

Graco Advancements in FRP Gun Technology



WHITE PAPER

Graco has designed a new spray gun specifically for the fiberglass reinforced plastics (FRP) market that is reliable, lightweight and makes maintenance much simpler. The Graco RS Gun utilizes an innovative needle assembly design that draws from the benefits of both needle and seat guns as well as rotating valve guns. The new and improved features address problems associated with traditional needle and seat guns, while reducing weight in an ergonomic design.

Traditional needle and seat guns are typically much lighter in weight than rotating valve guns and are often much easier to maintain, while rotating valve guns typically ensure both resin and catalyst material are dispensed at the same time without lead-lag problems. The fluid paths in the Graco RS Gun are at minimal angles, similar to a rotating valve gun, to make it attractive for use with high filled materials. The spray tips used in the Graco RS Gun have been carefully designed so that both standard airless tips and impingement tips can be used interchangeably on both external mix and internal mix gun models.

Platform Considerations

The Graco RS Gun has been designed around desired features that came from research from customers and material suppliers. The main objective for this product was to develop a lighter weight gun that was compatible with existing equipment in the composites market. The Graco RS Gun is rated for 3000 psi (206 bar) on external mix and 2000 psi (138 bar) on internal mix models.



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Design Initiatives

Graco has worked extensively on several key components on the Graco RS Gun, which were key for success.

- Graco-designed air motor
 - Smaller design with speed control built into design
- Lightweight
 - External Mix Gel – 2.08 lb (0.9 kg)
 - External Mix Chop – 2.20 lb (1.0 kg)
 - Internal Mix Gel – 2.32 lb (1.0 kg)
 - Internal Mix Chop – 2.46 lb (1.1 kg)
- Ergonomic design
- Easy to maintain
- Use with filled materials
- Address phasing (lead/lag) on needles when triggered
- High output
 - 14.1 lb/min @1250 psi static pressure with CSTS57 spray tip (general purpose resin)
- Quick change blades
- Break away front head
- Tight hose bundle (keeps gun flexible)
- Swivel fitting
- Common handle (four gun models)

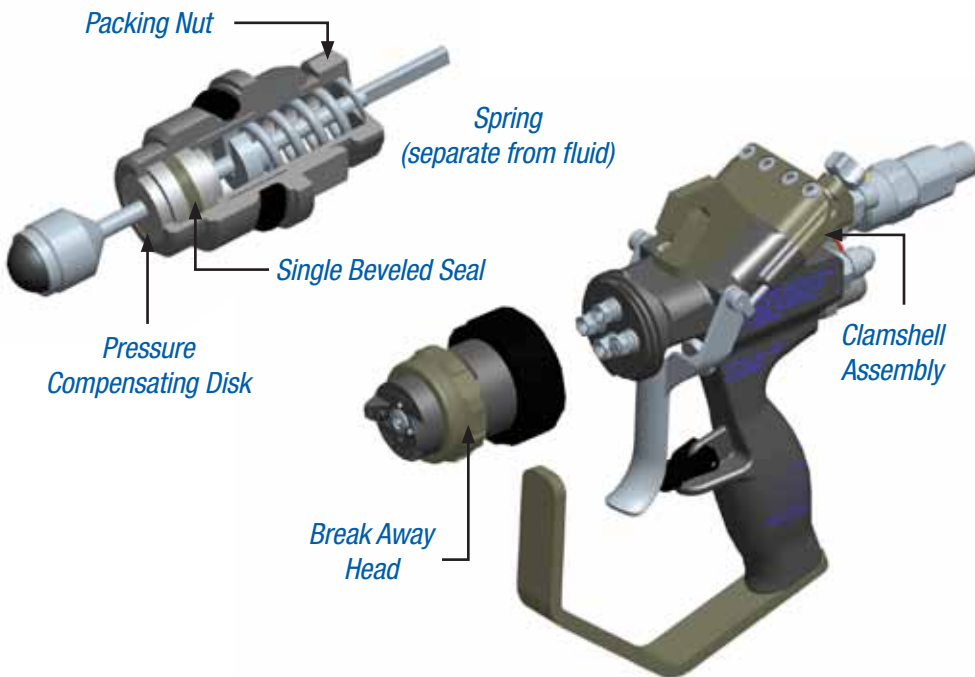
Gun Highlights

The Graco RS Gun handle is constructed from an aluminum forging that has a hard coat anodized finish and offers benefits over a traditionally cast handle. Forging uses high pressure, which compacts the aluminum material, eliminating porosity and voids that are common to traditional cast handles. The hard coat anodized finish gives a surface hardness of 60 – 70c Rockwell, while making the gun easier to clean.

