CRYOGENIC SEALS FOR PROCESS PUMPS

Stationary edge-welded metal bellows seals for liquefied gas service to -425°F (-253°C)

THE CHALLENGES OF CRYOGENIC SERVICE

Liquid nitrogen, oxygen, argon, hydrogen and LNG are pumped below -238°F (-150°C). At these temperatures, conventional seal designs are susceptible to:

- **Face heat and vaporization.** Cryogenic liquids operate near their vapor point. Heat from excess face loading flashes the fluid film and leaves the faces unlubricated.
- **Thermal contraction and embrittlement.** Components contract, and many materials lose toughness at cryogenic temperatures.
- **Pressure and temperature cycling.** Repeated cooldown and warm-up cycles stress seal components and reduce MTBF.
- **Leakage and safety risk.** One liter of liquid hydrogen vaporizes into hundreds of liters of flammable gas, making leakage a personnel safety and environmental compliance concern.



THE FLEXASEAL SOLUTION

Flexaseal has designed and manufactured edge-welded metal bellows in the U.S.A. since 1983. Its cryogenic seals are engineered to control heat generation at the faces and keep the lubricating film stable:

- **Light face loading** from controlled spring rates
- **347 SS bellows** that do not become brittle in extreme cold
- **Cryogenic face combination** to sustain the fluid film
- **Ignition-control features** per CGA G-4.7

EDGE-WELDED BELLOWS	FORMED BELLOWS
TIG-welded foil diaphragms	Rolled or hydroformed tubing
Lower spring rates, precise loading	Higher spring rates, larger deviations
Cryogenic-grade materials	Materials limited by forming

PUMP COMPATIBILITY AND APPLICATIONS

Stationary edge-welded metal bellows component seals designed to fit virtually all standard centrifugal cryogenic process pumps in processing systems, air separation, storage tanks, trucks and transfer stations.

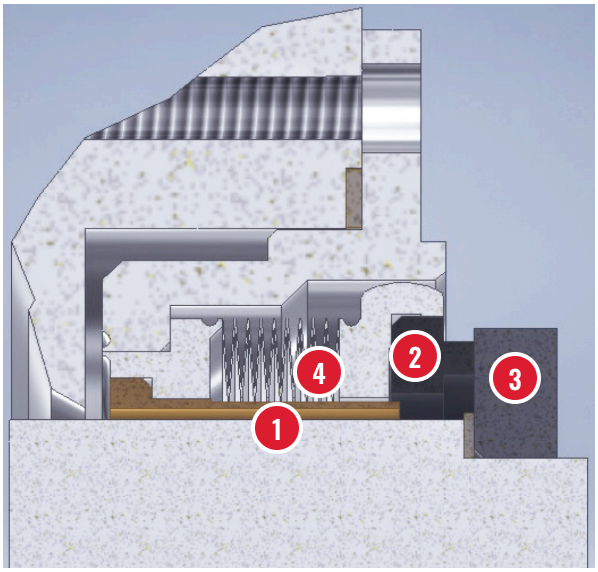
COMMON PUMPS	ACD · Airco Paul · Cosmodyne · Cryostar · Grofe · JC Carter
LIQUEFIED MEDIA	Nitrogen · Oxygen · Argon · Hydrogen · LNG · Low-temperature hydrocarbons
INDUSTRIES	Air separation · Industrial gas · Chemical · Aerospace and defense · Pharmaceutical

CRYOGENIC SEALS | DATA SHEET

flexaseal® ENGINEERED SEALS AND SYSTEMS, LLC

ANATOMY OF A CRYOGENIC SEAL

Every component engineered to keep heat away from the faces



SPECIFICATIONS

OPERATING PARAMETERS*

Temperature	To -425°F (-253°C)
Pressure	To 450 psi (31 bar)

MATERIALS OF CONSTRUCTION

Rotating face	Tungsten carbide
Stationary face	Impregnated carbon graphite
Bellows	347 SS (UNS S34700)
End fittings	316 SS
Anti-spark shield	Brass

CRYOGENIC SEAL FACES

2. **Cryogenic carbon graphite face.** A film-forming grade for "self-lubricating" operation, maintaining the lubricating film at temperatures approaching -328°F (-200°C).
3. **Tungsten carbide rotating face.** Stronger, and conducts heat better than hard faces such as hardened 440C steel.

- **Face combination and balance.** Maximizes PV values; hydraulic balance minimizes closing load and heat.

SAFETY BY DESIGN

1. **Non-sparking brass shield** between bellows and rotating shaft prevents ignition from contact, per CGA G-4.7.

- **No metal-to-metal contact** between the stationary seal ring retainer and the rotating seat over the bellows' full axial range.
- **Oxygen cleaning** in accordance with industry standards and certifications.

EDGE-WELDED METAL BELLOWS

4. **347 stainless steel** keeps its strength and does not turn brittle in extreme cold.

- **Tightly controlled spring rates** give light face loads and minimal heat, critical when sealing liquid near its vapor point.
- **No dynamic secondary seal.** The flexing bellows accommodates axial movement and vibration.

AT YOUR SPEED®

REQUEST A SEAL RECOMMENDATION

Provide the pump make and model, media, temperature and pressure, and our applications team will specify the cryogenic seal for your service.

sales@flexaseal.com
(800) 426-3594
flexaseal.com/request-a-quote

*Maximum temperature and pressure are independent operating extremes and do not imply the seal will run at both at once; contact Flexaseal for your conditions. Pump names are trademarks of their respective owners, used for identification only.