

BM-400/BM-450 Mixer/Mill

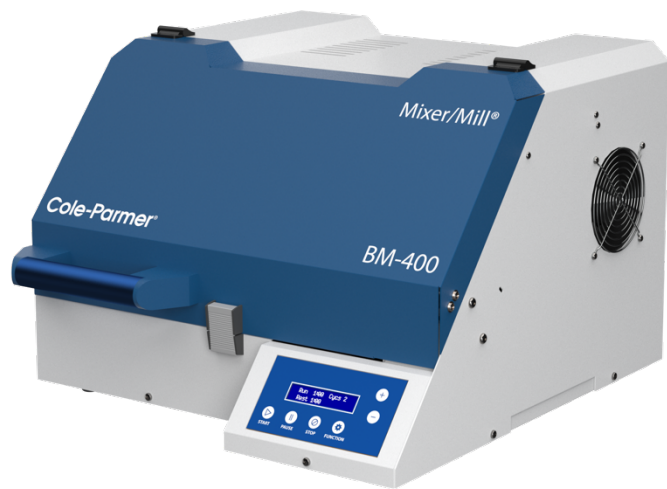
Rock and Mineral Grinder for Spectroscopy Applications

Operation Manual

For 115V (04578-12, 04578-10) and 230V (04578-13, 04578-11)



For Product Information



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SPEX SamplePrep is now part of Cole-Parmer®.

The Cole-Parmer® BM-400/BM-450 Mixer/Mill was formerly known as SPEX 8000M/8000D Mixer/Mill.

Over the years, we've acquired many high-quality and reputable brands. After many years of continual growth, we realize our brands are all as brilliant as each other. Rather than have a portfolio of complementary brands, we felt consolidating them under one world-class brand name enabled us to offer a single and significant brand experience. Through one brand we can speak in one voice through our team of experts who provide support in product selection, usage and troubleshooting to empower laboratories to run efficiently throughout the world.

Same Great Quality!

One World-Class Brand Name!

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1.0 INTRODUCTION

Cole-Parmer Mixer/Mills are a variant of the ball mill or jar mill, which grinds samples by placing them in a container along with one or more grinding balls, and imparting motion to the container. Generally the containers and grinding balls are made from the same material. As the container is moved, the kinetic force is transferred to the grinding balls causing them to move independently, into each other and against the container wall, grinding the sample.

The BM-400/BM-450 Mixer/Mill is an efficient single/dual-clamp laboratory mill. The Mixer/Mills have been used for pulverizing rocks, minerals, sand, cement, slag, ceramics, catalyst supports, and other brittle to hard samples in the 15-gram range.

Functionally described as a shaker or a high-energy ball mill, the BM-450 Dual Mixer/Mill is capable of rapidly shaking containers back and forth several thousand times a minute. This multi-purpose mill is capable of rapidly reducing hard and brittle samples to analytical fineness, blending powders, or making emulsions. It is also very effective for mechanical alloying or mechanochemistry.

With two clamps for increased throughput, the BM-450 also features a variable-range digital timer, sleek modern design, forced-air cooling, a safety interlock, and a choice of steel, tungsten carbide, agate, zirconia, silicon nitride, alumina, and plastic vials, which are purchased separately.

This mill duplicates the pulverizing, blending, and alloying action of the proven, reliable BM-400 Mixer/Mill. The vial, containing the sample and grinding media is secured in the clamp and moved energetically back and forth. The back-and-forth shaking motion is combined with lateral movements of the ends of the vial, so that the vial appears to be describing a figure-8 or infinity symbol as it moves. The length of that motion is the same as the internal length of the vial, about two inches. With each oscillation of the vial the ball impacts against the sample and the end of the vial, both milling and mixing the sample. Because of the amplitude and velocity of the clamp's movement, each ball develops high G-forces, enough to pulverize the toughest rocks, slag, and ceramics.

The dual clamps of the BM-450 Mixer/Mill not only allow twice as many samples to be ground in a given time, but they also move in symmetry, reducing vibration and extending the life of the mill's components. A fan keeps the motor and clamp mechanisms cool during operation.

1.1 Disclaimer

While many materials can be safely ground and/or mixed in the BM-400/BM-450 Mixer/Mill, some materials pose hazards and are not appropriate for use with the Mixer/Mill. Reactive materials can generate heat and pressure and are not suitable for use in a closed vessel such as the Mixer/Mill vials. Cole-Parmer is available to offer guidance to our customers. However, users are responsible for knowledge and understanding of the potential hazards of the material with which they are working.

