ELMI laboratory equipment

# Fugamix3™

## Centrifuge-Mixer CM-50MP


**Video instruction is available!**

youtube.com/elmimedia/videos

# User manual

ISO 9001:2008

Version 050514

# Contents

# Dear users!

Fugami-3 CM-50MP is a revolutionary system that guides you every step of the way to a faster and better plasmid DNA miniptep. We ask you to carefully read the user manual and follow the instructions for proper operation and maintenance of the CM-50MP. This will insure excellent results and enduring performance.

# General information

The Fugamix is used with a specially designed CarbonSpin(TM) rotor for 12 x 1.5/2ml tubes. This microprocessor-controlled system provides smooth rotor acceleration and braking during all segments of the operation. A big graphical display offers instant readout of all the relevant parameters, including time, braking level, mixing level and rotor speed (simultaneous RPM and RCF). The centrifuge lid locks during rotation and unlocks at the end of each run. Adjustable sound alarm , brightness and sleep mode are also standard. Imbalance detection and a temperature sensor protect the unit from imbalancing and overheating .

# Technical specifications

| | |
|---|---|
| Rotor rotation speed, RPM | 13500 |
| Speed step selection, RPM | 100 |
| Centrifugal force, RCF | 12388 |
| Centrifugal force step selection, RCF | 10 |
| Timer settings, Min | 0.1-99 |
| Number of braking levels | 5 |
| Number of mixing levels | 12 |
| Total possible imbalance of test tubes: | 0.7 |
| Environmental temperature,°C | 10-40 |
| Relative air moisture at 20°C,% | 80 |
| Power supply adapter, | 24V-5A |
| Max power consumption, W | 120 |
| Size of the device (length x width x height), mm | 200x180x145 |
| Weight | 3.1 |

# Delivery package

| **Item** | **Quantity** |
|---|---|
| Fugamix | 1 |
| Rotor nut | 1 |
| Rotor key | 1 |
| Power supply adapter 24V- 5A 120W | 1 |
| Power cord | 1 |
| User manual | 1 |
| Packaging material | 1 |

# Preparation to work

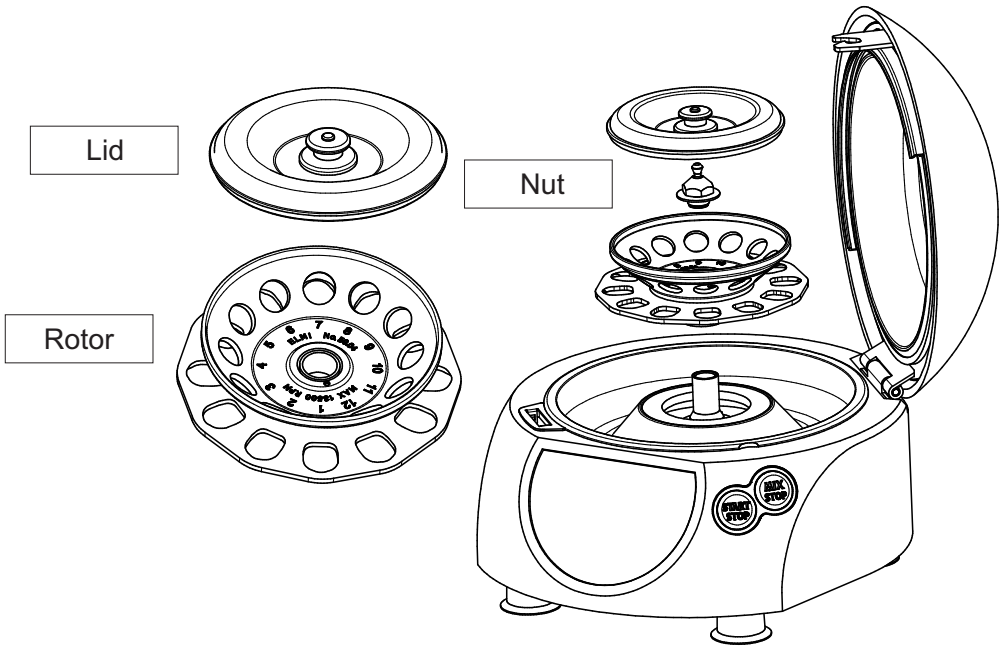
- Unpack the device.
- Inspect the appearance of the device, the adapter and the power cord for damage.
- Open the lid of the CM-50MP with the emergency lid opening lever and remove the packaging material.( see emergency opening of the centrifuge lid).
- In the cold season keep fugamix at room temperature for at least 2 hours.
- Assembly the rotor.
- Rotor must rotate freely without jamming.
- Connect the fugamix to the adapter and the adapter to the socket.
- Thus the light indicators will light up.
- In the absence of faults or damage the centrifuge can be considered ready to work.
- In the presence of faults and damage, do not use the fugamix without consulting a specialist.

