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An Endress+Hauser Company

Operating Manual

SpeedMill PLUS

Homogenizer

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1 Introduction

1.1 Use of SpeedMill PLUS

The SpeedMill PLUS is a highly efficient homogenizer for different starting materials used for the following isolation and purification of DNA, RNA, or proteins. The homogenization is based on an innovative patented mechanical principle, which prevents a heating of the samples as is the case with other homogenizers. This permits a trouble-free continuous operation.

Handling the SpeedMill PLUS, e.g. attaching and removing the sample holder, is very easy. No tools are required for operation. For homogenization purposes, Analytik Jena AG offers 0.5 ml and 2.0 ml reaction tubes (lysis tubes) filled with application-specific beads.

The samples are homogenized quickly and efficiently with specially optimized lysis tubes. Different lysis tubes are available with beads specially adapted to the corresponding application. The SpeedMill PLUS can homogenize hard and soft starting materials in an optimal way. Even very resistant starting materials like bones, cartilage, chitinous exoskeleton of insects or ticks can be homogenized completely and reproducibly in a short period of time.

In addition to the standard repertoire of manual and automatic purification kits of Analytik Jena AG, kits are available which are specially adapted to the SpeedMill PLUS for the complete nucleic acid isolation (DNA and RNA) from a broad range of starting materials. Application-specific beads and prefabricated buffers are part of the kits. As these kits (innuSPEED kits) are adapted especially to the starting material to be homogenized, a rapid and very efficient homogenization becomes possible. The recovery as well as the quality of the isolated nucleic acids are excellent. The nucleic acid purification with the innuSPEED kits on average takes 20 to 30 minutes.

DNA: After reducing mechanically the starting materials, a proteolytic step will follow. The genomic DNA is bound to a spin filter, washed and eluated. Recovery and quality of the DNA are excellent.

RNA: After reducing and denaturing mechanically the starting material, the genomic DNA is removed by binding it to a spin filter. Then the RNA is bound to a second spin filter, which is followed by washing steps and the final elution of the RNA.

1.2 Notes on the use of this manual

The following symbols for warnings and system messages are used in this manual:

WARNING

Indicates a potentially hazardous situation which might cause fatal or very serious injuries (deformities).

CAUTION

Indicates a potentially hazardous situation which might cause light or minor injuries.

ATTENTION

Indicates a potentially hazardous situation which might cause damage to property.

IMPORTANT

Indicates application hints and other especially useful information without any resulting hazardous or damaging situations.

User manual conventions

Instructions for action which occur in chronological order are numbered and combined into action units and furnished with the corresponding results.

Lists which are not in chronological order are shown as itemized lists, sub-listings as bullet points.

Safety notes are indicated by pictographs and signal words. The type and source of the danger, as well as the consequences, are stated together with notes on preventing the danger. The meaning of the pictographs and signal words used is explained in the chapter "Safety notes".

The elements of the control program are indicated as follows:

- Program terms are identified with SMALL CAPS.
- Buttons are shown by square brackets (e.g., [ENTER] button)

1.3 Warranty and liability

The warranty duration and liability comply with the legal requirements and the provisions in the general terms and conditions of Analytik Jena AG.

Deviations from the intended use described in this user manual result in limitations of warranty and liability during a damage event. Damage to wearing parts is not included in the warranty.

Warranty and liability claims are excluded for personal injury and property damage due to one or several of the following causes:

- use of the SpeedMill PLUS other than intended
- improper commissioning, operation and service of the SpeedMill PLUS
- modifications of the equipment without prior consultation with Analytik Jena AG
- unauthorized intervention in the equipment
- operation of the equipment with faulty safety equipment or improperly fitted safety and protection equipment
- inadequate monitoring of the equipment components subject to wear
- use of other than original spare parts, wearing parts or consumables
- improper repairs
- faults due to the non-observance of this user manual

2 Safety instructions

For your own safety and for a trouble-free operation, read this chapter with care before commissioning the SpeedMill PLUS.

Observe all safety instructions in the manual and pay attention to all messages and notes which are displayed on the screen by the control software.

2.1 Warning and safety symbols on the SpeedMill PLUS

The following warning and safety symbols are attached to the SpeedMill PLUS:

Unplug power cord!

This symbol is attached next to the power inlet at the back.

Do not dispose in domestic waste!

This symbol is attached next to the type plate at the back.

2.2 General warnings

Proper use!

The SpeedMill PLUS including its original accessories must only be used for the applications described in this instruction manual. The manufacturer does not accept liability for any other use, including that of any individual modules or components.

Repair work only must be carried out by authorized personnel!

The manufacturer does not accept any liability for service or repair works which have not been carried out by authorized service personnel. All warranty claims are forfeited in this case.

Local regulations!

Pay attention to local safety regulations which apply to the use of this appliance (e.g. work protection regulations, accident avoidance regulations, environmental guidelines).

References to potential dangers in the manual do not replace the local safety regulations, which must be observed.

Personnel!

The SpeedMill PLUS only must be operated by qualified personnel.

Knowledge of this manual is an essential requirement.

Shut down in case of emergency!

In case of emergency the SpeedMill PLUS has to be separated from the power mains by removing the plug from the power socket. The device has to be positioned so that the mains plug is freely accessible.

Electric shock!

The SpeedMill PLUS is supplied with electrical voltage. Life-threatening electrical voltages occur at various locations within the system!

The mains plug must only be inserted into a shock-proof socket to guarantee protection class I (protective conductor connection) for the device. The protective effect must not be invalidated by the use of an extension line which does not have a protective conductor.

Unplug power cord before opening the device! The device cover must only be opened by the technical customer service of Analytik Jena AG or by instructed personnel!

