FRITSCH

**FRITSCH · PLANETARY MILLS *premium line***


## IDEAL FOR

PHARMACEUTICALS
MECHANICAL ALLOYING
METALLURGY
CERAMICS
MATERIALS RESEARCH
GEOLOGY AND MINERALOGY
CHEMISTRY
BIOLOGY

THE NEW REFERENCE CLASS 1

# > premium line

## FRITSCH *premium line* – A QUANTUM LEAP INTO THE NANO CLASS

**Discover a completely new dimension in high-tech milling with the new FRITSCH *premium line*: For the first time ever, we have sunk the bowls in our high-performance Planetary Mills. Brilliantly simple – brilliantly effective! This allows us to reach rotational speeds never known before and achieve ultrafine grinding results down into the nano range.**

## FASTER, SIMPLER AND SAFER THAN EVER.

The FRITSCH family business is an internationally respected manufacturer of application-orientated laboratory instruments. In 1961 FRITSCH applied for a world wide patent for the first Laboratory Planetary Mill. In 1996 FRITSCH also patented the first ever Planetary Mill with only one working station (Mono Mill). Since then FRITSCH Planetary Mills have become the standard in industry and research laboratories worldwide. Now FRITSCH is redefining the Planetary Mill – with the FRITSCH *premium line*.

**FRITSCH. WE SET STANDARDS.**

Exceptionally stylish, exceptionally practical: The new, compact design of the FRITSCH *premium line* is the ideal match for the demanding requirements of a modern laboratory. State-of-the-art technology combines maximum performance, superior reliability and quiet running with minimal space requirements.

**New:** The ergonomically designed touch-screen features a particularly logical menu structure in 10 languages for easy, intuitive user navigation.

**New:** Smooth integration into the IT structure of your laboratory through integrated Ethernet, Bluetooth and USB interfaces – logging your results has never been easier.

**New:** Extremely high-speed milling thanks to sunken bowls with up to 1100 rpm and revolutionary acceleration of 95 times the force of gravity for better results in shorter times.


**New:** Added time savings and reliability due to fast bowl changes and the unique SelfLOCK system.

# FASTER.
# SIMPLER.
# SAFER.

# 1100 rpm

## FINER GRINDING RESULTS IN SHORTER TIME!

In the FRITSCH *premium line*, the grinding bowls sunk into the disk enable revolutionary rotational speeds of up to 1100 rpm for the first time. The result: significantly shorter milling processes, fineness levels down into the nano range.

## YOUR PRACTICAL ADVANTAGE:

**WORK EFFICIENTLY BY PREPARING MORE SAMPLES IN THE SAME AMOUNT OF TIME.**

# SIMPLER.

READY **steady** **go** FINISHED!




## EXTREMELY EASY BOWL CHANGES WITH JUST TWO MOTIONS

They are the centrepiece of the *premium line*: the sunken bowls featuring the revolutionary SelfLOCK technology. For the first time, the bowl and lid form a single unit – no additional tensioning, no incorrect operation! It is just as simple to place the bowls in the mill, where they position themselves and snap securely into place. The grinding chamber of the *premium line* opens and closes automatically and independently rotates the bowl mountings into a convenient position for handling. The bowls are also removed and opened with just two motions, making it the first Planetary Mill that is as simple to operate as a centrifuge. And the milling chamber cover can even be completely taken off for easy cleaning.

## YOUR PRACTICAL ADVANTAGE:

## A DECISIVE SIMPLIFICATION OF YOUR DAILY WORK.

# SAFER.

## INNOVATIVE TECHNOLOGY FOR MAXIMUM PROCESS RELIABILITY AND PRECISE REPRODUCIBILITY

Grinding has never been as safe and reliable: The revolutionary SelfLOCK technique of the grinding bowls, the automatic check of the locks in the mill, blocking in the event of impermissible operating states and the new automatic shutoff function if an imbalance occurs keep both operators and the machine itself safer than ever.

Process reliability redefined: The mill automatically detects the inserted grinding bowls via a special RFID chip, allowing the mill to optimise the rotation speed and prevent impermissible grinding settings.

Remarkably practical: The automatic parameter check performed before every grinding guarantees exact reproducibility. And to save time, all data can be easily exported via USB, Bluetooth and Ethernet.

A well-designed touchscreen facilitates simple and precise navigation through the menu structure; start times can be easily and precisely programmed.


