



Garlock
an EnPro Industries family of companies

GYLON®

High performance PTFE gasketing



GYLON®: High performance PTFE gasketing

Table of Content

GYLON®: FAMILY OF PTFE GASKETING	3
CONVENTIONAL PTFE GASKETING VS GYLON®	4
YOUR BENEFITS AT A GLANCE	5
OUR GYLON STYLES	6
TECHNICAL INFORMATION	8
INSTALLATION RECOMMENDATION	11
FLANGE CALCULATIONS	12
TRAINING	13
COMPREHENSIVE SERVICE	14
APPLICATION DATA SHEET	15

GYLON®: High performance PTFE gasketing

GYLON®

Family of PTFE Gasketing

GYLON® family history

When PTFE* was developed in 1938, the importance of the material to industrial sealing was quickly recognized because of the tremendous chemical resistance characteristics. While use of PTFE as a gasket material increased in industrial applications, complaints about certain properties started to build: skive marks made initial sealing difficult, cold flow caused leakage and premature failure, and temperature/pressure cycling was a problem.

Resistance to cold flow

These drawbacks were eliminated when Garlock introduced GYLON® Fawn, Style 3500, in 1967. The GYLON® process minimizes creep and cold flow normally associated with PTFE products, while retaining other positive characteristics of PTFE. GYLON® Fawn was so innovative that it received Chemical Processing magazine's Vaaler Award in 1968. As the variety and quantity of industrial chemicals increased, Garlock realized that new products would be required to serve the growing market. Two additional GYLON® styles were introduced to meet those demands: GYLON® Blue Style 3504, and GYLON® White Style 3510.

High pressure service, chemical compatibility

As production demands increased, pipe hammering and/or pressure spikes became more common. GYLON® Series HP 3560 and HP 3561 were designed to meet those extreme conditions. These perforated stainless steel-inserted GYLON® gasket materials outperform any other gasketing available for high pressure service where chemical compatibility is a concern.

* PTFE – polytetrafluoroethylene

Low bolt load sealing

In 1994, Garlock introduced GYLON® Soft Style 3545 for low bolt load applications. It was designed specifically to seal pitted, warped or wavy flanges. Featuring soft, compressible outer layers and a rigid PTFE inner core, Style 3545 is ideal in situations where a rigid gasket is required, such as hard-to reach piping systems, valves and flanges. The layers of rigid PTFE and microcellular PTFE are sandwiched together using the proprietary GYLON® thermal bonding process, rather than adhesives, for longer gasket life.

Unlimited sizes and dimensions

With growing concern over fugitive emissions, the traditional dovetailing method of creating larger sized gaskets no longer met many customer demands. In response, Garlock created the Welded GYLON® process. Welded GYLON® eliminated dovetail leak paths and allowed the use of large gaskets without handling problems or premature blowout. Today, GYLON® gaskets can be thermally bond (without the use of any adhesive or low melt temperature polymers) to any size or dimension; another breakthrough for Garlock gasketing.

Unparalleled reliability and service

The Garlock family of GYLON® products has evolved over the years with a focus on quality to meet and exceed customer expectations. The use of Employee Involvement, Statistical Process Control, Vendor Assurance Programs, and a continuous improvement philosophy continues to guarantee end users the highest quality products available.

Testing is performed regularly on all styles and thicknesses to ensure the consistency of Garlock quality in GYLON® sheets. Quality products, years of experience and value-added service programs, all are reasons why the GYLON® family of products has become such a major sealing component in the industry today.

There is no doubt that demands will change in the future. But one thing is certain - Garlock will continue to answer those changes and demands with products that are innovative and timely. GYLON®, a name you can trust and a complete family of products to choose from for your gasketing needs.

GYLON®: High performance PTFE gasketing

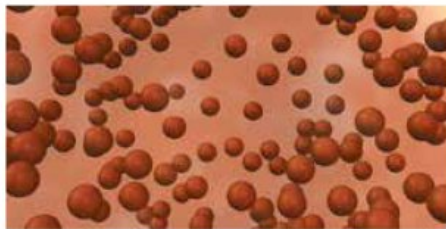
Conventional PTFE Gasketing vs GYLON®

A comparison of the production process shows the clear answer

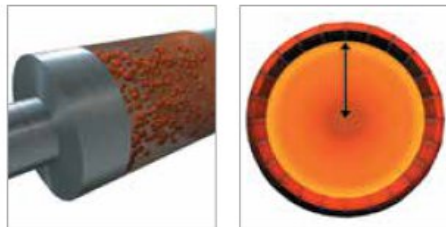
Conventional PTFE Gasketing
Production Process



Only the GYLON® Process
guarantees consistent mixing
and even dispersion.



