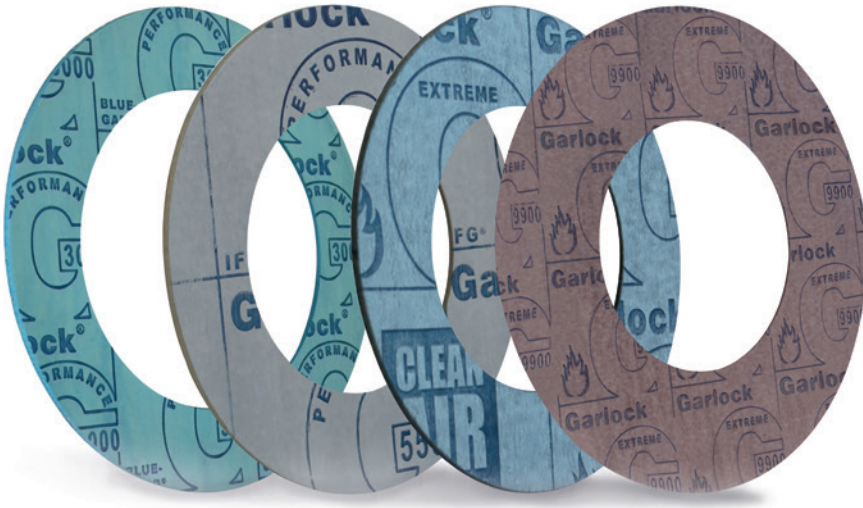


Garlock Fiber Gasketing

BLUE-GARD®, IFG®, Garlock Style 9850, Garlock Style 9900



Garlock Fiber Gasketing

Improved sealing capabilities and superior torque retention.

For decades, Garlock fiber gaskets have been effectively used in the machine building industry, the chemical processing, supply facilities and power plants all over the world.

Production and quality

Continuous quality controls on key process steps and innovative production techniques at our production locations guarantee a constantly high quality and availability of the products. Many products are available from stock in Neuss and can be cut to the desired dimensions due to state-of-the-art cutting and punching machines.



Our production facilities in Palmyra, USA and Mexico City, Mexico

Tight quality controls as well as a high level of quality awareness of our employees provide a high level of product safety and conformity to specifications. Garlock is tested and certified in accordance with ISO 9001:2008 and is annually audited by the Nuclear Procurement and Issues Committee (NUPIC).

Environment

As a part of the EnPro Industries Garlock improves continuously operations and products in terms of a clean environment. For our fiber sheets production we use a protected, environmentally friendly solvent without fugitive organic compounds. Garlock is tested and certified in accordance with ISO 14001:2004.

Benefits of Garlock fiber gaskets at a glance

- » **Excellent sealability:** Garlock fiber gaskets are characterized by immediate tightness, which remains constant over a long operating time. They have an excellent recovery in order to maintain the tightness of the connection, even during movements.
- » **Excellent media resistance** of the gaskets prevents the impairment of the physical properties by media such as acids or caustics (for more information, see compatibility list for Garlock gaskets).
- » **Flexibility/high adaptiveness:** Unevenness and damage of the sealing surfaces can be compensated even at low load.
- » **Anti-corrosive:** No corrosion of the sealing surfaces caused by the gasket.
- » **Excellent pressure resistance:** The high pressure resistance prevents destruction of the gasket under pressure.
- » **High efficiency:** Due to an excellent tightness, connected with longevity of our fiber gaskets, media losses could be reduced and service and maintenance costs cut down.

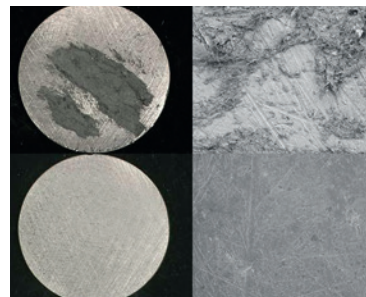
FLANGE-FREE™

Save costs through easy removal of the gaskets

For years, the seal residue on the sealing surfaces and the cleaning of the sealing strips where a problem for the end-users. In addition to the problem of opening flanges, there is a challenge of fully removing the seal residues from the sealing surfaces in a reasonable timeframe without damaging the flanges. A repair of the flanges is even more costly and time-intensive. Solvent based cleaners can be effective, but have often a very negative impact on health and the environment. All Garlock fiber gasketing materials are delivered with the effective Garlock FLANGE-FREE™ coating. With Garlock the FLANGE-FREE™ coating the sealing can be easily removed from the sealing surfaces.

