



Environmental Analysis Program

Pomona College
Biogeochemistry Laboratory

SOP-L104

Using a Vortex Mixer

Standard Operating Procedure

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1. Purpose

This procedure describes the operation and care of vortex mixers used in the EA Program laboratory. Vortex mixers produce a rapid orbital or oscillating motion that creates a vortex inside a tube or small container, providing fast and thorough mixing of liquids, suspensions, and reagents. They are used routinely in DNA extraction ([SOP-L700](#)), Qubit sample preparation ([SOP-L213](#)), chemical extractions, and general reagent mixing.

2. Scope

- **Applies to:** All vortex mixers in the EA Program laboratory, including the Fisher Scientific vortex mixers (SGM 134, qty 3) and the Vortex-Genie 2 (SGM 133)
- **Does not apply to:** Orbital shakers (for extended, gentle agitation of multiple samples); magnetic stir plates; sonicators (see [SOP-L115](#))
- **Location:** SGM 133 and SGM 134

3. Responsibilities

Role	Responsibility
Lab PI	Approve SOP
Lab Manager	Maintain equipment, replace cup attachments
Trained Personnel	Operate the vortex mixer per this SOP
New Students	Complete training before independent use

4. Definitions

- **Continuous mode:** A vortex mixer operating mode in which the platform spins continuously when the power switch is on; used when mixing many tubes in sequence without holding each one.
- **Touch mode:** A vortex mixer operating mode in which the platform spins only when downward pressure is applied to the platform; allows the user to control mixing duration for each tube individually.
- **Vortex:** A spiral or whirling motion of liquid produced when a tube's closed end is pressed off-center against a spinning platform; efficient for resuspending pellets, dissolving solids, and homogenizing small volumes.
- **Vortex mixer (Vortex-Genie):** A benchtop mixer with an eccentric rotating cup or platform that creates a vortex in tubes pressed against it; operated at variable speeds (typically 0–3,200 rpm).

5. Safety and Hazards



Hazards

- **Aerosol generation:** Vortexing uncapped or loosely capped tubes can spray liquid and generate aerosols. Always cap tubes securely before vortexing. If the sample contains hazardous biological or chemical material, vortex inside a fume hood or biological safety cabinet.
- **Tube ejection:** At high speed, improperly held tubes can slip from the cup head and be thrown from the mixer. Hold tubes firmly against the cup or use the hands-free cup attachment.

- **Breakage:** Thin-walled glass tubes may shatter under vigorous vortexing. Use polypropylene or thick-walled borosilicate tubes whenever possible.
- **Entanglement:** Keep hands, hair, jewelry, and loose clothing away from the spinning cup head.
- **Electrical:** Do not operate the mixer with a damaged power cord or loose components. Inspect the cord before use; report damage to the lab manager.

5.1. Required PPE

- ☐ Safety glasses
- ☐ Nitrile gloves (standard lab PPE)
- ☐ Lab coat

6. Equipment

Item	Location	Notes
Fisher Scientific vortex mixer	SGM 134	Qty 3; touch or continuous mode
Vortex-Genie 2 (Scientific Industries)	SGM 133	Variable speed; touch or continuous mode
Cup head (standard)	Attached	For single tubes (1.5 mL to 50 mL)
Flat head or platform head (optional)	SGM 134	For microplates or multiple small tubes held in a rack

7. Procedure

7.1. Pre-Use Inspection

1. Verify the vortex mixer is clean and free from visible damage
2. Ensure the power cord is intact and properly connected
3. Check that the rubber cup head or attachment is securely installed and not cracked or deformed

7.2. Setup

1. Verify that the vortex mixer is on a stable, flat bench surface and that the rubber feet are intact (prevents the unit from walking during operation)
2. Confirm that the appropriate head is installed:
 - **Cup head:** for individual tubes (microcentrifuge tubes, 15 mL and 50 mL centrifuge tubes, glass test tubes)
 - **Platform head:** for microplates or tube racks (if available)

3. Set the speed dial to the desired setting. For most routine mixing, a medium speed (setting 5–7 on the Vortex-Genie 2 dial) is sufficient. Use lower speeds for gentle mixing and higher speeds for vigorous vortexing (e.g., bead disruption steps in DNA extraction).

