Manual

Drum Mill TM 500

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 0002 of the "Drum Mill TM 500" 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

2 Safety

Safety Officer
The operating company itself must ensure the following with respect to persons authorised to work on the device:

- that they have read and understood all regulations contained in the chapter on safety;
- that they are aware before they start work of all instructions and regulations for the target group related to the work;
- that they have easy access to the manual for this device at all times;
- that they have been familiarised with the safe and correct handling of the device before starting work on it, by means of a verbal introduction by a competent person and/or using this manual.

⚠ Improper operation can lead to personal injuries. The operating company itself is responsible for its safety and that of its staff. The operating company itself must ensure that no unauthorised persons have access to the device.

Target group
All those operating, cleaning or working with or on the device.

This device is a modern, powerful product from Retsch GmbH and has been developed in line with the state-of-the art. The device is safe to use when operated correctly and when following the instructions in this manual.

⚠ People under the influence of intoxicating substances (medications, drugs, alcohol) or who are overtired may not operate the device or work on the device.

2.1 Explanations of the Safety Instructions

The following **warnings** in this manual warn of possible risks and damage:

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.

2.2 General Safety Instructions

⚠ 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.**

⚠ CAUTION C3.0015

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!**

NOTICE N2.0012

Changes to the device
Improper modifications

– The conformity declared by Retsch GmbH with the European Directives will lose its validity.
– Any warranty claims will be terminated.
- **Do not make any modification to the device.**
- **Use spare parts and accessories that have been approved by Retsch GmbH exclusively.**

WARNING

W2.0000

Risk of death caused by an electric shock
Strong voltage due to capacitor discharge

- Due to capacitor discharge on the frequency convertor, the machine conducts voltage for up to **3 minutes** after it has been unplugged.
- There is a risk of touching live contacts when the machine is open. An electric shock can result in burns and cardiac arrythmia, or in respiratory failure and cardiac arrest.
- **After disconnecting the mains lead, wait 3 minutes before opening the machine.**

WARNING Leakage currents of up to 38 mA can occur in a frequency range of up to 300 kHz. Measurement with Keithley 2000 Digital Multimeter using a 10 megohm shunt.

2.3 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:

2.4 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 Packaging, Transport and Installation

3.1 Packaging

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

NOTICE N3.0001

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.**

3.2 Transport

NOTICE N4.0017

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 N5.0014

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.**

3.3 Temperature Fluctuations and Condensation

NOTICE N6.0016

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.

3.4 Conditions for the Installation Site

NOTICE N7.0021

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.**

- Installation height: max. 2 000 m above sea level
- Ambient temperature: 5 °C – 40 °C
- 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 N8.0015

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.**

NOTICE N9.0000

Damage to property
Transport and storage temperature

- Electronic and mechanical components can be damaged.
- **During transport and storage, temperatures should be between -25 °C and 55 °C. For short periods of not more than 24 hours, 70 °C must not be exceeded.**

3.5 Electrical Connection

WARNING W3.0015

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).**

NOTICE N10.0022

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.

- Information about the required voltage and frequency of the device can be found on the type plate.
- The listed values must agree with the existing mains supply.
- The device may only be connected to the power supply using the connection cable supplied.

The drive on the machine is fitted with a frequency converter . In order to comply with the EMC Directive , this is equipped with a mains filter and shielded cables to the motor. If your mains connection for the machine includes a residual current device , the anti-interference circuit on the frequency converter may result in false alarms on the residual current device when it is

switched on – it is always switched on when the grinding chamber cover is closed – without there being any fault on the machine or the mains installation.
In accordance with the state of the art, selected all current sensitive residual current devices are recommended for such cases. The trip current must be adequately dimensioned because short-term capacitive compensation currents (shielded cable, mains filters) can easily lead to false alarms when switched on.
In some circumstances it may be necessary to operate the machine without the residual current device, although in this case checks must be conducted to ensure that this does not contradict any local regulations of electricity companies or other institutions as well as any applicable standards.

3.6 Type Plate Description

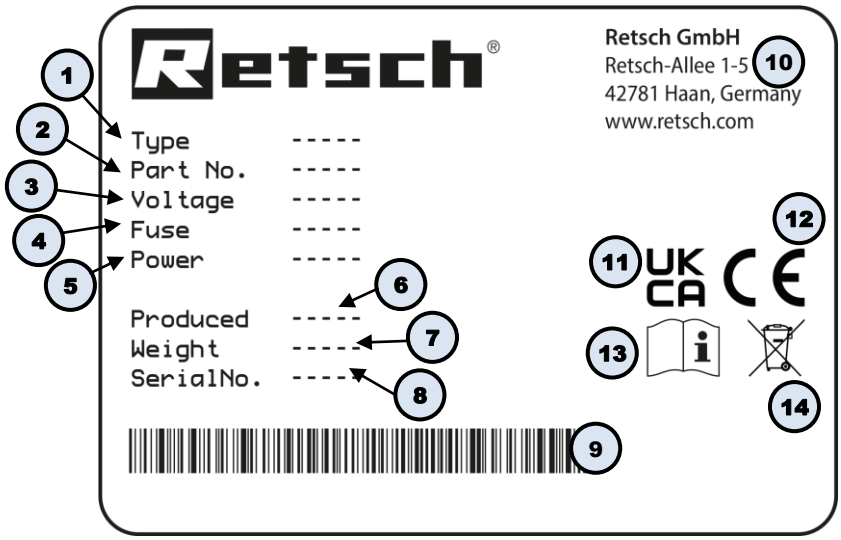

Fig. 1: Type plate

1 Device designation
2 Part number
3 Power version, Mains frequency
4 Fuse type and fuse strength
5 Capacity, Amperage
6 Year of production
7 Weight
8 Serial number
9 Bar code
10 Manufacturer's address
11 UKCA marking
12 CE marking
13 Safety warning: Read the manual
14 Disposal label

ⓘ In the case of queries please provide the device designation (**1**) or part number (**2**), as well as the serial number (**8**) of the device.
designation (**1**) or part number (**3**), as well as the serial number (**4**) of the device.

4 Description

4.1 Intended use

The TM 500 has been designed for grinding soft, medium-hard, fibrous and brittle sample material in a dry state and with a particle size of up to 20 mm.

With its large grinding drum, the machine is suitable for the fast, loss-free and powerful dry grinding of large volumes or quantities of sample material in continuous operation and delivers reproducible results.

The operator and operating staff must have read the manual and be familiar with the full range of functions of the machine.

Sample materials include the following substances:
- Waste samples
- Activated carbon
- Building rubble
- Concrete
- Soil
- Cellulose
- Electronic scrap
- Pigments
- Plaster
- Glass
- Limestone
- Kaolin
- Catalysers
- Ceramics
- Coal
- Compost
- Plant parts
- Polymers
- Quartz
- Seeds
- Slag
- Tobacco
- Cement
- Cement clinker
- Tiles

The machine has been designed for stationary operation in a clean and dry working environment. As a laboratory device, the machine may only be used to prepare samples and preparation of solids.

The user can set the grinding time, speed and pauses (e.g. to cool the ground material) or the delayed start function on the display. With the automatic swivel mode, the grinding drum can be ergonomically emptied.

The device meets high standards of cleanliness, speed, fineness, reproducibility and safety. The grinding drum is sealed to avoid loss when working.

Due to its robust design, the machine can also be used for the following areas in industry and research:

- Construction materials
- Geology
- Mineralogy
- Metallurgy
- Environmental sector
- Pharma sector

4.2 Improper use

⚠ CAUTION C4.0015

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!**

The machine may only be used as intended.

Any use other than those described under intended use are regarded as improper.

The machine is not suitable for processing sample materials that may 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.

