Retsch®

MILLING SIEVING ASSISTING

THE NEW MM 500 control

MONITOR AND CONTROL THE TEMPERATURE OF YOUR GRINDING PROCESS

The MM 500 control is the first mixer mill on the market that allows to monitor and control the temperature of a grinding process. The mill is especially designed for processing temperature sensitive sample materials and is suitable for dry, wet and cryogenic grinding.

part of VERDER scientific

THE NEW MM 500 control

MONITOR AND CONTROL THE TEMPERATURE OF YOUR GRINDING PROCESS

The temperature area covers a range from - 100 to 100 °C and is an optional feature that is realized with the concept of thermal plates. When the grinding jars are placed on the thermal plates, heat is effectively transferred from or to the jars.

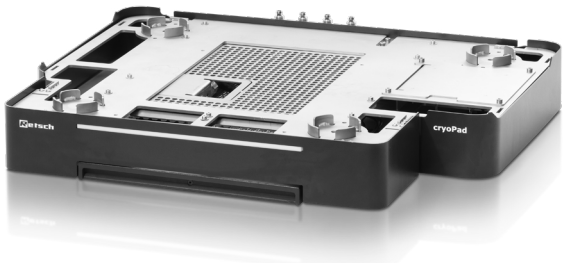
NEW FEATURE

The grinding jars are simply mounted on top of the thermal plates to realize a cooling or heating of the sample material.

To offer maximum versatility, the mill can be operated with various thermo fluids, allowing to use a large number of tempering devices for cooling or heating. Basically, there are two options:

1. TEMPERATURE REGULATION WITH LIQUID NITROGEN

If liquid nitrogen is chosen for cooling, the mill needs to be extended with the optionally available extension device cryoPad. The innovative cryoPad technology allows to select and maintain a specific cooling temperature in the range from - 100 to 0 °C for the grinding process.



Device extension cryoPad for the operation with liquid nitrogen

2. COOLING OR HEATING WITH A LIQUID THERMAL FLUID

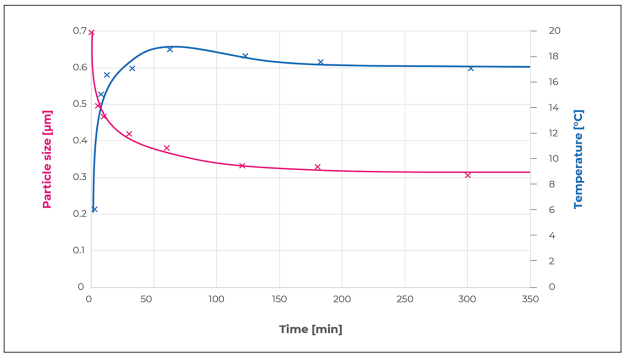
In this setup, the mill can either be connected to a cryostat, to a chiller or to the water tap. The cryoPad is not employed in this case. The external tempering device is directly connected to the machine and the thermal fluid transfers this temperature to the thermal plates and the grinding jars, respectively. The temperature of the thermal plates is restricted to a range from - 100 to 100 °C.

During a grinding process, the actual temperature of the thermal plates is continuously displayed, as it also depends on the heat development inside the jars.

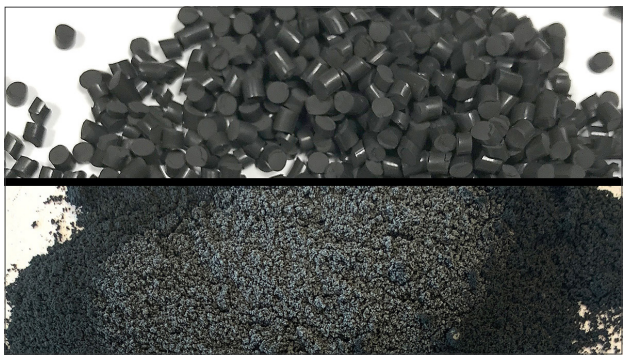
APPLICATION EXAMPLES

Application	Dry, wet and cryogenic grinding / mixing and homogenization with or without temperature regulation / continuous monitoring of actual temperature / designed to process temperature sensitive samples
Fields of application	Agriculture, biology, chemistry, plastics, construction, materials, engineering, electronics, environment, recycling, food, geology, metallurgy, glass, ceramics, medicine, pharmaceuticals, material science, mechanochemistry
Cooling and heating	Preserve volatile substances, the original state of pharmaceutical - and food ingredients / embrittlement / wet grinding < 30 °C / mechanochemistry / paste making / control mechanochemical reactions
Feed material	hard, medium-hard, soft, brittle, elastic, fibrous

