

PRODUCTOVERVIEW



MILLING SIEVING DIVIDING

FRITSCH. ONE STEP AHEAD.

FRITSCH is an internationally respected manufacturer of application-oriented laboratory instruments. Laboratories worldwide rely on our quality, our experience, our consultation and our service – for the fast industrial application as well as for the especially accurate research technology applications in the industry- and research laboratories.

WHEN WILL YOU JOIN US?

FRITSCH LASER TECHNOLOGY

With the patented FRITSCH measuring method of laser diffraction using a convergent laser beam, FRITSCH Laser Particle Sizers set entirely new standards of their own. Your advantage: state-of-the-art laser technology with outstanding performance for the price. And this for each individual area of application and utilisation.

Catch up on the state-of-the-art laser technology by FRITSCH!

 www.fritsch-laser.com

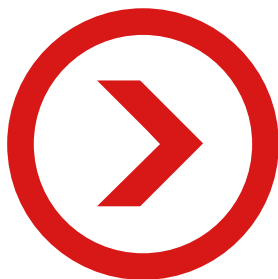
CONTENTS

- ④ **SERVICE AND CONSULTATION** 4-5
FRITSCH helps you quickly and easily to find exactly the right laboratory instrument for your application – including a free sample grinding. Benefit from our decades of experience.

- ④ **MILLING** 6-19
FRITSCH-high performance mills are the laboratory standard around the world – as Planetary Mills, Ball Mills, Cutting Mills, Rotor Mills, Beater Mills, Jaw Crushers or Special Mills for specific applications.

- ④ **SIEVING** 20-21
FRITSCH Sieve Shakers offer ease of use and guarantee precise, reproducible sieve analysis.

- ④ **DIVIDING** 22-23
FRITSCH instruments are second to none for dividing, feeding and ease of cleaning adding to the performance of your mills, sieve shakers and laser particle sizers. They are your guarantee for accurate reproducible sample preparation.



Yet another essential side of FRITSCH: Detailed consultation and comprehensive service – practically anywhere in the world. To help you find exactly the right laboratory instruments for your specific applications without long drawn out costly investigations – it's our aim to provide reliable solutions to questions about laboratory technology in our field of expertise.

TEST US – WE ARE PREPARED!

TEST US – WE

➤ FREE SAMPLE GRINDING AND ANALYSIS

Finding the right mill can be so easy: Simply send us a sample of your choice – we will perform a free grinding or particle size analysis and send you a detailed grinding/size analysis report.

➤ ON-SITE TEST IN THE MOBILE LABORATORY

Test the FRITSCH instruments with your own samples – practically and simply in our fully equipped laboratory bus. Simply schedule a date and we will drive by.

➤ TRAINING AND WORKSHOPS

We share our expertise – at regular workshops and seminars on your site or at convenient locations worldwide. Ask us about them!



ARE PREPARED!

➤ TECHNICAL APPLICATION CONSULTATION

We will advise you on all technical application questions: via phone or personally. Or meet with us at major national and international fairs and exhibitions.

➤ LONG-TERM MAINTENANCE AND REPLACEMENT PARTS SERVICE

We ensure optimal long-term use of your FRITSCH laboratory instruments with competitive maintenance contracts and a delivery guarantee for all important spares for at least 10 years – to maximise the security of your investment.

➤ WORLD-WIDE SERVICE

Wherever you are: FRITSCH is always nearby. With a global network of international representative offices employing highly trained staff offering: application consultation, advice on installation, maintenance and repair.

THE RIGHT MILL FOR FIRST-RATE ANALYSIS

ENSURE THE QUALITY OF YOUR ANALYSIS BY CHOOSING THE RIGHT MILL

The quality of every product or material analysis depends on the quality of the sample preparation. It is therefore extremely important to consider all the individual milling parameters in order to make an informed choice: material properties, feed size and volume of the sample, grinding time and desired final particle size, any abrasion of the grinding parts – all these factors are significant. And of course the costs.

For this reason, FRITSCH offers a wide selection of high-performance mills in various product groups for every application and every specific need: Planetary Mills *premium line* and *classic line*, Ball Mills, Cutting and Rotor Mills, Jaw Crushers and other Special Mills.



THE RIGHT MILL FOR EVERY MATERIAL

For a simple orientation, you can find the recommended mills for the most common material categories in this brochure. More detailed information offers the practical grinding report database at www.fritsch.de under the heading of Sample Preparation/Solutions. There you will find comparison grindings with detailed information.

OR SIMPLY GIVE US A CALL – OUR EXPERTS WILL BE HAPPY TO ASSIST YOU.

