



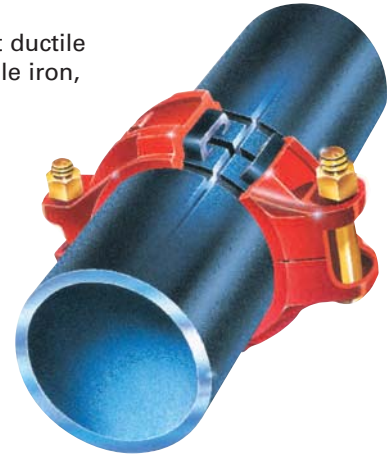
## ΑΥΛΑΚΩΤΑ ΕΞΑΡΤΗΜΑΤΑ – ΠΑΡΕΜΒΥΣΜΑΤΑ

**Metallurgical specifications:**

Grinnell Grooved Products are manufactured in modern, state of the art ductile iron foundries. The following applicable material specifications for ductile iron, galvanizing and rubber-injection apply:

**Housing & Fitting specifications**

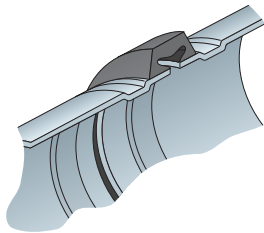
- Cast:
- ASTM A-536 – Standard specifications for Ductile Iron Castings Grade 65-45-12
  - Tensile Strength, minimum 65,000 psi
  - Yield Strength, minimum 45,000 psi
  - Elongation in 2" or 50 mm, minimum 12%
  - ASTM A-153 Standard Specification for Hot Dip Galvanizing

**Fabricated:**

Carbon steel according DIN/BS/ASTM Standard.  
ASTM A-153 or DIN EN10240 [Previous DIN2444]  
Standard Specification for Hot Dip Galvanizing

**Gasket Specifications**

Grade 'E' EPDM gaskets have a green color code identification and conform to ASTM D-2000 for service temperatures from -34°C [-30°F] to +110°C [+230°F]. They are recommended for hot water not to exceeding the +110°C [+230°F], plus a variety of dilute acids, oil free air and many chemical services. They are not recommended for petroleum services.



Grade 'T' Nitrile gaskets have an orange color code identification and conform to ASTM D-2000 for service temperatures from -29°C [-20°F] to +82°C [+180°F]. They are recommended for petroleum products, vegetable oils, mineral oils and air with oil vapors.

**Bolt specifications**

ANSI/Metric: Heat treated Carbon Steel Track Head Bolts conform to the physical properties of ASTM A-183 minimum Tensile Strength of 758,340 kPa (110,000 psi). Bolts and Nuts are zinc electroplated.

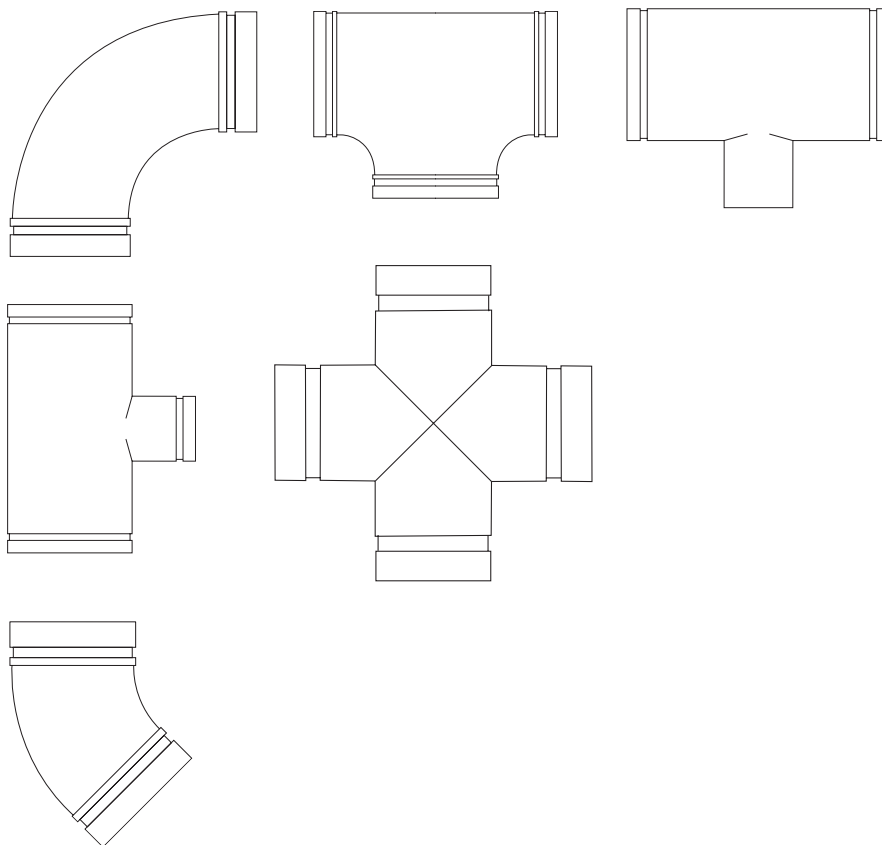
**Paint Specifications:**

Standard: Red RAL3000 - Non Lead  
Optional: Hot Dip Zinc Galvanized

**Nut size Wrench sizes**

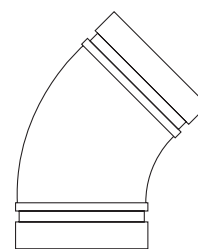
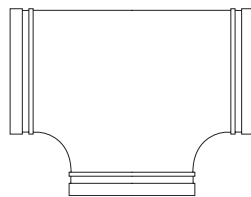
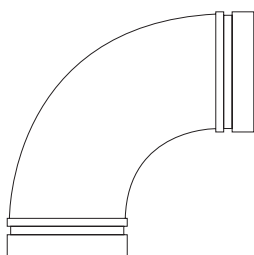
M10	17mm
M12	22mm
M16	27mm
M20	32mm
M22	36mm
M24	41mm

Note: All dimensions in this catalogue are nominal sizes.



