



NATIONAL

"a step up in value, a step down in cost"

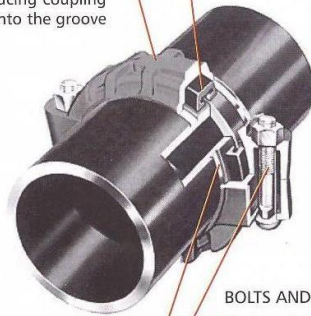
National Grooved piping system is reliable and is faster to install than welding, threading or flanging, resulting in lowest installed cost. It can be adopted to suit standard pipe with cut grooves or standard and light wall pipe with rolled grooves. Triple sealing of the C-shaped pressure responsive gasket is made from specially compounded rubbers with low compression set property. Couplings perform equally well under pressure and vacuum. Couplings with Tri-seal gaskets are highly suitable for higher vacuum service and dry systems subject to freezing. Couplings are available for flexible and rigid system. Couplings and fittings are painted with alkyd resin paint as standard finish to RAL 3000 colour. Hot dip galvanizing coat is optional.

HOUSINGS

Ductile iron housing segments conforming to ASTM-A 536 Grade 65-45-12 fully enclose the gasket. The housing keys engage into the grooves around the full pipe circumference, securing the pipe ends together with a positive grip. Housings are normally two identical castings for couplings through 12" (323.9 mm) sizes. From 14" (355.6 mm) up sizes, coupling housings are cast in multiple identical segments to ensure concentricity and easy handling. The housing is designed to provide the optimum combination of pressure, stress relief and end load conditions while maintaining reasonable weight and manufacturing characteristics. Every grooved pipe coupling, flange adaptor, reducing coupling has a similar key section. This engages fully into the groove tying the joint integrally to the pipe.

GASKETS

The sealing efficiency of gaskets is such that the Gasket forms an initial seal as it is stretched over the pipe Ends. 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 10inHg (-0.35 Bar) which may occur when a system is drained. Please refer to the Gasket selection guide for additional details and gasket materials. Gasket are pre-lubricated for easy assembly of coupling.



Roll or Cut grooved
standard steel pipe.

BOLTS AND NUTS

Oval neck track bolt conforming to ASTM A183 with minimum tensile strength of 110,000 psi or square neck carriage bolt to ASTM A446 with 120,000 psi minimum tensile strength permits tightening of the nuts from one side with a single wrench. Nuts conform to ASTM A194. Bolts & Nuts are electro galvanized.



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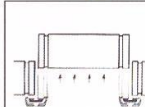
FEATURES

Reduced Costs



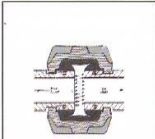
Coupling assembly is quick and easy. Special training not required. The system is free from contaminants such as weld slag and pipe dope. Installation costs are controllable and estimates are more precise.

Union Type Joint



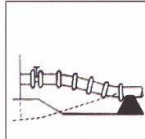
Couplings can be disassembled easily permitting maintenance and servicing of the piping system. It will facilitate periodic rotation of pipe to distribute internal wear from slurries or other abrasive media.

Reliability



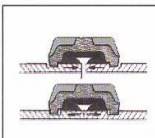
The couplings engage the pipe around the entire circumference and restrain the pipe ends from separation due to pressure and other forces, up to the maximum coupling rated working pressure.

Deflection & Misalignment



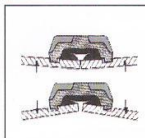
Precise location of pipe openings through walls and floors is unnecessary. Long radius curves may be designed with fewer elbows. Useful for providing pitch for drainage. Facilitates laying pipe on rough or uneven terrain.

Expansion & Contraction



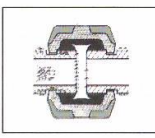
Provides linear movement at each joint. Allows pipe expansion and contraction. Suitable for hot and cold water lines and dual temperature systems.

Stress-Free Joint



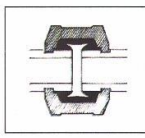
Flexibility of the joint reduces or eliminates stresses from settlement of buried pipe or induced by seismic tremors.

Noise & Vibration



Slight gap between pipe ends isolates noise and vibration. Resilient gasket also helps to absorb noise and vibration. Often permits elimination of noise suppression devices.

Rigidity



Couplings available for rigidity at valves, equipment or mechanical rooms. Couplings grip pipe to provide a rigid system used with standard groove specifications.



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INDUSTRY AND GOVERNMENT STANDARDS & APPROVALS



ISO 9001



PED 97/23/EC

- (ABS) American Bureau of Shipping
- (ANSI) American National Standards Institution
- (AWWA) American Water Works Association : C-606
- (API) American Petroleum Institute
- (ASHRAE) American Society of Heating, Refrigeration & Air Conditioning Engineers
- (ASME) American Society of Mechanical Engineers
- (ASTM) American Society of Testing & Materials
- (BBA) British Board of Agreement
- (BOCA) Building Officials & Code Administrators
- (BMI) Bureau of Marine Inspection
- (BPR) Bureau of Public Roads
- (CDC) Civil Defense Certificate, Dubai
- (COA) Corps of Engineers - CEGS 15000
- (FAA) Federal Aviation administration; HVAC, Plumbing, Fire Protection
- (FHA) Federal Housing Administration
- (FM) Factory Mutual Engineering Corp.
- (IAPMO) International Association of Plumbing & Mechanical Officials
- (MEA) Materials and Equipment acceptance
- (NAVFAC) Naval facilities Engineering Command: NFGS 15000 Series
- (NFPA) National Fire Protection Association
- (NSF) NSF International
- (SBCCI) Southern Building Code Congress International
- (TVA) Tennessee Valley Authority; Fire Protection, Storm drains
- (UL) Underwriter's Laboratories, Inc.
- (ULC) Underwriter's Laboratories of Canada
- (PED) Pressure Equipment Directive

WORLDWIDE

- (AS) AS 4041 - 1992 Australian Standard (3.24.10)
- (BV) Bureau Veritas
- (DNV) Det Norske Veritas
- (DVGW) Deutscher Verein des Gas-und Wasserfaches

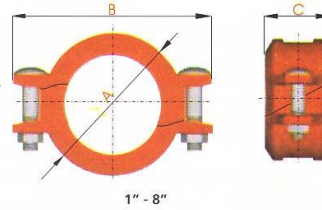


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RIGID COUPLING STYLE 2



- Provides a rigid joint by positive clamping of the pipe that resist flexural and torsional loads.
- As the coupling bolts are tightened, the angled bolt pads slide in opposite direction causing the coupling keys to tightly grip, the pipe, while at the same time the pipe grooves are forced outward against the coupling keys.
- The angle bolt pad design allows for faster swing over installation with the removal of only one bolt.
- Provide rigidity for valve connections, fire mains, machinery rooms & long straight runs. Support and hanging requirements correspond with NFPA 13 Sprinkler systems.



Pipe Nominal Size	Acti al Size in. /mm	Part Number	Max. Working Pressure psi / kPa	Allow Pipe End Separation s in. /mm	Dimensions (inch /mm)			Approx. Wt. Each lb. /kg.
					A	B	C	
1"	1.315 33.4	02100	500 5175	0.10 2.5	2.19 55.6	3.54 90.0	1.72 43.8	1.2 0.6
1 1/4"	1.660 42.2	02125	500 5175	0.10 2.5	2.56 65.0	3.90 99.0	1.73 43.8	1.2 0.6
1 1/2"	1.900 48.3	02150	500 5175	0.10 2.5	2.80 71.0	4.21 107.0	1.73 43.8	1.3 0.6
2"	2.375 60.3	02200	500 5175	0.10 2.5	3.29 83.8	4.72 120.0	1.79 45.7	1.5 0.7
2 1/2"	2.875 73.0	02250	500 5175	0.10 2.5	3.83 97.3	5.28 134.0	1.79 45.7	1.8 0.8
3"OD	3.000 76.1	02290	500 5175	0.10 2.5	3.96 100.9	5.39 137.0	1.79 45.7	2.1 1.0
3"	3.500 88.9	02300	500 5175	0.10 2.5	4.49 114.1	5.98 152.0	1.79 45.7	2.4 1.1
4"	4.500 114.3	02400	500 5175	0.16 4.1	5.83 148.0	7.20 183.0	1.99 50.6	3.7 1.7
5"	5.563 141.3	02500	300 5175	0.16 4.1	6.91 175.5	8.66 220.0	1.99 50.6	4.6 2.1
6"	6.625 168.3	02600	300 5175	0.16 4.1	8.07 205.0	9.80 249.0	1.99 50.6	6.0 2.7
6 1/2"OD	6.500 165.1	02650	300 5175	0.16 4.1	7.91 201.0	9.69 246.0	1.99 50.6	5.5 2.5
8"	8.625 219.1	02800	300 4140	0.19 4.8	10.26 260.5	12.40 315.0	2.32 59.1	11.9 5.4

Notes

Allowable pipe end separation is for cut groove pipe and for roll groove, figures will be one-half of the values listed and there are at time of initial pressurisation. Ø - Bolts and Nuts are Galvanized * - Maximum pressure including surges and maximum end loads from all internal and external forces, to which a joint could be subject under normal working conditions. This rating provides a nominal safety factor of 1.5 times working pressure based on standard weight steel pipe, cut or roll groove to pipe end preparation specification. Maximum joint working pressure may be subjected to a one time field test of 1.5 times the figures indicated. Contact our Engineering Department for performance on other pipes, and to request the approvals cut sheet. Refer to installations and groove specifications when assembling any grooved product. For dry system, TRI Seal gasket is recommended. EPDM based gasket is supplied as standard. For other gasket contact us.

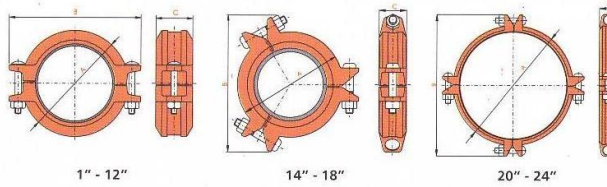


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RIGID COUPLING STYLE 5

- Provides joint rigidity, for the support and hanging requirements of ANSI B31.1 Power Piping Code; ANSI B31.9 Building Service Pipe Code and NFPA 13 Sprinkler Systems.
- Tongue and Groove arrangements in housings do not permit expansion, contraction and deflections are minimal.



