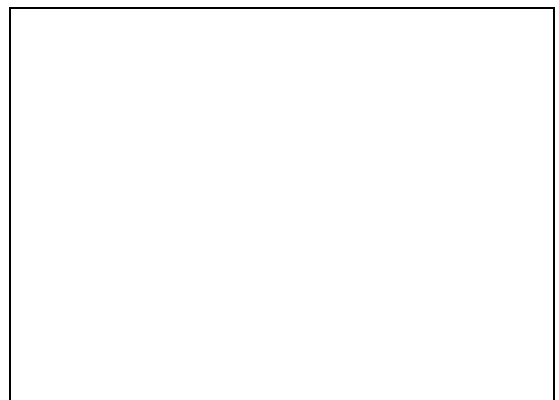


# Manual

## High Energy Ball Mill Emax



Translation

**Retsch**<sup>®</sup>

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## Table of Contents

<b>1</b>	<b>Notes on the manual .....</b>	<b>7</b>
1.1	Explanation of signs and symbols .....	7
1.2	Disclaimer .....	7
1.3	Copyright.....	7
<b>2</b>	<b>Safety .....</b>	<b>8</b>
2.1	Explanations of the Safety Instructions .....	9
2.2	General Safety Instructions .....	10
2.3	Repairs.....	11
2.4	Confirmation Form for the Managing Operator.....	12
<b>3</b>	<b>Technical Data .....</b>	<b>13</b>
3.1	Protective Equipment.....	13
3.2	Degree of Protection.....	13
3.3	Emissions.....	13
3.4	Electromagnetic Compatibility (EMC).....	14
3.5	Rated Power .....	14
3.6	Motor Rotation Speed.....	14
3.7	Dimensions and Weight.....	14
3.8	Required Floor Space.....	14
3.9	Receptacle Volume.....	14
3.10	Feed Grain Size .....	15
3.11	Cooling.....	15
3.11.1	Internal.....	15
3.11.2	External.....	15
<b>4</b>	<b>Packaging, Transport and Installation .....</b>	<b>16</b>
4.1	Packaging .....	16
4.2	Transport.....	16
4.3	Temperature Fluctuations and Condensation .....	16
4.4	Conditions for the Installation Site .....	16
4.5	Electrical Connection .....	18
4.6	Type Plate Description.....	18
4.7	Removing the Transportation Lock.....	19
4.8	Removing the Transportation Aid .....	21
<b>5</b>	<b>First Commissioning.....</b>	<b>23</b>
5.1	Commissioning of the Cooling.....	23
5.2	Connection to an External Cooler.....	26
5.3	Cooling Surfaces of the Grinding Jar.....	27
<b>6</b>	<b>Operating the Device .....</b>	<b>29</b>
6.1	Use of the Device for the Intended Purpose.....	29
6.2	Principle of Operation .....	30
6.3	Views of the device .....	30
6.3.1	Front.....	30
6.3.2	Back.....	32
6.4	Switching On / Off.....	33
6.5	Opening and Closing of the Device .....	33
6.5.1	Opening .....	33
6.5.2	Closing.....	33
6.6	Emergency Unlocking.....	34
6.7	Opening and Closing the Grinding Jar Support.....	35
6.7.1	Opening .....	35
6.7.2	Closing.....	36
6.8	Opening and Closing the Grinding Jar .....	38
6.8.1	Closing.....	38

6.8.2	Opening .....	39
6.8.3	Grinding Jar Identification .....	39
6.9	Ball Sizes and Speeds .....	39
6.9.1	Recommended Ball Sizes .....	39
6.9.2	Recommended Grinding Jar Filling .....	40
6.9.3	Recommended Speeds .....	40
6.10	Inserting the Grinding Jar .....	40
6.11	Wet Grinding with Highly Flammable Materials .....	42
<b>7</b>	<b>Controlling the Device .....</b>	<b>43</b>
7.1	Operating Controls, Displays and Functions .....	43
7.2	Operating Modes and Navigation .....	45
7.2.1	Navigation between Operating Modes .....	45
7.3	Grinding Parameters .....	45
7.3.1	Adjustable Parameters .....	45
7.3.2	Activatable or Deactivatable Parameters .....	47
7.4	Manual Mode .....	47
7.4.1	Start Process .....	47
7.4.2	Stop Process .....	48
7.4.3	Pause Process .....	48
7.5	Programme Mode .....	48
7.5.1	Select a Programme .....	49
7.5.2	Programme Heading and Description .....	49
7.5.2.1	Display of the Programme Description .....	49
7.5.2.2	Editing of the Programme Description and Heading .....	49
7.5.3	Edit a Programme .....	50
7.6	Sequence Mode .....	51
7.6.1	Select a Sequence .....	52
7.6.2	Sequence Heading and Description .....	52
7.6.2.1	Display of the Sequence Description .....	52
7.6.2.2	Editing of the Sequence Description and Heading .....	52
7.6.3	Edit a Sequence .....	52
7.6.3.1	Add a Programm to a Sequence .....	52
7.6.3.2	Change a Programm of a Sequence .....	52
7.6.3.3	Delete a Programm from a Sequence .....	53
7.7	Settings .....	53
7.7.1	Languages .....	55
7.7.2	Date and Time .....	55
7.7.3	Signal Tone .....	55
7.7.4	Automatic Opening .....	55
7.7.5	Extended Time .....	55
7.7.6	Temperature Limits .....	56
7.7.6.1	Grinding with Activated Temperature Limits .....	57
7.7.6.2	Warning of Hot Grinding Jars .....	57
7.7.7	Timer Settings .....	58
7.7.7.1	Setting the Timer .....	58
7.7.7.2	Start Grinding with Timer .....	58
7.7.8	Copy Logbook .....	59
7.7.9	Cleaning Mode .....	59
7.7.9.1	Automatic Cleaning Mode .....	59
7.7.10	Operating Hours .....	60
7.7.11	Software Versions .....	60
7.7.12	User Information .....	60
7.7.13	Service Environment .....	60

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<b>8</b>	<b>Error Messages and Information Notes .....</b>	<b>61</b>
8.1	Error Messages .....	61
8.2	Information Notes .....	62
8.3	Return for Service and Maintenance .....	63
<b>9</b>	<b>Cleaning, Wear and Maintenance .....</b>	<b>64</b>
9.1	Cleaning.....	64
9.1.1	Cleaning of the Grinding jar .....	65
9.1.2	Drying the Grinding Jars .....	65
9.2	Wear .....	65
9.3	Maintenance .....	65
9.3.1	Exchange of the Coolant .....	65
9.3.1.1	Removing the Coolant and Rinsing the Cooling System.....	65
9.3.1.2	Filling New Coolant.....	67
<b>10</b>	<b>Accessories .....</b>	<b>69</b>
10.1	Aeration Lid.....	69
10.1.1	Cleaning the Aeration Lid .....	70
<b>11</b>	<b>Disposal.....</b>	<b>72</b>
<b>12</b>	<b>Index .....</b>	<b>73</b>



## 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 0009 of the "High Energy Ball Mill Emax" manual has been prepared in accordance with the Machinery Directive 2006/42/EC.

### 1.1 Explanation of signs and symbols

In this document the following **signs and symbols** are being used:

①	Reference to a recommendation and/or an important information
→	Reference to a chapter, table or figure
⇒	Action instruction
Name	Software menu function
[Name]	Software button
<Name>	Software checkbox

### 1.2 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.

### 1.3 Copyright

This document or parts of it or its content may not be reproduced, distributed, edited or copied in any form without prior written permission of Retsch GmbH. Damage claims shall be asserted in the case of infringements.

## 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:


 <b>DANGER</b>	<small>D1.0000</small>
<b>Risk of fatal injuries</b>	
Source of danger	
– Possible consequences if the danger is ignored.	
• <b>Instructions and information on how to avoid the risk.</b>	

**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.

 <b>WARNING</b>	<small>W1.0000</small>
<b>Risk of life-threatening or serious injuries</b>	
Source of danger	
– Possible consequences if the danger is ignored.	
• <b>Instructions and information on how to avoid the risk.</b>	

**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.

 <b>CAUTION</b>	<small>C1.0000</small>
<b>Risk of injuries</b>	
Source of danger	
– Possible consequences if the danger is ignored.	
• <b>Instructions and information on how to avoid the risk.</b>	

**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.**



## 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 Technical Data

#### 3.1 Protective Equipment

- This device is equipped with an automatic hood lock. The lock prevents the device from being started when in an unsafe state.
- The device can only be started when the hood is closed.
- It is only possible to open the hood when the device has come to a halt.
- The grinding jar support (clamping lever) is permanently monitored before starting and during the grinding process.

#### 3.2 Degree of Protection

- IP30

#### 3.3 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**

C4.0077

**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.**



**Sound parameters:**

The sound parameters are also influenced by the properties of the sample material.

Example 1:

Container:	2 steel grinding jars (125 ml)
Grinding body:	50 steel balls each (10 mm)
Feed material:	Quartz sand (~ 0.5 mm)
Feed quantity:	60 ml
Speed:	2 000 rpm

At these operating conditions, the workplace related equivalent continuous sound level  $L_{eq} = 83 \text{ dB(A)}$ .

Example 2:

Container:	2 zirconium grinding jars (125 ml)
Grinding body:	275 g ZrO <sub>2</sub> balls each (2 mm)
Feed material:	Quartz sand (~ 0.5 mm) plus water (35 ml)
Feed quantity:	40 g
Speed:	1 500 rpm

At these operating conditions, the workplace related equivalent continuous sound level  
 $L_{eq} = 76 \text{ dB(A)}$ .

### 3.4 Electromagnetic Compatibility (EMC)

- EMC class according to DIN EN 55011: A

### 3.5 Rated Power

~ 3 100 W (VA)

### 3.6 Motor Rotation Speed

- Motor rated speed: 300 – 2 000 revolutions per minute (rpm)
- Adjustable as required

### 3.7 Dimensions and Weight

- Height: 525 mm
- Width: 625 mm
- Depth: 645 mm
- Weight: ~ 120 kg (without grinding jars)

### 3.8 Required Floor Space

**⚠ 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.**

- Height with open hood: ~ 945 mm
- Width of the base: 625 mm
- Depth of the base: 655 mm

**Location requirements:**

The device must be placed on a vibration-free and stable surface.

### 3.9 Receptacle Volume

The receptacle volume (feed volume) depends on the sample material and on the device configuration and setting.

- Feed volume: max. 2 x 50 ml

### 3.10 Feed Grain Size

The feed grain size depends on the sample material and on the device configuration and setting.

- Feed grain size:  $\leq 5$  mm

### 3.11 Cooling

- ① Please refer to chapter "[Commissioning of the Cooling](#)" for detailed information on the commissioning of the internal and external cooling.

#### 3.11.1 Internal

There is a coolant tank at the backside of the device which must be filled with coolant before putting into operation.

- Fill volume: ~ 600 ml
- Coolant: clean, lime-free water plus coolant additive

#### 3.11.2 External

An additional cooling can be connected at the back of the device.

- Maximum pressure: < 6 bar
- Minimum temperature of the cooling liquid: > 5 °C

**NOTICE** Only clean, lime-free water with a coolant additive (article no. 02.362.0027) is permitted as cooling liquid. The temperature must not fall below the minimum value, as otherwise the sealing gaskets of the cooling circuit can be damaged.

## 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

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.**

### 4.2 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.**

### 4.3 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.

### 4.4 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.**

### 4.5 Electrical Connection

**⚠ WARNING** W2.0015

**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** N9.0022

**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.

### 4.6 Type Plate Description

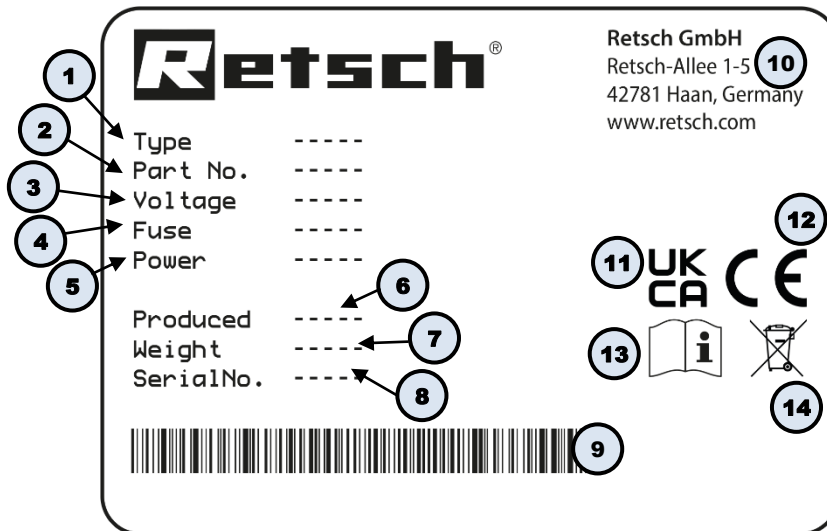


Fig. 1: Type plate

- 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

① 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.

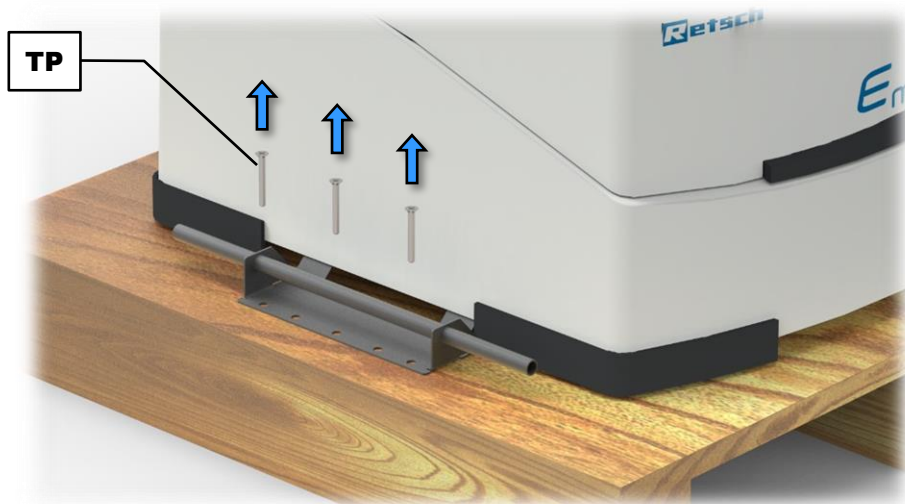
#### 4.7 Removing the Transportation Lock

**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!**



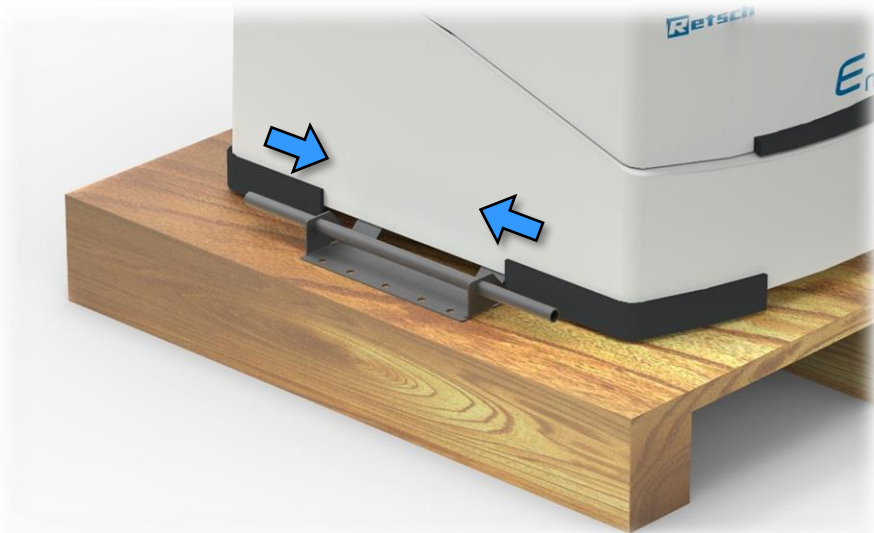
**Fig. 2:** Unscrewing the transportation lock

⇒ Unscrew the screws on either side of the device (TP).

① The transportation lock can also be used as transportation aid.

**CAUTION** The weight without grinding jars amounts approx. 120 kg. The device may only be lifted by four people.



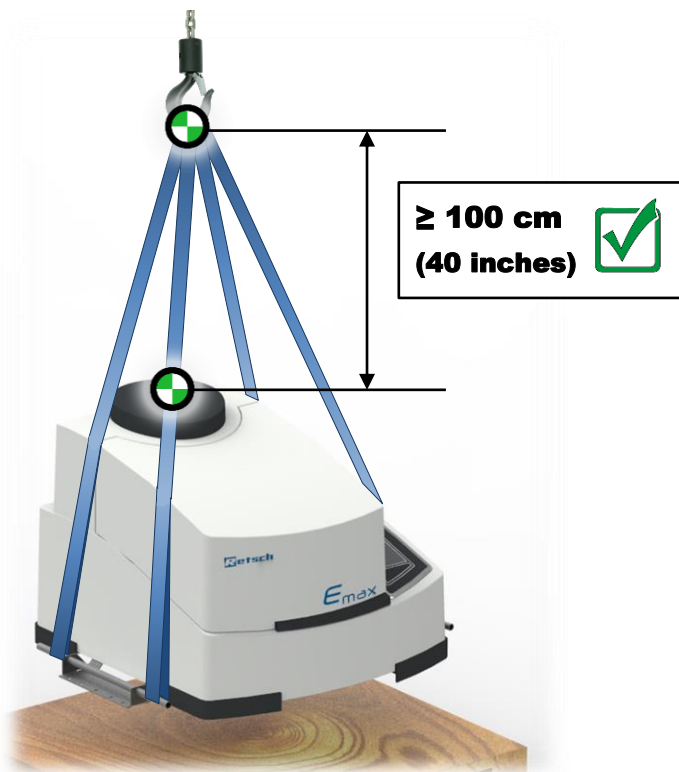


**Fig. 3:** Attaching lifting straps

The transportation aid can also be used for lifting the device with a crane.

