



Engineered solutions leading the way to hydrogen-fueled turbines



ENGINEERING YOUR SUCCESS.

Count on Parker

when shifting to more fuel-flexible gas turbines to reduce carbon emissions

As a carbon-free fuel, hydrogen is an attractive alternative to natural gas in energy production. Today, worldwide policy shifts to carbon neutrality—achieving net zero carbon emissions—are driving the adoption of decarbonization in the power generation industry. Such efforts can be a piece of the puzzle of supporting the energy and climate components of the United Nations' Sustainable Development Goals.

Advanced products and technologies are needed to raise efficiency, reduce cost, and ensure safety. As the world's leading original equipment manufacturer of advanced motion and control products to all segments of the power market for 75 years, Parker has the capability to support the newest applications of hydrogen as a high-volume gas turbine fuel **and** when blended with natural gas to improve combustion technology.



Advanced technologies to advance hydrogen-fuel power generation

Filtration

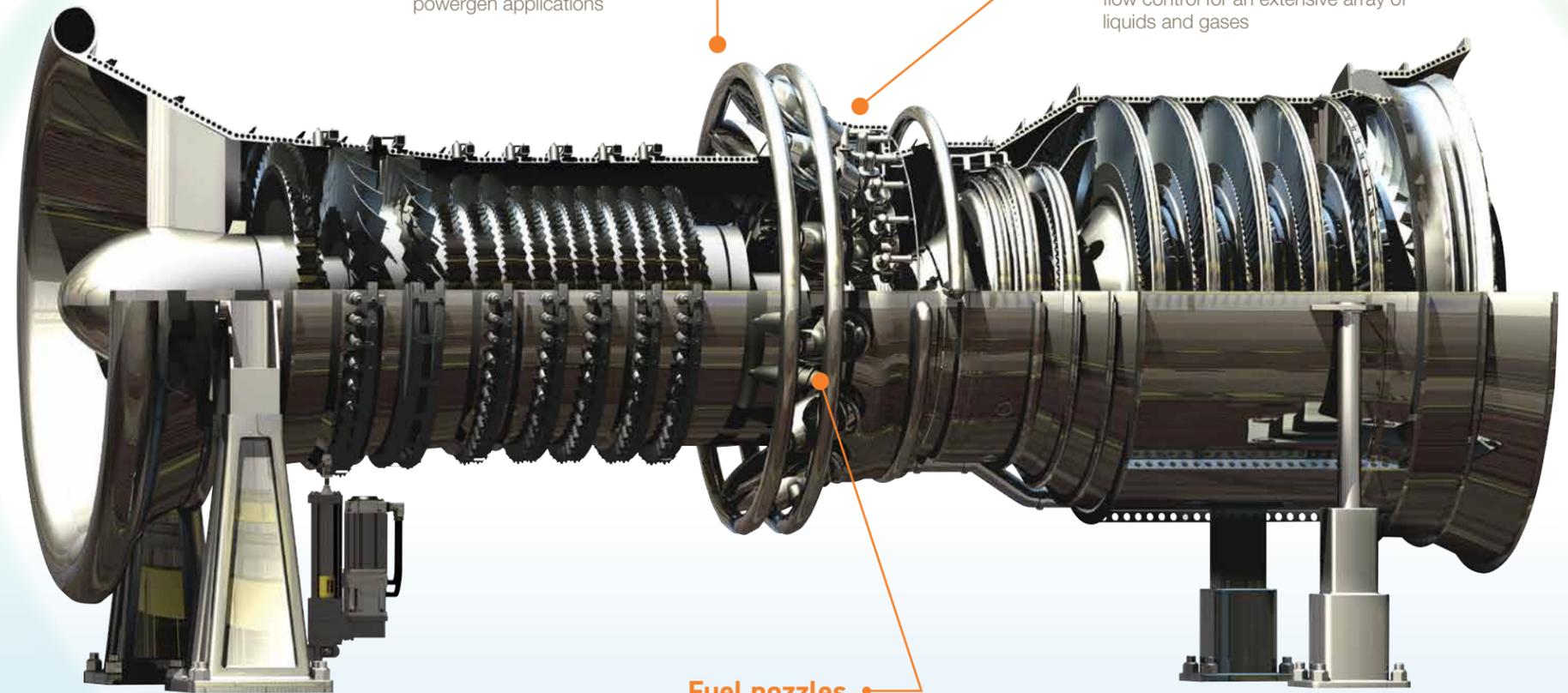
PEACH Gemini PuraSep® 2 horizontal gas filter-coalescer systems that protect critical equipment from solid and liquid contaminants

