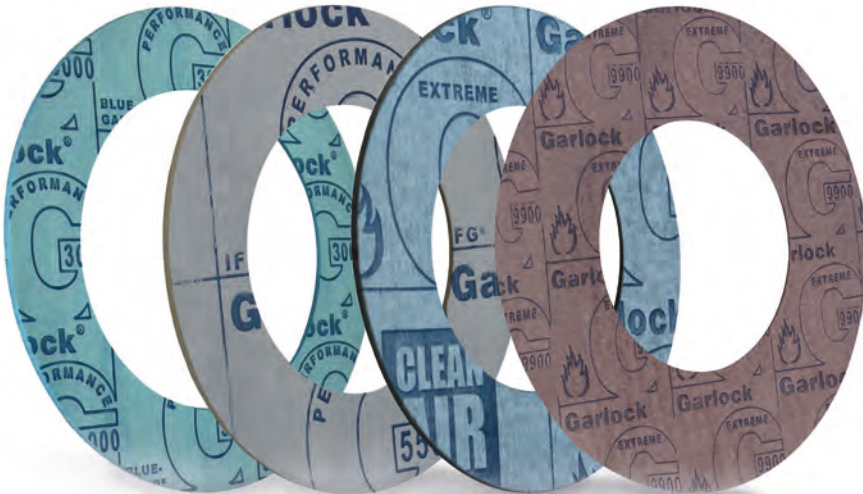


## Garlock Fiber Gasketing

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.

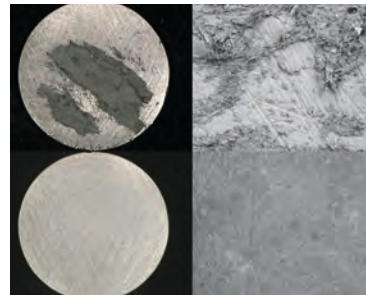
# FLANGE-FREE™

## 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

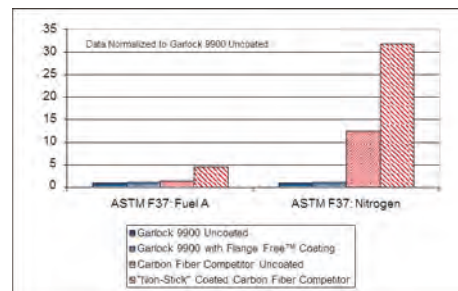
Fiber gasket with neoprene binders with FLANGE-FREE™ coating.

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.

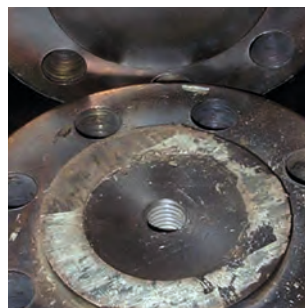


Comparison of the sealability of a Style 9900 gasket with FLANGE-FREE™ coating, uncoated, and other manufactures products coated and uncoated

