

*Planetary Mills - classic line*



**IDEAL FOR**

GEOLOGY AND MINERALOGY  
MATERIAL RESEARCH/MECHANICAL ALLOYING  
CERAMICS  
CHEMISTRY  
BIOLOGY  
PHARMACEUTICALS  
METALLURGY  
SAMPLE PREPARATION FOR ANALYSIS

*classic line*

**PLANETARY MILLS**



# QUALITY MADE IN GERMANY

FRITSCH is more than just a brand: It is backed by a strong, medium-sized, family business in its fourth generation, which has been firmly embedded in the region since 1920 and globally active for decades. All FRITSCH-products are produced according to strict quality criteria, and our entire production is in-house. The innovative ideas of our development department are inspired by the close relationship with our customers and their practical work in the lab. Satisfied customers worldwide count on our quality, our experience and our service. This makes us proud and motivates us.

**FRITSCH. ONE STEP AHEAD.**





## The laboratory standard

### ADVANTAGES TO YOU OF THE FRITSCH CLASSIC LINE AT A GLANCE:

- Fast grinding to below 1  $\mu\text{m}$
- Up to 800 rpm
- Safe clamping of the bowls with the Safe-Lock-System
- Simple, ergonomic handling and easy cleaning
- Grinding bowls and balls in 7 different materials to suit all needs and avoidance of contamination through abrasion



FRITSCH Planetary Mills *classic line* process hard, medium-hard, soft, brittle, abrasive, fibrous and moist materials from a few milligrams up to several kilograms and achieve final finenesses of less than 1  $\mu\text{m}$ .

#### Reliable, reproducible, durable

Worldwide, FRITSCH Planetary Mills of the *classic line* are the laboratory standard for the widest range of applications. The name PULVERISETTE is synonymous with fast, loss-free fine grinding of samples, operator friendly, consistent reproducibility and long, reliable service life even under continuous, heavy duty usage.

All *classic line* Planetary Mills are characterised by particularly easy, ergonomic operation, offer fast and easy cleaning and guarantee safe clamping of the bowls.

Depending on the fineness required, the grinding can be performed dry, in suspension or in inert gas. In addition to comminution, you can also use the Planetary Mills of the FRITSCH *classic line* for mixing and homogenising of emulsions and pastes or for mechanical alloying and activation in material research.

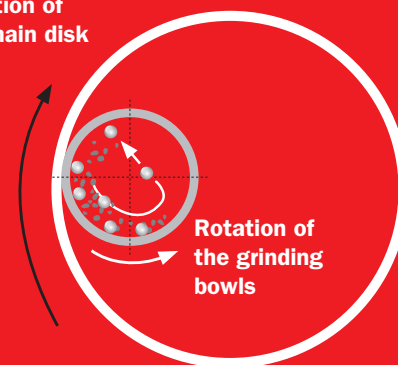


PULVERISETTE 6

### Planetary Ball Mills – high-performance all-rounders in routine laboratory work

In Planetary Ball Mills, the comminution of the sample material takes place primarily through the high-energy impact of grinding balls. To achieve this, the grinding bowl, containing the material to be ground and grinding balls, rotates around its own axis on a main disk rotating in the opposite direction. The overlapping of the centrifugal forces cause the sample material and grinding balls to bounce off the inner wall of the grinding bowl. The grinding balls cross the bowl diagonally at an extremely high speed and grind the sample material on the opposite wall of the bowl. The grinding bowls reach approximately twice the speed of the main disk during this process.

Rotation of the main disk



Rotation of the grinding bowls

Working principle of Planetary Ball Mills

# FRITSCH-Tip

## Application videos and reports

On the FRITSCH website you will find an extensive range of helpful solution approaches from a wide range of materials. With instructive videos, reports, pictures and graphics. Benefit from our decades of experience – practice oriented and well-founded.

Your web address: [www.fritsch-international.com/solution](http://www.fritsch-international.com/solution)

## Extensive grinding report database

Practically no material exists that has not already been processed by FRITSCH instruments over the decades. From standard samples to exotic ones. For each single grinding performed, you will find in the FRITSCH grinding report database the most important result parameters at a glance plus detailed information on the grindings divided into multiple actions. Your web address: [www.fritsch-international.com/grinding-reports](http://www.fritsch-international.com/grinding-reports)



<b>Number of working stations</b>
<b>Grinding bowl sizes</b>
<b>Grinding ball diameter</b>
<b>Max. feed size</b> (depending on the material)
<b>Sample quantity</b>
<b>Final fineness</b> (depending on the material)
<b>Typical grinding time down to analytical fineness</b>
<b>Grinding process</b>
<b>Grinding in inert gas</b>
<b>Gas pressure and temperature measurement</b>
<b>Rotational speed of main disk</b>
<b>Transmission ratio planetary disk/grinding bowl</b>
<b>Effective diameter of main disk</b>
<b>Centrifugal acceleration (<math>g = 9.81 \text{ m/s}^2</math>)</b>



