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# 8000M MIXER/MILL®




# OPERATING MANUAL

For 8000M-115 and 8000M-230 with Serial Numbers 10115 and higher;
this manual is Part No. 87011

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## 1.0 INTRODUCTION

The SPEX SamplePrep 8000-series Mixer/Mills are efficient, compact laboratory mills capable of pulverizing samples in the 10-gram range. Functionally described as shaker mills or high-energy ball mills, these Mixer/Mills shake containers back and forth approximately 1080 cycles per minute (60 Hz model). These multi-purpose mills are capable of reducing hard, brittle samples to analytical fineness, blending powders, making emulsions, and performing mechanical alloying.

The vial, which contains a sample and one or more balls, is shaken in a complex motion that combines back-and-forth swings with short lateral movements, each end of the vial describing a figure-8. The length of that swing is the same as the internal length of a standard 8000 series vial, about two inches. With each swing the balls impact against one end of the vial, simultaneously milling the sample to a powder and blending it. Because of the amplitude and velocity of the clamp's swing, each ball develops fairly high G-forces, enough to pulverize the toughest rocks, slags and ceramics.

The single-clamp 8000M Mixer/Mill, known simply as "the Spex Mill" to thousands of users, has served spectroscopists and analytical chemists for over forty years. The clamp mechanism has changed little since the earliest versions, simply because it has proven extremely durable. Many of the earliest 8000 Mixer/Mills are still in service. An electronic 100-minute timer has replaced the original wind-up timer and the mill's safety features have been improved: the lid is now locked down until the clamp stops moving.

8000-series Mixer/Mills have been used for pulverizing rocks, minerals, sand, cement, slag, ceramics, catalyst supports, and hundreds of other brittle, often hard samples. Early in its market introduction, the 8000 was used to grind samples, then blend them with graphite for arc/spark spectroscopy; now similar samples are ground, then blended with binder before being pressed into sample discs for XRF. The vigorous motion of the clamp is also excellent for making emulsions, such as paints, inks and pharmaceuticals. 8000M Mixer/Mills have also achieved notoriety for their ability to mechanically alloy small quantities of materials in fields such as superconductor research.

For assistance in choosing the SPEX SamplePrep grinding or blending containers which would be best for your application, please call SPEX SamplePrep at 1-800-522-7739 or 732-623-0465.



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## 2.0 SPECIFICATIONS

**Type of mill**: High-Energy Shaker Mill
**Grinding Containers**: Canister type vial with one or more balls
**Weight** (empty, without vial): 70 lbs. (31 kg)
**Dimensions:** 19 in (48 cm) x 14 in (36 cm) x 18 in (46 cm)

**Grinding Vials Available**:

| | |
|---|---|
| 8001 | Hardened Steel Vial Set. |
| 8003 | Alumina Ceramic Vial Set |
| 8004 | Tungsten Carbide Vial Set |
| 8005 | Zirconia Ceramic Vial Set |
| 8006 | Methacrylate Vial Set |
| 8007 | Stainless Steel Vial Set |
| 8008 | Silicon Nitride Vial Set |
| 8009 | Round-Ended Hardened Steel Vial Set |
| 8014 | Agate Vial Set |
| 3114 | Stainless Steel Vial Set |
| 3117 | Hardened Tool Steel Vial Set |
| 3127 | Hardened Tool Steel Vial Set |
| 3118 | Agate Vial Set |
| 5004 | Tungsten Carbide Lined Vial Set |

**Plastic Vials Available**:

| | |
|---|---|
| 3111 | Polystyrene Vial with Cap |
| 3116 | Polystyrene Vial with Cap |
| 6133 | Polystyrene Vial with Cap |
| 6133PC | Polycarbonate Vial with Cap |
| 6134 | Polystyrene Vial with Cap |
| 6135 | Polystyrene Vial with Cap |
| 8002 | Polystyrene Vial with Cap |
| 8006 | Methacrylate Vial Set |

***NOTE**: In practice, the sample capacity of any particular vial depends on the properties of the sample, particle-size requirements, and other considerations.*

**Electrical specifications**: available in 115V/60Hz or 230V/50Hz. Meets European CE Directives

**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 the power input module
230V/50HZ version, two 5 Amp slow-blow fuse in the power input module

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

**Safety Features**: Lid Interlock prevents mill from running if lid is not closed, locks down lid until clamp stops moving.