Grinding vials do not provide an airtight seal. Purging a vial with an inert gas prior to grinding will not ensure exclusion of oxygen. If an inert atmosphere is required, some customers have placed the entire Mixer/Mill into a glove box.

2.0 SPECIFICATIONS

Type of mill: High-Energy Ball Mill

Grinding container: Canister type vial with one or more balls

Weight (without vials): **BM-400**, 90 lbs. (36 kg)/**BM-450**, 92 lbs. (42 kg)

Dimensions: BM-400, 21 in (54 cm) x 22 in (56 cm) x 15 in (38 cm)

BM-450, 25 in (64 cm) x 21 in (54 cm) x 14 in (36 cm)

Grinding Vials Sets Available:

Plastic Vials Sets Available:

VPN	Description	VPN	Description
8001	Hardened Steel Vial Set	3111	Polystyrene Vial with Cap
8001LC	Low Chromium HS Vial Set	3116	Polystyrene Vial with Cap
8003	Alumina Ceramic Vial Set	6133	Polystyrene Vial with Cap
8004	Tungsten Carbide Vial Set	6133PC	Polycarbonate Vial with Cap
8005	Zirconia Ceramic Vial Set	6134	Polystyrene Vial with Cap
8007	Stainless Steel Vial Set	6135	Polystyrene Vial with Cap
8008	Silicon Nitride Vial Set	8002	Polystyrene Vial with Cap
8009	Round-Ended Hardened Steel Vial Set	8020	Polycarbonate Jar Set
8009SS	Round-Ended Stainless Steel Vial Set		
8014	Agate Vial Set		
3114	Stainless Steel Vial Set		
3117	Hardened Tool Steel Vial Set		
3127	Hardened Tool Steel Vial Set		
3120	Agate Vial Set		
5004	Tungsten Carbide Vial Set		

Electrical: Available in 115V/60Hz (10-amp fuse) or 230V 50Hz (5-amp fuse).

Cord: 115V/60HZ version, 3-prong grounded cord supplied.

230V/50HZ version, with European two-prong plug supplied.

NOTE: Operator is responsible for supplying alternate line cord/plug if required.

Fuses: 115V/60HZ version, two 10-amp slow-blow fuses in inlet module,

230V/50HZ version, two 5-amp slow-blow fuses in inlet module.

Motor: 1/3 Hp, 1725 RPM (115V), 1425 RPM (230V)

Clamp Movement: 2¼ in. back-and-forth, 1 in. side-to-side

Clamp Speed: 1060 back-and-forth cycles at 115V/60Hz or 875 at 230V/50Hz

Safety Features: Lid Interlock prevents the mill from running if lid is not closed. A rotary latch prevents the lid from being opened until the clamps come to a complete stop.

Controls: Start, Pause, Stop and Function buttons; programmable timer with digital display, factory-set to 150 minutes (maximum with 5 cycles). Timer adjustable to 120 hour (maximum 30 cycles) with special chip, but extended use may void warranty. (Call Cole-Parmer Sales for terms & conditions.)

3.0 UNPACKING

The BM-400/BM-450 Mixer/Mill is shipped assembled and carefully packed to avoid damage during shipping. Any visible damage to the shipping container should immediately be reported to the carrier. If there is no visible damage, remove all packing documents from the exterior of the box, and after completion of inspection file documents with your records.

Open the top of the shipping box. Remove the foam packing material. Using a two-man team, carefully grasp the straps on the mill from both sides, exercising caution while using proper lifting techniques to remove the unit from the container (the unit weighs approx. 92 lbs). Place the mill on the bench top where it will likely stay, and open the lid. Look for any hidden damage that may have occurred during shipping.

Follow the sequence of steps 1 – 7 as you inspect the unit.

1. Inspect the outside of the cabinet for any visible damage.
2. Inspect the electrical input module and On/Off switch for any visible damage.
3. Ensure that the latch mechanism is working properly (see Section 4.2).
4. Open the lid and inspect the interior of the Mixer/Mill.
5. Check that the motor has not been damaged.
6. Check that the springs and mounting points appear undamaged.
7. Inspect the accessory pack. Compare with the packing list.

If everything seems to be in proper order, store the packaging materials in case there is a need to return the unit for service or repair.

4.0 SETTING UP

BM-400: Remove the plastic bag containing the instructions, rubber-lined coil springs, black rubber spacer and spare fuses. Then loosen the locking tab on the clamp, and unscrew the clamp a few turns. Cut and remove the tie holding the clamp. Tilt the cabinet, and remove the two bolts on the bottom. They hold the floating base plate to the cabinet for shipping. Save the bolts and washers in case you must ship or transport the mill.