Pipe		Part Number	Max. Working Pressure psi / kPa	Allow Pipe End Separation in. / mm ³	Dimensions (inch / mm)			Approx. Wt. Each lb. / kg.
Nominal Size	Actual Size in. / mm				A	B	C	
1"	1.315 33.4	05100	750 5175	0.10 2.5	2.19 55.6	3.54 90.0	1.72 43.8	1.2 0.5
1 1/4"	1.660 42.2	05125	750 5175	0.10 2.5	2.56 65.0	3.90 99.0	1.73 43.9	1.2 0.6
1 1/2"	1.900 48.3	05150	750 5175	0.10 2.5	2.80 71.0	4.21 107.0	1.73 43.9	1.3 0.6
2"	2.375 60.3	05200	750 5175	0.10 2.5	3.29 83.6	4.72 120.0	1.79 45.7	1.5 0.7
2 1/2"	2.875 73.0	05250	750 5175	0.10 2.5	3.83 97.3	5.28 134.0	1.79 45.7	1.8 0.8
3"OD	3.000 76.1	05280	750 5175	0.10 2.5	3.96 100.5	5.39 137.0	1.79 45.7	2.1 1.0
3"	3.500 88.9	05300	750 5175	0.10 2.5	4.49 114.1	5.98 152.0	1.79 45.7	2.4 1.1
4"	4.500 114.3	05400	750 5175	0.16 4.1	5.83 148.0	7.20 183.0	1.99 50.6	3.7 1.7
5"	5.563 141.3	05500	750 5175	0.16 4.1	6.91 175.5	8.66 220.0	1.99 50.6	4.6 2.1
5 1/2"OD	5.500 139.7	05550	750 5175	0.16 4.1	6.84 173.8	8.66 220.0	1.99 50.6	4.6 2.1
6"	6.625 168.3	05600	750 5175	0.16 4.1	8.07 205.0	9.80 248.0	1.99 50.6	6.0 2.7
6 1/2"OD	6.500 165.1	05650	750 5175	0.16 4.1	7.91 201.0	9.69 246.0	1.99 50.6	5.5 2.5
8"	8.625 219.1	05800	600 4140	0.19 4.8	10.26 260.3	12.40 313.0	2.32 59.1	11.9 5.4
10"	10.750 273.0	05910	500 3450	0.13 3.3	12.66 321.6	15.43 392.0	2.44 62.2	19.0 8.6
12"	12.750 323.9	05912	400 2780	0.13 3.3	14.65 372.0	17.56 446.0	2.48 63.0	21.0 9.5
14"OD	14.000 355.6	05914	300 2070	0.13 3.3	15.87 403	18.97 481.9	2.91 74.0	30.4 13.8
16"OD	16.000 406.4	05916	300 2070	0.13 3.3	17.87 454.0	20.76 527.4	2.91 74.0	35.5 16.1
18"OD	18.000 457.2	05918	300 2070	0.13 3.3	20.00 508.0	22.57 573.3	3.06 77.6	44.0 20.0
20"OD	20.000 508.0	05920	300 2070	0.13 3.3	21.97 558.0	26.00 660.3	3.06 77.6	67.2 30.5
24"OD	24.000 610.0	05924	250 1725	0.09 2.3	25.98 660.0	30.03 762.8	3.09 78.5	76.2 34.6

Refer Page No:4 for Notes

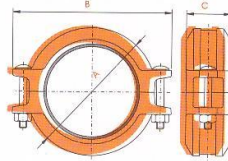


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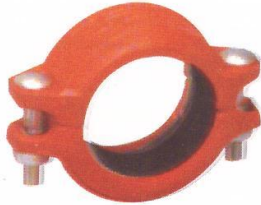
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FLEXIBLE COUPLING STYLE 10

- Provides joint flexibility required in some piping systems.
- Conforms to the requirements of ANSI B31.1 Power Piping Code; ANSI B31.9 Building Service Pipe Code and NFPA 13 Sprinkler Systems.
- Housing design makes it suitable for medium to high pressure application.



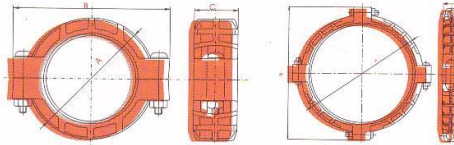
1" - 12"



Nominal Size	Pipe Actual Size (in./mm)	Part Number	Max. Working Pressure (psi/kPa)	Allow. Pipe End Separation (in./mm)	Max. Deflection From Center Line (in./mm)	Dimensions (inch/mm)			Approx. Wt. Each (lb./kg)
						A	B	C	
1"	1.315	10100	600	0.10	5'-26"	1.14	2.32	3.82	1.72
1 1/4"	1.660	10125	600	0.10	4'-19"	0.90	2.56	4.21	1.72
1 1/2"	1.900	10150	600	0.10	3'-46"	0.79	2.60	4.45	1.73
2"	2.375	10200	600	0.10	2'-11"	0.62	2.79	4.88	1.79
2 1/2"	2.875	10250	600	0.10	2'-29"	0.52	3.83	5.51	1.79
3"OD	3.000	10290	600	0.10	2'-23"	0.50	4.40	5.63	1.79
3"	3.500	10300	600	0.10	2'-3"	0.43	4.40	6.38	1.79
4"	4.500	10400	600	0.16	3'-11"	0.62	5.83	7.68	1.99
5"	5.563	10500	500	0.16	2'-35"	0.54	6.91	9.69	1.99
6"	6.625	10600	500	0.16	2'-10"	0.46	8.06	10.75	1.99
6 1/2" OD	6.500	10650	500	0.16	2'-12"	0.46	7.91	10.63	1.99
8"	8.625	10800	500	0.19	1'-40"	0.34	10.26	13.45	2.32
10"	10.750	10910	500	0.13	1'-20"	0.28	12.86	15.47	2.32
12"	12.750	10912	400	0.13	1'-7"	0.24	14.65	17.56	2.48

FLEXIBLE COUPLING STYLE 11

- Provides joint flexibility required in some piping systems.
- Conforms to the requirements of ANSI B31.1 Power Piping Code; ANSI B31.9 Building Service Pipe Code and NFPA 13 Sprinkler Systems.
- Heavy duty housings provide higher pressure ratings



1" - 12"

14" - 24"



Nominal Size	Pipe Actual Size (in./mm)	Part Number	Max. Working Pressure (psi/kPa)	Allow. Pipe End Separation (in./mm)	Max. Deflection From Center Line (in./mm)	Dimensions (inch/mm)			Approx. Wt. Each (lb./kg)
						A	B	C	
1 1/4"	1.660	11125	1000	0.12	4'-19"	0.90	2.62	4.50	1.73
1 1/2"	1.900	11150	1000	0.12	3'-46"	0.79	3.00	4.75	1.73
2"	2.375	11200	1000	0.12	3'-1"	0.62	3.62	5.00	1.79
2 1/2"	2.875	11250	1000	0.12	2'-9"	0.52	4.21	5.50	1.79
3"OD	3.000	11290	1000	0.12	2'-29"	0.52	4.37	5.91	1.79
3"	3.500	11300	1000	0.12	2'-3"	0.43	5.00	6.63	1.79
4"	4.500	11400	1000	0.25	3'-11"	0.62	6.37	8.38	1.99
5"	5.563	11500	1000	0.25	2'-35"	0.54	7.62	10.22	1.99
6"	6.625	11600	1000	0.25	2'-10"	0.46	9.00	11.00	1.99
6 1/2" OD	6.500	11650	1000	0.25	2'-10"	0.46	8.88	10.88	1.99
8"	8.625	11800	800	0.25	1'-40"	0.34	11.37	13.12	2.32
10"	10.750	11910	800	0.25	1'-20"	0.28	12.86	15.47	2.32
12"	12.750	11912	800	0.25	1'-7"	0.24	15.10	17.96	2.48
14"	14.000	11914	400	0.25	1'-2"	0.22	18.17	21.65	2.87
16"	16.000	11916	400	0.25	0'-5 1/4"	0.14	16.50	21.65	2.87
18"	18.000	11918	400	0.25	0'-4 1/4"	0.14	14.20	21.65	2.87
20"	20.000	11920	300	0.25	0'-4 1/4"	0.15	12.19	21.65	2.87
24"	24.000	11924	250	0.25	0'-3 1/2"	0.11	10.63	21.65	2.87

Refer Page No:4 for Notes



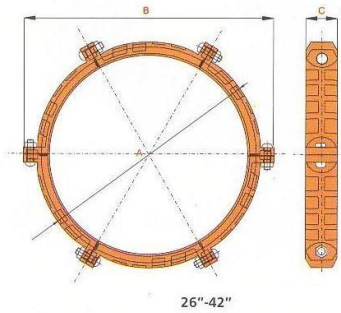
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FLEXIBLE COUPLING STYLE 11L



- > Style 11L couplings are designed to provide a strong reliable component for joining large diameter piping systems.
- > Coupling housings are cast in multiple identical segments, provides a joint with limited flexibility to accommodate settlement and alignment.
- > Ideal for roll grooved black or galvanized steel and stainless steel systems up to 435 psi depending on pipe size, pipe material and wall thickness.



SIZE NOMINAL Inches Actual mm	Max. Work Press. PSI* kPa	Coupling Dimensions Inches/mm			Nominal Range of Linear Movement ‡ Inches/mm		Nominal Deflection CL ‡		Approx. Wgt. Each Lbs. Kg
		A	B	C	Min.	Max.	Degrees	In./Ft. mm/m	
26 660.4	375 2580	29.75 756	34.25 870	5.00 127	0 0	0.38 9.7	0° - 50°	0.17 14.2	150.0 68.0
28 711.0	330 2270	31.75 807	36.33 923	5.00 127	0 0	0.38 9.7	0° - 46°	0.16 13.3	175.0 78.0
30 762.0	300 2065	33.75 857	38.32 973	5.00 127	0 0	0.38 9.7	0° - 43°	0.15 12.5	200.0 90.7
32 813.0	260 1790	35.75 908	40.43 1027	5.00 127	0 0	0.38 9.7	0° - 40°	0.14 11.7	225.0 102.0
36 914.0	200 1380	39.75 1010	44.33 1126	5.00 127	0 0	0.38 9.7	0° - 36°	0.12 10.0	250.0 113.4
42 1067.0	145 1000	45.75 1162	51.56 1310	5.76 146	0.31 7.9	0.69 17.5	0° - 31°	0.20 16.7	400.0 181.4

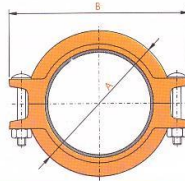
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FLEXIBLE COUPLING STYLE 12

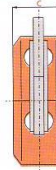
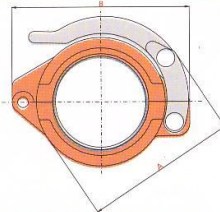
- Provides joint flexibility required in some piping systems.
- Conforms to the requirements of ANSI B31.1 Power Piping Code; ANSI B31.9 Building Service Pipe Code and NFPA 13 Sprinkler Systems.
- Most economical design for low pressure application.



Pipe		Part Number	Max. Working Pressure psi / kPa	Allow Pipe End Separation in./mm	Max. Deflection from Center Line 5 Per Coupl. Deg.	Dimensions (inch / mm)			Approx. Wt. Each lb./kg.		
Nominal Size	Actual Size in./mm					A	B	C			
1"	1.315 33.4	12100	300	0.10 2.5	5'-26"	1.14	95	2.19 55.4	3.54 90.0	1.72 43.8	1.2 0.5
1 1/4"	1.660 42.2	12125	300	0.10 2.5	4'-19"	0.90	75	2.56 65.0	3.90 99.0	1.73 43.9	1.2 0.6
1 1/2"	1.900 48.3	12150	300	0.10 2.5	3'-46"	0.79	66	2.80 71.0	4.21 107.0	1.73 43.9	1.3 0.6
2"	2.375 60.3	12200	300	0.10 2.5	3'-11"	0.62	52	3.29 83.6	4.72 120.0	1.79 45.7	1.5 0.8
2 1/2"	2.875 73.0	12250	300	0.10 2.5	2'-29"	0.52	43	3.83 97.3	5.28 134.0	1.79 45.7	1.8 0.8
3"OD	3.000 76.1	12290	300	0.10 2.5	2'-23"	0.50	42	3.96 100.5	5.39 137.0	1.79 45.7	2.1 1.0
3"	3.500 88.9	12300	300	0.10 2.5	2'-3"	0.43	36	4.49 114.1	5.98 152.0	1.79 45.7	2.4 1.1
4"	4.500 114.3	12400	300	0.16 4.1	3'-11"	0.67	56	5.83 148.0	7.20 183.0	1.99 50.6	3.7 1.7
5"	5.563 141.3	12500	300	0.16 4.1	2'-35"	0.54	45	6.91 175.5	8.66 220.0	1.99 50.6	4.6 2.1
5 1/2"OD	5.500 139.7	12550	300	0.16 4.1	2'-35"	0.54	45	6.84 173.8	8.66 220.0	1.99 50.6	4.6 2.1
6"	6.625 168.3	12600	300	0.16 4.1	2'-10"	0.46	38	8.07 205.0	9.80 249.0	1.99 50.6	6.0 2.7
6 1/2"OD	6.500 165.1	12650	300	0.16 4.1	2'-12"	0.46	38	7.91 201.0	9.69 246.6	1.99 50.6	5.5 2.5
8"	8.625 219.1	12800	300	0.19 4.8	1'-40"	0.34	29	10.26 260.5	12.40 315.0	2.32 59.1	11.9 5.4

SNAP LOCK COUPLING STYLE 20

Style 20 snap-Lock Couplings are designed to provide a quick make-and-break joint. Housing are hinged for one piece handling. An electroplated steel locking toggle is provided on 1" through 1 1/2"; a cost locking handling is supplied on 2" (60.3 mm) and larger sizes, Style 20 Snap-Lock Couplings are not designed for eccentric loading.



