HIGH-PRESSURE GAS-LUBRICATED TANDEM CARTRIDGE SEAL

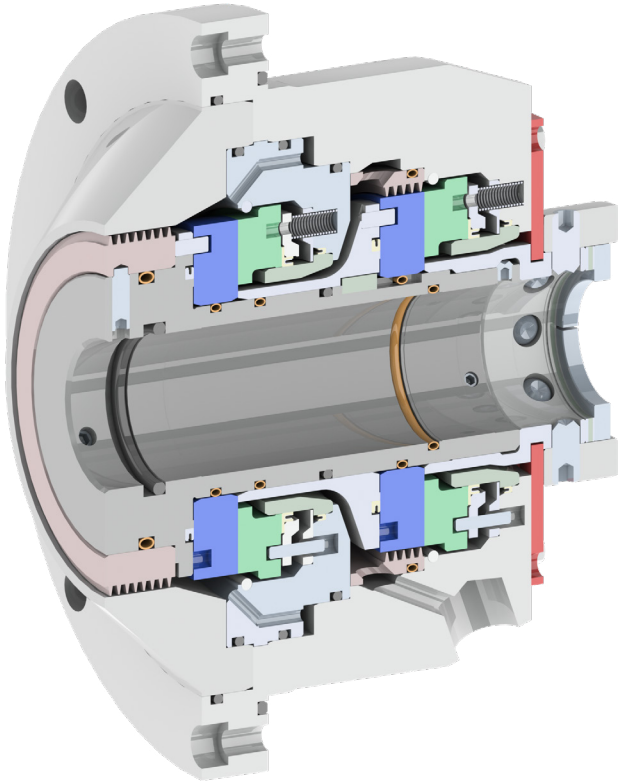
For High- and Ultra-High-Pressure Multi-Phase and Supercritical Fluid Services

The **Flexaseal Style HPGT** series is engineered specifically for high- and ultra-high-pressure supercritical fluid service in centrifugal pumps. Using proven bi-directional lift-off groove technology for non-contacting operation and advanced materials, the HPGT delivers stable, wear-free performance while ensuring reliable containment of hazardous and valuable gases.

- Non-contacting tandem seal arrangement eliminates heat generation and increases MTBR.
- Bi-directional lift-off grooves start lifting at low speeds, minimizing wear at startup and shutdown.
- Stationary multi-spring design provides uniform face loading and dynamic stability at high velocity.
- FEA-optimized components minimize distortion at high load, preserving flatness and low leakage rates.
- FlexSiCG primary faces offer excellent stiffness and resistance to supercritical fluid challenges.

Optional spring-energized PTFE secondary seals (UHPGT variant) mitigate explosive decompression and extend sealing capability up to 3,000 psig.

Typical Flush Plans: 12/72/75/76



MATERIALS OF CONSTRUCTION

Rotary Faces	Tungsten Carbide
Stationary Faces	Proprietary FlexSiCG (Siliconized Carbon/Graphite), AI Carbon (<1,500 psi [103.4 bar])
Springs	Hastelloy C276™
Metal Parts	316SS (std), Alloy 255, Hastelloy C276™
Secondary Seals	FKM, EPDM, TFEP, FFKM [UHPGT variant: spring energized PTFE]

OPERATING PARAMETERS

Temperature Range	HPGT: -10 °F to 275 °F (-12 °C to 135 °C) UHPGT: -100 °F to 400 °F (-73 °C to 204 °C)
Max Inboard Pressure	HPGT: 1500 psi (103 bar) UHPGT: 3000 psi (207 bar)
Max Speed	12,000 fpm (61 m/s)

*Max temperature / pressure / speed indicate operating extremes independently and do not imply the seal will function at these extremes at the same time. Contact Flexaseal if in doubt.

TYPE A | CATEGORY 2 & 3 NON-CONTACTING DRY SEALS

Arrangement 2

The **Flexaseal Style HPGT** is engineered for reliability in high-pressure supercritical applications. Each design element has been developed with a performance objective: eliminating face wear, controlling leakage, and extending MTBR, while simplifying integration with industry-standard support systems.