Only the GYLON® process
secures gasket tightness.



The patented multi-layer
construction is the basis for
permanent resilience.

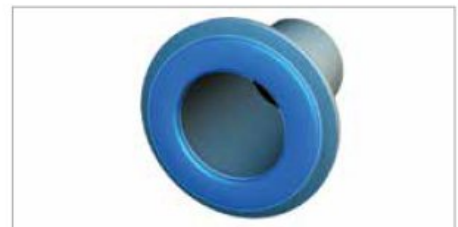
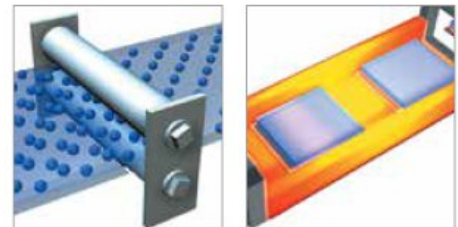
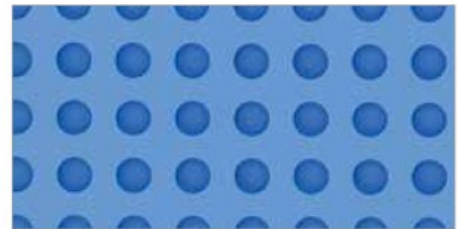
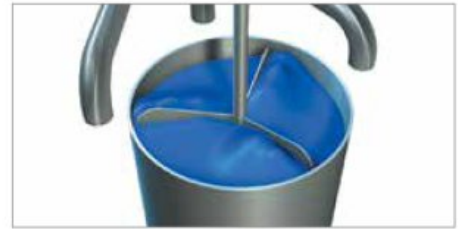


GYLON® gaskets offer
homogeneous properties under
every condition. Safety is
synonymous with GYLON®.



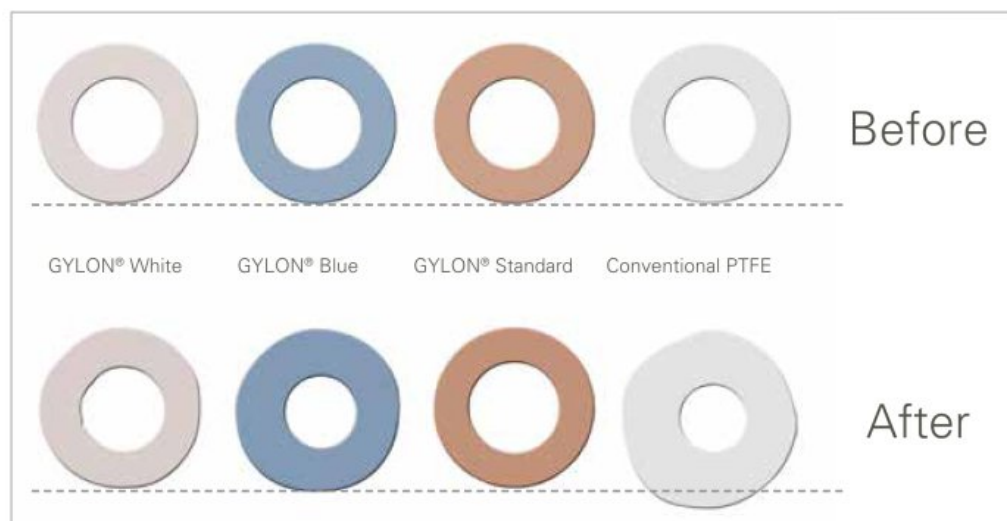
GYLON® eliminates coldflow
problems present in the past.

GYLON® Gasketing
Production Process



GYLON®: High performance PTFE gasketing

Your Benefits at a Glance



A comparison between GYLON® flat gaskets and un-filled PTFE after exposure to a load of 14 MPa for one hour at a temperature of 260 °C.

Benefits at a glance

- » Excellent chemical resistance
- » Minimal cold flow
- » Can be used in high pressure/temperature combinations
- » High resilience
- » Temperature range from –268 °C to +260 °C
- » Excellent dimensional stability under thermal stress
- » Good electrical insulating properties
- » High wear, abrasion, weather and UV resistant

GYLON® certificates

In order to meet the requirements of your special applications, we have subjected our materials to special tests. Detailed records on the tests listed below are available upon request.

