

Operating instructions

KNIFE MILL

PULVERISETTE 11

Valid from: 11.30X0/00001



Read the instructions prior to performing any task!



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Certifications and CE conformity

Certification

Fritsch GmbH has been certified by the SGS-TÜV Saar GmbH.



An audit certified that Fritsch GmbH conforms to the requirements of the DIN EN ISO 9001:2015.

CE Conformity

The enclosed Conformity Declaration lists the guidelines the FRITSCH instrument conforms to, to be able to bear the CE mark and the UKCA mark!



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1 Basic structure



- 1 Silicon lid
- 2 Knife
- 3 Grinding vessel
- 4 Bayonet lock
- 5 Touchscreen
- 6 Dial

- 7 Transparent screen, hood
- 8 Hood handle
- 9 Knife coupling
- 10 Silicon inlay
- 11 Main switch

2 Safety information and use

2.1 Requirements for the user

This operating manual is intended for persons assigned with operating and monitoring the Fritsch PULVERISETTE 11. The operating manual and especially its safety instructions are to be observed by all persons working on or with this device. In addition, the applicable rules and regulations for accident prevention at the installation site are to be observed. Always keep the operating manual at the installation site of the PULVERISETTE 11.

People with health problems or under the influence of medication, drugs, alcohol or exhaustion must not operate this device.

The PULVERISETTE 11 may only be operated by authorised persons and serviced or repaired by trained specialists. All commissioning, maintenance and repair work may only be carried out by technically qualified personnel. Qualified personnel are persons who, because of their education, experience and training as well as their knowledge of relevant standards, regulations, accident prevention guidelines and operating conditions, are authorised by those responsible for the safety of the machine to carry out the required work and are able to recognize and avoid possible hazards as defined for skilled workers in IEC 364.

In order to prevent hazards to users, follow the instructions in this manual.

Malfunctions that impair the safety of persons, the PULVERISETTE 11 or other material property must be rectified immediately. The following information serves both the personal safety of operating personnel as well as the safety of the products described and any devices connected to them: All maintenance and repair work may only be performed by technically qualified personnel.

This operating manual is not a complete technical description. Only the details required for operation and maintaining usability are described.

Fritsch has prepared and reviewed this operating manual with the greatest care. However, no guarantee is made for its completeness or accuracy.

Subject to technical modifications.

2.2 Scope of application



NOTICE

Fritsch laboratory mills are not intended for use in explosion-hazardous areas. Fritsch laboratory mills therefore fall outside the scope of the 94/9/EC Directive, but within the scope of the Machinery Directive 2006/42/EC. The use of Fritsch laboratory mills within explosion-hazardous areas is not permissible according to ATEX (94/9/EC) and is only allowed if additional explosion protection measures are taken. According to the Machinery Directive 2006/42/EC, there are no ignition sources in our mills that can become effective during normal operation. Nonetheless, there may be ignition sources in our mills that may become effective in the event of probable malfunctions.

Because Fritsch has only limited information on the composition of the ground product in use, its final fineness and therefore ultimately its ignition temperature, no statement regarding the explosion risk during intended use in conjunction with the occurring energy input can be made.

The occurrence of dust explosions can therefore never be completely ruled out. The user must create an explosion protection document in accordance with the ATEX 137 Directive (1999/92/EC) and define appropriate protective measures.



NOTICE

This laboratory instrument is designed for an 8-hour shift operation at 30 % duty cycle and not for continuous operation.

The duty cycle is defined as the ratio of load duration to run time. The run time is defined as load duration plus pause time. According to DIN EN 60034-1 (VDE 0530, IEC34-1) a continuous operation already takes place after a standardised run time of 10 minutes. At 30 % duty cycle (DC = ratio of load duration to run time) a load duration of 3 minutes and a pause time of 7 minutes would be within standard.

If the standardised run time of 10 minutes is exceeded, then, by definition, there would be a continuous operation and disproportionate temperature increases may occur, possibly involving increased wear.

The Knife Mill PULVERISETTE 11 is universally used for fast and gentle comminution and homogenisation of wet, oily, greasy soft, medium-hard and fibrous samples.

2.2.1 Operating principle

For comminution with the Knife Mill, the knife is screwed to the grinding vessel from below and placed in the PULVERISETTE 11. The sample material is filled into the grinding vessel, which is then closed with a lid. The knife speed can be adjusted between 2,000 and 10,000 rpm using a dial. A 2-piece knife with 4 stainless steel blades is used for comminution, or a 2-blade serrated stainless steel knife for demanding samples.

2.2.2 Drive motor and speed regulation

A universal AC motor is used as the drive. The speed can be adjusted in increments of 500 using the dial.

2.3 Obligations of the operator

Before using the PULVERISETTE 11, this manual is to be carefully read and understood. The use of the PULVERISETTE 11 requires technical knowledge; only commercial use is permitted.

The operating personnel must be familiar with the content of the operating manual. For this reason, it is very important that these persons actually receive the present operating manual. Ensure that the operating manual is always near the device.

The PULVERISETTE 11 may exclusively be used within the scope of applications set down in this manual and within the framework of guidelines put forth in this manual. In case of non-compliance or improper use, the customer assumes full liability for the functional capability of the PULVERISETTE 11 and for any damage or injury arising from failure to fulfil this obligation.

By using the PULVERISETTE 11 the customer agrees with this and recognizes that defects, malfunctions or errors cannot be completely excluded. To prevent risk of damage to persons or property or of other direct or indirect damage, resulting from this or other causes, the customer must implement sufficient and comprehensive safety measures for working with the PULVERISETTE 11.

Neither compliance with this manual nor the conditions and methods used during installation, operation, use and maintenance of the PULVERISETTE 11 can be monitored by Fritsch GmbH. Improper execution of the installation can result in property damage and thus endanger persons. Therefore, we assume absolutely no responsibility or liability for loss, damage or costs that result from errors at installation, improper operation or improper use or improper maintenance or are in any way connected to these.

The applicable accident prevention guidelines must be complied with.

Generally applicable legal and other obligatory regulations regarding environmental protection must be observed.

2.4 Information on hazards and symbols used in this manual

Safety information

Safety information in this manual is designated by symbols. Safety information is introduced by keywords that express the extent of the hazard.



DANGER

This symbol and keyword combination points out a directly hazardous situation that can result in death or serious injury if not avoided.



WARNING

This symbol and keyword combination points out a possibly hazardous situation that can result in death or serious injury if not avoided.



CAUTION

This symbol and keyword combination points out a possibly hazardous situation that can result in slight or minor injury if not avoided.



NOTICE

This symbol and keyword combination points out a possibly hazardous situation that can result in property damage if not avoided.

Special safety information

To call attention to specific hazards, the following symbols are used in the safety information:



 **DANGER**

This symbol and keyword combination points out a directly hazardous situation due to electrical current. Ignoring information with this designation will result in serious or fatal injury.



 **DANGER**

This symbol and keyword combination designates contents and instructions for proper use of the machine in explosive areas or with explosive substances. Ignoring information with this designation will result in serious or fatal injury.



 **DANGER**

This symbol and keyword combination designates contents and instructions for proper use of the machine with combustible substances. Ignoring information with this designation will result in serious or fatal injury.



 **WARNING**

This symbol and keyword combination points out a directly hazardous situation due to movable parts. Ignoring information with this designation can result in hand injuries.



 **WARNING**

This symbol and keyword combination points out a directly hazardous situation due to hot surfaces. Ignoring information with this designation can result in serious burn injuries due to skin contact with hot surfaces.

