

Fusion™ 936

Rapid Gas Decompression Resistant



Sealing Solutions

Most elastomers experience severe blistering or cracking when the forces of expanding gases overcome the strength of the surrounding material, but Fusion™ 936 provides superior RGD resistance. Fusion™ 936 also offers an expanded temperature range and chemical resistance not previously seen in RGD-resistant fluoroelastomers. For example, Fusion™ 936 exhibits better resistance to methanol, sour gas, hot water, steam, and corrosion inhibitors than conventional fluorocarbon elastomers. In addition, its lower compression set delivers improved sealing and leak prevention unmatched by competitive material.

Greene Tweed's Fusion™ 936 is a fluorocarbon elastomer specifically designed for Rapid Gas Decompression (RGD) resistance, also known as explosive decompression, in downhole, surface, and subsea oilfield equipment. RGD is a phenomenon that often occurs when high-pressure gas molecules migrate into an elastomer at a compressed state. When the pressure surrounding the elastomer is suddenly released, the compressed gas inside the elastomer tries to expand and exit the elastomer, thus causing RGD.

Features and Benefits

- Provides reliable RGD resistance at low temperatures down to -35°F (-37°C) so parts maintain sealing properties and equipment life is extended
- Offers reliable RGD resistance with compression set values that are much lower than existing material while preventing leakage and equipment failure
- Extends the life of oilfield equipment exposed to unanticipated process upsets resulting in pressure drops
- Reduces maintenance cost
- Reduces mean time between repair

Applications

- Drilling tools
- Completion equipment
- Valves
- Pumps

Availability

- O-rings
- G-T® rings
- Custom-molded shapes
- Vee rings

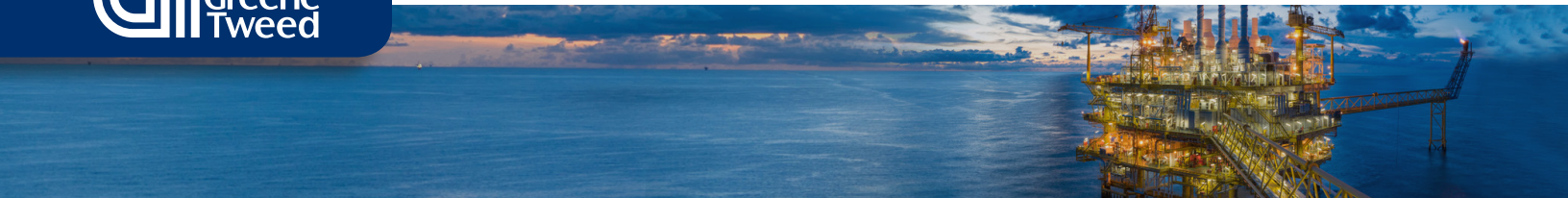
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Typical Properties	
Physical Properties (ASTM Standard)	Typical
Color	Black
Hardness, Shore A, Points (D2240)	90
Compression Set, 22 Hours @ 392°F (200°C) @ 25% Deflection, % of Original Deflection, Method B (D395)	9
Temperature Range	-35°F to 450°F (-37°C to 232°C)
O-ring Properties (ASTM Standard)	
Elongation @ Break, % (D1414)	100
Tensile Strength, psi [MPa] (D1414)	3,140 [21.6]
Slab Properties (ASTM Standard)	
Elongation @ Break, % (D412)	85
Tensile Strength, psi [MPa]	3,070 [21.2]

Test Results

Because of the relationship of pressure and volume in near ideal gases, RGD damage is realized near the lower end of a decompression cycle. If the gases trapped in the elastomer are assumed to be ideal, the damage due to RGD is highly dependent on absolute pressures rather than the pressure change (see below for sample of test results).