## Overview of the FRITSCH Planetary Mills *classic line*



### Planetary Mill **PULVERISETTE 5** *classic line*

**Fast and fine**

4 resp. 2  
80, 250, 500 ml  
0.1–40 mm  
10 mm  
10–900 ml  
< 1 µm

4 min

Dry/wet

Yes

Yes

50–400 rpm

$i_{\text{relative}} = 1 : -2.19$

~ 250 mm

22 g

### Planetary Mono Mill **PULVERISETTE 6** *classic line*

**High performance  
in minimum space**

1  
80, 250, 500 ml  
0.1–40 mm  
10 mm  
10–225 ml  
< 1 µm

4 min

Dry/wet

Yes

Yes

100–650 rpm

$i_{\text{relative}} = 1 : -1.82$

121.6 mm

29 g

### Planetary Micro Mill **PULVERISETTE 7** *classic line*

**Ideal for  
the smallest quantities**

2  
12, 45 ml  
0.1–15 mm  
5 mm  
0.5–40 ml  
< 1 µm

3 min

Dry/wet

Only possible in glove box

No

100–800 rpm

$i_{\text{relative}} = 1 : -2$

140 mm

50 g

**Choose from the FRITSCH *classic line*-range  
the perfect Planetary Mill for your specific needs!**

**We will be happy to advise you.**

+49 6784 70-150 · [consultation@fritsch.de](mailto:consultation@fritsch.de)



# PULVERISETTE 5

*classic line*

## THE FRITSCH PLANETARY MILL

- **Fast comminution of laboratory samples with up to 400 rpm**
- **Adjustable timer accurate to one second**
- **Suitable for grinding hard to soft materials, including in suspensions**
- **Perfect for homogenising of emulsions and pastes**
- **4 or 2 working stations**
- **Simultaneous processing of up to 8 samples**
- **Useful capacity up to 4 x 225 ml**
- **Bowl sizes 80 ml, 250 ml, 500 ml volume**



Also available: The P-5 *classic line* with 2 working stations

### Fast and fine

The ideal Planetary Mill: Quick and reliable thanks to the particularly high-energy effect of the grinding balls, the PULVERISETTE 5 *classic line* delivers loss-free grinding results down to colloidal fineness of dry laboratory samples or solids in suspension and even mixes and homogenises emulsions and pastes. The fixed transmission ratio, rotational speed regulation and precision quartz timing ensure exactly reproducible grinding conditions.





IQ/OQ documentation available to support equipment qualification.



**TECHNICAL DATA**

**Electrical details**

200-240 V/1~, 50-60 Hz, 1730 watt  
 100-120 V/1~, 50-60 Hz, 1470 watt

Weight with	4 working stations	2 working stations
Net	120 kg	100 kg
Gross	155 kg	135 kg

**Dimensions w x d x h**

Bench top instrument: 58 x 67 x 57 cm

**Packing w x d x h**

Pallet case: 100 x 72 x 83 cm

**Emission sound pressure level at the workplace according to DIN EN ISO 3746**

Up to approx.  $L_{pAd} = 83$  dB  
 (depending on the material to be ground, grinding bowls/balls, selected rotational speed)

Order no. for	4 working stations	2 working stations
	200-240 V/1~	200-240 V/1~
	05.5020.00	05.6020.00
	100-120 V/1~	100-120 V/1~
	05.5010.00	05.6010.00



Fast and reliable: The practical Safe-Lock-System



Saves time: Simultaneous grinding of up to 8 samples

**APPLICATION EXAMPLES**

<b>Geology and mineralogy</b>	Rock, gravel, sand, minerals
<b>Ceramics</b>	Porcelain, sintered ceramics, clay, fireclay
<b>Chemistry</b>	Pesticides, fertilisers, salts, inorganic and organic materials
<b>Biology</b>	Plants, leaves, freeze-dried samples
<b>Pharmaceuticals</b>	Ophthalmological agents, gels, creams, extracts, drugs, pastes, dragées, tablets
<b>Metallurgy</b>	Ores, sinters
<b>Material research/ Mechanical alloying</b>	Pigments, precious materials, new materials, alloys, mechanical alloying and activation
<b>Analysis preparation</b>	Spectroscopy, X-ray fluorescence, X-ray structure analysis, chromatography

