

FRITSCH · JAW CRUSHER

Operating Manual

A photograph of a Fritsch Jaw Crusher, a laboratory-scale grinding machine. It is primarily white with a blue base and a black motor. The machine has a hopper at the top for loading material and a discharge chute. The background is dark, and the machine is illuminated from the side.

translation of the original



PULVERISETTE 1

FRITSCH JAW CRUSHER

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Fritsch GmbH, Laborgerätebau has been certified by the TÜV-Zertifizierungsgemeinschaft e.V. Certificate registration number 71 100 4 008



It was verified through an audit that Fritsch GmbH satisfies the requirements of DIN EN ISO 9001:2000.

The enclosed conformity statement states the directives satisfied by the planetary micro mill "PULVERISETTE 1" in order to bear the CE mark.



Instrument number 01.50xx.00
applies as of serial number 2185

Instrument number 01.70xx.00
applies as of serial number 2180

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1 General Information / Introduction

1.1 Notes about Operating Instructions

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



Attention!
observe operating
instructions

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

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

1.3 Short Description of the Machine

1.3.1 Applications

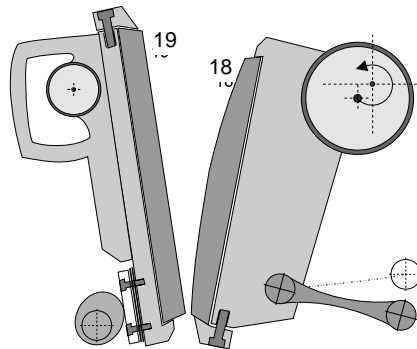
The „pulverisette 1“ is a laboratory jaw crusher for the pre-crushing of hard-brittle substances especially for the following fields of application: mining and metallurgy, geology and mineralogy, chemistry, glass and ceramics, earths and stones.

The initial feed size is of a maximum

- of 65 mm for the type P1/I
- of 100 mm for the type P1/II

The obtainable final size - depending on the gap setting - is from about 15 mm to 2 mm.

1.3.2 Method of Operation



The crushing of the materials is being done within a crushing chamber consisting of two lateral side walls, one settable fixed crushing jaw (19) and one movable crushing jaw (18). The movable crushing plate is put into an eccentric movement by means of a fly-wheel and a sturdy cam. The special design of the movement of the movable crushing jaw ensures that the materials to be crushed are drawn into the crushing chamber and that the blockage of crushed pieces within the chamber is prevented. The pre-crushed materials can easily fall out of the crushing chamber.

To collect the crushed materials, a plastic drawer is used or, if larger quantities have to be crushed, the instrument must be placed on a support and a larger container is placed below the jaw crusher.

1.4 Technical Data

Dimensions

model I + II: 72 x 41 x 83 (Höhe x Breite x Tiefe)

Weight

model I: netto 177 kg brutto 217 kg

model II: netto 205 kg brutto 245 kg

Working noise

The noise level equals up to approx. 93dB (A).

Voltage, Current consumption, Power consumption

The machine can be operated at two levels of voltage:

Model I:

- single-phase alternating voltage 115V \pm 10%, 21A, 1,9kW
- single-phase alternating voltage 230V \pm 10%, 9A, 1,57kW
- 3-phase alternating voltage 200V \pm 10%, 5,3A, 1,1kW
- 3-phase alternating voltage 400V \pm 10%, 2,62A, 1,45kW

Model II:

- 3-phase alternating voltage 230V \pm 10%, 9A, 2,78kW
- 3-phase alternating voltage 400V \pm 10%, 4,95A, 2,2kW
- 3-phase alternating voltage 500V \pm 10%, 5.15A, 3kW
- single-phase alternating voltage 230V \pm 10%, 13,5A, 2,36kW

Transient excess voltages are permissible in accordance with overload voltage category II.

(see also chapter on 3.5 Electrical connection)

Electric fuses

- The electric fuse is integrated in the protective motor switch, which is integrated in the on-off-switch.

