in the quick centrifugation mode.** Open the lid (fig. 2/1). Insert tubes in the rotor sockets, maintaining balance. Close the lid. Switch the power switch (fig. 2/4) into position **I (QS, quick spin)**. Press and hold the **QS** key (fig. 2/5) for quick mixing. After releasing the key, the rotor stops automatically. Switch the power switch into position **O (off)**, wait until the rotor stops, open lid and remove the tubes.



Note. Do not open the lid during rotor work, run-up or shutoff. The unit stops automatically when the lid is open.

5.2.3. **Operation in the vortexing mode.** Empty the rotor and close the lid. Switch the power switch into position **I**. While gently holding the tube, press the bottom part of the tube in the vortex head cavity (fig. 2/2). Press and hold the **QS** key for vortexing. After releasing the key, the rotor stops automatically. Switch the power switch into position **O**.



Note. Remember that the angle of hydrodynamic shift as well as the force of pressing to the vortex head are decisive factors of sediment dissolution effectiveness.

5.2.4. **Operation in the long centrifugation mode.** Open the lid. Insert tubes in the rotor sockets, maintaining balance. Close the lid. Switch the power switch into position **II (LS, long spin)**. The rotor starts the movement. Switch the power switch into position **O (off)**, wait until the rotor stops, open lid and remove the tubes.



Caution! Do not open the lid during rotor work, run-up or shutoff. The unit stops automatically when the lid is open.

5.2.5. After operation, disconnect the unit from the mains.

5.3. Working with **MSC-3000** and **MSC-6000**.

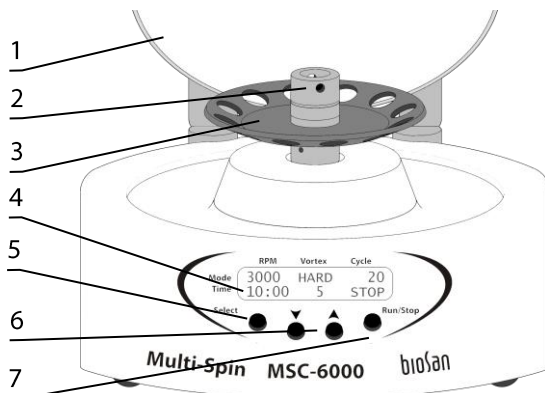


Figure 3. MSC-3000 and MSC-6000

- 5.3.1. Connect the external power supply to the grounded mains socket. Display (fig. 3/4) lights up and lid (fig. 3/1) unlocks (**MSC-6000**).
- 5.3.2. Open the lid and insert tubes in the rotor sockets, maintaining balance. Close the lid.
- 5.3.3. **Parameter setting.** Press the **Select** key (fig. 3/5) to choose a parameter to change. Each consecutive press of the **Select** key sequentially activates parameters in cycle. The active parameter will be blinking.
Use ▲ and ▼ keys (fig. 3/6) to set the necessary value. Pressing the key down longer than 2 s will make the values change quickly.
- 5.3.4. The program can also be changed during operation. Unit automatically applies the last changes on the new cycle of the program.
- 5.3.5. Both models can perform centrifugation and vortexing motions individually and one after another in a cycle, with separate timer for each motion and a cycle counter.



Note. Parameters for centrifugation and vortexing can be found in section

6. Specifications.

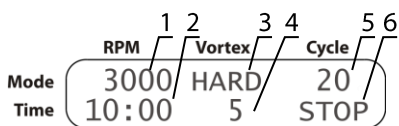


Figure 4. SMS-algorithm

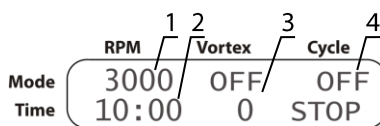


Figure 5. Centrifugation

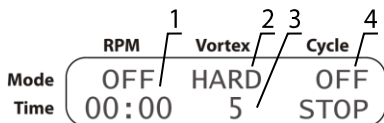


Figure 6. Vortexing



Figure 7. Display during operation

- 5.3.6. Listed below are possible modes with different motions.
- 5.3.6.1 **SMS-algorithm**. Set the centrifugation speed (fig. 4/1) and time (fig. 4/2). Set the vortexing intensity (fig. 4/3) and time (fig. 4/4). Set the number of SMS-algorithm cycles (fig. 4/5).
- 5.3.6.2 **Centrifugation**. Set the centrifugation speed (fig. 5/1) and time (fig. 5/2). Turn off vortexing by setting the time to zero (indication OFF, fig. 5/3). Note that the cycle counter turns off (indication OFF, fig. 5/4).
- 5.3.6.3 **Vortexing**. Turn off the centrifugation by setting the time to zero (indication OFF, fig. 6/1). Set the vortexing intensity (fig. 6/2) and time (fig. 6/3). Note that the cycle counter turns off (indication OFF, fig. 6/4).
- 5.3.7. Press the **Run/Stop** key (fig. 3/7) to start the program. Display shows indication RUN (fig. 7/2) and, for **MSC-6000**, lid lock symbol (🔒, fig. 7/1).
- 5.3.8. After the set number of cycles is performed, the unit stops, display shows blinking indication STOP (fig. 4/6), accompanied by a sound signal. Press the **Run/Stop** key to stop the signal. Model **MSC-6000** unlocks the lid after the rotor stops. Open the lid and remove the tubes.
- 5.3.9. If necessary, operation can be stopped at any time by pressing the **Run/Stop** key.
- 5.3.10. To repeat operation with the set parameters, press the **Run/Stop** key.
- 5.3.11. After finishing the operation, unplug the external power supply from the mains.



Note!

