



API RANGE OF SEALS

FOR THE OIL & GAS INDUSTRY

INNOVATION SINCE 1983

DESIGN, MANUFACTURING, REPAIR, AND SERVICE

Flexaseal supplies mechanical seals and seal support systems in the API market all over the world. We are knowledgeable in the specific challenges of emission controls, high pressures, speeds, and temperatures as well as sealing toxic, corrosive, and flammable products.

OUR CAPABILITIES INCLUDE:

- Heavy duty slurry seal.
- Engineered cartridge & component seals.
- Mixer/agitator seals.
- Gas seals.
- Welded metal bellows up to 1,400 psig.
- Single and dual cartridge seals.
- The world's first split cartridge mechanical seal.
- API repair and reliability improvements.
- Reverse engineering.
- Competitor repair and exchange programs.
- Complete seal repair services available in our Vermont, Texas, and Louisiana locations.

GLOSSARY OF API TERMINOLOGY

These definitions should be used as reference only. For a complete guide of all API terminology and specifications, please consult API Standard 682 Fourth Edition, May 2014.

API – American Petroleum Institute

ASME – American Society of Mechanical Engineers

ARRANGEMENT – Defines mechanical seal layout and support system parameters.

- **ARRANGEMENT 1:** One seal per cartridge assembly.
- **ARRANGEMENT 2:** Two seals per cartridge assembly; space between the seals is below seal chamber pressure.
- **ARRANGEMENT 3:** Two seals per cartridge assembly; space between the seals is pressurized by an external source to a pressure higher than the seal chamber pressure.

CATEGORY – Defines the dimensional parameters of the pump seal chamber design and the corresponding allowable operating ranges and limitations.

- **CATEGORY 1:** ASME B73.1 & B73.2 seal chamber specifications (non-API 610). -40°F to 500°F (-40°C to 260°C), 0 PSIG to 300 PSIG.
- **CATEGORY 2:** API 610 seal chamber specifications -40°F to 750°F (-40°C to 399°C), 0 PSIG to 600 PSIG.
- **CATEGORY 3:** API 610 (or equal) seal chamber specifications with mandatory qualification testing and documented seal design -40°F to 750°F (-40°C to 399°C), 0 PSIG to 600 PSIG.

TYPE – Defines the mechanical seal design. All three types listed below must be a balanced cartridge design mounted inside the seal chamber.

- **TYPE A:** Pusher seal with multi-spring design. Secondary seal design - elastomeric O-rings.
- **TYPE B:** Metal bellows seal. Preferred bellows material - Alloy C-276, secondary seal design - elastomeric O-rings.
- **TYPE C:** Metal bellows seal. Preferred stationary design; bellows material - Alloy 718, secondary seal design - flexible graphite.

MATERIALS OF CONSTRUCTION

- **SEAL FACES:** Carbon, Antimony-Impregnated Carbon, Sintered Silicon Carbide, Graphite-Loaded Silicon Carbide, Reaction-Bonded Silicon Carbide, Ni-B Tungsten Carbide.
- **WELDED METAL BELLOWS:** Alloy C-276, Alloy 718, AM350HT.
- **SECONDARY SEALING:** Viton®, Ethylene Propylene, Aflas®, Buna, Neoprene, Perfluorelastomers, Flexible Graphite.

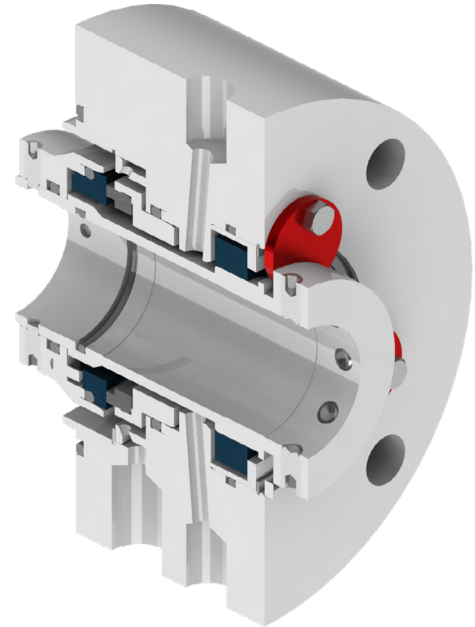
Other materials available upon request and design approval.

FLEXASEAL STYLE 58A

ARRANGEMENT 1

DESCRIPTION:

- Rugged stationary single seal design for high pressures.
- Robust and reliable seal face drive.
- Multi-point injection feature to ensure maximum, uniform cooling of seal faces.
- Flush, quench and drain connections.
- Piloted gland with confined gland packing to prevent blow out or gland packing extrusion.
- Fixed and floating throttle bushing options available.



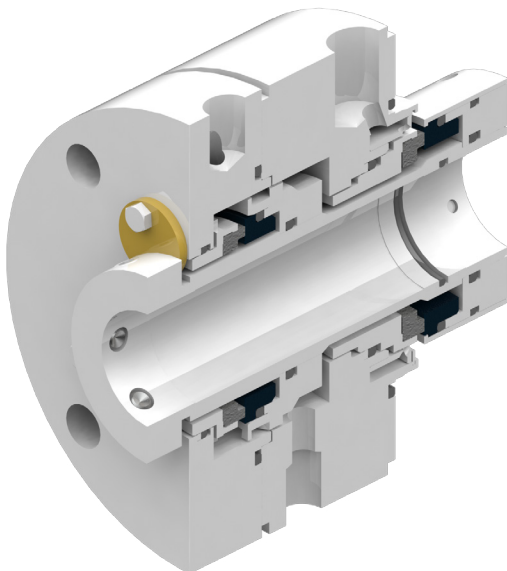
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FLEXASEAL STYLE 79A

ARRANGEMENT 2/3

DESCRIPTION:

- Heavy duty tandem multispring cartridge design.
- Application-specific pumping ring design and tangential gland connections to allow for optimal barrier/buffer fluid circulation.
- Double balanced inboard face allows for reverse pressures in upset conditions.
- Multi-point injection feature to ensure maximum, uniform cooling of seal faces.



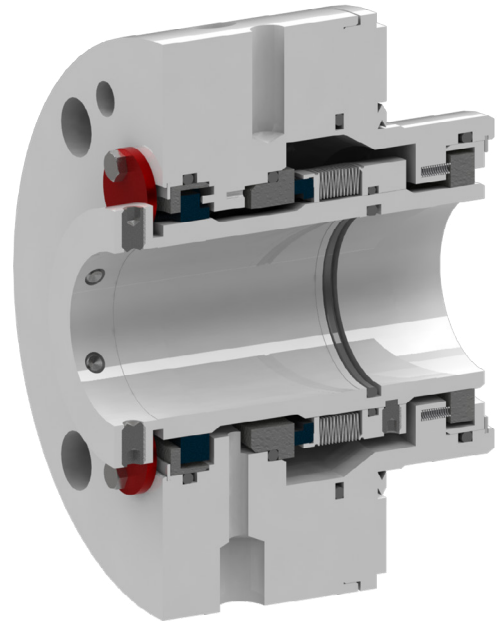
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FLEXASEAL STYLE 53A

ARRANGEMENT 1

DESCRIPTION:

- Heavy duty single welded metal bellows seal designed for API 682 recommendations.
- Self-cleaning rotating welded metal bellows.
- Piloted gland with confined gland packing to prevent blow out or gland packing extrusion.
- Multi-point injection feature to ensure maximum, uniform cooling of seal faces.
- Double-ply welded metal bellows design available for higher pressures.



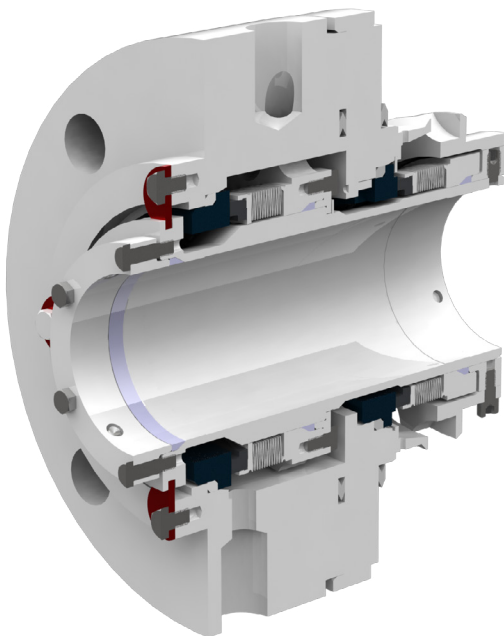
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FLEXASEAL STYLE 78A

ARRANGEMENT 2/3

DESCRIPTION:

- Tandem rotating welded metal bellows cartridge seal.
- Application-specific pumping ring design and tangential gland connections allow for optimal barrier/buffer fluid circulation.
- Double-ply welded metal bellows design available for higher pressures.
- Multi-point injection feature to ensure maximum, uniform cooling of seal faces.



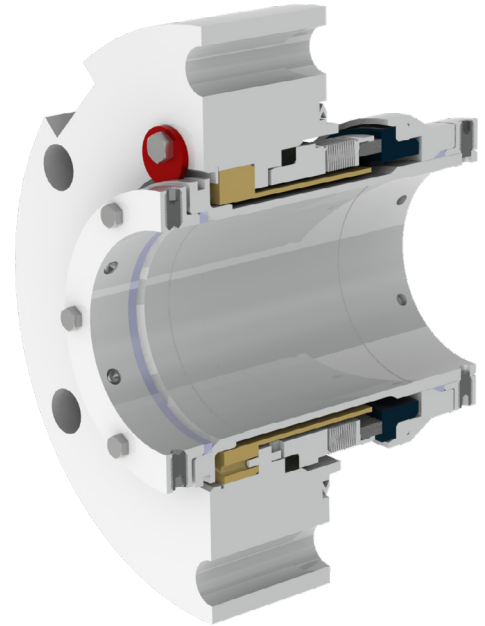
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FLEXASEAL STYLE 66A/63A

ARRANGEMENT 1

DESCRIPTION:

- Style 63A - Stationary welded metal bellows design.
- Style 66A - Rotating welded metal bellows design.
- Double-ply welded metal bellows design available for higher pressures.
- Piloted gland with confined metal-to-metal gland, gasket for even seal face loading.
- Steam deflector option diverts quench media to inside of stationary bellows design to prevent coking.
- Multi-point injection feature to ensure maximum, uniform cooling of seal faces.



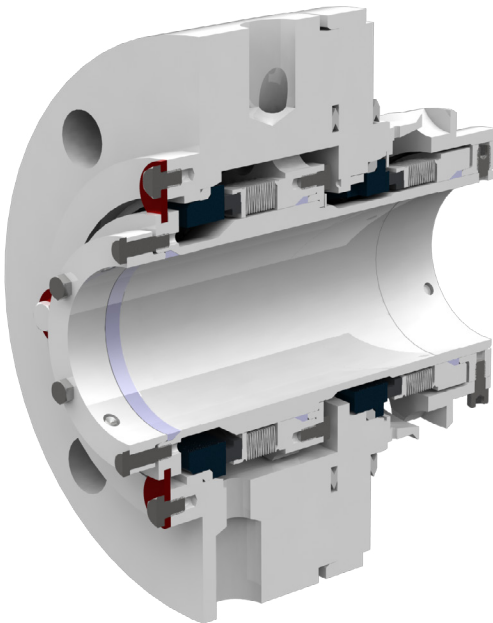
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FLEXASEAL STYLE 78HT

ARRANGEMENT 2/3

DESCRIPTION:

- Tandem rotating heat-treated welded metal bellows cartridge design for high temperature applications.
- Double-ply welded metal bellows design available for higher pressures.
- Multi-point injection feature to ensure maximum, uniform cooling of seal faces.
- Pumping ring design and tangential gland connections for optimal fluid circulation.
- Piloted gland with confined metal-to-metal gland gasket for even seal face loading.



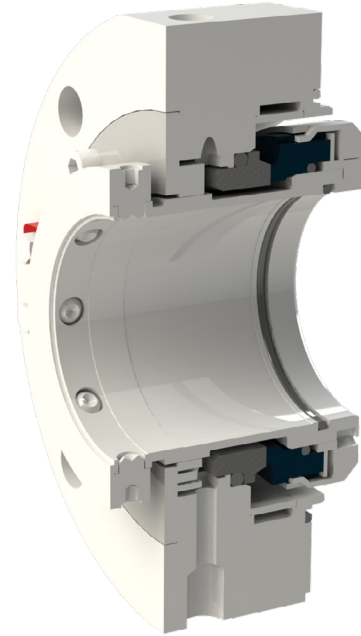
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FLEXASEAL STYLE 59A

ARRANGEMENT 1

DESCRIPTION:

- Oversized Monolithic Seal Faces for superior heat dissipation and durability.
- Circumferential Flush System to evenly distribute cooling flush flow around the seal faces.
- Convertible Outboard Bushing for fixed, floating and segmented designs to allow for all types of secondary leakage capture.
- Tang Drive System for reliable face torque transfer and reduced O-Ring hang up.
- Heavy Duty Springs to mitigate process debris clogging and reduce spring quantity.



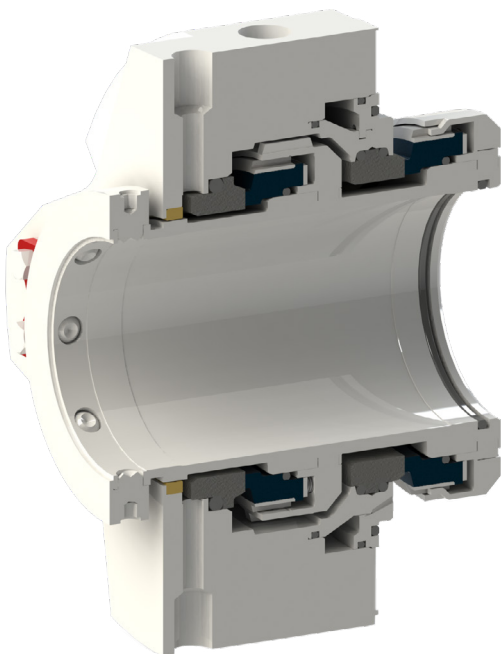
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FLEXASEAL STYLE 80A

ARRANGEMENT 2

DESCRIPTION:

- Oversized Monolithic Seal Faces for superior heat dissipation and durability.
- Tang Drive System for reliable face torque transfer and reduced O-Ring hang up.
- Heavy Duty Springs to mitigate process debris clogging and reduce spring quantity.
- Cushion Mounted Primary Seat to increase reliability in harsh services.
- Retained Seal Faces for pressurized or unpressurized barrier systems.
- Optimized Pumping Ring for higher barrier fluid flow and better seal cooling.



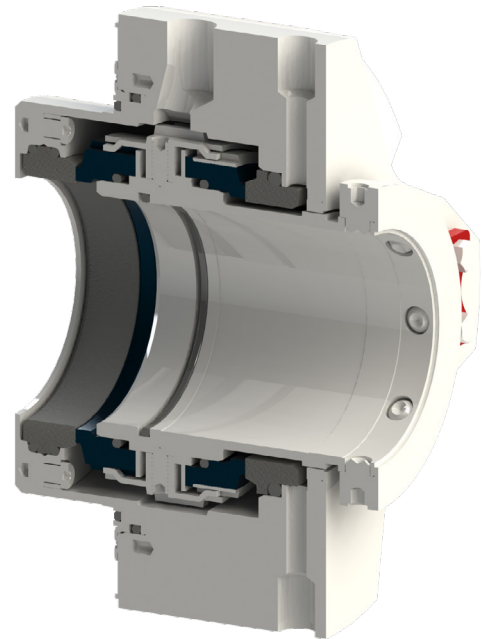
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FLEXASEAL STYLE 90A

ARRANGEMENT 3

DESCRIPTION:

- Oversized Monolithic Seal Faces for superior heat dissipation and durability.
- Tang Drive System for reliable face torque transfer and reduced O-Ring hang up.
- Heavy Duty Springs to mitigate process debris clogging and reduce spring quantity.
- Cushion Mounted Primary Seat to increase reliability in harsh services.
- Retained Seal Faces for pressurized barrier systems.
- Optimized Pumping Ring for higher barrier fluid flow and better seal cooling.
- OD Pressure Design for enhanced solids handling, barrier fluid distribution and seal reliability.

