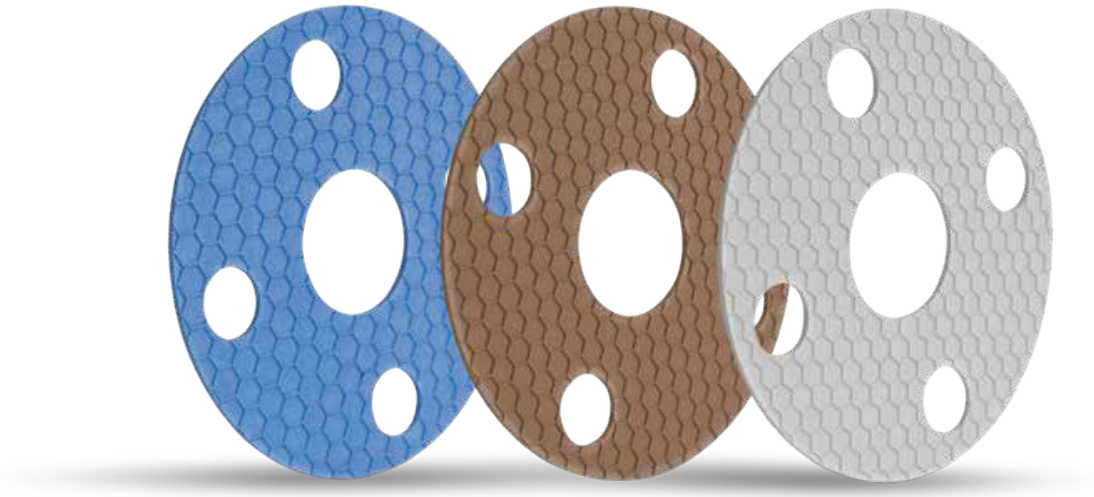
GASKET SUPPLY .COM

AN OVERVIEW OF GARLOCK GYLON EPIX

THE NEXT GENERATION IN PTFE GASKETING



(800) 530-9051

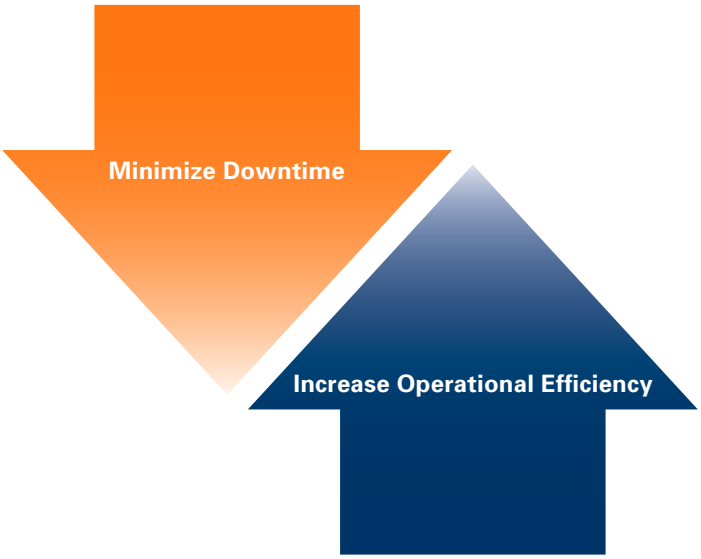
www.GasketSupply.com

Garlock GYLON EPIX®

Industry challenges

WE UNDERSTAND YOUR GOALS

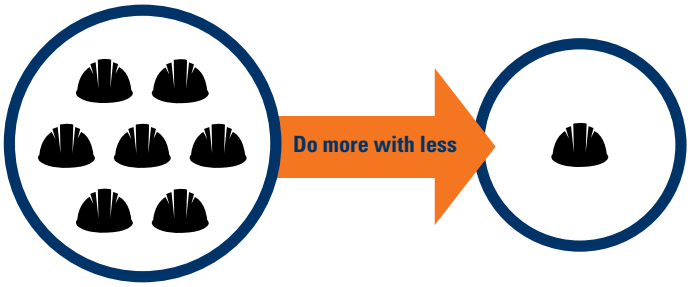
People or machines sitting idle results in products not being made, which affects your bottom line. Garlock is dedicated to helping our customers minimize downtime and increase operational efficiency.



The right combination of people, processes and technology align to optimize your business performance.

CHALLENGES

- Conflicting goals
- Understaffing
- Under trained maintenance personnel
- Outsourced labor



Reliability engineers are now responsible for a lot more equipment or areas of the plant than in the past.