 **+49 67 84 70-150 (direct line) - service@fritsch.de**

MATERIAL TABLE

| | | | |
|--------------------|---|------------------------------------|--|
| Abrasives | Ball Mills, Planetary Mills, P-9 | Lime | Ball Mills, Planetary Mills, P-2 |
| Alloys | Ball Mills, Planetary Mills, P-1 | Materials research | Planetary Mills, P-4, P-5 |
| Analysis | Ball Mills, Planetary Mills, P-14 | Mechanical alloying/ activation | Planetary Mills, P-4 |
| Animal fodder | Cutting Mills, P-0, P-23 | Metallurgy | Planetary Mills, P-1, P-9 |
| Biology | Ball Mills, Planetary Mills, Cutting Mills | Minerals | Ball Mills, Planetary Mills, P-1, P-13, P-9 |
| Bones | P-19, P-25, P-0 | Mining | Ball Mills, Planetary Mills, P-1, P-13, P-9 |
| Building materials | Ball Mills, Planetary Mills, P-1, P-13, P-9 | Ores | Ball Mills, Planetary Mills, P-1, P-13, P-9 |
| Catalysts | Ball Mills, Planetary Mills, P-1 | Pharmaceuticals | P-14, P-2 |
| Cement clinker | Ball Mills, Planetary Mills, P-1, P-13, P-9 | Pigments | Ball Mills, Planetary Mills, P-2 |
| Ceramics | Ball Mills, Planetary Mills, P-1, P-13, P-9 | Plants | Cutting Mills, P-2, P-14 |
| Coal | Ball Mills, Planetary Mills, P-16, P-1, P-13 | Plastics | Cutting Mills, P-14 |
| Coating powder | Ball Mills, Planetary Mills, P-14 | Refractory materials | Ball Mills, Planetary Mills, P-1, P-13, P-9 |
| Compound materials | Cutting Mills, P-25/P-19 Combination, P-14 | Rocks | Ball Mills, Planetary Mills, P-1, P-13, P-2, P-9 |
| Drugs | Ball Mills, Planetary Mills, Cutting Mills | RoHS/WEEE | Cutting Mills, P-0, P-9, P-14 |
| Electronic scrap | Cutting Mills, P-0, P-14 | Rubber | Cutting Mills, P-14 |
| Environment | Cutting Mills, P-0, P-23 | Sediments | Ball Mills, Planetary Mills, P-2, P-9 |
| Feed (pellets) | Cutting Mills, P-2, P-14 | Slags | Planetary Mills, P-1, P-9 |
| Fertilisers | Ball Mills, Planetary Mills, P-14, P-2 | Soil research | Ball Mills, Planetary Mills, P-1, P-13, P-8 |
| Fibres | Ball Mills, Planetary Mills, P-1, P-13, P-9 | Spectroscopy | Ball Mills, Planetary Mills, P-14 |
| Foils | Cutting Mills | Spices | Cutting Mills, P-14 |
| Food | Ball Mills, Planetary Mills, Cutting Mills, P-2 | Tablets | Ball Mills, Planetary Mills, P-2 |
| Glass | Ball Mills, Planetary Mills, P-1, P-13, P-9 | Textiles | Cutting Mills |
| Grains | Cutting Mills, P-14 | Wood | Cutting Mills, P-14 |
| Household waste | Cutting Mills, P-25/P-19 Combination | | |
| Leather | Cutting Mills | | |

MATERIAL TYPES – DEFINITION

Every FRITSCH mill is suitable for specific material types as shown in the product tables on the following pages. We have also summarised the material types for the most common materials, as an additional service for you.

| Material | Material Type |
|---|-----------------------|
| Slag, alloys, granite, porphyry, iron ore | Hard-abrasive |
| Clinker, quartz, rock, bauxite, ceramics, carborundum | Hard-brittle |
| Glass, cement, calcite, coal, ash, sewage sludge, catalysts, soil, polluted land samples, tablets, fertilisers, pellets | Medium-hard |
| Grain, gypsum, salts, talc, animal feed, graphite, leaves, grass, pigments, spices, dragées, mica | Soft |
| Alloys, ceramics, salts, tablets, silicon carbide, silicon nitride, coke, coal, embrittled, e.g. with liquid nitrogen: plastics, duroplast, rubber, perspex | Brittle |
| Leather, hides, rubber | Tough |
| Wool, resins, wood, cellulose, paper, plant roots | Fibrous |
| Thermoplastics, pharmaceuticals | Temperature-sensitive |
| Soil, grass, hay, leaves | Moist |

FRITSCH Planetary Mills *premium line*

A QUANTUM LEAP INTO THE NANO CLASS – EXTREMELY HIGH-SPEED MILLING WITH SUNKEN BOWLS ROTATING AT UP TO 1100 RPM.

IDEAL FOR

- PHARMACEUTICALS
- MECHANICAL ALLOYING
- METALLURGY
- CERAMICS
- MATERIAL RESEARCH
- GEOLOGY AND MINERALOGY
- CHEMISTRY
- BIOLOGY

Discover a completely new dimension of high-tech milling with the new **FRITSCH *premium line***: The grinding bowls sunk into the disk enable for the first time to achieve revolutionary rotation speeds of up to 1100 rpm at acceleration 95 times that of gravity. The result: significantly shorter grinding times and the finest possible grinding results down to the nano range.

Easy, intuitive user navigation is guaranteed by the ergonomically designed touch screen featuring a particularly logical menu structure in 10 languages.

