

FRITSCH · ROTOR AND BEATER MILLS



IDEAL FOR

ANALYTIC
BIOLOGY
CHEMISTRY
AGRICULTURE AND FORESTRY
FOODSTUFFS
GEOLOGY AND MINERALOGY
MINING AND METALLURGY
CERAMICS
PLASTICS AND TEXTILES
PHARMACEUTICALS
ENVIRONMENT/ROHS

**VARIABLE SPEED ROTOR MILL
AND CROSS BEATER MILL**



FRITSCH is an internationally respected manufacturer of

application-oriented laboratory instruments. For more than

80 years, laboratories worldwide have relied on our experience,

FRITSCH. ONE STEP AHEAD.

quality, service and innovation - for fast industrial applications

as well as for especially accurate results in control- and

research laboratories. See for yourself.

Due to their high grinding energy and the special combination of impact and shearing forces, rotor and beater mills from FRITSCH are the ideal instruments for pre-crushing and fine comminution of soft to medium-hard and brittle samples – in analytic laboratories or the industry.



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PULVERISETTE 14

VARIABLE SPEED ROTOR MILL SPECIFICALLY FOR YOUR APPLICATION

- Rapid sample throughput due to high-speed grinding and simple cleaning
- Max. feed size 10 mm, max. throughput 5 l/h
- Final fineness $d_{50} < 40 \mu\text{m}$, sieve inserts 0.08 - 6 mm
- Ideal for minimal sample quantities: 5 – 10 ml
- Simple changing of all grinding parts without tools
- Variable speed settings between 6,000 and 20,000 rpm
- Automatic speed regulation for constant milling

The FRITSCH Variable Speed Rotor Mill PULVERISETTE 14 is the ideal mill for fast, effective comminution of soft to medium-hard, brittle and fibrous materials as well as temperature-sensitive samples – proven worldwide for the use in trace analysis.

The motor speed can be varied – rpm in increments of one-thousandth - making it possible to adapt the mill to each specific application. An automatic speed compensation feature ensures an ideal adaptation of the grinding to the specific comminution behaviour of the sample. At the same time reduces the fast, effective grinding significantly the thermal strain on the sample.

IMPACT AND SHEARING

In the Variable Speed Rotor Mill, the sample is comminuted by impacting against the ribs of the rotor rotating at high speed and also sheared between the rotor teeth and the sieve ring.

EFFICIENT COOLING

Available only from FRITSCH: The ingenious air routing of the PULVERISETTE 14 ensures a constant airflow to cool the rotor, all motor components and the grinding material in the collecting vessel. At the same time, a large fan blows the cooling air into the instrument through a foam particle filter to create positive pressure that prevents the penetration of dirt particles from the ambient air.



Ingenious air routing for efficient cooling of the sample

OUR SUGGESTION

Use the PULVERISETTE 14 for fine comminution after pre-crushing with the FRITSCH Cutting Mills.



The **well-designed LED display** in the ergonomic operating panel with membrane keyboard displays the speed and motor load and alerts in the event of reaching the temperature limit and overload.



Especially time-saving: **Fast exchange of all grinding parts** in just a few motions without tools, ensuring an easy cleaning of all parts outside the mill.



The especially smooth surface of the stainless steel impact rotors simplifies a thorough cleaning – fast and easy!



Secure protection against contamination: **Wear-free labyrinth seal** between the grinding chamber and the motor.



PULVERISETTE 14

One Mill – Many Possibilities

As a standard you receive the Variable Speed Rotor Mill PULVERISETTE 14 in the basic configuration with collecting vessel and lid. In order to operate the mill, you must also order a rotor, a sieve ring, an impact bar or a pin insert - allowing you to select your grinding tools according to your specific application! To ensure this, an extensive accessory programme for the PULVERISETTE 14 with rotors and sieve rings in various designs and materials as well as additional accessories are available. Choose exactly what you need!

Configure your PULVERISETTE 14 according to your specific application – our experts will be happy to advise you.