**ATTENTION! Network socket must correspond to the adapter plug. In case of non compliance with this condition the rules of electrical safety are violated.**

# Rotor assembly and usage

## CarbonSpin™

The CM-50MP fugamix features our patented CarbonSpin(TM) rotor.
The rotor is composed of precisely machined proprietary aluminum alloy, significantly improving efficiency and ventilation.
To reduce the rotors weight while simultaneously increasing efficiency during intensive shake cycles, a custom carbon fiber layer stability ring was implemented.
The dependable design allows the user to spin and vigorously shake any substance, including heavy beads, for as long as the experiment requires.




**Assembly**: Put the rotor on the shaft first and then tighten the nut with a provided hand driven key.

**Usage**: always load the rotor symmetrically. By minimizing the difference of weight between the filled test tubes, you reduce the wear of mechanical parts of the centrifuge. If the overall imbalance of test tubes exceeds 0.7 gram, centrifuge will stop and the display will show “DISBALANCE” error code.

**Note:** The lid is specially designed to allow spinning down the tubes with the caps open.

# Control buttons

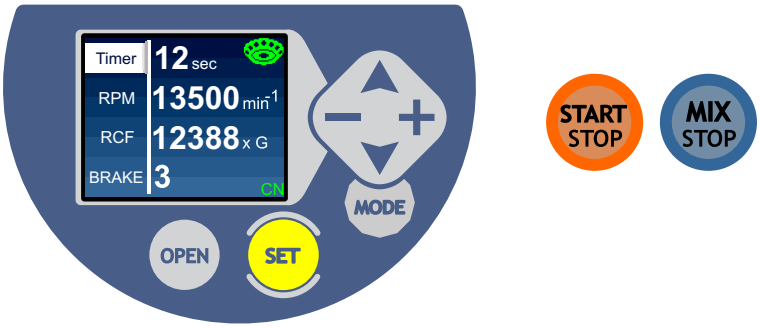



Fig. 1 Control panel.

OPEN — Lid opening.

SET — “Custom”, “Miniprep 1” and “Miniprep 2” mode view and configuration.

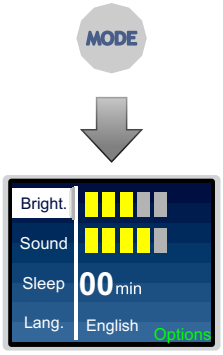
MODE — Mode selection.

Up and Down menu scroll and parameter change.

START STOP — Start/stop and custom program launch.

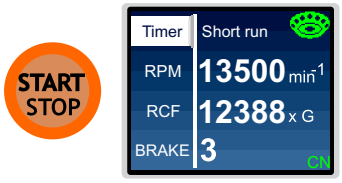
MIX STOP — Mixer start/stop.

# Additional commands of the buttons




By pressing and holding down “MODE” for 3 seconds you enter “Options” menu to adjust screen brightness, beeper volume and more.

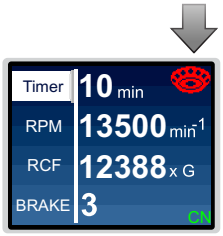

Use “START/STOP” and “MIX/STOP” buttons to switch between centrifugation “CN” and vortexing “Mixer” modes swiftly. One single click takes to the given mode immediately.




When timer is set to “Short run” you can push and spin the centrifuge. Operation will stop when button released.


When timer is set to “Short run” you can push and mix. Operation will stop when button released.

# Operating fugamix in centrifugation mode “CN”

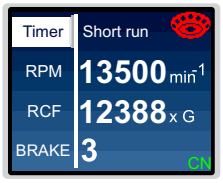



Rotor icon has a color code.
All the parameters are displayed clearly.


- Green color means that the lid is opened.
- Red color means the lid is closed and you can now run the fugamix.

Settings are made using the “+/- up/down” keyboard.
Parameters can only be changed while the centrifuge is not running.


To run centrifugation just press “START/STOP” button.




By reducing the timer to the minimum you will reach a “Short run” mode. This mode allows using “START/STOP” button to manage the duration of the spindown.
Centrifuge will run while the button is depressed and will stop automatically when released.