Valves, manifolds and fittings

A complete selection of connectors and valving that offers reliable, leak-free performance for hydrogen-fuel powergen applications

Fluid controls

Solenoid valves that bring precision flow control for an extensive array of liquids and gases



Fuel nozzles

For use in natural gas / hydrogen dual-fuel or all-hydrogen applications, offering low-NOx and no flashback

Sealing solutions

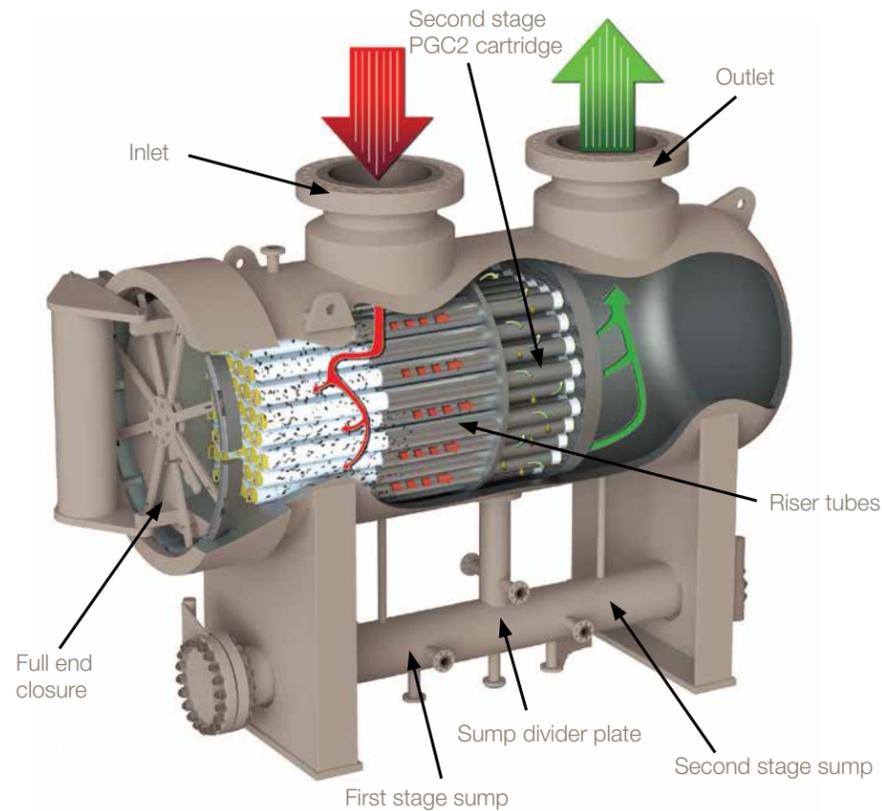
Innovative sealing solutions that maximize life cycles in demanding powergen environments with technologies to seal low molecular weight gases.

Hydrogen-ready solutions

Filtration

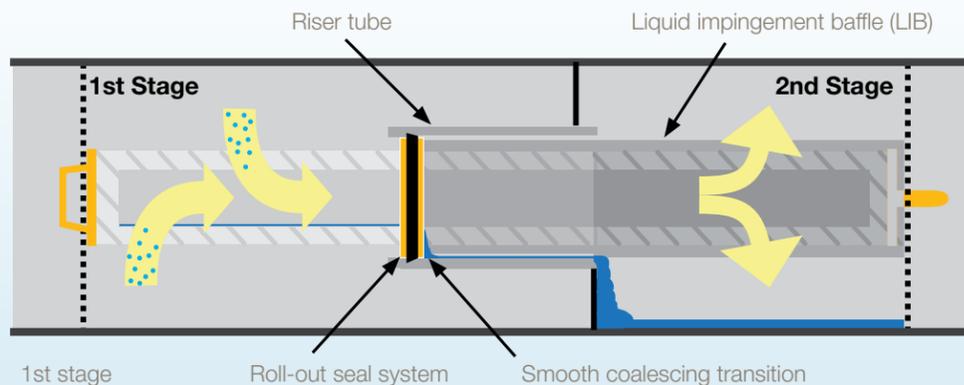
PEACH Gemini PuraSep® 2 horizontal gas filter-coalescer

The PEACH Gemini PuraSep® 2 is the most advanced gas filter-coalescing system available. Traditional filter-separators struggle to remove low surface tension liquids such as compressor oils and hydrocarbons that are typically found in pipelines. Vertical coalescers struggle with large solids loading and liquids loading. The PEACH Gemini PuraSep 2 combines both of these designs into one housing to provide an unmatched performance that makes it the proven winner in the field. The PEACH Gemini PuraSep 2 protects your critical equipment from damage and costly repairs.