**FACTS AND ADVANTAGES**

- Toothed belt drive for bowls provides constant transmission ratio
- Rotational speed regulated by microprocessor and digital display of the actual rotational speed of the main disk
- Programmable grinding and pause times and grinding sequences – for short-time operation adjustable down to the second
- Smaller grinding bowls also possible with an adapter
- Reversing function
- Overload protection with automatic rotational speed adjustment and display
- Maintenance-free drive due to electronically regulated rotary current motor (1.5 kW) with frequency converter and permanently lubricated bearings
- Grinding chamber hood safety lock with stoppage monitoring
- Membrane keyboard and robust housing of impact-resistant plastic
- Grinding chamber with forced air ventilation
- Gas pressure springs for easy opening of the cover
- Energy-save-function (electricity-saving mode)
- 2-year guarantee



# PULVERISETTE 6

*classic line*

## THE FRITSCH PLANETARY MONO MILL

- **Special grinding force due to a rotational speed of up to 650 rpm**
- **Low space requirements and ergonomic design**
- **Particularly easy-to-use**
- **Timer programming precise to  $\pm$  one second**
- **Suitable for grinding hard to soft materials, dry or in suspension**
- **Perfect mixing and homogenising of emulsions**
- **Simultaneous processing of up to 2 samples**
- **Useful capacity up to 225 ml**
- **Bowl sizes 80 ml, 250 ml and 500 ml volume**

### High performance in minimum space

The PULVERISETTE 6 *classic line* is a high-performance Planetary Ball Mill with a single grinding bowl mount and practical, easily adjustable imbalance compensation.

Your advantage: Particularly easy use and high-energy effect up to 650 rpm. This ensures a constantly high grinding performance with extremely low space requirements for loss-free grinding results even in suspension.

The electronic timer adjustable to one second and the programmable, automated reversing feature ensure precise, consistent reproducibility and grinding of even the smallest samples. At the same time, the PULVERISETTE 6 *classic line* is ideally suited for mechanical alloying or for mixing and perfect homogenising of emulsions and pastes.



IQ/OQ documentation available to support equipment qualification.



## TECHNICAL DATA

### Electrical details

100-120/200-240 V/1~, 50-60 Hz, 1000 watt

### Weight

Net 63 kg

Gross 83 kg

### Dimensions w x d x h

Bench top instrument: 37 x 53 x 50 cm

### Packaging w x d x h

Wooden case: 68 x 54 x 72 cm

### Emission sound pressure level at the workplace according to DIN EN ISO 3746

Up to approx.  $L_{pAd}$  = 85 dB

(depending on the material to be ground, grinding bowls/balls, selected rotational speed)

### Order no.

06.2000.00



Imbalance compensation with simple mechanical adjustment



Practical: The membrane keyboard can be operated when the mill is closed

## APPLICATION EXAMPLES

<b>Geology and mineralogy</b>	Rock, gravel, sand, minerals
<b>Ceramics</b>	Porcelain, sintered ceramics, clay, fireclay
<b>Chemistry</b>	Pesticides, fertilisers, salts, inorganic and organic materials
<b>Biology</b>	Plants, leaves, freeze-dried samples
<b>Pharmaceuticals</b>	Ophthalmological agents, gels, creams, extracts, drugs, pastes, dragées, tablets
<b>Metallurgy</b>	Ores, sinters
<b>Material research/ Mechanical alloying</b>	Pigments, precious materials, new materials, alloys, mechanical alloying and activation
<b>Analysis preparation</b>	Spectroscopy, X-ray fluorescence, X-ray structure analysis, chromatography

## FACTS AND ADVANTAGES

- Large rotational speed range with accurate display
- Grinding chamber completely encapsulated but easy to open
- Cooling of the grinding chamber with a built-in fan for long grinding times
- Exactly reproducible grinding results thanks to a regulated drive, precise transmission ratio (toothed belt), programmable microprocessor control electronics
- Programmable interval and pause times
- Smaller grinding bowls also possible with an adapter
- Monitoring of the grinding parameters even when grinding chamber is open through an ergonomically positioned and always visible, splash-proof IP65 membrane keyboard
- Easy cleaning of the grinding elements
- Recyclable plastic housing
- Extensive range of accessories
- Energy-save-function (electricity-saving mode)
- Mains voltage (100-120/200-240 V) configurable at the instrument
- 2-year guarantee



# PULVERISETTE 7

*classic line*

## THE FRITSCH PLANETARY MICRO MILL

- Rotational speed up to 800 rpm
- Fast fine grinding of small quantities
- Small footprint
- Programmable microprocessor control
- Up to 99 repetitions of the grinding cycle
- Suitable for grinding hard to soft materials, including in suspension
- Simultaneous processing of up to 2 samples
- Useful capacity up to 2 x 20 ml
- Grinding bowl sizes of 12 and 45 ml volume

### **Ideal for smallest quantities**

The PULVERISETTE 7 *classic line* is ideally suited for fast, uniform, and extremely fine comminution of very small samples down to colloidal fineness or for mixing and perfect homogenisation of emulsions or pastes.

