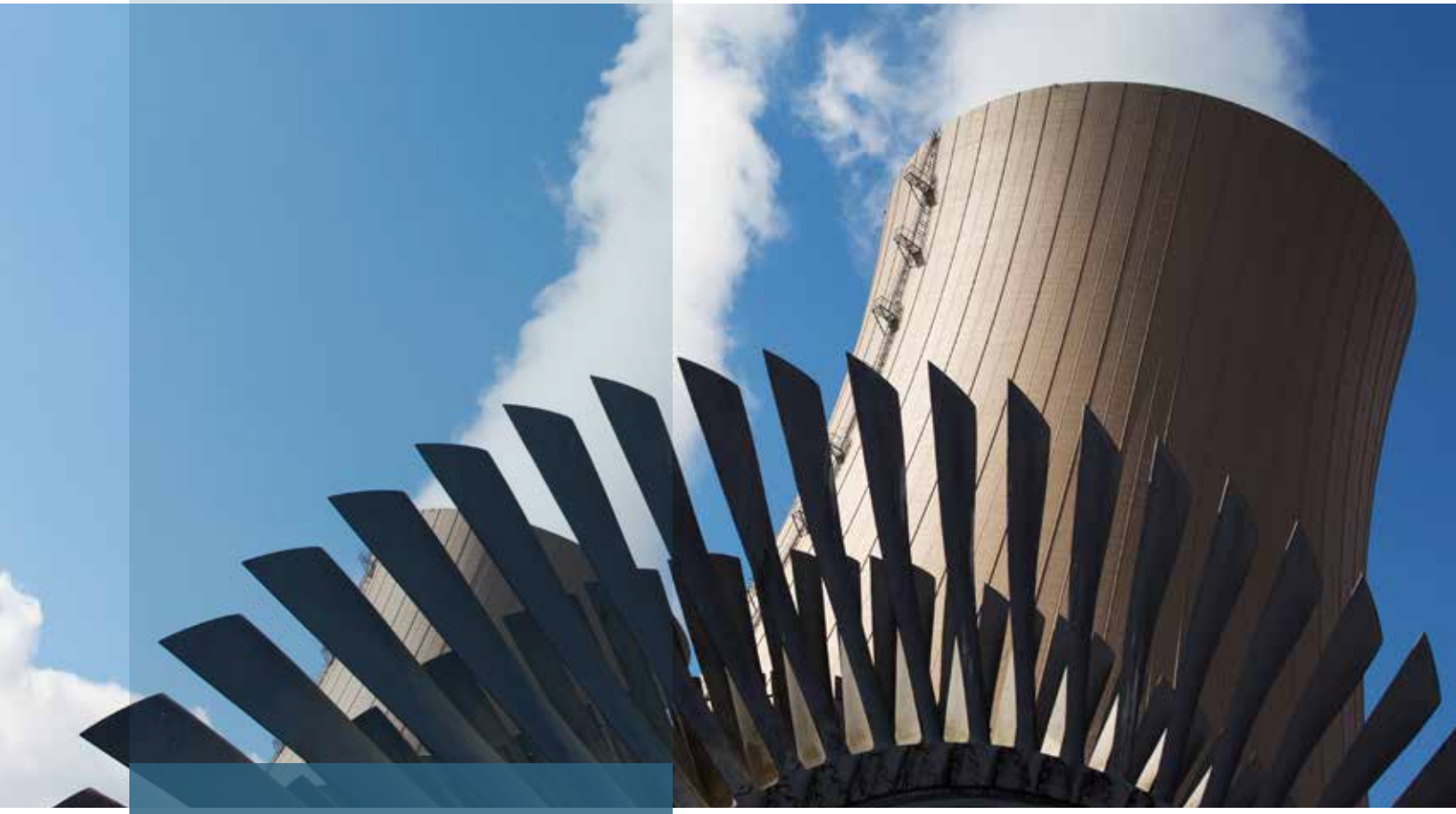
DURLON®
SEALING SOLUTIONS



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SEALING SOLUTIONS FOR

Steam Applications



Steam Applications

Steam is used throughout industrial operations to generate power, transfer heat, sterilize equipment, and support critical manufacturing processes. It is used across power generation, chemical processing, refining, pulp and paper, food and beverage, pharmaceutical production, primary metals, and general manufacturing.

Although steam is widely used, it can be difficult to seal reliably. Elevated temperatures, internal pressure, and repeated thermal cycling place significant demands on gaskets, bolting, and flange assemblies. During startup, shutdown, and changes in operating load, joint components expand and contract at different rates. Differential thermal expansion can redistribute bolt load, alter gasket stress, affect flange alignment, and create potential leak paths.

