

LMC-56

Laboratory centrifuge



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

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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 and versions:

Model and name	Version
LMC-56, laboratory centrifuge	V.1AD, V.1AE

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

- 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 in a horizontal position (see package label) at ambient temperatures between -20°C and +60°C and maximum relative humidity of 80%.
- 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.
- Use only original parts and accessories, provided by manufacturer for this product.
- 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

- Do not centrifuge flammable or chemically active substances. If such liquids are spilled on the rotor or rotor chamber, the centrifuge must be cleaned with a moist cloth and a mild soap solution.
- Do not use rotors with visible signs of corrosion, wear or mechanical damage.
- Do not use the rotor without fixation nut (see figure below). Fixation procedure is described in **4.4**.
- Do not fill in the tubes after they have been inserted in the rotor.
- Do not use glass tubes or tubes unsuitable for centrifugation.
- Select the correct type of rotor. Some rotors have limited maximum speed (see figure below). Selection procedure is described in **5.4.3**.
- Do not leave the operating unit unattended.
- 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

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



3 General information

LMC-56 is a modern benchtop, low-speed laboratory centrifuge designed for convenient sedimentation, centrifugation and collection of necessary samples. It provides operation with tubes, blood collection systems, gel cards, microtest and ELISA plates. Our centrifuges are designed for safe work (metal protecting housing), easy maintenance and wide application range in medical, biochemical, chemical, industrial and other type of laboratories.

FEATURES:

- User-friendly centrifugation parameter input and simultaneous display of the set and actual parameter values.
- Safe assay performance: metal protective housing and metal lid, automatic imbalance switch-off, lid lock during the centrifuge operation provide safe operation at all speeds.
- Rotor imbalance automatic diagnostics (emergency stop, imbalance indication).
- Automatic rotor detection with active rotational speed limit.
- Relatively high speed – maximum 6,000 rpm or 3,160 g.
- Wide choice of accessory rotors and adapters.
- A wide selection of rotors – up to 13.
- Improved chamber to reduce sample heating during centrifugation.
- Different modes of acceleration and deceleration, including deceleration mode with switched off forced braking.
- Possibility to set the speed both in revolutions per minute and by relative centrifugal force.

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:

- Laboratory centrifuge 1 pce.
- Power cable 1 pce.
- Spare fuse (inside fuse holder) 1 pce.
- Wrench for rotor fixation 1 pcs.
- Operating manual, declaration of conformity 1 copy

4.2.2 Optional accessories:

- R-6 rotoron request
- R-6P rotor.....on request
- R-12/10 rotoron request
- R-24/10 rotoron request
- R-12/15 rotoron request
- R-2 rotoron request
- R-24GC rotor for gel cardson request
- RMT-24 angle rotoron request
- BR-4U bucket rotoron request
- Adapter sets:
 BN-13/75, BN-13/100 and BN-16/100 (for R-12/10 and R24/10),
 AP-96 and AP-384 (for R-2)
 BA-2/50, BA-4/15, BA-4/10, BA-8/5 and BA-14/2U (for BR-4U).....on request
- RR-U rotor support standon request



R-6



R-6P



R-12/10



R-24/10



R-12/15



R-2



R-24GC



RMT-24



BR-4U with BA-2/50

BR-4U with BA-4/10

BR-4U with BA-8/5

BR-4U with BA-14/2U

4.3 Setup.

- Place the unit upon even horizontal stable non-flammable surface 30 cm away from any flammable materials, and clear 20 cm around the unit 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.
- 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.

4.4 Rotor replacement.

- Check the power cable for any signs of damage. Connect the power cable to a properly grounded mains socket. Set the power switch on the unit to position **I** (on). Press the **▲ Open** key (fig. 2/9) and lift the lid by hand.



Caution! Check the rotor and adapters for any signs of wear or corrosion and replace if necessary.

- Hold the rotor with one hand and, using the supplied wrench for rotor replacement (13 mm), turn the fixation nut (fig. 1/1) counter clockwise to release the rotor.
- Replace the rotor and secure the new rotor carefully by turning the fixation nut tightly.