Grinnell Grooved Fittings provide an economical and efficient method of changing direction, adding and outlet, reducing, or capping grooved piping systems. Grinnell Grooved Fittings are rated at the same pressure rating of the coupling being used.

Pressure ratings of Grinnell standard casted fittings conform to those of fig. 707 Grinnell couplings.



## FRICTION RESISTANCE (EXPRESSED AS EQUIVALENT STRAIGHT PIPE)

Nominal Size mm Inches	Pipe OD	Pipe Wall Thickness mm	Elbows 90° mtrs	Elbows 45° mtrs	Tee Branch mtrs	Tee Run mtrs
25 1	33.7	3.4	0.5	0.2	1.3	0.5
32 1 1/4	42.4	3.6	0.6	0.3	1.5	0.6
40 1 1/2	48.3	3.7	0.7	0.4	1.8	0.7
50 2	60.3	3.9	1.0	0.5	2.5	1.0
65 2 1/2	73.0	5.2	1.2	0.6	3.0	1.2
65 2 1/2	76.1	5.0	1.2	0.6	3.1	1.2
80 3	88.9	5.5	1.5	0.7	3.7	1.5
100 4	108.0	5.6	2.0	1.0	5.0	2.0
100 4	114.3	6.3	2.0	1.0	5.0	2.0
125 5	133.0	6.3	2.4	1.3	6.1	2.4
125 5	139.7	6.3	2.4	1.3	6.1	2.4
125 5	141.3	6.6	2.5	1.3	6.3	2.5
150 6	159.0	7.1	2.9	1.4	7.2	2.9
150 6	165.1	7.1	2.9	1.4	7.2	2.9
150 6	168.3	7.1	3.0	1.5	7.6	3.0
200 8	219.1	8.2	4.0	2.0	10.0	4.0
250 10	273.0	9.3	5.0	2.5	12.6	5.0
300 12	323.9	9.5	6.1	3.0	15.1	6.1
350 14	355.6	9.5	7.0	5.5	20.7	7.0
400 16	406.4	9.5	7.9	6.1	23.8	7.9
450 18	457.2	9.5	8.8	7.0	25.9	8.8
500 20	508.0	9.5	10.1	7.9	30.5	10.1
600 24	609.6	9.5	12.2	9.1	35.1	12.2

For the reducing tee and branches, use the value that is corresponding to the branch size. Example: For 6"x6"x3" tee, the branch value of 3" is 3.9 meters. For sizes not listed, interpolate from the values shown.

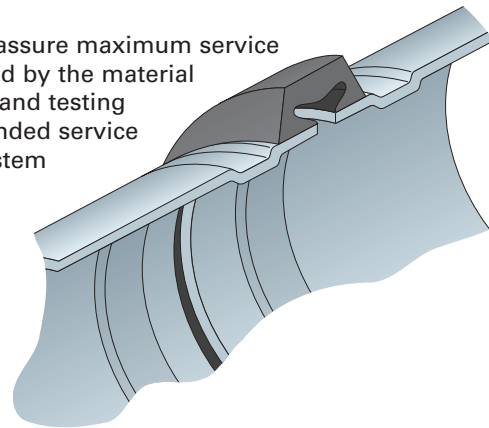
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**Grinnell Gasket Grade Index and Recommendations**

The Gasket Recommendation Tables have been developed to assure maximum service life. The tables have been developed from information supplied by the material manufacturers of the elastomer, technical reference literature and testing conducted by Grinnell. In evaluating the gasket grade for intended service applications consideration must be given to the following: system operating temperature, fluid or solution concentration, and duration of service.

All gasket recommendations are based on a temperature of 21°C (70°F) unless otherwise noted. Tyco Building Services Products should be consulted if combinations of service solutions are being considered. Contact Tyco Building Services Products for recommendations for services not listed. Gasket recommendations apply to Grinnell gaskets only. These listings do not apply for Grinnell Butterfly Valves.



**Standard Gaskets**

Grade	Temperature Range	Compound	Colour Code	General Service Application
E	-34°C to + 110°C (-30°F to +230°F)	EPDM	Green	Hot water, dilute acids, alkalis and many chemical services not involving petroleum products. Excellent oxidation resistance. NOT FOR USE WITH HYDROCARBONS
T	-29°C to + 82°C (-20°F to +180°F)	Nitrile (Buna-N)	Orange	Petroleum products, vegetable oils and air with oil vapors NOT FOR USE IN HOT WATER SERVICES

**Tri-Seal freezer gasket**

The Tri-Seal Grade E freezer gasket is used primarily for dry pipe fire protection systems, vacuum service, and freezer applications. The Tri-Seal freezer gasket differs from standard gaskets by closing off the gap of gasket cavity. This is accomplished by positioning the center "rib" of the gasket over the gap between the pipes. The Tri-Seal freezer gasket has two tapered sealing edges in addition to the center rib for additional strength and sealing.

The Tri-Seal freezer gasket is available in sizes 32mm to 300mm and is designed for use with Grinnell Figure 705, 705R, 707, 577, 772, 405 and 472 Couplings. A petroleum-free silicone based lubricant is recommended for all dry pipe systems. For low temperature services or dry systems in cold storage or freezer applications, use Tri-Seal freezer gaskets. For vacuum services greater than 10" Hg, Tri-Seal gaskets should be used.

Note: Rigid couplings are preferred for vacuum, dry pipe and freezer applications.



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- Contact Tyco BSP for an Engineering evaluation and recommendation where the gasket grade is shown in parenthesis.
- Specify gasket grade when ordering.
- For dry pipe systems or freezer systems, use Tri-Seal freezer gasket and petroleum free silicone lubricant.
- Check gasket colour code to be certain it is suitable for the service intended.
- Unless otherwise noted, all gasket listings are based upon a temperature of 21°C (70°F).
- For services not listed contact Tyco BSP for recommendation.
- Where more than one gasket is shown, the preferred gasket grade is listed first.

