



## OPERATING MANUAL

### GilSonic AutoSiever GA-6



08/06/2010

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# GilSonic AutoSiever

The speed and accuracy of sonic sieving coupled with microprocessor control make the AutoSiever the ultimate instrument for laboratory sieving as fine as 5µm.

## 1.0 INTRODUCTION

### 1.1 Sonic Sieving to 5µm with 3in Sieves

Useful Range with most Powders

- Wire-woven sieves from No.20 (850µm) to No.635 (20µm) or precision electroform nickel mesh 150µm to 5µm.
- Electroformed mesh sizes of 150µm and larger are available for ±2µm precision when needed.
- Larger wire-woven sieves from No.3-1/2 to No.20 are available for low density materials.

All sieves employ clear acrylic frames to allow viewing of the sieving process.

### 1.2 Unique Features

- Electronic controls give exact repeatability of programmed time and amplitude sequences.
- Amplitude may be set precisely with a digital LED 0-99 even-increment scale. Memory stores up to 10 programs with instant recall.
- Built-in vertical or alternating vertical and horizontal tapping helps clear sieves and deagglomerate samples.
- Large digital LED display and 8 LED mode indicators tell operator at a glance the mode or function in progress.

**NOTE:** Test times vary with size, density, texture, and quantity of samples. Five minutes is typical, but sieving time can be as little as 30 seconds under favorable conditions.

### 1.3 How It Works

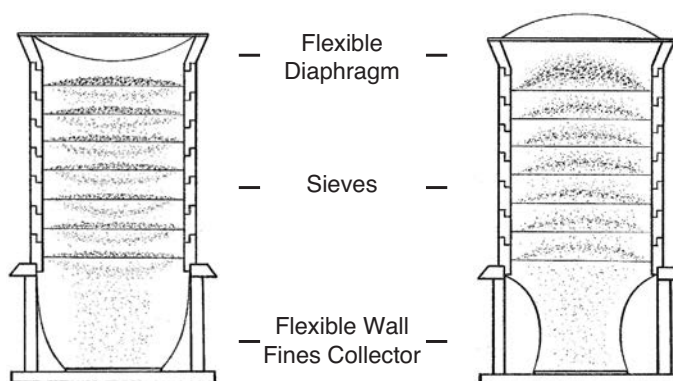
The AutoSiever is designed to automatically take full advantage of the unique capabilities of sonic sieving. Intensity of sieving action is varied by changing the amplitude of sonic pulses.

Sonic sieving uses a vertically oscillating air column to lift particles, then carry them back against mesh openings at 3,600 pulses per minute. Addition of tapping actions helps clear blinding of near-sized particles and assists in deagglomerating samples with electrostatic, hygroscopic, or other adhesion problems.

The AutoSiever's control panel and ten program memory help insure exact repeatability of sequences of time and vibration amplitude, plus user-selection of vertical and horizontal tapping. Desired maximum amplitude is determined in manual mode by viewing the action of the largest particles in each sample type.

Each program has timed segments for buildup to desired maximum amplitude (Time A), hold time at maximum (Time B), then down-ramp to zero (Time C). Amplitude is displayed on a 0-99 digital LED scale. Programs vary with sample types and particle size range. Once in memory, the test sequences can be rerun on demand to repeat testing of similar samples. All switch setting as well as time-amplitude sequences are stored for each of ten program memory slots where they are available for instant recall and use without resetting any controls.

**GA-6 Sonic Sieving Action**



**Figure 1.3**

## 2.0 SAFETY INSTRUCTIONS

You are responsible for the safe operation of this device, and maintaining this equipment in compliance with these instructions. You must read and completely understand these operating and safety instructions before using this machine.

**DANGER!** This machine operates on electric current. Improper operation could result in electric shock, electrocution, or an explosion.

1. The GA-6 AutoSiever is configured to operate on 115V/60Hz or 230V/50Hz power supplies, as noted in the assembly instructions. Make sure that the Voltage Selector Switch on the back of the unit is set to operate with the proper voltage supply. This unit is **NOT** explosion-proof.
2. **ALWAYS** check electrical wiring for loose connections and for pinched or frayed wiring.
3. **ALWAYS** use a properly configured three-pronged plug, as supplied with the unit. Connect the machine to a properly-wired, three-pronged receptacle. Make sure the cord is routed safely.
4. **ALWAYS** disconnect and lock-out power supply before performing maintenance and repairs.
5. **NEVER** operate this device without having all covers and case in place.
6. **ALWAYS** unplug or disconnect machine from the power source when the unit is not in operation.

## 3.0 UNCRATING & SETUP

After inspecting the shipment for external damage, immediately unpack the GilSonic AutoSiever and inspect for concealed shipping damage. Report damage immediately to the shipping company. Retain all shipping records and packing materials until proper operation is confirmed.