Fusion™ 936 has been successfully tested under the following conditions:

Test	Temperature °F (°C)	Pressure psi (MPa)	Media	Decompression Rate psi (MPa)	Cycles	Configuration
A	Ambient	800 (5.5)	CO ₂	260 (1.79)/sec	1	Open
B	160°F (71°C)	2,400 (16.5)	CO ₂ /N ₂	1,000 (6.89)/min	3	Gland
C	160°F (71°C)	2,400 (16.5)	CO ₂ /N ₂	1,000 (6.89)/min	5	Gland
D	150°F (66°C)	2,000 (13.8)	CO ₂ /CH ₄	1,000 (6.89)/min	5	Gland
E	150°F (66°C)	2,000 (13.8)	CO ₂ /N ₂	1,200 (8.27)/min	5	Open

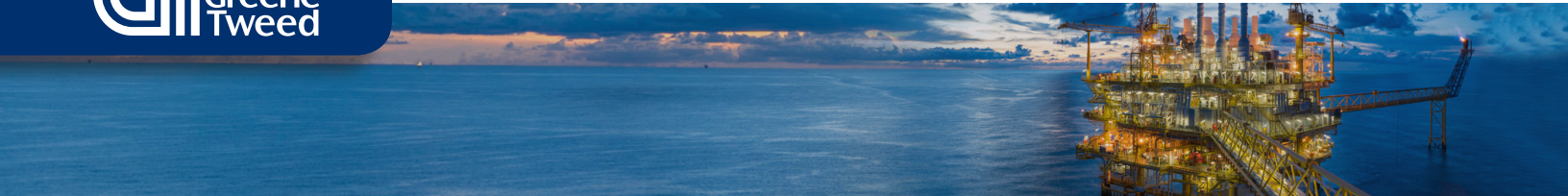
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Test A

- Standard NACE TM0192-98.
- Single cycle, 24-hour pressure soak with near instantaneous (3-second) pressure drop.
- Seals are placed in a pressure vessel and are unrestrained with pressure on all sides.
- Results: -214 o-rings: Internal 1,1 External 1,1 (2 samples).
- Results: -325 o-rings: Internal 1,1 External 1,1 (2 samples).

Test B

- Test based on Shell DODEP 02.01B.03.02 requirements.
- -214 o-rings.
- 3 cycles, consisting of a 48-hour hold at elevated pressure and temperature. Each decompression is at a rate no less than 1000 psi/min. Entire fixture is maintained @ ambient pressure for a minimum of 1 hour between cycles.
- Seals are constrained as a face seal with no back-up ring. Nominal squeeze and gland fill are 17% and 77%, respectively.
- Fluid media is approximately 30% CO₂ (by volume), balance N₂.
- Results: Internal: 1,1 External: 1,1* (2 samples tested).

Test C

- Test based on Shell DODEP 02.01B.03.02 requirements.
- -214 o-rings.
- 5 cycles, consisting of a 48-hour hold at elevated pressure and temperature. Each decompression is at a rate no less than 1000 psi/min. Entire fixture is maintained @ ambient pressure for a minimum of 1 hour between cycles.
- Seals are constrained as a face seal with no back-up ring. Nominal squeeze and gland fill are 17% and 77%, respectively.
- Fluid media is approximately 30% CO₂ (by volume), balance N₂.
- Results: Internal: 1,2,2 External: 1,2,2* (3 samples tested).

Test D

- Test based on Shell DODEP 02.01B.03.02 requirements.
- -214 o-rings.
- 5 cycles, consisting of a 48-hour hold at elevated pressure and temperature. Each decompression is at a rate no less than 1000 psi/min. Entire fixture is maintained @ ambient pressure for a minimum of 1 hour between cycles.
- Seals are constrained as a face seal with no back-up ring. Nominal squeeze and gland fill are 17% and 77%, respectively.
- Fluid media is approximately 30% CO₂ (by volume), balance CH₄ (Methane).
- Results: Internal: 1,1,1 External: 1,1,2* (3 samples tested).

Test E

- Test based on Shell DODEP 02.01B.03.02 requirements.
- -214 o-rings.
- 5 cycles, consisting of a 48-hour hold at elevated pressure and temperature. Each decompression is at a rate between 1000 - 1200 psi/min. Entire fixture is maintained @ ambient pressure for a minimum of 1 hour between cycles.
- Fluid media is approximately 5% CO₂ (by volume), balance N₂.
- Results: Internal: 1,1,1 External: 1,1,1* (3 samples tested).

Damage Rating Scale	
External Visual Damage	Internal Visual Damage
1. No visible damage.	1. No visible damage.
2. Less than or equal to 2 pimples or cracks.	2. Slight damage. One split/blister per cut surface.
3. 3-10 pimples or 1-2 blisters.	3. Moderate damage. Less than 50% of surface cut.
4. Less than 50% of surface subjected to blistering.	4. Severe damage. More than 50% of surface cut.
5. Considerable damage. More than 50% of surface covered with blisters or splits.	

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