Adhesion

Garlock FLANGE-FREE™ coating allows a residue-free removal of the fiber gasket from the flange surfaces. This saves time when changing the gaskets, a damage of the flanges is prevented, gasket changing in general is simplified, and the operator saves costs. This has been tested in accordance with ASTM Test Method F607 with a 1" large test flange made from 1018 stainless steel at 204°C for 22 hours with a fiber gasket with a neoprene binder with and without FLANGE-FREE™ coating, and with a 2" flange at 400°F for 24h with a carbon fiber with a SBR binder with FLANGE-FREE™ coating in comparison with other manufactures gaskets made of vermiculite and carbon.



Fiber gasket with neoprene binder without FLANGE-FREE™ coating.

Left: original image
Right: 1000x SEM

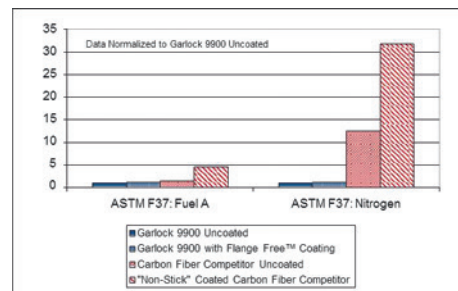
Fiber gasket with neoprene binders with FLANGE-FREE™ coating.

Left: original image
Right: 1000x SEM

Comparison of the adhesion of fiber gaskets with neoprene binders between FLANGE-FREE™ coating and uncoated

Sealability

The sealability of the Style 9900 with and without FLANGE-FREE™ coating as well as of comparable product of other manufactures have been tested according to ASTM F37. The comparison shows that the FLANGE-FREE™ coating has little to no effect on the sealing, while other coatings have a very strong negative influence.



Comparison of the sealability of a Style 9900 gasket with FLANGE-FREE™ coating, uncoated, and other manufactures products coated and uncoated

Adhesion comparison



Other manufactures gasket made of carbon



Other manufactures gasket made of vermiculite





Garlock gasket made of carbon with FLANGE-FREE™ coating

BLUE-GARD® and IFG®

For a wide range of applications



BLUE-GARD® fiber gaskets offer excellent sealability in a wide range of applications. IFG® gaskets are based on inorganic fibers, which achieve significantly better performance than gaskets with aramid fibers: Higher creep resistance, higher temperature and form stability due to no fiber oxidation and minimal weight loss.

Fiber Gasketing	BLUE-GARD® Style 3000	IFG® Style 5500
A selection of the correct gasketing only based on this table is not possible. Please do not hesitate to contact us.	 Good universal gaskets for liquid and gaseous media	 IFG® gaskets are used in general mechanical engineering, power plants and chemical processing.
Composition	Aramid fiber with NBR binder	Inorganic fibers with nitrile binder
Media Resistance	<ul style="list-style-type: none"> » Water » Oil » Aliphatic hydrocarbons » Gas » Mild acids and bases 	<ul style="list-style-type: none"> » Saturated steam » Oil » Gas » Water » Aliphatic hydrocarbons » Inert gases » Coolants
Approvals and Certificates	<ul style="list-style-type: none"> » TA-Luft » DIN EN 13555 characteristics » ABS (American Bureau of Shipping) » API » ISO 10497 (Fire-Safe) 	<ul style="list-style-type: none"> » DVGW VP 401 » TA-Luft with blow-out resistance » ABS (American Bureau of Shipping) » API » ISO 10497 (Fire-Safe)
Maximum Temperature	371 °C / 700 °F	427 °C / 800 °F
Continuous maximum Temperature	205 °C / 400 °F	288 °C / 550 °F
Minimum Temperature	-73 °C / -100 °F	-73 °C / -100 °F
Maximum Pressure	70 bar / 1 000 psig	83 bar / 1 200 psig
P x T 0,8 mm (1/32") / 1,6 mm (1/16") 3,2 mm (1/8")	bar x °C (psig x °F) 12 000 (350 000) 8 600 (250 000)	bar x °C (psig x °F) 14 000 (400 000) 9 600 (275 000)
Compressibility (ASTM F 36)	7-17 %	10 %
Recovery (ASTM F 36)	50 %	50 %
Creep Relaxation (ASTM F 38)	21 %	15 %
Tensile Strength (ASTM F 152)	15 N/mm ² / 2 250 psi	10 N/mm ² / 1 500 psi
Sealability ASTM F 37 B - Fuel A ASTM F 37 B - Nitrogen DIN 3535	0,2 ml/h 0,6 ml/h 0,05 cc/min	0,3 ml/h 1,0 ml/h 0,05 cc/min
Sheet Size* [mm x mm]	1500 x 1500, 3000 x 3000, 3800 x 3800	1500 x 1500, 3000 x 3000, 3800 x 3800
Thickness* [mm]	0,4 / 0,8 / 1,0 / 1,6 / 2,0 / 2,4 / 3,0 / 4,8	0,4 / 0,8 / 1,0 / 1,6 / 2,0 / 2,4 / 3,0 / 4,8