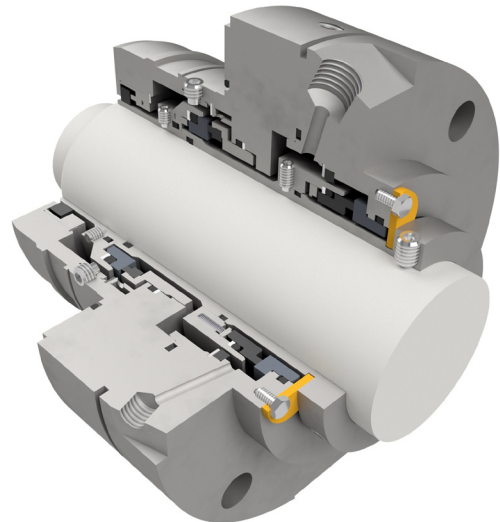


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STYLE FCS | DRY-RUNNING SECONDARY CONTAINMENT SEAL

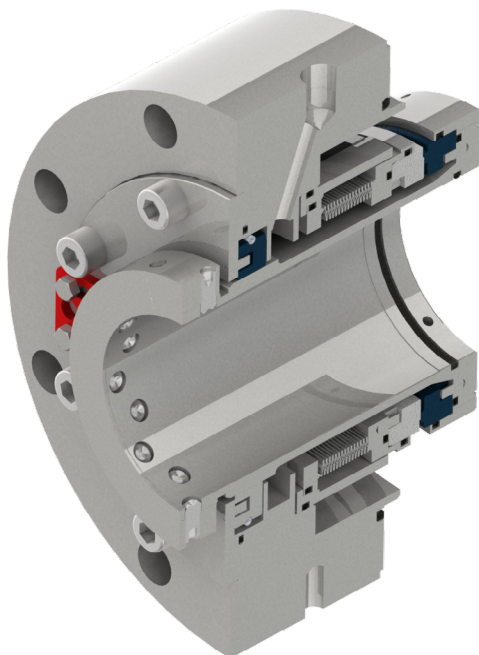
DESCRIPTION:

- Can be added to single seal styles including Style 53A, 58A, 63A, and 66A.
- Welded metal bellows technology maintains a uniform and controlled light load on dry running seal faces for long seal life.
- Stationary design enables optimum face tracking.
- Static O-ring position eliminates friction during operation and potential failures caused by O-ring hang up.
- Seal faces are heat shrunk retained for higher strength and torque transfer –no pin drive.
- Most commonly used with API Plans 72 and 76.



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STYLE HPCS | TRIPLE-PLY BELLOWS CARTRIDGE SEAL



DESCRIPTION:

- For High Pressure Crude Oil applications.
- Exclusive triple-ply welded bellows technology operates in pressures up to 1500 psig while accommodating significant axial movement.
- Drive lug design to positively drive rotating seal components and eliminate torsion loads on the face energizing elements.
- Choose from three (3) standard secondary bushing arrangements to accommodate Plans 65A and 66A.

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SEAL SUPPORT INFORMATION

Fluid control systems support the optimum operating conditions for mechanical seals in challenging environments. Flexaseal Engineered Seals and Systems designs and manufactures a full range of seal support systems including –

RESERVOIRS SYSTEMS

For pressurized and unpressurized dual seal support. Available for API 682 Plans 52, 53A, 53B, and 53C.



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LUBE OIL SYSTEMS

Minimize the potential of equipment failure by controlling the pressure and temperature of the equipment's lubrication oil.



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HEAT EXCHANGERS

That align with API 682 Flush Plans 21, 23, and 55.

- **SHELLCOOL** water-cooled systems with removable head and bundle for easy maintenance.
- **TURBOCOOL** air-cooled systems eliminate the need for cooling water.



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CYCLONE SEPARATORS

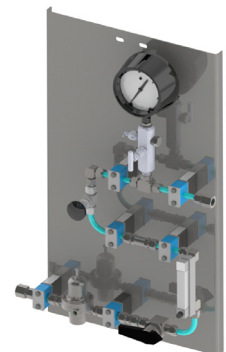
To remove abrasives, compatible with API 682 Plan 31.



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GAS SUPPORT PANELS

For dual seal configurations using buffer or barrier gases, such as API 682 Plans 72 and 74 and in conjunction with Plans 75 and 76.



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FILTRATION SYSTEMS

The M12 system's duplex filter design allows for continuous flow during transfer to a new filter. For use with API 682 Flush Plan 12.



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Flexaseal Seal Support Systems are designed and are compliant with industry standards including API 610 and 682, ASME VIII and ASME B31.3.

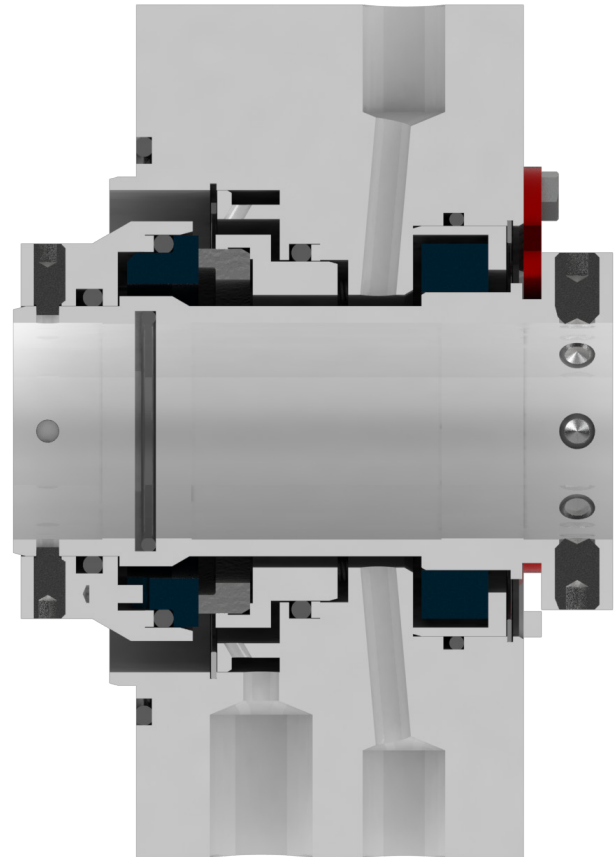
Flexaseal Seal Support Systems are manufactured in our Houston, TX location.

HEAVY DUTY STATIONARY MULTI-SPRING SINGLE CARTRIDGE SEAL

For High Pressure Applications

The **Flexaseal Style 58 single cartridge seal** is specifically designed for ruggedness and durability to withstand high pressure applications. Design elements include a piloted gland to positively center the seal assembly, as well as a metal-to-metal confined gland gasket which prevents blow-out or extrusion of the gland packing.

The Style 58 cartridge is uniquely customizable to your specific pump and application requirements. API 682-compliant options are also available.



MATERIALS OF CONSTRUCTION

Faces	Premium Grade Resin and Antimony Impregnated Carbons; Nickel Bound Tungsten Carbide; Sintered and Graphite-Loaded Silicon Carbide
Elastomers	FKM, EPDM, TFEP, Buna, Neoprene, Perfluoroelastomers
Metal Parts	316 and 17-4 Stainless Steel <i>Other options available:</i> Super Duplex Stainless Steel, Alloy C-276
Springs	Alloy C-276

OPERATING PARAMETERS

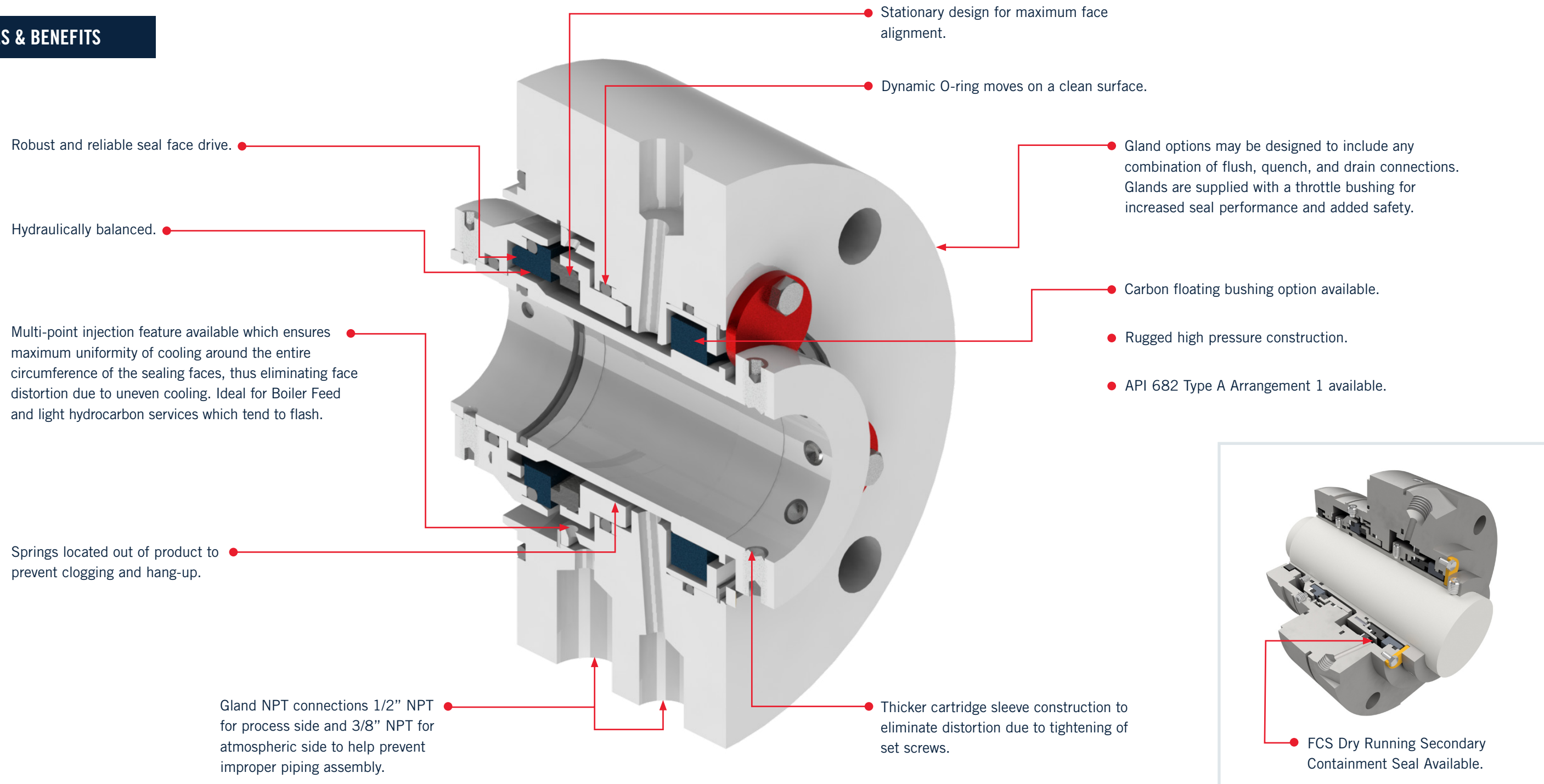
Max Temp	550°F (290°C)
Max Pressure	1200 psi (80 bar)
Max Speed	10,000 FPM (50m/sec)

*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.

HEAVY DUTY STATIONARY MULTI-SPRING SINGLE CARTRIDGE SEAL

FOR HIGH PRESSURE APPLICATIONS

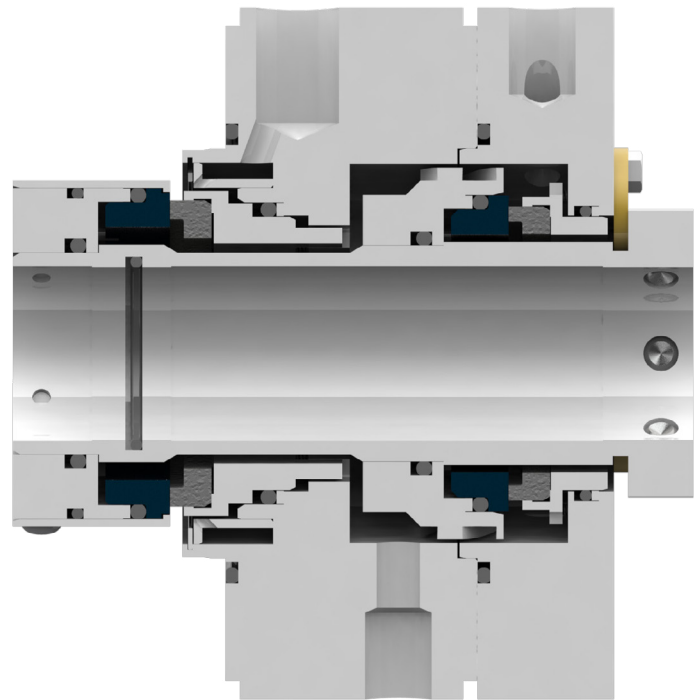
DESIGN FEATURES & BENEFITS



HEAVY DUTY STATIONARY TANDEM MULTI-SPRING CARTRIDGE SEAL *FOR CRITICAL SERVICES WHERE LEAKAGE MUST BE COMPLETELY CONTAINED*

The **Flexaseal Style 79 tandem cartridge seal** is specifically designed for ruggedness and durability to withstand services where leakage and emissions must be completely contained. Design elements include retained faces to allow for pressurized or unpressurized barrier systems, stationary design for maximum runout compensation and pilot gland to positively center the seal.

The Style 79 cartridge seal is uniquely customizable to your specific application requirements. API 682 Compliant options are also available.