7.3. Operation – Touch Mode

Touch mode is the default for most applications. The mixer runs only while the tube is pressed against the cup head.

1. Cap the tube securely
2. Hold the tube at a slight angle (approximately 15–30 degrees from vertical) and press the bottom of the tube firmly into the center of the cup head
3. The motor engages automatically. A visible vortex should form in the liquid.
4. Vortex for the duration specified in the analytical SOP (typically 2–5 seconds for brief mixing, 10–30 seconds for thorough resuspension)
5. Release the tube from the cup to stop

7.4. Operation – Continuous Mode

Use continuous mode for hands-free operation or when extended vortexing is required.

1. Switch the mode selector to **Continuous** (or **On**)
2. Adjust the speed dial to the desired setting
3. Place the capped tube in the cup head or in a tube holder secured to the platform head
4. The motor runs continuously at the set speed
5. After the prescribed duration, switch back to **Touch** mode or turn off the unit
6. Remove the tube

7.5. Vortexing Multiple Tubes

For rapid sequential vortexing of many tubes (e.g., a rack of Qubit assay tubes):

1. Set the mixer to touch mode at the desired speed
2. Work through the rack systematically, pressing each tube against the cup for 2–3 seconds
3. Return each tube to the rack before picking up the next

For simultaneous vortexing of a plate or rack, attach the platform head and secure the plate or rack with the provided clamp or tape. Run in continuous mode for the prescribed duration.

7.6. Special Applications

Application	Speed Setting	Duration	Notes
Brief reagent mixing	Medium (5–7)	2–5 s	Touch mode; just to mix

Application	Speed Setting	Duration	Notes
Qubit assay tube mixing (L213)	Medium (5–7)	2–3 s	Brief vortex after adding sample to working solution
DNA extraction bead disruption (L700)	Maximum (10)	Per kit protocol (often 10 min on adapter)	Use continuous mode with horizontal adapter if available
Resuspending pellets after centrifugation	High (8–10)	10–30 s	Until pellet is fully resuspended
Mixing soil extracts (L403, L409)	Medium (5–7)	5–10 s	Ensure homogeneous suspension before filtering

8. Maintenance

Task	Frequency
Wipe the cup head and body with 70% ethanol	After each use session
For eDNA/PCR work: wipe with 10% bleach, then ethanol	After each use session
Check rubber feet for wear	Monthly
Inspect cup head for cracks or deformation	Monthly
Replace cup head	When cracked or deformed

Note

If liquid spills into the cup head or body of the mixer, unplug the unit immediately, wipe up the spill, and allow to dry completely before re-use. Liquid inside the motor housing can cause electrical failure.

9. Waste Disposal

No waste is generated by the vortex mixer itself. Dispose of sample waste per the relevant analytical SOP and [SOP-L006 Waste Disposal](#).

10. References

- Scientific Industries. *Vortex-Genie 2 Instruction Manual*. Scientific Industries, Bohemia, NY.

11. Related SOPs

SOP	Title	Relationship
L115	Sonicator	Alternative mixing/disruption
L213	Qubit Fluorometer	Sample preparation requires vortexing
L403	KCl Extraction	Extract mixing
L700	DNA Extraction	Bead disruption step

##Training Record

Before using the vortex mixer independently, personnel must:

1. Read this SOP in full
2. Demonstrate proper tube holding technique in touch mode (cap secured, slight angle, firm contact with cup)
3. Demonstrate switching between touch and continuous mode
4. Be signed off by the PI or lab manager

12. Appendix A: Troubleshooting

Symptom	Probable Cause	Corrective Action
Mixer does not start	Power disconnected or cord damaged	Check power supply; inspect cord; try another outlet
Excessive vibration or walking	Unit on uneven surface; rubber feet worn	Reposition on a flat surface; replace rubber feet
Poor or incomplete mixing	Speed too low; tube not centered on cup	Increase speed; press tube firmly into center of cup
Sample leakage during vortexing	Tube cap not secured; tube overfilled	Cap tightly; reduce fill volume to leave headspace
Abnormal noise or grinding	Cup head loose or damaged; internal bearing wear	Tighten or replace cup head; report to lab manager for service
Liquid entered motor housing	Spill from uncapped tube	Unplug immediately; wipe and dry thoroughly; do not use until fully dry