The special microprocessor control with up to 99 programmable repetitions of the grinding cycle ensures exceptionally fast, precise, reproducible results. A mill that combines particularly high grinding performance with low bench space requirements!



IQ/OQ documentation available to support equipment qualification.

## TECHNICAL DATA

### Electrical details

100-120/200-240 V/1~, 50-60 Hz, 740 watt

### Weight

Net 35 kg

Gross 55 kg

### Dimensions w x d x h

Bench top instrument: 37 x 53 x 50 cm

### Packaging w x d x h

Wooden case: 68 x 54 x 72 cm

### Emission sound pressure level at the workplace according to DIN EN ISO 3746

Up to approx.  $L_{pAd}$  = 82 dB

(depending on the material to be ground, grinding bowls/balls, selected rotational speed)

### Order no.

07.4000.00



Unbeatably fast: **Rotational speed up to 800 rpm**



Impressive: Fast and fine grinding of smallest quantities

## APPLICATION EXAMPLES

<b>Geology and mineralogy</b>	Rock, gravel, sand, minerals
<b>Ceramics</b>	Porcelain, sintered ceramics, clay, fireclay
<b>Chemistry</b>	Pesticides, fertilisers, salts, inorganic and organic materials
<b>Biology</b>	Plants, leaves, freeze-dried samples
<b>Pharmaceuticals</b>	Ophthalmological agents, gels, creams, extracts, drugs, pastes, dragées, tablets
<b>Metallurgy</b>	Ores, sinters
<b>Material research/ Mechanical alloying</b>	Pigments, precious materials, new materials, alloys, mechanical alloying and activation
<b>Analysis preparation</b>	Spectroscopy, X-ray fluorescence, X-ray structure analysis, chromatography

## FACTS AND ADVANTAGES

- Large rotational speed range
- Grinding chamber completely encapsulated but easy to open
- Cooling of the grinding chamber with a built-in fan for long grinding times
- Programmable microprocessor control
- Precise rotational speed regulation with display of set/actual values
- Programme-timer for grinding operation and cooling phases
- Reversing function
- Energy-save-function (electricity-saving mode)
- Ergonomic IP64 membrane keyboard
- Maintenance-free drive with asynchronous motor and frequency converter
- Mains voltage (100-120/200-240 V) configurable on the instrument
- Recyclable plastic housing
- 2-year guarantee

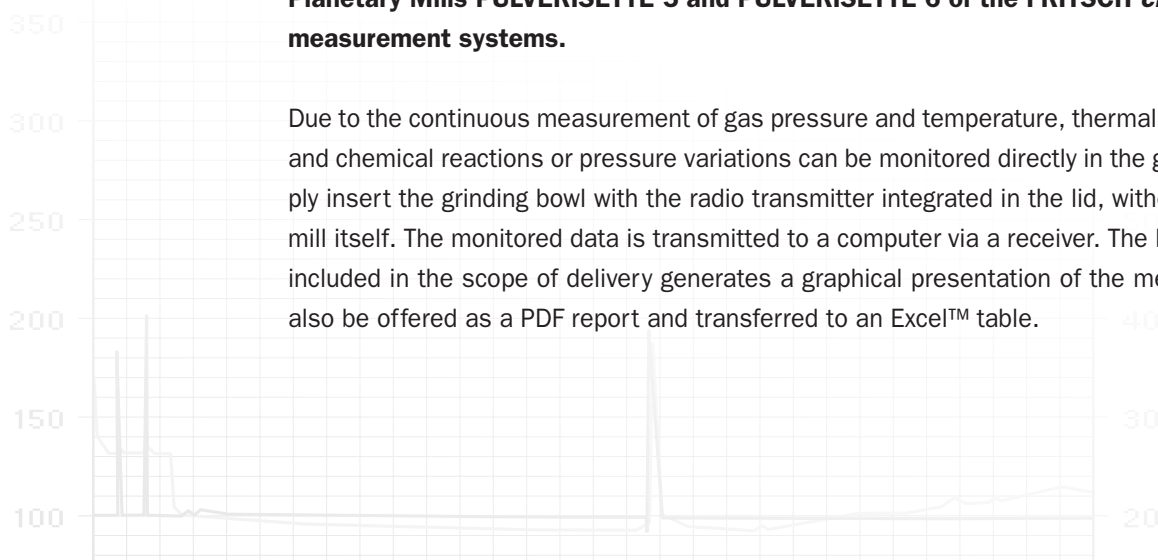


## EASY GTM *classic line*

Gas Pressure and Temperature Measuring System

**With the new EASY GTM Gas Pressure and Temperature Measuring System you can turn the Planetary Mills PULVERISETTE 5 and PULVERISETTE 6 of the FRITSCH *classic line* into analytical measurement systems.**

Due to the continuous measurement of gas pressure and temperature, thermal effects as well as physical and chemical reactions or pressure variations can be monitored directly in the grinding bowl. For this, simply insert the grinding bowl with the radio transmitter integrated in the lid, without any modification to the mill itself. The monitored data is transmitted to a computer via a receiver. The EASY GTMControl software included in the scope of delivery generates a graphical presentation of the measured values, which can also be offered as a PDF report and transferred to an Excel™ table.