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ROTORS AND SIEVE RINGS

The extremely durable, low-wear, stainless steel rotors and sieve rings of the PULVERISETTE 14 are suitable for all standard applications, for comminution of medium-hard, soft, brittle, fibrous substances from lime to plants. To meet various grinding tasks, rotors with 8, 12 and 24 ribs as well as sieve rings with trapezoidal or round perforation from 0.08 mm to 6 mm are available.

For particularly heavy duty loads, during the grinding of harder materials, all FRITSCH sieve rings up to 2 mm trapezoidal perforation are available with additional reinforced edges.

Select the appropriate **rotor** for your application:

Fast comminution of fibrous substances

⊙ 8-ribs rotor

Feed particle sizes < 10 mm

⊙ 12-ribs rotor

Fine materials with a feed particle sizes < 5 mm

⊙ 24-ribs rotor

Select the appropriate **sieve ring** for your application:

Fast comminution of medium-hard to soft materials

⊙ Sieve ring with trapezoidal perforation for additional shearing effects

Brittle material and medium fineness with narrow particle size range

⊙ Sieve ring with round perforation

Heavy duty loads

⊙ Sieve ring with reinforced edges



MILLING WITH THE FRITSCH IMPACT BAR

Difficult-to-mill samples, temperature-sensitive samples and plastics

In addition to the special air cooling of the PULVERISETTE 14, which also allows grinding of temperature-sensitive samples, we have developed the FRITSCH impact bar: With its clever design, it enables together with a sieve ring a very gentle comminution of the sample which in many cases would be impossible without the impact bar. The bar acts as a stator on which the material is additionally beaten. The result: increased grinding performance for a particularly fast and effective grinding that minimises the thermal load. The ideal solution for especially heat-sensitive materials such as powder coatings or plastics as well as for smooth pre-crushing and fine comminution of hard-brittle to soft, fatty or samples with residual moisture! The corresponding rotor and sieve ring for the impact bar must be ordered separately.

TEMPERATURE DATA COMPARISON

Material: Wood fibres

With impact bar 41.7°C

Without impact bar 56.1°C



HEAVY-METAL-(IRON-)FREE GRINDING

Grinding of soft samples

For both: heavy-metal-free and iron-free grinding of leaves, grain or soft foods, you can order your PULVERISETTE 14 with a PTFE-coated lid and collecting vessel. In addition, select a 12-ribs pure titanium impact rotor and a sieve ring with reinforced edges also made of pure titanium with a matching perforation for the desired final fineness.

Grinding of medium-hard samples

For both: heavy-metal-free and iron-free grinding of rice, wood, leather or plastics, you can order your PULVERISETTE 14 with PTFE-coated lid and collecting vessel. In addition, select a TiN-coated rotor and sieve ring. For feed particle sizes < 10 mm, use a 12-ribs rotor, for feed particle sizes < 5 mm, a 24-ribs rotor. A sieve ring with trapezoidal perforation ensures additional comminution.

RoHS

For sample preparation according to RoHS – such as for verification of hexavalent chromium – equip your PULVERISETTE 14 with a tungsten-carbide-coated 12-ribs rotor and a tungsten-carbide-coated sieve ring with trapezoidal perforation.



Tablets before and after grinding in the PULVERISETTE 14 with the impact bar and sieve ring with 2 mm trapezoidal perforation at 20,000 rpm



PULVERISETTE 14



AUTOMATIC FEEDING

Combine your PULVERISETTE 14 with the FRITSCH Vibratory Feeder LABORETTE 24 to ensure continuous feeding of the sample during the entire grinding process, even of smallest quantities. Due to a direct connection, the mill automatically matches the sample feeding to its load state at any given moment.

GRINDING WITHOUT SIEVE

Available only from FRITSCH: For grinding without a sieve for the most difficult, medium-hard, oil- or grease-containing materials such as waxes or paraffins, equip your PULVERISETTE 14 with the unique pin rotor and the corresponding grinding chamber lid with pin insert for grinding entirely without a sieve ring.

GRINDING OF LARGE QUANTITIES

Regardless of the specific configuration of rotor, sieve rings, impact bar or pin insert, you can turn your PULVERISETTE 14 into a true workhorse for the grinding of large quantities with the special conversion kit. The kit consists of a special collecting vessel with outlet and flange-mount nylon support sack for easily replaceable paper filter bags. This allows the comminution of sample quantities of up to 1 litre in a single step without the need to open the grinding chamber and empty the collecting pan during the process.