MATERIALS OF CONSTRUCTION

Rotary Faces	Silicon Carbide
Stationary Faces	Carbon, Silicon Carbide, Tungsten Carbide
Springs	Hastelloy C276*
Metal Parts	316 Stainless Steel
O. Rings	Viton®, Ethylene Propylene, AFLAS, Perfluoroelastomer

OPERATING PARAMETERS

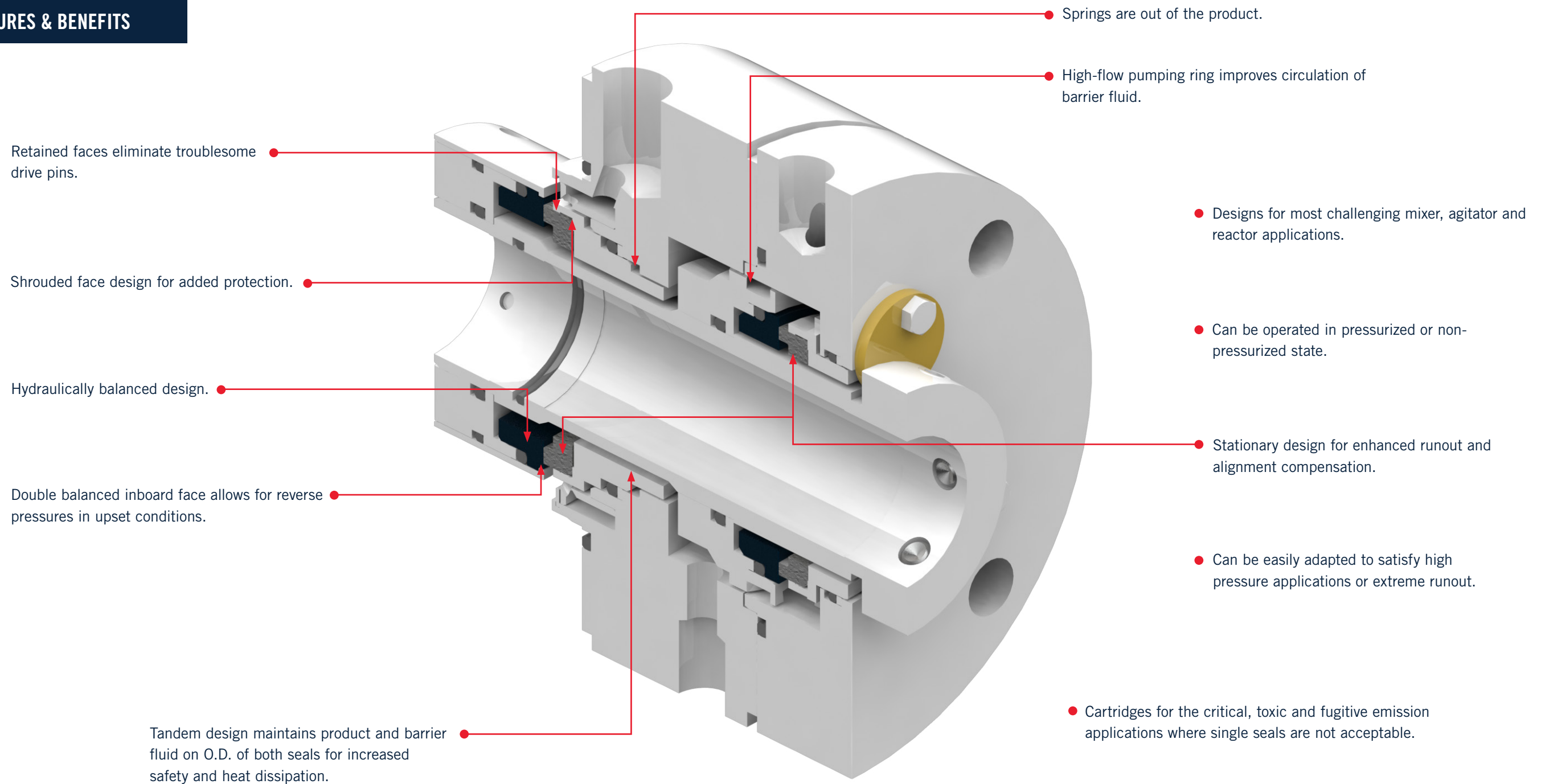
Max Temp	400°F
Max Pressure	1200 PSIG
Max Speed	4500 FPM

*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.

HEAVY DUTY STATIONARY TANDEM MULTI-SPRING CARTRIDGE SEAL

FOR CRITICAL SERVICES WHERE LEAKAGE MUST BE COMPLETELY CONTAINED

DESIGN FEATURES & BENEFITS



HEAVY DUTY ROTATING METAL BELLOWS CARTRIDGE SEAL

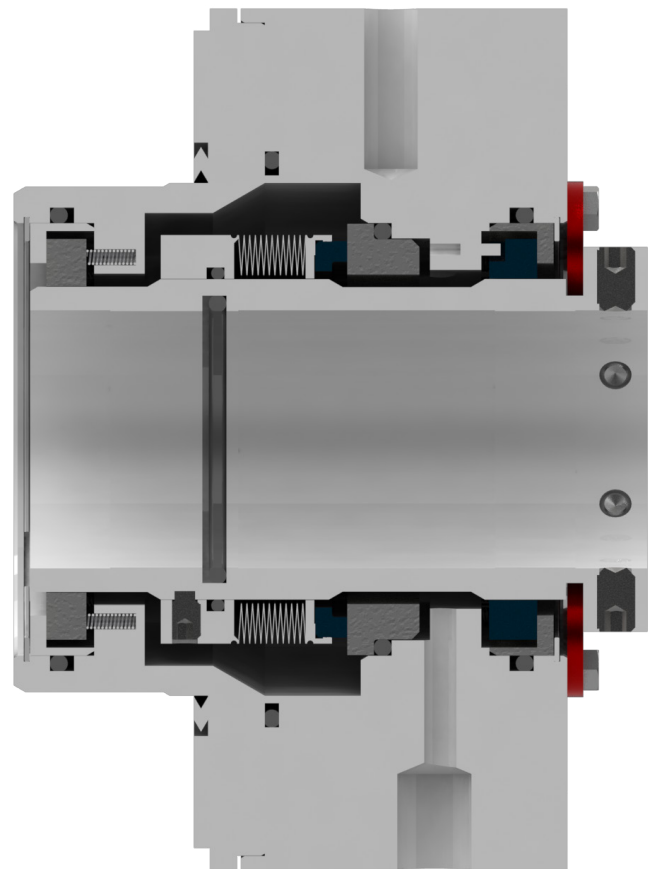
For Medium Temperature and Dirty Critical Services

The Flexaseal Style 53 cartridge seal is specifically designed for ruggedness and durability to withstand higher temperature or dirty services. The rotating bellows is self-cleaning for greater reliability in dirty services.

Multiple bellows materials available based on process conditions and fluids. Double Ply bellows designs for higher pressures.

Static elastomers throughout for elimination of o-ring abrasion and energized face hang up.

The Style 53 cartridge seal is uniquely customizable to your specific application requirements. API 682 Compliant options are also available.



MATERIALS OF CONSTRUCTION

Faces	Antimony Impregnated Carbon, Nickel Bound Tungsten Carbide, Sintered Silicon Carbide, Graphite Loaded Silicon Carbide
Welded Bellows	AM350HT, Inconel 718™, Hastelloy C-276™. Single and Double-Ply bellows options available.
Gland Bushings	Bronze, Carbon
Lantern Ring	PTFE
Standard Metallurgy	316 SS with low-expansion Alloy 42 retainer. Other material options available, please consult Flexaseal.

OPERATING PARAMETERS

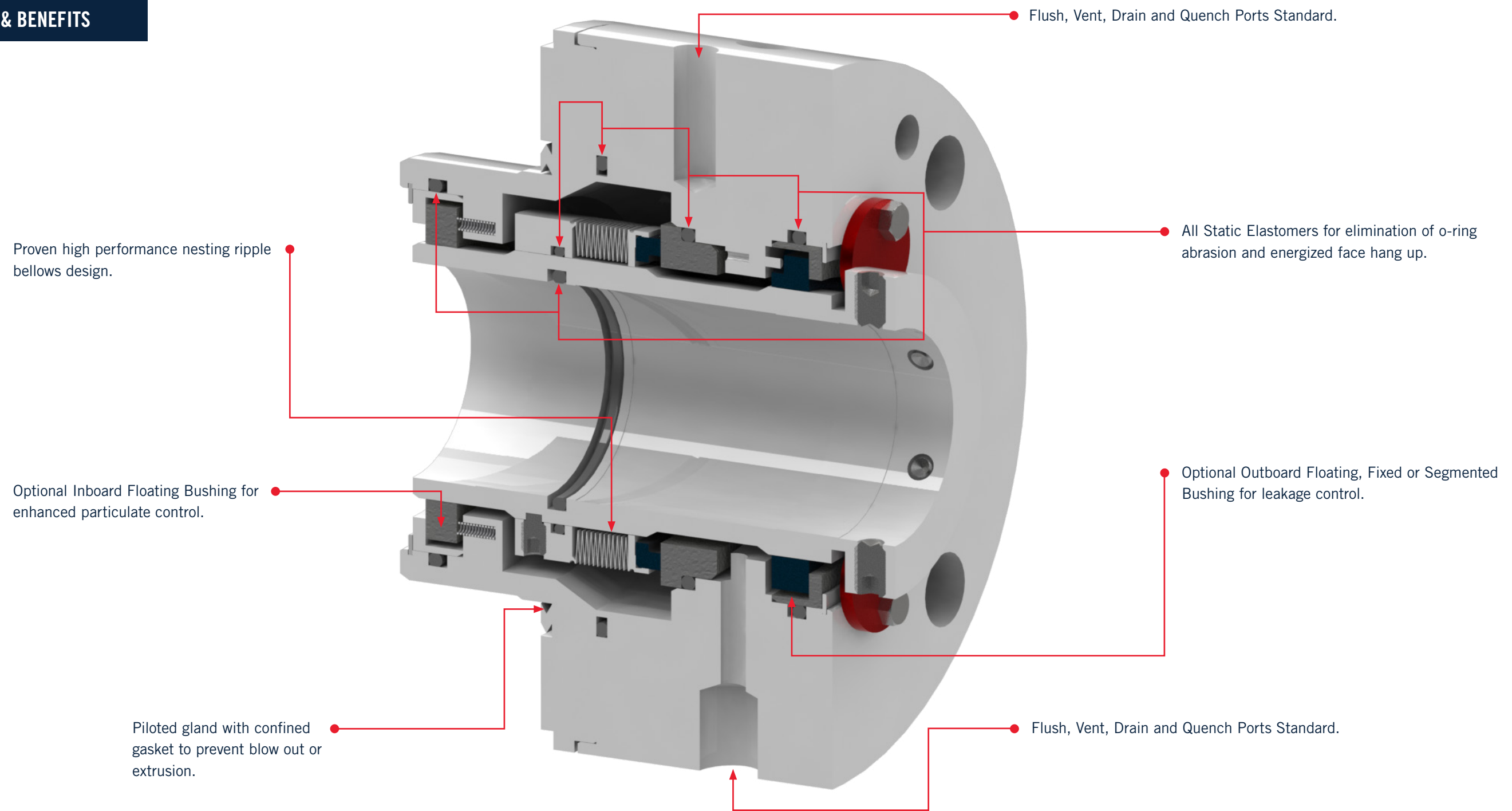
Max Temp	800°F
Max Pressure	400 PSIG
Max Speed	4500 FPM

*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.

HEAVY DUTY ROTATING METAL BELLOWS CARTRIDGE SEAL

For Medium Temperature and Dirty Critical Services

DESIGN FEATURES & BENEFITS



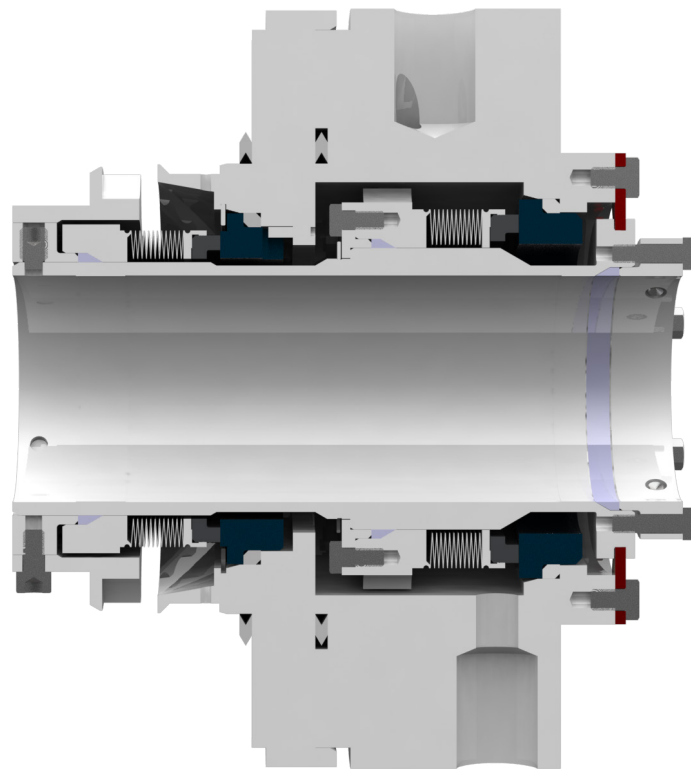
HEAVY DUTY ROTATING METAL BELLOWS CARTRIDGE SEAL

For Higher Temperature and Dirty Critical Services Where Leakage Must be Completely Contained

The Flexaseal Style 78 tandem cartridge seal is specifically designed for ruggedness and durability to withstand higher temperature or dirty services where leakage and emissions must be completely contained. Design elements include retained faces to allow for pressurized or unpressurized barrier systems, rotating metal bellows for self-cleaning and pilot gland to positively center the seal.

Style 78 is available in a High Temperature (HT) design with static O-Rings or with Grafoil Packing. This allows for operating temperatures up to 800F, while improving reliability by eliminating the dynamic secondary sealing element.

The Style 78 cartridge seal is uniquely customizable to your specific application requirements. API 682 Compliant options are also available.



MATERIALS OF CONSTRUCTION

Rotary Faces	Carbon, Nickel Bound Tungsten Carbide, Silicon Carbide
Stationary Faces	Silicon Carbide
Inboard Bellows	Hastelloy C276™, AM 350 Stainless Steel, Inconel 718™
Outboard Bellows	AM 350 Stainless Steel, Inconel 718™
Metal Parts	316 Stainless Steel, Hastelloy C276™
O. Rings	Viton®, Ethylene Propylene, AFLAS**, Perfluoroelastomer, Teflon Jacketed Viton®***

OPERATING PARAMETERS

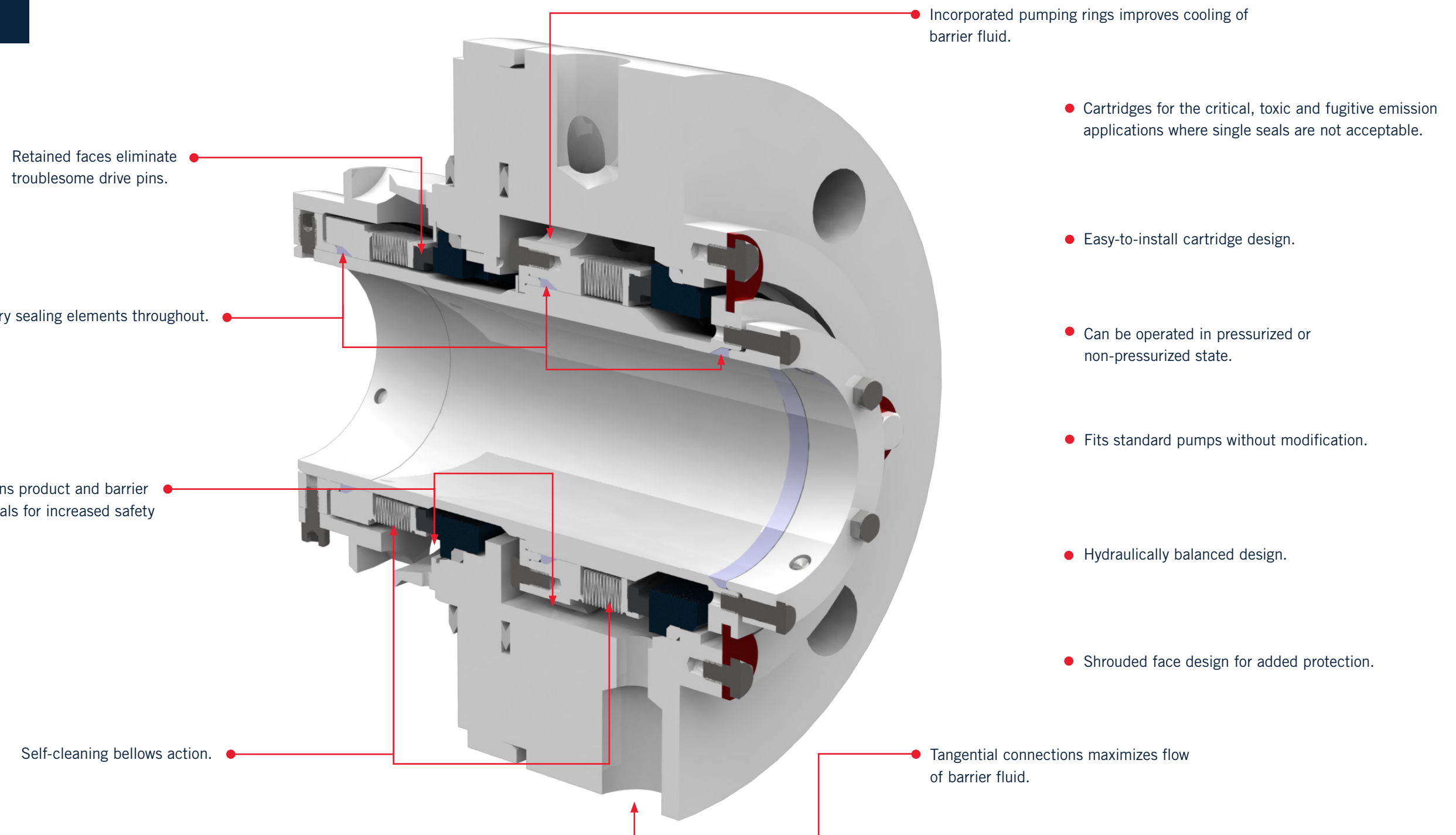
Max Temp	800°F
Max Pressure	400 PSIG
Max Speed	4500 FPM

*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.