### The EASY GTM-System provides valuable information

- Investigations in the area of mechanical alloying for the production of new amorphous and nano-crystalline materials
- Monitoring and optimisation of grinding processes in industrial applications

The measurement of the grinding bowl temperature allows an integral statement on the process variable temperature, which takes account of the effects of all friction, impact and transformation processes. The continuous and highly sensitive measurement of the gas pressure in the grinding bowl enables the detection of very rapid reactions. The measured gas pressure describes, among other things, the interactions of the gas with the surfaces created during grinding (adsorption and desorption of gases).

Extremely rapid phase formations can be observed for the first time IN SITU as an adiabatic process without heat exchange with the system.

## TECHNICAL DATA

- Temperature measurement range of the transmitter component: -40 to 110 °C
- Resolution of pressure signal: 1 mbar
- Permissible pressure in the grinding bowl: 0–20 bar – measuring range up to 30 bar
- Operating time with fully charged battery: approx. ½ year continuous operation (depending on operating temperature)
- Radio transmission: 2.4 GHz standard



EASY GTM grinding bowls *classic line* for the Planetary Mills PULVERISETTE 5 and Planetary Mono Mill PULVERISETTE 6 *classic line* are available in the bowl volumes 250 ml and 500 ml and made of hardened, stainless steel.

## Grinding in inert gas and for mechanical alloying

### Gassing lid

By using a special lid on the grinding bowl, you can also grind your samples in inert atmospheres and mechanically alloy. Two valves ensure easy and safe filling of the bowls, e. g. with inert gas while they are firmly clamped in the mill. A special additional lock-system is required for gas-tight removal and transportation (see below).



### Additional lock-system

With this special additional lock-system, you can seal your grinding bowls gas-tight for transport between filling in the glove box and the mill. With an additional adapter, it can also be used for small grinding bowls.





## Grinding bowls and balls *classic line*

All grinding bowls *classic line* and the corresponding balls are available in 7 different materials to directly prevent contamination of the sample as a result of undesired abrasion. In normal cases, grinding bowls and balls of the same material are used. You can select different grinding ball sizes in order to adapt the grinding to your specific application.



**Please note:** The material of the grinding elements must always be harder than the material to be ground.

**Our tip:** To shorten the grinding time, grinding bowls and balls with a higher density and correspondingly higher impact energy can be used.

### Material data for grinding bowls/grinding balls

Material	Main component of the material*	Density g/cm <sup>3</sup>	Abrasion resistance	Use for sample material
Agate	SiO <sub>2</sub>	2.65	Good	Soft to medium-hard samples
Sintered corundum	Al <sub>2</sub> O <sub>3</sub>	3.8	Fairly good	Medium-hard, fibrous samples
Silicon nitride	Si <sub>3</sub> N <sub>4</sub>	3.25	Excellent	Abrasive samples, metal-free grinding
Zirconium oxide	ZrO <sub>2</sub>	5.7	Very good	Fibrous, abrasive samples
Hardened, stainless steel	Fe – Cr	7.7	Good	Hard, medium-hard, brittle samples
Hardmetal tungsten carbide	WC	14.3	Very good	Hard, abrasive samples
Polypropylene disposable bowl (only for PULVERISETTE 7 <i>classic line</i> )		0.9		For homogenisation

\* At [www.fritsch.de](http://www.fritsch.de), you can find the corresponding element analyses with detailed information about the materials directly at the respective grinding bowls and balls.



## Recommended grinding ball size

Kind of application	Suitable grinding ball diameter
Maximum feed size 10 mm	30 mm* or 40 mm*
Average feed size ≤ 5 mm	20 mm*, 15 mm or 10 mm
Fine material < 0.5 mm	10 mm or smaller
Homogenisation of dry or liquid samples	20 mm*, 10 mm or smaller
Homogenisation of viscous samples	20 mm*

\* not suitable for Planetary Micro Mill PULVERISETTE 7 *classic line*

The specified grinding ball sizes are application-dependent reference values. It is not recommended to mix balls of different diameters. Grinding balls with a diameter of 40 mm should only be used for a short grinding time.