4.3 Views of the device

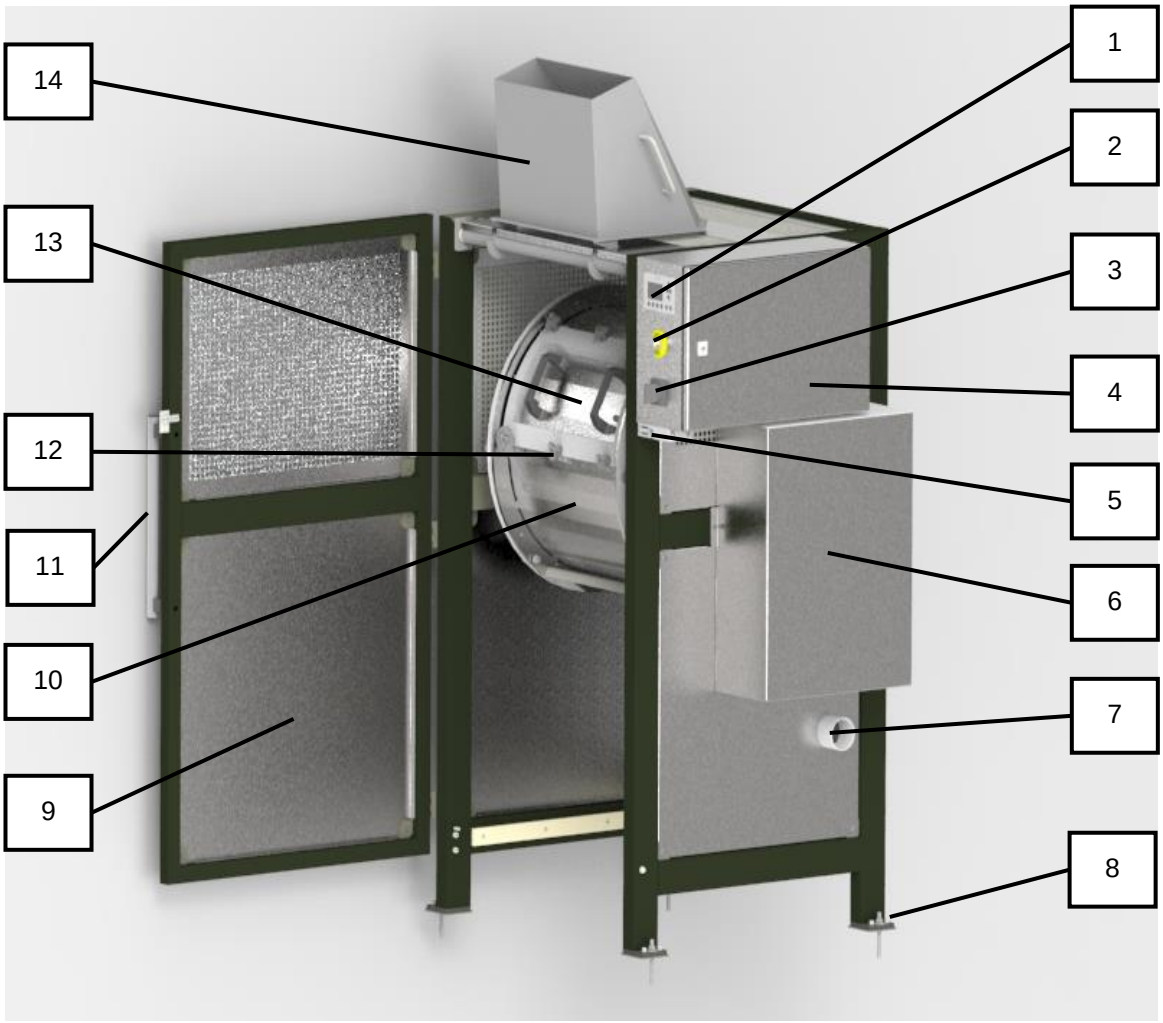

Abb. 2: Components of the TM 500 machine

Number	Component	Function
1	Display	• Secures the machine door • Releases the machine door • Controls operation • Displays operating states
2	Emergency stop button	Triggers the immediate stopping of the machine in an emergency
3	Mains power switch	Switches the machine on/off
4	Control unit cover	Protects the control electronics
5	Emergency release	Opens the machine door in an emergency
6	Motor cover	Protects the motor
7	100 mm opening	Enables an exhaust air system to be connected
8		Allows the device to be screwed to the floor
9	Machine door	Secures the grinding drum area
10	Grinding drum	Accommodates the sample material and grinding balls
11	Handle	Handle for opening and closing the door

12	Star Knob	6 star knobs secure the grinding drum lid
13	Grinding drum lid	Closes the grinding drum
14	Hopper	Used to fill in the sample material and the grinding balls

4.4 Technical data

Parameter	Value
Machine type designation	TM 500
Target group	• Operator • User
Weight	470 kg
Dimensions	• Height: 1607 mm (incl. Hopper 1982 mm) • Width: 1105 mm • Depth: 940 mm (machine door closed) • Depth: 1741 mm (machine door open 90°)
Installation height	Max. 2000 m above sea level
Ambient temperature	5 °C – 40 °C
Rel. air humidity at ambient temperatures ≤ 31 °C	< 80 %
Grinding drum volume	150 l
Grinding drum dimensions	• Diameter: 610 mm • Length: 570 mm
Particle size of sample material	< 20 mm
Large grinding balls	10 – 30 mm
Feed quantity	35 l / 50 kg
Final fineness	< 14 µm
Voltage	200 – 240 V
Frequency	50/60 Hz
Output	2200 W
Operating speed	10 – 50 rpm
Leakage current	Leakage currents of up to 38 mA can occur in a frequency range of up to 300 kHz. Measurement with Keithley 2000 Digital Multimeter using a 10m Ohm shunt.
Speed in SLS (Safely Limited Speed) mode (sample material removal): the machine ensures that a maximum speed is not exceeded	< 4 rpm
Noise emissions	> 85 dB(A)
Protection class	IP 30
Safety systems	• Machine can only be started when the door is closed • The door can only be opened when the machine has come to a standstill • SLS mode permits slow movement with the door open

Noise data
Noise measurement in accordance with DIN 45635-31-01-KL3
The noise parameters are largely influenced by the properties of the sample material.

Example:
Measurement after 0 hours at 10 rpm
Sound power level L_{eq}(A) = 78.8 dB(A)
Measurement after 0 hours at 50 rpm
Sound power level L_{eq}(A) = 94.0 dB(A)

Measurement after 4 hours at 10 rpm
Sound power level L_{eq}(A) = 75.3 dB(A)
Measurement after 4 hours at 50 rpm
Sound power level L_{eq}(A) = 97.2 dB(A)

Operating conditions:
Feed material: 40 kg quartz gravel, particle size 2-5 mm; 80 kg 30 mm grinding balls

⚠ CAUTION

C5.0045

Damage to hearing
A high sound level can arise depending on the type of material, the grinding balls used and the grinding time.

- Excessive noise in terms of intensity and duration can cause impairments or lasting damage to hearing.
- **Suitable noise protection measures must be taken, or hearing protection worn.**