Pipe		Part Number	Max. Working Pressure psi / kPa	Allow Pipe End Separation in./mm	Max. Deflect. from Center Line Per Coupl. Deg.	Dimensions (inch / mm)			Approx. Wt. Each lb./kg.		
Nominal Size	Actual Size in./mm					A	B	C			
1"	1.315 33.7	20100	300	0.13 3.2	5-26"	1.14	95	2.75 70.0	3.25 83.0	1.75 44.0	0.8 0.4
1 1/4"	1.660 42.4	20125	300	0.13 3.2	4-19"	0.90	75	3.13 79.0	3.75 95.0	1.75 44.0	1.1 0.5
1 1/2"	1.900 48.3	20150	300	0.13 3.2	3-46"	0.79	66	3.50 89.0	4.75 121.0	1.75 44.0	1.7 0.8
2"	2.375 60.3	20200	300	0.13 3.2	3-11"	0.63	52	4.00 102.0	4.75 121.0	1.75 44.0	1.8 0.8
2 1/2"	2.875 73.0	20250	300	0.13 3.2	2-29"	0.52	43	4.75 121.0	5.88 149.0	1.75 44.0	2.5 1.1
3"	3.500 88.9	20300	300	0.13 3.2	2-3"	0.43	38	5.38 137.0	6.25 159.0	1.75 44.0	3.0 1.4
4"	4.500 114.3	20500	300	0.25 6.4	3-11"	0.67	56	6.88 175.0	7.75 197.0	2.0 51.0	5.4 2.5
5"	5.563 141.3	20400	300	0.25 6.4	2-35"	0.54	45	8.75 222.0	9.50 241.0	2.0 51.0	9.8 4.4
6"	6.625 168.3	20600	300	0.25 6.4	2-10"	0.45	38	8.88 225.0	10.50 267.0	2.0 51.0	11.4 5.2
8"	8.625 219.1	20600	300	0.25 6.4	1'-40"	0.35	29	11.13 283.0	13.00 330.0	2.38 60.0	15.3 6.9

Refer Page No:4 for Notes

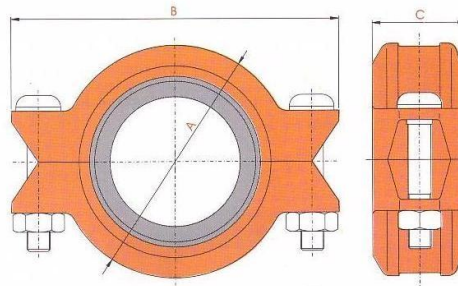


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REDUCING COUPLING STYLE 25



- Replaces two couplings and an in-line reducer (concentric or eccentric).
- Comes standard with a metal insert to prevent smaller pipe from slipping into larger pipe during vertical installations.



HEAD LOSS

Size (Inches)	Flow Reducing		Flow Expanding	
	Cl. Value	Equivalent Pipe Length (Smaller Dia.)	Cl. Value	Equivalent Pipe Length (Smaller Dia.)
6 x 4	0.16	4.5 ft	0.08	2.3 ft
5 x 4	0.14	3.0 ft	0.14	3.3 ft
4 x 3	0.37	6.0 ft	0.15	2.5 ft
3 x 2 1/2	0.30	3.8 ft	0.19	2.5 ft
3 x 2	0.50	5.5 ft	0.30	3.5 ft
2 1/2 x 2	0.18	1.9 ft	0.09	1.0 ft
2 x 1 1/2	0.25	1.9 ft	0.23	2.0 ft

In above table, $Cl = \frac{2GH^1}{V^2}$

H¹ = Head Loss in feet.

V = Velocity in smaller pipe in feet/sec.

G = Acceleration due to gravity = 32.2 feet/sec²



Pipe	Nominal Size	Actual Size in./mm	Part Number	Max. Working Press. # psi/kPa	Allow Pipe End sep. S in./mm	Max. Deflection S from Center Line Per Cou. Deg.	Dimensions (in./mm.)			Approx. Wt. Each lb./kg.	
							A	B	C		
1 1/2" X 1 1/4"	1,900 X 1,660	25150125	500	0.12	1'-5 3/8"	0.40	33	2.88	4.55	1.77	2.2
2" X 1 1/4"	2,375 X 1,660	25200125	500	0.12	1'-5 3/8"	0.40	33	3.33	4.87	1.80	2.2
2" X 1 1/2"	2,375 X 1,900	25200150	500	0.12	1'-3 3/8"	0.40	33	3.33	4.87	1.80	2.0
2 1/2" X 2"	2,875 X 2,375	25250200	500	0.12	1'-3 3/8"	0.32	27	3.88	5.75	1.84	3.1
3" OD X 2"	3,000 X 2,375	25290200	500	0.12	1'-3 3/8"	0.32	27	4.00	5.88	1.84	3.1
3" X 2"	3,500 X 2,375	25300200	500	0.12	1'-1 7/8"	0.26	22	4.55	6.42	1.84	4.0
3" X 2 1/2"	3,500 X 2,875	25300250	500	0.12	1'-1 7/8"	0.26	22	4.55	6.42	1.84	3.7
3" X 3" OD	3,500 X 3,000	25300290	500	0.12	1'-1 7/8"	0.26	22	4.55	6.42	1.84	3.7
4" X 2"	4,500 X 2,375	25400200	500	0.25	2'-3 3/8"	0.55	46	5.86	7.81	2.01	6.4
4" X 2 1/2"	4,500 X 2,875	25400250	500	0.25	2'-3 3/8"	0.55	46	5.86	7.81	2.01	6.2
4" X 3" OD	4,500 X 3,000	25400290	500	0.25	2'-3 3/8"	0.55	46	5.86	7.81	2.01	6.0
4" X 3"	4,500 X 3,500	25400300	500	0.25	2'-3 3/8"	0.55	46	5.86	7.81	2.01	5.5
5" X 4"	5,563 X 4,500	25500400	500	0.25	2'-5"	0.44	37	7.05	10.58	2.06	10.8
6 1/2" ODX 4"	6,500 X 4,500	25650400	500	0.25	1'-4 1/4"	0.38	32	7.95	10.88	2.06	11.0
6" X 4"	6,625 X 4,500	25600400	500	0.25	1'-4 1/4"	0.38	32	8.07	10.88	2.06	11.0
8" X 6 1/2" OD	8,625 X 6,500	25800650	500	0.25	1'-15"	0.26	22	10.39	13.43	2.21	19.0
8" X 6"	8,625 X 6,625	25800600	500	0.25	1'-15"	0.26	22	10.39	13.43	2.21	18.5

Refer Page No:4 for Notes



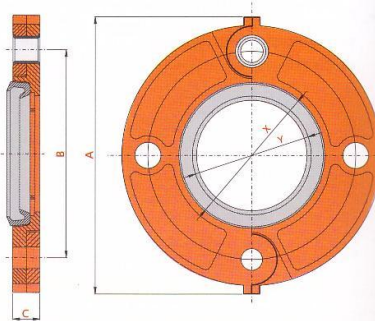
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GROOVE FLANGE STYLE 14



- Designed to connect ANSI Class 125 or 150 and BS 4504 Class PN16 flanged components to a grooved piping system.
- Made of ductile iron conforming to ASTM A-536. Every lot is metallurgically examined to insure compliance.
- Provided with EPDM rubber gasket as standard, suitable for -30°F to 230°F (-34°C to 110°C).



Pipe		Part Number	Max. * Working Pressure psi / kPa	No. Bolt/Nut Req.-Size Inch	Sealing Surface in. / mm		Dimensions in. / mm						Approx. Wt. Each lb. / kg	
Nominal Size	Actual Size in. / mm				X Min.	Y Max.	A			B				C
							ANSI	PN 10	PN 16	ANSI	PN 10	PN 16		
2"	2.375 60.3	14200	300 2070	4/4 - 5/8x2 1/2	3.09	2.42	6.50	7.02	7.02	4.75	4.92	4.92	0.78	3.0
					78.7	61.5	165.1	178.3	178.3	120.7	124.9	124.9	19.8	1.4
2 1/2"	2.875 73.0	14250	300 2070	4/4-5/8x3	3.58	2.92	7.50	7.79	7.79	5.50	5.71	5.71	0.78	4.2
					91.0	74.3	190.5	198.1	198.1	139.7	145.0	145.0	19.8	1.9
3"OD	3.000 76.1	14290	300 2070	4/4-5/8x3	3.70	3.05	7.50	7.79	7.79	5.50	5.71	5.71	0.78	4.3
3"	3.500 88.9	14300	300 2070	4/4-5/8x3	4.21	3.56	8.00	8.39	8.39	6.00	6.30	6.30	0.78	4.4
					106.9	90.3	203.2	213.2	213.2	152.4	160.0	160.0	19.8	2.0
4"	4.500 114.3	14400	300 2070	8/8-5/8x3	5.26	4.57	10.00	9.66	9.66	7.50	7.08	7.08	1.00	8.4
					133.6	116.0	253.7	245.5	245.5	190.5	179.9	179.9	25.4	3.8
5"	5.563 141.3	14500	300 2070	8/8-3/4x3 1/2	6.41	5.65	11.00	10.76	10.76	8.50	8.26	8.26	1.00	9.0
					162.8	143.4	279.4	273.4	273.4	216.0	210.0	210.0	25.4	4.1
5 1/2"OD	5.500 139.7	14550	300 2070	8/8-3/4x3 1/2	6.35	5.59	11.00	10.76	10.76	8.50	8.26	8.26	1.00	8.8
					161.3	141.9	279.4	273.4	273.4	216.0	210.0	210.0	25.4	4.0
6"	6.625 168.3	14600	300 2070	8/8-3/4x3 1/2	7.48	6.71	12.00	12.22	12.22	9.50	9.45	9.45	1.00	10.4
					190.0	170.5	304.8	310.4	310.4	241.3	240.0	240.0	25.4	4.7
6 1/2"OD	6.500 165.1	14650	300 2070	8/8-3/4x3 1/2	7.35	6.59	12.00	12.22	12.22	9.50	9.45	9.45	1.00	9.7
					186.8	167.5	304.8	310.4	310.4	241.3	240.0	240.0	25.4	4.5
8"	8.625 219.1	14800	300 2070	8/8-3/4x3 1/2(ANSI&PN10) 12/12-3/4x3 1/2(PN16)	9.58	8.70	14.50	14.37	14.37	11.75	11.61	11.61	1.12	19.8
					243.3	221.0	368.3	365.1	365.1	298.4	295.0	295.0	28.6	9.0
10"	10.750 273.0	14910	300 2070	12/12-7/8x4	11.54	10.84	18.00	17.52	17.71	14.25	13.78	13.98	1.18	24.2
					293.0	275.4	456.8	444.8	449.8	362.0	350.0	355.0	30.0	11.0
12"	12.750 323.9	14912	300 2070	12/12-7/8x4	13.58	12.84	21.00	19.56	20.15	17.00	15.75	16.14	1.26	36.4
					345.0	326.2	533.8	496.8	511.8	432.0	400.0	410.0	32.0	16.5

Notes

Style 14 provides a rigid joint with no angular or linear movement. Bolt pattern conforms to ANSI Class 125 and 150.* - Maximum pressure includes surges and Maximum end loads, from all internal and external forces, to which a joint could be subject under normal working conditions. This rating provides a nominal safety factor of 1.5 times working pressure based on standard weight steel pipe, cut or roll groove to pipe end preparation specification. Maximum joint working pressure may be subject to a one-time field test of 1.5 times the figures indicated. Contact our Engineering Department for performance on other pipe, request the approvals cut sheet. Refer to installations and groove specifications when assembling grooved product. When used with rubber faced valve or flanges, use Flange washer.