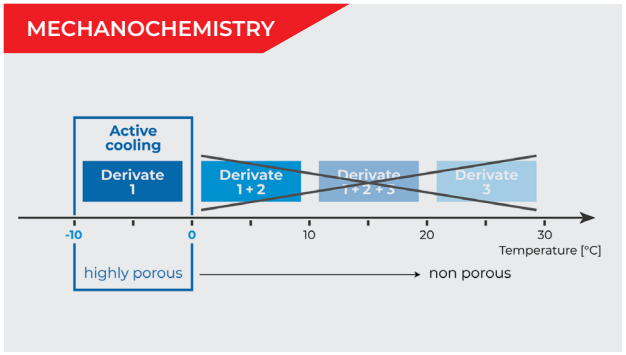
Grinding of coffee beans at a sample cooling temperature of -60 °C for natural substance analysis.



Particle size and temperature development for TiO_2 in a wet grinding process with 30 Hz. Sample cooling is realized with a chiller and water of 4 °C.



Fast milling of black Flurocarbon rubber (FKM) by embrittling the sample with liquid nitrogen in two 125 ml jars at a sample cooling temperature of – 100 °C.



By keeping the temperature below 0 °C, cooling restricts the synthesis of Zeolitic Imidazolate Frameworks to highly porous ZIF-8 derivates (derivate 1).

BENEFITS AT A GLANCE

USER FRIENDLY

- Parameter setting via touch display
- Storable SOPs and cycle programs
- Ergonomic jar clamping and safe handling of the thermal fluid
- Low noise level

FAST

- Two screw lock jars of up to 125 ml, each
- Active cooling concept allows continuous grinding without grinding breaks
- Cooling reduces heat and pressure development in jars and prevents cool down time after grinding
- Heating to accelerate chemical reaction

TEMPERATURE CONTROL

- Active cooling or heating during grinding process
- Continuous temperature monitoring
- The extension device cryoPad allows to select and maintain a specific cooling temperature and to select a sample cooling time while using LN_2
- Cycle programs

HIGH ENERGY GRINDING

- Disintegration by impact and friction
- Frequencies up to 30 Hz
- Sample processing in screw lock jars
- Temperature range from - 100 to 100 °C

MM 500 control AT A GLANCE

PERFORMANCE DATA	
Material feed size*	≤ 10 mm
Final fineness*	~ 0.1 µm
No. and volume of grinding jars	2 screw lock jars of 50 / 80 / 125 ml
Material of grinding tools	hardened steel, stainless steel, zirconium oxide, tungsten carbide
User interface	Touch display
Setting of vibrational frequency	3 – 30 Hz (180 – 1800 min^{-1})
Setting of grinding time	10 s – 8 h
Temperature range of thermal plates	-100 °C to +100 °C
Setting of temperature setpoint	-100 °C to 0 °C (only with cryoPad)
Setting of sample cooling time	0 min to 60 min (only with cryoPad)
Pressure thermal fluid supply	0 – 5 bar
Storable procedures	12 SOPs and 4 cycle programs with 99 repeats

TECHNICAL DATA	
Electrical supply data	100 – 120 V or 200 – 230 V, 50 – 60 Hz
Standards	CE
Protection consumption	750 W
W x H x D closed	690 x 375 x 585 mm
Net weight	~ 63 kg

cryoPad AT A GLANCE

PERFORMANCE DATA	
Communication connection to MM 500 control	via included connection cable
Tubing connection to MM 500 control	via included tubing set
Permissible fluid	Liquid nitrogen (-196 °C)
Connection to LN_2 supply	UNF 3/4"
Pressure range of LN_2 supply	1.2 – 1.24 bar
Temperature control algorithm	PID controlled
Setting of temperature setpoint	-100 °C to 0 °C (via interface of MM 500 control)
Setting of sample cooling time	0 min to 60 min (via interface of MM 500 control)

TECHNICAL DATA	
Electrical supply data	100 – 230 V, 50 – 60 Hz
Standards	CE
Protection consumption	100 W
W x H x D closed	670 x 110 x 590 mm
Net weight	~ 26 kg

*depending on feed material and instrument configuration

ACCESSORIES FOR MAXIMUM FLEXIBILITY

The MM 500 control is equipped with two grinding stations for screw-lock jars, available in the materials stainless steel, hardened steel, zirconium oxide and wolfram carbide in different jar sizes up to 80 ml or 125 ml. Heavy-metal-free grinding is possible, also at low temperatures. Ventilation lids allow for ventilation of the jars and for working under inert atmospheres.

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