Before connecting the SpeedMill PLUS to the mains, check if the operating voltage specified on the power rating plate at the left side of the device matches the mains voltage at the intended socket. Operation with a voltage other than the specified operating voltage can destroy the device.

Only fuses of the specified type must be used.

Caution: condensation water!

If the storage and the installation temperature differ a lot, wait until the SpeedMill PLUS has adapted to the new ambient temperature before connecting it in order to prevent damages to the device by condensation water.

Do not operate in explosive environments!

Caution! Risk of causing damage to vessels and equipment by the use of unsuitable substances!

Only substances suitable for the intended use may be used for homogenization. Hazardous substances such as highly corrosive acids or bases may damage the vessels and the equipment. In particular, it is also prohibited to use any flammable liquids or substances which may form explosive mixtures.

Caution! Risk of injury when using reaction vessels made of glass!

It is not permitted to use any type of glass vessels. There is a risk of injury from glass breakage! Only use reaction vessels made of plastic!

Heat build-up

Heat build-up can cause overheating and faults in the device. Ensure that the air vents at the SpeedMill PLUS are kept unobstructed in any case!

Water

Ensure that no liquid can enter the SpeedMill PLUS.

The device could be damaged.
Do not put any vessels with liquids onto the device!

Corrosion risk

Do not place the device immediately in the vicinity of aggressive vapor, e.g. strongly corrosive acid or lye vapor! The vapor can corrode the terminals and mechanical components of the device.

Do not open the cover of the SpeedMill PLUS while homogenization is going on

If the cover is opened during an ongoing homogenization, the operation will stop immediately.

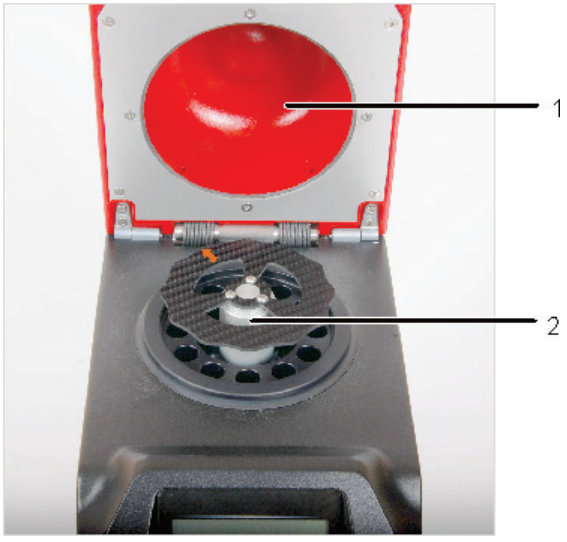
3 Device description and principle of operation

3.1 Design and terminals

Front view

1 Cover
2 Display
3 Keys
4 Touch sensor with LED status display

Fig. 1 Front view of the SpeedMill PLUS



1 Cover
2 Sample holder in the receiving unit

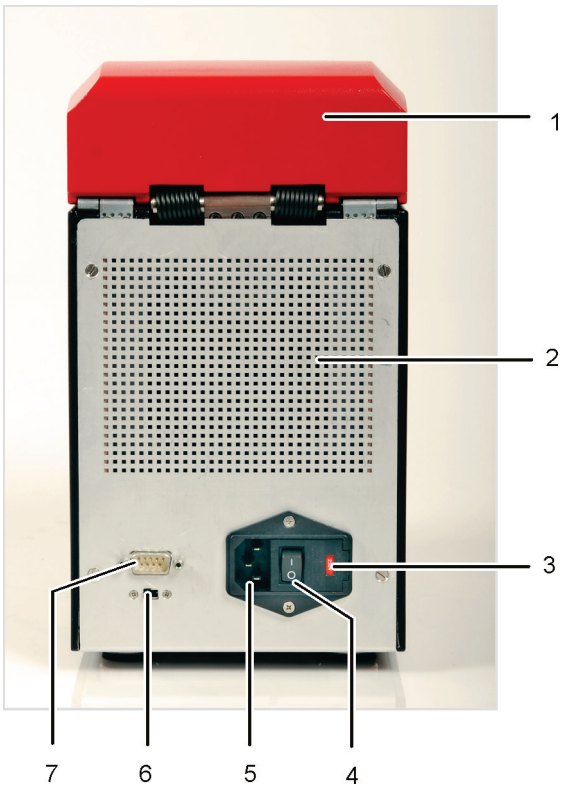
Fig. 2 Interior view of the SpeedMill PLUS

The lysis tubes containing the beads and having been populated with the starting material are placed into the sample holder.

The sample holder is secured inside the SpeedMill PLUS by means of the sample holder attachment. The subsequent homogenization is done by accelerated beads which reduce and crush the starting material.

The SpeedMill PLUS is a stand-alone device and requires no PC with control and monitoring software.

Terminals and switches at the back of the device

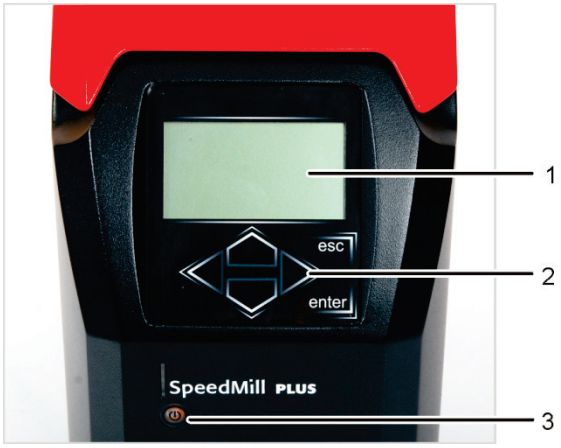


1 Cover
2 Ventilation opening
3 Mains fuse
4 Mains switch
5 Mains plug
6 Touch sensor switch
7 COM interface

Fig. 3 Terminals at the back of the SpeedMill PLUS

3.2 Keys and display

Keys and display are placed at the front of the SpeedMill PLUS.