The compact design of the FRITSCH *premium line* combines maximum performance, exceptional safety and quiet running with minimal space requirements.



Added time savings and reliability due to the ability to change bowls in seconds and the unique SelfLOCK system.

Simple, precise logging is ensured with perfect integration into the IT structure of your laboratory through integrated Ethernet, Bluetooth and USB interfaces.

REVOLUTIONARY SELFLOCK-TECHNOLOGY: PROVIDES AN EXTREMELY FAST BOWL CHANGE IN JUST TWO MOTIONS.

It could not be simpler or more reliable. The revolutionary SelfLOCK bowls of the **FRITSCH premium line** now form a single unit with the lid for the first time. They can be firmly and securely closed with one motion and snap just as tightly and securely into the mill with a second motion.



**Planetary Micro Mill
PULVERISETTE 7 premium line**

**High performance
for smallest quantities**



| | |
|--|---------------------------------------|
| Working principle | Impact force |
| Optimal for material type (for materials table and material type definitions, see page 7) | Hard, medium-hard, brittle |
| Number of working stations | 2 |
| Grinding bowl sizes | 20, 45, 80 ml |
| Grinding ball diameter | 0.5 – 20 mm |
| Max. feed size (depending on the material) | 5 mm |
| Min. sample quantity | 0.5 ml |
| Max. sample quantity | 70 ml |
| Final fineness (depending on the material) | < 0.1 µm |
| Typical grinding time down to analytical fineness | 3 min |
| Grinding process | Dry/wet |
| Grinding in inert gas | Yes |
| Gas pressure and temperature measurement | Yes |
| Rotational speed of main disk | 100 – 1100 rpm |
| Transmission ratio planetary disk/grinding bowl | $i_{\text{relative}} = 1 : -2$ |
| Effective diameter of main disk | 140 mm |
| Centrifugal acceleration (g = 9.81 m/s²) | 95 g |
| Interfaces | USB (Bluetooth, Ethernet optional) |
| Electrical details | 100-240 V/1~, 50-60 Hz, 1100 watt |
| Motor shaft power in accordance with VDE 0530, EN 60034 | 0.94 kW |
| Weight | 44 kg |
| Dimensions w x d x h | Bench top instrument: 40 x 58 x 36 cm |

FRITSCH Planetary Mills *classic line*

FRITSCH Planetary Mills of the *classic line* are ideally suited for wet and dry comminution of hard, medium-hard, brittle and fibrous materials. Samples can be processed from a few milligrams to several kilograms at a wide range of fineness levels down to less than 1 µm. They are absolutely reliable,

especially easy to operate and clean. Matching grinding parts of various materials are also available to provide maximum protection against undesired contamination of the samples.

IDEAL FOR

GEOLOGY AND MINERALOGY
MATERIALS TECHNOLOGY
**MECHANICAL ALLOYING/
 ACTIVATION**
**SAMPLE PREPARATION
 FOR ANALYSIS**
CERAMICS
CHEMISTRY
BIOLOGY
PHARMACEUTICALS
METALLURGY

Planetary Mill
PULVERISETTE 5 *classic line*

Fast and fine**4 working stations****2 working stations**

| | | |
|---|---|---|
| Working principle | Impact force | Impact force |
| Optimal for material type (for materials table and material type definitions, see page 7) | Hard, medium-hard, soft, brittle, tough, moist | Hard, medium-hard, soft, brittle, tough, moist |
| Number of working stations | 4 | 2 |
| Grinding bowl sizes | 80, 250, 500 ml | 80, 250, 500 ml |
| Grinding ball diameter | 0.5 – 40 mm | 0.5 – 40 mm |
| Max. feed size (depending on the material) | 10 mm | 10 mm |
| Min. sample quantity | 10 ml | 10 ml |
| Max. sample quantity | 900 ml | 450 ml |
| Final fineness (depending on the material) | < 1 µm | < 1 µm |
| Typical grinding time down to analytical fineness | 4 min | 4 min |
| Grinding process | Dry/wet | Dry/wet |
| Grinding in inert gas | Yes | Yes |
| Gas pressure and temperature measurement | Yes | Yes |
| Rotational speed of main disk | 50 – 400 rpm | 50 – 400 rpm |
| Transmission ratio planetary disk/grinding bowl | $i_{\text{relative}} = 1 : -2.19$ | $i_{\text{relative}} = 1 : -2.19$ |
| Effective diameter of main disk | ~ 250 mm | ~ 250 mm |
| Centrifugal acceleration ($g = 9.81 \text{ m/s}^2$) | 22 g | 22 g |
| Interfaces | Yes | Yes |
| Electrical details | 100-120/200-240 V/1~, 50-60 Hz, 1300/1600 watt | 100-120/200-240 V/1~, 50-60 Hz, 1300/1600 watt |
| Motor shaft power in accordance with VDE 0530, EN 60034 | 1.5 kW | 1.5 kW |
| Weight | 120 kg | 100 kg |
| Dimensions w x d x h | Bench top instrument: 58 x 67 x 57 cm | Bench top instrument: 58 x 67 x 57 cm |