The Graco RS Gun has been designed with an innovative needle that has many benefits over traditional needles found in most FRP guns. In the Graco RS Gun, the material is kept separated from the spring, which helps the needle to function with less likelihood of sticking. The needle uses a silicon nitride spherical ball to seal against the seat. This material is much harder than most materials available and is between 1400 – 1700 vickers, while maintaining sphericity of 0.000005 inches.

The harder material allows for a superior seal between the needle and seat especially when working with filled materials.

Additionally, the spring force to close the valves is higher, at 42 pounds combined closing force, which keeps material valves operating virtually maintenance free. The material needle utilizes a single material seal as well which makes packing adjustment much more efficient. The needle assembly also has a pressure compensating disk which when pressure is increased, it exerts a higher force on the beveled seal and creates a longer lasting seal. This also requires less tightening on the packing nut to ensure a seal. With internal testing done at Graco, the packings normally needed to be tightened between 45,000 to 60,000 trigger pulls while testing with a glue test material. After completion of the testing (1.1 million trigger pulls), the needles were still in good condition.



The Graco RS Gun also has a break-away front head, which allows for quick and easy maintenance. Phasing (lead/lag) has been addressed in the design and is factory set. No longer does the end user no longer have to make adjustments to the gun when the needle packing is tightened or the needle assembly replaced. The needle assemblies are also protected from overspray by a clamshell assembly.



Cutter Highlights

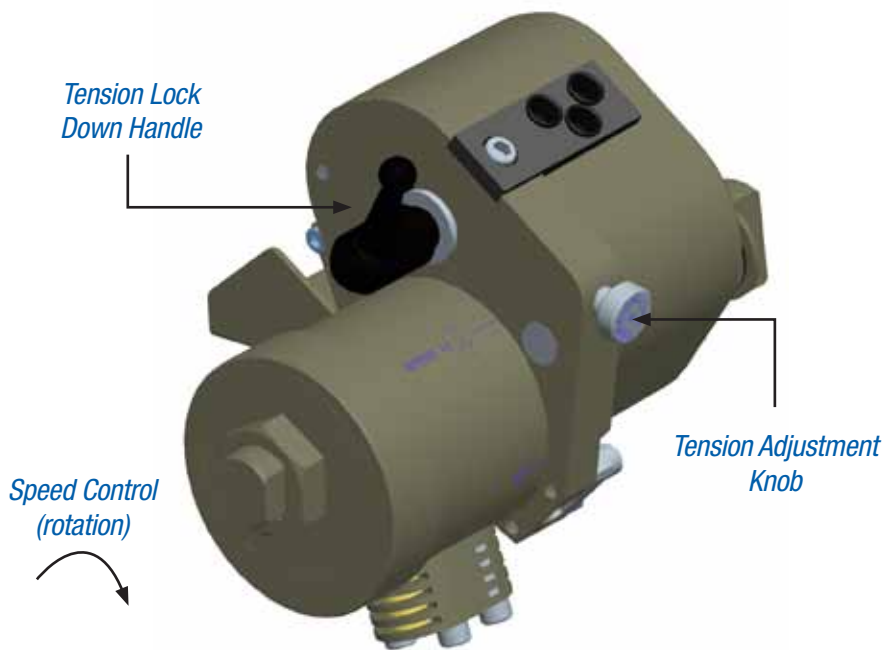
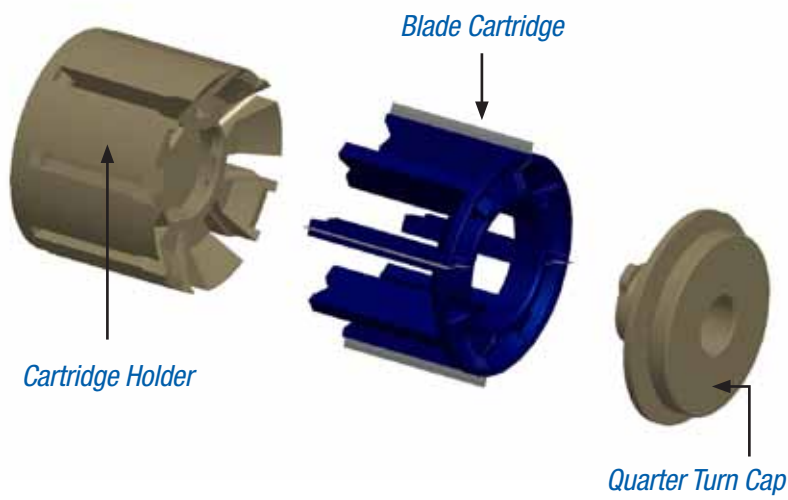
Based on industry input, the Graco RS Cutter has been completely redesigned from Graco's previous design. Graco has engineered a revolutionary air motor that produces high torque and speeds to get more glass output than previous cutters provide. At one strand of glass, 4.32 lb/min can be dispensed. At two strands of glass, 7.65 lb/min can be dispensed and at three strands of glass, as much as 9.8 lb/min of glass can be dispensed. This is 20 percent more than the B-410 cutter (Graco's previous design) and 22 percent more than MVP, while 65 percent more than Wolfangle.