Place the GilSonic AutoSiever on a stable, level surface at a convenient working height.

To access the Sieving Chamber (see Figure 3.0), lift the sliding door and lock the Sieve Stack Assembly (see Figure 5.1) by pulling down on the Sieve Stack Locking Bars until they snap onto the top ring of the Fines Collector Holder. Pull the Assembly out to remove it from the AutoSiever. The Diaphragm and Fines Collector are part of the Sieve Stack Assembly, but are packaged separately for shipping.

On the back of the AutoSiever, find the Voltage Selector and insure it is set to match the voltage of your power supply as shown in Figure 3.1. The 110V and 220V settings will work with either 50Hz or 60Hz electrical supplies. Connect the supplied 3-wire grounded power cord to the back of the AutoSiever and plug into a grounded electrical outlet.

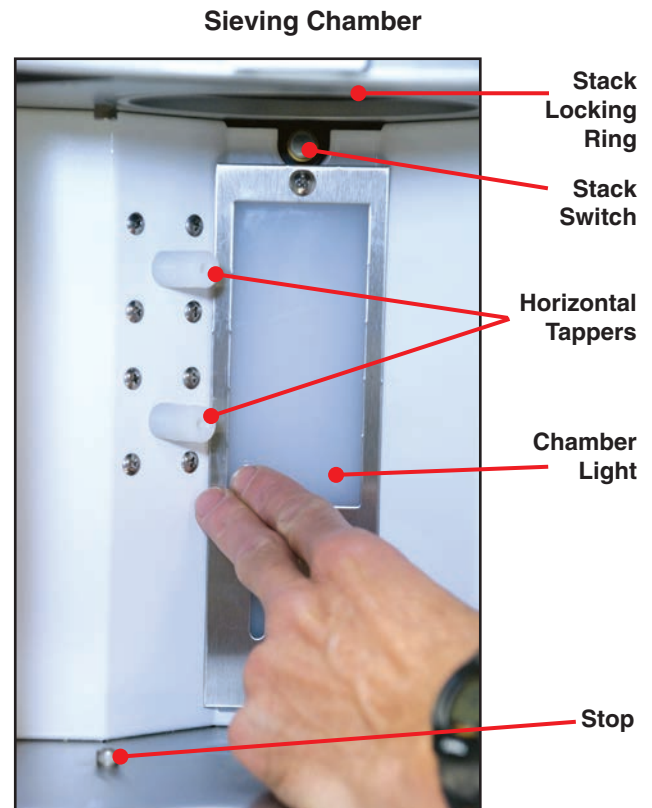


Figure 3.0

## 4.0 CONTROL & DISPLAY FUNCTIONS

### 4.1 Programmable Control Keypad

See Figure 4.0 for a diagram of the AutoSiever control panel.

#### RUN/STOP

The Run/Stop button starts and stops the sieving action. The "Run" LED light is on when the AutoSiever is running. The "Stop" is pressed during a sequence, the AutoSiever will abort the test. If "Start" is pressed again, another sequence will be initiated from the beginning.

#### MAN/AUTO

This function selects manual or automatic modes of operation for the AutoSiever. The Manual mode is generally used when determining proper time and amplitude settings for particular samples. The Auto mode is used when inputting data in programs or selecting programs from memory.

#### PAUSE/RES

The Pause/Resume function interrupts the progress of a sieving sequence. The "Pause" LED light is lit when this function is activated. When paused, remaining time and sequence position will be indicated on the display and program LED's. Press the Pause/Resume button a second time to resume operation.

#### PGM

The Program function is used to enter amplitude and phase times. The button is pressed to accept the displayed value and advance to the next entry. This function is also used to review saved values in an existing program.

#### REC/↑ AND SAVE/↓

The Recall and Save functions are used to store or recall programs from any of the ten memory locations coded 0 through 9. The buttons are enabled when programming in the "Auto" mode. The up and down arrow functions are used for setting time and amplitude values and are enabled in the "Manual" mode.

### 4.2 Tapping Action Control Buttons

Horizontal and vertical tapping assists in particle separation and freeing lodged, near-size particles from blinded openings:

#### Off

This disables all tapping. Pressing this will make Sieving action of the unit solely dependent on sonic energy.

#### ↑

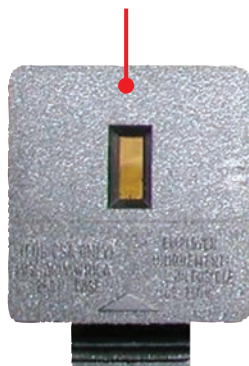
This button activates vertical tapping. The platform of the Sieving Chamber is struck from underneath, elevating and reorienting particles to the sieve cloth during the sieving sequence.