Steam may also change from vapor to liquid as it moves through the system. Condensate can form inside piping, valves, heat exchangers, and process equipment, introducing rapid temperature changes and mixed liquid-vapor conditions.

Reliable steam sealing requires more than selecting a gasket with a suitable maximum temperature. Steam condition, pressure, thermal cycling, flange design, available bolt load, gasket construction, surface finish, and installation practices must all be considered.

Durlon® offers compressed non-asbestos, flexible graphite, metallic, semi-metallic, and high-temperature gasket technologies for steam service ranging from general utility systems to high-pressure and superheated applications.

Understanding Steam Conditions

Saturated Steam
Saturated steam is produced when water boils at the temperature associated with the system pressure. It is widely used for process heating, heat transfer, and general utility applications. As it releases heat, it condenses back into water.

Superheated Steam
Superheated steam is heated above the saturation temperature for its operating pressure. It is commonly found in turbines, power generation, boilers, and severe process applications. Higher temperatures increase the importance of material stability, oxidation resistance, and retained gasket stress.

Wet Steam
Wet steam contains suspended water droplets or condensate. This mixed-phase condition can create rapid temperature changes, erosion, and fluctuating loads at valves, traps, and piping connections.

Utility Steam
Utility steam is distributed throughout a facility for general heating, cleaning, and process use. Conditions may change as pressure is reduced and steam is directed to different equipment.

Clean Steam and Steam-in-Place
Clean steam and steam-in-place systems are used in pharmaceutical, biotechnology, food-processing, and other hygienic processes. Gasket selection must consider material purity, cleanability, regulatory requirements, and repeated sterilization cycles.

Condensate Return
After steam transfers its heat, it returns to liquid form. Condensate piping, flash tanks, traps, pumps, and return systems remain hot and may experience flashing, pressure changes, and repeated thermal cycling.

How Steam Affects Gasketed Joints
The gasket must create and maintain a seal as temperatures, pressures, and equipment conditions may change.

Temperature and Pressure
As system pressure increases, so does the force attempting to separate the flanges. Elevated temperatures can also affect gasket properties, bolt strength, and flange rigidity. Maximum temperature and maximum pressure values must not be assumed to apply simultaneously.

Thermal Cycling
Repeated heating and cooling cause bolts, flanges, piping, and equipment to expand and contract. Differential movement can reduce residual gasket stress and increase the potential for leakage.

Gasket Stress
Every gasket requires sufficient compressive stress to conform to the flange surface and resist internal pressure. A steam-compatible gasket may still leak if it is not compressed adequately or evenly.

Available Bolt Load
Fasteners must generate enough force to seat the gasket and maintain compression during operation. Damaged bolts, low-strength

fasteners, or incorrect lubrication can prevent the required load from being achieved.

Flange Rigidity
Thin, distorted or lightly constructed flanges may rotate during tightening or operation. This can create uneven gasket compression across the sealing surface.

Surface Finish
Flange serrations help grip and seal the gasket. Radial scratches, corrosion, pitting, warpage, and residual gasket material can create potential leak paths.

Gasket Thickness
Thinner gaskets generally offer improved load retention where flange conditions permit. Thicker materials may help accommodate surface irregularities but should not be used to compensate for severely damaged or distorted flanges.

Graphite Oxidation
Flexible graphite performs well in high-temperature steam service but may oxidize when exposed to elevated temperatures and oxygen. Durlon® ETG constructions use protected graphite sealing zones for high-temperature conditions.



Durlon® Product Recommendations



Durlon® 8300

High-pressure & high-temperature industrial steam.



Durlon® 8400

Mild caustics, acids and a broad pH range.



Durlon® 8500

Utility steam and general process steam.



Durlon® 8900

Saturated and superheated steam.



Durlon® FGM316

Superheated steam and high mechanical loads.



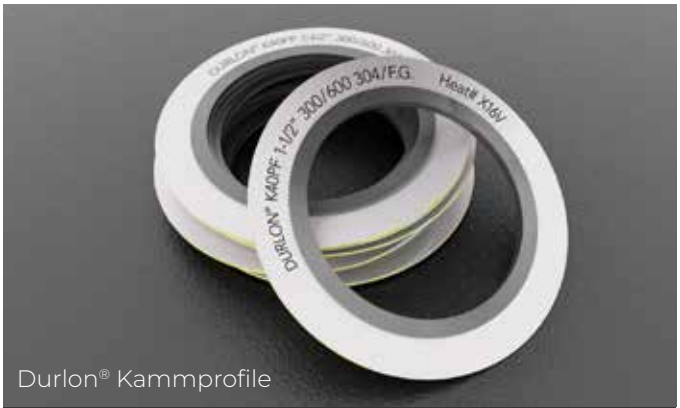
Durlon® CFG

Thermal cycling, pressure fluctuations & lower bolt loads.