4.5 Installation drawing

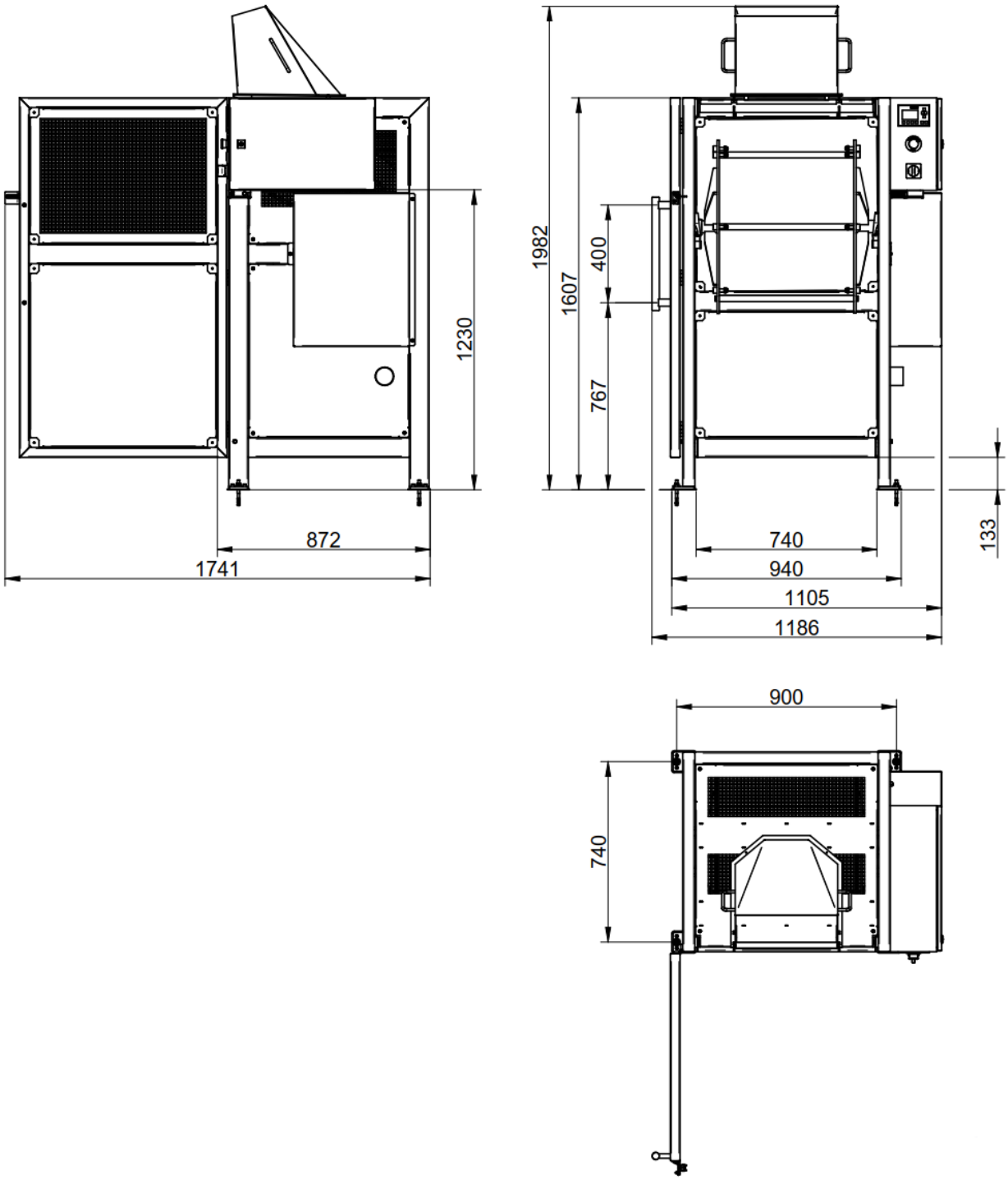

Fig. 3: Installation drawing

5 Putting into service

CAUTION C6.0005

Minor injury
Sharp edges

- Sharp edges that can form on the outlet and lid of the grinding drum may result in injuries caused by cuts.
- **Deburr the edge of the outlet if it is sharp.**

5.1 Accessories included with delivery

Key for the emergency release (Art. No. 05.728.0084)

Key for the control unit (Art. No. 05.728.0087)

Locking aid for the drum (Art. No. 23.728.0001)

Anchor bolts for floor mounting (4 x Art. No. 05.223.0147) + washers (4 x Art. No. 08.701.0098)

Grease cartridge (Art. No. 05.185.0019)

Grease gun (Art. No. 05.664.0002)

Feed hopper
Depending on the hopper ordered:
Standard: Art. No. 23.785.0026 + screws (4 x Art. No. 08.643.0113 – 8.8 – A2)
GMP: Art. No. 23.785.0025 + screws (4 x Art. No. 08.643.0213 – A4)

5.2 Transport

WARNING W4.0005

Risk of injury caused by the machine falling down
Lifting the machine above head height

- The machine can fall down when it is lifted, causing serious injuries.
- **Transport the machine as close as possible to the floor. In particular, avoid lifting the machine above head height.**
- **Make sure that the reinforcing rod is screwed tight (see Chapter 5.3 Setting up).**

NOTICE N11.0017

Damage to components
Transport

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

Fig. 4: Unscrewing the transport lock from the transport pallet

The transport lock (TS) uses four nuts to secure the machine to the pallet.

- Use a 17 mm wrench to unscrew the four nuts.

5.3 Setting up

WARNING W5.0001

Serious injury
Machine tipping over

– Bruises and broken bones may result if the machine tips over.
- **Screw the machine firmly to the base!**

WARNING W6.0001

Serious injury
Machine is in an unsteady position

– The machine can tip over if set up on an unstable surface or not positioned vertically, resulting in bruising or broken bones.
- **Set the machine up vertically on a level, stable base.**

WARNING

W7.0002

Risk of death caused by an electric shock
Damaged protective conductor

- Operating the machine with a damaged protective conductor can lead to life-threatening injuries caused by an electric shock.

- **In accordance with EN 60204-1, Section 8.2.6, the TM 500 must be erected with the supplied protective conductor (10 mm² diameter, IEC 60309 plug). The entire length of the protective conductor installed must be protected.**
- **Never operate the machine with a damaged protective conductor!**

CAUTION

C7.0010

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.**

CAUTION

C8.0005

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

C9.0006

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 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.**

NOTICE The machine has been designed so that it can be moved and set up using a standard forklift. To this end, a reinforcing rod (VS) has been installed at the front of the machine.

Fig. 5: Reinforcing rod

Proceed as follows to set up the machine:

1. Check that the installation site is sufficiently soundproofed. Substantial noise emissions arise during the grinding process. Establish noise protection in the building if necessary.
2. Ensure that the surface is resistant to the sample material. It is possible for sample material to fall onto the surface when filling or emptying the grinding drum.
3. Ensure that the surface is sufficiently strong. The machine is heavy and generates substantial vibrations during operation.
4. Screw the machine onto the surface. The reinforcing rod may then be removed.

NOTICE N12.0002

Setting up the machine
Disconnecting the machine from the power supply

- It must be possible to disconnect the machine from the power supply at any time.
- **The machine must be connected to an easily accessible socket so that the mains plug can be pulled out quickly in the event of danger.**

NOTICE

N13.0002

Workplace design
Adequate lighting

- Inadequate lighting at the workplace can lead to injuries.
- **The operator must provide adequate lighting at the workplace to ensure safe working with the machine.**

5.4 Connection

Proceed as follows to connect the machine:

1. Ensure that the data on the type plate complies with your mains power rating.
2. Using the plug, connect the machine to the power supply.

6 Operating the machine

DANGER D2.0001

Risk of death
Rotating parts

– Reaching into the machine while it is running can lead to strangulation and broken bones caused by rotating parts.

- **Never operate the machine without the grinding drum lid.**
- **Close the grinding drum lid before operating the machine.**
- **Comply with the pertinent standards on rotating speed and access openings (Equipment Directive, NEN-EN-ISO 13857:2008).**
- **Wear work clothing when operating the machine (e.g. no scarves, ties, chains). Secure long hair e.g. with a hair net.**

WARNING W8.0001

Serious injury
Thermal energy in the grinding chamber

– The thermal energy in the grinding chamber may result in injuries depending on the sample material.

- **Comply with the instructions in the safety datasheets for the sample material and take appropriate measures.**

WARNING W9.0001

Serious injury
Volume of the machine

– Depending on the sample material the machine can get very loud, which can result in physiological impairments (e.g. hearing loss, tinnitus, loss of balance, reduced alertness).

- **Wear hearing protection when operating the machine.**

WARNING W10.0001

Serious injury
Hazardous liquids, gases etc.

– Contact with the sample material, inhaling the sample material or the uncontrolled escape of the sample material may result in injuries depending on the sample material.

- **Comply with the instructions in the safety datasheets and take appropriate measures.**

WARNING W11.0001

Serious injury, damage to property
Flammable or explosive substances

– Flammable or explosive substances may ignite during processing, resulting in injuries and damage to property.
- **Do not process any flammable or explosive substances.**
- **The operator must conduct a risk assessment in accordance with GefStoffV, BetrSichV and ArbSchG.**

WARNING W12.0001

Serious injury, damage to property
Chemical changes to substances

– During processing, certain substances may reach a flammable state that can result in injuries and damage to property.
- **Do not process any substances that can become explosive as a result of processing.**

WARNING W13.0001

Serious injury
Ignition sparks

- Ignition sparks on electrics can lead to burns and poisoning.
- **Ensure that the machine is not operated in a potentially explosive atmosphere.**
- **Use V0 materials in the area of ignition sources.**

WARNING W14.0001

Serious injury
Careless use of protective equipment

– Incorrect use of protective clothing can lead to hearing loss, eye injuries, bruises or broken bones.
- **Wear hearing protection when operating the grinding drum.**
- **Wear safety footwear, a dust mask, gloves and protective goggles when opening the grinding drum.**
- **Wear personal protective equipment when starting the machine or use the delayed start option and leave the room.**
- **Comply with the instructions in the safety datasheets for the sample material and take appropriate measures.**

WARNING W15.0001

Serious injury
Unauthorised starting/operation

– Operation of the machine by third parties can result in bruises, crushing or broken bones.
- **Disconnect the machine from the power supply, e.g. during cleaning work.**

CAUTION C10.0005

Minor injury
Falling objects or escaping liquids

– Balls and sample material can fall down when the drum opening is not opened in the opening position. This may result in injuries caused by sample material or grinding balls.
  Escaping liquids may, for example, cause chemical burns.
- **Only open the drum in the opening position.**

