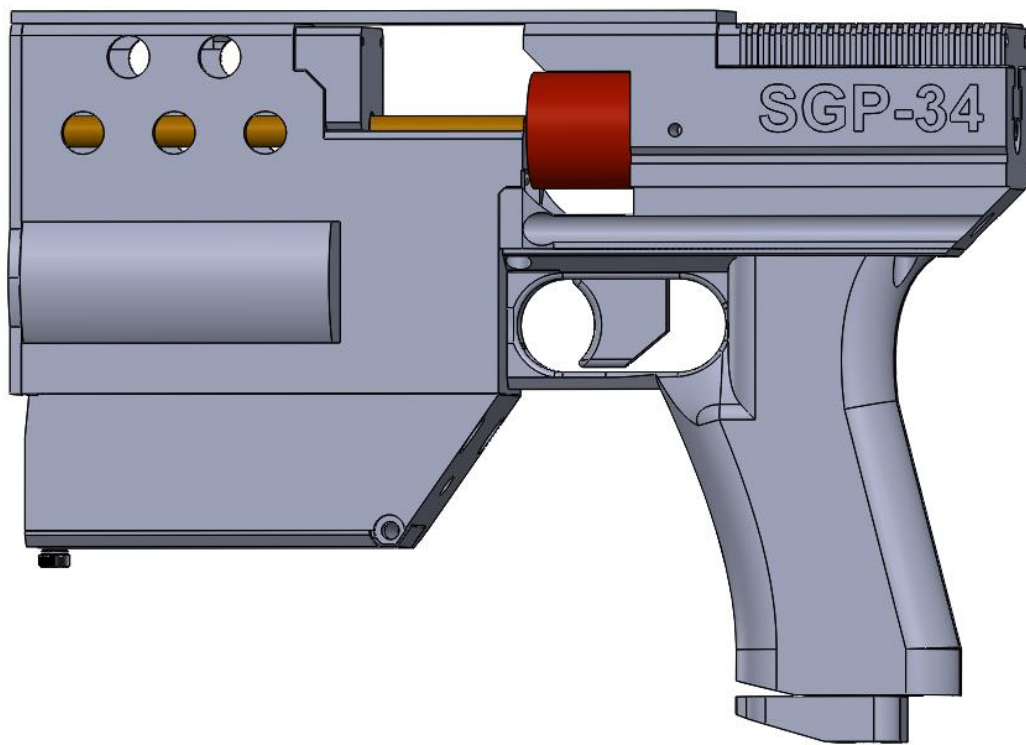


SGP-34

Single Stage SCR Coilgun

User Manual



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1. Introduction

The Arcflash Labs SGP-34 (Solenoid Gauss Pistol – Model 34) is a single stage, SCR switched, high voltage capacitor driven, slide-action coilgun.

It is a single stage design with TTL operation and no microcontroller components. The charging of the capacitor is activated by powering on the unit and discharging is initiated through the SCR and coil upon a trigger pull, or through a high wattage bleeder resistor when the power is shut down. The capacitor will remain energized for approximately 10 seconds after the power is removed.

The SGP-34 is configured to ONLY fire 0.25x0.75" steel projectiles (dowel pins). Arcflash Labs recommends the use of 2575 Magnetic Armatures (sold separately) but any 0.25x0.75" steel dowel pin should work.

The SGP-34 is shipped standard with a CFS (constant force spring) magazine which can hold up to 18 rounds single stacked. The gun is also shipped standard with a 850mAh 4S Lithium Polymer battery (charger sold separately) which can provide power for over 50 shots before needing to recharge. We recommend the use of the B6 V2 6S LiPo Balance Charger (sold at <https://arcflashlabs.com/accelerators/components/>), but the "YoungRC A400 3-4S Lipo battery charger" is also an effective third party charger for the SGP-34 battery.

As one of our crowdfunding supporters, you are privileged to join an exclusive community of electromagnetic gun developers and enthusiasts around the globe. Until now, only a handful of individuals have ever seen an electromagnetic gun, let alone fired one. Congratulations on your purchase of a piece of history.

1.1 Terminology and Safety

The list below and throughout this manual is a summary of the major hazards associated with the device, but is NOT ALL INCLUSIVE. There are many other hazards associated with the device which are not laid out in this manual. We recommend wearing high voltage, flame retardant gloves at all times when using the device as well as goggles and thick clothing. Never use the device indoors or around flammable materials and always have a fire extinguisher on standby.

The SGP-34 is NOT WATER RESISTANT AND NOT IMPACT SAFE. Exposure to water or dropping from distances greater than 1 foot may cause irreversible damage to the gun, fire, explosion, electrical shock or venting of toxic gas from the battery or capacitors. If the SGP-34 is dropped or exposed to water: discontinue use immediately and return the gun to its manufacturer for repairs.