Push the black rubber spacer down over the right rear tapered post. Aluminum spacers have probably been installed on the front and left rear tapered posts; if there are plastic ties securing those spacers, remove them. Then push the lined coil springs down on the posts – the long spring on the front post, and the two shorter springs on the two rear posts. Lift the floating base plate and place it on top of the springs; each bracket has a pin that fits into the spring/hose assembly.

BM-450: Remove the plastic bag containing the instructions and spare fuses. Then loosen the locking tab on the clamps, and unscrew the clamps a few turns. Cut and remove the tie holding the clamps together.

Tilt the cabinet about 45 degrees, and note the four bolts on the underside of the cabinet. They hold the floating base plate to the cabinet for shipping. Remove these bolts, the rear ones first, followed by the front two, and save them in case you have to re-ship the mill.

NOTE: Never ship the BM-400/BM-450 Mixer/Mill without the shipping bolts installed.

4.1 Electrical Connection

The power inlet, a fuse tray, and the On/Off switch (controlling power to the motor and timer), are located at the back of the unit. The On/Off switch is a rocker switch marked with a circle (0) and a bar (|). To turn on the power, press down the bar (|) side of the switch. Before plugging in the mill, set the power to off by pressing down the circle (0) side of the On/Off switch, then plug the power cord into the mill's power inlet. Plug the mill into a standard 3-prong grounded electrical outlet; a fused 20-amp circuit for the 115V/60 HZ version is recommended. The mill uses 10-amp "slow-blow" fuses. The 230V/50 HZ model uses 5-amp "slow-blow" fuses and comes with a European-style polarized plug; outside of Europe the 230V model's cord should be adapted to local requirements.

4.2 Standard Safety Features

Manual Lid Latch: The lid has a manual latch, right of the lid handle, which must be closed whenever the mill is running. To close the latch, pull the tab up and push in, engage it with the lid, and push the tab down. To open the latch, pull the tab up and out.

Pneumatic Cylinders: When the lid is raised all the way, the pneumatic cylinders brace the lid open, and keep it from being closed accidentally or abruptly. However, when raising or lowering the lid always hold the handle securely.

Clamp Locking Tab: The clamp is opened and closed by a knob on the end of its threaded shaft. Whenever the clamp is closed on a vial, lock the clamp by tightening the locking tab clockwise against the clamp crossbar (the locking tab is on the shaft between the knob and the clamp crossbar). When opening the clamp, first loosen the locking tab.

4.3 CE Safety Features

CE directives require that electricity to the motor and timer be interrupted whenever the lid is open, and that the clamp arm must stop completely before the lid can open.

Safety Interlock: The Safety Interlock cuts off power to the motor when the lid is open; the switch is located under the lid at the top right behind the curved interlock bracket. Do not disconnect or damage this switch.

Time-Delay Rotary Latch: The Time-Delay Latch keeps the lid closed while the mill is running, and for 4 seconds after the end of the run. The Time-Delay Rotary Latch, on the right side panel is powered by an internal motor to engage the latch actuator in the lid. When the mill is started the Time-Delay Latch locks the lid immediately, and there is a delay before the motor starts. When the timer reaches zero at the end of a run, the motor stops, the timer displays RUN COMPLETE, and the latch stays locked for 4 seconds. At the end of 4 seconds the latch unlocks, and the timer resets.

NOTE: *Never try to force open the lid before the Time-Delay Rotary Latch unlocks.*

4.4 General Safety



Caution: *Every effort has been made to ensure the BM-400/ BM-450 Mixer/Mill operates at a moderate noise level. The intensity of noise is directly impacted by the type of grinding vial, number of balls, and sample hardness. Ear protection is recommended.*

4.5 Control Panel (for BM-400/BM-450)

4.5.1 Digital Timer

The timer includes minutes: seconds numerical display for Run and Rest times, Cycles and Mode (Standard or Extended runtimes). Note: the Standard runtime chip comes installed in the BM-400/BM-450 Mixer/Mill. The Extended runtime chip is optional and sold separately. Pushbuttons for the start, stop and pause function; and plus (+) and minus (-) buttons to change the run settings. The display exhibits the programmed grinding time, Rest time, Cycles and Mode (STD) when the mill is not running: 3:00 means the Mixer/Mill is programmed for a 3-minute run. During a run the timer counts down the time remaining in 1-second increments: 2:30, 2:29, 2:28, etc. The time is displayed in minutes and seconds for Run, Rest; for example, a Run 2:30 equals two minutes and thirty seconds, and Rest 1:30 equals one minute and thirty seconds, 5 Cycles in Standard Mode, as shown in Figure 2.