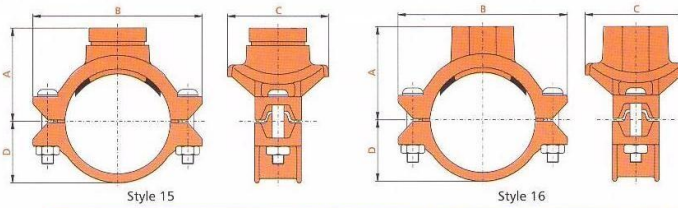
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**MECHANICAL BRANCHLETS
STYLE 15 GROOVED & STYLE 16 THREADED**



Mechanical Branchlet provides a direct branch connection at any location along the pipe run without welding. A hole cut along the center line of pipe will receive the hole locator collar to secure the outlet. A pressure responsive gasket moulded to suit the run pipe insures leak tight joint. Cross type connections can be made utilizing upper housings only.



Run Size (inch)	Outlet Size (inch)	Part Number		Max. Working Pressure psig/MPa	Hole Diameter Hole Saw in./mm	Max. Perm. in./mm	Dimensions (inch / mm)					Approx. Weight Each		
		Style 15 Grovd.	Style 16 Thrd.				Grvd. A	Thrd. A	B	C	D	Grvd. lb./kg.	Thrd. lb./kg.	
2	1/2	-	016 200050	500	1.50	1.63	-	2.79	4.62	2.87	1.57	-	2.5	1.1
		3450	38.1	41.2	71.0	117.4	73.0	39.9	-	-				
	3/4	-	016 200075	500	1.50	1.63	-	2.79	4.62	2.87	1.57	-	2.2	1.0
		3450	38.1	41.2	71.0	117.4	73.0	39.9	-	-				
	1	-	016 200100	500	1.50	1.63	-	2.79	4.62	2.87	1.57	-	2.4	1.1
		3450	38.1	41.2	71.0	117.4	73.0	39.9	-	-				
1 1/4	015 200125	016 200125	500	1.75	1.81	2.79	2.79	4.62	2.87	1.57	2.5	2.5	1.1	1.1
	3450	44.5	46.0	71.0	71.0	117.4	73.0	39.9	1.1	1.1				
2 1/2	1/2	-	016 250050	500	1.50	1.63	-	3.16	5.70	3.44	1.83	-	3.5	1.6
		3450	38.1	41.2	80.4	144.8	87.4	46.3	-	-				
	3/4	-	016 250075	500	1.50	1.63	-	3.16	5.70	3.44	1.83	-	3.3	1.5
		3450	38.1	41.2	80.4	144.8	87.4	46.3	-	-				
	1	-	016 250100	500	1.50	1.63	-	3.16	5.70	3.44	1.83	-	3.3	1.5
		3450	38.1	41.2	80.4	144.8	87.4	46.3	-	-				
1 1/4	015 250125	016 250125	500	2.00	2.13	3.16	3.16	5.70	3.44	1.83	-	3.5	1.6	
	3450	50.8	54.1	80.4	80.4	144.8	87.4	46.3	1.6	1.6				
3 O.D.	1/2	-	016 290050	500	1.50	1.63	-	3.16	5.70	3.44	1.88	-	3.5	1.5
		3450	38.1	41.2	80.4	144.8	87.4	47.8	-	-				
	3/4	-	016 290075	500	1.50	1.63	-	3.16	5.70	3.44	1.88	-	3.3	1.5
		3450	38.1	41.2	80.4	144.8	87.4	47.8	-	-				
	1	-	016 290100	500	1.50	1.63	-	3.16	5.70	3.44	1.88	-	3.3	1.5
		3450	38.1	41.2	80.4	144.8	87.4	47.8	-	-				
1 1/4	015 290125	016 290125	500	2.00	2.13	3.16	3.16	5.70	3.44	1.88	-	3.8	1.7	
	3450	50.8	54.1	80.4	80.4	144.8	87.4	47.8	1.7	1.7				
3	1/2	-	016 300050	500	1.50	1.63	-	3.38	6.25	3.74	2.13	-	4.0	1.8
		3450	38.1	41.2	85.9	159.0	95.0	54.1	-	-				
	3/4	-	016 300075	500	1.50	1.63	-	3.38	6.25	3.74	2.13	-	3.9	1.8
		3450	38.1	41.2	85.9	159.0	95.0	54.1	-	-				
	1	-	016 300100	500	1.50	1.63	-	3.38	6.25	3.74	2.13	-	3.9	1.8
		3450	38.1	41.2	85.9	159.0	95.0	54.1	-	-				
1 1/4	015 300125	016 300125	500	2.00	2.13	3.38	3.38	6.25	3.74	2.13	4.2	4.2	1.9	1.9
	3450	50.8	54.1	85.9	85.9	159.0	95.0	54.1	1.9	1.9				
4	1/2	-	016 400050	500	1.50	1.63	-	3.99	7.25	3.74	2.63	-	5.3	2.4
		3450	38.1	41.2	101.5	184.4	95.0	66.8	-	-				
	3/4	-	016 400075	500	1.50	1.63	-	3.99	7.25	3.74	2.63	-	5.1	2.3
		3450	38.1	41.2	101.5	184.4	95.0	66.8	-	-				
	1	-	016 400100	500	1.50	1.63	-	3.99	7.25	3.74	2.63	-	4.9	2.2
		3450	38.1	41.2	101.5	184.4	95.0	66.8	-	-				
1 1/4	015 400125	016 400125	500	2.00	2.13	3.99	3.99	7.25	3.74	2.63	5.4	5.1	2.4	2.3
	3450	50.8	54.1	101.5	101.5	184.4	95.0	66.8	2.4	2.3				
1 1/2	015 400150	016 400150	500	2.00	2.13	3.99	3.99	7.25	3.74	2.63	4.8	5.1	2.3	2.3
	3450	50.8	54.1	101.5	101.5	184.4	95.0	66.8	2.3	2.3				
2	015 400200	016 400200	500	2.50	2.63	3.99	3.99	7.25	4.37	2.63	5.1	4.8	2.3	2.2
	3450	63.5	66.8	88.9	88.9	159.0	98.5	54.1	1.9	2.0				
2 1/2	015 400250	016 400250	500	2.75	2.88	3.99	3.99	7.25	4.37	2.63	5.3	5.1	2.4	2.3
	3450	69.9	73.2	101.5	101.5	184.4	111.0	66.8	2.4	2.3				
3 O.D.	015 400290	016 400290	500	2.75	2.88	3.99	3.99	7.25	4.37	2.63	5.6	5.6	2.6	2.6
	3450	69.9	73.2	101.5	101.5	184.4	111.0	66.8	2.6	2.6				
3	015 400300	016 400300	500	2.50	2.63	4.50	4.50	7.25	5.11	2.63	6.4	6.4	2.9	2.9
	3450	63.5	66.8	92.2	114.3	184.4	130.0	66.8	2.9	2.9				

■ Requires 1/2" x 3 1/4" bolt in Cross configuration

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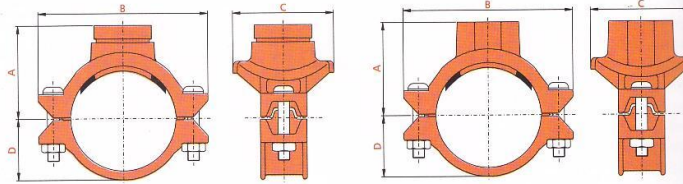
MECHANICAL BRANCHLETS



STYLE 15 GROOVED & STYLE 16 THREADED

Performance Data :

OUTLET SIZE Nominal Size Inches Actual Size mm	Cv Values	Equivalent feet/ meters of Pipe	
		Grd.	Female Thrd.
1/2	15	-	2.0
21.3		-	0.6
3/4	18	-	4.0
25.7		-	1.2
1	22	-	5.0
33.4		-	1.5
1 1/4	39	5.5	6.0
42.2		1.7	1.8
1 1/2	52	7.0	8.0
48.3		2.1	2.4
2	87	9.0	10.5
60.3		2.7	3.2
2 1/2	117	11.0	12.5
73.0		3.4	3.8
3	173	13.5	15.5
88.9		4.1	4.7
4	346	20.0	22.0
114.3		6.1	6.7



Style 15

Style 16



Cross Configuration

Run Size (Inch)	Outlet Size (Inch)	Part Number		Max. * Working Pressure psig / kPa	Hole Saw		Dimensions (in./mm.)					Approx. Weight Each	
		Style 15 Grd.	Style 16 Thrd.		in./mm	Max. Perm. in./mm	Grvd. A	Thrd. A	B	C	D	Grvd. lb./kg	Thrd. lb./kg
5	1 1/4	015 500125	016 500125	500	2.00	2.13	4.81	4.81	8.37	3.74	3.16	6.0	6.8
				3450	50.8	54.1	122.2	122.2	212.8	95.0	80.2	2.7	3.1
	1 1/2	015 500150	016 500150	500	2.00	2.13	4.81	4.81	8.37	3.74	3.16	6.2	6.6
				3450	50.8	54.1	122.2	122.2	212.8	95.0	80.2	2.8	3.0
	2	015 500200	016 500200	500	2.50	2.63	4.81	4.81	8.37	4.37	3.16	6.6	6.8
				3450	63.5	66.8	122.2	122.2	212.8	111.0	80.2	3.0	3.1
	2 1/2	015 500250	016 500250	500	2.75	2.88	4.81	4.81	8.37	4.67	3.16	7.5	7.9
				3450	69.9	73.2	122.2	122.2	212.8	118.7	80.2	3.4	3.6
	3 O.D.	015 500290	016 500290	500	2.75	2.88	4.81	4.81	8.37	4.67	3.16	7.5	7.9
				3450	69.9	73.2	122.2	122.2	212.8	118.7	80.2	3.4	3.6
3	015 500300	016 500300	500	3.50	3.63	5.05	5.05	8.37	5.11	3.16	8.3	8.2	
			3450	88.9	92.2	130.3	130.3	238.2	99.0	80.2	3.7	3.7	
6 1/2OD	1 1/4	015 650125	016 650125	500	2.00	2.13	5.13	5.13	9.37	3.74	3.65	7.0	7.0
				3450	50.8	54.1	130.3	130.3	238.2	95.0	92.6	3.2	3.2
	1 1/2	015 650150	016 650150	500	2.00	2.13	5.13	5.13	9.37	3.74	3.65	7.0	7.0
				3450	50.8	54.1	130.3	130.3	238.2	95.0	92.6	3.2	3.2
	2	015 650200	016 650200	500	2.50	2.63	5.13	5.13	9.37	4.37	3.65	7.3	7.3
				3450	63.5	66.8	130.3	130.3	238.2	111.0	92.6	3.2	3.2
	2 1/2	015 650250	016 650250	500	2.75	2.88	5.13	5.13	9.37	4.67	3.65	7.6	7.6
				3450	69.9	73.2	130.3	130.3	238.2	118.7	92.6	3.4	3.4
	3 O.D.	015 650290	016 650290	500	2.75	2.88	5.13	5.13	9.37	4.67	3.65	7.6	7.6
				3450	69.9	73.2	130.3	130.3	238.2	118.7	92.6	3.4	3.4
3	015 650300	016 650300	500	3.50	3.63	5.50	5.50	9.37	5.18	3.65	7.7	7.7	
			3450	88.9	92.2	139.7	139.7	238.2	131.6	92.6	3.5	3.5	
4	015 650400	016 650400	500	4.50	4.63	5.76	5.76	9.37	6.28	3.65	7.8	7.8	
			3450	114.3	117.6	146.4	146.4	238.2	159.6	92.6	3.5	3.5	
6	1 1/4	015 600125	016 600125	500	2.00	2.13	5.13	5.13	9.37	3.74	3.70	8.2	7.7
				3450	50.8	54.1	130.3	130.3	238.2	95.0	94.2	3.7	3.5
	1 1/2	015 600150	016 600150	500	2.00	2.13	5.13	5.13	9.37	3.74	3.70	7.5	7.5
				3450	50.8	54.1	130.3	130.3	238.2	95.0	94.2	3.4	3.4
	2	015 600200	016 600200	500	2.50	2.63	5.13	5.13	9.37	4.37	3.70	7.7	8.2
				3450	63.5	66.8	130.3	130.3	238.2	111.0	94.2	3.5	3.5
	2 1/2	015 600250	016 600250	500	2.75	2.88	5.13	5.13	9.37	4.67	3.70	7.7	8.2
				3450	69.9	73.2	130.3	130.3	238.2	118.7	94.2	3.5	3.5
	3 O.D.	015 600290	016 600290	500	2.75	2.88	5.13	5.13	9.37	4.67	3.70	8.5	8.5
				3450	69.9	73.2	130.3	130.3	238.2	118.7	94.2	3.9	3.9
3	015 600300	016 600300	500	3.50	3.63	5.50	5.50	9.37	5.18	3.70	9.0	8.8	
			3450	88.9	92.2	139.7	139.7	238.2	131.6	94.2	4.1	4.0	
4	015 600400	016 600400	500	4.50	4.63	5.76	5.76	9.37	6.28	3.70	11.0	12.8	
			3450	114.3	117.6	146.4	146.4	238.2	159.6	94.2	5.0	5.8	
8	2	015 800200	016 800200	500	2.50	2.63	6.31	6.31	12.00	4.37	4.71	11.0	11.5
				3450	63.5	66.8	160.2	160.2	304.8	111.0	119.6	5.0	5.4
	2 1/2	015 800250	016 800250	500	2.75	2.88	6.31	6.31	12.00	4.37	4.71	10.8	10.8
				3450	69.9	73.2	160.2	160.2	304.8	111.0	119.6	4.9	4.9
	3 O.D.	015 800290	016 800290	500	2.75	2.88	6.56	6.56	12.00	4.37	4.71	11.0	11.0
				3450	69.9	73.2	166.6	166.6	304.8	111.0	119.6	5.0	5.0
	3	015 800300	016 800300	500	3.50	3.63	6.56	6.56	12.00	5.18	4.71	12.3	12.5
				3450	88.9	92.2	166.6	166.6	304.8	131.6	119.6	5.8	5.7
	4	015 800400	016 800400	500	4.50	4.63	6.31	6.31	12.00	6.28	4.71	12.6	13.2
				3450	114.3	117.6	160.2	160.2	304.8	159.6	119.6	5.8	6.0