Garlock Style 9850 and Style 9900

High temperature gaskets

High-quality sealing materials based on carbon and graphite fibers with excellent flexibility and strength. Also under extreme temperature fluctuations, these special materials provide a long service life and facilitate an easy installation and removal of gaskets.

Garlock Style 9850	Garlock Style 9900	„Extreme Grade“
 <p>Recommended gasket material especially for use against mineral oil, petrol, gas and hydrocarbons.</p>	 <p>For the highest requirements for pressure and temperature resistance. Long service life even under extreme temperature fluctuations.</p>	<p>A selection of the correct gasketing only based on this table is not possible. Please do not hesitate to contact us.</p>
Carbon fiber with nitrile binder	Graphite fiber with nitrile binder	Composition
<ul style="list-style-type: none"> » Saturated Steam » Oil » Gas » Water » Aliphatic hydrocarbons » Most refrigerants 	<ul style="list-style-type: none"> » Saturated Steam » Oil » Grease » Water 	Media Resistance
<ul style="list-style-type: none"> » ISO 10497 (Fire-safe) 	<ul style="list-style-type: none"> » DVGW VP 401 » TA-Luft with blow-out resistance » DIN EN 13555 characteristics » ABS (American Bureau of Shipping) » API » ISO 10497 (Fire-Safe) 	Approvals and Certificates
482 °C / 900 °F	537 °C / 1000 °F	Maximum Temperature
343 °C / 650 °F	343 °C / 650 °F	Continuous maximum Temperature
-75 °C / -100 °F	-75 °C / -100 °F	Minimum Temperature
138 bar / 2 000 psig	138 bar / 2 000 psig	Maximum Pressure
bar x °C (psig x °F) 25 000 (700 000) 12 000 (350 000)	bar x °C (psig x °F) 25 000 (700 000) 12 000 (350 000)	P x T 0,8 mm (1/32") / 1,6 mm (1/16") 3,2 mm (1/8")
8 %	9 %	Compressibility (ASTM F 36)
55 %	55 %	Recovery (ASTM F 36)
15 %	9 %	Creep Relaxation (ASTM F 38)
12 N/mm ² / 1 800 psi	15 N/mm ² / 2 250 psi	Tensile Strength (ASTM F 152)
0,3 ml/h 0,6 ml/h 0,015 cc/min	0,3 ml/h 0,6 ml/h 0,015 cc/min	Sealability ASTM F 37 B - Fuel A ASTM F 37 B - Nitrogen DIN 3535
1500 x 1500, 3000 x 3000, 3800 x 3800	1500 x 1500, 3000 x 3000, 3800 x 3800	Sheet Size* [mm x mm]
0,4 / 0,8 / 1,0 / 1,6 / 2,0 / 3,2	0,4 / 0,8 / 1,0 / 1,6 / 2,0 / 3,2	Thickness* [mm]

Selecting the right gasket

Application parameters for a tight flanged connection

High requirements by the environment and legislation make the choice of the gasket material to a critical factor, when designing new plants as well as for the replacement of existing gaskets. In order to be able to guarantee durable, technical tight and safe sealing connections, there is a set of requirements for the gasket and the flanged connection. There are a number of factors such as temperature, pressure, the connection elements, and the media to be taken into consideration when selecting the gasket.