**Controls:** Start and Stop buttons; programmable timer with digital display, factory-set for 100 minute range. Adjustable to 175 hour range with special chip, but extended use may void warranty. (Call SPEX SamplePrep Sales for terms & conditions.)



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## 3.0 UNPACKING

The 8000M 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 with your records.

Open the top of the shipping box. Remove the foam packing material. Carefully grasp the straps on the mill from both sides, exercising caution while using proper lifting techniques to remove the unit from the carton (the unit weighs 70 lbs). Place the mill on the bench top where it will likely stay, remove the straps and open the lid. Look for any hidden damage that may have occurred during shipping.

Follow a logical sequence of steps as you inspect the unit (see Figure 1). For example:

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.

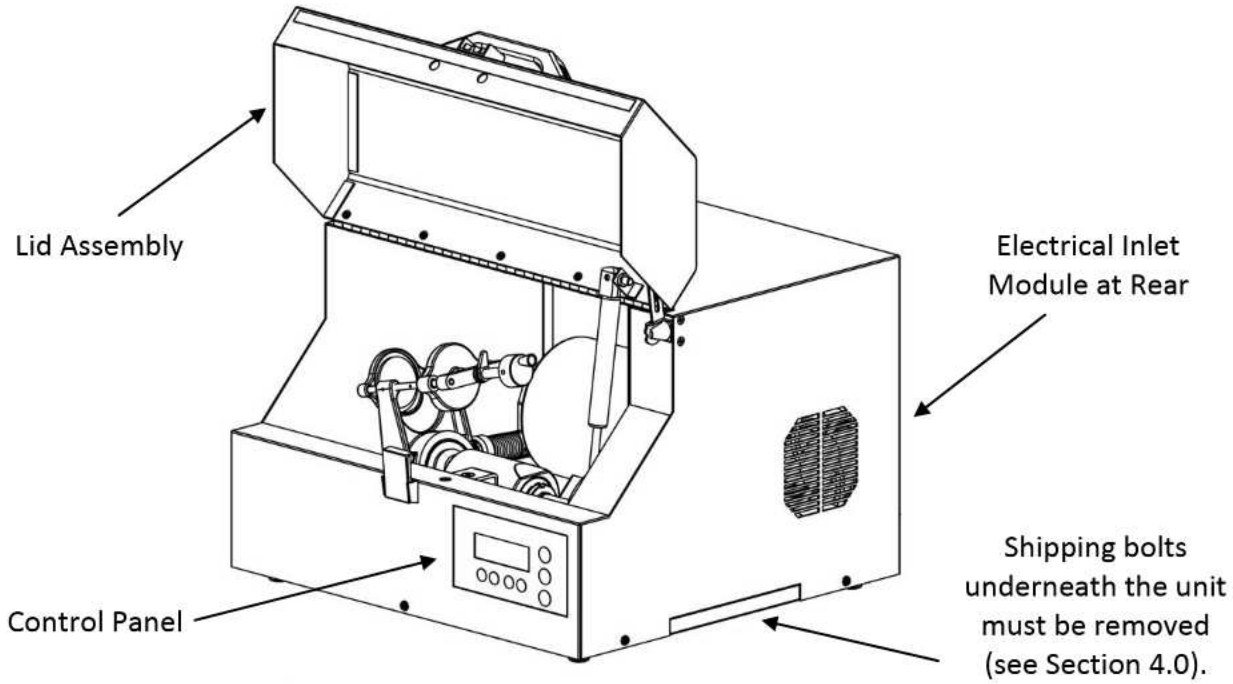



**Figure 1** - 8000M Mixer/Mill



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## 4.0 SETTING UP

Open the cabinet and remove the plastic bag(s) with the operating manual, spare fuses, rubber-lined coil springs, and black rubber spacer.