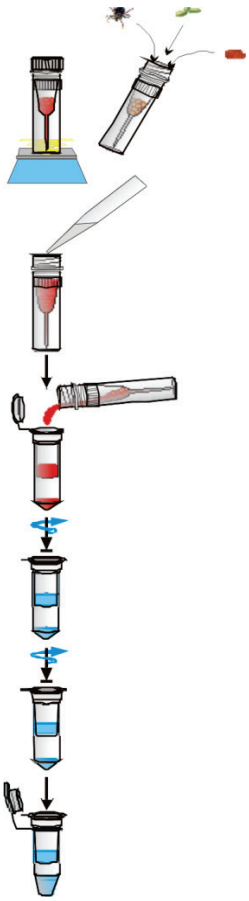
1 Screen
2 Keys
3 Touch sensor

Fig. 4 Key functions

The keys have the following functions:

▲▼◀▶	Direction keys for moving the cursor, parameter setting
[ENTER]	Confirming a parameter entry or selection, starting the homogenization process
[ESC]	Going back to the superior menu, interrupting/canceling an ongoing homogenization process

3.3 Principle of operation



Homogenization of the starting material by means of the SpeedMill PLUS and special lysis tubes

Lysis of the homogenized starting material in the special lysis tubes

Selective binding of the DNA or RNA to the spin filter surface

Washing the bound nucleic acid

Elution of the DNA or RNA

4 Installation, transport and storage conditions

Installation conditions

ATTENTION!

Always observe the following installation conditions!

- ❑ Keep the air vents at the back unobstructed!
- ❑ Do not deposit any objects on the device!
- ❑ Do not operate in explosive environments!
- ❑ No aggressive vapors, e.g. strongly corrosive acid and lye vapors in the immediate vicinity of the device!

The installation location must meet the following conditions:

- ❑ The work space of the SpeedMill PLUS should be free of draft, dust, corrosive vapors and vibrations.
- ❑ Do not position the SpeedMill PLUS near electromagnetic fields (e.g. motors).
- ❑ Do not position the SpeedMill PLUS near magnetic memories or sensitive electronic devices.
- ❑ Avoid dripping water, water accumulations and splashing water near the SpeedMill PLUS.
- ❑ Do not expose the SpeedMill PLUS to direct sunlight or heater radiation.
- ❑ Temperature range during operation: + 5 - + 40 °C
- ❑ Air humidity during operation: up to 80 % at + 30 °C

Dimensional requirements

Dimensions of SpeedMill PLUS

- With closed cover (W x D x H): 155 mm x 260 mm x 305 mm
- With opened cover (W x D x H): 155 mm x 310 mm x 420 mm

The sample holder has to be removed from the device from the above.

A minimal distance of 50 cm between ventilator and the nearest object has to be observed to guarantee the air circulation between device and environment. Do not position the device on a soft surface.

Storage and transport conditions

ATTENTION! Do not transport samples in the device!

Before storage and transport the lysis tubes have to be removed from the sample holder to prevent the device from damages.

Observe the following transport and storage conditions:

- Temperature range: -40 – +70 °C
- Air humidity: up to 80 %

5 Commissioning

Connecting and switching on

CAUTION

Electric shock!

Before connecting the SpeedMill PLUS to the mains, check if the operating voltage specified on the power rating plate matches the mains voltage at the intended socket. Operation with a voltage other than the specified operating voltage can destroy the device.

Caution: condensation water!

If the storage and the installation temperature differ a lot, wait until the SpeedMill PLUS has adapted to the new ambient temperature before connecting it in order to prevent damages at the device by condensation water.

Caution! Cancelation of homogenization due to interruption of power supply!

If the power supply is interrupted, it will cancel the current homogenization process and the device will turn off immediately. When power is re-established, the device and the homogenization process will have to be restarted.

1. Take the SpeedMill PLUS out of the packaging.
2. Connect the mains cable to the terminal at the back (→ "Design and terminals" p. 9).
3. Switch on the SpeedMill PLUS via the mains switch (back of the device).

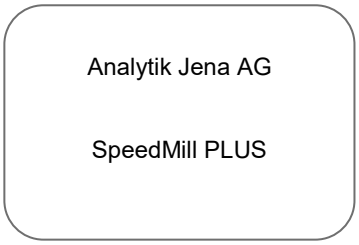


Fig. 5 Start screen

4. After the start screen has appeared, press [ENTER] to get to the main menu of the SpeedMill PLUS. The SpeedMill PLUS now is ready for operation.

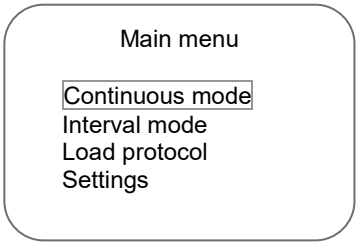


Fig. 6 Main menu

Switching off

ATTENTION! Sensitve samples!

o not switch off the SpeedMill PLUS before the cooling down is complete!

When the homogenization process has finished, you can switch off the SpeedMill PLUS at the mains switch.

Alternatively, you can put the SpeedMill PLUS into sleep mode.

To this purpose touch the touch sensor for approx. 3 s until it is illuminated in red.

The screen display goes out, the ventilators are switched off, the touch sensor is illuminated in red.

Note
During sleep mode the SpeedMill PLUS is not switched off completely but consumes power! To switch off the SpeedMill PLUS completely, switch it off at the mains switch.

Switching off the touch sensor

The touch sensor can be bypassed.

Move the switch (6 in Fig. 3 p. 10).

