Operating Instructions

Planetary Micro Mill

„pulverisette 7“

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Fritsch GmbH, Laborgerätebau has been certificated by the TÜV-Zertifizierungsgemeinschaft e.V. on November 21, 2003.

TÜV CERT DIN EN ISO 9001

An audit certificated the accordance of the Fritsch GmbH to the DIN EN ISO 9001:2000.

The enclosed declaration of conformity calls the directives which the „pulverisette 7“ corresponds to. This permitts us to mark the instrument with the CE-Sign.

CE

Instrument number 07.4000.00

Applies as of serial number 487

Edition 08/2002 Index 006 checked and released

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1 General Information / Introduction

1.1 Notes about Operating Instructions

- The copyright to these technical documents is the property of Fritsch GmbH, Manufacturers of Laboratory Instruments.
- These operating instructions are not to be reprinted or copied without the express approval of Fritsch GmbH.
- Please study these instructions carefully before operation.
- All operators must be familiar with the contents of the operating instructions.
- Please observe all notes concerning your safety.
- The sieve shaker was designed with the user's safety in mind, however inherent risks cannot be excluded. Follow the advices in these instructions to avoid risks to users. The symbols in the right hand margin highlight the risks described in the text.
- Symbols are also to be found on the instrument warning users of possible risks.
  Warning symbols are surrounded by a triangle.
- These operating instructions do not constitute a complete technical description. They describe only the details required for safe operation and maintenance for usage under normal conditions.

1.2 Explanations of the signs at the instrument and in the operating instructions

Attention! warning against danger spot observe operating instructions	
Attention! mains voltage	
Attention! risk of explosion	
Attention! hot surface	
Attention! inflammable substances	
wear protective gloves!	
wear ear protectors!	
wear safety goggles!	
Do not step below lifted load!	

1.3 Short Description of the Machine

1.3.1 Applications

The "pulverisette 7" planetary micromill is universally applicable for quick dry or wet grinding of inorganic and organic samples for analysis, quality control, materials testing and mechanical alloying.

In synthesis, the planetary micromill can be used for mixing and homogenisation of dry samples, of emulsions and of pastes.

1.3.2 Method of Operation

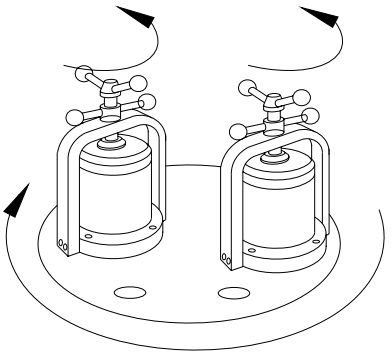
The material is crushed and disintegrated in a grinding bowl by grinding balls. The grinding balls and the material in the grinding bowl are acted upon by the centrifugal forces due to the rotation of the grinding bowl about its own axis and due to the rotating supporting disc.

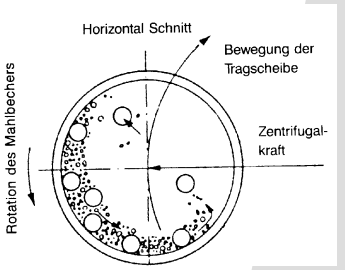
The grinding bowl and the supporting disc rotate in opposite directions, so that the centrifugal forces alternately act in the same and opposite directions.

This results in, as a frictional effect, the grinding balls running along the inner wall of the grinding bowl, and impact effect, the balls impacting against the opposite wall of the grinding bowl.

1.3.3 Drive Motor and Speed Control

The machine is driven by a maintenance-free three-phase a.c. motor, which is operated with a frequency converter.





1.4 Technical Data

Dimensions

500 x 370 x 530 mm

(height x width x depth)

Weight

Net: 35 kg

Gross: 55 kg

Operating Noise

The noise level can be as high as approx. 90dB (A). The value fluctuates greatly depending on the speed, the material being ground and on the type of grinding bowl and grinding balls.

Voltage

The machine can be operated in two voltage ranges:

- Single-phase alternating voltage 100-120V ± 10% and
- Single-phase alternating voltage 200-240V ± 10%.

(see also section 3.6 Adaptation to Mains Supply Voltage / Changing the Timer / Setup-Mode)

Current Input

The maximum current input is approx. 8,8 A (115V),

3,7 A (230V).