Notes

Ø Maximum torque is specified on casting DO NOT EXCEED. Oval neck track bolt conforming to the requirements of ASTM A-183 or A-449. * - Maximum pressure including surges and maximum end loads, from all internal and external forces, to which a joint could be subject under normal working conditions. This rating provides a nominal safety factor of 3 times working pressure based on standard weight steep pipe, cut or roll grooved to pipe end preparation specification. Maximum joint working pressure may be subject to a one-time field test of 1.5 times the figures indicated. For performance on other pipe, request the approvals cut sheet. Rubber gaskets with standard grade 'E' (EPDM). Temperature range -30°F + 230°F (-34°C to +110°C). Refer to installations and groove specifications when assembling any grooved product. Galvanized outlets are available. Add "G" at the end of part number. Available with BSP threads.

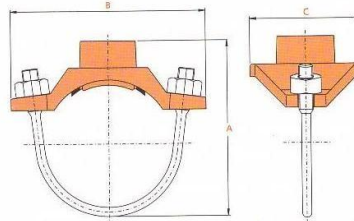


"a step up in value, a step down in cost"

MECHANICAL BRANCHLETS STYLE 13



- Ideal outlet fitting for direct connection to Sprinkler heads, drop nipples and or gauges.
- Wrap around casting is combined with a galvanized high tensile U-bolt flattened to prevent pipe deformation.
- Suitable for "arm-over" configurations.
- Utilizes ductile iron ASTM A536 housings, EPDM rubber gasket as standard, suitable for -30°F to 230°F (-34°C to 110°C)



Performance Data :

SIZE	Eqvt Feet / Meters of Pipe
1 1/4 X 1	16.53
42.2 X 33.4	5.0
1 1/2 X 1	17.57
48.2 X 33.4	5.4
2 X 1	3.43
60.2 X 33.4	1.1
2 1/2 X 1	2.76
73.0 X 33.4	0.8



Notes :

- Maximum torque is 30 ft.lb (22 Nm) DO NOT EXCEED. * - Maximum pressure including surges and maximum end loads, from all internal and external forces, to which a joint could be subject under normal working conditions. This rating provides a nominal safety factor of 3 times working pressure based on standard weight steel pipe, cut or roll groove to pipe end preparation specification. Maximum joint working pressure may be subject to a one-time field test of 1.5 times the figures indicated. For performance on other pipe, request the approvals cut sheet.

1" outlets are available with BSP threads. Add "B" at the end of part number.

Run Size Inch	Outlet Size Inch	Part Number	Max. # Working Pressure psi/kPa	Hole Diameter		U-Bolt/Nut Size Inch §	Dimensions In./mm			Approx. Wt. Each lb/ kg.
				Hole Saw in./mm	Max. Perm. in./mm		A	B	C	
1 1/4	3/8	13125037	500 3450	1.00 25.4	1.06 26.9	3/8 - U Bolt	1.75 44.4	3.66 93.0	2.16 55.0	0.9 0.4
	1/2	13125050	500 3450	1.00 25.4	1.06 26.9	3/8 - U Bolt	1.75 44.4	3.66 93.0	2.16 55.0	0.9 0.4
	3/4	13125075	500 3450	1.00 25.4	1.06 26.9	3/8 - U Bolt	1.75 44.4	3.66 93.0	2.16 55.0	0.9 0.4
	1	13125100	500 3450	1.00 25.4	1.06 26.9	3/8 - U Bolt	2.13 54.0	3.66 93.0	2.16 55.0	0.9 0.4
1 1/2	3/8	13150037	500 3450	1.00 25.4	1.06 26.9	3/8 - U Bolt	1.86 47.3	3.77 96.0	2.16 55.0	0.9 0.4
	1/2	13150050	500 3450	1.00 25.4	1.06 26.9	3/8 - U Bolt	1.86 47.3	3.77 96.0	2.16 55.0	0.9 0.4
	3/4	13150075	500 3450	1.00 25.4	1.06 26.9	3/8 - U Bolt	1.86 47.3	3.77 96.0	2.16 55.0	0.9 0.4
	1	13150100	500 3450	1.00 25.4	1.06 26.9	3/8 - U Bolt	2.24 57.0	3.77 96.0	2.16 55.0	0.9 0.4
2	3/8	13200037	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	2.10 53.4	4.13 105.0	2.52 64.0	1.0 0.5
	1/2	13200050	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	2.10 53.4	4.13 105.0	2.52 64.0	1.0 0.5
	3/4	13200075	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	2.10 53.4	4.13 105.0	2.52 64.0	1.0 0.5
	1	13200100	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	2.48 63.0	4.13 105.0	2.52 64.0	1.0 0.5
2 1/2	3/8	13250037	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	2.36 59.9	4.44 113.0	2.52 64.0	1.3 0.6
	1/2	13250050	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	2.36 59.9	4.44 113.0	2.52 64.0	1.3 0.6
	3/4	13250075	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	2.36 59.9	4.44 113.0	2.52 64.0	1.3 0.6
	1	13250100	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	2.74 69.5	4.44 113.0	2.52 64.0	1.3 0.6
3 OD	3/8	13290037	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	2.43 61.7	4.59 116.5	2.52 64.0	1.7 0.8
	1/2	13290050	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	2.43 61.7	4.59 116.5	2.52 64.0	1.7 0.8
	3/4	13290075	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	2.43 61.7	4.59 116.5	2.52 64.0	1.7 0.8
	1	13290100	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	2.80 71.1	4.59 116.5	2.52 64.0	1.7 0.8
3	3/8	13300037	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	2.69 68.3	5.03 128.0	2.52 64.0	2.0 0.9
	1/2	13300050	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	2.69 68.3	5.03 128.0	2.52 64.0	2.0 0.9
	3/4	13300075	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	2.69 68.3	5.03 128.0	2.52 64.0	2.0 0.9
	1	13300100	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	3.07 78.0	5.03 128.0	2.52 64.0	2.0 0.9
4	3/8	13400037	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	3.20 81.2	6.06 154.0	2.52 64.0	2.0 0.9
	1/2	13400050	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	3.20 81.2	6.06 154.0	2.52 64.0	2.0 0.9
	3/4	13400075	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	3.20 81.2	6.06 154.0	2.52 64.0	2.0 0.9
	1	13400100	500 3450	1.25 31.8	1.31 33.2	3/8 - U Bolt	3.58 91.0	6.06 154.0	2.52 64.0	2.0 0.9



NATIONAL

"a step up in value, a step down in cost"

STANDARD GROOVED FITTINGS
STYLES 100, 101, 102, 103, 110 & 150

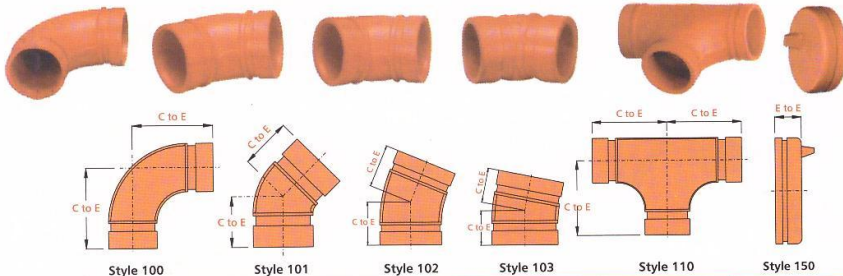


- All fittings are full flow design.
- Pressure ratings of Standard fittings conform to Style 11 Couplings.
- Made of durable, high strength Ductile Iron conforming to ASTM A536. Every lot is metallurgically examined for compliance.

FLOW DATA
 Frictional Resistance
 (Expressed as equivalent Straight Pipe in Ft./m)

Nominal Size Inches	Elbow		Tee		Nominal Size Inches	Elbow		Tee	
	90° Elbow	45° Elbow	Branch	Run		90° Elbow	45° Elbow	Branch	Run
1 1/4"	2.3	1.2	5.8	2.3	6 1/2 OD	10.0	5.0	24.9	10.0
1 1/2"	2.7	1.3	6.7	2.7	8	13.3	6.7	33.3	13.3
2"	3.4	1.7	8.6	3.4	10	16.7	8.4	41.8	16.7
2 1/2"	4.1	2.1	10.3	4.1	12	20.0	10.0	50.0	20.0
3 OD	4.3	2.2	10.6	4.3	14	22.2	11.1	55.6	22.2
3"	5.1	2.6	12.8	5.1	16	25.5	12.8	63.9	25.5
4"	6.7	3.4	16.8	6.7	18	28.9	14.5	73.1	28.9
5"	8.4	4.2	21.0	8.4	20	32.2	16.1	80.5	32.2
6"	10.3	5.1	25.3	10.3	24	38.9	19.5	99.4	38.9
8"	13.3	6.7	33.3	13.3					
10"	16.7	8.4	41.8	16.7					
12"	20.0	10.0	50.0	20.0					
14"	22.2	11.1	55.6	22.2					
16"	25.5	12.8	63.9	25.5					
18"	28.9	14.5	73.1	28.9					
20"	32.2	16.1	80.5	32.2					
24"	38.9	19.5	99.4	38.9					

Flow data is based upon the pressure drop of Sch. 40 pipe.



