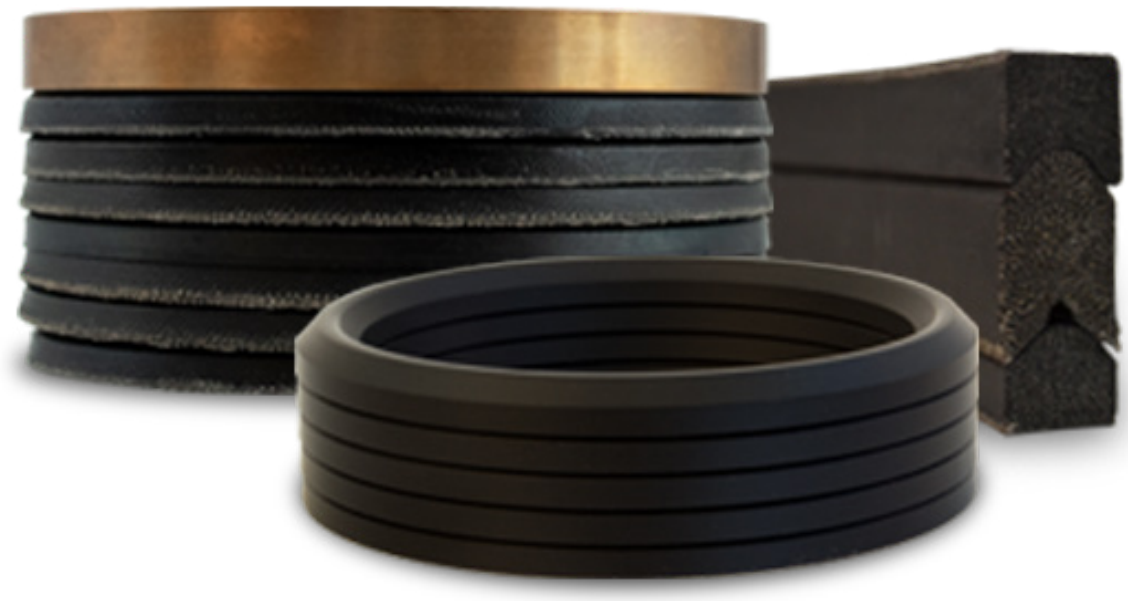
Garlock
An ENPRO Company

Garlock Hydraulic Components

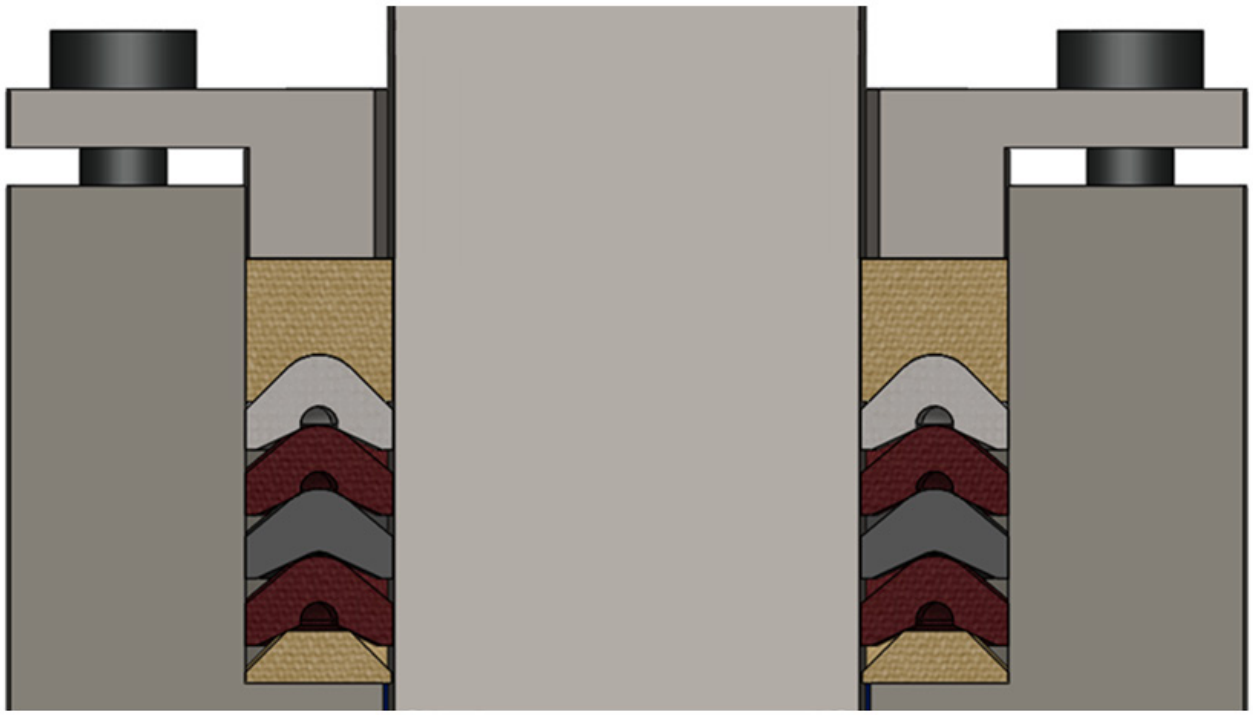
Technical Manual



Garlock Hydraulic Components Technical Manual

Garlock Hydraulic Components are available in a wide range of sizes and materials to ensure that you have the best solution for your application. Our rubber and fabric-reinforced rings are compounded and designed by industry-leading experts to achieve peak performance. Whether you have old, worn equipment, abrasives, chemical service, or high pressures, we have the packing solution for you.

Our CHEVRON® V-ring Packing is the industry standard for high performance and is offered in many material options. Garlock's Engineered Packing sets are designed for specific applications using a combination of products to excel in the most demanding applications.