Power consumption

The maximum power consumption is approx. 600 W.

Electrical Fuses

- Fuse unit at the rear of the machine: 2 x 8 A T
- Miniature fuse 2 x 0.063 A T
  on printed circuit board (remove housing)
- Miniature fuse 10 A T
  in the frequency converter (remove housing)

Material

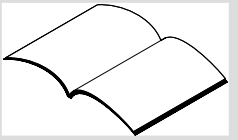
- Maximum feed size approx. 5 mm
- Maximum feed quantity 2 x 20 ml

Final fineness

- Dry grinding
  down to d_{50} < 20 µm (depending on material)
- Wet grinding
  down to d_{50} < 1 µm (depending on material)

2 Operating Safety

2.1 General Safety Instructions



- Read the operating instructions carefully before use.
- The instrument can only to be used for the purpose described in section 1.3.1 Applications.
- Use only original accessories and original spare parts. Failure to do so may call into question the performance of the instrument.
- The operators must be familiar with the contents of the operating instructions.
  To this end, for example, the operating instructions must with the instrument.
- Do not remove labels.
- Protective devices must not be made unserviceable or removed.

- Unauthorized modification of the instrument or any part thereof will result in the loss of the conformity to European directives which is asserted by Fritsch and the warranty.
- Wear protective gloves!
  Grinding bowls may be very hot after grinding.

- Wear safety glasses
  Wet grinding may cause high pressure in the grinding bowl- Danger of squirting!
- Wear ear protectors if the noise level is higher than 85dB(A).

- Don’t run the instrument several hours without cooling phases - Danger of overheating.
- Behaviour at all times must be such as to strictly preclude any accidents.
- Furthermore, the MAC values at place of work specified in the pertinent safety regulations must be adhered to. Where applicable, ventilation must be provided or the instrument must be operated under an exhaust hood.
- Use the instrument only inside. The air must not contain any electrical conductive dust.

- When oxidizable materials such as metals, organic materials, wood, coal, plastic, etc. are ground or sieved, the risk of spontaneous ignition (dust explosion) exists whenever the fine particles exceed a specific percentage. While such materials are being ground, it is therefore necessary to take special safety precautions (e.g. wet grinding) and the work must be supervised by a specialist.
- The instrument is not explosion-proof and is unsuitable to grind or sieve materials which are explosive, combustible or promote combustion.
- Do not allow the planetary micromill to run unsupervised. Due to the vibrations, under certain operating conditions, the machine may creep along the surface on which it is located or mounted.

2.2 Operators

- No one other than authorized persons should operate the instrument and it must be serviced and repaired by trained specialists.
- No one suffering from medical problems or under the influence of medications, drugs, alcohol or overtiredness should be permitted to operate the instrument.

2.3 Protective Devices

Protective devices should be used for the intended purpose and must not be made unserviceable or removed.

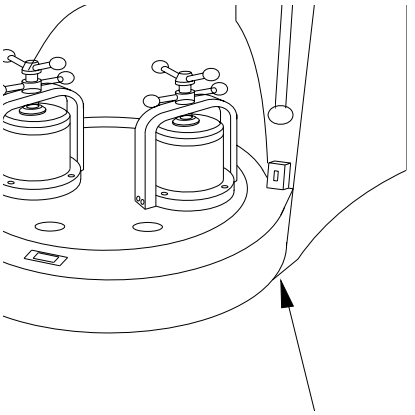
All protective devices should be regularly checked for completeness and to ensure that they are functioning correctly. See section 6 on Maintenance.

The hood must be closed when the machine is started up.

The hood is locked:

- when the machine is disconnected from the mains supply
- during operation

The hood can be opened only when the drive of the mill has come to a standstill.