HEAVY DUTY ROTATING METAL BELLOWS CARTRIDGE SEAL

For Higher Temperature and Dirty Critical Services Where Leakage Must be Completely Contained

DESIGN FEATURES & BENEFITS



HEAVY DUTY METAL BELLOWS CARTRIDGE SEAL

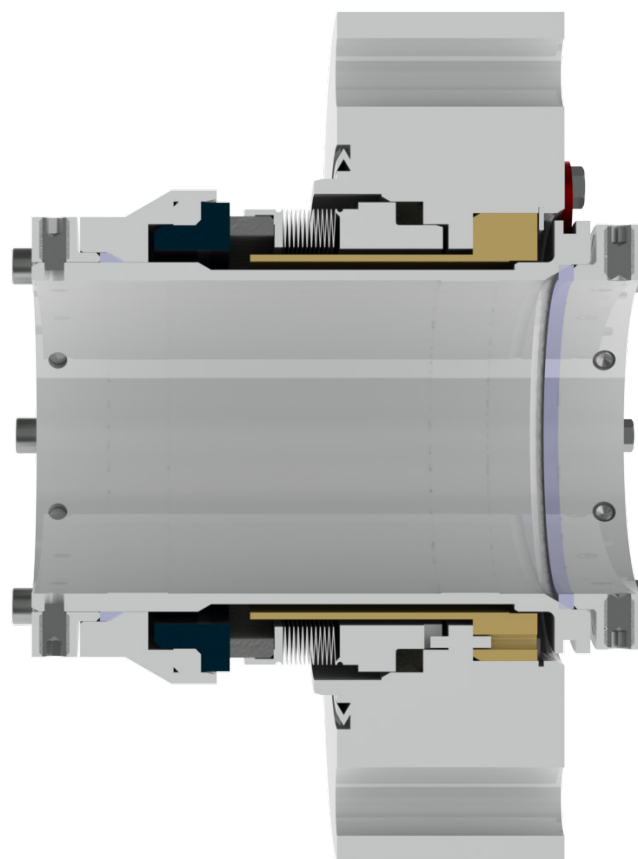
For Higher Temperature and Dirty Critical Services

The Flexaseal Style 63/66 cartridge seal is specifically designed for ruggedness and durability to withstand higher temperature or dirty services. The Style 63 features a stationary bellows unit for superior performance in applications that require higher shaft runout or large assembly tolerances. The Style 66 is a rotating bellows unit for enhanced solids handling.

Standard Inconel 718 Bellows units for wide temperature and process fluid compatibility.

Grafoil packing throughout allows for operating temperatures up to 800F, while improving reliability by eliminating the dynamic secondary sealing element.

The Style 63/66 cartridge seal is uniquely customizable to your specific application requirements. API 682 Compliant options are also available.



MATERIALS OF CONSTRUCTION

Faces	Antimony Impregnated Carbon, Nickel Bound Tungsten Carbide, Sintered Silicon Carbide, Graphite Loaded Silicon Carbide
Welded Bellows	AM350HT, Alloy 718. Single- and double-ply bellows options available.
Gland Bushing	Bronze, Carbon
Standard Metallurgy	316 SS with low-expansion Alloy 42 retainer. Other material options available, please consult Flexaseal.

OPERATING PARAMETERS

Max Temp	800°F (425°C)
Max Pressure	300 psi (20 bar)
Max Speed	Style 63: 10,000 SFPM (50m/sec) Style 66: 4,500 SFPM (22m/sec)

*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.

HEAVY DUTY METAL BELLOWS CARTRIDGE SEAL

For Higher Temperature and Dirty Critical Services

DESIGN FEATURES & BENEFITS

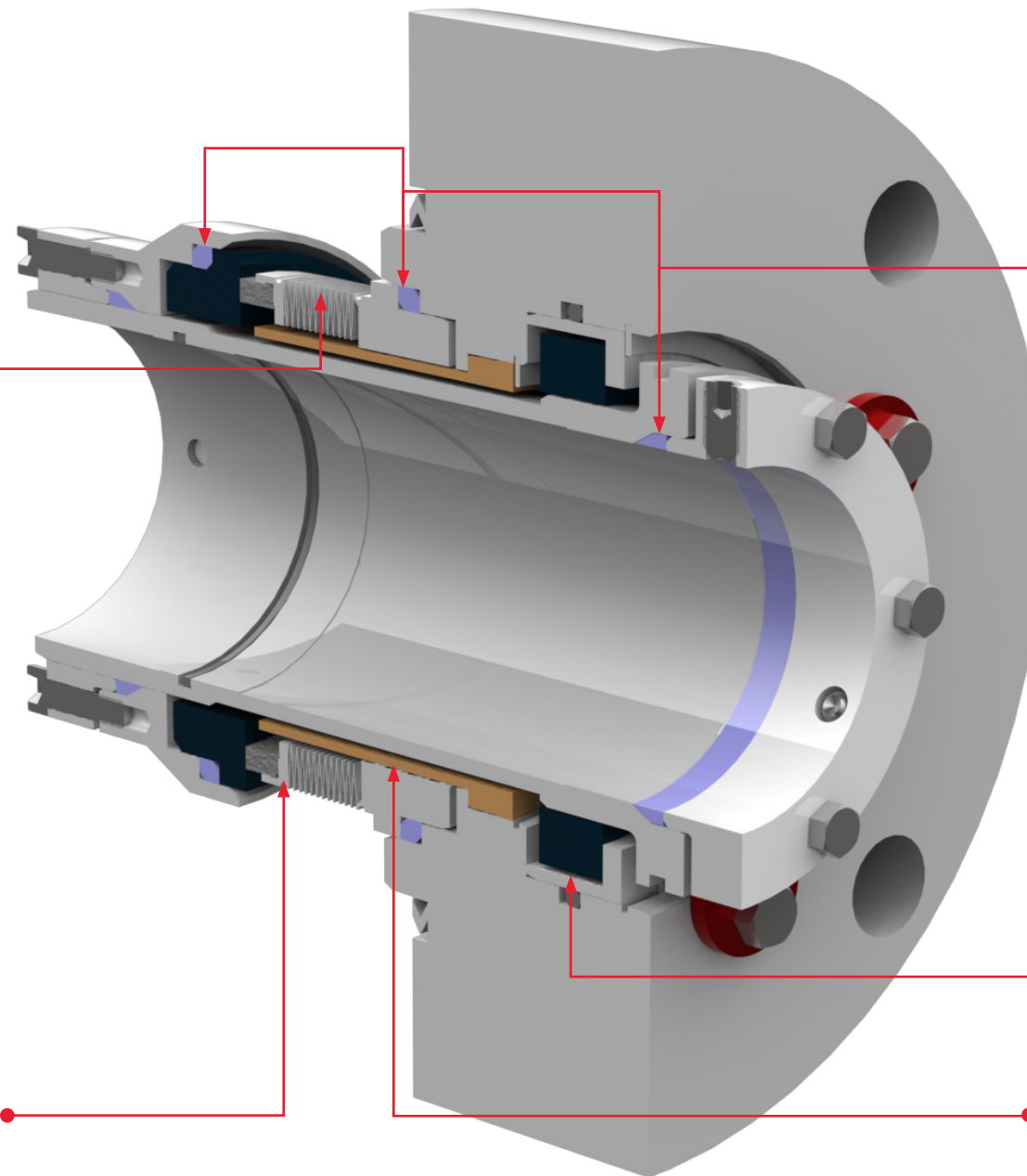
Easy cartridge seal installation. ●

Proven high performance nesting ripple bellows design. ●

Gland design with flush, quench and drain connections and throttle bushing. ●

Upgradeable to include any of the extensive array of API 682 design specifications such as a piloted gland with a metal-to-metal confined gland gasket, specific sleeve thicknesses, surface finishes, and throttle bushing clearances. ●

Low expansion alloy face retainer. ●



Style 63: Stationary welded metal bellows cartridge.

Style 66: Rotating welded metal bellows cartridge.

● High temperature static grafoil packing throughout seal.

● Standard AM350 heat treated bellows; Alloy 718 heat treated bellows option available.

● Double-ply welded bellows available for higher pressures.

● Carbon floating bushing option available.

● Bronze steam deflector option available to assist various API 682 plans in eliminating coking buildup on the bellows assemblies.

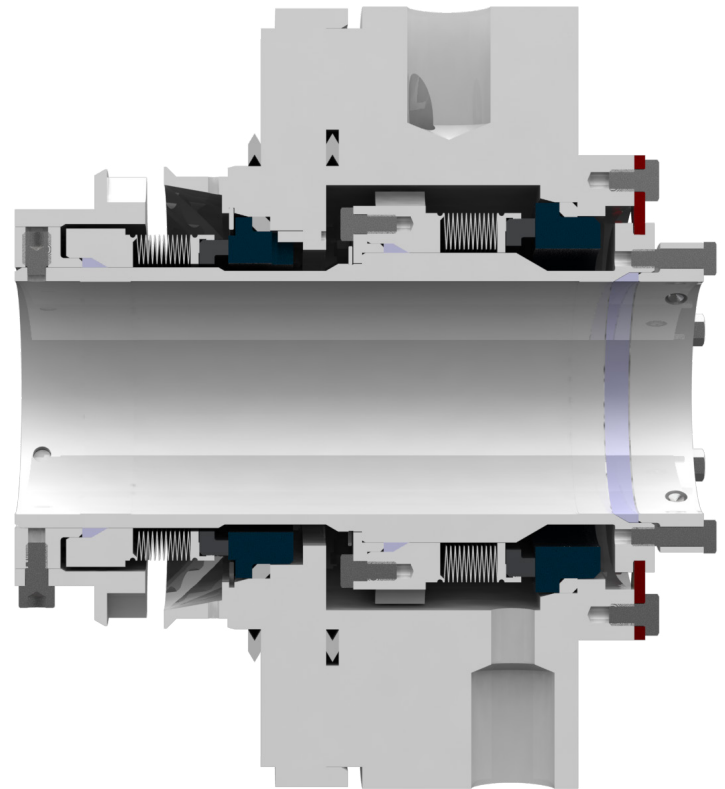
HEAVY DUTY ROTATING METAL BELLOWS CARTRIDGE SEAL

For Higher Temperature and Dirty Critical Services Where Leakage Must be Completely Contained

The Flexaseal Style 78 tandem cartridge seal is specifically designed for ruggedness and durability to withstand higher temperature or dirty services where leakage and emissions must be completely contained. Design elements include retained faces to allow for pressurized or unpressurized barrier systems, rotating metal bellows for self-cleaning and pilot gland to positively center the seal.

Style 78 is available in a High Temperature (HT) design with static O-Rings or with Grafoil Packing. This allows for operating temperatures up to 800F, while improving reliability by eliminating the dynamic secondary sealing element.

The Style 78 cartridge seal is uniquely customizable to your specific application requirements. API 682 Compliant options are also available.



MATERIALS OF CONSTRUCTION

Rotary Faces	Carbon, Nickel Bound Tungsten Carbide, Silicon Carbide
Stationary Faces	Silicon Carbide
Inboard Bellows	Hastelloy C276™, AM 350 Stainless Steel, Inconel 718™
Outboard Bellows	AM 350 Stainless Steel, Inconel 718™
Metal Parts	316 Stainless Steel, Hastelloy C276™
O. Rings	Viton®, Ethylene Propylene, AFLAS**, Perfluoroelastomer, Teflon Jacketed Viton®***

OPERATING PARAMETERS

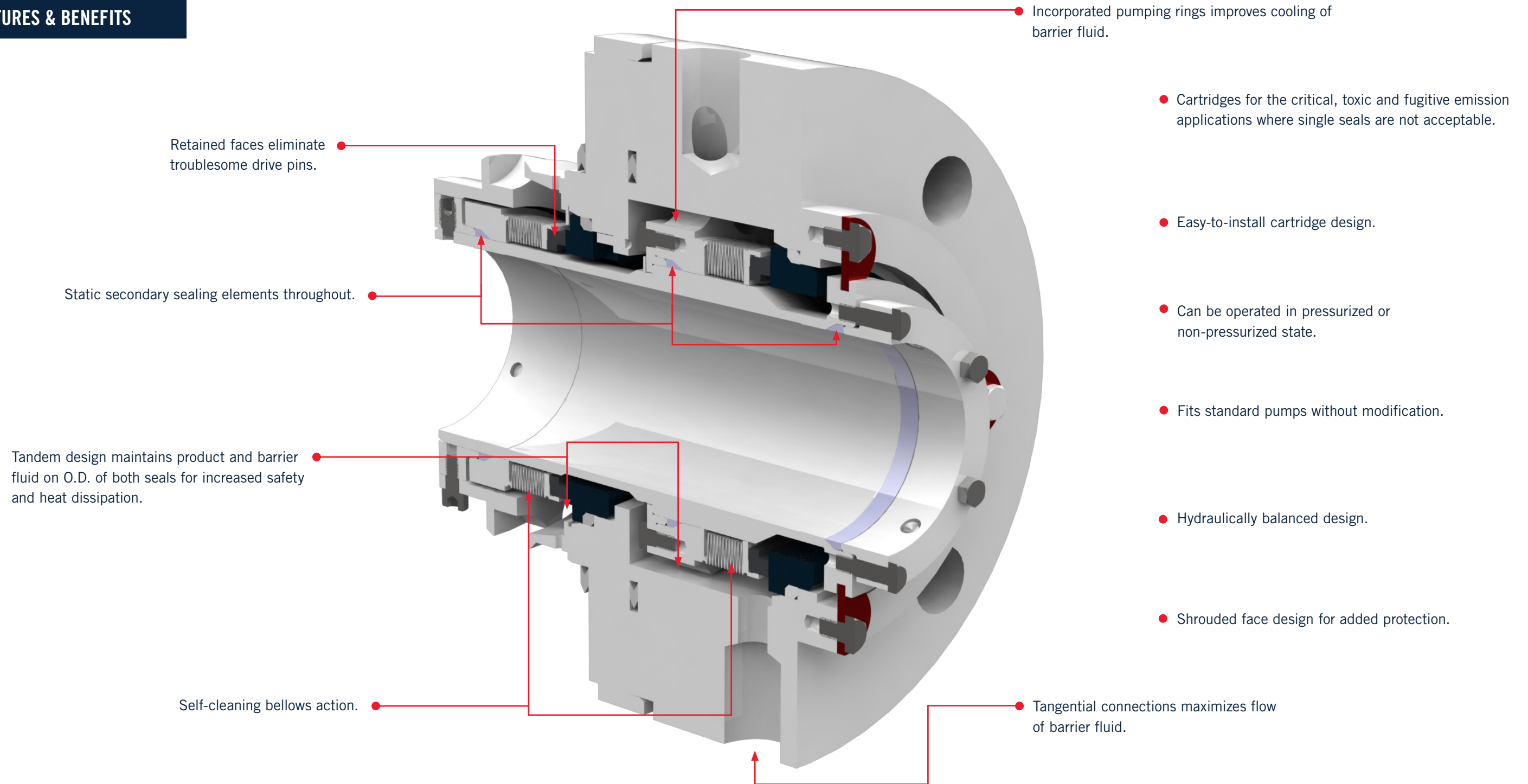
Max Temp	800°F
Max Pressure	400 PSIG
Max Speed	4500 FPM

*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.