## Recommended grinding bowl filling

### I. Grinding balls ≥ 5 mm: Recommended number of balls per grinding bowl

Grinding bowl / Useful capacity (sample volume)	12 ml 0.5 – 5 ml	45 ml 3 – 20 ml	80 ml 10 – 30 ml	250 ml 30 – 125 ml	500 ml 80 – 225 ml
Balls diameter					
40 mm					4
30 mm				6	8
20 mm			5	15	25
15 mm		7	10	45	70
10 mm	6	18	25	50	100
5 mm	50	180	250	1200	2000

### II. Grinding balls ≤ 3 mm: Recommended ball mass per grinding bowl in grams

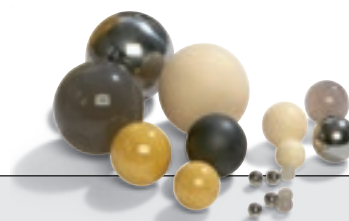
Grinding bowl / Useful capacity (sample volume)	12 ml 0.5 – 5 ml	45 ml 3 – 20 ml	80 ml 10 – 30 ml	250 ml 30 – 125 ml	500 ml 80 – 225 ml
Material					
Zirconium oxide	20	70	100	400	800
Hardened, stainless steel	30	90	150	500	1100
Hardmetal tungsten carbide	50	200	300	1000	2100

Grinding balls with a diameter of 3 mm or less must be weighed out. The above table provides you with the required mass per grinding bowl.

The useful capacity depends on the type of material. The specified ball filling per bowl is the minimum quantity and should possibly be increased depending on the material properties. In exceptional cases, the number of grinding balls can be reduced by up to 15 %. However, increased abrasion should be expected.

We will be happy to assist you to select the right grinding bowls and the appropriate ball size.

**Ask our experts: +49 6784 70-150 · [consultation@fritsch.de](mailto:consultation@fritsch.de)**



## ORDERING DATA



Order No. Article

## PLANETARY MILLS classic line

## PLANETARY MILL PULVERISETTE 5

Instrument without grinding bowls and balls, incl. Safe-Lock clamping system

## • with 4 grinding bowl fasteners

05.5020.00 For 200-240 V/1~, 50-60 Hz, 1730 watt  
05.5010.00 For 100-120 V/1~, 50-60 Hz, 1470 watt

## • with 2 grinding bowl fasteners

05.6020.00 For 200-240 V/1~, 50-60 Hz, 1730 watt  
05.6010.00 For 100-120 V/1~, 50-60 Hz, 1470 watt

## PLANETARY MONO MILL PULVERISETTE 6

Instrument without grinding bowls and balls, incl. Safe-Lock clamping system

06.2000.00 For 100-120/200-240 V/1~, 50-60 Hz, 1000 watt\*



## PLANETARY MICRO MILL PULVERISETTE 7

Instrument without grinding bowls and balls, incl. clamping system

07.4000.00 For 100-120/200-240 V/1~, 50-60 Hz, 740 watt\*



\* The voltage specified in the order is set.

## EASY GTM classic line –

## GAS PRESSURE AND TEMPERATURE MEASURING SYSTEM

For continuous measurement of gas pressure and temperature for PULVERISETTE 5 and PULVERISETTE 6 classic line

50.2480.00 Incl. 250 ml grinding bowl made of hardened, stainless steel with special lid, transmitter and separate receiver  
50.2490.00 Incl. 500 ml grinding bowl made of hardened, stainless steel with special lid, transmitter and separate receiver

If further grinding bowls and transmitters are required, please ask!

## CERTIFICATION

## for PULVERISETTE 5 classic line

96.0220.00 IQ/OQ documentation (questionnaire format – for filling out by customer)

## for PULVERISETTE 6 classic line

96.0240.00 IQ/OQ documentation (questionnaire format – for filling out by customer)

## for PULVERISETTE 7 classic line

96.0280.00 IQ/OQ documentation (questionnaire format – for filling out by customer)



Order No. Article

## GRINDING BOWL WITH LID AND SEAL RING classic line

## Grinding bowl 500 ml volume

for PULVERISETTE 5 and PULVERISETTE 6 classic line

50.1055.00 Agate, with steel casing  
50.1060.00 Sintered corundum (99.7% Al<sub>2</sub>O<sub>3</sub>)  
50.1310.00 Silicon nitride, with steel casing  
50.1110.00 Zirconium oxide  
50.1090.00 Hardened, stainless steel  
50.2661.20 Replacement seal ring PTFE 121/110 mm dia. for agate bowls 500 ml volume  
50.1010.20 Replacement seal ring PTFE 110/101 mm dia. for silicon nitride bowls 500 ml volume  
50.1230.20 Replacement seal ring PTFE 116/100 mm dia. for all other bowls 500 ml volume