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 have to 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.

Cut the tie that holds down the clamp, and make sure the control cable is plugged into its receptacle on the right inner side of the cabinet.

### 4.1 Electrical Hookup

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, just below the lid handle, which should be closed whenever the mill is run. To close the latch, pull the tab up and out, engage it with the lid, and push the tab down. To open the latch, pull the tab up and out.

**Pneumatic Cylinder:** When the lid is raised all the way, the pneumatic cylinder braces the lid open, and keeps it from being closed accidentally or abruptly. However, when raising or lowering the lid always hold the handle.

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



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## 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 have stopped completely before the lid can open.

**Safety Interlock**: The Safety Interlock cuts off power when the lid is opened; the switch is under the lid on the upper right-hand side. Do not disconnect or damage this switch!

**Time-Delay Latch**: The Time-Delay Latch keeps the lid latched while the mill is running, and for 5 seconds after the end of the run. The Time-Delay Latch consists of two pins, one on either side of the manual lid latch, powered by a solenoid to engage two holes 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 5 seconds. At the end of 5 seconds the latch unlocks with an audible click, and the timer re-sets.

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

## 4.4 Control Panel

### 4.4.1 *Digital Timer*

The timer includes a minutes: seconds numerical display; push-buttons for the start, stop and pause functions; and buttons to change the timer setting. The display indicates the programmed grinding time 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 5-second increments: 2:05, 2:00, 1:55, etc. The time is displayed in minutes and seconds; for example, 1:30 equals one minute and thirty seconds.

Time is programmed up or down, in 5-second increments, by pressing the up/down buttons below the timer display.

The timer display also includes three status screens:

- PAUSED is displayed when the pause button has been pressed;
- RUN COMPLETE is displayed for 5 seconds after the run is over;, and
- ERROR: LATCH FAILURE is displayed when the lid interlock cannot engage.



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**4.4 Control Panel** (Cont'd)

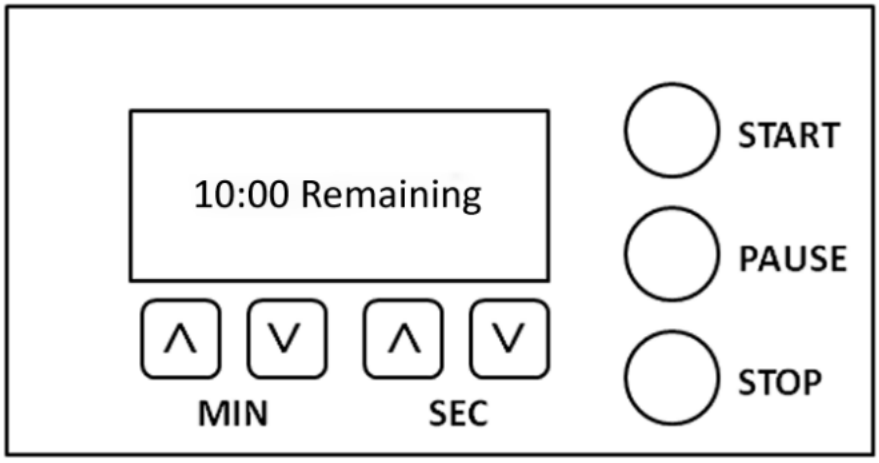



**Figure 2** – 8000M Mixer/Mill Digital Timer Screen and Controls

**4.4.2 *Setting the Timer***

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

SPEX SamplePrep
8000 Series
MIXER/MILL

The timer will then display the default timer setting of five minutes (5:00). Assuming a grinding vial is clamped into the mill and the lid is down, pressing START will initiate a run of 5 minutes. First there will be a delay of several seconds for the lid latch to engage, then the timer will start counting down in 5 second increments: 4:55, 4:50, 4:45, etc.