**WATER & AIR**

Service	Gasket Grade
Air, (no oil vapors), Temp. -34°C to + 110°C (-30°F to + 230°F)	E
Air, with oil vapors, Temp. -29°C to + 66°C (-20°F to + 150°F)	T
Water, Temperature to 66°C (150°F)	E/T
Water, Temperature to 110°C (230°F) [not recommended for steam services]	E
Water, Acid Mine	E/T
Water, Chlorine	E
Water, Deionized	E
Water, Seawater	E
Water, Waste (no petroleum products)	E

**PETROLEUM PRODUCTS**

Service	Gasket Grade
Crude Oil - Sour	T
Diesel Oil	T
Fuel Oil	T
Gasoline, Leaded	T
Hydraulic Oil	T
Kerosene	T
Lube Oil, to 66°C (150°F)	T
Motor Oil	T
Tar and Tar Oil	T

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Chemical Composition	Gasket Grade
Acetic Acid up to 10%	E
Acetone	E
Acetylene	E/T
Alkalis	E
Aluminium Chloride	E/T
Aluminium Fluoride	E/T
Aluminium Hydroxide	E
Aluminium Nitrate	E/T
Aluminium Salts	T
Ammonia Gas, Cold	E
Ammonia Liquid	E
Ammonium Chloride	E/T
Amyl Acetate	E
Amyl Alcohol	E
Aniline	E
Arsenic Acid to 75%	T
Barium Carbonate	E
Barium Chloride	E/T
Barium Hydroxide	E/T
Benzoic Acid	E
Benzyl Alcohol	E
Borax Solutions	E
Boric Acid	E/T
Butyl Alcohol	E/T
Butylene	T
Calcium Bisulphate	T
Calcium Chloride	E/T
Calcium Hydroxide (Lime)	E/T
Calcium Sulfate	E/T
Calcium Sulfide	E
Carbitol	E/T
Carbon Dioxide, Dry	E/T
Carbon Dioxide, Wet	E/T
Carbon Monoxide	E
Caustic Potash	T
Chrome Alum	T
Citric Acid	E/T
Copper Chloride	T
Copper Cyanide	E/T
Copper Sulphate	E/T
Cupric Fluoride	E
Cupric Sulphate	E/T
Diocetyl Phthalate	E
Ethane	E
Ethanolamine	E
Ethyl Alcohol	E
Ethyl Chloride	E
Ethylene Chlorohydrin	E
Ethylene Diamine	T
Ethylene Glycol	E/T
Ferric Sulphate	T
Fluboric Acid	E/T
Fly Ash	E
Fomaldehyde	E/T
Formamide	E/T
Formic Acid	E
Fructose	E/T
Furfuryl Alcohol	E
Glycerin	E/T
Glycerol	E/T
Glycol	E/T

Chemical Composition	Gasket Grade
Heptane	T
Hexaldehyde	E
Hexane	T
Hexylene Glycol	T
Hydrochloric Acid to 36%, 24°C (75°F) Max	E
Hydrofluosilicic Acid	E
Isobutyl Alcohol	E
Isopropyl Alcohol	E
Lead Acetate	T
Lithium Bromide	T
Magnesium Chloride	E/T
Magnesium Hydroxide	E/T
Magnesium Sulphate	E/T
Methyl Alcohol, Methanol	E/T
Methyl Ethyl Ketone	(E)
Methyl Isobutyl Carbinol	E
Mineral Oils	T
Nickel Chloride	E/T
Nickel Plating Solution 52°C (125°F) Max	E/T
Nitric Acid, to 10%, 24°C (75°F) Max	E
Nitrous Oxide	E
Ozone	E
Phosphate Ester	E
Phosphoric Acid to 75% & 21°C (70°F) Max	E/T
Potassium Bromide	E/T
Potassium Carbonate	E/T
Potassium Chloride	E
Potassium Chromate	T
Potassium Hydroxide	T
Propylene Glycol	E
Salicylic Acid	E
Silver Nitrate	E
Soda Ash, Sodium Carbonate	E/T
Sodium Bicarbonate	E/T
Sodium Bisulphate	E/T
Sodium Bisulphite (black liquor)	E/T
Sodium Bromide	E/T
Sodium Chlorate	E
Sodium Chloride	E/T
Sodium Cyanide	E/T
Sodium Hydroxide, up to 50%	E
Sodium Hypochlorite, to 20%	E
Sodium Metaphosphate	T
Sodium Nitrate	E
Sodium Peroxide	E
Sodium Phosphate	T
Sodium Silicate	T
Sodium Sulfide	T
Sodium Sulfite Solution, to 20%	T
Sodium Thiosulphate, "Hypo"	T
Stannous Chloride, to 15%	T
Stearic Acid	T
Sulphur	E
Sulphuric Acid, to 25%, 66°C(150°F) Max	E
Toluene 30%	T
Triethanolamine	E/T
Trisdodium Phosphate (5 kg/189 ltr)	E
Turpentine 70°C (158°F) Max	(T)
Urea	T
Vegetable Oil	T
Vinyl Acetate	E

Note: Contact Tyco BSP for an Engineering evaluation and recommendation where the gasket grade is shown in parenthesis.  
 For dry pipe systems or freezer systems, use Tri-Seal freezer gasket and petroleum free silicone lubricant.  
 Check gasket colour code to be certain it is recommended for the service intended.  
 Unless otherwise noted, all gasket listings are based upon a temperature of 70° F (21° C).  
 For services not listed contact Tyco BSP for recommendation.  
 Where more than one gasket is shown, the preferred gasket grade is listed first.