Caution! Do not hold the rotor by rings or adapters mounting when mounting and fixing it. Hold the rotor as shown on figure 1 (✓).



Caution! Since some plastic tubes and microtest plates can be damaged at higher speeds, maximum speed is limited for some rotors. **LMC-56** detects the rotor automatically, see **5.13**.

- If the unit will not be used, close the lid carefully and smoothly until a clicking sound is heard. Set the power switch on the side to position **O** (off). Disconnect the power cable from electric circuit.

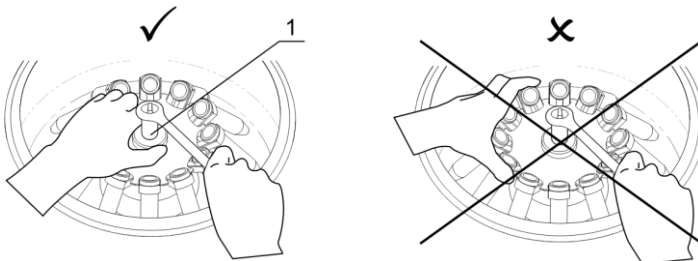


Figure 1. Rotor fixation

5 Operation

5.1 Recommendations during operation:

- Use even numbers of tubes arranged symmetrically (one opposite another) when loading to give the unit even balance during operation. The opposite tubes must be filled up equally.
- Centrifuge rotors must not be filled over the volume specified by the manufacturer.
- Do not fill in the tubes after they have been inserted in the rotor.
- Do not use glass tubes or tubes unsuitable for centrifugation.
- Rotor must always be fixed securely. Stop the operation immediately by pressing and holding the **RUN/STOP** ►/■ key for more than 2 seconds if any unusual noise occurs during acceleration, which can be due to improper rotor fixation.
- Since some plastic tubes and microtest plates can be damaged at higher speeds, maximum speed is limited for some rotors. Model **LMC-56** detects the rotor automatically, see **5.13**.

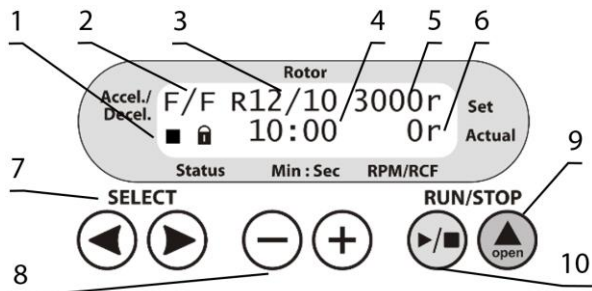


Figure 2. LMC-56 control panel

- 5.2 Check the power cable for any signs of damage. Connect the power cable to a properly grounded mains socket. Set the power switch on the side to position I (on).
- 5.3 The centrifuge turns on. The following readouts appear on the display:
- Acceleration and deceleration modes (fig. 2/2);
 - Set rotor speed in RPM or RCF¹ (fig. 2/6);
 - Status icons of rotor, ■ stopped or ► running (fig. 2/1, first symbol);
 - Status icons of lid, ■ closed or ► open (fig. 2/1, second symbol);
 - Set time of centrifugation, in minutes and seconds (fig. 2/4);
 - Actual rotor speed, in RPM or RCF (fig. 2/6);
- 5.4 Press the ▲ **Open** key (fig. 2/9) and lift the lid by hand. Check the rotor, buckets for any signs of wear or corrosion, and replace if necessary. Insert **EVEN** number of tubes/microtest plates in rotor one opposite another. The loading in the opposite tubes must be equal.



Caution! Check the rotor fixation every 10 days. Tighten the fixation nut if necessary, see figure 1.

¹ Revolutions per minute and Relative Centrifugal Force

- 5.5 **Setting parameters.** Use the **SELECT** ◀ and ▶ keys (fig. 2/7) to choose a parameter and the – and + keys (fig. 2/8) to modify it. Selected parameter will be blinking. Program automatically saves any changes made after no keys are pressed for 2 seconds.
- 5.5.1 Acceleration modes (fig. 2/2, first letter). Three modes of acceleration are available, slow (shortened to **S**), normal (**N**) and fast (**F**).
- 5.5.2 Deceleration modes (fig. 2/2, second letter). Four modes of deceleration are available, free brake (**0**), slow (**S**), normal (**N**) and fast (**F**).



