Certificate of approval

Intelli-Mixer RM-2 ____ N_____ has been inspected for the technical conditions and it 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_____

Manufacturer's address:
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05.12.2013

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Content

Dear user!

The Intelli-Mixer RM-2 is a simple and reliable device. We ask you to consider technical requirements of exploitation to insure pleasant and continuous usage of machine.

General information

The Intelli-Mixer RM-2 is designed to perform mixing of various laboratory liquid samples in a wide range of test tubes from 0.5ml up to 50ml volume. Control system features 20 mixing programs and 3 extra custom programs for manual programming by operator. This machine has proved its superior efficiency in medicine, biology, analytical chemistry and many others.

Technical specifications

Variable rotation speed, rev./min.:	from 1 to 99
Speed selection step, rev./min.	1
Environmental temperature, °C:	from +2 to + 50
Relative moisture of the atmosphere (at the temp. +°20 C):	not more than 80 %
Power adapter input:	110-220 V; 50 Hz
Power adapter output: ⊖—C—⊕	12VDC, 1,33 A
Power consumption, W:	not more than 12
Size of equipment (length x width x height) mm:	432 x 177 x 168
Weight, kg:	1, 6

Models	RM1S	RM1M	RM1L
Dimensions L x W x H	316x125x168	344x125x168	420x125x168
Weight, kg	1.5	1.6	1.9
Applied racks	DxN 11x28 13x24 16x14 30x8	DxN 11x32 13x28 16x16 30x10	DxN 11x42 13x38 16x22 30x14

D – Diameter of applied test tubes.
N – Number of applied test tubes.

(!) It is also possible to combine different tubes types in one rack up to customers' desire.

Delivery package

Item	**Quantity**
Intelli-Mixer RM-2	1
Power adapter 12VDC, 1,33A	1
Rack fixation wrench	1
User manual	1
Packaging box	1

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.

Safety features

It is prohibited to:

- Plug the machine in to a power outlet with configuration which differs from the power adapters' plug configuration.
- Plug the power adapter in to the outlet if the adapter is damaged.

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 so 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 than 80% and temperature range from +10 °C up to +40 °C.
It is not recommended to store the equipment more than 36 month.

Warranty statements

- Warranty applies to 24 month period from the date of purchasing.
- Malfunctions arisen through the fault of producer in the course of this period, are removed free of charge.
- Guaranty 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 keep the transportation 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.

Troubleshooting

Problem description	Possible causes	Possible solutions
While vortexing rack is shifted from given position.	Vortexing frequency is too high for current rack loading.	Reduce vortexing frequency by adjusting vortexing programs **PU** & **Pu**
Rack is not rotating or is rotating not accordingly to set program.	There is a mechanical obstacle for rack movement.	Find and remove an obstacle.
The machine does not work accordingly to the set program.	Program is entered incorrectly.	Carefully examine programming manual once again and try to re-enter the program.
	Program does not contain **position correction**	Recompose the program entering position correction function.
While programming the machine exited programming mode automatically.	Program length of 78 steps is exceeded.	Try to reduce the length of a program.
Custom programs **C1**, **C2** or **C3** perform simple rotation.	Program memory is empty.	Enter a new custom program. (See **creating custom programs**).

General description of Intelli-Mixer construction

Intelli-Mixer consists of the control block, base platform and rack.
On the front side of control block the control board is situated. Start/stop button ⏻ On is on the top of the control block. Power supply socket is on the back side of the control block. Rack-to-motor connector is on the right side of the control block.