In model **MSC-6000**, lid is unlocked only when the unit is powered. Connect the external power supply to the grounded mains socket to switch on the unit. Do not force the lid open.

- 5.3.12. **MSC-6000 lid emergency opening**. Disconnect the external power supply from the mains and wait for the rotor to stop. Move the centrifuge to the front of the bench to access the emergency opening slot on the underside of the unit, next to the right front foot. Avoid tilting the centrifuge as this may cause spilling of the materials from the containers inside the centrifuge.

Insert a small screwdriver or a similar tool with diameter up to 3 mm into the emergency opening slot to 15 mm depth. Move the tool as a lever from one side to another with one hand and open the lid with another.

6. Specifications

The unit is designed for operation in cold rooms, incubators (except CO₂ incubators) and closed laboratory rooms at ambient temperature from +4°C to +40°C in a non-condensing atmosphere and maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C.

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

Model	FV-2400	FVL-2400N	MSC-3000	MSC-6000
Centrifugation mode	Fixed, 2800 or 3500* RPM		1000 – 3500 RPM	1000-6000 RPM
Relative centrifugal force	500g or 700g*		Up to 800g	Up to 2350g
Centrifugation timer	-		1 s – 99 min	1 s – 30 min
Vortexing mode	Single tube		Full rotor	
Vortexing intensity	Manual pressure		Soft, medium, hard	
Vortexing timer	-		0 – 20 s	
SMS-cycle regulation	-		1 – 999 cycles	
Tube protection	-	Stop at open lid		Lid lock
Display	-		LCD, 2x16 symbols	
Dimensions, mm	120x170x120		190x235x125	
Weight, kg**	1.4	1.7	2.1	2.5
Power consumption, W	30		11	24
Input voltage	230 V, 50 Hz or 120/230 V, 60 Hz		100-240 V, 50/60 Hz	
External power supply	-		DC 12 V	DC 24 V

Optional accessories	For model				Description	Catalogue number
	FV-2400	FVL-2400N	MSC-3000	MSC-6000		
R-2/0.5 rotor	•	•	•	•	For 8x2 ml and 8x0.5 ml microtubes	BS-010205-CK
R-2/0.5/0.2 rotor	•	•	•	•	For 6x2 ml, 6x0.5 ml and 6x0.2 ml microtubes	BS-010205-DK
SR-16 rotor	•	•	•	•	For 2 strips of 8x0.2 ml microtubes	BS-010202-AK
SR-32 rotor	•	•	•	•	For 4 strips of 8x0.2 ml microtubes	BS-010202-FK
SR-64 rotor	•				For 8 strips of 8x0.2 ml microtubes	BS-010201-EK

Replacement parts	For model				Description	Catalogue number
	FV-2400	FVL-2400N	MSC-3000	MSC-6000		
R-1.5M rotor	•				For 12x1.5 ml microtubes	BS-010205-AK
R-0.5/0.2M rotor	•				For 12x0.2 ml and 12x0.5 ml microtubes	BS-010205-BK
R-1.5 rotor		•	•	•	For 12x1.5 ml microtubes	BS-010205-AK
R-0.5/0.2 rotor		•	•	•	For 12x0.2 ml and 12x0.5 ml microtubes	BS-010205-BK
Vortex head	•	•			Vortex head with 2 mm eccentric	BS-010202-S13

* Depending on the frequency of the input current

** Accurate within ±10%.

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.
- 7.3.1. Regularly clean **MSC-3000** support suction feet for improvement of their adhesion with desk surface. To clean the support suction feet and desk surface, use mild soap and water with a soft cloth or sponge. Wipe excess water from support suction feet and desk surface with an absorbent soft cloth or sponge.
- 7.4. Fuse replacement (**FV-2400 & FVL-2400N**). Disconnect the unit from electric circuit. Open the fuse holder located on rear side of the device by turning its cover counter clockwise. Replace with the correct fuse, T 250 mA for 230 V or T 500 mA for 120 V (type **T** - time lag: fast).

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. For extended warranty, see p. 8.5.
- 8.3. Warranty covers only the units transported in the original package.
- 8.4. 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 section Technical support on our website at link below.
- 8.5. Extended warranty.
- For **MSC-3000** and **MSC-6000**, the *Premium* class models, one year of extended warranty is available free of charge after registration, during 6 months from the date of sale. Online registration form can be found in section **Warranty registration** on our website at the link below.
 - For **FV-2400** and **FVL-2400N**, the *Basic Plus* class models, 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.
- 8.6. Description of the classes of our products is available in the **Product class description** section on our website at the link below.

Technical support



biosan.lv/en/support

Warranty registration



biosan.lv/register-en

Product class description



biosan.lv/classes-en

- 8.7. 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	FV-2400 Microspin, FVL-2400N Combi-Spin, MSC-3000 / MSC-6000 Multi-Spin Minicentrifuge-Vortex
Serial number	
Date of sale	

9. EU Declaration of Conformity

EU Declaration of Conformity

Unit type	Minicentrifuges-vortexes
Models	FV-2400, FVL-2400N, MSC-3000, MSC-6000, CVP-2
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 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	<u>LVS EN 61326-1: 2013</u> Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements. <u>LVS EN 61010-1: 2011</u> Safety requirements for electrical equipment for measurement, control, and laboratory use. General requirements. <u>LVS EN 61010-2-020: 2006</u> Particular requirements for laboratory centrifuges.

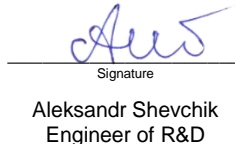
We declare that this product conforms to the requirements of the above Directives



Signature
Svetlana Bankovska
Managing director

19.07.2016.

Date



Signature
Aleksandr Shevchik
Engineer of R&D

19.07.2016

Date

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