CONTENTS

CHEVRON® Vee Ring Packing

CHEVRON® Packing

AUTOMATIC SEALING SYSTEM

Garlock CHEVRON® packing is the original automatic hydraulic and pneumatic design for sealing rods, pistons and plungers. The distinctive and exclusive hinge-like action of each CHEVRON® ring permits immediate reaction even to minor pressure changes. Each individual lip of a CHEVRON® packing set independently reacts to pressure, and automatically effects a seal. The multiple lip configuration automatically distributes pressure and an effective seal along the shaft. The proprietary design of Garlock CHEVRON® packing also permits an automatic reaction to pressure shock and overloads. Once Garlock CHEVRON® packing has been selected and installed, it will seal effectively, and automatically.

FEATURES	ADVANTAGES
Multiple Sealing Lips	• Automatically distribute system pressure • Offers "back-up" sealing rings
Hinged Design	• Vee rings automatically react to increasing/ decreasing pressure • Makes rings easy to install
Wide Range of Materials and Sizes	• Packing can be used in virtually any kind of fluid • Offers flexibility in design
Special End Rings	• Prevent packing extrusion at elevated pressures
Split Sets	• Quick installation • Can be cut from solid rings or coil stock

BENEFITS

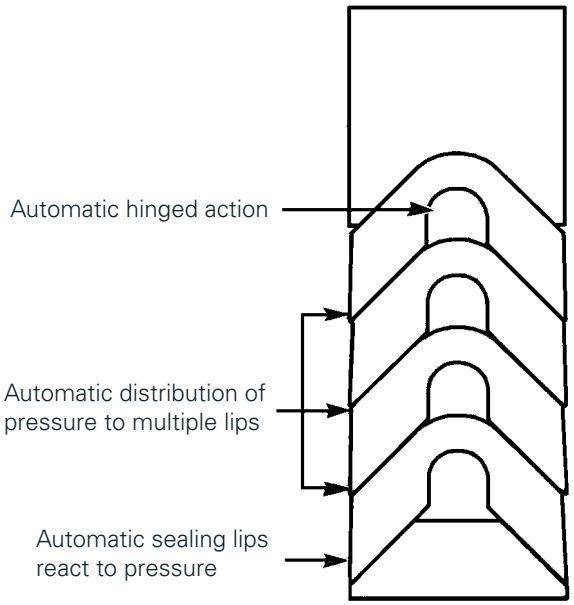
- Elimination of costly seal failure or blowouts
- Reduced installation costs
- Reduced equipment downtime with exact seal specifications
- Extended packing and seal life reduces maintenance and operating costs
- Reduced inventory costs

APPLICATIONS

Since CHEVRON® products have been the industry standard for many years, they can be found as the sealing device in many different types of equipment. Although normally associated with reciprocating applications, CHEVRON® has been used successfully on slow rotating equipment as well.

The most common applications are:

- Accumulators
- Bailing Presses
- Extrusion Presses
- Fluid Transfer Pumps
- Forging Presses
- Homogenizers
- Hydraulic Cylinders
- Injection Molding Presses
- Intensifiers
- Jacks
- Lifts
- Pneumatic Cylinders
- Rubber Molding Presses
- Steam Hammers
- Valve Stem Packing
- Water Flood Pumps



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.

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Application Data Sheet

The first step in recommending CHEVRON® products is to determine as much as possible about the operating of the equipment, the stuffing box dimensions, environmental conditions, what product(s) have been used before and any related problems.
The data sheet below is provided to help simplify this process.

EQUIPMENT TYPE

Cylinder Press Pump*

Other (explain)

Manufacturer Model No.

STUFFING BOX DATA

Shaft, Rod, Ram or Plunger Diameter

Stuffing Box Bore

Depth of Box

Gland: Adjustable Nonadjustable

Maximum Gland Entry

OPERATIONING CONDITIONS

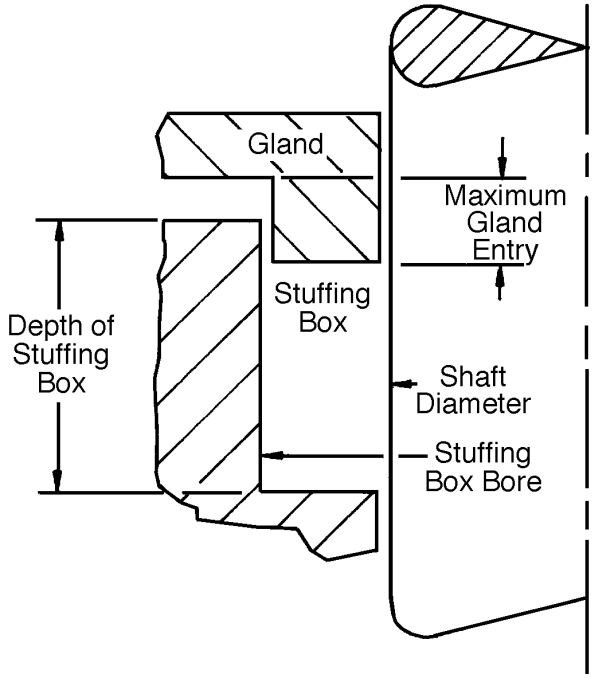
Fluid Type

Manufacturer's No.

Pressure: Min. Max.

Temperature: Min. Max.

Motion: Reciprocating
Length of Stroke
Cycles/min.



To aid in selecting the proper CHEVRON® packing, please refer to the following pages where information on product compatibility, stack height, pressure ranges and clearances is available.

If factory assistance is required, copy the data sheet section above, fill in the blanks and fax or mail it directly to Garlock Hydraulic Components, fax 866.636.4275.

For other than reciprocating equipment (i.e. rotary, oscillating), contact Garlock for recommendations.

* See page 12 for more detailed information on reciprocating equipment.

