Manual

Mixer Mill MM 500 nano

Translation

Table of Contents

1 Notes on the manual

This manual provides technical guidelines for the safe operation of the device. Read this manual through carefully before installing, putting into service and operating the device. Reading and understanding this manual is essential for handling the device safely and as intended.

This manual does not contain any repair instructions. Please contact your supplier or contact Retsch GmbH directly if anything is unclear or you have questions about these guidelines or the device, or in the case of any faults or necessary repairs.

You can find further information about your device at **http://www.retsch.com** on the pages for the specific device concerned.

Amendment status:
The document amendment 0001 of the "Mixer Mill MM 500 nano" manual has been prepared in accordance with the Machinery Directive 2006/42/EC.

1.1 Disclaimer

This manual has been prepared with great care. We reserve the right to make technical changes. We assume no liability for personal injuries resulting from the failure to follow the safety information and warnings in this manual. No liability will be assumed for damage to property resulting from the failure to follow the information in this manual.

1.2 Copyright

1.3 Explanation of signs and symbols

The following signs and symbols are used in this manual:

Signs and symbols	Meaning
ⓘ	Indicates a recommendation and/or important information.
Bold type	Indicates an important term.
• < Point 1> • < Point 2> • < Point 3>	List of equivalent points.
⇨	Steps for following an instruction.

1.4 Explanations of the Safety Instructions

DANGER D1.0000

Risk of fatal injuries
Source of danger

– Possible consequences if the danger is ignored.
- **Instructions and information on how to avoid the risk.**

Fatal or serious injuries may result if the “Danger” sign is disregarded. There is a **very high risk** of a life-threatening accident or lasting personal injury. The signal word **DANGER** is additionally used in the running text or in instructions.

WARNING W1.0000

Risk of life-threatening or serious injuries
Source of danger

– Possible consequences if the danger is ignored.
- **Instructions and information on how to avoid the risk.**

Life-threatening or serious injuries may result if the “Warning” sign is disregarded. There is an **increased risk** of a serious accident or of a possibly fatal personal injury. The signal word **WARNING** is additionally used in the running text or in instructions.

CAUTION C1.0000

Risk of injuries
Source of danger

– Possible consequences if the danger is ignored.
- **Instructions and information on how to avoid the risk.**

Average to slight injuries may result if the “Caution” sign is disregarded. There is an average or slight risk of an accident or personal injury. The signal word **CAUTION** is additionally used in the running text or in instructions.

NOTICE N1.0000

Type of damage to property
Source of the damage to property

– Possible consequences if the information is ignored.
- **Instructions and information on how to avoid the damage to property.**

Damage to property may result if the information is disregarded. The signal word ***NOTICE*** is additionally used in the running text or in instructions.

2 Safety

CAUTION

C2.0002

Risk of injury
Lack of knowledge of the manual

- The manual contains all safety-related information. Disregarding the manual can therefore lead to injuries.
- **Read the manual carefully before operating the device.**

Target group:

The MM 500 nano has been designed for preparing samples in a laboratory environment. laboratory environment. This manual is therefore directed at persons who work with this device in a comparable environment and who already have experience with similar equipment.

The MM 500 nano is a modern, efficient, state-of-the-art product from Retsch GmbH. Its reliability is ensured when used as intended and with knowledge of this technical documentation.

2.1 Intended use of the device

The MM 500 nano is designed for the crushing, grinding, mixing and homogenisation of wet and dry soft, medium-hard, fibrous and brittle materials with a particle size of up to 10 mm.

As a laboratory machine, the MM 500 nano may only be used to prepare samples and not as a production machine.

The device has been designed for stationary use in a dry and clean working environment.

The user and operating personnel must have read the manual and be familiarised with the complete functional scope of the device.

2.2 Improper use

The MM 500 nano may only be used as intended.

Any uses other than the described intended use are regarded as improper use.

The MM 500 nano is **not** suitable for processing sample materials that can form explosive air mixtures.

Any form of claims for damage to equipment or personal injury resulting from improper use and/or the failure to comply with the safety instructions shall be ruled out.

2.3 Obligations of the operating company

2.3.1 Provisions

The user bears responsibility for ensuring that people working with the device and the corresponding equipment have taken note of and understood all relevant safety regulations.

2.3.2 Personnel

- Ensure that only trained personnel are deployed whose training and experience enable them to recognise risks and avoid potential hazards.
- Staff should be given regular training on using the device, and in particular regarding sudden events.
- Only allow trainee staff to work on the device when they are being supervised by qualified personnel.
- Check the safety awareness of staff regularly.
- Define staff responsibilities according to qualification and job description.
- Provide staff with personal protective equipment (PPE).
- Ensure that the following conditions have been met:
  - Staff have read and understood this Manual, and in particular the chapter on Safety.
  - Staff are aware and take note of the relevant accident prevention and safety regulations.
  - Staff wear the designated personal protective equipment (PPE) when working with the device.

2.3.3 Workstation and device

- Ensure that there is sufficient lighting and ventilation at the workstation.
- Ensure that the exhaust air is properly conducted outside.
- All signs on the device must be kept in a legible condition.
- Ensure that all inspections and servicing work prescribed in this Manual are carried out.

2.3.4 Qualification of personnel

Work/operating phase	Qualification
Transport Installation Commissioning Operation Controlling Servicing Disposal	Qualified employee who has been trained in the safe use of the device.
Work on the electrical equipment on the device	Electrician who, on the basis of his/her training, knowledge and experience is able to evaluate the work assigned and recognise potential hazards.

2.3.5 Personal protective equipment (PPE)

Work/operating phase	Personal protective equipment (PPE)
Transport Installation	Safety footwear
Commissioning Installation of additional equipment Servicing	No PPE needed.
Disposal	Safety footwear
Normal operation (operation and control)	Hearing protection Possibly protective gloves to remove extremely hot or cold sample material. Protective gloves and goggles for cryogenic grinding using liquid nitrogen.

2.4 Protective Equipment

Emergency stop switch

The device is **not** fitted with an emergency stop switch as standard. In an emergency it must be shut down by pressing the main button or by disconnecting the device from the power supply.

Hood lock

The MM 500 nano is equipped with an automatic hood lock . Once a grinding process has started, a magnetic clamp firmly closes the hood of the device. If the hood is nevertheless opened during a grinding process, the process is interrupted and the device comes to an immediate halt. An appropriate error message is then displayed on the touchscreen.

2.5 Repairs

This manual does not contain any repair instructions. For safety reasons, repairs may only be carried out by Retsch GmbH or an authorised representative or by qualified service technicians.

In case of repair, please inform…

…the Retsch GmbH representative in your country,
…your supplier, or
…Retsch GmbH directly.

Service address:

2.6 Preventing risks during normal operation

The failure to comply with the following safety instructions constitutes improper use and presents a risk to personnel and to operational safety.

Transport and installation

- Do not carry the device by yourself during transport and installation.
- Wear safety footwear for transport and installation.
- Only connect the device to sockets with a PE protective conductor.
- When connecting the device, the values on the type plate must correspond to those for the power connection.

Operation

- Read the manual before commissioning the device.
- Only operate the device at a workstation of sufficient size that offers adequate stability.
- Check the mains lead for damage before operating the device.
- Never operate the device if damage is visible or suspected.
- Only operate the device according to the technical application limits.
- During operation, do not wear any jewellery, wear your hair down or wear a tie or similar loose item of clothing.
- Wearing hearing protection during operation.
- Before operating the device, take measures that take account of restricted communication during operation of the device.
- Pay attention to your surroundings during grinding because the noise makes it more difficult to pick up acoustic signals.
- Do not operate the device in potentially explosive atmospheres.
- Take note of the safety data sheets for the samples and follow instructions by taking appropriate measures in advance.
- Do not grind any explosive and/or flammable substances.
- Do not grind any substances that might become explosive and/or flammable during grinding.
- The components that come into contact with sample material can get very hot or cold during operation. Before removing the samples, wait for the temperature to adjust, and wear protective gloves if necessary.
- Always wear protective gloves and goggles when handling liquid nitrogen for cryogenic grinding.
- Under no circumstances fill liquid nitrogen or dry ice into the grinding jar and then close the jar. The high pressure that arises in the jar would burst the grinding jar open.

Servicing and repair

- Before servicing, switch the device off at the main switch.
- Only clean the device with a dry or damp cloth.
- Do not clean the device with compressed air.
- Have all repairs carried out by the device manufacturer or by an authorised agent.

2.7 Preventing damage to equipment

- Protect the device against condensation if large fluctuations in temperature are to be expected (e.g. during air transport.
- Do not knock, shake or throw the device during transport and installation.
- Comply with conditions at the installation site when installing the device.
- Under no circumstances fill liquid nitrogen or dry ice into the grinding jar and then close the jar. The high pressure that arises in the jar would burst the grinding jar open.
- Only clean the device with a dry or damp cloth.
- Do not use any solvent or aggressive detergent for cleaning.
- Only use original spare parts for maintenance work.

2.8 Confirmation Form for the Managing Operator

This manual contains essential instructions for operating and maintaining the device which must be strictly observed. It is essential that they be read by the user and by the qualified staff responsible for the device before the device is commissioned. This manual must be available and accessible at the place of use at all times.

The user of the device herewith confirms to the managing operator (owner) that he has received sufficient instructions about the operation and maintenance of the system. The user has received the manual, has read and taken note of its contents and consequently has all the information required for safe operation and is sufficiently familiar with the device.

The managing operator should for legal protection have the user confirm the instruction about the operation of the device.

I have read and taken note of the contents of all chapters in this manual as well as all safety instructions and warnings.

User
Surname, first name (block letters)
Position in the company
Place, date and signature

Managing operator or service technician
Surname, first name (block letters)
Position in the company
Place, date and signature

3 The Mixer Mill MM 500 nano

The MM 500 nano from Retsch GmbH is a laboratory device used to prepare samples.

The device permits the fast grinding, mixing and homogenisation of soft, medium-hard, fibrous and brittle materials with a particle size of up to 10 mm.

Due to the effective grinding process in a closed system, the MM 500 nano guarantees gentle preparation of samples ready for analysis in a very short time.

Depending on the properties of the material and grinding parameters, it is possible to achieve final fineness levels of up 0.1 µm.

Fig. 1: The Mixer Mill MM 500 nano

3.1 Technical data

General information	
Applications	For (dry and wet) grinding, mixing, homogenisation, cell disruption, cryogenic grinding
Area of application	Agriculture, biology, chemicals, plastics, building materials, engineering, electrical engineering, environment, foodstuffs, geology, metallurgy, glass, ceramics, medicine, pharmaceuticals
Feed material	Hard, medium-hard, soft, brittle, elastic, fibrous
Specifications	
Grinding principle	Impact, friction
Feed size	≤ 10 mm
Final fineness	0.1 µm

Batch / Feed quantity	Max. 2x 5 ml
Vibration frequency setting	Digital, 3 – 35 Hz (180 – 2100 min^{-1})
Typical grinding time	30 seconds – 30 minutes
Grinding time setting	Digital, 10 seconds (minimum) to 8 hours (maximum)
Maximum grinding time	Up to 99 hours
Number of grinding stations	2
Grinding jar sizes	50 ml/80 ml/125 ml
Grinding jars (materials)	Hardened steel Stainless steel Tungsten carbide Zirconium oxide
Sensors	Temperature (optional), pressure (optional)
Operation	4.3 inch touchscreen with dial
Storable SOPs (standard operating procedures)	12
Programmable cycles	4 (up to 99 repeats)
Communication	myRetsch Web Portal, Retsch APP
Mains connection	1 phase, 100 – 120 VAC 50/60 Hz, 200 – 230 VAC 50/60 Hz
Protection class	IP 20
Electromagnetic compatibility (EMC)	EMC class in accordance with DIN EN 55011: A
Motor output	750 W (with frequency converter)
W x H x D closed	660 x 410 x 580 mm
Weight, net	60 kg
Conformity	CE

3.2 Emissions

⚠ CAUTION C.0020

Risk of injury caused by not hearing acoustic signals
Loud grinding noise

– Loud grinding noise may result in not hearing acoustic warning signals, leading to injuries.

- **Take the volume of grinding noise into consideration when designing the acoustic signals in the working environment.**
- **Where necessary, use additional visual signals.**

⚠ CAUTION C3.0077

Risk of hearing loss
High sound level

– The sound level may be high depending on the type of material, the number of balls used, the set grinding frequency and the grinding time. Excess noise in terms of intensity and duration can lead to impairments or permanent damage to hearing.

- **Ensure you take suitable soundproofing measures.**
- **Wear hearing protection if there is loud or lasting noise.**

Noise levels:
The noise levels will also be influenced by the properties of the sample material.

Example 1	
Receptacle	2 (125 ml)
Grinding component	18 steel balls each (15 mm)
Feed material	Silica sand (~ 0.5 mm)
Feed quantity	60 ml
Speed	35 Hz

The workplace-related equivalent sound pressure level under these operating conditions L_{eq} = 77 dB(A).

Example 2	
Receptacle	2 steel grinding jars (125 ml)
Grinding component	50 steel balls each (10 mm)
Feed material	Silica sand (~ 0.5 mm)
Feed quantity	60 ml
Speed	35 Hz

The workplace-related equivalent sound pressure level under these operating conditions L_{eq} = 74 dB(A).

3.3 Views of the device

3.3.1 Front

Fig. 2: Device hood closed

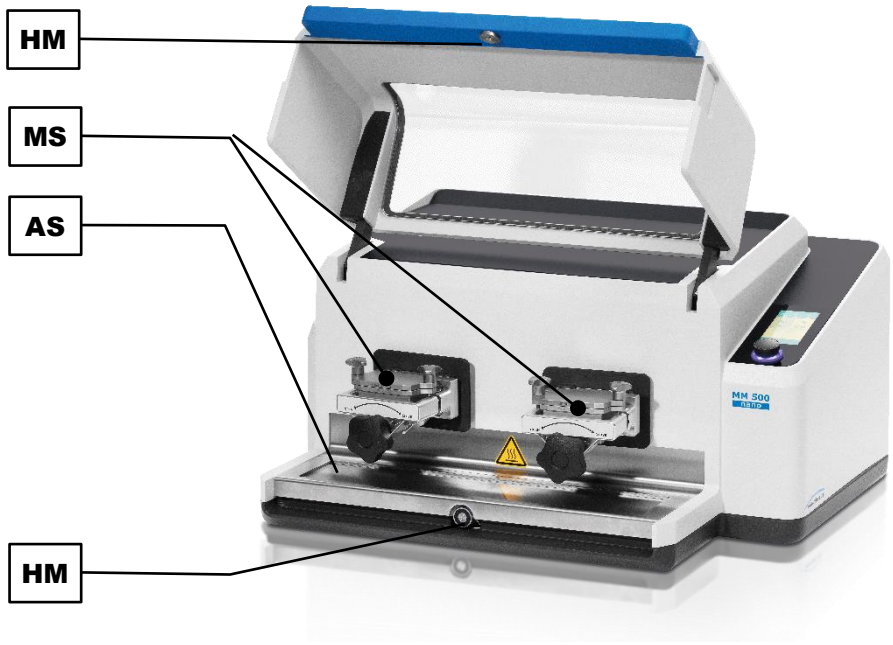


Fig. 3: Device hood open t

	Component	Function
H	Device hood	Closes the inside of the device.
T	Touchscreen with dial	For controlling the device. To select and configure grinding parameters.
HM	Magnetic clamps	To keep the device hood closed while the device is being operated.
MS	Grinding stations	Position of the grinding jar supports to hold the grinding jars.
AS	Collecting dish	Collects sample residue and may be removed for cleaning.

3.3.2 View of the grinding jar support

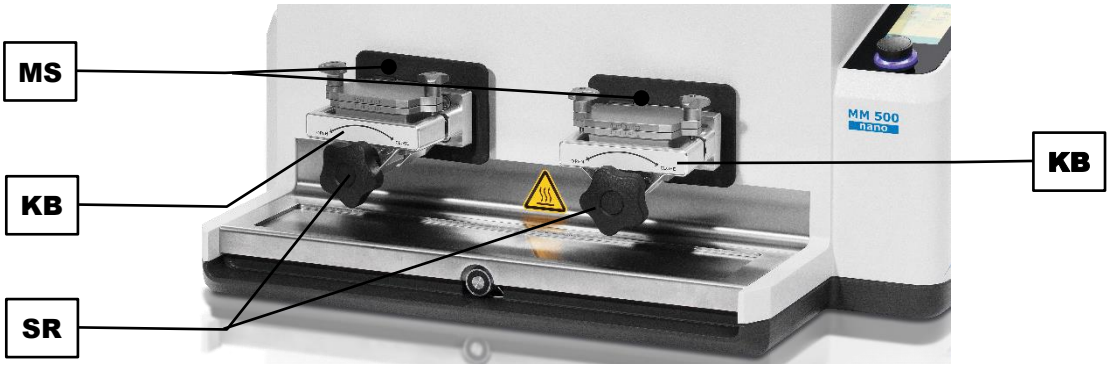


Fig. 4: Grinding stations

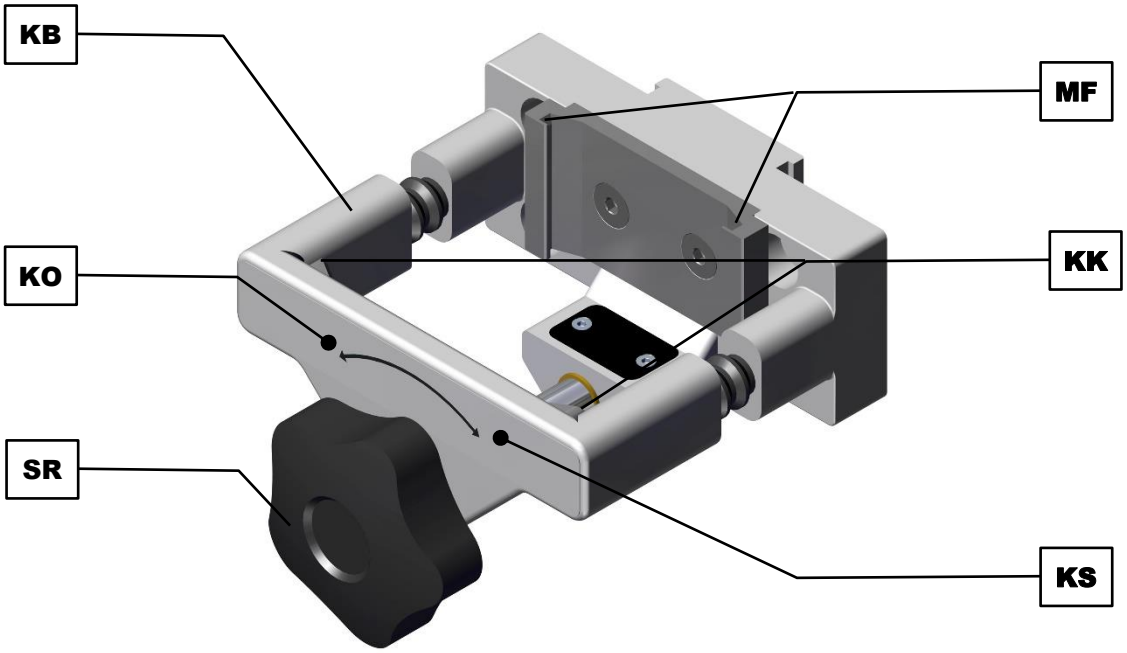


Fig. 5: Grinding jar support

	Component	Function
MS	Grinding stations	Position of the grinding jar supports to hold the grinding jars.
KB	Clamp	For mounting the grinding jars.
SR	Locking wheel	To tighten or loosen the grinding jars in the grinding jar support.
KK	Clamping wedges (Grinding jar support)	To secure the grinding jar after it has been correctly closed using the clamp.
KS	Direction of rotation of the locking wheel: close the clamps	Closes the clamps, thereby securing the grinding jar in the grinding jar support.
MF	Grinding jar guide	For correctly inserting the grinding jar without becoming misaligned.
KO	Direction of rotation of the locking wheel: open the clamps	Opens the clamps, thereby enabling the grinding jar to be removed.

