FIRE HAS MET ITS MATCH.

HIGH TEMPERATURE SEALING

Providing Solutions For Extreme Applications

DURLON®

PERFORMANCE IS KEY

When exposing industrial bolted joints to extreme temperatures and pressure, you need to have the right gasket that not only provides effective sealing but lasts longer.

Gasket temperature limits can be classified into (but are not limited to) the following temperature ranges: Phyllosilicate 1000ºC (1832ºF), Flexible Graphite 450ºC (850ºF), Compressed Fiber 400ºC (750ºF).

When considering high temperature applications such as gas turbines, heat exchangers, exhaust manifolds and others commonly found in the refinery, power generation and chemical industries, Phyllosilicate is a good choice for the following reasons:

- ✔ high tensile strength
- ✔ low weight loss at extreme conditions
- ✔ chemically resistant
- ✔ laboratory tested for fire safety
- ✔ non-combustible
- ✔ sustainable solution

Phlogopite mica is a temperature resistant member of the phyllosilicates family. The combined content of phlogopite mica paper when impregnated with an inorganic binder at less than half the amount found in vermiculite filled products, allows for superior weight retention; less than 4% weight loss at 800°C (1,472°F) and results in ultimate extreme temperature sealing performance up to 1,000°C (1,832°F).

Durlon® provides extreme temperature gaskets for industrial applications that require superior sealing performance, can effectively retain their stability at high temperatures, provide lower torque retention leakage rates, and reduce maintenance time.

DURLON®
SEALING SOLUTIONS

Durlon® HT1000®

Durlon® HT1000® consists of phlogopite mica paper impregnated with an inorganic binder at less than half the binder amount found in vermiculite-phyllosilicate filled products. This lower binder content allows for superior weight retention, less than 4% weight loss at 800°C (1,472°F), and results in ultimate extreme temperature sealing performance up to 1,000°C (1,832°F). Durlon® HT1000® characteristics allow for it to be used as a sealing material on its own or combined with various carrier media in heat exchangers, exhaust manifolds, and other equipment commonly found in the refinery, power generation, and chemical industries.

Phlogopite mica is a non-toxic naturally occurring hydrated silicate of potassium and magnesium with a lamellar and non-fibrous structure. It is flexible, has a high tensile strength, can withstand substantial mechanical pressure perpendicular to the lamellar plane, is chemically resistant, fireproof, infusible, incombustible, non-flammable, and is a known alternative to asbestos.

INDUSTRY APPLICATIONS:

- General/Heavy Industry
- Marine
- Chemical Processing
- OEM Services
- Petrochemical
- Power Generation
- Refining
- Mining

Physical Properties	
Color	Metallic Green-Gold
Material	Phlogopite Mica, 90% min.
Binder	Silicone
Temperature: Min Max	-55°C (-67°F) 1,000°C (1,832°F)
Pressure, Max, bar (psi) Style S90 Styles L316/T316	 5 (73) 40 (580)
Density, g/cc (lbs/ft^3)	1.9 (119)
Compressibility, % ASTM F36J	18-25
Recovery, % ASTM F36J	39-43
Creep Strength, MPa (psi) DIN 52913	40 (5,800)
Tensile Strength, MPa (psi) ISO 178	20 (2,900)
Weight Loss @ 800°C, % DIN 52911	≤5
Thermal Conductivity, W/(m.K) DIN 52612 @200ºC @400ºC @600ºC	 ~0.20 ~0.35 ~0.60
Dielectric Strength @ 20ºC, kV/mm (V/mil) IEC 60243	~20 (508)

Certifications	
Fire Test	API 607, 4th edition with Exxon modifications

HT1000® is a registered trademark of Triangle Fluid Controls Ltd.

Style: S90

Phlogopite mica paper impregnated with an inorganic binder and no carrier.

Style: L316

Phlogopite mica paper impregnated with an inorganic binder laminated with a 0.002” thick 316 stainless steel carrier.

Style: T316

Phlogopite mica paper impregnated with an inorganic binder laminated with a 0.004” thick 316 stainless steel perforated carrier.

The Durlon® ETG's design is the sealing industry's current best available technology for effectively sealing extreme temperature applications.

Durlon® DRI-ETG SWG

Durlon® Extreme Temperature Gaskets (ETG) have been engineered to provide the preeminent solution to sealing gasketed joints having exposure to high temperatures, typically greater than 650°C (1,200°F) and up to 1,000°C (1,832°F). At extreme temperatures, flange assembly torque retention is the key component to maintaining a tight seal. Durlon® ETG combines a oxidation boundary material with the excellent stability and sealing characteristics of flexible graphite in order to preserve seal integrity and to retain the initial assembly torque.