Recommeded Style for General Service

		Fabric Reinforced Materials							
Style/Materials of Constuction		**260RH/261RH** Cotton Fabric, Natural Rubber, Rockhard	**432/435** Cotton Fabric, Nitrile Elastomer	**1633** Cotton Fabric, Nitrile Elastomer (FDA)	**532** PolyCotton Fabric, Nitrile Elastomer	**7960** PloyCotton Fabric, Fluoroelastomer	**7532** Aramid Fabric w/ HNBR Elastomer	**8140** PolyCotton Fabric, SBR Elastomer, Rochhard	**7910** PTFE w/ Hi-Temp Aramid/ Fiber Fabric
Available Forms	Vee-Rings		•	•	•	•	•	•	•
	Adapters	•	• (432)	•	•	•	•	•	
Recommeded for Use Against:	Air	•	•	•	•			•	•
	Acids	•				•			•
	Aliphatic Solutions	•	•	•	•	•	•		•
	Alkalies	•				•		•	•
	Aromatic Solutions					•			•
	Hydrocarbons	•	•	•	•	•	•	•	•
	Ketones								•
	Phosphate Esters	•				•		•	•
	Steam				• Up to 300˚F		• Up to 350˚F		•
	Water Glycol	•	•	•	•	•	•	•	•
	Water in Oil	•	•	•	•	•	•	•	•
Temperature	Minimum	-40°F (-40°C)	-40°F (-40°C)	-40°F (-40°C)	-40°F (-40°C)	-20°F (-29°C)	-30°F (-34°C)	-40°F (-40°C)	Cryogenic
	Maximum	+275°F (+135°C)	+250°F (+121°C)	+250°F (+121°C)	+300°F (+149°C)	+300°F (+149°C)	+325°F (+162°C)	+250°F (+121°C)	+450°F (+232°C)
Heat Resistance		Good	Good	Good	Very Good	Very Good	Very Good	Good	Very Good
Pressure Rating[1]		Medium to High	Low to High	Low to High	Low to High	Low to High	Low to High	Medium to High	Medium to High
Abrasion Resistance		Great	Good	Fair	Great	Good	Excellent	Excellent	Great
Relative Hardness/ Flexibility		Very Hard/Rigid	Firm but Flexible	Firm but Flexible	Firm but Flexible	Firm/Very Flexible	Firm but Rigid	Very Hard/Rigid	Hard
Generally Recommended For:		Worn or misaligned equipment where extrusion resistant adapters are needed	General hydraulic oils, water emulsions. multi-purpose	Food, beverage, dairy applications. FDA Compliant. EC 1935/2004.	Moderate to high temperature, oil or steam	Chemical service, most fire-resistant fluids	High temperature. oil or steam	Excellent for water and high pressure service	All except very low pH fluids. A problem solver

1. Pressure ratings are affected by actual condition of equipment, clearances and tolerances, leakage acceptability and other factors. Complete application data could result in slightly different recom-mendations. Contact the factory with specific questions and/or problems. Other styles available.

Recommeded Style for General Service

		Homogeneous Materials							
Style/Materials of Constuction		**9298** Homogeneous Nitrile Elastomer	**8455** Homogeneous Silicone Elastomer	**9188** Homogeneous Butyl Elastomer	**9511** Homogeneous Nitrile Elastomer	**9600** Homogeneous Fluoroelastomer	**7500** PTFE	**7600** PTFE & Graphite	**9005** Glass Filled Nylon MARBLOCK®
Available Forms	Vee-Rings	•	•	•	•	•	•	•	
	Adapters						•	•	•
Recommeded for Use Against:	Air	•	•	•	•	•	•	•	•
	Acids		•	•		•	•	•	
	Aliphatic Solutions	•			•	•	•	•	•
	Alkalies		•	•		•	•	•	
	Aromatic Solutions					•	•	•	
	Hydrocarbons	•	•		•	•	•	•	•
	Ketones						•	•	
	Phosphate Esters		•	•		•	•	•	•
	Steam						•	•	
	Water Glycol	•	•	•	•	•	•	•	•
	Water in Oil	•	•		•	•	•	•	•
Temperature	Minimum	-10F (-23C)	-70°F (-57°C)	-40°F (-40°C)	-20°F (-29°C)	-20°F (-29°C)	Cryogenic	Cryogenic	-65°F (-54°C)
	Maximum	+250F (121C)	+500°F (+260°C)	+250°F (+121°C)	+250°F (+121°C)	+400°F (+204°C)	+500°F (+260°C)	+500°F (+260°C)	+300°F (+149°C)
Heat Resistance		Good	Excellent	Good	Good	Very Good	Excellent	Excellent	Good
Pressure Rating[1]		Vacuum to Low	Vacuum to Low	Vacuum to Low	Vacuum to Low	Vacuum to Low	Low to Medium	Low to Medium	High
Abrasion Resistance		Good	Fair	Good	Fair	Good	Good	Good	Excellent
Relative Hardness/ Flexibility		95 Duro Flexible	80 Duro Flexible	90 Duro Flexible	70 Duro Flexible	85 Duro Flexible	Firm/Rigid	Hard/Rigid	Very Hard/Rigid
Generally Recommended For:		General purpose oil, air and water service	Most fluids except strong acids and alkalies or steam	Same as style 433. For low pressure service.	General purpose - air, oil and water service	Low pressure seals in high temperature, and chemical service	Excellent for all fluids, non-lubricated service or food processing	Especially suitable for soot blowers	Excellent bearing material for hydraulic cylinders. Low break-away friction. High strength

WARNING:
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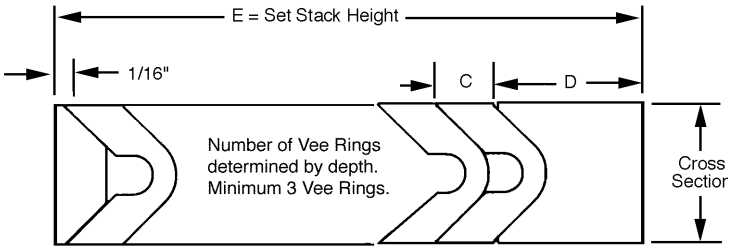
CHEVRON® Stack Height Table