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Grinnell Coupling Working Pressure Ratings (Bar) on Roll Grooved ISO Size Steel Pipe. Maximum Working Pressure Bar**								
Nom. Pipe Size Inches DN/mm	Pipe Outside Diameter mm	Nominal Wall Thickness mm	Fig. 705 Flexible Max. Work Pressure Bar	Fig. 577 Rigid Max. Work Pressure Bar	Fig. 707 Flexible Max. Work Pressure Bar	Fig. 772 Rigid Max. Work Pressure Bar	Fig. 716 Reducing Max. Work Pressure Bar	Fig. 71 Flange Max. Work Pressure Bar
1 25	33.7	1.8	-	20.7	-	-	-	-
		2.9	-	20.7	-	-	-	-
		3.2	-	20.7	-	-	-	-
1 1/4 32	42.4	1.8	20.7	20.7	-	51.7	-	-
		2.9	34.5	20.7	-	51.7	-	-
		3.6	34.5	20.7	-	51.7	-	-
1 1/2 40	48.3	1.8	34.5	20.7	34.5	34.5	24.1	-
		2.9	34.5	20.7	51.7	51.7	24.1	-
		3.6	34.5	20.7	69.0	51.7	24.1	-
2 50	60.3	1.8	34.5	20.7	34.5	34.5	24.1	13.8
		2.9	34.5	20.7	51.7	51.7	24.1	17.2
		3.6	34.5	20.7	69.0	51.7	24.1	20.7
2 1/2 65	73.0	2.0	34.5	20.7	34.5	34.5	24.1	13.8
		3.2	34.5	20.7	41.3	41.3	24.1	17.2
		5.0	34.5	20.7	69.0	51.7	24.1	20.7
2 1/2 65	76.1	2.0	34.5	20.7	34.5	34.5	24.1	13.8
		3.2	34.5	20.7	41.3	41.3	24.1	17.2
		5.0	34.5	20.7	69.0	51.7	24.1	20.7
3 80	88.9	2.0	34.5	20.7	34.5	34.5	24.1	13.8
		3.2	34.5	20.7	41.3	41.3	24.1	17.2
		5.6	34.5	20.7	69.0	51.7	24.1	20.7
4 100	114.3	2.0	27.6	20.7	27.6	27.6	24.1	13.8
		3.2	34.5	20.7	41.3	41.3	24.1	17.2
		5.6	34.5	20.7	69.0	51.7	24.1	20.7
4 100	108.0	2.0	27.6	-	-	-	-	-
		3.2	34.5	-	-	-	-	-
		5.6	34.5	-	-	-	-	-
5 125	141.3	2.9	24.1	20.7	24.1	24.1	24.1	13.8
		3.6	31.0	20.7	34.5	31.0	24.1	17.2
		6.3	31.0	20.7	69.0	51.7	24.1	20.7
5 125	133.0	2.9	24.1	-	-	-	-	-
		3.6	31.0	-	-	-	-	-
		6.3	31.0	-	-	-	-	-
5 125	139.7	2.9	24.1	20.7	-	24.1	-	13.8
		3.6	31.0	20.7	-	31.0	-	17.2
		6.3	31.0	20.7	-	51.7	-	20.7
6 150	168.3	2.9	24.1	20.7	24.1	24.1	17.2	13.8
		3.6	31.0	20.7	31.0	34.5	24.1	17.2
		7.1	31.0	20.7	69.0	48.2	24.1	20.7
6 150	159.0	2.9	24.1	-	-	-	-	-
		3.6	31.0	-	-	-	-	-
		7.1	31.0	-	-	-	-	-
6 150	165.1	2.9	24.1	20.7	24.1	24.1	17.2	13.8
		3.6	31.0	20.7	31.0	34.5	24.1	17.2
		7.1	31.0	20.7	69.0	48.2	24.1	20.7
8 200	219.1	2.9	17.2	17.2	17.2	17.2	-	13.8
		5.0	20.7	20.7	20.7	20.7	-	13.8
		8.0	31.0	20.7	55.1	41.3	-	20.7
10 250	273.0	3.6	20.7	-	17.2	17.2	-	13.8
		5.0	24.1	-	20.7	20.7	-	13.8
		8.0	24.1	-	34.5	27.6	-	17.2
12 300	323.9	4.0	20.7	-	13.8	13.8	-	13.8
		5.0	24.1	-	20.7	13.8	-	13.8
		8.0	24.1	-	34.5	27.6	-	17.2
14 350	355.6	4.0	-	-	8.6	-	-	-
		6.3	-	-	17.2	-	-	-
		8.8	-	-	20.7	-	-	-
16 400	406.4	4.0	-	-	6.9	-	-	-
		6.3	-	-	12.1	-	-	-
		8.8	-	-	20.7	-	-	-
18 450	457.2	5.0	-	-	5.2	-	-	-
		6.3	-	-	6.9	-	-	-
		8.8	-	-	20.7	-	-	-
20 500	508.0	5.0	-	-	3.4	-	-	-
		6.3	-	-	6.9	-	-	-
		8.8	-	-	20.7	-	-	-
24 600	609.6	5.0	-	-	1.7	-	-	-
		6.3	-	-	5.2	-	-	-
		8.8	-	-	17.2	-	-	-

\*\*Maximum line pressure, including surge, to which a joint should be subjected on pipe roll grooved to standard roll grooving specification with coupling properly assembled

