

*Advancing the Science of Sealing™*

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# EPA CLEAN AIR COMPLIANCE

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*PRODUCT RECOMMENDATION GUIDE*



**Garlock**  
SEALING TECHNOLOGIES®

an EnPro Industries company

# Pumps

Phase I:  
10,000 ppm, and  
Leak Detection and  
Repair (LDAR)

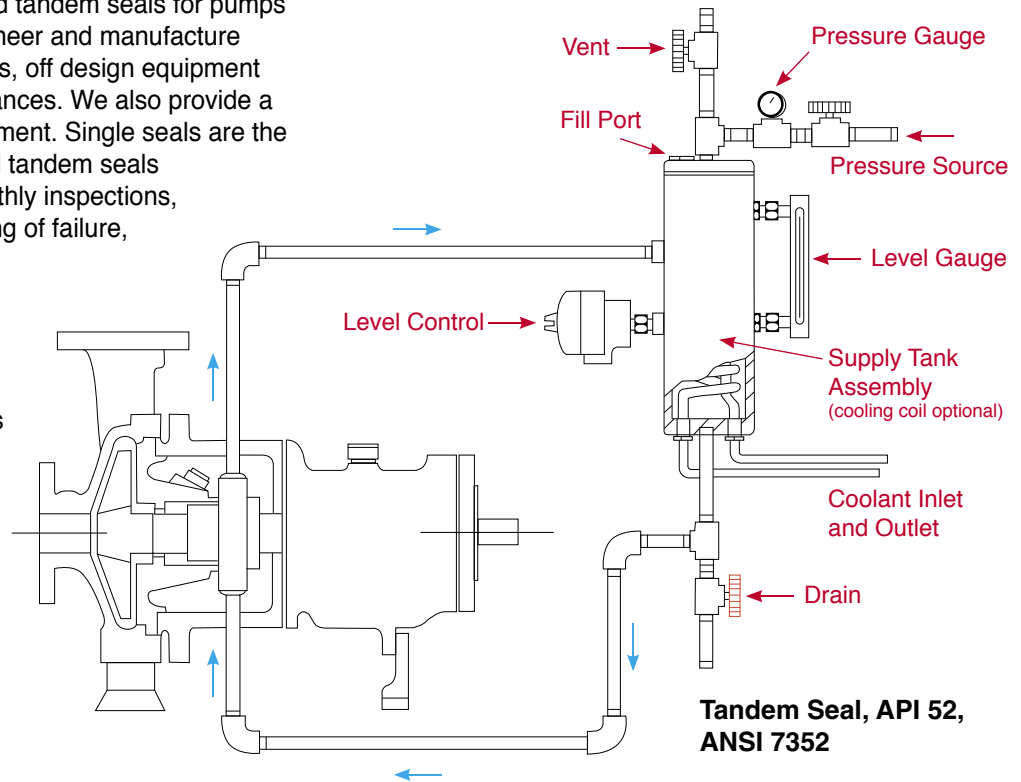
Phase II:  
5,000 ppm, LDAR,  
and Quality Improve-  
ment Program (QIP).

Phase III:  
1,000 ppm (2,000 for  
Polymerizing Mono-  
mers), LDAR, QIP.

More stringent regulatory limits are being placed on pumps handling hydrocarbon fluids. And the EPA is proposing another emission category of "No Detectable Emission." meaning less than 50 ppm.

## General Sealing Guide

Garlock makes single, double and tandem seals for pumps and rotating equipment. We engineer and manufacture specialty seals for severe services, off design equipment and special operational circumstances. We also provide a full line of support ancillary equipment. Single seals are the most economical. But double and tandem seals can exempt equipment from monthly inspections, have longer life, give early warning of failure, and have predictive failure for scheduled maintenance. Double seals are best for dirty products, abrasive/suspended solids, poor lubricating products, and pumps prone to cavitation. Tandem seals are best for high pressures, and pumps that must continue functioning to complete operations.



## Mechanical Seals



### PS® II

Cartridge seal with multiple sealing elements handles clean asphalt and other viscous products, in positive displacement pumps to 150 psi.



### GMP I (Single Cartridge Seal)

Balanced cartridge seal utilized in a broad range of applications. Easily rebuilt in the field reducing overall cost and downtime.



### 3-D Mixer Seal

Floating housing compensates for excessive axial movement, eccentricity, shaft deflection and vibration for tight seal in mixers, agitators and reactors.



### GMP II (Double Cartridge Seal)

Balanced cartridge seal utilized in a broad range of applications. Easily rebuilt in the field reducing overall cost and downtime.