Material

Feed particle size: model I: approx. 60 mm

model II: approx. 95 mm

Throughput: model I: 140kg/h

model II: 200kg/h

Final fineness

The final fineness depends on the inserted gap width and is between 1,0 mm and 15,0 mm.

2 Operational safety

2.1 General safety instructions

- Read the operating manual carefully.
- The laboratory jaw crusher may only be used for the purposes described in chapter 1.3.1 Applications .
- We recommend that a safety logbook should be kept in which all work (service, repairs etc.) carried out on the machine should be entered.
- Use only original accessories and original spare parts. The safety of the machine is impaired if this instruction is not followed.
- Do not continue to use damaged accessories.
- Operating personnel must be acquainted with the contents of the operating manual.
For this reason it is essential that – among other things - the operating manual is kept near the machine at all times.
- Do not remove instructive labels or signs.
- Do not deactivate safety devices.
- Unauthorised changes to the machine lead to the loss of Fritsch's attestation of conformity to European directives as well as the loss of the warranty.
- Wear protective glasses!
- Wear ear protection! The noise level is above 93dB(A)
- Operating personnel must always operate the machine with safety in mind.
- All threshold limit values according to current safety requirements must be followed; if necessary, a ventilator must be provided or the machine must be operated under an extractor outlet.
- When grinding oxidable materials (e.g. metals or coal), there is a risk of instantaneous combustion (dust explosion) if the material exceeds a certain fineness. The fine material can be absorbed through a filter in the back of the machine and could ignite on electric components. It is therefore necessary to take special safety precautions when grinding such material and the work must be supervised by a specialised
- When grinding electrically conductive materials, the fine dust can be absorbed by the filter in the back of the machine and cause short circuiting. It is therefore necessary to take special safety precautions and to pay special attention to cleanliness when grinding such material.
- The laboratory jaw crusher is not explosion protected and is not designed to grind explosive materials.
- Do not run the laboratory jaw crusher unsupervised.



observe operating instructions!



wear protective gloves!



wear safety goggles!



wear ear protectors!



Attention! risk of explosion

2.2 Operating personnel

- The laboratory jaw crusher may only be operated by authorised personnel and maintenance and repairs may only be carried out by trained specialists.
- People with health problems or under the influence of medication, drugs, alcohol or exhaustion must not operate the high-speed rotor mill.

2.3 Safety equipment

Attention!!!

- Safety equipment must be used in accordance with the regulations and must not be rendered inoperative or be removed.
- All safety equipment must be checked regularly for completeness and function, see the chapter 7 Maintenance on.

Inside the jaw crusher „pulverisette 1“ several elements independently acting contribute to security:

1. A star feeder is installed inside the funnel in order to prevent the user from getting into the crusher with hands while feeding in the material.
2. A safety switch mounted behind the macrolon cover controls that the cover has been closed before the jaw crusher could be started.
 - ⇒ If the cover is left open, the jaw crusher can not be put in operation.
 - ⇒ Only after the cover is on its place, the jaw crusher can be put into operation.
 - ⇒ After lifting off the cover the jaw crusher stops.

2.4 Hazard points

- Danger of crushing at the funnel lid!
- Danger of crushing at the Macrolon lid!

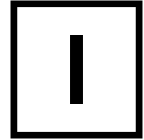


Attention!

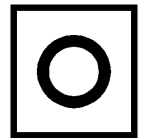
2.5 Electrical safety

General

- The main switch disconnects the machine from the mains.
 - If the jaw crusher is not in use over a prolonged period of time, Night shut-off: Unplug the jaw crusher from the mains
 - The disk mill is turned off and on by means of a **motor protection switch** matched to the mains voltage (as per nameplate).
 - ⇒ Press the **Start** button: The disk mill starts up.
- In the event of overload or a faulty motor or cable a protection switch automatically interrupts the flow of power, The jaw crusher can be turned back on with the motor protection switch once the malfunction is eliminated.
- By pressing the **Stop** key, the jaw crusher: comes to a halt after approx. 3 seconds.
 - ⇒ The lid can now be opened.