Durlon® DRI-ETG SWG

Steam piping, boilers & high-pressure flanged joints.



Durlon® Kammprofile

Heat exchangers, pressure vessels & cyclic steam equip.

Physical Properties & Certifications

Physical Properties	8300	8400	8500	8900	FGM316	CFG	ETG	Kamm
Composition	Carbon NBR	Phenolic NBR	Aramid -Inorganic NBR	Aramid -Inorganic NBR	Homogeneous, 316SS Foil Insert 316SS Tang Insert, 316SS Multilayer	Corrugated Flexible Graphite Gasket	Extreme Temperature Gasket	Grooved Metal Gasket / Covering Layers
Color	Black	Gold	Green	Black	Graphite	-	SWG	Metal
Temperature: Min Max Cont., Max	-40°C (-40°F) 482°C (900°F) 343°C (650°F)	-40°C (-40°F) 427°C (800°F) 290°C (554°F)	-40°C (-40°F) 371°C (700°F) 287°C (548°F)	-40°C (-40°F) 496°C (925°F) 400°C (752°F)	-260°C (-450°F) 550°C (1,022°F) 650°C (1,200°F)	-200°C (-328°F) 650°C (1,200°F) 550°C (1,022°F)	> 650°C (1,200°F) 1,000°C (1,832°F) -	-200°C (-328°F) 450°C (842°F) 400°C (752°F)
Pressure, max, bar (psi)	139 (2,000)	103 (1,500)	103 (1,500)	138 (2,000)	250 (3,625)	207 (3,000)	-	414 (6,000)
Density, g/cm³ (lb/ft³)	1.6 (100)	1.7 (106)	1.7 (106)	1.6 (100)	-	-	-	-
Compressibility, %	8–16	8–16	8–16	7–17	30–40	-	-	-
Recovery, %	50	50	50	50	10-15	-	-	-
Creep Relaxation, %	18	25	20	15	5	-	-	-
Tensile Strength, MPa (psi)	12.4 (1,800)	12.4 (1,800)	13.8 (2,000)	13.8 (2,000)	-	-	-	-
Sealability ASTM F2378 (Nitrogen)	0.05 mL/min	0.03 mL/min	0.03 mL/min	0.2 mL/min	0.4 mL/min	-	-	-

FGM316 - Inhibited grade sheet laminated with multiple layers of 0.004" thick 316 stainless steel foil core. This product is used in applications with high mechanical stress or pressure, above average burst resistance, exceptional rigidity, and suitable to cut gaskets with narrow strips.
Durlon® ETG adds an inner and outer protection boundary in the form of a mica-phyllosilicate based sealing material - Durlon® HT1000® : 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® Kammprofile - Actual performance and service life are dependent upon material selection, operating conditions and environmental factors.

Style	Certifications
8300	Passed API 6FB, 4th Edition Fire Test; California Proposition 65; RoHS and REACH Declaration.
8400	California Proposition 65; RoHS and REACH Declaration.
8500	California Proposition 65 and RoHS and REACH Declaration compliant, API 6FB Fire Test with avg. temperature >650°C, 30 minutes, 40 bar, 1 mL/(in·min) max allowable leakage, Conforms to the FDA requirements of 21 CFR 177.2600, ABS Tier 2 - PDA Issued.
8900	Tested in accordance with ANSI/API 607, 6th Edition, with zero leakage; RoHS and REACH Declaration compliant.
CFG	Passed API 6FB, 4th Edition Fire Test; RoHS and REACH Declaration compliant.
ETG	API 6FB, 4th Edition (2019), Type 1 (Onshore Test); API 6FB, 4th Edition (2019), Type 2 (Offshore Test); API 607, 4th Edition Fire Test with Exxon modifications.
Kammprofile	RoHS and REACH Declaration compliant.

Note: ASTM properties are based on 1/16" sheet thickness, except ASTM F38 which is based on 1/32" sheet thickness. This is a general guide only and should not be the sole means of accepting or rejecting this material. The data listed here falls within the normal range of product properties, but should not be used to establish specification limits nor used alone as the basis of design. For applications above
Class 300, contact our technical department.
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.



The core of the Durlon® brand is to provide fluid sealing solutions that make sense, both financially and strategically. We accomplish this through process-oriented design, sector-specific knowledge, and extensive testing.

For steam applications, sealing reliability supports overall system performance, efficiency, equipment integrity, operational safety, and long-term reliability through changing temperatures, pressures, and thermal cycles.

At Durlon®, we offer specially developed sealing solutions tailored to your specific needs.

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