CAUTION C11.0005

Minor injury
Sharp edges

- Sharp edges that can form on the outlet and lid of the grinding drum may result in injuries caused by cuts.
- **Deburr the edge of the outlet if it is sharp.**

CAUTION C12.0005

Minor injury
Faulty assembly

- Operation of the machine without the lid can cause bruises and broken bones.
- **Before the grinding process, ensure that the lid closes the grinding drum and that all knobs have been tightened as far as they can go. Use the supplied drum locking aid to tighten the knobs.**

CAUTION C13.0005

Minor injury
Hot grinding drum

- Contact with objects or materials that are very hot or cold as well as flames, explosions and radiation from sources of heat can result in burns or frostbite.
- **Wear personal protective equipment when operating the grinding drum.**

NOTICE N14.0012

Risk of injury due to a restart
Rotating parts

- Reaching into the machine while it is running following a restart can lead to injuries.
- **A hazardous situation after a restart is prevented by the built-in frequency converter which requires a new start signal.**

NOTICE N15.0012

Grinding drum blockage
Rotating parts

- Reaching into the machine while it is running can lead to injuries.
- **The automatic stopping of the machine prevents a hazardous situation after a grinding drum blockage.**
- **Turn the machine off by the mains power switch.**
- **Open the machine door using the emergency release (the key for the emergency release is supplied with the machine).**
- **Remove the blockage.**
- **Switch the machine back on.**

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 safety shoes and protective gloves for the removal of sample material with extreme temperatures.

6.1 Operating Controls, Displays and Functions

NOTICE Only the functions (symbols) that are possible for the current operation are ever shown.

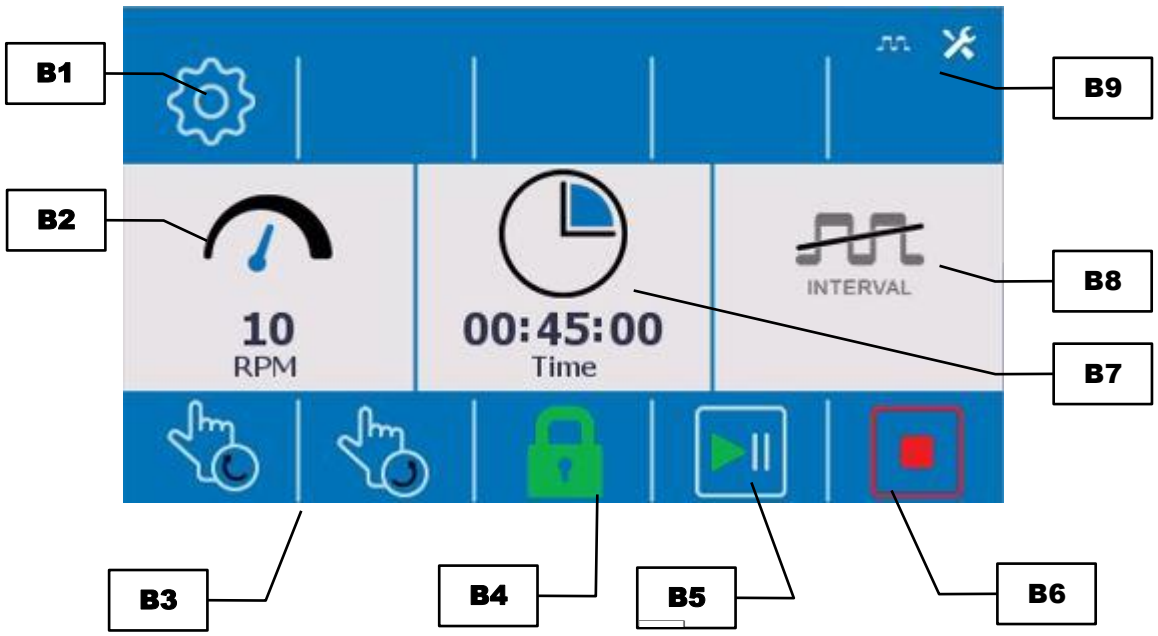

Abb. 6: Display

Element	Description	Function
B1	Settings	Access to the setting area for the delayed start, the service menu and interval / pause times
B2	Revolution	Setting the number of revolutions
B3	SLS mode	SLS mode settings. The buttons are activated when the door is open
B4	Door lock	Displays the state of door locking
B5	Pause/Restart	Pausing or restarting the machine
B6	Start/Stop	Start or stop the machine
B7	Runtime	Setting the runtime or process time (if pauses are programmed)
B8	Interval	Switching on the interval mode and reversing the direction of rotation
B9	Messages	Messages regarding interval settings or upcoming maintenance

6.2 Preparing the grinding process

NOTICE N16.0000

Wear or damage to the grinding drum
Insufficient fill quantity

– Operating the grinding drum with a low fill quantity can result in wear or damage to the grinding drum.

- **Do not operate the mill without sample material.**

NOTICE N17.0066

Wear or damage to the machine
Operation without grinding drum

– Operating the machine without a grinding drum can result in increased wear or damage to the machine.

- **Only operate the machine with a clamped grinding drum.**

The following rules of thumb apply to filling the grinding drum:

- Approx. 80 kg of grinding balls (10 mm, 20 mm or 30 mm)
- Approx. 50 kg or 35 l of sample material
- Balls and sample material together should not weigh more than 150 kg

The maximum particle size of the sample material depends on the grinding drum volume and the degree of hardness of the sample material.
The size of the grinding balls must always be greater than the size of the sample material (ideally three times larger than the coarsest sample particles) and may be a max. of 30 mm.
The grinding drum has a volume of 150 l. Due to the weight of the grinding balls, the following grinding balls are recommended:

Size of the grinding balls	Max. quantity of sample material		Max. particle size of sample material
10 mm	50 kg	35 l	6 mm*
20 mm			13 mm*
30 mm			20 mm*

* Depending on the sample material

Proceed as follows to prepare the grinding process:

1. Switch the machine on by turning the switch.
2. Wait until the user interface appears.
3. Press the Lock button and open the machine door.
4. Open the lid of the grinding drum by turning the 6 star knobs, then remove the lid.
5. Use the hopper for filling where necessary.
6. Fill the grinding balls (recommendation 80 kg) into the grinding drum.
   Ideally the grinding balls must be 3 x bigger than the coarsest particle size of the sample material.

7. Fill a max. of 35 l (or preferably only 30 l for a better result) of sample material into the grinding drum.
   The contents of the grinding drum with both the grinding balls and sample material must not exceed 150 kg!
8. Close the lid of the grinding drum by turning the 6 star knobs. Use the supplied locking aid and tighten the star grips firmly.
9. Close the machine door and press the Lock button . The door is locked.

6.3 Starting the grinding process

Proceed as follows to start the grinding process:

- Close the machine door.
- Lock the machine door by pressing the Lock button (B4).

Fig. 7: Display: Locking the door

- Set the revolutions per minute.
  - Press the setting for revolutions (B2).

Fig. 8: Display: Setting the revolutions

  - In the following window, enter the number of revolutions (10–50) using the numerical keypad, and press the Enter button.

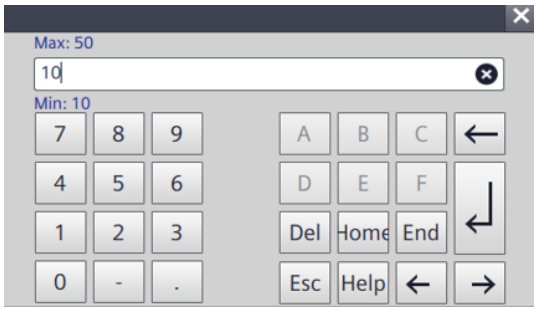

Fig. 9: Display: Entering the revolutions

- Set the duration of the grinding process or process time (if pauses have been programmed) (B7).
  - Press the setting for the number of hours.