3.3.3 Back

Fig. 6: Back of the device

	Component	Function
K	USB interface	To update the operating software.
I	Main switch	To switch the device on or off using the motor protection circuit breaker.
M	Appliance socket	Connection for the mains lead.
U	RS232 interface	To connect the GrindControl (optional temperature/pressure measurement system).
J	Interface for Retschbox	To connect the Retschbox (optional Wi-Fi module).
GL	Housing fan	To conduct waste heat.
RB	Retschbox	Optional equipment. Among other things permits remote control of the device.

3.3.4 View of grinding jars

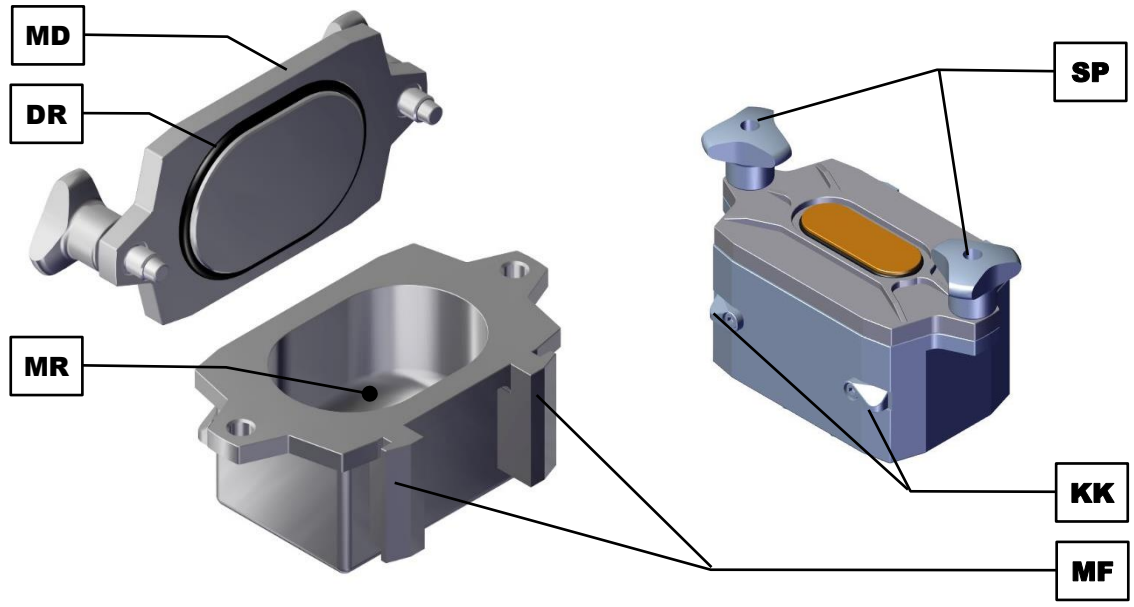


Fig. 7: Grinding jars

	Component	Function
MD	Grinding jar cover	Closes the grinding chamber on the grinding jar.
DR	Sealing ring	For sealing between the grinding jar cover and grinding jar. May be replaced if worn.
MR	Grinding chamber	To accommodate the grinding balls and material.
SP	Clamping screws with guide bolts	To attach and secure the grinding jar cover on the grinding jar . The clamping screws are permanently mounted on the grinding jar cover .
KK	Clamping wedges (grinding jar)	To secure the grinding jar in the grinding jar support after it has been correctly closed using the clamp.
MF	Grinding jar guide	For correctly inserting the grinding jars in the grinding jar support, without becoming misaligned.

3.4 Opening aid

An opening aid is also included with delivery of the MM 500 nano. Both sides of this tool can be used.
The clamping screws on the grinding jar cover can be tightened or loosened using the (ÖS) side. The locking wheels on the grinding jar support are loosened using the (ÖR) side.

ⓘ It is essential to use the opening aid to close the grinding jars because tightening the clamping screws by hand is not sufficient.
By contrast, manual tightening of the locking wheels without the opening aid is sufficient when clamping the grinding jars in the grinding jar supports.
The opening aid can be used to unscrew the clamping screws on the grinding jar and the locking wheels on the grinding jar support.

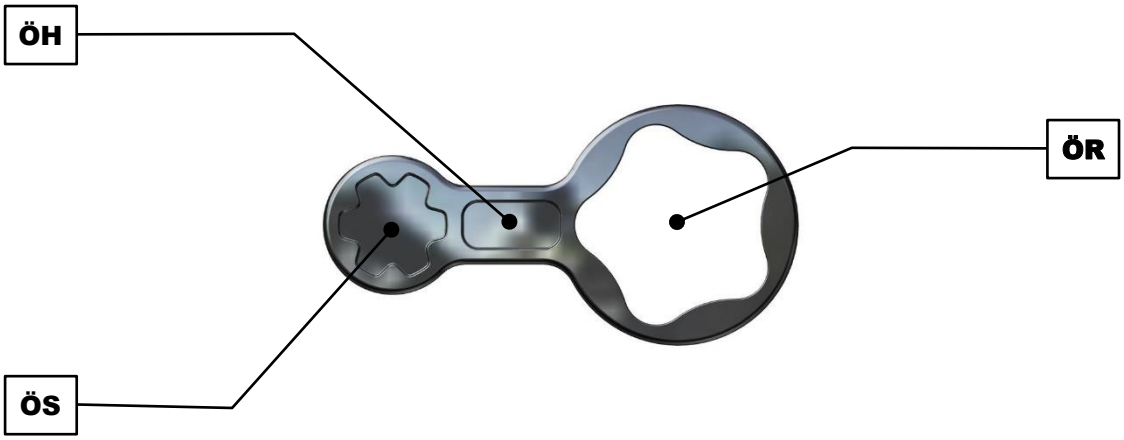


Fig. 8: Opening aid

	Component	Function
ÖH	Opening aid	The clamping screws on the grinding jar cover are tightened using the supplied opening aid . The opening aid can additionally be used to unscrew the clamping screws on the grinding jar and the locking wheels on the grinding jar support.
ÖS	Side for clamping screws	This side is for tightening and unscrewing the clamping screws on the grinding jar cover.
ÖR	Side for locking wheel	This side is for unscrewing the locking wheels on the grinding jar supports.

3.5 Signs on the device

Fig. 9: Signs on the device

No.	Sign	Meaning
HG	Wear hearing protection	Safety warning: We recommend that you wear hearing protection when operating the device for a long period of time.
B	Read the manual	Safety warning: The manual must be read before commissioning and operating the device.
L	Electricity warning	Caution - electric shock! Housing may only be opened by qualified personnel. Pull the plug out before maintenance work!
N	Type plate	Information: Performance and connection data for the device.

3.6 Type Plate Description

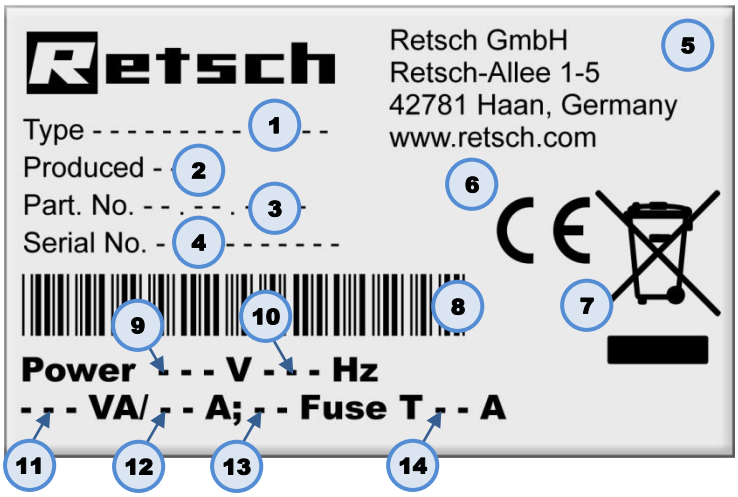


Fig. 10: Type plate

1 Device name
2 Year of manufacture
3 Article number
4 Serial number
5 Manufacturer's address
6 CE mark
7 Disposal sign
8 Barcode
9 Power version
10 Mains frequency
11 Power
12 Current
13 Number of fuses
14 Fuse type and fuse rating

ⓘ Please always specify the device name (1) or article number (3) as well as the serial number (4) of the device if you have any questions.

4 Packaging, Transport and Installation

4.1 Packaging

The packaging has been adapted to the mode of transport. It complies with the generally applicable packaging guidelines.

NOTICE N2.0001

Complaint or return
Keeping the packaging

– Inadequate packaging and insufficient securing of the device can jeopardise the warranty claim in the event of a complaint or return.
- **Keep the packaging for the duration of the warranty period.**

4.2 Transport

WARNING W2.0005

Risk of injury due to the device falling down
Lifting the device above head height

– The device can fall causing serious injuries when lifted above head height.
- **Never lift the device above head height!**

CAUTION C4.0000

Risk of injury caused by the device falling down
Incorrect transport of the device

– Due to its weight, the device can cause injuries if it falls down.
- **Do not transport the device by yourself.**

NOTICE N3.0017

Damage to components
Transport

– Mechanical or electronic components may be damaged during transport.
- **The device must not be knocked, shaken or thrown during transport.**

NOTICE N4.0014

Complaints
Incomplete delivery or transport damage

– The forwarding agent and Retsch GmbH must be notified immediately in the event of transport damage. It is otherwise possible that subsequent complaints will not be recognised.
- **Please check the delivery on receipt of the device for its completeness and intactness.**
- **Notify your forwarding agent and Retsch GmbH within 24 hours.**

4.3 Temperature Fluctuations and Condensation

NOTICE N5.0016

Damaged components due to condensation
Temperature fluctuations

- The device may be exposed to substantial fluctuations in temperature during transport. The ensuing condensation can damage electronic components.
- **Wait until the device has acclimatised before putting it into service.**

Temporary storage:
Also in case of an interim storage the device must be stored dry and within the specified ambient temperature range.

4.4 Conditions for the Installation Site

⚠ CAUTION C5.0047

Risk of injury caused by the device falling down
Incorrect installation of the device

- Due to its weight, the device can cause injuries if it falls down.
- **Only operate the device on a sufficiently large, strong and stable workstation.**
- **Ensure that all of the device feet are securely supported.**

NOTICE N6.0004

Setting up the device
Vibrations during operation

- Depending on the operating mode of the device, slight vibrations may occur.
- **Set up the device only on a vibration-free, plane and stable surface.**

NOTICE N7.0002

Setting up the device
Disconnecting the device from the mains

- A separation of the device from the mains must be possible at any time.
- **Set up the device in such a way, that the connection for the power cable is always easily accessible.**

NOTICE N8.0021

Ambient temperature
Temperatures outside the permitted range

- Electronic and mechanical components may be damaged.
- The performance data alter to an unknown extent.
- **Do not exceed or fall below the permitted temperature range (5 °C to 40 °C ambient temperature) of the device.**

- Maximum relative humidity < 80 % (at ambient temperatures ≤ 31 °C)

For ambient temperatures U_T between 31 °C and 40 °C, the maximum relative humidity value L_F linearly decreases according to $L_F = -(U_T - 55) / 0.3$:

Ambient temperature	Max. rel. humidity
≤ 31 °C	80 %
33 °C	73.3 %
35 °C	66.7 %
37 °C	60 %
39 °C	53.3 %
40 °C	50 %

NOTICE N9.0015

Humidity
High relative humidity

- Electronic and mechanical components may be damaged.
- The performance data alter to an unknown extent.
- **The relative humidity in the vicinity of the device should be kept as low as possible.**

- Installation height: max. 2 000 m above sea level

The MM 500 nano must be installed on a stable and solid surface. Vibrations from the device will otherwise be transmitted to the surroundings during the grinding process.

4.5 Removing the Transportation Lock

WARNING W3.0005

Risk of injury due to the device falling down
Lifting the device above head height

- The device can fall causing serious injuries when lifted above head height.
- **Never lift the device above head height!**

NOTICE N10.0018

Transportation lock
Transport without transportation lock, or operation with transportation lock

- Mechanical components may be damaged.
- **Only transport the device with mounted transportation lock.**
- **Do not operate the device with built-in transportation lock.**

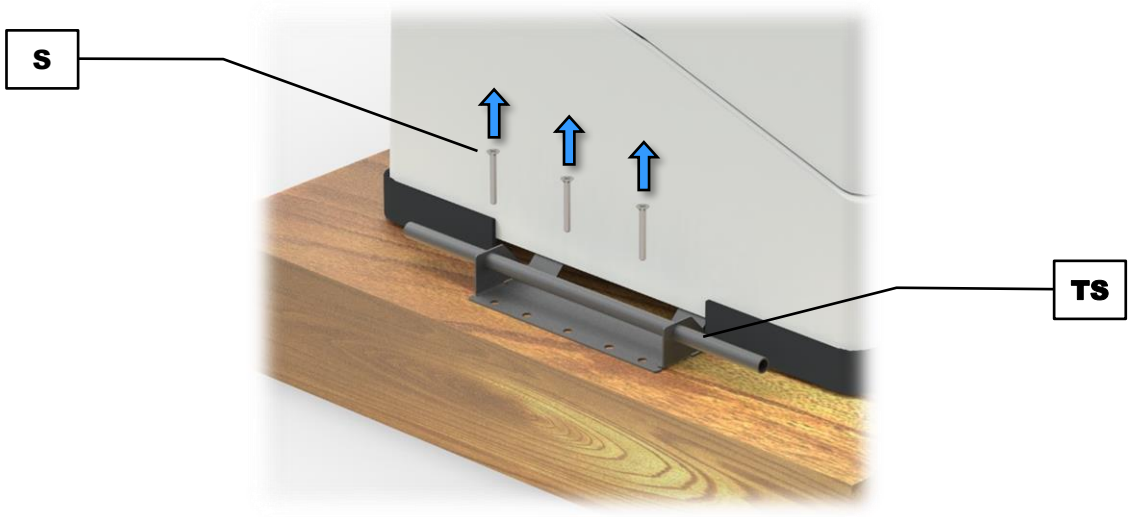


Fig. 11: Unscrewing the transport lock

	Component
S	Screw
TS	Transport lock

Remove the transport lock and transport the device as follows:

⇨ Unscrew and remove the six screws (S), three on each side of the device.

ⓘ The transport lock is simultaneously also a transport aid .

⇨ Use the transport lock (TS) as a transport aid when transporting the device to the application site.

CAUTION The weight without grinding jar is approx. 60 kg. The device may only be lifted by two people .

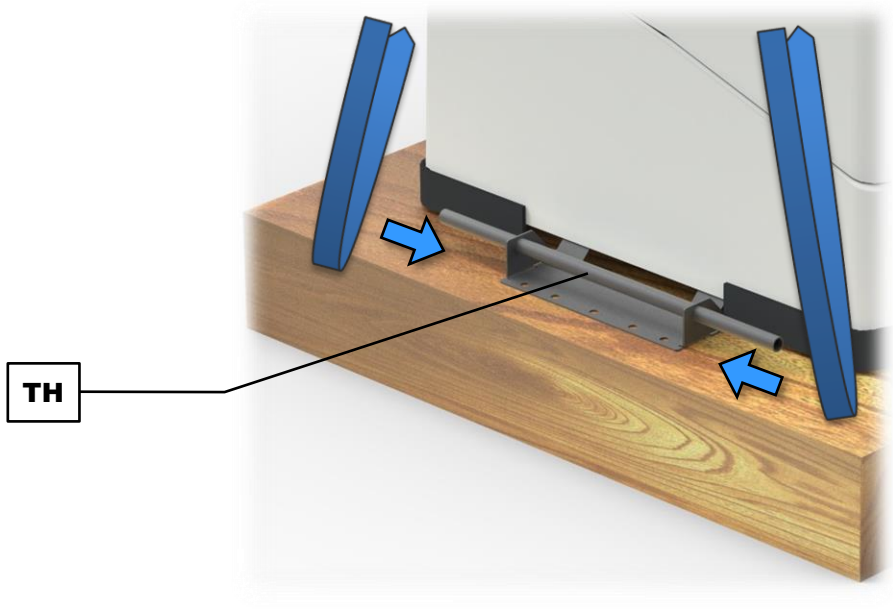


Fig. 12: Attach lifting belts

	Component
TH	Transport aid

The transport aid (TH) can also be used to lift the device by crane.

Transport the device by crane as follows:
- ⇨ Attach lifting belts to both of the transport aids (TH).
- ⇨ Transport the device by crane to the application site.

NOTICE The housing may be damaged if the lifting belts are too short. The four lifting belts must be long enough to ensure a minimum distance of 100 cm between the device and the lifting gear.

4.6 Removing the Transportation Aid

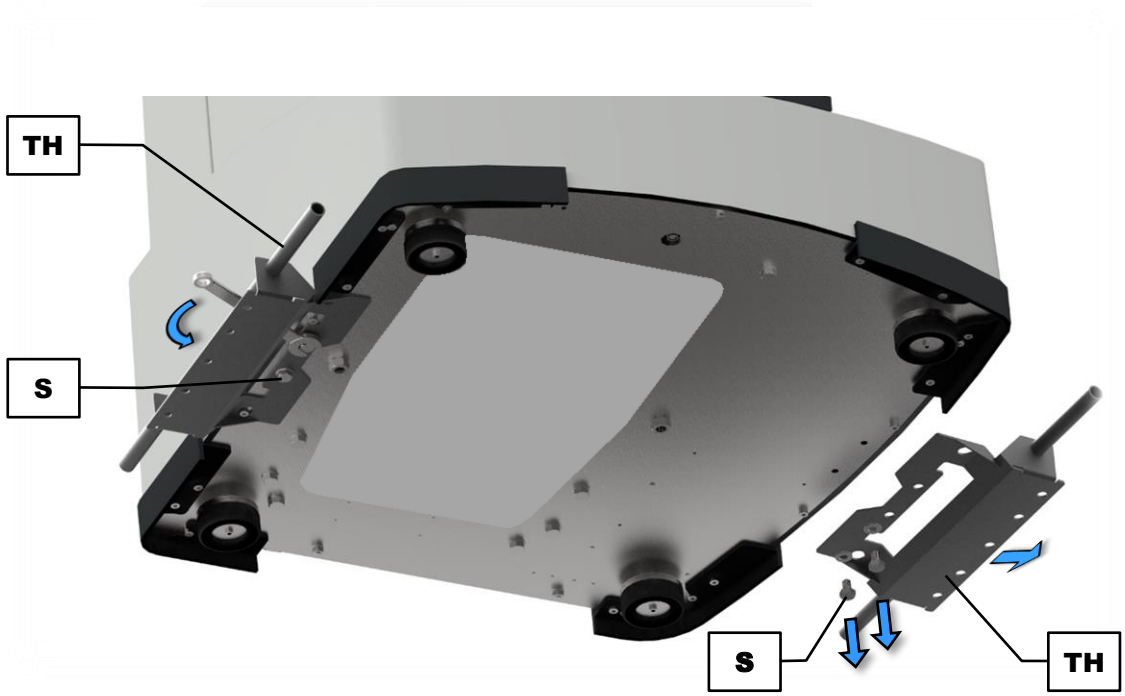


Fig. 13: Removing the transport aid

	Component
TH	Transport aid
S	Screw

Remove the transport aids as follows:
- ⇨ Using a 13 mm open end wrench, loosen and remove the four screws (S), two on each side of the device.
- ⇨ Unscrew and remove the transport aids (TH).