#### ↑/→

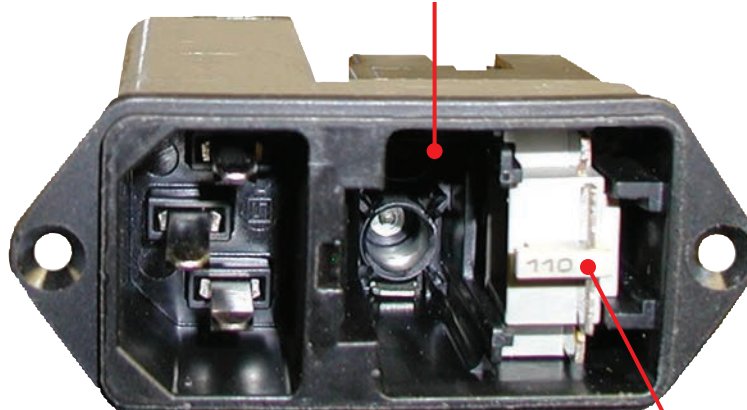
This button engages both horizontal and vertical tapping. The two horizontal tappers can be seen in the rear of the sieving chamber on the left-hand side. Use of both Vertical and horizontal tapping assures maximum movement of hard to separate material.

### Fuse & Voltage Selector Block

Remove panel and set aside.



Remove fuses.



Voltage selector setup for 110V operation. To change to 220V, pull out, turn 180° and insert with "220" showing.

Figure 3.1

### 4.3 Test Phase Indicator Lights

#### Time A

This phase begins the test sequence and determines the time in which amplitude is increased from 0 to the programmed setting. Gradual increase of amplitude allows samples with large amounts of fines, low density or electrostatic tendencies to gently separate before more severe action generates static buildup and causes particles to agglomerate.

#### Time B

This phase determines the time that the test will be run at the programmed maximum amplitude setting. Most of the testing time will be in this phase.

#### Time C

This is the duration needed for the amplitude to decline from maximum to zero. Each sieve size has an optimum separation amplitude that decreases with particle size. The gradual decrease at the end of the test serves to clean up separation of near-sized particles on each sieve.

#### Max. Amplitude

This LED is on at any time the programmed maximum amplitude setting is active.

### 4.4 Operating Mode Indicator Lights

#### Run

This LED is active whenever the AutoSiever is in operation.

#### Pause

This LED is lit when the "PAUSE/RES" button is pressed. In this mode, the test in progress is interrupted, but the time and amplitude settings are saved. When the button is pressed again, the test sequence resumes. This LED is also lit when the stack assembly is removed during a run.

#### Auto

The Auto LED is lit when programming, saving programs or testing with a saved program.

#### Manual

The Manual LED is lit when establishing amplitude levels and sequencing for materials.

The LED Digital display shows all of the settings and values needed when programming and using the AutoSiever. When numerical values are entered, they appear in the space for the right-hand digit and "push" any digit currently displayed to the left. It may be necessary to enter a series of zeroes if you want to start from a "clear" display.