The touch sensor LED goes out. Now the SpeedMill PLUS only can be switched on and off at the mains switch.

6 Handling of SpeedMill PLUS

6.1 Sample preparation

ATTENTION!

Risk of causing damage to vessels and equipment by the use of unsuitable substances!

Only substances suitable for the intended use may be used for homogenization. Hazardous substances such as highly corrosive acids or bases may damage the vessels and the equipment. In particular, it is also prohibited to use any flammable liquids or substances which may form explosive mixtures.

The SpeedMill PLUS is an open system so that different consumables can be used for the homogenization process.

To guarantee a trouble-free operation and nucleic acid extraction, it is recommended to use the innuSPEED kits of Analytik Jena (→ "Homogenization with innuSPEED kits (Analytik Jena)" p. 17). Part of these kits are optimized homogenization routines, protocols for the DNA / RNA isolation and lysis tubes which have been adapted specially to the corresponding starting materials.

If other applications than the nucleic acid isolation will follow, it is recommended to use the innuSPEED lysis tubes for homogenizing the starting material. A description can be found under “Homogenization with innuSPEED kits (Analytik Jena)" p. 17.

6.1.1 Homogenization with innuSPEED kits (Analytik Jena)

1. All buffers and solutions have to be prepared depending on the starting material and the isolation routine. A detailed description can be found in the corresponding kit manual. Follow the instructions in the corresponding kit manual under "Kit components / initial steps".
2. It is recommended to preheat the thermo shaker to the desired temperature as described in the kit manual under "Recommended steps before start".
3. Populate the lysis tubes with the starting material or sample parts:

Plant material	Optimum size for homogenization
Soft plant material like: soft leaves, fruits etc.	approx. 5 mm x 5 mm
Material of medium hardness like: conifers	approx. 2.5 mm x 2.5 mm
Very hard material like: conifers or very thick and hard leaves	approx. 1-1.5 mm x 1-1.5 mm

Table 1 Plant material – optimum size for homogenization

Tissue material	Optimum size for homogenization
Soft tissue material like: lung, kidney, brain, melt, liver etc.	approx. 5 mm x 5 mm
Very hard material like: rodent tails or cartilage material	approx. 1 mm

Table 2 Tissue material – optimum size for homogenization

4. Add the corresponding volume of lysis solution or H_2O to the sample in the lysis tubes as described in the corresponding kit manual.

6.1.2 Homogenization with other kinds of beads

CAUTION!

Risk of injury when using reaction vessels made of glass!

It is not permitted to use any type of glass vessels. There is a risk of injury from glass breakage! Only use reaction vessels made of plastic!

Note

Analytik Jena does not warrant any homogenization results when using other beads instead of the innuSPEED lysis tubes!

The samples can be homogenized wet and dry.

For mechanical homogenization of the starting material with the SpeedMill PLUS also other beads can be used.
To this purpose the beads must be placed into reaction vessels with screw closures which stand upright by themselves, with a size of 0.5 ml, 1.5 ml or 2.0 ml.

For this it is necessary that the beads are placed in reaction vessels with screw closures which stand upright on their own, with a size of 0.5 ml, 1.5 ml or 2.0 ml, which are suitable for homogenization.

6.1.3 Recommendations for homogenization times

NOTE

When using the innuSPEED kits of Analytik Jena AG, optimum homogenization times (depending on the starting material) are specified in the kit manual for the corresponding nucleic acid isolation.

The following tables provide an overview of the recommended homogenization times depending on the type and characteristics of the starting material:

Plant material	Recommended homogenization time
Soft plant material like: soft leaves, fruits etc.	approx. 1 min
Material of medium hardness like: conifers	approx. 2 min
Very hard material like: conifers or very thick and hard leaves, hard fruits	approx. 3 min

Table 3 Recommended time for homogenizing plant material

Tissue material	Recommended homogenization time
Soft tissue material like: lung, kidney, brain, melt, liver etc.	approx. 30 sec – 1 min
Very hard material like: rodent tails or cartilage tissue	approx. 2 x 2 min
Other tissues: e.g. insects, ticks	approx. 2 x 2 min

Table 4 Recommended time for homogenizing tissue material

6.2 Sample holder

The sample holder is divided into three parts which are inserted one after the other into the sample compartment of the SpeedMill PLUS. For cleaning the sample compartment, the sample holder can be removed completely.

The sample holder has space for 12 lysis tubes.

1 Base plate
2 Holder for lysis tubes
3 Closure and upper cover

Fig. 7 Sample holder, disassembled

Fig. 8 Sample holder mounted to the SpeedMill PLUS

CAUTION

Do not start the SpeedMill PLUS without the sample holder and without at least one sample!

6.2.1 Inserting samples into the SpeedMill PLUS

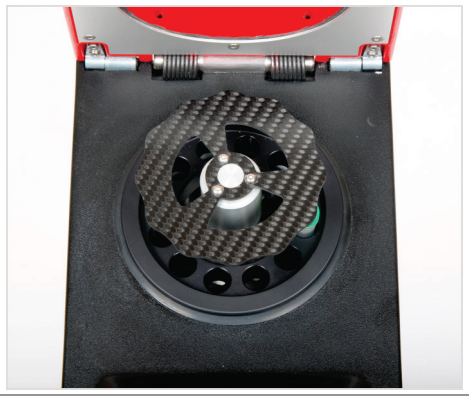
Before starting the homogenization, the sample holder has to be populated with lysis tubes.