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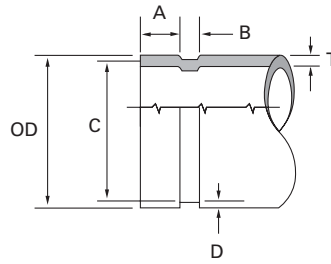
Grinnell Coupling Working Pressure Ratings (Bar) on Roll Grooved ISO Size 304/316 Stainless Steel Pipe. Maximum Working Pressure Bar**								
Nom. Pipe Size Inches DN/mm	Pipe Outside Diameter mm	Nominal Wall Thickness mm	Fig. 705 Flexible Max. Work Pressure Bar	Fig. 577 Rigid Max. Work Pressure Bar	Fig. 707 Flexible Max. Work Pressure Bar	Fig. 772 Rigid Max. Work Pressure Bar	Fig. 405 Flexible Max. Work Pressure Bar	Fig. 472 Rigid Max. Work Pressure Bar
1 25	33.7	1.7	-	21	-	-	-	16
		2.0	-	21	-	-	-	16
		2.8	-	21	-	-	-	21
		3.4	-	21	-	-	-	16
1 1/4 32	42.4	1.7	-	21	-	28	21	16
		2.0	-	21	-	28	21	16
		2.8	-	21	-	34	21	21
		3.6	-	21	-	52	21	21
1 1/2 40	48.3	1.7	28	21	28	28	21	16
		2.0	28	21	28	28	21	16
		2.8	34	21	34	34	21	21
		3.7	34	21	52	52	21	21
2 50	60.3	1.7	17	21	22	22	21	16
		2.0	17	21	22	22	21	16
		2.8	28	21	34	34	21	21
		3.9	34	21	52	52	21	21
2 1/2 65	73.0	2.1	17	21	22	22	21	16
		2.0	17	21	22	22	21	16
		3.0	28	21	34	34	21	21
		5.2	34	21	52	52	21	21
3 65.0	76.1	2.8	17	21	22	22	21	16
		3.8	17	21	22	22	21	21
		5.1	28	21	34	34	21	21
		6.4	34	21	52	52	21	21
3 80	88.9	2.1	17	21	22	22	21	16
		2.0	17	21	22	22	21	16
		3.0	28	21	34	34	21	21
		5.5	34	21	52	52	21	21
4 100	114.3	2.1	16	21	17	17	21	16
		3.0	21	21	28	28	21	21
		6.0	34	21	52	52	21	21
		2.8	9	21	16	16	17	16
5 125	139.7	3.0	9	21	16	16	17	16
		5.1	16	21	21	21	21	21
		6.4	21	21	34	34	21	21
		2.8	9	21	16	16	17	16
5 125	141.3	3.0	9	21	16	16	17	16
		3.4	16	21	21	21	21	21
		6.6	21	21	34	34	21	21
		2.8	6	21	9	9	17	16
6 150	165.1	3.0	6	21	9	9	17	16
		5.1	9	21	16	16	21	21
		6.4	21	21	34	31	21	21
		2.8	6	21	9	9	17	16
6 150	168.3	3.0	6	21	9	9	17	16
		3.4	9	21	16	16	21	21
		7.1	21	21	34	31	21	21
		2.8	-	17	6	6	7	16
8 200	219.1	3.0	-	17	6	6	7	16
		3.8	6	21	9	9	14	21
		8.2	21	21	28	28	21	21
		3.4	-	-	-	-	-	-
10 250	273.1	4.0	-	-	6	6	-	16
		4.2	-	-	6	6	-	21
		9.3	-	-	28	22	-	21
		4.0	-	-	6	6	-	16
12 300	323.9	4.6	-	-	9	9	-	21
		9.5	-	-	28	17	-	21

\*\*Maximum line pressure, including surge, to which a joint should be subjected on 304/316 stainless steel pipe roll grooved to standard roll grooving specification with coupling properly assembled. For sizes above 12" consult Tyco BSP.

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Nominal Pipe Size	Pipe Outside diameter mm		Gasket Seat A ±0.76 mm	Groove Width B ±0.76 mm	Groove Diameter C mm		Groove Depth D (Ref. only) mm	Min. Allow. Wall Thick T mm	Max. Flare Dia. mm			
	mm	Inches			Nom:	Tolerance + -				Actual	Tolerance +0.00	
25	25	1	33.7	0.33	0.33	15.88	7.14	30.23	-0.38	1.60	1.65	36.32
32	32	1 1/4	42.4	0.41	0.41	15.88	7.14	38.99	-0.38	1.60	1.65	44.96
40	40	1 1/2	48.3	0.48	0.48	15.88	7.14	45.09	-0.38	1.60	1.65	51.05
50	50	2	60.3	0.61	0.61	15.88	8.74	57.15	-0.38	1.60	1.65	62.99
65	65	2 1/2	73.0	0.74	0.74	15.88	8.74	69.09	-0.46	1.98	2.11	75.69
65	65	2 1/2	76.1	0.76	0.76	15.88	8.74	72.26	-0.46	1.93	2.11	78.74
80	80	3	88.9	0.89	0.79	15.88	8.74	84.94	-0.46	1.98	2.11	91.44
100	100	4	108.0	1.09	0.79	15.88	8.74	103.73	-0.51	2.11	2.11	110.50
100	100	4	114.3	1.14	0.79	15.88	8.74	110.08	-0.51	2.11	2.11	116.84
125	125	5	133.0	1.35	0.79	15.88	8.74	129.13	-0.56	2.11	2.77	135.90
125	125	5	139.7	1.42	0.79	15.88	8.74	135.48	-0.56	2.11	2.77	142.24
125	125	5	141.3	1.42	0.79	15.88	8.74	137.03	-0.56	2.13	2.77	143.76
150	150	6	159.0	1.60	0.79	15.88	8.74	154.54	-0.76	2.16	2.77	161.30
150	150	6	165.1	1.60	0.79	15.88	8.74	160.78	-0.56	2.16	2.77	167.64
150	150	6	168.3	1.60	0.79	15.88	8.74	163.96	-0.56	2.16	2.77	170.94
200	200	8	219.1	1.60	0.79	19.05	11.91	214.40	-0.64	2.39	2.77	223.52
250	250	10	273.0	1.60	0.79	19.05	11.91	268.27	-0.69	2.39	3.40	277.37
300	300	12	323.9	1.60	0.79	19.05	11.91	318.29	-0.76	2.77	3.96	328.17
350	350	14	355.6	1.60	0.79	23.83	11.91	350.04	-0.76	2.77	3.96	358.14
400	400	16	406.4	1.60	0.79	23.83	11.91	400.84	-0.76	2.77	4.19	408.94
450	450	18	457.2	1.60	0.79	25.40	11.91	451.64	-0.76	2.77	4.19	461.26
500	500	20	508.0	1.60	0.79	25.40	11.91	502.44	-0.76	2.77	4.78	512.06
600	600	24	609.6	1.60	0.79	25.40	12.70	600.86	-0.76	4.37	5.54	614.68

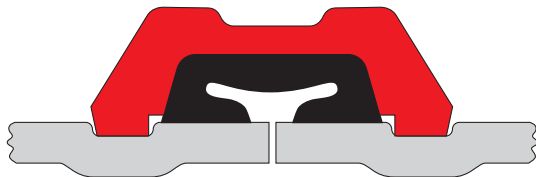
- The maximum allowable tolerances for IPS pipe from square cut ends is 0.76 mm (0.030") for sizes 1"-3"; 1.14 mm (0.045") for sizes 4"-6"; and above 1.52 mm (0.060") for sizes 8" and above.
- Gasket Seating Surface 'A' must be free from score marks, ridges, indentations, projections, loose paint, scale, dirt, chips, grease, rust, etc. that would prevent a positive seal.
- Groove diameter 'C' must be of uniform depth around the circumference of the pipe.
- Groove depth 'D' is a reference dimension only. The Groove Diameter 'C' must be maintained.
- Minimum Wall Thickness 'T' is the minimum pipe wall thickness that should be roll grooved.
- Maximum allowable pipe end flare diameter is measured at the pipe end diameter.