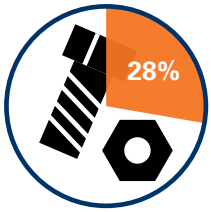
DID YOU KNOW?

Gasket selection can greatly impact downtime and operational efficiency.

COMMON GASKETING CHALLENGES

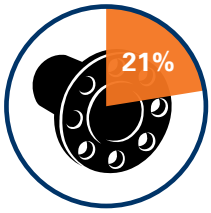
IMPROPER BOLT LOAD

End-users struggle when it comes to ensuring gaskets are installed to proper bolt loads as gaskets require different loads.



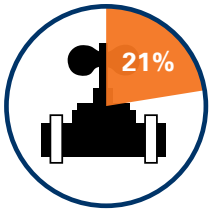
SEALABILITY

End-users want a gasket that seals "tighter" when available assembly stresses are less than ideal.



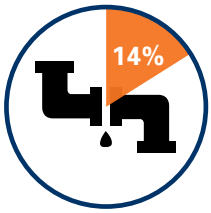
IMPROVED LOAD RETENTION

End-users struggle with gaskets that leak prematurely due to load loss and need gaskets with improved load retention for better service life.



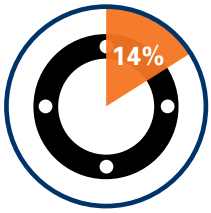
LEAKAGE

End-users are frustrated by gaskets that leak – particularly when carrying aggressive and corrosive chemicals.



INSTALLATION ISSUES

End-users are frustrated when equipment damage and unplanned outages happen due to human error and installation mistakes.



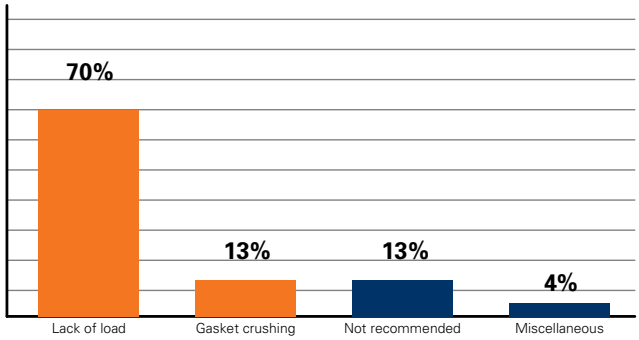
Garlock GYLON EPIX®

The perfect solution for imperfect flanges

GASKETING MISCONCEPTION

In a world where we are bombarded with the belief that "more is better" sealing science contradicts that theory with facts that show "thinner is better" when it comes to gaskets, as they provide improved load retention, pressure resistance and sealability. Yet thicker gaskets have their place for uneven, worn or damaged sealing surfaces. So how does a person make the right choice? What if there was a product that could do both?

WHY GASKETS FAIL



83% of gasket failures are due to installation errors

Introducing GYLON EPIX®

THERE IS A BETTER WAY

GYLON EPIX® is a family of gaskets that effectively seals a broader range of applications and is more forgiving during the installation process.

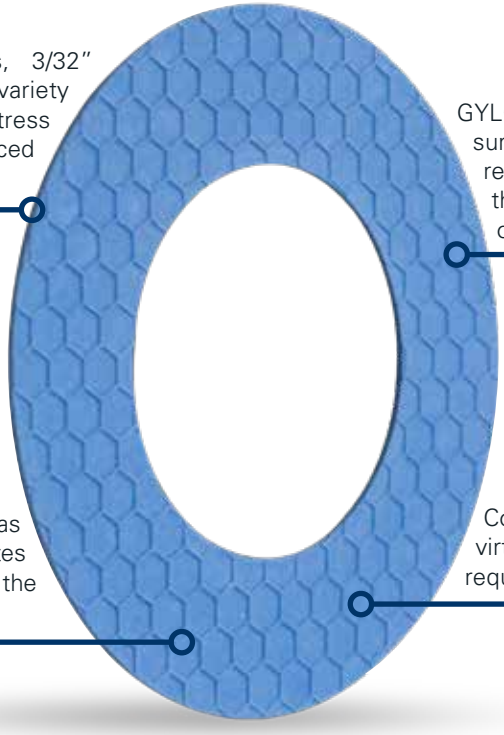
GYLON EPIX® allows the end user to save valuable turn-around time, reduce re-work, and lower costs, helping them to finish ahead of schedule and under budget.