Start!



Stop!

Protection against warm restart

In case of **Power failure**, while the machine is in operation, the jaw crusher: comes to a halt after approx. 3 seconds.

The jaw crusher does not start when power supply returns.

- ⇒ The jaw crusher is protected against warm restart.
- ⇒ Press the **Start** key: to start the jaw crusher.

3 Installation

3.1 Unpacking

Attention!!!

Weight: Modell I: 177 Kg
 Modell II: 217 Kg

- Pull out the staples with the help of a pincers.
- Lift the hood from the transport pallet.
- Compare the contents of the delivery with your order.

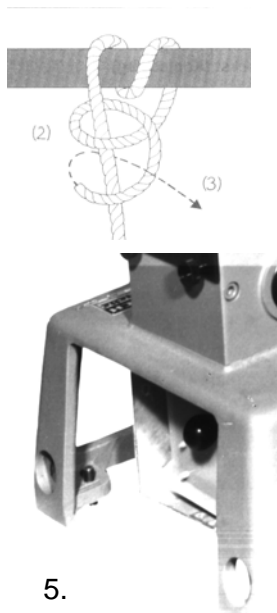
3.2 Transportation

- Transport only with a fork lift truck or a low lift platform truck on the transport pallet.
- You will need assistance to move the jaw crusher.

To carry the jaw crusher you need 5 support people.

3.3 Setting up

- The jaw crusher is fixed on the pallet with 4 screws. Unscrew the screws with a 17 mm open-end wrench.
- To carry the jaw crusher you need 5 support people:



1. Fasten a sturdy rope on a ca. 1 m long and 20 mm Ø iron rod, so that the rope could not slip.
2. Pull its free end through the two holes at the narrow side of the jaw crusher and fasten it at the rope in the same way you did first.
3. Do the same with a second rod and rope at the opposite side.
4. With the help of the iron rods 4 support people carry the jaw crusher; the fifth one prevent it from swinging during transport.

5.

- The jaw crusher must be placed on an even, stable surface. If you wish, you can also screw it to such a surface or to a ground plate.

3.4 Ambient requirements

- The machine may only be operated indoors.
- The surrounding air must not contain electrically conductive dusts.
- Room temperature must be between 5 - 40°C.
- Height up to 2000m sea level
- Maximum relative humidity 80% for temperatures up to 31°C, linearly decreasing to 50% relative humidity at 40°C.
- Contamination grade 2 in accordance with IEC 664.



Danger: mains voltage

3.5 Electrical connection

Kindly compare the tension and current values indicated on the sign with the values of the existing power supply system before connecting the instrument.

(see chapter 1.4 Technical Data)



Danger: mains voltage

3.5.1 Matching the jaw crusher to the mains voltage

Only a trained specialist is allowed to convert the supply voltage from 230 to 400 volts and/or to change the power lead.

3.5.2 Drive motor

Drive is a 1~120 V motor or 1~230 V motor or 3~115 / 200 V motor or 3~230 / 400 V motor

The drive motors are A.C. motors. Due to their high reduction ratio, the jaw crusher comes to a stop in a minimum of time after being shut off.

3.5.3 Direction of rotation of drive motor

The 3-phase A.C. motor must show left hand rotation when looking onto the motor.

The 1-phase A.C. motor left hand rotation is secured at the factory.

Refer to:

- DIN VDE 0530, Part 8, "Terminal Markings and Direction of Rotation"
- DIN VDE 0530, Part 7 / EN 60 934-7, "Abbreviations for Models"

Make this change in the direction of rotation by interchanging two supply conductors "L1, L2, L3" (or the supply leads "U1, U2, U3" in the socket outlet).

Attention!!!

Only a trained specialist is permitted to change the direction of rotation.