	BAM Federal Institute for Materials Research and Testing	KTW	TA-Luft including blow-out proof certificate	FDA	USP Class VI	EN 1935/2004	DIN EN 13555 characteristic up to 80 bar
GYLON® Standard Style 3501-E	x	x	x	x			x
GYLON® Blue Style 3504	x	x	x	x	x	x	x
GYLON® White Style 3510	x	x	x	x	x	x	x
GYLON® Soft Style 3545			x	x			

Additional certificates for individual styles are available upon request (i.e. ABS, EC 10/2011, USP class 87, Hydrocheck).

GYLON®: High performance PTFE gasketing

Our GYLON® Styles



GYLON® Standard Style 3501-E and Style 3500

The first choice for universal applications in the chemical and petrochemical industries. The combination of high pressure/temperature (P x T) and minimal cold flow far exceeds the performance of conventional PTFE.

GYLON® Blue Style 3504

Highly compressible and flexible through the well controlled and uniform process of aluminosilicate microspheric filler distribution. Excellent for low-stress components requiring low bolt torque loads, i.e. enameled and plastic flanges, glass tubes, GRP (Glass Reinforced Plastic) and FRP (Fiberglass Reinforced Plastic).

GYLON® White Style 3510

The product with the broadest chemical resistance. The preferred choice for extremely aggressive media including hydrofluoric acid, aluminum fluorides, chlorine/alkali, caustic potash solutions and electroplating baths. Inhibits the polymerization ("pop-corning") of monomers.

GYLON®: High performance PTFE gasketing

Our GYLON® Styles



GYLON® Soft Style 3545

Manufactured from soft compressible micro-cellular PTFE outer layers with a hard PTFE pressure resistant central layer, homogeneously sintered together. Ideal for uneven surfaces and with a maximum chemical resistance of 100% PTFE. An excellent alternative to expanded PTFE on applications requiring consistent and reliable performance.



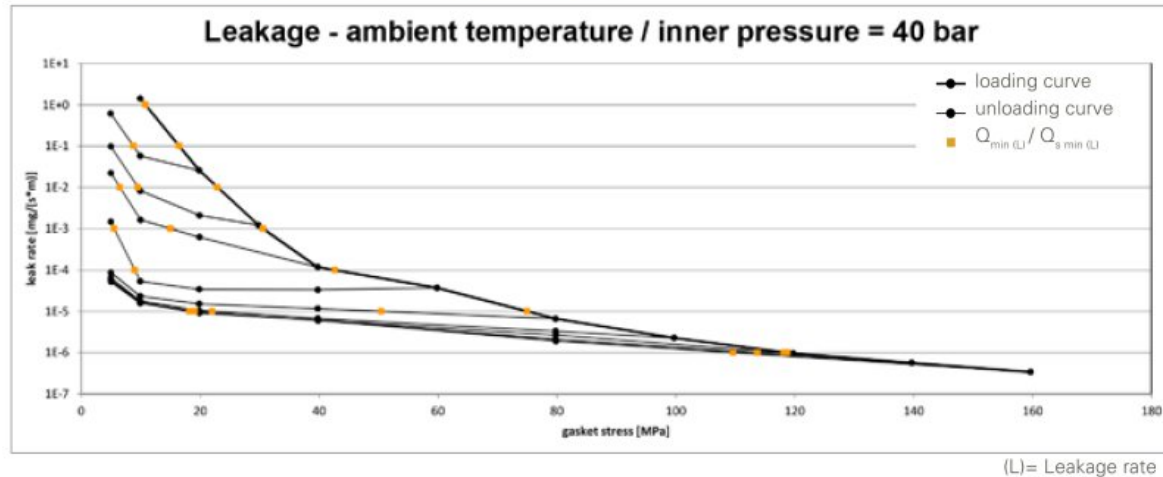
GYLON® HP Style 3560

Style 3560, with its perforated stainless steel re-inforcing insert, offers higher safety levels against blowouts induced by aggressive media and high pressure/temperature "spikes" (i.e. boiling operations relating to pulp production).

GYLON®: High performance PTFE gasketing

Technical Information

The technical data as stated here are laboratory values which have been determined in accordance with DIN or ASTM guidelines. In practice, deviations may result due to differing operating conditions.