# Operating fugamix in “SP” mode

Sample preparation is a programmable sequence of mixing and spin down that allows effectively mix small volumes of reagents and collect them on the bottom of a test tube.


“Timer” - Controls the overall duration of the procedure.
“RPM / RCF” - Variable spin down speed.
“Mixer” - Vortexing speed.


When all the setting are made, just press “START/STOP” to start the program.


When timer is done operation will stop and automatically open up the lid. Rotor indicator will change from Red to Green and a sound notification will beep.

# Operating fugamix in “Miniprep 1” and “Miniprep 2” modes Advantages of the Fugamix 3


Fugamix 3 has two special modes for doing DNA extraction from E-coli in miniprep and FAST-miniprep format.

“Miniprep 1” and”Miniprep 2” are preprogrammed and optimized to work semiautomatically with a standard kit for DNA extraction. Every step of the protocol is optimized for best performance in mixing and spin down and all you need to do is to follow the protocol and press START/STOP.
These modes are compatible with all DNA extraction kits available on the market.
Using the Fugamix 3 for miniprep and FAST-miniprep significantly reduces the time spent extracting DNA. The result is also more consistent preps with less effort required.

Here is a list of major advantages of using Fugamix 3 for DNA extraction:

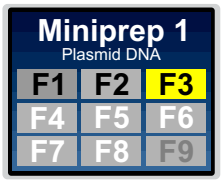
**1.** All 12 tube pellets are resuspended automatically and simultaneously.
No need for manual pipetting and vortexing.

**2.** Mixing of lysis and neutralizing buffers is done automatically and simultaneously.

**3.** Plasmid DNA extraction is reproducible, rapid and efficient.

**4.** Higher quality of DNA is the result of this innovative method of resuspending bacterial cell pellets, lysis, and instant neutralization in all 12 samples.

# Operating fugamix in “Miniprep” mode
# Understanding the interface




Miniprep plasmid DNA extraction mode is a sequence of preprogrammed steps that follow the standard protocol.

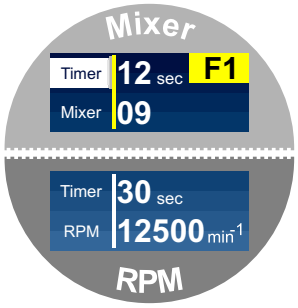
**Understanding the color code for program steps.**

F3 - Yellow field: selection marker. This step is currently selected for execution.

F9 - Grey field, grey letters: this step is empty and is not in use for this protocol.

F5 - Grey field, white letters: this step is not yet executed.

F2 - Grey field, black letters: this step has already been executed.

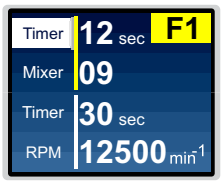



**Every step has two parts :**

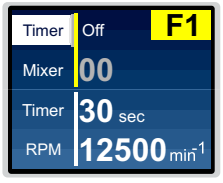
- Mixer: Preset speed vortexing

- RPM: Spin down with an preset speed.

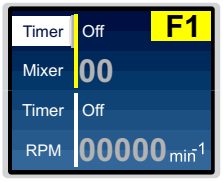
**Examples of different steps:**




- Fully programmed both Mixing and RPM part of a step.
This step will do 12 second mixing with a level 9 speed and then do 30 sec spin down with 12500 RPM speed.

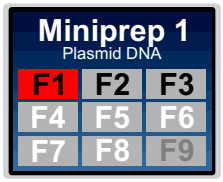



- This step is programmed to do only the spin down and skip the mixing part. It will do 30 sec spin down with 12500 RPM speed. Same way you can disable the spin down part and do only the Mixing.




- This step has both parts disactivated “Off” and will appear on a main screen as a grey cell with grey number “Empty”. Programm will just skip this step.

# Operating fugamix in “Miniprep 1” mode

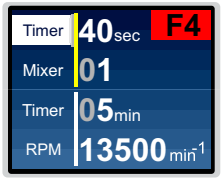



**Miniprep plasmid DNA extraction mode mapped on a standard protocol and a standard kit.**


**Step 1**
Load test tubes containing bacteria in to the rotor. Press Start/Stop and wait 1 min until the cells will be separated. Remove supernatant.