Our suggestion: During grinding of very light materials, the material yield can be significantly improved by the high air circulation of the conversion kit for grinding large quantities – even when grinding smaller quantities!

Another suggestion: During grinding of temperature-sensitive samples, the conversion kit for grinding large quantities with its large nylon support sack ensures a high air throughput, resulting in even better cooling.



FRITSCH pin insert for grinding without sieve

OUR SUGGESTION

Difficult-to-mill samples, or extremely temperature-sensitive samples such as styrenes, polyester, synthetic resins, films, PVC, PP and PE can be embrittled with the addition of liquid nitrogen and afterwards ground in the PULVERISETTE 14.

TECHNICAL DATA

Electrical details

100-120/200-240 V/1~, 50-60 Hz, 1150 watt

Motor shaft power in accordance with VDE 0530, EN 60034

550 W

Weight

Net 23 kg

Gross 25 kg

Dimensions w x d x h

Bench top instrument 31 x 48 x 47 cm

Packaging w x d x h

Cardboard box 46 x 63 x 55 cm

Emissions value of workplace according to IEC 61672-1

Approx. 75 dB(A)

(depending on the material to be ground, adjusted rotor-speed and instrument configuration)

Order no.

14.3000.00



Raw coffee before and after grinding with the P-14 and sieve ring 1 mm trapezoidal perforation at 20,000 rpm

APPLICATION EXAMPLES

Analytic	Creation of samples for the chemical analysis of soil samples, slurries or plant samples, spectroscopy
Biology	Plants, roots, leaves, needles, grains, drugs, peat, seeds, ash
Chemistry	Chemicals, fillers, waxes, paraffins, chalk, kaolin
Agriculture and forestry	Plants, wood, roots, leaves, needles, grains, soil (without stones), fertilisers, pellets, feed
Foodstuffs	Rice, spices, foodstuffs for protein and nitrogen analysis, dried fruits
Plastics and textiles	Textiles, leather, cellulose, compound materials, rubber, powder coatings, styrenes, polyester, synthetic resins, foils, PVC, PP and PE
Pharmaceuticals	Pharmaceuticals, dragées, tablets
Environment/RoHS	Electronic parts, plastics, glass

FACTS AND ADVANTAGES

- Simple, tool-free changing of rotor, collecting vessel, sieve ring and labyrinth seal
- Simple, contamination-free cleaning and assembly of all grinding parts outside the instrument
- Efficient cooling of the grinding chamber due to extremely high airflow
- Highly durable low-wear rotor made of stainless steel
- Grinding chamber made of stainless steel or PTFE-coated with practical quick-clamping lock
- Grinding parts made of stainless steel, pure titanium, TiN-coated and WC-coated
- Maintenance-free three-phase motor with regulated rotor speed 6,000 - 20,000 rpm
- High speed stability even under full load
- Wear-free labyrinth seal between the grinding chamber and drive motor
- Removable dust filter for convenient cleaning
- Ergonomic operating panel with membrane keyboard and timer
- Microcontroller with integrated regulation function for Vibratory Feeder
- 2-year guarantee



PULVERISETTE 16

THE FRITSCH CROSS BEATER MILL

- Max. feed size 20 mm, final fineness 0.12 - 10 mm
- Ideal for comminution of coal, coke, lime or slate
- Ideal for fast work with high throughput of up to 80 l/h
- Easy-to-change bottom sieve
- Easy cleaning
- Min. sample quantity 30 - 40 ml
- Batch or continuous operation possible

In event of unintended opening of the screw connection, a **safety switch** activates the motor brake, bringing the rotor to a stop in less than 0.5 seconds.

With a high rotor speed of 2,800 rpm, the **FRITSCH Cross Beater Mill PULVERISETTE 16** is the ideal universal mill for fast and gentle pre-crushing and fine comminution of medium-hard, brittle materials up to a Mohs hardness of 6 in laboratories and industry.