INVENTORY SIMPLIFICATION

Offered in one universal thickness, 3/32" (2.4mm), eliminating the need to stock a variety of material thicknesses with different stress requirements. This translates to reduced inventory and better sheet utilization.

IMPROVED LOAD RETENTION

GYLON EPIX® features a hexagonal surface profile that provides the torque retention and blowout resistance of a thinner gasket and the conformability of a thicker gasket.



TRUSTED MATERIALS

Made from the same PTFE material as standard GYLON® products so it eliminates the need for most customers to qualify the new GYLON EPIX™ products.

CHEMICAL RESISTANCE

Complete family portfolio designed to virtually cover all chemical resistance requirements within the industry.

Garlock GYLON EPIX®

The perfect solution for imperfect flanges

GYLON EPIX® is a newly developed family of PTFE gaskets. It is manufactured using a patented, profiled surface based on our proven Fawn, Off-White, and Blue GYLON® to create highly conformable materials for optimum sealing performance.

The innovative GYLON EPIX®, provides superior functional performance by combining the traditional attributes of GYLON® with an innovative surface design. It offers a broader range of applications than traditional PTFE gaskets used in worn and pitted flanges. In addition, GYLON EPIX® delivers the sealing and load retention properties of $^{1}/_{16}$" and the conformability of $^{1}/_{8}$". The hexagonal profile provides improved compressibility and recovery. The profiled surface reduces the contact area during initial compression to concentrate the compressive force of the flange for improved sealability.

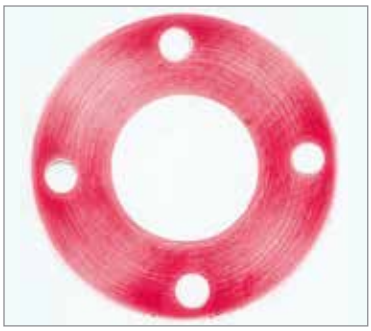
Designed for increased compressibility, GYLON EPIX® improves performance in misaligned flanges. The consolidation of two thicknesses to one reduces the need to inventory multiple thicknesses. Garlock is dedicated to providing real sealing solutions that meet real world sealing needs. With an improved design, color-coded materials and a single thickness, GYLON EPIX® makes sealing easier.

GYLON EPIX® has been awarded in excess of 15 patents.

FEATURES AND BENEFITS

- One thickness does the job of two.
- Seal performance and load retention equal of $^{1}/_{16}$".
- Compressibility and forgiveness/conformability of $^{1}/_{8}$".
- Patented hexagonal profile creates superb sealing and ability to conform to imperfect flange surfaces.
- Same materials as traditional GYLON®
- Ideal for use in FRP flanges
- Available in sheet and discreet gasket forms
- Effectively seals in FRP flanges (see page 11)
- Can be dovetailed to make segmented gaskets of any size

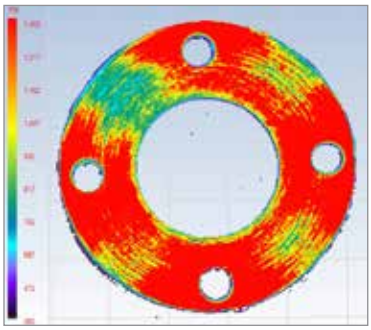
THE GYLON EPIX® DIFFERENCE



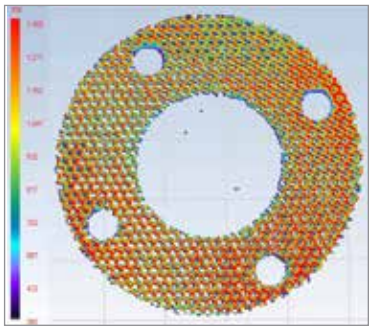
Traditional GYLON®

GYLON EPIX®

GYLON EPIX® and a traditional full face gasket were installed in a 3"-150# flat face flange at 120 ft.lbs. with pressure sensitive film. The film revealed that the traditional material saw heavier loading-near and around the bolts, and lighter loading at the points furthest from the bolts. The GYLON EPIX® was able to distribute the load more evenly and prevent the low loading phenomenon.