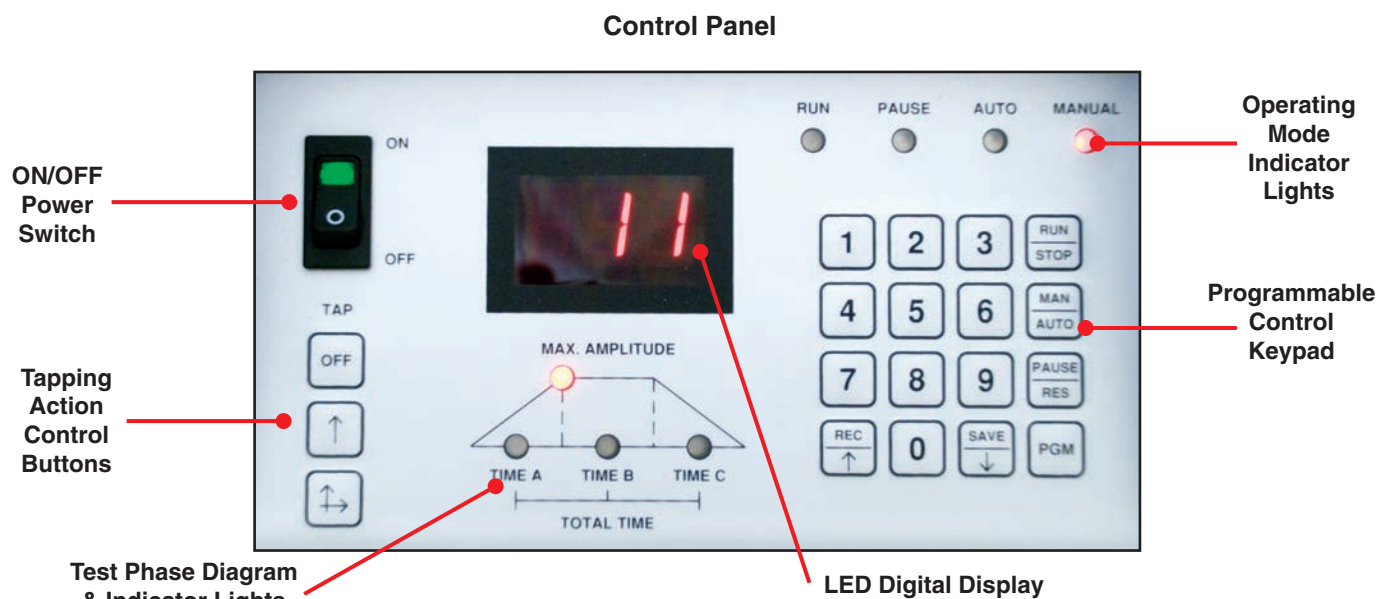
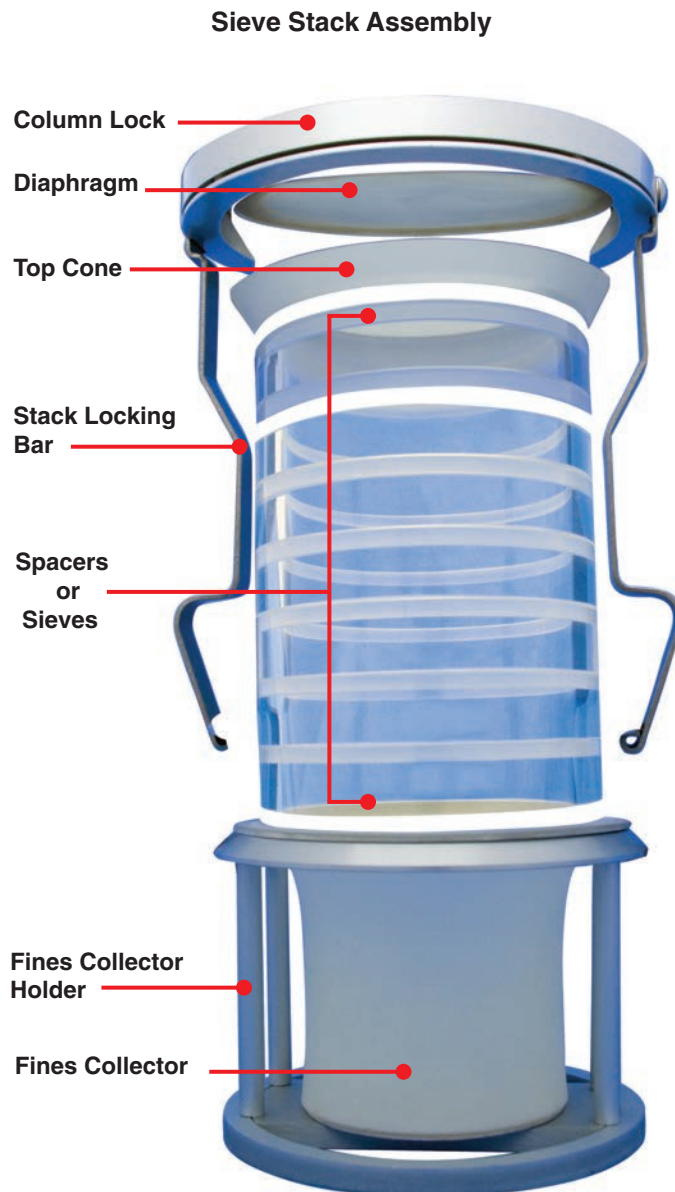


Figure 4.0

## 5.0 PREPARING THE SIEVE STACK ASSEMBLY

**PLEASE NOTE:** Using brands of sieves, fines collectors and/or diaphragms other than Gilson may void the warranty.



**Figure 5.1**

- A. Select desired sieves for testing. Capacity of Sieve Stack Assembly (Figure 5.1) is seven standard sieves or three precision sieves. When using fewer sieves, spacers must be added to maintain correct height of Sieve Stack Assembly. Mixing of wire-woven and precision sieves in the same stack is not recommended.

**CAUTION:** Sieve stack capacity is one when using precision sieves with openings of 10mm or less. Fine sieve openings may impede airflow enough to damage sieves.

- B. On a balance sensitive to at least 0.01 gram, determine and record the tare mass of parts that will contact the sample during testing:
- Diaphragm
  - Top Cone
  - Each Sieve
  - Each Spacer
  - Fines Collector
- C. Place the Fines Collector into the Fines Collector Holder. The top ring of the Collector should nest in the recess in the top ring of the Holder. Attach the Collector by inserting the keyhole slot in the Collector disc under the screw head in the Holder.
- D. Nest the stack of sieves to be used, finest at the bottom, coarsest on top, with spacers as necessary to maintain correct stack height. Fit the stack onto the top of the Fines Collector.