**GYLON® 3501-E Standard – Really leak tight**

The diagram depicts the characteristics of GYLON® at high compressive surface pressures as well as subsequent rapid relaxation. Even at a high load of 160 MPa (up to 220 MPa at room temperature) no physical or structural changes to the material is detectable. In the case of the subsequent relaxation to approximately 5 MPa, the leakage values still remain far below the values specified by the German TA Luft (Technical Instructions on Air Quality) (criteria and accordance to VDI2200 and VDI2440).

These values were determined by CST (Center of Sealing Technology, Steinfurt Germany/ University of Münster) at an inside pressure of 40 bar. Many PTFE-based materials – when severely compressed – tend to change significantly by sudden cold flowing, rupturing or other failure mechanisms. Highly sophisticated DIN EN 13555 characteristics like PQR and Creep/relaxation are available as well.

GYLON®: High performance PTFE gasketing

Technical Information

General sealing characteristics

	GYLON® Standard Style 3501-E	GYLON® Standard Style 3500	GYLON® Blue Style 3504	GYLON® White Style 3510	GYLON® Soft Style 3545	GYLON® HP Style 3560
Temperature range	-268 °C up to +260 °C	-268 °C up to +260 °C	-268 °C up to +260 °C	-268 °C up to +260 °C	-268 °C up to +260 °C	-268 °C up to +260 °C
Maximum pressure load	83 bar	83 bar	55 bar	83 bar	83 bar	172 bar
P x T, max.* thickness 1,0 and 1,5 mm 3,0 mm	12000 8600	12000 8600	12000 8600	12000 8600	12000 8600	25000 15000
Compressive creep strength (DIN 52913)						
150 °C - 30 MPa	16	16	15	14	14	–
175 °C - 50 MPa	25	25	–	–	–	–
Compressibility (ASTM F 36)	7-12%	7-12%	25-45%	4-10%	60-70%	4-9%
Recovery (ASTM F 36)	40%	40%	30%	40%	15%	45%
Creep relaxation (ASTM F 38)	18%	18%	40%	11%	15%	20%
Tensile strength (ASTM D 1708)	14 MPa	14 MPa	14 MPa	14 MPa	–	34 MPa
Sealability (ASTM F 37 B) ASTM Fuel A: Internal pressure = 0,7 bar, Gasket load = 7 MPa	0,1 ml/h	0,22 ml/h	0,12 ml/h	0,04 ml/h	0,15 ml/h	0,02 ml/h
Gas sealability (DIN 3535/6)	0,10 cm³/min	0,25 cm³/min	0,15 cm³/min	0,10 cm³/min	0,04 cm³/min	0,02 cm³/min
Leak rate (DIN 28090-2), λ2,0	<0,001 mg/ (s x m)	<0,001 mg/ (s x m)	<0,001 mg/ (s x m)	<0,001 mg/ (s x m)	<0,002 mg/ (s x m)	–
Density (DIN 28090-2)	2,19 g/cm³	2,10 g/cm³	1,70 g/cm³	2,80 g/cm³	–	–

*Operating temperature and pressure values may not be attained simultaneously. The P x T factor (pressure x temperature) allows for limits to the actual operating data in the use of GYLON®.

Available Sizes

Thickness (mm)	Tolerance (mm)	GYLON® Style 3501-E	GYLON® Style 3504	GYLON® Style 3510	GYLON® Style 3545	GYLON® Style 3560
0,8*	+0,13 / –0,13	x	x	x		
1,0	+0,13 / –0,13	x	x	x		
1,6	+0,15 / –0,15	x	x	x		x
2,0	+0,15 / –0,15	x	x	x	x	
3,2	+0,25 / –0,25	x	x	x	x	x
4,8	+0,40 / –0,40	x	x	x	x	
6,4	+0,50 / –0,50	x	x	x	x	
Sheet Sizes* (mm)		1500 x 1500 1500 x 2280 1780 x 1780	1500 x 1500 1500 x 2280 1780 x 1780	1500 x 1500 1500 x 2280 1780 x 1780	1500 x 1500	600 x 600 1,6 mm = Single stainless steel insert 3,2 mm = Two stainless steel inserts

