

Grooved Piping System | Product Catalog





Table of Contents VGS Product Catalog

Introducing VGS
Listings and Approvals4
Design Features5
Grooved Couplings11
Rigid 11
Flexible 12
Reducing13
Grooved Fittings 14
Elbow14
Tee / Cross15
Concentric Reducer 17
Cap / End-All Fitting 18
Short Radius Fittings 20
Flange 21
Mechanical Tees 22
Application Information 26
Anchoring, Hanging, and Supports
Gasket Selection Guide 31
End of Pipe Preparation 34
Bolt Torque Specifications
Terms and Conditions 41

VGS

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Leave Nothing to Chance

Managing your business is only getting more complicated. To succeed, you need a trusted partner that delivers not just products, but complete solutions. A partner that understands your challenges, and provides you with the innovative products and unparalleled service required to meet these challenges head on.

Introducing VGS[™], a new grooved piping system from the most trusted name in fire protection – Viking. For 90 years, Viking has followed a rigorous commitment to provide only the highest quality fire protection products and services. VGS is the latest example of this demanding standard.

With VGS, you now have access to a complete, dependable grooved piping system from Viking. And, with Viking SupplyNet as your partner, you are assured consistent product availability, prompt delivery, expert technical support, and anything else that you need to eliminate job-site surprises. VGS allows you to install with the confidence of knowing you are backed by a trusted partner with a dedicated focus on your business.

Putting it All Together

The complete VGS product line is available through Viking SupplyNet's integrated distribution network, which includes 34 locations in North America. Through Viking SupplyNet, you have access to the most complete line of fire protection products from the industry's leading manufacturers, including Viking, Tolco, Potter, BlazeMaster, NIBCO, Ames, Kennedy, AGF, and Wilkins. Finally, Viking Fabrication Services links it all together with full-service pipe fabrication capabilities for even the most demanding applications.

Integrating VGS into this package creates a seamless, comprehensive, single-source solution for your business. Furthermore, this entire package is supported by Viking's dedicated technical support team and field staff. We invite you to discover why a single-source, turn-key system is the best solution for your business. We want to be your partner.

VGS - Continuing the Legacy of Trust.





Canadian Automatic Sprinkler Association

Listings and Approvals

GENERAL CODES, STANDARDS, SPECIFICATIONS, ASSOCIATIONS & APPROVAL BODIES

VGS production facilities are certified to ISO 9001. Products are designed to conform to ASTM and other standards where applicable and are listed, approved and or certified by cULus, ULC, FM, NSF and others. VGS is active in industry membership organizations such as AFSA, NFSA, CASA, NFPA, IFSA, and others.



Model No.	Product Description	Approval Body
Grooved F	Piping Systems	
V-7706	Reducing Coupling	cULus / FM
V-7041	Flange Adapter–ANSI 125/150, PN10/16	cULus / FM
V-7110	90° Elbow, Regular Radius	cULus / FM
V-7110DR	Drain Elbow	cULus / FM
V-7111	45° Elbow, Regular Radius	cULus / FM
V-7112	22-1/2° Elbow	cULus / FM
V-7113	11-1/4° Elbow	cULus / FM
V-7120	Тее	cULus / FM
V-7121	Reducing Tee	cULus / FM
V-7135	Cross	cULus / FM
V-7150	Conc. Reducer	cULus / FM
V-7160	Domed End Cap	cULus / FM

Model No.	Product Description	Approval Body							
Hole-Cut	Piping System								
V-M21	Mechanical Tee, Threaded Outlet	cULus / FM							
V-M22	Mechanical Tee, Grooved Outlet	cULus / FM							
Fire Protection Systems									
V-7705	Standard Flexible Coupling	cULus / FM							
V-Z05	Rigid Coupling	cULus / FM							
V-899	End-All Fitting	cULus / FM							
V-901	Short Radius 90° Elbow	cULus / FM							
V-903	Short Radius Tee	cULus / FM							
V-723	Saddle-Let	cULus / FM							
V-M21	Mechanical Tee, Threaded Outlet	cULus / FM							
V-M22	Mechanical Tee, Grooved Outlet	cULus / FM							





RIGID OR FLEXIBLE?

VGS grooved couplings are classified into two types, flexible and rigid. What are the differences? When and where should they be used? The following information is intended for system designers and installers to better understand the nature of the grooved piping systems. This will allow the designer and installer to make better use of the design features and advantages of grooved piping components and systems.



Туре	Angular Movement deg.	Axial Displacement mm	Rotation after installation	Model Nos.	
Flexible Coupling	<u>≥</u> 1°	1.6 - 3.2	Yes	V-7705, V-7706	
Rigid Coupling	< 1°	< 1.6	No	V-Z05	

Note 1) Angular movement of flexible couplings 8" and larger sizes should be $\ge 0.5^{\circ}$. 2) Axial displacement data based on roll-grooved pipe.

RIGID COUPLINGS

VGS rigid couplings can be used in applications where you require a rigid joint similar to that of a traditional flanged, welded and/or threaded connection. You need not worry about the snaking of the pipe on straight runs, as all VGS rigid couplings utilize both a mechanical and frictional interlock design to provide rigidity. Rigid couplings eliminate or reduce undesired angular movement, axial displacement and rotation after installation as is required under normal service conditions. Rigid couplings are some of the most popular and most widely used today.

• Angle-pad design: As the bolts are tightened, the angled bolt pads slide in opposite directions causing the couplings keys to tightly grip the pipe, while at the same time the pipe grooves are forced outward against the coupling keys.



FLEXIBLE COUPLINGS

VGS flexible couplings allow for full design features in applications such as curved or deflected layouts and or when systems are exposed to outside forces beyond normal static conditions such as seismic events or where vibration and or noise attenuation are a concern. The ability to design in controlled flexibility is an advantageous feature when compared to traditional rigid joining methods such as threading, flanging and welding. When designing with flexible couplings you must allow for proper support to the system so as to eliminate undesired stress.

There are several published standards and codes covering grooved piping components. These codes or standards may vary as to the definition or standard for flexible couplings. System designers should confirm which standard(s) and or code(s) are required for the system being designed and they should select the applicable coupling for the application.

NFPA 13 defines a flexible coupling as:

"a listed coupling or fitting that allows axial displacement, rotation, and at least 1 degree of angular movement of the pipe without inducing harm on the pipe. For pipe diameters of 8 in. and larger, the angular movement shall be permitted to be less than 1 degree but not less than 0.5 degrees." (NFPA 13-2007 3.5.4)

For sprinkler systems, NFPA 13 specifies the use of flexible couplings

to protect the system against damage from earthquakes sets some specific examples of how and where they should be used. Designers and installers should design their protection systems in compliance with this standard.







Design Features Flexible Coupling

Axial Displacement & Angular Movement (Model V-7705)

Size		Axial	Angular Movement (Deflection)			
Nom. Size mm/in	Actual OD mm/in	-ment mm/in	Per coupling degrees	Per pipe mm/m, in/ft		
20	26.7	1.6	CP 451	118		
0.75	1.050	0.0625	6" - 46	1.42		
25	33.4	1.6	F° 20'	96		
1	1.315	0.0625	5 - 50	1.16		
32	42.4	1.6	48 201	76		
1.25	1.660	0.0625	4' - 20	0.91		
40	48.3	1.6	28 40	66		
1.5	1.900	0.0625	3" - 48	0.80		
50	60.3	1.6	28 01	53		
2	2.375	0.0625	3" - 01"	0.63		
65	73.0	1.6	2° 20'	44		
2.5	2.875	0.0625	2 - 30	0.52		
65	76.1	1.6	28 24	42		
			2 - 24			
80	88.9	1.6	2° 04'	36		
3	3.500	0.0625	2 - 04	0.43		
100	114.3	3.2	29 12	55		
4	4.500	0.125	5 - 12	0.67		
125	141.3	3.2	2° 26'	45		
5	5.563	0.125	2 - 50	0.54		
150	165.1	3.2	2° - 14'	39		
			2 - 14			
150	168.3	3.2	2° - 10'	38		
6	6.625	0.125	2 - 10	0.45		
200	219.1	3.2	1° - 40'	29		
8	8.625	0.125	1 - 40	0.35		
250	273.0	3.2	1° - 20'	23		
10	10.750	0.125	1 - 20	0.28		
300	323.9	3.2	1° - 08'	20		
12	12.750	0.125	1-00	0.24		

Note: Axial displacement is the maximum value when the system is pressurized to the maximum working pressure. Angular movement is the maximum value that a coupling allows under no internal pressure.





Design Features Hole-Cut Piping Systems

HOLE-CUT PIPING SYSTEMS

The VGS hole-cut piping systems provide a fast and easy mid-point branch outlet, eliminating the need for multiple fittings and allowing for easy expansion of the piping system.

The VGS mechanical tees Models V-M21 and V-M22 provide an easy takeout of a branch outlet without the need for welding. First a hole is cut or drilled at the desired location. The mechanical tee is then positioned so that the built-in locating collar fits within the hole.

As the housing bolts are tightened, the pressure responsive gasket forms a leak-tight seal.



Grooved-end and threaded outlets are available

 A mechanical cross connection can be made by combining two upper housing segments



The Model V-723 Saddle-Let mechanical tee is the ideal outlet fitting for direct connection to sprinkler heads, short risers, drops, and or gauges.







Design Features Materials

MATERIALS

HOUSINGS

The housing segments not only provide significant strength to the joint but they also compress and protect the gasket from exposure.

Ductile Iron: Standard coupling housings and fittings are made of ductile iron conforming to ASTM A536 Gr. 65-45-12 or Gr. 65-45-15. The properties of Grade 65-45-12 ductile iron are as follows; 65,000 psi (448 MPa) tensile strength, 45,000 psi (310 MPa) yield strength and 12% elongation. Grade

65-45-15 has the same properties, except it provides for 15% elongation.

GASKETS

VGS gaskets are available in a variety of configurations to meet your specific requirements. These gaskets have excellent self sealing capabilities and are designed to provide a leak tight seal. During assembly the gasket is first stretched over the pipe ends which forms the initial seal. As the housing segments are installed and secured the pressure responsive gasket is slightly compressed to form a leak-tight joint. The strength of the seal is further enhanced by internal line pressure that creates downward pressure on the lips of the gasket. The gasket also seals well under vacuum conditions up to 10 inHg (254 mmHg) which may occur when a system is drained. Please refer to the VGS Gasket Selection Guide for additional details and gasket materials.



BOLTS AND NUTS

VGS products utilize oval neck track bolts made of carbon steel conforming to ASTM A183 Gr. 2 and heavy duty hex nuts, available either in UNC threaded or ISO metric threaded. The oval neck track bolts mate into the oval holes in the housing segments to allow for easy tightening using only a single wrench/



spanner. The UNC bolts and nuts are electro zinc plated in a silver chromate color and ISO bolts and nuts in a gold chromate color. Hot-dip galvanized bolts and nuts are also available upon request.





Design Features Friction Loss Data

FLOW DATA / FRICTIONAL RESISTANCE

Expressed as equivalent length of straight pipe

				Elbows		Tees		
Nominal	D' 0 D	Pipe Wall	V-7110 90°	V-901 90°	V-7111 45°	V-7120	V-903	
Size mm/in	Pipe O. D. mm/in	mm/in	Std. Radius meters / feet	Short Radius meters / feet	Std. Radius meters / feet	Branch meters / feet	Branch meters / feet	
25	33.4	3.4	0.5		0.2	1.3		
1	1.315	0.133	1.7		0.8	4.2		
32	42.2	3.6	0.8	0.8	0.3	1.4	1.4	
1-1/4	1.660	0.140	2.5	2.5 1.0		4.7	4.7	
40	48.3	40	1.1	1.1	0.5	2.0	2.0	
1-1/2	1.900	0.154	3.5	3.5	1.5	6.5	6.5	
50	60.3	5.2	1.2	1.2	0.5	2.6	2.6	
2	2.375	0.203	4.0	4.0	1.7	8.5	8.5	
65	73.0	5.0	1.4	1.4	0.6	3.1	3.1	
2-1/2	2.875	0.197	4.5	4.5	2.0	10.0	10.0	
80	88.9	6.3	1.5	1.5	0.8	3.7	3.7	
3	3.500	0.237	5.0	5.0	2.5	12.0	12.0	
100	114.3	5.6	2.0	2.0 0.9		4.6	4.6	
4	4.500	0.220	6.7	6.7	3.0	15.0	15.0	
125	141.3	6.6	2.3	2.3	1.2	5.8	5.8	
5	5.563	0.258	7.5	7.5	4.0	19.0	19.0	
150	168.3	7.1	2.7	2.7	1.4	6.7	6.7	
6	6.625	0.280	9.0	9.0	4.5	22.0	22.0	
200	219.1	8.2	4.0	4.0	2.0	10.1	10.1	
8	8.625	0.322	13.0	13.0	6.5	33.0	33.0	
250	273.0	8.8	5.2		2.5	12.5		
10	10.750	0.365	17.0		8.3	41.0		
300	323.9	9.5	6.1		3.1	14.9		
12	12.750	0.375	20.0		10.0	49.0		





DATA CHART NOTES

Nominal Size mm/in	Pipe O.D. mm/in	Max. Working Pressure Bar/PSI	Max. End Load kN/Lbs	Axial Displacement mm/in	Angular N Degree Per Coupling(°)	ovement Pipe mm/m in/ft	A mm/in	Dimensior B mm/in	C mm/in	Bolt Size in	Bolt Torque N-m/Lbs-Ft	Weight Kgs/Lbs
1	2	3	4	5		L 5	-	7	_	8	9	10

 1
 Nominal Size: VGS couplings and fittings are identified by the nominal IPS pipe size in inches or nominal diameter of pipe (DN) in millimeters.

Pipe OD: Actual outside diameter of pipe in inches and millimeters.

- 3 Maximum Working Pressure: Maximum working pressures listed are CWP (cold water pressure) or maximum allowed working pressure within the service temperature range of the gasket used in the coupling, based on standard wall or sch. 40 steel pipe, cut or roll-grooved to ANSI/AWWA C606-04 specifications.
 - These ratings may occasionally differ from maximum working pressures listed and/or approved by UL, ULC, and/or FM as testing conditions and test pipes differ. For performance data on other pipe schedules contact VGS.

Note: For one time field test only the maximum joint working pressure may be increased 1.5 times the figures shown.

- A Maximum End Load: Maximum end loads listed are total of internal and external forces to which the joint can be subjected, based on standard wall or sch. 40 steel pipe, cut or roll-grooved to ANSI/AWWA C606-04 specifications.
- 5 Axial Displacement: Designed range of the gap between pipe ends based on roll grooved pipe.
- Angular Movement (Deflection): Maximum allowable deflection of pipe from centerline when the joint is used with cut or roll-grooved steel pipe under no internal pressure.
- Z Dimensions: "A", "B", "C" and so on are external dimensions for reference purpose only in millimeters and inches.
- 8 Bolt Size: UNC bolt size and length in inches and ISO metric bolt size and length in millimeters with numbers of bolts where applicable.
- 9 Bolt Torque: Recommended bolt fastening torque in Lbs-Ft and N-m.
- 10 Approximate Weight: Weight of a coupling complete with gasket, bolts and nuts or of a fitting in kilograms and pounds.

GENERAL NOTES

Service Fluid and Temperature: Service fluid and temperature limitations for VGS couplings are primarily governed by the gasket used within the coupling. Always refer to and consult the VGS Gasket Selection Guide.

Working Pressure: VGS grooved couplings are engineered for use with a wide variety of pipe types and can be used within the rated working pressures as shown in the VGS literature. A one time only field test at 1.5 times the working pressure is allowed.

As there are limitations in service temperatures, the VGS couplings and fittings do not adopt the ANSI temperature-pressure ratings (Class 150, Class 300, etc.), ISO or JIS methods of pressure ratings (PN10, PN16, JIS 10K or 20K, etc.). All the published working pressures are CWP, non-shock cold water pressures, unless otherwise specified. Actual allowed working pressures for a specific coupling will

vary depending on the coupling size, pipe material, pipe schedule (or thickness) and types of grooves used. Special attention is required when using thin wall stainless steel pipe such as sch. 10S and 5S. For further details request the performance data for specific thin wall pipe.

The dimensions, weights, performance data, and other specifications shown in this catalog supersede all previous published data. VGS reserves the right to change product designs and or specifications without notice and without obligation.

Illustrations shown within this catalog are for illustrative purposes. They are not drawn to scale and may have been exaggerated for clarity. Any person who makes use of the information or materials contained herein shall do so at their own risk and shall be liable for any results arising from such use.



Product Specifications Grooved Couplings

MODEL V-Z05 STANDARD RIGID COUPLING

Angle-Pad Design

The VGS Model V-Z05 is an angle-pad design standard rigid coupling for general piping applications where rigidity is required including valve connections, mechanical rooms, fire mains and long straight runs. The anglepad design allows the coupling housings to slide along the bolt pads when tightened. The result is an offset clamping action which provides a rigid joint that resists flexural and torsional loads. Support and hanging requirements correspond to ANSI B31.1, B31.9 and NFPA 13.