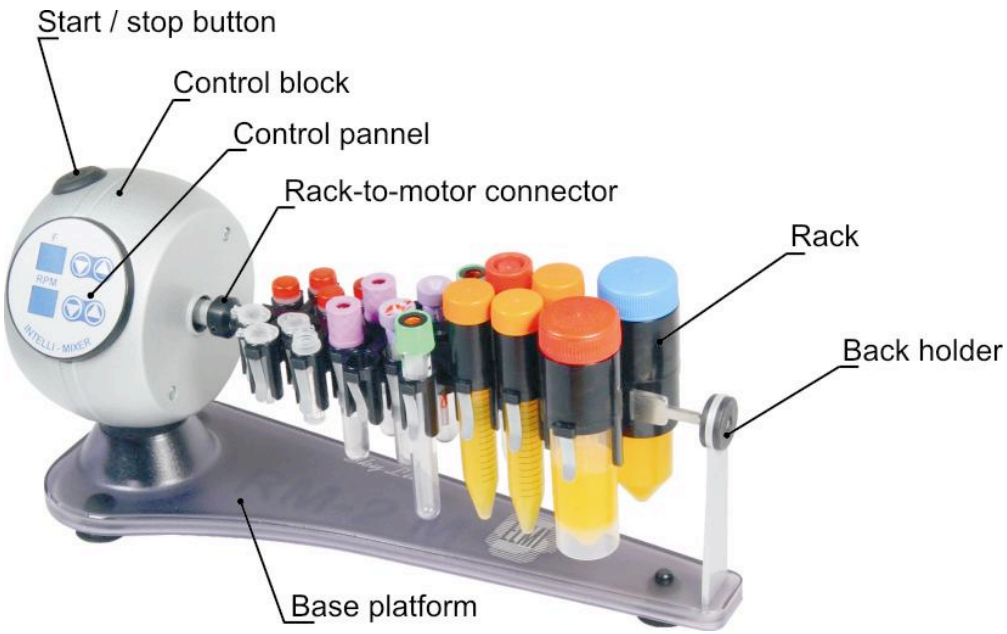


Fig. 1

Control panel.

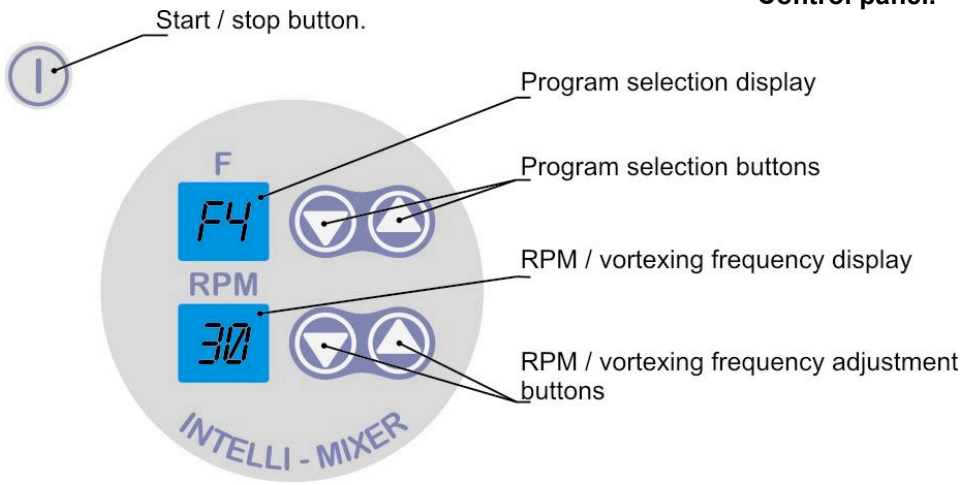
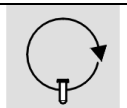
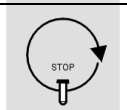
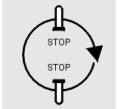
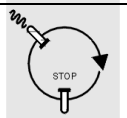
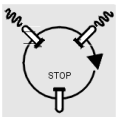
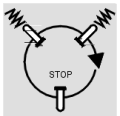
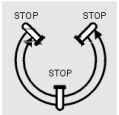
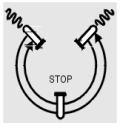
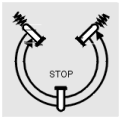