## YOUR PRACTICAL ADVANTAGE:

## GUARANTEED CONSTANT AND OPTIMAL RESULTS – INCORRECT OPERATION IS IMPOSSIBLE.

## PLANETARY MICRO MILL PULVERISETTE 7 *premium line*

The smallest Planetary Mill of the *premium line* operates with two grinding bowls in the sizes 20 ml, 45 ml or 80 ml, which turn with a transmission ratio of 1 : –2 relative to the main disk.

Due to the enormous rotational speed of the main disk – up to 1100 rpm – the PULVERISETTE 7 *premium line* reaches sensational **centrifugal accelerations of up to 95 times the force of gravity,** making the energy application approximately 150% greater than conventional Planetary Mills.

Your advantage: the shortest grinding times down to any desired fineness, even into the nano range.

### PLANETARY MILLS – HIGH-PERFORMANCE ALL-ROUNDERS IN ROUTINE LABORATORY WORK

FRITSCH Planetary Mills are a standard component in any laboratory: designed for a broad range of applications and ideally suited for loss-free grinding down to a fineness as small as 100 nm. Depending on the desired fineness, the grinding can be performed dry, in suspension or in an inert gas. The comminution 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. At a certain speed, the centrifugal force causes the ground sample material and grinding balls to bounce off the inner wall of the grinding bowl, cross the bowl diagonally at an extremely high speed, and impact on the material to be ground on the opposite wall of the bowl. In addition to comminution, you can also use Planetary Mills for mixing and homogenising emulsions and pastes or for mechanical activation and alloying in materials research.

**DOCUMENTED APPLICATION EXAMPLES AND A TABLE WITH GRINDING RESULTS CAN BE FOUND AT www.fritsch.de**

| PULVERISETTE 7 *premium line* | |
|---|---|
| Number of working stations | 2 |
| Grinding bowl sizes | 20, 45, 80 ml |
| 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 | 3 min |
| Grinding process | Dry/wet |
| Speed of main disk | 100 – 1100 rpm* |
| Transmission ratio | $i_{relative}$ = 1 : –2 |
| Effective diameter of main disk | 140 mm |
| Centrifugal acceleration | 95 g |
| Interfaces | USB, Bluetooth, Ethernet |
| 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 | Net: 44 kg, gross: 61 kg |
| Dimensions w x d x h | Bench top instrument: 40 x 58 x 36 cm |
| Packing details | Pallet box: 69 x 52 x 60 cm |

* At www.fritsch.de, you find the appropriate rotor speed limits for grinding ball-diameters and grinding bowls made of agate.


**Especially practical:** The user-friendly touchscreen of the PULVERISETTE 7 can be adjusted with just a single movement, allowing it to be easily adapted to any set-up situation.

## PERFECTLY CONCEIVED – THE INTELLIGENT *premium line* GRINDING BOWLS

As a revolutionary unit comprising both bowl and lid, the completely new *premium line* grinding bowls ensure the fastest and easiest bowl change ever.

All *premium line* grinding bowls are cased in stainless steel, have a code and a label field. An RFID chip stores the exact parameters of the grinding bowl. The advantage: Upon insertion into the mill, the control unit identifies the specific bowl and automatically sets the grinding parameters to the maximum permissible presets. It could not be any simpler or more reliable!

Grinding bowls for the PULVERISETTE 7 *premium line* are available in 20 ml, 45 ml and 80 ml sizes. All *premium line* grinding bowls have the same inner diameter – regardless of their volume. The advantage: The optimal transmission ratio is not impaired by different grinding bowl geometries.

For the best grinding results in each individual case, all *premium line* grinding bowls are available in 7 different materials, thus directly preventing contamination of the samples as a result of undesired abrasion.

### Material Data for Grinding Bowls/Balls

| Material | Main component of the material* | Density g/cm³ | Abrasion resistance | Use for material to be ground |
|---|---|---|---|---|
| Agate | $SiO_2$ | 2.65 | Good | Soft to medium-hard samples |
| Sintered corundum | $Al_2O_3$ | 3.8 | Fairly good | Medium-hard, fibrous samples |
| Silicon nitride | $Si_3N_4$ | 3.1 | Excellent | Abrasive samples, iron-free grinding |
| Zirconium oxide | $ZrO_2$ | 5.7 | Very good | Fibrous, abrasive samples |
| Stainless steel | Fe – Cr – Ni | 7.8 | Fairly good | Medium-hard, brittle samples |
| Tempered steel | Fe – Cr | 7.9 | Good | Hard, brittle samples |
| Hardmetal tungsten carbide | WC | 14.89 | Very good | Hard, abrasive samples |

* At www.fritsch.de, you can find the corresponding element analyses with detailed information about the materials.