Traditional GYLON®

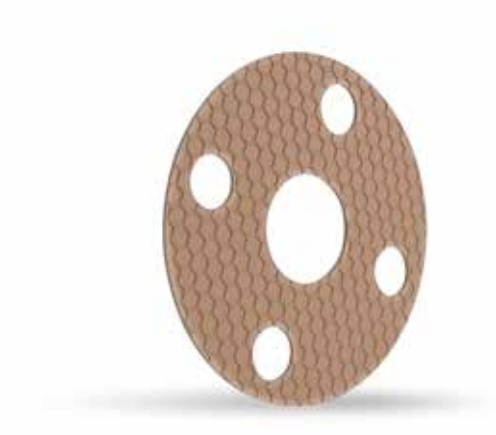


GYLON EPIX®

The pressure sensitive film was then analyzed with special software that translates the various shades of red into a full color spectrum to provide a better visualization of the stresses that were developed on each of the gaskets. Again, while the traditional gasket saw areas of lower stress (green and blue areas), the hexagonal pattern in the GYLON EPIX® concentrated and distributed the stress more evenly across the entire gasket.

Garlock GYLON EPIX®

Gasket Simplification

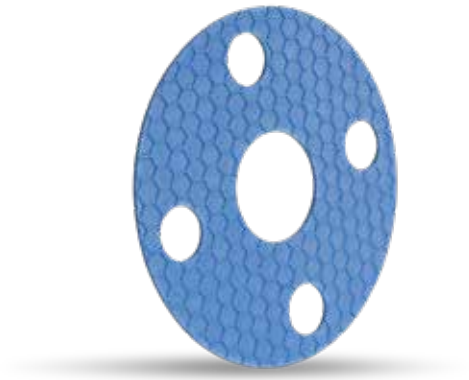


GYLON EPIX® STYLE 3500 EPX

GYLON EPIX® Style 3500 EPX is a high performance, silica filled PTFE sheet material designed for use with strong acids, solvents, hydrocarbons, and other aggressive media. Style 3500 EPX withstands a wide range of chemicals for extended service in a wide variety of applications.

APPLICATIONS

- Strong Acids
- Solvents
- Hydrocarbons
- Water
- Steam
- Chlorine
- Cryogenics

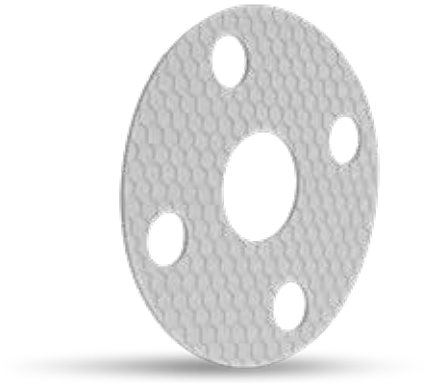


GYLON EPIX® STYLE 3504 EPX

GYLON EPIX® Style 3504 EPX is a high performance, aluminosilicate microsphere filled PTFE sheet material designed for use with most acids and caustics, as well as hydrocarbons, refrigerants, and more.

APPLICATIONS

- Most acids and some caustics
- Hydrocarbons
- Solvents
- Water
- Refrigerants
- Cryogenics



GYLON EPIX® STYLE 3510 EPX

GYLON EPIX® Style 3510 EPX is a high performance, barium sulfate filled PTFE gasketing material. Style 3510 EPX is designed for use where initiating and maintaining an extremely tight seal is critical; these applications include: strong caustics and moderate acids, chlorine, gases, water, steam, hydrocarbons, and cryogenics.

APPLICATIONS

- Strong caustics
- Moderate acids
- Chlorine
- Gases
- Monomers
- Steam
- Hydrocarbons
- Cryogenics & aluminum fluoride

TECHNICAL DATA

GYLON EPIX® APPROVALS & CERTIFICATIONS

	Style 3500 EPX	Style 3504 EPX	Style 3510 EPX
FDA	X	X	X
USDA	X		
ADI/TSE Free	X	X	X
USP VI <87>	X	X	X
USP VI <88>	X	X	X
USP VI <661>		X	
REACH	X	X	X
RoHS 3	X	X	X