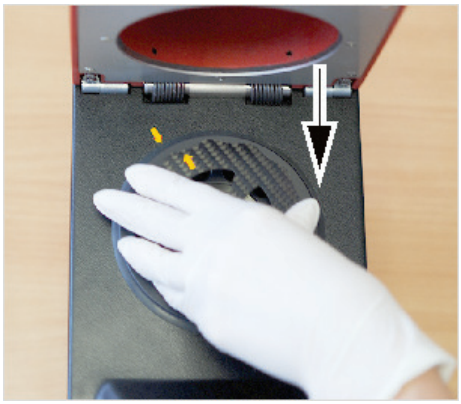
ATTENTION! Device damage!

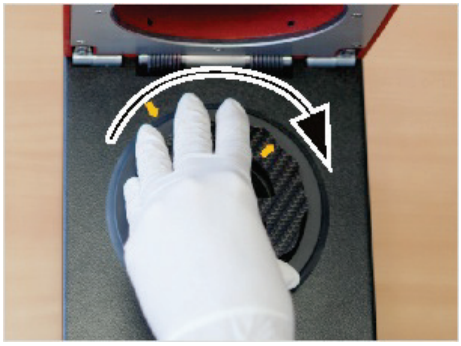
Ensure that the closure is installed correctly before starting the homogenization process!

Note

Before the SpeedMill PLUS can be started, at least one lysis tube has to be placed into the sample holder. Up to 12 samples can be processed simultaneously. If more than one lysis tube is used, ensure that the tubes in the sample holder are balanced.

	1. Put the base plate onto the shaft in the sample compartment.
	2. Insert holder for lysis tubes. Push the holder down until the edge of the holder is even with the edge of the sample compartment.
	3. Populate the holder with the lysis tubes containing the beads and samples. If more than one lysis tube is used, ensure that the tubes are balanced.
	4. Put the closure onto the shaft. The two red arrows on the SpeedMill PLUS and the closure have to point to each other.





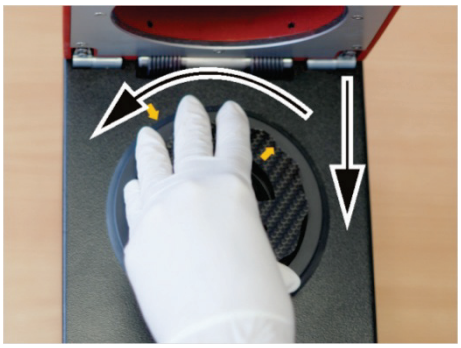
5. Push down the closure as far as it will go and then turn it clockwise by approx. 90°.

The closure is installed correctly if it cannot be removed upwards by drafting it ***slightly***.

6.2.2 Removing the sample holder

ATTENTION! Device damage!

Do not try to remove the sample holder by drafting before unlatching it!



1. Press the closure down and turn it anti-clockwise by approx. 90°.

	2. Remove the cover and the sample vessels.

7 Operation of SpeedMill PLUS

CAUTION!

Do not open the cover of the SpeedMill PLUS while the homogenization is going on

If the cover is opened during an ongoing homogenization, the operation will stop immediately.

Some basic conditions apply for operating the SpeedMill PLUS.

The maximum homogenization time is 4 min 59 s. Each homogenization is followed by a cooling down. The cooling down lasts as long as the homogenization, but at least 30 s. Only open the cover of the SpeedMill PLUS if the last cooling down phase is finished.

For operating the SpeedMill PLUS, three different operating modes are available.

The **Quick mode** starts homogenization immediately without any further parameter settings. An ongoing homogenization can be interrupted by pressing the **[esc]** key. If the homogenization is not interrupted, it will continue as long as the previous homogenization time has lasted, maximally 4 min 59 s.

In the **Continuous mode** the homogenization is realized within a preset time.

In the **Interval mode** a series of homogenization cycles can be started with different times and repetitions. Protocols entered during this mode can be saved and loaded later on for further use.

The SpeedMill PLUS is operated via the four cursor keys ◀▶▲ and ▼ and the keys [ENTER] and **[esc]**.

◀▶▲ and ▼	Setting parameters
[ENTER]	Confirming selected/set parameters Starting / continuing homogenization
[ESC]	Going back to superior menu when entering parameters Interrupting / canceling ongoing homogenization

7.1 Preparing and starting a homogenization

1. Prepare the samples to be homogenized. To this purpose several possibilities exist which are described in detail in the following sections:
   - Homogenization with innuSPEED kits (Analytik Jena)
   - Homogenization with innuSPEED lysis tubes (Analytik Jena)
   - Homogenization with other kinds of beads
2. Open the cover of the SpeedMill PLUS and insert the samples into the SpeedMill PLUS (→ see section "Inserting samples into the SpeedMill PLUS" 20).
3. Start a homogenization in one of the three modes which can be set and load or start a saved protocol.
4. After finishing the homogenization process, open the cover and remove the sample holder.

The homogenized samples are now ready for further applications.

7.2 Continuous mode

The homogenization is carried through with a preselected time (prep time). The homogenization is followed by a cooling down phase which lasts as long as the homogenization time, but at least 30 s.

Main menu Continuous mode Interval mode Load protocol Settings	5. Select the option CONTINUOUS MODE in the main menu with the cursor keys ▼▲. 6. Press [ENTER].
Continuous mode Prep time: 0:00 Use Arrow keys to adjust time. Use ENTER to start	7. Enter the PREP TIME in the format "minute:second": ◀ ▶ – switching from minute to second ▲ ▼ – adjusting the time gradually. Note The maximum PREP TIME is 4 min 59 s.
Continuous mode Prep time: 0:10 Press ESC to stop	8. Start the homogenization with **[enter]**. The time is displayed running backwards. The following text appears: "Press ESC to stop". The cooling down phase follows automatically. It takes at least 30 seconds. 9. When the cooling down is complete, the screen for setting the PREP TIME appears again. Start the next homogenization in the CONTINUOUS MODE by pressing [ENTER] or leave the mode and go back to the main menu by pressing [ESC].