Fig. 2

Intelli-Mixer programs overview

Indications on **'F'** display.	Rack movement overview	Mixing program description.
F1		Variable speed continuous rotation.
F2		Rotation 360° **clockwise*** and hold for 1.5 sec. In **initial point**.**
F3		180° clockwise rotation, 1.5 sec. hold, 180° clockwise rotation, 1.5 sec. Hold in initial point.
F4		135° clockwise rotation, 1.5 sec. Big amplitude **'U'** shaking, 225° clockwise rotation, 1.5 sec. Hold in initial point.
F5		135° clockwise rotation, 1.5 sec. Big amplitude **'U'** shaking, 90° clockwise rotation, 1.5 sec. Big amplitude **'U'** shaking, 135° clockwise rotation, 1.5 sec. Hold in initial point.
F6		135° clockwise rotation, 1.5 sec. Small amplitude **'u'** shaking, 90° clockwise rotation, 1.5 sec. Small amplitude **'u'** shaking, 135° clockwise rotation, 1.5 sec. Hold in initial point.
F7		110° clockwise rotation, 1.5 sec. hold, 110° clockwise rotation , 1.5 sec. Hold in initial point, 110° **counter clockwise*** ** rotation , 1.5 sec. hold, 110° clockwise rotation, 1.5 sec. Hold in initial point.
F8		110° clockwise rotation, 1.5 sec big amplitude 'U' shaking, 110° counter clockwise rotation, 1.5 sec. Hold in initial point, 110° counter clockwise rotation, 1.5 sec big amplitude **'U'** shaking, 110° clockwise rotation1.5 sec. Hold in initial point.
F9		110° clockwise rotation, 1.5 sec. Small amplitude **'u'** shaking, 110° counter clockwise rotation, 1.5 sec. Hold in initial point, 110° counter clockwise rotation, 1.5 sec. Small amplitude **'u'** shaking, 110° clockwise rotation1.5 sec. Hold in initial point.

If during the operation the rack is hold by hand or any other external obstacle it automatically stops and gives sound alarm. To restart operation press ⏻ button.

If the machine is not operational and is not disturbed during 10 minutes it automatically goes in to energy consumption mode **SLEEP** and shows blinking dots on **F** and **RPM** displays. To exit **SLEEP** mode either press any button or push the rack with your hand a few degrees. By pressing ⏻ button twice the machine goes out of the SLEEP mode and continues operation from the same rack position where it was stopped. (applies in vortexing programs).

Operation order

Before turning the machine on carefully examine the power adapter, power supply wire and external look of the machine. In case of external damage do not turn on the machine without permission of the specialist.

- Fixing the rack.
  Put the rack **1** with the cylinder type end in to the back holder **2** until it is fixed (Fig. 5A, 5B)
  Put the flat side of the rack in to the shaft **3** until it is fixed and fasten the screw **4** by the rack fixation wrench (Fig. 5). Find rack fixation wrench underneath the machine.
- To replace the rack perform all the steps in reverse order.