**NOTE:** Stacking the sieves with the labels facing to the side will allow unobstructed viewing of the material during sieving operations.

- E. Carefully deposit the sample into the top sieve. Insert the small end of the Top Cone into the top sieve and place the Diaphragm on top with the metal ring facing down.

**NOTE:** There are two issues to consider involving quantity of sample to be tested. The first is physical load on the sieve cloth. The Fine sieves in both woven-wire and electroform versions are quite delicate. Excessive mass on the cloth dramatically shortens the useful life of the sieve. Additionally, excessive volume can restrict free movement of the air column created by sonic energy in the AutoSiever. This also creates excessive loads on the sieve cloth and may result in damage to the sieves. Generally, following the guidelines below for effective separation will prevent most problems from overloading. If your material has especially high or low bulk density, you should discuss your application with a Gilson Technical Support representative.

The second issue is optimum sample quantity for effective separation. This is dependant upon powder density, sieve sizes to be used and sample load on each sieve at completion of sieving. For proper separation, there should be no more than a thin layer of sample on any one sieve when the test is complete.

Maximum sample quantity for woven-wire sieves 38mm (No. 400) or larger is 20g or 7cc. For finer woven-wire sieves, 10g or 4cc is the maximum. For precision sieving with electroformed sieves, a one gram sample is typical and 5 grams or 5cc is maximum.

- F. Place the Column Lock over the Diaphragm and press down until the Stack Locking Bars snap onto the top ring of the Fines Collector Holder.
- G. Insert the Sieve Stack Assembly into the sieving chamber of the AutoSiever until it rests against the stops on the platform. Release the Sieve Stack Locking Bars by inserting a thumb and forefinger inside the bars at the bottom of the stack and forcing them outward (see Figure 5.2). When released, the assembly will rise upward and the Column Lock should fit into the Stack Locking Ring in the top of the sieving chamber, securing the stack in place. Check that the Stack Assembly is secured by gently pulling outward.

**NOTE:** When properly secured, the Stack Switch is depressed and will enable normal operation. If not secured, the AutoSiever will go into Pause mode and the unit will not operate.

## 6.0 ESTABLISHING TEST SEQUENCES

For each type of material tested, a sequence should be established that most effectively processes the particular material type. This assures the highest degree of accuracy and repeatability from the AutoSiever and enables subsequent samples of similar materials to be processed efficiently using custom-programmed sequences.

- Prepare a sample of material to be tested, place it in the sieve stack and put together the Sieve Stack Assembly as discussed in Section 5.0.
- Insert the assembly into the Sieving Chamber and release the Sieve Stack Locking Bars as noted in Section 5.0 G.
- Turn the AutoSiever power switch on and check that the Manual mode LED is lit. If not, set it for Manual operation by pressing the MAN/AUTO button.

### Sieve Stack Releasing with Thumb & Finger



Figure 5.2



## 6.1 Setting Maximum Amplitude

- A. Using the REC/↑ and SAVE/↓ arrow keys, adjust the amplitude level to an initial low number, such as 5, and press the Run/Stop button to start.
- F. Press PGM to accept the displayed value. The setting will be stored and the Max. Amplitude LED will begin to blink.

**CAUTION:** The Electroformed cloth in Precision Sieves is especially delicate and may be destroyed if the amplitude setting is too high. While it is impossible to state an exact maximum value, an amplitude setting of 25 or more for sieves of 20µm or less should be approached incrementally. Coarser Electroformed sieves will be more robust, as will most wire-woven sieves, but it is still possible to damage them with excessively high settings or prolonged run-times. If you are unable to achieve satisfactory separations in 15 minutes or less at amplitude settings under 50, please consult a Technical Support representative at Gilson. Attempting higher settings may void the warranty.

- B. Gradually increase the amplitude until sample material on the top sieve flows smoothly in a gentle fluid action. Note the final number on the display for later programming as the maximum amplitude value.

- G. Enter the maximum amplitude setting as determined in manual mode above and press PGM. The value will be stored and the Time B LED will start blinking.
- H. Continue entering and storing values for Time B and Time C phases. After a value for Time C is entered and stored, the total time for the test (A+B+C) will be displayed.
- I. Select one of the three Tapping Action buttons to program tapping during operation.

**NOTE:** For most materials, operation with both horizontal and vertical tapping (↑/→) insures the best separation. Some problem materials may respond best using only vertical tapping or none at all.

- J. To execute the entered program one time, simply press the Run/STOP button. The AutoSiever will run the sequence and stop automatically at completion.

## 6.2 Establishing Phase Times

Phase times require experimentation to find the best values, but the settings below are generally a good starting point:

- Time "A" (Ramp-up) 0.5 minutes
- Time "B" (Time at Max. Amplitude) 5.0 minutes
- Time "C" (Cleanup) 0.3 minutes

- C. Press MAN/AUTO to return the unit to automatic operation.