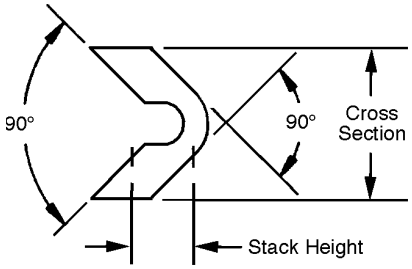
	STACK HEIGHT											
Cross-section	CHEVRON "C"	Adapter Set "D"+1/16"	TOTAL DEPTH "E" (includes the adapter set plus the number of CHEVRON x "C")									
			1	2	3	4	5	6	7	8	9	10
3/16" 0.188"	7/64" 0.109"	5/16" 0.313"	27/64" 0.422"	17/32" 0.531"	41/64" 0.641"	3/4" 0.750"	55/64" 0.859"	31/32" 0.969"	1-5/64" 1.078"	1-3/16" 1.188"	1-19/64" 1.297"	1-13/32" 1.406"
7/32" 0.219"	7/64" 0.109"	5/16" 0.313"	27/64" 0.422"	17/32" 0.531"	41/64" 0.641"	3/4" 0.750"	55/64" 0.859"	31/32" 0.969"	1-5/64" 1.078"	1-3/16" 1.188"	1-19/64" 1.297"	1-13/32" 1.406"
1/4" 0.250"	7/64" 0.109"	5/16" 0.313"	27/64" 0.422"	17/32" 0.531"	41/64" 0.641"	3/4" 0.750"	55/64" 0.859"	31/32" 0.969"	1-5/64" 1.078"	1-3/16" 1.188"	1-19/64" 1.297"	1-13/32" 1.406"
9/32" 0.281"	5/32" 0.156"	11/32" 0.344"	1/2" 0.500"	21/32" 0.656"	13/16" 0.813"	31/32" 0.969"	1-1/8" 1.125"	1-9/32" 1.281"	1-7/16" 1.438"	1-19/32" 1.594"	1-3/4" 1.750"	1-29/32" 1.906"
5/16" 0.313"	11/64" 0.172"	3/8" 0.375"	35/64" 0.547"	23/32" 0.719"	57/64" 0.891"	1-1/16" 1.063"	1-15/64" 1.234"	1-13/32" 1.406"	1-37/64" 1.578"	1-3/4" 1.750"	1-59/64" 1.922"	2-3/32" 2.094"
11/32" 0.344"	3/16" 0.188"	13/32" 0.406"	19/32" 0.594"	25/32" 0.781"	31/32" 0.969"	1-5/32" 1.156"	1-11/32" 1.344"	1-17/32" 1.531"	1-23/32" 1.719"	1-29/32" 1.906"	2-3/32" 2.094"	2-9/32" 2.281"
3/8" 0.375"	3/16" 0.188"	7/16" 0.438"	5/8" 0.625"	13/16" 0.813"	1" 1.000"	1-3/16" 1.188"	1-3/8" 1.375"	1-9/16" 1.563"	1-3/4" 1.750"	1-15/16" 1.938"	2-1/8" 2.125"	2-5/16" 2.313"
13/32" 0.406"	3/16" 0.188"	15/32" 0.469"	21/32" 0.656"	27/32" 0.844"	1-1/32" 1.031"	1-7/32" 1.219"	1-13/32" 1.406"	1-19/32" 1.594"	1-25/32" 1.781"	1-31/32" 1.969"	2-5/32" 2.156"	2-11/32" 2.344"
7/16" 0.438"	15/64" 0.234"	1/2" 0.500"	47/64" 0.734"	31/32" 0.969"	1-13/64" 1.203"	1-7/16" 1.438"	1-43/64" 1.672"	1-29/32" 1.906"	2-9/64" 2.141"	2-3/8" 2.375"	2-39/64" 2.609"	2-27/32" 2.844"
15/32" 0.469"	15/64" 0.234"	9/16" 0.563"	51/64" 0.797"	1-1/32" 1.031"	1-17/64" 1.266"	1-1/2" 1.500"	1-47/64" 1.734"	1-31/32" 1.969"	2-13/64'' 2.203"	2-7/16" 2.438"	2-43/64" 2.672"	2-29/32" 2.906"
1/2" 0.500"	15/64" 0.234"	19/32" 0.594"	53/64" 0.828"	1-1/16" 1.063"	1-19/64" 1.297"	1-17/32" 1.531"	1-49/64" 1.766"	2" 2.000"	2-15/64" 2.234"	2-15/32" 2.469"	2-45/64" 2.703"	2-15/16" 2.938"