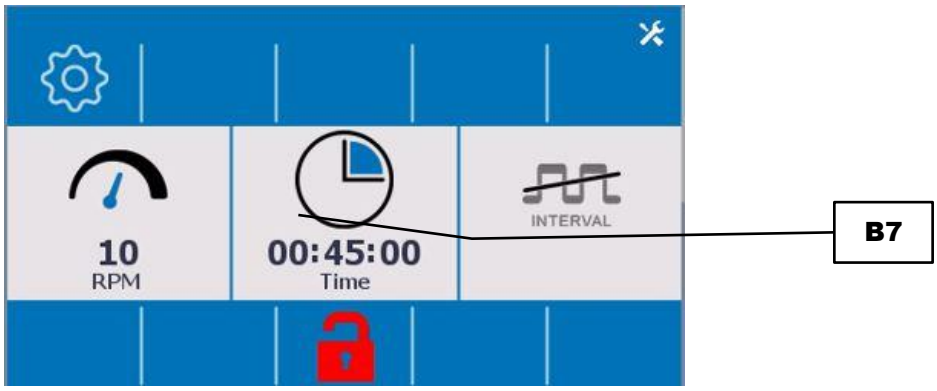

Fig. 10: Display: Entering the time

  - In the following window, enter the number of hours (maximum 99 hours) using the numerical keypad.

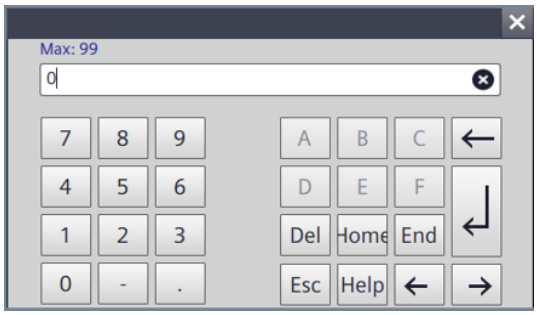

Fig. 11: Display: Entering the hours

  - In the same way, you can enter the time for minutes and seconds by selecting the desired parameter.

- Set the parameters for interval grinding.
  - Press the button to set the interval (B8).
  - Three interval options are available:
    a. Interval off:
    b. Interval on:
    c. Interval with direction reversal:
  - Press the button again to switch between the options.

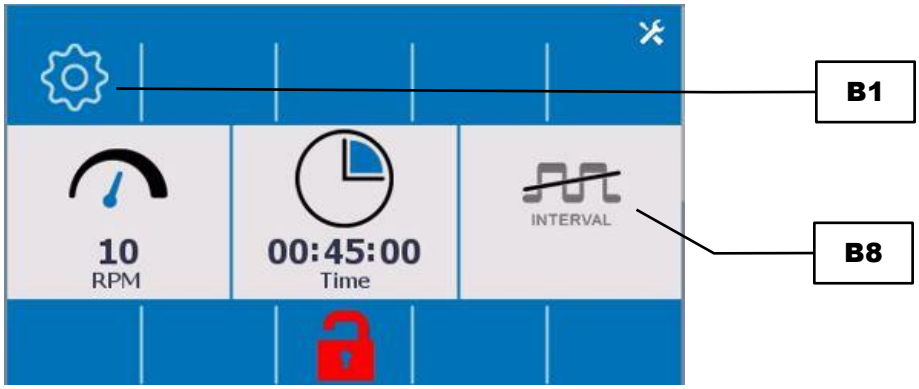

Fig. 12: Display: Selecting the interval

Press the Settings button (B1).

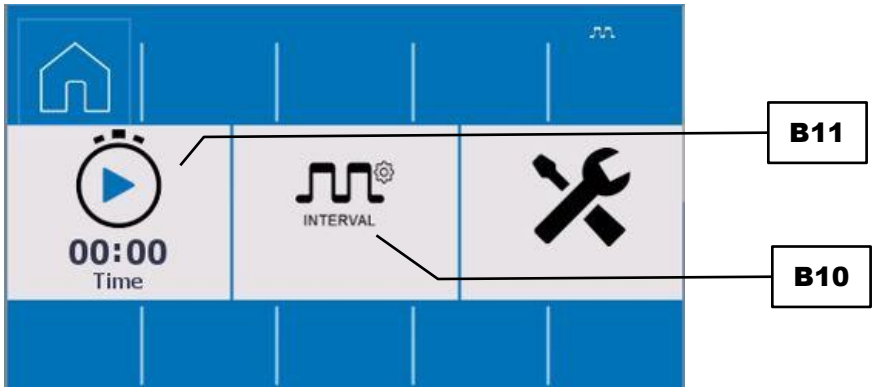

Abb. 13: Display: Select settings

- If necessary, set the delayed start time (B11). Press the hour or minute display.
  If you have activated a delay time, the display shows the symbol for the delayed start . The remaining delay time is counted down. This setting is also possible without an interval.

- Press the button for the interval parameters (B10).
  Set the following parameters:
  - Interval duration (B13).
  - Pause time (e.g. to cool the grind material) (B12)
    You can only set a pause duration (default: 1 minute) if you have set an interval duration.
    If a pause time has been programmed, you must subtract this from the run time to calculate the grinding time. Example: If you set a total running time (=process time) of 1 hour with an interval duration of 30 minutes and a pause duration of 15 minutes, the actual grinding time is 45 minutes!

  Select the settings for hours and minutes.

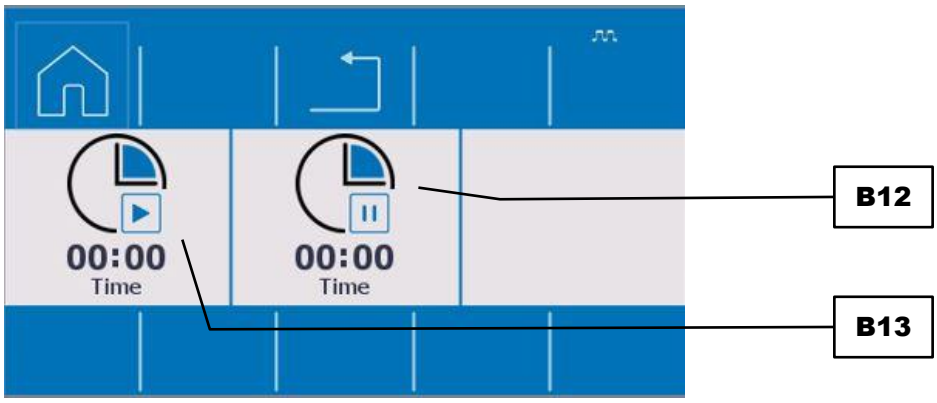

Fig. 14: Display: Set interval parameters

- Press the Home button or the Back button .
- Press the Start button .

6.4 Pausing the grinding process

You can pause the grinding process at any time using the Pause button (B5).

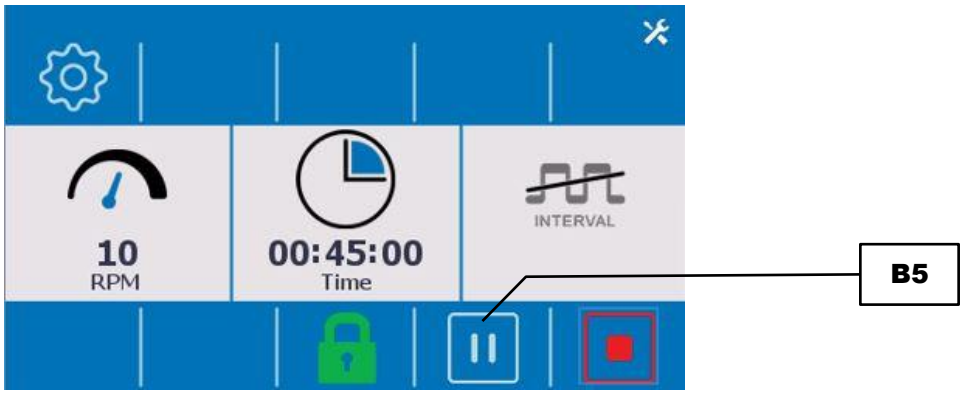

Fig. 15: Display: Pausing the grinding process

The grinding drum rotates into position with the lid at the top so that the sample material can be removed.

Fig. 16: Display: Positioning indicator

You can now remove a sample, for example to check the fineness of grinding.

Click the Continue button to continue the grinding process.

If you have set an interval and pause time for the grinding process, the grinding process starts again with a complete interval after you continue!

6.5 Stopping the grinding process

The machine automatically stops the grinding process according to the selected runtime.

Stop the grinding process before expiry of the selected runtime by pressing the Stop button (B6).