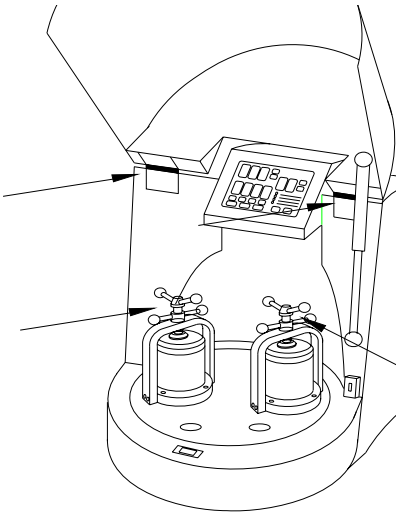


Opening the hood when the machine is disconnected from the mains supply

1. Remove the plug from the safety lock. It can be accessed via the bore in the base of the machine.
2. Insert the attached triangular wrench through the bore, and turn clockwise.
3. The closure hatch can now be opened after the spring-loaded lock at the front of the hood is opened.
4. The planetary micromill can now not be switched on. If it is to be switched on, the safety lock must be activated by turning the triangular wrench anticlockwise, and the hood must be closed.

2.4 Danger Points

- Danger of crushing when the hood is being closed.
- Danger of crushing at the grinding bowl holder.
- Balance the mill:
  Symmetrical charging by using two bowls of the same weight.



2.5 Electrical Safety

General

- The main switch disconnects the machine from the mains supply at two poles.
- Switch off the main switch if the planetary micromill is to be inoperative for an extended period (e.g. over night).

Protection against Restarting

In the event of a mains failure during operation or after switching-off with the main switch, the hood will remain locked. When the mains voltage is restored, the lock of the hood will open. For safety reasons, however, the planetary micromill will not start again.

Overload Protection (see Troubleshooting Checklist)

In the event of overloading, the speed of the machine will be reduced. This is indicated by the OVERLOAD light beeing illuminated.

If the drive motor overheats, the machine will switch off.

If the drive is obstructed, the machine will switch off.

Unbalance Detection (see Troubleshooting Checklist)

In the event of an excessive unbalance, the machine will switch off.

3 Installation

3.1 Unpacking

- Open the bandages with which the hood is fastened on the transport pallet. The hood is a wooden box placed over the transport pallet.
- Lift the hood off the transport pallet.
- The cellular parts can be removed now or during the installation. To ease this removal you can break the performated segments.
- Check that the items supplied correspond to your order. Grinding bowls of hardened steel may exhibit surface indentations caused by the manufacturing process. These do not influence the grinding or the grinding result and generally disappear after the first grinding.
  When present, these surface indentations lie within the permissible manufacturing tolerance ranges. Accordingly, complaints regarding such grinding bowls cannot be accepted.
- Please store the transport packing carefully to use it again in case of an eventual return of the instrument. Fritsch GmbH does not bear the risk of damages depending on improper packings (non-Fritsch packings).

3.2 Transport

- Transport the planetary micromill on the transport pallet with a fork lift truck or a hand fork lift truck.
- To carry the machine, grip it below the edge of the housing.

Carrying the machine will require at least two persons.

3.3 Erection

- Lift the planetary micromill off the transport pallet.

Lifting the machine down will require at least two persons.

- If the cellular parts have not yet been removed, this can be done now. See section 3.1 Unpacking.
- Place the planetary micromill on a level, stable surface, indoors. It is not necessary to fasten the planetary micromill on the erection site.
  The planetary micromill can also be mounted on a sturdy table.

It is inadvisable to operate the planetary micromill while it is standing on the transport pallet.

- Ensure that there is good access to the planetary micromill. There must be enough space to reach the main switch.
- Do not block the exit of air from the ventilator louver at the side. There is a danger of overheating if the louver is blocked.

3.4 Ambience conditions

- Use the instrument only inside.
- The ambient temperature must be between 5 and 40°C.
- Height up to 2000m M.S.L.
- Maximum relative humidity of air 80% temperature up to 31°C, linear decreasing down to 50% relative humidity of air at 40°C
- Contamination level 2 (IEC 664)

3.5 Electrical Connection

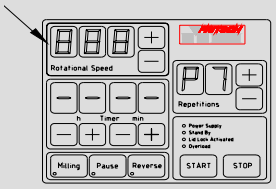
Before making the connection, compare the voltage and current values shown on the nameplate with the values of the mains supply to which the planetary micromill is to be connected.

Single-phase alternating voltage with protective conductor (see section 1.4 Technical Data).

The connecting cable may be changed only by a trained expert.