- Gas-lubricated, non-contacting design eliminates face wear, minimizes heat generation, and extends MTBR.
- Bi-directional rotary face lift-off grooves generate stiff dry-gas film between primary and mating rings.
- Stationary multi-spring configuration ensures stability at high shaft speeds.
- Rigid tungsten carbide balance sleeves resist deformation under high pressures and loads.
- Proprietary FlexSiCG face material offers the latest in material science with high rigidity and forgiveness during upset conditions, and excellent heat dissipation for slow-rolls and start/stops.
- FEA-optimized seal faces minimize distortion under high-pressures, preserving a stiff interface capable of supporting extreme applied loads.
- The tandem arrangement with containment ensures that primary leakage is directed to flare or vapor recovery.
- Standard HPGT variant, as shown in Figure 1, uses O-ring secondary seals, see HPGT cross-section at right. Optional spring-energized PTFE secondary seals (UHPGT variant) available for safe, reliable sealing in ultra-high-pressure or sCO_2 service where elastomers risk explosive decompression.

You can rely upon the HPGT and UHPGT for containment of supercritical fluids, extended service intervals, and reduced equipment life-cycle costs.

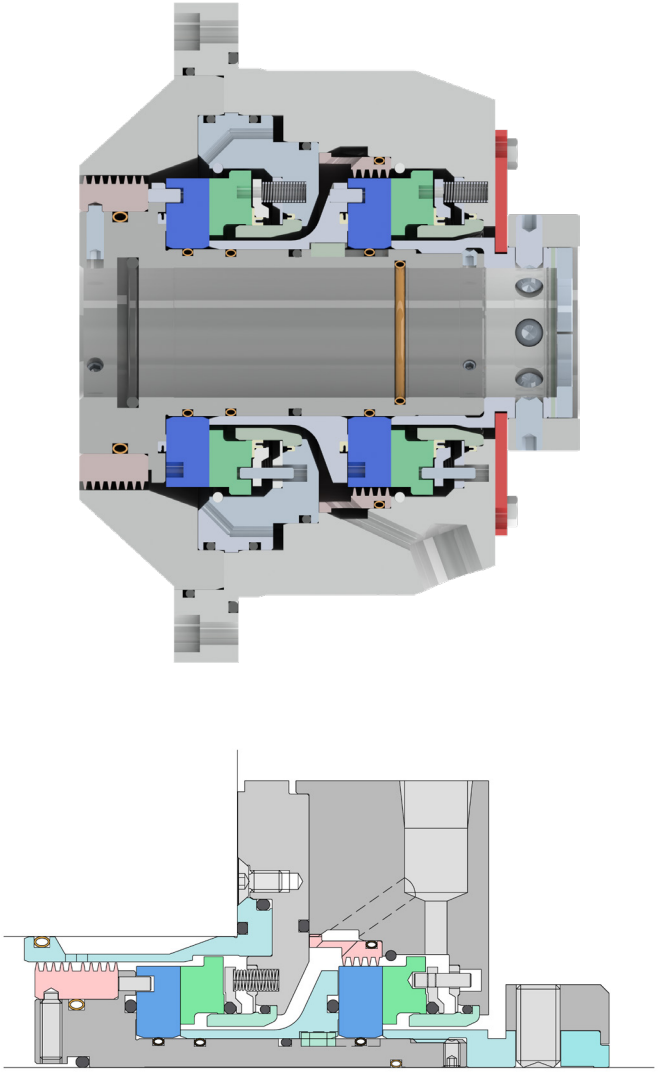


Figure 1. HPGT Cross-Section standard variant with O-ring secondary seals, shown in black.