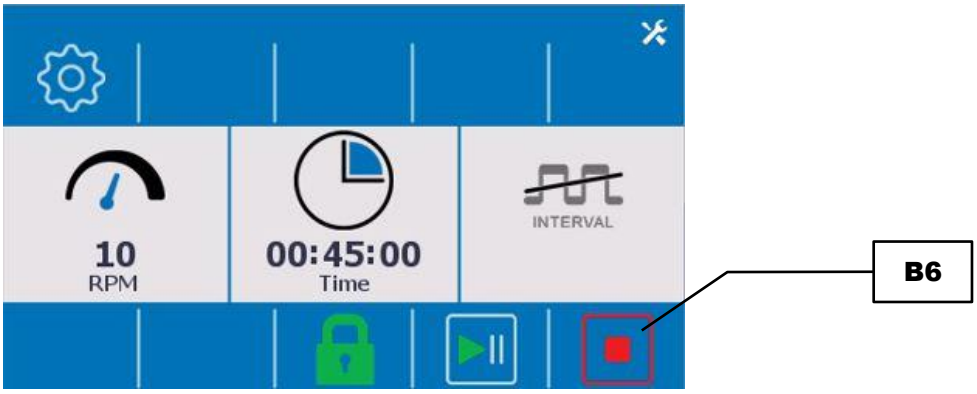

Fig. 17: Display: Stopping the grinding process

The grinding drum rotates into position with the lid at the top so that the sample material can be removed.

Fig. 18: Display: Positioning indicator

6.6 Emergency stop

Pressing the emergency stop buttons brings the machine to an immediate halt.
The emergency stop button is intended for emergencies and not to be used generally to stop the grinding process.
Release the emergency stop button using a twist and pull movement.
Prior to emptying, the grinding drum must be positioned so that the lid is at the top. Use the SLS mode.

6.7 Manually turning the grinding drum: SLS mode

In SLS (Safely Limited Speed) mode, turn the grinding drum manually in both directions (e.g. to set up or empty the machine).
The SLS mode only works if the machine door is unlocked.

Proceed as follows to manually turn the grinding drum (SLS mode):

1. Unlock the machine door by pressing button (B4).

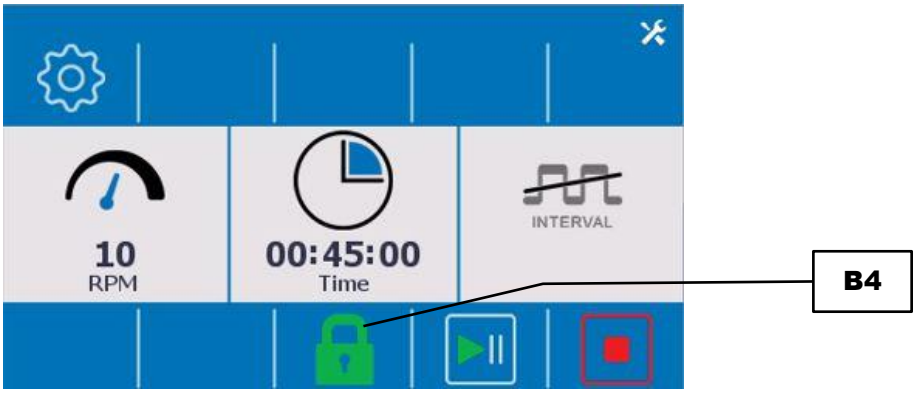

Fig. 19: Display: Unlock machine door

2. Move the grinding drum into the desired position.
   - Press the Drive CW button (B3.1) and turn the grinding drum in a clockwise direction.
   - Press the Drive CCW button (B3.2) and turn the grinding drum in an anticlockwise direction.

Fig. 20: Display: Turning the grinding drum

6.8 Emptying the grinding drum

CAUTION

C14.0024

Risks of burns and scalding
Hot drum and/or sample material

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

Empty the grinding drum on expiry of the selected runtime or after manual stopping (Stop button ■).

Proceed as follows to empty the grinding drum:

1. Ensure that the grinding drum has come to a halt.
2. Press the Lock button (B4) and open the machine door.

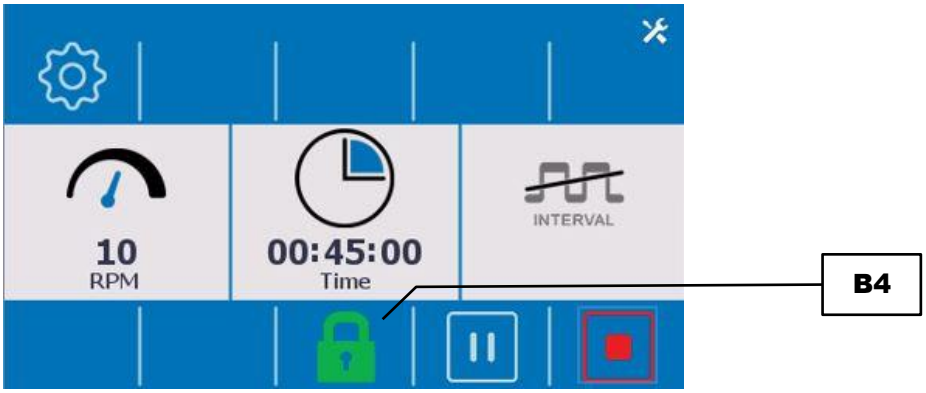

Fig. 21: Display: Opening the door

3. Ensure that the lid of the grinding drum is positioned at the top.
   Where necessary use the SLS mode to position the grinding drum.
4. Release the 6 star knobs and remove the grinding drum lid.
5. Take the sample material and grinding balls out of the grinding drum.
   Where necessary turn the open grinding drum downwards to empty the grinding drum into a container placed beneath it.

   CAUTION

   C15.0045

   Always turn the open grinding drum in an anticlockwise direction (in SLS mode use the "Drive CCW" (B3.2) function)!
6. Separate the sample material from the grinding balls outside the grinding drum.

Sample material and grinding balls can be separated from each other with the help of the optional separation unit.

An extraction unit is recommended in the case of dusty materials.

6.9 Cleaning the grinding drum

WARNING W16.0003

Risk to life caused by an electric shock
Using water when cleaning live parts

– Using water to clean the device 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 involving water on the device when it has been disconnected from the power supply (unplugged).**
- **Use a cloth moistened with water for cleaning.**

WARNING W17.0000

Risk of death caused by an electric shock
Strong voltage due to capacitor discharge

- Due to capacitor discharge on the frequency convertor, the machine conducts voltage for up to **3 minutes** after it has been unplugged.
- There is a risk of touching live contacts when the machine is open. An electric shock can result in burns and cardiac arrythmia, or in respiratory failure and cardiac arrest.

- **After disconnecting the mains lead, wait 3 minutes before opening the machine.**

The machine must always be turned off and disconnected from the mains before interventions for cleaning and maintenance purposes.

Clean the grinding drum according to your requirements.

6.10 Emergency Unlocking

CAUTION C16.0009

Risk of injuries
Coasting drive

– In the event of a power failure, the drive of the machine continues to coast for a long time without braking, as do machine parts connected to the drive. Bits of clothing and parts of the body can become trapped in the moving machine parts after actuating the emergency release (use the triangular key supplied with every machine to do this).

- **Disconnect the machine from the power supply before actuating the emergency release.**
- **Wait until all parts of the machine have stopped moving.**

7 Error messages

Error messages inform the user about detected machine or program errors. An error message indicates the presence of a fault which automatically interrupts operation of the machine or program. Faults of this kind must be rectified before the machine is started up again.

Error code	Description	Actions
E26	Frequency converter error	• Turn the main switch off and wait for 30 seconds before turning the machine back on again. • Make certain that the drum is not too full. • If the error persists, contact Customer Service at Retsch GmbH.
E40	Positioning mode error	• The machine stops automatically without moving to the end position. • Acknowledge the message and start the machine again or use the SLS mode to move the drum manually into the desired position. • If the error persists, contact Customer Service at Retsch GmbH.
E51	Emergency stop error	• Release the emergency stop switch. • If the error persists, contact Customer Service at Retsch GmbH.

8 Accessories

Information about the available accessories and corresponding operating instructions can be found directly on the Retsch GmbH website (https://www.retsch.com) in the "Downloads" section for the machine.

Accessories include the following:

- Standard drum 150 l (Item No. 23.462.0052)
- Stainless steel drum 150 l (Item No. 23.462.0053)
- GMP-compliant drum made of 316L (1.4404) with 150 l (Item No. 23.462.0051)
- Separation unit to separate sample material and balls (Item No. 02.407.0148)

Abb. 22: TM500 with separation unit

- Ball fillings in various sizes
- M 10 ring nuts to dismantle the drum (Item No. 08.606.0001)

9 Maintenance

CAUTION C17.0013

Risk of injury
Incorrect maintenance

– Unauthorised and incorrect maintenance can cause injuries.
- **The machine may only be maintained by Retsch service technicians or an authorised agency.**
- **The settings for the service area may only be adjusted by Retsch service technicians or an authorised agency.**
- **Do not carry out any unauthorised maintenance on the machine!**

9.1 Service menu

A message (B9) will appear on the display as soon as the time until the next maintenance is due falls below 100 hours.