3.6 Initial switch-on / performance check

The machine may be switched on only after all work described in the chapter 3 on Installation has been carried out.

During the first operating hours, it is possible that some grease may escape from the eccentric cam bearing of the movable crushing jaw (see also section 7.3). After a few operating hours, the grease will be evenly distributed within the roller bearing space and no additional grease will escape.

Attention!!!

Never switch the crusher on unless crushing plate are installed and fixed!

4 Working with the jaw crusher

4.1 Selection of crushing plates and lateral support walls

The standard version of the jaw crusher is provided with crushing plates and lateral support walls made of hardened tool steel.

On special request the instrument can be provided or we can later on supply crushing plates and lateral support walls made of the following materials:

Model I		
Material	Name	Order-No.
tempered steel	fixed crushing plate	43.0010.09
	movable crushing plate	43.0020.09
	1 pair of lateral support walls	43.0070.09
stainless steel	fixed crushing plate	43.0030.10
	movable crushing plate	43.0040.10
	1 pair of lateral support walls	43.0080.10
Hard metal tungsten carbide	fixed crushing plate	43.0050.08
	movable crushing plate	43.0060.08
	1 pair of lateral support walls	43.0090.08
zirconium oxide	fixed crushing plate	43.0100.27
	movable crushing plate	43.0110.27
manganese steel	fixed crushing plate	43.0130.23
	movable crushing plate	43.0140.23

Model II		
Material	Name	Order-No.
tempered steel	fixed crushing plate	43.3010.09
	movable crushing plate	43.3020.09
	1 pair of lateral support walls	43.3070.09
stainless steel	fixed crushing plate	43.3030.10
	movable crushing plate	43.3040.10
	1 pair of lateral support walls	43.3080.10
Hard metal tungsten carbide	fixed crushing plate	43.3050.08
	movable crushing plate	43.3060.08
	1 pair of lateral support walls	43.3090.08
zirconium oxide	fixed crushing plate	43.3100.27
	movable crushing plate	43.3110.27
manganese steel	fixed crushing plate	43.3130.23
	movable crushing plate	43.3140.23

Stainless steel plates and walls are recommended if moist/humid materials have to be crushed which would lead to corrosion when using tool steel.

Hard metal tungsten carbide plates and walls are recommended in the case of very hard materials to be crushed or if iron-contamination (from the abrasion of the plates and walls) must be avoided.

Zirconium oxide plates must be used only for crushing ceramics and the like - metals are not to be crushed.

For „iron free“ crushing the use of the conversion kit is recommended:

Model I Order-No.: 01.5400.00

Model II Order-No.: 01.7400.00

The conversion kits include the zirconium oxide plates, 1 pair lateral support walls and the fasteners made of duraluminium.

4.2 Mounting the crushing plates and lateral support walls

When the jaw crusher is supplied, one set of crushing plates and lateral support walls is installed in the instrument. After the electrical connection, the instrument is ready for operation.

The crushing plates (and to a very small extent also the support walls) are subject to abrasion and must eventually be replaced.

(When checking the condition of the plates or if you realise while cleaning the instrument that the plates are only abraded in their lower part, then these must not yet be replaced but can simply be turned upside-down).

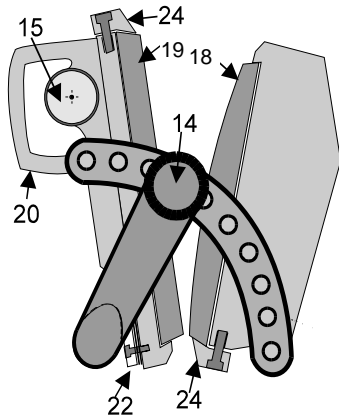
4.2.1 Mounting the crushing plates

Attention:

Disconnect jaw crusher: Draw the mains plug!

Attention:

The crushing plates have different shapes.