Safety information in the procedure instructions

Safety information and use

Safety information can refer to specific, individual procedure instructions. Such safety information is embedded in the procedure instructions so that the text can be read without interruption as the procedure is being carried out. The keywords described above are used.

Example:

1. → Loosen screw.

2. →



CAUTION

Risk of entrapment at the lid.

Close the lid carefully.

3. → Tighten screw.

Tips and recommendations



This symbol emphasises useful tips and recommendations as well as information for efficient operation without malfunction.

2.5 Device safety information

Please observe!

- Only use original accessories and original spare parts. Failure to observe this instruction can compromise the safety of the machine.
- Safe conduct must be strictly observed during all work.
- All currently applicable national and international accident prevention guidelines must be complied with.



CAUTION

Wear hearing protection!

If a noise level of 85 dB(A) is reached or exceeded, ear protection should be worn to prevent hearing damage.



WARNING

The maximum accepted concentration (MAC) levels of the relevant safety guidelines must be observed; if necessary, ventilation must be provided or the machine must be operated under an extractor hood.



! DANGER

Explosion hazard!

- When Comminution oxidisable substances, e.g. metal or coal, there is a risk of spontaneous combustion (dust explosion) if the proportion of fine particles exceeds a certain percentage. When Comminution these kinds of substances, special safety measures must be taken and the work must be supervised by a specialist.
- The device is not explosion-protected and is not suitable for Comminution explosive materials.

- Do not remove the information signs.



NOTICE

Immediately replace damaged or illegible information signs.

- Unauthorised alteration of the device will void Fritsch's declaration of conformity to European directives and void the guarantee.
- The PULVERISETTE 11 should only be used when it is in proper working order, as intended and in a safety- and hazard-conscious manner adhering to the operating manual. In particular, immediately rectify any malfunctions that could pose a safety hazard.
- If, after reading the operating manual, there are still questions or problems, please do not hesitate to contact our specialised personnel.
- Do not reuse damaged accessories.
- Do not leave the Knife Mill running for several hours without cooling phases. Risk of overheating!
- The mill must never be left running unsupervised. In certain operating states, the vibrations may result in a shifting effect on the surface.

2.6 Protective equipment



Protective equipment is to be used as intended and may not be disabled or removed.

All protective equipment is to be regularly checked for integrity and proper functioning.

For start-up, the hood (3) has to be closed.

The hood (3) is locked:

- without mains connection
- during operation

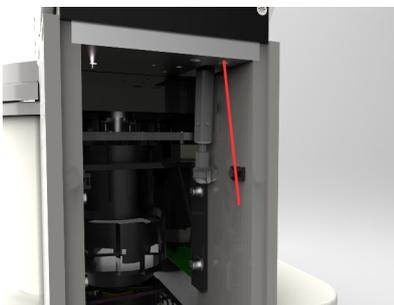


The hood (3) can only be opened, if the mill's drive is at standstill.

2.6.1 Opening the hood without mains connection



Only open the PULVERISETTE 11 in this way if there are problems with your mains supply or with the safety lock. Opening the mill during the grinding process could damage the device.



To open the hood without a mains connection, proceed as follows:

1. ➤ Loosen the four screws on the lower rear panel.
2. ➤ Mind the cabling when removing the rear panel.
3. ➤ On the right, a cable is attached to the inside that can be used to release the locking mechanism. Pull it.
 - ➔ The hood is now unlocked!
4. ➤ Replace the cable in its provided holder and reinstall the rear panel. The locking mechanism automatically resets itself correctly when the power returns.

Follow the following link to view a step-by-step instructional video on opening the PULVERISETTE 11 without a mains connection. ➔ [Click here](#).

2.7 Hazardous points



CAUTION

Wear safety gloves!

- Crushing hazard when closing the hood!
- The knife may be very hot after grinding.



CAUTION

Crushing hazard!

- Falling accessories during installation!

Wear safety shoes!

**CAUTION****Wear safety gloves!**

Mind the knife blades when installing or removing cutting tools. They are very sharp and pose a cutting hazard.

2.8 Electrical safety

2.8.1 General information

- The main switch (9) separates the device from the mains on two poles.
- Switch off the main switch (9) if the Knife Mill will be idle for an extended period of time (e.g. overnight).

2.8.2 Protection against restart

If a power failure occurs during operation or if the device is switched off with the main switch (9), the hood is locked. The hood lock is opened when power returns. For safety reasons, however, the mill does not restart.

2.8.3 Overload protection

- In the event of overload, the device reduces the power in a controlled manner. The actual speed may vary depending on the cutting material.
- The device switches off if the drive motor becomes too hot.
- The device switches off if the drive is blocked.

2.8.4 Operation on GFCI (Ground-Fault Circuit Interrupters)

It is possible that the leakage currents will become marginal during operation. This may trigger the earth leakage circuit breaker. These values can quickly be reached when all devices are added to the circuit.

Solution: Circuit without an earth leakage circuit breaker or, if possible, increase the earth leakage circuit breaker threshold.

3 Technical data

3.1 Dimensions

320 x 430 x 480 mm (width x depth x height)

3.2 Weight

Net: 17.6 kg

3.3 Speed

- Speeds between 2,000 - 10,000 rpm can be set in increments of 100 via the SOP mode. On the home screen you can set it via dial in increments of 500.
- When using the single-use adapter: Speeds between 2,000 - 14,000 rpm can be set in increments of 100 via the SOP mode. On the home screen you can set it via dial in increments of 500.
- Turbo function with up to 14,000 rpm can be activated for short periods (not if using the single-use adapter!)
- 2,000 rpm in reverse mode

3.4 Operating noise



CAUTION

The noise level may increase or decrease depending on the sample material used. Wear hearing protection during comminution to prevent hearing damage.

At 10,000 rpm idle speed, a workplace-specific emission value L_{pA} of 71 dB(A) is produced.

3.5 Voltage

Single phase alternating current 200 - 240 V

Single phase alternating current 100 - 120 V

3.6 Protection class

IP 21

3.7 Current consumption

- 200 - 240 V → 7 A
- 100 - 120 V → 10 A

3.8 Power consumption

Depending on the voltage range, the maximum power consumption is approx. 1.25 kW.

3.9 Electrical fuses

2 x 10 AT

1 x 1 AT

3.10 Material

- Maximum feed size 40 mm
- Maximum feed quantity 1300 ml

3.11 Final fineness

The final fineness depends highly on the sample and the comminution parameters.

Depending on the material, a final fineness < 300 μm can be achieved.

4 Installation

4.1 Transport



DANGER

Do not step under the transport pallet during transport.

- The device is packaged in a wooden crate.
- Reach under the edge of the housing to carry the device.



WARNING

Improper lifting can lead to personal injury or property damage. The machine is only to be lifted with suitable equipment and by qualified personnel.

The warranty excludes all claims for damage due to improper transport.

4.2 Unpacking

- Pull out the 4 nails that fasten the lid to the surrounding packaging. (for delivery in a wooden crate!)
- Remove the lid.
- Take out the accessories and the foam parts.
- Then lift the device out of the wooden crate or cardboard box.
- Please store the transport packaging so that it can be reused if you need to return the product. Fritsch GmbH accepts no liability for damage caused by improper packaging (packaging that is not from Fritsch).
- Compare the contents of your delivery with your order.

Follow the following link to view a step-by-step instructional video on unpacking the PULVERISETTE 11 . ➔ [Click here](#).