7.3 Interval mode

In this mode the homogenization is realized in intervals. For each interval you have to enter a homogenization time (prep time) and a number of repetitions (cycles). Multiple subsequent intervals can be defined. The created homogenization protocols can be saved.

Main menu Continuous mode Interval mode Load protocol Settings	1. Select the option INTERVAL MODE in the main menu with the cursor keys ▲▼. 2. Press [ENTER].

Create protocol Interval step: 1 Prep time: 0:00 Cycles: 01 Accept Next	3. Enter the PREP TIME in the format "minute:second": ◀ ▶ – switching from minute to second ▲ ▼ – adjusting the time gradually. *Note:* The maximum PREP TIME is 4 min 59 s. 4. Press [ENTER]. The cursor goes to the input field for CYCLES. 5. Set the number of repetitions with ▲ ▼. 6. Press [ENTER]. 7. Select an option with ◀ ▶ : – ACCEPT – complete protocol – go on with step (10). – NEXT – add further interval step to the protocol- go on with step (8).
Create protocol Interval step: 2 Prep time: 0:00 Cycles: 01 Back Accept Next	8. Enter next interval step. Repeat steps (3) to (7). 9. Select an option with ◀ ▶: – BACK – go back to the preceding interval step. – ACCEPT – complete protocol – go on with step (10). – NEXT – add further interval step to the protocol- repeat steps (3) to (7) until all interval steps are programmed.
Create protocol Total time: 3:39 Start protocol Edit protocol Save protocol	10. After actuating ACCEPT the adjacent screen will open. The TOTAL TIME is displayed (homogenization times + cooling down times). Select an option with ▲ ▼ and confirm with [ENTER]: – START PROTOCOL – start homogenization (go on with step (11)) – EDIT PROTOCOL – change protocol anew – SAVE PROTOCOL – save created protocol (see section "Saving protocols" p. 28).
Running protocol Name Total time: 3:39 Remaining 2:59 running	11. Select START PROTOCOL and confirm with [ENTER]. The homogenization starts. The following data are displayed on the current screen: – Display of the total time (homogenization times + cooling down times) – Display of remaining time **Note:** A running protocol can be interrupted with [ESC].

Running protocol Total time: 3:39 program finished	After the homogenization is finished, the note "program finished" is displayed. 12. Remove the samples from the SpeedMill PLUS. 13. Press [ENTER].
Running protocol Total time: 3:39 Start again with ENTER End program with ESC	14. Press [ENTER] to start the protocol again or press [ESC] to get back to the main menu.

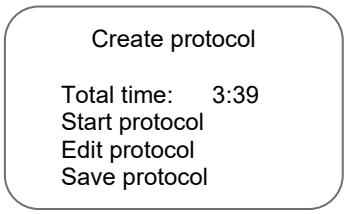
7.4 Quick mode

The Quick mode serves to start the homogenization immediately without further parameter settings. Presettings for the Quick mode can be realized in the SETTINGS menu (→ see section "Parameters for Quick mode" p.31).

Analytik Jena AG SpeedMill PLUS	1. Switch on SpeedMill PLUS. The start screen appears.
Prep time: 20 s	2. Press [◀] for 3 seconds. The homogenization starts automatically. The elapsed homogenization time is displayed on the screen.
Prep time: 20 s Cool down: 30 s	3. Press [ESC] to cancel the homogenization, or let the homogenization continue until the end. The cooling down follows according to the homogenization time. **Note:** If the PREP TIME has been preset in the SETTINGS menu, the time is counted down. The homogenization ends when the PREP TIME is elapsed.

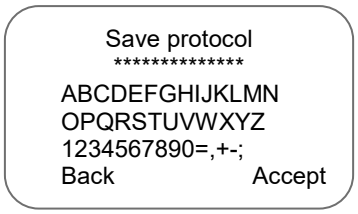
7.5 Managing protocols

7.5.1 Saving protocols



The adjacent screen appears after the protocol has been entered in the Interval mode.

1. Select the option SAVE PROTOCOL with ▲ ▼ and confirm with [ENTER].

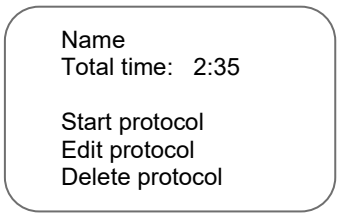


2. Select letters, numbers and signs with the cursor keys and confirm with [ENTER].

   The asterisks are overwritten one after each other.

3. Select ACCEPT with the cursor keys and confirm with [ENTER].

   The protocol has been saved under the entered name in the "user-defined" folder.

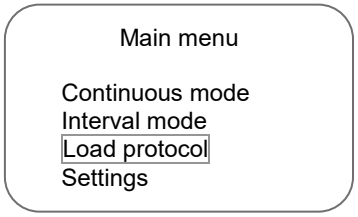


4. If no further operation is requested press [ESC] to get back to the main menu.

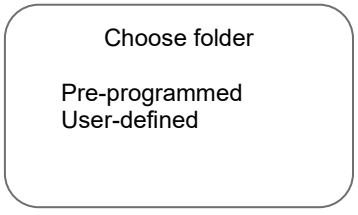
   Alternatively one of the following operations can be selected:

   – START PROTOCOL – The current protocol is started.
   – EDIT PROTOCOL – The current protocol can be edited.
   – DELETE PROTOCOL – The protocol is deleted.