Durlon® ETG adds an inner and outer protection boundary in the form of a mica-phyllosilicate based sealing material called Durlon® HT1000® which consists of phlogopite mica paper impregnated with an inorganic binder at less than half the binder amount found in a typical vermiculite-phyllosilicate filled product. This lower binder content allows for superior weight retention and results in ultimate extreme temperature sealing performance.

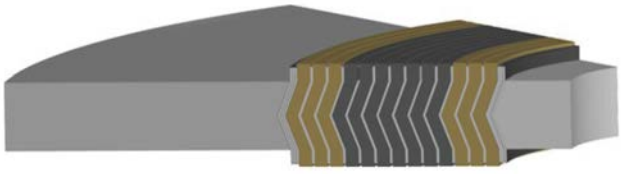
Durlon® Spiral Wound Gaskets are made with an alternating combination of a preformed engineered metal strip and a more compressible filler material which creates an excellent seal when compressed. The engineered shape of the metal strip acts as a spring under load, resulting in a very resilient seal under varying conditions. The strip metallurgy and filler material can be selected to seal a wide range of applications. All Class 150 & 300 Durlon® SWG styles have been engineered to precise manufacturing tolerances and utilize optimal winding density that allow for lower stress (bolt load) sealing compared to conventional spiral wound gaskets thus eliminating the need to stock both standard and low stress SWG's.

Gasket Factors	G_b psi (MPa)	a	G_s psi (MPa)
Type DRI ETG	90 (.620)	0.590	0.1 (0.0001)

m & Y Factors	m	Y psi
Type DRI ETG	2.8	5,800

Style DRI:

Sealing element (D) combined with a centering ring (R) and an inner ring (I) which improves radial strength and protects the sealing element from erosion and inward buckling



Certifications	
Fire Test	API 607, 4th edition with Exxon modifications
Fire Test	API Standard 6FB, Fourth Edition

INDUSTRY APPLICATIONS:

- General/Heavy Industry
- Marine
- Chemical Processing
- OEM Services
- Petrochemical
- Power Generation
- Refining
- Mining

Durlon® K40-ETG Kammprofile

Durlon® Kammprofile gaskets have a solid metal core with concentrically serrated grooves machined into the top and bottom faces. The metal core is typically stainless steel, but it can be supplied in various metallurgies as per the customer's request.

The serrated core is covered with soft sealing material and is dependent on the service conditions of the system. Flexible graphite and expanded PTFE sealing layers are most common, but other products like HT1000® or (Extreme Temperature Gaskets) ETG's can be used as well. While providing the Durlon® Kammprofile gasket with excellent sealing properties, the soft sealing layers also fill in minor flange imperfections and protect the flange surfaces from damage.

Durlon® Kammprofile gaskets are the preferred choice for applications requiring improved performance at low seating stresses. The serrated peaks provide reduced contact area and when combined with the soft conformable sealing layers, the Durlon® Kammprofile gasket provides a virtual metal-to-metal connection. They feature excellent resistance to blowout and provide superior stability for ease of handling and installation.

Durlon® ETG's engineered design principle is focused around providing oxidation protection zones around the central oxidation inhibited flexible graphite sealing component. Standard industrial grade flexible graphite typically begins to rapidly oxidize at around 650°C (1,200°F). By adding oxidation inhibitors to the graphite, the rate and amount of oxidation can be significantly reduced, thus extending the seal life of the material. However, oxidation can still occur and at extreme temperatures, it can be fatal to the integrity of the joint.

Physical Properties	
Temperature: Min Max (material dependent)	 -200°C (-328°F) 1,000°C (1,832°F)
Pressure, max, bar (psi)	414 (6,000)
pH range, Room Temp	0-14

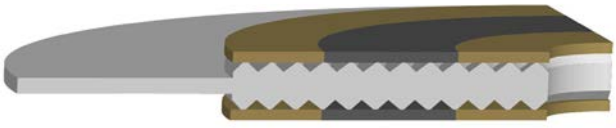
Gasket Factors	
m, Y psi (MPa)	4.00, 1,000

Parallel Root Core:

This core design is where the main sealing faces of the serrated metal core are parallel to each other. These are the standard design of Kammprofile gaskets.

Integral Centering Ring:

The centering ring is used to position the gasket between flat face and raised face type flanges.