For individual grain feeding in batches, the maximum feed size is 20 mm; for continuous comminution, the maximum size is 15 mm. Depending on the material and bottom sieve used, you can achieve a throughput of up to 80 l/h. For batchwise operation, a 5 litre collecting vessel with filter hose is delivered as standard. A 30 litre collecting vessel with filter hose is also available for larger quantities. The final fineness depends on the selection of the bottom sieve and the breaking properties of the respective material and ranges up to around 100 µm. In general, 100% of the sample is smaller than 70% of the mesh width of the bottom sieve used.

IMPACT, FRICTION, SHEARING

Comminution in the Cross Beater Mill takes place through impact, friction and shearing forces. The feeding funnel guides the grinding material directly into the centre of the grinding chamber, where it is comminuted between the cross beater and the teeth of the grinding insert. The selected bottom sieve determines the final fineness. The rotating cross beater also creates an airflow through the funnel that accelerates the discharging of the ground sample into the collecting vessel. The supplied filter hose can be integrated here to effectively reduce the release of fine dust.

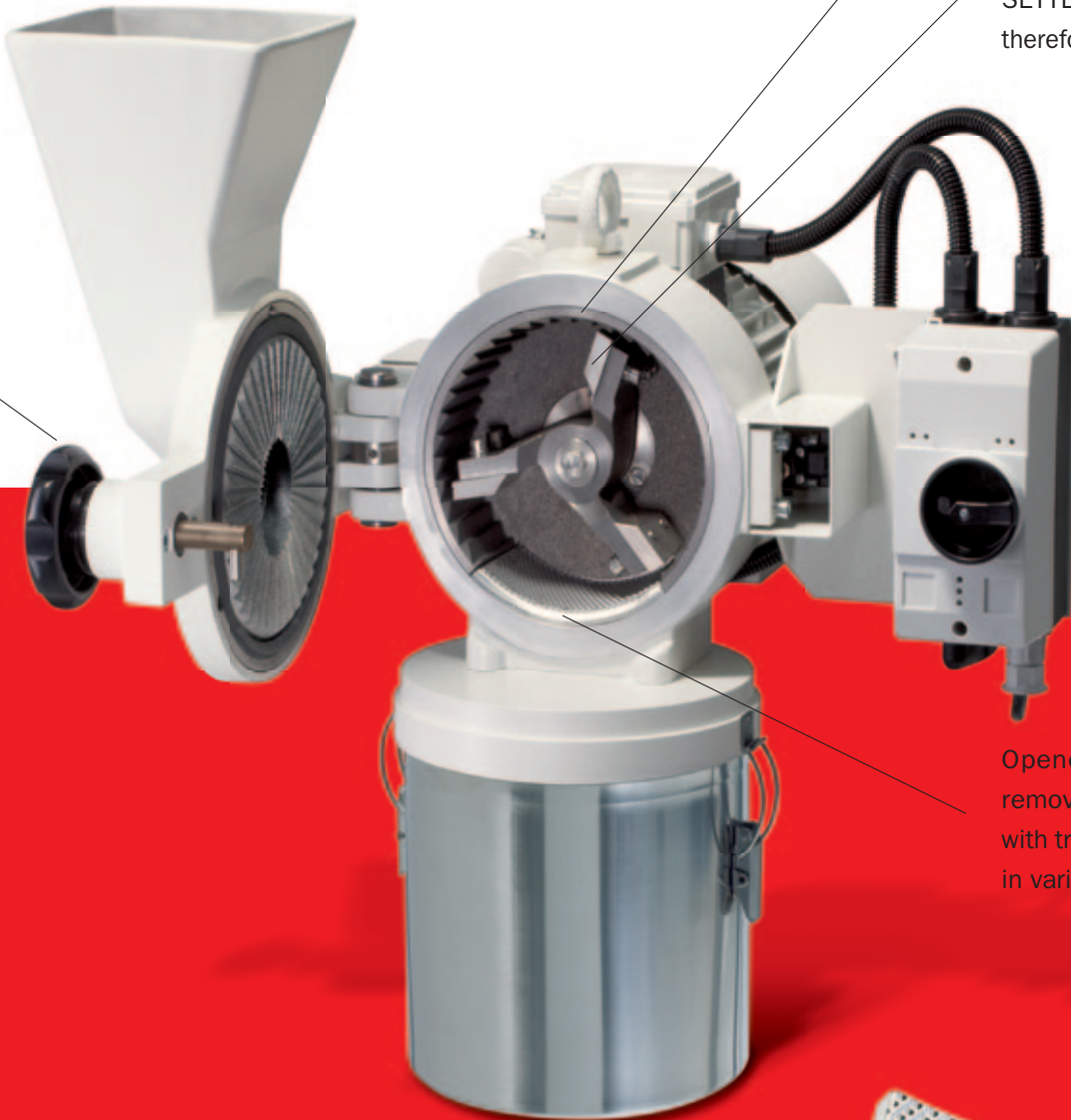
THE FRITSCH-EXTRA

The standard equipment delivered with the PULVERI-SETTE 16 includes a cloth filter hose between the mill and the collecting vessel that ensures a constant airflow in the grinding chamber; accelerates the throughput and prevents blockages – for fast, gentle comminution.

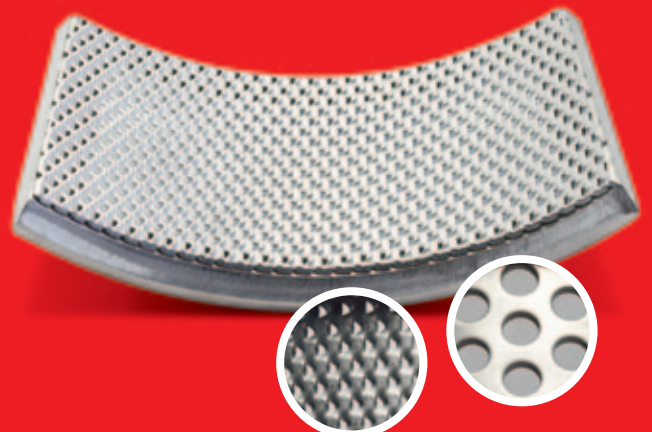


The **grinding insert** of the PULVERI-SETTE 16 is available in either cast iron or stainless steel.