View from above

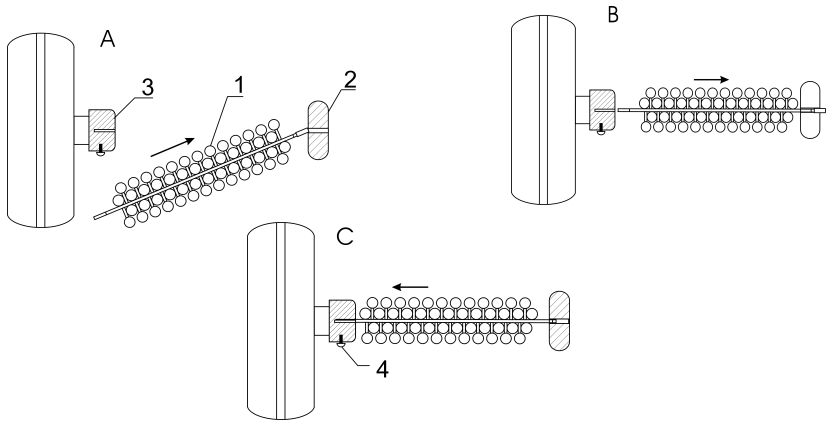


Fig. 5

- Plug the adapter first to the machine power socket then to the power outlet 110-220V 50Hz.
- Put **closed** tubes in rack adapters.
- Using buttons select operation program (see **Intelli-mixer program overview** table).
- Set rotation speed and shaking intensity (see **using mixing programs**).
  (**Note !** Operation programs can be selected either during operation or while mixer is stopped).
- Start operation by pressing button.
- When mixing is complete stop the machine by pressing button.

u		Continuous variable intensity small amplitude **'u'** vortexing under manually selected angle.
U		Continuous variable intensity big amplitude **'U'** vortexing under manually selected angle.
6, 8, 10, 15, 30, 45, 60, 90, 99		Clockwise and counter clockwise continuous rotation with angels indicated on **'F'** display: 6°,8°,10°,15°,30°, 45°, 60° ,90°, 99°.
C1, C2, C3		Customer programs see 'Customer programs designing' instructions.

***Clockwise rotation-** Rack rotation clockwise relatively to motor control block.
****Initial point**- Initial rack vertical position.
*****Counter clockwise rotation -** Rack rotation counter clockwise relatively to motor control block.

Using mixing programs

Rotation programs F1, F2, F3, F7

These programs are used to perform mixing of laboratory samples by means of rotation of the rack. Rotation speed is indicated on **RPM** display and could be changed either during the operation or when the rack is stopped.

*(**Tip !** Once RPM has been set it will apply to all the programs in the **F** menu including customer programs).*

Vortexing programs 'u' & 'U' (Vortexing regimes).

These programs are used to perform intensive mixing of different size test tubes by means of shaking and vortexing. Vortexing frequency is indicated on **RPM** display and could be changed either during the operation or when the rack is stopped.

During these regimes rack could be manually positioned under any angle by hand to insure best performance and convenience.

*(**Tip !** Once vortexing frequency has been set it will apply to all the programs in the **F** menu that feature shaking including customer programs).*

*(**Tip !** In case of rack loosing its preset position while vortexing reduce the vortexing frequency until operation becomes stable).*

Angular shaking 6, 8, 10, 15, 30, 45, 60, 90, **99**

These programs are performing defined angle and speed shakes from the vertical initial position. This kind of shaking is recommended for mixing samples in tubes bigger then 5 ml volume.

Current angel settings are displayed on **F** display**.** Shaking speed is shown on **RPM** display**.** All the parameters of angle and speed can be changed either during operation or when the rack is stopped.

*(**Tip !** In case of rack loosing its preset position while shaking reduce the shaking frequency until operation become stable).*

Combined programs F4, F5, F6, F8, F9

These programs are performing different combinations of rotation and vortexing.

Current speed is shown on **RPM** display and can be changed either during operation or when the rack is stopped.

Vortexing frequency can be changed by selecting on **'F'** display either **'u'** or **'U'** function and set vortexing frequency accordingly. (**see also Vortexing programs 'u' and 'U'**)

Now vortexing frequency is adjusted to the best performance within current application.

*(**Tip !** Vortexing frequency settings that has been defined in **'u'** or **'U'** functions and rotation speed settings are valid throughout all the programs including customer programs).*

Customer programs C1, C2, C3

Are used to create customized algorithms of rack rotation and shaking (see **'Creating customer programs'**).

Creating customer programs C1, C2, C3

Introduction

Customer programs consist of a sequence of basic operations or **steps*** that are inputted by operator to the memory of a mixer. Single program can consist of up to 78 steps and must have its start and end point in the **initial point****

***step.** Is a single basic operation that is inputted in the memory by pressing button.

****Initial point.** Initial rack vertical position.

List of steps available for creating customer programs.