CORE MATERIALS:

- Standard core material is 316 stainless steel with a nominal thickness of 0.125" (3mm)
- Other core materials: SS304, SS321, SS316Ti, Monel®, Titanium, Hastelloy® & Alloy 20 can be manufactured to your specifications on request
- Core material is generally selected in an identical material to the piping system in order to reduce corrosion problems

INDUSTRY APPLICATIONS:

- Oil & Gas
- Mining
- Petrochemical
- Power Generation
- Heavy Industrial
- Chemical Processing
- Pulp & Paper

Durlon® Durtec® ETG

Durlon® Durtec® gaskets are made with a specially engineered machined metal core that is bonded on both sides with soft covering layers, typically flexible graphite. The core is produced by proprietary technology that allows the finished gasket to have the best possible mechanical support function. The Durtec® core is virtually uncrushable, unlike conventional corrugated metal core gaskets. The precision construction guarantees that Durlon® Durtec® gaskets will have excellent sealing characteristics even under low bolt loads.

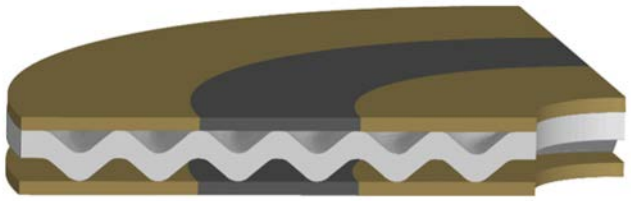
The Durtec® gasket is designed to withstand high temperatures and pressures, to be blowout resistant, to be fire safe, and to resist toxic and or corrosive chemicals for such applications as: pipeline flanges, valves, small & large pressure vessels, heat exchangers, towers, and tanks.

Durtec® is a registered trademark of Triangle Fluid Controls Ltd.

Physical Properties*	
Temp.: Min Max (material dependent) Continuous, Max	-200°C (-328°F) 1,000°C (1,832°F) 650°C (1,200°F)
pH range, Room Temp.	0-14
Pressure: Max, bar (psi)	430.9 (6,250)

**Depends on facing material and metallurgy of core.*
Note: Data shown is for 316LSS core with HT1000 covering layers.

Gasket Factors	
G_b psi (MPa)	187 (1.29)
a	0.467
G_s psi (MPa)	0.5 (0.003)
m, Y psi (MPa)	1.5, 833 (5.74)



CORE MATERIALS:

- Standard core material is 316 stainless steel with a nominal thickness of 0.125" (3mm)
- Other core materials: SS304, SS321, SS316Ti, Monel®, Titanium, Hastelloy® & Alloy 20 can be manufactured to your specifications on request

INDUSTRY APPLICATIONS:

- Water & Wastewater
- Oil & Gas
- Mining
- Food & Beverage
- OEM Services
- Petrochemical
- Power Generation
- General Industrial
- Marine
- Chemical Processing
- Pulp & Paper

Certifications	
Fire Test**	API 607, 4th edition with Exxon modifications

***Passed modified API 607 fire test and meets the requirements of Shell Specification MESC SPE 85/203 & PVRC SCR Flexible Graphite Spec for FG 600 material.*

API 607 fire test:

- Average bolt torque loss (with no adjustments): Upstream 45%; Downstream 33%
- Fire, Cool-Down & Post-Burn: Combined Leak Rate (2 gaskets) 0 mL/min at 30 psig avg.
- Exxon requirements post burn: Combined Leak Rate (2 gaskets) with no flange bolt re-torques at any test pressure 0 mL/min at 30 psig, 0mL/min at 50 psig, 0 mL/min at 100psig and, 0mL/min at 200 psig.

Durlon® HT1000® Paste

High Temperature Sealing Compound

Durlon® HT1000® Paste is a sealing compound designed to be used in conjunction with our HT1000® sheet material specifically for end users creating a larger one-piece constructed gasket from cost effective dovetail segments.

CONTAINER SIZES: 170 g and 90 g.

SHELF LIFE: 6 months in unopened container from the date it was packaged.

CAUTION: (FOR INDUSTRIAL USE ONLY) Wear eye and skin protection when handling. Ventilation may be needed. Wash hands after use. Avoid contact with open flame or other ignition sources. Keeping compound moist will minimize airborne particles when sanding or grinding cured sealant. DO NOT reuse container. KEEP OUT OF REACH OF CHILDREN.

WARNING: Avoid inhaling dust or vapors. Do not get on eyes, skin, or clothing. If swallowed, rinse mouth, DO NOT induce vomiting, call poison control and consult a physician. Inhalation: If ventilation is poor, wear respiratory protection. If experiencing breathing problems move to fresh air and seek medical aid. If on skin: wash with lots of soap and water. If irritation or rash develops, seek medical attention. Use protective equipment as required. Always read SDS and product technical data before use.

CONTAINS: Solvent Mixture, Crystalline Silica, Tetraborate Pentahydrate, Aluminosilicate, Kaolin, Modified Natural Resins.