Sizes available: 1-1/4 in ~ 10 in / 32 mm ~ 200 mm Working Pressure: Up to 300 psi / 20 bar









Nominal		Max. Working	Max. End	Axial		Dimensions			Bolts Size	
Size	Pipe O. D.	Pressure	Load	Displacement	A	В	С			Weight
mm/in	mm/in	Bar/PSI	kN/Lbs	mm/in	mm/in	mm/in	mm/in	No.	mm/in	Kgs/Lbs
32	42.2	20	2.80	0 ~ 1.2	66	102	46		M10 x 55	0.6
1.25	1.660	300	649	0 ~ 0.05	2.60	4.00	1.81	2	3/8 x 2-1/8	1.4
40	48.3	20	3.66	0 ~ 1.2	72	109	46		M10 x 55	0.7
1.5	1.900	300	850	0 ~ 0.05	2.83	4.29	1.81	2	3/8 x 2-1/8	1.5
50	60.3	20	5.71	0 ~ 1.7	85	117	47		M10 x 70	0.8
2	2.375	300	1330	0 ~ 0.07	3.35	4.61	1.85	2	3/8 x 2-3/4	1.7
65	73.0	20	8.37	0 ~ 1.7	98	132	47		M10 x 70	0.9
2.5	2.875	300	1950	0 ~ 0.07	3.86	5.20	1.85	2	3/8 x 2-3/4	2.1
65	76.1	20	11.01	0 ~ 1.7	100	136	47		M10 x 70	1.0
80	88.9	20	12.41	0 ~ 1.7	113	148	48		M10 x 70	1.2
3	3.500	300	2885	0 ~ 0.07	4.45	5.83	1.88	2	3/8 x 2-3/4	2.6
100	114.3	20	24.77	0 ~ 4.1	146	182	53		M10 x 70	1.9
4	4.500	300	5565	0 ~ 0.16	5.75	7.17	2.09	2	3/8 x 2-3/4	4.1
125	141.3	20	32.45	0 ~ 4.1	175	229	53		M12 x 75	2.6
5	5.563	300	7290	0~0.16	6.89	9.02	2.09	2	1/2 x 3	5.7
150	165.1	20	44.30	0 ~ 4.1	200	246	54		M12 x 75	3.1
150	168.3	20	46.02	0 ~ 4.1	203	249	54		M12 x 75	3.1
6	6.625	300	10340	0~0.16	8.00	9.80	2.13	2	1/2 x 3	6.8
200	219.1	20	78.00	0 ~ 4.8	264	330	64		M16 x 135	6.1
8	8.625	300	17525	0~0.19	10.40	12.99	2.52	2	5/8 x 5-5/16	13.4

MODEL V-Z07 STANDARD RIGID COUPLING



Nominal		Max. Working	Max. End	Axial					Bolts Size	
Size	Pipe O. D.	Pressure	Load	Displacement	A	В	С			Weight
mm/in	mm/in	Bar/PSI	kN/Lbs	mm/in	mm/in	mm/in	mm/in	No.	mm/in	Kgs/Lbs
250	273.0	24	202.21	0 ~ 3.2	327	431	65			10.3
10	10.750	350	45400	0 ~ 0.13	12.86	16.98	2.56	2	7/8 x 6-1/2	22.9





Product Specifications Grooved Couplings

MODEL V-7705 STANDARD FLEXIBLE COUPLING

The VGS Model V-7705 flexible coupling is designed for use in a variety of piping applications of moderate or high pressure services. Working pressure is usually dictated by the wall thickness and rating of the pipe being used. The Model V-7705 couplings feature flexibility that can deal with misalignment, distortion, thermal stress, vibration and noise and also resist seismic tremors. With the use of Model V-7705 couplings you can even design a curved layout. See Typical Applications – Flexible Couplings on page 25.

Sizes available: 1-1/2" $_{\sim}$ 8" / 40mm $_{\sim}$ 200mm Working Pressure: Up to 500 psi / 35 bar







NIKING

1-1/2" ~ 8"

Nominal	ominal Pipe Max. Working Max. End Axial					Dimensions			
Size mm/in	O.D. mm/in	Pressure Bar/PSI	Load kN/Lbs	Displacement mm/in	A mm/in	B mm/in	C mm/in	Bolt Size mm/in	Weight Kgs/Lbs
40	48.3	20	6.3	1.6	72	108	46	M10 x 55	0.7
1.5	1.900	300	1420	0.0625	2.83	4.25	1.81	3/8 x 2-1/8	1.6
50	60.3	20	9.9	1.6	84	129	48	M10 x 55	0.8
2	2.375	300	2210	0.0625	3.31	5.08	1.89	3/8 x 2-1/8	1.8
65	73.0	20	14.4	1.6	99	142	48	M10 x 55	0.9
2.5	2.875	300	3240	0.0625	3.9	5.59	1.89	3/8 x 2-1/8	2.0
65	76.1	20	15.7	1.6	102	147	48	M10 x 55	1.0
80	88.9	20	21.4	1.6	116	169	48	M12 x 75	1.3
3	3.500	300	4810	0.0625	4.57	6.65	1.89	1/2 x 3	2.8
100	114.3	20	35.4	3.2	145	197	52	M12 x 75	1.9
4	4.500	300	7950	0.125	5.71	7.76	2.05	1/2 x 3	4.1
125	141.3	20	48.6	3.2	172	234	52	M16 x 90	2.6
5	5.563	300	10930	0.125	6.77	9.21	2.05	5/8 x 3-1/2	5.7
150	165.1	20	66.4	3.2	196	260	54	M16 x 90	3.1
150	168.3	20	69.0	3.2	200	268	62	M16 x 90	3.2
6	6.625	300	15500	0.125	7.87	10.55	2.44	5/8 x 3-1/2	7.0
200	219.1	20	116.9	3.2	260	350	64	M16 x 90	5.8
8	8.625	300	26280	0.125	10.24	13.78	2.52	5/8 x 3-1/2	12.8





Product Specifications Grooved Couplings

MODEL V-7706 REDUCING COUPLING

The VGS Model V-7706 reducing coupling allows for direct reduction on a piping run and eliminates the need for a concentric reducer and couplings. The specially designed rubber gasket helps prevent small pipe from telescoping into larger pipe during vertical assembly.

Caution: The Model V-7706 couplings should not be used with an end cap, as the end cap may be sucked into the pipe when draining the system.







NIKING

Nominal	Pipe	Max. Working	Max. End	Axial	Angular N	lovement		Dimension	s		
Size mm/in	O.D. mm/in	Pressure Bar/PSI	Load kN/Lbs	Displacement mm/in	Per Coupling Degree (°)	Per Pipe mm/m in/ft	A mm/in	B mm/in	C mm/in	Bolt Size mm/in	Weight Kgs/Lbs
50 x 40	60.3 x 48.3	20	4.40	0 ~ 3.2		26.0	85	122	48	M10 x 55	0.9
2 x 1.5	2.375 x 1.900	300	1550	0~0.13	3° - 02'	0.31	3.35	4.80	1.89	3/8 x 2-1/8	2.0
65 x 50	73.0 x 60.3	20	6.85	0 ~ 3.2		22.0	96	144	48	M10 x 55	1.2
2.5 x 2	2.875 x 2.375	300	2270	0~0.13	2° - 30'	0.26	3.78	5.67	1.89	3/8 x 2-1/8	2.6
65 x 50	76.1 x 60.3	20	6.85	0 ~ 3.2	28 24	21.0	102	138	48	M10 x 55	1.2
					2 - 24						
80 x 50	88.9 x 60.3	20	6.85	0 ~ 3.2	2° - 04'	18.0	116	168	48	M12 x 75	1.5
3 x 2	3.500 x 2375	300	3370	0~0.13	2 - 04	0.22	4.57	6.61	1.89	1/2 x 3	3.3
80 x 65	88.9 x 73.0	20	10.04	0 ~ 3.2	2° - 04'	18.0	116	168	48	M12 x 75	1.7
3 x 2.5	3.500 x 2.875	300	3370	0~0.13	2 - 04	0.22	4.57	6.61	1.89	1/2 x 3	3.7
80 x 65	88.9 x 76.1	20	10.91	0 ~ 3.2	2° - 04'	18.0	116	168	48	M12 x 75	1.7
					2 04						
100 x 50	114.3 x 60.3	20	6.85	0 ~ 4.8	2° - 04'	21.0	146	198	52	M12 x 75	2.4
4 x 2	4.500 x 2.375	300	5560	0 ~ 0.19	2 04	0.25	5.75	7.80	2.05	1/2 x 3	5.3
100 x 65	114.3 x 73.0	20	10.04	0 ~ 4.8	2º - 24'	21.0	146	198	52	M12 x 75	2.6
4 x 2.5	4.500 x 2.875	300	5560	0~0.19	2 - 24	0.25	5.75	7.80	2.05	1/2 x 3	5.7
100 x 65	114.3 x 76.1	20	10.91	0 _~ 4.8	2° - 24'	21.0	146	198	52	M12 x 75	2.6
					2 - 24						
100 x 80	114.3 x 88.9	20	14.89	0 ~ 4.8	2° - 24'	21.0	146	198	52	M12 x 75	2.4
4 x 3	4.500 x 3.500	300	5560	0~0.19	2 24	0.25	5.75	7.80	2.05	1/2 x 3	5.3
150 x 100	165.1 x 114.3	20	24.61	0 ~ 6.4	2º - 14'	20.0	202	269	52	M16 x 90	4.5
					2 - 14						
150 x 100	168.3 x 114.3	20	24.61	0~6.4	2º - 12'	19.0	208	275	52	M16 x 90	4.5
6 x 4	6.625 x 4.500	300	12060	0~0.25	2 - 12	0.23	8.19	10.83	2.05	5/8 x 3-1/2	9.9
200 x 150	219.1 x 168.3	20	53.35	0 ~ 6.4	1° - 40'	15.0	260	334	57	M20 x 120	7.6
8 x 6	8.625 x 6.625	300	20440	0 ~ 0.25	1 - 40	0.18	10.24	13.15	2.24	3/4 x 4-3/4	16.7
200 x 150	219.1 x 165.1	20	51.35	0 ~ 6.4	1º - 40'	15.0	260	334	57	M20 x 120	7.6
					1 40						

Deflection or angular movement is the maximum value that a coupling allows under no internal pressure.



C-E

C-E

Fig. 7111

45° Elbow

GROOVED ELBOWS MODEL V-7110 90° ELBOW MODEL V-7111 45° ELBOW MODEL V-7112 22-¹/2° ELBOW MODEL V-7113 11-¹/4° ELBOW

VGS grooved fittings are cast of ductile iron.









KING

Nominal Size	Pipe O.D.	V-7 90° E	110 Ibow	V-7 45° E	111 Ibow	V-7112 22-1/2° Elbov	N	V-71 11-1/4° E	13 Elbow
mm/in	mm/in	C - E	Kgs/Lbs	C - E	Kgs/Lbs	C - E	Kgs/Lbs	C - E	Kgs/Lbs
32	42.2	70	0.5	45	0.3	45	0.3	35	0.2
1.25	1.660	2.75	1.1	1.75	0.7	1.75	0.7	1.38	0.4
40	48.3	70	0.7	45	0.4	45	0.6	35	0.3
1.5	1.900	2.75	1.5	1.75	0.9	1.75	1.3	1.38	0.7
50	60.3	83	0.9	51	0.7	48	0.8	35	0.8
2	2.375	3.25	2.0	2.00	1.5	1.88	1.8	1.38	1.8
65	73.0	95	1.2	57	0.9	51	1.0	38	1.0
2.5	2.875	3.75	2.6	2.25	2.0	2.01	2.2	1.50	2.2
65	76.1	95	1.4	57	1.0	51	1.0	38	1.0
80	88.9	108	2.0	64	1.3	57	1.4	38	0.8
3	3.500	4.25	4.3	2.50	2.9	2.25	3.1	1.50	1.8
114.3	127	2.8	76	2.0	73	2.0	45		
4	4.500	5.00	6.2	3.00	4.4	2.88	4.4	1.75	3.3
125	141.3	140	5.0	83	3.5				
5	5.563	5.50	11.0	3.25	7.7				
150	168.3	165	6.4	89	4.4	79	5.0	51	3.4
6	6.625	6.50	14.1	3.50	9.7	3.12	11.0	2.00	7.5
150	165.1	165	5.7	89	4.4	79	5.0	51	3.4
200	219.1	197	12.5	108	9.0	98	10.0	51	5.5
8	8.625	7.75	27.5	4.25	19.8	3.88	22.0	2.00	12.1
250	273.0	229	24.0	121	17.0				
10	10.750	9.00	52.8	4.75	37.4				

MODEL V-7110DR DRAIN ELBOW

The Model V-7110DR is a grooved-end ductile iron cast elbow with an integral 1" NPT or BSP drain. The V-7110DR was primarily designed for, but not limited to, use on fire protection standpipes.



Also available with	hot dip zinc gal	vanized finished (d	optional).





MODEL V-7120 TEE MODEL V-7135 CROSS

VGS grooved fittings are cast of ductile iron.









Nominal Size	Pipe O.D.	V-7 Te	120 ee	V-7 Cri	135 pss
mm/in	mm/in	C - E	Kgs/Lbs	C - E	Kgs/Lbs
32	42.2	70	0.7	70	1.0
1.25	1.660	2.75	1.5	2.75	2.2
40	48.3	70	0.9	70	1.1
1.5	1.900	2.75	2.0	2.75	2.5
50	60.3	83	1.3	83	1.2
2	2.375	3.25	2.9	3.25	2.7
65	73.0	95	2.2	95	3.0
2.5	2.875	3.75	4.8	3.75	6.7
65	76.1	95	2.3	95	3.0
80	88.9	108	3.1	108	3.1
3	3.500	4.25	6.8	4.25	6.8
100	114.3	127	4.6	127	5.2
4	4.500	5.00	10.1	5.00	11.5
125	141.3	140	6.5		
5	5.563	5.50	14.3		
150	168.3	165	10.0	165	14.5
6	6.625	6.50	22.0	6.50	32.0
150	165.1	165	8.5	165	14.5
200	219.1	197	20.0	197	20.00
8	8.625	7.75	44.0	7.75	44.1

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> Fig. V-7135 Cross





MODEL V-7121 REDUCING TEE

VGS reducing tees are cast of ductile iron.



LISTED	APPROVED		
Nominal Size	Pipe	Standard	Weight
mm/in	O.D.	C - E	Kac/Lbc
505025	(0.2	02	1.2
50 X 50 X 25	00.3 X 00.3 X 33.4	3 25	1.2
50 x 50 x 40	60 3 x 60 3 x 48 3	83	1.2
2 x 2 x 1.5	2.375 x 2.375 x 1.900	3.25	2.6
65 x 65 x 25	73.0 x 73.0 x 33.4	95	1.7
2.5 x 2.5 x 1	2.875 x 2.875 x 1.315	3.75	3.8
65 x 65 x 40	76.1 x 76.1 x 48.3	95	1.8
65 x 65 x 50	73.0 x 73.0 x 60.3	95	2.0
2.5 x 2.5 x 2	2.8/5 x 2.8/5 x 2.3/5	3./5	4.4
05 X 05 X 50	70.1 X 70.1 X 00.3	95	2.0
80 x 80 x 25	88.9 x 88.9 x 33.4	108	2.8
3 x 3 x 1	3.500 x 3.500 x 1.315	4.25	6.1
80 x 80 x 40	88.9 x 88.9 x 48.3	108	2.9
3 x 3 x 1.5	3.500 x 3.500 x 1.900	4.25	6.5
80 x 80 x 50	88.9 x 88.9 x 60.3	108	2.8
3 x 3 x 2	3.500 x 3.500 x 2.375	4.25	6.2
80 x 80 x 65	88.9 x 88.9 x 73.0	108	2.8
3 x 3 x 2.5	3.500 x 3.500 x 2.875	4.25	6.2
80 x 80 x 65	88.9 x 88.9 x 76.1	108	2.8
 100 x 100 x 25	 114.2 x 114.2 x 22.4		2.5
4 x 4 x 1	4 500 x 4 500 x 1 315	3 75	7.8
100 x 100 x 50	114.3 x 114.3 x 60.3	127	4.2
4 x 4 x 2	4,500 x 4,500 x 2,375	5.00	9.2
100 x 100 x 65	114.3 x 114.3 x 73.0	127	4.3
4 x 4 x 2.5	4.500 x 4.500 x 2.875	5.00	
100 x 100 x 65	114.3 x 114.3 x 76.1	127	4.3
100 x 100 x 80	114.3 x 114.3 x 88.9	127	4.5
4 x 4 x 3	4.500 x 4.500 x 3.500	5.00	9.9
125 X 125 X 50	141.3 X 141.3 X 60.3	5 50	0.0
125 x 125 x 100	141 3 x 141 3 x 114 3	140	62
5 x 5 x 4	5.563 x 5.563 x 4.500	5.50	13.6
150 x 150 x 50	168.3 x 168.3 x 60.3	165	8.0
6 x 6 x 2	6.625 x 6.625 x 2.375	6.50	17.6
150 x 150 x 65	168.3 x 168.3 x 73.0	165	8.5
6 x 6 x 2.5	6.625 x 6.625 x 2.875	6.50	18.7
150 x 150 x 80	168.3 x 168.3 x 88.9	165	9.2
6 x 6 x 3	6.625 x 6.625 x 3.500	6.50	20.2
150 x 150 x 100	168.3 x 168.3 x 114.3	165	8.8
6 x 6 x 4	6.625 x 6.625 x 4.500	6.50	19.4
150 x 150 x 50	105.1 X 105.1 X 00.5	105	8.0
150 x 150 x 65	165.1 x 165.1 x 76.1	165	8.5
150 x 150 x 80	165.1 x 165.1 x 88.9	165	9.2
6 x 6 x 3	6.500 x 6.500 x 3.500	6.50	20.2
150 x 150 x 100	165.1 x 165.1 x 114.3	165	8.8
200 x 200 x 80	219.1 x 219.1 x 88.9	197	16.8
8 x 8 x 3	8.625 x 8.625 x 3.500	7.75	37.0
200 x 200 x 100	219.1 x 219.1 x 114.3	197	20.0
8 x 8 x 4	8.625 x 8.625 x 4.500	7.75	44.0
200 x 200 x 150	219.1 X 219.1 X 168.3	7 75	21.0
0.0.0	3.023 × 0.023 × 0.023	1.15	40.2



 * Also available with hot dip zinc galvanized finished (optional).



Trusted above all.™



MODEL V-7150 CONCENTRIC REDUCER

The VGS concentric reducers are cast using ductile iron. The end-to-end dimensions of these reducers are less than that of fabricated reducers of the same size.