*Thickness 0,8 mm: available sheet size 750x750 mm only

GYLON®: High performance PTFE gasketing

Technical Information

Sealing characteristics in accordance with DIN EN 13555:12-2004

		Test Method	Unit	GYLON® Style 3501-E 2,0 mm	GYLON® Style 3504 2,0 mm	GYLON® Style 3510 2,0 mm
Maximum load during installation $Q_{s \max}$	20 °C	EN 13555	MPa	230	200	200
	150 °C	EN 13555	MPa	180	80	160
	200 °C	EN 13555	MPa	180	80	140
	250 °C	EN 13555	MPa	140	60	100
Minimum load during installation $Q_{\min}$ (L = 0,01)	10 bar	EN 13555	MPa	15	13	10
	40 bar	EN 13555	MPa	20	13	16
	80 bar	EN 13555	MPa	30	20	20
Minimum load during operation $Q_{s \min}$ (L = 0,01)		EN 13555	MPa (10, 20 and 40 bar)	<10	<5	<20
Maximum Sealand-class $T_p = 20 \text{ °C}; p = 40 \text{ bar}$		EN 13555	L[mg/(s*m)]	1,0x10E ⁻⁰⁵	1,0x10E ⁻⁰⁴	1,0x10E ⁻⁰⁵

(L)= Leakage rate

Relaxation value P_{OR} under bending stiffness $C = 500 \text{ kN/mm}$

	Test Method	Unit	GYLON® Style 3501-E				GYLON® Style 3504				GYLON® Style 3510			
Temperature		°C	20	150	200	250	20	150	200	250	20	150	200	250
Stress Level 1	EN 13555	(10 MPa)	0,92	0,84	0,81	0,65	0,90	0,46	0,41	0,31	0,89	0,87	0,61	0,58
Stress Level 2	EN 13555	(30 MPa)	0,93	0,75	0,45	0,53	0,78	0,41	0,32	0,23	0,89	0,50	0,34	0,30
$Q_{s \max}$	EN 13555	(230/180/140 MPa)	0,92	0,72	0,74	0,59	0,95	0,55	0,52	0,36	0,94	0,73	0,71	0,45

GYLON®: High performance PTFE gasketing

Installation Recommendation

Please note the information given below is to ensure a long service life and sealing integrity of your gasket.

1 FIRST CHECK

- » Is the selected material suitable for the application?
Do temperature, pressure and medium agree with the process data?
- » Does the gasket have the correct dimensions regarding thickness, inside and outside diameter for the components?
 - » Can the bolts deliver the necessary seating stress to the gasket?
 - » Has the bolt torque been correctly calculated?

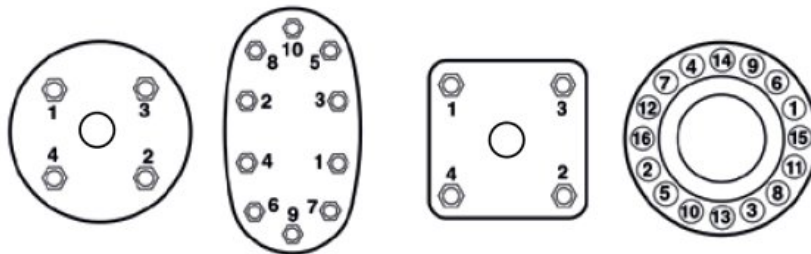
GARLOCK will calculate the correct torque levels upon request!

2 BEFORE INSTALLATION

- » Remove old gasket, and clean flange surface of all debris. For best results, use a metal flange scraper, an aerosol gasket remover and a wire brush, suitable for the flange, then inspect the flange for damage. Be sure surface finish and flatness are satisfactory.
- » Use the thinnest possible gasket. However, flanges that are warped, bowed or severely pitted require thicker gaskets.
- » Whenever possible, on metric flanges, use ring gaskets. Full face gaskets have more surface area, requiring additional compressive load on the gasket.
- » Never use metal-based anti-seize on gaskets, since particles may accumulate in the surface imperfections, thereby creating a flange surface that is too smooth to be effective. Such coatings will also greatly impair the resistance of the gasket pressure.

3 INSTALLATION

- » Center the gasket on the flange. This is extremely vital where raised faces are involved.
Note: Standard ANSI ring gaskets, when properly cut, should center themselves when the bolts are in place.
- » Use a torque wrench and well-lubricated fasteners with hardened flat washers to ensure correct initial loading.
- » Tighten bolts to compress gasket uniformly. This means going from side to side around the joint in a star-like crossing pattern (see figures below).
- » All bolts should be tightened in one-third increments, according to proper bolting patterns.
 - A) initially to 30% of the specified torque
 - B) 2nd step to 70% of the specified torque
 - C) 3rd step to 100% of the specified torque
 - D) 4th step round clockwise with 100% torque
- » We do not recommend retorquing pressurized systems. Retorques should be performed on room temperature (non-pressurized) systems 12-24 hours after initial installation.
- » All applicable safety standards including lockout/tagout procedure should be observed.
- » Never use liquid or metallic based anti-stick or lubricating compounds on the gaskets. Premature failure could occur as a result.