The **impact plates** of the PULVERI-SETTE 16 can be unscrewed and therefore are easy to replace.

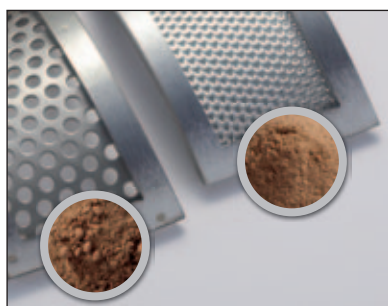


Opened grinding chamber with removable **bottom sieve**, available with trapezoidal or round perforation in various sizes.





PULVERISETTE 16



OUR SUGGESTION

In general, the finer the desired final fineness, the smaller the perforation of the bottom sieve should be; the larger the perforation, the higher the throughput.

THE RIGHT ACCESSORIES

As standard, your Cross Beater Mill PULVERISETTE 16 is equipped with a grinding insert either made of cast iron or alternatively stainless steel, which is harder. A 5 litre collecting vessel with filter hose is also included. The bottom sieve must be ordered separately.

Bottom sieve

Bottom sieves made of stainless steel are available in various sizes and perforations for your PULVERISETTE 16.

Collecting vessel for large quantities

For comminution of large quantities, you can equip your PULVERISETTE 16 with the special 30 litre collecting vessel with filter hose.

Practical use as a free-standing instrument

Combine your PULVERISETTE 16 with a separately available support stand for a stand-alone instrument that you can place anywhere.





TECHNICAL DATA

Electrical details

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

1.1 kW

Weight

Net 38 kg

Gross 76 kg

Dimensions w x d x h

Table-mounting or on stand 42 x 45 x 56 cm

Packaging w x d x h

Wooden case 80 x 70 x 70 cm

Emissions value of workplace according to IEC 61672-1

Approx. 86 dB(A)

(depending on the material to be ground and instrument configuration)

Order no.	400 V/3~	230 V/1~	110 V/1~
Grinding insert Cast iron	16.3030.00	16.3020.00	16.3010.00
Grinding insert Stainless steel	16.3080.00	16.3070.00	16.3060.00