⇒ Attach the lifting straps to the two transportation aids as shown in the figure.

**NOTICE** The housing can be damaged if the lifting straps are too short. The four lifting straps must be sufficiently long in order to observe a minimum distance of 100 cm between the device and the hoist.



**Fig. 4:** Minimum distance between housing and hoist

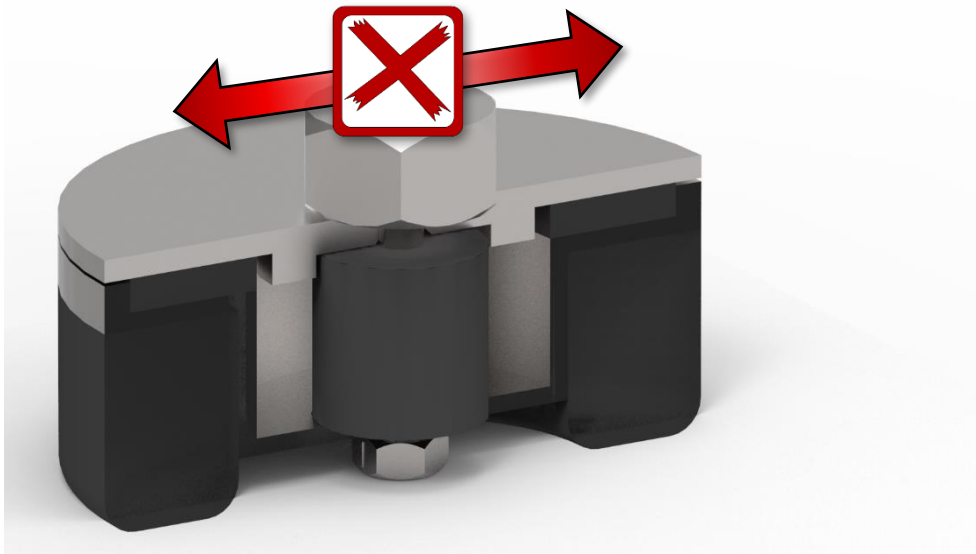


Fig. 5: Free-force compensation sockets: do not push or pull the device

**NOTICE**

N10.0071

**Damage to the free-force compensation sockets**

Pushing or pulling the device

- The free-force compensation sockets will be damaged if the device is pulled or pushed across a surface.
- **Do not pull or push the device.**
- **Lift the device to move it.**

**4.8 Removing the Transportation Aid**

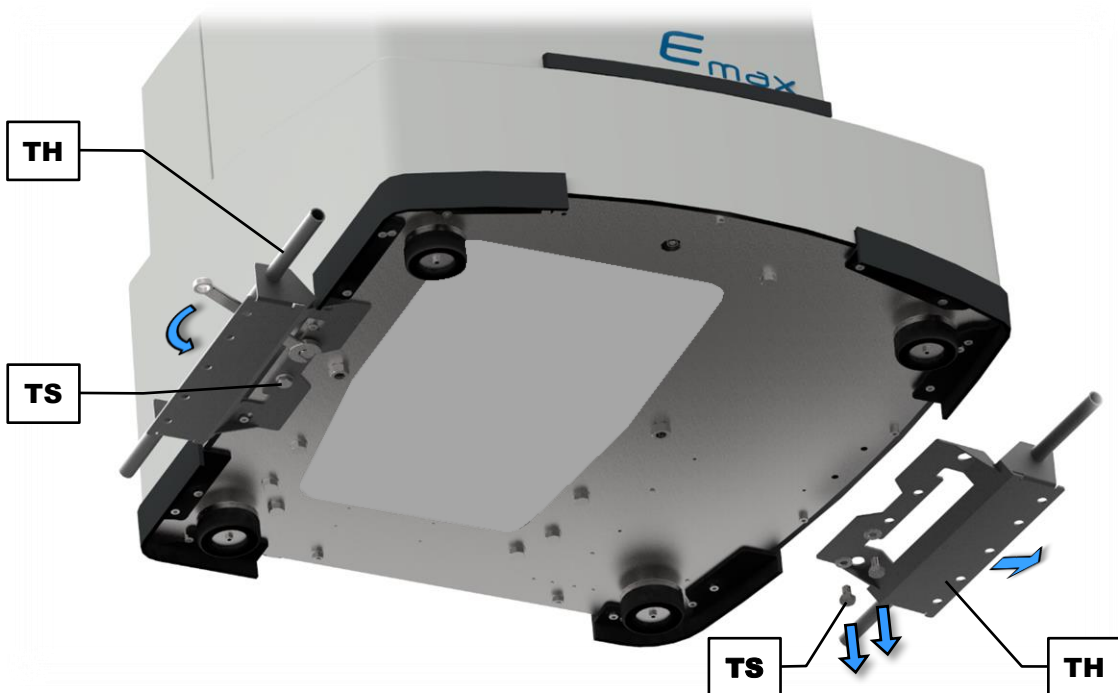


Fig. 6: Removing the transportation aid


The two transportation aids (**TH**) are fixed by four screws (**TS**) to the underside of the device.  
⇒ Use a 13 mm open-end wrench to remove the screws.

## 5 First Commissioning

**⚠ WARNING** W4.0002

**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!**



**⚠ WARNING** W5.0008

**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.**



**NOTICE** N11.0002

**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** N12.0004

**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.**

During the first commissioning the control panel shows a window to select the language.

⇒ Select the desired language for the control panel.

After the language setting, the date and time can be set.

⇒ Set the current date.

⇒ Confirm the input by pressing the [Done] button.

⇒ Set the current time.

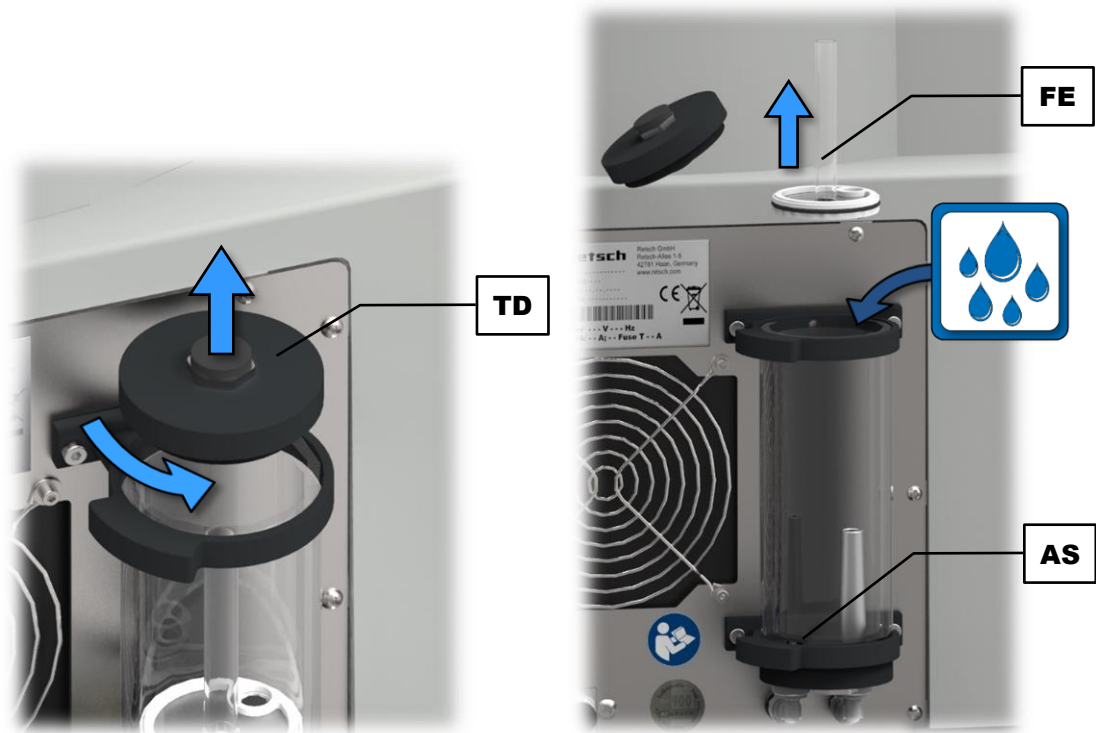
⇒ Confirm the input by pressing the [Done] button.

### 5.1 Commissioning of the Cooling

**NOTICE** Before putting into operation, the coolant tank on the backside of the device must be filled with coolant.

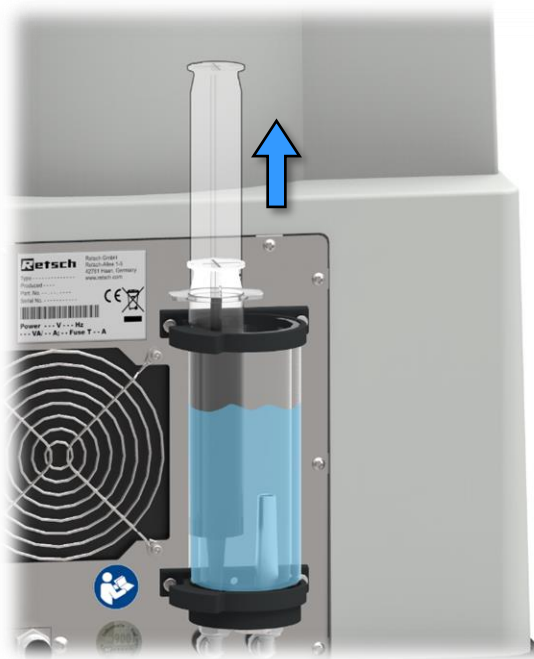
**NOTICE** The coolant consists of cooling liquid and a coolant additive. Only clean, lime-free water is permitted as cooling liquid. The coolant additive (article no. 02.362.0027) is included with the delivery of the device and can be ordered separately when required.

- ⇒ Mix 600 ml of clean, lime-free water with 15 ml of the supplied coolant additive.
- ⇒ Unscrew the lid (TD) to fill in the coolant.
- ⇒ Remove the filter insert (FE) from the coolant tank.
- ⇒ Activate the cleaning mode in the "Settings" menu (→ Chapter "[Cleaning Mode](#)").



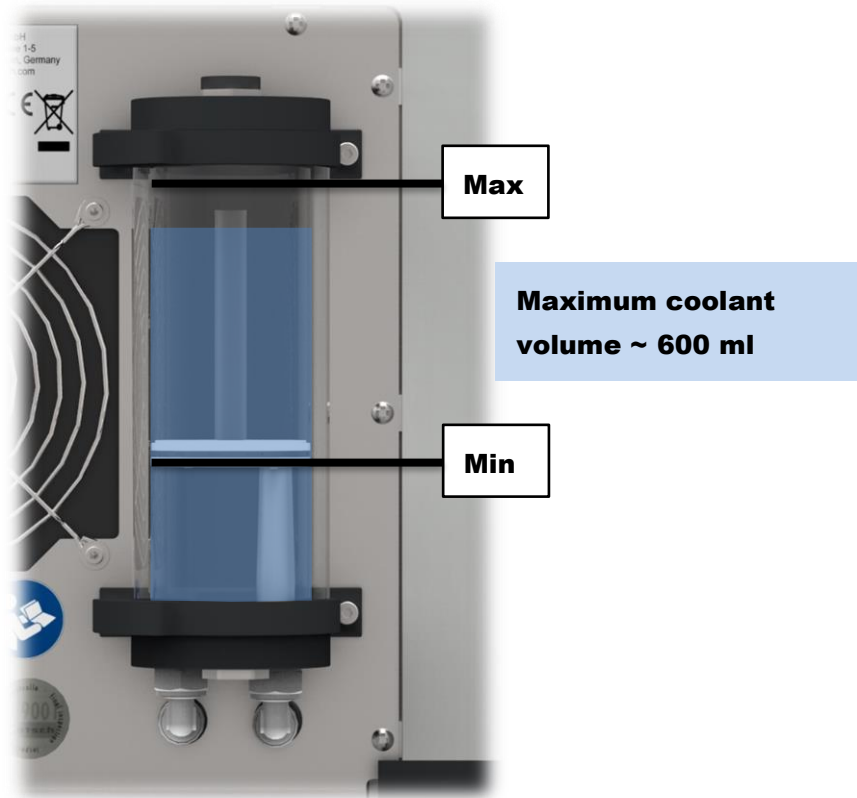
**Fig. 7:** Filling the coolant tank: open (left), remove filter insert (right)

- ⇒ Fill in the coolant in the coolant tank.
- ⇒ If necessary add more coolant until the fill level is located in the top third, but below the maximum fill level.



**Fig. 8:** Deaerating the system

- ⇒ To deaerate the system, insert the supplied syringe with **depressed** plunger into the suction opening (**AS**) in the bottom of the coolant tank and then withdraw the plunger of the syringe completely.
- ⇒ Empty coolant, which may be in the syringe, back into the coolant tank.
- ⇒ Repeat this procedure approx. two to three times.
- ⇒ Deactivate the cleaning mode.
- ⇒ Reinsert the filter insert (**FE**). Ensure the proper fitting of the sealing gasket.
- ⇒ Screw the lid (**TD**) back onto the coolant tank. Ensure the proper fitting of the sealing gasket.



**Fig. 9:** Maximum and minimum fill level

- ⇒ Check the supply of coolant regularly. The coolant level must be within the maximum and minimum fill levels. The minimum fill level is defined by the coolant feed inside the tank.
- ⇒ Only use clean, lime-free water when topping up.
- ⇒ Pay attention to contaminations in the coolant. If it is too dirty, the coolant must be replaced (→ Chapter "[Replacing the Coolant](#)").
- ⇒ Check the cooling system regularly for leaks.

**NOTICE**

N13.0072

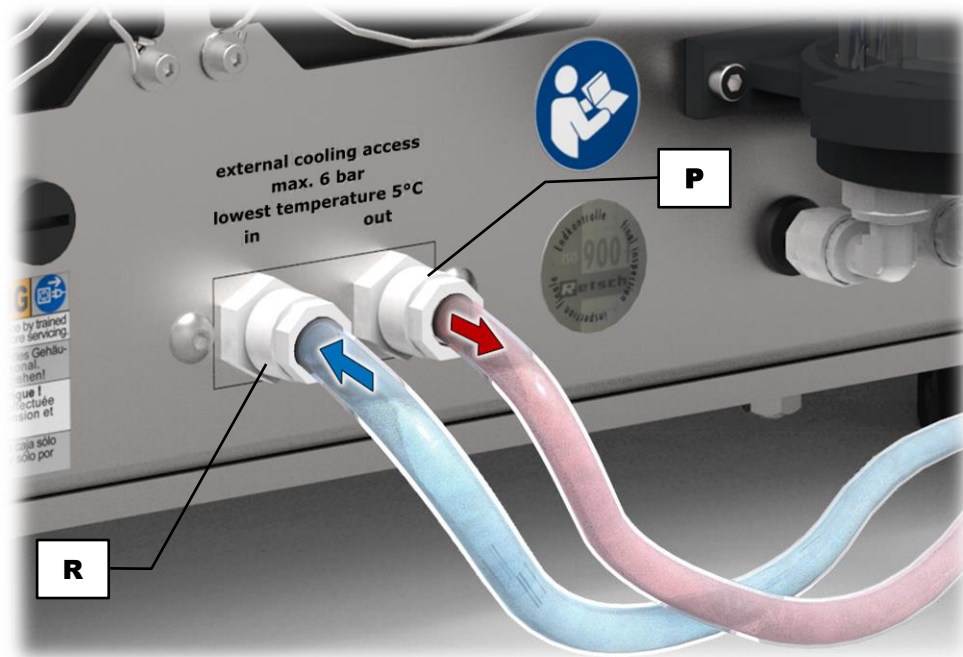
**Error message E46**

Flowmeter

- The following error sources can lead to an E46 error message:
  - No or too little coolant in the cooling system
  - Flowmeter sensor faulty
  - Pump faulty
  - Blockage in the cooling system
- **Check whether sufficient coolant is in the coolant tank.**

**5.2 Connection to an External Cooler**

If the internal cooling is not sufficient for the application, an additional external cooling can be connected to the two connections (R) and (P). The internal cooling is then supported via a heat exchanger by the external cooling.



**Fig. 10:** Connections for external cooling

Two 10/8 mm hoses (not contained in the scope of delivery) can be connected to the connections already mounted on the housing. Alternatively, the connections can be removed and replaced by own screw connections with a G 1/4" thread.

**NOTICE** Please check the tightness of both connections.

The maximum pressure in feed and drain pipes must not exceed 6 bar. The minimum temperature of the cooling liquid may not be less than 5 °C. Only clean, lime-free water is permitted as cooling liquid.