4.3 Setting up



NOTICE

Allow the device to acclimatise for two hours before commissioning. High temperature differences can lead to condensation in the device and damage to the electronics after switching on.

Strong temperature fluctuations can occur during transport or interim storage. Depending on the temperature difference between the installation site and the transport or storage environment, condensation can form inside the device. This can damage the electronics if the devices are switched on too early. Wait for at least two hours after setup before switching on the device.



DANGER

Do not step under the transport pallet during transport.



CAUTION

The knife mill weighs about 17.6 kg.



NOTICE

Never operate the mill while it is standing on the transport pallet!

4.4 Scope of delivery



Compare the contents of the delivery with your order and the attached shipping papers.

- PULVERISETTE 11
- Grinding vessel
- Lid for grinding vessel
- Cutting tool
- Accessories as ordered

4.5 Ambient conditions



WARNING

Mains voltage

- The device may only be operated indoors.
- The surrounding air must not contain any electrically conductive particles.
- Maximum relative humidity 80% for temperatures up to 31 °C, linearly decreasing down to 50% relative humidity at 40 °C.

- The room temperature should be between 5 and 40 °C.
- Altitudes up to 2000 m
- Degree of pollution 2 according to IEC 60664-1:2007.

4.6 Electrical connection



 **DANGER**

Provide short-circuit protection!

Risk of damage due to short-circuits.

- Make sure that the socket is connected to a mains line protected with a residual current circuit breaker.



DANGER

Mains voltage!

Changes to the connection line may only be made by a qualified person.



CAUTION

Ignoring the values on the type plate may result in damage to the electrical and mechanical components.

Before establishing the connection, compare the voltage and current values stated on the type plate with the values of the mains system to be used.

1. Plug the supplied power cord into the port on the back of the device.
2. Then connect the device to the mains using the power cord!

5 Initial start-up

Perform initial start-up only after all work as described in [Chapter 4 'Installation'](#) on page 18 has been carried out.

5.1 Switching on

- Connect the device to the mains.
- Switch on the device with the main switch (9) on the front of the device.
- Display is switched on, the locking mechanism releases with a slight delay.

5.2 Function check

- Set the speed to 2000 rpm (see [Chapter 6.6 'Settings on the control panel'](#) on page 28).
- Clamp the knife with a bayonet lock in the vessel and insert it.
- Close the hood.
- Press START or push the dial.
- Check the set speed and the actual speed.
- To stop the PULVERISETTE 11, release the dial or press the 'STOP' button.

6 Using the device



CAUTION

If the grinding elements used are not genuine accessories, we assume no guarantee and exclude all liability for damage to the device or for personal injury.



DANGER

Explosion hazard!

- When Comminution oxidisable substances, e.g. metal or coal, there is a risk of spontaneous combustion (dust explosion) if the proportion of fine particles exceeds a certain percentage. When Comminution these kinds of substances, special safety measures must be taken and the work must be supervised by a specialist.
- The device is not explosion-protected and is not suitable for Comminution explosive materials.



NOTICE

Damage to the grinding vessel made of plastic

When grinding materials, make sure that they do not get hotter than 110° C when using the standard PC plastic grinding vessel. This can damage the grinding vessel.

The standard grinding vessel made of plastic PC is unsuitable for samples containing fat or fruit. The acids contained therein can irreversibly attack the grinding vessel (formation of micro-cracks).



NOTICE

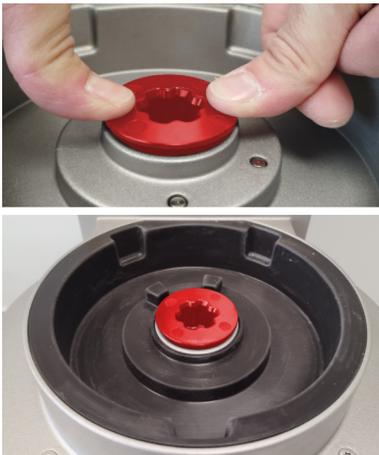
The grinding vessel made of Tritan™ is food safe, tasteless, heat resistant up to 85°C, colour stable, chemical resistant, dishwasher safe up to max. 80°C (80 cycles, with manual cleaning up to 300 cycles), free from bisphenol A (BPA) and free from plasticizers.



NOTICE

Due to the high energies and the blade geometry, high temperatures (around 60°C) can occur on the material to be ground, depending on the speed and grinding time. This temperature can have a strong/irreversible effect on sensitive samples! (e.g. denaturation of organic samples)

6.1 Installing the cutting insert



CAUTION

Wear safety gloves!

Mind the knife blades when installing or removing cutting tools. They are very sharp and pose a cutting hazard.



Before inserting the grinding vessel with the cutting insert fitted, make sure that the silicone insert and the blade coupling have been inserted correctly. Use a little force to push the knife coupling down as far as possible!



A black blade coupling is included as a replacement for the red blade coupling. This is used in an emergency until a new red blade coupling is available!

The grinding vessel with a pre-installed cutting tool can be found in the machine when unpacked. To remove and install the cutting tool, proceed as follows:



The following approach applies to PC plastic, 316L stainless steel and Tritan copolyester grinding vessels!



1. → The cutting tool with seal (11.3201.15) is counter-held with a bayonet lock underneath the grinding vessel. Turn it clockwise (seen from above). Remove the lock and the knife.
2. → To install the cutting tool, place the knife with seal in the grinding vessel from above, and counter it from below with the bayonet lock. Make sure you insert the lock properly into the two guides. Clamp the cutting tool by turning the lock anti-clockwise (seen from above).

Using the device

6.1.1 Assembly of cutting tool for grinding vessels made of glass



NOTICE

The grinding vessel made of glass must not be subjected to too great temperature differences. Frozen materials, firm samples or suspensions with materials that are incompatible with glass such as acids may not be ground with the grinding vessel made of glass.

The grinding vessel made of glass is suitable for the food-safe analysis and for verification of polymers. Fasten the knife bearing in the glass vessel as follows:

1. Place the seal (2) from above into the grinding vessel.



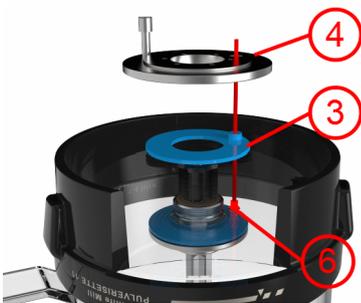
NOTICE

Make sure the sealing surface is clean and the seal is not damaged.

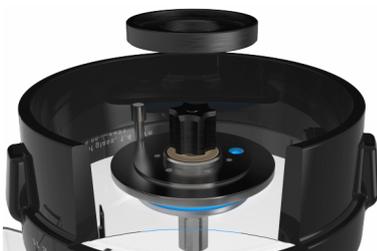
2. Place the knife bearing (1) from above into the seal (2).
3. Hold the knife bearing firm and turn the vessel with the opening downwards.



4. Insert the seal (3) and the lower bearing (4). Make sure that the holes are pushed over each other on the glass pin (6) and do not slip away.



5. Fasten the knife bearing with the knurled screw until everything is firm and sealed.



Check the correct assembly for leaks outside of the device. Pour 20 ml water into the vessel and check for leaking fluids from underneath.

6.2 Filling the grinding vessel

After the cutting tool has been mounted correctly, sample material can be filled into the vessel.