The new Graco RS Cutter weighs 2.0 lbs, which is 23 to 40 percent lighter than any cutter on the market today. Air flow through the gun and cutter have been optimized to achieve high performance to the air motor. The air flow through the gun allows for 22 scfm of air to feed the air motor which ensures the gun is not a choke point for air motor performance.

The Graco RS Cutter also has incorporated a new design that allows for fast blade changes. With Graco's unique blade design, which features blades molded into the cartridge, an end user can change blades in less than 30 seconds. Other designs can take up to 15 minutes or even longer depending upon the availability of necessary tools, work bench or work area, experience level of maintenance staff, and other site specific factors. The new design virtually eliminates nicks and cuts since operators never have to touch a blade.

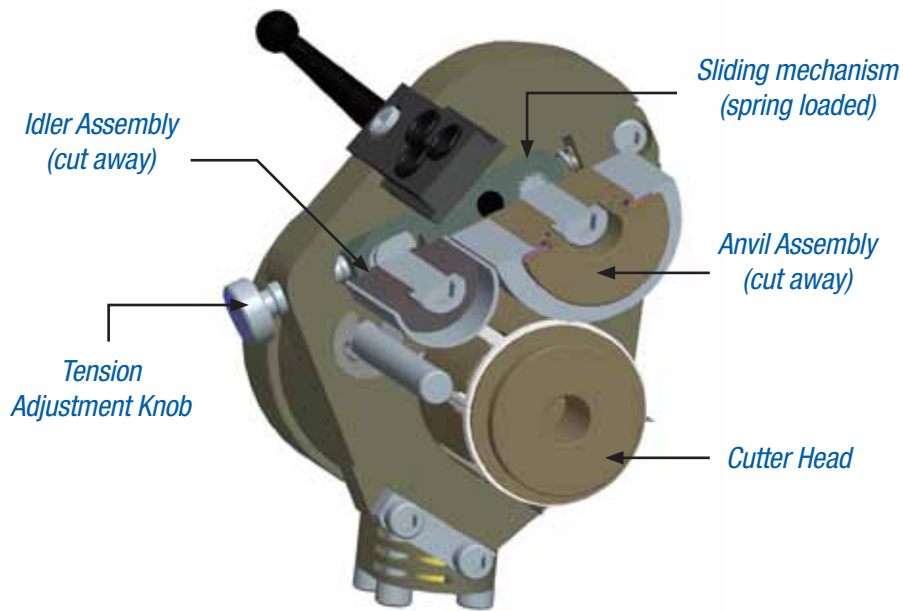
Additionally, the tension of the anvil to the cutter head can now be adjusted on the fly without removing the cover. The anvil and idler on the Graco RS Cutter are on a sliding mechanism that is spring loaded. A tension adjustment knob determines how much force is applied between the anvil and cutter head. This is a great improvement over previous designs as it was often difficult to achieve repeatability with anvil and blade life since adjustments affect the performance. This can now be controlled much easier with small adjustments to the tensioning knob on the cutter.

The Graco RS Gun and Cutter optimize the distribution of weight to have a balanced gun with a low center of gravity. The angle of the cutter in proportion to the spray pattern also ensures that the cut fiberglass strands are evenly distributed into the spray pattern.



GRACO RS CUTTER

- *More glass output*
- *Lightweight*
- *Fast blade change*
- *External anvil adjustment*



Customer Benefits

The Graco RS Gun provides new features that will help the FRP market and bring updates needed in this market. With traditional cutter heads, replacing blades required down time and careful attention so that operator did not injure him or herself. With the speed of blade changes on the new cutter, production can be increased with less down time and should increase profitability of the market.

The operator will spend less time adjusting the tension between the idler, anvil and cutter head when blades start to get dull. With the Graco RS Gun, the operator can make the adjustment on the fly without removing the cover. All gun models share common parts, making maintenance easier and requiring fewer parts in inventory.

Summary

The Graco RS Gun and Cutter offer advancements in the FRP industry. There are gun models for both resin and gelcoat applications in various models including internal mix and external mix. All four new products represent significant improvements for the dispensing of fiberglass reinforced plastics.

BIOGRAPHY

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Jon McMichael is a Mechanical Design Engineer for the Applied Fluid Technologies Division of Graco, and works in North Canton, Ohio.

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