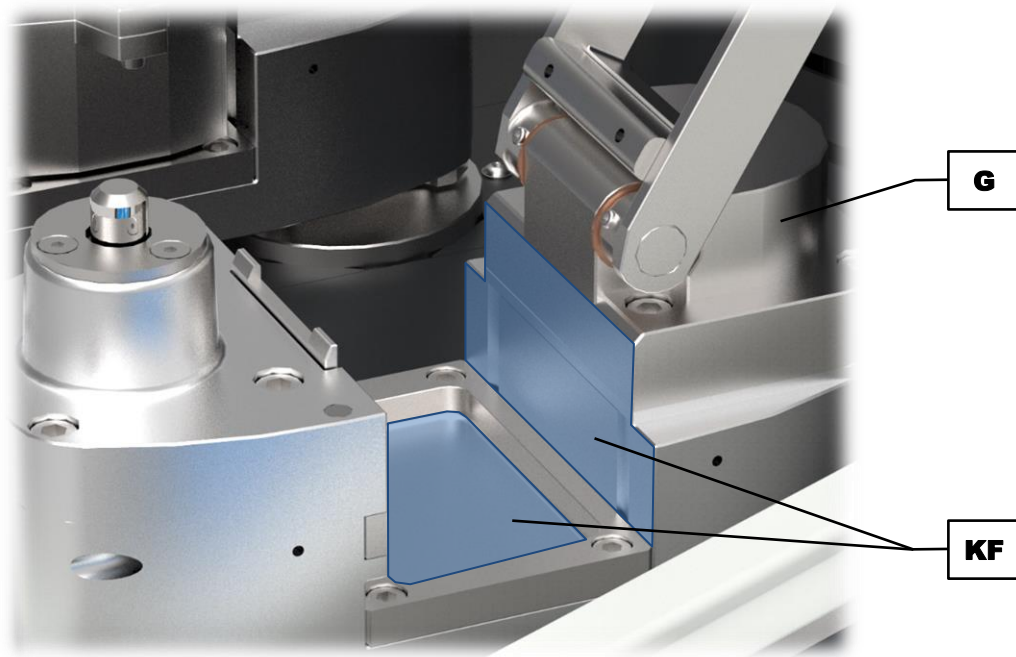
**External cooling specifications:**

Cooling liquid	clean, lime-free water
Minimum pump pressure	0.6 bar
Maximum pump pressure	6 bar
Minimum cooling capacity at 20 °C	1 kW
Flow rate	10 l/min
Working temperature	0 °C – 40 °C

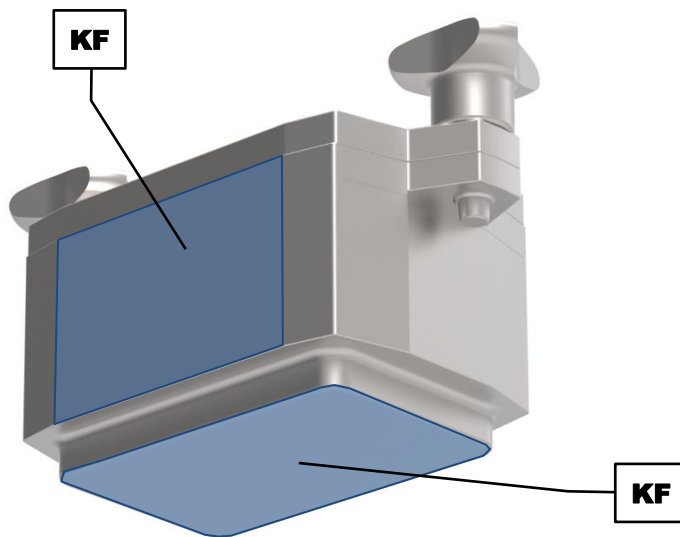
### 5.3 Cooling Surfaces of the Grinding Jar

The grinding jar is cooled by the cooling surfaces (**KF**) in the grinding jar support (**G**). For good cooling performance, the surfaces on the grinding jar and support must be absolutely clean and level.

- ⇒ Remove any dirt and adhesion from the grinding jar and the support.
- ⇒ Take care that the surfaces are level and undamaged.



**Fig. 11:** Cooling surfaces of the grinding jar support



**Fig. 12:** Cooling surfaces of the grinding jar

**NOTICE** As a result of the operation, corrosion may occur at the contact surfaces of the grinding jars and grinding jar supports. This is normal and harmless.

## 6 Operating the Device

### 6.1 Use of the Device for the Intended Purpose

#### 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

C7.0006

##### 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

C8.0004

##### 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

C9.0010

##### 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.**



This High Energy Ball Mill of the Retsch GmbH is a laboratory device. It grinds and mixes soft, medium-hard to extremely hard, brittle and fibrous materials. Minerals, ores, alloys, chemicals, glass, ceramics, plant parts, soil, sewage sludge and many other substances can be ground easily, quickly and without loss.

The High Energy Ball Mill of the Retsch GmbH is successfully deployed in almost all areas of industry and research, especially where there are high demands regarding cleanliness, speed, fineness and reproducibility.

Only grinding sets from Retsch GmbH may be used. Dry and wet grinding may be conducted.

Grinding with solvents is permitted. In this case please note the additional comments in Chapter "[Wet Grinding with Highly Flammable Materials](#)".

**NOTICE**

N14.0007

**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.**

**NOTICE**

N15.0007

**Range of application of the device**

Long-term operation

- This laboratory device is designed for eight-hour single-shift operation with a duty cycle of 30 %.
- **This device may not be used as a production machine nor is it intended for continuous operation.**

## 6.2 Principle of Operation

The combination of high-frequency impact grinding, intense friction and circular jar movements ensures an unprecedented grinding performance. This unique combination is generated by the oval shape and the movement of the grinding jars.

The grinding jar supports are each mounted on two discs, which rotate in the same direction, thus moving the grinding jars on a circular path without changing their orientation. The interplay of jar geometry and movement mechanics causes strong friction between the grinding balls, the sample material and the jar walls, as well as a high acceleration, which allows the grinding balls to hit the sample material with a strong impact at the curvatures of the jars. This results in a significantly better mixing of the particles with a higher final fineness and a narrower particle size distribution than was previously possible with ball mills.

## 6.3 Views of the device

### 6.3.1 Front



Fig. 13: Front view of the device

Element	Description	Function
<b>A</b>	Locking mechanism	Keeps the device closed
<b>B</b>	Operating controls (touchscreen)	Operation of the device
<b>C</b>	Turning handle of the grinding jar support	Clamps the grinding jar
<b>D</b>	Turning handle locking pin	Secures the turning handle of the grinding jar support
<b>E</b>	Grinding jar	Container for the grinding process
<b>F</b>	Retaining bracket of the locking mechanism	Holds the locking mechanism of the hood
<b>G</b>	Clamping bracket	Clamps the grinding jar

<b>H</b>	Hood	Closes the device
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6.3.2 Back

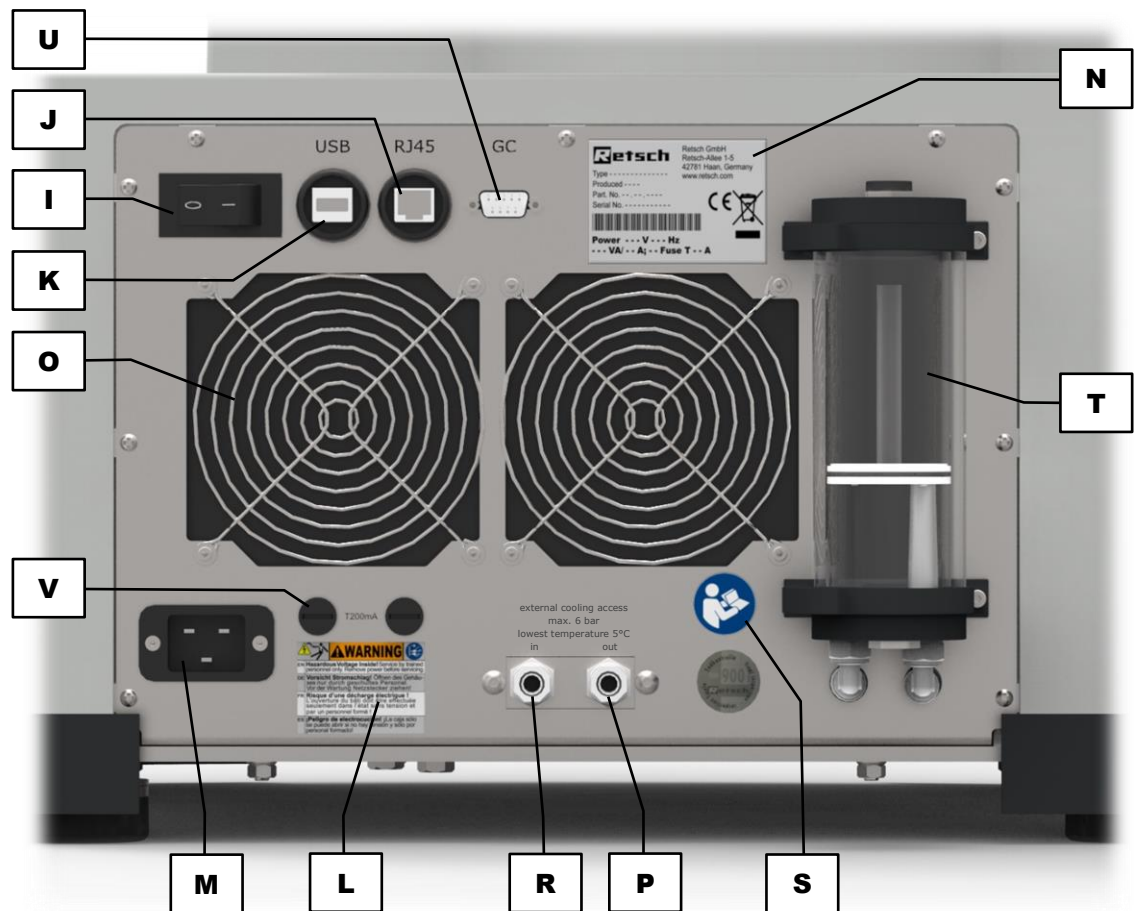


Fig. 14: Back view of the device

Element	Description	Function
<b>I</b>	Mains switch	Switches the device on and off, disconnects the device from the mains
<b>J</b>	RJ45 interface (Ethernet)	Data connection (inactive)
<b>K</b>	USB interface	Data connection
<b>L</b>	Warning sign "Disconnect from the mains"	Warning of electric shock
<b>M</b>	Mains connection	Connection for the power cable
<b>N</b>	Type plate	Lists, among others, the voltage type, the serial number and the type of the device
<b>O</b>	Housing fans	Fans for the waist heat
<b>P</b>	Cooling liquid outlet (optional)	External cooling outlet for hot water
<b>R</b>	Cooling liquid inlet (optional)	External cooling inlet for cold water
<b>S</b>	Sticker "Manual"	Reminds to read the manual
<b>T</b>	Coolant tank of the internal cooling circuit	Coolant compensating reservoir, filling

<b>U</b>	GrindControl interface	Data connection for the optional pressure and temperature measuring system GrindControl
<b>V</b>	Fuse drawers	Contain the operating controls fuses protecting against overvoltage (fuse: 200 mA delay-action at 100 – 240 V)

## 6.4 Switching On / Off


⇒ Turn on the Emax with the mains switch (I) on the back side of the device.

When the device is switched off, it is completely disconnected from the mains.



## 6.5 Opening and Closing of the Device

### 6.5.1 Opening

When the automatic opening is active, the grinding chamber hood is automatically lifted once the grinding process has ended (→ Chapter "[Automatic Opening](#)").

When the automatic opening is deactivated, the grinding chamber hood must be opened manually at the end of grinding process using the  button.

⇒ To open the device, press the  button. The icon of the button changes to .

① After pressing the  button, the locking mechanism is opened and the hood is lifted slightly up. The information note H42 "Open and close lid/cover" appears in the display and can be quit with .

### 6.5.2 Closing

#### CAUTION



C10.0008

##### 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.**




⇒ Press down the hood until the automatic locking is noticeably pulling tight the hood. The icon of the  button changes to .

#### NOTICE

N16.0073

##### Hood is not closed

Automatic locking has not engaged

- If the hood has not closed sufficiently when it is closed, the automatic locking cannot engage.
- **Open the automatic locking by pressing the  button.**
- **Use a little force to press the hood downwards until the automatic locking is noticeably pulling tight the hood.**

## 6.6 Emergency Unlocking

**⚠ CAUTION**

C11.0009

**Risk of injuries**

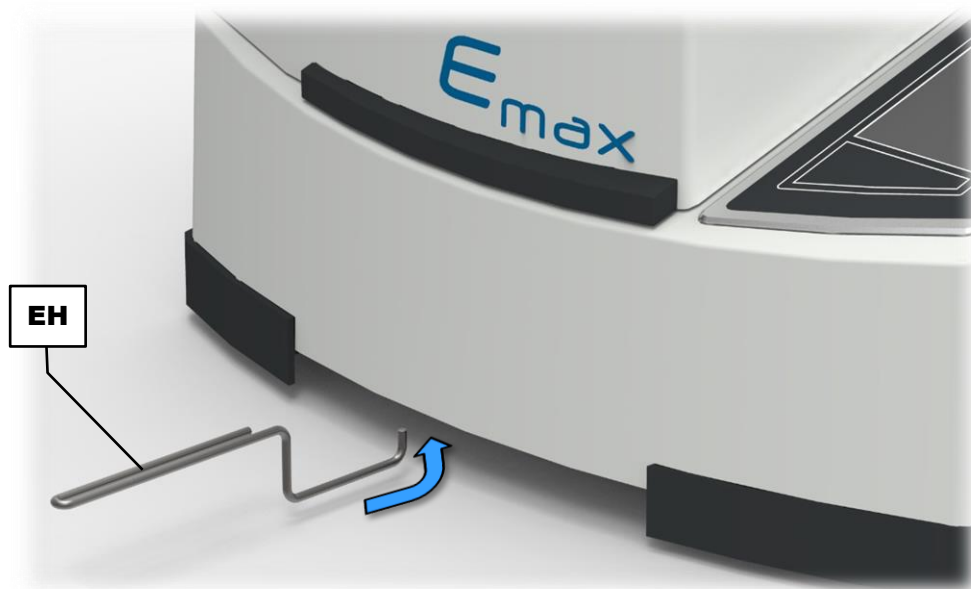
Drive coasting

- In the event of a power failure, the drive on the device continues to coast for a long time, as does the drive on connected device parts. After activating the emergency release, items of clothing and parts of the body can get caught in moving components of the device. This can result in substantial injuries.
- **Disconnect the device from the power supply before activating the emergency release.**
- **Wait until all parts of the device have stopped moving.**



Electrical unlocking is not possible in case of a power outage.

⇒ Open the hood with the unlocking aid (EH) as shown in the figures.



**Fig. 15:** Position of the emergency unlocking

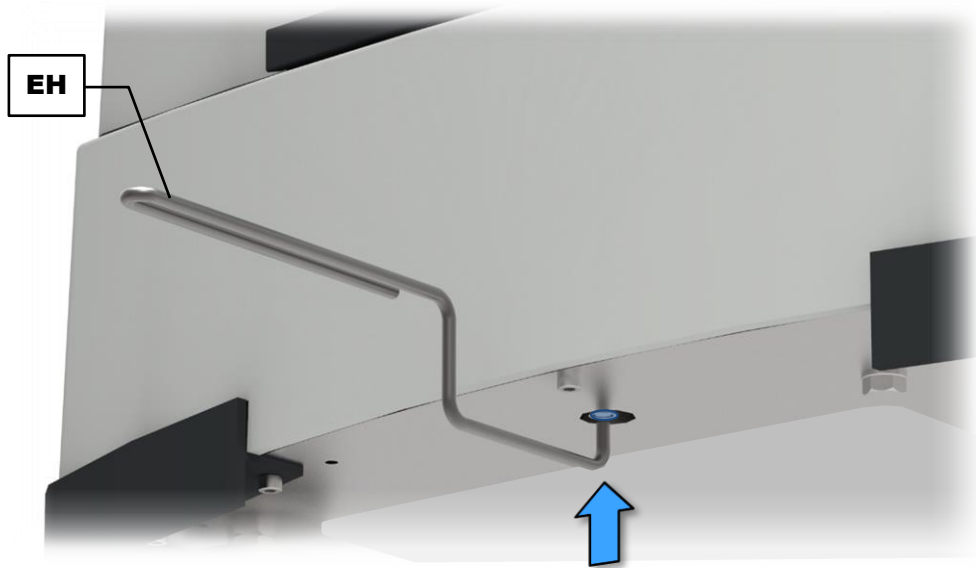


Fig. 16: Activating the emergency unlocking

## 6.7 Opening and Closing the Grinding Jar Support

**CAUTION**

C12.0024

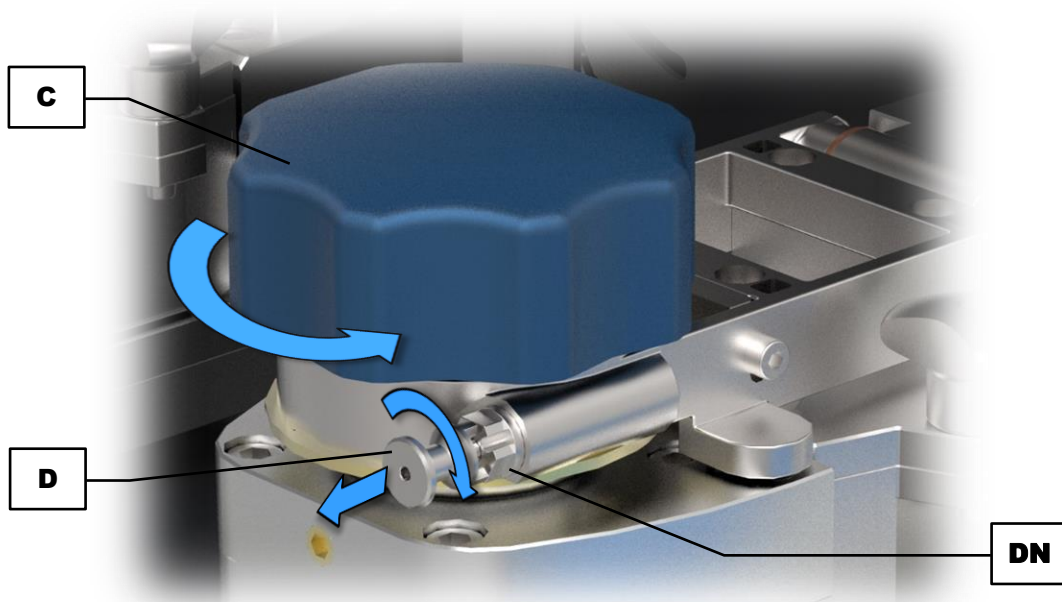
**Risks of burns and scalding**

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.**



### 6.7.1 Opening

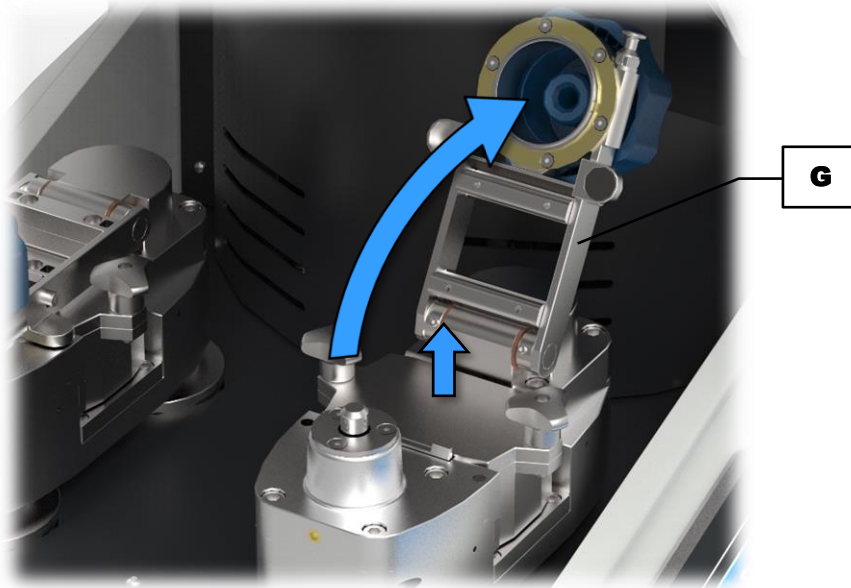


**Fig. 17:** Releasing the grinding jar support

The turning handle (C) of the grinding jar support (G) is secured by the locking pin (D) to prevent inadvertent opening.