17/32" 0.219"	15/64" 0.234"	5/8" 0.625"	55/64" 0.859"	1-3/32" 1.094"	1-21/64" 1.328"	1-9/16" 1.563"	1-51/64" 1.797"	2-1/32" 2.031"	2-17/64" 2.266"	2-1/2" 2.500"	2-47/64" 2.734"	2-31/32" 2.969"
9/16" 0.563"	15/64" 0.234"	21/32" 0.656"	57/64" 0.891"	1-1/8" 1.125"	1-23/64" 1.359"	1-19/32" 1.594"	1-53/64" 1.828"	2-1/16" 2.063"	2-19/64" 2.297"	2-17/32" 2.531"	2-49/64" 2.766"	3" 3.000"
5/8" 0.625"	9/32" 0.281"	23/32" 0.719"	1" 1.000"	1-9/32" 1.281"	1-9/16" 1.563"	1-27/32" 1.844"	2-1/8" 2.125"	2-13/32" 2.406"	2-11/16" 2.688"	2-31/32" 2.969"	3-1/4" 3.250"	3-17/32" 3.531"
11/16" 0.688"	9/32" 0.281"	25/32" 0.781"	1-1/16" 1.063"	1-11/32" 1.344"	1-5/8" 1.625"	1-29/32" 1.906"	2-3/16" 2.188"	2-15/32" 2.469"	2-3/4" 2.750"	3-1/32" 3.031"	3-5/16" 3.313"	3-19/32" 3.594"
3/4" 0.750"	21/64" 0.328"	27/32" 0.844"	1-11/64" 1.172"	1-1/2" 1.500"	1-53/64" 1.828"	2-5/32" 2.156"	2-31/64" 2.484"	2-13/16" 2.813"	3-9/64" 3.141"	3-15/32" 3.469"	3-51/64" 3.797"	4-1/8" 4.125"
13/16" 0.813"	21/64" 0.328"	29/32" 0.844"	1-15/64" 1.234"	1-9/16" 1.563"	1-57/64" 1.891"	2-7/32" 2.219"	2-35/64" 2.547"	2-7/8" 2.875"	3-13/64" 3.203"	3-17/32" 3.531"	3-55/64" 3.859"	4-3/16" 4.188"
7/8" 0.875"	3/8" 0.375"	1" 1.000"	1-3/8" 1.375"	1-3/4" 1.750"	2-1/8" 2.125"	2-1/2" 2.500"	2-7/8" 2.875"	3-1/4" 3.250"	3-5/8" 3.625"	4" 4.000"	4-3/8" 4.375"	4-3/4" 4.750"
15/16" 0.938"	3/8" 0.375"	1-1/16" 1.063"	1-7/16" 1.438"	1-13/16" 1.813"	2-3/16" 2.188"	2-9/16" 2.563"	2-15/16" 2.938"	3-5/16" 3.313"	3-11/16" 3.688"	4-1/16" 4.063"	4-7/16" 4.438"	4-13/16" 4.813"
1" 1.000"	13/32" 0.406"	1-1/8" 1.125"	1-17/32" 1.531"	1-15/16" 1.938"	2-11/32" 2.344"	2-3/4" 2.750"	3-5/32" 3.156"	3-9/16" 3.563"	3-31/32" 3.969"	4-3/8" 4.375"	4-25/32" 4.781"	5-3/16" 5.188"
1-1/16" 1.063"	13/32" 0.406"	1-3/16" 1.188"	1-19/32" 1.594"	2" 2.000"	2-13/32" 2.406"	2-13/16" 2.813"	3-7/32" 3.219"	3-5/8" 3.625"	4-1/32" 4.031"	4-7/16" 4.438"	4-27/32" 4.844"	5-1/4" 5.250"
1-1/8" 1.125"	29/64" 0.453"	1-1/4" 1.250"	1-45/64" 1.703"	2-5/32" 2.156"	2-39/64" 2.609"	3-1/16" 3.063"	3-33/64" 3.516"	3-31/32" 3.969"	4-27/64" 4.578"	4-7/8" 4.875"	5-21/64" 5.328"	5-25/32" 5.781"
1-3/16" 1.188"	1/2" 0.500"	1-5/16" 1.313"	1-13/16" 1.813"	2-5/16" 2.313"	2-13/16" 2.813"	3-5/16" 3.313"	3-13/16" 3.813"	4-5/16" 4.313"	4-13/16" 4.813"	5-5/16" 5.313"	5-13/16" 5.813"	6-5/16" 6.313"
1-1/4" 1.250"	1 /2" 0.500"	1-3/8" 1.375"	1-7/8" 1.875"	2-3/8" 2.375"	2-7/8" 2.875"	3-3/8" 3.375"	3-7/8" 3.875"	4-3/8" 4.375"	4-7/8" 4.875"	5-3/8" 5.375"	5-7/8" 5.875"	6-3/8" 6.375"