HEAVY DUTY ROTATING METAL BELLOWS CARTRIDGE SEAL

For Higher Temperature and Dirty Critical Services Where Leakage Must be Completely Contained

DESIGN FEATURES & BENEFITS



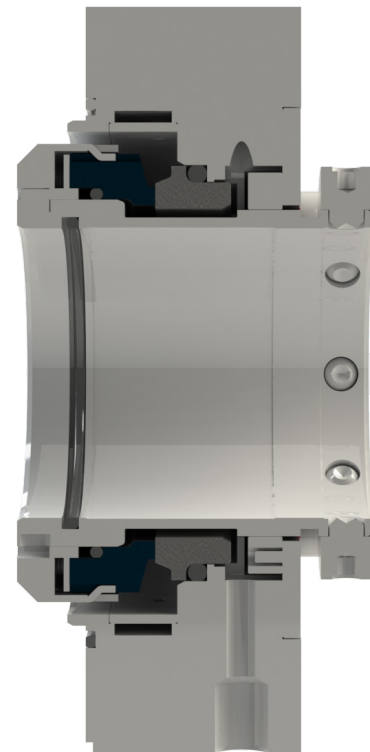
HEAVY DUTY ROTATING MULTI-SPRING SINGLE CARTRIDGE SEAL

For API 682 Applications

The **Flexaseal Style 59A** is designed specifically to conform to API 682 Category 2 Applications for Midstream and Downstream Oil and Gas Applications. Standard design features include:

- Oversized Monolithic Seal Faces for superior heat dissipation and durability.
- Circumferential Flush System to evenly distribute cooling flush flow around the seal faces.
- Convertible Outboard Bushing for fixed, floating and segmented designs to allow for all types of secondary leakage capture.
- Tang Drive System for reliable face torque transfer and reduced O-Ring hang up.
- Heavy Duty Springs to mitigate process debris clogging and reduce spring quantity.

The 59A is also available with contacting and non-contacting secondary sealing. The Flexaseal FC seal (Available as 59A/FC) provides decades of proven operational reliability as a contacting secondary seal. The Flexaseal FGSA (Available as 59A/FGSA) is our newest lift-off design for API applications that require a non-contacting secondary seal.



MATERIALS OF CONSTRUCTION

Faces	Premium Grade Resin and Antimony Impregnated Carbons; Nickel Bound Tungsten Carbide; Sintered and Graphite-Loaded Silicon Carbide
Elastomers	FKM, EPDM, TFEP, Buna, Neoprene, Perfluoroelastomers
Metal Parts	316 and 17-4 Stainless Steel Other options available: Super Duplex Stainless Steel, Alloy C-276
Springs	Alloy C-276

OPERATING PARAMETERS

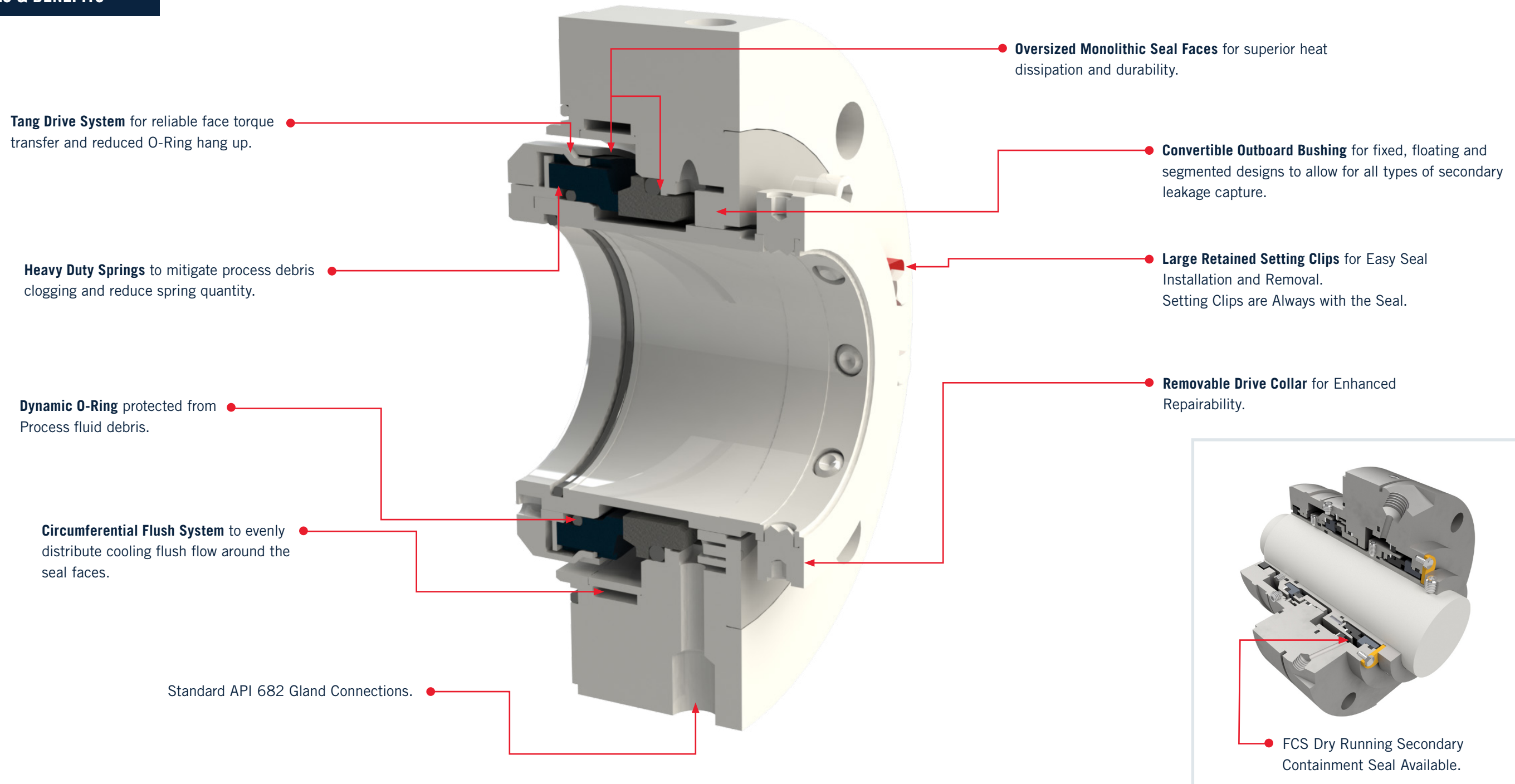
Max Temp	-40 to 400°F / -40 to 204°C
Max Pressure	600 PSIG / 41.4 bar
Max Speed	4,500 FPM / 23m/s

*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.

HEAVY DUTY ROTATING MULTI-SPRING SINGLE CARTRIDGE SEAL

For API 682 Applications

DESIGN FEATURES & BENEFITS

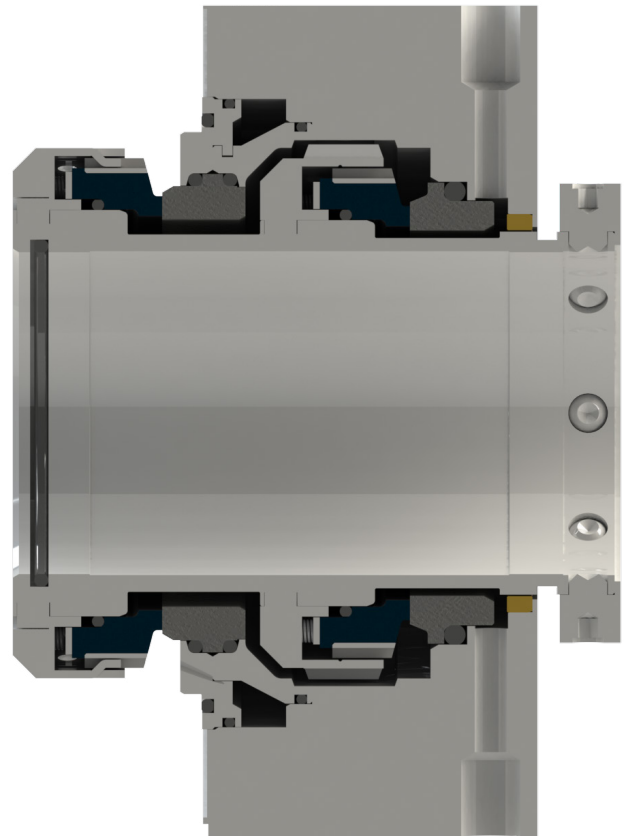


HEAVY DUTY ROTATING MULTI-SPRING TANDEM CARTRIDGE SEAL FOR API 682 APPLICATIONS

The **Flexaseal Style 80A** is designed specifically to conform to API 682 Category 2 Applications for Midstream and Downstream Oil and Gas Applications where a Pressurized or Unpressurized Tandem Arrangement is Desired. Standard design features include:

- Oversized Monolithic Seal Faces for superior heat dissipation and durability.
- Tang Drive System for reliable face torque transfer and reduced O-Ring hang up.
- Heavy Duty Springs to mitigate process debris clogging and reduce spring quantity.
- Cushion Mounted Primary Seat to increase reliability in harsh services.
- Retained Seal Faces for pressurized or unpressurized barrier systems.
- Optimized Pumping Ring for higher barrier fluid flow and better seal cooling.

Flush Plans 11/52/53A/53B/54



MATERIALS OF CONSTRUCTION

Rotary Faces	Silicon Carbide
Stationary Faces	Carbon, Silicon Carbide, Tungsten Carbide
Springs	Hastelloy C276*
Metal Parts	316 Stainless Steel
O. Rings	Viton®, Ethylene Propylene, AFLAS, Perfluoroelastomer

OPERATING PARAMETERS

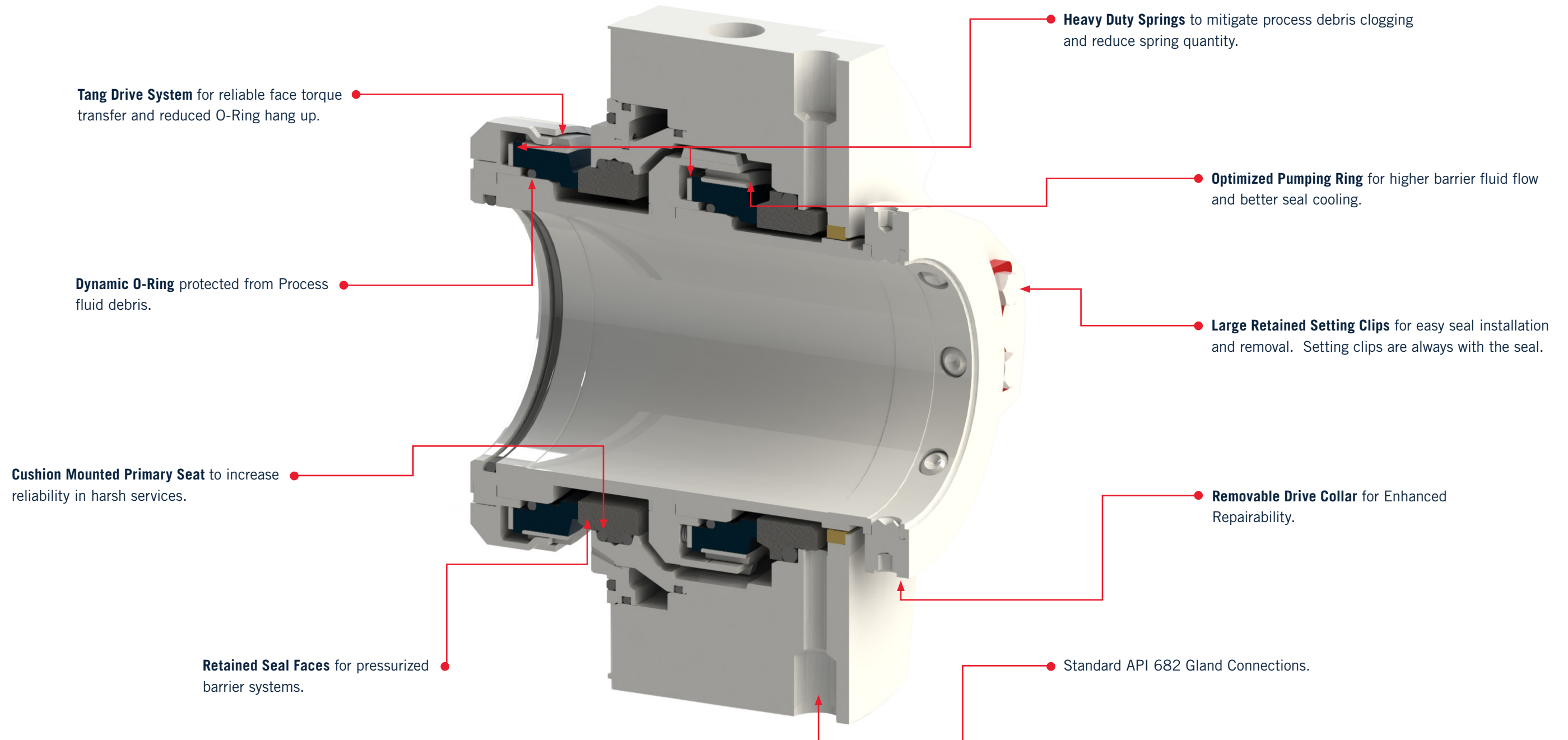
Max Temp	-40 to 400°F / -40 to 204°C
Max Pressure	600 PSIG / 41.4 bar
Max Speed	4,500 FPM / 23m/s

*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.

HEAVY DUTY ROTATING MULTI-SPRING TANDEM CARTRIDGE SEAL

FOR API 682 APPLICATIONS

DESIGN FEATURES & BENEFITS

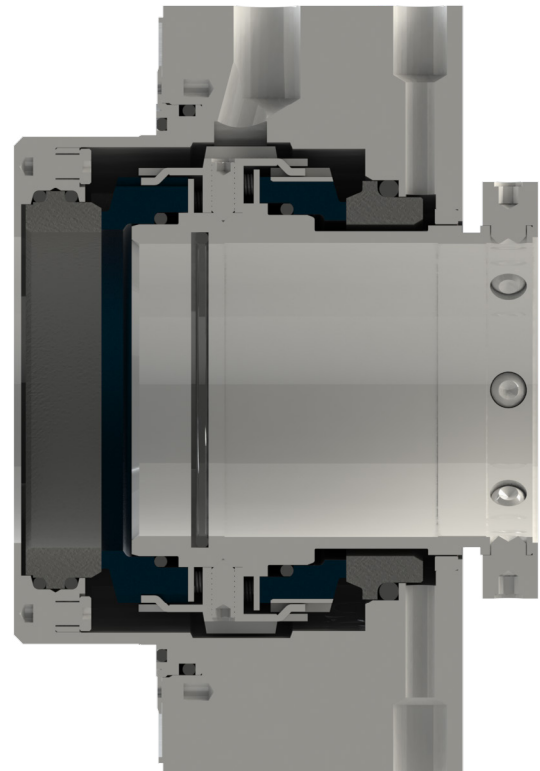


HEAVY DUTY ROTATING MULTI-SPRING DUAL CARTRIDGE SEAL *FOR API 682 APPLICATIONS*

The **Flexaseal Style 90A** is designed specifically to conform to API 682 Category 2 Applications for Midstream and Downstream Oil and Gas Applications where a Pressurized Dual Arrangement is Desired. Standard design features include:

- Oversized Monolithic Seal Faces for superior heat dissipation and durability.
- Tang Drive System for reliable face torque transfer and reduced O-Ring hang up.
- Heavy Duty Springs to mitigate process debris clogging and reduce spring quantity.
- Cushion Mounted Primary Seat to increase reliability in harsh services.
- Retained Seal Faces for pressurized barrier systems.
- Optimized Pumping Ring for higher barrier fluid flow and better seal cooling.
- OD Pressure Design for enhanced solids handling, barrier fluid distribution and seal reliability.