7.5.2 Loading a protocol



1. Select the option LOAD PROTOCOL in the main menu with ▲ ▼ and confirm with [ENTER].



2. Select a folder with ▲ ▼ and confirm with [ENTER]:
   – Pre-programmed – folder with protocols saved at factory
   – User-defined – folder with protocols created by the user

User defined 5MINX54 TISSUE PLANT	3. A list of the saved programs appears. 4. Select a program with ▲ ▼ and confirm with [ENTER].
Name Total time: 2:35 Start protocol Edit protocol Delete protocol	5. Select one of the options with ▲ ▼ and confirm with [ENTER]: – START PROTOCOL – The current protocol is started immediately. – EDIT PROTOCOL – The current protocol can be edited. – DELETE PROTOCOL – The protocol is deleted.

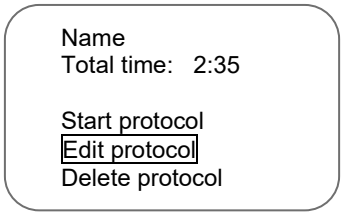
7.5.3 Starting a protocol

After loading the protocol the homogenization can be started directly.

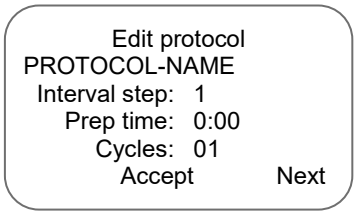
Name Total time: 2:35 Start protocol Edit protocol Delete protocol	1. After loading the protocol select the option START PROTOCOL and confirm with [ENTER].
Running protocol Name Total time: 3:39 Remaining 2:59 running	The homogenization starts immediately. The following data are displayed on the current screen: – Display of total time (sum of entered homogenization times and resulting cool down times) – Display of remaining time **Note:** A running protocol can be interrupted with [ESC].
Running protocol Total time: 3:39 program finished	After the homogenization is finished, the note "program finished" is displayed. 2. Press [ENTER].
Running protocol Total time: 3:39 Start again with ENTER End program with ESC	3. Press [ENTER] to start the protocol again or press [ESC] to get back to the main menu.

7.5.4 Editing a protocol

A user-defined, currently loaded protocol can be edited. Programs which have been installed in the "pre-programmed" folder at the factory cannot be changed.



1. After loading the protocol select the option EDIT PROTOCOL and confirm with [ENTER].

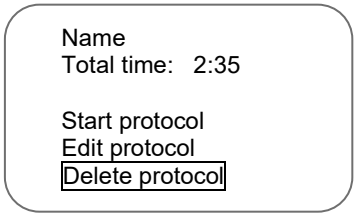


The screen for editing the program will appear.

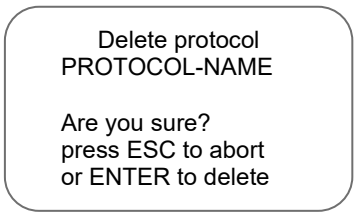
2. Continue as described in section "Interval mode" p. 25.

7.5.5 Deleting a protocol

The currently loaded protocol can be deleted.



1. After loading the protocol select the option DELETE PROTOCOL and confirm with [ENTER].



2. Accept the confirmation request with [ENTER].

The protocol is deleted.

7.6 Reconfiguring parameters for operating modes

For the two operating modes Quick mode and Continuous mode parameters can be preconfigured. The parameters appear when these operating modes are called up.

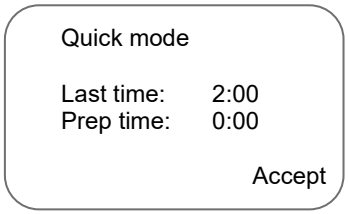
7.6.1 Parameters for Continuous mode

Main menu Continuous mode Interval mode Load protocol Settings	1. Select the option SETTINGS in the main menu with [▲] and [▼] and confirm with [ENTER].
Settings Quick mode Continous mode	2. Select the option CONTINUOUS MODE and confirm with [ENTER].
Settings Prep time: 0:00 Use as default time? yes no Accept	3. Set the PREP TIME homogenization time with the cursor keys and confirm with [ENTER]. 4. Select the option YES with ◀ ▶ and confirm with [ENTER]. 5. Select the option ACCEPT with ▼. 6. Press [ENTER].

7.6.2 Parameters for Quick mode

If the homogenization time called PREP TIME is preconfigured, this time will be used at each start of the Quick mode. If no PREP TIME is set, the time of the last homogenization is used (LAST TIME).

Main menu Continuous mode Interval mode Load protocol Settings	1. Select the option SETTINGS in the main menu with ▲ ▼ and confirm with [ENTER].
Settings Quick mode Continous mode	2. Select the option QUICK MODE and confirm with [ENTER].



3. Enter LAST TIME or PREP TIME.

Note:
Only one of the times can be entered, the other time is set to 0.

4. Select ACCEPT and confirm with [ENTER].

7.7 Pre-programmed protocols

Name	Total time
BACTERIA	12 min
TISSUE-SOFT1	1 min
TISSUE-SOFT2	2 min
TISSUE-VH+O	8 min
PLANT-SOFT	2 min
PLANT-MH	4 min
PLANT-VH	6 min
SOIL-DNA	8 min

8 Maintenance and care

The SpeedMill PLUS is largely maintenance-free. Care and maintenance work is restricted to cleaning and changing the fuses.

WARNING!

You are not authorized to open the device cover.

The device cover must only be opened by the technical customer service of Analytik Jena AG or by instructed personnel!

8.1 Cleaning

WARNING!

Danger of electrical short circuit!

Before cleaning the device with disinfection agents, pull the mains plug from the terminal of the SpeedMill PLUS!

The SpeedMill PLUS only must be recommissioned when the device is completely dry.

Avoid contamination by handling sample substances with care.

Wipe spilled samples or reagents immediately with an absorbent cloth or piece of paper.

If the SpeedMill PLUS is used for the analysis of infectious material, great care must be taken, because the SpeedMill PLUS cannot be decontaminated as a whole device.

Visible contamination must be removed immediately using suitable detergents, making sure that no solvent enters the inside of the device.