- ⇒ Pull out the locking pin (D) to release it from the groove (DN).
- ⇒ Turn the locking pin 90 degrees in order to release it permanently.
- ⇒ Turn the turning handle (C) anticlockwise to open the grinding jar support.

**⚠ CAUTION** Only remove the grinding jar with closed lid. Only open the grinding jar once it has cooled down and only in a safe position (e.g. under a suction device).

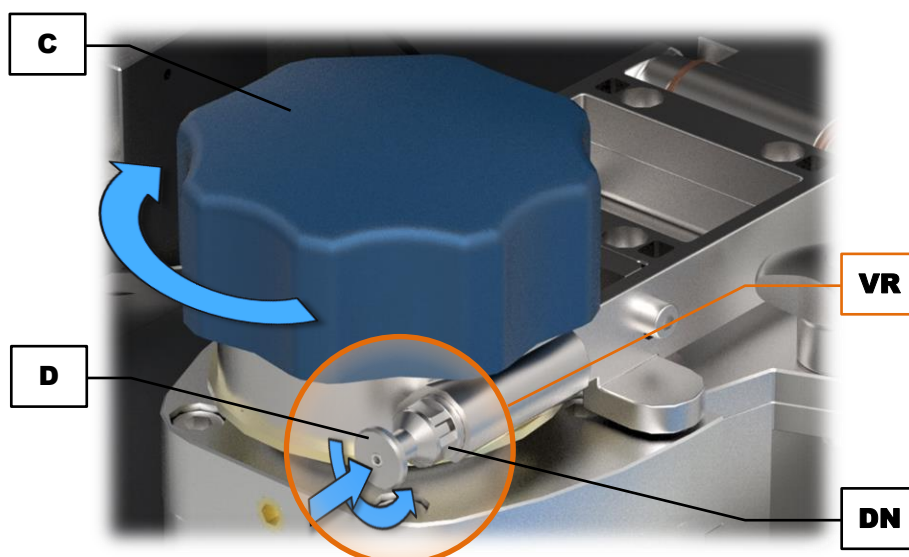


**Fig. 18:** Removing the grinding jar

### 6.7.2 Closing

With the Emax a very large amount of energy enters the sample material.

- ⇒ Therefore, make sure that the grinding jar support has been closed properly.
- ⇒ Before grinding check the lock on the grinding jar support (VR).

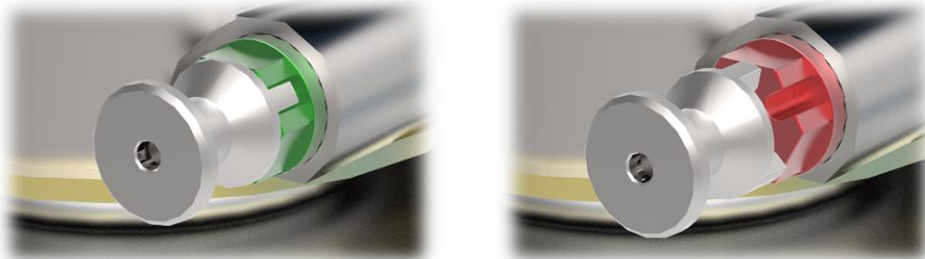


**Fig. 19:** Locking the grinding jar support

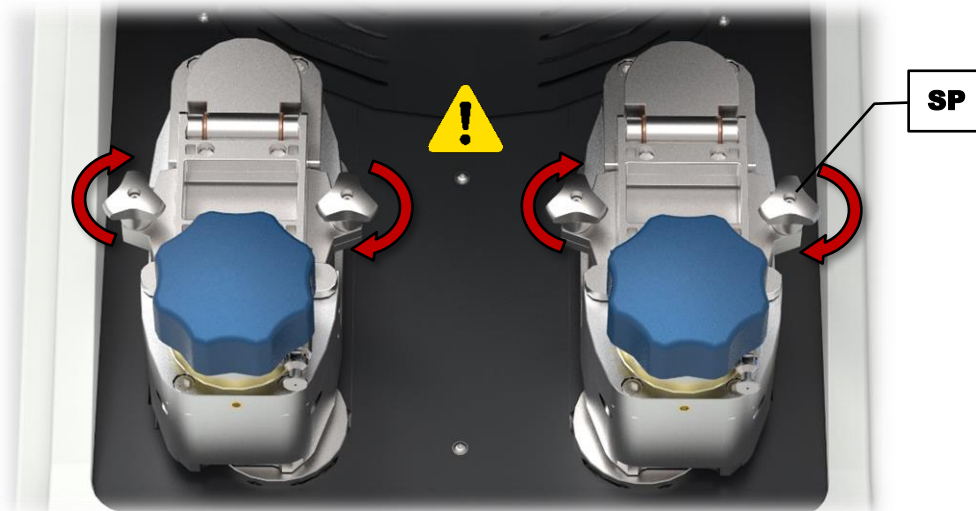
The turning handle (C) of the grinding jar support (G) is secured by the locking pin (D) to prevent inadvertent opening.

- ⇒ Turn the locking pin (D) until it engages in the groove (DN).
- ⇒ Turn the turning handle (C) clockwise and tighten the turning handle (C) hand-tight when closing. No greater force than "hand-tight" is required because the turning handle is secured by the locking pin.

① As a check for the activated locking mechanism, a rattling sound can be heard when turning the turning handle (C) with the lock (D) being closed correctly.

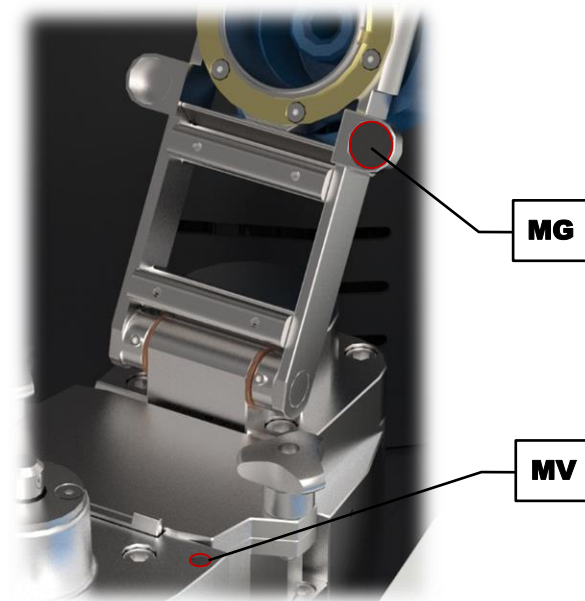


**Fig. 20:** Locking pin secured (left) and opened (right)



**Fig. 21:** Pulling tight the grinding jar clamping screws

- ⇒ After tightening the grinding jar support (G) check the tension on the four clamping screws (SP).

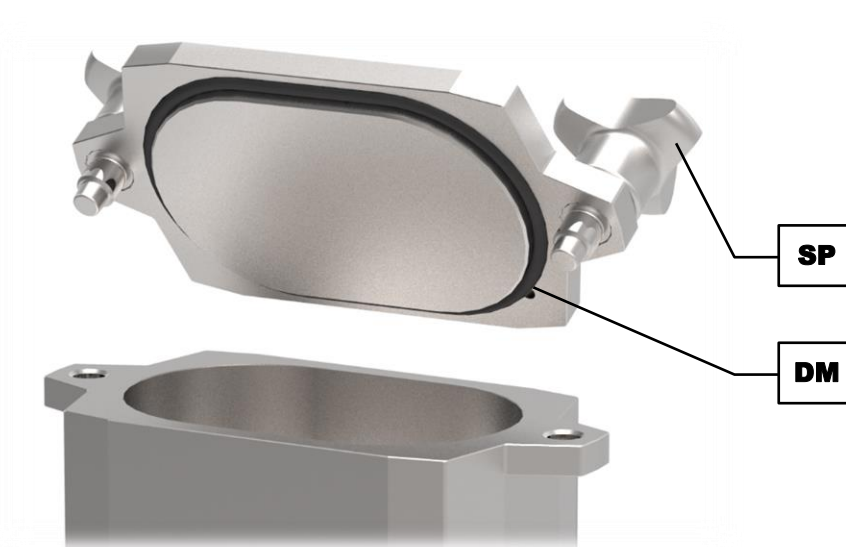


**Fig. 22:** Monitoring the grinding jar support

To avoid operating errors, the correct position of the grinding jar support is queried using a magnet (**MG**) via extension (**MV**) and the corresponding sensor before each start of the device and during the grinding process.

## 6.8 Opening and Closing the Grinding Jar

### 6.8.1 Closing



**Fig. 23:** Closing the grinding jar

With the Emax a very large amount of energy enters the sample material.

- ⇒ Therefore ensure the careful closing of the grinding jar.
- ⇒ When closing the grinding jar, ensure that the sealing gasket (**DM**) is firmly in place.
- ⇒ Tighten the clamping screws (**SP**) rigidly by means of the opening aid (**OE**) included in the delivery.
- ⇒ Check the tension on the four clamping screws (**SP**) after closing the grinding jar support (**G**) with the turning handle (**C**).

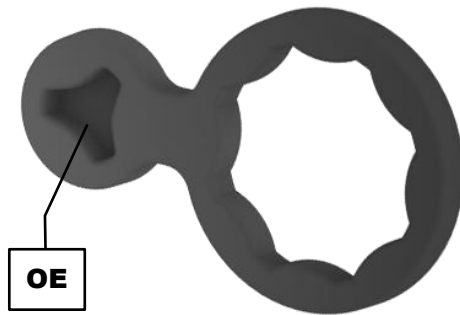


Fig. 24: Grinding jar opening aid

**NOTICE** The grinding jars must **always** be closed with the opening aid! Hand-tight screwing is not sufficient! This prevents the ejection of sample material especially when the device is operated at 2 000 revolutions per minute.

### 6.8.2 Opening

#### 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** Do not open the grinding jar inside the device. The excess pressure generated during the grinding process may be discharged suddenly when the grinding jar is opened, ejecting sample material. Only open the grinding jar once it has cooled down and only in a safe position (e.g. under a suction device).

⇒ Loosen the clamping screws (**SP**) by means of the opening aid (**OE**) included in the delivery.

### 6.8.3 Grinding Jar Identification

All grinding jars, as well as the corresponding lids can be identified by a labelling area on one of the outer sides. The labelling area provides information on the size and material of the grinding jar.

## 6.9 Ball Sizes and Speeds

With the Emax a very large amount of energy enters the sample material. This high amount of energy also acts on the grinding jar and the grinding balls.

Therefore, depending on the jar size the following recommendations for the sample amount and the ball sizes used apply. Likewise note the recommended speeds depending on the grinding jar material.

### 6.9.1 Recommended Ball Sizes

Grinding jar size	Ball size
50 ml	up to 12 mm
125 ml	up to 15 mm

### 6.9.2 Recommended Grinding Jar Filling

Grinding jar size	Sample amount	Max. feed size	Recommended number of grinding balls				
			∅ 5 mm	∅ 7 mm	∅ 10 mm	∅ 12 mm	∅ 15 mm
50 ml	5 – 20 ml	4 mm	160	45	16	8 – 12	–
125 ml	15 – 50 ml	5 mm	400	110	50	35	15 – 18

In addition to the instrument settings, the filling level of the grinding jar is also of crucial importance for a successful grinding process in the High Energy Ball Mill of Retsch GmbH. **When grinding bulk materials, the grinding jar filling should consist of approximately one third of sample and one third of ball quantity.** The remaining third is the free grinding jar volume, which is required for the movement of the balls.

If an increase or decrease in sample volume is to be expected during the grinding process, the amount of sample can be adjusted within the range listed in the table. Thus, e.g. for voluminous materials such as wool, leaves, grasses and similar, a material filling level of 70 – 80 % is necessary. For wet grinding with grinding balls < 3 mm, the ball charge should be 60 % of the grinding jar volume.

#### NOTICE

N17.0052

#### Cryogenic grinding

Grinding with liquid nitrogen (LN<sub>2</sub>) or dry ice

- When grinding with liquid nitrogen or dry ice, breakage of the grinding set and damage to the device can occur!
- **Grinding with liquid nitrogen or dry ice is not permitted!**

### 6.9.3 Recommended Speeds

The following speed restrictions apply to grinding balls larger than or equal to 10 mm:

Grinding jar material	Revolutions per minute
Stainless steel	up to 1 500
Tungsten carbide (WC)	up to 1 200
Zirconium oxide	up to 1 200

### 6.10 Inserting the Grinding Jar

#### NOTICE

N18.0067

#### 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**

N19.0011

**Wear or damage to the grinding set**

Use of different materials

- During operation of a grinding set, in which the individual components are made of different materials, increased wear or damage to the grinding set is possible.
- **Only use grinding sets, where all components are made of the same material.**

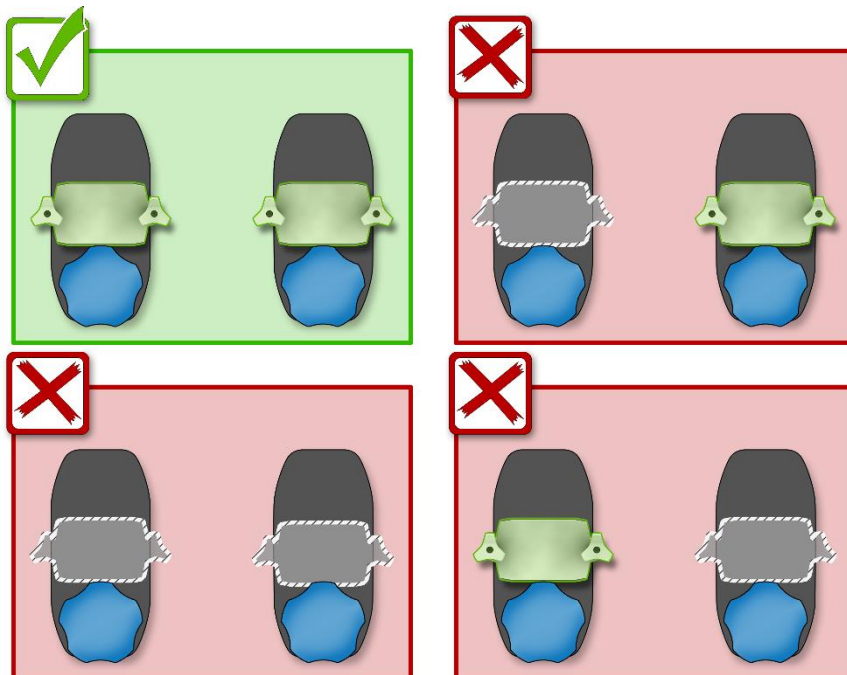


Fig. 25: Correct mounting of the grinding places

**NOTICE** Both grinding places must always be loaded. If only one grinding jar is needed, the second grinding jar must be inserted **empty** (no grinding balls, no sample material) as counterbalance. **Never** operate the Emax **without grinding jars!**

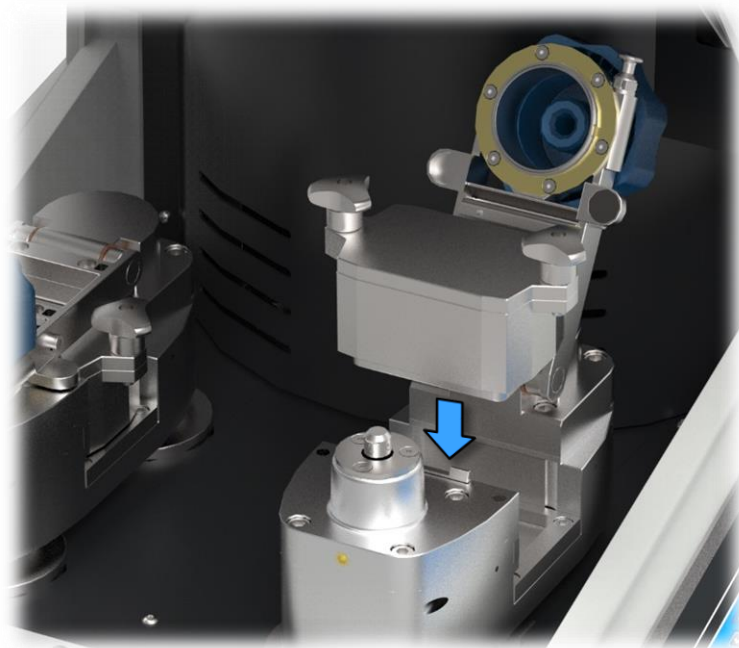


Fig. 26: Inserting the grinding jar

## 6.11 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, benzene 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.