Flush Plans 11/53A/53B/54



MATERIALS OF CONSTRUCTION

Rotary Faces	Silicon Carbide
Stationary Faces	Carbon, Silicon Carbide, Tungsten Carbide
Springs	Hastelloy C276*
Metal Parts	316 Stainless Steel
O. Rings	Viton®, Ethylene Propylene, AFLAS, Perfluoroelastomer

OPERATING PARAMETERS

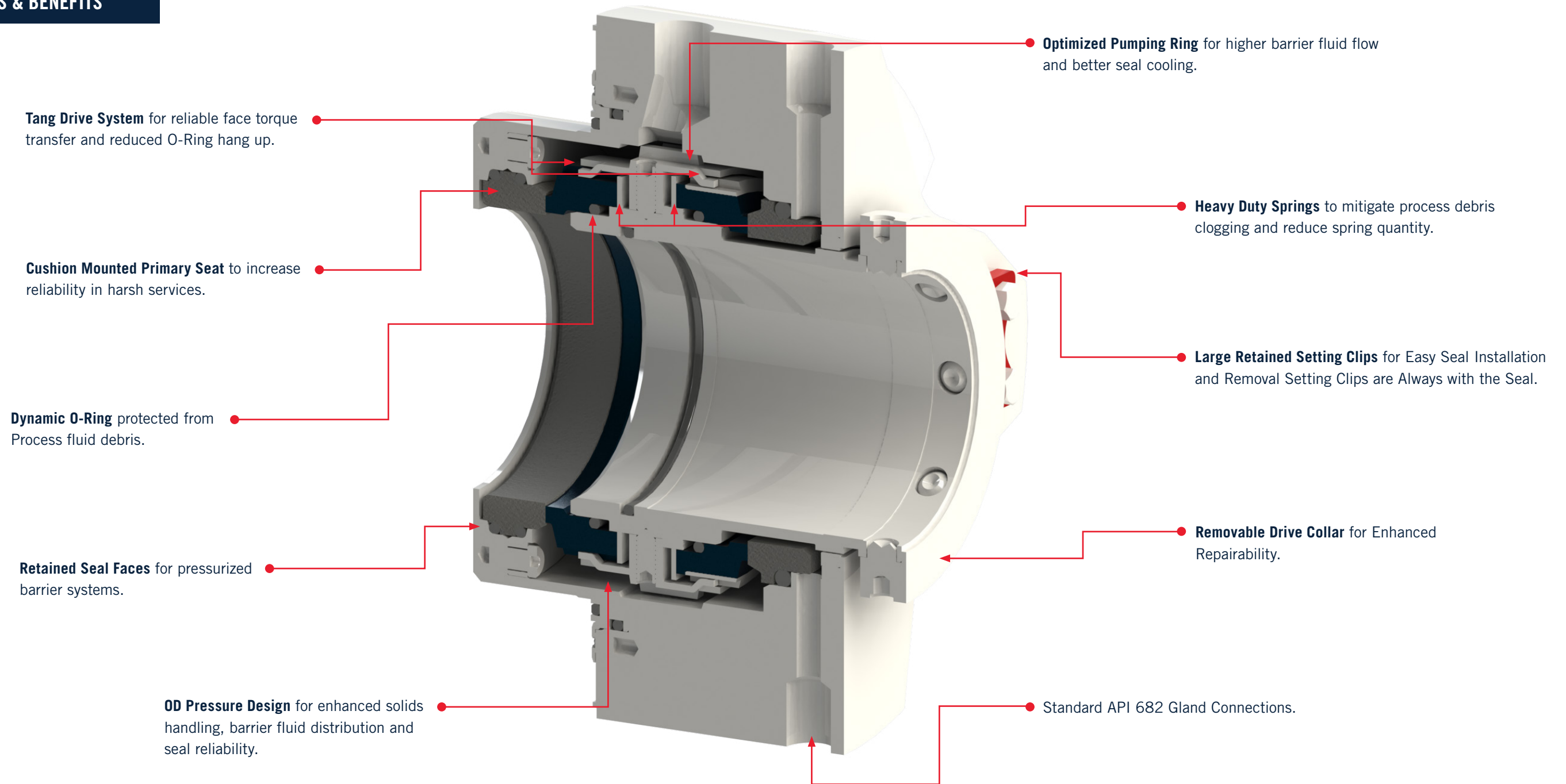
Max Temp	-40 to 400°F / -40 to 204°C
Max Pressure	600 PSIG / 41.4 bar
Max Speed	4,500 FPM / 23m/s

*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.

HEAVY DUTY ROTATING MULTI-SPRING DUAL CARTRIDGE SEAL

FOR API 682 APPLICATIONS

DESIGN FEATURES & BENEFITS



DRY-RUNNING SECONDARY CONTAINMENT SEAL

DESIGNED FOR SAFE FLUID CONTAINMENT & ENVIRONMENTAL EMISSION CONTROL

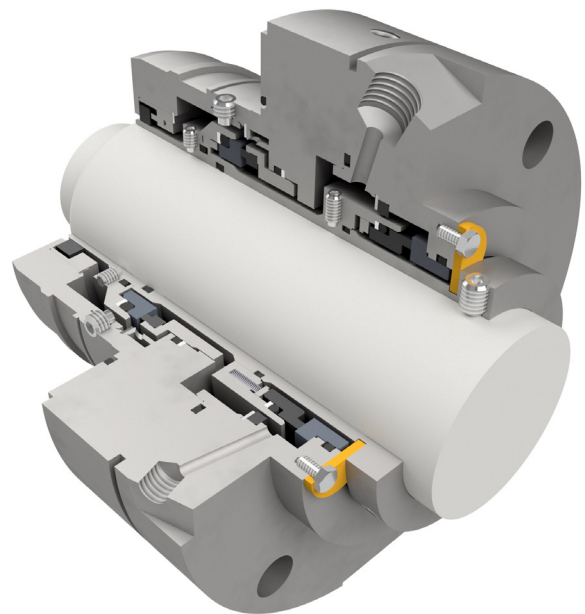
In certain processes dangerous and volatile fluids require additional precautions to protect personnel, ensure safe operation, and prevent downtime. The Flexaseal Multi-Spring Fluid Containment Seal (FCS) has been specifically designed as an economical option for applications where the highest level of safety and environmental control is necessary. The FCS Seal allows monitoring of any primary seal leakage and functions as a secondary containment seal in the event of primary seal failure.

The FCS Seal is a contacting, dry-running pusher seal which can be added to most of Flexaseal's single cartridge options, including:

- Style 58 Heavy Duty API Stationary Multi-Spring Cartridge Seal
- Style 53A API Rotating Welded Metal Bellows Cartridge Seal
- Style SMS Stationary Multi-Spring Cartridge Seal
- Style RB Rotating Welded Metal Bellows Cartridge Seal

Utilizing the FCS secondary seal design in conjunction with API 682 Plan 72, 75, or 76 eliminates the cost and maintenance of installing a dual seal with an API 682 Plan 52 buffer system.

The FCS Seal is cost-effective choice to meet emission regulations and safeguard personnel and equipment.



MATERIALS OF CONSTRUCTION

Faces	Special Dry-Running Carbon, Reaction Bonded Silicon Carbide
Elastomers	FKM, EPDM, TFEP, Buna, Neoprene, Perfluoroelastomers
Metallurgy	316 Stainless Steel, Alloy C-276, Super Duplex Alloy 255, Titanium
Springs	Alloy C-276

OPERATING PARAMETERS

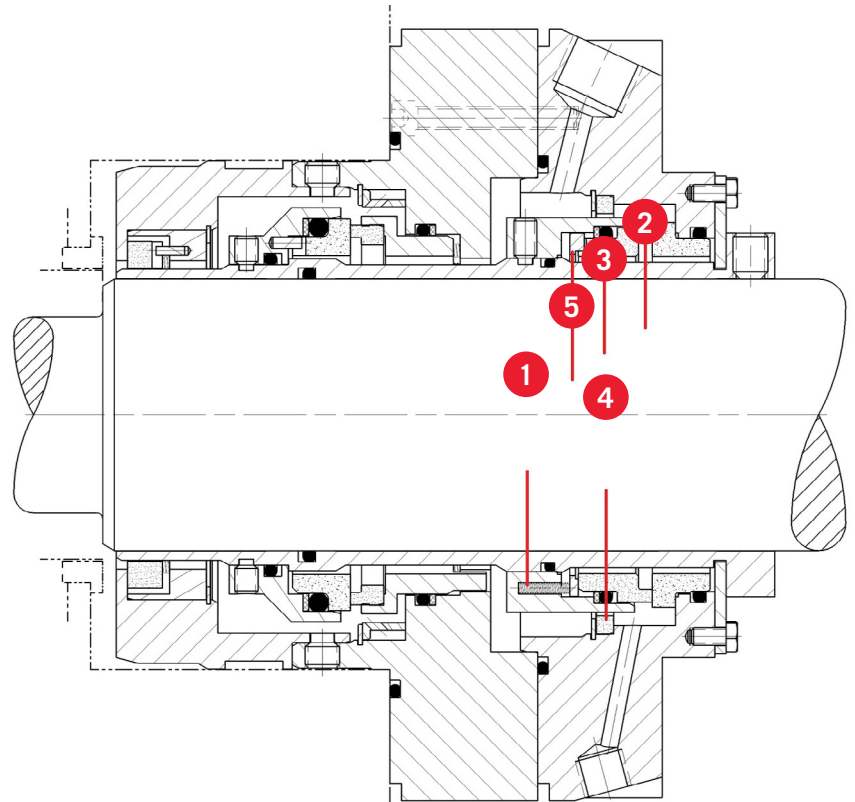
Speed	10000 FPM (50 m/sec)
Temperature	Up to 550°F (288°C) using high temperature elastomers
Pressure	Gas-lubricated: up to 10 psig (0.7 barg) Liquid-lubricated: 300 psig (20.7 barg), dynamic Liquid-lubricated: 600 psig (41.4 barg), static

*Maximum temperature / speed / pressure indicate operating extremes independently and do not imply the seal will function at these extremes at the same time.

FEATURES & BENEFITS

AS SHOWN WITH A STYLE 58/FCS CARTRIDGE SEAL

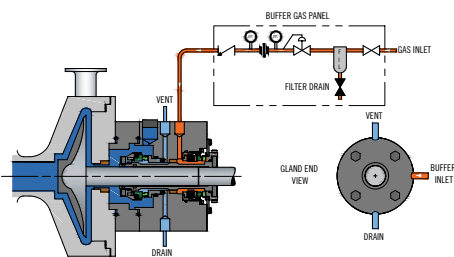
1. Lightly loaded seal face minimizes wear and face temperature during operation.
2. Extended seal face has long wear life.
3. Balanced seal design minimizes heat generation and power consumption, guaranteeing stable operation under worst-case containment conditions.
4. Isolation bushing keeps normal inboard seal leakage away from the FCS seal portion.
5. Dynamic drive ring prevents pin-wear hang up.



FOR USE WITH

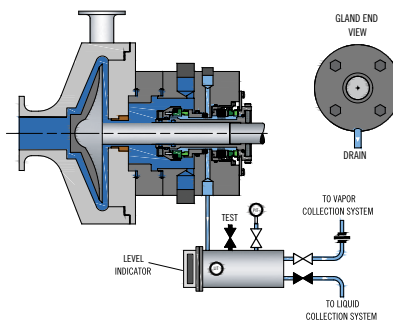
PLAN 72

Externally supplied buffer gas maintained at a pressure less than the seal chamber pressure.



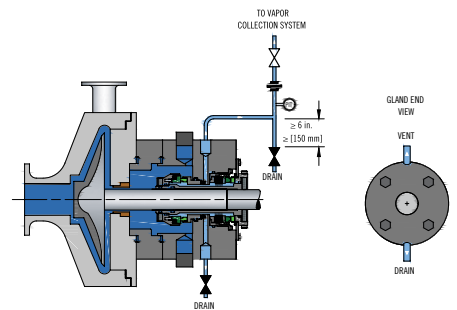
PLAN 75

Leakage collection system for condensing or mixed phase leakage with a contacting containment seal.



PLAN 76

Vent for non-condensing leakage with a contacting containment seal.

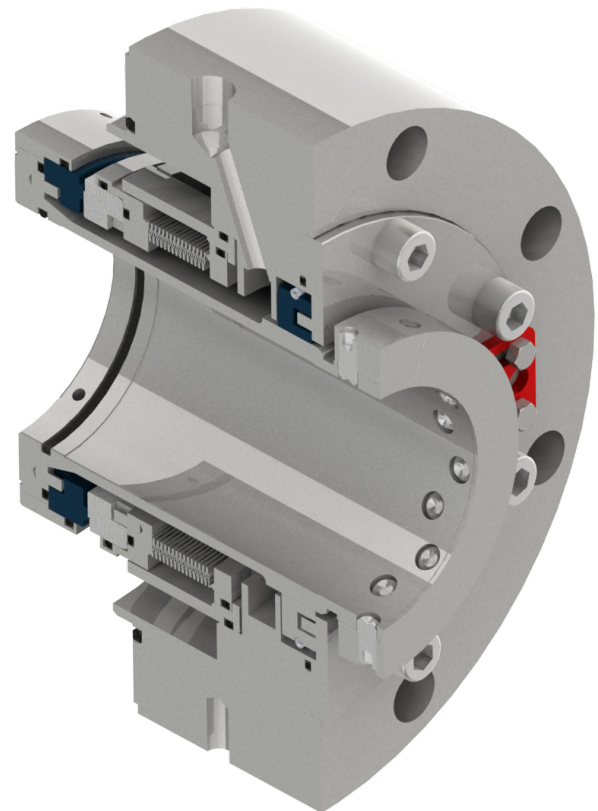


TRIPLE-PLY BELLOWS CARTRIDGE SEAL

For High Pressure Crude Oil Applications

Now there is a true high pressure bellows solution for one of the toughest oil and gas pipeline challenges: sealing crude oil under high pressures. Flexaseal brings its state-of-the-art, engineered edge welded metal bellows knowledge and capabilities to this demanding service.

- API 682-compliant design is heavy-duty with a long sealing life and easy reparability.
- Exclusive triple-ply welded bellows technology operates in pressures up to 1500 psig while accommodating significant axial movement.
- All seal elastomers are static, eliminating dynamic O-ring wear and damage.
- **FLEXdrive Torsional Drive System** uses a drive lug design to positively drive rotating seal components and eliminates torsion loads on the face energizing elements.
- Choose from three (3) standard secondary bushing arrangements to accommodate Plans 65A and 66A.
- **Available STEALTH Proactive Seal Health Monitoring System** Sensor technology for remote equipment monitoring.