	Mode: STD		Mode: EXT			
Run (max)	0.10 - 100 min	0.10 – 30 min	15 min - 120 hrs	15 min - 24 hrs	15 min - 7:30 hrs	15 min – 5 hrs
Cycles	1	2 - 5	1	2 - 5	6 - 20	21 - 30
Rest	---	0.10 – 30 min	---	30 - 120 min	30 - 120 min	30 - 120 min

NOTE: Minimum runtime is 10 seconds for Standard Run mode, with 5-second increments.
 Minimum rest time is 10 seconds for Standard Run mode, with 5-second increments
 Minimum runtime is 15 minutes for Extended Run mode, with 15-minute increments.
 Minimum rest time is 15 minutes for Extended Run mode, with 15-minute increments.

4.5 Control Panel (Cont'd)

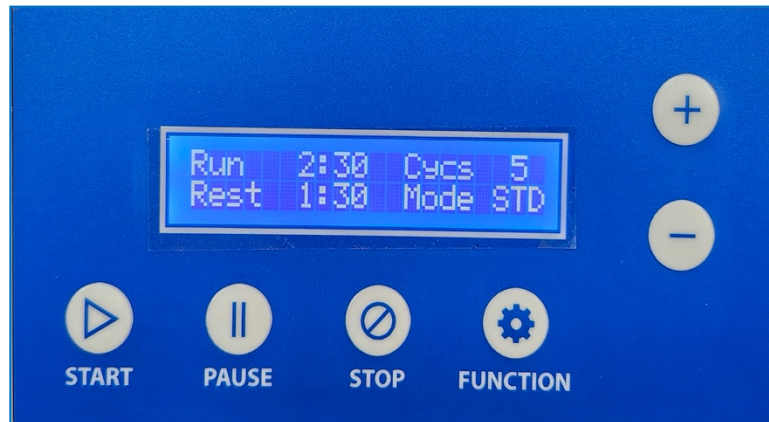


Figure 2 – BM-400/BM-450 Mixer/Mill Digital Timer Screen and Controls

The timer display also includes four status screens:

- PAUSED is displayed when the pause button has been pressed.
- RUN COMPLETE is displayed for 4 seconds after the run is over.
- ERROR: LATCH FAILURE is displayed when the lid interlock cannot engage.
- ERROR: LID OPEN is displayed when lid is not completely closed. Fasten manual latch.

4.5.2 Programming A Run

When the power is switched on, the timer will display:

“COLE-PARMER”

“MIXER/MILL”

Standard Mode - Run Chip Only

Step 1. To set a programmed run push the FUNCTION button to access parameters window. Continue to press the Function button to select the Run, Cycles, and Rest. Press the plus (+) button to increase the selected parameter or press the minus (-) button to decrease the parameter.

Step 2. To exit the Function programming screen push the STOP button.

Step 3. Push the START button to begin a programmed run. The timer counts down in 1-second increments, showing the time left in the run. When the timer reaches zero and the motor shuts off, the timer will display RUN COMPLETE. The safety interlock switch prevents the unit from running if the lid is open.

4.5 Control Panel (Cont'd)

Step 4. To have the mill pause during a run and retain the timer setting, push the PAUSE button. The motor will shut off and PAUSED will appear on the display. To resume the run, close the lid and push START; the timer will briefly display the exact number of seconds left in the run and then continue to count down in 1-second increments. To abort the run, push STOP; RUN COMPLETE will be displayed.

Extended Mode - Run Chip (Program includes Standard Mode)

Step 1. To set a programmed run push the FUNCTION button to access parameters window. Continue to press the Function button to select the Run, Cycles, Rest and Mode. Press the plus (+) button to increase the selected parameter or press the minus (-) button to decrease the parameter.

Step 2. To exit the Function programming screen push the STOP button.

Step 3. Push the START button to begin a programmed run. The timer counts down in 1-second increments, showing the time left in the run. When the timer reaches zero and the motor shuts off, the timer will display RUN COMPLETE. The safety interlock switch prevents the unit from running if the lid is open.

4.5.3 Starting and Running the Mixer/Mill

Push the START button to begin a grinding cycle, as shown in Figure 3. There will be a short pause while the lid interlock engages, and then the Mixer/Mill motor will start. The timer counts down 1 second at a time, showing the time left in the run. When the timer reaches zero and the motor shuts off, the timer will display RUN COMPLETE for 4 seconds while the rotary latch stays locked. This allows the clamp mechanism to slow down. When the rotary latch releases the lid, the timer display will return to its prior setting. **Never try to open the lid before the interlock releases; this can damage the rotary latch.**



Figure 3 – The Start Button

NOTE: Before setting the timer and operating the BM-400/BM-450 Mixer/Mill, always clamp two grinding vials of approximately the same weight firmly in place.