The following must be verified with respect to the device:

- It is necessary to consider the durability of the O-rings (EPDM 75° shore) when selecting the solvent and the durability of the adhesive used when using ceramic inserts.
- The clamping screws of the grinding jars must be tightened firmly.
- Please note that the grinding jars can heat up considerably depending on the grinding jar size, the ball filling, the speed and the grinding duration.
- Before removing the grinding jars, the tightness of the clamping screws must be checked anew.

## 7 Controlling the Device

### 7.1 Operating Controls, Displays and Functions

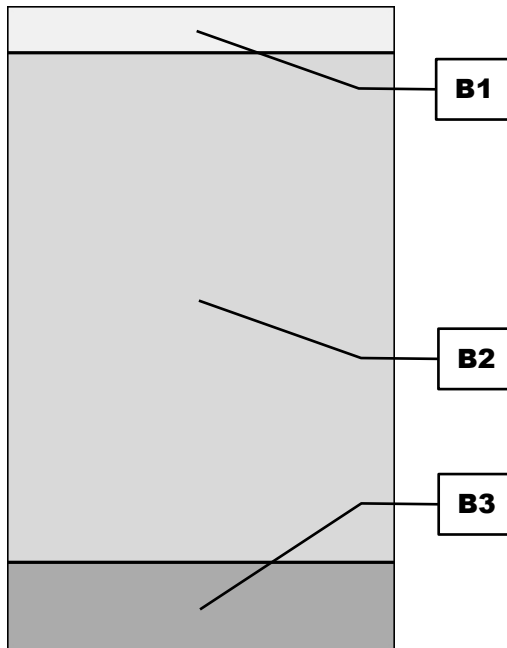


Fig. 27: Control panel areas

Element	Description	Function
<b>B1</b>	Navigation	Selection of the operating modes "Manual", "Program" and "Sequence". Display of date and time. Access to the menu "Settings"
<b>B2</b>	Settings and display of parameters	Settings of grinding parameters and display of parameters during the grinding process
<b>B3</b>	Device control	Start, stop, pause, open hood

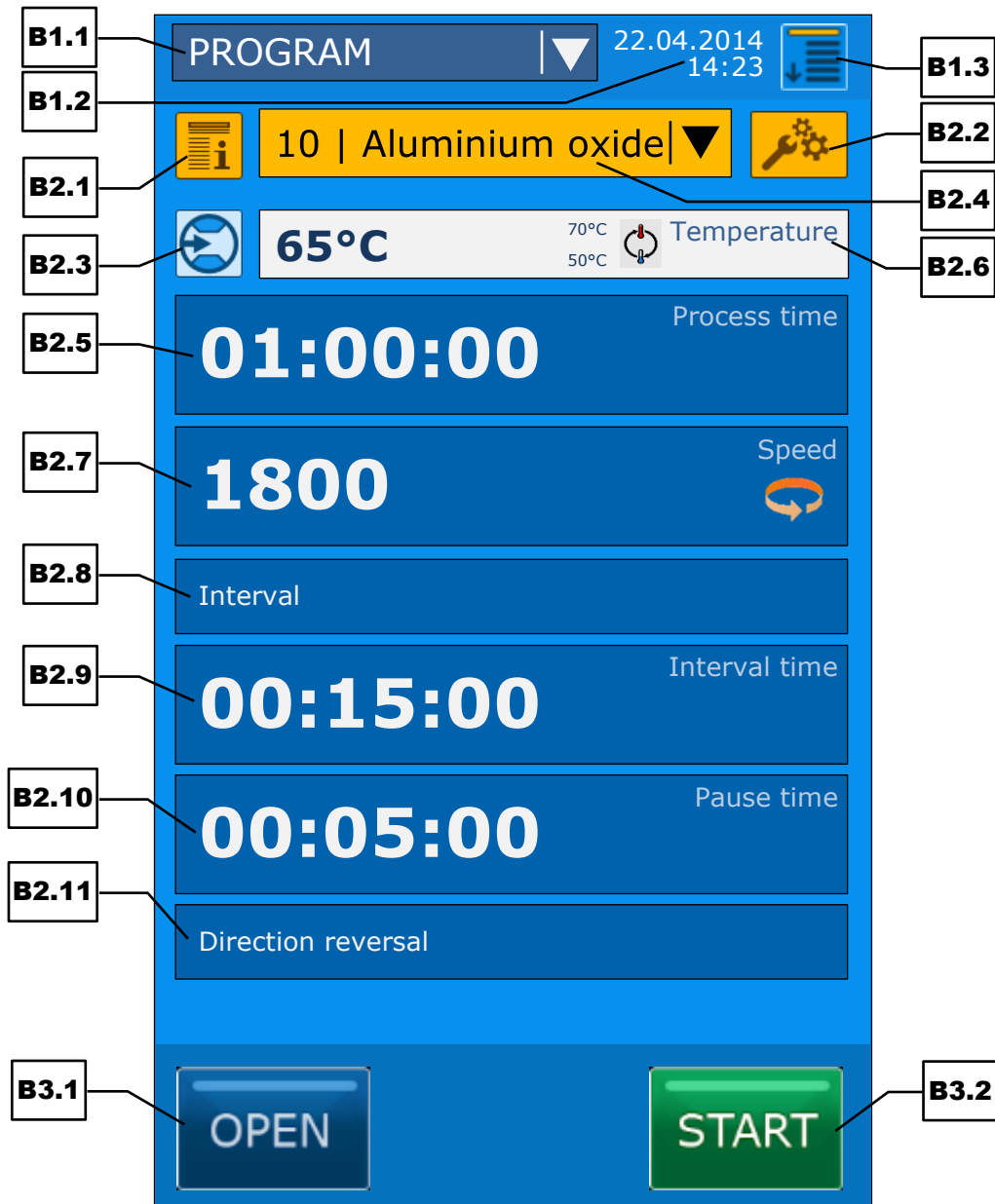


Fig. 28: Control panel and functions

Element	Description	Function
<b>B1.1</b>	Navigation	Switching between the operating modes "Manual", "Program" and "Sequence"
<b>B1.2</b>	Date and time	Displays the current date and time
<b>B1.3</b>	Settings	Access to the menu "Settings"
<b>B2.1</b>	Programme information, sequence information	Retrieval of user data for the current programme or sequence
<b>B2.2</b>	Programme settings, sequence settings	Opens the editing menu for the current programme or sequence
<b>B2.3</b>	Cooling	Displays the cooling status (flow active or inactive)
<b>B2.4</b>	Programme designation, sequence designation	Displays the current programme or sequence number and name. Selection of the desired programme or sequence

<b>B2.5</b>	Process time	Displays the grinding duration
<b>B2.6</b>	Temperature, temperature limits	Displays the current grinding jar temperature (outside) and the set temperature limits
<b>B2.7</b>	Speed	Display of the speed and rotation direction
<b>B2.8</b>	Interval	Indicates whether the interval grinding is active or inactive
<b>B2.9</b>	Interval time	Displays the interval time
<b>B2.10</b>	Pause time	Displays the pause time
<b>B2.11</b>	Direction reversal	Indicates whether the change in rotation direction is active or inactive
<b>B3.1</b>	OPEN	Opens the hood
<b>B3.2</b>	START, STOP	Starts or stops the grinding process

## 7.2 Operating Modes and Navigation

The device can be operated entirely using the touchscreen. The operating software can be divided into three operating modes:

- Manual
- Programme
- Sequence

### 7.2.1 Navigation between Operating Modes

- ⇒ Press on the navigation button (**B1.1**). The navigation menu opens. The current mode is highlighted in colour and marked by ►.
- ⇒ Press on the desired mode.

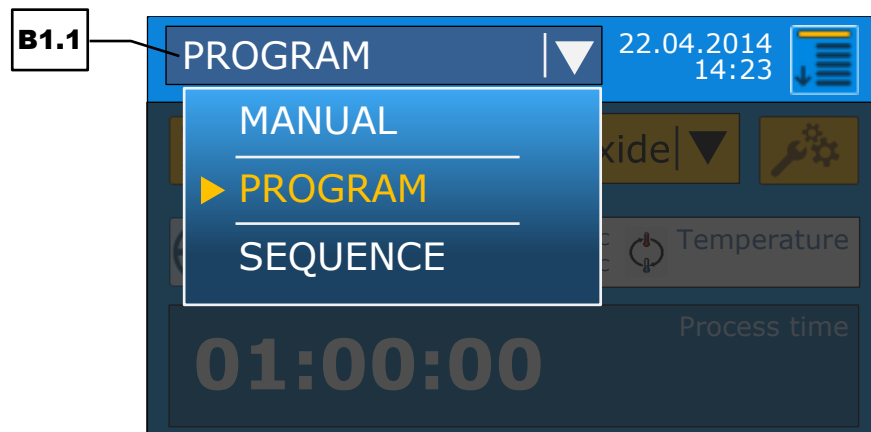


Fig. 29: Selection of the operating mode

## 7.3 Grinding Parameters


The grinding parameters can be set or changed via the control panel. It can be distinguished between adjustable parameters and parameters that can be activated or deactivated.

- ① The grinding parameters cannot be set or changed during the grinding process.

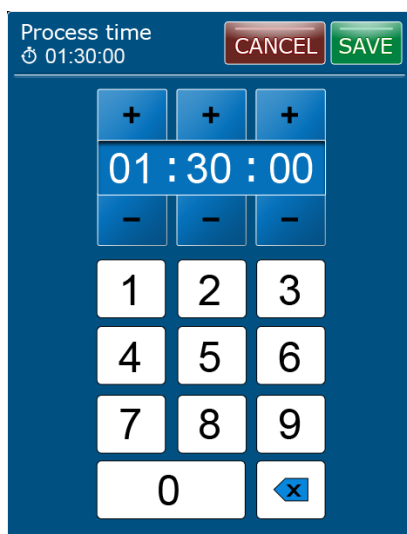
### 7.3.1 Adjustable Parameters

The following parameters can be set via direct data entry:

- Process time
- Speed
- Interval time
- Pause time

In manual mode the parameters can be edited directly. In programme mode the parameters can only be changed when the edit mode has been activated via the  icon (**B2.2**).

- ⇒ Press on the parameter to be edited. The window for direct data entry opens. The parameter can either be set directly using the numeric buttons or stepwise via the [+] and [-] buttons.
- ⇒ Press the **CANCEL** button to cancel the editing without saving the entries. The entries are not applied, and the menu displays the previous screen.
- ⇒ Press the **SAVE** button to save the entries. The entries are applied, and the menu displays the previous screen.



**Fig. 30:** Data entry window

**Process time:**

The process time shows the total duration of the grinding process. An arbitrary process time between 00:01:00 and 99:59:59 (hh:mm:ss) can be set in the data entry window. The process time is continuously counted down to 00:00:00 after the start of the grinding process. A pause of the grinding process will also interrupt the process time as soon as the device has stopped. On activated interval function, the process time consists of both, the interval times and the pause times.

**Speed:**

An arbitrary speed (revolutions per minute) between 300 and 2 000 can be set using the numeric buttons in the data entry window. Via the [+] and [-] buttons the speed can be changed in steps of 100.

**Interval time:**

The interval time defines the duration of the grinding until the next pause. An arbitrary interval time between 00:01:00 and 99:59:59 (hh:mm:ss) can be set in the data entry window. The process time keeps running parallel to the interval time.

- ① The interval time can only be set if the [interval](#) function is activated.

**Pause time:**


The pause time defines the duration of the grinding pause between two intervals. An arbitrary pause time between 00:01:00 and 99:59:59 (hh:mm:ss) can be set in the data entry window. The process time keeps running parallel to the pause time.

① The pause time can only be set if the [interval](#) function is activated.

**7.3.2 Activatable or Deactivatable Parameters**

The following parameters can be activated or deactivated:

- Interval
- Direction reversal

In manual mode the parameters can be edited directly. In programme mode the parameters can only be changed when the edit mode has been activated via the  icon (**B2.2**).

⇒ Press the interval button (**B2.8**). Depending on the previous state, interval grinding is then active or inactive.

**Interval:**

The activation of the interval function allows for the editing of the interval time and the pause time, as well as the activation or deactivation of the direction reversal.

**Direction reversal:**

On activation of the direction reversal, the rotation direction of the grinding jars is changed after each pause. The current sense of rotation of the respective interval phase is displayed by one of the following symbols:



Clockwise direction of rotation



Anti-clockwise direction of rotation

① The direction reversal can only be set if the [interval](#) function is activated.


**7.4 Manual Mode**





The following grinding parameters can be edited directly in manual mode:


- Process time
- Interval time
- Pause time
- Speed
- Interval
- Direction reversal

Please refer to Chapter "[Grinding Parameters](#)" for a detailed description of the parameter settings.

**7.4.1 Start Process**

⇒ Press and hold the  button for approx. two seconds to start the grinding process.

After the start of the grinding the cooling (**B2.3**) is activated. The flow icon changes from  (inactive) to  (active). The  and  buttons appear now in the control panel area of the device control (**B3**).

- ① During the grinding process, it is not possible to access the menu "Settings" (the  button (**B1.3**) is inactive).

### 7.4.2 Stop Process

The grinding process will stop automatically after the set process time has elapsed. However, the grinding process can be stopped manually at any time.


- ⇒ Press the  button to stop the grinding process.




When the automatic opening is active, the grinding chamber hood is automatically lifted once the grinding process has ended (→ Chapter "[Automatic Opening](#)") and the information note H42 "Open and close lid/cover" appears in the display.

- ⇒ Press  to quit the message.



### 7.4.3 Pause Process

The grinding process will stop automatically after the set process time has elapsed. However, the grinding process can be interrupted manually at any time.

- ⇒ Press the  button to interrupt the grinding process.


The process time is stopped and the ,  and  buttons appear now in the control panel area of the device control (**B3**).

#### Open the hood:


- ⇒ Press the  button to open the hood. The information note H42 "Open and close lid/cover" appears in the display together with the remaining process time.
- ⇒ Press  to quit the message.

The grinding process can be resumed after the closing of the hood.

#### Continue the process:

- ⇒ Press and hold the  button for approx. two seconds to continue the grinding process.

#### End the process:

- ⇒ Press the  button to stop the grinding process.

## 7.5 Programme Mode

Often, different but perseverative sample materials with individual grinding parameters are being processed. For such samples, individual grinding parameter sets can be saved in programmes and retrieved when needed.

There are ten programme memory positions available. The following grinding parameters can be stored in the individual programmes:

- Process time
- Interval time

- Pause time
- Speed
- Interval
- Direction reversal

Please refer to Chapter "[Grinding Parameters](#)" for a detailed description of the parameter settings.

Furthermore, an individual heading and description can be assigned to each programme.

### 7.5.1 Select a Programme

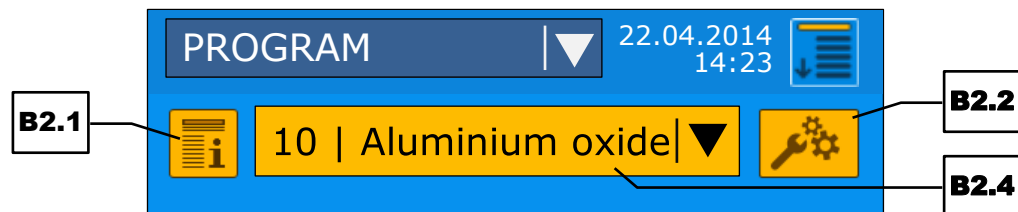






Fig. 31: Programme mode functions




- ⇒ Press the programme name button (B2.4). The programme selection window opens. The current programme is displayed in grey in the list.
- ⇒ To open the programme description of the respective programme, press the  icon.
- ⇒ Press on the desired programme. The programme selection window closes and the relevant programme is loaded.

### 7.5.2 Programme Heading and Description

#### 7.5.2.1 Display of the Programme Description

- ⇒ Press the  icon (B2.1) to open the programme description window. If no programme description has been entered yet, the  icon (B2.1) is displayed in grey.
- ⇒ Press the  button to return to the previous screen.

#### 7.5.2.2 Editing of the Programme Description and Heading

- ⇒ Press the  icon (B2.1) to open the programme description window. If no programme description has been entered yet, the  icon (B2.1) is displayed in grey.
- ⇒ Press the  button to edit the programme description and heading. A further window to edit the programme description and heading opens.
- ⇒ To edit the heading, press on the edit box (B4.1). Use the keypad (B4.4) for entries and editing.
- ⇒ To edit the programme description, press on the edit box (B4.2). Use the keypad (B4.4) for entries and editing.

Simple text editor functions allow for the adding of terms to a dictionary, as well as the deleting, cutting, copying, replacing and/or inserting of words. The number of characters in the programme description is limited to 1 000 characters. The number of characters in the heading is limited to 15 characters.

- ⇒ Press the **CANCEL** button (B4.3) to cancel the editing without saving the description and heading. The entries are not applied, and the menu displays the previous screen (programme description).
- ⇒ Press the **SAVE** button (B4.5) to save the description and heading. The description and heading are applied, and the menu display the previous screen (programme description).