Fig. V-7150 Conc. Reducer



Nominal	Pipe	V-7150 Conc. Reducer			
Size	O.D.	E - E	Weight		
mm/in	mm/in	mm/in	kgs/Lbs		
32 x 25	42.2 x 33.4	64	0.20		
1.25 x 1	1.660 x 1.315	2.50	0.44		
40 x 25	48.3 x 33.4	64	0.23		
1.5 x 1	1.900 x 1.315	2.50	0.51		
40 x 32	48.3 x 42.2	64	0.28		
1.5 x 1.25	1.900 x 1.660	2.50	0.62		
50 x 32	60.3 x 42.2	64	0.4		
2 x 1.25	2.375 x 1.660	2.50	0.9		
50 x 40	60.3 x 48.3	64	0.35		
2 x 1.5	2.375 x 1.900	2.50	0.77		
65 x 50	73.0 x 60.3	64	0.60		
2.5 x 2	2.875 x 2.375	2.50	1.30		
65 x 50	76.1 x 60.3	64	0.5		
80 x 50	88.9 x 60.3	64	0.6		
3 x 2	3.500 x 2.375	2.50	1.3		
80 x 65	88.9 x 73.0	64	0.6		
3 x 2.5	3.500 x 2.875	2.5	1.3		
80 x 65	88 9 x 76 1	64	0.6		
100 x 50	114.3 x 60.3	76	1.1		
4 x 2	4.500 x 2.375	3.00	2.2		
100 x 65	114.3 x 73.0	76	1.0		
4 x 2.5	4.500 x 2.875	3.0	2.2		
100 x 65	114.3 x 76.1	76	1.0		
100 x 80	114.3 x 88.9	76	1.0		
4 x 3	4.500 x 3.500	3.00	2.2		
125 x 100	141.3 x 114.3	89	2.0		
5 x 4	5.563 x 4.500	3.50	4.4		
150 x 50	168.3 x 60.3	102	1.9		
6 x 2	6.625 x 2.375	4.00	4.2		
150 x 80	168.3 x 88.9	102	2.0		
6 x 3	6.625 x 3.500	4.00	4.4		
150 x 100	168.3 x 114.3	102	2.1		
6 x 4	6.625 x 4.500	4.00	4.6		
150 x 125	168.3 x 141.3	102	2.5		
6 x 5	6.625 x 5.563	4.00	5.5		
200 x 100	219.1 x 114.3	127	5.1		
8 x 4	8.625 x 4.500	5.00	11.2		
200 x 150	219.1 x 168.3	127	5.2		
8 x 6	8.625 x 6.625	5.00	11.4		





MODEL V-7160 END CAP









Nominal		V-/160 End Cap	
Size	Pipe O.D.	E-E	
mm/in	mm/in	mm/in	Kgs/Lbs
32	42.2	25	0.2
1.25	1.660	1.00	0.4
40	48.3	25	0.2
1.5	1.900	1.00	0.4
50	60.3	25	0.3
2	2.375	1.00	0.7
65	73.0	25	0.4
2.5	2.875	1.00	0.9
65	76.1	25	0.4
80	88.9	25	0.7
3	3.500	1.00	1.5
100	108.0	25	1.1
4	4.250	1.00	2.4
125	141.3	25	1.7
5	5.563	1.00	3.7
150	168.3	25	3.0
6	6.625	1.00	6.6
150	165.1	25	3.0
200	219.1	30	5.5
8	8.625	1.18	12.1
250	273.0	32	7.0
10	10.750	1.25	15.4
300	323.9	32	10.0
12	12.750	1.25	22.0





MODEL V-899 END-ALL FITTING

The Model V-899 End-All fitting is a unique domed end cap fitting available with 1/2", 3/4" and 1" NPT threaded outlets. Designed as an end of line fitting the End-All features two multi-function bosses which can be used for the direct connection of sprinkler heads, sprigs, drops, drains and or gauges.







Nominal Size	Dimer	nsions	10/=:=h+
Grooved X Threaded mm/in	A mm/in	B mm/in	Kqs/Lbs
32 x 15	44.5	30.1	0.3
1.25 x 0.5	1.750	1.190	0.7
32 x 20	44.5	30.1	0.3
1.25 x 0.75	1.750	1.190	0.7
32x 25	48.3	31.8	0.3
1.25 x 1	1.900	1.250	0.7
40 x 15	44.5	33.3	0.4
1.5 x 0.5	1.750	1.313	0.9
40 x 20	44.5	33.3	0.4
1.5 x 0.75	1.750	1.313	0.9
40 x 25	48.3	34.9	0.4
1.5 x 1	1.900	1.375	0.9
50 x 15	44.5	39.7	0.5
2 x 0.5	1.750	1.562	1.1
50 x 20	44.5	39.7	0.5
2 x 0.75	1.750	1.562	1.1
50 x 25	48.3	41.3	0.5
2 x 1	1.900	1.625	1.1
66 x 15	44.5	44.5	0.6
2.5 x 0.5	1.750	1.750	1.3
66 x 20	44.5	44.5	0.6
2.5 x 3/4	1.750	1.750	1.3
66 x 25	48.3	46.0	0.6
2.5 x 1	1.900	1.813	1.3





MODEL V-901 SHORT RADIUS 90° ELBOW MODEL V-903 SHORT RADIUS TEE





Nominal Size	Pipe O.D.	V-9 SR 90°	901 Elbow	V-9 SR Stra	903 ight Tee
mm/in	mm/in	C - E (mm/in)	Kgs/Lbs	C - E (mm/in)	Kgs/Lbs
50	60.3	70	0.7	70	1.0
2	2.375	2.75	1.5	2.75	2.2
65	73.0	76	0.9	76	1.3
2.5	2.875	3.00	2.0	3.00	2.9
65	76.1	76	0.9	76	1.3
80	88.9	86	1.4	86	2.0
3	3.500	3.38	3.1	3.38	4.4
100	114.3	102	1.7	102	3.6
4	4.500	4.00	3.7	4.00	7.9
125	141.3	124	3.5	124	4.6
5	5.563	4.88	7.7	4.88	10.1
150	165.1	140	5.5	140	8.6
150	168.3	140	5.5	140	8.6
6	6.625	5.50	12.1	5.50	18.9
200	219.1	176	11.0	176	16.5
8	8.625	6.94	24.2	6.94	36.3





MODEL V-7041 FLANGE ANSI CLASS 125/150

VGS Model V-7041 flange adapters 2" through 12" (50mm $_{\sim}$ 300mm) are supplied hinged as a single assembly. Maximum working pressure is up to 300 psi (20 bar).





FM C US LISTED APPROVED

Nominal	Pipe	Max. Working	Max. End		Dimensions		Sealing	Surface	Bolt		
Size mm/in	O.D. mm/in	Pressure Bar/PSI	Load kN/Lbs	A mm/in	B mm/in	C mm/in	D mm/in	E mm/in	Size mm/in	No.	Weight Kgs/Lbs
50	60.3	20	5.7	152	121	19	60	87		4	2.0
2	2.375	300	1330	6.00	4.75	0.75	2.36	3.42	5/8	4	4.4
65	73.0	20	8.4	178	140	22	73	102		4	2.5
2.5	2.875	300	1950	7.00	5.50	0.87	2.87	4.00	5/8	4	5.5
80	88.9	20	12.3	190	152	24	89	116		4	3.4
3	3.500	300	2890	7.50	6.00	0.94	3.50	4.56	5/8	Ŧ	7.5
100	114.3	20	20.5	229	191	24	114	141		8	4.0
4	4.500	300	4770	9.00	7.50	0.94	4.50	5.56	5/8	0	8.8
150	168.3	20	44.5	279	241	25	168	198		8	5.5
6	6.625	300	10340	11.00	9.50	1.00	6.62	7.79	3/4	0	12.1
200	219.1	20	75.3	343	298	28	219	254		8	8.0
8	8.625	300	17520	13.50	11.75	1.12	8.62	10.00	3/4	0	17.6
250	273.0	20	117.0	405	355	26	273	308		12	11.7
10	10.750	300	27210	16.00	14.25	1.18	10.75	12.12	7/8	12	25.7
300	323.9	20	164.7	460	410	28	324	359		12	17.7
12	12.750	300	38280	19.00	17.00	1.25	12.75	14.13	7/8	.2	38.9





Product Specification Hole-Cut System

MODEL V-M21 & V-M22 MECHANICAL TEES

The VGS Models V-M21 & V-M22 are compact and advanced design mechanical tees. The Model V-M21 comes with a female threaded outlet and V-M22 with a grooved-end outlet. VGS mechanical tees provide a fast and easy mid-point branch outlet eliminating the need for welding or the use of multiple fittings. The mechanical tee is comprised of ductile iron housing segments, a grade "E" EPDM gasket and plated track bolts and nuts. The locating collar is seated in the hole to secure a positive joint.

When bolts are tightened with a proper torque, the outlet housing comes to metal-to-metal contact with the outer surface of the pipe.

NOTES:

1, V-M21 and V-M22 housing segments and gaskets are compatible with each other.

2. The hole must be clearly cut using the correct size hole saw and shall have a smooth edge. Never use a torch for cutting a hole.

3. It is normal to see equal bolt pad gaps on both sides of mechanical tee.







It is normal to see bolt pad gaps





Product Specification Hole-Cut System

MODEL V-M21 MECHANICAL TEE FEMALE THREADED OUTLET

The VGS Model V-M21 mechanical tee provides a fast and easy mid-pipe threaded branch outlet. Threads are NPT per ANSI B1.20.1. UL/FM working pressure is rated 300 psi (20 bar).





Nominal Size	Hole Dia.			Dimensions			Bolt	
Run x Branch	+3.2,-0/+0.13,-0	T*	A mm/in	B mm/in	C mm/in	D mm/in	Size mm/in	Weight Kas/Lbs
50 X 25	38	47	63.5	38.1	115.9	81	M10 X 55	1.09
2 X 1	1.50	1.85	2.50	1.50	4.56	3.19	3/8 X 2-1/8	2.40
50 X 32	[45]	52	73.0	38.1	115.9	84	M10 X 55	1.26
2 X 1.25	[1.75]	2.05	2.87	1.50	4.56	3.31	3/8 X 2-1/8	2.77
50 X 40	[45]	52	76.2	38.1	115.9	84	M10 X 55	1.37
2 X 1.5	[1.75]	2.08	3.00	1.50	4.56	3.31	3/8 X 2-1/8	3.01
65 X 25	38	53	69.9	44.5	141 3	81	M12 X 60	1 30
25X1	1.50	2.09	2 75	1.75	5 56	3 19	1/2 X 2-3/8	2.86
65 X 32	51	58	76.2	44.5	141.3	94	M12 X 60	1.46
2.5 X 1.25	2.00	2.28	3.00	1.75	5.56	3.70	1/2 X 2-3/8	3.21
65 X 40	51	58	76.2	44.5	141.3	94	M12 X 60	1.56
2.5 X 1.5	2.00	2.28	3.00	1.75	5.56	3.70	1/2 X 2-3/8	3.43
80 X 25	38	61	77.8	53.2	157.2	81	M12 X 75	1.53
3 X 1	1.50	2.40	3.06	2.09	6.19	3.19	1/2 X 3	3.37
80 X 32	51	65	82.6	53.2	157.2	94	M12 X 75	1.81
3 X 1.25	2.00	2.56	3.25	2.09	6.19	3.70	1/2 X 3	3.98
80 X 40	51	71	88.9	53.2	157.2	94	M12 X 75	1.88
3 X 1.5	2.00	2.80	3.50	2.09	6.19	3.70	1/2 X 3	4.14
80 X 50	64	70	88.9	53.2	157.2	108	M12 X 75	2.07
3 X 2	2.50	2.76	3.50	2.09	6.19	4.25	1/2 X 3	4.55
100 X 25	38	73	93.7	66.7	182.6	79.4	M12 X 75	1.70
4 X 1	1.50	2.87	3.69	2.63	7.19	3.13	1/2 X 3	3.74
100 X 32	51	78	92.1	66.7	182.6	101.6	M12 X 75	1.90
4 X 1.25	2.00	3.07	3.63	2.63	7.19	4.00	1/2 X 3	4.18
100 X 40	51	84	92.1	66.7	182.6	101.6	M12 X 75	2.04
4 X 1.5	2.00	3.31	3.63	2.63	7.19	4.00	1/2 X 3	4.49
100 X 50	64	83	101.6	66.7	182.6	101.6	M12 X 75	2.27
4 X 2	2.50	3.27	4.00	2.63	7.19	4.00	1/2 X 3	5.00
100 X 65	70	73	101.6	66.7	182.6	112.7	M12 X 75	2.47
4 X 2.5	2.75	2.87	4.00	2.63	7.19	4.44	1/2 X 3	5.43
100 X 80	89	84	104.8	66.7	182.6	128.6	M12 X 75	2.91
4 X 3	3.50	3.31	4.13	2.63	7.19	5.06	1/2 X 3	6.41
125 X 50	64	83	120.7	81.0	223.8	106.4	M16 X 90	2.90
5 X 2	2.50	3.27	4.75	3.19	8.81	4.19	5/8 X 3-1/2	6.38
150 X 32	51	112	130.2	94.5	250.8	92.1	M16 X 90	2.91
6 X 1.25	2.00	4.41	5.13	3.72	9.87	3.63	5/8 X 3-1/2	6.41
150 X 40	51	112	130.2	94.5	250.8	92.1	M16 X 90	2.99
6 X 1.5	2.00	4.41	5.13	3.72	9.87	3.63	5/8 X 3-1/2	6.58
150 X 50	64	111	130.2	94.5	250.8	106.4	M16 X 90	3.18
6 X 2	2.50	4.37	5.13	3.72	9.87	4.19	5/8 X 3-1/2	7.00
150 X 65	70	101	130.2	94.5	250.8	112.7	M16 X 90	3.58
6 X 2.5	2.75	3.98	5.13	3.72	9.87	4.44	5/8 X 3-1/2	7.88

1. Hole diameters listed are suggested hole saw diameters. 2. *T: Take-out (Center of run to end of pipe to be engaged)





Product Specifications Hole-Cut System

MODEL V-M22 MECHANICAL TEE, GROOVED-END OUTLET

The VGS Model V-M22 mechanical tee provides a fast and easy mid-pipe grooved-end branch outlet. The groove dimensions conform to AWWA C606. UL/FM working pressure is rated 300 psi (20 bar).







Nominal Size	Pipe	Hole Dia.	Dimensions			Dimensions Bolt		Bolt	
Run x Branch	O.D.	+3.2,-0/+0.13,-0	A mm/in	B mm/in	C mm/in	D mm/in	Size mm/in	Weight Kas/Lbs	
80 X 40	88.9 X 48.3	51	90.5	53.2	157.2	94.0	M12 X 75	1.70	
3 X 1.5	3.500 X 1.900	2.00	3.56	2.09	6.19	3.70	1/2 X 3	3.74	
80 X 50	88.9 X 60.3	64	90.5	53.2	157.2	108.0	M12 X 75	1.83	
3 X 2	3.500 X 2.375	2.50	3.56	2.09	6.19	4.25	1/2 X 3	4.03	
100 X 40	114.3 X 48.3	51	92.1	66.7	182.6	101.6	M12 X 75	1.81	
4 X 1.5	4.500 X 1.900	2.00	3.63	2.63	7.19	4.00	1/2 X 3	3.98	
100 X 50	114.3 X 60.3	64	101.6	66.7	182.6	101.6	M12 X 75	1.93	
4 X 2	4.500 X 2.375	2.50	4.00	2.63	7.19	4.00	1/2 X 3	4.25	
100 X 65	114.3 X 73.0	70	101.6	66.7	182.6	112.7	M12 X 75	2.66	
4 X 2.5	4.500 X 2.875	2.75	4.00	2.63	7.19	4.44	1/2 X 3	5.85	
100 X 80	114.3 X 88.9	89	104.8	66.7	182.6	128.6	M12 X 75	2.41	
4 X 3	4.500 X 3.500	3.50	4.13	2.63	7.19	5.06	1/2 X 3	5.30	
125 X 50	141.3 X 60.3	64	120.7	81.0	223.8	106.4	M16 X 90	2.63	
5 X 2	5.563 X2.375	2.50	4.75	3.19	8.81	4.19	5/8 X 3-1/2	5.79	
125 X 65	141.3 X 73.0	70	120.7	81.0	223.8	112.7	M16 X 90	2.88	
5 X 2.5	5.563X 2.875	2.75	4.75	3.19	8.81	4.44	5/8 X 3-1/2	6.34	
150 X 50	168.3 X 60.3	64	130.2	94.5	250.8	106.4	M16 X 90	2.92	
6 X 2	6.625 X 2.375	2.50	5.13	3.72	9.87	4.19	5/8 X 3-1/2	6.42	
150 X 65	168.3 X 73.0	70	130.2	94.5	250.8	112.7	M16 X 90	3.22	
6 X 2.5	6.625 X 2.875	2.75	5.13	3.72	9.87	4.44	5/8 X 3-1/2	7.08	
150 X 80	168.3 X 88.9	89	130.2	94.5	250.8	131.8	M16 X 90	3.68	
6 X 3	6.625 X 3.500	3.50	5.13	3.72	9.87	5.19	5/8 X 3-1/2	8.10	
150 X 100	168.3 X 114.3	114	137.1	94.5	250.8	158.8	M16 X 90	4.05	
6 X 4	6.625 X 4.500	4.50	5.40	3.72	9.87	6.25	5/8 X 3-1/2	8.91	

1. Hole diameters listed are suggested hole saw diameters.





Product Specification Hole-Cut System

MODEL V-723 SADDLE-LET (Small Mechanical Tee)

The Model 723 Saddle-Let is the ideal outlet fitting for direct connections to sprinkler heads, drop nipples and or gauges. No need for welding, just cut or drill a hole at the desired outlet location. Position the Saddle-Let so that the locating collar fits within the hole and secure with the U-bolt and nuts. The Saddle-Let comes with a standard black finish or as an option can be supplied electro zinc plated or painted orange. The Saddle-Let allows full bore flow and is pressure rated to 300 psi (20 bar).