Fig. 23: Display: Display next maintenance

To open the service menu, first press the "Settings" button (B1).

Fig. 24: Display: Switching to the service menu

Then press the "Service menu" button (B14).

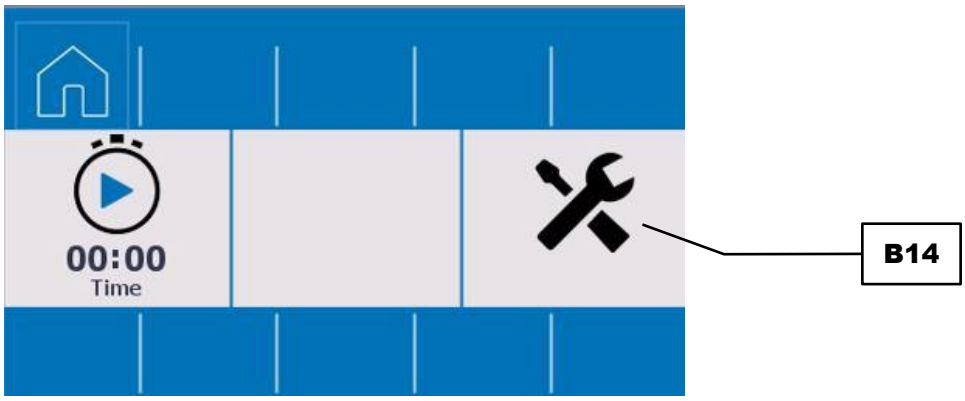

Fig. 25: Display: Switching to the service menu

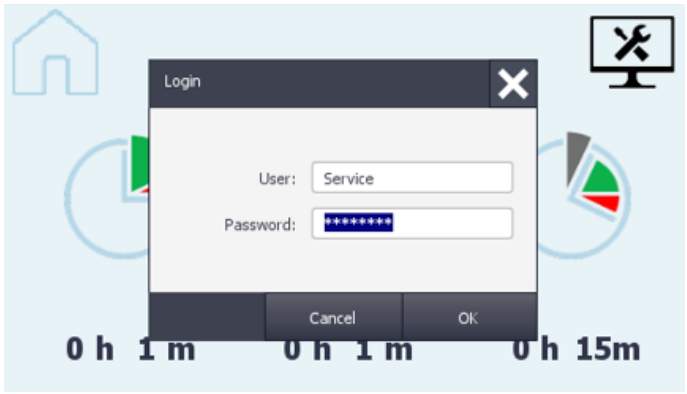

Fig. 26: Display: Login window

Functions of the service menu:

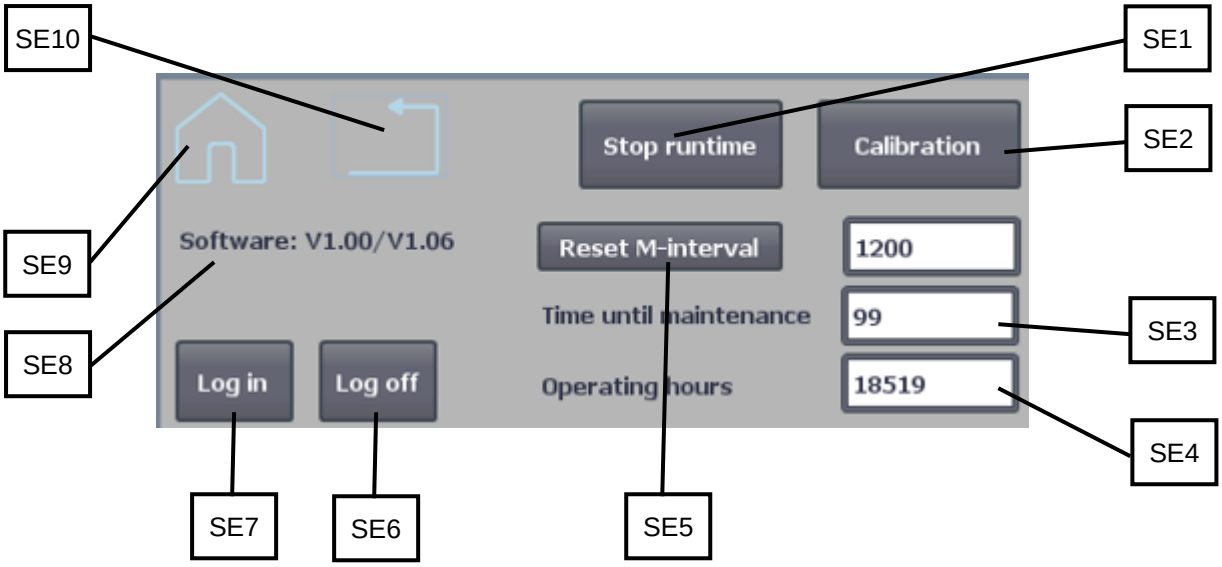

Fig. 27: Display: Service menu

SE1	Stop runtime	Hardware settings
SE2	Calibration	Switching to calibration mode

SE3	Time until maintenance	Display of the operating hours remaining until the next maintenance
SE4	Operating hours	Display of total operating hours. The operating hours counter is reset to 0 during every update.
SE5	Reset M-interval	Interval counter is reset to the initial value (1200 h)
SE6	Log off	User log off
SE7	Log in	User log in
SE8	Software	Software version of the control unit / display
SE9	Home	Return to the home screen
SE10	Back	One level back

Starting calibration mode:

Press the "Calibration" button. This takes you to the calibration mode:

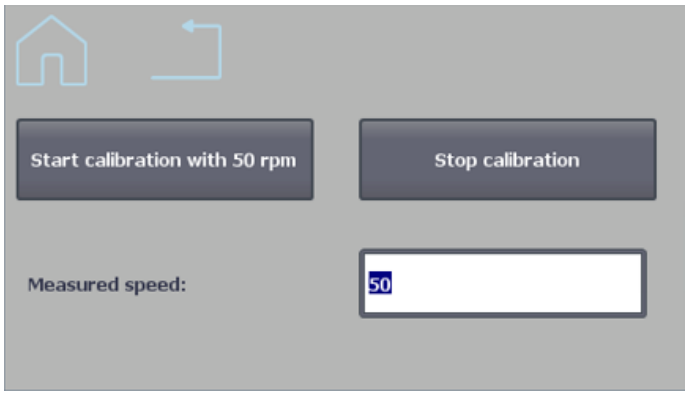

Fig. 28: Display: Calibration mode

On pressing the "Start Calibration with 50 rpm" button, the machine starts at the initial set point of 50 rpm. Once the machine has got started (wait approx. 15 s), count the number of revolutions over a period of precisely 1 minute.

Enter the number of revolutions counted in "Measured speed" and press the Home or back button. The figure has now been saved.

9.2 Lubrication

DANGER D3.0001

Risk of death
Rotating parts

- Reaching into the machine while it is running can lead to strangulation and broken bones caused by rotating parts.
- **Never operate the machine without the grinding drum lid.**
- **Close the grinding drum lid before operating the machine.**
- **Comply with the pertinent standards on rotating speed and access openings (Equipment Directive, NEN-EN-ISO 13857:2008).**
- **Wear work clothing when operating the machine (e.g. no scarves, ties, chains). Secure long hair e.g. with a hair net.**

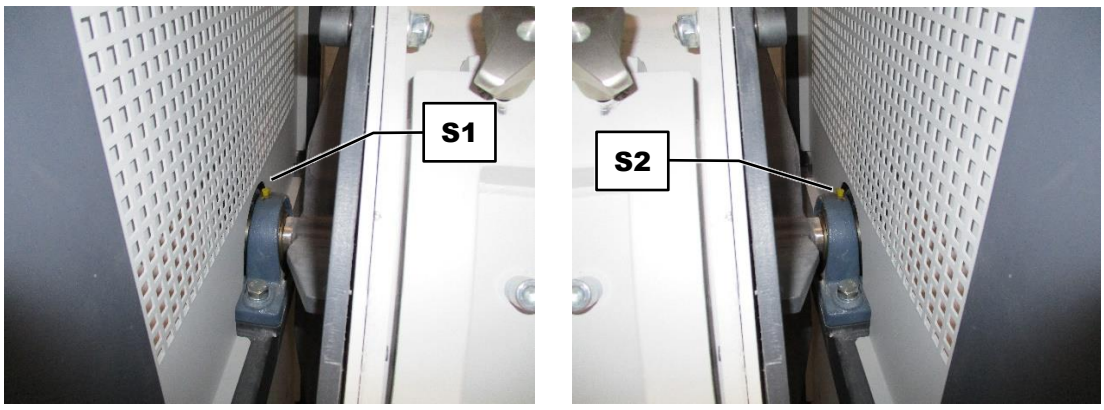

Fig. 29: Lubrication points

NOTICE The TM 500 must be lubricated regularly (see the table below). There are two lubrication points (**S1, S2**) on the machine. Use the supplied grease gun for lubrication.