### 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.
<b>Composition</b>	Aramid fiber with NBR binder	Inorganic fibers with nitrile binder
<b>Media Resistance</b>	<ul style="list-style-type: none"> <li>» Water</li> <li>» Oil</li> <li>» Aliphatic hydrocarbons</li> <li>» Gas</li> <li>» Mild acids and bases</li> </ul>	<ul style="list-style-type: none"> <li>» Saturated steam</li> <li>» Oil</li> <li>» Gas</li> <li>» Water</li> <li>» Aliphatic hydrocarbons</li> <li>» Inert gases</li> <li>» Coolants</li> </ul>
<b>Approvals and Certificates</b>	<ul style="list-style-type: none"> <li>» TA-Luft</li> <li>» DIN EN 13555 characteristics</li> <li>» ABS (American Bureau of Shipping)</li> <li>» API</li> <li>» ISO 10497 (Fire-Safe)</li> </ul>	<ul style="list-style-type: none"> <li>» DVGW VP 401</li> <li>» TA-Luft with blow-out resistance</li> <li>» ABS (American Bureau of Shipping)</li> <li>» API</li> <li>» ISO 10497 (Fire-Safe)</li> </ul>
<b>Maximum Temperature</b>	371 °C / 700 °F	427 °C / 800 °F
<b>Continuous maximum Temperature</b>	205 °C / 400 °F	288 °C / 550 °F
<b>Minimum Temperature</b>	-73 °C / -100 °F	-73 °C / -100 °F
<b>Maximum Pressure</b>	70 bar / 1 000 psig	83 bar / 1 200 psig
<b>P x T</b> <b>0,8 mm (1/32") / 1,6 mm (1/16")</b> <b>3,2 mm (1/8")</b>	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)
<b>Compressibility (ASTM F 36)</b>	7-17 %	10 %
<b>Recovery (ASTM F 36)</b>	50 %	50 %
<b>Creep Relaxation (ASTM F 38)</b>	21 %	15 %
<b>Tensile Strength (ASTM F 152)</b>	15 N/mm <sup>2</sup> / 2 250 psi	10 N/mm <sup>2</sup> / 1 500 psi
<b>Sealability</b> <b>ASTM F 37 B - Fuel A</b> <b>ASTM F 37 B - Nitrogen</b> <b>DIN 3535</b>	0,2 ml/h 0,6 ml/h 0,05 cc/min	0,3 ml/h 1,0 ml/h 0,05 cc/min
<b>Sheet Size* [mm x mm]</b>	<b>1500 x 1500, 3000 x 3000, 3800 x 3800</b>	<b>1500 x 1500, 3000 x 3000, 3800 x 3800</b>
<b>Thickness* [mm]</b>	<b>0,4 / 0,8 / 1,0 / 1,6 / 2,0 / 2,4 / 3,0 / 4,8</b>	<b>0,4 / 0,8 / 1,0 / 1,6 / 2,0 / 2,4 / 3,0 / 4,8</b>

# 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	<b>Composition</b>
<ul style="list-style-type: none"> <li>» Saturated Steam</li> <li>» Oil</li> <li>» Gas</li> <li>» Water</li> <li>» Aliphatic hydrocarbons</li> <li>» Most refrigerants</li> </ul>	<ul style="list-style-type: none"> <li>» Saturated Steam</li> <li>» Oil</li> <li>» Grease</li> <li>» Water</li> </ul>	<b>Media Resistance</b>
<ul style="list-style-type: none"> <li>» ISO 10497 (Fire-safe)</li> </ul>	<ul style="list-style-type: none"> <li>» DVGW VP 401</li> <li>» TA-Luft with blow-out resistance</li> <li>» DIN EN 13555 characteristics</li> <li>» ABS (American Bureau of Shipping)</li> <li>» API</li> <li>» ISO 10497 (Fire-Safe)</li> </ul>	<b>Approvals and Certificates</b>
482 °C / 900 °F	537 °C / 1000 °F	<b>Maximum Temperature</b>
343 °C / 650 °F	343 °C / 650 °F	<b>Continuous maximum Temperature</b>
-75 °C / -100 °F	-75 °C / -100 °F	<b>Minimum Temperature</b>
138 bar / 2 000 psig	138 bar / 2 000 psig	<b>Maximum Pressure</b>
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)	<b>P x T</b> <b>0,8 mm (1/32") / 1,6 mm (1/16")</b> <b>3,2 mm (1/8")</b>
8 %	9 %	<b>Compressibility (ASTM F 36)</b>
55 %	55 %	<b>Recovery (ASTM F 36)</b>
15 %	9 %	<b>Creep Relaxation (ASTM F 38)</b>
12 N/mm <sup>2</sup> / 1 800 psi	15 N/mm <sup>2</sup> / 2 250 psi	<b>Tensile Strength (ASTM F 152)</b>
0,3 ml/h 0,6 ml/h 0,015 cc/min	0,3 ml/h 0,6 ml/h 0,015 cc/min	<b>Sealability</b> <b>ASTM F 37 B - Fuel A</b> <b>ASTM F 37 B - Nitrogen</b> <b>DIN 3535</b>
<b>1500 x 1500, 3000 x 3000, 3800 x 3800</b>	<b>1500 x 1500, 3000 x 3000, 3800 x 3800</b>	<b>Sheet Size* [mm x mm]</b>
<b>0,4 / 0,8 / 1,0 / 1,6 / 2,0 / 3,2</b>	<b>0,4 / 0,8 / 1,0 / 1,6 / 2,0 / 3,2</b>	<b>Thickness* [mm]</b>

# 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.