We recommend the following disinfection agents:

- Decosept AF disinfectant spray Dr. Schuhmacher GmbH
- Meliseptol HBV - cloths B. Braun

If the SpeedMill PLUS has to be sent to the customer service of Analytik Jena AG and has been contaminated with infectious material, a decontamination must be carried out before shipping.

8.2 Replacing the fuses

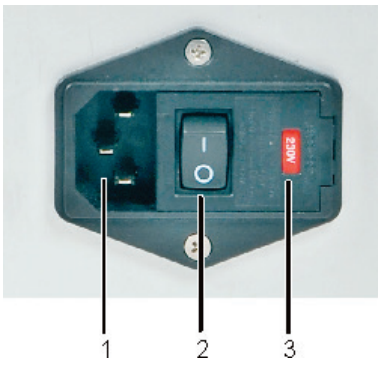
WARNING!

Danger, electric shock!

Pull the mains plug before changing fuses!

If the mains fuses of the SpeedMill PLUS are faulty you can replace them.

1. Switch off the SpeedMill PLUS and pull out the mains plug from the terminal of the SpeedMill PLUS.
2. Open the fuse holder by inserting a flat screwdriver into the groove of the holder on the right side and carefully prying open the lid.
3. Pull out the red block with the fuses.
4. Replace the faulty mains fuse. Use the following fuse:
   – 2 x T 4 A / 250 V
5. Put the fuse holder back and close the fuse holder.
   Make sure that the red block is inserted according to the required operating voltage.
   The operating voltage setting is visible in the window of the lid holder.



1 Terminal for mains plug
2 Mains switch
3 Fuse holder

Fig. 9 Fuse holder

8.3 Changing to another operating voltage

The fuse holder is used to change to another operating voltage. The operating voltage is shown in the window of the fuse holder.

1. Open the fuse holder by inserting a flat screwdriver into the groove of the holder on the right side and carefully prying open the lid.
2. Pull out the red block with the fuses.
3. Rotate it by 180° and insert it again. The marking indicating the desired operating voltage must be pointing to the right (arrow in Fig. 10).
4. Close the lid of the fuse holder and make sure that the correct operating voltage is displayed in the window.

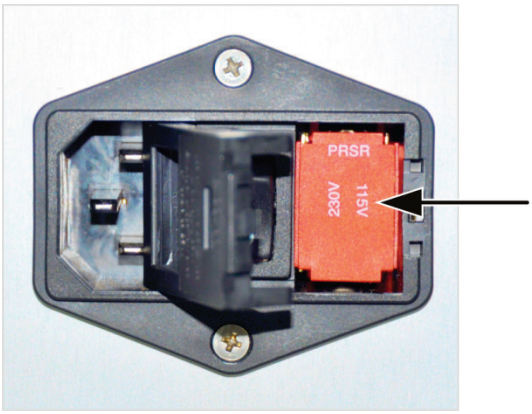


Fig. 10 Adjusting the operating voltage

9 Transport and storage

9.1 Transport

ATTENTION!

For packaging only use the transport packaging recommended by AJ. Only this provides optimum protection of the SpeedMill PLUS against transport damage.

If sending the SpeedMill PLUS to Analytik Jena AG, complete the decontamination description and place it together with an error description into the cardboard box.

Pack the SpeedMill PLUS as follows:

1. Switch off the device and disconnect the mains plug from the SpeedMill PLUS.
2. Remove remaining consumables from the SpeedMill PLUS.

3. Insert the sample holder in the SpeedMill PLUS.

4. Place one foam frame onto the flor of the packiging.

5. Warp the SpeedMill PLUS into the plastic bag to protect it against scratching and place it into the packaging.

	6. Slide the second foam frame onto Speed-Mill PLUS. 7. Place the main cabel on the device. 8. Close the packaging.

Transport note

Avoid the following during transport:

- ❑ Shocks and vibrations
  Risk of damage from jolts, shocks or vibrations!
- ❑ Large fluctuations in temperature
  Risk of condensate formation!

9.2 Storage

ATTENTION

Environmental influences and condensate formation can destroy individual components of the device!

The device must only be stored in air-conditioned rooms. The atmosphere must be low in dust and free from aggressive vapors.

If the device is not installed immediately after delivery or not required for prolonged periods, it should be stored in its original packaging. A suitable desiccant should be added to the equipment to prevent damage from moisture.

The following storage conditions must be met:

- ❑ Temperature range: -10 – 55°C
- ❑ Max. humidity: max. 80% (use desiccant)

10 Waste disposal

The operator of the SpeedMill PLUS must dispose the waste materials arising during measurements (sample materials) in accordance with the statutory and local regulations.

At the end of its service life the SpeedMill PLUS and its electronic components must be disposed of as electronic waste in accordance with the applicable regulations.

11 Technical data

System parameters	
Homogenization time	30 s to 4 min (depending on the type of the starting material)
DNA/RNA purification time	20 – 30 min for standard protocols for complete nucleic acid isolation
Acceleration time	none
Deceleration time	none
Application parameter	
Sample capacity	Simultaneous processing of up to 12 samples
Sample cooling	Sample holder cooled passively, storage at up to –40 °C (–104 °F)
Program parameters	
Homogenization time	1 s to 4:59 min
Minimum time adjustment range	1 s
Pre-programmed protocols	8
Memory capacity for user-defined protocols	20
Number of cycles	1 – 99
Number of protocol steps	1 – 6
Other technical data	
Dimensions (W x H x D)	154 x 275 x 257 mm
Weight	26.46 lb
Energy supply	AC 115/230 V, 50/60 Hz
Power consumption	170 W (max.)
Warranty	2 years
Fuse	2x T 4 A, 250 V
Safety type	IP 20