6.2.1 Fill quantity



The maximum fill level depends on the material used. With lettuce, for example, the fill level is reduced significantly after only a few seconds of comminution.

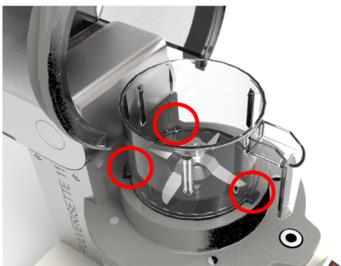
The maximum filling amount is 1400 ml.

6.3 Insert the grinding vessel



NOTICE

Before installing the grinding vessel check if the silicon inlay and the motor coupling are installed correctly. First you have to install the silicon inlay and then the motor coupling. (See)



After closing the grinding vessel properly, place it in the Knife Mill. Observe the three centring guides marked in red.

You can follow the following link to view a step-by-step instructional video on installing the silicon insert and knife coupling. ➔ [Click here.](#)

6.4 Close the grinding vessel

6.4.1 Silicon lid



Place the silicon lid on the grinding vessel. Make sure that the lid fits properly all around.

6.4.2 Vario lid system



Materials that have a large volume in their initial state, such as lettuce, can have a very small volume after several seconds of grinding. A Vario lid system is suitable for these materials. With this system, the grinding chamber volume can be variably reduced and increased.

Using the device

The Vario lid system can be used to reduce the volume of the grinding vessel to a minimum of 0.54 l. Use the lid system as follows:



1. Insert the locking element (1) through the reduction lid (2) and screw it to the reduction slider (3).

2. Place the lid system on the grinding vessel.

3. Close the hood and insert the plunger (4) through the opening in the hood. Operate the locking pin (5) to connect the plunger (4) to the locking element.

4. Release the locking pin (5) after pushing the plunger (4) all the way to the stop. Now you can push the reduction lid up or down.

5. To open the hood for removing the sample material, press the locking pin (5) again and pull out the plunger (4). Then you may open the hood and remove the grinding vessel.

6.4.3 Special lid for cryogenic comminution



NOTICE

Make sure that the special lid does not come into contact with liquid nitrogen or dry ice for extended periods. This can cause damage to the special lid.



The special lid for cryogenic comminution serves to provide pressure equalisation in the grinding vessel. To ensure this equilibrium, exchange the sieve insert after every grinding.

For comminution with liquid nitrogen or dry ice, use the grinding vessel made of stainless steel 316L, the standard knife made of stainless steel and the optionally available special lid for cryogenic comminution. It has a single-use sieve insert. The white filter disk is inserted from above and fixated with the flat sieve.

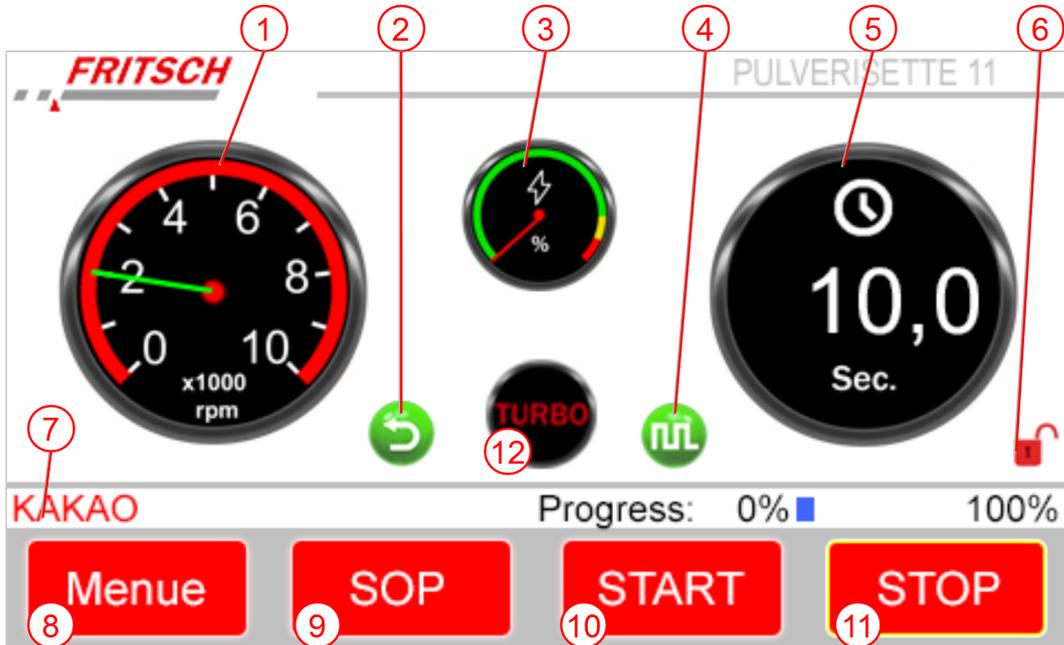
6.5 Closing the hood



There is a magnet on the hood's grip to support the closing mechanism. This develops a certain temperature depending on the duration of the closure.

Once the grinding vessel is properly installed and closed, the hood can be closed. Simply fold it forward. The hood is locked automatically after a few seconds, or when the Start button is pressed.

6.6 Settings on the control panel



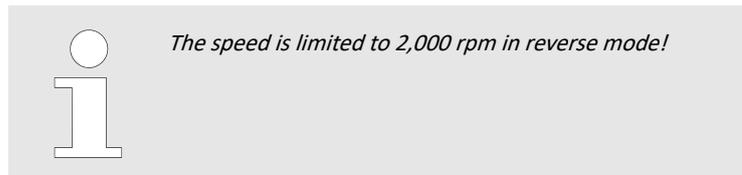
The home screen contains the following information:

Speed indicator

1. Press on the display to use the dial for setting the target speed in the green bar. Pressing the dial or the display accepts the selected speed. The red bar indicates the actual speed during operation.

Reverse mode

2. If the button is shown in green, then the reverse mode is active and the cutting tool spins anticlockwise. The button is grey in the standard mode.



Power display

3. This indicator shows the motor utilisation.

Interval mode

4. If the button is shown in green, then the interval mode is active and the interval settings from the 'Parameter' menu apply. The button is grey in the standard mode.

Timer

5. Press on the display to use the dial for setting a defined time (max. 6 minutes) for comminution. When the dial is in the negative range, the symbol ∞ indicates that the continuous mode is active. Pressing the dial or the display accepts the time setting.



To reset the time, select the 'Timer' area and press the 'STOP' button for several seconds.



Deactivate the 'Timer' area to be able to start comminution.

Hood locked or unlocked

6. A green, closed padlock indicates that the hood is locked. A red, open padlock indicates that the hood is unlocked.

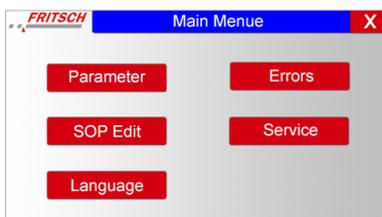
SOP active

7. This area displays which SOP is currently selected and shows the progress of the previously processed SOP steps. It is possible to use the machine without selecting an SOP.



If an SOP is activated, it is no longer possible to make further settings in the 'Speed (1)' or 'Timer (5)' areas. These settings can be re-enabled by activating the SOP 'no SOP selected'.