ⓘ Keep the transport aids for transporting the device at a later date.

5 First Commissioning

5.1 Electrical Connection

⚠ WARNING W4.0015

Risk to life caused by an electric shock
Connection to socket without a protective earth conductor

- Connecting the device to sockets without a protective earth conductor can lead to life-threatening injuries caused by an electric shock.
- **Always operate the device using sockets with a protective earth conductor (PE).**

⚠ WARNING W5.0002

Danger to life through electric shock
Damaged power cable

- Operating the device with a damaged power cable or plug can lead to life-threatening injuries caused by an electric shock.
- **Before operating the device, check the power cable and plug for damage.**
- **Never operate the device with damaged power cable or plug!**

NOTICE N11.0022

Electrical connection
Failure to observe the values on the type plate

- Electronic and mechanical components may be damaged.
- **Connect the device only to a mains supply matching the values on the type plate.**

⚠ WARNING When connecting the power cable to the mains supply, use an external fuse that complies with the regulations applicable to the place of installation.

- Check the type plate for details on the necessary voltage**,** frequency, and maximum external current source fuse for the device.
- The listed values must agree with the existing mains supply.
- Only use the supplied power cable to connect the device to the mains supply.

The MM 500 nano must be connected to the power supply on site for initial commissioning.

Ensure the following before connecting the device to the power supply:

- The application site complies with the installation requirements;
- The device is securely and firmly in place;
- The power values for the device (type plate) correspond to the values of the power supply at the site.

5.2 Connecting the device to the power supply

Fig. 14: Connecting to the power supply

	Component
M	Appliance socket
N	Type plate

Connect the device to the power supply as described below:

⇨ Compare the voltage and frequency on the type plate (N) of the device to the values on site.

⇨ Plug the supplied mains lead into the appliance socket (M).

⇨ Plug the other end of the mains lead into a socket at the installation site.

⇨ Provide external fusing according to the regulations at the installation site.

6 Operating the Device

WARNING W6.0002

Danger to life through electric shock
Damaged power cable

- Operating the device with a damaged power cable or plug can lead to life-threatening injuries caused by an electric shock.

- **Before operating the device, check the power cable and plug for damage.**
- **Never operate the device with damaged power cable or plug!**

CAUTION C6.0005

Risk of injury
Potentially explosive atmosphere

- The device is not suitable for use in potentially explosive atmospheres. Operating the device in a potentially explosive atmosphere can lead to injuries caused by an explosion or fire.

- **Never operate the device in a potentially explosive atmosphere!**

CAUTION C7.0077

Risk of hearing loss
High sound level

- The sound level may be high depending on the type of material, the number of balls used, the set grinding frequency and the grinding time. Excess noise in terms of intensity and duration can lead to impairments or permanent damage to hearing.

- **Ensure you take suitable soundproofing measures.**
- **Wear hearing protection if there is loud or lasting noise.**

6.1 Switching the device on/off

Fig. 15: Main switch

Fig. 16: Front of the device with touchscreen

	Component
I	Main switch
H	Device hood
T	Touchscreen with dial

Switch the device on as follows:

⇨ Switch the device on by the main switch (I) on the back of the device.

ⓘ The opening and closing of the device hood (H) are indicated on the touchscreen (T).

⇨ Open the device hood (H) by hand and then close it again. The device is then ready for use.

Switch the device off as follows:

⇨ Switch the device off by the main switch (I) on the back of the device when no grinding process is running.

6.2 Opening and Closing of the Device

CAUTION

C8.0008

Risk of pinching and bruising

Device hood closing

– The device hood can trap fingers when closing, thereby causing pinching or bruising.

- **Never allow the device hood to close by itself.**
- **Always hold the device hood firmly when closing it.**

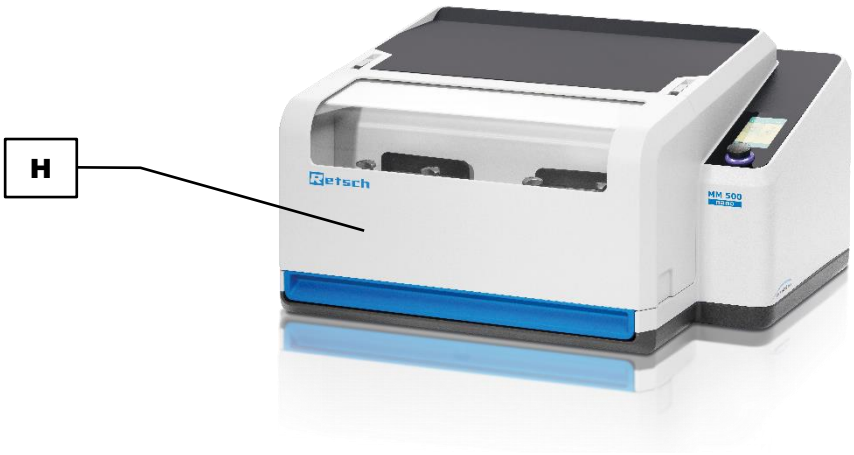


Fig. 17: Device with closed device hood

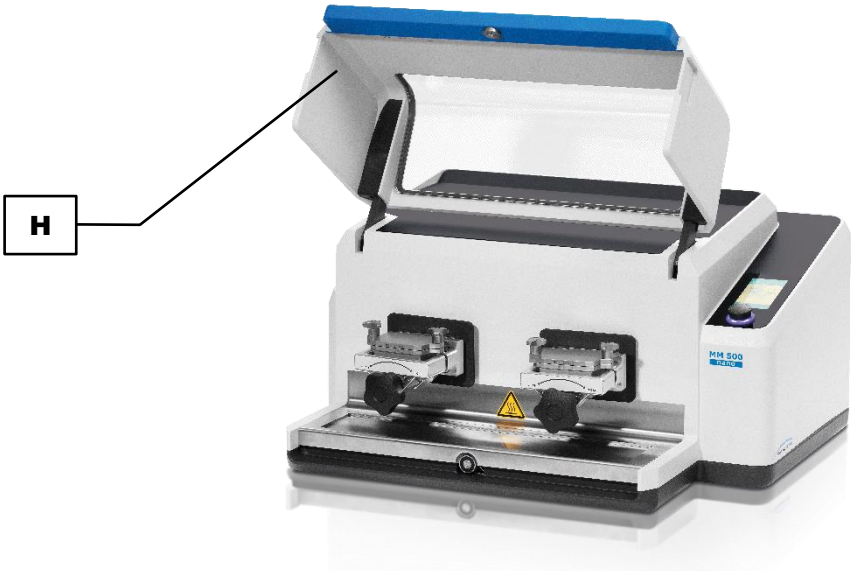


Fig. 18: Device with open device hood

	Component
H	Device hood

Open the device as follows:

⇨ Lift the device hood (H) by hand and open it completely.

ⓘ The device hood is fitted with cushioning. This cushioning ensures that the device hood does not open in an uncontrolled manner. The cushioning on the device takes effect as from an opening angle of approx. 80°.

Close the device as follows:

⇨ Press the device hood (H) down by hand and close it completely.

ⓘ The device hood is fitted with cushioning, which ensures that the device hood does not close in an uncontrolled manner. The cushioning on the device hood takes effect as from an opening angle of 80°.

6.3 Specifications regarding grinding balls and grinding jars

NOTICE N12.0011

Wear or damage to the grinding balls and grinding jars
Use of different materials

– Greater wear or damage is possible when operating the device with grinding balls and grinding jars whose individual components are made of different materials.

- **Only use grinding balls and grinding jars made of the same material.**

NOTICE N13.0000

Damage to the grinding jars
Incorrect filling of the grinding jars

– The grinding balls damage the grinding jar and the device if the grinding jars are not filled with any material or with insufficient material.

- **Do not operate the device without material in the grinding jars.**
- **The filling in the grinding jars must not be less than 25 % of the grinding jar volume.**

6.3.1 Grinding Jar Identification

All grinding jars and the corresponding grinding jar covers can be identified by labelling on the outside. The labelling indicates the size and material of the grinding jar.

6.3.2 Ball Sizes and Speeds

A very large amount of energy is applied to the sample material on the MM 500 nano. This large amount of energy also affects the grinding jars and the grinding balls.

Depending on the grinding jar size , the following recommendations therefore apply to the sample volume and ball sizes that can be used.

6.3.3 Recommended maximum ball sizes

Grinding jar size	Ball size
50 ml	25 mm
80 ml	25 mm
125 ml	20 mm

6.3.4 Recommended Grinding Jar Filling

In addition to device settings, the fill level of the grinding jars is crucial for the success of grinding in the Mixer Mill. **When grinding bulk materials, a grinding jar filling should consist roughly of one third sample material and one third ball volume.** The remaining third is the empty grinding jar volume that the balls need in order to move. Please pay attention to the maximum permitted ball size for the material in question.

If an increase in volume or decrease in volume is to be expected during grinding, the sample volume can be adjusted in line with the range set out in the table. For example in the case of voluminous sample material such as wool, leaves, grasses etc., an initial material filling of 70 – 80 % is necessary.

The ball filling should comprise 60 % of the grinding jar volume for wet grinding with grinding balls < 3 mm. As with dry grinding, the sample material should fill one third of the grinding jar volume. Wet grinding should be conducted in such a way that the mixture of grinding balls, sample material and liquid achieves a viscous consistency. If the mixture is too viscous, the grinding balls do not move sufficiently. If it is not viscous enough, the grinding results will be poorer and there will be increased wear to the grinding balls and grinding jars.

				Recommended number of grinding balls						
Material	**Grinding jar size**	**Sample volume**	**Max. feed size**	Ø 5 mm	Ø 7 mm	Ø 10 mm	Ø 12 mm	Ø 15 mm	Ø 20 mm	Ø 25 mm
Stainless steel	50 ml	5 – 20 ml	8 mm	160	45	16	8 - 12	-	1	1
	80 ml	10 - 32 ml	10 mm	260	70	32	23	12	3	1
	125 ml	15 - 50 ml	10 mm	400	110	50	35	15 - 18	8	-
Hardened steel	50 ml	5 - 20 ml	8 mm	160	45	16	8 - 12	-	1	1
	80 ml	10 - 32 ml	10 mm	260	70	32	23	12	3	1
	125 ml	15 - 50 ml	10 mm	400	110	50	35	15 - 18	8	-
Zirconium oxide	50 ml	5 - 20 ml	8 mm	160	45	16	8 - 12	-	-	-
	80 ml	10 - 32 ml	10 mm	260	75	32	123	12	-	-
	125 ml	15 - 50 ml	10 mm	400	110	50	35	15 - 18	-	-
Tungsten carbide	50 ml	5 - 20 ml	8 mm	160	45	16	8 -12	-	1	-
	80 ml	10 - 32 ml	10 mm	260	70	32	23	12	3	-

6.4 Special grinding methods

6.4.1 Cryogenic grinding

WARNING W7.0000

Risk of injury caused by liquid nitrogen
Use of liquid nitrogen during cryogenic grinding

– Liquid nitrogen has a boiling point of – 196 °C and causes burn-like injuries and frostbite if there is skin and eye contact.

- **Take note of the liquid nitrogen safety data sheets.**
- **Always wear goggles and protective gloves when using liquid nitrogen.**

WARNING W8.0000

Risk of injury caused by liquid nitrogen and dry ice
Use of liquid nitrogen and dry ice in closed grinding jars

- Liquid nitrogen and dry ice expand and generate high pressure in closed receptacles. This high pressure bursts grinding jars and leads to serious injuries.

- **Under no circumstances should you put liquid nitrogen or dry ice into the grinding jar and then close the jar.**
- **Only undertake indirect embrittlement for cryogenic grinding.**

Materials that can only be ground with difficulty or not at all under normal temperatures must be ground cold. Indirect embrittlement with liquid nitrogen (- 196 °C) improves the fracture behaviour of thermoplastics, rubber products, greasy foodstuffs, pharmaceuticals etc.

ⓘ For cryogenic grinding, Retsch GmbH offers the Cryo Kit (Order Number: 22.354.0003) for cooling the grinding jars with liquid nitrogen.

Carry out the embrittlement of elastic and tough sample material as follows:

⇨ The embrittlement of sample material for grinding must be performed indirectly.

ⓘ **Only use grinding balls and grinding jars made of stainless steel or hardened steel for cryogenic grinding.**
Grinding balls and grinding jars made of zirconium oxide or tungsten carbide are not suitable for grinding at very low temperatures.

⇨ The sample material must be filled together with the grinding balls (steel) in a grinding jar (steel), and the grinding jar (steel) firmly sealed.

⇨ Using the Cryo Kit tongs, the firmly sealed grinding jar (steel) is then dipped into a bath of liquid nitrogen until this stops bubbling.

⇨ The sample material inside the grinding jar (steel) is then likewise cooled and ready for grinding.

ⓘ Under no circumstances should you fill liquid nitrogen or dry ice into the grinding jar and then close it. The high pressure generated in the grinding jar would burst it.

6.4.2 Wet Grinding with Highly Flammable Materials

Wet grinding using highly flammable materials is permitted with this device if certain precautionary measures are complied with.

When using highly flammable materials such as hexane, isopropyl, ethanol, benzine etc. as a grinding aid , the inside of the grinding jars should be classed as Zone 0, i.e. as a permanent explosive mixture.

It is therefore necessary to prevent potentially explosive vapours escaping from the clamped grinding jars during a grinding process or being able to reach places which have the necessary ignition energy. These vapours are in particular also pressed outwards by the temperature rise that takes place and by the consequent increase in pressure inside the grinding jar.

For this reason we urgently recommend that the user of the device (the employer) assesses the existing hazards within a coherent explosion protection concept according to local conditions before using such solvents and, where necessary, records supplementary organisational measures in an explosion protection document.

This approach is regulated in the EU under Articles 118 and 118a of EC Directive 89/391/EEC. Account must be taken of corresponding provisions in other countries outside the EU.

6.5 Preparing the grinding jar

NOTICE N14.0011

Wear or damage to the grinding balls and grinding jars
Use of different materials

- Greater wear or damage is possible when operating the device with grinding balls and grinding jars whose individual components are made of different materials.
- **Only use grinding balls and grinding jars made of the same material.**

NOTICE N15.0000

Damage to the grinding jars
Incorrect filling of the grinding jars

- The grinding balls damage the grinding jar and the device if the grinding jars are not filled with any material or with insufficient material.
  - **Do not operate the device without material in the grinding jars.**
  - **The filling in the grinding jars must not be less than 25 % of the grinding jar volume.**

6.5.1 Opening the grinding jar

CAUTION

C9.0024

Risks of burns and scalding
Hot grinding jar and/or sample material

– The sample material and grinding jar can get very hot during the grinding process.

- **After grinding, always wear protective gloves when handling the grinding jar.**
- **Never open hot grinding jars!**
- **Allow grinding jars to cool down to room temperature before opening them.**

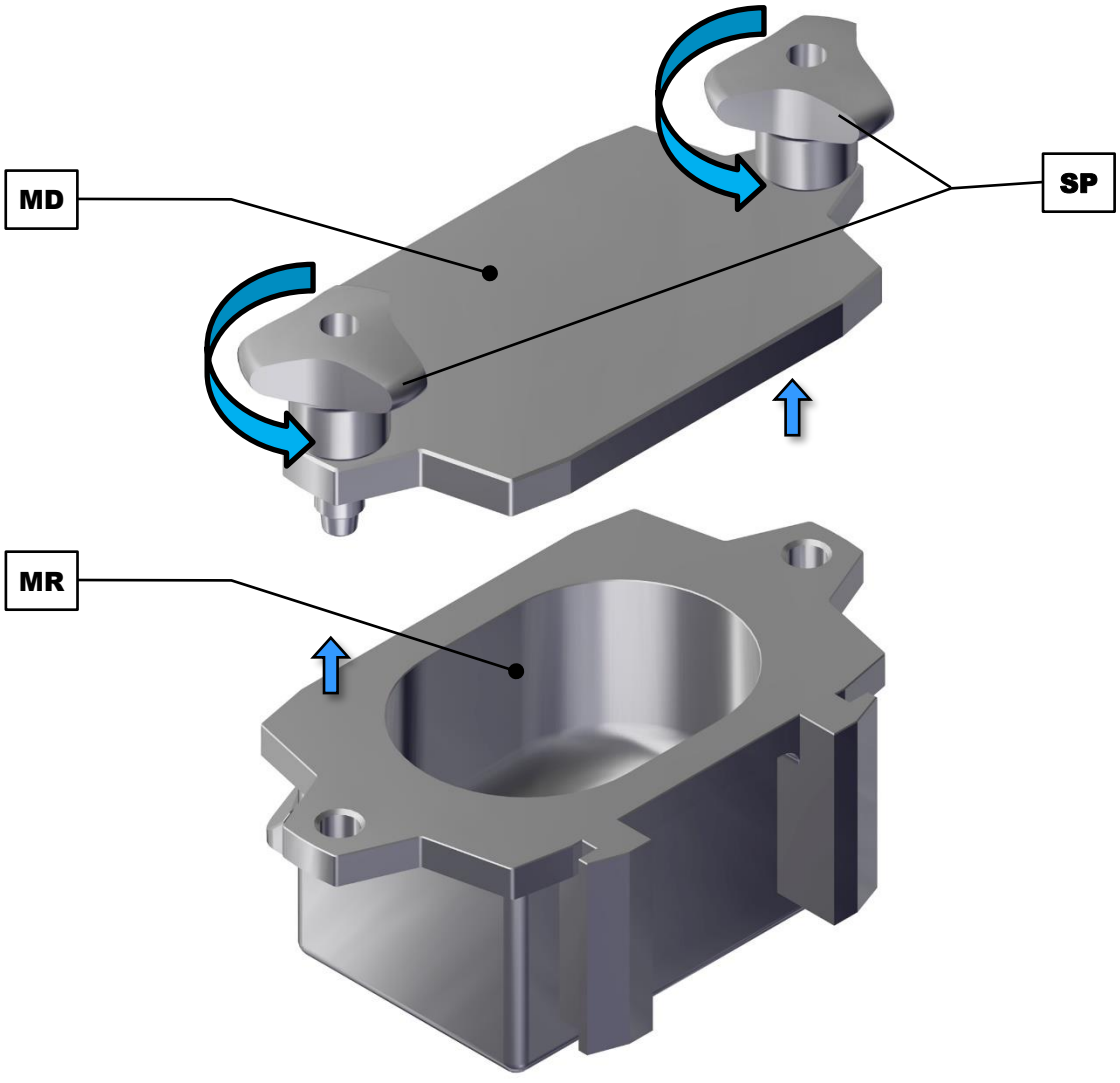


Fig. 19: Opening the grinding jar

	Component
SP	Clamping screws
MD	Grinding jar cover

MR	Grinding chamber

Open the grinding jar as follows:

⇨ Loosen both clamping screws (SP) on the grinding jar cover (MD) and unscrew evenly until the grinding jar cover (MD) can be lifted off without becoming misaligned.