MATERIALS OF CONSTRUCTION

Seal Faces	Sintered Silicon Carbide
Elastomers	FKM standard Other materials upon request
Bellows	Inconel 718™
Metallurgy	316 Stainless Steel
Bushing	Bronze, Carbon

OPERATING PARAMETERS

Pressure	Up to 1500 psig (103.4 bar)
Temperature	Up to 180°F (82°C)
Speed	Up to 3600 RPM
Shaft Sizes	Up to 5.50" (139.7mm)

Registered Trademarks: Inconel 718™

*Maximum temperature/speed/pressure/runout indicates operating extremes independently and does not imply the seal will function at these extremes at the same time.

MP52 & 53

LIQUID BUFFER / BARRIER FLUID

MP52/53A

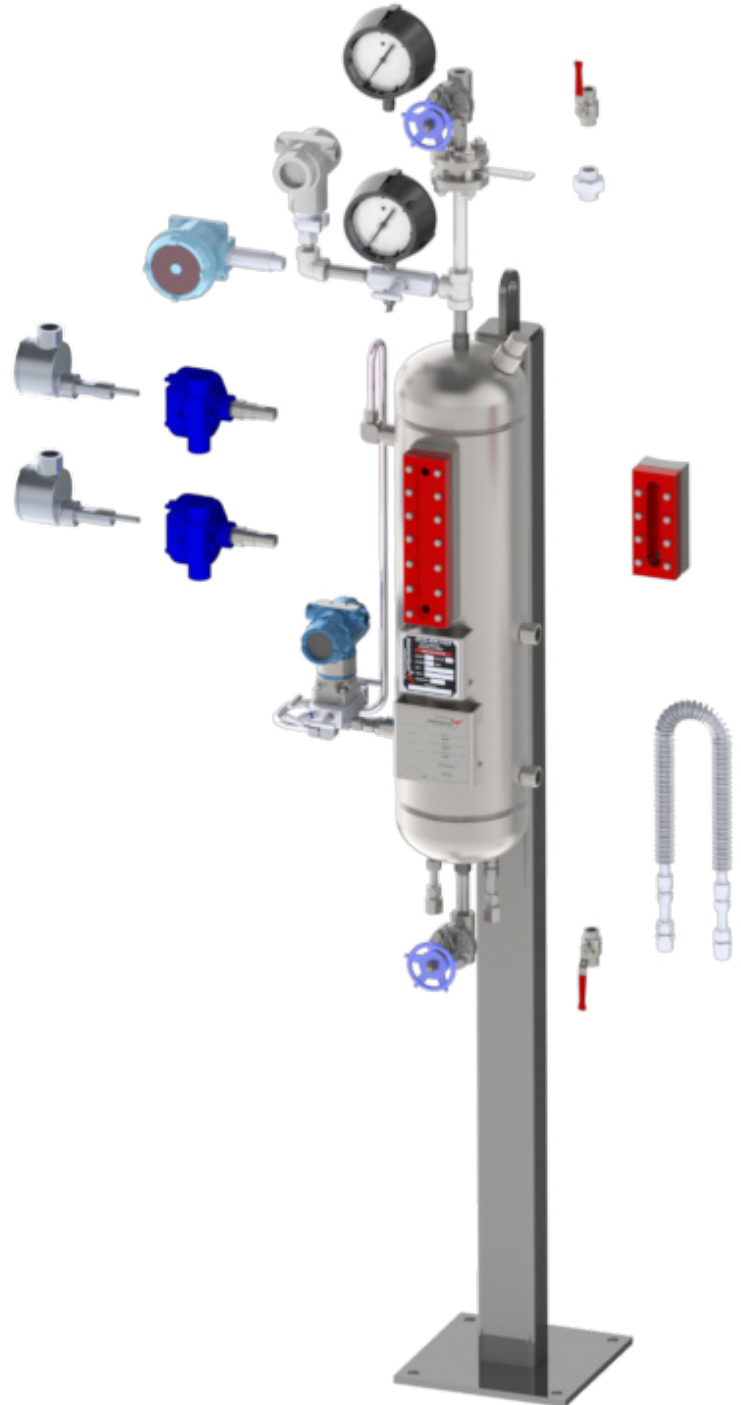
MP52 supports liquid buffer fluid for a containment seal chamber that is at a pressure less than the primary seal chamber pressure. MP53A supplies a liquid barrier fluid to the dual seal assembly at a higher pressure than the seal chamber.

FEATURES

- System designed to ASME code Section VIII Div. I, Section IX Weld Procedures.
- ASME U stamp available National Board DFAR compliant materials.
- Designed to MAWP of pump.
- Removable head available.

APPLICATION

API 682 Plan 52
API 682 Plan 53A



STANDARD 4–6 WEEK DELIVERY

MP53B

External barrier fluid pressurized by a bladder accumulator. Supplies clean barrier fluid to the dual seal at a pressure greater than the seal chamber.

FEATURES

- U stamp accumulator standard.
- 5-10 gallon capacity.
- Air or water cooled available.
- Integral barrier fluid make up pump.

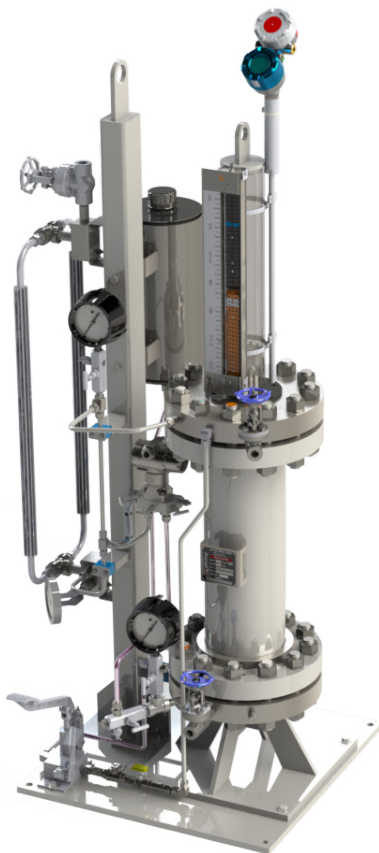
APPLICATION

API 682 Plan 53B



53B ACCUMULATOR

53B NATURAL CONVECTION



53C

MP53C

External barrier fluid pressurized by a piston accumulator. Supplies clean barrier fluid to the dual seal at a pressure greater than the seal chamber.

FEATURES

- Integral head porting eliminates pigtail design.
- U stamp coded vessel design.
- Magnetic level indication available.



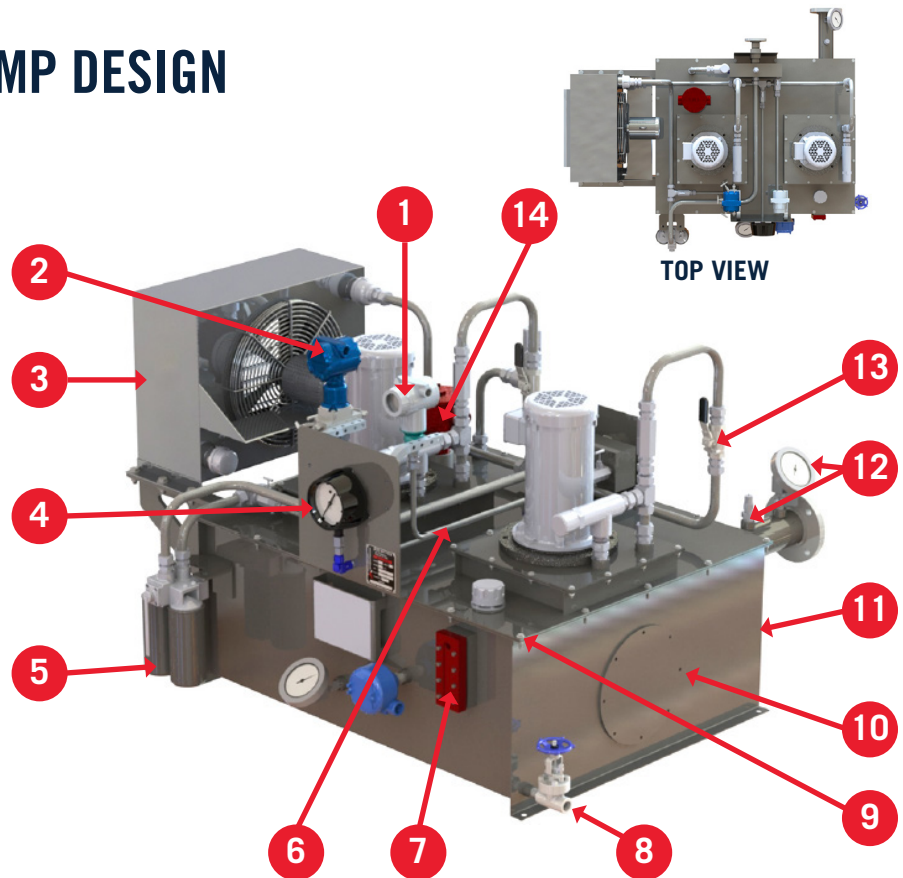
APPLICATION

API 682 Plan 53C

LUBE OIL SYSTEM: DUAL PUMP DESIGN

FEATURES

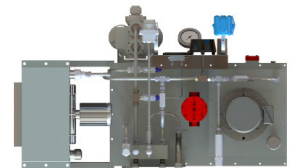
- Configured for ease of maintenance.
- Reduces lubrication piping and facilitates pump maintenance.
- Full-flow pump protection and system pressure control valves.
- Top entry heating element:
 - Eliminates requirement to drain reservoir for heating element replacement.
 - Mitigates flooding of heater control head associated with side entry design.



- | | |
|---|---|
| <p>1. Temperature indicating transmitter to monitor supply side lube oil.</p> <p>2. Differential pressure indicating transmitter to monitor filter status.</p> <p>3. Reservoir mounted air-cooled heat exchanger.</p> <p>4. Single point system monitoring instrument panel.</p> <p>5. Dual spin-on filter elements with integral transfer valve.</p> <p>6. Consolidated plumbing design for ease of maintenance and critical component changeability.</p> <p>7. Easy view sight glass for unit filling.</p> | <p>8. Sloped bottom low point drain.</p> <p>9. Removable reservoir lid construction for “clean out” maintenance.</p> <p>10. Two removable “clean out” covers for reservoir inspection, sloped bottom.</p> <p>11. 40 gallon usable fluid capacity reservoir with internal stilling tube for degassing of return fluid.</p> <p>12. Return fluid temperature indicator and RTD.</p> <p>13. Single point disconnect capability allowing ease of removable pump motor assemblies.</p> <p>14. Top mounted heater assembly.</p> |
|---|---|

STANDARD DESIGN – 8 WEEK DELIVERY

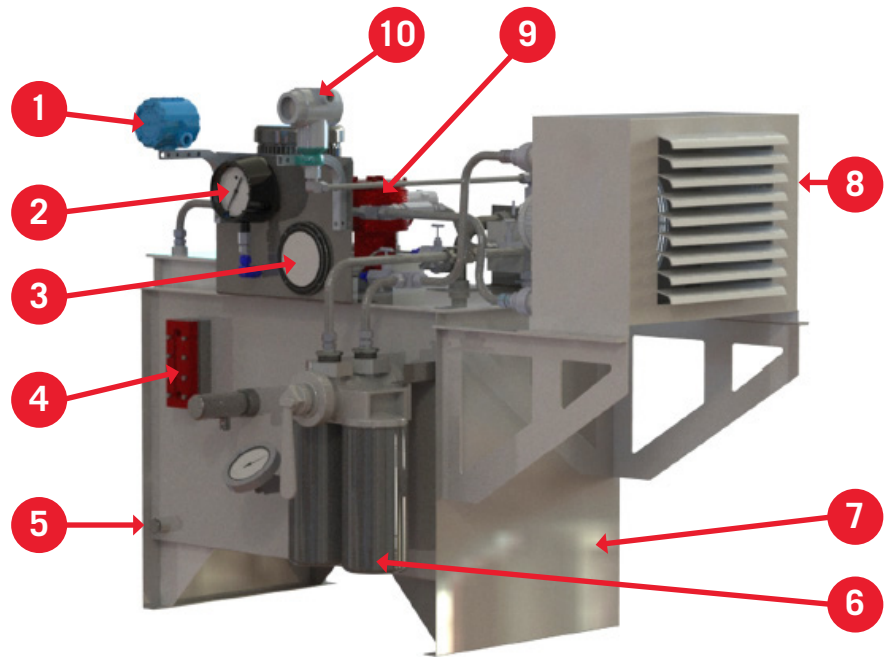
LUBE OIL SYSTEM: SINGLE PUMP DESIGN



TOP VIEW

FEATURES

- Compact design.
- Configured for ease of maintenance.
- Full-flow pump protection and system pressure control valves.



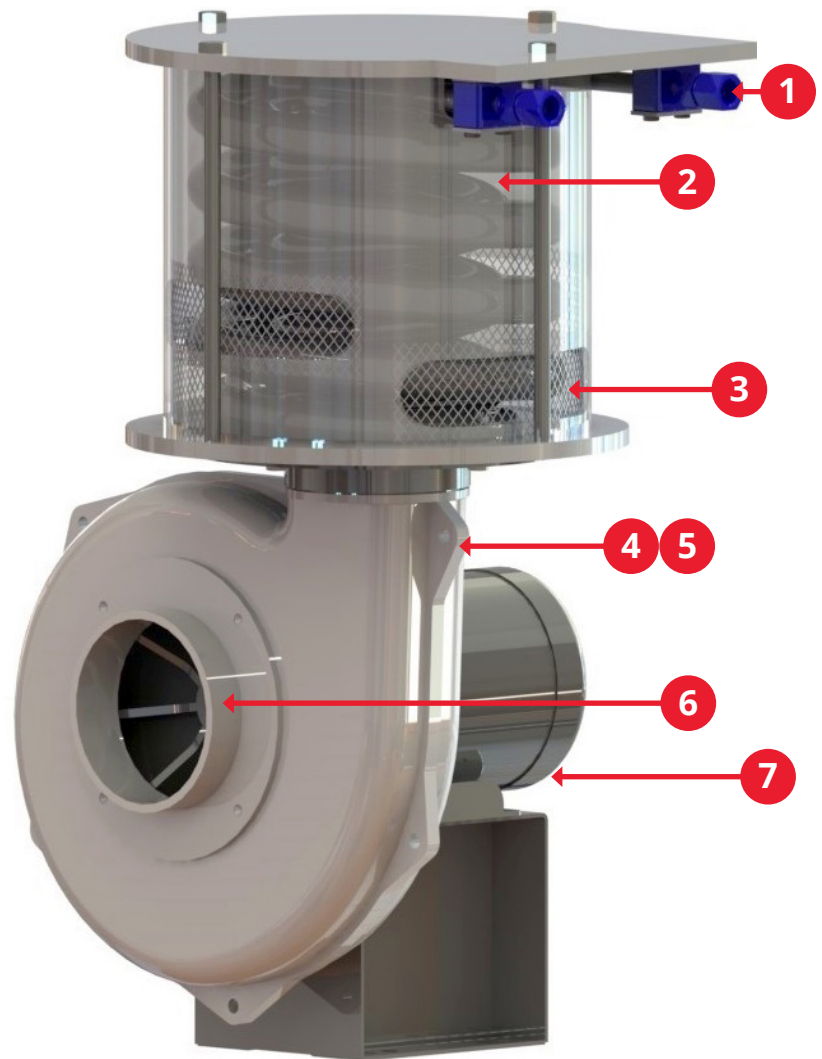
1. Temperature indicating transmitter to monitor supply side lube oil.
2. Single point system monitoring instrument panel.
3. Differential filter pressure gauge.
4. Easy view sight glass for unit filling.
5. Sloped bottom low point drain.
6. Dual spin-on filter elements with integral transfer valve.
7. 40 gallon usable fluid capacity reservoir with internal stilling tube for degassing of return fluid.
8. Reservoir mounted air-cooled heat exchanger.
9. Top mounted heater assembly.
10. Pressure indicating transmitter.