Garlock: Always close to the customer

Flange Calculations

Garlock offers flange calculations according to DIN EN 1591-1 as a service.

For the calculation of pipe classes and flanges, the following parameters are considered:

- » Detailed flange dimensions as well as gasket style and dimension (if non standard)
- » Relevant testing and operating temperatures
- » Applied test and operating pressures, as well as additional forces
- » Flange, screws and sealing materials, type of screws and nominal width

Benefits

- » VDI 2290 compliance
- » Detection of weak components/joints within piping classes
- » TÜV-certified software to calculate flange connections
- » Proof of technical sealability prior to mounting
- » Increased plant availability possible
- » Determining an applicable tightening torque



Garlock: Always close to the customer

Training

Garlock is offering mounting crew trainings in accordance to DIN EN 1591-4 (Europe) in order to fulfill demands of VDI 2290 (Germany only). The training is available at Garlock Neuss or anywhere on site.

Topic

All assembly-teams in Germany and their supervisors who install joint connections in pressurized systems which are in critical use must be specially trained and certified. This is specified by DIN EN 1591-4, which has been released in September 2014. In-House trainings are not permitted under the new standard, a third-party arrangement is mandatory in which the assessor and the trainer must be different and neutral people.

Training center

At the newly established training center, Garlock sealing specialists will explain the correct handling of various flange seals. Topics include storage, transportation, removal and fitting of seals, occupational safety issues, suitable bolts, tools and equipment, tightening methods and handling tightening equipments. The individual installation steps are practiced on various sealing systems. Particular focus is placed on the importance of specific torque and correct handling of gaskets or sealing elements. The aim is to enable all participants to produce a joint connection that remains "leak-proof" throughout the entire service life. The training course concludes on the second day with an examination.

We offer the solution

Garlock is offering certified installation training courses as a service at its facility in Neuss or anywhere on site. The two-day, exam-based course, can be completed by employees from industry and installation companies. At the end is an exam, as well as a certificate. Successful participants receive a credit-card-sized card that certifies their level of competence, a diploma, as well as a batch for their international safety training book.

Additional training modules

- » Installation of packings for valves
- » Installation of hydraulic sealing elements
- » Correct handling of calculation programs
- » Theory and practice for the selection and the use of dynamic sealing systems
- » Trainings can be held at customer plants
- » Individual training modules



Approved training provider with assessment of competence in accordance with the requirements of DIN EN 1591-4 training by qualified instructors and testing by accredited assessors.

GYLON®: High performance PTFE gasketing

Comprehensive Service

More than just water jet cutting technology

Several "water jet" systems are available for cutting precise, accurate and complex gasket geometries and sizes. Rapid fabrication to tight manufacturing tolerances, for one-off and small production batches, can be produced economically without expensive tooling costs.

GYLON® endless gaskets

Large diameter gaskets, exceeding standard sheet sizes, can be supplied quickly. Individual segments are joined in a customized sintering/welding process without additives ("dry" welding technique) maintaining the original material homogeneity and density, increasing the safety of your plant.

Segmented gaskets

We manufacture larger flange gaskets in multiple segments with jigsaw, multibotton or dovetail joints. The precision waterjet cutting technology with its high accuracy ensures an extremely small gap width, fabricating gaskets close to endless ones.

Volume production

Our well-equipped range of press tool equipment is available for larger batches. A wide selection of standard and custom tools, with Kanban stocking procedures for volume standard gasket production, guarantees optimum order processing in the shortest time.



GYLON®: High performance PTFE gasketing

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.



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	Flow 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: _____ CAS No.: _____

Concentration: _____ Liquid or Gas: _____

Bolts

Rating	Size	Number	Details		
			Dry	Lubricated	Coated
			Standard Bolts	Tension Bolts	

Flange

Norm: _____

Material: _____

Inner ID x Outer OD: _____

Face (raised, flat): _____

Surface finish: _____

Thickness: _____

Comments: _____

GARLOCK GMBH
an 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 India Private Limited

Garlock de Canada, LTD
Garlock China
Garlock Singapore
Garlock USA

Garlock de Mexico, S.A. De C.V.
Garlock New Zealand
Garlock Great Britain Limited
Garlock Middle East