ⓘ If the clamping screws (SP) cannot be unscrewed by hand, use the opening aid to unscrew the clamping screws (SP).

⇨ Lift the grinding jar cover (MD) off to open the grinding chamber (MR) of the grinding jar.

6.5.2 Filling the grinding jar

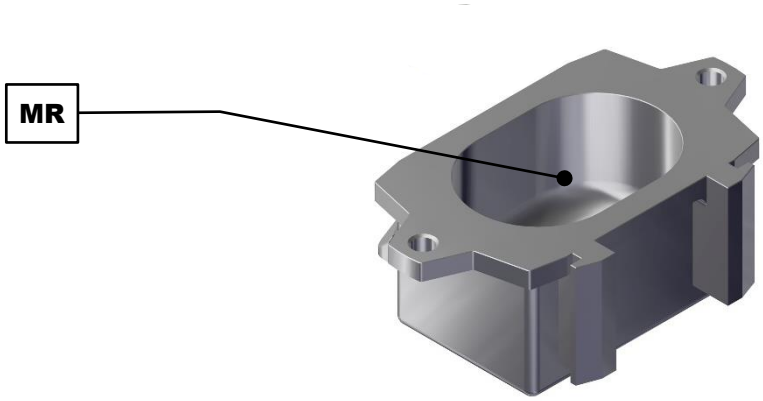


Fig. 20: Filling the grinding jar

	Component
MR	Grinding chamber

Fill the grinding jar as follows:

⇨ Fill the right number of grinding balls made of a suitable material into the grinding chamber (MR) of the grinding jar.

⇨ Add material for grinding to the grinding balls in the grinding chamber (MR) of the grinding jar.

ⓘ When filling the grinding jar, take care not to fall below 1/4 of the total volume of the grinding jar.
The ideal fill quantity in the grinding jar is 1/3 material and 1/3 grinding balls, thus corresponding to 2/3 of the total volume.
In the case of wet grinding, the ideal fill quantity in the grinding jar is 60 % grinding balls and 1/3 material.

6.5.3 Closing the grinding jar

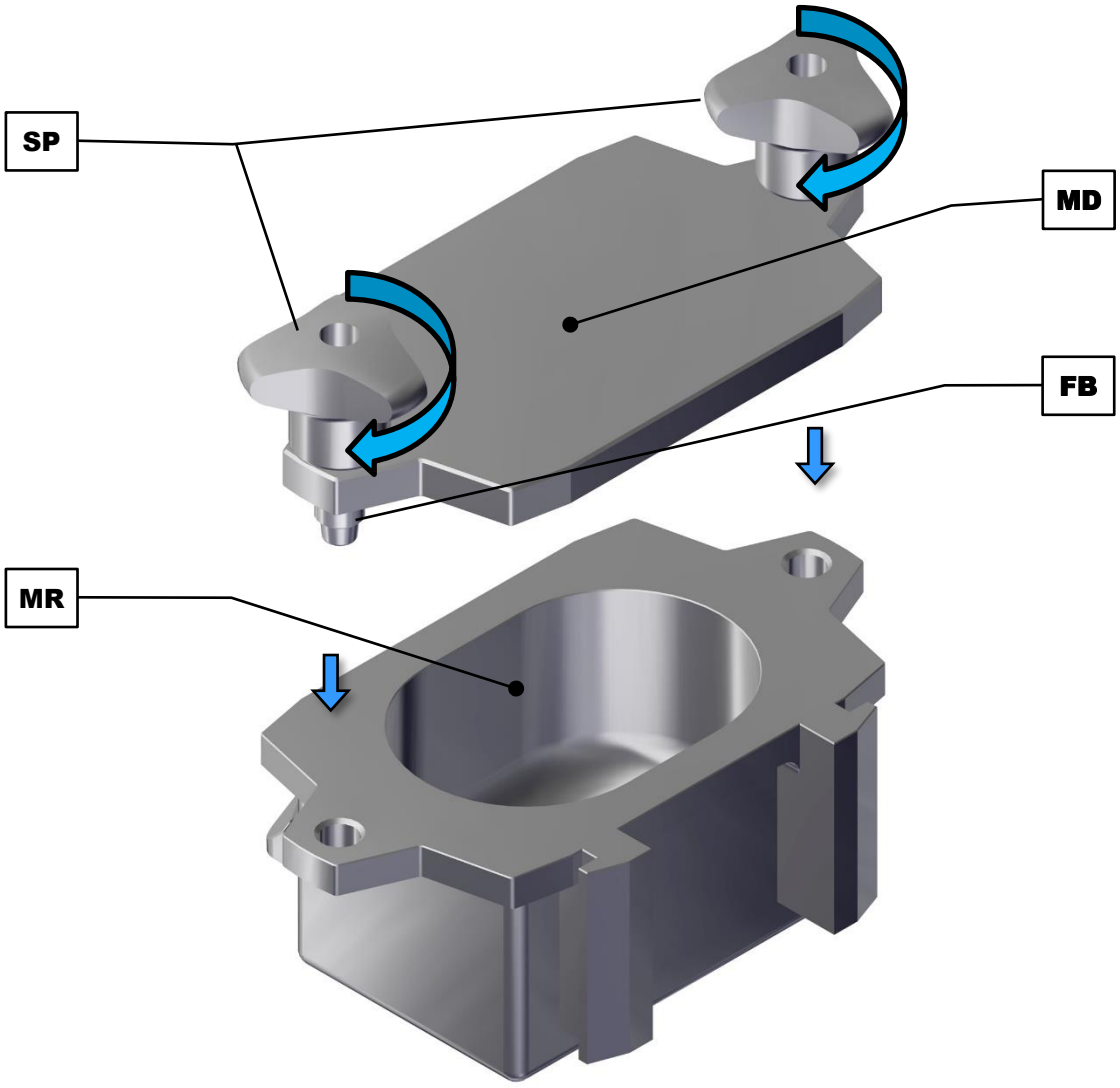


Fig. 21: Closing the grinding jar

	Component
MD	Grinding jar cover
FB	Guide bolts
MR	Grinding chamber
SP	Clamping screws

Close the grinding jar as follows:

⇨ Place the grinding jar cover (MD) suitably onto the two guide bolts (FB) of the grinding jar and close the grinding chamber (MR).

⇨ Tighten both clamping screws (SP) on the grinding jar cover (MD) evenly to prevent misalignment and to close the grinding chamber (MR).

ⓘ Use the opening aid for a tight seal when tightening the clamping screws.

Tightening the clamping screws by hand is not sufficient to completely seal the grinding jar. The clamping screws may break off, however, if too much force is exerted with the opening aid.

6.6 Inserting the Grinding Jar

NOTICE N16.0067

Strong vibrations and loud noise
Uneven loading

- The device can generate particularly strong vibrations and loud noise if loaded unevenly.
- **Always insert two grinding jars of equal size, even if you only want to grind one sample. In this case leave the second grinding jar empty (no grinding balls, no sample material)!**
- **Switch the device off immediately if it is vibrating strongly and making a loud noise, and check the number, the gross weight and correct position of the grinding jars.**

NOTICE N17.0011

Wear or damage to the grinding balls and grinding jars
Use of different materials

- Greater wear or damage is possible when operating the device with grinding balls and grinding jars whose individual components are made of different materials.
- **Only use grinding balls and grinding jars made of the same material.**

NOTICE N18.0000

Damage to the device
Grinding jars incorrectly inserted

- In order to prevent damage to the device during grinding, the grinding jars must be correctly and firmly positioned in the guide of the grinding jar supports when inserted.
- **When inserting the grinding jars, ensure that the grinding jars do not become misaligned, but are positioned firmly and correctly in the grinding jar guide.**
- **Use the opening aid to clamp the grinding jars firmly in the grinding jar supports.**

6.6.1 Opening the grinding jar support

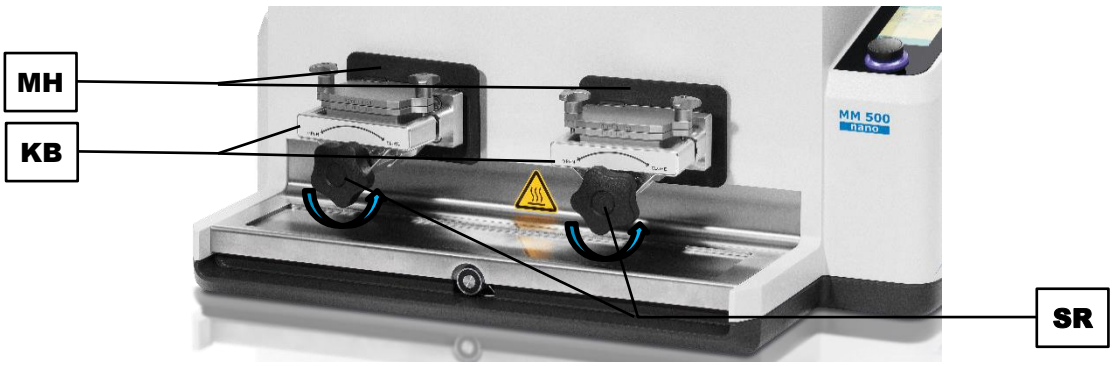


Fig. 22: Opening the grinding jar support

	Component
MH	Grinding jar support
KB	Clamp
SR	Locking wheel

Open the grinding jar support as follows:

⇨ Twist the locking wheel (SR) on the grinding jar support (MH) in an anticlockwise direction to open the clamp (KB).

ⓘ If the locking wheel (SR) cannot be twisted by hand, use the opening aid to unscrew the locking wheel (SR).

⇨ Twist the locking wheel (SR) as far as it will go so that the clamp (KB) on the grinding jar support (MH) is open as far as possible.

6.6.2 Inserting the grinding jar

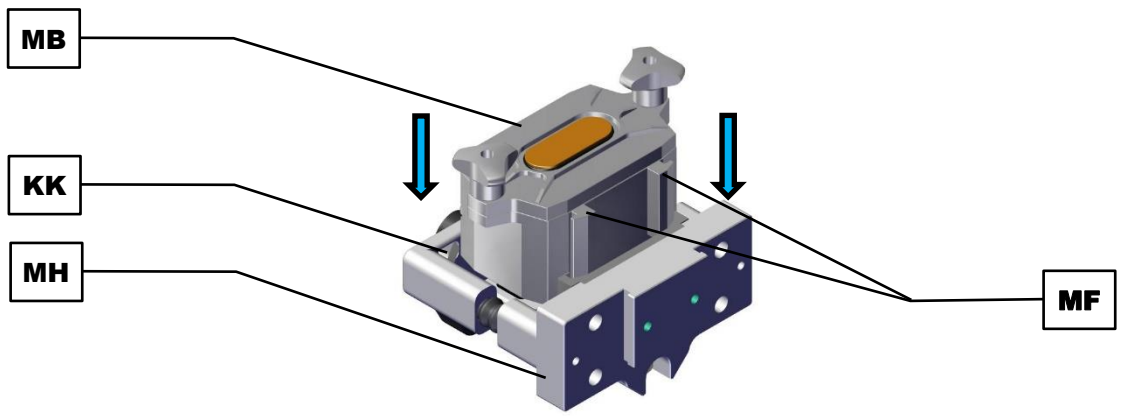


Fig. 23: Inserting the grinding jar

	Component
MB	Grinding jar
MH	Grinding jar support
KK	Clamping wedge (Grinding jar support)
MF	Grinding jar guide

Insert the grinding jar in the grinding jar support as follows:

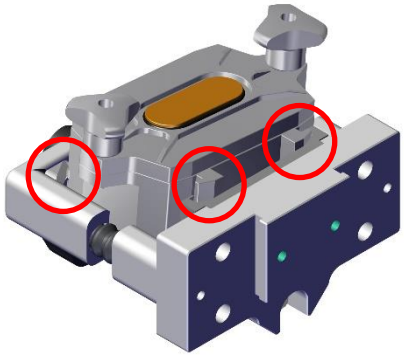
⇨ Insert the grinding jar (MB) correctly into the grinding jar support (MH). Ensure that the grinding jar guide (MF) is positioned correctly in the grinding jar support (MH).

⇨ Push the grinding jar (MB) down as far as it will go.

ⓘ The grinding jar (MB) must be correctly positioned in the grinding jar support and must not become misaligned when inserted. The edges of the grinding jar guide (MF) and of the grinding jar support (MH) must close almost flush.

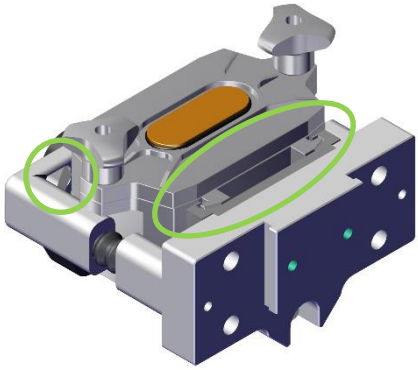
NOTICE The grinding jars must be correctly inserted in the grinding jar support and be clamped firmly using the clamp. To this end, the grinding jar must be pushed as far as possible into the grinding jar support without becoming misaligned. The clamping wedges on the grinding jar support must lie above those on the grinding jar. The edges of the grinding jar guide and of the grinding jar support must close almost flush.

Never operate the MM 500 nano **with a grinding jar that has become misaligned when inserted!**

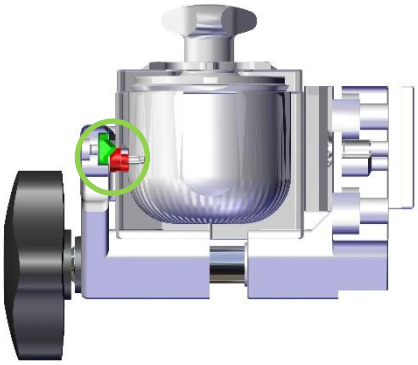


Incorrect: The grinding jars have **not** been inserted correctly. The grinding jar guide is misaligned in the grinding jar support. The clamping wedges on the grinding jar are higher than those on the grinding jar support.
The clamps cannot therefore be closed correctly.

Fig. 24: Grinding jar misaligned



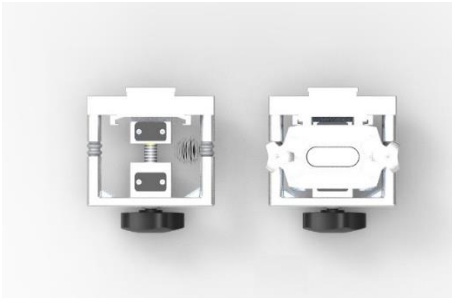
Correct: The grinding jar guide and grinding jar support close almost flush.



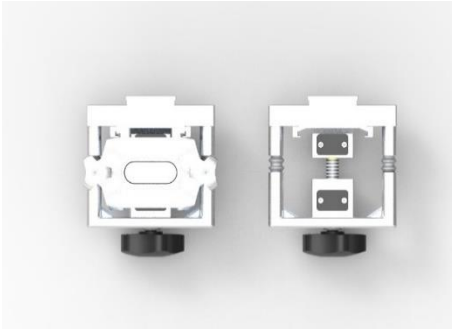
The clamping wedges on the grinding jar support lie above those on the grinding jar. The clamps can therefore be closed correctly.

Fig. 25: Grinding jar flush with grinding jar support

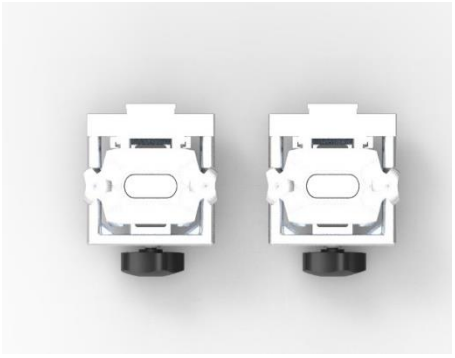
NOTICE Both grinding stations must always be loaded. If only one grinding jar is required, the second grinding jar must be inserted **empty** (without grinding balls, without sample material) as a counterweight.
Never operate the MM 500 nano **without grinding jars!**



Incorrectly loading the grinding stations with grinding jars.



Incorrectly loading the grinding stations with grinding jars.



Correctly loading the grinding stations with grinding jars.

Fig. 26: Loading the grinding stations

6.6.3 Closing the grinding jar support

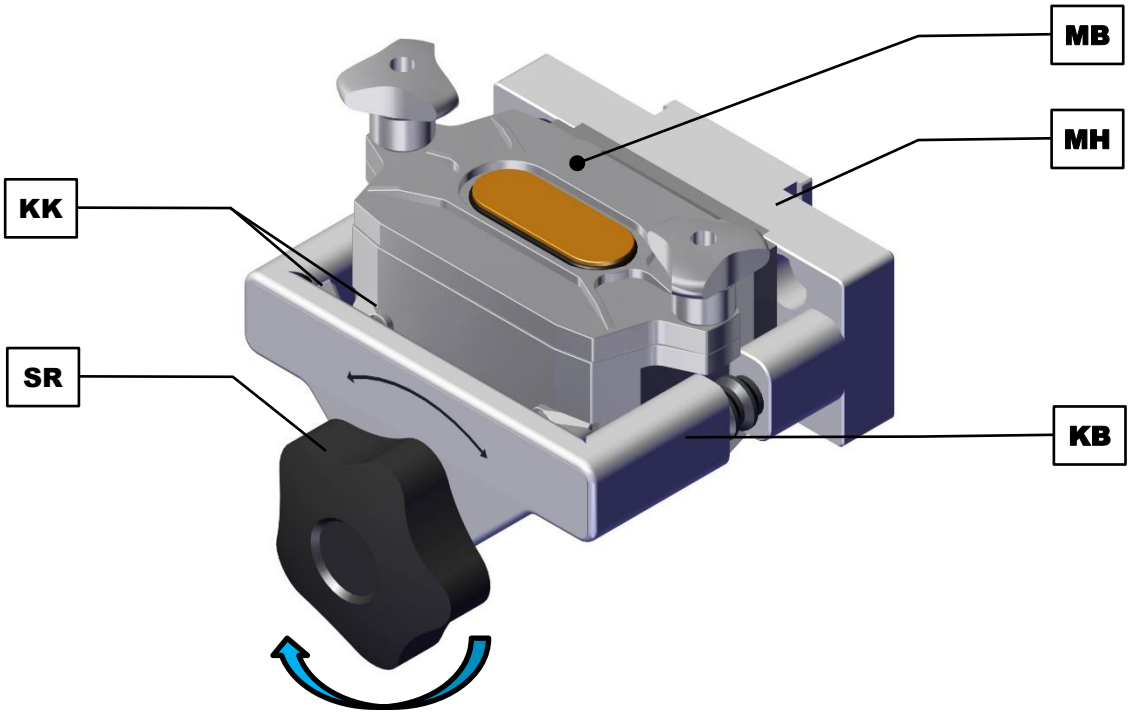


Fig. 27: Clamping the grinding jar

Fig. 28: Device with loaded grinding stations

	Component
SR	Locking wheel

MH	Grinding jar support
KB	Clamp
MB	Grinding jar
KK	Clamping wedges (Grinding jar and grinding jar support)

Close the grinding jar support as follows:

⇨ Turn the locking wheel (SR) on the grinding jar support (MH) clockwise to close the clamp (KB) and to firmly clamp the grinding jar (MB).

ⓘ The clamping wedges of the grinding jar must lie below those of the grinding jar support.

6.7 Grinding process

⚠ CAUTION

C10.0004

Risk of injury

Explosive or flammable samples

– Samples can explode or catch fire during the grinding process.