	Hole Dia.	D	imensions-mm/	/in	Take-Out			
Nominal Size	+1.6, -0/+0.063, -0				Т	Bolt Size	Bolt Torque	Weight
mm/in	mm/in	A	В	C	mm/in	in	N-M/Lb-Ft	Kgs/Lbs
32 x 15	30	53.0	89.0	56.0	35.0	3/8ø	20 - 30	0.4
1.25 x 0.5	1.18	2.08	3.50	2.20	1.38	U-Bolt	15 - 22	0.9
32 x 20	30	53.0	89.0	56.0	35.0	3/8ø	20 - 30	0.4
1.25 x 0.75	1.18	2.08	3.50	2.20	1.38	U-Bolt	15 - 22	0.9
32 x 25	30	56.0	89.0	56.0	38.0	3/8ø	20 - 30	0.4
1.25 x 1	1.18	2.20	3.50	2.20	1.50	U-Bolt	15 - 22	0.9
40 x 15	30	55.0	89.0	56.0	35.0	3/8ø	20 - 30	0.4
1.5 x 0.5	1.18	2.16	3.50	2.20	1.38	U-Bolt	15 - 22	0.9
40 x 20	30	55.0	89.0	56.0	35.0	3/8ø	20 - 30	0.4
1.5 x 0.75	1.18	2.16	3.50	2.20	1.38	U-Bolt	15 - 22	0.9
40 x 25	30	58.0	89.0	56.0	38.0	3/8ø	20 - 30	0.4
1.5 x 1	1.18	2.28	3.50	2.20	1.50	U-Bolt	15 - 22	0.9
50 x 15	30	64.0	98.0	56.0	42.0	3/8ø	20 - 30	0.4
2 x 0.5	1.18	2.51	3.85	2.20	1.65	U-Bolt	15 - 22	0.9
50 x 20	30	64.0	98.0	56.0	42.0	3/8ø	20 - 30	0.4
2 x 0.75	1.18	2.51	3.85	2.20	1.65	U-Bolt	15 - 22	0.9
50 x 25	30	67.0	98.0	56.0	45.0	3/8ø	20 - 30	0.4
2 x 1	1.18	2.63	3.85	2.20	1.77	U-Bolt	15 - 22	0.9
65 x 15	30	69.0	111.0	56.0	51.0	3/8ø	20 - 30	0.4
2.5 x 0.5	1.18	2.71	4.37	2.20	2.00	U-Bolt	15 - 22	0.9
65 x 20	30	69.0	111.0	56.0	51.0	3/8ø	20 - 30	0.4
2.5 x 0.75	1.18	2.71	4.37	2.20	2.00	U-Bolt	15 - 22	0.9
65 x 25	30	72.0	111.0	56.0	54.0	3/8ø	20 - 30	0.5
2.5 x 1	1.18	2.83	4.37	2.20	2.13	U-Bolt	15 - 22	1.1

1. Hole diameters listed are suggested hole saw diameters. 2. *T: Take-out (Center of run to end of pipe to be engaged)





Design Applications Typical Applications

TYPICAL APPLICATIONS - FLEXIBLE COUPLINGS – SPRINKLER SYSTEMS (NFPA 13)

The following illustrations are part of NFPA 13 – 2007 Annex A Explanatory Material. These are for informational purposes only and not a mandatory requirement. For specific requirements for any other areas of sprinkler systems, refer to the latest version of NFPA 13.

1. Flexible Couplings for Main Risers and Branch Line Riser



Note to Detail A: The four-way brace should be attached above the upper flexible coupling required for the riser and preferably to the roof structure if suitable. The brace should not be attached directly to a plywood or metal deck.

FIGURE A.9.3.2(a) Riser Details.



2. Flexible Couplings on Horizontal Portion of Tie-In



3. Flexible Coupling on Main Riser and Branch Line Riser



- FIGURE A.9.3.2.3(2) (b) Flexible Coupling on Main Riser And Branch Line Riser
- 4. Flexible Couplings for Drops



FIGURE A.9.3.2.4 Flexible Coupling for Drops

NGS

Design Applications Typical Applications

5. Seismic Separation Assembly



FIGURE A.9.3.3(a) Seismic Separation Assembly. Shown are an 8 in. (203 mm) Separation Crossed by Pipes up to 4 in. (102mm) in Nominal Diameter. For other separation distances and pipe sizes, lengths and distances should be modified proportionally.

6. Earthquake protection for sprinkler piping







7. Typical Location of Bracing on a Looped System



Typical Location of Bracing on a Looped System.

Systems having more flexible couplings than required above shall be provided with additional sway bracing. A lateral brace shall be provided within 24" (600mm) of every other coupling unless pipes are supported by rods less than 6" (152mm) long from the ceiling or by U-type hooks underside of the structural element. (NFPA 13 – 2007 9.3.2. & 9.3.5.)



Design Application Anchoring, Hanging, and Supports

ANCHORING, HANGING AND SUPPORTS

VGS grooved couplings are designed to hold axial thrusts 4-5 times their rated working pressure, though the strength against bending movements is less than that of steel pipe. The joint may be damaged when a bending movement greater than the allowed deflection occurs. System designers should provide anchors (main and intermediate) and pipe guides with proper spacing to protect the system from unexpected large bending movements.

These illustrations are examples only, and are not intended to be used for all installations as conditions and requirements vary from job to job. Reliance on general data or information contained herein shall be at the user's sole risk and without obligation to Viking.

Hangers shall be designed to support five times the weight of water-filled pipe plus 250 lb (115 kgs) at each point of pipe support (NFPA 13 9.1.1.1.). The following illustrations are examples of acceptable hanger types and sizes per NFPA 13.



Wraparound U-hook

D dimensi

Pipe size in	D dimension in/mm
~ 2	5/16 (7.9)
2-1/2 ~ 6	3/8 (9.5)
8	1/2 (12.7)



on	-	
ſ		

Adjustable swivel

Rod sizes			
Pipe size in	D dimension in/mm		
~ 4	3/8 (9.5)		
5~8	1/2 (12.7)		
10 ~ 12	5/8 (15.9)		



Hangers for straight runs

For straight runs, you can use both flexible and rigid couplings. When rigid couplings are used, the same hanger spacing as other piping methods can be applied. You can refer to the hanger spacing standards of ANSI B31.1 Power Piping Code, B31.9 Building Services Piping Code, NFPA 13 Sprinkler Systems, or Mechanical Equipment Construction Guide (Japan). See the table below.

Suggested Max. Span between Supports (steel pipe)						
Nominal		Water Se	ervice		Gas or Air S	Service
Pipe Size		(met	ers)		(mete	rs)
in/mm	1)	2)	3)	4)	1)	2)
1 / 25	2.1	2.7	3.7	2.0	2.7	2.7
1.25 / 32	2.1	3.4	3.7	2.0	2.7	3.4
1.5 / 40	2.1	3.7	4.6	2.0	2.7	4.0
2 / 50	3.1	4.0	4.6	2.0	4.0	4.6
3 / 80	3.7	4.6	4.6	2.0	4.6	5.2
4 / 100	4.3	5.2	4.6	2.0	5.2	6.4
6 / 150	5.2	6.1	4.6	3.0	6.4	7.6
8 / 200	5.8	6.4	4.6	3.0	7.3	8.5
10/250	5.8	6.4		3.0	7.3	9.5

1) ANSI B31.1 Power Piping Code 2) ANSI B31.9 Building Services Piping Code

3) NFPA 13 Sprinkler systems

4) Ministry of Land & Transportation of Japan: Mechanical Equipment Construction Guide

Hanger locations on straight runs where flexible couplings are used

When flexible couplings are used on straight runs, location of hangers shall be designed as close to each coupling as possible, or within a distance of less than 1/6 the span.







Design Application Anchoring, Hanging, and Supports

Typical designs of hangers and sway braces for pipe runs Pipe runs shall be adequately suspended by rod hangers or steel angles that are directly attached to the building structure to restrict the movement



A rod hanger for a single pipe run



A trapeze hanger for multiple pipe runs

of the piping. Hangers and their components shall be ferrous. The maximum distance between hangers shall not exceed that specified in the table of previous page.



A trapeze hanger suspended from ceiling





Design Application Anchoring, Hanging, and Supports

Supports for risers

In multi-story buildings, risers shall be fixed (or anchored) at the lowest level and at the top of the riser and shall be supported by riser clamps or U-bolts at each floor level to prevent the risers from swaying. If risers are braced by

the penetration floors, the number of riser clamps or U-bolts may be reduced to one at each three stories. For risers, either flexible or rigid couplings can be used as long as proper anchoring and support is provided.





- Anchors should be sufficient to hold the weight of water-filled pipe and pressure thrusts.
- Pipe guides (sway braces) should be such as to brace lateral movement of the system.

Anchors for risers (--)



Sway braces for risers (-++-)



Anchor (->---)



Sway brace (-++-)

Sway brace (-++-)







Technical Information Gasket Selection Guide

Standard Gaskets

V-Z05 (Rigid) and V-7705 (Flexible) VGS Coupling Gaskets					
Compound	Grade	Color Code	Recommended Services	Maximum Temp. Range	
EPDM	E	Green Stripe* Purple Stripe** Green and Purple Stripe***	Good for cold & hot water up to +230°F (+110°C). Also good for services for water with acid, water with chlorine, deionized water, seawater and waste water, dilute acids, oil-free air, and many chemicals Not recommended for petroleum oils, mineral oils, solvents, and aromatic hydrocarbons.	-30°F (-34°C) to +230°F (+110°C)	
*Lubricated **Composition Change, Lubricated ***Additional Color Coding, Lubricated Note: Additional lubricant is not required. All other gasketed products (i.e. reducing coupling, mech tee, etc.) have never been prelubricated.					







GASKET STYLES

Due to the number of VGS products offered and the variety of service applications, a wide variety of gaskets are available. Even though the products and gaskets may look different the sealing principles remain the same. The following are some of the most common gasket styles.



VACUUM SERVICE

VGS standard gaskets are designed to seal well under vacuum conditions up to 10 inHg (absolute)/254 mmHg (absolute) which may occur when a system is drained. For continuous services greater than 10 inHg (absolute)/254 mmHg (absolute), the use of GapSeal[®] gaskets or EP (end protection) gaskets in combination with rigid style couplings is recommended. Contact VGS for specific recommendations.

DRY PIPE AND FREEZER SERVICES

VGS recommends the use of GapSeal[®] Grade E gaskets for dry pipe fire protection systems and freezer applications. The GapSeal[®] gasket closes off the gap between the pipes or gasket cavity. This will prevent any remaining liquid from entering the cavities and freezing when the temperature drops.

Trusted above all.™

Do not use the VGS standard lubricant for dry pipe and freezer systems. Always use a petroleum free silicone based lubricant.



Rigid couplings are preferred for dry pipe, freezer and vacuum applications. Reducing couplings are not recommended for these applications.







Technical Information Chemical Resistance

The following are general service recommendations only and are provided to aid you in selecting the proper gaskets. Unless otherwise noted, the recommendations are based upon $38^{\circ}C$ ($100^{\circ}F$) maximum temperature service

conditions. For unusual and or severe services, or services not listed please contact VGS for a recommendation.

Number= Max. Recommended Temp. (°F) NR= Not Recommended --- = Incomplete Data

Number - Max. Recomme	
Chemical Name	EPDM
Acetaldehyde	200
Acetamide	200
Acetic Acid, to 10%	180
Acetic Acid, 10 - 50%	140
Acetic Acid, Glacial	100
Acetic Anhvdride	100
Aretone	130
Acetonitrile	NR
Acetonhenone	140
Acetyl Chloride	NR
Acetylono	200
Acerdic Docin	NR
Acrylopitrilo	NIR
Acryionitriie	200
Adipic Acid, Saturated	200
Air, oil tree	230
Air with vapored oil	NR
Alkalis	Good
Allyl Alcohol	70
Allyl Chloride	NR
Aluminum Acetate	200
Aluminum Ammonium	200
Aluminum Chloride	200
Aluminum Chrome	200
Aluminum Fluoride	200
Aluminum Hydroxide	200
Aluminum Nitrate	200
Aluminum Phosphate	200
Aluminum Potassium Sulfate	200
Aluminum Salts	200
Aluminum Sulfate	200
Alums	200
Ammmonia	175
Ammonia Anhydrous (Pure Ammonia	NR
Ammonia Gas	140
Ammonia, cus	140
Ammonia, Aqua, 18 22	175
Ammonia nyurokiac	1/0
Ammonium Acetate	140
Ammonium Biriuoride	200
Ammonium Carbonate	200
Ammonium Chloride	200
Ammonium Fluoride, to 10%	200
Ammonium Hydroxide	200
Ammonium Metaphosphate	200
Ammonium Nitrate	200
Ammonium Nitrite	200
Ammonium Persulfate	200
Ammonium Phosphate	200
Ammonium Sulfamate	
Ammonium Sulfate	200
Ammonium Sulfide	200
Ammonium Thiocyanate	
Amyl Acetate	70
Amyl Alcohol	200
Amvl Borate	NR
Amyl Chloride	NR
Amyl Chloronaphthalene	NR
Anilino	140
Aniline Anilina Hudrochlorida	ND
Annine Hydrochionde	ININ

Change Land Margar	ED.24.
Chemical Name	EPDM
Aniline Oil	100
Animal Fats	NR
Anthraquinone	NR
Anthraquinone Sulfonic Acid	NR
Antimony Chloride	100
Antimony Tricholoride	140
Anyiline Hydrochloride	
Argon Gas	200
Aroclors	NR
Arsenic Acid, to 75%	185
Arylsulfonic Acid	140
ASTM #1, 2 & 3 Oil	NR
Aviation Fuel	NR
Barium Carbonate	200
Barium Chloride	200
Barium Hydroxide	180
Barium Nitrate	200
Barium Sulfide	140
Beer	200
Beet Sugar liquors	200
Benzaldehyde	140
Benzene	NR
Benzene Benzol	200
Benzene Sulfonic Acid	NR
Benzine	NR
Benzoic Acid (Saturated)	NR
Benzol	NR
Benzyl Alcohol	NR
Benzyl Benzoate	140
Black Liquor	180
Black Sulfate Liquor	100
Blast Furnance Gas	NR
Bleach, Industrial (15% Cl2)	70
Borax	140
Bordeaux Mixture	200
Boric Acid	140
Brine Acid	200
Bromohenzene	NR
Bromotoluono	NID
Butadiana	
Butano	
Butanal (coo Butul Aleah - 1)	1016
Buttor	200
"Rutud "Collocolus Advect "	100
Dutyl Cellosolve Adipate"	100
Butyl Acetate	140
Butyl Acetyl Ricinoleate	200
Butyl Alcohol	200
Butyl Cellosolve	140
Butyl Stearate	NR
Butylene	NR
Butylene Glycol	150
Butyne Diol	NR
Butyric Acid	140
Cadmium Cyanide	
Calcium Acetate	NR
Calcium Bisulfate	NR
Calcium Bisulfide	NR
Calcium Risulfito	100

 = Incomplete Data	
Chemical Name	EPDM
Calcium Carbonate	200
Calcium Chlorate	140
Calcium Chloride	200
Calcium Hydrochloride	200
Calcium Hydroxide	200
Calcium Hypochlorite	70
Calcium Nitrate	200
Calcium Oxide	200
Calcium Sulfate	200
Calcium Sulfide	200
Caliche Liquors	200
Camphor Crystals	200
Cane Sugar Liquors	200
Carbitol [™]	140
Carbon Dioxide Dry	140
Carbon Dioxide, Dry	140
Carbon Disulfide	NP
Carbon Monovido	200
Carbon Monoxide	200
Carboni retractilonde	200
Carbonic Aciu, Fenor	200
Caster Oli	140
Callessic Poldsii	140
Cellosoive	140
Cellulose Acetate	140
Cellulube 220 (In-Aryl-Phosphate)	200
Cellulube Hydraulic Fluids	200
China Wood Oil, Tung Oil	NR
Chloralhydrate	NR
Chloric Acid, to 20%	NR
Chlorine Gas, Dry or Wet	NR
Chloroacetone	200
Chlorobenzene	NR
Chlorobromomethane	NR
Chloroform	NR
Chlorosulphonic Acid	NR
Chrome Alum	100
Chromic Acid, to 10%	70
Chromium Potassium Nitrate	140
Citric Acid, Saturated	200
Coconut Oil	NR
Cod Liver Oil	NR
Coke Oven Gas	70
Copper Acetate, Saturated	100
Copper Carbonate	200
Copper Chloride	200
Copper Cyanide	200
Copper Fluoride	200
Copper Nitrate	200
Copper Sulfate	200
Corn Oil	NR
Corn Syrup	
Corrosion Inhibitors (for heating systems)	NR
Cotton Seed Oil	NR
Creosote	NR
Creosote, Coal Tar	NR
Creosote, Wood	NR
Cresol	NR
Cresylic Acid. to 50%	NR