Pipe	90° Elbow - No.100			45° Elbow - No.101			22 1/2° Elbow - No. 102			11 1/4° Elbow - No.103			Equal Tee - No.110			End Cap - No.150			
Nominal Size	Actual Size	Part Number	C to E	Approx. Wgt. Ea.	Part Number	C to E	Approx. Wgt. Ea.	Part Number	C to E	Approx. Wgt. Ea.	Part Number	C to E	Approx. Wgt. Ea.	Part Number	E to E	Approx. Wgt. Ea.	Part Number	E to E	Approx. Wgt. Ea.
1 1/4"	1.660	100125	2.75	0.9	101125	1.75	0.6	102125	1.75	0.7	103125	1.38	0.5	110125	2.75	1.4	-	-	-
1 1/2"	1.900	100150	2.75	1.1	101150	1.75	1.0	102150	1.75	0.8	103150	1.38	0.7	110150	2.75	1.8	-	-	-
2"	2.375	100200	3.25	1.9	101200	2.00	1.3	102200	1.88	1.5	103200	1.38	0.9	110200	3.25	2.8	-	-	-
2 1/2"	2.875	100250	3.75	3.0	101250	2.25	2.2	102250	2.00	1.9	103250	1.50	1.5	110250	3.75	4.4	-	-	-
3" OD	3.000	100290	3.75	3.0	101290	2.25	2.2	-	-	-	-	-	-	110290	3.75	4.4	-	-	-
3"	3.500	100300	4.25	4.7	101300	2.50	3.2	102300	2.25	3.2	103300	1.50	2.0	110300	4.25	6.5	-	-	-
4"	4.500	100400	5.00	7.8	101400	3.00	5.5	102400	2.63	5.3	103400	1.75	3.3	110400	5.00	11.8	-	-	-
5"	5.563	100500	5.50	12.1	101500	3.25	8.5	102500	2.88	7.2	103500	2.00	5.0	110500	5.50	19.2	-	-	-
5 1/2" OD	5.500	100550	5.50	12.1	101550	3.25	8.5	-	-	-	-	-	-	110550	5.50	18.7	-	-	-
6"	6.625	100600	6.50	16.5	101600	3.50	12.5	102600	3.13	11.4	103600	2.00	7.4	110600	6.50	24.0	-	-	-
6 1/2" OD	6.500	100650	6.50	16.5	101650	3.50	12.5	102650	3.13	11.4	103650	2.00	7.4	110650	6.50	23.4	-	-	-
8"	8.625	100800	7.75	33.1	101800	4.25	21.8	102800	3.88	17.8	103800	2.00	10.0	110800	7.75	51.8	-	-	-
10"	10.750	100910	9.00	61.1	101910	4.75	28.9	102910	4.38	30.0	103910	2.13	14.5	110910	9.00	77.1	150910	2.72	26.0
12"	12.750	100912	10.00	67.2	101912	5.25	40.1	102912	4.88	40.4	103912	2.25	18.7	110912	10.00	92.5	150912	2.78	34.2
14"	14.000	100914	11.00	92.6	101914	6.00	59.5	-	-	-	-	-	-	110914	11.00	125.7	150914	3.08	52.0
16"	16.000	100916	12.00	95.9	101916	7.25	79.4	-	-	-	-	-	-	110916	12.00	134.5	150916	3.14	78.7
18"	18.000	100918	15.50	159.9	101918	8.00	89.3	-	-	-	-	-	-	110918	15.50	233.7	150918	3.18	86.0
20"	20.000	100920	17.25	201.8	101920	9.00	123.5	-	-	-	-	-	-	110920	17.25	277.8	150920	3.23	97.0
24"	24.000	100924	20.00	241.4	101924	11.00	179.7	-	-	-	-	-	-	110924	20.00	333.0	150924	3.31	108.0



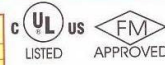
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STANDARD REDUCER TEE

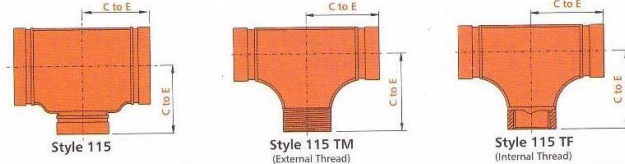
STYLE 115

- All Fittings are Full Flow Design
Made of durable high strength Ductile Iron conforming to ASTM A536.
Every lot is metallurgically examined for compliance.
Pressure ratings of Standard fittings conforms to those of Style 11 couplings.

Table with columns: Normal Size Inches, Branch, Run, Nominal Size Inches, Branch, Run. Row headers include 1 1/4, 1 1/2, 2, 2 1/2, 3, 4, 5, 6 and 1 1/2 OD, 2, 3, 4.



Flow data is based upon the pressure drop of Sch. 40 Pipe.



Reducer Tee - No. 115. Table with columns: Nominal Size, Part Number, C to E, Approx. Wgt. Ea., Nominal Size, Part Number, C to E, Approx. Wgt. Ea., Nominal Size, Part Number, C to E, Approx. Wgt. Ea.

Style 115TM and 115TF are available upto 8" run size and 2 1/2" outlet size. Add "B" at end of the part number for BSP threads.



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STANDARD CONCENTRIC REDUCER STYLE 140

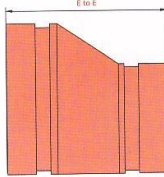
- All fittings are Smooth Flow Patterns.
- Pressure Ratings of Standard fittings Conform to Style 11 upto 12" and for sizes above 12" to style 5 Coupling.
- Made of durable, high strength Ductile Iron conforming to ASTM A-536. Every lot is metallurgically examined to insure compliance.



UL LISTED US FM APPROVED

See Style 140TM and 140TF for threaded outlet

ECCENTRIC REDUCER STYLE 145



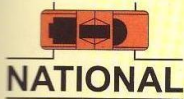
UL LISTED US FM APPROVED

Eccentric Reducer - No. 145
Add after part number the letters TF for Internal or TM for External threaded outlet

Nominal Size	Part Number	E to E in/mm	Approx. Wgt. Ea. lb./kg.	Nominal Size	Part Number	E to E in/mm	Approx. Wgt. Ea. lb./kg.
2"x1 1/4"	145200125	2.50	4.6	10"x6"	145910600	6.00	10.8
2"x1 1/2"	145200150	2.50	4.6	10"x8"	145910800	6.00	21.6
2 1/2"x2"	145250200	2.50	1.4	12"x4"	145912400	7.00	48.0
3"x1 1/4"	145300125	2.50	4.8	12"x6"	145912600	7.00	50
3"x1 1/2"	145300150	2.50	5.0	12"x8"	145912800	7.00	53.5
3"x2"	145300200	2.50	1.8	12"x10"	145912910	7.00	29.5
3"ODx2"	145290200	2.50	4.7	14"x6"	145914600	13.0	59.9
3"x2 1/2"	145300250	2.50	1.6	14"x8"	145914800	13.0	59.9
3"x3"OD	145300290	2.50	7.0	14"x10"	145914910	13.0	65
4"x2"	145400200	3.00	2.6	16"x12"	145914912	13.0	65
4"x2 1/2"	145400250	3.00	2.8	16"x8"	145916800	14.0	72.9
4"x3"	145400300	3.00	3.3	16"x10"	145916910	14.0	72.9
4"x3"OD	145400290	3.00	3.5	16"x12"	145914912	14.0	72.9
5"x2"	145500200	3.50	5.2	18"x14"	145918912	15.0	91.0
5"x2 1/2"	145500250	3.50	10.8	18"x10"	145918910	15.0	91.0
5"x3"	145500300	3.50	11.0	18"x12"	145918912	15.0	91.0
5"x4"	145500300	3.50	5.1	18"x14"	145918914	15.0	91.0
6"x2"	145600200	4.00	14.5	18"x16"	145918916	15.0	91.0
6"x2 1/2"	145600250	4.00	14.1	20"x10"	145920910	20.0	177
6"x3"	145600300	4.00	14.9	20"x12"	145920912	20.0	120
6"x4"	145600400	4.00	6.6	20"x14"	145920914	20.0	150
6"x5"	145600500	4.00	9.4	20"x16"	145920916	20.0	120
8"x3"	145800300	5.00	22.0	20"x18"	145920918	20.0	136
8"x4"	145800400	5.00	11.4	24"x10"	145924910	20.0	142
8"x5"	145800500	5.00	30.8	24"x12"	145924912	20.0	162
8"x6"	145800600	5.00	30.8	24"x14"	145924914	20.0	162
10"x3"	145910300	6.00	29.7	24"x16"	145924916	20.0	162
10"x4"	145910400	6.00	31.9	24"x18"	145924918	20.0	162
10"x5"	145910500	6.00	34.6	24"x20"	145924920	20.0	190

Concentric Reducer - No. 140

Nominal Size	Part Number	E to E in/mm	Approx. Wgt. Ea. lb./kg.	Nominal Size	Part Number	E to E in/mm	Approx. Wgt. Ea. lb./kg.
1 1/4"x1"	140125100	2.50	0.6	6"x5"	140600500	4.00	6.4
1 1/2"x1"	140150100	2.50	0.8	6"x3"OD	140800290	5.00	9.3
2"x1"	140200100	2.50	0.7	8"x3"	140800300	5.00	9.3
2"x1 1/4"	140200125	2.50	1.2	8"x4"	140800400	5.00	10.4
2"x1 1/2"	140200150	2.50	1.0	8"x5 1/2"OD	140800550	5.00	12.8
2 1/2"x1"	140250100	2.50	3.6	8"x5"	140800500	5.00	13.7
2 1/2"x1 1/4"	140250125	2.50	3.3	8"x6 1/2"OD	140800650	5.00	14.1
2 1/2"x1 1/2"	140250150	2.50	3.6	8"x6"	140800600	5.00	14.3
2 1/2"x2"	140250200	2.50	3.9	10"x3"	140910300	6.00	13.0
3"ODx1"	140290100	2.50	3.0	10"x4"	140910400	6.00	13.0
3"ODx1 1/4"	140290125	2.50	3.0	10"x5"	140910500	6.00	13.2
3"ODx1 1/2"	140290150	2.50	3.0	10"x5 1/2"OD	140910550	6.00	13.2
3"ODx2"	140290200	2.50	1.6	10"x6 1/2"OD	140910650	6.00	13.9
3"x1"	140300100	2.50	1.3	10"x6"	140910600	6.00	14.1
3"x1 1/4"	140300125	2.50	3.0	10"x8"	140910800	6.00	16.5
3"x1 1/2"	140300150	2.50	5.1	12"x4"	140912400	7.00	18.1
3"x2"	140300200	2.50	1.6	12"x6 1/2"OD	140912650	7.00	18.5
3"x2 1/2"	140300250	2.50	1.8	12"x6"	140912600	7.00	18.7
3"x3"OD	140300290	2.50	2.1	12"x8"	140912800	7.00	20.5
4"x1"	140400100	3.00	3.0	12"x10"	140912910	7.00	21.6
4"x1 1/4"	140400125	3.00	4.6	14"x6"	140914600	13.00	44.1
4"x1 1/2"	140400150	3.00	6.9	14"x8"	140914800	13.00	48.1
4"x2"	140400200	3.00	2.4	14"x10"	140914910	13.00	52.3
4"x2 1/2"	140400250	3.00	2.7	14"x12"	140914912	13.00	56.2
4"x3"OD	140400290	3.00	2.7	16"x8"	140916800	14.00	56.4
4"x3"	140400300	3.00	3.2	16"x10"	140916910	14.00	62.6
5 1/2"ODx4"	140550400	3.50	4.3	16"x12"	140914912	14.00	69.5
5"x2"	140500200	3.50	4.6	16"x14"	140914912	14.00	76.3
5"x2 1/2"	140500250	3.50	4.5	18"x10"	140918910	15.00	70.6
5"x3"OD	140500290	3.50	4.5	18"x12"	140918912	15.00	79.4
5"x3"	140500300	3.50	4.4	18"x14"	140918914	15.00	86.0
5"x4"	140500300	3.50	4.5	18"x16"	140918916	15.00	91.0
6 1/2"ODx2"	140650200	4.00	6.6	20"x10"	140920910	20.00	100.3
6 1/2"ODx3"OD	140650290	4.00	6.4	20"x12"	140920912	20.00	105.2
6 1/2"ODx3"	140650300	4.00	6.4	20"x14"	140920914	20.00	110.2
6 1/2"ODx4"	140650400	4.00	6.5	20"x16"	140920916	20.00	113.5
6 1/2"ODx5"	140650500	4.00	6.4	20"x18"	140920918	20.00	130.1
6"ODx5 1/2"OD	140650550	4.00	6.6	24"x10"	140924910	20.00	114.9
6"x2"	140600200	4.00	6.4	24"x12"	140924912	20.00	121.7
6"x2 1/2"	140600250	4.00	6.4	24"x14"	140924914	20.00	128.3
6"x3"OD	140600290	4.00	6.4	24"x16"	140924916	20.00	135.2
6"x3"	140600300	4.00	6.4	24"x18"	140924918	20.00	142.2
6"x4"	140600400	4.00	6.5	24"x20"	140924920	20.00	148.8
6"x5 1/2"OD	140600550	4.00	6.4				