NOTES:

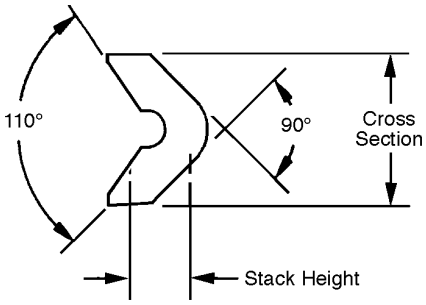
1. Heights are approximate. Exact height cannot be guaranteed.
2. Table applies to fabric-reinforced CHEVRON® sets only.
3. Due to space restrictions we cannot list all of our size capabilities such as large cross sections, metric sizes, optional stack heights, and a multitude of size variations cut from coil.

Vee Ring and Adapter Designs

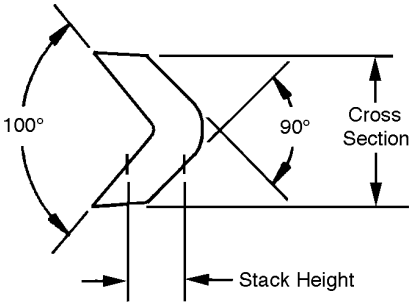
A. Fabric - Hinge - Type XE



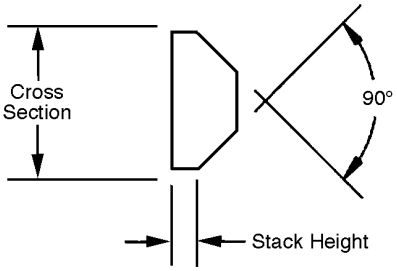
B. Fabric - Modified Hinge - Type GX

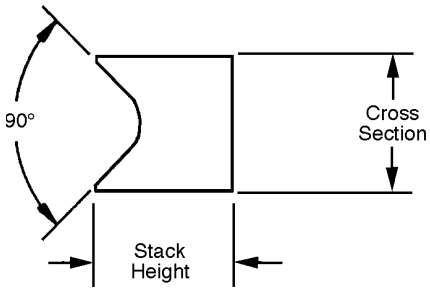


C. Homogeneous Rubber - No Hinge - Type NH

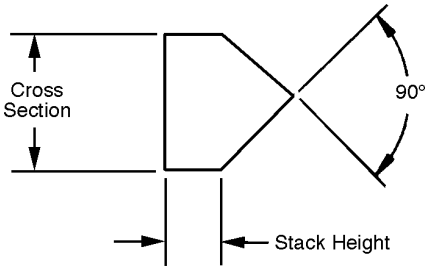


D. Fabric and Metal Adapters

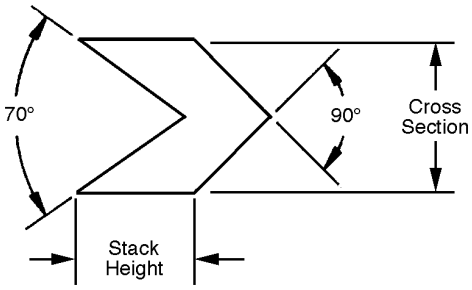




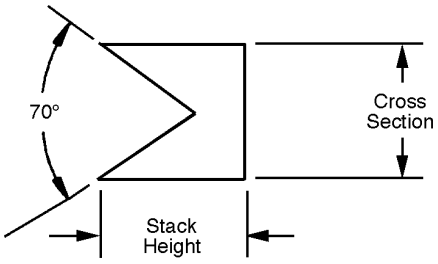
E. PTFE Male Adapter



F. PTFE Vee Ring



G. PTFE Female Adapter



Cross Section	Male (E) Std./J.I.C.	Vee Ring (F) Std./J.I.C.	Female (G) Std. or J.I.C.
0.188	0.075/0.063	0.150/0.083	0.188
0.219	0.088/0.063	0.175/0.083	0.219
0.250	0.100/0.063	0.200/0.083	0.250
0.313	0.125/0.063	0.250/0.140	0.313
0.375	0.150/0.063	0.300/0.156	0.375
0.438	0.175/0.063	0.350/0.197	0.438
0.500	0.200/0.063	0.400/0.197	0.500
0.563	0.225/0.063	0.450/0.197	0.563
0.625	0.250/0.063	0.500/0.250	0.625
0.750	0.300/0.063	0.600/0.297	0.750

PTFE Stack Heights (inches)

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Design Parameters

Number of Vee Rings by Application

PISTON APPLICATIONS

Diameter of Cylinder	Zero to 1,000 psi		1,000 - 2,500 psi		2,500 - 4,000 psi		4,000 psi and Up	
	Cross Section	Vee Rings per Set	Cross Section	Vee Rings per Set	Cross Section	Vee Rings per Set	Cross Section	Vee Rings per Set
1" to 2"	1/4"	3	1/4"	4	5/16"	4	3/8"	5
2" to 3"	5/16"	3	5/16"	4	5/16"	4	3/8"	5
3" to 6"	3/8"	3	3/8"	4	3/8"	4	3/8"	5
6" to 8"	1/2"	3	1/2"	4	1/2"	4	1/2"	5
8" to 14"	5/8"	3	5/8"	4	5/8"	4	5/8"	5

ROD, PLUNGER OR RAM APPLICATIONS

Diameter of Cylinder	Zero to 1,000 psi		1,000 - 2,500 psi		2,500 - 4,000 psi		4,000 psi and Up	
	Cross Section	Vee Rings per Set	Cross Section	Vee Rings per Set	Cross Section	Vee Rings per Set	Cross Section	Vee Rings per Set
1" to 3"	1/4"	4	1/4"	5	5/16"	5	5/16"	6
3" to 6"	1/4"	4	5/16"	5	3/8"	5	3/8"	6
6" to 8"	5/16"	4	3/8"	5	1/2""	5	1/2"	6
8" to 14"	3/8"	4	1/2"	5	1/2"	5	5/8"	6
14" to 24"	1/2"	4	5/8"	5	5/8"	5	3/4"	6
24" to 36"	5/8"	4	3/4"	5	3/4"	5	1"	6
36" and up	3/4"	4	1"	5	1"	5	1"	6

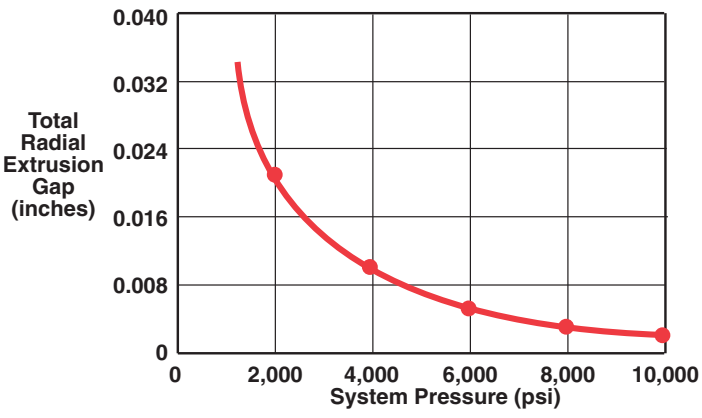
RECOMMENDED ADAPTERS FOR PRESSURE RANGES

Adapter Type	1,000 psi	2,000 psi	3,000 psi	5,000 psi
Standard Fabric	•	•		
Rockhard Fabric		•	•	
Bronze			•	•
MARBLOCK®	•	•	•	

NOTE:
See Stack Height Table on page E-6 for the height of the Vee rings plus male and female adapter rings per set. This table is for general guidance. Many satisfactory Garlock CHEVRON® packing installations can be made with variations in the recommended equipment or packing guidelines.

CLEARANCES

If excessive clearance exists between the cylinder wall or the shaft and the component supporting the female adapter, operating pressure will extrude the adapter into the clearance. The greater the pressure and clearance, the more quickly extrusion will occur. In a clean system, where concentricity requirements are met, and where minimum clearances are held, optimum seal life can be expected.