Crude Oil NR Crude Oil, Sour NR Curpel, Fluoride 200 Cupric Sulfate 200 Cyclonexane Alycyclic (Hydorated) NR Cyclohexane Alycyclic (Hydorated) NR Cyclohexanol NR Cyclohexanol NR Cyclohexanol NR Cyclohexanol NR Cyclohexanol NR Dettrigents 200 Dextrin NR Diacetone Alcohol 70 Dibutxyl Ethyl Phthalate 70 Dibutxyl Ethyl Phthalate 70 Dichloroethylene NR Dicthyl Cellosolve NR Diethyl Ether NR Diethyl Phthalate 70 Diethyl Phthalate 70 Diethyl Phthalate 70 Diethyl Ether NR Dioctyl Phthalate 70 Diotyl Phthalate 70 Diotyl Phthalate 70 Diotyl Phthalate 70 Dioxoane 70 <th>Chemical Name</th> <th>EPDM</th>	Chemical Name	EPDM
Crude Oil, Sour NR Curnene NR Cupric Fluoride 200 Cupric Sulfate 200 Cupric Sulfate 200 Cyclobexanol NR Cyclohexanol NR Cyclohexanol NR Cyclohexanone 70 Detergents 200 Dextrin NR Dextrose 140 Diacetone Alcohol 70 Dibutxy Ethyl Phthalate 70 Dibutyl Phthalate 70 Dibutyl Phthalate 70 Dictoloro Difloro Methane Dictoloroethylene NR Diethyl Cellosolve NR Diethyl Sebacate 100 Diethyl Sebacate 100 Diethyl Phthalate 70 Diotane 70 Diotane 70 Diotyl Phthalate 70 Diotyl Phthalate 70 Diotyl Phthalate 70 Diotyl Phthalate 70 Diotyl Phthalate <td>Crude Oil</td> <td>NR</td>	Crude Oil	NR
Cumene NR Cupric Fluoride 200 Cupric Sulfate 200 Cupric Sulfate 200 Cyclonexane Alycyclle/Hydorabrad NR Cyclohexanone 70 Detergents 200 Dextriose 140 Diactone Alcohol 70 Dibutoxy Ethyl Phthalate 70 Dibutoxy Ethyl Phthalate 70 Dibutory Difloro Methane Dichloro Difloro Methane Dichloro Difloro Methane Dictyl Phthalate 70 Diethyl Sebacate NR Diethyl Sebacate NR Diethyl Phthalate 70 Dibethyl Phthalate 70 Diethyl Phthalate 70 Diethyl Phthalate 70 Diotyl Phthalate 70 Diotyl Phthalate 70 Diotyl Phthalate 70 Diprophlene Glycol Disodium Phosphate 200 Divryl Phthalate 70 Diprophl	Crude Oil, Sour	NR
Cupric Fluoride 200 Cupric Sulfate 200 Cupric Sulfate 200 Cyclones Chloride 200 Cyclohexane Alycyclic (Hydroarber) NR Cyclohexanone 70 Detergents 200 Dextrin NR Dextrose 140 Diacetone Alcohol 70 Dibutoxy Ethyl Phthalate 70 Dichloro Difloro Methane Dichloro Difloro Methane 1-0 Dictyl Phthalate 100 Diethyl Cellosolve NR Diethyl Sebacate 100 Diethyl Sebacate 100 Diethyl Amine 70 Diethylamine 140 Dioctyl Phthalate 70 Diothyl Phosphate 200 Dioryl Phosphate 200 Dioryl Phosphate 200 Diovinyl benzene NR Dowtherm A NR Dowtherm SR-1 100 Ethyl Accioacetate 100 Ethyl Accolacetate	Cumene	NR
Cupric Sulfate 200 Cuprics Chloride 200 Cyclohexane Alycyclic (Hydocaton) NR Cyclohexanol NR Cyclohexanon 70 Detergents 200 Dextrin NR Dextrose 140 Diacetone Alcohol 70 Dibutxy Ethyl Phthalate 70 Dibutxy Ethyl Phthalate 70 Dichloro Difloro Methane Dichlyl Sebacate 100 Direthyl Cellosolve NR Dimethylamine 140 Dioctyl Phthalate 70 Diogenter (Terpene-Hydrocarbon NR Diproplylene Glycol Diodium Phosphate 200 Divinylbenzene NR Dowtherm SR-1 100 Ethyl Acohol (Ethanol) 200	Cupric Fluoride	200
Cuprous Chloride 200 Cyclohexane Alycyclic (Hydorated) NR Cyclohexanone 70 Detergents 200 Detergents 200 Detergents 200 Diatorse 140 Diatorse 140 Diatorse 140 Diatorse Alcohol 70 Dibutoxy Ethyl Phthalate 70 Dibutoro Difloro Methane Dichloro Difloro Methane Dichloro Difloro Methane Dichloro Difloro Methane Dichyl Phthalate 70 Diethyl Cellosolve NR Diethyl Sebacate 100 Diethyl Sebacate 100 Diotryl Phthalate 70 Diotryl Phthalate	Cupric Sulfate	200
Cyclohexane Alycyclic (Hydroatboal NR Cyclohexanol NR Cyclohexanone 70 Detergents 200 Destrogents 200 Diactone Alcohol 70 Diactone Alcohol 70 Dibutoxy Ethyl Phthalate 70 Dibutoxy Ethyl Phthalate 70 Dibutoxy Ethyl Phthalate 70 Dichoro Difloro Methane Dichloro Difloro Methane Dichloro Difloro Methane Dichyl Cellosolve NR Diethyl Cellosolve NR Diethyl Sebacate 100 Diethyl Sebacate 70 Diotcyl Phthalate 70 Diotcyl Phthalate 70 Dioxane 70 Di	Cuprous Chloride	200
Cyclohexanol NR Cyclohexanone 70 Detergents 200 Dextrin NR Dextrose 140 Dextrose 140 Dikotay Ethyl Phthalate 70 Dibutxy Ethyl Phthalate 70 Dibutxy Ethyl Phthalate 70 Dichloro Difloro Methane Dichloroethylene NR Dicyclohexylamine Dichly Sebacate 100 Diethyl Sebacate 100 Diethyl Sebacate 100 Diethyl Phthalate 70 Diethyl Phthalate 70 Diethyl Phthalate 70 Diotyl Phthalate 70 Divnyl Benzene NR	Cyclohexane Alycyclic (Hydrocarbon)	NR
Cyclohexanone 70 Detergents 200 Dextrin NR Dextrose 140 Diacetone Alcohol 70 Dibutxy Ethyl Phthalate 70 Dibutxy Ethyl Phthalate 70 Dibutxy Ethyl Phthalate 70 Dibutxy Ethyl Phthalate 70 Dichloro Difloro Methane Dichloro Ethylene NR Diethyl Cellosolve NR Diethyl Ether NR Diethyl Sebacate 100 Diethyl Sebacate 100 Diethyl Phthalate 70 Diethyl Phthalate 70 Diotayne Glycol Diodium Phosphate 200 Divnylbenzene NR Dowtherm A NR Dowtherm SR-1 100 Ethanolamine 140 Ethyl Acetoacetate 100 Ethyl Acylate 70 Disdium Phosphate 200 Ethyl Choloide (Ethanol) 200 Ethylachol (Ethanol) <t< td=""><td>Cyclohexanol</td><td>NR</td></t<>	Cyclohexanol	NR
Detergents 200 Dextrin NR Dextrose 140 Diactorse Alcohol 70 Dibutoxy Ethyl Phthalate 70 Dibuty 2thyl Phthalate 70 Dibuty 2thyl Phthalate 70 Dichloro Difloro Methane Dichloro Difloro Methane Dichloro Difloro Methane Dichloro Difloro Methane Dicthyl Cellosolve NR Diethyl Sebacate NR Diethyl Sebacate 70 Diethyl Sebacate 70 Diethyl Sebacate 70 Diethyl Sebacate 70 Diotyal Phthalate 70 Diotyal Phthalate 70 Diotyane 70 Dipentene (Terpene-Hydrocarbon NR Dymotherm A NR Dowtherm A NR Dowtherm SR-1 100 Ethanolamine 140 Ethanolamine 140 Ethyl Acohol (Ethanol) 200 Ethyl Acohol (Etha	Cyclohexanone	70
Dextrin NR Dextrose 140 Diactone Alcohol 70 Dibutoxy Ethyl Phthalate 70 Dibutyl Phthalate 70 Dichoro Difloro Methane Dichloro Difloro Methane Dichloro Difloro Methane Dichloro Difloro Methane Diesel Oil NR Diethyl Cellosolve NR Diethyl Sebacate 100 Diethyl Sebacate 100 Diethyl Sebacate 70 Diethylamine 140 Diocyl Phthalate 70 Diproptivene Glycol Disodium Phosphate 200 Divrinylbenzene NR Dowtherm A NR Dowtherm SR-1 100 Ethanolamine 140 Ethyl Accivalete 100 Ethyl Accivalete 100 Ethyl Accivalete 100 Ethylane NR Dowtherm S 100 Ethylance NR	Detergents	200
Dextrose 140 Diacetone Alcohol 70 Dibutoxy Ethyl Phthalate 70 Dibutyl Phthalate 70 Dibutyl Phthalate 70 Dichloro Difloro Methane Dichloro Difloro Methane Dichloro Ethylene NR Dictyl Phthalate 100 Diethyl Cellosolve NR Diethyl Sebacate 100 Diethyl Sebacate 100 Diethylamine 70 Diethylamine 70 Diethylamine 140 Dioctyl Phthalate 70 Diotyl Phthalate 70 Diodum Phosphate 200 Divinylbenzene NR Dowtherm A NR Dowtherm SR-1 100 Epson Salt 200 Ethyl Cellusolve* NR Dowtherm B NR Dowtherm SR-1 100 Ethyl Accola (Ethanol) 200 Ethyl Cellusolve* NR Ethyl Colol (Ethanol) 200	Dextrin	NR
Diacetone Alcohol 70 Dibutoxy Ethyl Phthalate 70 Dibutyl Phthalate 70 Dibutyl Phthalate 70 Dichloro Difloro Methane Dichloro Difloro Methane Dickloro Difloro Methane Dickloro Difloro Methane Dickloro Difloro Methane Dickloro Difloro Methane Dickloroethylene NR Diethyl Cellosolve NR Diethyl Sebacate 100 Dimethylamine 140 Dioctyl Phthalate 70 Dimethylamine 140 Dioctyl Phthalate 70 Diotylene Glycol Disodium Phosphate 200 Divinylbenzene NR Dowtherm SR-1 100 Ethers NR Dowtherm SR-1 100 Ethyl Acohol (Ethanol) 200 Ethyl Acohol (Ethanol) 200 Ethyl Acohol (Ethanol) 200 Ethyl Chloride 70	Dextrose	140
Dibutoxy Ethyl Phthalate 70 Dibutyl Phthalate 70 Dibutyl Phthalate 70 Dichloro Difloro Methane Dichloro Difloro Methane Dicyclohexylamine Dietyl Cellosolve NR Diethyl Ether NR Diethyl Sebacate 100 Diethyl Sebacate 100 Diethylamine 70 Diethylane Glycol 200 Digester Gas NR Dimethylamine 140 Diotyl Phthalate 70 Diotyl Phthalate 200 Divinylbenzene NR Dowtherm SR-1 100 Ethers NR Tethyl Cellusolve" 100 Ethyl Cacloacetate 100 Ethyl Cohol (Ethanol) 200 Ethyl Cohol (Ethanol) 200 Ethyl Cohol (Ethanol) <td>Diacetone Alcohol</td> <td>70</td>	Diacetone Alcohol	70
Dibutyl Phthalate 70 Dichloro Difloro Methane Dichloro Difloro Methane Dichloroothylene NR Dicyclohexylamine Diesel Oil NR Diethyl Cellosolve NR Diethyl Sebacate 100 Diethyl Sebacate 100 Diethyl Glycol 200 Diethyl Glycol 200 Digester Gas NR Dimethylamine 140 Diocarle 70 Dipentene (Terpene-Hydrocarbon NR Dorophylene Glycol Disodium Phosphate 200 Divinylbenzene NR Dowtherm A NR Dowtherm SR-1 100 Ethyl Cellusolve" 100 Ethyl Acetoacetate 100 Ethyl Acetoacetate 100 Ethyl Chloride 70 Ethyl Chloride<	Dibutoxy Ethyl Phthalate	70
Dichloro Difloro Methane Dichloroethylene NR Dicyclohexylamine Diesol Oll NR Diethyl Cellosolve NR Diethyl Sebacate 100 Diethyl Phylamine 140 Dioctyl Phthalate 70 Diotyl Phthalate 70 Diotyl Phthalate 70 Diotyl Phthalate 80 Diotyl Phthalate 70 Diotyl Phthalate 100 Divinyl Phthalate 70 Diotyl Phthalate 70 Diotyl Phthalate 70 Diotyl Phthalate 70 Divinyl Phylene Glycol Disodium Phosphate 200 Divinylbenzene NR Dowtherm SR-1 100 Ethyl Acetoacetate 100 Ethyl Acetoacetate 100 Ethyl Acylate 70 Ethyl Choloride (Ethanol) 200 Ethyl Choloride 70 Ethyl Choloride 70 Ethyl Choloride 70 <td>Dibutyl Phthalate</td> <td>70</td>	Dibutyl Phthalate	70
Dichloroethylene NR Dicyclohexylamine Dicyclohexylamine Diethyl Cellosolve NR Diethyl Sebacate N0 Diethyl Sebacate N0 Diethyl Sebacate 70 Digester Gas NR Dimethylamine 140 Diocyl Phthalate 70 Diodium Phosphate 200 Divinylbenzene NR Dowtherm A NR Dowtherm SR-1 100 Ethanolamine 140 Ethyl Acrolate 70 Ethyl Acrolate 100 Ethyl Acrolate 100 Ethyl Acrolate 100 Ethyl Acrolate NR Dowtherm SR-1 100 Ethyl Acrolate NR Ethyl Choloride (Ethanol) 200	Dichloro Difloro Methane	
Dicyclohexylamine Diesel Oll NR Diethyl Cellosolve NR Diethyl Ether NR Diethyl Sebacate 100 Diethyl Sebacate 100 Diethylamine 70 Diethylamine 140 Dioctyl Phthalate 70 Diproplylene Glycol Disodium Phosphate 200 Divnylbenzene NR Dowtherm A NR Dowtherm SR-1 100 Ethanolamine 140 Etharolamine 140 Diverthylene Clepson- NR Dowtherm A NR Dowtherm SR-1 100 Etharolamine 140 Ethal 'Cellusolve' 100 Ethyl Actolatic Ethanol) 200 Ethyl Actolate 100 Ethyl Cellulose NR Dowtherm B NR Dowtherm SR-1 100 Ethyl Actolatic Ethanol 200 Ethyl Actolatic Ethanol 200 Ethyl Actolatic Ethanol 200 Ethyl Cellulose NR Ethylene Chlorohydrin 70 Ethylene Dichloride Dichlorotem NR Ethylene Chlorohydrin 70	Dichloroethylene	NR
Diesel Oil NR Diethyl Cellosolve NR Diethyl Ether NR Diethyl Sebacate 100 Diethyl Sebacate 100 Diethyl Glycol 200 Diethyl Ene Glycol 200 Dimethylamine 70 Dinethylamine 140 Dioctyl Phthalate 70 Diothyl Erepen-Hydrocarbon NR Diproplylene Glycol Disodium Phosphate 200 Divinylbenzene NR Dowtherm A NR Dowtherm SR-1 100 Ethanolamine 140 Ethers NR Tethyl Acetoacetate 100 Ethyl Acetoal (Ethanol) 200 Ethyl Coloride 70 Ethyl Coloride 70 Ethyl Coloride 70 Ethyl Coloride 70 Ethyl Acotoacetate 100 Ethyl Acotoal (Ethanol) 200 Ethyl Coloride 70 Ethyl Coloride 70 Ethylene Dichloride (Ethanol) 200 Ethylene Dichloride (Ethanol) 200 Ethylene Dichloride (Ethanol) 70 Ethylene Dichloride (Ethanol) 70 Ethylene Dichloride (Etha	Dicyclohexylamine	
Diethyl Cellosolve NR Diethyl Ether NR Diethyl Sebacate 100 Diethyl Sebacate 100 Diethylamine 70 Dimethylamine 140 Diothyl Phthalate 70 Divinyl Benzene NR Dowtherm SR-1 100 Ethers NR Dowtherm SR-1 100 Ethyl Accolacetate 100 Ethyl Accolacetate 100 Ethyl Accola(Ethanol) 200 Ethyl Choloide 70 </td <td>Diesel Oil</td> <td>NR</td>	Diesel Oil	NR
Diethyl Ether NR Diethyl Sebacate 100 Diethylamine 70 Diethylamine 100 Digtylene Glycol 200 Digtylene Glycol 70 Diottyl Phthalate 70 Diottyl Phthalate 70 Diotyl Phthalate 200 Divinylbenzene NR Dowtherm A NR Dowtherm SR-1 100 Ethonolamine 140 Ethers NR Topothyl Acetoacetate 100 Ethyl Calcolol (Ethanol) 200 Ethyl Choride 70 Ethylene Dichloride (0chlorethure) NR Ethylene Dichloride (0chlorethure) NR Ethylene Dichlori	Diethyl Cellosolve	NR
Diethyl Sebacate 100 Diethylamine 70 Diethylane Glycol 200 Digetser Gas NR Dimethylamine 140 Dimethylamine 140 Dinethylamine 140 Dinethylamine 70 Diotyl Phthalate 70 Diotyl Phthalate 70 Diotyl Phthalate 200 Diproplylene Glycol Disodium Phosphate 200 Dowtherm A NR Dowtherm SR-1 100 Epsom Salt 200 Ethyl Cellusolve" 100 Ethyl Cacetoacetate 100 Ethyl Caclool (Ethanol) 200 Ethyl Coloride 70 Ethyl Chloride 70 Ethyl Chloride 70 Et	Diethyl Ether	NR
Diethylamine 70 Diethylene Glycol 200 Digester Gas NR Dimethylamine 140 Diotyl Phthalate 70 Diotyl Phthalate 70 Dipentene (Terpene-Hydrocarbon NR Diproplylene Glycol Disodium Phosphate 200 Divitylbenzene NR Dowtherm A NR Dowtherm SR-1 100 Ethanolamine 140 Ethyl Cellusolve" 100 Ethyl Acetoacetate 100 Ethyl Acylate 70 Ethyl Choloride 70 Ethyl Choloride 100 Ethyl Coloride 70 Ethyl Choloride 70 Ethylene Chlorohydrin 70	Diethyl Sebacate	100
Diethylene Glycol 200 Digester Gas NR Dimethylamine 140 Dioctyl Phthalate 70 Dioxane 70 Dipentene (Terpene-Hydrocarbon NR Diproplylene Glycol Disodium Phosphate 200 Divinylbenzene NR Dowtherm A NR Dowtherm SR-1 100 Ethanolamine 140 Ethyl *Cellusolve* 100 Ethyl Acetoacetate 100 Ethyl Acrylate 70 Ethyl Aclohol (Ethanol) 200 Ethyl Chloride 70 Ethyl Chloride NR Dowtherm SR-1 100 Ethyl Acrylate 70 Ethyl Acrylate 70 Ethyl Choloide (Ethanol) 200 Ethyl Choloide 70 Ethyl Choloide 70 Ethylene Chlorohydrin 70 Ethylene Chlorohydrin 70 Ethylene Chlorohydrin 70 Ethylene Chlorohydrin	Diethylamine	70
Digester Gas NR Dimethylamine 140 Dioctyl Phthalate 70 Diordyl Phthalate 70 Dipentene (Terpene-Hydrocarbon NR Diproplylene Glycol Disodium Phosphate 200 Divinylbenzene NR Dowtherm A NR Dowtherm SR-1 100 Ethanolamine 140 Ethers NR "Ethyl "Cellusolve" 100 Ethyl Acetoacetate 100 Ethyl Acholo (Ethanol) 200 Ethyl Cellulose NR Ethyl Choride 70 Ethyl Choride NR Ethyl Choride (Ethanol) 200 Ethyl Choride NR Ethyl Choride NR Ethyl Choride (Ethanol) 200 Ethyl Choride (Ethanol) 200 Ethyl Ether NR Ethylene Chlorohydrin 70 Ethylene Chlorohydrin 70 Ethylene Dichloride (Dichoretane) NR Ethylene Dichloride (Dichoretane) NR Ethylene Chlorohydrin 70 Ethylene Oxide NR Ethylene Oxide NR Ethylene Oxide NR Ethylene Oxide	Diethylene Glycol	200
Dimethylamine 140 Dioctyl Phthalate 70 Dioctyl Phthalate 70 Diorentene (Terpene-Hydrocarbon NR Diproplylene Glycol Disodium Phosphate 200 Divinylbenzene NR Dowtherm A NR Dowtherm E NR Dowtherm SR-1 100 Ethanolamine 140 Ethers NR "Ethyl Cellusolve" 100 Ethyl Acctoacetate 100 Ethyl Acchol (Ethanol) 200 Ethyl Acchol (Ethanol) 200 Ethyl Colloide 70 Ethyl Acchol (Ethanol) 200 Ethyl Coloide NR	Digester Gas	NR
Dioctyl Phthalate 70 Dioxane 70 Dipentene (Terpene-Hydrocarbon) NR Diprophylene Glycol Disodium Phosphate 200 Divinylbenzene NR Dowtherm A NR Dowtherm A NR Dowtherm SR-1 100 Ethyl Scala 200 Ethanolamine 140 Ethers NR "Ethyl 'Cellusolve" 100 Ethyl Acetoacetate 100 Ethyl Acolol (Ethanol) 200 Ethyl Coloride 70 Ethyl Acolol (Ethanol) 200 Ethyl Chloride 70 Ethyl Acolol (Ethanol) 200 Ethyl Chloride 70 Ethyl Chloride 70 Ethylene Chlorohydrin 70 Ethylene Chlorohydrin 70 Ethylene Diamine 70 Ethylene Diamine 70 Ethylene Oklorohydrin 70 Ethylene Oklorohydrin 70 Ethylene Chlorohydrin 70 Ethylene Diamine 70 Ethylene Oklorohydrin 70 Ethylene Oklorohydrin 70 Ethylene Oklorohydrin 70 Ethylene Oklorohydrin 7	Dimethylamine	140
Dioxane 70 Dipentene (Terpene-Hydrocarbon NR Diproplylene Glycol Disodium Phosphate 200 Divinylbenzene NR Dowtherm A NR Dowtherm E NR Dowtherm SR-1 100 Ethanolamine 140 Ethers NR Dowtherm SR-1 100 Ethyl Cellusolve* 100 Ethyl Cactoacetate 100 Ethyl Acotoacetate 100 Ethyl Acotoacetate 100 Ethyl Acotoal (Ethanol) 200 Ethyl Callulose NR Ethyl Chloride 70 Ethyl Slicate 100 Ethyl Slicate 100 Ethylene Dichloride (0chlorethure) NR Ethylene Dichloride (0chlorethure) NR Ethylene Dichloride (0chlorethure) NR Ethylene Oxide NR Ethylene Oxide NR Ethylene Oxide NR Ethylene Oxide NR Ethylene Oxid	Dioctyl Phthalate	70
Dipentene (Terpene-Hydrocarbon NR Diproplylene Glycol Disodium Phosphate 200 Divinylbenzene NR Dowtherm A NR Dowtherm B NR Dowtherm SR-1 100 Ethyland Salt 200 Ethyl Acetoacetate 100 Ethyl Acetoacetate 100 Ethyl Acetoacetate 100 Ethyl Calluosol NR Ethyl Acohol (Ethanol) 200 Ethyl Calluose NR Ethyl Calluose NR Ethyl Chloride 70 Ethylene Chlorohydrin 70 Ethylene Chlorohydrin 70 Ethylene Dichloride (Echloroehume <	Dioxane	70
Diproplylene Glycol Disodium Phosphate 200 Divinylbenzene NR Dowtherm A NR Dowtherm SR-1 100 Epsom Salt 200 Ethanolamine 140 Ethers NR Tethyl "Cellusolve" 100 Ethyl Acetoacetate 100 Ethyl Acetoacetate 100 Ethyl Acetoacetate 100 Ethyl Acetoalette 70 Ethyl Choloride 70 Ethyl Coholide 70 Ethyl Choloride 70 Ethyl Choloride 70 Ethyl Choloride 70 Ethyl Choloride 70 Ethyl Chloride 70 Ethyl Chloride 70 Ethyl Chloride 70 Ethyl Chloride 70 Ethylene NR Ethylene NR Ethylene Chlorohydrin 70 Ethylene Glycol 200 Ethylene Glycol 200 Ethylene Gly	Dipentene (Terpene-Hydrocarbon	NR
Disodium Phosphate 200 Divinylbenzene NR Dowtherm A NR Dowtherm SR-1 100 Dowtherm SR-1 200 Ethanolamine 140 Ethanolamine 140 Ethyl "Cellusolve" 100 Ethyl Acetoacetate 100 Ethyl Acetoacetate 100 Ethyl Acylate 70 Ethyl Choloride 70 Ethyl Choloride 70 Ethyl Choloride 100 Ethyl Choloride 70 Ethylene Chlorohydrin 70 Ethylene Glycol 200 Ethylene Glycol 200 Ethylene Chlorohydrin 70	Diproplylene Glycol	
Divinylbenzene NR Dowtherm A NR Dowtherm SR-1 100 Epsom Salt 200 Ethanolamine 140 Ethanolamine 140 Ethyl "Cellusolve" 100 Ethyl Acetoacetate 100 Ethyl Acylate 70 Ethyl Achohol (Ethanol) 200 Ethyl Achohol (Ethanol) 200 Ethyl Achohol (Ethanol) 200 Ethyl Choloride NR Ethyl Choloride NR Ethyl Chloride NR Ethyl Chloride NR Ethylene Chloride Dichorether NR Ethylene Chloride Dichorether NR Ethylene Chloride Dichorether NR Ethylene Dichoride Dichorether NR Ethylene Chloride Dichorether NR Ethylene Chloride Dichorether NR Ethylene Oxide NR Ethylene Oxide NR Farty Acid NR Ferric Chloride, to 35% 200 Ferric Chloride, to 35% 200 <td>Disodium Phosphate</td> <td>200</td>	Disodium Phosphate	200
Dowtherm A NR Dowtherm E NR Dowtherm SR-1 100 Epsom Salt 200 Ethanolamine 140 Ethers NR "Ethyl Cellusolve" 100 Ethyl Actoaccatate 100 Ethyl Accola (Ethanol) 200 Ethyl Alcohol (Ethanol) 200 Ethyl Callulose NR Ethyl Callulose NR Ethyl Choride 70 Ethyl Silicate 100 Ethylene Chlorohydrin 70 Ethylene Dichloride Dichlorether NR Ethylene Oklorohydrin 70	Divinylbenzene	NR
Dowtherm E NR Dowtherm SR-1 100 Epsom Salt 200 Ethanolamine 140 Ethanolamine 140 Ethanolamine 100 Ethers NR "Ethyl Cellusolve" 100 Ethyl Cellusolve" 100 Ethyl Actopate 70 Ethyl Actohol (Ethanol) 200 Ethyl Chloride 70 Ethyl Chloride 70 Ethyl Chloride 100 Ethylene Diamine 70 Ethylene Diamine 70 Ethylene Diamine 70 Ethylene Okido 200 Ethylene Okido NR Ethylene Okido NR Ethylene Okido 200 Ethylene Okido 200 Ethylene Okido 180 Ferric Chloride, t	Dowtherm A	NR
Dowtherm SR-1 100 Epsom Salt 200 Ethanolamine 140 Ethers NR "Ethyl "Cellusolve" 100 Ethyl Acetoacetate 100 Ethyl Acetoacetate 70 Ethyl Acohol (Ethanol) 200 Ethyl Acohol (Ethanol) 200 Ethyl Colluse NR Ethyl Colluse NR Ethyl Choride 70 Ethyl Silicate 100 Ethyl Silicate 100 Ethylene Chlorohydrin 70 Ethylene Diamine 70 Ethylene Glycol 200 Ethylene Glycol 200 Ethylene Glycol 200 Ethylene Chloride, to 35% 200 Ferric Chloride, to 35% 200 Ferric Nitrate 200	Dowtherm E	NR
Epsom Salt 200 Ethanolamine 140 Ethanolamine 140 Ethers NR "Ethyl Cellusolve" 100 Ethyl Acetoacetate 100 Ethyl Acetoacetate 70 Ethyl Acohol (Ethanol) 200 Ethyl Acohol (Ethanol) 200 Ethyl Chloride 70 Ethyl Silicate 100 Ethyl Silicate 100 Ethylene NR Ethylene Chlorohydrin 70 Ethylene Diamine 70 Ethylene Diamine 70 Ethylene Diamine 70 Ethylene Diamine 70 Ethylene Glycol 200 Ethylene Glycol 200 Ethylene Chloride, to 35% 200 Ferric Chlydroxide 180 Ferric Klydroxide 180 Ferric Klaftate 200	Dowtherm SR-1	100
Ethanolamine 140 Ethers NR "Ethyl "Cellusolve" 100 Ethyl Acetoacetate 100 Ethyl Acetoacetate 200 Ethyl Acohol (Ethanol) 200 Ethyl Cellulose NR Ethyl Cohol (Ethanol) 200 Ethyl Cohol (Ethanol) 200 Ethyl Chloride 70 Ethyl Silicate 100 Ethylene Chlorohydrin 70 Ethylene Dichloride (Dichlorothane) NR Ethylene Dichloride (Dichlorothane) NR Ethylene Glycol 200 Ethylene Oxide NR Fatty Acid NR Ferric Chloride, to 35% 200 Ferric Chloridate 200 Ferric Klifate 200	Epsom Salt	200
Ethers NR "Ethyl "Cellusolve" 100 Ethyl Acetoacetate 100 Ethyl Acetoacetate 70 Ethyl Acetoacetate 70 Ethyl Acetoacetate 70 Ethyl Acohol (Ethanol) 200 Ethyl Choloride 70 Ethyl Chloride 70 Ethyl Chloride 70 Ethyl Chloride 100 Ethyl Silicate 100 Ethylene NR Ethylene Chlorohydrin 70 Ethylene Diamine 70 Ethylene Glycol 200 Ethylene Glycol 200 Ethylene Glycol 200 Ethylene Oxide NR Fatty Acid NR Ferric Chloride, to 35% 200 Ferric Nitrate 200	Ethanolamine	140
"Ethyl *Cellusolve" 100 Ethyl Acetoacetate 100 Ethyl Acetoacetate 100 Ethyl Acrylate 70 Ethyl Acylate 100 Ethyl Chloride NR Ethyl Chloride 70 Ethyl Chloride 100 Ethyl Chloride 100 Ethyl Chloride 100 Ethyl Chloride NR Ethylene NR Ethylene Chlorohydrin 70 Ethylene Diamine 70 Ethylene Glycol 200 Ethylene Glycol 200 Ethylene Oxide NR Fartig Acid NR Ferric Chloride, to 35% 200 Ferric Nitrate 200 Ferric Nitrate 200	Ethers	NR
Ethyl Acetoacetate 100 Ethyl Acrylate 70 Ethyl Alcohol (Ethanol) 200 Ethyl Alcohol (Ethanol) 200 Ethyl Callulose NR Ethyl Chloride 70 Ethyl Ether NR Ethyl Chloride 100 Ethyl Callucate 100 Ethylene NR Ethylene Chlorohydrin 70 Ethylene Dichloride (Dichlorothane) NR Ethylene Okidoride (Dichlorothane) NR Ethylene Okido NR Fatty Acid NR Ferric Chloride, to 35% 200 Ferric Nitrate 200 Ferric Nitrate 200	"Ethyl "Cellusolve"	100
Ethyl Acrylate 70 Ethyl Alcohol (Ethanol) 200 Ethyl Cellulose NR Ethyl Chloride 70 Ethyl Ether NR Ethyl Silicate 100 Ethyl Silicate 100 Ethylene Chlorohydrin 70 Ethylene Diamine 70 Ethylene Olioohydrin 200 Ferric Lifydroxide 180 Ferric Lifydroxide 180 Ferric Sulfate 200	Ethyl Acetoacetate	100
Ethyl Alcohol (Ethanol) 200 Ethyl Cellulose NR Ethyl Chloride 70 Ethyl Chloride 70 Ethyl Ether NR Ethyl Chloride 100 Ethyl Silicate 100 Ethylene Chlorohydrin 70 Ethylene Diamine 70 Ethylene Oklorohydrin 80 Ferric Chloride, to 35% 200 Ferric Nifate 200	Ethyl Acrylate	70
Ethyl Cellulose NR Ethyl Chloride 70 Ethyl Chloride 70 Ethyl Chloride 70 Ethyl Chloride 100 Ethyl Oxalate 100 Ethyl Silicate 100 Ethylene NR Ethylene Diamine 70 Ethylene Diamine 70 Ethylene Okidoretame NR Ethylene Okido 200 Ethylene Oxide NR Fatty Acid NR Ferric Chloride, to 35% 200 Ferric Klydraxide 180 Ferric Klydraxide 200	Ethyl Alcohol (Ethanol)	200
Ethyl Chloride 70 Ethyl Ether NR Ethyl Coxalate 100 Ethyl Coxalate 100 Ethyl Silicate 100 Ethyl Silicate 100 Ethylene Chlorohydrin 70 Ethylene Diamine 70 Ethylene Diamine 200 Ethylene Glycol 200 Ethylene Oxide NR Fatty Acid NR Ferric Chloride, to 35% 200 Ferric Nitrate 200 Ferric Siffate 200	Ethyl Cellulose	NR
Ethyl Ether NR Ethyl Oxalate 100 Ethyl Oxalate 100 Ethyl Sillcate 100 Ethyl Sillcate 100 Ethyl Ethylene Chlorohydrin 70 Ethylene Diamine 70 Ethylene Dichloride (Echlorothane) NR Ethylene Glycol 200 Ethylene Oxide NR Fatty Acid NR Ferric Chloride, to 35% 200 Ferric Chloride, to 35% 200 Ferric Nitrate 200	Ethyl Chloride	70
Ethyl Oxalate 100 Ethyl Silicate 100 Ethylsen NR Ethylene Chlorohydrin 70 Ethylene Diamine 70 Ethylene Dichloride (Dichlorothume) NR Ethylene Glycol 200 Ethylene Oxide NR Fatty Acid NR Ferric Chloride, to 35% 200 Ferric Chloride, to 35% 200 Ferric Nitrate 200	Ethyl Ether	NR
Ethyl Silicate 100 Ethylene NR Ethylene Chlorohydrin 70 Ethylene Dialmine 70 Ethylene Dichlorothyle Dichlorothare NR Ethylene Glycol 200 Ethylene Oxide NR Fatty Acid NR Ferric Chloride, to 35% 200 Ferric Chloride, to 35% 200 Ferric Nitrate 200	Ethyl Oxalate	100
Ethylene NR Ethylene Chlorohydrin 70 Ethylene Diamine 70 Ethylene Dichloride (Dichorethane) NR Ethylene Glycol 200 Ethylene Axide NR Farty Axid NR Ferric Chloride, to 35% 200 Ferric Hydroxide 180 Ferric Kifate 200	Ethyl Silicate	100
Ethylene Chlorohydrin 70 Ethylene Diamine 70 Ethylene Dichloride (Dichorethane) NR Ethylene Glycol 200 Ethylene Oxide NR Farty Acid NR Ferric Chloride, to 35% 200 Ferric Hydroxide 180 Ferric Suffate 200	Ethylene	NR
Ethylene Diamine 70 Ethylene Dichloride (Dichlorethine) NR Ethylene Glycol 200 Ethylene Oxide NR Fatty Acid NR Ferric Chloride, to 35% 200 Ferric Hydroxide 180 Ferric Kifate 200	Ethylene Chlorohydrin	70
Ethylene Dichloride (Dicklorethanz) NR Ethylene Glycol 200 Ethylene Oxide NR Fatty Acid NR Ferric Chloride, to 35% 200 Ferric Hydroxide 180 Ferric Nitrate 200 Ferric Stifate 200	Ethylene Diamine	70
Ethylene Glycol 200 Ethylene Oxide NR Fatty Acid NR Ferric Chloride, to 35% 200 Ferric Hydroxide 180 Ferric Nitrate 200 Ferric Stifate 200	Ethylene Dichloride (Dichloroethane)	NR
Ethylene Oxide NR Fatty Acid NR Ferric Chloride, to 35% 200 Ferric Hydroxide 180 Ferric Nitrate 200 Ferric Stifate 200	Ethylene Glycol	200
Fatty Acid NR Ferric Chloride, to 35% 200 Ferric Hydroxide 180 Ferric Nitrate 200 Ferric Sulfate 200	Ethylene Oxide	NR
Ferric Chloride, to 35% 200 Ferric Hydroxide 180 Ferric Nitrate 200 Ferric Sulfate 200	Fatty Acid	NR
Ferric Hydroxide 180 Ferric Nitrate 200 Ferric Sulfate 200	Ferric Chloride, to 35%	200
Ferric Nitrate 200 Ferric Sulfate 200	Ferric Hydroxide	180
Ferric Sulfate 200	Ferric Nitrate	200
200	Ferric Sulfate	200