TurboCOOL

HIGH PERFORMANCE AIR COOLED HEAT EXCHANGER PROCESS APPLICATIONS

FEATURES

1. Self-venting design for easy commissioning.
2. Double wrap, finned tubing for increased cooling surface area.
3. High performance, CFD-optimized heat exchanger cowling.
4. Aluminum blower impeller and housing for extended service life and corrosion resistance.
5. Heavy duty centrifugal blower. Air flow rate matched to specific process conditions.
6. Available inlet filter for reduced heat exchanger maintenance due to fouling.
7. Standard NEMA or IEC motor frames.
8. Eliminates cooling water.



APPLICATION

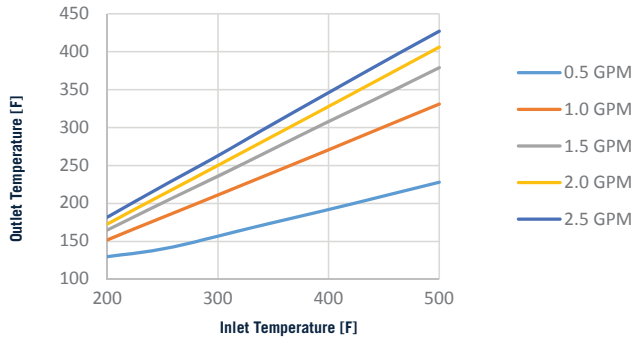
API Flush Plan 21
 API Flush Plan 23
 API Flush Plan 55

STANDARD 2–4 WEEK DELIVERY

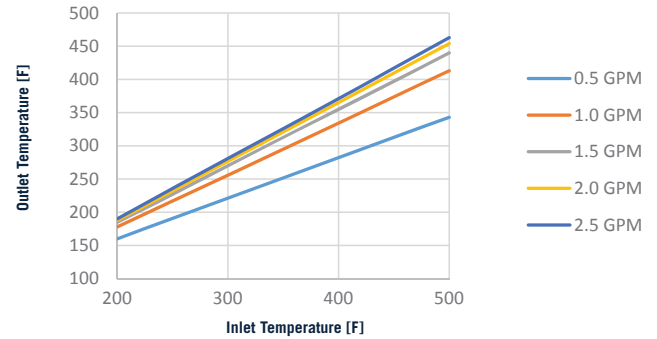
PERFORMANCE CURVES

MAWP: 2215 psig at 750°F
Temperature: up to 750°F

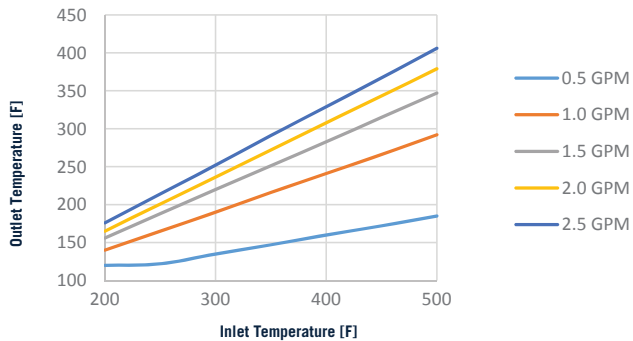
MODEL S [650 CFM] - OIL



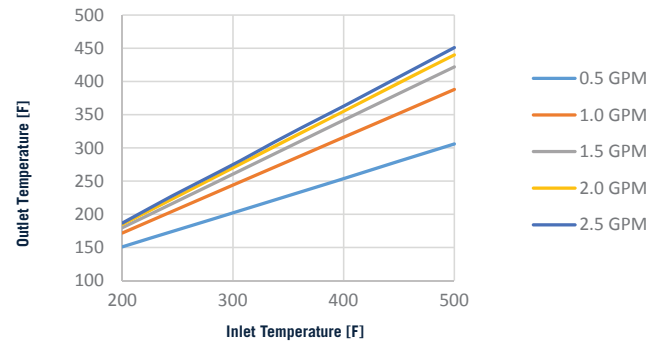
MODEL S [650 CFM] - WATER



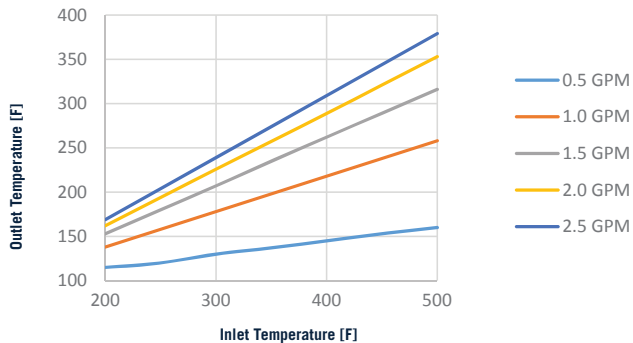
MODEL M [1000 CFM] - OIL



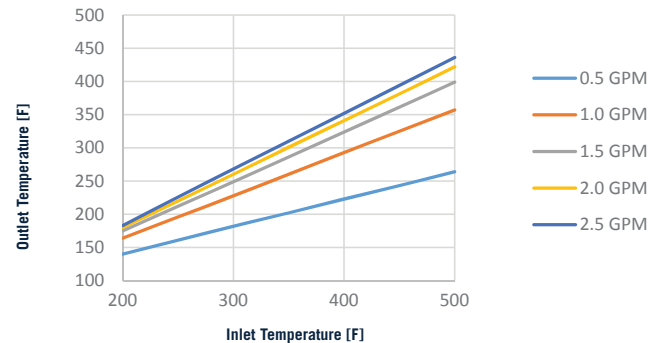
MODEL M [1000 CFM] - WATER



MODEL L [1500 CFM] - OIL



MODEL L [1500 CFM] - WATER



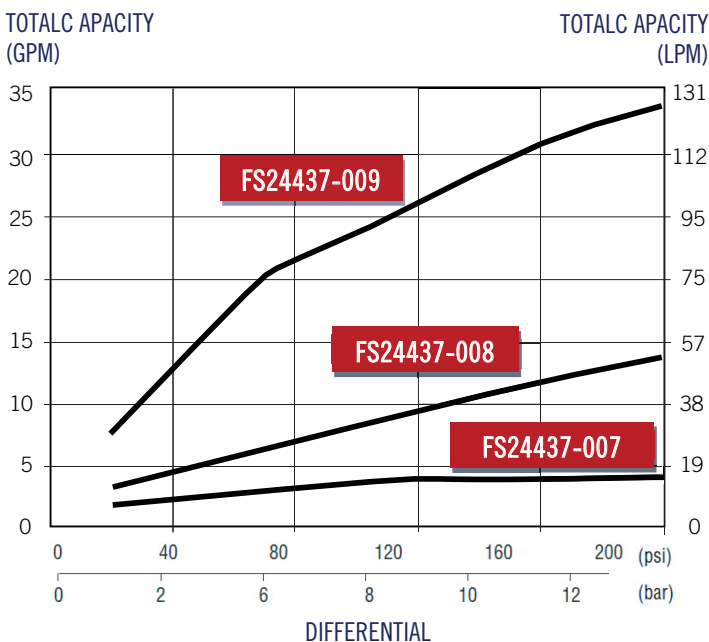
The information provided is to be used as a selection guide only. Each application should be reviewed in detail as specific properties of process fluids and environmental variables may have a significant effect on cooler performance. Information subject to change without notice.

When an external source of clean fluid is not available or economical to use for a seal flush plan, a Flexaseal Cyclone Separator may be the answer. Cyclone separators efficiently remove abrasive media from a pump's discharge, circulating the resulting clean fluid back into the seal chamber to cool the seal faces.

The simple construction of the Flexaseal Cyclone Separator utilizes a one-piece pressure casing, eliminating the temperature and pressure constraints imposed by bolted and gasketed casing cover designs.

When properly installed, the FAS Cyclone Separator provides lower pipe stress when inline mounted, improves circulation, and reduces temperature at the seal faces, all while offering operating pressures up to 3000 psi / 207 bar.

How a cyclone separator operates is affected by many factors, and the following process should be used as a selection guideline.



1. Determine the maximum and minimum acceptable clean circulation flow rates using the seal manufacturer's information.
2. Establish the required total capacity of the cyclone separator using the following formula:
Clean Flow Rate x 1.4 = Total Capacity (GPM or LPM)
3. Calculate available differential pressure using the following formula:
Pump Discharge Pressure – Stuffing Box Pressure = Differential Pressure
4. On the chart to the left, locate the intersection of the lines corresponding to total capacity and differential pressure. Choose the cyclone separator model with a flow rate greater than the required minimum.

HIGHFLOW SERIES

API 682 PLAN 12 / SEAL FILTRATION SYSTEM

FEATURES

- Up to 75 GPM flow rate.
- Filter elements 3 & 10 micron, absolute rated.
- Two closure designs available, Yale-type threaded cap and bolted flange.
- Filter systems designed to ASME Sec. VIII, div. 1.

APPLICATION

API 682 Plan 12



STANDARD 6 WEEK DELIVERY

- Duplex Filter Design for uninterrupted flow during transfer to the new filter.
- 316 SS Filter Core, capable of 75 psig differential pressure, is threaded into filter body and remains installed reducing filter costs.
- Two closure designs are available: 1. Flange bolted with a spiral wound gasket or 2. ACME threaded cap with an O-ring seal. Lifting davits are available for both closure designs.
- Filter bodies are designed per ASME section VIII, Division 1.
- ASME U stamp available on request, National Board registered. Filter bodies constructed from stainless to carbon steel, per your requirements. Lifting eye provided.
- Flow and pressure instrumentation provided by industry leaders, such as Rosemount Transmitters and Hedland Flow Meters.
- ¾" tubing and ball valves, 316 SS. Fittings and valves are Swagelok or per your request.
- The inlet and outlet connections terminate at a manifold for a clean installation.
- The top view foot print is 30" x 30" typical, 50" height.

- Borosilicate Glass microfiber filter media used because no other element works as efficiently or gathers as many particles as the Borosilicate.
- 3 or 10 micron filter element, absolute rated.
- Beta Ratio – 5,000 Efficiency – 99.98%
- Mass Flux = Mass Flow per unit area

EXAMPLE

MP12:

20 gpm flush / 40 sq.ft. filter area = **0.5 flux**

Other systems:

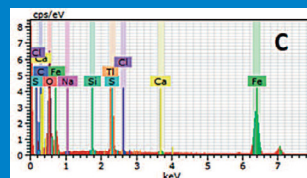
20 gpm flush / 0.8 sq.ft. filter area = **25 flux**

The lower the flux, the longer the filter life.

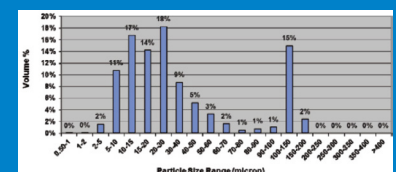
- O-ring sealed filter to filter housing for positive sealing and ease of maintenance.
- The filters incorporate a handle on the top and replacement simply requires lifting the filter off of the O-ring sealing surface/core element.
- The Borosilicate element holds much more particulate than cellulose media filters, which are nominal rated 60 to 98% of the rated pore size. Less filter changes and absolute filtration to the rated pore size.
- Low filter cost and longer life cycles, with better filtration offers low cost of ownership and value.

EXPERIENCING EXCESSIVE FILTER FOULING?

We can provide filtrated particulate analysis.



PARTICULATE COMPOSITION



ANALYSIS OF SPENT FILTER

DRY RUNNING / GAS SEAL TECHNOLOGY

MP72

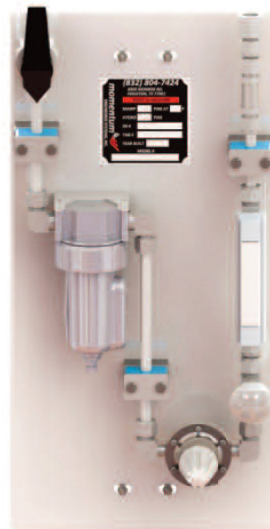
Buffer gas used with an unpressurized dual, dry running containment seal or with a segmental bushing, to dilute leakage for reduced emissions.

FEATURES

- **Panel Mounted** – Can be mounted to existing structure.
- **Stand Mounted** – Vertically mounted onto stand, reduces footprint and eliminates panel obstruction.
- API 682 4th edition compliant, CRN available.

APPLICATION

API 682 Plan 72



MP72
PANEL MOUNTED



MP72
STAND MOUNTED

MP74

Barrier gas used on pressurized dual gas seal.

FEATURES

- **Panel Mounted** – Can be mounted to existing structure.
- **Stand Mounted** – Vertically mounted onto stand, reduces footprint and eliminates panel obstruction.
- API 682 4th edition compliant, CRN available.

APPLICATION

API 682 Plan 74



MP74
PANEL MOUNTED

STANDARD 4–6 WEEK DELIVERY

DRY RUNNING / GAS SEAL TECHNOLOGY

MP75

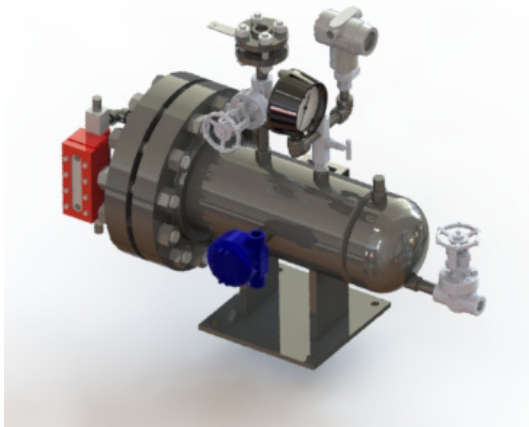
Leakage collection system for an unpressurized dual, dry running containment seal in condensing or mixed phase applications and may be used with an API 682 Plan 72 buffer gas.

FEATURES

- Plan 75 can be mounted with a stand, incorporating vent piping.
- Designed to meet the MAWP of the pump.
- API 682 4th edition compliant, CRN available.
- U stamp available.

APPLICATION

API 682 Plan 75



MP75

MP76

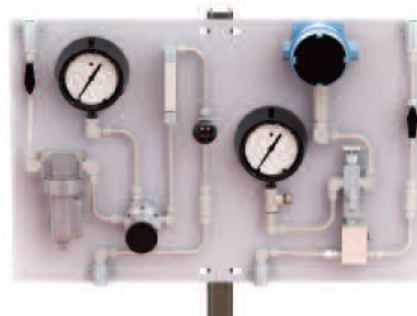
Leakage collection system for an unpressurized dual, dry running containment seal in noncondensing applications and may be used with an API 682 Plan 72 buffer gas.

FEATURES

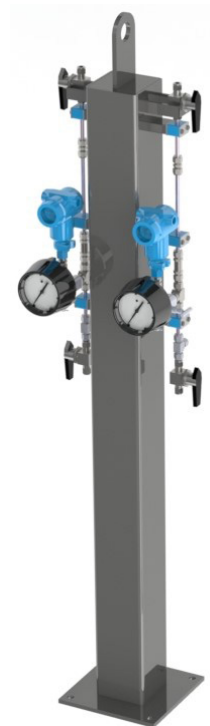
- **Panel Mounted** – Can be stand mounted or mounted to existing structure.
- **Stand Mounted** – Vertically mounted onto stand, reduces footprint and eliminates panel obstruction.
- API 682 4th edition compliant, CRN available.

APPLICATION

API 682 Plan 76



MP76
PANEL MOUNTED



MP76
STAND MOUNTED