3.6 Adaptation to Mains Supply Voltage / Changing the Timer / Setup-Mode

The voltage range of the machine should be switched over only by specialist staff:



1. Disconnect the machine from the mains supply.
2. At the rear of the machine, set the changeover switch to the voltage range.
3. Connect the machine to the mains supply.
4. Press and hold down the STOP button on the control panel at the front.
5. Switch on the main switch at the rear of the machine and release the STOP button immediately afterwards.
6. The POWER SUPPLY light must flash. If it does not, repeat the procedure.
7. With the + / - ROTATIONAL SPEED buttons, select the mains supply voltage level (90 - 260 V).
8. The timer function can now also be altered: With the right-hand + button in the TIMER panel, select the time range:
   Hours and minutes (display: -) or
   Minutes and seconds (display: 1)
9. To store the settings and end the setup mode, press the STOP button.

Pressing the + / - REPETITIONS buttons alters the machine type.

Do not change anything here: P7 should be indicated in the display. Otherwise, damage will occur during operation!

3.7 Switching On for the First Time / Test for Correct Functioning

Switch on the machine only when all the work described in section 3 on Installation has been done.

Switching On

1. Connect the machine to the mains supply.
2. Switch on the machine with the main switch at the rear.
3. The green POWER SUPPLY display will come on.
4. Open the hood.
5. Both bowl holders: clamp the wood or empty bowl with the spindle.
6. Close the hood.
7. Set the speed to 100 on the control panel.
8. Press START on the control panel.
9. The hood will be locked and the mill will run at the preselected speed.

Switching Off

- Press STOP on the control panel.
- After a short period (after the mill has come to a standstill), the hood is unlocked and can be opened.

4 Working with the Planetary Micromill

4.1 Choice of Grinding Bowls and Grinding Balls

Caution!!!

No warranty or claims shall be accepted in case of damages caused on account of using grinding bowls and grinding balls that are not original accessories of the appliance.

In order to prevent excessive abrasion, the hardness of the grinding bowl used and of the grinding balls must be higher than that of the material used.

Material (bowl and balls)		**density*** in g/cm^3	**restistance to abrasion**
Agate	(99.9% SiO_2)	2.65	Good
Sintered corundum 1	(99.7% Al_2O_3)	3.8	Fairly good
Zirconium dioxide	(95% ZrO_2)	5.7	Very good
Stainless steel	bowl: (17-19% Cr + 8-10% Ni) ball: (12,5-14,5% Cr + 1% Ni)	7.8	Fairly good
Tempered steel	bowl: (11-12% Cr) ball: (1,0-1,65% Cr)	7.9	Good
Tungsten carbide	(93%WC+6% Co)	14.7	Very good
Silicon nitride (Syalon)	(90% Si_3N_4)	3.1	Extremely good

The grinding bowls and grinding balls of zirconium dioxide are resistant to acids with the exception of hydrofluoric acid.

Normally, grinding bowls and grinding balls of the same material should be chosen.

Exeption:
Tungsten carbide balls may be combined with steel bowls.

The size of the grinding bowls and grinding balls should be determined experimentally.

4.1.1 Size of the Grinding Balls

Type of feed material	Ball diameter
Hard samples feed with a piece size between 2mm and 5mm	15 mm
Fine material (0.5 mm)	10 mm / 5 mm
Homogenisation of dry or liquid samples	10 mm /

These are just clues: the size of the grinding bowls and grinding balls should be determined experimentally if necessary.

Attentione:

Mixing balls with different diameters is not recommended. (If different ball diameters are used there is the danger of higher abrasion of the balls!)

*High density means high impact energy

4.1.2 Number of Balls per Grinding Bowl

A larger number of balls reduces the grinding time, and the grinding result will lie within a narrower grain band width.

Ball Ø (mm)	Grinding bowl volume (ml)	12	45
5	Number of balls (piece)	50	180 - 200
10	Number of balls (piece)	6 - 8	18 - 20
15	Number of balls (piece)		7

The number of balls should be observed to prevent attrition.