Different connection elements

The demands on the sealability of a flanged connection cannot be fulfilled only by a proper gasket. The flange and bolt materials have at least an equally influence as the gasket material itself. We offer the possibility of calculating the required tightening torques or validate the leak-proof, using the DIN EN 1591-1 calculations which meet the requirements of the VDI 2290.

Compressive creep strength

Leakage has many reasons, like reduction of the compressive creep strength or mass loss of the installed gasket. This thickness loss appears in decreasing clamping effect of flange bolts.

Use in high temperatures

Garlock gaskets can be used in a wide temperature range and even at very high temperatures without any issues.

The pressure-temperature factor: P x T factor

Each system has a different set of pressure-temperature combinations. The P x T factor provides a simple way to assign the appropriate gasket material. For our Garlock gaskets maximum temperature and pressure, as well as the P x T factors are specified.

The maximum temperature and pressure on your system must not exceed this maximum values.

Sealing behavior

Sealability is a measure of leakage through the gasket material and the contact surfaces between the gasket and the flange. Studies have shown that the largest part of the leakage migrates through the sealing material (permeation).

Therefore, a material composition for fiber gaskets is selected which has a high tightness even at low load.

Resistance against the medium

Garlock fiber gaskets are suitable for the widest range of liquid and gaseous media. Detailed statements on the media resistance are listed in our brochure „Engineered Gasketing Technical Manual. Well loaded gaskets are in general more resistant than low-loaded.

Internal pressure of the system

Fiber gaskets are available for different pressure ranges. Additional demands such as strong load changes and extreme pressure peaks can affect the possibilities for use.

We emphasize on a close cooperation between the manufacturer and the end-user in order to guarantee the right product portfolio. Our application engineers would be happy to assist you finding the right product for your application.

Application Data Sheet

Service

Of course you can contact Garlock for an application-specific seal construction. To get this service as fast as possible, please order our application data sheet, which you can also find on our website www.garlock.com.



an EnPro Industries family of companies

Application Data Sheet: Gasketing

Name: _____

Company: _____

Address: _____

Phone No.: _____

Fax No.: _____

E-Mail: _____

Date	
Enquiry No.	
Attachment	Yes No

Garlock ID: _____

Application

Flange	Heat Exchanger	Manway	Compressor
Pumps	Valve Bonnet	Flue Duct	Other

Service Conditions

Max. Temperature (°C): _____

Continuous Temperature (°C): _____

Internal Pressure (MPa): _____

Thermal cycling (24 hours): _____

Pressure: continuous intermittent

Vibration: Yes No

Other specify: _____

Chemical Compatibility

Media: _____

Concentration: _____ CAS No.: _____

Liquid or Gas: _____

Bolts

Rating	Size	Number	Details		
			Dry	Lubricated	Coated
			Standard Bolts	Tension Bolts	

Flange

Norm: _____

Material: _____

Inner Ø x Outer Ø: _____

Comments: _____

Face (raised, flat): _____

Surface finish: _____

Thickness: _____

GARLOCK GMBH EnPro Industries family of companies Falkenweg 1, 41468 Neuss, Germany Tel: +49 2131 349 0 www.garlock.com	Garlock Sealing Technologies GPT Garlock PTY Garlock do Brasil	Garlock de Canada, LTD Garlock China Garlock Singapore Garlock USA Garlock India Private Limited
Garlock de Mexico, S.A. De C.V. Garlock New Zealand Garlock Great Britain Limited Garlock Middle East		

Note:
Properties/applications shown throughout this brochure are typical. Your specific application should not be undertaken without independent study and evaluation for suitability. For specific application recommendations consult Garlock. Failure to select the proper sealing products could result in property damage and/or serious personal injury. Performance data published in this brochure has been developed from field testing, customer field reports and/or in-house testing. While the utmost care has been used in compiling this brochure, we assume no responsibility for errors. Specifications subject to change without notice. This edition cancels all previous issues. Subject to change without notice GARLOCK is a registered trademark for packings, seals, gaskets, and other products of Garlock.
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