STORAGE: Store in closed container in a cool, dry place (refrigerate for best shelf life). Keep away from open flames.

WARRANTY: The company assumes no liability for damage caused by this product other than purchase or replacement of this product. The responsibility for determining whether or not the product is suitable for use rest with the purchaser.

INSTRUCTIONS FOR USE:

1. Make sure gasket segments are aligned and laying flat pre-assembled. Ensure that both the gasket and flange are free of debris, oils, and grease.
2. Stir well before use. Surface should be clean and dry. Open container of HT1000® Paste and apply a thin, even layer to the dovetail portion of the gasket, using a disposable brush or putty knife, smoothing out any uneven portions. Close and tighten joint.
3. Assemble flange and tighten bolts according to gasket manufacturer's recommendations
   (torque, bolt-up method, etc.).
4. HT1000® Paste will begin to cure in service.
   (Please refer to applicable Required Cure Time above)

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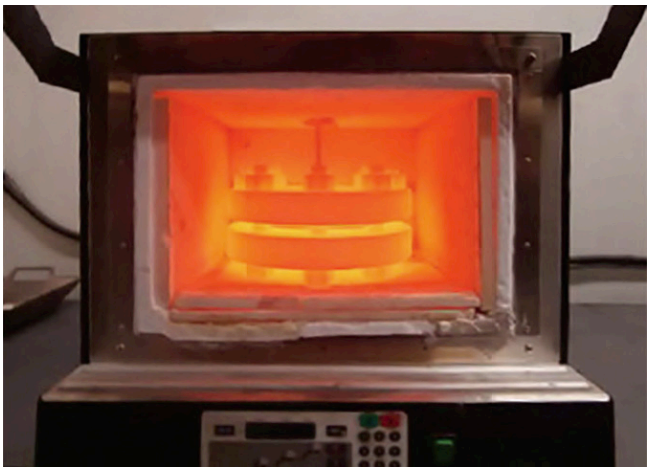
Physical Properties	
Temp.: Min Max	65ºC (150ºF) 980ºC (1800ºF)
Curing	
Temperature	Required Time
149°C (300°F)	4 Hrs
204°C (400°F)	3 Hrs
260°C (500°F)	2 Hrs
316°C (600°F)	1 Hr
371°C (700°F) or Higher	<1 Hr

Testing Results

HIGH TEMPERATURE TEST PROCEDURE

Two types of 4-inch Class 600 Inconel 625 spiral wound gaskets (with Inconel 625 bolts and washers) were prepared for this testing procedure: one with ETG configuration and one using HT1000 filler entirely.
The gaskets were tested at 14,500 psi and 25,000 psi gasket stresses according to the following procedure:



1. Test assembly was calibrated for pressure drops vs. volumetric leak rate
2. The assembly was pressurized with nitrogen to 150 psig and leakage was measured
3. The entire assembly was heated in the oven to 1382°F and was held for 24 hours
4. After stabilization, the leakage was recorded by pressure decay method
5. The assembly then was cooled to the ambient and pressurized with nitrogen to 150 psig to measure the leakage one final time

Temperature (ºF)	Leakage (ml/min)			
	4” 600# 625/ETG		4” 600# 625/HT1000	
	14,500 psi	25,000 psi	14,500 psi	25,000 psi
1382	0.032	0.016	0.45	0.27

We recommend a re-bolt when the gasket is brought down to room temperature.
This test has been authenticated by Yarmouth Research and Technology (www.yarmouthresearch.com).

YARMOUTH
RESEARCH AND TECHNOLOGY

HIGH TEMPERATURE SEALING

Industrial sealing requires superior performing gaskets that can effectively retain their stability at high temperatures.

Some applications involve both high pressure and high temperature, and the right gasket for their use should match these needs with minimal chances of failure. Over the years, Durlon® High Temperature gaskets have been known to offer the required resilience as may be required on industrial-scale applications.

To get the right gasket for your high temperature application, you need to be sure of its reliability and its ability to yield optimal results. Rely on Durlon® for high performance gaskets to match your needs.

Warning: Durlon® gasket materials should never be recommended when both temperature and pressure are at the maximum listed. Properties and applications stated are typical. No applications should be undertaken by anyone without independent study and evaluation for suitability. Never use more than one gasket in one flange joint and never reuse a gasket. Improper use or gasket selection could cause property damage and/or serious injury. Data reported is a compilation of field testing, field service reports and/or in-house testing. While the utmost care has gone into publishing the information contained herein, we assume no responsibility for errors. Specifications and information contained within are subject to change without notice. This edition cancels and obsoletes all previous editions.

DURLON®
SEALING SOLUTIONS