- D. Press PGM until the Time A indicator LED is blinking.

- E. Use the keypad to enter the time for the amplitude to ramp up from 0 to the established maximum setting. A default value of 0.1 is already programmed.

**NOTE:** After running through a test cycle at these initial settings, the individual fractions can be weighed, then tested again for an additional minute at the previously determined amplitude setting. If the amount passing a given sieve increases less than about 1%, then the original settings are adequate. If there is more than an additional 1% passing, the process of increasing test times in one-minute increments should be continued. If the material being tested is exceptionally dense or lightweight, prone to agglomerate or gather static charges, time and amplitude settings may have to be increased. (See Caution note in Section 6.1 A.)

- K. To store the entered program into memory, press SAVE and enter a number from 0 to 9 for the memory location.

**NOTE:** Time is displayed in 0.1 minute (6 second) increments. 1 minute, 18 seconds would be displayed as 1.3. Digits entered appear in the right-hand space of the display and "push" other digits to the left. When entering new values, it may be necessary to enter 0's until the display is cleared.

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## 7.0 PERFORMING A TEST

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- A. To perform a test with the AutoSiever, start by following the steps in Section 5.0, Preparing the Sieve Stack Assembly. Place the Stack Assembly with the sample into the unit and close the door.
- B. Turn the power switch on and either enter amplitude and phase time values as described in Section 6.2 C through J, or select a previously stored program from one of the ten memory locations by pressing REC/↑ and the memory location.
- C. Press the RUN/STOP button to initiate the test. The AutoSiever will execute the program and automatically stop at completion.
- D. Remove and disassemble the stack assembly and weigh the individual sieves with the separated fractions. Subtract the tare weights of the individual sieves to determine fraction weights.
- E. Total sample weight can be determined by adding the fraction weights to the weight of the fines on the tared Fines Collector, Top Diaphragm, Top Cone and Spacers and subtracting the tare weight of the components.



### Standard & Precision Sieves

- Do not expose to radiant heat or attempt to dry in a conventional or microwave oven.
- When dry, store Precision Sieves in their plastic jewel cases until ready for next use.
- Never touch the mesh of Precision Sieves with the fingers. Acids and oils on the skin will quickly discolor and corrode the mesh.

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## 8.0 CARE & HANDLING OF SIEVES

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### 8.1 Precision Sieves

Gilson Precision Sieves are made of unsupported electroformed nickel mesh for the maximum open area. Sieves with support grid are also available. These sieves are delicate testing instruments and must be handled with care.

- When testing with sieves of 10 $\mu$ m or less, **use only one sieve at a time** in the sieve stack assembly. Using more may impede air flow and result in damage or poor separations.
- Never exceed a sample weight of 5g or volume of 5 cc when using Precision Sieves.
- For cleaning, use an Ultrasonic Cleaner of 150 watts or less with water temperature between 70° and 90°F (21° to 32°C). Place sieves in on edge for 30 seconds to one minute, then remove and allow to air-dry. **Do NOT brush or use compressed air to clean precision sieves!**

### 8.2 Standard Sieves

Sieves with woven-wire mesh are generally more robust than Precision Sieves, but must still be handled with care to maintain their effectiveness as testing instruments.

- Do not subject sieves to temperatures higher than 120°F (49°C).
- Coarser sieves may be gently brushed to clean; finer sieves should be immersed in an ultrasonic cleaner as noted above.
- Do not use compressed air to clean sieves.

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## 9.0 MONITORING PERFORMANCE

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While it is not practical to attempt to “calibrate” the AutoSiever device itself, performance of the unit as related to particle separation can be monitored. Tracking ongoing performance and repeatability can be an important part of a QC/QA program and should be done periodically for any testing device.

At a minimum, an appropriately sized reference material will be needed. Gilson offers Whitehouse Sieve Standards, which are single-use vials of glass beads for use on individual sieves. We also have Standard Reference Materials supplied directly from NIST or BCR (European Community Bureau of Reference), designed to cover a range of sizes. These materials are intended for use to monitor average size openings on sieves, but will also reflect the repeatability of an individual AutoSiever unit over time.

For the most meaningful results, the reference material should be tested on a master sieve or set of sieves and sieve stack assembly that is set aside only for this purpose. AutoSiever controller settings must be the same for each performance check. If significant variations are found, adjustment of amplitude or time settings or changing the diaphragms may reconcile the results. If these adjustments do not help, it may be a sign of more complex problems. Gilson may be consulted at any time to assist with diagnosis.

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## 10.0 MAINTENANCE & REPAIR

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### 10.1 General Repairs

Simple replacement of speakers, lamps and fuses are easily accomplished by following the instructions below. More complex diagnosis and repair should be performed in cooperation with Gilson personnel or by returning the unit to Gilson.

**WARNING!** Always disconnect the unit from its power supply before attempting any maintenance, adjustment or repair procedure.