Large collecting vessel 30 l, small collecting vessel 5 l

APPLICATION EXAMPLES

Agriculture and forestry	Grain, peat, seeds, dried plants, feed, pellets
Geology and mineralogy	Salts, gypsum, potash, minerals, stones and soil, bauxite, limestone, dry clay, pyrite, cement clinker, refractory materials
Mining and metallurgy	Coal, coke, ores, slate, slag
Ceramics	Oxide ceramics
Plastics and textiles	Resins, cellulose, synthetic resins

FACTS AND ADVANTAGES

- Practical grinding chamber quick-clamping lock
- Easily replaceable impact plates
- Useable as a table-mounted or free-standing instrument with support stand (ordered separately)
- 1.1 kW brake motor, 2,850 rpm with maintenance-free direct drive
- Overload protection
- Toothed grinding tools made of cast iron or stainless steel
- Collection vessel made of stainless steel in 2 sizes (5 l and 30 l)
- Trapezoidal and round perforation bottom sieves made of stainless steel in various sizes
- Housing made of cast aluminium
- Easy assembly
- 2-year guarantee

ORDERING DATA

Order no.	Article
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VARIABLE SPEED ROTOR MILL

PULVERISETTE 14
Instrument without impact rotor and sieve ring, incl. collecting vessel with lid



14.3000.00	For 100-120/200-240 V/1~, 50-60 Hz, 1150 watt The voltage specified in the order is set.
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Impact rotors made of stainless steel

44.4080.10	With 8 ribs
44.4120.10	With 12 ribs
44.4240.10	With 24 ribs

Sieve rings made of stainless steel

44.1000.10	0.08 mm trapezoidal perforation
44.1010.10	0.12 mm trapezoidal perforation
44.1020.10	0.2 mm trapezoidal perforation
44.1050.10	0.5 mm trapezoidal perforation
44.1080.10	0.75 mm trapezoidal perforation
44.1100.10	1 mm trapezoidal perforation
44.1150.10	1.5 mm trapezoidal perforation
44.1200.10	2 mm trapezoidal perforation

44.2100.10	1 mm round perforation
44.2200.10	2 mm round perforation
44.2400.10	4 mm round perforation
44.2600.10	6 mm round perforation

Sieve rings for heavy duty loads made of stainless steel with reinforced edges

44.3000.10	0.08 mm trapezoidal perforation
44.3010.10	0.12 mm trapezoidal perforation
44.3020.10	0.2 mm trapezoidal perforation
44.3050.10	0.5 mm trapezoidal perforation
44.3080.10	0.75 mm trapezoidal perforation
44.3100.10	1 mm trapezoidal perforation
44.3150.10	1.5 mm trapezoidal perforation
44.3200.10	2 mm trapezoidal perforation

Accessories for heavy-metal-(iron)-free grinding

14.3750.00	Lid and collecting vessel, PTFE-coated
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44.4120.32	Impact rotor with 12 ribs, pure titanium
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44.3021.32	Sieve ring 0.2 mm trapezoidal perforation, pure titanium with reinforced edges
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44.3051.32	Sieve ring 0.5 mm trapezoidal perforation, pure titanium with reinforced edges
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44.3101.32	Sieve ring 1 mm trapezoidal perforation, pure titanium with reinforced edges
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44.4120.00	Impact rotor with 12 ribs, TiN-coated
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44.4240.00	Impact rotor with 24 ribs, TiN-coated
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44.1010.00	Sieve ring 0.12 mm trapezoidal perforation, TiN-coated
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44.1020.00	Sieve ring 0.2 mm trapezoidal perforation, TiN-coated
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44.1050.00	Sieve ring 0.5 mm trapezoidal perforation, TiN-coated
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44.1100.00	Sieve ring 1 mm trapezoidal perforation, TiN-coated
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Accessories for RoHS sample preparation

44.4120.08	Impact rotor with 12 ribs, WC-coated
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44.1025.08	Sieve ring 0.25 mm trapezoidal perforation, WC-coated
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Accessories for difficult-to-mill and temperature-sensitive samples

44.1121.10	Impact bar (Please note: rotor and special sieve ring are additionally necessary!)
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Sieve rings made of stainless steel for impact bar