Deep Vee CHEVRON® Packing

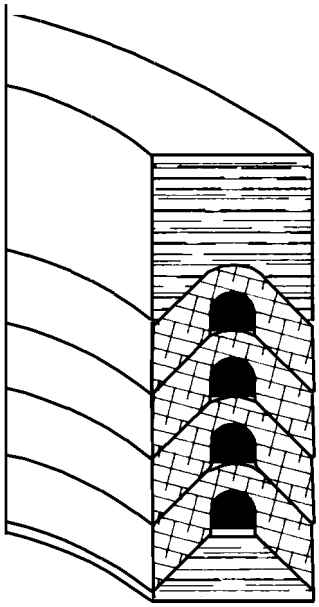
BENEFITS

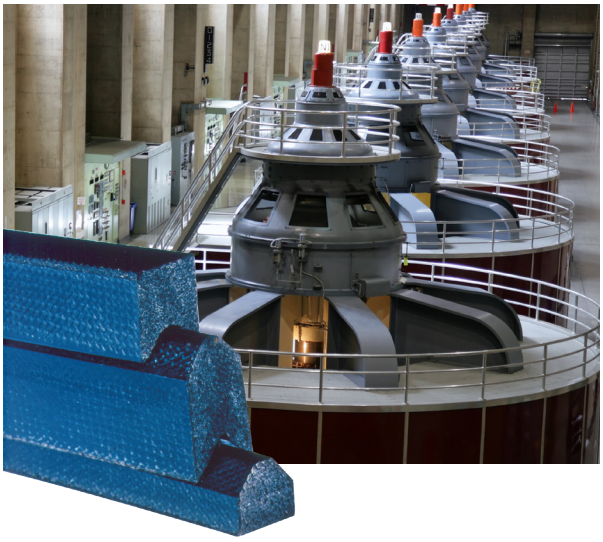
- Easier installation—fewer rings required
- Quicker turnaround—rings won't "roll-over" during installation
- Wide variety of styles—choose from the many popular fabric and rubber styles available from Garlock to suit your application
- Few size restrictions—made in our continuous process, so large diameters are no problem
- Most popular cross sections are: ⅝", ¾", ⅞", 1"

CHEVRON® Packings for High Pressure Service

In unusually high pressure applications, CHEVRON® packing might need to be reinforced to prevent undue distortion from this extreme pressure. The following are examples of some design considerations that can be used to overcome problems experienced with standard components. "D" filler rings can be installed in the groove of the hingetype CHEVRON® Vee Rings to prevent distortion of the packing without interfering with the automatic hinge action of the rings.

CHEVRON® Packing with "D" shaped filler rings





"D" fillers can be used only with ⅜" cross sections and up with hinge type "XE" CHEVRON® rings per illustration A, page 9.

When pressure ranges exceed those normally satisfied with standard Style 432 or 532 adapters, the stronger rockhard adapters such as 260RH and 261RH should be considered.

When a problem relates to excessive clearances, as discussed on page 10, a close tolerance phenolic (Style 155) or bronze bushing installed behind the female adapter will act as additional support and reduce the extrusion gap. A phenolic or bronze female adapter will serve the same purpose.

These configurations have been used successfully to extend the life of CHEVRON® packing sets. However, specific applications should be considered on an individual basis, taking into account the type of equipment, size, temperature, media being sealed, pressure, surface speed, condition of equipment and any other contributing factors.

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Seals for Reciprocating Plunger Pump Applications

Garlock has long been a leader in the development of seals and packings for reciprocating equipment. The CHEVRON® trade name for vee packing was registered over 75 years ago; and although it is very popular for use in such applications as hydraulic cylinders and hydraulic presses, it also is capable of providing excellent performance for the demanding service conditions found in plunger pumps.

However, it is important to be able to offer alternative packing recommendations. With hundreds of tooled sizes available in numerous materials, Garlock CHEVRON® provides the options necessary to meet the changing needs of Simplex and Multiplex pumps.

Over the years Garlock has developed styles specifically for plunger pump applications. Although other materials are available, one of the following packing styles will most likely provide satisfactory service:

- **8024**: SBR rubber/cotton fabric, rockhard cure
- **8064**: SBR rubber/cotton fabric, standard cure
- **8140**: SBR rubber/polyester-cotton fabric, rockhard cure
- **8150**: NBR/PTFE/polyester-cotton fabric, standard cure
- **8872**: Nitrile/polyester-cotton fabric

In addition to selecting the proper material for an application, the packing arrangement and design of the other packing set components are equally important. Bronze is the material of choice for male and female adapters or lantern rings to provide plunger alignment through the sealing CHEVRON®, as well as prevent its extrusion. Figures 1 through 4 illustrate some common packing assemblies.

Since stuffing box spaces vary with pump models, it may be necessary to have Garlock design the packing set. The minimum information necessary to do so should include the operating conditions and details of the packing area, which may be best covered by a drawing. Garlock has the products, experience and quality to satisfy your plunger pump packing needs.

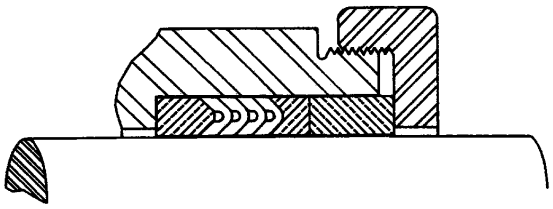


Figure 1: Non-lubricated box Adjustable CHEVRON® set

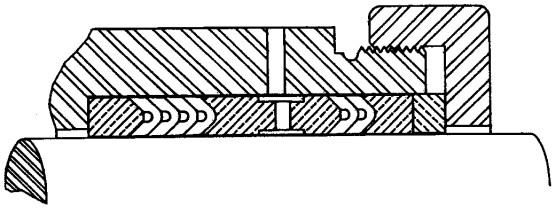


Figure 2: Lubricated box Adjustable primary and secondary CHEVRON® sets

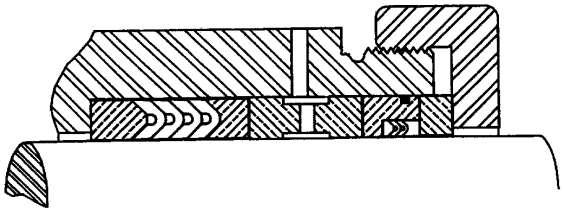


Figure 3: Lubricated box Adjustable primary CHEVRON® set Non-adjustable secondary CHEVRON® set