### 10.2 Speaker Replacement

- A. Disconnect power by unplugging and removing the power cord from the rear of the unit.
- B. Remove the 7 Phillips-head screws on the top of the unit and remove the case top and handle.
- C. Note orientation of the speaker and remove the two lugged wires from the terminals.
- D. Remove the 4 slotted screws holding the speaker in place and remove the speaker from the case.
- E. Install the replacement speaker in correct orientation.
- F. Reinstall the 4 slotted screws and tighten snugly.

- G. Gently attach lugged speaker wires, taking care not to bend terminals.
- H. Replace top and handle and reinstall the 7 Phillips-head screws. Tighten snugly.
- I. Replace power cord in rear of unit.

### 10.3 Fuse Replacement

- A. Disconnect power by unplugging and removing the power cord from the rear of the unit.
- B. The fuse holder is contained in the power receptacle at the rear of the unit. The fuse holder is a small “drawer” at the bottom of the receptacle, which may be opened with a fingernail or small screwdriver. The fuse holder can then be pulled out.
- C. There are two fuses in the holder. The one closest to the cabinet is the functional unit. The fuse to the outside is a spare.
- D. Test the fuse for continuity with an ohmmeter. If no continuity, replace with the spare fuse.
- E. Push the fuse holder back in until it latches.
- F. Replace the power cord.

### 10.4 Lamp Replacement

- A. Disconnect power by unplugging and removing the power cord from the rear of the unit.
- B. Open the Sieving Chamber door and remove the Sieve Stack, if necessary.
- C. Remove the two Phillips-head screws securing the stainless steel diffuser bezel.
- D. Remove the bezel and diffuser lens.
- E. Carefully pull straight up on the lamp to remove.
- F. Insert replacement lamp, pushing gently down into place to seat.
- G. Replace bezel and diffuser and reinstall the two Phillips-head screws.
- H. Replace the power cord.

## 11.0 APPENDIX: ADDITIONAL INFORMATION

AUTOSIEVER SIEVES (Acrylic Frames, Mesh as Indicated)		
Standard Sieves with stainless steel mesh in US Standard sizes		
Mesh Size	Size (mm/μm)	Model
No.3-1/2	5.60mm	GAA-20
No.4	4.75mm	GAA-21
No.5	4.00mm	GAA-22
No.6	3.35mm	GAA-23
No.7	2.80mm	GAA-24
No.8	2.36mm	GAA-25
No.10	2.00mm	GAA-26
No.12	1.70mm	GAA-27
No.14	1.40mm	GAA-28
No.16	1.18mm	GAA-29
No.18	1.00mm	GAA-30
No.20	850μm	GAA-31
No.25	710μm	GAA-32
No.30	600μm	GAA-33
No.35	500μm	GAA-34
No.40	425μm	GAA-35
No.45	355μm	GAA-36
No.50	300μm	GAA-37
No.60	250μm	GAA-38
No.70	212μm	GAA-39
No.80	180μm	GAA-40
No.100	150μm	GAA-41
No.120	125μm	GAA-42
No.140	106μm	GAA-43
No.170	90μm	GAA-44
No.200	75μm	GAA-45
No.230	63μm	GAA-46
No.270	53μm	GAA-47
No.325	45μm	GAA-48
No.400	38μm	GAA-49
No.450	32μm	GAA-50
No.500	25μm	GAA-51
No.635	20μm	GAA-52

PRECISION ELECTROFORMED SIEVES		
With unsupported electroformed nickel mesh in lines per inch (LPI)		
μm	LPI	Model
150	110	GAA-62
125	125	GAA-63
106	125	GAA-63A
105	150	GAA-64
100	150	GAA-65
95	150	GAA-66
90	150	GAA-67
85	150	GAA-68
80	150	GAA-69
75	150	GAA-70
70	181	GAA-71
65	181	GAA-72
63	181	GAA-72A
60	181	GAA-73
55	250	GAA-74
53	250	GAA-74A
50	250	GAA-75
45	250	GAA-76
40	300	GAA-77
38	300	GAA-77A
35	300	GAA-78
32	300	GAA-78A
30	300	GAA-79
25	400	GAA-80
20	400	GAA-81
15	400	GAA-82
10	500	GAA-83
5	500	GAA-84

GilSonic AutoSiever Specifications	
<b>Program Memory:</b>	10 Programs
<b>LED Digital Indicator:</b>	3 digits, 5/8in high
<b>Timing Range:</b>	0-99.9 minutes
<b>Amplitude:</b>	0-99 linear scale
<b>Sonic Pulsing:</b>	3600 pulses/min. at 50/60Hz
<b>Electromechanical Tapping:</b>	Switch selectable
<b>Sieve Capacity:</b>	7 Standard sieves 3 Precision sieves
<b>Cabinet:</b>	Steel, baked painted finish, light, sliding acrylic door
<b>Electrical:</b>	230/115V selectable; 40 Watts max.
<b>Memory:</b>	Nonvolatile RAM
<b>Dimensions:</b>	10x10x20in WxDxH (254x254x508mm)
<b>Net Weight:</b>	37lb (16.8kg)