Every time power is turned off and back on, the timer will revert to the 5:00 default setting. To maintain another timer setting, leave the power on. If power is not interrupted, the timer will display the most recently programmed setting.

Set the mixing/grinding time with the four buttons below the timer display. There are up and down buttons for minutes, and up and down buttons for seconds. The MIN buttons will change the minute setting in 1 minute increments, and the SEC buttons will change the seconds setting in 5 second increments. 100:00 is the maximum running time; increasing the minutes setting past 100 will take the setting to zero. 55 is the maximum setting for seconds; increasing the seconds past 55 will take the setting to zero. If a button is pushed and immediately released, it will change its setting by one unit. If a button is held down, the setting will advance rapidly.



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### 4.4.3 *Starting and Running the Mixer/Mill*

Push the START button to begin a grinding cycle. There will be a short pause while the lid interlock engages, and then the Mixer/Mill motor will start. The timer counts down 5 seconds 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 5 seconds while the lid latch stays locked. This allows the clamp mechanism to slow down. When the interlock releases the lid (with an audible click), the timer display will return to its prior setting. **Never try to open the lid before the interlock releases; this can damage the lid latch.**

***NOTE*: Before setting the timer and operating the 8000D Mixer/Mill, always clamp a grinding vial firmly in place.**

### 4.4.4 *Using the Stop and Pause Buttons*

To stop the mill during a run, push the STOP button. This will shut off the motor and re-set the timer. RUN COMPLETE will be displayed for 5 seconds and the lid will stay latched. After 5 seconds the original timer setting will re-appear and the lid 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 lid latch will not release. 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 5-second increments. To abort the run, push STOP; RUN COMPLETE will be displayed for five seconds and the lid latch will release.

### 4.4.5 *Timer/Lid Latch Interlock*

The timer is connected to the safety interlock, a latch in the lid that hooks under the front edge of the cabinet when the START button is pressed, and locks the lid down. 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, correct any problems with the interlock latch, 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.



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## 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 "SPEX SamplePrep" and "8000 Series 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. Tighten the clamp with the knob, and lock the clamp with the locking tab. Close the lid and fasten with the manual latch.

3. Program the timer setting as described in Section 4.5.3 **Setting the Timer** using the up/down buttons. The timer will retain a given setting as long as the power is left on; when power is turned off that setting is lost, and when the power is turned back on the timer setting will revert to 5:00.

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 5 second increments. When the run is over, the timer will display RUN COMPLETE for five seconds while the lid stays latched. Then the lid latch will disengage with an audible click, 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 5 seconds and the lid will stay latched. After 5 seconds the original timer setting will reappear and the lid 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 lid latch will not release. 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 5-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 on the back of the mill to 0.

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:*** ***Always wait five seconds after the mill shuts off for the lid to unlatch. During this time the timer will display RUN COMPLETE. Opening the lid prematurely can damage the latch.***



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## 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 metals (e.g. antimony), carbon, and other easily friable materials.

***NOTE*: *If the Mixer/Mill clamp swings wide and hits the motor when a plastic (lightweight) vial is used, it may be necessary to use the 8012 Adapter, which adds weight to the clamp and prevents extra-wide oscillation.***

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

Most 8000-series vials accept 3 to 10 ml of sample for grinding. A typical mixing load is up to 25 ml, or about 40% of the vial's volume.

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 handicaps: 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, 8007, and 8009 steel vials and the 8004 tungsten carbide vial: 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 is 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 be achieved by also running the Mixer/Mill in a glove box under inert gas.

Avoid grinding small loads (less than 3 grams) in brittle containers such as alumina, agate, zirconia, and silicon nitride. If there is not enough material to cushion the impact of the balls, they will generate excess contamination and can in extreme cases chip the container.