## Grinding bowl 250 ml volume

for PULVERISETTE 5 and PULVERISETTE 6 classic line

50.2055.00 Agate, with steel casing  
50.2060.00 Sintered corundum (99.7% Al<sub>2</sub>O<sub>3</sub>)  
50.2310.00 Silicon nitride, with steel casing  
50.2110.00 Zirconium oxide  
50.2090.00 Hardened, stainless steel  
50.2080.00 Hardmetal tungsten carbide, with steel casing  
50.2011.20 Replacement seal ring PTFE 85/70 mm dia. for agate bowls 250 ml volume  
50.2010.20 Replacement seal ring PTFE 85/76 mm dia. for silicon nitride bowls 250 ml volume  
50.2230.20 Replacement seal ring PTFE 90/75 mm dia. for all other bowls 250 ml volume

## Grinding bowl 80 ml volume

for PULVERISETTE 5 and PULVERISETTE 6 classic line

50.4055.00 Agate, with steel casing  
50.4060.00 Sintered corundum (99.7% Al<sub>2</sub>O<sub>3</sub>)  
50.4310.00 Silicon nitride  
50.4110.00 Zirconium oxide  
50.4090.00 Hardened, stainless steel  
50.4080.00 Hardmetal tungsten carbide, with steel casing  
50.2011.20 Replacement seal ring PTFE 85/70 mm dia. for agate bowls 80 ml volume  
50.4230.20 Replacement seal ring PTFE 80/65 mm dia. for all other bowls 80 ml volume  
90.1120.09 Adapter for grinding bowls 80 ml volume (essential, if only one grinding bowl is inserted in the grinding bowl holder)

## Grinding bowl 45 ml volume

for PULVERISETTE 7 classic line

50.7050.00 Agate  
50.7060.00 Sintered corundum (99.7% Al<sub>2</sub>O<sub>3</sub>)  
50.7310.00 Silicon nitride  
50.7110.00 Zirconium oxide  
50.7090.00 Hardened, stainless steel  
50.7080.00 Hardmetal tungsten carbide, with steel casing  
50.7200.00 Polypropylene disposable bowl (only for PULVERISETTE 7 classic line)  
07.3280.13 Bowl adapter for disposable bowl (only for PULVERISETTE 7 classic line)  
50.7250.20 Replacement seal ring PTFE 50/40 mm dia. for all bowls 45 ml volume

## Grinding bowl 12 ml volume

for PULVERISETTE 7 classic line

50.5050.00 Agate  
50.5060.00 Sintered corundum (99.7% Al<sub>2</sub>O<sub>3</sub>)  
50.5310.00 Silicon nitride  
50.5110.00 Zirconium oxide  
50.5090.00 Hardened, stainless steel  
50.5080.00 Hardmetal tungsten carbide  
50.5250.20 Replacement seal ring PTFE 37/26 mm dia. for all bowls 12 ml volume

## ACCESSORIES FOR GRINDING IN INERT GAS AND FOR MECHANICAL ALLOYING

for PULVERISETTE 5 and PULVERISETTE 6 classic line

## Gassing lid with 2 valves and seal ring for grinding bowls

## 500 ml volume

50.8010.00 Agate, with steel casing  
50.9150.00 Silicon nitride, with steel casing  
50.9100.00 Zirconium oxide  
50.8400.00 Hardened, stainless steel  
50.8013.16 Replacement seal ring Viton for gassing lid for agate bowls 500 ml volume  
50.1230.16 Replacement seal ring Viton for gassing lid for all other bowls 500 ml volume

## Gassing lid with 2 valves and seal ring for grinding bowls 250 ml volume

50.8100.00 Agate, with steel casing  
50.8900.00 Silicon nitride, with steel casing  
50.8950.00 Zirconium oxide  
50.8500.00 Hardened, stainless steel  
50.8600.00 Hardmetal tungsten carbide, with steel casing  
50.2011.16 Replacement seal ring Viton for gassing lid for agate bowls 250 ml volume  
50.2010.16 Replacement seal ring Viton for gassing lid for silicon nitride bowls 250 ml volume  
50.2230.16 Replacement seal ring Viton for gassing lid for all other bowls 250 ml volume



Order No.	Article
	<b>Gasping lid with 2 valves and seal ring for grinding bowls 80 ml</b>
50.8810.00	Agate, with steel casing
50.8840.00	Zirconium oxide
50.8700.00	Hardened, stainless steel
50.8880.00	Hardmetal tungsten carbide, with steel casing
50.2011.16	Replacement seal ring Viton for gasping lid for agate bowls 80 ml volume
50.4230.16	Replacement seal ring Viton for gasping lid for all other bowls 80 ml volume
90.1400.00	Additional lock-system for all grinding bowls 500 ml, 250 ml, 80 ml volume (for the transport of the closed grinding bowl)

Gasping lids with Swagelok valves are available on request.