GILSONIC AUTOSIEVER	
	Model
GilSonic AutoSiever, 115/230V, (specify) 50/60Hz	GA-6
<b>Accessories*</b> (See Figure 12.0) Complete Sieve Stack Assembly, with column lock, diaphragm, top cone, fines collector, collector holder & 7 spacers	GAA-2
Column Lock	GAA-85
Diaphragm	GAA-3
Top Cone	GAA-87
Standard Acrylic Spacer	GAA-88
Fines Collector	GAA-4
Fines Collector Holder	GAA-89

\*Order sieves separately.

## 12.0 REPLACEMENT PARTS

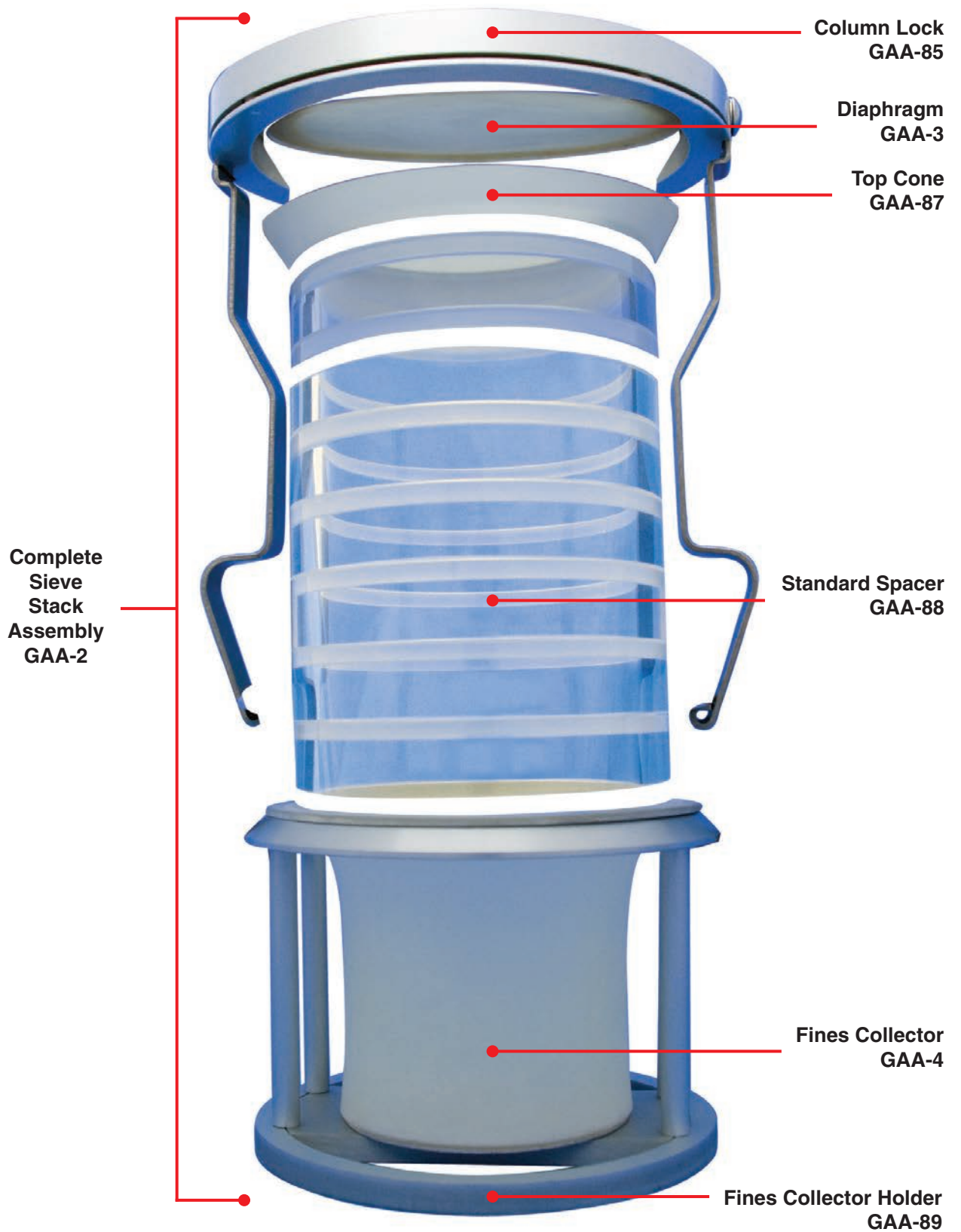


Figure 12.0