4.1.3 Calculated Ball Weight

Ball diameter in mm		5	10	15
Material	**density in g/cm³**	**Calculated ball weight in g**		
Agate	2.65	0.17	1.39	4.68
Sintered corundum	3.8	0.25	1.99	6.72
Zirconium oxide	5.7	0.37	2.98	10.07
Stainless steel	7.8	0.51	4.08	13.78
Tempered steel	7.9	0.52	4.14	13.96
Hardmetal tungsten carbide	14.7	0.96	7.70	25.98
Silicon nitride (Syalon)	3.1	0.20	1.62	5.48

To calculate the weight of the required balls, the “calculated ball weight” is multiplied by the “number” of balls needed.

Example: A 45 ml agate bowl must be filled with 185 agate balls of 5 mm diameter.

Calculation: 0.17 g * 185 balls = 31.45 g

31.45 g of grinding balls can be weighed out and placed in the grinding bowl; this saves the time required for counting out the balls.

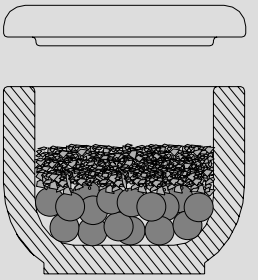
4.2 Filling the Grinding Bowl

Grinding bowl	Min. filling†	max. filling
45ml	3ml	20ml
12ml	0,5ml	5ml

Using less sample material than recommended will cause higher abrasion!

It is imperative that the following sequence be observed:

1. Place the grinding balls in the empty bowl.
2. Fill the material to be ground on the balls.



Never use the mill without sample material!
Danger of badly damage of the grinding balls and bowl!

4.3 Influencing Quantities During Grinding

Running time (grinding time)

A longer grinding time will increase the fine fraction.

Speed

A higher speed will reduce the grinding time and increase the fine fraction.

Reversing operation (regular reversal of the direction of rotation)

May improve the grinding; useful for mechanical alloying.

Number and size of the balls

Pregrinding coarse, hard material with large balls: small fine fraction.

Use of many small balls will increase the fine fraction if the running time is increased.

Mass of the balls (type of material)

A higher mass (density) of the grinding balls will accelerate the grinding.

(See the table in section 4.1 on Choice of Grinding Bowls and Grinding Balls.)

† filling = sample material

4.3.1 Dry Grinding

Below a particle size of approx. 20 µm, surface forces predominate and the material will start to "stick".

Further dry grinding can be achieved if surface-active substances are added to the material.

Examples (maximum quantity to be added in % by mass)

- Stearic acid 2-3%
- Aerosil (microdispersed silicic acid) 0.5-2%
- Silica sand ~ 2%
- Glass powder ~ 2%

4.3.2 Wet Grinding (Grinding in Suspension)

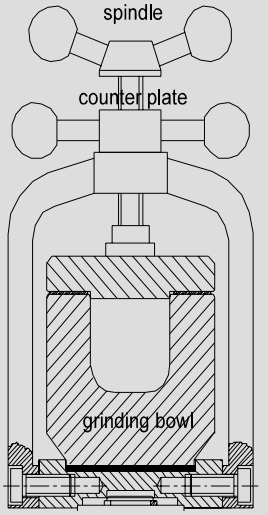
When grinding in suspension, you can add auxiliary substances in liquid form with a high boiling point and low vapour pressure.

Flammable liquids such as ketones and petroleum spirits with a boiling point <120°C should not be used.

4.4 Clamping the Grinding Bowls

The following tests should be performed before the grinding bowls are clamped in the machine:

- Check the cork disc for damage.
  Replace cork discs that are black and flattened.
- The flat Teflon seal (for sealing between the lid and the bowl) must not be damaged or dirty.
  Replace severely deformed flat Teflon seals.
- Check the rubber disc for damage.
  Replace rubber discs that are flattened and project laterally beyond the pressure piece.
- The plane surfaces of the counter plate and of the clamp clip must not be dirty.
- The surfaces of the lid and of the bowl on which the flat Teflon seal rests must be clean.



Clamping

- Place the sealing ring and the lid on the bowl.
- Insert the grinding bowl in the pot mounting on the cork disc. Do not tilt it.
- Screw the spindle down fully until the rubber disc of the pressure piece rests flat on the lid.
- Tighten the spindle by hand.
- Screw the counter plate down fully until it rests flat on the clamp clip.
- Tighten the counter plate by hand.

After a few minutes of grinding, and in the cooling phases, check that the spindle and the counter plate are secure.