Chemical Name	EPDM
Ferrous Chloride	200
Ferrous Hydroxide	180
Ferrous Nitrate	180
Ferrous Sulfate	200
Fire Fighting Form (AFFF)	180
Fish Oils (Solubles)	NR
Fluboric Acid	140
Fluorine Gas, Wet	NR
Fluorosilicic Acid, to 30%	140
Fly Ash	180
FM200	200
Foam	180
Fog Oil	NR
Formaldehvde	140
Formanide	NR
Formic Acid to 25%	200
Freon E-11	NR
Freon F-113	NR
From E 114	ND
From E 12	ND
Freen 122	ND
Freen 124a	
Freon 134a	INK
Freon F-21	NK
Freon F-22	NR
Fructose	175
Fruit Juice, Pulp	
Fuel Oil	NR
Fumaric Acid	100
Furan	NR
Furfural	140
Furfuryl Alcohol	140
Gallic Acid	70
Gasoline, Leaded	NR
Gasoline, Refined	NR
Gasoline, Sour	NR
Gasoline, Unleaded	NR
Gelatin	200
Glucose	200
Glue	150
Glycerine	200
Glycerol	150
Glycol	180
Glycolic Acid	NR
Grape Sugar, Juice	200
Grease	NR
Green Sulfate Liquor	180
Halon 1301	180
Heptane	NR
Hexaldehyde	180
Hexane	NR
Hexanol	NR
Hexanol Tertiary	NR
Hexyl Alcohol	NR
Hexylene Glycol	NR
Hydraulic Oil	NR
Hydrobromic Acid, to 50%	140
Hydrochloric Acid, to 37%	75
Hydrocyanic Acid, to 10%	200