## GRINDING BALLS 40 MM – 5 MM DIAMETER (PIECE)

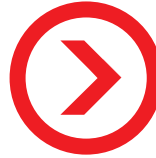
	<b>Grinding ball 40 mm diameter for grinding bowls 500 ml</b>
55.0400.06	Sintered corundum (99.7% Al <sub>2</sub> O <sub>3</sub> )
55.0400.31	Silicon nitride
55.0400.27	Zirconium oxide
55.0400.09	Hardened, stainless steel
	<b>Grinding ball 30 mm diameter for grinding bowls 500, 250 ml</b>
55.0300.05	Agate, polished
55.0300.06	Sintered corundum (99.7% Al <sub>2</sub> O <sub>3</sub> )
55.0300.31	Silicon nitride
55.0300.27	Zirconium oxide
55.0300.09	Hardened, stainless steel
55.0300.08	Hardmetal tungsten carbide
	<b>Grinding ball 20 mm diameter for grinding bowls 500, 250, 80 ml</b>
55.0200.05	Agate, polished
55.0200.06	Sintered corundum (99.7% Al <sub>2</sub> O <sub>3</sub> )
55.0200.31	Silicon nitride
55.0200.27	Zirconium oxide
55.0200.09	Hardened, stainless steel
55.0200.08	Hardmetal tungsten carbide
	<b>Grinding ball 15 mm diameter for grinding bowls 500, 250, 80, 45 ml</b>
55.0150.05	Agate, polished
55.0150.06	Sintered corundum (99.7% Al <sub>2</sub> O <sub>3</sub> )
55.0150.31	Silicon nitride
55.0150.27	Zirconium oxide
55.0150.09	Hardened, stainless steel
55.0150.08	Hardmetal tungsten carbide
	<b>Grinding ball 10 mm diameter for grinding bowls 500, 250, 80, 45, 20, 12 ml</b>
55.0100.05	Agate, polished
55.0100.06	Sintered corundum (99.7% Al <sub>2</sub> O <sub>3</sub> )
55.0100.31	Silicon nitride
55.0100.27	Zirconium oxide
55.0100.09	Hardened, stainless steel
55.0100.08	Hardmetal tungsten carbide
	<b>Grinding ball 5 mm diameter for grinding bowls 500, 250, 80, 45, 20, 12 ml</b>
55.0050.05	Agate, polished (100 pieces weigh approx. 17 g) <sup>1)</sup>
55.0050.27	Zirconium oxide (100 pieces weigh approx. 38 g) <sup>1)</sup>
55.0050.09	Hardened, stainless steel (100 pieces weigh approx. 52 g) <sup>1)</sup>
55.0050.08	Hardmetal tungsten carbide (100 pieces weigh approx. 97 g) <sup>1)</sup>
	<sup>1)</sup> With aid of the indication of the weight, can the high number of balls per grinding bowl be determined by weighing.

## GRINDING BALLS ≤ 3 MM DIAMETER (100-G PACKAGE)

	<b>Grinding ball ≤ 3 mm diameter for grinding bowls 500, 250, 80, 45, 20, 12 ml</b>
55.0030.27	Zirconium oxide 3 mm dia.
55.0020.27	Zirconium oxide 2 mm dia.
55.0015.27	Zirconium oxide 1.5 mm dia.
55.0010.27	Zirconium oxide 1 mm dia.
55.0005.27	Zirconium oxide 0.5 mm dia.
55.0001.27	Zirconium oxide 0.1 mm dia.
55.0030.09	Hardened, stainless steel 3 mm dia.
55.0010.09	Hardened, stainless steel 1 mm dia.
55.0030.08	Hardmetal tungsten carbide 3 mm dia.
55.0016.08	Hardmetal tungsten carbide 1.6 mm dia.
55.0006.08	Hardmetal tungsten carbide 0.6 mm dia.

Further grinding balls ≤ 3 mm dia. are available.

Grinding balls also available in further sizes.



# Worldwide at your service in 116 countries

## Always nearby

Wherever you use your FRITSCH instruments: we are nearby. With direct contact persons for application consulting and technical service – and in Europe with the FRITSCH mobile laboratory for practical demonstrations on-site.

## Virtual application consultation

Experience the FRITSCH Planetary Mills directly at your workplace and find the right instrument for your specific application quickly and easily. Simply arrange your virtual consultation appointment at: [www.fritsch-international.com/appointment](http://www.fritsch-international.com/appointment)

## Showing you how it's done!

Our applications laboratory will be more than glad to help you find the right Mill for your specific task. If desired, within the scope of a product recommendation, we will conduct a comminution of your material. Simply request at [www.fritsch-international.com/service/sample-analysis](http://www.fritsch-international.com/service/sample-analysis).

The result will convince you.

**Or simply give us a call – our experts will be happy to assist you.**

**+49 6784 70-150  
consultation@fritsch.de  
www.fritsch.de**



Fritsch GmbH  
Milling and Sizing  
Industriestrasse 8  
55743 Idar-Oberstein  
Germany  
Phone +49 6784 70-0  
info@fritsch.de  
www.fritsch.de