## Non-Metallic Gasketing



### Style G-9900

G-9900 is the most versatile compressed gasket material on the market today. SERVICES: saturated steam, water, inert gases, aliphatic hydrocarbons, oils, gasoline, mild acids and mild alkalies.

- Patented design enables G-9900 to perform in temperatures to 1000°F, pressures to 2000 psi and a PxT maximum of 700,000, even during thermocycling.
- DIN and ASTM tests show G-9900 has superior sealability and retains bolt loads for a positive seal.
- Has passed API 607 and stringent Garlock fire test standards.
- Graphite fibers provide high temperature performance and ease of handling in a truly “flexible” graphite sheet.



### GYLON® Gasketing Style 3510

Garlock GYLON® Gasketing Style 3510 (Off white) for severe chemical applications. Style 3510 has very wide general fluid resistance. It is particularly suited for service against strong chemicals such as potassium and sodium hydroxide, hydrogen fluoride, aluminum fluoride and chrome plating solutions.

- For temperatures to 500°F, pressures to 1200 psi and a PxT maximum of 350,000.
- Reduces creep relaxation and cold flow problems.
- Retains bolt torque loads for fewer adjustments.
- Choice of larger size sheets for one piece gaskets.
- Can be customized by a patented welding process.



### HOCHDRUCK® Style 3128 Gasket

HOCHDRUCK® is a sealing material with excellent mechanical properties which is manufactured by a patented process without the use of adhesives (adhesives tend to weaken load retention at elevated temperatures). HOCHDRUCK® is available in Standard Grade, High Temperature "HT" and Reduced Sulfur Grade "RS", certified to meet D50YP12 and other current nuclear and military specifications.

Phase I:  
10,000 ppm, and  
Leak Detection and  
Repair (LDAR)

Phase II:  
5,000 ppm,  
plus LDAR

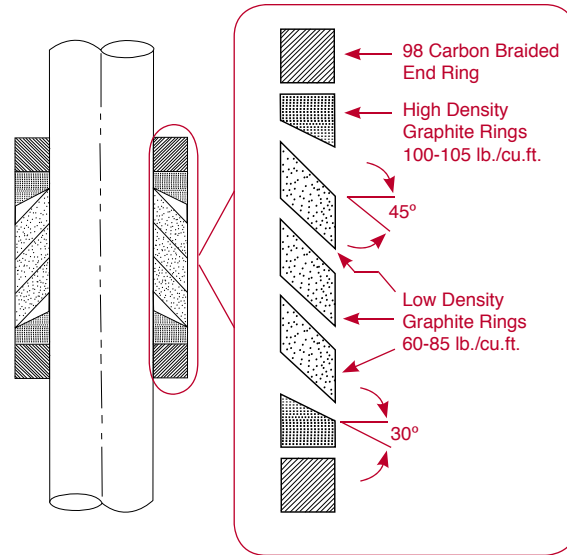
Phase III:  
< 2% of valves at > 500 ppm/  
V. LDAR or QIP with moni-  
toring ranging from monthly  
to annually depending on  
compliance record.

## General Sealing Guide

Garlock valve packings not only provide proven sealability to comply with Volatile Organic Compounds (VOC) Emissions Regulations, but also have tested resistance to high pressures, temperatures, chemicals and fire. They are tested to meet every code and requirement. These advanced Garlock sealing concepts will bring your valves into compliance with Federal VOC emission requirements and State Implementation Plans (SIP).

## In Plant Survey

Trained and experienced Garlock engineers can provide a comprehensive survey of your equipment and processes to identify possible sealing problems. We then will recommend products that can provide solutions to potentially costly fugitive VOC emissions applications. To arrange for your survey, call toll free 1.800.448.6688, and ask to speak with an applications engineer.



Cross Section of simplified EVSP® Packing

## Non-Metallic Gasketing



### Style G-9900

Graphite fiber gasketing withstands elevated heat and pressures; maintains a tight seal during thermal cycling, even in saturated steam and hot oils.



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hydroxide, hydrogen fluoride, aluminum fluoride and chrome plating solutions.

## Garlock Valve Stem Solutions

Environmental compliance is an objective that every company shares, but one that is particularly important to chemical and hydrocarbon processing facilities. According to the Ecological Society of America (ESA) half of all fugitive emissions come from these two process industries. The same ESA study identifies valve stem leaks as the leading source of fugitive emissions, accounting for 60% of emissions. To that end Garlock has created products whose sole purpose is to dramatically reduce fugitive valve stem emissions.