➤ **Free FRITSCH sample grinding!**

Send us your sample – we will advise you which mill is the right one for you. Or take a look in the practical grinding report database by logging on www.fritsch.de select menu item Sample Preparation/Solutions.

| Planetary Mono Mill PULVERISETTE 6 classic line | Planetary Micro Mill PULVERISETTE 7 classic line | Vario-Planetary Mill PULVERISETTE 4 classic line |
|--|--|--|
| High performance in minimum space | Ideal for the smallest quantities | Unique – a variable transmission ratio |
|  |  |  |

| Impact force | Impact force | Impact force |
|--|---|--|
| Hard, medium-hard, soft, brittle, tough, moist | Hard, medium-hard, brittle, moist | Hard, medium-hard, soft, brittle, tough, moist |
| 1 | 2 | 2 |
| 80, 250, 500 ml | 12, 45 ml | 12, 45, 80, 250, 500 ml |
| 0.5 – 40 mm | 0.5 – 15 mm | 0.5 – 40 mm |
| 10 mm | 5 mm | 10 mm |
| 10 ml | 0.5 ml | 0.5 ml |
| 225 ml | 40 ml | 450 ml |
| < 1 µm | < 1 µm | < 1 µm |
| 4 min | 3 min | 4 min |
| Dry/wet | Dry/wet | Dry/wet |
| Yes | Only possible in glove box | Yes |
| Yes | No | Yes |
| 100 – 650 rpm | 100 – 800 rpm | 0 – 400 rpm |
| $i_{\text{relative}} = 1 : -1.82$ | $i_{\text{relative}} = 1 : -2$ | Variable |
| 121.6 mm | 140 mm | ~ 250 mm |
| 29 g | 50 g | 22 g |
| Yes | Yes | Yes |
| 100-120/200-240 V/1~, 50-60 Hz, 1100 watt | 100-120/200-240 V/1~, 50-60 Hz, 880 watt | 400 V/3~, 50-60 Hz, 6000 watt |
| 0.75 kW | 0.37 kW | 2.2 kW supporting disk, 2.5 kW planetary disk |
| 63 kg | 35 kg | 320 kg |
| Bench top instrument: 37 x 53 x 50 cm | Bench top instrument: 37 x 53 x 50 cm | Floor instrument: 60 x 80 x 110 cm |

FRITSCH Grinding Bowls and Grinding Balls

To avoid the risk of contaminating the samples with abrasion from grinding elements, we offer grinding bowls and grinding balls in 8 different materials for the **FRITSCH classic line** and **premium line**. In normal cases, grinding bowls and balls of the same material are used.

To shorten the grinding time, balls with a higher density and correspondingly higher impact energy can be used, e.g. tungsten carbide balls in a steel bowl or zirconium oxide balls in a silicon nitride bowl.

**THE RIGHT MATERIAL
FOR EVERY
APPLICATION**



GASSING LID

Through the use of a special lid on the grinding bowl, you can also grind your samples in inert atmospheres. Two valves allow for easy and safe filling of the bowls with inert gas while they are firmly clamped in the mill. A special additional Lock-System is required for gas-tight removal and transport.



GTM – GAS PRESSURE AND TEMPERATURE MEASURING SYSTEM

With this Gas Pressure and Temperature Measurement System developed in cooperation with the Fraunhofer Institute for Applied Materials Research (IFAM) in Dresden, the Planetary Mills PULVERISETTE 4, PULVERISETTE 5 and PULVERISETTE 6 of the FRITSCH *classic line* can be transformed into analytical measurement systems.



FRITSCH Ball Mills

FRITSCH Ball Mills are the most effective laboratory mills for rapid batchwise comminution of medium-hard to very hard samples down to the finest particle sizes. The grinding can take place dry or wet. Grinding sets of many different

materials are available. **FRITSCH ball mills** are also the ideal lab assistants for mixing and homogenising.

IDEAL FOR

FINE COMMINATION
OF SMALL QUANTITIES –
DRY OR WET

| Vibratory Micro Mill PULVERISETTE 0 | Mini-Mill PULVERISETTE 23 |
|--|--|
| Fine comminution and sieving in one unit | The smallest instrument for small quantities |
|  |  |

| | | |
|--|--|---------------------------------------|
| Working principle | Impact force | Impact force |
| Optimal for material type (for materials table and material type definitions, see page 7) | Medium-hard, brittle, temperature-sensitive, moist | Medium-hard, brittle, moist |
| Grinding bowl sizes | - | 5, 10, 15 ml |
| Grinding ball diameter | 50 – 70 mm | 0.5 – 15 mm |
| Max. feed size (depending on the material) | 5 mm | 6 mm |
| Min. sample quantity | 0.1 ml | 0.2 ml |
| Max. sample quantity | 10 ml | 5 ml |
| Final fineness (depending on the material) | 5 – 10 µm | 10 µm |
| Grinding process | Dry/wet | Dry/wet |
| Grinding bowl oscillations per minute | 3000 – 3600 at 1 – 3 mm amplitude | 900 – 3000 at 9 mm amplitude |
| Electrical details | 100-240 V/1~, 50-60 Hz, 50 watt | 100-240 V/1~, 50-60 Hz, 90 watt |
| Weight | 21 kg | 7 kg |
| Dimensions w x d x h | Bench top instrument: 37 x 40 x 20 cm | Bench top instrument: 20 x 30 x 30 cm |

FRITSCH Cutting Mills

Cutting Mills are ideal for comminution of soft to medium-hard, fibrous or tough materials as well as plastics and for preparation of heterogeneous mixtures. The samples are comminuted by cutting and shearing forces, and the selected sieve insert determines the final fineness.