***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.***



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**5.1 Mixing and Grinding** (Cont'd)

Avoid grinding small loads (less than 3 grams) in brittle containers such as alumina, agate, zirconia, and silicon nitride. If there is not enough material to cushion the impact of the balls, they will generate excess contamination and can in extreme cases chip the container.

***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 hasten grinding in the strongest containers, the steel ones.

When using grinding containers with threaded aluminum caps (steel and tungsten carbide), be careful to keep the threads clean. 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 they are knocked out of round they can be very difficult to use.



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## 6.0 MAINTENANCE

The 8000M MIXER/MILL has been designed to provide trouble-free operation over a long period of time. To assure proper performance, perhaps the most important factor is overall cleanliness. Any spilled powders or liquids should be wiped up immediately with a damp cotton cloth. This should also be done occasionally after extended periods of use. This should minimize the buildup of any powders, mold/mildew, or unsightly gunk over the life of the unit. To maintain the exterior of the unit, first disconnect the 8000M MIXER/MILL, then an occasional spraying and wiping down with a mild window cleaner or similar product will be sufficient.

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

The threads of the clamp screw should be kept clean to avoid jamming. 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 regreased.

The 8000M 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 8000M Mixer/Mill is warranted against defects of materials and workmanship for one year 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 8000D Mixer/Mill, please contact our specialists by phone at 1-800 LAB-SPEX (522-7739) or 732-623-0465, or by e-mail at sampleprep@spexcsp.com



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## 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 of the 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 3. 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.