4.5.4 Using the Stop and Pause Buttons

To STOP the mill during a run, push the stop button. This will shut off the motor and reset the timer. RUN COMPLETE will be displayed for 4 seconds and the lid will stay locked. After 4 seconds the original timer setting will reappear, and the rotary latch will release.

To have the mill pause during a run and retain the timer setting, push the PAUSE button. The motor will shut off and PAUSED will appear in the display. The rotary latch will release and the lid can now be opened. To resume the run, close the lid and latch then press START; the timer will briefly display the exact number of seconds left in the run and then count down in 1-second increments. To abort the run, push STOP; RUN COMPLETE will be displayed for 4 seconds and the rotary latch will release.

4.5.5 Timer/Lid Interlock

The timer is connected to the safety interlock, (on the right side) the bracket in the lid is guided into an opening in the internal cover of the cabinet striking the safety interlock when the lid is closed. Close the lid, apply manual latch, and press the START button. If the Mixer/Mill lid cannot be locked down when START is pressed, the motor will not start and ERROR: LATCH FAILURE will appear on the timer display. When this happens, open and close the lid, then press STOP to clear ERROR LATCH FAILURE from the display, and restore the timer setting. Only when the timer setting is restored can the Mixer/Mill be started again.

5.0 OPERATION

The following sequence is typical. It supposes familiarity with the chief features of the Mixer/Mill, as described in Section 4.0 SETTING UP.

1. Plug the power cord into the mill's electrical inlet, and then into an approved grounded outlet. Ensure that the On/Off switch (next to the power inlet) is in the off position, before plugging the unit in. After the unit is plugged in, switch the power on by means of the rocker switch. The timer will briefly display "Cole-Parmer" and "Mixer/Mill". This will then change to show the default timer setting of 5:00.
2. After loading the vial with the sample to be mixed or ground, place it in a clamp, as shown in Figure 4. Tighten the clamp with the knob (Figure 5), and lock the clamp with the locking tab. Close the lid and fasten with the manual latch.

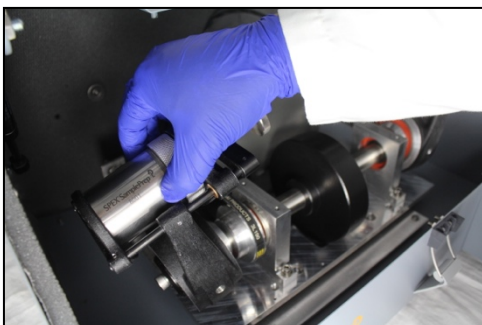


Figure 4 – Placing Vial in Clamp

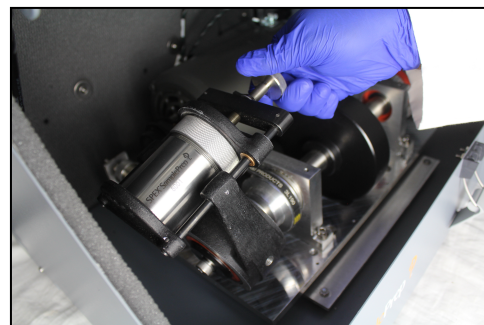


Figure 5 – Tightening the Clamp

5.0 Operation (Cont'd)

3. Program the timer setting as described in Section 4.5.2 **Programming A Run** using the Function and display buttons.
4. Start the Mixer/Mill by pushing the START button. During the run, the timer will count down, and display the time left in the run in 1 second increments. When the run is over, the timer will display RUN COMPLETE for 4 seconds while the lid stays latched. Then the rotary latch will disengage, and the timer will reset. Open the lid, loosen the locking tabs, then open the clamps and remove the vials.
5. To stop the mill during a run, press the STOP button. This motor will stop and the timer will reset. RUN COMPLETE will be displayed for 4 seconds and the lid will stay latched. After 4 seconds the original timer setting will reappear and the rotary latch will release.
6. To pause a run, press the PAUSE button. The motor will shut off and PAUSED will appear in the display. The rotary latch will release and the lid can be opened. To resume the run, push START; the timer will briefly display the exact number of seconds left in the run and then count down in 1-second increments. In the unlikely event that pushing the STOP or PAUSE button does not shut down the Mixer/Mill, cut off power by pressing the rocker switch down on the back of the mill to the circle (0) side of the On/Off switch.
7. If ERROR: LATCH FAILURE is displayed instead of numerals when the Start button is pressed, the interlock has not properly engaged. Clear the timer by pressing the Stop button, and correct the problem.