Various knife geometries and replaceable blades ensure maximum flexibility and durability. Grinding parts of various steel types as well as of hardmetal tungsten carbide can be used for controlling the abrasion problems.

IDEAL FOR

HETEROGENEOUS SAMPLES

DERIVED FUELS

PLASTICS

PLANT MATERIALS

RoHS/WEEE

Cutting Mill PULVERISETTE 15

Effective and inexpensive



| | |
|--|--|
| Working principle | Cutting |
| Optimal for material type (for materials table and material type definitions, see page 7) | Medium-hard, soft, fibrous |
| Max. feed size (depending on the material and funnel) | 70 x 70 mm |
| Max. throughput (depending on the material and sieve size) | 50 l/h |
| Sieve inserts | 0.25 - 6 mm |
| Feeding | Batchwise/continuous |
| Materials of the grinding parts | Tool steel, chromium-free steel |
| Rotor speed | 2800 - 3400 rpm depending on voltage and frequency |
| Electrical details | 400 V/3~, 50 Hz, 1900 watt 230-240 V/1~, 50 Hz, 2100 watt 100-120 V/1~, 60 Hz, 1800 watt |
| Motor shaft power in accordance with VDE 0530, EN 60034 | 1.5 kW for all motors, except 1.1 kW for 100-120 V/1~ motor |
| Weight | 42 kg |
| Dimensions w x d x h | Table-mounting or on stand: 42 x 48 x 69 cm |



Unmatched ease of cleaning!

FRITSCH cutting mills allow the entire grinding chamber to be opened without tools in seconds with just two simple motions for complete cleaning of all grinding parts. Unbeatably fast, simple and efficient!

| Universal Cutting Mill PULVERISETTE 19 | Power Cutting Mill PULVERISETTE 25 | Cutting Mill Combination PULVERISETTE 25/19 |
|--|--|--|
| Easy cleaning due to simply exchangeable grinding parts | Powerful pre-crushing even for larger samples | Pre-crushing and fine grinding in a single step |
|  |  |  |

| Cutting | Cutting | Cutting |
|---|---|---|
| Medium-hard, soft, brittle, tough, fibrous | Medium-hard, brittle, tough, fibrous | Medium-hard, brittle, tough, fibrous |
| 70 x 80 mm | 120 x 85 mm | 120 x 85 mm |
| 60 l/h | 85 l/h | 60 l/h |
| 0.25 – 6 mm | 1 – 10 mm | 0.25 – 6 mm |
| Batchwise/continuous | Batchwise/continuous | Batchwise/continuous |
| Tool steel, hardmetal tungsten carbide, chromium-free steel | Tool steel, hardmetal tungsten carbide, chromium-free steel | Tool steel, hardmetal tungsten carbide, chromium-free steel |
| 2800 rpm | 300 rpm | 300/2800 rpm |
| 400 V/3~, 50-60 Hz, 2000 watt 230 V/1~, 50-60 Hz, 2200 watt 100-120 V/1~, 50-60 Hz, 1850 watt | 400 V/3~, 50-60 Hz, 3340 watt | 400 V/3~, 50-60 Hz, 6340 watt |
| 1.5 kW for all motors, except 1.1 kW for 100-120 V/1~ motor | 2.2 kW | 2.2/1.5 kW |
| 56 kg | 75 kg | 214 kg |
| Table-mounting or on stand: 44 x 55 x 63 cm | Table-mounting or on stand: 45 x 65 x 63 cm | On stand: 62 x 82 x 145 cm |



FRITSCH Rotor-/Beater Mills

Due to their high grinding energy, **Beater Mills** are the best choice for soft to medium-hard and brittle samples – including plastics. The material is comminuted through impact and friction forces. The final fineness of the samples depends on the selected sieve insert.

To avoid undesired abrasion, the **FRITSCH Variable Speed Rotor Mill PULVERISETTE 14** can be equipped with rotors made of stainless steel, titanium or with titanium nitride or tungsten carbide coatings.

