

FRITSCH · SAMPLE PREPARATION

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

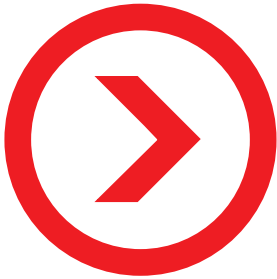
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FRITSCH helps you quickly and easily to find exactly the right laboratory instrument for your application – including a free sample grinding. Benefit from our decades of experience.

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FRITSCH-high performance mills are the laboratory standard around the world – as Planetary Mills, Ball Mills, Cutting Mills, Rotor Mills, Beater Mills, Jaw Crushers, Disk Mills, Mortar Grinders or Soil Deagglomerator 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, Disk Mills 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.

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

Analytical measuring with EASY GTM – Gas pressure and temperature measuring system

Transform your PULVERISETTE 7 into an analytical measuring system by using two EASY GTM-bowls with special lid and a transmitter as well as a receiver board. The advantage: Simple and easy monitoring of thermal effects, physical and chemical reactions or increase or decrease in pressure due to continuous measurement of gas pressure and temperature directly in the grinding bowl. The grinding process is automatically controlled in a manner that the set parameters are not exceeded. Especially practical: The receiver unit needs only to be inserted and adjusted just once – regardless of the number of EASY GTM-bowls used. EASY GTM grinding bowls are available in tempered steel, hardmetal tungsten carbide and zirconium oxide with a bowl volume of 80 ml.



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.

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

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.

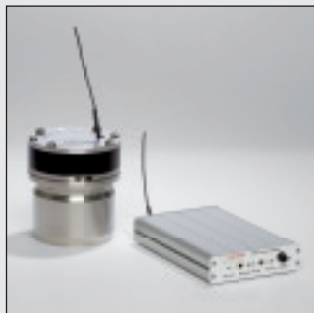
To shorten the grinding time, balls with a higher density and correspondingly higher impact energy can be used, e.g. tungsten carbide balls in a steel bowl or zirconium oxide balls in a silicon nitride bowl.

**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	1 ml	1 ml
Max. sample quantity	10 ml	5 ml
Final fineness (depending on the material)	10 µm	5 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

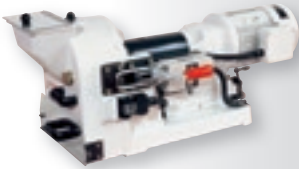

FRITSCH Disk Mills

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

IDEAL FOR

FINE AND ULTRA-FINE GRINDING OF
HARD AND BRITTLE MATERIALS

Disk Mill PULVERISETTE 13	Vibrating Cup Mill PULVERISETTE 9
Ideal for comminution down to 100 µm	Fastest comminution thanks to powerful drive
	

Working principle	Shearing force	Impact force
Optimal for material type (for materials table and material type definitions, see page 7)	Hard-brittle, medium-hard	Hard-brittle, medium-hard
Max. feed size (depending on the material)	20 mm	12 mm
Min. sample quantity	20 - 30 ml	10 - 20 ml
Max. throughput (depending on the material)	150 kg/h	250 ml
Final fineness	0.1 - 12 mm	10 - 20 µm
Feeding	Batchwise/continuous	Batchwise
Grinding parts	Fixed and movable grinding disk	Grinding puck with impact rings
Rotor speed	440 rpm	1100 rpm, 1300 rpm at optimised speed
Electrical details	400 V/3~, 50-60 Hz, 1830 watt	100-240 V/1~, 50-60 Hz, 1900 watt
Motor shaft power in accordance with VDE 0530, EN 60034	1.5 kW	1.1 kW
Weight	140 kg	250 kg
Dimensions w x d x h	Bench top instrument: 44 x 87 x 40 cm	Floor instrument: 72 x 66 x 120 cm



FRITSCH Mortar Grinder and Deagglomerator

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.

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

IDEAL FOR

WIDE RANGING APPLICATIONS
AND SPECIAL APPLICATIONS

Mortar Grinder PULVERISETTE 2	Soil Deagglomerator PULVERISETTE 8
Gentle grinding without thermal effects	Ideal for deagglomeration of dry soil samples
	

Working principle	Friction	Shearing force
Optimal for material type (for materials table and material type definitions, see page 7)	Medium-hard, brittle, moist, temperature-sensitive	Medium-hard
Max. feed size (depending on the material)	8 mm	30 mm
Min. sample quantity	30 ml	500 ml
Max. throughput (depending on the material)	150 ml	2 l
Final fineness	10 - 20 µm	< 2 mm
Feeding	Batchwise	Batchwise
Grinding parts	Mortar bowl with pestle	Spiral nylon brushes and sieving sheet
Rotor speed	70/80 rpm	400 rpm
Electrical details	100-120/200-240 V/1~, 50-60 Hz, 250 watt	400 V/3~, 50-60 Hz, 1240 watt
Motor shaft power in accordance with VDE 0530, EN 60034	0.18 kW	0.9 kW during grinding, 0.25 kW during cleaning
Weight	24 kg	100 kg
Dimensions w x d x h	Bench top instrument: 31 x 46 x 41 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	