- **Do not use any samples in this device that carry a risk of explosion or fire.**
- **Take note of the safety data sheets for the sample material.**

⚠ CAUTION

C11.0006

Risk of injury

Sample material that is harmful to health

– Sample material that is harmful to health can injure people (illness, contamination).

- **Use suitable extraction systems with sample material that is harmful to health.**
- **Use suitable personal protective equipment with sample material that is harmful to health.**
- **Take note of the safety data sheets for the sample material.**

⚠ CAUTION

C12.0010

Risk of burns or poisoning

Varying sample properties

– The properties and therefore also the chemical reactivity of the sample can change during the grinding process and can cause burns or poisoning as a result.

- **Do not process any substances in this device whose chemical reactivity is so changed by grinding that there is a risk of explosion or poisoning.**
- **Take note of the safety data sheets for the sample material.**

6.7.1 Starting the grinding process

Fig. 29: Starting the grinding process

	Component
H	Device hood
T	Touchscreen
DK	Dial

Start the grinding process as follows:

⇨ Close the device hood (H) by hand.

⇨ Configure the parameters for grinding on the touchscreen (T) and using the dial (DK).

⇨ Press ▶ on the touchscreen (T) to start the grinding process.

ⓘ The grinding process can only be started by pressing ▶ if this symbol is displayed on the touchscreen.

If ▶ is not displayed on the touchscreen, the parameters for grinding have possibly not been completely configured or the device hood has not been closed properly.

⇨ Wait for the end of the grinding process before finally removing the sample material.

6.8 Removing the sample material

CAUTION C13.0024

Risks of burns and scalding
Hot grinding jar and/or sample material

- The sample material and grinding jar can get very hot during the grinding process.
- **After grinding, always wear protective gloves when handling the grinding jar.**
- **Never open hot grinding jars!**
- **Allow grinding jars to cool down to room temperature before opening them.**

NOTICE N19.0007

Handling foodstuffs, pharmaceuticals and cosmetic products
Products processed

- Foodstuffs, pharmaceuticals and cosmetic products that have been processed on the device may no longer be eaten, used or put into circulation,.
- **Dispose of these substances according to applicable directives.**

Fig. 30: Removing the sample material

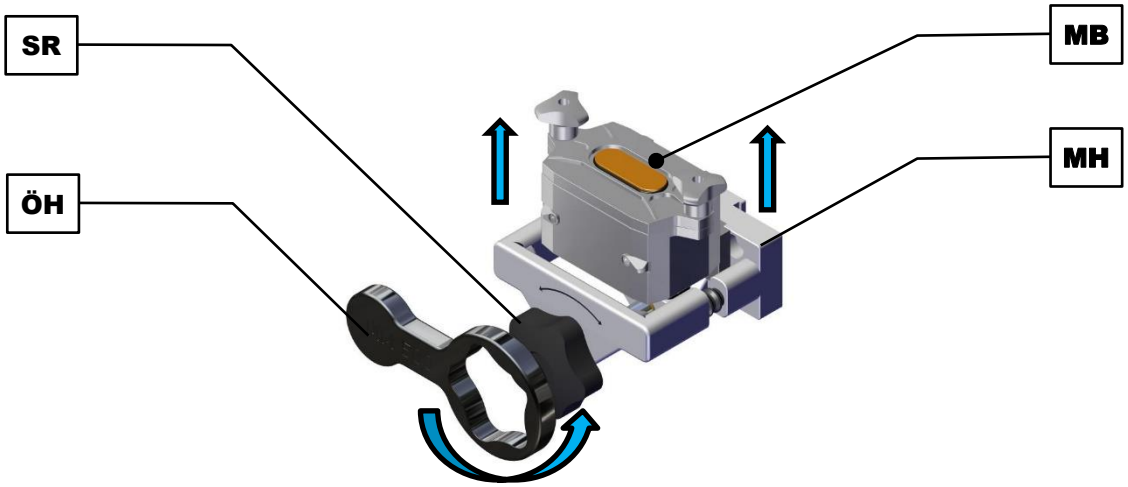


Fig. 31: Removing the grinding jar

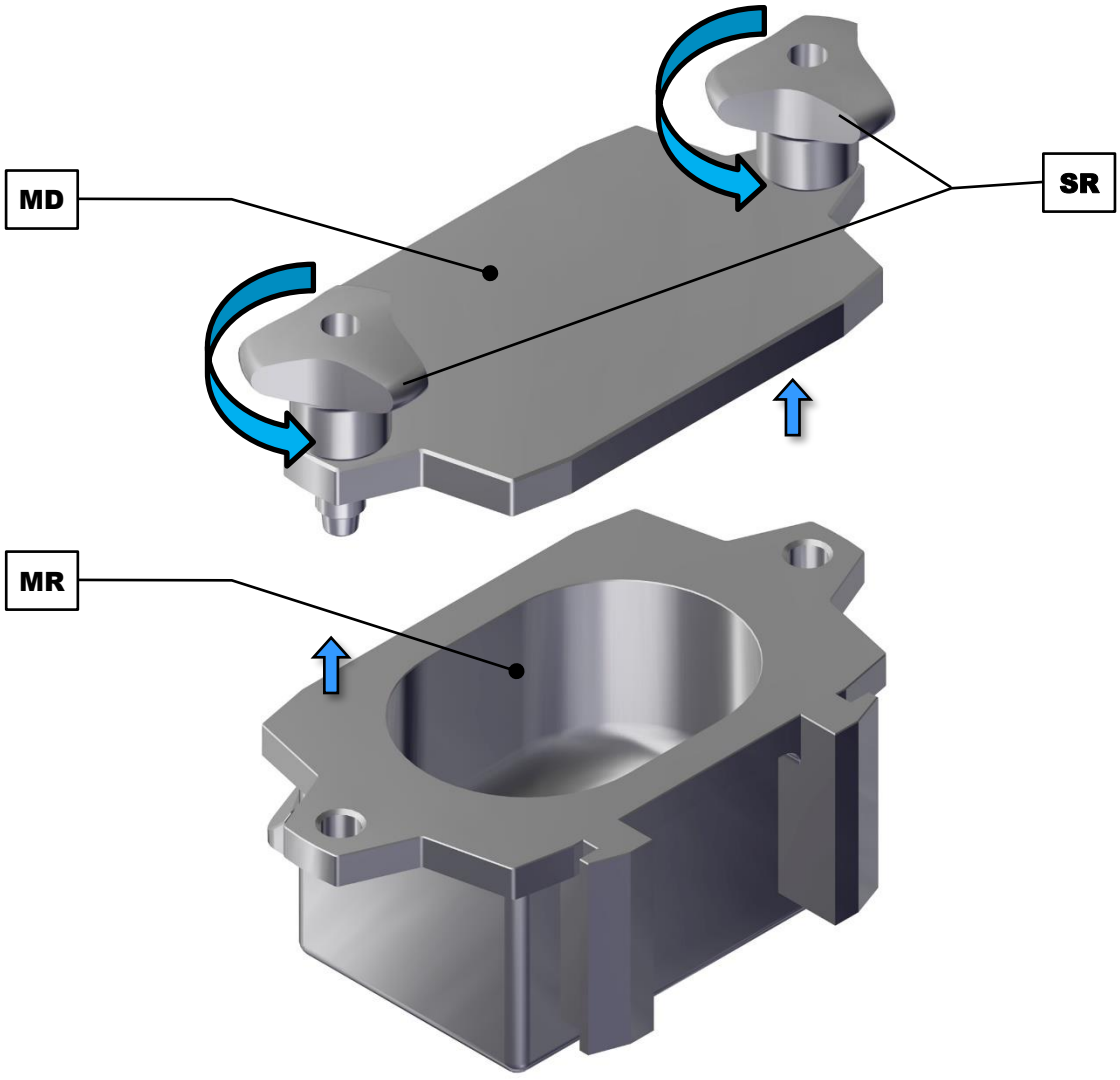


Fig. 32: Opening the grinding jar for emptying

	Component
H	Device hood
SR	Locking wheel
MH	Grinding jar support
ÖH	Opening aid
MB	Grinding jar
SP	Clamping screws
MD	Grinding jar cover
MR	Grinding chamber

Remove the sample material as follows:

⇨ Wait for the end of the grinding process.
⇨ Open the device hood (H).
⇨ Open the locking wheel (SR) on the grinding jar support (MH) by hand or using the appropriate side of the Opening aid (ÖH) if necessary.
⇨ Remove the grinding jar (MB) by pulling it up and out of the grinding jar support (MH).
⇨ Open the clamping screws (SP) on the grinding jar (MB) using the appropriate side of the opening aid (ÖH).
⇨ Lift the grinding jar cover (MD) off.
⇨ Remove the sample material from the grinding chamber (MR).

7 Device control

The device is controlled using the touchscreen in combination with the dial .

These control elements are used to configure parameter settings for grinding and to start, pause and end the grinding process.
Parameters for recurring grinding processes are configured, stored and selected as necessary in the program and cycle mode.
The system settings for the MM 500 nano are also selected from the main menu and can be changed where necessary.

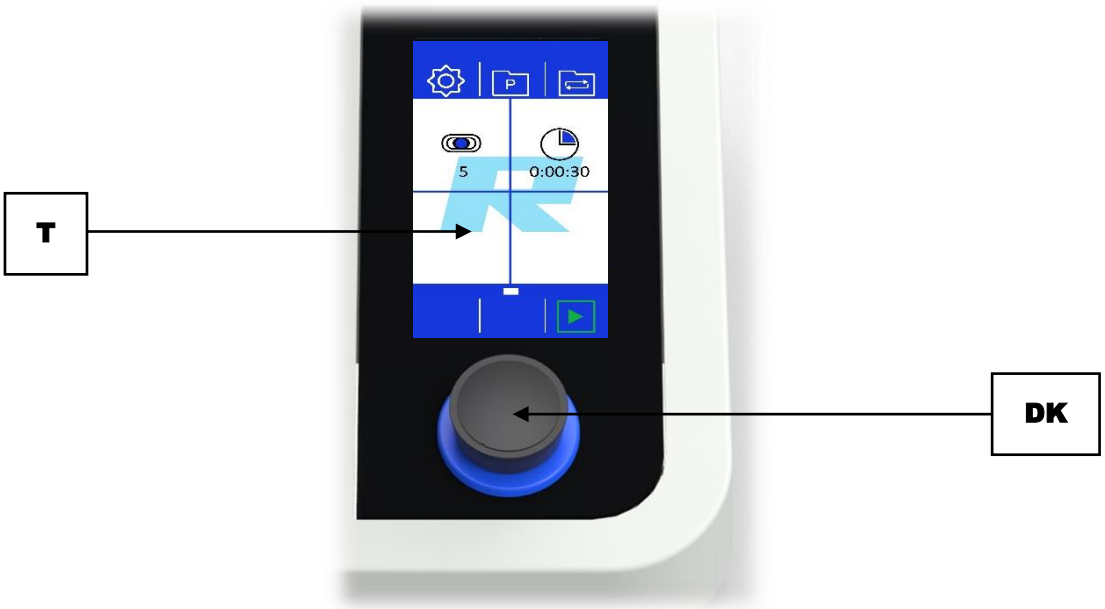


Fig. 33: Touchscreen and dial

	Control element	Function
T	Touchscreen	Touchscreen for selecting the function elements.
DK	Dial	To configure the parameters for the grinding process, the program and cycle mode and the system settings.

ⓘ The dial lights up in blue when a function element whose value can be changed by the dial is selected on the touchscreen. The section containing the function element is additionally highlighted in grey.

7.1 Menu interface on the touchscreen

The menu interface on the touchscreen is divided into the following areas:

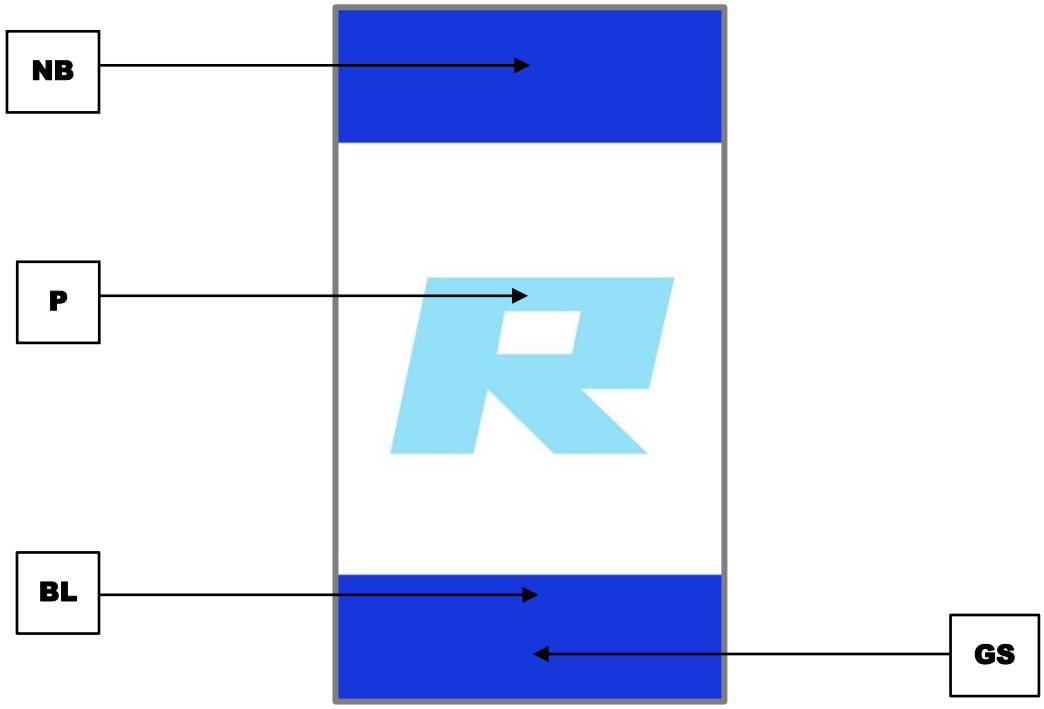


Fig. 34: Menu interface of the touchscreen

	Area	Function
NB	Navigation area	The following menu views can be selected from the navigation area: • Main menu • Program mode • Cycle mode • System settings
P	Parameter settings	The following parameters for grinding are configured in this area: • Vibration frequency • Grinding time • Cycle (sequence of parameter sets with different parameters)
	Parameter displays	The following parameters are displayed in this area once the grinding process has started: • Vibration frequency configured • Remaining grinding time • Total duration and progress of the cycle
BL	Scroll bar	Indicates the position of the menu.
GS	Control	The device is directly controlled by the function elements in this area. • Start, pause and cancel the grinding process • Select, edit, save, delete and start the program • Select, edit, save, delete and start the cycle

7.2 Function elements

Function elements are selected on the touchscreen and configured using the dial.

ⓘ Only the function elements that can currently be selected and configured are displayed and active.
The dial lights up in blue when a value that can be altered is selected.

Element	Description	Function
	Main menu	To select the main menu. Parameters for the grinding process can be configured and grinding started using the main menu.
	Open the device hood	After switching the device on, a prompt to open and close the device hood is displayed on the touchscreen. ⓘ The device is ready to use after being opened and closed once.
	Close the device hood	
	System settings	Select system settings.
	Program mode	Access to the program mode.
	Gallery view	Select gallery view. The saved programs will be displayed and can be directly selected.
	Vibration frequency	Vibration frequency for configuring the grinding process.
	Grinding time	Grinding time for configuring the grinding process.

Element	Description	Function
	Cycle mode	Access to cycle mode.
	Edit program and cycle	New programs and cycles can be created, and saved programs and cycles can be edited here.
	Delete program/cycle	Deletes a created program or a cycle.
	Save program/cycle	Saves a created program or a cycle.
	Cancel	Cancel the entry / return to the previous menu.
	Start	Start the grinding process.
	Pause	Pause the grinding process.
	Continue	Continue the grinding process after a pause.
	Stop	Stop the grinding process.

7.3 Menu navigation

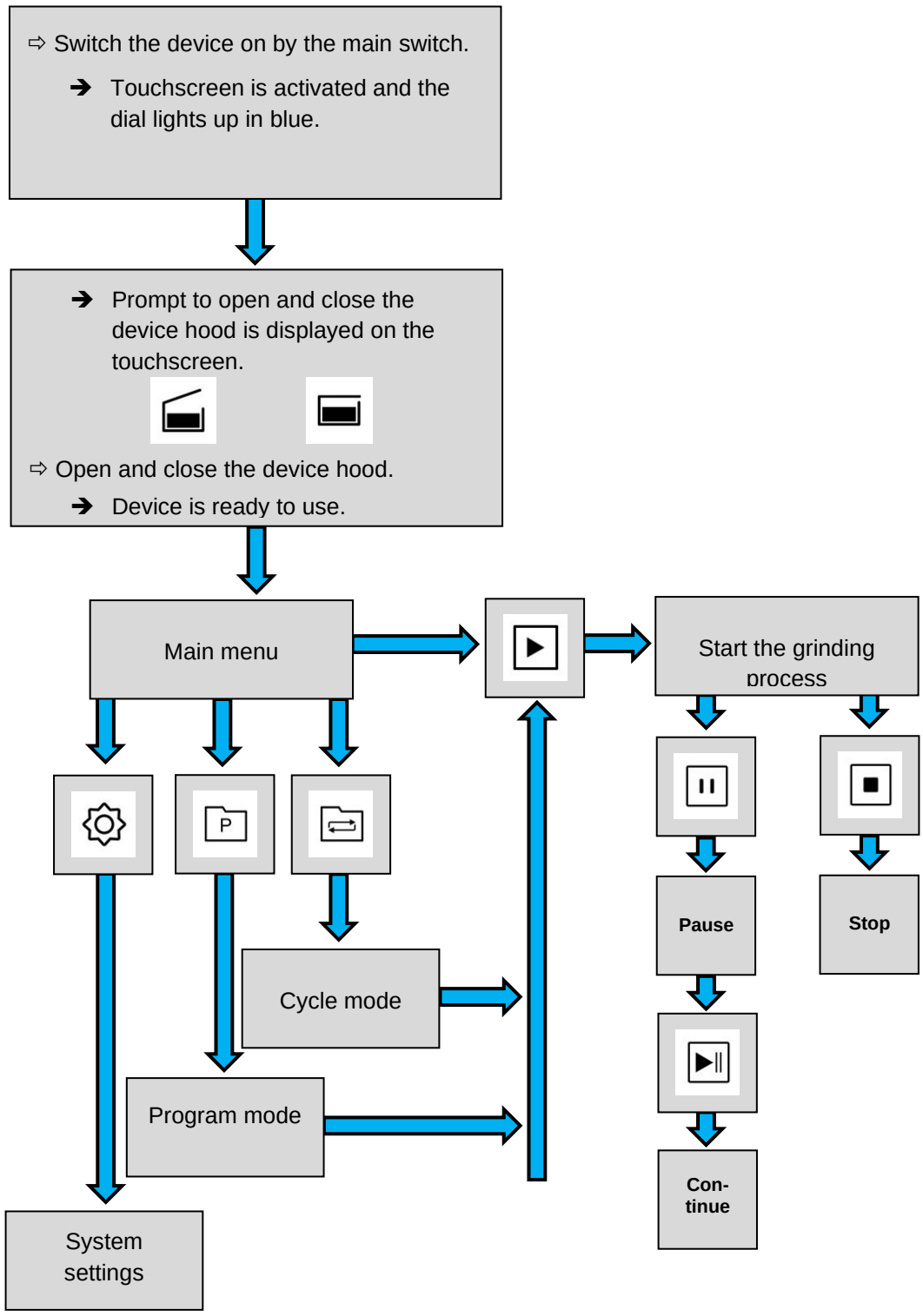


Fig. 35: Diagram of the menu navigation

7.4 Main menu

Using the main menu, other menu views can be selected, parameters configured for the grinding process and grinding can be started.