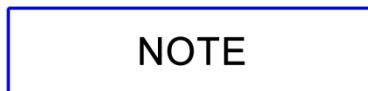
The following terminology is used throughout this manual for the purpose of denoting important and safety critical information:



An operation, procedure, or practice which if not correctly followed could result in personal injury or loss of life.

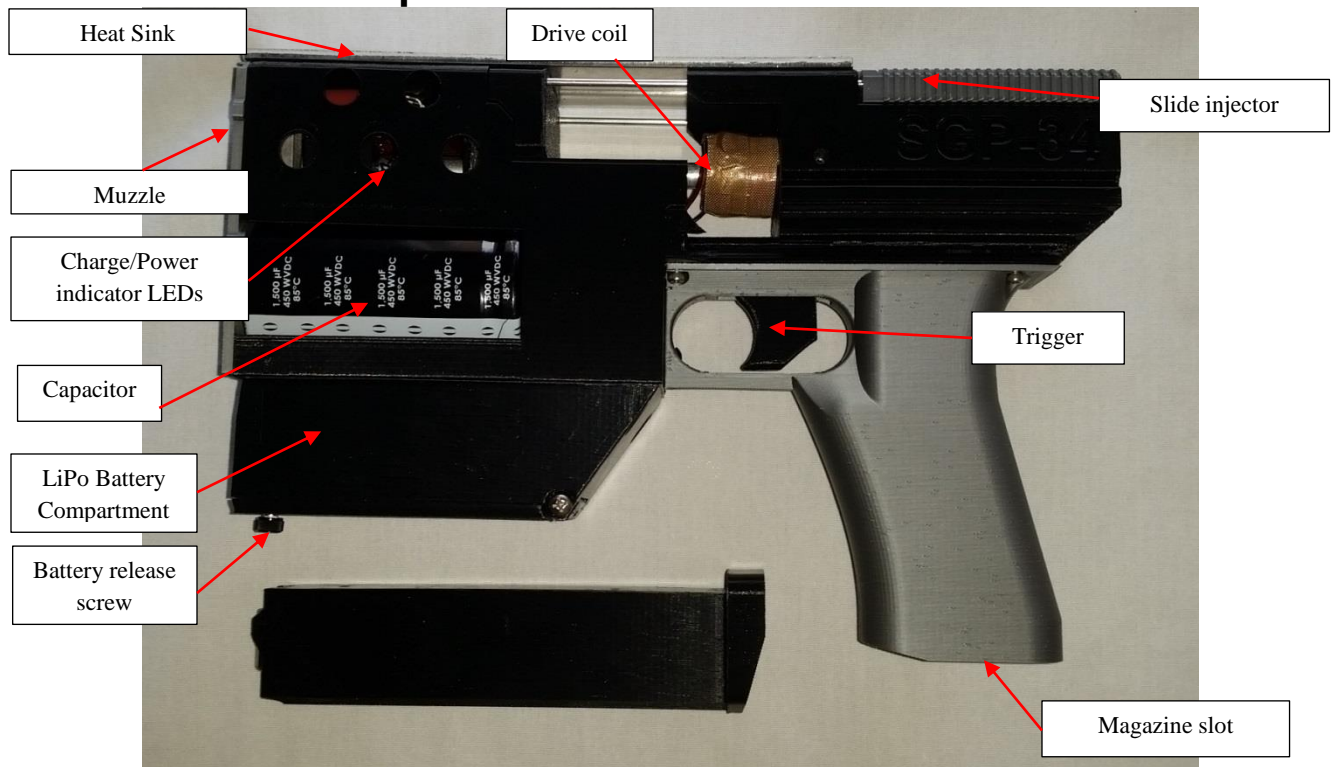


An operation, procedure, or practice which if not strictly observed, could result in damage to the device and/or voiding of the device's warranty.



A recommended procedure, suggested practice, or point of additional information which may facilitate the ease of use for the operator, or point out a feature of particular importance which is useful to know, but not safety-critical.

2. Overview of components



2.1 Barrel



- **Lethal shock hazard: The SGP-34 operates at 450 Volts and 1000 Amps. Never touch any components inside the ventilation holes. Never disassemble the unit. Never touch metal components while the unit is powered on, or within 10s of being switched off.**
- Muzzle energy is sufficient to break bones, cause serious injury or even death. It goes without saying: never point the gun at anyone or anything you do not intend to destroy.
- Never fire projectiles longer than 0.75" – firing projectiles other than Arcflash 2575 Magnetic Armatures or 0.25x0.75" steel dowel pins could result in fire or explosion.