NOTE: Wait four seconds after the run is complete for the lid to unlock. During this time the timer will display RUN COMPLETE. Opening the lid prematurely can damage the latch.

5.1 Mixing and Grinding

Mixing is usually done in a plastic vial with plastic balls. Depending on the nature and amount of material to be mixed, one or several balls may be used. With a small amount of material and more than one or two balls, the impact may break the bottom of the plastic vial, so keep the number of balls to a minimum. Plastic vials and balls can also be used to grind soft metalloids (e.g. antimony), carbon, and other brittle materials.

For samples that cake during mixing, a slurry with water or alcohol may be helpful. Water may be dried out afterwards by heating plastic vials in a very low temperature oven. If caking is due to static charge, a small amount of cellulose (10%) can be added to the vial.

5.1 Mixing and Grinding (Cont'd)

Grinding is also done in metallic and ceramic containers: steel, tungsten carbide, alumina, zirconia, silicon nitride, and agate. Dry grinding is the simplest approach and is most often used. The criteria for container selection are usually those of grinding efficiency versus trace contamination; steel and tungsten carbide grind more rapidly than ceramics or agate, but contaminate sample more. Tungsten carbide, alumina ceramic, zirconia ceramic, silicon nitride, and agate vials cannot be warranted against breakage.

If a sample is not being ground fine enough, one can decrease the amount of sample, increase grinding time, use a denser grinding medium, and/or add a grinding aid or a liquid. Wet grinding keeps the sample from caking and will give a smaller final particle size, but there are hindrances: an extra drying step is required, the fluid used for wet grinding must be chosen carefully not to alter the sample or attack the container, and not all the vials are leak-proof. The best vials for wet grinding are the 8001, and 8007 steel vials, 8004 Tungsten Carbide, and

8020 polycarbonate vials: all have gaskets and screw caps, and are watertight. The Alumina vial (8003) has optional clamps (8015) for slurry grinding. The 8005 Zirconia vial and 8008 Silicon Nitride vials will hold liquid as long as they are tightly clamped into the mill. The 8014 Agate vial is not suitable for use with liquids.

None of these vials are inherently gas tight. Limited results can be achieved with steel vials by loading and unloading them in a glove box under inert gas. The best results can also be achieved by running the Mixer/Mill in a glove box under inert gas.

Avoid grinding small loads (less than 5 grams) in brittle containers such as agate, alumina, zirconia, and silicon nitride. If there is not enough sample to lessen the impact of the balls to vial, an increase in trace contamination from the vial is possible and in extreme cases the vial can chip from excessive impact from the balls.

CAUTION: Always use grinding balls that match the material of the container, e.g. steel balls for a steel container, agate balls for an agate container, etc. This will limit contamination. An inappropriate choice of balls, such as tungsten carbide balls in an alumina container, can damage the container.

Two balls are standard for most grinding containers, though some users feel that only one ball should be used in the most brittle containers (alumina and agate). Three balls can accelerate grinding in the steel and tungsten carbide containers.

When using grinding containers with threaded aluminum caps (8001, 8007, 8009 steel and 8004 tungsten carbide), be careful to keep the threads clean with each use. Over time, if care is not exercised to maintain the threads clean, as sample accumulates in the threads it can jam the caps. Also be careful not to drop these caps on edge, as if the round shape is deformed they can be very difficult to use.

6.0 MAINTENANCE

The BM-400/BM-450 Mixer/Mill has been designed to provide trouble-free operation over a long period of time. To ensure proper performance, an important factor is overall cleanliness. Any spilled powders or liquids should be wiped up immediately. This should minimize the buildup of any powders or residue. To maintain the exterior of the unit, first disconnect the BM-400/BM-450 Mixer/Mill, then spray it with a mild window cleaner or similar product, and wipe it down.

NOTE: Always unplug the Mixer/Mill before any cleanup or maintenance work.

The threads of the clamp screw should also be kept clean. The foam pads in the clamp should be replaced when damaged, worn, or missing.

If the drive belt becomes loose, tighten it by moving the motor back: loosen the motor mounting bolts, move the motor, and tighten the bolts. If the drive belt breaks or becomes heavily worn, replace it. A properly tensioned drive belt can be depressed about ½" midway between the sprockets.

The flywheel and motor sprockets should be checked from time to time to make sure that they are tight on their shafts; if either sprocket loosens it must be realigned with the other and the set screws tightened.

The sealed ball bearings in the clamp and pillow block assemblies are lubricated for life and require no maintenance. The shaft bearings of the motor are lubricated for ten years of intermittent use or one year of heavy use.