4.5 Mass Balance

To balance the mill, always clamp a corresponding heavy grinding bowl with lid and sealing into the opposed bowl holder. This second grinding bowl may be empty (without balls and sample).

Under certain operating conditions, the machine may creep along the surface on which it is located or mounted. This may be due to a difference in weight of the grinding bowls.

4.6 Grinding Time

In accordance with the application, the grinding time should be adapted to the heating of the bowl. In the case of grinding at high speeds and with large bowls, the grinding time should not exceed 1 hour. Then allow to cool for 0.5 to 1 hour.

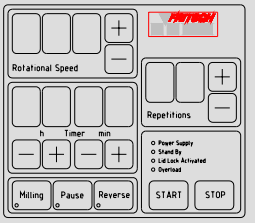
Pay attention to the heating of the material; in the case of extended running times, if necessary set a break time for cooling.

To reduce the grinding time, choose grinding balls of a higher density.

In the case of operation for mixing and homogenisation at low speeds, the mill may run for several hours without harm being done. The machine cannot be operated with an external timer.

4.7 Control Panel

- Switch on the main switch at the rear of the machine.
- he green POWER SUPPLY standby display on the control panel will light up.



4.7.1 Setting the Speed

➔ ROTATIONAL SPEED control panel area

Press or press and hold down the "+" or "-" button.
The speed can be selected in steps of 10 rpm between 100 and 800 rpm.

During operation, the actual speed is indicated; pressing the "+" or "-" button will cause the specified speed to be shown temporarily.

4.7.2 Setting the Running Time

➔ TIMER control panel area

- Press the MILLING button.
  The button will light up.
  Press the "+" or "-" button and select the running time in hours (0..99) and minutes (0..60).
- Set a break time if this is required for cooling.
  Press the "Pause" button.
  The button will light up.
  Press the "-" or "+" button and select the break time in hours (0..99) and minutes (0..60).
  If no break time is required, set the break time to 0.

Notes:

- If the combination minutes/seconds instead of hours/minutes was set in the set-up mode (section 3.6), the **h** numbers indicate the minutes and the **min** numbers the seconds.
- During operation, the remaining running times and the remaining break times are indicated.
- The machine cannot be operated with an external timer.
- For information on running times, see section 4.6 on Grinding Time.
- To interrupt the grinding, press the STOP button; continue grinding by pressing the START button, n.b. account is taken of the grinding time already elapsed and of the number of repetitions.

4.7.3 Reversing Operation

➔ Press the REVERSE button.

The direction of rotation of the planetary monomill will now be changed after the chosen running time has elapsed. For this function REPETITIONS is set to minimal 1.

4.7.4 Repetition of the Grinding / Break Cycles

➔ Repetitions control panel area

Press the "+" or "-" button and choose the number of repetitions (0..99). During operation, the number of the remaining cycles is indicated.

4.8 Performing a Grinding Operation

- After everything has been set up as described in section 4 on Working with the Planetary Micromill, close the hood.
- The green LID LOCK ACTIVATED light on the control panel will come on.
- Press the START button on the control panel.
- The hood will be locked and the planetary monomill will run.
- The planetary monomill will rotate at the speed set (set speed) – if the load is too great, e.g. if the grinding bowl is too large, the machine will be run at a lower speed (actual speed) so as to prevent overloading.

If the planetary monomill does not start, see the Troubleshooting Checklist in section 8.

Overloading

In the event of overloading of the planetary monomill, the speed will be reduced and the OVERLOAD light will shine.

If it is overloaded for a prolonged period, the mill will switch off; see theTroubleshooting Checklist in section 8.

Miscellaneous

During operation, the hood will remain locked even during the breaks, and the fan will run.

Switching Off

- Press STOP on the control panel.
- When the drive has come to a standstill, the hood is unlocked and can be opened.
- Switch off the main switch at the rear of the machine if the machine is to be inoperative for an extended period.

4.9 Cooling the Grinding Bowls

- with the hood open or
- at the programmed break times with the hood closed (locked) and the ventilator running.

4.10 Standby

After one hour, if the mill is not being operated and the hood is open, the mill will switch to the energy-saving standby mode. The STAND BY light will come on.

The standby function will not be activated when the hood is closed.