Chemical Name	EPDM
Hydrofluoric Acid, to 30%	NR
Hydrofluosilicic Acid, to 50%	140
Hydrogen Gas	200
Hydrogen Peroxide, to 30%	140
Hydrogen Phosphide	NR
Hydrogen Sulfide.	100
Hydroquinone	NR
Hydroxylamine Sulfate	70
Hypochlorous Acid	70
lodine Solution, to 10%	150
Isobutyl Alcohol	180
Isododecane	NR
Isooctane	NR
Isooctyle Alcohol	140
Isopropyl Acetate	140
Isopropyl Alcohol	140
Isopropyl Ether	NR
Jet Fuel, JP-4	NR
Jet Fuel, JP-5	NR
Kerosene	NR
Ketones	NR
Lactic Acid	70
Lard Oil	NR
Lator (10) Channe & Butediane)	NIR
Lauxis Asid	ND
Laund Chlorido	140
Lauryi Chionue	140
Lavenuer On	200
Lead Acetate	200
Lead Chloride	175
	1/5
Lead Sulfamate	140
Lead Sulfate	200
Lemon Oil	
Ligroine	
Lime and H_O	180
Lime Sulfur	200
Linoleic Acid	70
Linseed Oil	70
Lithium Bromide (Brine)	
Lithium Chloride	100
Lubricating Oil, ASTM#1,#2,#3	NR
Magnesium Ammonium Sulfate	NR
Magnesium Carbonate	170
Magnesium Chloride	170
Magnesium Citrate	175
Magnesium Fluoride	140
Magnesium Hydroxide	200
Magnesium Nitrate	200
Magnesium Oxide	140
Magnesium Sulfate	175
Maleic Acid, Saturated	70
Malic Acid	
Manganese Sulfate	175
Mercuric Chloride	200
Mercuric Cyanide	70
Mercurous Nitrate	70
Mercury	200
Methane	NR



Technical Information Chemical Resistance

Chemical Name	EPDM
Methyl Acetate	140
Methyl Alcohol, Methanol	140
Methyl Amine	70
Methyl Butyle Ketone	140
Methyl Bromide	NR
Methyl Cellosolve	70
Methyl Chloride	NR
Methyl Cyclopentane	NR
Methyl Ethyl Ketone	70
Methyl Ecrypate	100
Methyl Formate	ND
	NK
Methylene Chloride	NR
Methylene Chlorobromide	NR
Methylene Dichloride	NR
Methylene Iodine	200
MIL-05606	NR
MIL-08515	NR
MIL-L7808	NR
Naphtenic Acid	NR
Natural Gas	NR
Nickel Acetate	70
Nickel Ammonium Sulfate	70
Nickel Chloride	200
Nickel Nitrate	180
Nickel Sulfate	200
Nickel Juliate	200
Nicotine	INK
Nicotine Acid	/0
Nitric Acid, to 10%	75
Nitric Acid, 10 - 50%	NR
Nitric Acid, Red Fuming	NR
Nitrobenzene	70
Nitrocellulose	
Nitroethane	100
Nitrogen	180
Nitromethane	70
Nitrous Acid, to 10%	NR
Nitrous Oxide	NR
Octyl Alcohol	NR
Ogisogiric Acid, to 75%	NR
Oleic Acid	70
Oleum	NR
Oropito 9200 Silicato Estor Eluid	ND
Ordnite 8200 Silicate Ester Fluid	
	INK
OS-45 Silicate Ester Fluid	NK
OS-45-1	NR
Oxalic Acid	150
Oxygen	200
Ozone (100 ppm)	200
Palm Oil	NR
Palmitic Acid	70
Paraffin	NR
Peanut Oil	NR
Pentachlorophenol	NR
Pentane	
Perchloric Acid, to 10%	70
Perchloric Acid, to 70%	70
Perchloroethylene	
Petroleum Ether (see Benzene)	NR
Petroleum Oils	NR
Phonol (Carbolic Acid)	70
Phonulhudrazic -	70
Phenyinyarazine	INK 70
Prienyinydrazine Hydrochloride	/0
Phosohoric Acid, to 10%	140
Photoboric Acid 10 50%	70

Chemical Name	EPDM
Phosphorous Pentoxide	200
Photographic Solutions	100
Phthalic Anhydride	100
Picric Acid	140
Pine Oil	
Plating Solutions, Brass	70
Plating Solutions, Cadmium	70
Plating Solutions, Chrome	70
Plating Solutions, Copper	70
Plating Solutions, Gold	70
Plating Solutions, Nickel	125
Plating Solutions, Silver	70
Plating Solutions, Tin	100
Plating Solutions, Zinc	70
Polyvinyl Acetate, Solid in	
Liquid State is 50% solution of	180
Methanol or 60% solution of (HPO)	
Potash	
Potassium Acetate	170
Potassium Alum	200
Potassium Aluminum Sulfate	200
Potassium Bicarbonate	170
Potassium Bisulfate	170
Potassium Borate	200
Potassium Bromate	
Potassium Bromide	170
Potassium Carbonate	170
Potassium Chlorate	140
Potassium Chloride	200
Potassium Cromate	140
Potassium Cyanide Potassium Dichromate	140
Potassium Eerrocyanide	140
Potassium Fluoride	140
Potassium Hydroxide	140
Potassium Iodide	140
Potassium Nitrate	200
Potassium Perborate	
Potassium Perchlorate	140
Potassium Permanganate, to 10%	200
Potassium Permanganate, to 25%	5 140
Potassium Persulfate	200
Potassium Silicate	200
Potassium Sulfate	200
Prestone	
Propane Gas	NR
Propanol	
Propargyl Alconol	140
Propyl Acetate	140
Propyl Alconol	NP
Propylene Glycol	200
Propylene Oxide	70
Pydraul F-9 and 150	NR
Pyranol 1467	NR
Pyranol 1476	NR
"Pyroguard "C"	
- "Pyroguard "D"	
Pyroguard 55	180
Pyrrole	100
Rapeseed Oil	NR
Ref. Fuel (ISO Octane, 30 Toluene)	
Rosin Oil	NR
Salicylic Acid	200

Chemical Name	EPDM
Secondary Butyl Alcohol	
Sewage	200
Silicic Acid	140
Silicone Oil	140
Silver Cvanide	140
Silver Nitrate	200
Silver Fulfate	170
	170
	200
Skydrol 500 Phosphate Ester	170
Soap Solutions	200
Soda Ash, Sodium Carbonate	180
Sodium Acetate	170
Sodium Alum	170
Sodium Aluminate	200
Sodium Benzoate	200
Sodium Bicarbonate	200
Sodium Bichromate	140
Sodium Bisulfate	200
Sodium Risulfite (Black Liquor)	200
Sodium Borate	140
Sodium Bromide	200
Socium Carbonate	200
Socium Carbonate	140
Sodium Chlorate	140
Sodium Chloride	140
Sodium Cyanide	140
Sodium Dichromate	140
Sodium Ferricyanide	140
Sodium Ferrocyanide	140
Sodium Fluoride	140
Sodium Hydroxide, to 15%	180
Sodium Hypochlorite to 20%	70
Sodium Metanhosnhate	70
Codium Nitrato	200
Social Nicita	200
Sodium Nitrile	170
Sodium Perborate	70
Sodium Peroxide	140
Sodium Phosphate, Acid	170
Sodium Phosphate, Alkaline	170
Sodium Phosphate, Neutral	170
Sodium Silicate	200
Sodium Sulfate	140
Sodium Sulfide	140
Sodium Sulfite	140
"Sodium Thiosulfate "hypo"	200
Sobovis 47	200
SolidVIS 47	
SONOVIS /8	
Solvasol #1,2 & 3	
Solvasol #73	
Solvasol #74	NR
Soybean Oil	NR
Spindle Oil	NR
Stannic Chloride	100
Stannous Chloride	70
Starch	170
Steam	NR
Stearic Acid	ND
Steaddard Salue -+	
	NK
Styrene	NR
Sucrose Solutions	
Sulfamic Acid	NR
Sulfite Liquor	140
Sulfer Dioxide, Dry	140
Sulfonic Acid	150
Sulfur	140
Sulfur Chloride	NR
ar emonae	

	C	hemical Name	EPDM
	Su	ılfur Dioxide, Dry	70
	Su	Ilfur Dioxide, Wet	140
	Su	ulfur Trioxide	70
	Su	ılfuric Acid, 10 - 30%	150
	Su	Ilfuric Acid, Fuming	NR
	Su	Ilfuric Acid, Oleum	NR
1	Su	Ilfurous Acid	75
1	Ta	III Oil	NR
1	Ta	nnic Acid, all conc.	70
1	Ta	Innic Acid, Liquors	100
1	Ta	nning Liquors(50g, alum	
1	So	lution 50g dichromate solution)	NR
1		ir	NR
ł	-	rpional	NID
	-	ripierioi	140
	16	ertiary Butyl Alconol	140
	16	trabutyl linanate	140
	Te	etrachloroethylene	NR
	Te	etrahydrofuran	NR
	Te	etralin	NR
l	Te	etraric Acid	140
l	Tł	nionyl Chloride	NR
J	Tł	niopene	NR
1	Tł	nread Cutting Oil	NR
1	Tì	tanium Tetracholoride	NR
1	To	oluene, to 30%	NR
	T	mato Juice	200
	Tr	ansformer Oil	140
	Tr	ansmission Fluid Type A	NR
		iacetin	NR
	-	isklaresthans	ND
	-	ichloroethalie	
	-	ichioroethylene	INR
		icresyl Phosphate	NR
	Tr	iethanolamine	70
	Tr	iethylamine	
	Tr	imethylpropane	180
	Tr	isodium Phosphate	70
	Tu	ing Oil	NR
	Tu	irbo Oil #15 Diester Lubricant	NR
	Τι	urpentine	NR
	U	rea	200
	U	rine	200
1	Vá	aseline	NR
1	Ve	egetable Oils	NR
l	Vi	negar	180
ł	Vi	- nyl Acetate	70
l	Vi	nyl Chloride	NR
ł		-Pex	
I		ater	220
I		ater Acid Mino	200
ł		ator Promino	200
ł		ater, DIUIIIIIIe	100
ł		ater, Chiorinated, to 3500ppm	100
ł		ater, Chiorinated, above 3500ppm	NR
		ater, Deionized	200
	W	ater, Demineralized	200
	W	ater, Distilled	200
	W	ater, Potable	Gr. E-pw
l	W	ater, Salt	200
l	W	ater, Sewage	200
I	W	ater, Seawater	200
1	W	ater, Swimming Pool	200
1	w	ater, waste	200
1	w	'hiskey	200
ł	w	'hite Liguor	170
ł	w	ines .	170
1		lood Oil	NR
1		000.01	1.00

Chemical Name	EPDN
Xylene	NR
Zinc Acetate	180
Zinc Chloride	180
Zinc Nitrate	180
Zinc Sulfate	180



PIPE END PREPARATION

How to process roll-grooves

VGS grooved piping systems require the processing of a roll or cut groove to the pipe ends being connected. The engagement of the housing keys in the grooves is integral in providing a secure and leak-tight joint. It is essential that the grooves are properly processed for optimum joint performance.



Nominal pipe size

VGS couplings and fittings are identified by the nominal IPS pipe size in inches or nominal diameter of pipe (DN) in millimeters. Always check the actual O.D. of the pipe and fittings to be connected, as in some markets it is customary to refer to different O.D. pipes with the same nominal size.

Roll groove standard

Roll grooves must meet the specifications and requirements of ANSI/AWWA C-606-04 Table 5. For other pipe sizes not specified in this standard, refer to the applicable groove specifications shown in this catalog or VGS installation manual.

Square cut

Pipe ends must be square cut. Always use a pipe band-saw or automatic round-saw for cutting pipe. The maximum allowable tolerances from square ends are .03"/0.8mm for sizes up to 3-1/2"/ 90 mm; .045"/1.2mm for 4" through 6"/100mm through 150mm and .060"/1.6mm for sizes 8"/200mm and above.



Applicable pipe wall thickness

Roll grooves are generally applicable to .375"/9.5mm thick or thinner wall carbon steel pipe, stainless steel pipe, copper tube, aluminum pipe and PVC pipe depending on the type of roll-grooving machine and roll set being used. Different wall thicknesses and sizes require the use of different roll sets as with Sch. 10 and Sch. 40 pipe as shown.

IPS Sizes - Inch	es	Metric Sizes - millimeters		
Nominal size	Nominal size Actual size		Actual size	
1/2	0.840	15	21.3	
3/4	1.050	20	26.7	
1	1.315	25	33.4	
1-1/4	1.660	32	42.2	
1-1/2	1.900	40	48.3	
2	2.375	50	60.3	
2-1/2	2.875	65	73.0	
3	3.500	80	88.9	
4	4.500	100	114.3	
5	5.563	125	141.3	
6	6.625	150	168.3	
8	8.625	200	219.1	
10	10.750	250	273.0	





Plain end pipe and beveled end pipe

While plain-end pipe is preferred, the use of beveled end pipe is acceptable providing that the wall thickness is .375"/9.5mm or thinner and the bevel is $37-1/2 \pm 2-1/2^{\circ}$ or 30° as specified in ANSI B16.25 and ASTM A-53 respectively.



Galvanized pipe

Galvanized pipe is acceptable as long as the gasket seating surface is smooth and free from scale and imperfections that could affect gasket sealing. Whenever you remove welding beads or projections from the sealing surface of galvanized pipe, use caution so as to not overgrind the surface. After grinding, always apply a proper rust-prevention coating to this area.



Galvanized Pipe

Heavy wall pipe

When you attempt to roll-groove pipe thicker than .375"/9.5mm, the metal may deform and heap up on both sides of the groove rather than radially deforming and protruding on the inside of the pipe. The extra heaped metal on the sealing surface may preclude the coupling housings from making metal-to-metal contact, which could lead to joint failure. In such a case, you should grind off any such extra metal to achieve a flat and smooth sealing surface. A proper rust preventative coating must be applied on the ground surface. Viking strongly recommends the processing of cutgrooves on heavy or thick wall pipe.



Weld Beads

ERW pipe is one of the most popular types of pipe used today. Depending on the individual pipe and manufacturer, welding beads may remain on the surface (inside and out) of the pipe. Always remove harmful weld beads near the pipe ends as they can cause rattling of the roll grooving machine resulting in inaccurate grooves.



Spiral welded pipe

Spiral welded pipe may be used as long as the weld beads are removed from the gasket seating surface. It is also acceptable and recommended to weld a grooved end nipple to the pipe end as shown below. Whenever you remove weld beads or projections from the gasket seating surface, use caution so as to not over-grind the surface. After grinding, always apply a proper rust-prevention coating to this area.









Stainless steel pipe

Stainless steel pipe in general is more difficult to groove than carbon steel pipe, as it is more difficult to achieve defined groove corners on stainless pipe. Grooves that are not defined and have too much of a radius could result in joint failure. Care must be taken to process grooves as defined as possible. For this reason, roll-groove machine manufacturers offer a variety of roll sets depending on the pipe material and wall thickness being grooved. Always select the correct roll set for the pipe being grooved



Caution: If the same roll-set that has been used for carbon steel pipe is used on stainless steel pipe, rust or scale may be transferred to the stainless steel pipe during processing of the groove. Thus we recommend the use of a separate roll set specifically for use with stainless steel pipe. Also use caution to keep roll grooved stainless steel pipe dry prior to installation.

Gasket seating surface (A)

The exterior surface of the gasket seating area shall be free from any indentations, projections, roll marks or other harmful defects such as loose paint, scale, dirt, chips, grease and rust.



Roll groove profile

Roll grooves should be as defined as possible. To achieve optimum joint performance the "K" dimension should be as small as possible. When processing a roll groove the machine operator should manage the feed pressure of the upper roll set so as to achieve the best possible groove profile.



Groove diameter (C)

The groove diameters are average values. The groove must be of uniform depth around the entire pipe circumference. Use a VGS groove gage or groove measuring tape to check the groove diameter.



Or you can use a coupling housing for a quick check after verification of the groove dimensions. When using a housing segment as a reference always make up a sample and verify the diameter is within the acceptable range. If the housing fits well you may choose to use this as a reference gauge.



Quick check with a housing segment





HOLE-CUTTING

The hole-cut method of pipe preparation is required when using mechanical tees, mechanical crosses, and saddle-lets. The method of pipe preparation requires the cutting or drilling of a specified hole size on the centerline of



the pipe. Always use the correct hole saw size as shown in this catalog and never use a torch for cutting a hole. After the hole has been cut all rough edges must be removed and the area within 5/8" (16mm) of the hole should be inspected to ensure a clean smooth surface, free of any indentations or projections that could affect proper gasket sealing. The area within the "A" dimension should also be inspected and must be free of dirt, scale or any imperfection that could affect proper seating or assembly of the fitting.