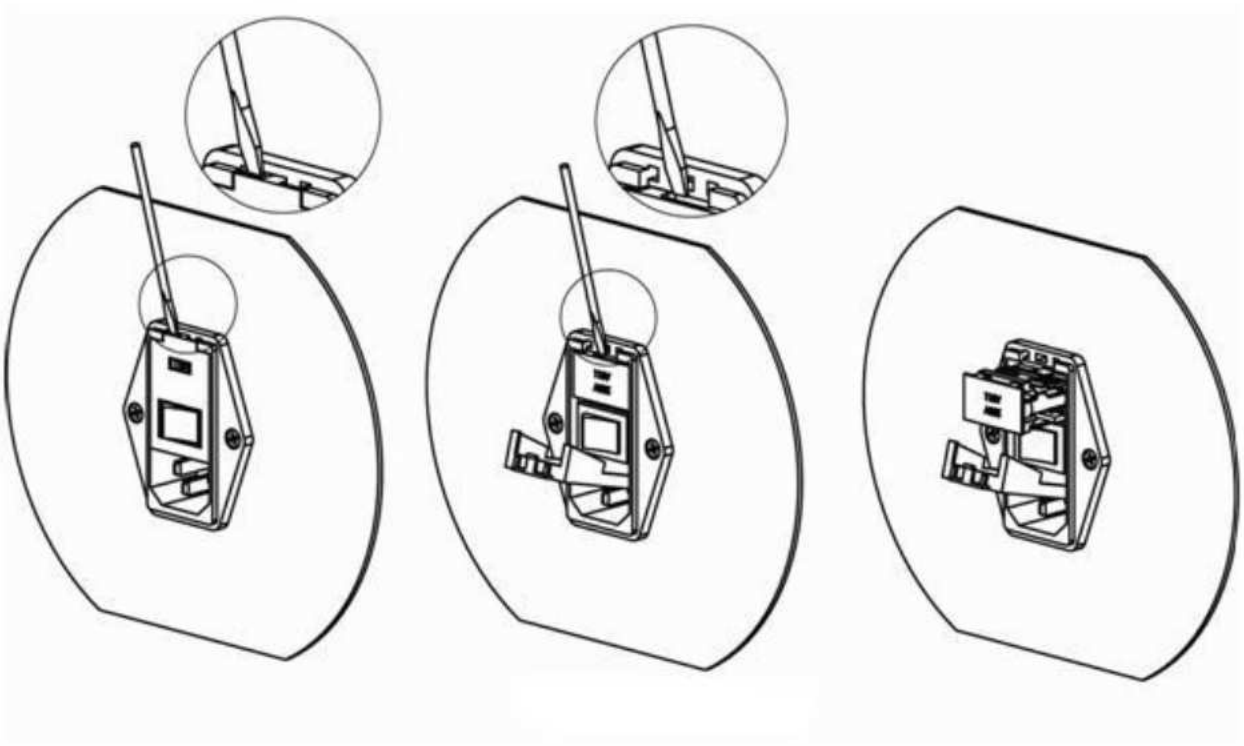


**Figure 3** – Fuse Compartment



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## 7.0 ACCESSORIES: GRINDING/MIXING VIALS

*(If not included in your order, these are available for purchase at additional cost.)*

**8001 Hardened Steel Vial Set**
Vial size 2 1/4 in. dia. x 3 in. Vial body and cap liner of hardened tool steel. Set includes screw-on cap with O-ring to allow wet or dry grinding/ mixing, two 1/2 in. and four 1/4 in. steel balls. Grinding load 3–10 ml; mixing load approx. 25 ml.



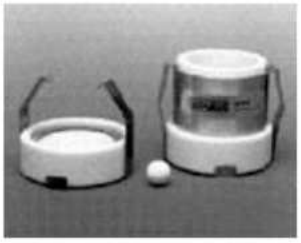
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**8003 Alumina Ceramic Vial Set**
For dry grinding/mixing. Vial size 2 1/4 in. diameter x 2 3/4 in. High purity 99.5% alumina ceramic vial body and two slip-on caps with one 1/2 in. ball; set includes eight corprene gaskets. Grinding load 2–8 ml; mixing load approximately 20 ml.



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**8015 Clamp for 8003**
Clamps permit slurry grinding in 8003 vials; sold in pairs. One pair required for each 8003.



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**8004 Tungsten Carbide Vial Set**
For wet or dry grinding/mixing. Vial size 2 1/4 in. diameter x 2 1/2 in. Tungsten carbide-lined body, two screw-on tungsten carbide-lined caps, two 7/16 in. tungsten carbide balls, eight corprene gaskets. Grinding load 3-10ml, mixing load approximately 25ml.



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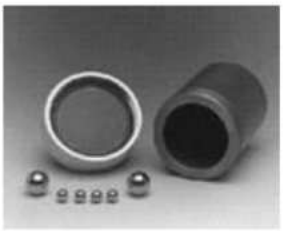
## 7.0 ACCESSORIES: GRINDING/MIXING VIALS (Cont'd)

**8005 Zirconia Ceramic Vial Set**
Vial size 2 1/2 in. diameter x 2 11/16 in. Solid zirconia ceramic vial, cap, and two 1/2 in. balls; seven corprene gaskets. Grinding load approximately 2-8ml; mixing load approximately 20ml.



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**8007 Stainless Steel Vial Set**
Vial size 2 1/4 in. diameter x 3 in. Vial body and cap liner made of hardened 440C stainless steel. Two 1/2 in. and four 1/4 in. stainless steel balls are included. Set includes screw-on cap with O-ring to permit wet or dry grinding/mixing. Grinding load 3–10 ml; mixing load approx. 25 ml.



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**8008 Silicon Nitride Vial Set**
Vial size 2 1/2 in. diameter x 2 11/16 in. solid silicon nitride vial, cap, and two 1/2 in. balls; seven corprene gaskets. Grinding load approximately 2-8ml; mixing load approximately 20ml.



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**8009 Round-Ended Hardened Steel Vial Set**
Vial size 2 3/8 in. diameter x 3 in. Hardened steel vial body has grinding chamber with rounded ends for more efficient grinding/mixing. Includes screw-on cap and O-ring for wet or dry use, two 1/2 in. and four 1/4 in. steel balls. Grinding load 3-10ml; mixing load approximately 25ml.