44.1301.10	Sieve ring 0.08 mm trapezoidal perforation
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44.1311.10	Sieve ring 0.12 mm trapezoidal perforation
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44.1321.10	Sieve ring 0.2 mm trapezoidal perforation
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44.1351.10	Sieve ring 0.5 mm trapezoidal perforation
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44.1381.10	Sieve ring 0.75 mm trapezoidal perforation
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44.1401.10	Sieve ring 1 mm trapezoidal perforation
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44.1451.10	Sieve ring 1.5 mm trapezoidal perforation
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44.1501.10	Sieve ring 2 mm trapezoidal perforation
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44.1711.10	Sieve ring 1 mm round perforation
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44.1721.10	Sieve ring 2 mm round perforation
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44.1741.10	Sieve ring 4 mm round perforation
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44.1761.10	Sieve ring 6 mm round perforation
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Accessories for grinding without a sieve

14.2600.00	Pin insert (consisting of pin rotor and grinding chamber lid with pin insert)
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Order no.	Article
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14.3510.00	Accessories for grinding large quantities Conversion kit for grinding large quantities (consisting of pan with outlet and flange-mount nylon support sack [outside] for paper filter bag [inside])
83.0010.00	Set paper filter bags for conversion kit (set = 20 pieces)

	Accessories for automatic sample feeding
	Vibratory Feeder LABORETTE 24
	Instrument with V-shaped channel and control unit
24.0030.00	For 200-240 V/1~, 50-60 Hz
24.0040.00	For 100-120 V/1~, 50-60 Hz
24.9100.00	Stand for Feeder

Order no.	Article
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CROSS BEATER MILL

PULVERISETTE 16
Instrument without bottom sieve and stand, incl. collecting vessel 5 litres with filter hose



16.3030.00	Grinding insert made of cast iron For 400 V/3~, 50 Hz, 1480 watt
16.3020.00	For 230 V/1~, 50 Hz, 1590 watt
16.3010.00	For 110 V/1~, 60 Hz, 1500 watt

16.3080.00	Grinding insert made of stainless steel For 400 V/3~, 50 Hz, 1480 watt
16.3070.00	For 230 V/1~, 50 Hz, 1590 watt
16.3060.00	For 110 V/1~, 60 Hz, 1500 watt

The PULVERISETTE 16 with voltage of „/3~“ can **only** be operated on a three-phase supply network!
Other voltages on request!

16.5100.10	Bottom sieves made of stainless steel 0.12 mm trapezoidal perforation
16.5110.10	0.2 mm trapezoidal perforation
16.5120.10	0.25 mm trapezoidal perforation
16.5130.10	0.5 mm trapezoidal perforation
16.5140.10	0.75 mm trapezoidal perforation
16.5150.10	1 mm trapezoidal perforation
16.5160.10	1.5 mm trapezoidal perforation
16.5170.10	2 mm trapezoidal perforation

16.5200.10	3 mm round perforation
16.5210.10	4 mm round perforation
16.5220.10	5 mm round perforation
16.5230.10	6 mm round perforation
16.5240.10	8 mm round perforation
16.5250.10	10 mm round perforation

45.5820.00	Further accessories Universal support stand
16.3600.00	Collecting vessel 30 litres with filter hose



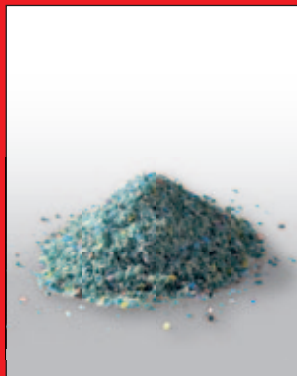
Grinding reports online

At www.fritsch.de, you will find a comprehensive database of grinding reports for various materials and industries under the menu item **Sample Preparation / Solutions** – it's worth to take a look!



Practical on-site demonstration

If you would like to be convinced of the performance and ease of use of the FRITSCH laboratory instruments, we would be happy to call on you with the FRITSCH mobile laboratory and provide you with on-site practical demonstrations.



Free sample grinding

Send us your sample for a complimentary grinding trial. We will then submit a fully documented grinding report identifying the mill, which is the right one for you.

Information and scheduling

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