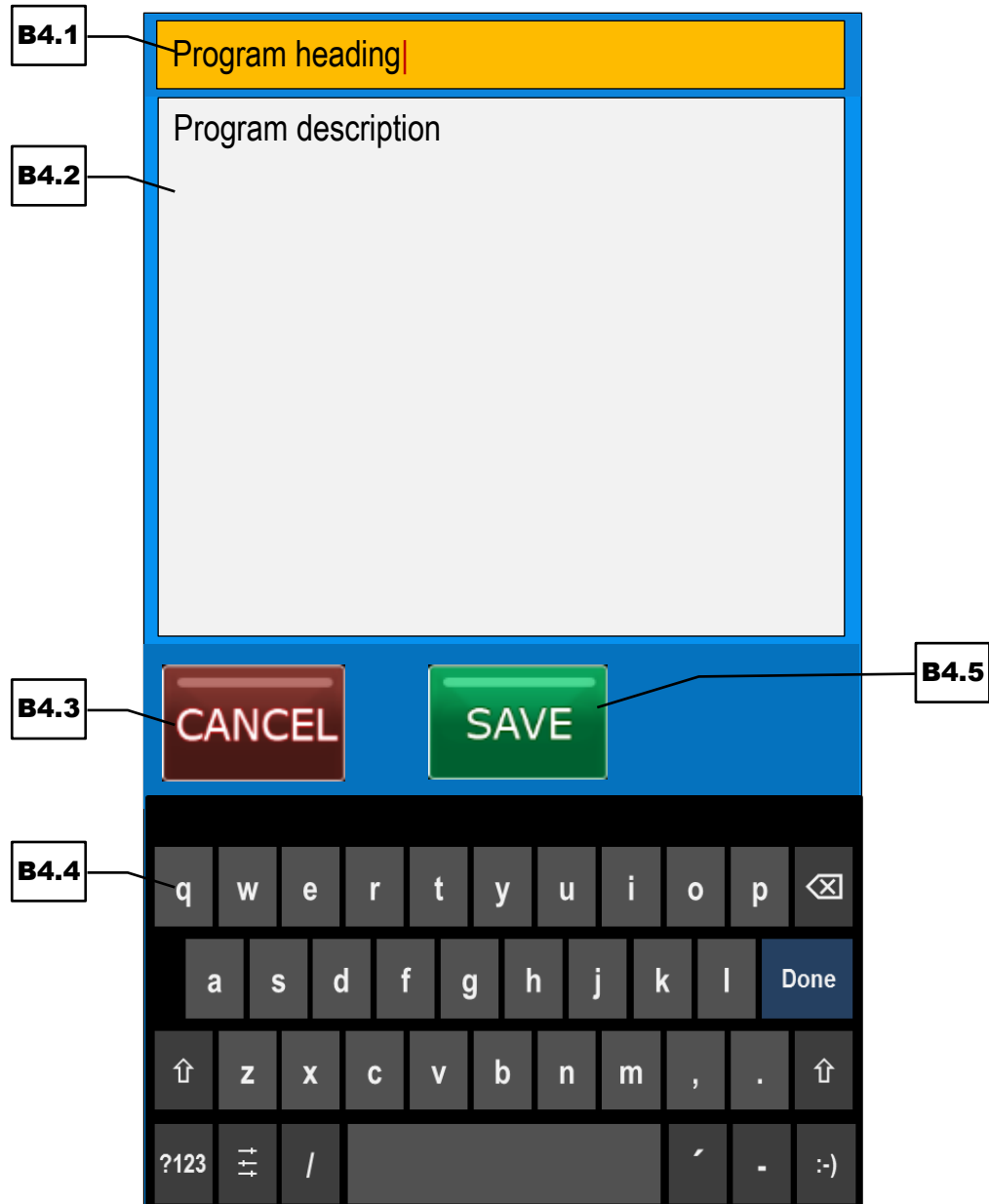



Fig. 32: Window for editing the programme description and heading

### 7.5.3 Edit a Programme

The parameters in programme mode can only be modified with activated editing.

- ⇒ Press the  icon (B2.2) to edit the grinding parameters stored in the respective programme. Please refer to Chapter "[Grinding Parameters](#)" for a detailed description of the parameter settings.
- ⇒ Press the **CANCEL** button to cancel the editing without saving the values. Entered values are not applied, and the menu displays the previous screen.

⇒ Press the **SAVE** button to save the values. Entered values are applied, and the menu displays the previous screen.

## 7.6 Sequence Mode

For special grinding tasks, previously saved programmes can be combined to one sequence in this mode. This allows for the design of very complex grinding processes.


There are three sequence memory positions available. Each sequence consists of up to ten freely selectable programmes. Programmes may be repeated within one sequence. The grinding parameters of the individual programmes, however, cannot be modified in the sequence mode. To do so, change to the [programme mode](#).

Analogous to the programme mode, an individual heading and description can be assigned to each sequence.






Fig. 33: Sequence mode functions

### 7.6.1 Select a Sequence



- ⇒ Press the sequence name button (**B5.4**). The sequence selection window opens. The current sequence is displayed in grey in the list.
- ⇒ To open the sequence description of the respective sequence, press the  icon.
- ⇒ Press on the desired sequence. The sequence selection window closes and the relevant sequence is loaded.

### 7.6.2 Sequence Heading and Description

#### 7.6.2.1 Display of the Sequence Description


- ⇒ Press the  icon (**B5.1**) to open the sequence description window. If no sequence description has been entered yet, the  icon (**B5.1**) is displayed in grey.
- ⇒ Press the  button to return to the previous screen.

#### 7.6.2.2 Editing of the Sequence Description and Heading

- ⇒ Press the  icon (**B5.1**) to open the sequence description window.
- ⇒ Press the  button to edit the sequence description and heading. The steps for editing are analogous to those described in Chapter "[Editing of the Programme Description and Heading](#)".




### 7.6.3 Edit a Sequence

The programme composition of a sequence can only be modified with activated editing.

- ⇒ Press the  icon (**B5.2**) to edit the programmes stored in the respective sequence.

The process times of each programme saved in the sequence are added and displayed as total process time.

#### 7.6.3.1 Add a Programm to a Sequence

- ⇒ Press the arrow ▼ of the last editable memory line marked with "-". The list of all saved programmes appears.
- ⇒ Press the  icon to open the programme description of the respective programme.
- ⇒ Press on the desired programme. The selected programme is added to the sequence and the menu displays the previous screen.
- ⇒ Press the  button to cancel the editing without saving. Changes are not applied and the menu displays the previous screen.
- ⇒ Press the  button to save the editing. Changes are applied and the menu displays the previous screen.

#### 7.6.3.2 Change a Programm of a Sequence


- ⇒ Press the arrow ▼ of the memory line containing the programme to be changed. All further steps are analogous to the [adding of a programme to a sequence](#).

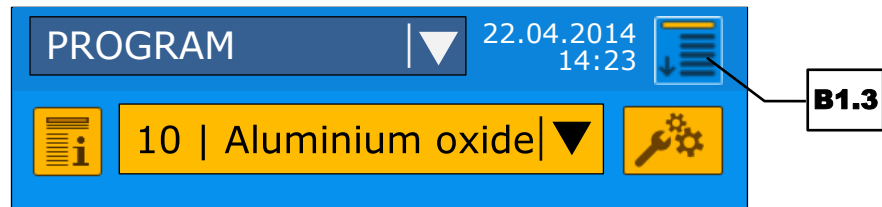
### 7.6.3.3 Delete a Programm from a Sequence

- ⇒ Press the arrow ▼ of the memory line containing the programme to be deleted. The list of all saved programmes appears.
- ⇒ Press on the top line "- (no program)". The programme is removed from the sequence and the menu displays the previous screen.
- ⇒ Press the **CANCEL** button to cancel the editing without saving. Changes are not applied and the menu displays the previous screen.
- ⇒ Press the **SAVE** button to save the editing. Changes are applied and the menu displays the previous screen.

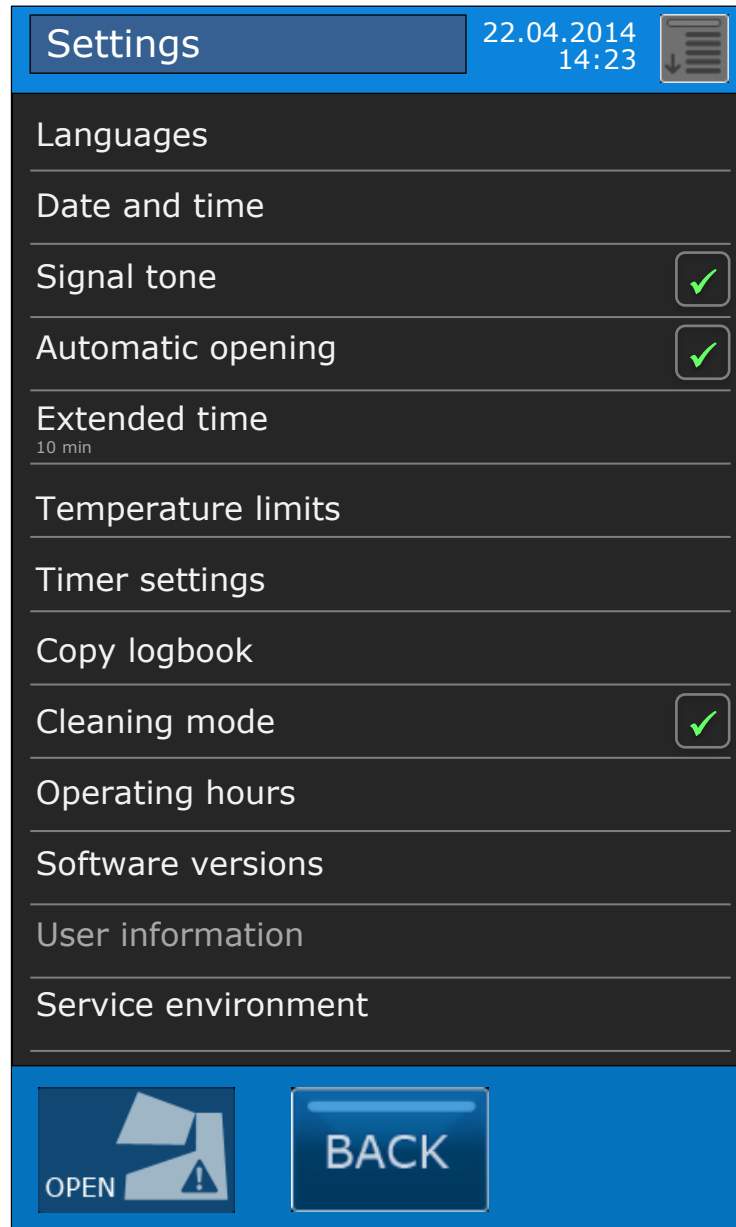
## 7.7 Settings

The menu "Settings" can be accessed from any operating mode.

- ⇒ Press the  icon (**B1.3**). The menu "Settings" is opened.



**Fig. 34:** Access to the menu "Settings"



**Fig. 35:** Menu "Settings"

The following settings can be accessed via the menu:

- Languages
- Date and time
- Signal tone
- Automatic opening
- Extended time
- Temperature limits
- Timer settings
- Copy logbook
- Cleaning mode
- Operating hours
- Software versions
- User information
- Service environment

The individual functions are described in detail in the following subchapters.

⇒ Press the  button to return to exit the "Settings" menu.

### 7.7.1 Languages

In this menu the language of the control panel can be selected.

⇒ Press on the desired language. After the selection, the entire menu structure is displayed in the selected language.

① An exception is the control panel area of the device control (**B3**). The buttons for the device control are displayed in English only.

### 7.7.2 Date and Time

Under this menu item, the current date and time can be changed and saved.

⇒ Set the current date by means of the [+] and [-] buttons in the first window.

⇒ Confirm the input by pressing the [Done] button.

⇒ Set the current time by means of the [+] and [-] buttons in the second window.


⇒ Confirm the input by pressing the [Done] button. Date and time are now saved.

The device can be disconnected from the mains for up to 30 days without losing the settings.

### 7.7.3 Signal Tone

The end of the grinding process, as well as occurring error messages can be signalled acoustically by a warning tone.


⇒ Press the signal tone button to activate or deactivate the acoustic warning tone.


The activated function is marked with the  icon.

### 7.7.4 Automatic Opening

With activated automatic opening the grinding chamber hood is automatically lifted slightly once the grinding process has ended.

⇒ Press the automatic opening button to activate or deactivate the function.


The activated function is marked with the  icon.


When the function is deactivated, the grinding chamber hood must be opened manually using the  button (**B3.1**).

### 7.7.5 Extended Time

During the grinding process the grinding jars can heat up significantly. With the extended time function, the cooling circuit continuous to run for a set duration (between 0 and 99 minutes) after the end of the grinding process. This helps to cool down the grinding jars more quickly.

⇒ Press the extended time button. The window for direct data entry appears. The time in minutes can either be set directly using the numeric buttons or stepwise via the [+] and [-] buttons.

⇒ Press the  button to cancel the editing without saving the entry. The entry is not applied, and the menu displays the previous screen.


⇒ Press the  button to save the entry. The entry is applied, and the menu displays the previous screen.


The currently set time is displayed in small letters below the extended time button.

### 7.7.6 Temperature Limits

This function allows to implement additional grinding pauses for temperature-sensitive sample materials when a certain temperature limit is exceeded. The cooling phase can thus prevent an overheating of the sample material.

- ⇒ Press the button for the temperature limits. The display changes to the settings window.
- ⇒ Press the button for the automatic speed reduction to activate or deactivate the function.

The activated function is marked with the  icon and the temperature limits, as well as the type of the speed reduction can be set.

- ⇒ Press the button for the maximum and minimum temperature. The direct data entry window of the temperature limits opens. Alternatively, the direct data entry window can also be opened via the  icon (B2.6) in the control element.

The maximum and minimum values can either be set directly using the numeric buttons or stepwise via the [+] and [-] buttons. The maximum value amounts 119 °C, the minimum value is 0 °C.

- ⇒ Press the **CANCEL** button to cancel the editing without saving the entries. The entries are not applied, and the menu displays the previous screen.
- ⇒ Press the **SAVE** button to save the entries. The entries are applied and the menu displays the previous screen.

- ⓘ The **SAVE** button remains inactive as long as the maximum value is smaller than the minimum value, or the temperature difference is less than 10 °C.

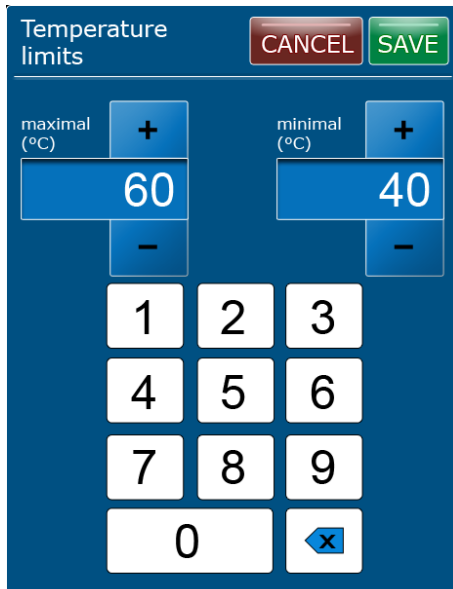




Fig. 36: Direct data entry window of the temperature limits

The currently set temperature limits are displayed in the button for the maximum and minimum temperature.

Additionally, the type of the speed reduction can be selected.

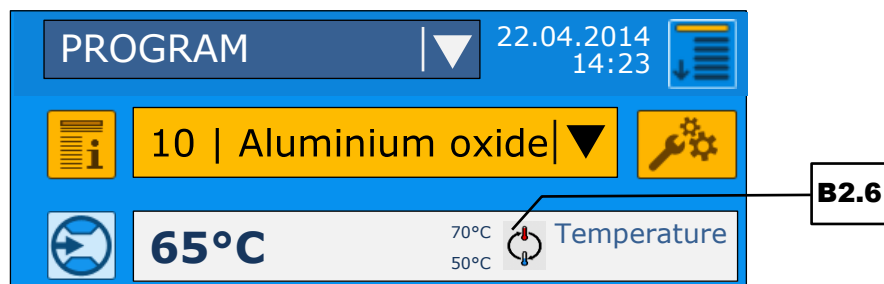
⇒ Press the speed button to activate or deactivate the function.

The activated function is marked with the  icon and the speed will be reduced to 300 rpm upon reaching the set maximum temperature. When the function is deactivated, the drive will stop completely when the set maximum temperature is reached.



⇒ Press the  button to return to the menu "Settings".

### 7.7.6.1 Grinding with Activated Temperature Limits

The grinding is driven at the set speed until the set maximum temperature is reached. Depending on the settings, the speed will either set to 0 rpm or reduced to 300 rpm upon reaching the maximum temperature until the minimum temperature is reached. Once the minimum temperature has been reached, grinding takes place at the set speed again.



**Fig. 37:** Display of the temperature limits

Next to the current temperature, the set maximum and minimum values of the temperature limits are displayed in the control panel next to the  icon (**B2.6**). When the automatic speed reduction becomes active due to exceeded maximum temperature, a black dot  flashes in the temperature icon until the temperature of the grinding jar is again lower than the minimum value.

**NOTICE** The displayed current temperature value corresponds to the temperature on the outside of the grinding jars without correlation to the temperature inside the jar. The sample material itself may have a considerably higher temperature! In case the measured temperatures of the left and right IR sensor differ from each other, the higher value will always be displayed.

① Consider the ambient temperature during temperature controlled operation. In warm climatic areas, the set temperature limits are reached much faster than in colder regions. The set minimum value should be significantly higher than the ambient temperature.

### 7.7.6.2 Warning of Hot Grinding Jars

In the event of excessive heating of the grinding jars, the operator is warned by an information note H46 when the temperature rises above 110 °C.