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## 7.0 ACCESSORIES: GRINDING/MIXING VIALS (Cont'd)

**8014 Agate Vial Set**
For dry grinding and mixing. Vial size 2 1/4 in. diameter x 2 3/4 in. All-agate vial body, two slip-on caps, two 1/2 in. agate balls, and eight corprene gaskets. Grinding load 3-8ml; mixing load approximately 20ml.



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**8006 Methacrylate Vial Set**
2 1/4 in. diameter x 2 5/8 in. Vial body of heavy-gauge methacrylate with methacrylate-lined aluminum screw-on cap. Set includes corprene gasket, two 8006A (1/2 in.) and four 3112 (3/8) in. plastic balls. Allows grinding of soft materials without metallic contamination.



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**3114 Stainless Steel Vial Set**
1/2 in. diameter x 1 in. long. Made of 303 stainless steel; includes slip-on cap and 1/4 in. steel ball; grinding load 0.2-0.6 ml, mixing load 1ml.



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**3117 Hardened Tool Steel Vial Set**
1/2 in. diameter x 1 in. long. Made of Worpliss tool steel. Includes slip-on cap and 1/4 in. steel ball. Grinding load 0.2-0.6ml, mixing load 1ml.



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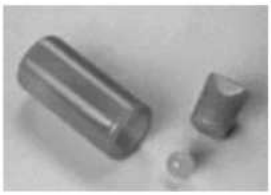
## 7.0 ACCESSORIES: GRINDING/MIXING VIALS (Cont'd)

**3127 Hardened Tool Steel Vial Set**
3/4 in. diameter x 1 7/8 in. long. Made of Worpliss tool steel; includes center cylinder with two slip-on caps and 1/4 in. steel ball. Grinding load 0.5-1.0ml, mixing load 2ml.



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**3118 Agate Vial Set**
Handmade from flawless Brazilian agate; must be run inside cushioned SPEX CertiPrep 6133 vial (included); includes stopper and 1/4 in. agate ball. Grinding load 0.2-0.6ml, mixing load 1 ml.



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**5004 Tungsten Carbide-Lined Steel Vial Set**
3/4 in. diameter x 2 1/8 in. long. Includes two slip-on Delrin caps with tungsten carbide inserts, six disposable methacrylate center cylinders, and two 5/16 in. tungsten carbide balls. Grinding load 0.5-1.5ml; mixing load 3ml.



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**6134 Plastic Vial**



**6135 Plastic Vial**



**8002 Plastic Vial**

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To Order any additional accessories,
call Customer Service at 800-522-7739 Ext. 465



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## 11.0 WARRANTY

SPEX SamplePrep LLC guarantees its products and new equipment 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 SPEX SamplePrep LLC 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 some parts.

The customer pays return freight for warranty claims. If the warranty claim is valid, SPEX will pay return freight to the customer. However, SPEX SamplePrep 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.

## 11.1 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 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.

## 11.2 To Arrange A Return Shipment

We want you to be happy with whatever you purchase from SPEX SamplePrep LLC. 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. 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 up to a maximum of $200.00.



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## 12.0 CONTACT US

Within the United States, write, telephone, or e-mail us at:

**SPEX SamplePrep LLC**
15 Liberty St.
Metuchen, New Jersey 08840

Tel.: 732-623-0465
Fax: 732-906-2492
Website: www.spexsampleprep.com
E-mail: sampleprep@spexcsp.com

In Europe, please contact our European Headquarters at:

**SPEX CertiPrep Ltd**
2 Dalston Gardens
Stanmore
Middlesex HA7 1BQ
United Kingdom

Tel: +44 (0) 208 204 6656
Fax: +44 (0) 208 204 6654
Website: www.spexcertiprep.co.uk

Outside the United States and Europe, contact the SPEX SamplePrep representative from whom you bought your equipment. A list of our current representatives is on our website, www.spexsampleprep.com.



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