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. ONE STEP AHEAD.

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 USB interface – 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: IQ/OQ documentation available to support equipment qualification.

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. 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.

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.

With a flat seal 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.

Remarkably practical: The automatic parameter check performed before every grinding guarantees exact reproducibility. Via USB all data can be exported and the mill can be controlled - easily and time saving.

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.

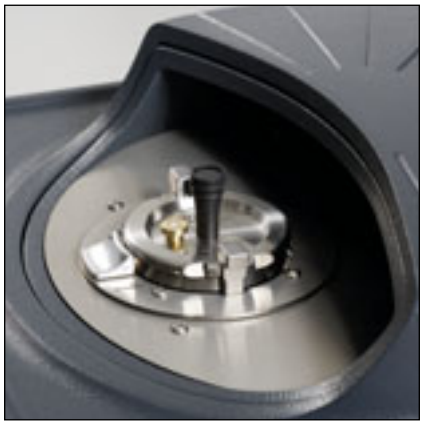
PLANETARY MILLS – HIGH-PERFORMANCE ALL-ROUNDERS IN ROUTINE LABORATORY WORK

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 down to analytical fineness	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 (g = 9.81 m/s²)	95 g
Interfaces	USB
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
Emissions value of workplace according to DIN EN ISO 3746:2005 (depending on the material to be ground, grinding bowls/balls, selected rotational speed)	Up to approx. 80 dB(A)
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.

FRITSCH-SOFTWARE MillControl

The PULVERISETTE 7 *premium line* can also be operated via the software MillControl. The advantages:

- Automatic operation and monitoring of the mill
- Control and graphical display of the set and actual rotational speed and power consumption
- Preparation and saving of individual SOP's for various grinding processes with different parameters to ensure identical conditions for recurring grinding tasks
- Generation of standardized evaluation reports with for each case interesting parameters
- Archive function for the documentation of the grinding processes – especially for comparing results for example in the pharmaceutical industry

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 and the included MillControl software. The advantage: Simple and easy monitoring and reporting 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 mill 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, the software MillControl needs to be installed from the USB-stick once – regardless of the number of EASY GTM-bowls used. EASY GTM grinding bowls are available in 7 different materials with a bowl volume of 80 ml.

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 and balls 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	3.25	Excellent	Abrasive samples, metal-free grinding
Zirconium oxide	ZrO_2	5.9	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	14.95	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/	20 ml	45 ml	80 ml
Useful capacity (sample volume)	**1 – 9 ml**	**3 – 20 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/	20 ml	45 ml	80 ml
Useful capacity (sample volume)	**1 – 9 ml**	**3 – 20 ml**	**10 – 30 ml**
Material			
Zirconium oxide	30	70	100
Stainless steel/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, grinding bowls and balls with a higher density and correspondingly higher impact energy can be used.

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.

The counterweight is essential for weight compensation, if only one grinding bowl is used for grinding. It can be utilized for all grinding bowls *premium line* 80 ml, 45 ml, 20 ml volume.

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

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
	Software
83.5605.00	Software MillControl for Windows for automatic control and monitoring of the mill and for continuous measurement of gas pressure and temperature directly in the EASY GTM grinding bowl
	Certification
96.0260.00	IQ/OQ documentation (questionnaire format – implementation by customer)
	Accessories for all grinding bowls premium line
50.9900.00	Special emptying device for all grinding bowls *premium line* 80 ml, 45 ml, 20 ml volume
50.9890.00	Counterweight for all grinding bowls *premium line* 80 ml, 45 ml, 20 ml volume (essential for weight compensation, if only one grinding bowl is used for grinding)
	Replacement seal rings for all grinding bowls premium line
84.0342.15	Replacement seal ring Silicone 57.5 x 48 x 2 mm for all grinding bowls *premium line* 80 ml, 45 ml, 20 ml volume
84.0341.15	Replacement seal ring Viton 57.5 x 48 x 2 mm for all grinding bowls *premium line* 80 ml, 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
	Gassing lids with Swagelok valves are available on request.

Order No.	Article
	EASY GTM – *Gas pressure and temperature measuring system for controlling the milling process*
81.0013.00	Receiver unit – board and software MillConrol (Receiver unit and software MillControl only need to be ordered once.)
50.9040.00	80 ml grinding bowl made of agate with special lid and transmitter
50.9080.00	80 ml grinding bowl made of sintered corundum (99.7 % Al_2O_3) with special lid and transmitter
50.9090.00	80 ml grinding bowl made of silicon nitride with special lid and transmitter
50.9070.00	80 ml grinding bowl made of zirconium oxide with special lid and transmitter
50.9020.00	80 ml grinding bowl made of stainless steel with special lid and transmitter
50.9050.00	80 ml grinding bowl made of tempered steel with special lid and transmitter
50.9060.00	80 ml grinding bowl made of hardmetal tungsten carbide with special lid and transmitter
	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 (100 pieces weigh approx. 17 g)[1]
55.0050.27	Zirconium oxide (100 pieces weigh approx. 38 g)[1]
55.0050.10	Stainless steel (100 pieces weigh approx. 51 g)[1]
55.0050.09	Tempered steel (100 pieces weigh approx. 52 g)[1]
55.0050.08	Hardmetal tungsten carbide (100 pieces weigh approx. 97 g)[1] [1] due to the indication of weight, the high number of balls per grinding bowl can be weight.
	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
55.0001.27	Zirconium oxide 0.1 mm diameter
55.0030.10	Stainless steel 3 mm diameter
55.0010.10	Stainless steel 1 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

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premiume_13-09-2/Z