Button menu



8. The menu offers the following options:

- The interval mode can be defined using the 'Parameter' button. Which stop and run times are used in interval mode.
- The error history is shown under 'Errors'.
- In the 'SOP - Edit' area, you can load SOPs and edit them with up to 15 steps. SOPs that are no longer needed can be deleted, and the names can be changed.
- Pressing the 'Service' button displays the motor temperature, operating hours, the specific motor utilisation ranges, the set voltage and the current firmware version. Encoders A and B detect the direction of rotation and speed. The login area is intended for Fritsch internal purposes and requires a password for access.
- You can set the language you want via 'Language'.

SOP button



9. Pressing on the 'SOP' button takes you to the SOP selection. Use the dial to select an SOP. The currently selected SOP is highlighted. Press the name of the SOP or use the dial to activate the SOP.

START button

10. This button starts the comminution process.

Using the device

OPEN (STOP) button

11. This button stops the comminution process. During a stop, it is shown as STOP. When no comminution is taking place, this button can be used to open the hood.

TURBO mode

12. Use this button during comminution to increase the speed to up to 14,000 rpm for the duration you press and hold TURBO. The TURBO mode automatically disengages after 6 seconds. It can be reactivated after 20 seconds.



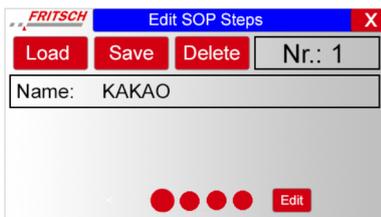
If you activate the TURBO mode for only 3 seconds, the PULVERISETTE 11 will wait until the remaining 3 seconds are used before the TURBO mode cannot be selected for 20 seconds.

6.6.1 Editing SOPs

Press the 'SOP Edit' button in the main menu to get to the SOP edit mode.

The following options are available on the first page:

- **Load** - Press the 'Load' button to select an SOP for deletion or editing.



The 'Load SOP' window opens. Use the dial and press 'OK' to load an SOP.

- **Save** - Save a newly created or revised SOP.
- **Delete** - Delete the selected SOP.
- The SOP number is displayed in the 'Number' area. A total of 20 SOPs can be saved.



- The 'Name' area displays the name of the SOP. Press in this area to open the 'Edit SOP Steps' window. You can enter a name for the SOP. Press 'OK' to confirm.

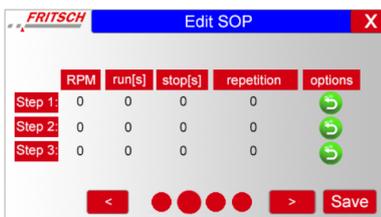
After pressing the 'Edit' button, the following pages offer 15 possible steps that can be defined for an SOP.

For each step, the following parameters can be defined:



- **RPM**: The speed of the cutting tool.
- **run[s]**: For how many seconds will process run at the defined speed?
- **stop[s]**: How long are the breaks between the individual repetitions? E.g. for cooling down.
- **repetition**: How often should the cycle of comminution and stop times be repeated?
- **options**: Here you can activate (green) or deactivate (grey) the Reverse mode

To define the steps, click on the desired field and set the parameters using the dial.



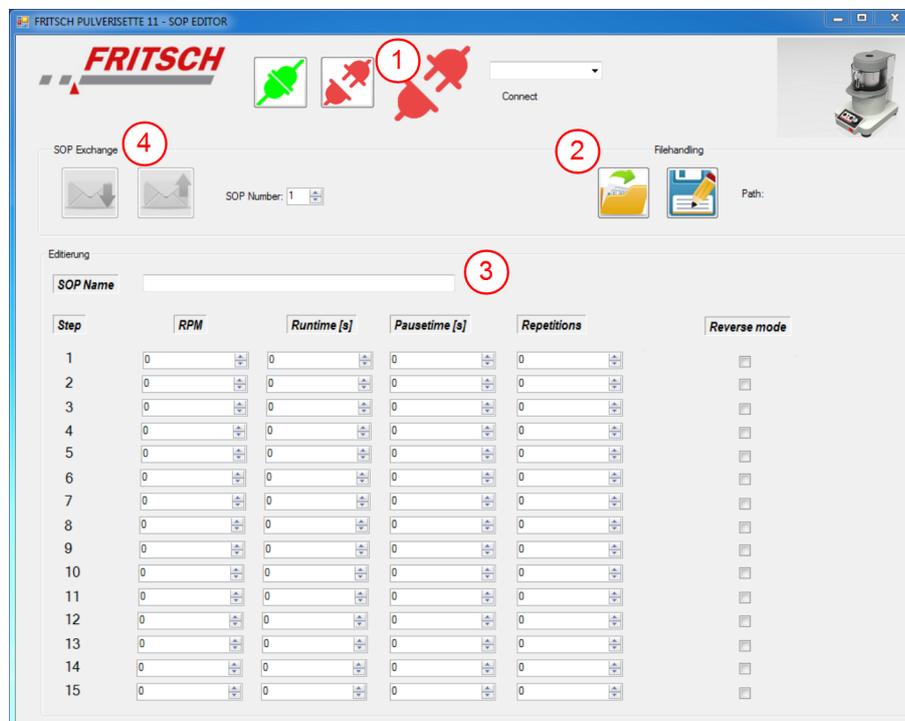
After selecting all desired parameters for each step, press 'Save' to store the SOP under the name defined on the first page.

6.6.2 SOP Editor



Install the driver from the download package in order to be able to connect to the PULVERISETTE 11.

The SOP Editor is available for download at www.fritsch.de/p-11/SOP and can be used as follows:



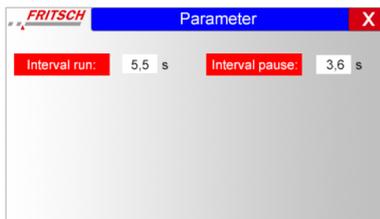
1. Under 'Connection', select the COM port to which the device is connected and press the green button to connect.
2. The 'Filehandling' area is for saving and loading an SOP.
3. 'Editing' is the area in which the SOP name and the up to 15 steps of an SOP. Here you have the same options as with SOP editing in the device itself.
4. After editing or loading your SOP, you can send it to the device here in the 'Navigation' area. Enter the desired SOP number and press the envelope with the green arrow. If you would like to import a certain SOP from the mill, set the SOP number and press the envelope with the blue arrow.
The SOP is loaded in the editor and can be stored on your computer.

Using the device

For example, if you sent a sample to the Fritsch application lab, you can request the SOP used by Fritsch here and import it into your Knife Mill via the SOP Editor. To do this, proceed as follows:

1. ➤ Save the SOP in a folder.
2. ➤ Start the SOP Editor program and select the right COM port to which the PULVERISETTE 11 is connected.
3. ➤ In the *'Filehandling'* area, you can now use the button with the file and the green arrow to load the SOP into the program.
 - ➔ The various parameters are then displayed.
4. ➤ In order to access the SOP on your device, define an SOP number and operate the button with the green arrow on the right side of the editor window.
 - ➔ The SOP loaded to the Knife Mill and can be used.

6.6.3 Programming an interval



Press on the *'Parameter'* button in the main menu. A window appears where you can define the time (in seconds) for which the device runs (Interval run) and stops (Interval pause).

6.7 Comminution using the cutting insert



CAUTION

Wear safety gloves!

Mind the knife blades when installing or removing cutting tools. They are very sharp and pose a cutting hazard.



CAUTION

Wear safety gloves!

Depending on the process duration and parameters, the grinding vessel and the cutting tool may become very hot.