Additional certificates for individual styles are available upon request

DIN EN 13555 CHARACTERISTICS		**GYLON EPIX® Style 3500 EPX**	**GYLON EPIX® Style 3504 EPX**	**GYLON EPIX® Style 3510 EPX**
Qsmax Maximum tolerated assembly stress at various temperatures	68°F (20°C)	33,350 psi (230 MPa)	29,000 psi (200 MPa)	33,350 psi (230 MPa)
	212°F (100°C)	29,000 psi (200 MPa)	17,400 psi (120 MPa)	23,200 psi (160 MPa)
	302°F (150°C)	29,000 psi (200 MPa)	14,500 psi (100 MPa)	20,300 psi (140 MPa)
	392°F (200°C)	26,100 psi (180 MPa)	11,600 psi (80 MPa)	17,400 psi (120 MPa)
	482°F (250°C)	23,200 psi (160 MPa)	8,700 psi (60 MPa)	14,500 psi (100 MPa)
Qmin Minimum stress needed to reach 0.01 [mg/(s*m)] at various system pressures	145-290 psig (10-20 bar)	725 psi (5 MPa)	725 psi (5 MPa)	725 psi (5 MPa)
	580 psig (40 bar)	1,160 psi (8 MPa)	725 psi (5 MPa)	725 psi (5 MPa)
	1,160 psig (80 bar)	1,740 psi (12 MPa)	1,450 psi (10 MPa)	1,450 psi (10 MPa)
Maximum sealability class at 68°F (20°C) at 2,900 psi (20 MPa) at various system pressures	145 psig (10 bar)	$1.0x10^{-3}$ mg/(s*m)	$1.0x10^{-4}$ mg/(s*m)	$1.0x10^{-4}$ mg/(s*m)
	290 psig (20 bar)	$1.0x10^{-3}$ mg/(s*m)	$1.0x10^{-3}$ mg/(s*m)	$1.0x10^{-3}$ mg/(s*m)
	580 psig (40 bar)	$1.0x10^{-3}$ mg/(s*m)	$1.0x10^{-3}$ mg/(s*m)	$1.0x10^{-3}$ mg/(s*m)
	1,160 psig (80 bar)	$1.0x10^{-3}$ mg/(s*m)	$1.0x10^{-3}$ mg/(s*m)	$1.0x10^{-3}$ mg/(s*m)
Maximum sealability class at 68°F (20°C) at 23,200 psi (160 MPa) assembly stress at noted system pressure	580 psig (40 bar)	$1.0x10^{-6}$ mg/(s*m)	$1.0x10^{-5}$ mg/(s*m)	$1.0x10^{-6}$ mg/(s*m)

Initial & residual assembly stress required to achieve sealability of 0.01 mg/(s*m) and residual load after unloading to maintain sealability class L0.01 mg/(s*m)	**System pressure**	**Initial Assembly Stress (QA)**	**Residual Assembly Stress Style 3500 EPX**	**Residual Assembly Stress Style 3504 EPX**	**Residual Assembly Stress Style 3510 EPX**
	145 psig (10 bar)	1,450 psi (10 Mpa)	435 psi (3 Mpa)	435 psi (3 Mpa)	435 psi (3 Mpa)
	290 psig (20 bar)	1,450 psi (10 Mpa)	435 psi (3 Mpa)	435 psi (3 Mpa)	435 psi (3 Mpa)
	580 psig (40 bar)	1,450 psi (10 Mpa)	725 psi (5 Mpa)	725 psi (5 Mpa)	725 psi (5 Mpa)
	1,160 psig (80 bar)	2,900 psi (20 Mpa)	1,450 psi (10 Mpa)	1,450 psi (10 Mpa)	1,450 psi (10 Mpa)

NOTE:
» Data in accordance to DIN EN 13555 for calculations to be done in accordance to DIN EN 1591-1
» Data can be used for ASME PCC-1:2013 including Appendix "I" or Appendix "O"
» Please contact Garlock Engineering if gasket cross-section (width) is less than 0.5" (12.7mm)