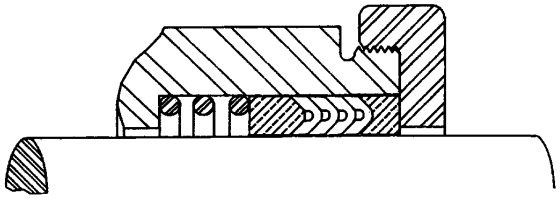
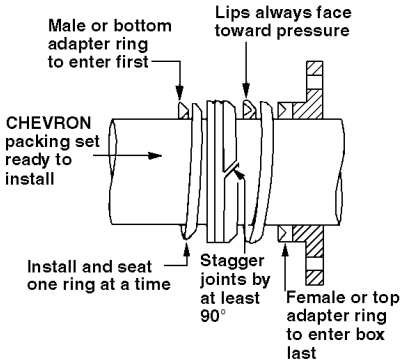


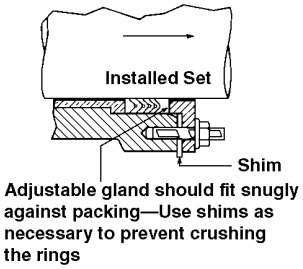
Figure 4: Non-lubricated box Spring-loaded self-adjusting CHEVRON® set

CHEVRON® Installation and Adjustment

Protect your investment. Do not hang Garlock CHEVRON® packing on nails or under any excessive stack pressure that might deform the concentricity of the product. Do not stock in extreme weather conditions. Avoid constant sunlight. The elastomer compounds used in CHEVRON® packing are highly technical and, while reliable, they are subject to handling stress.



1. Packing on a moving ram should be endless rings, if possible, for best service life.
2. If rams are grooved, worn, rusted or corroded, they should be reconditioned or replaced. No packing stands up to these conditions. Use boots to protect rams if abrasive dust is a problem.
3. On high pressure jobs, make clearance between rod and gland as close as possible to prevent extrusion.
4. If lubrication is not getting into a Garlock CHEVRON® packing set, the gland may be drawn up too tightly and should be loosened appropriately. To avoid over-tightening and/or cocking of the gland, place a shim under the gland.
5. If a stuffing box is very deep, spacer(s) can be used to take up the space of additional CHEVRON® rings that are not needed. This saves replacement time and cost.
6. Use the correct style. For example, don't use butyl against a petroleum base oil, or a nitrile against a phosphate ester.
7. Use the right size. In emergencies, "off-size" parts can be distorted and made to work for a short period of time, but do not expect them to last or work as efficiently as the correct size.



8. Make sure all rings are seat-ed with no voids in the set.
9. Use lubrication when installing the rings, as it makes installation much easier and helps during the break-in period.
10. Make sure sections of the lips of the rings are not turned over or twisted. This is easy to do, especially in blind installation, and will result in premature leakage and failure.
11. Make sure the packings are facing in the direction of the medium being sealed—whether liquid, air, dust, etc.
12. Consider metal structure. Many times a packing is blamed for leakage when the real culprit is porous metal—either the rod or the housing.
13. Let Garlock help you. Tell us about the application. If a forging press is under shock load, then packing must be a more rugged type, for example. Or, if low pressures are involved, the packing selection must be more flexible than for high pressure.
14. Don't use sharp metal tools like screwdrivers when installing packings. Hardwood tools are best and will not score rod or stuffing box. For installation of endless CHEVRON® packing, gland pressure should be only sufficient to snug rings within the confining cavity. On split ring installations, adjustment practice will vary depending on service conditions. For horizontal packing installations, nominally light gland pressure is necessary to seal the ring joints. Adjustment is made by turns of 1/4 flat on gland bolts. On vertical applications of split rings, it is desirable to provide increased gland pressure for the effective seal of ring joints.

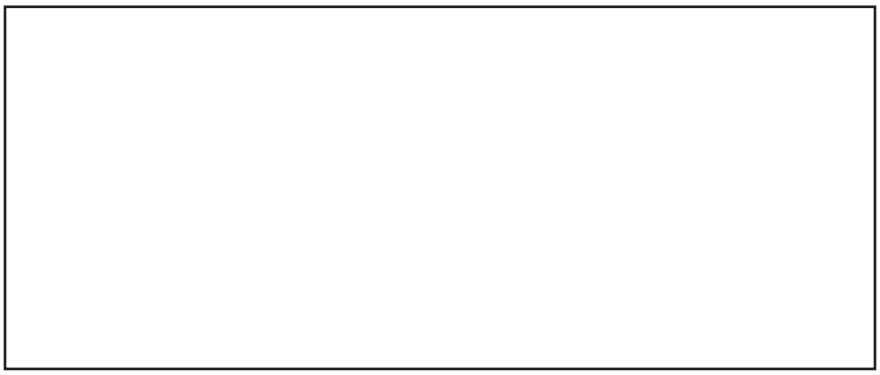
More than just great products.

Beyond offering you the widest available range of products for packing and sealing, Garlock enhances the value of its products with technical services and comprehensive training programs:

- ISO 9001:2000 registration for Industrial Gasketing, Industrial Packing, KLOZURE® Oil Seals, Bearing Protectors, and Mechanical Seals, Expansion Joints, Hydraulic Components, and Industrial Rubber Products.
- A global network of stocking Authorized Garlock Distributors.
- Factory sales representatives and applications engineers available for problem solving when and where it is needed.
- Toll-free 800 telephone and fax numbers for immediate product information.
- In-plant surveys of equipment and processes, providing the customer with recommendations to identify and eliminate sealing and packing problems before they start.
- The most sophisticated and most comprehensive test facilities available.
- Technical field seminars on all Garlock products.
- Factory-sponsored product training programs, including hands-on seminars, to ensure that Garlock representatives and their distributor personnel are the best in the industry.
- Technical Bulletins to keep you up-to-date on product enhancements and changes.

Customers who specify Garlock fluid sealing products get, at no extra cost, the high quality support needed to run a profitable operation.

Notes:



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