Note. Acceleration and deceleration speed values can be found in the **Specifications** section. This information can also be found on the lid of the unit.

- 5.5.3 Installed rotor (fig. 2/3). Combinations of rotors, adapters and their maximum allowed speed is listed below in the **Table 1**.


Table 1. Rotor speed limits for the centrifuges.

Code on display (fig. 2/3)	Rotor	Adapter	Maximum speed, RPM	Maximum RCF, g
R6	R-6	–	4200	3160
	R-6P	–		
R12/15	R-12/15	–	4200	3160
R24/10	R-24/10	–	4000	2860
	R-24/10	BN-16/100		
	R-24/10	BN-13/100		
R12/10	R-12/10	–	4200	3160
	R-12/10	BN-16/100		
	R-12/10	BN-13/100		
BN13/75	R-12/10	BN-13/75	4200	2660
R2	R-2	–	2000	560
	R-2	AP-96		
	R-2	AP-384		
R24GC	R-24GC	–	1500	280
RMT-24	RMT-24	–	6000	3750
BR-4U	BR-4U	BA-2/50	4200	3260
		BA-4/15		3260
		BA-4/10		2960
		BA-8/5		2370
		BA-14/2U		2070







Note. **LMC-56** detects the rotor and adjusts the speed automatically. See **5.13** for additional information.

- 5.5.4 Rotation parameters (fig. 2/5). Rotor speed can be set in RPM and in RCF, denoted after numeric value by **r** and **g**, accordingly. Values convert after changing units. RCF depends on selected rotor or adapters, as shown in Table 1.
- 5.5.5 Time setting (fig. 2/4). Select duration of centrifugation in minutes, step 1 minute.

5.6 Close the lid carefully and smoothly until a clicking sound is heard. Icon  appears on the display (fig. 2/1).







Note. If the  icon did not appear on the display, program does not start the centrifugation. Try to open and close the lid again.

5.7 Press the **RUN/STOP** / key (fig. 2/10) to start centrifugation. Icon  (fig. 2/1) and actual speed (fig. 2/6) are shown in the lower line of the display. The timer (fig. 2/4) starts the countdown after set speed is achieved.






Note. If the rotor imbalance occurs causing vibration, the centrifuge stops automatically (IMBALANCE indication appears on the display). In this case, open the lid after the rotor stops and remedy the cause of imbalance.

5.8 Centrifugation is stopped automatically after the set time elapses. A sound signal is emitted after full stop of the rotor. Press the **RUN/STOP** / key to stop the signal.

5.9 If necessary, centrifugation can be stopped before the set time elapses. Press the **RUN/STOP** / key. Rotor stops according to set deceleration mode.



Note. For emergency, to apply fast braking regardless of set deceleration mode, press and hold **RUN/STOP** / key for more than 2 seconds.

5.10 Press the **▲ Open** key and open the lid by lifting it upwards with your hand. It is possible to unlock and open the lid only when the rotor is stopped. Display shows  icon.

5.11 At the end of operation, set the Power switch in position **O** (OFF) on the rear panel of the unit. Disconnect the power cord from the mains.







Note. The electrical lid lock allows opening the lid only when the unit is connected to the mains and is turned on. Do not force the lid to open when the unit is switched off!

5.12 **Lid emergency opening.** Disconnect the power cord from the mains. Ensure that the rotor has stopped. Slide the unit to the front of the bench to access the emergency opening slot on the underside of the unit (located in the front side). Avoid tilting the unit as this may cause spilling of the materials from the containers inside the unit. Insert a small screwdriver (or similar tool with diameter up to 3 mm) into the emergency opening slot in front of the dot on the label “Open” at a depth of 10-15 mm. Move the lever to the arrow direction until a click is heard and open the unlocked lid..