14	gap setting lever
15	guide bolt
18	movable jaw
19	fixed jaw
20	crushing plate
22	pressure plate
24	clamping block

The **fixed** jaw (19) has plane parallel surfaces, the **movable** jaw (18) is convex on the crushing surface and it is a bit longer.

To replace the **fixed** crushing jaw (19), remove the guide bolt (15) and take out the crushing plate (20) with the jaw.

After loosening the clamping block at the bottom of the jaw, the jaw can be removed, the replacement jaw can be inserted and the clamping block must be very **firmly** re-screwed.

To replace the **movable** crushing jaw (18), the clamping block (24) which can be reached from below the crushing chamber has to be loosened and the jaw can be removed. After replacement of the jaw the clamping block (24) must be very **firmly** re-screwed.

After replacement of the crushing jaws, the gap width between the jaws must be control led:

remove the fly-wheel guard (4) in order to be able to turn the fly-wheel by hand. Set the gap setting lever (14) to the lowest (smallest) gap position. The gap between the jaws must be between 0,5 and 1 mm (this is measured with a thickness gauge which is placed between the jaws from below). By adding respectively removing thin spacer plates between the pressure plate (22) and the jaw support (20) you can set the smallest gap between the crushing jaws.

When operating the crusher, the crushing jaws must by no means have direct contact with each other when set on the smallest gap as this would lead to a damage of the jaws and eventually of the crusher.

4.2.2 Lateral support walls

Replacing the lateral support walls (17) is practically only required if the material of the crushing jaws is replaced by another one (i.e. from tool steel to stainless steel) and if even the smallest (P.P.M. range) contamination (abrasion) from the support walls has to be avoided.

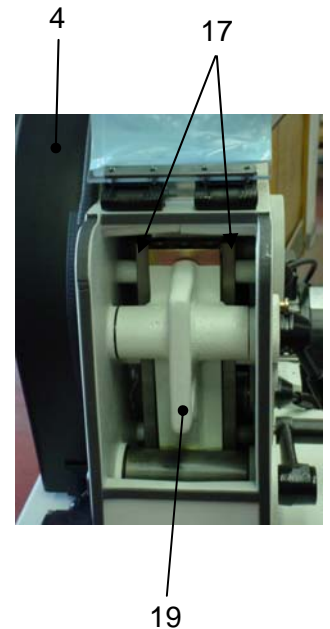
To replace the support walls at first remove the guide bolt (15) and take out the crushing plate (20) with the jaw. Then remove the fly-wheel guard (4) and remove the fly-wheel. Then the appearing fastening screws of the support wall are unscrewed and the support wall is removed from the inside of the crusher.

The fastening screws of the other support wall can be directly reached. After having unscrewed them, the support wall can also be removed from the inside.

Replacing the support walls is done the opposite way. The fastening screws must be very **firmly** tightened. After the installation of the pulley, you have to bring the v-belt to it's position.

Attention:

Do not forget to put back the fly-wheel guard after having installed the fly-wheel. This is a safety precaution.



4.3 Crushing of material

4.3.1 Setting the jaw gap

The opening of the gap between the jaws determines the average grain size of the crushed material. With the gap setting lever (14) the opening gap can be selected by steps between about 1 mm and 15 mm. (In the lowest position the gap is the smallest).

To select a different gap, pull out the knurled knob of the gap setting lever (14) and insert the lever into the desired position. The lever is fixed when the knurled knob snaps in.

Difficult to crush material (i. e. metal alloys) should first be pre-crushed at a larger gap opening before the final gap setting is selected for a second pass.

The same should be done if you do not know the crushing behaviour of the material in order to avoid an eventual damage to the crusher or the crushing jaws.

4.3.2 Introducing the material to be crushed

Attention:

The instrument must be switched-on/running before filling material into the funnel.

Larger pieces of material

- model I max. edge length 60 mm,
- model II max. edge length 95 mm

should be introduced piece by piece into the funnel and the lid of the funnel must be closed immediately to avoid projection of material out of it.