Environmental compliance is just one reason to cut emissions though. If a facility is already meeting mandated emissions level, why go farther? The answer is that while an active Leak Detection and Repair (LDAR) program has the obvious benefit of bringing your operation into compliance with environmental standards it also produces a stream of tangible and intangible benefits that go far beyond merely satisfying environmental regulations.

For example, cutting emissions improves production yields which, in turn increases operating profits.

Further, in an age of Marketable Pollution Permits, cutting emissions below mandated levels allow an operation to sell

its unused emissions units. This not only improves operating profits, but creates a competitive advantage in that it increases the cost of competitors' operations.

Operating efficiency is also improved as a result of creating a safer, and therefore more productive, workplace. Fewer lost time accidents and a proactive environmental program will also help your operation be perceived as the employer of choice and as a leader in the community.

### Style 9000 EVSP



Garlock Expandable Valve Stem Packing or EVSP is the ideal solution for applications where fugitive emissions have to be less than 100 PPM, fire safety or chemical resistance are required or where adjusting the packing load is not feasible.

EVSP's outstanding sealing characteristics surpass the emission standards of today and will meet the standards of tomorrow.

The low friction design allows for easy actuation and results in a more efficient use of instrument air plant resources.

EVSP's superior radial expansion characteristics will seal even older, worn valves. This means that emissions compliance can be achieved throughout the plant without the capital cost of replacing valves or the maintenance expense of bringing valves back into manufacturer's specifications.

In addition to making the seal fire safe and chemically resistant, the densified graphite construction resists volume loss, meaning that a valve packed with EVSP will be in service for years to come.



### Style 1303-FEP

If measuring all the stuffing box of all the valves prior to installation is not a realistic option, then Garlock Style 1303-FEP spool stock is a great alternative to EVSP. This proprietary wire reinforced graphite packing provides the low emissions levels of an engineered set with the installation flexibility and speed that comes from braided packing. Style 1303-FEP offers the same fire safety and chemical resistance as EVSP.

The wire reinforced construction makes for a long lasting valve packing that requires minimal adjustment and will deliver superior emissions control from turn around to turn around. What's more, the wire reinforcement will not score the stem and doesn't add excessive stem friction. In a recent independent 3000 cycle test conducted at Yarmouth Research and Technology, Style 1303-FEP not only provide marked improvement in emissions control, but it also required 60% fewer adjustments and 4% less actuation torque as compared to the next best competitive braided emissions packing.

Style 1303-FEP is available in a wide range of cross sections so that it can be used in virtually any valve. Further, with our world class manufacturing facility and supply chain, 1303-FEP can be delivered in one day.

## General Sealing Guide

In addition to mechanical factors, the selection of a gasket product is based primarily on:

- Temperature at the gasketed joint
- Nature of the media
- The internal pressure of the media

For maintenance, repair and operating users, choose the styles with optimum physical properties with the major emphasis on sealability, creep relaxation, compressibility, recovery, and any other desired properties. As a general rule, thinner gaskets seal better.

## Non-Metallic Gasketing



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strong chemicals such as potassium and sodium hydroxide, hydrogen fluoride, aluminum fluoride and chrome plating solutions.

- For temperatures to 500°F, pressures to 1,200 psi and a P x T maximum of 350,000 psi x °F for 1/16" thick material and 250,000 psi x °F for 1/8" thick material.
- Reduces creep relaxation and cold flow problems.
- Retains bolt torque loads for fewer adjustments.
- Choice of larger size sheets for one piece gaskets.
- Can be customized by a patented thermal bonding process.

## Metallic Gaskets



### FLEXSEAL® Lo-Load Spiral Wound

- Compensates for weak flange designs enhancing plant and personnel safety.
- Ensure bolt stresses do not exceed 25,000 psi for compliance with ASME 31.3 and PV and B codes.
- High tightness level achieved with minimal compressive load.
- No exposed filler for ease of handling and installation.
- Exceptional blow out resistance.
- Available in wide range of spiral wound designs and materials of construction.
- Complies with ASME B16.20 dimensions
- Available in standard spiral wound gasket thicknesses (.125", .175", .250" and .285").