**Step 2**
Add 250 µl of resuspension buffer. Press Start/Stop.
Within 20 sec all the precipitate will resuspend.


**Step 3**
Add 250 µl of lysys buffer.Press Start/Stop. Two solutions will now mix homogeneously while cell lyses.

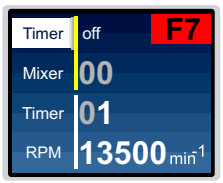



**Step 4**
Add 350 µl of neutralization buffer. Press Start/Stop.
Two solutions will mix homogeneously and neutralize. Followed by 5 min spin down. Proteins and DNA is now separated.


**Step 5**
Transfer the supernatant to a spin column and press Start/Stop.
20 sec spindown will gather plasmid DNA on the column.

# Operating fugamix in “Miniprep 1” mode


**Step 6**
Remove elution. Apply 700 µl of washing buffer on the spin column. Press Start/Stop and spin down for 20 sec.



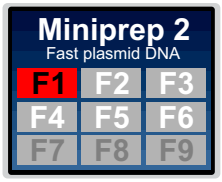

**Step 7**
Remove elution and press Start/Stop. 1 min spin down will clear out the remaining wash buffer and dry the membrane.


**Step 8**
Move the spin columns to the elution test tubes. Add 50 µl of elution buffer to the center of a spin columns’ membrane.
Press Start/Stop and spin down for 1 min.
Now purified plasmid DNA is eluted.

## Characteristics of an extracted plasmide DNA.

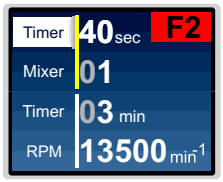
- Plasmid DNA obtained by the Fugamix(TM) is very pure and do not contain any RNA or chromosome DNA.
- More then 95% of plasmid is in CCC format.
- Plasmid DNA extracted can be used for sequencing, cloning, transformation and molecular biology studies.
- Ratio OD 260/280 – 1.85-1.9

# Operating fugamix in “Miniprep 2”




**Fast plasmid DNA extraction mode mapped on a standard protocol and a standard kit.**


**Step 1**
Add 20 µl RNaseA (10mg/ml) 100 µl of resuspension buffer and press Start/Stop. Two solutions will mix homogeneously while cells lyses.




**Step 2**
Add 350 µl of neutralization buffer. Press Start/Stop.
Two solutions will mix homogeneously and neutralize. Followed by 3 min spin down. Proteins and DNA is now separated.


**Step 3**
Transfer the supernatant to a spin column and press Start/Stop.
15 sec spindown will gather plasmid DNA on the column.


**Step 4**
Remove elution. Apply 700 µl of washing buffer on the spin column. Press Start/Stop and spin down for 15 sec.


**Step 5**
Remove elution and press Start/Stop. 1 min spin down will clear out the remaining wash buffer and dry the membrane.

# Operating fugamix in “Miniprep 2”

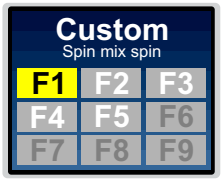

**Step 6**

Move the spin columns to the elution test tubes. Add 50 µl of elution buffer to the center of a spin columns’ membrane.
Press Start/Stop and spin down for 1 min.
Now purified plasmid DNA is eluted.

**Characteristics of an extracted plasmide DNA.**

- Plasmid DNA obtained by the Fugamix(TM) is very pure and do not contain any RNA or chromosome DNA.
- More then 95% of plasmid is in CCC format.
- Plasmid DNA extracted can be used for sequencing, cloning, transformation and molecular biology studies.
- Ratio OD 260/280 – 1.85-1.9

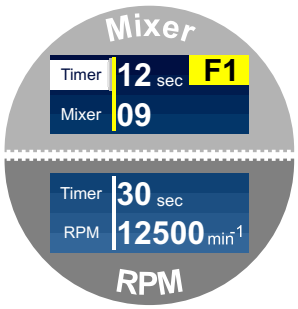
# Operating fugamix in “Custom” mode
# Understanding the interface




Custom mode is a step by step program with 9 independently programmable steps F1-F9.

**Understanding the color code for program steps.**

- F1 - Yellow field: selection marker. This step is currently selected for editing or running.
- F1 - Grey field, grey letters: this step is empty and has no user settings.
- F1 - Grey field, white letters: this step contains user created program.
- F1 - Grey field, black letters: this step contains user created program and it has already been executed.




**Every step has two parts that are individually programmable:**

- Mixer: Variable speed vortexing
- RPM: Spin down with an optional speed.