Lubrication point	Interval (operating hours)	Operating state
S1	1200	Idling
S2	1200	Idling

NOTICE Use natural coloured, lithium saponified (graphite free) grease. Shell Gadus S2 V220 2 is provided with the TM 500.

Lubricating the lubrication points (S1, S2) on the bearings

⇨ Switch the TM 500 on (idling).
⇨ During relubrication, the grease should be pressed in slowly while the bearing is running until fresh grease escapes from the seal. Excessive pressure should be avoided because this may damage the seals.
⇨ Switch the TM 500 off.

9.3 Dismantling the grinding drum

DANGER D4.0001

Risk of death
Rotating parts

- Reaching into the machine while it is running can lead to strangulation and broken bones caused by rotating parts.
- **Never operate the machine without the grinding drum lid.**
- **Close the grinding drum lid before operating the machine.**
- **Comply with the pertinent standards on rotating speed and access openings (Equipment Directive, NEN-EN-ISO 13857:2008).**
- **Wear work clothing when operating the machine (e.g. no scarves, ties, chains). Secure long hair e.g. with a hair net.**

WARNING W18.0005

Risk of injury caused by the grinding drum falling down
Lifting the grinding drum above head height

- The machine can fall down when lifting the grinding drum above head height, causing serious injuries.
- **Transport the grinding drum as close as possible to the floor. In particular, avoid lifting the machine above head height.**

Proceed as follows when dismantling the grinding drum:

- Empty the grinding drum.
- Remove the grinding drum lid.
- Dismantle the two rear locking screws on the drum fixing.
- Turn the opening of the drum upwards (see Chapter "6.6 Manually turning the grinding drum: SLS mode").
- Dismantle the two front locking screws on the drum fixing.

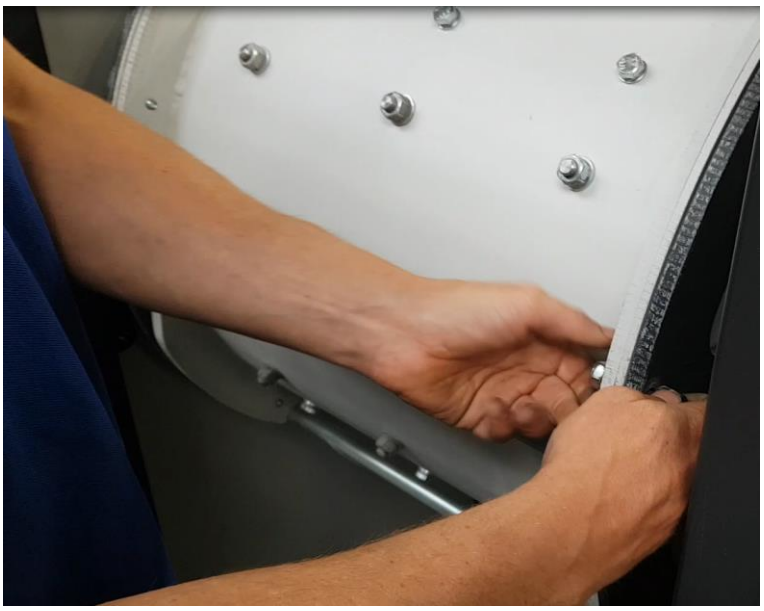

Fig. 30: Removing the locking screws

- **⚠ WARNING** Disconnect the machine from the power supply.
- Remove the two middle knobs and replace these with M 10 ring nuts. The ring nuts are available as an accessory (Item No. 08.606.0001).
- Affix a strap to the two ring nuts.
- Using a suitable crane (load-bearing capacity of at least 400 kg), lift the grinding drum straight out from the machine.
  NOTICE Make sure that the drum is not tilted!

Fig. 31: Securing the drum

- Store the grinding drum on a level surface and secure it to prevent it rolling away.

Installation of the grinding drum takes place in reverse order. Ensure that the drum is suspended correctly in the four drum support rods.

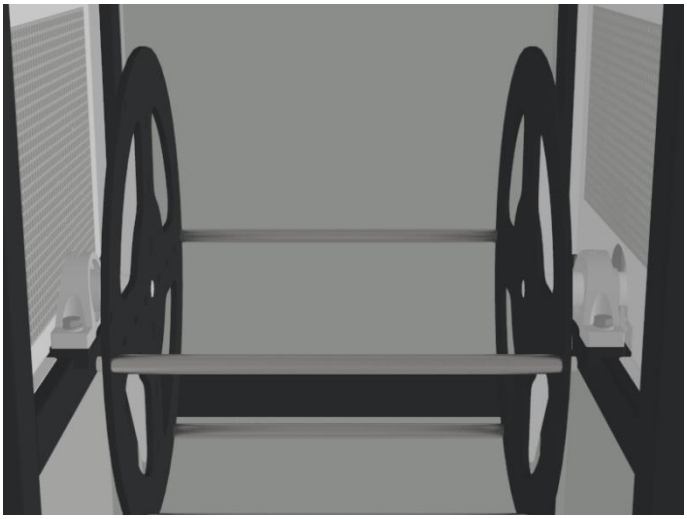

Fig. 32: TM 500 without grinding drum

10 Return for Service and Maintenance

Fig. 33: 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.

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.

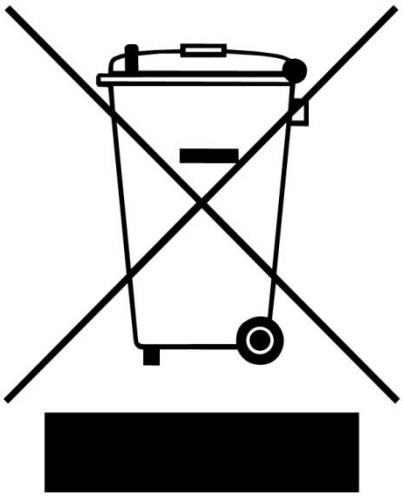

Fig. 34: Disposal label

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.

12 Index

EU Declaration of Conformity

Translation

DRUM MILL

TM 500 | 21.403.xxxx

EU DECLARATION OF CONFORMITY

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

Machinery Directive 2006/42/EC

Applied standards, in particular:

DIN EN ISO 12100	Machine Safety - General Design Principles
DIN EN ISO 14123-1	Machine Safety - Reducing Health Risks Related to Hazardous Emissions from Machinery
DIN EN ISO 14120	Safety of machinery - Guards
DIN EN ISO 14119	Safety of machinery - Interlocking devices associated with guards
DIN EN ISO 14118	Safety of machinery - Prevention of unexpected start-up
DIN EN ISO 13857	Machine Safety - Safety Distances to Avoid Reaching Hazardous Areas With Upper and Lower Limbs
DIN EN ISO 13849-1	Safety of machinery - Safety-related parts of control systems
DIN EN 60204-1	Safety of machinery – Electrical equipment of machines
DIN EN 1005-3	Machine Safety - Human Physical Performance

Electromagnetic compatibility 2014/30/EU (tested at 230 V, 50 Hz)

Applied standards, in particular:

EN 55011	Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement
DIN EN 61326-1	Electrical equipment for measurement, control and laboratory use - EMC requirements

Restriction of hazardous substances (RoHS) 2011/65/EU

Authorised person for compilation of the technical documentation:
Julia Kürten (Technical Documentation)

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

In the event of a modification of the device not agreed on by Retsch GmbH, as well as the use of non-approved spare parts or accessories, this declaration loses its validity.

Retsch GmbH

Haan, 09/2023

Dr. Alexander Mühlig, Technical Manager

CE