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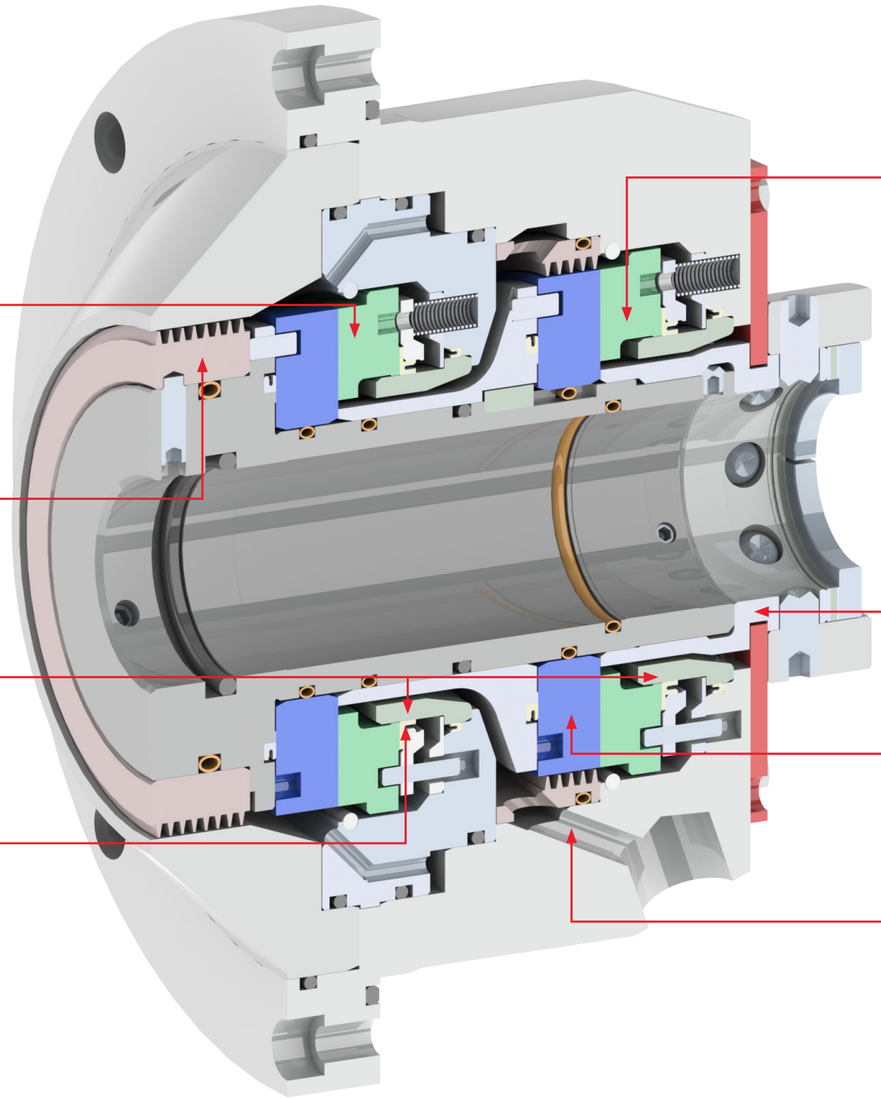
DESIGN FEATURES & BENEFITS



Rigid Primary Faces offer rigidity at high pressures and forgiveness at start-up and shut-down.

Labyrinth Seals keep seal area clean and isolated from process.

Rigid Tungsten Carbide Balance Sleeves resist deformation under high pressures and loads.

Optional Ultra-High-Pressure (UHPGT) Variant incorporates spring-energized PTFE secondary seals to eliminate extrusion and explosive decompression of those components.

Laser-Etched Grooves on Primary Faces generate bi-directional liftoff in the sealing interface, ensuring non-contacting operation at low pressures. Liftoff pad geometry allows for the gas to enter, build pressure/ liftoff, and exit,reducing overall gas consumption.

Two-Piece Sleeve Design withstands extreme thrust loads for reliability under strain.

High-Strength Tungsten Carbide Mating Rings resist fracturing and reduce risk of damage to equipment.

Inboard Seal Leakage is Redirected to flare or vapor recovery.