5 Cleaning

5.1 Grinding accessories

- Clean the grinding bowl and grinding balls after each use: e.g. brush them clean under running water with usual cleaning agents.
- Fill the grinding bowl with grinding balls and some sand and water half-full and run the planetary motormill for 2 to 3 minutes (with the grinding bowl correctly clamped in position).
- Cleaning in the ultrasonic bath is permissible.
- When sterilising the grinding bowl and grinding balls in the drying chamber, heat only to 250°C.

Attention!!

Do not heat agate grinding parts above 110°C. Cool them **slowly and carefully**.

Agate parts must never be heated in the microwave (they heat up too rapidly).

They must never be subjected to temperature shocks, such shocks may destroy the parts → They burst apart explosively.

5.2 Mill

- When switched off, the planetary monomill can be wiped down with a damp cloth.

Do not allow any liquids to seep into the machine.

6 Maintenance

Before commencing maintenance work, disconnect the mains plug and secure the machine against being switched on again unintentionally.

When maintenance work is being performed, this should be indicated with a warning sign.

Regular cleaning is the most important part of maintenance of the planetary monomill.

Functional part	Task	Test	Maintenance interval
Safety lock	Locking the hood	Is the closed hood held shut when the main switch is off? If this test fails, you must not continue to work before the error is corrected	Before each use
LID LOCK ACTIVATED light in the control panel	Indicates that the hood is closed	With the hood closed, the green LID LOCK ACTIVATED light must be illuminated.	1 x monthly
Rotating bearings	Permanent lubrication	Bearing play	Every 2,000 hours or annually
Drive motor	Permanent lubrication	Bearing play	Every 4,000 hours or annually
V-belt	Motor – planet disc	Check the tension Remove the housing; the belt should not yield by more than approx. 10 mm under thumb pressure.	1 x annually
Fan	Cooling the grinding chamber and electronics	Operation; clean when dirty	2 x annually
Spindle of the grinding bowl holder	Clamping the grinding bowl	Freedom of motion; oil lightly, if necessary	Every 1,000 hours
Grinding bowl holder	Cork disc, rubber of the pressure piece, and grinding bowl lid seal	Signs of use; when it has been pressed flat and is thus non-elastic, replace it	Every 1,000 hours

7 Warranty

The warranty card accompanying this instrument must be returned to the manufacturer, duly filled out, in order for the warranty to become effective.

The option of online registration is available. For further information, please refer to your warranty card or visit our Homepage http://www.fritsch.de

We, Fritsch GmbH, Germany, our application technology laboratory and our agent in your country will gladly provide advice and assistance with this instrument.

Always include the serial number found on the nameplate with any queries.

Please note that in case of a return of the instrument the original packing has to be used. Compensation for damages depending on improper packings (non-Fritsch packings) is excluded.

8 Troubleshooting Checklist

Malfunction	Possible cause	Elimination of error
POWER SUPPLY standby display not illuminated	Not connected to mains	Plug in mains plug
	Main switch	Switch on the main switch
	Circuit breaker of the building in which the machine is set up	Check the circuit breaker
START button pressed but mill does not start	Check as above when POWER SUPPLY does not shine	See above
	when LID LOCK ACTIVATED does not shine	Close the hood securely
	Break time active	Wait for the break to end or press STOP
	Fuse blown	Replace fuse on printed circuit board 0.063 A T or in the voltage converter 10 A T.
Mill speed reduced	when OVERLOAD shines: overloading	Press "Stop" Reduce the load or accept the reduced speed
Mill stops	Switched off because of thermal overloading of the drive	Let the machine cool down and choose a lower speed
	Unbalance of the machine too large	Set the mass balance in a better manner
	Drive was obstructed	Eliminate the obstruction in the grinding chamber
	Motor V-belt loose or snapped	Check the V-belt and replace it if necessary
	Speed sensor defective	Call customer service
Hood cannot be opened	When the hood was being opened, the button at the front of the hood was not activated	
	Miniature fuse on the printed circuit board blown	Check the miniature fuse. For this, the housing must be removed.
Material escapes	Holder loose Sealing ring defective	Tighten the holder Replace the sealing ring
Uneven running with severe vibration	Mass balance not adequate	Set the mass balance in a better manner

9 List of Keywords