Hole Size: The hole sizes are dictated by the branch size of the mechanical tee.

Table 1 Hole Si	zes for Mechanical Tees
-----------------	-------------------------

Table 1 Hole Sizes for Mechanical Tees ut								
Models V-M21 & V-M22 Mechanical Tees								
Hole Dim Hole Saw Size	nensions Max Dia. Allowed	Surface Preparation "A"						
38	41	89						
1-1/2	1-5/8	3-1/2						
51*	54*	102						
2	2-1/8	4						
64	67	114						
2-1/2	2-5/8	4-1/2						
70	73	121						
2-3/4	2-7/8	4-3/4						
89	92	140						
3-1/2	3-5/8	5-1/2						
114	118	165						
4-1/2	4-5/8	6-1/2						
	Dele Sizes for -M21 & V- Hole Din Hole Saw Size 38 1-1/2 51* 2 64 2-1/2 70 2-3/4 89 3-1/2 114 4-1/2	Sizes for Mechanical Hole Dimensions Hole Saw Max Dia. Size Allowed 38 41 1-1/2 1-5/8 51* 54* 2 2-1/8 64 67 2-1/2 2-5/8 70 73 2-3/4 2-7/8 89 92 3-1/2 3-5/8 114 118 4-1/2 4-5/8						

*See Table 1-b for exception.

Table 2

Model V-723 Saddle-Let							
Hole Dimensions							
Mechanical Tee	Hole Saw	Max Dia.	Surface Preparation				
Branch Size	Size	Allowed	"A"				
15, 20, 25	30	32	89				
1/2, 3/4, 1	1-3/16	1-1/4	3-1/2				





Technical Information Roll Groove Specifications

Standard Roll Groove for ANSI B36.10 and Other IPS Pipe



1		2		3	4	5	6	7	8
Nominal	Pipe O.D.		A	B	C	Min. Wall	Groove Depth	Max. Allowed	
Size	Basic		±0.76	±0.76	+0.00	t	d (ref.)	Flare Dia.	
mm/in	mm/in Tolerance		±0.030	±0.030	+0.000	mm/in	mm/in	mm/in	
20	26.7	+0.25	-0.25	15.88	7.14	23.83-0.38	1.65	1.42	29.2
0.75	1.050		-0.010	0.625	0.281	0.938-0.015	0.065	0.056	1.15
25	33.4	+0.33	-0.33	15.88	7.14	30.23-0.38	1.65	1.60	36.3
1	1.315	+0.013	-0.013	0.625	0.281	1.190-0.015	0.065	0.063	1.43
32	42.2	+0.41	-0.41	15.88	7.14	38.99-0.38	1.65	1.60	45.0
1.25	1.660	+0.016	-0.016	0.625	0.281	1.535-0.015	0.065	0.063	1.77
40	48.3	+0.48	-0.48	15.88	7.14	45.09-0.38	1.65	1.60	51.1
1.5	1.900	+0.019	-0.019	0.625	0.281	1.775-0.015	0.065	0.063	2.01
50	60.3	+0.61	-0.61	15.88	8.74	57.15-0.38	1.65	1.60	63.0
2	2.375	+0.024	-0.024	0.625	0.344	2.250-0.015	0.065	0.063	2.48
65	73.0	+0.74	-0.74	15.88	8.74	69.09-0.46	2.11	1.98	75.7
2.5	2.875	+0.029	-0.029	0.625	0.344	2.720-0.018	0.083	0.078	2.98
80	88.9	+0.89	-0.79	15.88	8.74	84.94-0.46	2.11	1.98	91.4
3	3.500	+0.035	-0.31	0.625	0.344	3.344-0.018	0.083	0.078	3.60
90	101.6	+1.02	-0.79	15.88	8.74	97.38-0.51	2.11	2.11	104.1
3.5	4.000	+0.040	-0.031	0.625	0.344	38.34-0.020	0.083	0.083	4.10
100	114.3	+1.14	-0.79	15.88	8.74	110.08-0.51	2.11	2.11	116.8
4	4.500	+0.045	-0.031	0.625	0.344	4.334-0.020	0.083	0.083	4.60
125	141.3	+1.42	-0.79	15.88	8.74	137.03-0.56	2.77	2.11	143.8
5	5.563	+0.056	0.031	0.625	0.344	5.395-0.022	0.109	0.083	5.66
150	168.3	+1.60	-0.79	15.88	8.74	163.96-0.56	2.77	2.16	170.9
6	6.625	+0.063	0.031	0.625	0.344	6.455-0.022	0.109	0.085	6.73
200	219.1	+1.60	-0.79	19.05	11.91	214.40-0.64	2.77	2.34	223.5
8	8.625	+0.063	-0.031	0.750	0.469	8.441-0.025	0.109		8.80
250	273.0	+1.60	-0.79	19.05	11.91	268.27-0.69	3.40	2.39	277.4
10	10.750	+0.063	0.031	0.750	0.469	10.562-0.027	0.134	0.094	

Pipe OD (Column 2):

Maximum allowable tolerances from square cut ends is 0.03" for sizes up to 3 1/2"; 0.045" for 4" thru 6"; and 0.060" for sizes 8" and above.

Gasket Seating Surface (Column 3): The gasket seating surface shall be free from deep scores, marks, or ridges that could prevent a positive seal.

Groove Width (Column 4):

Groove width is to be measured between vertical flanks of the groove side walls. Groove Diameter (Column 5):

The 'C' diameters are average values. The groove must be of uniform depth around the entire pipe circumference.

Minimum Wall Thickness (Column 6): The 't' is the minimum allowable wall thickness that may be roll-grooved.

Groove Depth (Column 7):

The 'd' is for reference use only. The groove dimension shall be determined by the groove diameter 'C'. Flare Diameter (Column 8):

The pipe end that may flare when the groove is rolled shall be within this limit when measured at the extreme end of the pipe.





Technical Information Cut Groove Specifications

Standard Cut Groove Specifications for IPS / BS / ISO / JIS Pipe

Gasket Seating Surface (Column 3): The gasket seating surface shall be free from deep scores, marks, or ridges that could prevent a positive seal. Groove Width (Column 4): Groove width is to be measured between vertical flanks of the groove side walls. Groove Diameter (Column 5): The 'C' diameters are average values. The groove must be of uniform depth around the entire pipe circumference. Minimum Wall Thickness (Column 6): The 't' is the minimum allowable wall thickness that may be cut-grooved.

Groove Depth (Column 7): The 'd' is for reference use only. The groove dimension shall be determined by the groove diameter 'C'.



. 1		2		3	4	5	6	7
Nominal Size	Dania	Pipe O.D.		A +0.79	B +0.79	C +0.00	Min. Wall t	Groove Depth d (ref.)
mm/in	mm/in	Tole	rance	±0.031	±0.031	+0.000	mm/in	mm/in
20	26.7	+0.25	-0.25	15.88	7.95	23.83-0.38	2.87	1.42
0.75	1.050	+0.010	-0.010	0.625	0.313	0.938-0.015	0.113	0.056
25	33.4	+0.33	-0.33	15.88	7.95	30.23-0.38	3.38	1.60
1	1.315	+0.013	-0.013	0.625	0.313	1.190-0.015	0.133	0.063
32	42.2	+0.41	-0.41	15.88	7.95	38.99-0.38	3.56	1.60
1.25	1.660	+0.016	-0.016	0.625	0.313	1.535-0.015	0.140	0.063
40	48.3	+0.48	-0.48	15.88	7.95	45.09-0.38	3.68	1.60
1.5	1.900	+0.019	-0.019	0.625	0.313	1.775-0.015	0.145	0.063
50	60.3	+0.61	-0.61	15.88	7.95	57.15-0.38	3.91	1.60
2	2.375	+0.024	-0.024	0.625	0.313	2.250-0.015	0.154	0.063
65	73.0	+0.74	-0.74	15.88	7.95	69.09-0.46	4.78	1.98
2.5	2.875	+0.029	-0.029	0.625	0.313	2.720-0.018	0.188	0.078
65	76.1	+0.76	-0.76	15.88	7.95	72.26-0.46	4.78	1.93
80	88.9	+0.89	-0.79	15.88	7.95	84.94-0.46	4.78	1.98
3	3.500	+0.035	-0.031	0.625	0.313	3.344-0.018	0.188	0.078
90	101.6	+1.02	-0.79	15.88	7.95	97.38-0.51	4.78	1.98
3.5	4.000	+0.040	-0.031	0.625	0.313	3.834-0.020	0.188	0.078
100	114.3	+1.14	-0.79	15.88	9.53	110.08-0.51	5.16	2.11
4	4.500	+0.045	-0.031	0.625	0.375	4.334-0.020	0.203	0.083
125	141.3	+1.42	-0.79	15.88	9.53	137.03-0.56	5.16	2.11
5	5.563	-0.056	-0.031	0.625	0.375	5.395-0.022	0.203	0.083
150	165.1	+1.60	-0.79	15.88	9.53	160.80-0.56	5.56	2.16
150	168.3	+1.60	-0.79	15.88	9.53	163.96-0.56	5.56	2.16
6	6.625	+0.063	-0.031	0.625	0.375	6.455-0.022	0.219	0.085
200	219.1	+1.60	-0.79	19.05	11.13	214.40-0.64	6.05	2.34
8	8.625	+0.063	-0.031	0.750	0.438	8.441-0.025	0.238	0.092
250	273.0	+1.60	-0.79	19.05	12.70	268.27-0.69	6.35	2.39
10	10 750	+0.063	-0.031	0.750	0.500	10 562-0.027	0.250	0.094





Technical Information Bolt Torque

BOLT TORQUE FOR PROPER ASSEMBLY OF COUPLINGS

VGS pipe couplings are always supplied with factory bolts and nuts. Always use factory supplied bolts and nuts for assembly of VGS pipe couplings. Shown below are required torque ranges for proper installation with factory supplied bolts and nuts. These are not the maximum torques, though never exceed the listed torque values by more than 25%, as excessive torque can lead to bolt or joint failure. Always tighten nuts evenly and equally by alternating sides to prevent the gasket from being pinched. Pinching of gasket may cause an immediate or delayed leak.

These torque range values can be used for setting the torque on power drivers.

Table 1 Carboi	l : n Stee	l Track Bolt	S	Table 2 Stainle	2: ess Ste	el Track Bo	lts
Bolt	Size	Torque	Range	Bolt	Size	Torque	Range
mm	Inch	N-m	Lbs - ft	mm	Inch	N-m	Lbs - ft
M10	3/8	20 - 30	15 - 22	M8	5/16	8 – 15	6 - 11
M12	1/2	40 - 68	30 - 50	M10	3/8	17 – 25	12 – 18
M16	5/8	80 - 120	60 - 90	M12	1/2	35 – 60	25 – 45
M20	3/4	100 - 235	74 – 170	M16	5/8	68 – 100	50 – 75
M22	7/8	170 - 275	125 - 200	M20	3/4	85 – 200	65 – 150
M24	1	275 - 400	200 - 300	M22	7/8	145 - 235	105 - 175

Metal-to-metal Contact: Except for those products listed below, all VGS grooved couplings are designed so that bolt pads make metal-to-metal contact when properly installed. For these couplings, bolt pad gaps are not acceptable. In many cases proper installation can be achieved with smaller torque values than listed. For couplings smaller than 300 mm / 12" size, the use of a torque wrench is usually not required. After metal-to-metal contact is achieved, tighten nuts by another one quarter to one half turn to make sure the bolts and nuts are snug and secure. For couplings lager than 350 mm / 14" size, tighten nuts until the bolt pads make metal-to-metal contact and continue to tighten nuts until the required torque value is achieved.



Metal-to-metal contact



After metal-to-metal, further tighten one quarter or half turn If bolt pad gaps are evident after installation, disassemble and reinstall the coupling after checking the following:

- I The coupling, pipe and or fitting being connected are the correct size.
- \square The coupling keys are fully engaged in the pipe and or component grooves.
- ☑ The gasket is not being pinched.
- \Box The grooves conform to the applicable groove dimension specifications.
- \Box The pipe end flare is within the specification tolerance.

BOLT TORQUE FOR PROPER ASSEMBLY OF FLANGE ADAPTERS

Assembly Bolts & Nuts: Installers are requested to prepare conventional hexagonal bolts and nuts for assembly of VGS flange adapter as Viking does not supply assembly bolts and nuts except those that are necessary to put the flange segments together.

Bolt Tightening Sequence: VGS flange adapters are designed for direct connection of the grooved system to flanged components sealed with elastic gaskets. Like a regular flange joint, it is important to make flange faces contact parallel. Tighten nuts alternately in the sequence of diagonally opposite pairs as shown below until the flange faces meet and make metal-to-metal contact.



Required Bolt Torque: Shown below are standard torque values for proper assembly of VGS flange adapters. Use a torque wrench so that all the nuts are tightened equally with a same torque value. These are not maximum torque values and bolts may be tightened far above the torque values shown here but it is not necessary as VGS flange adapters are sealed with elastic (rubber) gaskets, which require much lower torques than that for metallic gaskets.

Table 3: VGS Flange adapters Models 7041-A, H312, SS-41, SS-41, C341 & A512 (ANSI Class 125/150)

-						
Nom.	Bolt	Required Torque				
Size	Size					
inch	inch	N-m	Lbs-Ft			
2"	5/8 (4)	30 - 50	22 - 37			
2 1/2"	5/8 (4)	30 - 50	22 - 37			
3"	5/8 (4)	40 - 68	30 - 50			
4"	5/8 (8)	40 - 68	30 - 50			
5"	3/4 (8)	40 - 68	30 - 50			
6"	3/4 (8)	40 - 68	30 - 50			
8"	3/4 (8)	68 - 90	50 - 66			

(): No. of bolts

THE VIKING CORPORATION Standard Terms and Conditions of Sale

The terms set forth in this form are the sole terms for the sale of goods and services by The Viking Corporation ("Viking"), unless otherwise specifically provided for by Viking in this document, and shall apply to the exclusion of any inconsistent or additional terms contained in the end purchaser's (collectively, the "Buyer") order or acknowledgment or otherwise proposed by

Buyer. Buyer's acceptance of these terms shall be conclusively presumed by Buyer's submission of a purchase order to Supply Network, Inc. d/b/a Viking SupplyNet, or by Buyer's acceptance of delivery of, or payment for, the goods and services. Any contract made for the sale of goods or services by Viking is expressly conditional on Buyer's assent to the terms stated in this document.

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 and then observing such reasonable instructions as Viking may give in authorizing any return. All returns must be accompanied by a valid Viking RMA (return material authorization).
 Material accepted for return is subject to a minimum 20% restocking fee, or the standard restocking fee charged by the manufacturer or supplier on returns to them. Returned material
 must be unused or not installed, in its original packaging, and of current design. Sprinkler heads must be in unopened original packaging. Any returned material not in this condition is
 subject to additional charges to cover inspection, handling, repackaging, refurbishment, or any other expenses incurred by Viking in accepting the material. Viking may deny credit on
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- 8. Governing Law. Michigan law shall govern all transactions to which these standard terms and conditions apply. Viking and Buyer agree that any action arising out of the sale of goods or services in accordance with this document will be brought, heard and decided in Kent County, Michigan. Buyer submits to personal jurisdiction in Michigan.
- 9. Buyer's Design Responsibility. Buyer acknowledges that Viking's goods are produced or provided according to Buyer's specifications. Buyer acknowledges that Buyer is not relying on Viking in any way with respect to the suitability of its products or the adequacy of the specifications. Viking has no responsibility for design, engineering, or other advice, regarding any product specifications provided by Buyer. Buyer shall defend, indemnify and hold Viking harmless against all product liability, product recall, and other claims, liabilities and expenses, including but not limited to actual attorney fees, incurred by Viking arising out of any claimed design or engineering defect relating to specifications provided by Buyer to Viking.
- 10. Indemnification of Viking (General). Buyer shall indemnify, defend and hold Viking and its agents harmless from all claims, liabilities, and expenses, including but not limited to actual attorney fees, sustained by Viking or its agents that are caused by any action of Buyer relating to the goods or services sold by Viking to Buyer.
- 11. Indemnification of Viking (Patents). Buyer shall indemnify, defend, and hold Viking and its agents harmless from all claims, liabilities, and expenses, including but not limited to actual attorney fees, arising out of any claim of infringement of a patent, copyright, trademark, trade name, or other proprietary right, or claim of unfair trade or of unfair competition in connection with the manufacture, sale, or use of the goods sold to Buyer, except to the extent that any claim, liability, or expense arises solely from specifications developed by Viking.
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15. Severability. All terms shall be enforced only to the maximum extend permitted by law. If any term is invalid or unenforceable, all other terms shall remain in effect.

VCORP TC 0408

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- 2. Payment. Unless otherwise provided in an invoice issued by VSN, payment terms are net 45 days from the date of invoice. Invoices not paid within 45 days shall have a service charge added to the amount due of one and one-half percent (1-1/2%) per month on the highest interest rate allowable by law.
- 3. Inspection/Acceptance/Return. Buyer may not return any goods, under warranty claim or otherwise, without first reporting to VSN the reasons for such return and first obtaining and then observing such reasonable instructions as VSN may give in authorizing any return. All returns must be accompanied by a valid VSN RMA (return material authorization). Material accepted for return is subject to a minimum 20% restocking fee, or the standard restocking fee charged by the manufacturer or supplier on returns to them. Returned material must be unused or not installed, in its original packaging, and of current design. Sprinkler heads must be in unopened original packaging. Any returned material not in this condition is subject to additional charges to cover inspection, handling, repackaging, refurbishment, or any other expenses incurred by VSN in accepting the material. VSN may deny credit on returned merchandise not meeting these requirements.
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15. Severability. All terms shall be enforced only to the maximum extend permitted by law. if any term is invalid or unenforceable, all other terms shall remain in effect.

VSN TC 0408

Notes



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Viking SupplyNet - Latin America 2840 SW 42nd Street, Bldg IV Fort Lauderdale, FL 33312 Phone: 954-791-2901 Fax: 954-791-1181 Viking SupplyNet - U.S. Midwest 2353 International Street Columbus, OH 43228 Phone: 800-926-7757 Fax: 614-527-5818

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