Proceed as follows to use the device for a comminution process:

1. ➤ Insert the cutting tool into the grinding vessel.
2. ➤ Lock the knife with the bayonet lock as described in ➔ *Chapter 6.1 'Installing the cutting insert' on page 23.*
3. ➤ Fill the vessel with the sample material. (Filling quantities see ➔ *Chapter 6.2.1 'Fill quantity' on page 25*)
4. ➤ Insert the filled grinding vessel with the cutting insert installed into the Knife Mill. (See ➔ *Chapter 6.3 'Insert the grinding vessel' on page 25*).
5. ➤ Lock the vessel and close the hood. (See ➔ *Chapter 6.4 'Close the grinding vessel' on page 25* and ➔ *Chapter 6.5 'Closing the hood' on page 27*)

6.  Select the desired SOP from the menu, or manually set the desired parameter. (See [Chapter 6.6 'Settings on the control panel'](#) on page 28)
7.  Press the 'START' button to start the comminution process.
8.  After the set time has expired or the comminution process has been stopped with the 'STOP' button, the hood is unlocked after a few seconds and the vessel can be removed.

6.7.1 Overload

If the PULVERISETTE 11 is overloaded, then the power is reduced. Depending on the type of sample material, this may result in a short-term decrease in speed. If the clogging doesn't resolve, then the device is shut down completely.

Very brittle or sticky materials may cause the cutting tool to become stuck, in which case the machine stops due to overload. Press the 'STOP' button to reset the error message, and try to loosen the clogging by starting the device in reverse mode.

If the clogging persists, open the vessel and loosen the clog manually. For wet grinding, add a little more liquid.

6.7.2 Switching off

After completing the comminution process and removing the sample material from the vessel, the Knife Mill can be switched off with the hood closed by pressing the main switch on the front panel.

6.8 Comminution with liquid nitrogen or dry ice



DANGER

Explosion hazard!

There is a risk of explosion if the grinding vessel is overfilled with liquid nitrogen or dry ice.

Observe the quantity specifications in the following procedure instruction.



CAUTION

Risk of freeze burns or injuries

When handling liquid nitrogen wear appropriate cryo-insulating protective gloves and appropriate eye protection!



NOTICE

Blocking of the knife!

When working with liquid nitrogen or dry ice, the knife bearing can become stiff due to the low temperatures and thus block. To avoid this, it is essential to work quickly. If the knife becomes blocked, the error message "Motor blocked" is displayed. The knife must then be reheated (max. room temperature) before continuing to work.

Using the device

For comminution with liquid nitrogen or dry ice, use the stainless steel vessel, the standard knife and the cyro attachment. Proceed as follows:

1. ▶ Prepare the stainless steel vessel with the standard knife and make sure that seals and the bayonet lock are fitted properly and firm. Place the ready vessel outside of the mill on a firm base.
2. ▶ **Using liquid nitrogen:**
 - Fill about 150 ml liquid nitrogen into the stainless steel vessel and wear protective equipment while swirling the vessel gently.
 - After evaporating the liquid nitrogen (remaining amount approx. 50 ml), fill in the sample material. Make sure that the max. sample quantity is not exceeded in volume.
 - Flood the sample material in the grinding vessel once more with liquid nitrogen. (max. 200 ml)
 - **Ensure that you proceed quickly to prevent the knife bearing from freezing!**

Using dry ice:

- Fill about 50 ml dry ice / CO₂ pellets into the vessel while wearing protective equipment. Swirl the vessel gently to prechill it evenly.
 - Fill in the sample material. Make sure that the max. sample quantity is not exceeded in volume.
 - Add additional dry ice / CO₂ pellets. (Max. 200ml – otherwise there is a risk of the sieve mesh wire of the cyro attachment breaking)
 - **Ensure that you proceed quickly to prevent the knife bearing from freezing!**
3. ▶ Mix the sample material thoroughly to ensure a uniform cooling. Attention: Make sure that the sample material does not freeze onto the base of the grinding vessel.



NOTICE

When positioning the cyro attachment, check that the sieve mesh wire has been mounted properly and that no soiling influences the holding of the sieve.

4. ▶ Place the cyro attachment onto the stainless steel vessel and place in the mill. Work quickly in order to avoid a warming up of the sample material. Close the hood and start the mill. **Attention:** Never overfill the bowl with dry ice / CO₂ pellets or liquid nitrogen. **Explosion hazard!** A slight outgassing is normal though (white vapour stream)
5. ▶ Recommended grinding parameters: Max. speed (10000 rpm) and very short grinding time 3-5 sec., work with intervals / SOP if necessary.
 - ➔ In case the result is not satisfactory (inhomogeneous, not fine enough), either repeat as of step 4 or carry out the test with less sample material.

7 Accessories



CAUTION

If the grinding elements used are not genuine accessories, we assume no guarantee and exclude all liability for damage to the device or for personal injury.



Fritsch standard autoclaving procedure

Fritsch accessories marked as autoclavable are tested by us under the following conditions:

- *The accessories are sterilised by pressurised, saturated water vapour inside an autoclave. The sterilisation phase takes place at 121°C under 1 bar of pressure above atmosphere over a period of 20 minutes.*
- *The conditions for dry sterilisation are 134°C under 1 bar of pressure above atmosphere over a period of 5 minutes and must not be exceeded.*

A maximum of 5 consecutive cycles with intermittent cooling pauses can be carried out, but a wet sterilisation cycle must not exceed a total time of 20 minutes and a dry sterilisation cycle 5 minutes.

7.1 Optional accessories

Order no.:	Article
11.3151.16*	1.4 l standard grinding vessel made of plastic PC; autoclavable
11.3280.00	1.4 l grinding vessel made of stainless steel 316L; autoclavable
11.3152.16	1.4 l grinding vessel made of Eastman Tritan copolyester
11.3170.00	1.4 l glass grinding vessel
11.3180.00	Vario lid system with plunger made of plastic PP and reduction sample pusher for moist, liquid and viscous samples
11.3189.16	Reduction sample pusher for dry, firm samples for use with the Vario lid system
11.3203.15*	Standard lid made of silicone, autoclavable
11.3220.00	Special lid for cryogenic comminution with single-use sieve insert, autoclavable without inlay
11.3224.00	Set of single-use sieve inserts
11.3204.00*	Standard knife made of stainless steel, autoclavable* ¹
11.3205.16	Knife coupling
11.3208.00	Sickle knife made of stainless steel; autoclavable* ¹

Accessories

Order no.:	Article
11.3210.00	Sickle knife with serrated blade made of stainless steel, autoclavable* ¹
11.3215.00	Sickle knife with TiN-coated serrated blade; autoclavable* ¹
11.3270.00	Stainless steel sickle knife for use in the glass grinding vessel, autoclavable
11.3271.00	Sickle knife with serrated blade made of stainless steel for use in the grass grinding vessel* ¹
11.3272.00	Sickle knife with TiN-coated serrated blade made of stainless steel for use in the grass grinding vessel* ¹
11.3230.00	Adapter for single-use grinding vessels
83.3280.00	Set of single-use grinding vessels, 40 ml volume made of plastic PP (set = 10 pieces)
83.3282.00	Set of single-use grinding vessels, 40 ml volume made of plastic PP (set = 100 pieces)
83.3283.00	Reusable grinding vessel 40 ml (1x vessel, 25x seals, 5x beaters, 5x couplings, 1x torque spanner)
83.3285.00	Set of single-use grinding vessels, 100 ml volume made of plastic PP (set = 10 pieces)
83.3287.00	Set of single-use grinding vessels, 100 ml volume made of plastic PP (set = 100 pieces)
11.3990.00	Software P-11 Control for Windows
83.4075.00	Scraper
96.0350.00	IQ/OQ documentation
*	Standard accessories
* ¹	The bayonet locks of the knives must not be autoclaved. See → Chapter 1 'Basic structure' on page 7!