The SGP-34 is a single shot handheld gauss pistol – its core component is a high voltage switch called a silicon controlled rectifier (SCR) which quickly discharges all the stored energy in the capacitor into the drive coil, creating a large magnetic field. The field is designed to expand as the projectile moves towards the center of the drive coil and contract a precise amount of time after. The expansion and contraction of this magnetic field is precisely timed to accelerate the 2575 armature. Projectiles longer or shorter than the standard may not fire at all or may fire less effectively. The nominal exit velocity is between 22-32 m/s for the 2575 armature.

While its muzzle energy is comparable to most bb-guns (around 1.6 joules or 1.2 ft/lbs), it should be treated the same way as a firearm: with the utmost respect. While the muzzle energy is roughly the same as a bb-gun, the projectile mass is far higher. Hazards from accidental discharge include broken bones and severe injuries – in short, never point the device at anything you don't want to destroy. Treat it as loaded at all times.

Some versions of the SGP-34 ship standard with an aluminum barrel and some ship standard with a brown Garolite (polymer composite) barrel. Do not be alarmed if your barrel appears different from the picture. All coilguns are tested and verified before shipment to ensure they meet specs.

The drive coil of the SGP-34 may appear larger or smaller than the picture. Despite its small size, it is mathematically optimized to deliver the most energy from the capacitor into the projectile. Do not be concerned if the coil you receive appears smaller than the pictured version, as the physical size of the coil is in no way correlated with the muzzle energy.

The device is powered by a low voltage (16V) battery, but this low voltage is internally stepped up to 450V and stored in the capacitor. The SCR is capable of delivering this energy to the coil at over 1000A. Never touch any metal parts of the gun while it is powered or shortly after it is shut down as it takes approximately 10 seconds for the gun to fully power down, even after the green power light has extinguished.

2.2 Injector



- **Do not slam the slide or let go of the slide at full extension like a conventional firearm. This will damage the retention mechanism and it will also NOT properly seat the round.**
- **To properly seat a round, rack the injector slowly, keeping your hand on the injector slide mechanism at all times.**

Projectiles are pushed out of the magazine by a hand-operated slide injector. This mechanism is similar to that of a conventional firearm in appearance and function, but more delicate since it relies on a small magnet for retention and proper positioning rather than a flange. This injector dispenses single rounds from the magazine into the chamber, where the action of the trigger activates the SCR, creating an expanding magnetic field in the drive coil and sucking the projectile out of the injector mechanism and into the barrel where it is then accelerated out of the gun.

To operate the injector, insert a magazine, and pull the injector slowly back to the rear position until you hear a light click and the slide encounters resistance, then slowly move the slide forward again until it is fully reset to the original forward position. This will chamber an armature. After each shot, you must manually rack the slide to chamber the next round, similar to a bolt-action.



The injector held in the rear position.

It may be useful to inspect the chamber after removing the magazine to verify whether the gun is loaded. To do this, rack the slide back all the way with the magazine removed, hold the top of the gun up to a bright light or light-colored surface (like a wall or ceiling) and look down the magazine well. If you can see light, there is potentially no armature in the chamber. If you do not see light, or see only a small light, there is likely an armature chambered.



Armature in chamber



Potentially safe

While this method demonstrates one potential way to check whether the gun is safe, just because there is no armature in the chamber does NOT mean that the gun is safe or unloaded. There still may be a round jammed in the barrel. The only way to fully verify that the gun is unloaded is to insert a wire or rod down the barrel and observe the end of the rod through the magazine well.

2.3 Heat sink



- **Lethal shock hazard: The SGP-34 operates at 450 Volts and 1000 Amps. Never touch metal components (including the heat sink) while the unit is powered on, or within 10s of being switched off. Never touch any components inside the ventilation holes.**
- While the heat sink is electrically shielded from sources of high voltage, there still exists the possibility, however slight, that a component may become dislodged and the heat sink may become electrically charged during operation, therefore we advise against touching it while the unit is powered on.
- **Serious burn hazard: The heat sink gets hot enough to burn after extended operation (>150°F). Don't touch it. Wear gloves.**

The SGP-34 relies on an ultra-compact high voltage boost converter to step up the battery voltage and charge its capacitor rapidly. Due to the small size of the SGP-34, it relies on a less advanced technology than Arcflash Labs' patented CQR chargers. The boost converter generates a great deal of heat and its core components are mounted to the bottom of the aluminum plate that runs the length of the top of the gun. This aluminum plate serves to cool the charger – it is not recommended to tape over it or cover it as doing so may result in overheating of the charger, fire or explosion of the electrical components.



2.5 Battery



- The SGP-34 contains a large 4S Lithium Polymer battery. Never leave a charged battery unattended and always store in a cool , dry environment.



- Take care not to pinch the wires when closing the battery compartment.

The SGP-34 contains a Lithium Polymer battery. As with any device containing a large lithium battery, it presents a number of hazards including shock, fire, explosion or venting of toxic gas. Always store the gun and battery in a cool, dry environment indoors, away from any flammable materials.