IDEAL FOR

SOFT, MEDIUM-HARD AND
BRITTLE MATERIALS

| Variable Speed Rotor Mill PULVERISETTE 14 | Cross Beater Mill PULVERISETTE 16 |
|--|--|
| Finest grinding thanks to highest speed | Ideal for soft to medium-hard samples |
|  |  |

| | | |
|--|---|--|
| Working principle | Impact force | Impact force |
| Optimal for material type (for materials table and material type definitions, see page 7) | Medium-hard, soft, brittle, fibrous | Medium-hard, brittle |
| Max. feed size (depending on the material) | 10 mm | 20 mm |
| Min. sample quantity | 5 – 10 ml | 30 – 40 ml |
| Max. throughput (depending on the material and sieve size) | 5 l/h | 80 l/h |
| Sieve inserts | 0.08 – 6 mm | 0.12 – 10 mm |
| Feeding | Batchwise/continuous | Batchwise/continuous |
| Grinding parts | Impact rotor, pin insert, impact blade | Cross beater |
| Materials of the grinding parts | Stainless steel, pure titanium, TiN-coated steel, WC-coated steel | Steel cast, stainless steel |
| Rotor speed | 6000 – 20000 rpm | 2850 rpm |
| Electrical details | 100-120/200-240 V/1~, 50-60 Hz, 1150 watt | 400 V/3~, 50 Hz, 1480 watt 230 V/1~, 50 Hz, 1590 watt 110 V/1~, 60 Hz, 1500 watt |
| Motor shaft power in accordance with VDE 0530, EN 60034 | 0.55 kW | 1.1 kW |
| Weight | 23 kg | 36 kg |
| Dimensions w x d x h | Bench top instrument: 31 x 48 x 47 cm | Bench top instrument or on stand: 42 x 45 x 56 cm |

FRITSCH Jaw Crushers

The **Jaw Crusher** is the classic “workhorse” for the pre-crushing of brittle materials. FRITSCH offers grinding parts for these instruments made of various steel types, tungsten carbide and zirconium oxide.

The combination of the **FRITSCH Jaw Crusher PULVERISETTE 1** with the **FRITSCH Disk Mill PULVERISETTE 13** (see page 18) is ideal for automatic and continuous comminution of large quantities down to analytical fineness – including coarse materials.

IDEAL FOR

PRE-CRUSHING OF
COARSE MATERIALS

| Jaw Crushers PULVERISETTE 1 (2 models) | Jaw Crusher/Disk Mill PULVERISETTE 1/13 |
|---|---|
| The standard for pre-crushing | Coarse and fine comminution in a single step |
| | |

| | | |
|--|--|--|
| Working principle | Pressure | Pressure/shearing force |
| Optimal for material type (for materials table and material type definitions, see page 7) | Hard, medium-hard, brittle | Hard, medium-hard, brittle |
| Max. feed size (depending on the material) | 95 mm resp. 60 mm | 95 mm resp. 60 mm |
| Min. sample quantity | 20 ml | 20 ml |
| Max. continuous throughput (depending on the material and gap width) | 200 kg/h resp. 140 kg/h | 150 kg/h |
| Final fineness | 1 - 15 mm | 0.1 - 12 mm |
| Feeding | Batchwise/continuous | Batchwise/continuous |
| Grinding parts | Fixed and movable crushing jaws | Fixed and movable crushing jaws and grinding disks |
| Materials of the grinding parts | Tempered steel, stainless steel, chromium-free steel, manganese steel, hardmetal tungsten carbide, zirconium oxide | Tempered steel, stainless steel, chromium-free steel resp. hardened steel cast, manganese steel, hardmetal tungsten carbide, zirconium oxide |
| Eccentric oscillations | 308 movements/min | - |
| Electrical details | 400 V/3~, 50-60 Hz, 2780 watt resp. 1450 watt 230 V/1~, 50-60 Hz, 1570 watt 115 V/1~, 50-60 Hz, 1900 watt | 400 V/3~, 50-60 Hz, 3280 watt resp. 400 V/3~, 50-60 Hz, 4610 watt |
| Motor shaft power in accordance with VDE 0530, EN 60034 | 2.2 kW resp. 1.1 kW | P-1, model I: 1.1 kW P-1, model II: 2.2 kW P-13: 1.5 kW |
| Weight | 205 kg resp. 177 kg | 334 resp. 362 kg |
| Dimensions w x d x h | Bench top instrument: 40 x 80 x 80 cm | Floor instrument: 87 x 44 x 130 cm |

FRITSCH Special Mills

The **FRITSCH Disk Mill** is most suited for size reduction within the medium particle size range. Comminution takes place through pressure and shearing force.

The **FRITSCH Mortar Grinder** is an all purpose mill suitable for a wide range of materials: hard-brittle to soft-wet and the popular choice in the chemical/pharmaceutical area. Its gentle grinding through pressure and friction makes it the ideal mill for grinding tablets in galenics.

IDEAL FOR

SPECIAL APPLICATIONS

Disk Mill PULVERISETTE 13

Ideal for comminution
down to 100 µm



| | |
|--|---------------------------------------|
| Working principle | Shearing force |
| Optimal for material type (for materials table and material type definitions, see page 7) | Medium-hard, brittle |
| Max. feed size (depending on the material) | 20 mm |
| Min. sample quantity | 20 – 30 ml |
| Max. throughput (depending on the material) | 150 kg/h |
| Final fineness | 0.1 – 12 mm |
| Feeding | Batchwise/continuous |
| Grinding parts | Fixed and movable grinding disk |
| Rotor speed | 440 rpm |
| Electrical details | 400 V/3~, 50-60 Hz, 1830 watt |
| Motor shaft power in accordance with VDE 0530, EN 60034 | 1.5 kW |
| Weight | 140 kg |
| Dimensions w x d x h | Bench top instrument: 44 x 87 x 40 cm |

THE FRITSCH SPECIALISTS FOR SPECIAL APPLICATIONS.