⇒ Confirm the information note with .



**Fig. 38:** Warning note: hot grinding jars

If the grinding jar temperature exceeds 130 °C, the grinding process is aborted for safety reasons.


- ⇒ Allow the device to cool down.
- ⇒ If not yet done, connect the external cooling.



## 7.7.7 Timer Settings

### 7.7.7.1 Setting the Timer


With the timer function the device can be started with a time lag.

- ⇒ Press the timer settings button. The display changes to the settings window.
- ⇒ Press the [Timer active] button to activate or deactivate the function.



The activated function is marked with the  icon and the time of the timer can be set between minimal 1 minute and maximal 99 hours/59 minutes.



- ⇒ Press the [Timer] button. The window for direct data entry opens. The time can either be set directly using the numeric buttons or stepwise via the [+] and [-] buttons.
- ⇒ Press the  button to cancel the editing without saving the entries. The entries are not applied, and the menu displays the previous screen.
- ⇒ Press the  button to save the entries. The entries are applied, and the menu displays the previous screen.

The currently set time is displayed next to the timer button.

- ⇒ Press the  button to return to the menu "Settings".

### 7.7.7.2 Start Grinding with Timer

When the timer function has been activated, the  button will be displayed as  button showing the previously set delay time.

- ⇒ Press and hold the  button for approx. two seconds to start the countdown. The "Timer countdown" window is displayed and the countdown starts running.
- ⇒ To stop the countdown, press the  button.

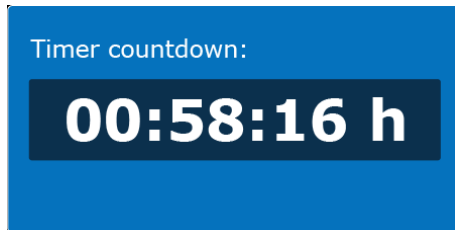


Fig. 39: Timer countdown window

### 7.7.8 Copy Logbook

With this menu function, the following information will be transferred in ASCII format (text format) to a connected USB stick:

- List of error messages (sum counter)
  - Logbook (device log) of the Emax
- ⇒ Plug a suitable USB storage device into the USB port (K) on the back of the device.
  - NOTICE** USB 3.0 storage devices are not supported.
  - ⇒ Press the [Copy logbook] button. The data transfer dialogue box opens, the USB storage device is checked and the information is transferred to the USB storage device in two separate CSV files.
  - ⇒ Press on the data transfer dialogue box to complete the process and to return to the menu "Settings".

**NOTICE** Depending on the amount of data and the speed of the USB storage device, writing to the USB storage device can take a few seconds. Wait at least ten seconds before unplugging the USB storage device from the USB port.


The two stored CSV files can then be opened and evaluated with a spreadsheet programme (e.g. Microsoft Excel).

### 7.7.9 Cleaning Mode

The cleaning mode is required for filling the coolant tank or cleaning it.

With activated cleaning mode the coolant pump is switched on and the coolant circulated in the system.

- ⇒ Press the cleaning mode button to activate or deactivate the function.

The activated function is marked with the  icon.

#### 7.7.9.1 Automatic Cleaning Mode

The cleaning mode is automatically switched on, when the device has not been used for an extended period of time.

If the device has not been turned on for more than two days, the device will start in cleaning mode for two minutes the next time it is switched on. This time is required for the coolant to circulate through the system and to wet all the seals sufficiently.

If the device has not been turned on for more than five days, the device will start in cleaning mode for five minutes the next time it is switched on.

**NOTICE** Do not turn off the automatic cleaning mode! If the automatic cleaning mode is interrupted, it will restart the next time the device is switched on again. The device is only ready for use after successful completion of the cleaning mode.

### 7.7.10 Operating Hours

This function displays the operating hours of the device. The process times, i.e. the times between start and stop are counted. The time cannot be manipulated.

### 7.7.11 Software Versions

The following two software versions of the device can be viewed and updated in this menu:

- Firmware (device control)
- Display (display)

The current software version is displayed next to the respective entry.

⇒ Press the button of the desired software version to perform an update.

**NOTICE** A suitable USB storage device containing the firmware and display software must be connected to the device. The firmware and display software must be located in the root directory. The device then automatically recognises the new software.

### 7.7.12 User Information

① The user information is currently disabled.

### 7.7.13 Service Environment

The service environment is password protected and can only be accessed by service technicians from 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
E10	Drive overload	<ul style="list-style-type: none"> <li>⇒ Switch off the main switch and wait for 30 s before switching on again.</li> <li>⇒ If the error persists, contact service.</li> </ul>
E20	Failure main board	<ul style="list-style-type: none"> <li>⇒ Switch off the main switch and wait for 30 s before switching on again.</li> <li>⇒ If the error persists, contact service.</li> </ul>
E21	Failure rotation speed (speed deviation 10 %)	<ul style="list-style-type: none"> <li>⇒ Switch off the main switch and wait for 30 s before switching on again.</li> <li>⇒ If the error persists, contact service.</li> </ul>
E25	Failure display	<ul style="list-style-type: none"> <li>⇒ Switch off the main switch and wait for 30 s before switching on again.</li> <li>⇒ If the error persists, contact service.</li> </ul>
E26	Failure frequency converter	<ul style="list-style-type: none"> <li>⇒ Switch off the main switch and wait for 30 s before switching on again.</li> <li>⇒ If the error persists, contact service.</li> </ul>
E40	Failure sensor 1 (grinding jar monitoring right)	<ul style="list-style-type: none"> <li>⇒ Confirm the message on the control panel.</li> <li>⇒ Check the secure fit of the grinding jar.</li> <li>⇒ Ensure that the grinding jar support is firmly closed.</li> <li>⇒ If the error persists, contact service.</li> </ul>
E41	Failure speed sensor	<ul style="list-style-type: none"> <li>⇒ Switch off the main switch and wait for 30 s before switching on again.</li> <li>⇒ If the error persists, contact service.</li> </ul>
E42	Failure temperature sensor 1 (IR sensor right)	<ul style="list-style-type: none"> <li>⇒ Switch off the main switch and wait for 30 s before switching on again.</li> <li>⇒ If the error persists, contact service.</li> </ul>
E43	Failure temperature sensor 2 (IR sensor left)	<ul style="list-style-type: none"> <li>⇒ Switch off the main switch and wait for 30 s before switching on again.</li> <li>⇒ If the error persists, contact service.</li> </ul>
E45	Failure sensor 2 (grinding jar monitoring left)	<ul style="list-style-type: none"> <li>⇒ Confirm the message on the control panel.</li> <li>⇒ Check the secure fit of the grinding jar.</li> <li>⇒ Ensure that the grinding jar support is firmly closed.</li> <li>⇒ If the error persists, contact service.</li> </ul>
E46	Failure sensor 3 (flow sensor)	<ul style="list-style-type: none"> <li>⇒ Switch off the main switch and wait for 30 s before switching on again.</li> <li>⇒ If the error persists, contact service.</li> </ul>
E47	Out of balance (imbalance sensor)	<ul style="list-style-type: none"> <li>⇒ Switch off the main switch and wait for 30 s before switching on again.</li> <li>⇒ Check if there are <b>two</b> grinding jars firmly clamped in the properly closed grinding jar supports.</li> <li>⇒ If the error persists, contact service.</li> </ul>

<b>E50</b>	Failure in safety circuit	⇒ Switch off the main switch and wait for 30 s before switching on again. ⇒ If the error persists, contact service.
<b>E51</b>	Safety switch defective (locking)	⇒ Switch off the main switch and wait for 30 s before switching on again. ⇒ If the error persists, contact service.
<b>E52</b>	Failure switch 1 (cover switch right)	⇒ Switch off the main switch and wait for 30 s before switching on again. ⇒ If the error persists, contact service.
<b>E53</b>	Failure switch 2 (cover switch left)	⇒ Switch off the main switch and wait for 30 s before switching on again. ⇒ If the error persists, contact service.
<b>E54</b>	Balance switch	⇒ Switch off the main switch and wait for 30 s before switching on again. ⇒ If the error persists, contact service.
<b>E87</b>	Temperature limit	⇒ Switch off the main switch. ⇒ Allow the device to cool down before switching on again. ⇒ If the error persists, contact service.

## 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.

<b>Notice code</b>	<b>Description</b>	<b>Measures</b>
<b>H42</b>	Open and close lid/cover	⇒ Confirm the message on the control panel. ⇒ Open the hood.
<b>H46</b>	Hot grinding jars!	⇒ Confirm the message on the control panel. ⇒ Stop the grinding process. ⇒ Allow the grinding jars to cool down.

### 8.3 Return for Service and Maintenance



**Fig. 40:** 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.

## 9 Cleaning, Wear and Maintenance

### **⚠ 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

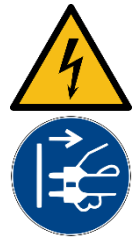
### **⚠ WARNING**

W6.0003

#### 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!**



### **⚠ 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.**



### **NOTICE**

N20.0009

#### Damage to the housing and device

Use of organic solvents

- Organic solvents may damage plastic parts and the coating.
- **The use of organic solvents is not permitted.**

⇒ 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.

⇒ Check at regular intervals whether coolant or grease is escaping in or beneath the device.

### 9.1.1 Cleaning of the Grinding jar

All grinding jars, also those with glued ceramic inserts, can be cleaned with alcohol, petrol or normal household detergent.

#### NOTICE

N21.0010

#### Grinding jars with ceramic inserts

Sudden temperature changes

- Ceramic inserts can crack as a result of sudden temperature changes.
- **Do not expose grinding jars with ceramic inserts to sudden temperature differences.**

### 9.1.2 Drying the Grinding Jars

The grinding jars may be dried after cleaning in the drying cabinet at the following specified temperatures:

Grinding jar material	Temperature
Stainless steel	up to 200 °C
Tungsten carbide (WC)	up to 150 °C
Zirconium oxide	up to 120 °C

## 9.2 Wear

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.

## 9.3 Maintenance

To ensure the function of the seals and to prevent damage to the cooling system or the drive, it is necessary to observe the following points if the device is used rarely:

- Run the device at least every 2-3 weeks (one cleaning cycle and 15 minutes at the lowest speed).
- Replace the water with added coolant every 6 months.

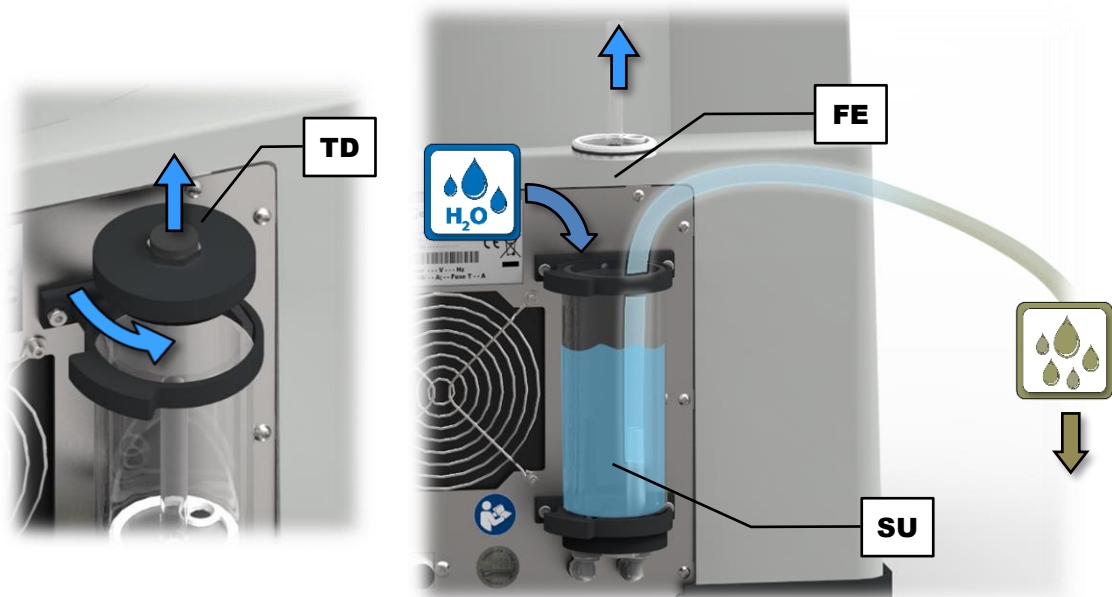
The maintenance of the Emax includes the regular exchange of the coolant. The coolant must be exchanged when it shows a significant cloudiness.

### 9.3.1 Exchange of the Coolant

#### 9.3.1.1 Removing the Coolant and Rinsing the Cooling System

- ⇒ Unscrew the lid (**TD**) of the coolant tank.
- ⇒ Remove the filter insert (**FE**) from the coolant tank.
- ⇒ Place one end of the supplied hose over the opening of the outlet socket (**SU**).
- ⇒ Insert the other end of the supplied hose into a collecting vessel with a capacity of approx. five litres (not included in the delivery). Make sure that the collecting vessel is located **below** the coolant tank and that the hose has a **continuous slope down**.

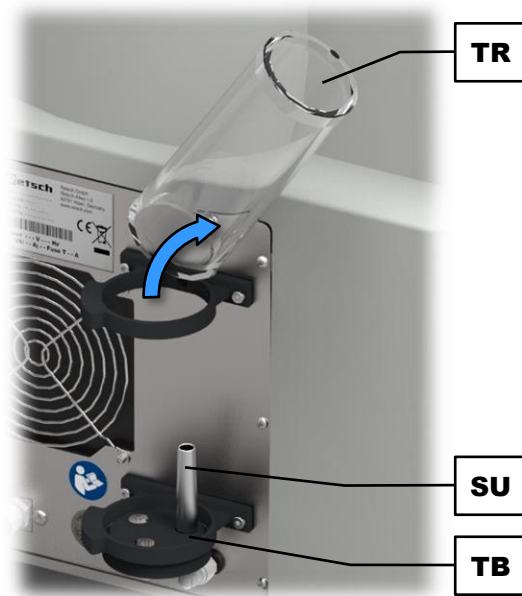
- ⇒ Activate the cleaning mode in the "Settings" menu (→ Chapter "[Cleaning Mode](#)"). The old coolant is now drained from the system and pumped into the collecting vessel.



**Fig. 41:** Removing the lid (left), draining the coolant and rinsing the system (right)

- ⇒ Fill 600 ml of clean, lime-free water into the coolant tank. The water is circulated through the system and drained again via the hose. **NOTICE** Only use lukewarm water for rinsing. Do not use boiling water and do not add any descaling agents!
- ⇒ Repeat this process approx. three to five times, until the turbidity of the water disappears and the clear water flows from the cooling system into the collecting vessel.
- ⇒ Deactivate the cleaning mode as soon as the cooling system is emptied.
- ⇒ Remove the hose from the outlet socket (**SU**).

A residual cloudiness of the cooling liquid can persist, even after repeated rinsing. This, however, is uncritical.



**Fig. 42:** Removing the pipe

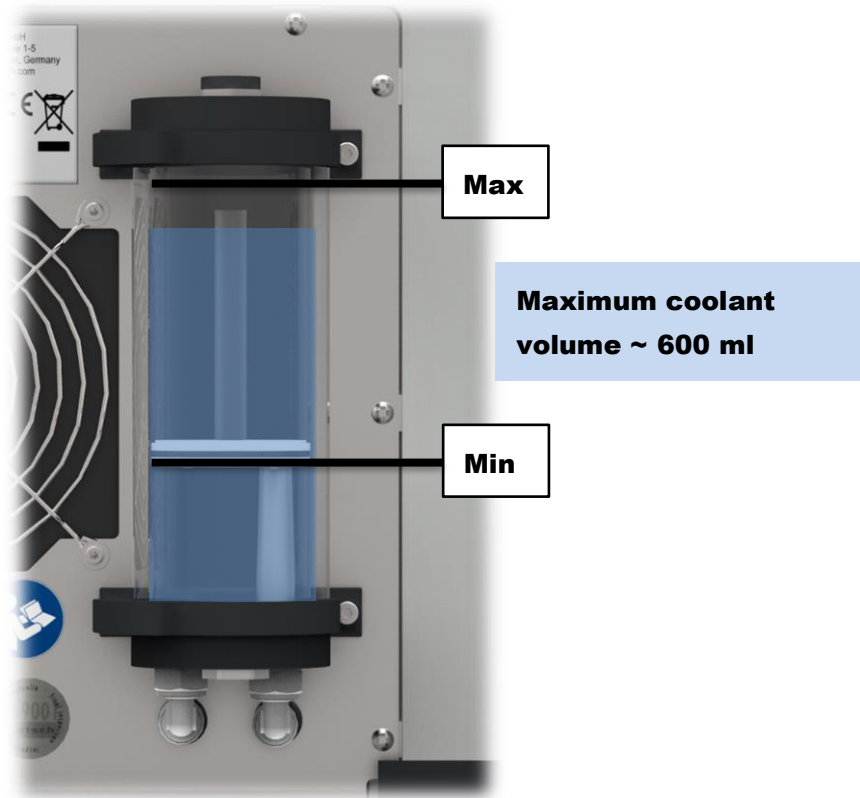
- ⇒ Remove and clean the pipe (TR).
- ⇒ Clean the base (TB) of the coolant tank.
- ⇒ Also clean the previously removed filter insert (FE).
- ⇒ Reinsert the pipe (TR). Ensure the proper fit of the sealing gaskets.

### 9.3.1.2 Filling New Coolant

**NOTICE** The coolant consists of cooling liquid and a coolant additive. Only clean, lime-free water is permitted as cooling liquid. The coolant additive (article no. 02.362.0027) is included with the delivery of the device and can be ordered separately when required.