TECHNICAL DATA

GENERAL SEALING CHARACTERISTICS

	Style 3500 EPX	Style 3504 EPX	Style 3510 EPX
MATERIAL PROPERTIES			
Color	Fawn	Blue	Off-White
Composition	PTFE w/ silica	PTFE w/ aluminosilicate	PTFE w/ barium sulfate
Temperature range			
Minimum:	-450°F (-268°C)	-450°F (-268°C)	-450°F (-268°C)
Ideal Operating Limit:	400°F (204°C)	400°F (204°C)	400°F (204°C)
Maximum:	See Pressure/Temperature Ratings graph		
Pressure			
Ideal Operating Limit:	750 psig (52 bar)	750 psig (52 bar)	750 psig (52 bar)
Maximum:	See Pressure/Temperature Ratings graph		
TYPICAL PHYSICAL PROPERTIES			
Load Retention (DIN 52913)	50%	50%	50%
Compressibility (ASTM F 36)	47%	52%	43%
Recovery (ASTM F 36)	17%	25%	18%
Tensile strength (ASTM D 1708)	2,000 psi (13.8 N/mm^2)	2,000 psi (13.8 N/mm^2)	2,000 psi (13.8 N/mm^2)
DESIGN & PERFORMANCE VALUES			
Design Factors (ASTM F3149)			
"m" factor:	2.5	2.5	2.5
"y" factor:	2,000 psi (13.8 MPa)	2,000 psi (13.8 MPa)	2,000 psi (13.8 MPa)
Gasket constants (ASTM ROTT)			
Gb:	174 psi	76 psi	248 psi
a:	0.424	0.508	0.368
Gs:	2.03 psi	13.6 psi	0.939 psi
Hot Blowout (ASTM HOBT2)			
Rating at 435 psig:	530°F (277°C)	432°F (222°C)	475°F (246°C)
SEALING CHARACTERISTICS			
Sealability (ASTM F 37 B) Fuel A:* Internal pressure = 9.8 psig (0.7 bar) Gasket load = 1000 psi (6.9 MPa)	0.2 ml/hr.	0.2 ml/hr.	0.2 ml/hr.
Sealability (ASTM F 37 B) Nitrogen* Internal pressure = 30 psig (2 bar) Gasket load = 3000 psi (20.7 MPa)	0.25 ml/hr.	0.15 ml/hr.	0.2 ml/hr.
Gas permeability (DIN 3535/6) mg/m-sec	<0.0005	<0.0005	<0.0005
Gas permeability (DIN 3535/4) cc/min	<0.006	<0.006	<0.006