The **FRITSCH Vibrating Cup Mill** for fast sample preparation is found in almost every spectroscopy preparation lab as well as in ore and geology laboratories.

The **FRITSCH Soil Deagglomerator** almost completely automates the deagglomeration of soil samples and simultaneous removal of stones and a high sample throughput.

| Mortar Grinder PULVERISETTE 2 | Vibrating Cup Mill PULVERISETTE 9 | Soil Deagglomerator PULVERISETTE 8 |
|--|--|--|
| Gentle grinding without thermal effects | Fastest comminution thanks to powerful drive | Ideal for deagglomeration of dry soil samples |
|  |  |  |

| Friction | Impact force | Shearing force |
|--|------------------------------------|--|
| Medium-hard, brittle, moist, temperature-sensitive | Hard, medium-hard, brittle | Medium-hard |
| 8 mm | 12 mm | 30 mm |
| 30 ml | 10 - 20 ml | 500 ml |
| 150 ml | 250 ml | 2 l |
| 10 - 20 µm | 10 - 20 µm | < 2 mm |
| Batchwise | Batchwise | Batchwise |
| Mortar bowl with pestle | Grinding puck with impact rings | Spiral nylon brushes and sieving sheet |
| 70/80 rpm | 1150 rpm | 400 rpm |
| 100-120/200-240 V/1~, 50-60 Hz, 250 watt | 100-240 V/1~, 50-60 Hz, 1900 watt | 400 V/3~, 50-60 Hz, 1240 watt |
| 0.18 kW | 1.1 kW | 0.9 kW during grinding, 0.25 kW during cleaning |
| 24 kg | 250 kg | 100 kg |
| Bench top instrument: 31 x 46 x 41 cm | Floor instrument: 72 x 66 x 120 cm | Floor instrument: 120 x 50 x 120 cm |

FRITSCH Sieve Shakers

With their innovative and practical features, the new generation of **FRITSCH Sieve Shakers** satisfy all requirements for accurate and reproducible sieving analysis and even exceed requirements in many areas.

These instruments offer maximum comfort and precision with automatic amplitude control, programme selection, control and evaluation software as well as high-quality sieve stack tensioning system.

IDEAL FOR

QUANTITATIVE PARTICLE SIZE ANALYSIS OF SOLIDS AND SUSPENSIONS OF ALL TYPES WITH AUTOMATIC SIEVE ANALYSIS BY THE CONTROL AND EVALUATION PROGRAMME AUTOSIEVE

Vibratory Sieve Shaker ANALYSETTE 3 PRO



Quality control through amplitude monitoring



| | |
|--|--|
| Method of analysis | Sieving |
| Dry sieving | Measuring range: 32 µm – 63 mm Max. sample quantity (approx.): 1 kg Sieving time (approx.): 3 – 20 min |
| Wet sieving | Measuring range: 20 µm – 10 mm Max. sample quantity (approx.): 20 – 100 g Sieving time (approx.): 3 – 10 min |
| Micro-precision sieving | Measuring range: 5 µm – 100 µm Max. sample quantity (approx.): 0.2 – 0.5 g Sieving time (approx.): 30 – 60 min |
| Amplitude control | Automatic |
| Max. sieve diameter | 200 mm/8" |
| Max. number of sieves per sieve stack | 10 (50 mm height) or 16 (25 mm height) |
| Control and evaluation programme AUTOSIEVE | Yes |
| Testing instrument calibration according to ISO 9001:2000 | Yes |
| Interfaces | Yes |
| Electrical details | 100-240 V/1~, 50-60 Hz, 50 watt |
| Weight | 21 kg |
| Dimensions w x d x h | Bench top instrument: 37 x 40 x 20 cm |

The top model **ANALYSETTE 3 PRO** can be integrated into any quality management system according to DIN EN ISO 9000:2001 as a testing instrument thanks to state-of-the-art electronics and maximum reliability.