5.13 **Automatic rotor detection for LMC-56.** The centrifuge **LMC-56** has automatic rotor detection. It detects currently inserted rotor in the beginning of rotation initiation and will automatically limit the RPM of various rotors mentioned in **Table 1**.

5.13.1 Algorithm of rotor detection.

- Press **RUN/STOP** / to initiate rotor rotation, rotor detection is automatically started at 300 ± 50 RPM with duration of up to 5 seconds.
- If the set RPM is in the correct range for the rotor, the centrifuge continues operation.
- If the set RPM is not correct for the rotor, the centrifuge automatically adjusts to the closest possible working RPM of the rotor.
- If the adjusted RPM is satisfactory, stop the sound signal by pressing **RUN/STOP** /.

6 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.

Speed setting range

In RPM 100 – 6000 RPM

In relative centrifugal force (RCF) 10 – 3750 g

Speed increment 100 RPM or 5 g

Timer setting..... 1 – 90 min

Timer increment 1 min

Acceleration, RPM/s

Slow mode 50

Normal mode..... 75

Fast mode (depending on the load) 280

Deceleration, RPM/s

Brakes off (depending on the load) 30

Slow mode 8

Normal mode..... 50

Fast mode (depending on the load) 150

Rotor imbalance automatic diagnostics ..Emergency stop, display indication “IMBALANCE”

Rotor detection Yes

Rotation direction Counterclockwise

Display..... 2x16, LCD

Chamber diameter..... 355 mm

Dimensions..... 560x480x315 mm

Power consumption..... 320 W (**V.1AD**); 330 W (**V.1AE**);

Operational voltage 230 V, 50/60 Hz (**V.1AD**); 120 V, 50/60 Hz (**V.1AE**)

Weight, accurate within $\pm 10\%$ 16.5 kg

7 Ordering information

7.1 Models and versions available:

Model	Version	Description	Catalogue number
LMC-56	V.1AD	230 V, 50/60 Hz	BS-040118-CK
	V.1AE	120 V, 50/60 Hz	

7.2 To inquire about or order the optional accessories or the replacement parts, contact Biosan or your local Biosan representative.

7.2.1 Optional accessories. Rotors and rotor holder.

Model	Description	Maximum speed ¹ , RPM	Maximum RCF ² , g	Catalogue number
R-6	For 6 conical centrifuge tubes of 50 ml, with aluminium tube holders, ØxH: 40x103 mm	4200	3160	BS-010208-DK
R-6P	For 6 conical centrifuge tubes of 50 ml, with plastic tube holders, ØxH: 40x103 mm	4200	3160	BS-010208-XK
R-12/15	For 12 conical centrifuge tubes of 15 ml, ØxH: 17x120 mm	4200	3160	BS-010208-EK
R-12/10	For 12 round-bottom centrifuge tubes of 10-15 ml, ØxH: 16x90 mm	4200	3160	BS-010208-BK
R-24/10	For 24 round-bottom centrifuge tubes of 10-15 ml, ØxH: 16x90 mm	4000	2860	BS-010212-JK
R-2	For 2 standard 96-well microplates, LxWxH _{max} 128x85.6x45 mm	2000	560	BS-010208-AK
R-24GC	For 24 of 8-column gel cards for blood group serology testing, LxW 53x74 mm	1500	280	BS-010208-VK
RMT-24	For 24 of 1.5 or 2 ml microtubes, angled rotor	6000	3750	BS-010221-AK
BR-4U	Bucket rotor, 4 places for adapters	4200	– ³	BS-010221-BK
RR-U	Stand for rotors			BS-010208-UK