### Recommended Bowl Filling

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

| Grinding Bowl/ Useful capacity (sample volume) | 20 ml 1 – 9 ml | 45 ml 3 – 20 ml | 80 ml 10 – 30 ml |
|---|---|---|---|
| Balls diameter | | | |
| 20 mm | | | 5 |
| 15 mm | | 7 | 10 |
| 10 mm | 10 | 18 | 25 |
| 5 mm | 80 | 180 | 250 |

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

| Grinding Bowl/ Useful capacity (sample volume) | 20 ml 1 – 9 ml | 45 ml 3 – 20 ml | 80 ml 10 – 30 ml |
|---|---|---|---|
| Material | | | |
| Zirconium oxide | 30 | 70 | 100 |
| Tempered steel | 40 | 90 | 150 |
| Hardmetal tungsten carbide | 80 | 200 | 300 |

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 quantity of grinding balls may be reduced by up to 15%; however, increased abrasion can then be expected. The specified number/mass of balls per bowl is the minimum quantity; depending on the material properties, it may need to be increased.
In normal cases, grinding bowls and balls of the same material are used. To shorten the grinding time, larger or heavier balls with a higher density can be used, e.g. tungsten carbide balls in a steel bowl or zirconium oxide balls in a silicon nitride bowl.

With a fixed O-ring in the lid, the *premium line* grinding bowl is so tightly sealed that even grinding in suspension without an additional seal is absolutely smooth and problem-free.

All standard lids are equipped with a bleeder valve. Any overpressure in the grinding bowl can be equalised in a controlled fashion. The grinding bowl can be opened simply and safely.

The *premium line* gassing lids allow grinding in inert gas and mechanical alloying – quickly and safely.

After grinding in suspension the FRITSCH Special Emptying Device with 2 sieves enables a quick and easy separation of the grinding balls and suspension. For this purpose, the device is firmly attached onto the grinding bowl, the suspension is drawn out with the syringe and the balls remain in the bowl.

To achieve the best grinding results, grinding balls of different sizes and materials are available. The grinding process can thus be optimally adapted to each specific application.

