



News Release

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Parker's tube connection breakthrough speeds assembly of ultra-safe instrumentation systems for pressures up to 22,500 PSI

- *flared cone design prevents tube ejection and incorporates redundant second seal for enhanced safety*
- *very short make-up time: up to 5 times faster than traditional cone and thread*

March, 2016--- Parker Hannifin, the global leader in motion and control technologies has announced a breakthrough in high integrity tube connection technology offering instrumentation system designers and installers major performance and time-saving advantages. Designed for working pressures as high as 22,500 PSI (1,550 bar), the new 'flared cone' technology is believed to be the safest and most reliable compression style tube connection system that has ever been produced – according to Parker. It overcomes significant challenges faced by users today – including the drive to design simple yet safe instrument tubing systems that are capable of operating at higher pressures – and aims to set a new performance standard for medium pressure instrumentation applications in the oil and gas industries.

Developed by Parker Autoclave Engineers, the leader in high pressure instrumentation valves, fittings and tubing systems, the new flared cone connection technology is a significant advance on the type of 'cone and thread' tube connections pioneered by the company. Cone and thread connections are renowned for their strength and ability to accommodate repeated assembly/disassembly, making them the industry's preferred choice for oil and gas applications whenever working pressures exceed 6,000 PSI (414 bar). However, forming the cone and then cutting the thread requires skill and preparation time – it can take a trained installer 15 to 20 minutes per connection.

In contrast, the new flared cone connections are much simpler to make up and demand considerably less skill. Installers can now typically complete the entire task in less than four minutes, after only minimal training. This time-saving can result in significant cost reductions on installations with a large number of tube connections. Flared cone connections are also especially cost-effective in applications where leaks caused by vibration are an issue; they are intrinsically resistant to vibration, whereas cone and thread connections are usually fitted with an additional anti-vibration gland.

According to Michael O'Keane, Product Marketing Manager for Parker Autoclave Engineers, "Although people like the simplicity and ease of use of ferrule or compression sleeve tube connections for low pressure applications, they tend to prefer cone and thread for medium pressures, accepting that its increased strength incurs longer make-up times. Now, however, our flared cone connection technology offers the best of both worlds. It provides the make-up and installation simplicity of compression style connections and the strength of cone and thread, with more safety features and higher pressure capabilities than similar technologies. The technology is likely to prove especially popular with the offshore oil and gas industries, as they strive to further improve safety while at the same time moving into ever deeper operating environments."

Parker Autoclave Engineers' patent-pending flared cone connection technology is based on a single sleeve compression style system. However, unlike conventional designs, the tube end is flared to

prevent any possibility of ejection – and also provides the connection's primary metal-to-metal seal. When the gland nut is tightened, the inside surface of the anti-ejection flare mates with a cone in the fitting or valve. The compression sleeve then mates with the body of the component to form a second, redundant, metal-to-metal seal. This dual seal approach has a major safety benefit; in the unlikely event that the primary seal fails, the secondary seal preserves the integrity of the connection. Installing a flared cone connection is simply a matter of screwing the gland nut into the fitting or valve and tightening it to the prescribed torque.

Connection make-up is a quick and simple two-step procedure that is easy to understand and implement, with visually verifiable results. The entire process is inherently self-controlled by a hydraulic set tool, which helps to eliminate potential assembly errors that could compromise connection integrity. Parker Autoclave Engineers offers two versions of this tool; a single cylinder model with two easy-to-change dies and a more project-oriented model with two pressure cylinders – one for setting the compression sleeve and the other to flare the tube. Both types of hydraulic set tool are powered by a foot-operated air pump.

After cutting and deburring, the tube is fitted with a gland and compression sleeve and inserted into the set tool. This applies force to the gland and causes the inner edge of the compression sleeve to bite deeply into the tubing, creating a shoulder that provides positive mechanical support for the tubing end load. Once the sleeve is permanently fixed onto the tube the assembly is temporarily removed from the tool while a different die is fitted for the second stage of the process. The tube assembly is then inserted into the set tool for a second time and force is reapplied. The die uses a tapered protrusion to form a flared end on the tube. The entire two-stage process takes just a few minutes.

Parker Autoclave Engineers' flared cone connection technology is available in five different sizes, to accommodate medium pressure tubing with outside diameters of 1/4, 3/8, 9/16, 3/4 or 1 inch. There is a wide range of compatible fitting shapes that includes elbows, tees and crosses, as well as straight and bulkhead couplings. An equally extensive choice of valve types includes needle valves, relief valves and high pressure ball valves. Available in 2-, 3-, 4-way and double-block-and-bleed configurations, the ball valves feature a one-piece stem design that facilitates alignment and eliminates the risk of shear failure.

As standard, Parker Autoclave Engineers manufactures the tubing, fittings and valves for its flared cone connection system from cold worked 316 stainless steel. These components are capable of working pressures up to 20,000 PSI (1,380 bar) and operating temperatures from minus 100 to 650 degrees Fahrenheit (minus 73 to 343 degrees Celsius). In May 2015, the company will also make its new FCC connection system available in SAF 2507 Super Duplex, with working pressures to 22,500 PSI (1,550 bar) and the same operating temperatures as above.

Parker Autoclave Engineers' flared cone connections are designed in accordance with ASME B31.1 Chapter IX standards. All sizes of tubing and connections have been subjected to extensive pressure, temperature, vibration and burst tests, with no recorded failures.

SAF 2507 is a registered trademark of Sandvik.

About Parker Hannifin

With annual sales of approximately \$13 billion in fiscal year 2015, Parker Hannifin is the world's leading diversified manufacturer of motion and control technologies and systems, providing precision-engineered solutions for a wide variety of mobile, industrial and aerospace markets. The company employs approximately 55,000 people in 50 countries around the world. Parker has increased its annual dividends paid to shareholders for 59 consecutive fiscal years, among the top five longest-running dividend-increase records in the S&P 500 index. For more information, visit the company's website at www.parker.com, or its investor information website at www.phstock.com.

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