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**Rigid Joints**



Grinnell Rigid Couplings provide rigid gripping of the pipe. They are designed to bring the pipe ends closely together and the coupling clamps firmly onto the pipe OD and also onto the bottom of the grooves. Because Rigid Couplings clamp around the entire pipe surface, they provide resistance to flexural and torsional loads and therefore permit longer spacing to ASME/ANSI B31.1 (Power Piping) and ASME/ANSI B39.1 (Building Services) requirements as well as NFPA 13 (Sprinkler Systems).

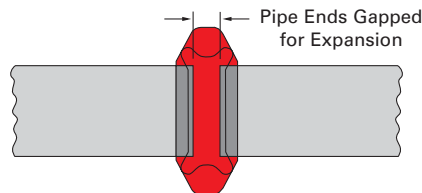
**Flexible Joints**



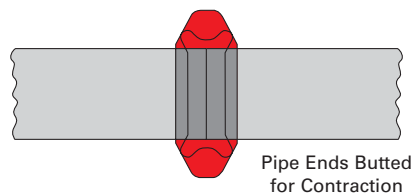
Grinnell Flexible Couplings act as an "expansion joint", allowing linear and angular movement of the pipe. They are designed with the coupling keys engaging the pipe without gripping on the bottom of the grooves, while still providing for a restrained mechanical joint. This is particularly useful to allow for pipe expansion / contraction and piping misalignment.

**Linear Movement (Flexible Joints)**

For thermal expansion the pipe ends at each joint should be fully gapped to the maximum end gap. This can be accomplished by pressurizing the system and then anchoring the system.



For thermal contraction with flexible couplings, the pipe ends at each joint should be fully butted. The system can then be anchored in place to prevent the pipe ends from opening up to the maximum end gap when pressurized.



For design purposes, the maximum pipe end gap should be reduced to account for field practices as follows:

Pipe Size Inches mm	Maximum Pipe End Cap Reduction
1 1/4 - 3 42.4 - 88.9	50%
4 - 24 114.3 - 609.6	25%

Therefore the following values should be used as available pipe end movements for Grinnell Figure 705, 705R, 707, 716 and 405 Flexible Couplings:

Pipe Size Inches mm	Pipe End Movements	
	Cut Grooved Inches mm	Roll Grooved* Inches mm
1 1/4 - 3 42.4 - 88.9	0 - 0.063 0 - 1.6	0 - 0.031 0 - 0.8
4 - 24 114.3 - 609.6	0 - 0.188 0 - 4.8	0 - 0.094 0 - 2.4

\* Roll grooved joints provide 1/2 the available movement of cut grooved joints.

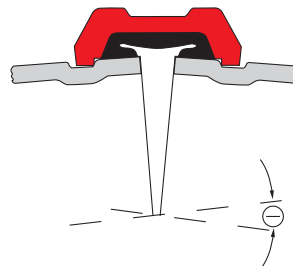
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**Angular Deflection**

Grinnell Flexible Couplings are capable of accommodating angular deflection.

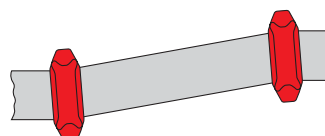


The deflection published in our literature is a maximum value. For design purposes the maximum deflection should be reduced to account for field practices as shown:

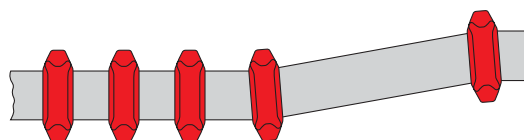
Pipe Size Inches mm	Deflection	
	Maximum Pipe Deflection Reduction	
1 1/4 - 3 42.4 - 88.9	50%	
4 - 24 114.3 - 609.6	25%	

**Expansion / Contraction**

Grinnell Flexible Couplings are capable of accommodating pipe thermal movements provided they are properly gapped and a sufficient quantity of flexible couplings are used. Note that flexible couplings will not accommodate both full maximum linear movement and the maximum available angular deflection concurrently at the same joint.



If it is desired to have both deflection and linear movement available, then the system should have sufficient flexible joints to accommodate the requirement.



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**Thermal Movement**

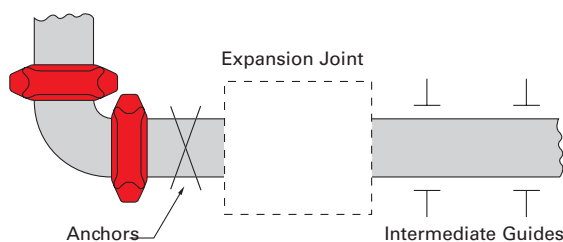
The following guidelines are similar to any expansion joint: Its is recommended that anchors be installed at changes of direction on the pipe lines to control the pipe movement. The thermal expansion/contraction in the piping system can be accommodated utilizing Grinnell Flexible Couplings. In designing anchoring systems. It is suggested that the following be taken into consideration as a minimum:

- Pressure thrusts
- Frictional resistance of any guides or supports
- Centrifugal thrust due to velocity at changes of direction
- Activation force required to compress or expand a flexible coupling

Pipe Size Inches mm	Activation Force	
	Lbs.	N
1 1/4	35	
42.4	156	
1 1/2	45	
48.3	200	
2	70	
60.3	311	
2 1/2	100	
73.0	645	
76.1	110	
	489	
3	145	
88.9	645	
4	240	
114.3	1068	
5	375	
139.7/141.3	1668	
165.1	500	
	2224	
6	520	
168.3	2313	
8	880	
219.1	3914	
10	1365	
273.0	6072	
12	1915	
323.9	8518	

Three methods are available as examples to accommodate thermal expansion/contraction:

- 1) Design the system with rigid couplings and place expansion joints at the relevant locations. Expansion joints may be a series of flexible grooved couplings of a sufficient quantity to accommodate the movement.
- 2) Design the system with flexible and/or rigid couplings and allow the pipe to move in directions desired, with the use of anchors and guides if so required. With this method, it is important to ensure that movement at branch connections, changes of direction, equipment hookup, etc., will not cause damage or excessive stresses.



