



MEASURING SYSTEM GRINDCONTROL

The GrindControl monitors and records the development of pressure and temperature of a ball mill process.

Monitoring the two variables "pressure" and "temperature" provides valuable information about what is happening inside the grinding jar. GrindControl is used to improve sample preparation, for example of temperature-sensitive materials, to control colloidal or long-term grinding processes, or to successfully perform material synthesis such as mechanical alloying or mechanochemical processes.

The GrindControl system is available for the planetary ball mills PM 100, PM 300 and PM 400 as well as for the Mixer Mills MM 500 nano and MM 500 control and for the High-Energy Ball Mill Emax. The system consists of the pressure and temperature measurement hardware and an analysis software.



GRINDCONTROL AT A GLANCE

- | Temperature measurement in a range from -25 °C to 90 °C with a resolution of up to 0.2 °C.
- | Measurement of atmospheric pressure inside the jar in a range from 0 - 5 bar with a resolution of up to 50 mbar.
- | Gases and atmospheres can be introduced via an inlet and outlet port.
- | Software for continuous monitoring, recording and management of measurements.

ADVANTAGES THROUGH TECHNOLOGY

- | Using of the GrindControl is a standalone operation and does not require any modifications at the mill.
- | Modular design of the jar lid facilitates conversion between different jar materials and sizes.
- | Simultaneously monitoring of measurement data from up to two GrindControl modules.
- | Wireless data transmission range up to 5 meter.
- | Standard battery life of up to 80 hours.
- | Cleaning accessories for hardware maintenance are included.

GRINDCONTROL

BENEFITS OF MEASURING TEMPERATURE AND PRESSURE

Monitoring and documentation of the temperature and the pressure inside the grinding jar are of interest in research as well as in quality control.

It helps to improve:

Quality - Temperature and pressure can significantly affect the quality of the final product prepared in the ball mill. Monitoring these two variables ensures the quality of the final product.

Efficiency - The temperature development of a grinding process have a considerable influence on the grinding result of a material, as some material properties depend on temperatures. By monitoring the actual temperature, it can be ensured that the sample is processed under optimum conditions.

Safety - During a ball milling process, high temperatures and pressures can be potentially dangerous. Monitoring the temperature and pressure helps to ensure that the ball mill process remains within specified limits.

Error detection - A sudden change in temperature or pressure in a ball mill process can indicate that the grinding process is not running optimally. By continuously monitoring these parameters, deviations can be detected at an early point, allowing potential problems to be quickly identified and corrected.



GRINDCONTROL

APPLICATION EXAMPLES

When **preparing temperature-sensitive materials for analysis**, it is important to ensure that the substances to be analysed are not altered by heating during homogenization. For example, if the temperature rises above 40°C during the grinding process, APIs, vitamins or volatile components may be altered.



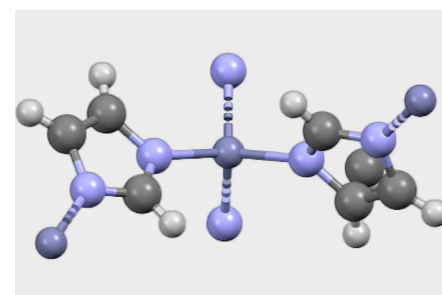
Temperature-controlled sample preparation of tablets

In **wet grinding** processes, the temperature inside the jar increases significantly due to high energy input and longer grinding times. In addition, also pressure levels can be high, for example when alcohols are used as dispersion media. Monitoring temperature and pressure helps ensure safer operations and facilitates process management.



Monitoring of temperature and pressure in wet grinding processes

When ball mills are used to convert **chemical processes**, specific temperature or pressure conditions are required to achieve the desired properties of the end product. Pressure and temperature measurements can be used to study the conditions under which specific reactions take place.



Temperature monitoring of mechanochemical reactions

FUNCTION PRINCIPLE

A transmitter is integrated in the lid and sends the signals of the pressure and temperature sensor data to a receiver that is plugged into the PC. A secure industry standard protocol is used for transmission. To detect the temperature inside the grinding jar, the temperature sensor is thermally decoupled. A filter is used to protect the pressure sensor from contamination.

The GrindControl software is an intuitive program that allows to record the measured variables in real time making them available for later evaluation. The measurement data is transferred to the PC and a measurement protocol is stored in a consecutive measurement list. The data can be exported for further processing.



GRINDCONTROL

TECHNICAL DATA

Applications	pressure and temperature measuring on PM 100, PM 300, PM 400, Emax, MM 500 nano/control
Field of application	biology, chemistry / plastics, construction materials, engineering / electronics, environment / recycling, food, geology / metallurgy, glass / ceramics, material synthesis/ agriculture, medicine / pharmaceuticals
Feed material	hard, medium-hard, soft, brittle, elastic, fibrous
Size reduction principle	impact, friction
Measurement ranges	gas pressure: 0 - 500 kPa (5 bar) temperature: -25°C - +90 °C (accuracy 1% for 0 - 70 °C)
Batch size / feed quantity*	45 ml (MM); max. 220 ml (PM)
Dry grinding	yes
Wet grinding	yes
Cryogenic grinding	yes min. -25 °C
Type of grinding jars	Screw-Lock (MM) and EasyFit jars (PM) with integrated safety closure devices

Material of grinding tools	hardened stainless steel, zirconium oxide
Grinding jar sizes	125 ml (MM); 250 ml & 500 ml (PM)
Transmission frequency	1 /s
Interface	PC Software "GrindControl-Center" (Bluetooth connection up to 5 m)
Electrical supply data	battery (up to 90 h operation time)
Accessories	grinding jar, opening aid, cleaning tools, o-ring, PC-software (PC not included), USB-Bluetooth dongle, filter
Net weight	lid with sensor unit 1660 g (PM); 340 g (MM)
Standards	CE
Technical requirements	PC with min. Windows 10 and USB 2.0
Software	live monitoring of measurement data, full measurement protocol, storable templates, list of performed measurements, data export in .pdf and .csv

MM = Mixer Mill; PM = Planetary Ball Mill | The GrindControl for the planetary ball mills is only compatible with the EasyFit grinding jars. Grinding jars "comfort" have other dimensions and are not compatible.

www.retsch.com/grindcontrol

ORDER DATA

PRESSURE AND TEMPERATURE MEASURING SYSTEM GRINDCONTROL

incl. lid with lid insert, sensors and transmitter unit, receiver, software, case, grinding jar, opening aid and cleaning accessories for PM EasyFit grinding jars (only)

22.782.0023 GrindControl with PM grinding jar EasyFit 250 ml, stainless, hardened steel


22.782.0029 GrindControl with PM grinding jar EasyFit 250 ml, zirconium oxide


22.782.0024  GrindControl with PM grinding jar EasyFit 500 ml, stainless, hardened steel


22.782.0030 GrindControl with PM grinding jar EasyFit 500 ml, zirconium oxide

ACCESSORIES

05.114.0054  O-ring for 250 ml - 500 ml grinding jars EasyFit (PM)

22.186.0006  Sintered filter with O-ring, set à three pieces

03.474.0228  GrindControl insert of lid for PM grinding jar EasyFit 250 and 500 ml, stainless, hardened steel

03.474.0239  GrindControl insert of lid for PM grinding jar EasyFit 250 and 500 ml, zirconium oxide

22.864.0001  Spare set valves M8X1 for GrindControl and aeration lids