7.2 Adapter for employing the single-use grinding containers



The single-use and reusable grinding container are only suitable for grinding dry to moist samples. Grinding in liquid is not possible.

The adapter and the single-use grinding vessels are employed as follows:



1. → Position the adapter in the device.
2. → Fill the single-use grinding vessel with your sample material. Mind the scale marked on the vessel thereby. The grinding result can vary wildly depending on the amount and the sample's properties.
3. → Place the grinding vessel into the adapter. Press the grinding vessel onto the coupling for that and latch it by a slight rotation in clockwise direction.
4. → Close the hood.
5. → The mill recognises the adapter automatically and thus allows for speeds up to 14,000 rpm in continuous operation.
6. → To remove the single-use grinding vessel again, press the vessel down slightly and release it by rotating it anti-clockwise.

7.3 Assembling the reusable grinding vessel 40 ml



The single-use and reusable grinding container are only suitable for grinding dry to moist samples. Grinding in liquid is not possible.



The reusable grinding container is used in the same way as the single-use grinding container. See → Chapter 7.2 'Adapter for employing the single-use grinding containers' on page 36.



- 1 Reusable grinding vessel top
- 2 Beater with seal
- 3 Reusable grinding vessel base
- 4 Grinding vessel holder
- 5 Torque spanner

With order number 83.3286.00, you will receive the following parts:

- 1x vessel
- 25x seals
- 5x beaters
- 5x couplings
- 1x torque spanner

To dismantle the individual components, proceed as follows:



1. ➤ Hold the lower part (3) upwards and release the upper part.
2. ➤ Place the lower part (3) in the grinding vessel holder (4).
3. ➤ Place the torque spanner (5) on the beater (6).
4. ➤ To loosen the beater (6), turn the torque spanner (5) clockwise.
 - Once the beater has been loosened, it is held in place on the torque spanner by a magnet.
5. ➤ Remove the coupling (8) and the seal (7) from the beater.
6. ➤ Reassemble the coupling, seal and the new beater in reverse order.

8 Cleaning



DANGER

Mains voltage!

- Before beginning with cleaning work, disconnect the mains plug and protect the device against being unintentionally switched back on!
- Do not allow any liquids to flow into the device.
- Indicate cleaning work with warning signs.
- Put safety equipment back into operation after cleaning work.



When cleaning the entire device, adhere to the guidelines of the Accident Prevention Regulation (BGV A3) - especially when the device has been set up in a dusty environment or when the grinding stock processed produces dust.



Fritsch standard autoclaving procedure

Fritsch accessories marked as autoclavable are tested by us under the following conditions:

- *The accessories are sterilised by pressurised, saturated water vapour inside an autoclave. The sterilisation phase takes place at 121°C under 1 bar of pressure above atmosphere over a period of 20 minutes.*
- *The conditions for dry sterilisation are 134°C under 1 bar of pressure above atmosphere over a period of 5 minutes and must not be exceeded.*

A maximum of 5 consecutive cycles with intermittent cooling pauses can be carried out, but a wet sterilisation cycle must not exceed a total time of 20 minutes and a dry sterilisation cycle 5 minutes.

8.1 Comminution accessories



NOTICE

Various accessory parts can be autoclaved. For this, see [➔ Chapter 7 'Accessories' on page 35.](#)

The bayonet lock of the knife must **not** be autoclaved.

- The cutting tool and grinding vessel with lid can be cleaned under running water and usual cleaning agents.

8.2 Device

- The Knife Mill can be wiped down with a damp cloth when it is switched off.

9 Maintenance



 **DANGER**

Mains voltage

- Before beginning with maintenance work, unplug the mains plug and protect the device against being unintentionally switched back on again!
- Indicate maintenance work with warning signs.
- Maintenance work may only be performed by specialised personnel.
- Put safety equipment back into operation after maintenance or repair work



We recommend keeping a safety logbook → Chapter 14 'Safety logbook' on page 50, where all work (maintenance, repairs.....) performed on the device is entered.



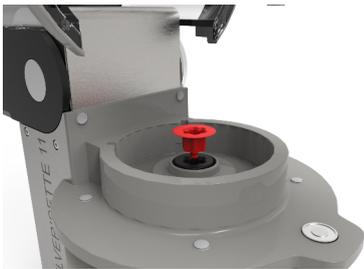
The most important element of maintenance is regular cleaning!

Interval	Maintenance work
Before each use	<p>Grinding vessel <i>Cracks or other damage</i> If severe wear or cracks are visible on the grinding vessel, they must be replaced.</p> <p>Knives</p> <p>Seal <i>Wear or embrittlement</i> If the seal shows signs of wear or damage, replace the seal (11.3201.15) immediately.</p> <p>Blade <i>Wear</i> If the blades are dull or show any other damage, replace the knife to maintain optimal results.</p> <p>Star coupling <i>Wear</i> If the star coupling shows wear on the knife, the knife must be replaced immediately.</p>

Maintenance

Interval	Maintenance work
Before each use	Hood <i>Transparent screen</i> <i>Cracks or other damage</i> If the transparent screen on the hood shows damage or cracks, replace it immediately.
	Bayonet lock <i>Wear</i> If there are signs of wear on the bayonet lock, the bayonet lock should be replaced immediately.

9.1 Knife coupling replacement



A red knife coupling (item no. 11.3205.16) is used to minimise wear on the knife holder. This knife coupling should be checked depending on the application of the PULVERISETTE 11 and whenever changing the knife. Replace the coupling with the included black spare in case of visible wear. This only serves as an emergency coupling until a new red blade coupling is available and can be installed.



➔ Video knife coupling

Replace the knife coupling after at least 200 hours of operation to prevent damage to the device. After 200 hours of operation, a message is displayed, asking you to change the knife coupling.

10 Repairs

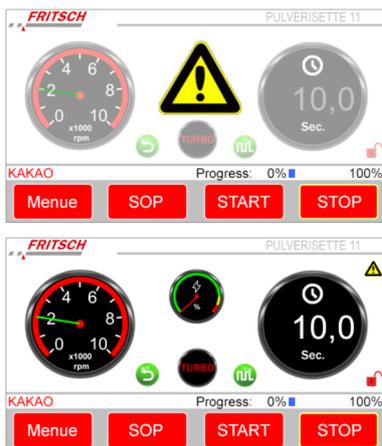


DANGER

Mains voltage!

- Before beginning with repair work, unplug the mains plug and protect the device against being unintentionally switched back on.
- Indicate repair work with warning signs.
- Repair work may only be performed by specialised personnel.
- Put safety equipment back into operation after maintenance work.

10.1 Error display



The main screen shows 2 kinds of error messages:

1. ➔ Malfunctions cause the device to be switched off immediately, and a large warning triangle with an exclamation mark appears on the screen. Press the warning triangle to show the list of errors with information about the malfunction.
2. ➔ If a warning occurs, then this is indicated by a small warning triangle in the upper right corner of the display. Press the warning triangle to access the list of errors.

In the list of errors, malfunctions are displayed in 'red', while warnings are displayed in 'yellow'. Press 'OK' to mark the errors as seen and delete them from the list if they have been repaired. Exit the list of errors by pressing 'X' in the upper right corner.