The clamp retaining spring assembly includes two open ball-and-socket joints that are lubricated with heavy-duty automotive-type lithium grease. If these bearings dry out they should be taken apart and re-greased.

The BM-400/BM-450 Mixer/Mill is intended for intermittent use with running times that are typically 5 to 20 minutes long. Under those conditions it should run for many years without maintenance other than that described above. Prolonged periods (over 100 min.) of continuous running, as when the mill is used for mechanical alloying, require extra maintenance, and may void the warranty by wearing out key parts. The BM-400/BM-450 Mixer/Mill is warranted against defects of materials and workmanship for three years from date of shipment. However, extreme uses of the mill, such as mechanical alloying, may modify or void the warranty. Contact us for further information about operating your mill under unusual circumstances.

If you have any questions about the operation and maintenance of your BM-400/BM-450 Mixer/Mill, please contact Cole-Parmer.

6.1 Changing the Fuses

If the Mixer/Mill will not operate when the start button is pressed, it is possible that one or both fuses may have blown. To access the fuses, first remove the power cord from the back of the Mixer/Mill. Then open the door on the fuse compartment by gently prying it open at the top and flipping it down. Use a small screwdriver to gently pry the red fuse holder out of the compartment, as shown in Figure 6. Remove the fuses and check them using a continuity tester. If either fuse is blown or defective, replace both with 3AG 10-amp, 230V slow-blow fuses for the 115V model, or 3AG 5-amp, 230V slow-blow fuses for the 230V model. Position the fuse holder such that the appropriate operating voltage appears on top. Return the fuse holder to the fuse compartment and close the access door. Check the window of the fuse compartment to make sure that it shows the appropriate voltage. If not, the fuse holder is upside down and must be turned around before attempting to operate the Mixer/Mill.