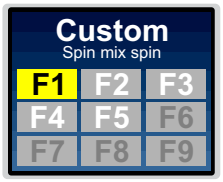
**Way to program individual steps.**


- Fully programmed both Mixing and RPM part of a step.
This step will do 12 second mixing with a level 9 speed and then do 30 sec spin down with 12500 RPM speed.


- This step is programmed to do only the spin down and skip the mixing part. It will do 30 sec spin down with 12500 RPM speed. Same way you can disable the spin down part and do only the Mixing.


- This step has both parts disactivated “Off” and will appear on a main screen as a grey cell with grey number “Empty”. Programm will just skip this step.

# Operating fugamix in “Custom” mode
# Creating a program




Find mode “Custom” in a mode list by pressing “MODE” button.


In order to start programming steps of the program press “SET”.

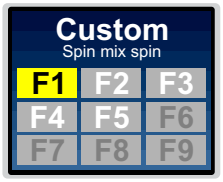

Cell editing screen will open up. Here you can modify the settings of Mixer and RPM by using “+/- up/down” keyboard.


When the first F1 step editing is finished press “MODE” to proceed to step F2 then F3 and so on.


When all the steps are edited press “SET” and return to main screen of the “Custom” mode. You will see your edited steps as a grey cells with white letters.

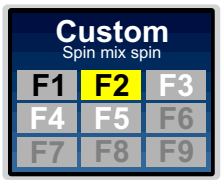
You can also move between  steps by pushing “up and down” buttons on the control keyboard.

# Operating fugamix in “Custom” mode
# Running a program




Selector is automatically placed at the beginning of the program to the fist step F1.

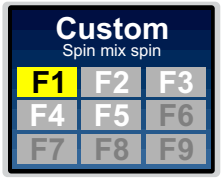

Press START/STOP to run the program.




Upon completion of every step centrifuge will stop, open the lid and wait to proceed to the next step F2.
Steps that are already completed are marked black color.


To proceed to step two F2 press START/STOP.

If needed you can move selector from one step to another to change the sequence using the “+/- up/down” keyboard.




When all the steps are completed the system will return to main screen of the “Custom” mode. You can now repeat the program again.

# Operating fugamix in “Mixer” mode

Mixer mode is a fully functional vortexer. Easy to set vibration speed from 1 to 12.


Settings adjustments are made using the “+/- up/down” keyboard.
Parameters can also be change while the centrifuge is running.


To run vortexing just press “MIX/STOP” button.


By reducing the timer to the minimum you will reach a “Short run” mode. This mode allows using “MIX/STOP” button to manage the duration of vortexing.
Vortexer will run while the button is depressed and will stop automatically when released.

**Open**

**Shut**

Centrifuge lid can be either open or shut while vortexer is running.

# Vortexing levels explained.

| Vortexing level | RPM |
|---|---|
| 1 | 105 |
| 2 | 375 |
| 3 | 525 |
| 4 | 575 |
| 5 | 732 |
| 6 | 945 |
| 7 | 1082 |
| 8 | 1220 |
| 9 | 1332 |
| 10 | 1400 |
| 11 | 1540 |
| 12 | 1620 |

Vortexing mode 1 is a Smart function which resembles hand shaking motion!

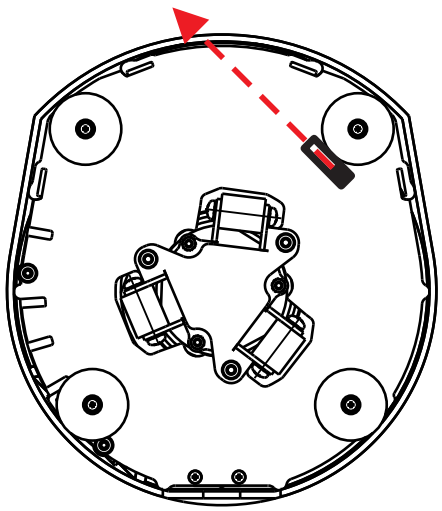
Relative speed in rounds per minute from level 2 to lever 12.