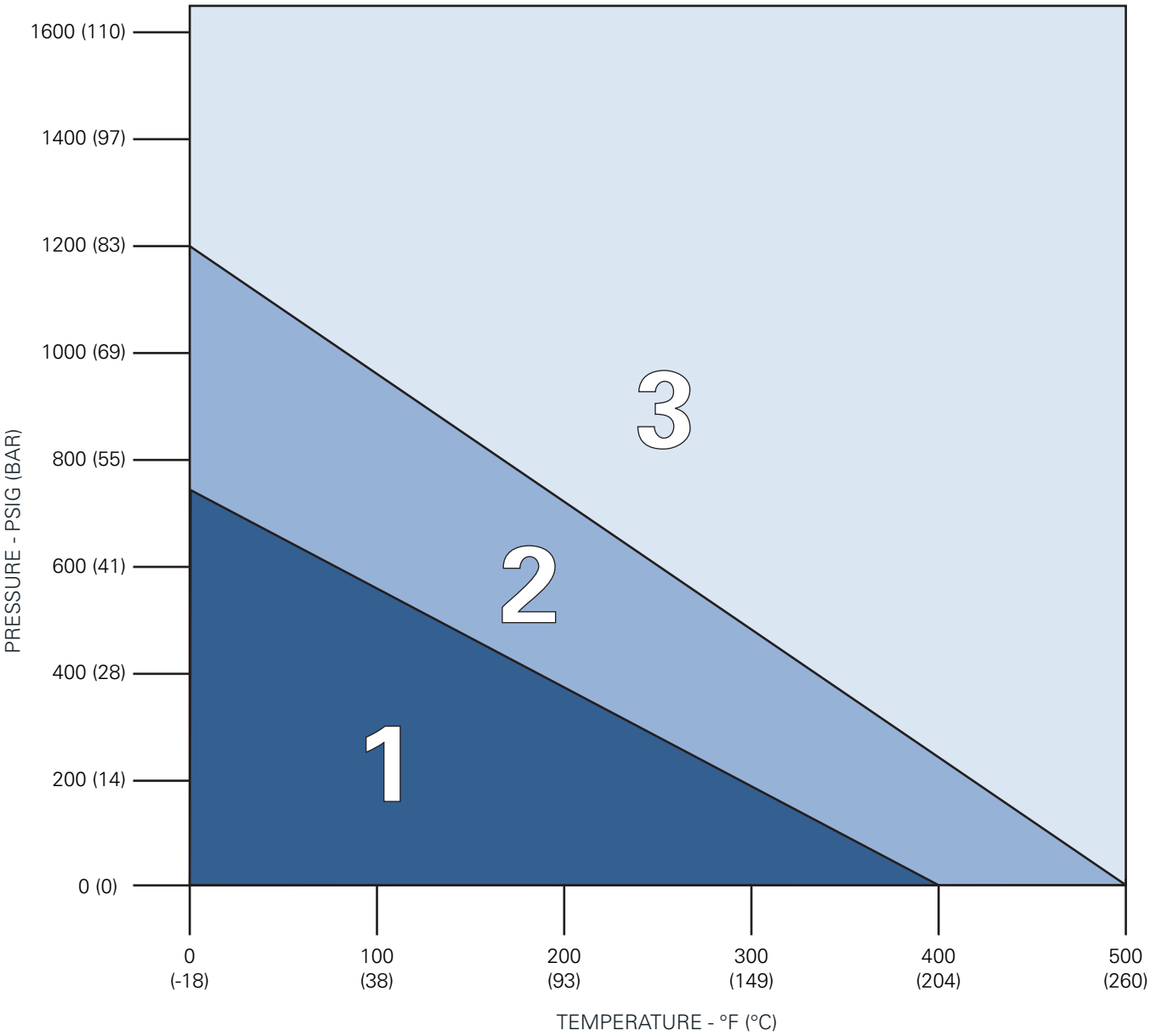
*0.2" ID x 1.20" OD test gasket size

AVAILABLE SIZES

	Style 3500 EPX	Style 3504 EPX	Style 3510 EPX
Thickness - inch (mm)	3/32" (2.4mm)	3/32" (2.4mm)	3/32" (2.4mm)
Tolerance - inch (mm)	+/- 0.008 (0.2mm)	+/- 0.008 (0.2mm)	+/- 0.008 (0.2mm)
Sheet Sizes - inch (m)	60"x 60" (1.5m x 1.5m)	60"x 60" (1.5m x 1.5m)	60"x 60" (1.5m x 1.5m)

TECHNICAL DATA

PRESSURE/TEMPERATURE RATINGS



LEGEND:

1. Suitable for use if chemically compatible and installed using Garlock's recommended installation practices and assembly stresses.
2. Please consult Garlock Applications Engineering to confirm the suitability with your service conditions.
3. Generally not suitable - please consult Garlock Applications Engineering to confirm the suitability with your service conditions.

INSTALLATION RECOMMENDATIONS

FACTORS AFFECTING GASKET PERFORMANCE

A gasket has one basic function: to create a positive seal between two relatively stationary parts. The gasket must do a number of different jobs well to function properly - first, create an initial seal; second, maintain the seal over a desired length of time; third, be easily removed and replaced. Varying degrees of success are dependent on how well the gasket does the following:

1. Seals system fluid.
2. Chemically resists the system fluid to prevent serious impairment of its physical properties.
3. Deforms enough to flow into the imperfections on the gasket seating surfaces to provide intimate contact between the gasket and the sealing surfaces.
4. Withstands system temperatures without serious impairments of its performance properties.
5. Is resilient and creep resistant enough to maintain an adequate portion of the applied load.
6. Has sufficient strength to resist crushing under the applied load, and maintain its integrity when being handled and installed.
7. Does not contaminate the system fluid.
8. Does not promote corrosion of the gasket seating surfaces.
9. Is easily and cleanly removable at the time of replacement.

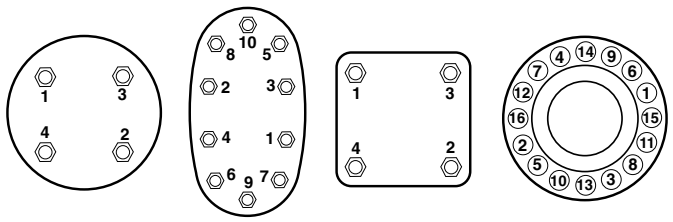
During the gasket product selection process that follows, we recommend that these nine (9) factors be used as a checklist from the viewpoint of the user's degree of need for each factor and the manufacturer's degree of compliance.

INSTALLATION

A few simple precautionary measures must be observed during installation to ensure the most satisfactory joint.

- The features of GYLON EPIX® significantly improve many of the properties, such as compressiblity, recovery, load retention, sealability, etc. over traditional PTFE gasketing. Proper installation practices are still critical to achieving optimum performance from GYLON EPIX® gaskets; consult torque requirements in the tables provided in this publication.
- For optimum performance the sealing surface should be no less than ½" wide.
- Center the gasket on the flange. This is extremely vital where raised faces are involved.
- Be sure surface finish and flatness are satisfactory.
- Tighten the bolts to compress the gasket uniformly. This means going from side to side around the joint. See correct bolting pattern below.
- Use a torque wrench, well-lubricated fasteners, and hardened flat washers to ensure correct initial loading.
- All bolts should be tightened in one-third increments, according to proper bolting patterns.
- Make a final check pass at the target torque value moving consecutively from bolt to bolt.
- Re-torque 12 to 24 hours after initial installation, whenever possible. All applicable safety standards including lockout/tag-out procedures should be observed.
- Never use liquid or metallic based anti-stick or lubricating compounds on the gaskets. Premature failure could occur as a result.