SP – Rack spinning.

***Clockwise rotation-** Rack rotation clockwise relatively to motor control block.

*****Counterclockwise rotation** - Rack rotation counterclockwise relatively to motor control block.

Example 3. Perform small amplitude shaking **'u'** during 3 sec., then rotate counter clockwise 90 deg., then hold 1.5 sec., then shake 1.5 sec. with big amplitude **'U'** & 1.5 sec. with small amplitude **'u'**, then rotate clockwise 180 deg., then rotate counter clockwise to the 00 deg. point and hold 1.5 sec. Store the program in **C3.**

3.1 Select **C1** on **F** display.
3.2 Hold button for 4.5 seconds. Rack will automatically find **00** initial point.

3.3. Select **Pu** function on **F** display.
3.4. Press enter button **.** 1.5 sec shaking is entered.
3.5. Press enter button **.** Extra 1.5 sec shaking is entered.
3.6. Pressing counter clockwise rotation button turn the rack until 75 value on **RPM** indicator, that corresponds to 90 degrees (see Fig. 3).
3.7**.** Press enter button **.**
3.8. Select **PP** function on **F** display 1.5 sec. pause.
3.9. Press enter button **.**
3.10. Select **PU** function on **F** display 1.5 sec. big amplitude shaking.
3.11. Press enter button **.**
3.12. Select **Pu** function on **F** display 1.5 sec. small amplitude shaking.
3.13. Pressing clockwise rotation button turn the rack until 25 value on **RPM** indicator, that corresponds to 180 degrees (see Fig. 3).
3.14. Pressing counter clockwise rotation button turn the rack until 00 value on **RPM** indicator.
(Caution ! reaching 00 point automatically is offered **P0** function that sets end of program. If you would like to continue programming do not press button on this step)
3.15. Select **PP** function on **F** display 1.5 sec. pause.
3.16. Press enter button **.**
3.17. Select **P0** function on **F** display.
3.18. Press enter button
Program is successfully recorded.

Example 1. Racks rotates clockwise 180 deg. then counter clockwise 270 deg. Store program in **C1**.

1.1 Select **C1** on **F** display.
1.2 Hold button for 4.5 seconds. Rack will automatically find **00** initial point.
1.3 Pressing clockwise rotation button set 50 value on **RPM** indicator, that corresponds to 180 degrees (see Fig. 3).
1.4 Press enter button
1.5 Pressing counter clockwise rotation button turn the rack until 75 value on **RPM** indicator, that corresponds to 270 degrees (see Fig. 3).
1.6 Press enter button
1.7 Pressing clockwise rotation button or counter clockwise rotation button se 00 value on **RPM** indicator, **F** indicator will show **P0**.
1.8 Press enter button
Program is successfully recorded.

Example 2. *(Features entering position correction).*
Rack rotates clockwise 180 deg., then counter clockwise 180 deg., entering position correction in 00 deg. point then rotates 90 deg. counter clockwise.
Store program in **C2.**
2.1 Select **C2** on **F** display.
2.2 Hold button for 4.5 seconds. Rack will automatically find **00** initial point.
2.3 Pressing clockwise rotation button set 50 value on **RPM** indicator, that corresponds to 180 degrees (see Fig. 3).
2.4 Press enter button
2.5 Pressing counter clockwise rotation button turn the rack until 00 value on **RPM** indicator.
(Caution ! reaching 00 point automatically is offered **P0** function that sets end of program. If you would like to continue programming do not press button on this step.
2.6 Choose **SP** function on **F** display.
2.7 Press enter button (position correction entered)
2.8 Pressing counter clockwise rotation button turn the rack until 75 value on **RPM** indicator, that corresponds to 270 degrees (see Fig. 3).
2.9 Press enter button
2.10 Pressing clockwise rotation button or counter clockwise rotation button set 00 value on **RPM** indicator, **F** indicator will show **P0**.
2.11 Press enter button
Program is successfully recorded.(actions 1.5, 1.6, 1.7 – position correction)