10.2 Checklist for troubleshooting

Fault description	Cause	Remedy
Message 'Failure in safety switch 1 // 2'	Internal safety switch at the hood is defective.	Please contact Fritsch Service.
Message 'Please close safety hood'	Device was started with the hood open.	Acknowledge the error, close the hood and re-start the device. If the error persists, contact Fritsch Service.
Message 'Safety interlock not closed'	Error closing the device	Acknowledge the error and check whether the grinding hood is closed completely. Then re-start the device. If the error persists, contact Fritsch Service.
Message 'Safety interlock not open'	Error closing the device	Stop and re-open the device. If the error persists, contact Fritsch Service.

Repairs

Fault description	Cause	Remedy
Message <i>'Cooling fan blocked'</i>	Fan in the bottom plate is slow or blocked due to soiling.	Acknowledge the error. Clean the fan and the fan cover. It may be necessary to dismantle the fan cover. ATTENTION! Pull the power plug before any repair or maintenance work.
Message <i>'Motor overloaded'</i>	The drive motor was overloaded.	Acknowledge the error and reduce the sample material volume.
Message <i>'Setpoint speed not reached'</i>	Target speed cannot be reached due to high load.	Acknowledge the error and reduce the sample material volume.
Message <i>'Motor stocked'</i>	Drive motor is blocked.	Acknowledge the error and reduce the sample material volume. If the error persists, contact Fritsch Service.
Message <i>'Frequency converter communication lost'</i>	Communication between display and drive controller not possible.	Acknowledge the error. If the error persists, contact Fritsch Service.
Message <i>'Warning – motor temperature high'</i>	The motor temperature exceeds the normal operating limits.	Acknowledge the warning, wait until the motor has cooled, and reduce the amount of sample material for future processes.
Message <i>'Motor temperature too high'</i>	The motor temperature exceeds the normal operating limits.	Acknowledge the message, wait until the motor has cooled, and reduce the amount of sample material for future processes.
Message <i>'No grinding bowl inserted'</i>	The device has detected that no grinding vessel has been inserted.	Acknowledge the message and insert a grinding vessel into the device.
Message <i>'Temperature sensor motor defective'</i>	The temperature sensor is not sending any information and a warning is displayed first.	If this message is ignored, the knife mill can be used for another 10 seconds, followed by a malfunction that will immediately shut off the device to prevent damage to the motor.
Message <i>'Temperature sensor motor defective'</i>	The temperature sensor does not send any information and reports this malfunction after 10 seconds.	The device was shut off in order to prevent damage to the motor. The device can be used again for 10 seconds after acknowledging the message. To resolve this problem, contact Fritsch Service.
Message <i>'Speed sensor or braking resistor defective'</i>	The braking process of the mill takes longer than usual. Either the brake resistor is defective or the speed sensor is not sending any information.	Acknowledge the message and switch off the device. Contact Fritsch Service.
Message <i>'Winding temperature too high'</i>	The motor temperature is too high.	Acknowledge the message, switch off the device and let it cool down for a few minutes. If the error persists, contact Fritsch Service.

11 Disposal

It is hereby confirmed that FRITSCH has implemented the directive 2002/95/EC of the European Parliament and Council from 27th January 2003 for the limitation of the use of certain dangerous substances in electrical and electronic devices.

FRITSCH has registered the following categories according to the German electrical and electronic equipment act, section 6, paragraph 1, clause 1 and section 17, paragraphs 1 and 2:

Mills and devices for the preparation of samples have been registered under category 6 for electrical and electronic tools (except for large stationary industrial tools).

Analytical devices have been registered under category 9, monitoring and control instruments.

It has been accepted that FRITSCH is operating only in the business-to-business area. The German registration number for FRITSCH is WEEE reg. no. DE 60198769

FRITSCH WEEE coverage

Since the registration of FRITSCH is classified for bilateral transactions, no legal recycling or disposal process is described. FRITSCH is not obliged to take back used FRITSCH devices.

FRITSCH declares it is prepared to take back used FRITSCH devices for recycling or disposal free of charge whenever a new device is purchased. The used FRITSCH device must be delivered free of charge to a FRITSCH establishment.

In all other cases FRITSCH takes back used FRITSCH devices for recycling or disposal only against payment.

12 Guarantee terms

Guarantee period

As manufacturer, FRITSCH GmbH provides – above and beyond any guarantee claims against the seller – a guaranty valid for the duration of two years from the date of issue of the guarantee certificate supplied with the device.

Within this guarantee period, we shall remedy all deficiencies due to material or manufacturing defects free of charge. Rectification may take the form of either repair or replacement of the device, at our sole discretion. The guarantee may be redeemed in all countries in which this FRITSCH device is sold with our authorisation.

Conditions for claims against the guarantee

This guarantee is subject to the condition that the device is operated according to the instructions for use / operating manual and its intended use.

Claims against the guarantee must include presentation of the original receipt, stating the date of purchase and name of the dealer, together with the complete device type and serial number.

For this guarantee to take effect, the answer card entitled "Securing of Guarantee" (enclosed with the device) must be properly filled out and despatched without delay after receipt of the device and be received by us within three weeks or alternatively, *online registration* must be carried out with the above-mentioned information.

Reasons for loss of the guarantee

The guarantee will not be granted in cases where:

- Damage has arisen due to normal wear and tear, especially for wear parts, such as: Crushing jaws, support walls, grinding bowls, grinding balls, sieve plates, brush strips, grinding sets, grinding disks, rotors, sieve rings, pin inserts, conversion kits, sieve inserts, bottom sieves, grinding inserts, cutting tools, sieve cassettes, sieve and measuring cell glasses.
- Repairs, adaptations or modifications were made to the device by unauthorized persons or companies.
- The device was not used in a laboratory environment and/or has been used in continuous operation.
- Damage is present due to external factors (lightning, water, fire or similar) or improper handling.
- Damage is present that only insubstantially affects the value or proper functioning of the device.
- The device type or serial number on the device has been changed, deleted, removed or in any other way rendered illegible
- The above-mentioned documents have been changed in any way or rendered illegible.

Costs not covered by the guarantee

This guarantee excludes any costs for transport, packaging or travel that accrue in the event the product must be sent to us or in the event that one of our specialist technicians is required to come to your site. Any servicing done by persons not authorised by us and any use of parts that are not original FRITSCH accessories and spare parts will void the guarantee.

Further information about the guarantee

The guarantee period will neither extend nor will a new period of guarantee begin in the event that a claim is placed against the guarantee.

Please provide a detailed description of the type of error or the complaint. If no error description is enclosed, we shall interpret the shipment as an assignment to remedy all recognisable errors or faults, including those not covered by the guarantee. Errors or faults not covered by the guarantee shall in this case be rectified at cost.

We recommend reading the operating manual before contacting us or your dealer, in order to avoid unnecessary inconvenience.

Ownership of defective parts is transferred to us with the delivery of the replacement part; the defective part shall be returned to us at buyer's expense.

**NOTICE**

Please note that in the event that the device must be returned, the device must be shipped in the original Fritsch packaging. Fritsch GmbH denies all liability for any damage due to improper packaging (packaging not from Fritsch).

Any enquiries must include a reference to the serial number imprinted on the type plate.

13 Exclusion of liability

Before using the product, be sure to have read and understood this operating manual.

The use of the product requires technical knowledge; only commercial use is permitted.

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