"a step up in value, a step down in cost"

GROOVED FITTINGS - SHORT PATTERN

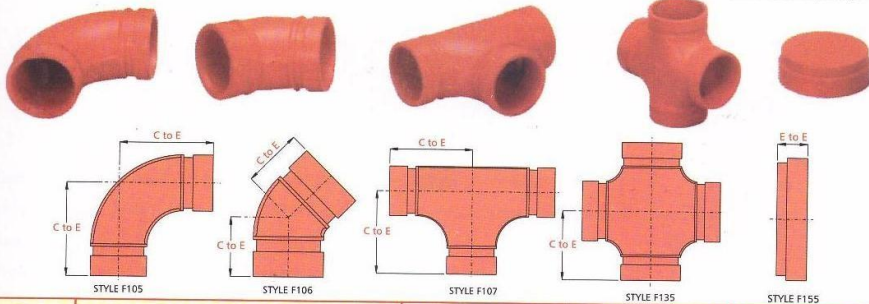
STYLES F105, F106, F107, F135 & F155



- Sized to improve flow.
- Designed for short center to end dimensions. Easier installation in less space.
- Rated for 300 lb operation, with a 5 to 1 safety factor.
- Made of durable, high strength Ductile Iron conforming to ASTM A-536. Every lot is metallurgically examined to insure compliance.
- Usage of these fittings with Style 10 and Style 11 Couplings should be evaluated properly due to bolt pad interference of Couplings.

Nominal Size inches	FLOW DATA Frictional Resistance (Expressed as equivalent Straight Pipe in Ft./m)							
	90° Elbow		45° Elbow		Branch Tee		Run Tee	
	STD	FS300	STD	FS300	STD	FS300	STD	FS300
1	1.7	1.4	0.9	0.9	4.4	4.0	1.7	1.4
1 1/4	2.3	1.8	1.2	1.0	5.8	4.2	2.3	1.8
1 1/2	2.7	2.5	1.3	1.3	6.7	5.5	2.7	2.5
2	3.4	3.2	1.7	1.6	8.6	8.2	3.4	2.5
2 1/2	4.1	3.9	2.1	2.0	10.3	10.1	4.1	3.9
3	4.3	4.5	2.2	2.2	10.8	10.6	4.3	4.5
4	5.1	4.8	2.6	2.4	12.8	12.5	5.1	4.8
5	6.7	6.5	3.4	3.2	16.8	16.0	6.7	6.5
6	8.4	8.4	4.2	4.0	21.0	20.5	8.4	8.2
8	10.1	10.0	5.1	4.8	25.3	24.0	10.1	9.6
6 1/2 OD	10.0	9.6	5.0	4.8	24.9	24.0	10.0	9.6
8	13.3	13.0	6.7	6.5	33.3	33.0	13.3	13.0

Flow data is based upon the pressure drop of Sch. 40 Pipe.



Pipe	90° Elbow - No. F105			45° Elbow - No. F106			Equal Tee - No. F107		Cross - No. F135		End cap - No. F155		
Nominal Size	Actual Size in./mm	Part Number	C to E in./mm	Approx. Wgt. Ea. lb./kg.	Part Number	C to E in./mm	Approx. Wgt. Ea. lb./kg.	Part Number	C to E in./mm	Approx. Wgt. Ea. lb./kg.	Part Number	E to E in./mm	Approx. Wgt. Ea. lb./kg.
1 1/4"	1.660 42.2	105125	2.25 57.2	0.9 0.4	106125	1.75 44.5	0.5 0.2	107125	2.25 57.2	1.0 0.5	-	-	-
1 1/2"	1.900 48.3	105150	2.50 63.5	1.1 0.5	106150	1.75 44.5	0.9 0.4	107150	2.50 63.5	1.5 0.7	-	-	-
2"	2.375 60.3	105200	2.75 69.8	1.3 0.6	106200	2.00 50.8	1.1 0.5	107200	2.75 69.8	1.9 0.9	135200	2.75 69.8	2.2 1.0
2 1/2"	2.875 73.0	105250	3.00 76.2	2.0 0.9	106250	2.25 57.2	1.8 0.8	107250	3.00 76.2	2.6 1.2	135250	3.00 76.2	3.3 1.5
3"OD	3.000 76.1	105290	3.13 79.5	2.1 1.0	106290	2.25 57.2	2.0 0.9	107290	3.13 79.5	3.1 1.4	135290	3.13 79.5	3.7 1.7
3"	3.500 88.9	105300	3.38 85.9	2.6 1.2	106300	2.00 50.8	2.2 1.0	107300	3.38 85.9	4.2 1.9	135300	3.38 85.9	5.1 2.3
4"	4.500 114.3	105400	4.00 101.6	5.4 2.3	106400	2.25 57.2	4.0 1.8	107400	4.00 101.6	6.6 3.0	135400	4.00 101.6	7.5 3.4
5"	5.563 141.3	105500	4.88 124.0	6.8 3.1	106500	2.50 63.5	6.4 2.9	107500	4.88 124.0	9.0 4.1	135500	4.88 124.0	13.7 6.2
6 1/2"OD	6.500 165.1	105650	5.50 139.7	11.0 5.0	106650	2.90 73.7	9.0 4.1	107650	5.50 139.7	20.9 9.5	135650	5.50 139.7	18.3 8.3
6"	6.625 168.3	105600	5.50 139.7	12.8 5.8	106600	2.90 73.7	9.3 4.2	107600	5.50 139.7	20.9 9.5	135600	5.50 139.7	19.7 9.0
8"	8.625 219.1	105800	6.80 173.0	22.7 10.3	106800	3.25 82.6	16.3 7.4	107800	6.95 176.5	32.9 14.9	135800	6.80 173.0	34.4 15.6



"a step up in value, a step down in cost"

DRAIN ELBOW

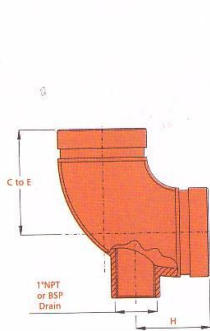
STYLES F100D & F105D



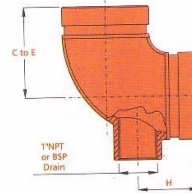
- Provides a 1" NPT/BSP drain required on some fire protection stand pipes.
- Smoother flow than fabricated segmented steel elbows.
- Made of Ductile Iron conforming to ASTM A-536. Every lot is metallurgically examined to insure compliance.
- 300 lb pressure rating with 5 to 1 safety factor.

FLOW DATA Equivalent Feet Of Straight Pipe			
Nominal Size	O.D. Size	90 Elbow	
		STD	FS300
2"	2.375	3.5	3.2
2 1/2"	2.875	4.3	3.9
3"	3.500	5.0	4.8
4"	4.500	6.8	6.5
6"	6.625	10.0	10.0

Flow data is based upon the pressure drop of Sch. 40 Pipe.



Drain Elbow - Standard
Style F100D



Drain Elbow - Short Pattern
Style F105D

Pipe		Part Number	Dimensions in./mm		Approx. Wt Each lbs./kg
Nominal Size	Actual Size In./mm		C to E	H	
2"	2.375	100D200	3.25	2.75	3.8
	60.3		82.6	70.0	1.7
2 1/2"	2.875	100D250	3.75	2.75	5.2
	73.0		95.3	70.0	2.4
3"	3.500	100D300	4.25	2.75	5.3
	88.9		108.0	70.0	2.4
4"	4.500	100D400	5.00	2.75	8.8
	114.3		127.0	70.0	4.0
6"	6.625	100D600	6.50	2.75	18.7
	168.3		165.1	70.0	8.5

Add "B" at the end of Part Number for BSP Threads.

Pipe		Part Number	Dimensions in./mm		Approx. Wt Each lbs./kg
Nominal Size	Actual Size In./mm		C to E	H	
2"	2.375	105D200	2.75	2.00	1.0
	60.3		69.8	50.8	0.5
2 1/2"	2.875	105D250	3.00	2.00	1.7
	73.0		76.2	50.8	0.8
3"	3.500	105D300	3.38	2.00	2.5
	88.9		85.9	50.8	1.1
4"	4.500	105D400	4.00	2.00	5.3
	114.3		101.6	50.8	2.4
6"	6.625	105D600	5.50	2.00	13.9
	168.3		139.7	50.8	6.3

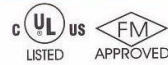
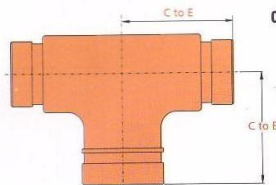


"a step up in value, a step down in cost"

BULLHEAD TEE - STANDARD

STYLE F111

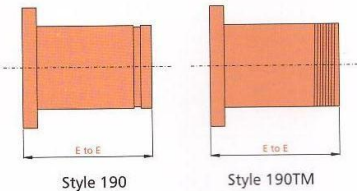
- Replaces a Standard Tee and two reducing couplings.
- Less installed cost.
- Made of Ductile Iron conforming to ASTM A-536. Every lot is metallurgically examined to insure compliance.
- Pressure ratings of fittings conform to those of Style 11 coupling.



Pipe		Part Number	C to E in./mm	Approx. Wt. Each lb./ kg
Nominal Size	Actual Size in./mm			
1 1/2"x1 1/2"x2"	1.90X1.90X2.37 48.3X48.3X60.3	111125200	3.25 82.6	1.9 0.9
2"x2"x2 1/2"	2.37X2.37X2.87 60.3X60.3X73.0	111200250	3.75 95.3	4.6 2.1
2"x2"x3"	2.37X2.37X3.50 60.3X60.3X88.9	111200300	4.25 108.0	4.6 2.1
2"x2"x4"	2.37X2.37X4.50 60.3X60.3X114.3	111200400	5.00 127.0	11.9 5.4
2 1/2"x2 1/2"x3"	2.87X2.87X3.50 73.0X73.0X88.9	111250300	4.25 108.0	6.6 3.0
2 1/2"x2 1/2"x4"	2.87X2.87X4.50 73.0X73.0X114.3	111250400	5.00 127.0	12.3 5.6
3"x3"x4"	3.50X3.50X4.50 88.9X88.9X114.3	111300400	5.00 127.0	11.7 5.3
4"x4"x6"	4.50X4.50X6.67 114.3X114.3X168.3	111400600	6.50 165.1	29.8 13.5
6"x6"x8"	6.62X6.62X8.62 168.3X168.3X219.1	111600800	6.50 165.1	37.5 17.0

FLANGE ADAPTERS STYLE 190

- Conforms to class ANSI 125 lb Flange and BS 4504 Class PN16 flange drilling
- Made of ductile iron conforming to ASTM A-536. Every lot is metallurgically examined to ensure compliance.
- Available with external or internal threaded ends as optional.
- Pressure ratings of fittings conform to those of Style 11 couplings.