PP - Pause Hold the rack in any defined position for 1.5 sec.
PU – Shaking Big amplitude **U** shaking for 1.5 sec. in any defined position.
Pu - Shaking Small amplitude **u** shaking for 1.5 sec. in any defined position.
P0 – End of program
*(**Tip !** by inputting any of PP, PU, Pu steps more then one time the duration of this operation increases accordingly).*

Entering programming mode

- Turn on the machine. Select any of custom programs C1, C2 or C3 on **F** display.
- Press button during 4,5 sec. Rack will take the vertical initial position, **RPM** display shows **00, F** display shows **P0.**

Now we can start programming.
(Note ! It is not possible to reprogram any of the default programs and it is only possible to enter programming mode for custom programs C1, C2 and C3).

Programming mode

During programming mode control buttons and displays acquire additional functions. (See figure 2).

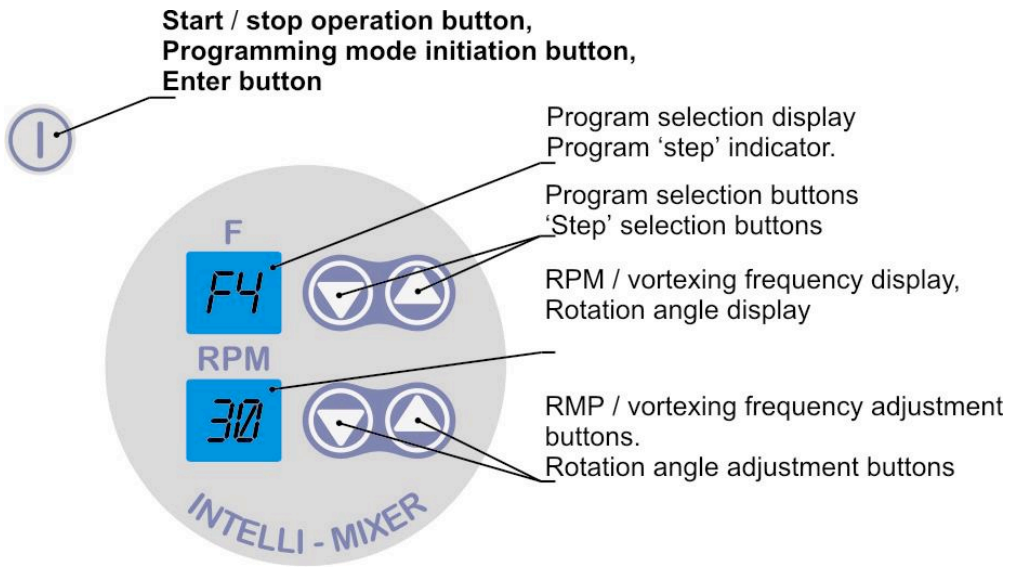


Fig. 3

During programming mode **RPM** display shows rack rotation angle relatively to initial position. (See diagram on fig.4).