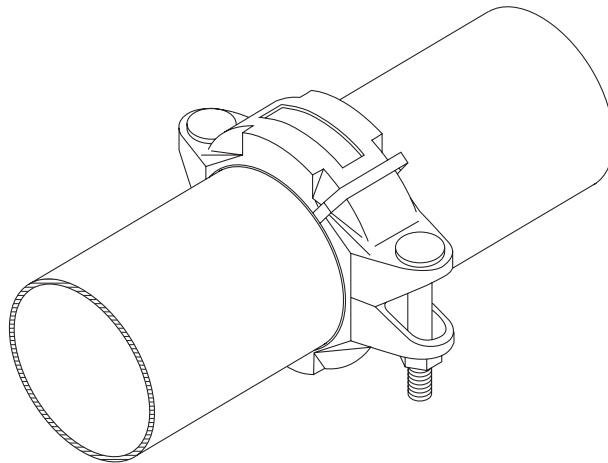
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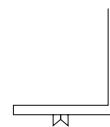
When a continuity clip is used electrical continuity across a Grinnell flexible coupling (Fig. 705 or 707) is maintained in a variety of situations including high current loads and extremely corrosive environments. In other words, the use of one clip per coupling offers the contractor a fast and simple means of providing earth continuity of steel pipework. Rigid type couplings have a build in feature which insure electrical continuity. Therefore when using rigid couplings, there is no need for continuity clips.

The Grinnell continuity clip is a light weight, stainless steel 301 clip, whereby tiny burrs provide proper grounding. It is designed for earthing requirements according British Standard (BS) 6087. The Grinnell continuity clip complies to the I.E.E regulations, 15th edition, which requires "equipotential bonding of conductive parts".

Three clips cover the coupling range from 1" up to 12" and fit both the Fig. 705 and Fig. 707 coupling.



DETAIL A



DETAIL A

Tyco BSP Article Number	Suitable for Size Coupling	Approx Weight
	Inches	Kg
CLIP0103	1 - 3	0.005
CLIP0406	4 - 6	0.005
CLIP0812	8 - 12	0.005

General notes: Additional information is included in our data sheets and is available upon request. It is the Designer's responsibility to select products suitable for the intended service and to ensure that pressure ratings and performance data is not exceeded. Always read and understand the installation constructions. Never remove any piping components nor correct or modify any piping deficiencies without first depressurizing and draining the system. Material and gasket selection should be verified with the gasket recommendation listing for the specific application.

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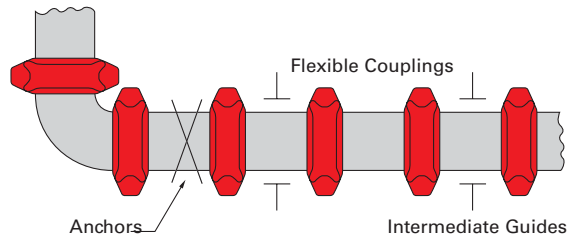




**CHRYSSAFIDIS**

3) Design the system with flexible couplings utilizing the expansion/contraction capabilities of these products. The following example illustrates this method:

- 150mm Schedule 40 Steel Pipe, Roll Grooved, 45.7m long, anchored at each end.
- Maximum Temperature = 93°C
- Minimum Temperature = 4°C
- Install Temperature = 27°C



3a) Thermal Expansion

Utilizing the Thermal Expansion Table, the following calculations are performed:

3b) Allowance for installation temperature to the minimum temperature, in this case 26.7°C to 4.4°C is calculated as:

Expansion/contraction factor steel = 1.2 mm per mtr/100° C  
 $26.7-4.4 (\Delta T) \times 1.2/100 = 0.264 \text{ mm/mtr}$

3c) Allowance for installation temperature to the maximum temperature, in this case 26.7°C to 93.3°C is calculated as:

$93.3-26.7 (\Delta T) \times 1.2/100 = 0.8$   
 Total expansion =  $0.8 \times 45.7 = 36.56 \text{ mm}$  per 45.73 mtr

$\Delta$ Temperature °C	mm/mtr	$\Delta$ Temperature °C	mm/mtr
-40	-0.48	50	0.60
-30	-0.36	60	0.72
-20	-0.24	70	0.84
-10	-0.12	80	0.96
0	0	90	1.08
10	0.12	100	1.20
20	0.24	110	1.32
30	0.36	120	1.44
40	0.48	130	1.56

3d) Couplings Required

Available linear movement for a 150 mm Figure 707 on roll grooved pipe = 2.4 mm per coupling, therefore the number of flexible Figure 707 Couplings required is:

**Fully Butted Together for Contraction Only**  
 Installation temperature to minimum temperature:

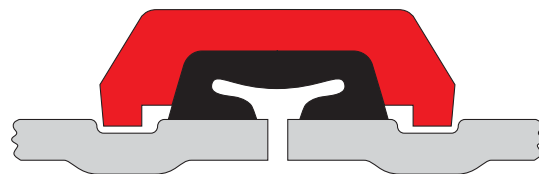
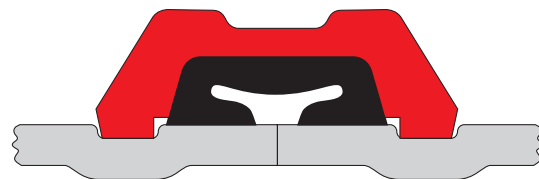
$$\frac{12.1 \text{ mm}}{2.4 \text{ mm per coupling}} = 5.1$$

Use 6 Figure 707 Couplings for pipe contraction with pipe ends fully butted together.

**Fully Gapped Apart for Expansion Only**  
 Installation temperature to minimum temperature:

$$\frac{36.6 \text{ mm}}{2.4 \text{ mm per coupling}} = 15.3$$

Use 16 Figure 707 Couplings for pipe expansion with pipe ends fully gapped apart.