- ⇒ Mix 600 ml of clean, lime-free water with 15 ml of the supplied coolant additive.
- ⇒ Fill in the coolant.
- ⇒ Activate the cleaning mode in the "Settings" menu (→ Chapter "[Cleaning Mode](#)").
- ⇒ If necessary add more coolant until the level is located in the top third, but below the maximum fill level.
- ⇒ Deaerate the system (→ Chapter "[Commissioning of the Cooling](#)")!
- ⇒ Deactivate the cleaning mode.
- ⇒ Insert the filter insert (FE) again and screw the lid (TD) back onto the coolant tank. Ensure the proper fit of the sealing gaskets.

**NOTICE** Check the cooling system regularly for leaks.



**Fig. 43:** Maximum and minimum fill level

**NOTICE**

N22.0072

**Error message E46**

Flowmeter

- The following error sources can lead to an E46 error message:
  - No or too little coolant in the cooling system
  - Flowmeter sensor faulty
  - Pump faulty
  - Blockage in the cooling system
- **Check whether sufficient coolant is in the coolant tank.**

## 10 Accessories

Information on available accessories as well as the respective manuals are accessible directly on the Retsch GmbH homepage (<http://www.retsch.com>) under the heading "Downloads" of the device.

Information on wear parts and small accessories can be found in the Retsch GmbH general catalogue also available on the homepage.

In case of any questions concerning spare parts please contact the Retsch GmbH representative in your country, or Retsch GmbH directly.

### 10.1 Aeration Lid



**Fig. 44:** Grinding jar with aeration lid

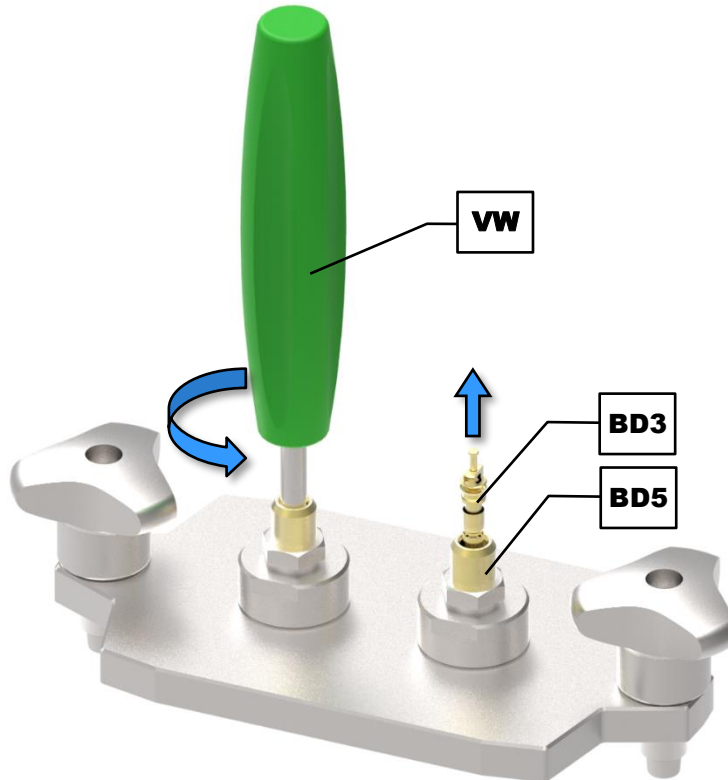
By using the optional aeration lid, grinding processes can be carried out in an inert atmosphere.

- ⇒ Put the grinding material together with the grinding balls into the grinding jar.
- ⇒ Close the grinding jar with the aeration lid. Use the opening aid (OE) for this purpose (→ Chapter "[Opening and Closing the Grinding Jar](#)").
- ⇒ Clip the supplied valve nipple (BD1) on one of the two valves (BD3). The valve is permanently opened by the valve nipple.
- ⇒ Screw the supplied valve cap (BD2) onto the other of the two valves (BD3). The valve can be opened by pressing the valve cap.
- ⇒ Connect the desired inert gas to the valve nipple (BD1) using a hose (not supplied).
- ⇒ Let the inert gas flow through the valve nipple (BD1) into the grinding jar, while simultaneously pressing on the valve cap (BD2) to allow the air to escape from the grinding jar and be replaced by the inert gas.
- ⇒ Once all air in the grinding jar has been replaced with the desired inert gas, release the valve cap (BD2) (usually after a few seconds). The valve closes.
- ⇒ Stop the supply of the inert gas and remove the valve nipple (BD1).
- ⇒ Unscrew the valve cap (BD2).

Alternatively, a negative pressure can be generated in the grinding jar instead of an inert atmosphere. For this purpose, instead of a gas cylinder, a compressor can be connected to the valve nipple (BD1). The valve cap (BD2) remains permanently closed during this procedure.

**NOTICE** Only use **grinding balls > 2 mm** to prevent the aeration holes (**BD4**) in the lid from being clogged by grinding balls.

### 10.1.1 Cleaning the Aeration Lid



**Fig. 45:** Cleaning of the aeration lid

For thorough cleaning of the aeration lid, it is recommended to unscrew the valves (**BD3**) from the valve retainer (**BD5**).

⇒ Unscrew both valves (**BD3**) from the valve retainers (**BD5**) using the supplied valve tool (**VW**).

The aeration lid can be cleaned with alcohol, petrol or normal household detergent. The aeration holes (**BD4**) can be cleaned with compressed air through the valve retainers (**BD5**). The aeration lid and the valves are also dishwasher suitable.

The valves (**BD3**) can also be cleaned in an ultrasonic cleaning-bath. As cleaning agent, water together with a standard surfactant is recommended. The cleaning in the ultrasonic bath usually takes two to three minutes. After that the valves are thoroughly rinsed with water and dried. The cleaning with strong bases or acids is generally not recommended.

Additional information concerning ultrasonic cleaning-baths can be found on the Retsch GmbH homepage (<http://www.retsch.com>).

**CAUTION**

C16.0031

**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.**

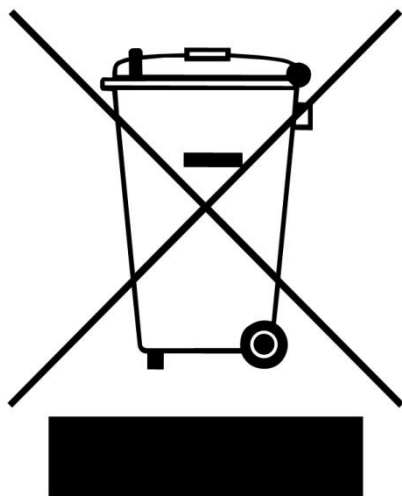


## 11 Disposal

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 13<sup>th</sup> 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. 46:** 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 23<sup>rd</sup> 2006. From this date on, the manufacturer must provide an adequate possibility of returning all devices delivered since August 13<sup>th</sup> 2005. For all devices delivered before August 13<sup>th</sup> 2005 the end user is responsible for the proper disposal.

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## 12 Index

### A

Accessories .....	69
Activatable parameters .....	47
Additional cooling.....	15
cooling liquid .....	15
maximum pressure.....	15
minimum temperature .....	15
Adjustable parameters.....	45
Aeration lid	
cleaning.....	70
Aeration Lid.....	69
Ambient temperature .....	17, 57
Amendment status.....	7
Amperage .....	18
Automatic opening .....	33, 48, 55
activated.....	55
deactivated.....	55
Automatic speed reduction .....	56, 57

### B

Back .....	32
Back view.....	32
Ball size.....	39
Bar code .....	19
Blockage .....	26, 68

### C

Calibration.....	63
Capacity .....	18
CE marking .....	19
Ceramic insert.....	42
Clamping bracket.....	31
Clamping screws .....	37, 38, 39, 42
Cleaning.....	64
Cleaning mode.....	59
activated.....	59
automatic.....	59
Closing .....	33, 36, 38
Complaints.....	16
Condensation.....	16
Confirmation form for the managing operator.....	12
Connection to an external cooler .....	26
Control panel .....	44
areas .....	43
language .....	55
Controlling the device .....	43
Coolant.....	15, 24
contaminations .....	26
draining .....	66
exchange.....	65
fill level.....	24
fill volume .....	15
new filling .....	67
removing .....	65
Coolant additive .....	15, 24, 67

Coolant feed.....	26
Coolant tank .....	15, 23, 24, 32
maximum fill level.....	26
minimum fill level.....	26
removing the lid .....	66
removing the pipe.....	67

Cooling .....	15, 44, 48
commissioning.....	23
external.....	15, 58
grinding jar.....	55
internal.....	15

Cooling capacity	
minimum.....	27

Cooling circuit .....	55
Cooling liquid .....	24, 27, 67
inlet .....	32
minimum temperature .....	27
outlet.....	32

Cooling performance.....	27
Cooling phase .....	56
Copyright.....	7
Corrosion .....	28
Cryogenic grinding .....	40
CSV file .....	59

### D

Data entry window .....	46
Date.....	23, 44, 55
Deactivatable parameters .....	47
Deaerating .....	25
Decrease of sample volume during grinding	
process.....	40
Degree of protection .....	13
Depth.....	14
base.....	14
Description	
editing.....	49
number of characters .....	49

Device	
close .....	33
open.....	33

Device control .....	43, 55
Device designation.....	18
Dimensions .....	14
Direction reversal .....	45, 47
Disclaimer .....	7
Disconnection from the mains .....	23
Display .....	43
software .....	60
Displays .....	43
Disposal .....	72
label.....	72
regulations.....	72

Disposal label.....	19
Dry ice.....	40

<b>E</b>	
Edit window .....	50
Electrical connection .....	18
Electromagnetic compatibility .....	14
EMC .....	14
Emergency unlocking .....	34
Emissions .....	13
Equivalent continuous sound level .....	13, 14
Error	
E10 .....	61
E20 .....	61
E21 .....	61
E25 .....	61
E26 .....	61
E40 .....	61
E41 .....	61
E42 .....	61
E43 .....	61
E45 .....	61
E46 .....	26, 61, 68
E47 .....	61
E50 .....	62
E51 .....	62
E52 .....	62
E53 .....	62
E54 .....	62
E87 .....	62
Error messages .....	55, 61
list .....	59
Ethernet .....	32
Explanations of the safety instructions .....	9
Extended time .....	55
External cooling	
connections .....	27
inlet .....	32
maximum pressure .....	27
outlet .....	32
specifications .....	27
External fuse .....	18
<b>F</b>	
Feed grain size .....	15
Feed size .....	40
Feed volume .....	14
Fill level	
maximum .....	26, 68
minimum .....	26, 68
Firmware .....	60
First commissioning .....	23
Flow icon .....	48
Flow rate .....	27
Flowmeter .....	26, 68
sensor faulty .....	26, 68
Free-force compensation sockets .....	21
Frequency .....	18
Front .....	30
Front view .....	31
Functions .....	43, 44
Fuse strength .....	18
Fuse type .....	18
Fuses .....	33
<b>G</b>	
General catalogue .....	69
General safety instructions .....	10
GrindControl	
interface .....	33
Grinding	
start with timer .....	58
with activated temperature limits .....	57
with solvents .....	30
Grinding aid .....	42
Grinding ball	
size .....	40
Grinding jar .....	31
ceramic insert .....	65
clamping screws .....	37
cleaning .....	65
closing .....	38
cooling surfaces .....	27, 28
drying .....	65
filling level .....	40
identification .....	39
inserting .....	40, 42
inside temperature .....	57
material .....	39, 40, 65
opening .....	38, 39
outside temperature .....	57
removing .....	36
sealing gasket .....	38
size .....	39, 40
Grinding jar support .....	31, 36, 37
closing .....	35
cooling surfaces .....	28
locking .....	37
monitoring .....	13, 38
opening .....	35, 36
releasing .....	36
sensor .....	38
Grinding materials .....	29
Grinding noise .....	13
Grinding parameters .....	45
Grinding pause .....	56
Grinding places .....	41
<b>H</b>	
Heading	
editing .....	49
number of characters .....	49
Hearing loss .....	13
Height .....	14
with open hood .....	14
Hood .....	32
opening .....	48
Hot grinding jars .....	57, 58
Housing fans .....	32
Humidity .....	17

<b>I</b>	
Increase of sample volume during grinding	
process .....	40
Inert atmosphere .....	69
Inert gas .....	69
Information note	
H42 .....	33, 48, 62
H46 .....	57, 62
Information notes .....	61, 62
Installation .....	16
Installation height .....	17
Installation site	
conditions .....	16
Interval .....	45, 47
Interval time .....	45, 46
<b>L</b>	
Languages .....	23, 55
$L_{eq}$ .....	13, 14
Lifting the device .....	19, 20
Liquid nitrogen .....	40
Location requirements .....	14
Lock .....	13
Locking mechanism .....	31, 33
Locking pin .....	31, 36, 37
close .....	37
open .....	37
Logbook .....	59
copy .....	59
Long-term operation .....	30
<b>M</b>	
Mains connection .....	32
Mains frequency .....	18
Mains supply .....	18
Mains switch .....	32
Maintenance .....	12, 63, 64, 65
Manual .....	7
Manual .....	10
Manual .....	12
Manual mode .....	46, 47
Manufacturer's address .....	19
Maximum relative humidity .....	17
Motor rotation speed .....	14
<b>N</b>	
Navigation .....	43, 44, 45
menu .....	45
Negative pressure .....	69
Notes on the manual .....	7
<b>O</b>	
Open .....	45
Opening .....	33, 35, 39
Opening aid .....	38, 39
Operating controls .....	31, 43
Operating hours .....	60
Operating instructions .....	12
Operating mode	
change .....	45
manual .....	45
programme .....	45
selection .....	45
sequence .....	45
Operating modes .....	45
Operating the device .....	29
Organic solvents .....	64
<b>P</b>	
Packaging .....	16
Part number .....	18
Pause time .....	45, 46, 47
Power version .....	18
Principle of operation .....	30
Process	
continue .....	48
end .....	48
pause .....	48
start .....	47
stop .....	48
Process time .....	45, 46, 52
Programme	
display description .....	49
edit description and heading .....	49
editing .....	50
selecting .....	49
Programme description .....	49
Programme designation .....	44
Programme heading and description .....	49
Programme information .....	44
Programme memory position .....	48
Programme mode .....	46, 47, 48
functions .....	49
Programme name .....	49
Programme selection .....	49
Programme settings .....	44
Protective equipment .....	13
Pump	
faulty .....	26, 68
Pump pressure	
maximum .....	27
minimum .....	27
<b>R</b>	
Range of application of the device .....	30
Rated power .....	14
Receptacle volume .....	14
Recommended ball sizes .....	39
Recommended grinding jar filling .....	40
Recommended number of grinding balls .....	40
Recommended speeds .....	40
Repair .....	11, 63, 64
Repair instructions .....	11
Required floor space .....	14
Return .....	16
for service and maintenance .....	63
Return device .....	72
Return form .....	63
Revolutions per minute .....	40

Rinsing the cooling system .....	65	minimum .....	56
RJ45 interface.....	32	Temperature limits .....	56
Rotation direction.....	45, 47	activated .....	56
<b>S</b>		display .....	57
Safety.....	8	Temperature range .....	17
Safety Officer .....	8	Temporary storage.....	16
Sample amount.....	40	Text editor .....	49
Sequence		Time .....	23, 44, 55
adding a programme .....	52	Timer .....	58
changing a programme .....	52	activated .....	58
deleting a programme .....	53	set.....	58
display description.....	52	settings .....	58
editing.....	52	Timer countdown window .....	59
editing description and heading .....	52	Touchscreen .....	31, 45
selecting .....	52	Transport.....	16
Sequence description .....	52	Transport damage.....	16
Sequence designation .....	44	Transportation aid .....	19, 20
Sequence heading and description .....	52	removing.....	21
Sequence information.....	44	Transportation lock .....	19
Sequence memory position .....	51	removing.....	19
Sequence mode.....	51	unscrewing .....	19
functions.....	51	Tungsten carbide .....	40, 65
Sequence name.....	52	Turning handle .....	36, 37
Sequence selection .....	52	Type plate .....	18, 32
Sequence settings .....	44	description .....	18
Serial number .....	19	<b>U</b>	
Service address.....	11	UKCA marking .....	19
Service environment.....	60	Unlocking .....	34
Settings .....	43, 44, 53, 54	Unlocking aid .....	34
Signal tone.....	55	USB interface.....	32
Signs .....	7	Use of the device for the intended purpose .....	29
Small accessories .....	69	User information.....	60
Software		<b>V</b>	
update .....	60	Vibrations .....	23, 40
versions.....	60	Views of the device.....	30
Sound level.....	13	Voltage.....	18
Sound parameters .....	13	<b>W</b>	
Spare parts .....	69	Warning.....	9
Speed.....	39, 45, 46, 57	Information .....	10
activated.....	57	Warning tone.....	55
deactivated.....	57	Warranty claim .....	16
Speed reduction.....	56	Warranty claims .....	10
Speed restrictions .....	40	WC .....	40, 65
Stainless steel.....	40, 65	Wear.....	64, 65
Start .....	45	Wear parts .....	69
Stop.....	45	Weight.....	14, 18, 19
Switching on / off .....	33	Wet grinding.....	42
Symbols .....	7	with highly flammable materials .....	42
<b>T</b>		Width .....	14
Target group .....	8	base.....	14
Technical data .....	13	Working temperature .....	27
Temperature .....	45, 65	Workplace related emission level .....	13, 14
actual value .....	57	<b>Y</b>	
icon.....	57	Year of production.....	18
limits .....	45		
Temperature fluctuations .....	16		
Temperature limit			
maximum.....	56		

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**Z**

Zirconium oxide .....40, 65

# HIGH ENERGY BALL MILL

Emax | 20.510.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 13849-1	Safety of machinery - Safety-related parts of control systems
DIN EN 61010-1	Safety Regulations for Electrical Measurement, Control, Regulation and Laboratory Devices

### 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. Frank Janetta, Head of Development





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