CORRECT BOLTING PATTERN



BOLT TORQUE VALUES FOR GYLON EPIX®

ASME B16.5 CLASS 150# RAISED FACE FLANGES WITH A193 GRADE B7 BOLTS

Nom. Pipe Size inches	# of bolts	Size of Bolts inches	Internal Pressure psig	Minimum Torque ft. lbs.	Preferred Torque ft. lbs.
2	4	5/8	300	52	120
2½	4	5/8	300	61	120
3	4	5/8	300	89	120
3½	8	5/8	300	50	120
4	8	5/8	300	63	120
5	8	¾	300	88	200
6	8	¾	300	111	200
8	8	¾	300	150	200
10	12	7/8	300	141	320
12	12	7/8	300	187	320
14	12	1	300	238	490
16	16	1	300	226	490
18	16	1 1/8	300	336	710
20	20	1 1/8	300	296	710
24	20	1¼	300	422	1000

Minimum torque values based on a minimum gasket stress of 3600 psi.
Preferred torque values based on a maximum gasket stress of 15,000 psi or 60,000 psi bolt stress, whichever occurs first.
Contact Garlock Application Engineering if flanges are non-metallic or if bolt grade is other than A193 B7.

ASME B16.5 CLASS 300# RAISED FACE FLANGES WITH A193 GRADE B7 BOLTS

Nom. Pipe Size inches	# of bolts	Size of Bolts inches	Internal Pressure psig	Minimum Torque ft. lbs.	Preferred Torque ft. lbs.
2	8	5/8	800	35	108
2½	8	¾	800	45	141
3	8	¾	800	66	200
3½	8	¾	800	74	200
4	8	¾	800	94	200
5	8	¾	800	117	200
6	12	¾	800	99	200
8	12	7/8	800	160	320
10	16	1	800	185	490
12	16	1 1/8	800	269	710
14	20	1 1/8	800	234	652
16	16	1¼	800	328	912
18	24	1¼	800	371	1000
20	24	1¼	800	409	1000
24	24	1½	800	579	1552

Minimum torque values based on a minimum gasket stress of 4800 psi to 5600 psi (depending on flange size).
Preferred torque values based on a maximum gasket stress of 15,000 psi or 60,000 psi bolt stress, whichever occurs first.
Contact Garlock Application Engineering if flanges are non-metallic or if bolt grade is other than A193 B7.

BOLT TORQUE GUIDANCE FOR GYLON EPIX® IN FIBER REINFORCED PLASTIC (FRP) FLANGES

MINIMUM TORQUE TO SEAL GYLON EPIX®

150 psig ambient temperature water
Smooth flat face FRP flanges*

Nominal Size (Inch)	Torque (ft.-lb.)		
	3500 EPX	3504 EPX	3510 EPX
1	7	7	14
1.5	9	9	19
2	16	16	33
3	24	24	49
4	16	16	33
6	23	23	46
8	33	33	66
10	32	32	64
12	47	47	93
14	67	67	134
16	60	60	120
18	66	66	132
20	62	62	124
24	87	87	173

Minimum torque to seal GYLON EPIX® 150 psig ambient temperature water for smooth flat face FRP flanges .

*FRP flanges must have smooth faces with no surface profiles or raised features. Consult applications engineering if the flanges are PVC/CPVC and/or have a profiled finish. Never exceed the maximum allowable torque published by the FRP flange manufacturer. Doing so could result in flange/equipment damage.

The table shows the results of testing GYLON EPIX® in a 6" Class 150 FRP flange test rig at 150 psig and 180°F and laboratory test fixtures. All flange face surfaces were smooth; no raised features. It was observed that 3500 EPX and 3504 EPX sealed 150 psig ambient temperature water at 300 psi compressive stress and 3510 EPX at 600 psi. These stresses were used to calculate the torques in the table. Torques calculations based on lubricated bolts with a K factor of 0.15 to 0.16 depending on the bolt size.