# Error codes and solutions

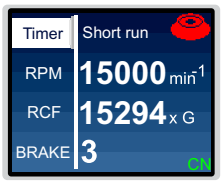
| Error code | Cause | Solution |
|---|---|---|
| “BLACK SCREEN” | No main power connection.<br><br>Power failure | Check connection of the power cable. Check if the power supply adapter is functioning. |
| ⚠ THE LID IS NOT SHUT | Centrifuge lid is left open. | Close and press on the lid till you hear a click. |
| ⚠ DISBALANCE | Total imbalance of test tubes is more than 1 gram. | Load rotor symmetrically. |
| ⚠ PCB OVERHEAT | Processor Control Board is overheated. | Give a little time and centrifuge will cool down automatically. |
| ⚠ MOTOR OVERHEAT | Motor is overheated. | Give a little time and centrifuge will cool down automatically. |
| Rotor detection fails. Centrifuge does not start. Power supply cuts off. Disbalance detection failure. | Controller factory settings mismatch. | Go to “TO” special menu. |

# Emergency opening of the lid

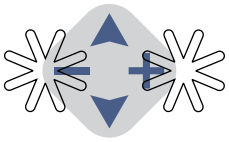
**T**o open the lid of centrifuge in case of power failure or lock damage of the lid it is necessary to raise the centrifuge and move the lever, which is located on the bottom of a centrifuge under the control panel, to the side as it is shown on the figure.



# Restoring factory settings using special “TO” menu




When in “CN” mode turn the fugamix off by clicking the main power switch to “off” position.

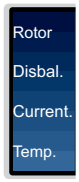


Press and hold down both buttons (-) and (+).
While holding down the buttons click the power switch to “on” position.

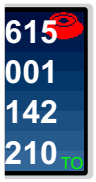

Centrifuge will enter to a special service menu “TO”.

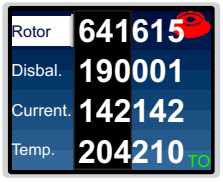
# Understanding the screen readouts:

**Parameter** **Modifiable parameter** **Actual parameter**








Compare the “modifiable parameter” figures with corresponding factory default figures that you can find on the **“centificates”** page in the end of this manual.
If figures does not match - correct them manually using “up/down +/-” keyboard.

# Safety features

Service personnel are prohibited to:

- Plug the devie in to a power outlet with configuration that differs from the power adapters configuration.
- Use the device with damaged adapter, power cord, rotor aerodynamic lid or housing.
- Move the device during centrifugation.
- Run the unit without rotor aerodynamic lid or housing.
- Load the rotor asymmetry.
- Use damaged tubes.

**ATTENTION! Studied Samples may contain pathological material, including pathogens of serious diseases.**

# Disinfection and cleaning

Before you start disinfection or cleaning make sure the power adapter is unplugged. It is recommended to perform cleaning with water and universal washing liquids. Afterwards the machine should be carefully dried. Do not let the water get inside the centriguge-mixer.

# Transportation and storage

To insure safety during the transportation, transported equipment should be packed in the original manufacturers packaging or similar packaging substitute.
Equipment can be transported by any kind of closed transport make sure that equipment is tightly fixed and transportation runs accordingly to regulations applied to this way of transport.
Equipment should be stored in original manufacturers packaging in dry room with humidity not more then 80% and temperature range from +10 C up to +40 C. It is not recommended to store the equipment more then 36 month.

# Warranty statements

- Warranty applies to 24 month period from the date of purchasing.
- Malfunctions arisen by the fault of manufacturer during warranty period, are removed free of charge.
- Warranty is is not valid in the following cases:
  - If the serial number label of the manufacturer is damaged.
  - If damages appears as a result of the incorrect operation, transportation or storage.
- These documents are necessary if applying for warranty repair:
  - User manual with serial number of the machine.
  - Officially signed report, describing the reasons and conditions of equipment malfunction.
- Warranty repair could be performed only if the equipment is delivered in the original manufacturers packaging or equally safe packaging. Therefore please save the packaging after unpacking the device.
- If the above warranty requirements are disturbed, repair charges are applied to the consumer.
- For all further questions concerning exploitation and maintenance please contact manufacturer or product vendor.

# Certificate of approval

Fugamix CM-50MP___ N_____ has been inspected for the technical conditions and meets all regulations necessary for such class of device.

Quality control person_____.
(name) (signature)

Date of manufacture_____.

Place for stamp.

# Certificate of sale

Organization _____.

Address _____.

Phone_____.

Vendor _____.
(name) (signature)

Date of sale _____.

Manufacturers' address.
21-136 Aizkraukles Str., Riga LV-1006
Tel: (+371) 6755 8743
Fax: (+371) 6755 1934
E-mail: info@elmi-tech.com
WWW: www.elmi-tech.com

# Default factory settings

| | |
|---|---|
| **Rotor** | |
| **Disbal.** | |
| **Current** | |


elmi Ltd.
laboratory equipment

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