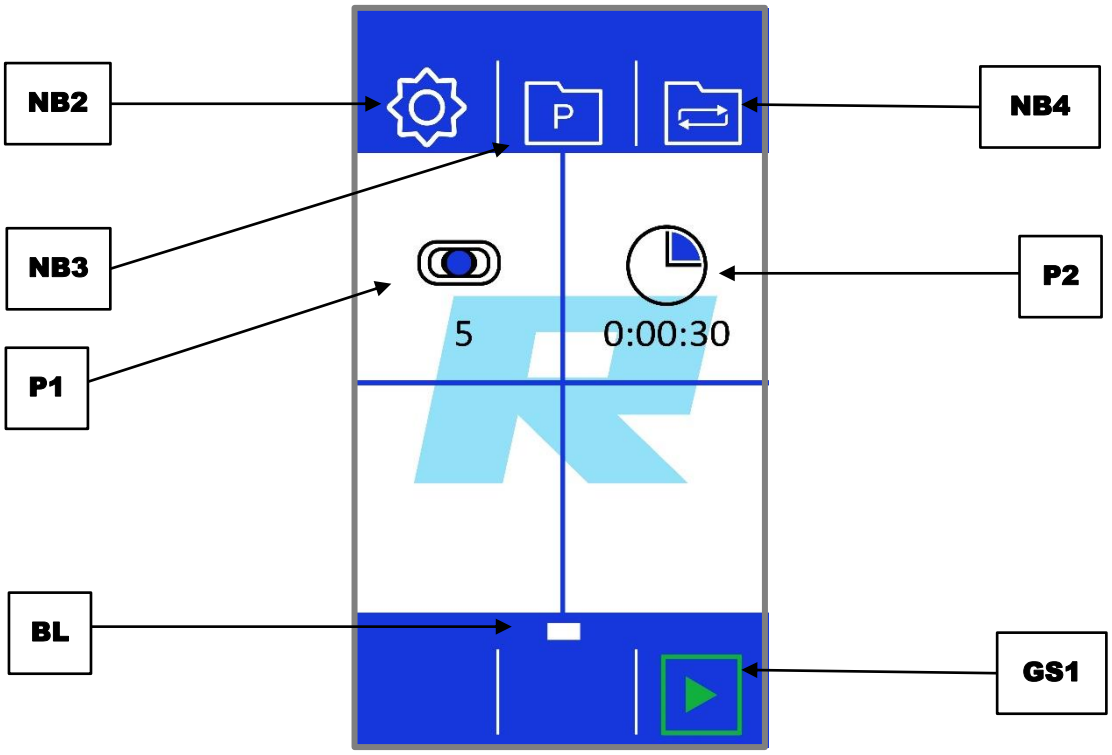


Fig. 36: Main menu

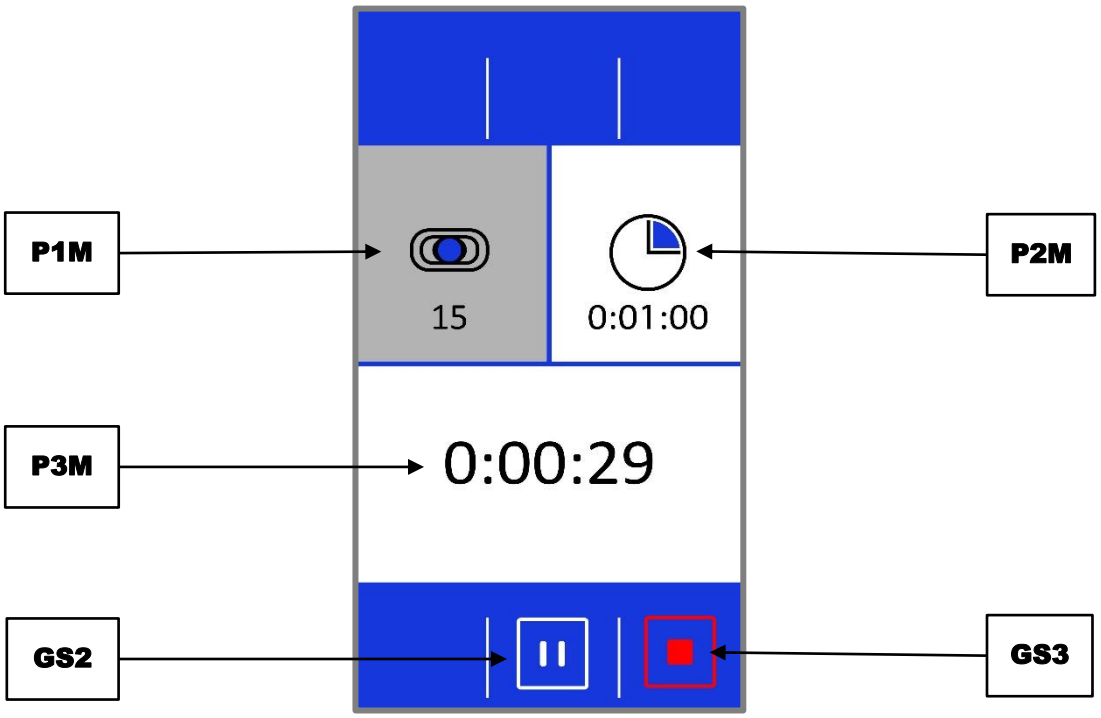


Fig. 37: Menu view after starting the grinding process

	Element	Function
NB2	System settings	To select system settings.
NB3	Program mode	For access to program mode
NB4	Cycle mode	For access to cycle mode
P1	Vibration frequency	Following selection on the touchscreen, the vibration frequency can be set to between 3 and 35 Hz using the dial.
P2	Grinding time	Following selection on the touchscreen, the grinding time can be set to between 10 seconds and 8 hours using the dial.
BL	Scroll bar	Indicates the position of the menu.
GS1	Start grinding process	Starts the grinding process after configuration of the parameters.
P1M	Vibration frequency of the grinding process	Displays the configured vibration frequency of the current grinding process.
P2M	Grinding time of the grinding process	Displays the configured grinding time of the current grinding process.
P3M	Remaining grinding time	Displays the remaining grinding time of the grinding process.
GS2	Pause grinding process	Pauses the grinding process (only after the start of the grinding process).
GS3	Stop grinding process	Stops the grinding process (only after the start of the grinding process).

7.5 Controlling the grinding process

The grinding process can be controlled from the main menu, from the program and the cycle mode using the function elements.


Start grinding process


Pause grinding process


Continue grinding process after a pause


Stop grinding process

7.6 Starting the grinding process

⇨ Press  to start the grinding.

⇨ After starting, the start sign  changes to the stop sign  .

7.7 Pausing the grinding process

⇨ Press ⏸ to pause the grinding.

⇨ After pausing, the pause sign ⏸ changes to the continue sign ⏯.

⇨ Press ⏯ to continue the grinding process after a pause.

7.8 Stopping the grinding process

The grinding process is stopped automatically once a defined grinding time has expired.

Grinding can also be actively stopped by pressing the stop button.

⇨ Press ⏹ to stop the grinding.

7.9 Program mode

Press the 🗀 button in the main menu to switch to the program mode. The display switches to the current program.

Programs can be selected, edited, saved, deleted and started in the program mode.

If sample materials are frequently ground with the same parameters, these parameters can be saved in program presets and selected when needed as standard operating procedures (SOP). Up to twelve program presets are available.

The following parameters can be saved in the individual programs:

- Vibration frequency
- Grinding time

ⓘ When starting grinding using a program, the grinding parameters cannot be changed during the grinding process.

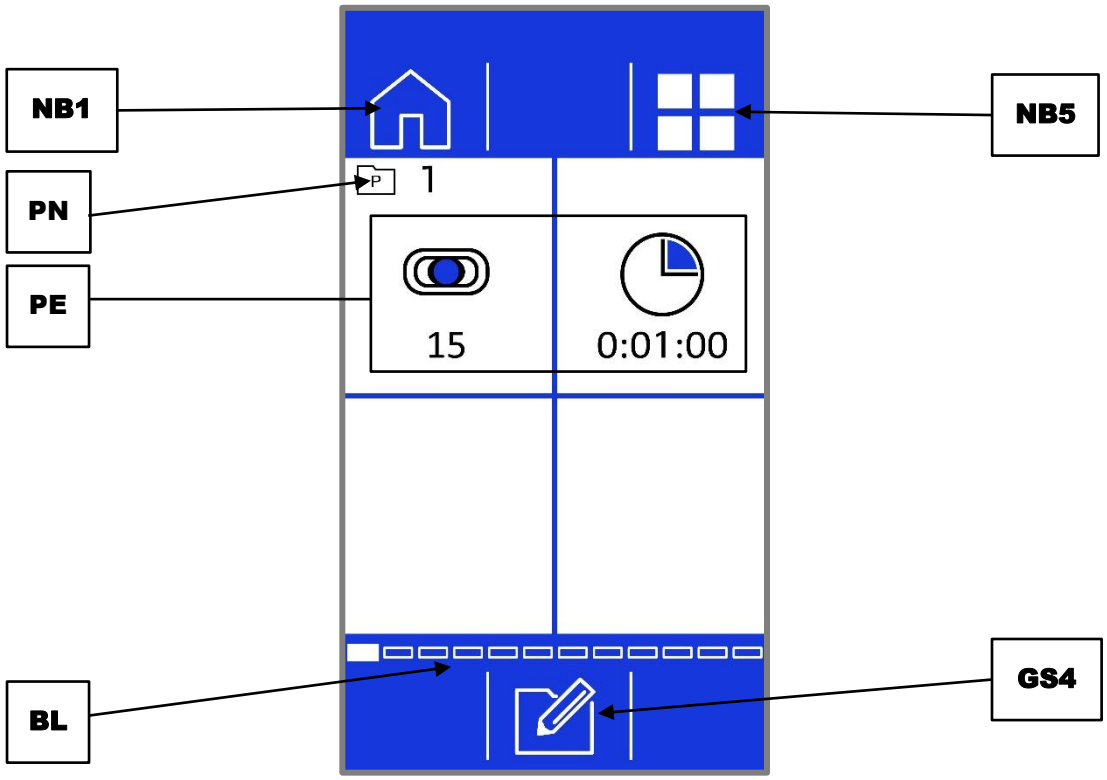


Fig. 38: Program mode

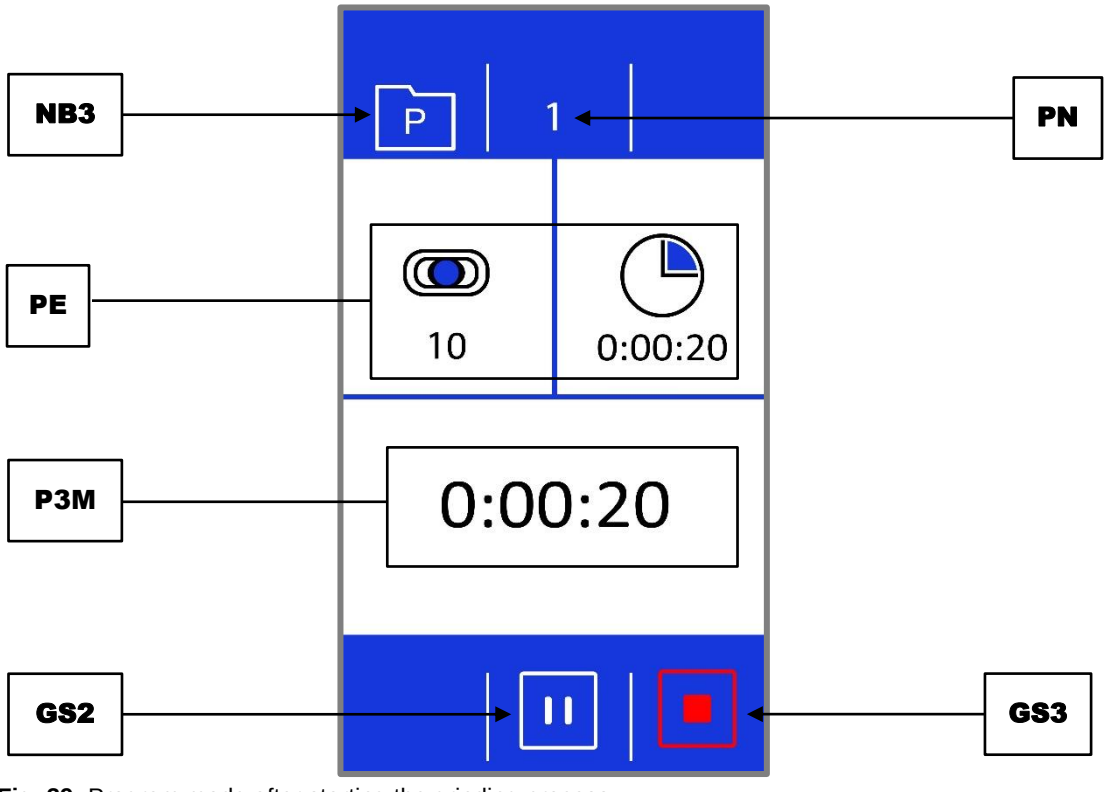


Fig. 39: Program mode after starting the grinding process

	Element	Function
NB1	Main menu	To return to the main menu.
NB5	Gallery view	Opens the gallery view for programs or the available program presets.
PN	Program number	Shows the number of the current program.

PE	Parameter settings	Shows the parameters of the active program.
BL	Scroll bar	Indicates the position of the program.
GS4	Editor mode	Opens the program editor.
NB3	Program mode	Access to program mode.
P3M	Remaining grinding time	Displays the remaining grinding time for the grinding process.
GS2	Pause	Pauses the grinding process.
G3M	Stop	Stops the grinding process.

7.9.1 Select a Program

Programs with default parameters for the grinding process can be selected in the program mode. To select a program, press the button in the main menu. The relevant program number will be displayed next to the symbol.

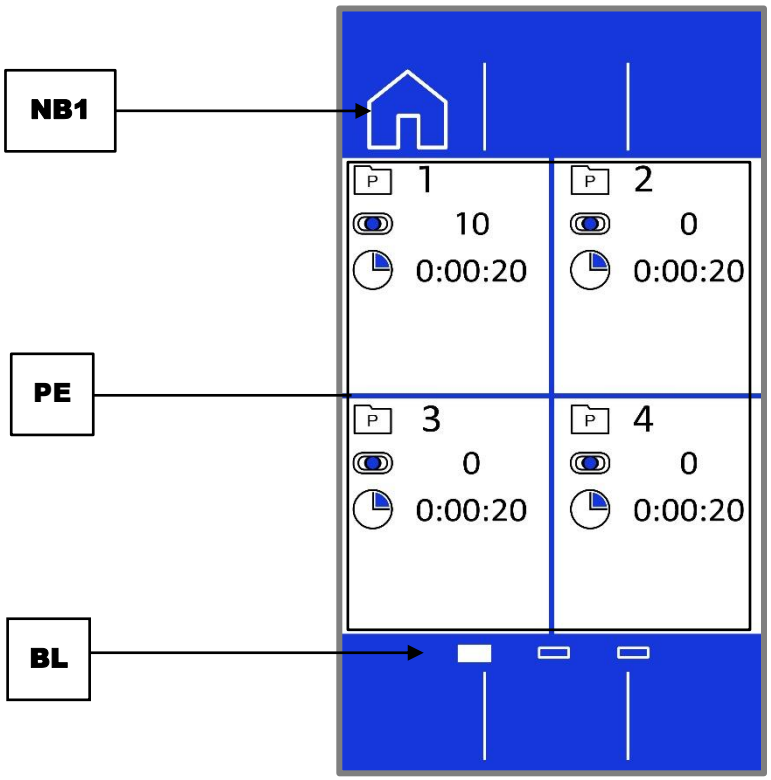


Fig. 40: Selecting a program (gallery view)

	Element	Function
NB1	Main menu	To return to the main menu.
PE	Program parameter settings	Displays the parameters configured for the current program.
BL	Scroll bar	Indicates the position of the program.

⇨ Swipe the display from right to left or from left to right to navigate through the programs. The position of the program is displayed on the scroll bar.

Alternatively the gallery view of programs can be selected by pressing . Every program is shown in a section on the menu interface of the display.

⇨ Swipe the display to switch between the program group 1 to 4, 5 to 8 and 9 to 12.
⇨ Press the upper third of the desired program section to activate a program.

⇨ Press ▶ to start the selected program and the grinding process.
⇨ Press ⌂ to exit program mode and return to the main menu .

7.9.2 Edit a Program

Programs can be created, saved and deleted in the program editor (GS4).

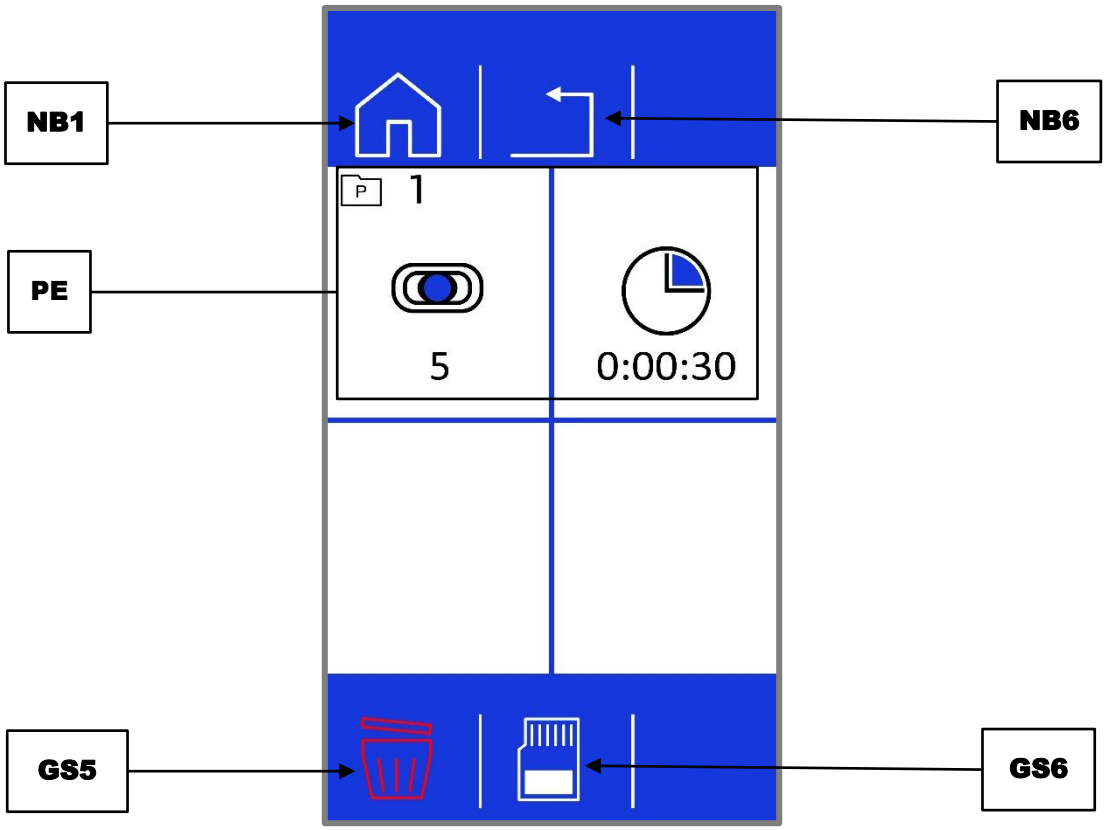


Fig. 41: Program editor

	Element	Function
NB1	Main menu	To return to the main menu.
NB6	Cancel	Cancels editing of the program.
PE	Parameter settings	Shows the parameters configured for the current program.
GS5	Delete	Deletes the parameters for the program.
GS6	Save	Saves the program.