Cartridge Series PGC2

Gemini 2's PEACH® technology cartridges are available in polyester or polypropylene media with various performance levels to meet your exact needs.



STANDARD RECIPE: 99.99% of 0.3 micron & larger solid particles
99.8% of 0.3 micron & larger liquid droplets < 50 PPB (wt) effluent

PL-20 RECIPE: 99.99% of 0.3 micron & larger solid particles
99.99% of 0.3 micron & larger liquid droplets < 8 PPB (wt) effluent

PL-23 RECIPE: 99.99% of 0.3 micron & larger solid particles
99.98% of 0.1 micron & larger liquid droplets
99.99% of 0.3 micron & larger liquid droplets < 2 PPB (wt) effluent

Valves, manifolds and fittings

Seal-Lok Xtreme - Parker Seal-Lok™

Provides leak-free connections that optimize fuel conveyance in natural gas, hydrogen and liquid fuel applications. An alternative to the sealing capability of O-ring face seal SAE J1453 connections in critical power plant applications. The patented stainless steel high-temperature metal sealing ring can withstand severe temperatures and solves chemical compatibility issues often seen with elastomeric seals.



Features & Benefits

- Superior tube and hose connections at temperatures as low as -325°F (163°C) and as high as 1,200°F (649°C)
- Reduced galling potential due to special dry film lubrication used on stainless steel nuts
- Zero clearance interface enables quick and easy plumbing
- Easy assembly using specified torque values
- High resistance to over-tightening and / or providing maximum resistance to vibration-induced loosening
- Working pressures up to 6000 psi
- SAE/AISI 316/316L stainless steel materials for corrosion resistance

Non-welded solutions

The Parker Parflange® F37 product range is a non-welded flange system. It is well known and used product in the marine and offshore applications.



The system has proven its reliability for decades and Parker directs a lot of approvals for various applications. As a result, more and more customers are switching from welded to the non welded Parflange® F37 system because of its convincing benefits.

With all the market and market experience, Parflange® F37 is a safe and reliable system, that can be used on H2-Applications. The bended Parflange® F37 pipes reduce the amount of needed connections and lead therefore to significant cost savings. The system is available for dimensions from 20 mm up to 10" outer diameter. Various sealing materials, especially for H2 applications are available. The Parflange® F37 concept also enables the easy, fast and repeatable machine forming and assembly on-site.



In addition to that, Parker also offers on-site workshop container with customized content. As a part of the project, Parker offers also engineering support and advice, machine and product training to the customer. Depending on the customer requirements, Parker can offer ready to install pipe kits as well.

CPI™ and A-LOK®

Parker CPI™ and A-LOK® compression tube fittings are designed to handle the challenging applications of turbine fuel systems, manufactured to the highest quality standards and are available in a broad range of sizes, materials, and configurations. All fully heat code traceable.



Features & Benefits

- CPI: The Safest and Simplest three-piece design available; excellent for in thermal cycling and heavy high vibration applications.
- Both fittings have a legacy of proven performance in a range of H2 systems.
- Both fittings come standard with Suparcase® treated ferrules for optimal performance in 316 SS applications.
- CPI: Molybdenum disulfide coated nuts prevent galling and provide permanent thread lubrication

Weld-Lok®

Parker's Weld-lok® permanent socket weld and butt weld tube fittings offer the ability to adapt from pipe to a tubing system with either single- or two-ferrule compression tube fittings. Compatible for 316H and 316L tubing and piping systems. Made from ASTM/ASME close grain forgings and bar stock. Designed in accordance with ANSI B 16.11, and parallels the Schedule 80, 3000-pound fitting pressure class, and is compatible with O.D. tube wall thickness meeting the related 3000-pound pipe class pressure requirements.



Pedigreed proven product used in a wide range of high temperature and high pressure systems.

Valves, manifolds and fittings continued

Parker Autoclave Engineers®

Pressure Fittings and Valves have extensive use in Hydrogen vehicle and fuel cell storage and dispensing applications up to 20,000 psi. Rocket and Missile fueling are also common uses of our products. Both the Cone & Thread and MPI Compression Ferrule technology provide safe, leak-tight connections for high pressure gas and liquid applications from -423°F (-253°C) to over 1000°F (538°C). Cone & Thread can extend this capability to pressures in excess of 100,000 psi (7000 bar).