A new piece of material should not be introduced before the crushing noise has distinctly decreased.

You should never introduce more material to be crushed than the volume of the crushing chamber can accept. The crushing chamber is limited by the upper edge of the lateral support walls (17) and the crushing jaws (18, 19).

No material to be crushed should be placed above that limit.

Also when working on a continuous basis, no more material to be crushed must be added than crushed material comes out of the crushing gap.

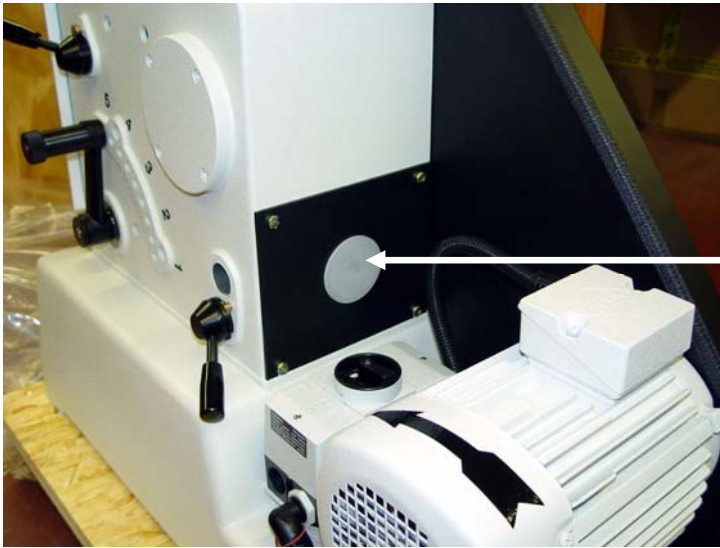
The feed rate depends on the crushing behaviour of the material. It must be determined for each material according to its behaviour during the crushing (crushing noise, quantity of crushed material coming out of the crushing gap).

4.3.3 Dust exhaust

When crushing certain materials (i.e. rocks, stones, coke, etc.) dust is created which should not settle in the crushing room. The „pulverisette 1“ can be equipped with a dust exhaust system which absolutely prevents the development of dust outside of the crusher. The flexible tube of the system is plugged into the rear cover of the crusher (at the motor side) and the system is operated during the crushing.

- Dust exhaust system Order-No. 43.9020.00
- Paper filter bags (3 pcs.) Order-No. 43.9530.00

4.3.3.1 Connection to Dust Exhaust



Remove Plug.



Insert rubber coupling and rub with potassim soap.



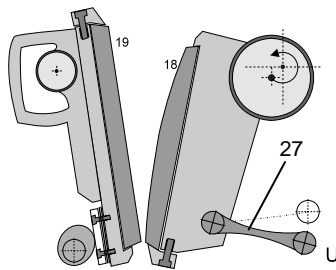
Mount front pipe of dust exhaust.

4.3.4 Final size

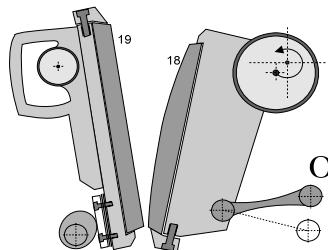
The obtainable final size depends upon the selected gap setting (about 1 mm to 15 mm). The gap setting determines only one dimension of the crushed material. This means, that for instance flaky shaped material can have a completely different size in another dimension compared with the set gap. If this should be the case, in many cases a second pass of the crushed material through the crusher will considerably reduce the amount of the grains being larger in one dimension.

At the smallest gap setting (gap setting lever (14) in lowest position) the size of the crushed material has an average of 2 mm.