⇨ Press ✎ in program mode to select the program editor.

ⓘ Parameters can only be changed in program mode if editing has been activated using the ✎ button.

ⓘ The process can be cancelled by pressing the ↵ button.
All settings made will then be discarded.

⇨ Press on the parameter you wish to edit.
⇨ Turn the dial, until the desired value is displayed.
⇨ Press on the parameter again or select a different parameter to accept the set value

7.9.3 Save a Programme

Proceed as follows to save the configured parameters in a program preset:

⇨ Press to save the configured parameters in the selected program preset.

7.9.4 Delete a Programme

Proceed as follows to delete the parameters of a program:

⇨ Press and keep pressed for approx. 3 seconds.
⇨ All parameters in the selected program preset will be deleted.

7.10 Cycle mode

Press the button in the main menu to switch to cycle mode. The display switches to the current cycle.

Cycles can be selected, edited, saved, deleted and started in cycle mode.

If sample materials are frequently ground with the same parameters, these parameters can be saved in cycle presets and selected when needed as standard operating procedures (SOP). Up to four cycle presets are available.

The following parameters can be saved in the individual cycles:

- Vibration frequency
- Grinding time
- Cycles (repeats of the grinding time and vibration frequency)

A cycle consists of two parameter sets (A and B). The vibration frequency and the grinding time can be freely selected for each parameter set. The complete cycle consists of the two parameter sets (A and B) and the set repeats.

ⓘ When starting grinding using a cycle, the grinding parameters cannot be changed during the grinding process.

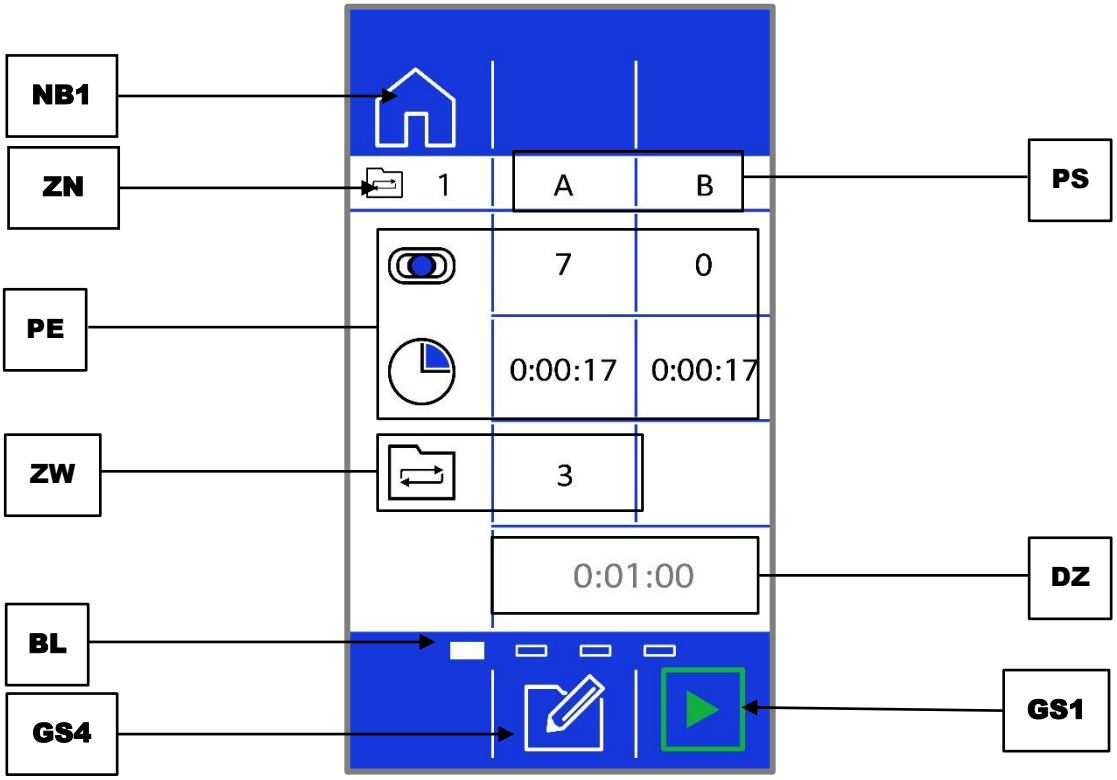


Fig. 42: Cycle mode

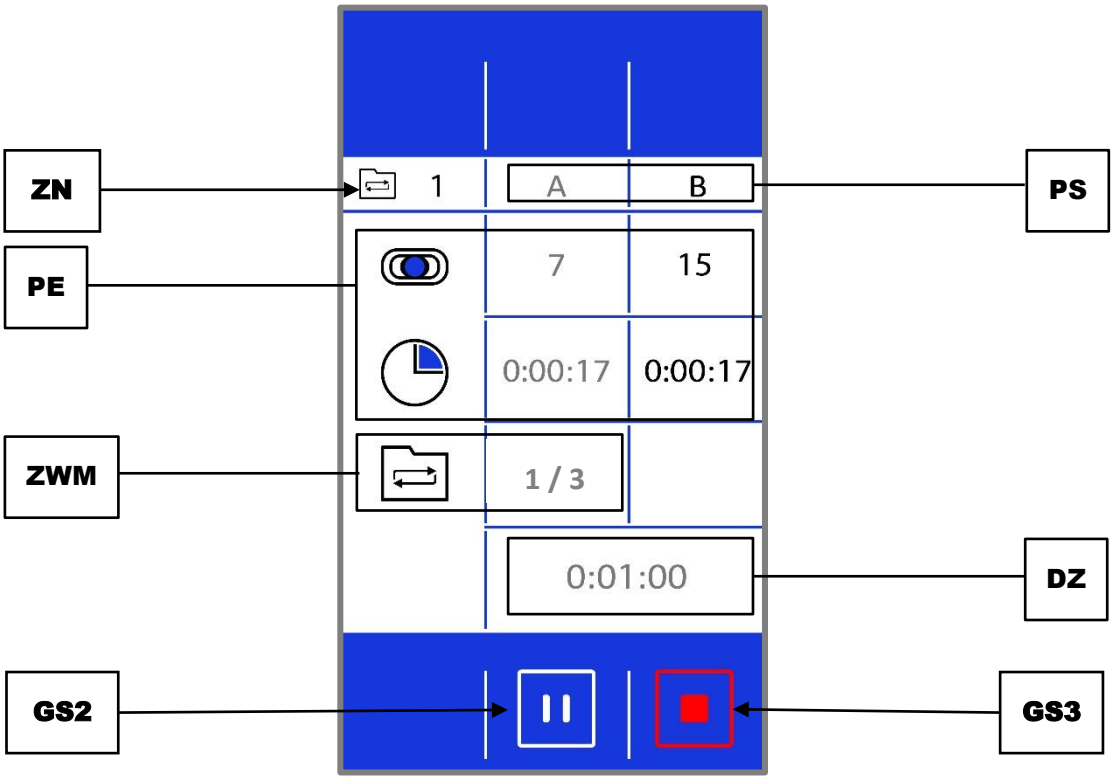


Fig. 43: Cycle mode after starting the grinding process

	Element	Function
NB1	Main menu	To return to the main menu.
ZN	Cycle number	Displays the number of the current cycle.

PE	Parameter settings	Displays the parameters of the active cycle.
ZW	Cycle repeats	Displays how often the configured cycle is repeated until the grinding process is finished.
ZWM	Status of cycle repeats	After the start of the grinding process, the current status of the cycle is displayed here.
BL	Scroll bar	Indicates the position of the cycle.
GS4	Editor mode	Opens the cycle editor.
PS	Parameter sets (A/B)	A cycle is divided into parameter sets A and B.
DZ	Total duration of the cycle	Displays the total duration of the complete cycle until the grinding process is finished.
GS1	Start cycle	Starts the grinding process or the cycle.
GS2	Pause cycle	Pauses the current cycle.
GS3	Stop cycle	Stops the current cycle.

7.10.1 Selecting the cycle

Cycles with preset parameters for the grinding process can be selected in cycle mode. To select a cycle, press the button in the main menu. The respective cycle number is displayed next to the symbol.

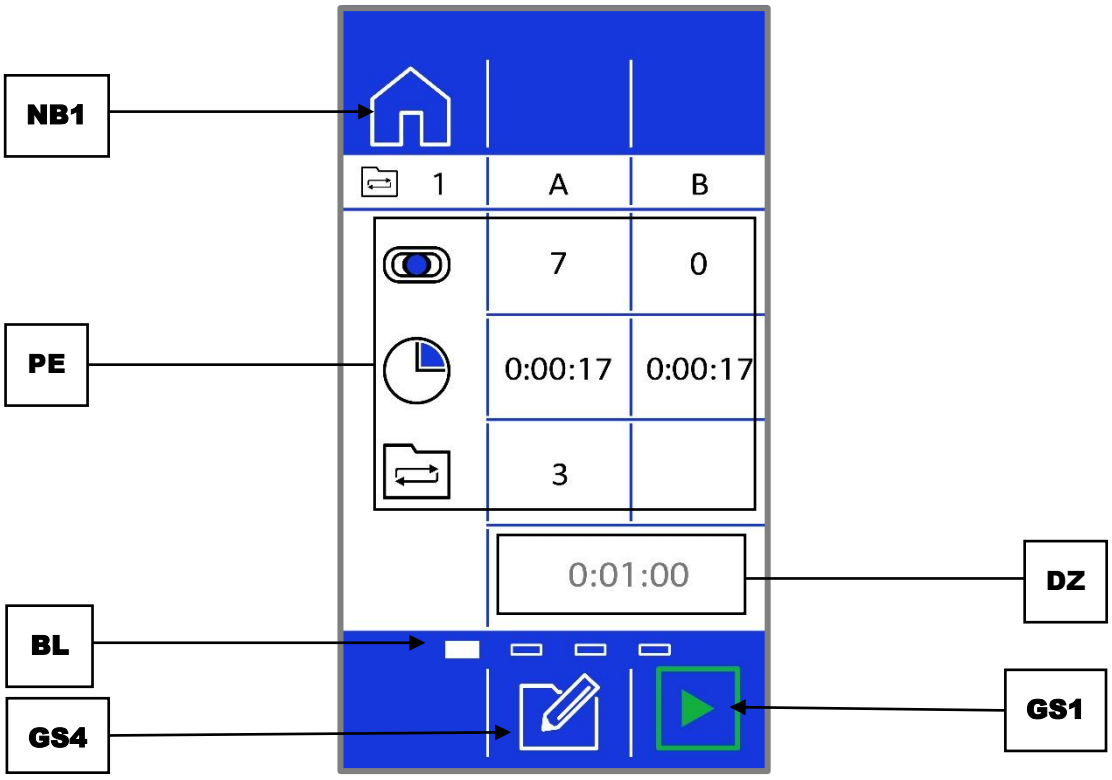


Fig. 44: Selecting the cycle

	Element	Function
NB1	Main menu	To return to the main menu.
PE	Parameter settings	Displays the parameters that are configured for the current cycle.

BL	Scroll bar	Indicates the position of the cycle.
GS4	Editor mode	Opens the cycle editor.
DZ	Total duration of the cycle	Displays the total duration of the complete cycle until the grinding process is finished.
GS1	Start cycle	Starts the grinding process for the currently selected cycle.

⇨ Swipe the display from right to left or from left to right to navigate through the cycles. The position of the cycle is displayed on the scroll bar .

⇨ Press ▶ to start the selected cycle and the grinding process.

⇨ Press ⌂ to exit cycle mode and return to the main menu.

7.10.2 Editing the cycle

Cycles can be created, edited, saved and deleted in the cycle editor.

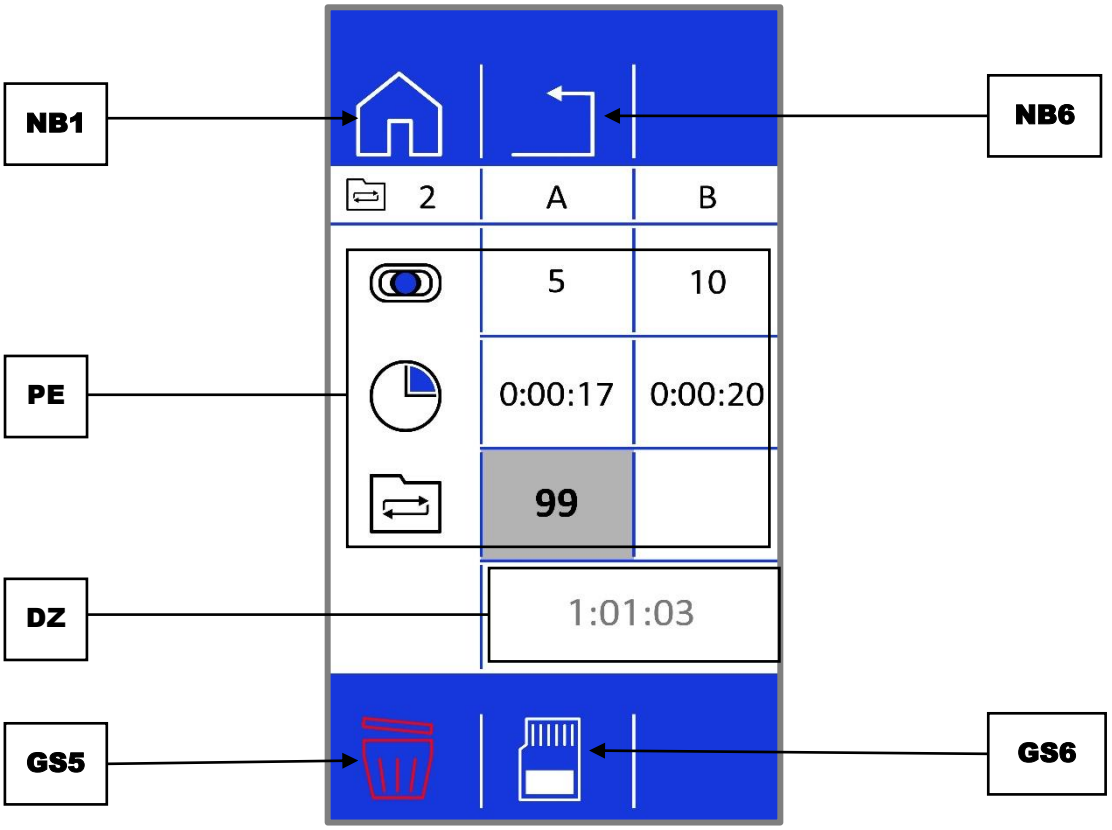


Fig. 45: Cycle editor

	Element	Function
NB1	Main menu	To return to the main menu.
NB6	Cancel	Cancels editing of the cycle.
PE	Parameter settings	Displays the parameter configured for the active cycle.
DZ	Total duration of the cycle	Displays the total duration of the cycle (the total duration consists of the two parameter sets (A/B) and the repeats). ⓘ The total duration of a cycle is limited to 99 hours.
GS5	Delete	Deletes the parameters of the cycle.
GS6	Save	Saves the cycle.

⇨ Press in cycle mode to select the cycle editor and to edit the activated cycle.

ⓘ The total duration of a cycle may not exceed 99 hours. A total duration of more than 99 hours cannot be saved and will be shown in red.

The process can be cancelled by pressing the button.
All settings made will then be discarded.

ⓘ Parameters can only be changed in cycle mode if editing has been activated using the button.

⇨ Press on the parameter you wish to edit.
⇨ Turn the dial until the desired value is displayed.
⇨ Press on the parameter again or select a different parameter to accept the set value.

7.10.3 Saving the cycle

⇨ Press to save the set parameters in the selected cycle preset.

7.10.4 Deleting the cycle

⇨ Press and hold the button for approx. three seconds to delete all parameters in the selected cycle preset.

7.11 System settings

You can access the system settings from the main menu.

⇨ Press .
⇨ Swipe from right to left or from left to right to select the three different system settings windows.
⇨ Then press on the desired section to view or configure the settings.