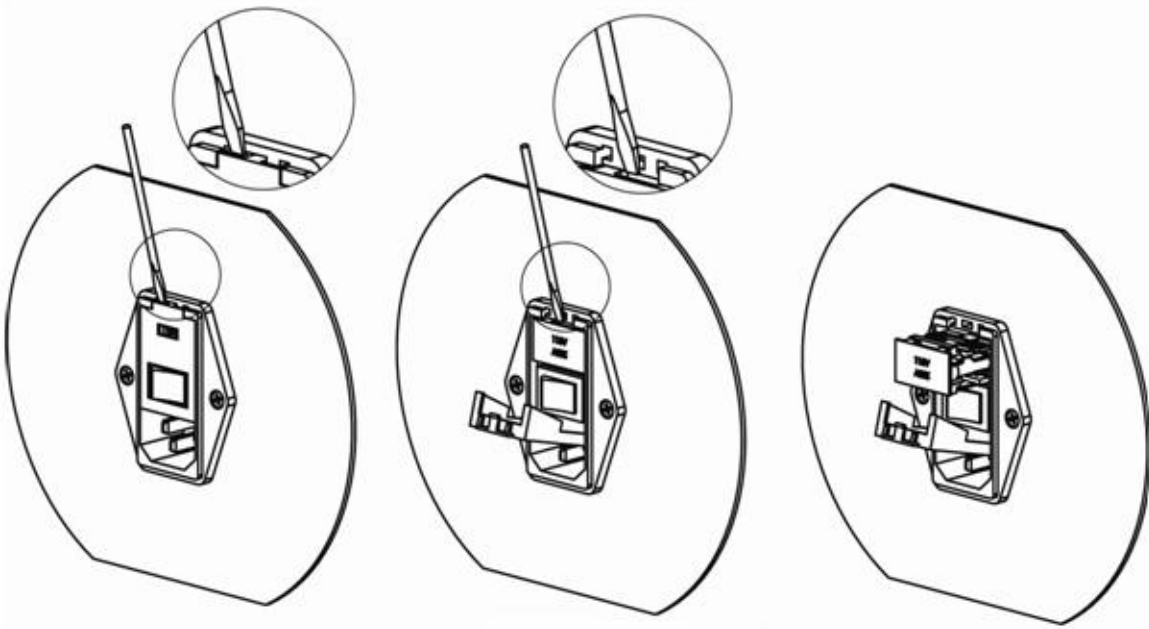


Figure 6 – Fuse Compartment

7.0 TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
The unit does not turn on.	No current.	Check outlet for power and correct as required.
	Blown fuse.	Replace fuses.
	Power switch not turned on.	Press power switch to ON position.
Unit does not run. Display shows ERROR: LATCH FAILURE.	Safety interlock switch.	Make sure the lid is completely closed. Press STOP to clear display.
Unit does not run. Display shows ERROR: LID OPEN.	Manual Latch not engaged	Lock down manual latch.
Unit does not run.	Disconnected harness.	Re-connect wiring harness to motor.
Display shows ERROR: MECH FAILURE.	Mechanical issue.	Inspect interior for loose connections. Turn off power, then turn on.
Display reads RUN COMPLETE, but lid is locked.	Lid opened too soon.	Wait 4 seconds before lifting lid.
Lid does not open.	Rotary latch stuck.	Shut off power, correct problem.
Grinding balls don't move inside vial.	Too much sample.	Decrease sample load.
Excessive vibration.	Shipping bolts still in place.	Remove shipping bolts.
Excessive Vibration. (BM-450)	Clamp load not in balance.	Balance clamp load.
Clamp loosens during run.	Locking tab loose.	Tighten locking tab.
V-belt loose or worn.	Motor loose or misaligned.	Align motor pulley with flywheel, replace V-belt if necessary. Tighten down motor.
	Pulleys loose or out of alignment.	
Mill becomes noisy after long use.	Loose bearings.	Check bearings. Replace if necessary.
	Worn spring.	Check spring pre-load is 4½ inches. Adjust if necessary.

8.0 WARRANTY

Cole-Parmer® guarantees its products against defects in materials or workmanship for one year from the date of original shipment. Repairs, replacements, or parts are guaranteed for 30 days or for the remaining original warranty period (whichever is greater) for the item that was repaired or replaced. Items not produced by Cole-Parmer® carry the manufacturer's warranty only.

The warranty generally does not cover normal wear and tear due to routine use, or equipment failure due to operator misuse or negligence. The warranty excludes wear parts. These are parts that wear out through use and must be replaced periodically for proper operation. Mixer/Mill wear parts include the V-belt and clamp retaining spring assembly. Running the Mixer/Mill for long, continuous periods can constitute excessive wear and void the warranty for other parts.

Wear Parts	
Part No.	Description
50140	V-belt
33297	Clamp Retaining Spring Assembly

In the event that these or other parts require service, please contact Cole-Parmer to arrange a return shipment.

The customer pays return freight for warranty claims. If the warranty claim is valid, Cole-Parmer® will pay return freight to the customer. However, Cole-Parmer® reserves the right to judge whether a malfunction during the warranty period is due to defects in materials or workmanship, or to wear, negligence, or misuse.

8.1 Product Specifications

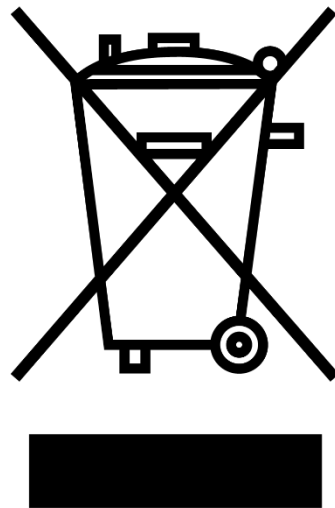
Every effort has been made to provide complete and accurate product operation and information in this manual. However, since specifications are subject to change without notice, changes may be made from time to time to improve the performance, reliability, and function of the product. Therefore, slight changes that are not reflected in the current illustrations should be considered minor and inconsequential for the purposes of this operating manual.

8.2 To Arrange a Return Shipment

We want you to be satisfied with your purchase from Cole-Parmer®. Please bring any problem to our attention, but please DO NOT RETURN any item before contacting us for a Return Authorization Number and instructions. Unauthorized returns will be refused. The cost for all return transportation is the responsibility of the customer. Credit for returned merchandise will be issued only after goods have been received and inspected. Returned goods are subject to a 25% restocking charge.

9.0 INSTRUMENT DISPOSAL

In accordance to the EU Directive 2012/19/EU covering Waste Electrical and Electronic Equipment, all equipment with the disposal symbol must not be disposed of with general waste. (See Figure 7)



Disposal Label is located on the back of unit.

Figure 7 – Disposal Symbol

Throughout the European Community, guidelines regarding disposal regulations may vary from territory to territory. Please contact the national legislation or local authority for more information on proper disposal of all equipment with this symbol.

10.0 CONTACT US

Repair Service

Phone: 1.732.623.0465

Cole-Parmer SamplePrep
65 Liberty St
Metuchen, NJ 08840
US

Attn: Service and Repair

Please include RA Number on the shipping label.



65 Liberty Street
Metuchen, NJ. 08840
USA

Phone: +1.732.623.0465

Email: sampleprep@coleparmer.com

Web: cpsampleprep.com