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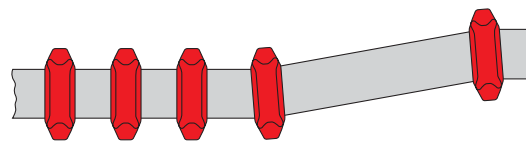
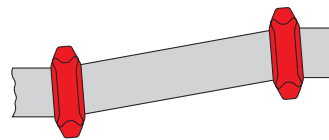
Misalignment and Deflection

Grinnell flexible couplings provide for restrained joints and allow for deflection to aid where the pipe or equipments is misaligned.

Note that flexible couplings will not accommodate both full maximum linear movement and the maximum available angular deflection concurrently at the same joint.

If it is desired to have both deflection and linear movement available, then the system should have sufficient flexible joints to accommodate the requirement.

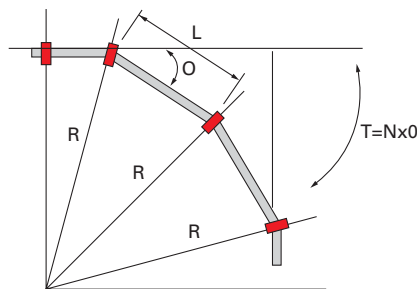
Flexible couplings are also useful in designing curved piping systems.



$$R = L/(2)(\text{Sin } \emptyset/2)$$

$$L = 2R(\text{Sin } \emptyset/2)$$

$$N = T/\emptyset$$



- N = Number of flexible couplings needed
- R = Radius of curve
- L = Pipe length
- Ø = Deflection from centerline, in degrees, for each coupling (see table)
- T = Total deflection in degrees required

This table represents the design deflection for roll grooved pipe and incorporates the recommended safety factor reduction for field practices (50% for sizes 25mm - 80mm and 25% for sizes 100mm - 600mm).

Deflection Ø (Roll Grooved Pipe)	
Pipe Size Inches mm	Figures 705 and 707 Degrees
1 1/4 42.4	1.08
1 1/2 48.3	0.94
2 60.3	0.75
2 1/2 73.0	0.62
76.1	0.60
3 88.9	0.51
4 114.3	1.19
5 139.7/141.3	0.97
165.1	0.83
6 168.3	0.81
8 219.1	0.63
10 273.0	0.50
12 323.9	0.42

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**Pipe Support**

All piping systems require that the support system accommodate the weight of the pipe, joint connections, fluid and other system components. In addition, consideration may be necessary in reducing stresses, accommodation thermal expansion or contraction, building settlement, seismic movement, etc. The following table provides guidelines for grooved steel piping products without concentrated loads between supports.

Note: The requirements of NFPA, ANSI, ASME or other code groups may require additional supports.

**Flexible Joints**

For pipe runs when linear movement is accommodated by the flexible coupling:

Pipe Size Inches mm	Number of hangers per pipe length							
	Pipe length in meters							
	3.3	3.7	4.6	6.7	7.6	9.1	10.7	12.2
2 50	2	2	2	3	4	4	5	6
2 1/2 - 4 65 - 100	1	2	2	2	2	3	4	4
5 - 24 125 - 600	1	1	2	2	2	3	3	3

For pipe runs when linear movement is not required:

Pipe Size Inches mm	Distance between Supports
	Maximum Distance between supports mtr
1 1/4 42.4	3.7
2 - 8 60.3 - 219.1	4.6
10 - 12 273.0 - 323.9	4.9
14 - 16 355.6 - 406.4	5.5
18 - 24 457.2 - 609.6	6.1

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**Rigid Joints**

For pipe runs with rigid couplings:

Suggested Maximum Span Between Supports Meters						
Pipe Size Inches mm	Water Service			Air Service		
	I	II	III	I	II	III
1	7	9	12	9	9	
25	2.1	2.7	3.7	2.7	2.7	12
1 1/4	7	11	12	9	11	3.7
32	2.1	3.4	3.7	2.7	3.4	12
1 1/2	7	12	15	9	13	3.7
40	2.1	3.7	4.6	2.7	4.0	15
2	10	13	15	13	15	4.6
50	3.0	4.0	4.6	4.0	4.6	15
2 1/2	11	14	15	14	16	4.6
65	3.4	4.3	4.6	4.3	4.9	15
3	11	14	15	14	16	4.6
65	3.4	4.3	4.6	4.3	4.9	15
3	12	15	15	15	17	4.6
80	3.7	4.6	4.6	4.6	5.2	15
4	14	17	15	17	21	4.6
100	4.3	5.2	4.6	5.2	6.4	15
5	16	19	15	20	24	4.6
125	4.9	5.8	4.6	6.1	7.3	15
5 1/4	15	18	15	19	23	4.6
125	4.6	5.5	4.6	5.2	7	15
5 1/2	16	19	15	20	24	4.6
125	4.9	5.8	4.6	6.1	7.3	15
6	17	20	15	21	25	4.6
150	5.2	6.1	4.6	6.4	7.6	15
6 1/2	17	20	15	21	25	4.6
150	5.2	6.1	4.6	6.4	7.6	15
8	19	21	15	24	28	4.6
200	5.8	6.4	4.6	7.3	8.5	15
10	19	21	15	24	31	4.6
250	5.8	6.4	4.6	7.3	9.4	15
12	23	21	15	30	33	4.6
300	7	6.4	4.6	9.1	10.1	15
14	23	21	15	30	33	4.6
350	7	6.4	4.6	9.1	10.1	15
16	27	21	15	35	33	4.6
400	8.2	6.4	4.6	10.7	10.1	15
18	27	21	15	35	33	4.6
450	8.2	6.4	4.6	10.7	10.1	15
20	30	21	15	39	33	4.6
500	9.1	6.4	4.6	11.9	10.1	15
24	32	21	15	42	33	4.6
600	9.8	6.4	4.6	12.8	10.1	15
						4.6

- I - Spacing by ANSI B31.1 Power Piping Code
- II - Spacing by ANSI B39.1 Building Piping Code
- III - Spacing by NFPA 13 Sprinkler Systems (Steel Pipe except Threaded Lightwall)

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