7.2.1.1 Centrifuge tube and microplate manufacturers: Corning, Falcon, Greiner Bio-one, Nunc, Sarstedt.

7.2.1.2 Gel card manufacturers: Grifols, Diamed.

¹ Accurate within ±5%

² Relative Centrifugal Force

³ Depends on the inserted buckets, see 7.2.2

7.2.2 Optional accessories. Rotor adapter sets.

Model	For rotor	Description	Max. RCF ¹	Catalogue number
BN-13/75	R-12/10	Adapters for 2-5 ml vacutainers (ØxH: 13x75 mm)	1360g	BS-010208-PK
BN-13/100	R-12/10	Adapters for 4-8 ml vacutainers (ØxH: 13x100 mm)	1610g	BS-010208-QK
	R-24/10		3160g	
BN-16/100	R-12/10	Adapters for 8-9 ml vacutainers (ØxH: 16x100 mm)	1610g	BS-010208-RK
	R-24/10		3160g	
AP-96	R-2	Adapters for unskirted or semi-skirted 96-well microplates (LxWxH _{max} : 128x85.6x45 mm)	560g	BS-010219-DK
AP-384	R-2	Adapters for 384-well microplates (LxWxH _{max} : 128x85.6x45 mm)	560g	BS-010219-EK
BA-2/50	BR-4U	Bucket adapters for 2 tubes of 50 ml	3260g	BS-010221-CK
BA-4/15	BR-4U	Bucket adapters for 4 tubes of 15 ml	3260g	BS-010221-DK
BA-4/10	BR-4U	Bucket adapters for 4 tubes of 10 ml	2960g	BS-010221-EK
BA-8/5	BR-4U	Bucket adapters for 8 tubes of 5 ml	2370g	BS-010221-FK
BA-14/2U	BR-4U	Bucket adapters for 14 microtubes of 2 ml	2070g	BS-010221-JK

7.2.3 Replacement parts. Rotor adapter sets.

Model	For rotor	Description	Max. RCF ⁵	Catalogue number
BN-11/30	R-6P	Adapters for 6 of 50 ml centrifuge tubes (ØxH: 40x103 mm)	1610g	BS-010208-ZK
BN-17/120	R-12/15	Adapters for 12 of 15 ml centrifuge tubes (ØxH: 17x120 mm)	1610g	BS-010208-TK
BN-16/90	R-12/10	Adapters for 12 of 10-15 ml centrifuge tubes (ØxH: 16x90 mm)	1610g	BS-010208-SK
	R-24/10		3160g	

8 Care and maintenance

- 8.1 If the unit requires maintenance, disconnect the unit from the mains and contact Biosan or your local Biosan representative.
- 8.2 All maintenance and repair operations must be performed only by qualified and specially trained personnel.
- 8.3 **Cleaning and disinfection.**
 - 8.3.1 Standard ethanol (75%) or other cleaning agents recommended for cleaning of laboratory equipment can be used for cleaning and decontamination of the unit.
 - 8.3.2 Disinfect the unit after operation by cleaning the parts inside the centrifuge chamber.
 - 8.3.3 The rotor and other accessories are autoclavable (120°C, 20 min).

¹ Relative Centrifugal Force

- 8.4 **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 (fig. 3). Check and replace with a correct fuse if necessary, see table below:

Model & version	Fuse ¹
LMC-56 V.1AD, 230 V, 50/60 Hz	M 2 A
LMC-56 V.1AE, 120 V, 60 Hz	M 4 A

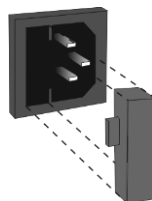


Figure 3. Fuse holder

9 Warranty

- 9.1 The Manufacturer guarantees the compliance of the unit with the requirements of Specifications, provided the Customer follows the operation, storage and transportation instructions.
- 9.2 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 **9.5**.
- 9.3 Warranty covers only the units transported in the original package.
- 9.4 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.
- 9.5 Extended warranty. For **LMC-56**, the *Premium* class model, 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.
- 9.6 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

Registration



biosan.lv/register-en

Product class description



biosan.lv/classes-en

- 9.7 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
LMC-56 , Laboratory centrifuge		

¹ Fuse type M - time lag Medium

10 EU Declaration of conformity

EU Declaration of Conformity

Unit type Mini-centrifuge, laboratory centrifuge

Models **Microspin-12, LMC-3000, LMC-4200R, LMC-56**

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 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 61010-2-020:2016 Particular requirements for laboratory centrifuges.
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

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