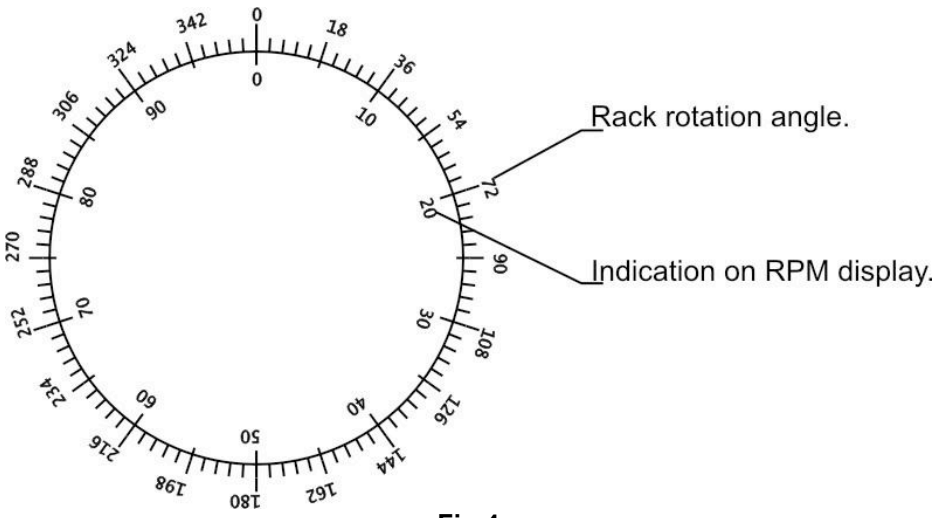


Fig.4

The full circle of rack rotation is split in to 100 steps from 1 to 99. For example 25 steps are equal to 90 degree turn.

Learning to use program steps

Spinning:

Pressing clockwise rotation button ▽ or counter clockwise rotation button △ will set the desired rotation angle value (see Fig. 4). **F** display will show **SP.** Press enter button ⓘ to save rotation value in the memory. When rack reaches starting initial 00 point, **F** display shows **P0.**
If you wish to finish creating program press ⓘ in **P0** point and it will exit and save program in memory.

Temporary pause

Select **PP** function on **F** display**.** Press ⓘ button and enter pause function in the memory. You have set 1.5 sec. Pause. Each time you press ⓘ button it will increase pause time by 1.5 sec.
Note ! *each push of* ⓘ button counts as one step of a program.

Big amplitude shaking 'U'

Select **PU** function on **F** display**.** Press ⓘ button to input this function in the memory. You have entered 1.5 sec. big amplitude shaking. Each time we press ⓘ button it will increase shaking time by 1.5 sec.
Note ! *each push of* ⓘ button counts as one step of a program.

Small Amplitude shaking 'u'

Select **Pu** function on **F** display**.** Press ⓘ button to enter this function in the memory. You have entered 1.5 sec. Small amplitude shaking. Each time we press ⓘ button it will increase shaking time by 1.5 sec.
(Note ! *each push of* ⓘ button counts as one step of a program).

Entering position correction

While entering long programs it is recommended to enter **positioning correction** each time we pass **00** vertical position point.
This can be done by selecting **SP,** function in **00** point (**F** display shows **P0**) and pressing ⓘ button. If we would like to enter any other function like **PP, PU** or **Pu** in **00** position, scroll the **F** display menu for desired function and press ⓘ button. **PP, PU** & **Pu** function entered in **00** position also make position correction.

Ending the custom program

By scrolling clockwise ▽ & counter clockwise △ find the initial vertical rack position**,** F display will show **P0** and **RPM** display will show **00.**
Press ⓘ button to enter **P0** end of program function.
Now press ⓘ button to launch created program and check if program works correctly.
(Tip ! It is possible to end a program and exit programming mode any time by holding ⓘ button for 4,5 seconds, however it may cause incorrect operation as it is necessary to enter programs' end point **P0**).

Erasing custom program

Select custom program, which you want to erase on **F** display.
Enter the programming mode (See **Entering programming mode**).
Press ⓘ button while **F** display shows **P0** , this will erase previously entered program and set simple rotation program as a default.

(Tip ! If maximal number of 78 steps of the program is exceeded, program will break and exit programming mode. For correct performance it is necessary to reduce number of steps and input program again.
(Tip ! Custom programs **C1, C2** & **C3** could be reprogrammed over 100'000 (!) times. Since custom program is entered it will remain in the memory until operator decides to reprogram or erase it and will not erase after power cut off).