4.3.5 Setting of the link plate

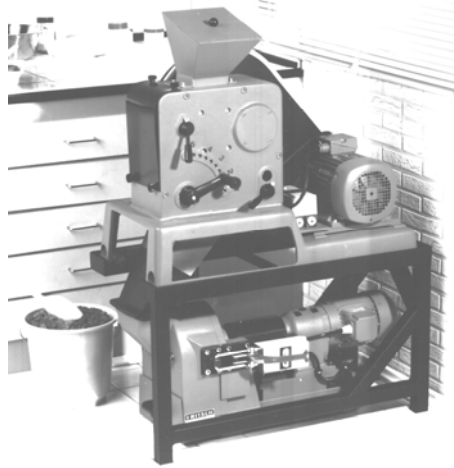


Normally, the link plate (27) which is held by the knuckle pin (26) is positioned in the lower position (U).



In some cases it may be advantageous to crush materials having positioned the link plate and knuckle pin in the upper position (O). Because of the fact that such a position reduces the gap opening between the jaws, the particle size distribution of the crushed material is narrower respectively the particle size is more uniform. However, this leads to a slightly longer crushing time. This position can not be selected for materials like slates, coal, coke and somewhat sticky materials. It can only be selected for easy to break/crush samples. In some cases it can be of advantage to pre-crush the material in the lower position and to finally crush it to a small size in the upper position.

5 Crushing and comminuting to the fineness of a disk mill



Coarse material can be comminuted to the fineness of the disk mill in one pass by combining it with the disk mill „pulverisette 13“.

The fragmentation is performed with this combination in **a single pass** from 95 mm (or 65 mm) input size to an average grain size (d_{50}) of 0.1 mm.

Install the jaw crusher over the disk mill in a mounting rack (order no. 43.5100.00). The preground material from the jaw breaker slides down a special chute directly into the hopper of the disk mill.

6 Cleaning

6.1 Cleaning the grinding chamber

The fixed shear plate must be removed first in order to reach the grinding chamber. This can be done by turning the handle of the top fixture upwards until the nut fits into the groove and the guide bolt can be pulled out.

Attention:

Hold on to the shear plate while doing so.

The shear plate is then pulled forward out of the machine.

The grinding chamber can be sucked out with a vacuum cleaner and brush or blown out with compressed air (Pay attention to the mill feed that may fly around). Stubborn residues can be removed with a wire brush. Subsequently, wipe out the grinding chamber with a damp cloth and then with alcohol (corrosion protection).

6.2 Cleaning the intake

Loosen the 4 screws of the cover on the rear side of the grinding chamber. Remove the cover and suck out the hollow cavity behind it.

7 Maintenance

Before you begin with the maintenance work, you have to pull the mains plug and make sure that the machine is safe against unintended starting.

Maintenance work have to be marked by a danger sign.

7.1 Crushing jaw

Depending on the materials to be crushed, crushing jaws are subject to abrasion. They should be checked within certain intervals and should be eventually turned upside-down or be replaced (see chapter 6.1 Cleaning the grinding chamber).

7.2 V-belts

To re-tighten the V-belts, the fastening screws (4 pieces) of the motor on its rail are loosened, the motor is pushed to the back and the screws are firmly re-tightened.

To replace the V-belts, the fly-wheel guard (4) must be removed. Loosen the motor and replace the V-belts (Order-No. 82.0170.00). Then push back the motor and re-tighten the 4 screws as mentioned above.

Do not forget to put back and fasten the fly-wheel guard.

This is a safety precaution.

7.3 Greasing the bearings

All bearings are self-lubricating. The guide bolt (15) and the knuckle pin (26) should occasionally be cleaned and greased. Two grease nipples are located on the main axle (7). Depending upon the pollution degree of the crusher - within intervals of about 500 operating hours - the main bearings should be greased with roller bearing grease (i. e. as to DIN 51806).

8 Warranty

The warranty card accompanying this delivery must be completely filled in and returned to the supplier in order for the warranty to come into force.

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

The company Fritsch GmbH, Idar-Oberstein and its "Application Technology Laboratory" or the corresponding state representatives will gladly offer help and advice.

It is necessary to name the serial number imprinted on the nameplate with any enquiries.