### EDGE® Spiral Wound Gasket

- Anti-radial buckling design for sealing integrity
- Low compressive force to seal



### Tandem Seal™

- Maximum chemical resistance
- Fire safe design
- Improved service life for flanges



### Kammprofile

- Superior blow out resistance
- Solid metal-to-metal sealing
- Stable in large diameters

## Clean Air Action

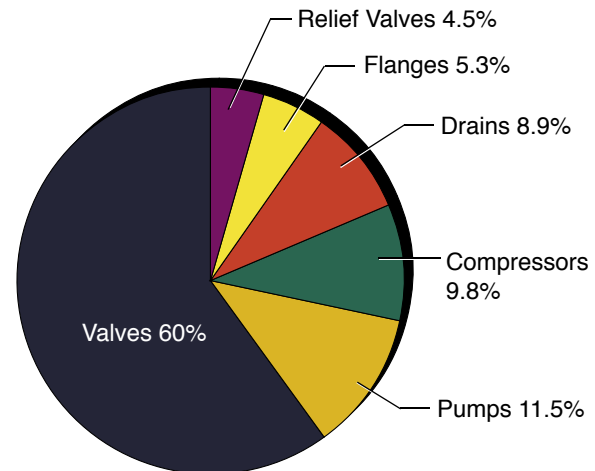
Deadlines are near for compliance with the EPA Clean Air Act Volatile Organic Compound (VOC) Emission requirements and State Implementation Plans (SIP). Fugitive emissions of almost 200 different chemicals, including Volatile Hazardous Air Polutants (VHAP's), must be significantly reduced, monitored by Leak Detection and Repair (LDAR) procedures, or covered by a costly Quality Improvement Program (QIP). This can involve extensive record keeping, reporting procedures, and civil or criminal penalties for non-compliance.

## Garlock Total Sealing Approach

Garlock is the Single Sealing Source that can make it as economical as possible to bring your entire operation into compliance through effective retrofitting. We've specialized in sealing technology for more than a century. Today we manufacture eight complete product lines; gasketing, compression packing, oil seals, mechanical seals, hydraulic seals, molded rubber products, expansion joints and industrial textiles. And we've kept ahead of regulations for years with the most advanced seals thoroughly tested and proven for the widest range of process applications, temperatures, pressures and chemicals.

## Cost-effective Retrofitting Benefits

- Eliminate 75% of emissions by retrofitting pumps, valves and flanges with Garlock Single Source Sealing Products.
- Eliminate or reduce the capital costs of replacing equipment.
- Avoid costly shutdowns; Garlock seals are designed for long lasting effectiveness.
- Reduce costs of an LDAR program with fast, total compliance.
- Avoid costs and penalties of QIP mandated improvements.
- Cut high costs of product loss and energy with a leak tight system.



Equipment requiring sealing compliance.

## Garlock — A single sealing source you can count on for total compliance.

Garlock has been the world leader in sealing technology for over a century. We offer the widest range of seals, gasketing, packings, and expansion joints. Our in house testing facilities are the most complete and most sophisticated in the industry. To help you meet all sealing requirements throughout your operation, we offer:

- A nationwide network of factory trained, stocking distributors.
- On site assistance of Garlock and Distributor sales representatives.
- Technical assistance from experienced Garlock application engineers.
- In plant surveys with complete sealing products recommendations.
- Compliance assistance by calling toll free 1.800.448.6688.
- Technical field seminars on sealing products.
- Training programs for Garlock and distributor representatives.
- Detailed technical bulletins on all Garlock products.

The most simple, effective and economical way to comply with VOC emissions standards is to count on Garlock for plant wide retrofitting. And the time to do it is now. See your Garlock representative or Authorized Garlock Distributor. For more information and assistance, call 1.800.448.6688, or fax 1.800.543.0598.