| Order No. | Article |
|---|---|
| **PLANETARY MICRO MILL PULVERISETTE 7 *PREMIUM LINE*** | |
| | Instrument without grinding bowls and balls |
| 07.5000.00 | For 100-240 V/1~, 50-60 Hz, 1100 watt |
| | **GRINDING BOWL WITH LID AND SEAL RING** |
| | ***Grinding bowl 80 ml*** |
| 50.9620.00 | Agate, with steel casing |
| 50.9630.00 | Sintered corundum (99.7 % $Al_2O_3$), with steel casing |
| 50.9670.00 | Silicon nitride, with steel casing |
| 50.9660.00 | Zirconium oxide, with steel casing |
| 50.9610.00 | Stainless steel, with steel casing |
| 50.9650.00 | Tempered steel, with steel casing |
| 50.9640.00 | Hardmetal tungsten carbide, with steel casing |
| | ***Grinding bowl 45 ml*** |
| 50.9720.00 | Agate, with steel casing |
| 50.9730.00 | Sintered corundum (99.7% $Al_2O_3$), with steel casing |
| 50.9770.00 | Silicon nitride, with steel casing |
| 50.9760.00 | Zirconium oxide, with steel casing |
| 50.9710.00 | Stainless steel, with steel casing |
| 50.9750.00 | Tempered steel, with steel casing |
| 50.9740.00 | Hardmetal tungsten carbide, with steel casing |
| | ***Grinding bowl 20 ml*** |
| 50.9820.00 | Agate, with steel casing |
| 50.9830.00 | Sintered corundum (99.7% $Al_2O_3$), with steel casing |
| 50.9870.00 | Silicon nitride, with steel casing |
| 50.9860.00 | Zirconium oxide, with steel casing |
| 50.9810.00 | Stainless steel, with steel casing |
| 50.9850.00 | Tempered steel, with steel casing |
| 50.9840.00 | Hardmetal tungsten carbide, with steel casing |
| | ***Further accessories (also suitable for gassing lids)*** |
| 84.0306.15 | Replacement seal ring Viton 49 x 4 mm<br>for all grinding bowls 80 ml, 45 ml, 20 ml volume except stainless steel |
| 84.0302.15 | Replacement seal ring Viton 39 x 4 mm<br>for all stainless steel grinding bowls 80 ml, 45 ml, 20 ml volume |
| 50.9900.00 | special emptying device for all grinding bowls 80 ml,<br>45 ml, 20 ml volume except stainless steel |
| 50.9970.00 | special emptying device for all stainless steel grinding bowls 80 ml,<br>45 ml, 20 ml volume |
| | **ACCESSORIES FOR GRINDING IN INERT GAS AND FOR MECHANICAL ALLOYING** |
| | ***Gassing lid with valves and seal ring for grinding bowls 80 ml, 45 ml, 20 ml*** |
| 50.9627.00 | Agate, with steel casing |
| 50.9637.00 | Sintered corundum (99.7% $Al_2O_3$), with steel casing |
| 50.9677.00 | Silicon nitride, with steel casing |
| 50.9667.00 | Zirconium oxide, with steel casing |
| 50.9617.00 | Stainless steel, with steel casing |
| 50.9657.00 | Tempered steel, with steel casing |
| 50.9647.00 | Hardmetal tungsten carbide, with steel casing |
| | **GRINDING BALLS (PER PIECE)** |
| | ***Grinding balls 20 mm in diameter*** |
| 55.0200.05 | Agate, polished |
| 55.0200.06 | Sintered corundum (99.7 % $Al_2O_3$) |
| 55.0200.31 | Silicon nitride |
| 55.0200.27 | Zirconium oxide |
| 55.0200.10 | Stainless steel |
| 55.0200.09 | Tempered steel |
| 55.0200.08 | Hardmetal tungsten carbide |
| | ***Grinding balls 15 mm in diameter*** |
| 55.0150.05 | Agate, polished |
| 55.0150.06 | Sintered corundum (99.7 % $Al_2O_3$) |
| 55.0150.31 | Silicon nitride |
| 55.0150.27 | Zirconium oxide |
| 55.0150.10 | Stainless steel |
| 55.0150.09 | Tempered steel |
| 55.0150.08 | Hardmetal tungsten carbide |
| | ***Grinding balls 10 mm in diameter*** |
| 55.0100.05 | Agate, polished |
| 55.0100.06 | Sintered corundum (99.7 % $Al_2O_3$) |
| 55.0100.31 | Silicon nitride |
| 55.0100.27 | Zirconium oxide |
| 55.0100.10 | Stainless steel |
| 55.0100.09 | Tempered steel |
| 55.0100.08 | Hardmetal tungsten carbide |
| | ***Grinding balls 5 mm in diameter*** |
| 55.0050.05 | Agate, polished |
| 55.0050.27 | Zirconium oxide |
| 55.0050.10 | Stainless steel |
| 55.0050.09 | Tempered steel |
| 55.0050.08 | Hardmetal tungsten carbide |
| | **GRINDING BALLS ≤ 3 MM IN DIAMETER (100-G PACKAGE)** |
| 55.0030.27 | Zirconium oxide 3 mm diameter |
| 55.0020.27 | Zirconium oxide 2 mm diameter |
| 55.0015.27 | Zirconium oxide 1.5 mm diameter |
| 55.0010.27 | Zirconium oxide 1 mm diameter |
| 55.0005.27 | Zirconium oxide 0.5 mm diameter |
| 55.0030.09 | Tempered steel 3 mm diameter |
| 55.0010.09 | Tempered steel 1 mm diameter |
| 55.0030.08 | Hardmetal tungsten carbide 3 mm diameter |
| 55.0016.08 | Hardmetal tungsten carbide 1.6 mm diameter |
| 55.0006.08 | Hardmetal tungsten carbide 0.6 mm diameter |

FASTER SIMPLER SAFER

FRITSCH

Fritsch GmbH
Milling and Sizing
Industriestrasse 8
55743 Idar-Oberstein
Germany
Phone +49 67 84 70 0
Fax +49 67 84 70 11
info@fritsch.de
www.fritsch.de

**Concept and design:** Zink & Kraemer, Trier · Cologne, www.zuk.de

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