FRITSCH Sieve Shakers are available for sieves up to 450 mm in diameter for dry, wet and micro-precision sieving. The automatic sieving analysis is performed by the free control and evaluation software AUTOSIEVE.

| | |
|--|--|
| Vibratory Sieve Shaker ANALYSETTE 3 SPARTAN | Heavy Duty Analytical Sieve Shaker ANALYSETTE 18 |
| The best deal in size separation | Ideal for large sample quantities |
|  |  |

| | |
|--|---|
| Sieving | Sieving |
| Measuring range: 32 µm – 63 mm Max. sample quantity (approx.): 1 kg Sieving time (approx.): 3 – 20 min | Measuring range: 63 µm – 125 mm Max. sample quantity (approx.): 6 kg Sieving time (approx.): 5 – 60 min |
| Measuring range: 20 µm – 10 mm Max. sample quantity (approx.): 20 – 100 g Sieving time (approx.): 3 – 10 min | - |
| - | - |
| Manual | Fix |
| 200 mm/8" | 450 mm/18" |
| 10 (50 mm height) or 16 (25 mm height) | 7 (65 mm height) |
| Yes | Yes |
| No | No |
| No | No |
| 100-240 V/1~, 50-60 Hz, 50 watt | 230 V/1~, 50 Hz, 480 watt 115 V/1~, 60 Hz, 290 watt |
| 21 kg | 92 kg |
| Bench top instrument: 37 x 40 x 20 cm | Floor instrument: 58 x 58 x 39 cm |

FRITSCH Sample Division/Feeding/Ultrasonic Cleaning

The instruments of the **FRITSCH LABORETTE line** will make your work more efficient and guarantee reproducible and representative sample preparation – the foundation for every precise analysis! The **FRITSCH Rotary Cone Sample Divider** creates the optimal basis for reliable analysis of

a representative sample. Its unique combination of three dividing methods achieves previously unheard of dividing precision. Variable division ratios and the design in several variants guarantee adaptation to a wide range of applications with a dividing accuracy of up to 99.9%.

IDEAL FOR
REPRESENTATIVE
SAMPLE PREPARATION!

Rotary Cone Sample Divider LABORETTE 27



Indispensable for representative
 sample preparation



| Division ratio | Division 1:8 | Division 1:10 | Division 1:30 |
|--------------------------------|--|--|--|
| Number of possible sub-samples | 8 | 10 | 3 |
| Materials | Plastic POM or aluminium | Plastic POM or aluminium | Plastic POM or PTFE-coated aluminium |
| Max. particle size | 10 mm | 10 mm | 2.5 mm |
| Max. sample quantity | 4000 ml | 2500 ml | 300 ml |
| Capacity of sample bottles | 25, 250, 500 ml | 25, 250 ml | 15, 20, 30 ml |
| Division | Dry/wet | Dry/wet | Dry/wet |
| Electrical details | 230 V/1~, 50-60 Hz, 90 watt 115 V/1~, 50-60 Hz, 90 watt | 230 V/1~, 50-60 Hz, 90 watt 115 V/1~, 50-60 Hz, 90 watt | 230 V/1~, 50-60 Hz, 90 watt 115 V/1~, 50-60 Hz, 90 watt |
| Weight | 8 kg | 8 kg | 8 kg |
| Dimensions w x d x h | Bench top instrument: 27 x 45 x 46 cm | Bench top instrument: 27 x 45 x 46 cm | Bench top instrument: 27 x 45 x 46 cm |

The **FRITSCH LABORETTE 24** is the ideal instrument for efficient feeding of mills, sample dividers, mixers, sieve shakers, balances and other laboratory instruments. Both models of the **FRITSCH LABORETTE 17** gently clean

sensitive parts such as test sieves, micro-precision sieves, filters, glassware and laboratory instruments and also help in accelerating chemical reactions as well as dispersing suspensions.

| | | |
|--|--|--|
| | Vibratory Feeder with V-shaped channel/wide channel LABORETTE 24 | Ultrasonic Cleaner LABORETTE 17 (2 models) |
| | For automatic feeding | Ideal for gentle cleaning and dispersing |
| |  |  |

| | | |
|------------------------------------|--|---|
| Useful capacities | | 5.6 litres resp. 28 litres |
| Tank dimensions | | Ø 24.5 cm, 13 cm deep resp. 50 x 30 x 20 cm |
| Suspended basket dimensions | | Ø 22.5 cm, 11.5 cm deep, grid 10 x 10 cm resp. 43 x 23.5 x 5 cm, grid 5 x 5 cm |
| Max. sound output | | 2 x 240 watt/period, 35 kHz resp. 2 x 600 watt/period, 35 kHz |
| Electrical details | | 230 V/1~, 50-60 Hz, 140 watt resp. 750 watt 115 V/1~, 50-60 Hz, 140 watt |
| Weight | | 5.5 kg resp. 15 kg |
| Dimensions w x d x h | | Bench top instrument: 26 x 26 x 26 cm resp. 52.5 x 32 x 40 cm |

| | | |
|-------------------------------------|--|--|
| Length of the feeder channel | 215 mm | |
| Max. feed quantity | 2500 g/min | |
| Min. feed quantity | 1 g/min | |
| Change of the channel | V-shaped channel and U channel can be easily exchanged | |
| Electrical details | 200-240 V/1~, 50-60 Hz, 20 watt 100-120 V/1~, 50-60 Hz, 20 watt | |
| Weight | 12 kg | |
| Dimensions w x d x h | Bench top instrument: 44 x 14 x 34 cm | |



Fritsch GmbH

Milling and Sizing

Industriestrasse 8

55743 Idar-Oberstein

Germany

Phone +49 67 84 70 0

Fax +49 67 84 70 11

info@fritsch.de

www.fritsch.de