## Guide to chemicals covered by the EPA Clean Air Act Fugitive Emissions Regulations

Acetaldehyde	Chlorobenzilate	2,4-Dinitrophenol	Hydrochloric acid	N-Nitrosodimethylamine	1,2,4-Trichlorobenzene
Acetamide	Chloroform	2,4-Dinitrotoluene	Hydrogen fluoride	N-Nitrosomorpholine	1,1,2-Trichloroethane
Acetonitrile	Chloromethyl methyl ether	1,4-Dioxane	(hydrofluoric acid)	Parathion	Trichloroethylene
Acetophenone	Chloroprene	(1,4-Diethyleneoxide	Hydroquinone	Pentachloronitrobenzene	2,4,5-Trichlorophenol
2-Acetylaminofluorene	Cresols/Cresylic acid	1,2-Diphenylhydrazine	Isophorone	(Quintobenzene)	2,4,6-Trichlorophenol
Acrolein	(isomers and mixture)	Epichlorohydrin	Undane (all isomers)	Pentachlorophenol	Triethylamine
Acrylamide	o-Cresol	(1-Chloro-2,3-epoxypropane)	Maleic anhydride	Phenol	Trifluralin
Acrylic acid	m-Cresol		Methanol	p-Phenylenediamine	2,2,4-Trimethylpentane
Acrylonitrile	p-Cresol	1,2-Epoxybutane	Methoxychlor	Phosgene	Vinyl acetate
Allyl Chloride	Cumene	Ethyl acrylate	Methyl bromide	Phosphine	Vinyl bromide
4-Aminobiphenyl	2,4-D, salts and esters	Ethyl benzene	(Bromomethane)	Phosphorus	Vinyl chloride
Aniline	DDE	Ethyl carbamate	Methyl chloride	Phthalic anhydride	Vinylidene chloride
Anisidine	Diazomethane	(Urethane)	(Chloromethane)	Polychlorinated biphenyls	(1,1-Dichloroethylene)
Banzen	Dibenzofurane	Ethyl chloride	Methyl chloroform	(Arodors)	Xylene (isomers and mixture)
(including benzene from gasoline)	1,2 Dibromo-3-chloropropane	(Chloroethane)	(1,1,1-Trichloroethane)	1,3-Propane sultone	o-Xylenes
Benzidine	Dibutylphthalate	Ethylene dibromide	Methyl ethyl ketone	beta-Propiolactone	m-Xylenes
Benzotrithloride	1,4-Dichlorobenzene (p)	(Dibromoethane)	(2-Butanone)	Propionaldehyde	p-Xylenes
Benzyl chloride	3,3-Dichlorobenzidene	Ethylene dichloride	Methyl hydrazine	Propoxur (Baygon)	Antimony Compounds
Biphenyl	3,3-Dichloroethyl ether	(1,2-Dichloroethane)	Methyl iodide	Propylene dichloride	Arsenic Compounds
Bis (2-ethylhexyl) phthalate (DEHP)	Dichloroethyl ether	Ethylene glycol	(iodomethane)	(1,2-Dichloropropane)	(inorganic including amine)
Bis (chloromethyl) ether	(Bis(2 chloroethyl)ether)	Ethylene imine (Aziridine)	Methyl isobutyl ketone	Propylene oxide	Beryllium Compounds
Bromotorn	1,3-Dichloropropene	Ethylene oxide	(Hexone)	1,2-Propylenimine	Cadmium Compounds
1,3-Butadiene	Dichlorovos	Ethylene thloure	Methyl isocyanate	(2-Methyl aziridine)	Chromium Compounds
Calcium cyanamide	Diethanolamine	Ethylidene dichloride	Methyl methacrylate	Quinoline	Cobalt Compounds
Caprolactam	N,N-Diethyl aniline	(1,1-Dichloroethane)	Methyl tart butyl ether	Quinone	Coke Oven Emissions
Capran	(n,N-Dimethylaniline)	Formaldehyde	4,4-Methylene bis (2-chloroaniline)	Styrene	Cyanide Compounds
Carfaryl	Diethyl sulfate	Heptachlor	Methylene chloride	Styrene oxide	Glycol Ethers
Carbon disulfide	3,3-Dimethoxybenzidine	Hexachlorobenzene	(Dichloromethane)	2,3,7,8-Tetrachlorodibenzo-p-dioxin	Lead Compounds
Carbon tetrachloride	Dimethyl aminoazobenzene	Hexachlorocyclopentadiene	Methylene diphenyl diisocyanate (MDI)	1,1,2,2-Tetrachloroethane	Manganese Compounds
Carbonyl sulfide	3,3-Dimethyl benzidine	Hexachloroethane	4,4-Methylenedianiline	Tetrachloroethylene	Mercury Compounds
Carechol	Dimethyl carbamoyl chloride	Hexamethylene-1,6-diisocyanate	Naphthalene	(Perchloroethylene)	Nickel Compounds
Chloramben	Dimethyl fonnamide	Hexameth-ylphosphoramidate	Nitrobenzene	Titanium tetrachloride	Polycyclic Organic Matter
Chlordane	1,1-Dimethyl hydrazine	Hexane	4-Nitrophenyl	Toluene	Radionuclides
Chlorine	Dimethyl phthalate	Hydrazine	4-Nitrophenol	2,4-Toluene diamine	(including radon)
Chloroacetic acid	Dimethyl sulfate		2-Nitropropane	2,4-Toluene diisocyanate	Selenium Compounds
2-Chloroacetophenone	4,6-Dinitro-o-cresol, and salts		N-Nitrosopropane	o-Toluidine	
Chlorobenzene			N-Nitroso-N-methylurea	Toxaphene (chlorinated camphene)	

### AUTHORIZED REPRESENTATIVE

**Garlock**  
SEALING TECHNOLOGIES®

an EnPro Industries company

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### WARNING:

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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