To insert or remove the battery, simply turn the thumbscrew at the bottom of the battery compartment to release the latch, then connect the battery with the main switch off. Position it appropriately as shown below, and tuck the charging cables neatly into the remaining space before closing the compartment. Ensure that no wires are pinching when closing the compartment as this could result in a short or battery fire.



Proper positioning of the battery after connection

2.6 Trigger



- Do not exert excessive pressure on the trigger. It is a fragile component.

The trigger of the SGP-34 is connected to a small microswitch internally and is actuated by a small spring. The trigger only has roughly 0.06" of travel length and the spring return is very fragile. If excessive pressure is exerted on the trigger, the spring return could detach. If this occurs, discontinue use of the gun and immediately return to the manufacturer for repairs. If further pressure is exerted on the trigger, damage to the microswitch and/or main control board could result.

2.7 Magazine

The SGP-34 uses a proprietary 18 round magazine design based loosely off of the MG20. Similar to the MG20, it uses a constant force spring and accepts Arcflash Labs 2575 magnetic armatures. The SGP-34 is NOT compatible with the MG series of magazines. To order a replacement or extra magazine, please contact Arcflash Labs directly at admin@arcflashlabs.com.

2.8 Capacitors



- The SGP-34 contains one large 1500uF capacitor capable of storing over 150J of energy.

The SGP-34 contains one large electrolytic capacitor (1,500 uF total capacitance). It is capable of delivering over 1000A burst current at 450V and storing over 150J of energy.

The capacitors remain charged for approximately **TEN SECONDS** after disconnecting all power from the gun. During this time, the gun may still fire. To power down the gun we recommend the following procedure: 1) set the main switch to the off position, ensuring the green power light is not active, 2) remove the magazine from the gun, verify that there is no round still remaining in the barrel, and 3) wait approximately 10 seconds before removing the battery.

The red LED near the barrel indicates the state of charge on the capacitor. If the red LED is illuminated, the capacitor is fully charged.

3. Operation

3.1 Startup



- It is unsafe to power up the gun with a magazine inserted.
- Always check that there is nothing inside the barrel before powering up. Any rounds or debris inside the barrel during startup could result in a misfire.

1. Ensure battery is charged to its nominal voltage of 16.8V.
2. Open battery compartment and connect the battery as shown in section 2.5.
3. Stuff connector and wires into the battery compartment gently, ensure wires clear pinch points and close the compartment.
4. Insert a magazine into the bottom of the handle, apply force to the bottom of the magazine to ensure it is fully seated. It may be necessary and it is encouraged to slap the magazine to ensure it is fully seated against the injector rod.



Insert magazine



Seat magazine fully

5. Activate the main switch.



6. Observe the barrel of the gun, ensure the green LED immediately illuminates; the red LED should also illuminate 1-2 seconds after activating the main switch. If the red LED does not

come on, this indicates a charging system fault. If this happens, please contact Arcflash Labs for support.



Ensure the green LED activates



Ensure the red LED activates

7. The red LED indicates that the capacitor is charged and the gun is ready to fire.
8. Rack the slide slowly back until you hear a light click, and **gently guide the slide forward** to chamber the first round. **DO NOT let go of the slide from the rear position.**
9. The gun is now charged and loaded. Press the trigger to fire.

3.2 Shutdown



- The heat sink is hot enough to burn you after extended operation. Even without firing a round, the heat sink may still be hot.

1. Remove the magazine.
2. Discharge any round still left in the chamber.
3. Shut off the main switch, ensure both the red and green LEDs extinguish.



4. Wait 10 seconds, and perform a chamber inspection as described in section 2.2, being careful to point the gun in a safe direction.
5. Remove the battery.
6. Wait for the heat sink to cool before storing. Use the back of your hand to feel the air above the heat sink without touching it. **The heat sink may still be hot enough to burn, even after the gun has been shut down.**

4. Software

The SGP-34 is operated by hard-wired TTL and has no software.

5. Hardware Specifications

Accelerator Specifications

Primary power source	1x 4S LiPo – 16.8V, 850mAh
Power supply	100W (IGBT boost driver)
Capacitors	1x 1500uF/450V electrolytic
Switches	1x 1.1kA pulse-rated SCR
Projectile	0.25x0.75" carbon steel, 71gr
Capacity	18 rounds
Rate of fire	<1.0 rounds/sec
Muzzle velocity	72-105 fps (89 fps nominal)
Muzzle energy	~1.2 ft-lbs
Efficiency	1.1%

Physical Dimensions

Active barrel length	1.1"
Bore	0.25"
Physical Dimensions	10.5" x 7" x 1.8"
Overall Weight (unloaded, no battery)	1.67 lbs