- Optimized connections to meet any application challenge in liquid, liquid-gas, and gaseous media
- Proven valve and fitting performance in high pressure H2 applications
- Uniform Valve design with specialty low molecular weight gas sealing options
- MPI connection designed for use with specialty or commercially available tubing

Manufactured standard of 316 Stainless Steel, many additional material options meet a wide variety of application demands as well as NACE/ISO 15156-3 requirements.

Parker PGI valves and manifolds

Parker PGI manifolds feature the patented PTFE Pressure-Core® stem seal with an unmatched seven-year warranty. Valves and manifolds available with a bonnet handle lock-out that prevents unauthorized cycling in either the open or closed position, or an anti-tamper bonnet that allows the bonnet stem to be placed in any position before removing the handle. Our manifold offering of two-, three- and five-valve models ranges from a simple bypass manifold to our sophisticated purge adapter. Valves and manifolds are offered in a wide range of materials.

Standard 316 SS models conform to NACE MR0175/ ISO 15156-3.

Features & Benefits

- Leak-free, self-adjusting PTFE Pressure-Core® stem seal
- Tested and verified by an independent laboratory to meet the requirements of EPA Method 21
- Power versions meet the requirements of ASME B31.1 for power/steam plant valves and manifolds
- Low-Torque™ Grafoil packing bonnet design to lower stem torque by 50%, reducing stem abrasion and stem damage from being over-torqued
- Carbide ball “roddable” hard seat design for repeatable “bubble-tight” shut-off
- Valve temperature and pressure ratings to ANSI B16.34 (100% hydrostatic tested)
- Standard ASTM materials in either 316 stainless steel (NACE MR01-75) or carbon steel (coated with zinc phosphate) to prevent corrosion
- Metal-to-metal back seat to eliminate stem blowout
- Valve bodies are marked per MSS-SP-25 with “Microlase” laser engraving



Two-Way On/Off Solenoid Valves – High Pressure Applications

Our Skinner and Gold Ring brands of two-way solenoid valves offer actuation via a pilot or remote signal.

These high-pressure valves provide flow control for an extensive array of liquids and gases.

Features & Benefits

- Wide variety of enclosures, coil types, and seal materials
- Up to 3,000 psi working pressure
- Broad range of port sizes and thread connections
- Stringent manufacturing processes for high quality, trouble-free operation



Fuel nozzles

GTPGD Fuel Nozzle & Control System for hydrogen and syngas applications

Parker is the acknowledged leader in gas turbine fuel atomization technology in both the aerospace and power generation markets. Building on that extensive knowledge, our Gas Turbine PowerGen Division's (GTPGD) Lean Direct Hydrogen Injection & High Bandwidth Fuel Control system is designed to provide fuel flexibility and dynamics attenuation at industry leading NOx emissions.

Features & Benefits

- Fast and efficient micro-scale mixing with short residence time
- Proven results running 100% H2 up to 12 atm
- NOx Emissions ~3 ppm
- Scalable to all engine sizes
- Proportional and high-bandwidth fuel modulation capable of tuning flame dynamics, heat release, and combustor acoustic signature

Sealing solutions

Parker metal seals are available in these high strength alloys:

- Inconel® 625, 718, X-750
- Hastelloy® C-276
- Rene® 41
- Waspaloy
- Stainless steels – 304, 316, 321, 347

Specialized platings and wear protective coatings are also available.

Inconel® is a registered trademark of Special Metals Corporation. Hastelloy® is a registered trademark of Haynes International. Rene® is a registered trademark of General Electric.

Applications:

Fuel Nozzle and Combustor Flanges:

- E, C and spring energized C seal seals are used to seal flanged connections between the fuel nozzles and end covers.



Turbine Section Seals:

- Parker's highly compliant E and V seals are used to seal along the turbine section reducing leakage. This reduced leakage improves the output of the turbine maximizing the engines overall efficiency.



- Parker's pre-compressed seals enable easy installation of seal segments into close cavities. This technology greatly reduces assembly time and potential seal damage.



Linear Casing Seals:

- Parker's casing seals reduce leakages along turbine casing flanges that result from deflections caused by extreme high temperatures. In some cases, using Parker's casing seals reduce the number of casing bolts required and saving overall engine costs.





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