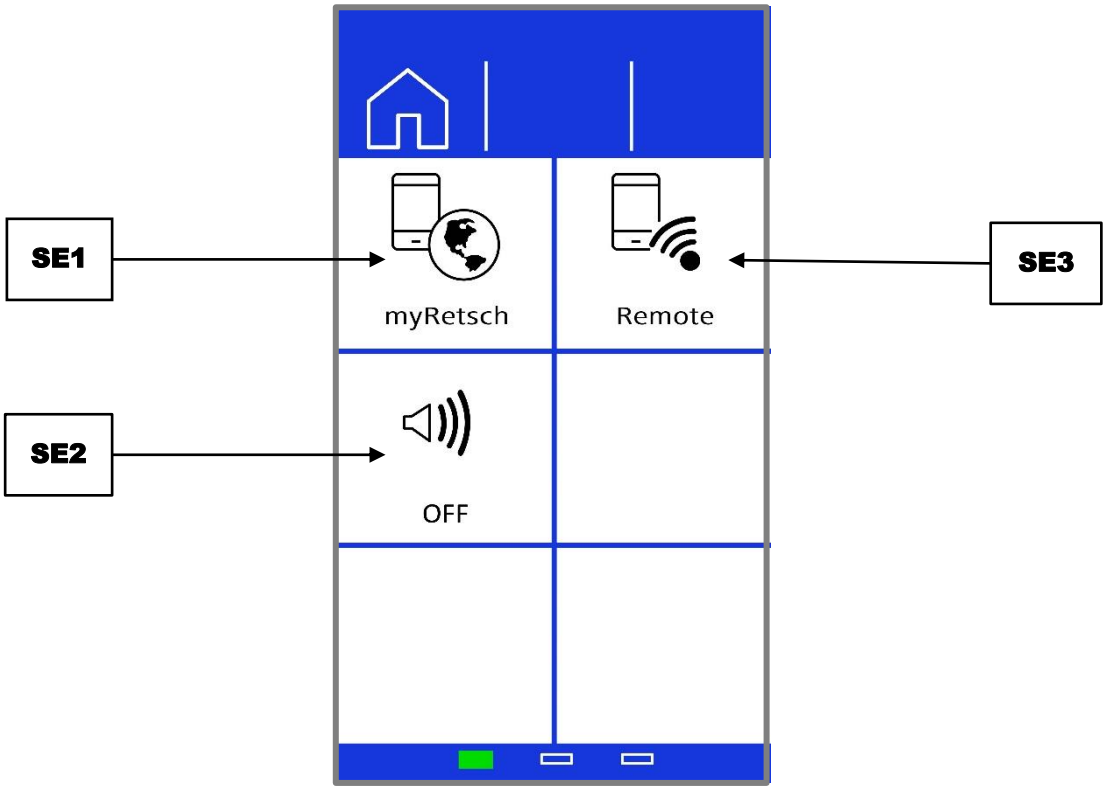


Fig. 46: System settings Page 1

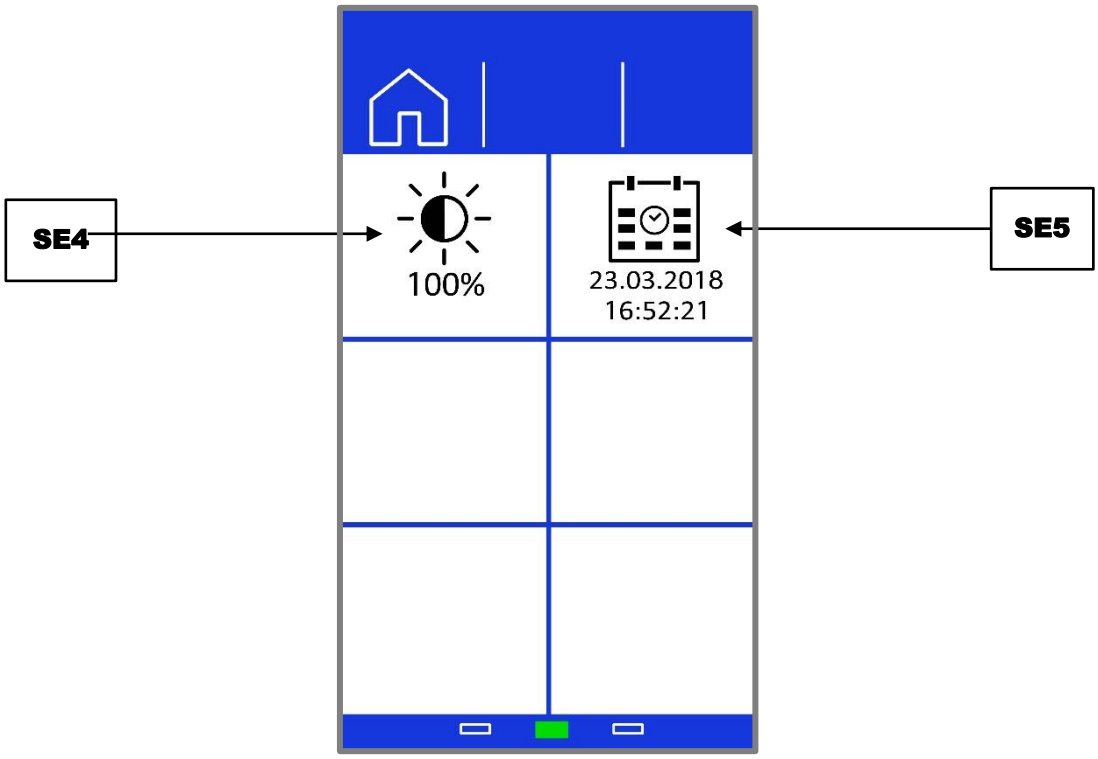


Fig. 47: System settings Page 2

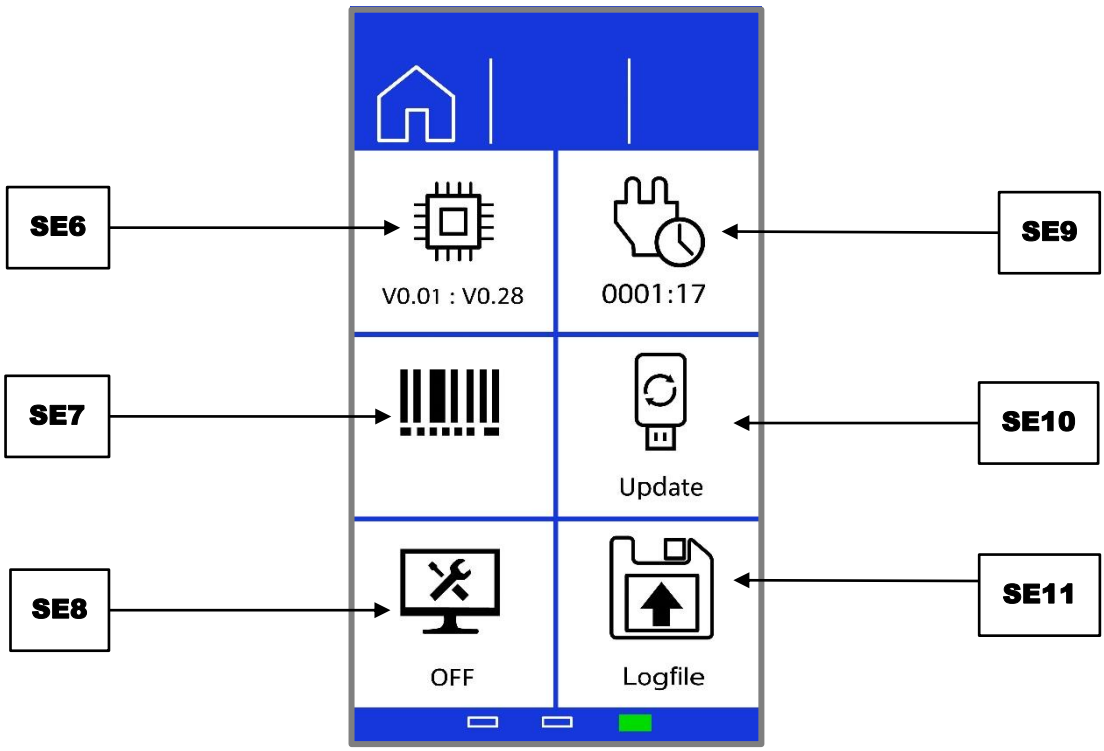


Fig. 48: System settings Page 3

	Element	Function
SE1	“myRetsch”	Shows the QR code on the display.
SE2	Signalling device (on/off)	The signalling device for the device can be switched on or off here.
SE3	Remote	When the function is selected, the device is paired to a smartphone, tablet or PC. The device can then only be operated via the phone, tablet or PC. The stop button interrupts grinding and the connection to the app.
SE4	Brightness	Adjusts the brightness level on the display.
SE5	Date and time	Displays the date and time.
SE6	Software version	Displays the software version. Display (program control): Firmware (device control)
SE7	Serial number	The serial number of the device is displayed here.
SE8	Service environment	Enables a service technician to access the service environment.
SE9	Operating hours	Displays the operating hours.
SE10	Software update	Software update on the device via a USB data carrier.
SE11	Log file	A log file for the device can be created here and saved on a USB data carrier (for reading out operating hours, error messages, information etc.). The function can only be accessed by service employees.

7.11.1 myRetsch

This section permits access to the Retsch GmbH web portal using a QR code. This can be read using a smartphone that has the relevant software and internet connection. Additional information such as tips and tricks and an application database can then be accessed.

⇨ Press this section to show the QR code.

Fig. 49: QR code

7.11.2 Remote

Selecting this section enables the device to be controlled by a mobile phone, tablet or PC.

ⓘ Remote device control is only possible after installing and setting up the optional Retschbox Wi-Fi module.

⇨ Press this section to establish a remote connection to the device.

After connecting to the device via remote, the device is controlled solely by the respective phone, tablet or PC.

The only item that can still be selected on the device is ⊡ to cancel the grinding process. The other function elements on the touchscreen are inactive.

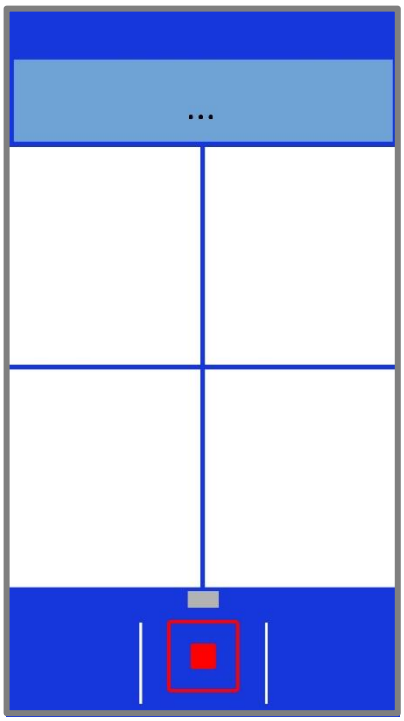


Fig. 50: Remote

ⓘ You can find further information on connecting the device to the Wi-Fi module and on the remote control of the device in the separate Retschbox manual.

7.11.3 Signalling device

The signalling device on the device can be switched on or off using this section.
The signalling device generates an acoustic signal as soon as a grinding process finishes.

7.11.4 Brightness

Proceed as follows to adjust the brightness level on the touchscreen:

⇨ Press the section.
⇨ Turn the dial until the desired level of brightness has been reached on the display.
⇨ The set value will be accepted as soon as you press this section again or on another section, or as soon as you exit system settings.

7.11.5 Date and time

Proceed as follows to adjust the date and time:

⇨ Press the section.
⇨ Select the desired settings using the dial.
⇨ The set values will be accepted as soon as you press this section again or on another section, or as soon as you exit system settings.

7.11.6 Software Version

The following two software versions of the device can be viewed in this section:

- Firmware (device control)
- Display (program control)

ⓘ The current software versions are specified in turn, whereby the firmware is listed first.

7.11.7 Operating Hours

The operating hours of the device in hours and minutes (hh:mm) are displayed in this section. The process times are counted, i.e. the total times between starting and stopping a grinding process. The time cannot be manipulated.

7.11.8 Serial number

The serial number of the device can be displayed in this section.

7.11.9 Software Update

The software can be updated using this section.

ⓘ There must be a suitable USB data carrier in the USB interface.

- The USB data carrier must be formatted to the FAT32 file system.
- USB 3.0 data carriers are not supported.
- Only the software to be installed may be located in the main directory. The device then automatically detects the new software.

Proceed as follows to update the software:

⇨ Press the  symbol to perform an update.

⇨ Wait until the transfer and installation have finished.

ⓘ The dial flashes blue until the touchscreen is restarted. This may take a few seconds.

7.11.10 Service Environment

The service environment can be accessed using this section. The service environment can only be accessed by service technicians who have been authorised by Retsch GmbH.

ⓘ If the service environment is selected, the USB interface is activated and "On" displayed beneath the  symbol. No other functions will be executed, however.

⇨ Deactivate the service environment by pressing on the section or exit the "System settings" menu by pressing the  button.

ⓘ All other functions remain deactivated while the service environment is activated.

7.11.11 Log file

Using this section a log file of the device can be prepared and saved on a USB carrier. This function is also used to read out operating hours, error messages and information, and can only be accessed by service technicians who have been authorised by Retsch GmbH.

8 Error Messages and Information Notes

8.1 Error Messages

Error messages inform the user about detected device or programme errors. In the event of an error message, a fault has occurred, in which the operation of the device or the programme is automatically interrupted. Such faults must be resolved before next startup.

Error code	Description	Measures
E11	Drive overloaded	• Turn the main switch off and wait 30 secs before switching the device back on. • Remove any foreign bodies inside the device. • Make sure that the cassette is not overfilled. • If the fault remains, contact Service at Retsch GmbH.
E20	Control fault	• Turn the main switch off and wait 30 secs before switching the device back on. • If the fault remains, contact Service at Retsch GmbH.
E25	Display fault	
E26	Frequency converter fault	
E41	Speed sensor fault	
E50	Safety circuit fault	
E80	USB interface fault	

8.2 Information Notes

Notices inform the user on specific device or programme processes. The operation of the device or programme may be interrupted briefly, but there is no fault. The information notice must be acknowledged by the user to continue the process. Information notices provide additional information for the user as an aid, but do not represent any device or programme errors.

Information code	Description	Measures
H10	Motor is overheated.	• Allow the motor to cool down.
H42	Safety inspection after commissioning the device.	• Open the device hood and close it again.

9 Servicing

This chapter contains descriptions on cleaning and maintaining the MM 500 nano.

CAUTION C14.0013

Risk of injury
Improper repairs

– Unauthorised and improper repairs can cause injuries.
- **Repairs to the device may only be carried out by the Retsch GmbH , an authorised representative or by qualified service technicians.**
- **Do not carry out any unauthorised or improper repairs to the device!**

9.1 Cleaning

Cleaning must be performed when necessary and at least monthly to ensure the reliability and operational safety of the MM 500 nano.

WARNING W9.0003

Risk to life caused by an electric shock
Cleaning live parts with water

– Cleaning the device with water can lead to life-threatening injuries caused by an electric shock if the device has not been disconnected from the power supply.
- **Only carry out cleaning work on the device when it has been disconnected from the power supply.**
- **Use a cloth moistened with water for cleaning.**
- **Do not clean the device under running water!**

WARNING W10.0008

Risk of death caused by an electric shock
Penetration of water if the mains plug is not fully plugged in

– If the IEC connector is not fully plugged in to the IEC appliance socket, water may enter the socket causing an electric shock.
- **Only operate the device with the IEC connector fully plugged in.**

CAUTION C15.0031

Risk of injury
Cleaning with compressed air

– When using compressed air for cleaning purposes dust and remnant of the sample material can be flung around and injure eyes.
- **Always wear safety glasses when cleaning with compressed air.**
- **Observe the material safety data sheets of the sample material.**

9.1.1 Cleaning the outside of the device

⇨ Clean the housing of the device with a damp cloth and if necessary, with a household cleaning agent. Pay attention that no water or cleaning agent enters the interior of the device.

9.1.2 Cleaning the collecting tray

Clean the collecting tray using a damp cloth and a standard household cleaning agent if necessary.

9.1.3 Cleaning the inside

Clean the inside of the device using a vacuum cleaner or a damp cloth and a standard household cleaning agent if necessary.
During cleaning, the collecting receptacle underneath the grinding stations can be removed and cleaned separately.
Ensure that no water or detergent gets inside the device.

9.1.4 Cleaning the grinding jar

All grinding jars, including those with glued-in ceramic inserts , can be cleaned using alcohol, benzine or normal household detergent.

ⓘ Cleaning in a dishwasher is also possible.

After cleaning, the grinding jars can be dried in the drying cabinet at the following temperatures:

Grinding jar material	Temperature
Hardened steel	Up to 200 °C
Stainless steel	Up to 200 °C
Tungsten carbide(TC)	Up to 150 °C
Zirconium oxide	Up to 120 °C

9.1.5 Cleaning the grinding balls

All grinding balls can be cleaned using alcohol, benzine or normal household detergent.

ⓘ Cleaning in a dishwasher is also possible.

9.2 Maintenance

The MM 500 nano is maintenance-free.
No maintenance work needs to be carried out if the device is used as intended.

⚠ CAUTION C16.0015

Risk of injury
Improper modifications to the device

- Improper modifications to the device can result in injuries.
- **Do not make any unauthorised changes to the device.**
- **Only use the spare parts and accessories approved by Retsch GmbH!**

9.3 Wear

⚠ CAUTION C17.0013

Risk of injury
Improper repairs

- Unauthorised and improper repairs can cause injuries.
- **Repairs to the device may only be carried out by the Retsch GmbH , an authorised representative or by qualified service technicians.**
- **Do not carry out any unauthorised or improper repairs to the device!**

The grinding tools may become worn, depending on the frequency of the grinding operation and the sample material. The grinding jars and, depending on the presence, the grinding balls or grinding set should be regularly checked for wear and replaced if necessary.

Likewise, all existing sealing gaskets (of grinding tools and in the device) should be checked for wear regularly and replaced if necessary.

9.4 Returning for repair and maintenance

Fig. 51: Return form

The acceptance of devices and accessories of the Retsch GmbH for repair, maintenance or calibration can only be effected, if the return form including the decontamination declaration service has been correctly and fully completed.

⇨ Download the return form located in the download section "Miscellaneous" on the Retsch GmbH homepage (http://www.retsch.com/downloads/miscellaneous/).

⇨ When returning a device, attach the return form to the outside of the packaging.

In order to eliminate any health risk to the service technicians, Retsch GmbH reserves the right to refuse the acceptance and to return the respective delivery at the expense of the sender.

10 Accessories

Information about available accessories and corresponding manuals for the device can be found directly on the Retsch GmbH website (http://www.retsch.com) under "Downloads" and viewed on the myRetsch portal.

Information on wear parts and small accessories can be found in the complete catalogue of Retsch GmbH which is likewise available on the website.

Please contact the Retsch GmbH agent in your country or Retsch GmbH directly if you have any questions regarding spare parts .

11 Disposal

In the case of a disposal, the respective statutory requirements must be observed. In the following, information on the disposal of electrical and electronic devices in the European Community are given.

Within the European Community the disposal of electrically operated devices is regulated by national provisions that are based on the EU Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE).

Accordingly, all devices supplied after August 13th 2005 in the business-to-business area, to which this product is classified, may no longer be disposed of with municipal or household waste. To document this, the devices are provided with the disposal label.

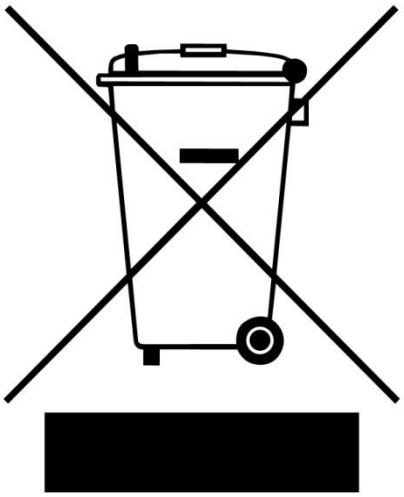


Fig. 1: Disposal label

Since the disposal regulations worldwide and also within the EU may differ from country to country, the supplier of the device should be consulted directly in case of need.

This labelling obligation is applied in Germany since March 23rd 2006. From this date on, the manufacturer must provide an adequate possibility of returning all devices delivered since August 13th 2005. For all devices delivered before August 13th 2005 the end user is responsible for the proper disposal.

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Retsch

EC Declaration of Conformity

Translation of the Original

MIXER MILL

MM 500 | 20.765.xxxx

EU DECLARATION OF CONFORMITY

We, represented by the undersigned, hereby declare that the above device conforms to the following directives and harmonised standards:

Machinery Directive 2006/42/EC

Applied standards, in particular:

ISO 12100:2010	Safety of machinery
DIN EN ISO 13849-1:2015	Safety of machinery – Safety-related parts of control systems
DIN EN 60204-1:2006	Safety of machinery – Electrical equipment of machines
EN 1005-3:2002	Recommended force limits for machinery operation
EN ISO 14118:2018	Prevention of unexpected start-up
EN ISO 14119:2013	Interlocking devices associated with guards
EN ISO 14120:2015	Guards
ISO 14123-1:2015	Hazardous substances emitted by machinery

Electromagnetic compatibility 2014/30/EU

Applied standards, in particular:

DIN EN 55011:2009	Industrial, scientific and medical equipment. Radio-frequency disturbance characteristics. Limits and methods of measurement
EN 61000-3-2:2014	Electromagnetic compatibility (EMC) Limits for harmonic current emissions
EN 61000-3-3:2103	Electromagnetic compatibility (EMC) Limitation of voltage changes
EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use. EMC requirements.

Restriction of hazardous substances 2014/30/EU

Applied standards, in particular:

DIN EN 50581:2012	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Person authorised to compile the technical documents:

Stefan Drechsler (Technical documentation)

We furthermore declare that the technical documentation for the above device has been compiled in accordance with Annex VII Part A of the Machinery Directive, and we undertake to submit these documents to the market surveillance authorities on request.

This declaration shall cease to be valid in the event of a change to the device not agreed with Retsch GmbH or the use of non-approved spare parts or accessories.

Retsch GmbH

Dr. Alexander Mühlig, Technical Manager

Haan, 03/2019

CE

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