Nominal Size Inch	Actual Size in./mm	Part Number	Dimensions E to E in./mm	Approx. Wgt. Ea. Lbs./ kg
2	2.375 60.3	190200	4.0 101.6	6.6 3.0
2 1/2	2.875 73.0	190250	4.0 101.6	8.8 4.0
3	3.500 88.9	190300	4.0 101.6	11.0 5.0
4	4.500 114.3	190400	6.0 152.4	19.8 9.0
5	5.563 141.3	190500	6.0 152.4	22.0 10.0
6	6.625 168.3	190600	6.0 152.4	28.6 13.0
8	8.625 219.1	190800	6.0 152.4	43.0 19.5
10	10.750 273.0	190910	8.0 203.2	60.5 27.5
12	12.750 323.9	190912	8.0 203.2	76.0 34.5

Style 190TM and 190TF are available with BSP threads. Add "B" at the end of Part Number.



NATIONAL

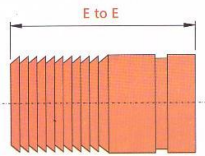
"a step up in value, a step down in cost"

NIPPLES (STEEL) STYLE 35



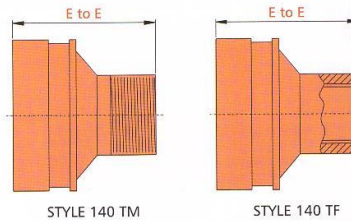
NOMINAL SIZE	E to E Inch/mm	APPROX. Wgt. Ea Lb/kg
1"	3/76.2	0.4/0.2
1-1/4"	4/101.6	0.8/0.4
1-1/2"	4/101.6	0.8/0.4
2"	4/101.6	1.2/0.5
2-1/2"	4/101.6	1.9/0.9
3"	4/101.6	2.5/1.1
4"	6/152.4	5.5/2.5
5"	6/152.4	7.4/3.4
6"	6/152.4	9.5/4.3
8"	6/152.4	14.2/6.4
10"	8/203.2	27.0/12.2
12"	8/203.2	33.0/15.0

HOSE NIPPLE STYLE 80



Size Inches millimeters	E to E Inches mm	Weight Each Lbs kg
1	3.25	0.4
25	83	0.2
11/4	3.63	0.6
32	92	0.3
11/2	4.00	0.8
40	102	0.4
2	4.63	1.1
50	118	0.5
21/2	5.50	2.0
65	140	0.9
3	6.00	3.2
80	152	1.5
4	7.25	4.9
100	184	2.2

CONCENTRIC REDUCER STYLE 140



NOMINAL SIZE	E to E Inch/mm	APPROX. Wgt. Ea Lb/kg
2"x1"	2.5/63.5	1.39/0.632
2"x1-1/4"	2.5/63.5	0.74/0.338
2"x1-1/2"	2.5/63.5	0.74/0.338
2-1/2"x1	2.5/63.5	1.14/0.520
2-1/2"x1-1/4"	2.5/63.5	1.14/0.520
2-1/2"x1-1/2"	2.5/63.5	1.14/0.520
2-1/2"x2"	2.5/63.5	1.14/0.520
3"ODx1"	2.5/63.5	1.14/0.520
3"ODx1-1/4"	2.5/63.5	1.14/0.520
3"ODx1-1/2"	2.5/63.5	1.14/0.520
3"ODx2"	2.5/63.5	1.14/0.520
3"x1"	2.5/63.5	1.59/0.725
3"x1-1/4"	2.5/63.5	1.59/0.725
3"x1-1/2"	2.5/63.5	1.59/0.725
3"x2"	2.5/63.5	1.38/0.630
4"x1"	3/76.2	2.28/1.036
4"x1-1/4"	3/76.2	2.28/1.036
4"x1-1/2"	3/76.2	2.28/1.036
4"x2"	3/76.2	2.28/1.036
6"x1"	4/101.6	6.92/3.146
6"x1-1/4"	4/101.6	6.92/3.146
6"x1-1/2"	4/101.6	6.92/3.146
6"x2"	4/101.6	6.92/3.146

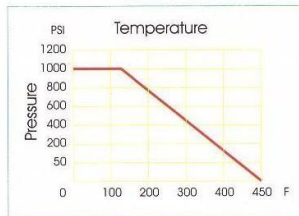
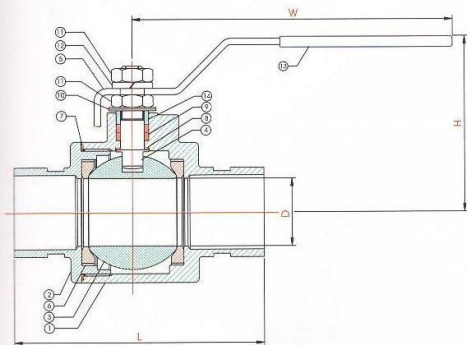
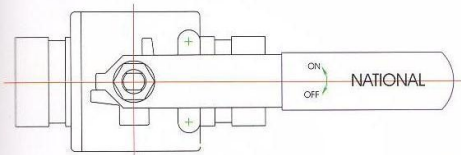


NATIONAL

"a step up in value, a step down in cost"

GROOVED END BALL VALVE

- Full port stream lined design provides better flow characteristics in all sizes.
- Valve body and end cap are ductile iron rated for 500 psi
- Microfinished Steel ball and stem (SS 304/316) seals on PTFE seats.
- Available in full stainless body and end cap (SS 304/316) as optional.



Size	1 1/4"	1 1/2"	2"	2 1/2"	3"
ød	32	38	50	62	77
L	118	123	145	165	190
H	86	95	108	138	151
W	151	181	181	247	247
Cv	46	80	110	310	360
TQ	158	187	230	430	1380
KG	2.05	2.8	4.35	8.4	14.5

TQ = Torque. Unit: in-lb
 KG = Weight. Unit: kg
 Cv = Gallons per minute of water thru' valve with 1 PSI pressure drop



NATIONAL

"a step up in value, a step down in cost"

GROOVED END BUTTERFLY VALVE

- Grooved end for fast, easy installation
- Excellent flow characteristics
- Ductile iron valve body dual seal, rubber coated ductile disc for bubble tight shut-off to 300 psi.
- Available with manual handles, gear operators or automated in two way and three way configurations.

MATERIAL LIST

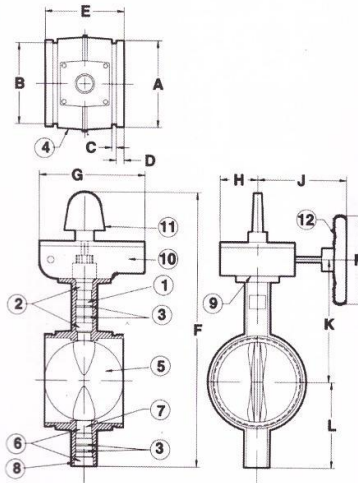
S.No.	PART	MATERIAL
1.	Upper Stem	Stainless Steel AISI 420
2.	Upper Bushing	Carbon Steel (Fiber-Flon + Glass Coating)
3.	"O" Ring	EPDM
4.	Body	Ductile Iron ASTM A-537 with Nylon Coating
5.	Disc	Ductile Iron ASTM A-536 with EPDM Encapsulating
6.	Lower Busing	Carbon Steel (Fiber-Flon + Glass Coating)
7.	Lower Stem	Stainless Steel AISI 420
8.	Dust Plug	EPDM
9.	Nameplate	Aluminum
10.	Gear Operator	Ductile Iron ASTM A-536, Powder Coated
11.	Indicator Flag	Ductile Iron ASTM A-536, Powder Coated
12.	Handwheel	Carbon Steel ASTM A 619



DIMENSIONS - WEIGHTS

SIZE	A	B	C	D	E	F	G
2 1/2"	2.88	2.72	0.31	3.63	3.80	13.27	6.73
3"	3.50	3.34	0.31	0.63	3.80	13.82	6.73
4"	4.50	4.33	0.38	0.63	4.54	15.75	6.73
6"	6.63	6.45	0.38	0.63	5.21	18.58	6.73
8"	8.63	8.44	0.44	0.75	5.80	20.51	6.73

SIZE	H	J	K	L	M	Weight (lbs.)
2 1/2"	2.95	5.31	5.31	3.36	4.92	18
3"	2.95	5.31	5.60	3.62	4.92	20
4"	2.95	5.31	6.89	4.25	4.92	24
6"	2.95	7.60	8.27	5.71	8.86	34
8"	2.95	7.60	9.21	6.69	8.86	50





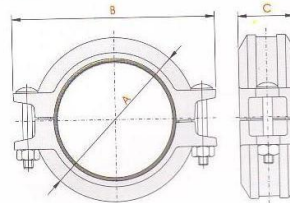
"a step up in value, a step down in cost"

STAINLESS STEEL COUPLINGS

Designed to provide rugged, corrosion resistant components for grooved end stainless steel piping systems, coupling and fittings are investment cast ASTM A351 in 304 grade stainless steel and suitable for sch. 5, 10 or 40 stainless pipe. Available in 1"-8" sizes. Couplings are supplied with ASTM A193, grade B8M hex head bolts and A194, grade B8M nuts. Grade 316 housings with compatible bolts and nuts optionally available. Allows pipe support and hanging to ANSI B31.1. Available with a variety of gasket material to suit service conditions.

RIGID COUPLING STYLE 055

Provides joint rigidity and does not allow expansion, contraction nor deflection. Tongue and groove design with wider key section prevents expansion and contraction.

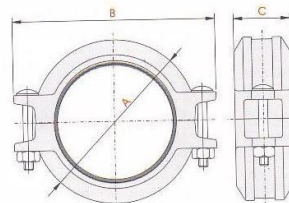


(Refer Page No.4 for Notes)

Nominal Size	Pipe Actual Size in./mm	Part Number	Max. Working Pressure psi / MPa	Allow. Pipe End Separation in./mm	No. Bolt/Nut Repl. Size Inch. Ø	Dimensions (inch./mm)			Approx. Wt. Each in./kg
						A	B	C	
1"	1.315 33.8	055100	300	0.10	2/2 - 3/8x2-1/8	2.19	3.54	1.72	1.4
1 1/4"	1.660 42.2	055125	300	0.10	2/2 - 3/8x2-1/8	2.56	3.90	1.73	1.4
1 1/2"	1.900 48.3	055150	300	0.10	2/2 - 3/8x2-1/8	2.80	4.21	1.73	1.5
2"	2.375 60.3	055200	300	0.10	2/2 - 3/8x2-1/8	3.29	4.72	1.79	1.8
2 1/2"	2.875 73.0	055250	300	0.10	2/2 - 3/8x2-1/8	3.83	5.28	1.79	2.1
3"	3.500 88.9	055300	300	0.10	2/2 - 3/8x2-7/8	4.49	5.96	1.79	2.5
4"	4.500 114.3	055400	300	0.16	2/2 - 3/8x2-7/8	5.83	7.20	1.99	4.3
5"	5.563 141.3	055500	300	0.16	2/2 - 1/2x3-3/8	6.91	8.66	1.99	5.4
6"	6.625 168.3	055600	300	0.16	2/2 - 1/2x3-3/8	8.07	9.80	1.99	7.0
8"	8.625 219.1	055800	300	0.19	2/2 - 5/8x4-1/2	10.26	12.40	2.32	13.3

FLEXIBLE COUPLING STYLE 125

Provides expansion, contraction controlled angular and rotational movement of a joint. Accommodates settling, vibration, noise and other piping system movements.



(Refer Page No. 4 for Notes)

Nominal Size	Pipe Actual Size in./mm	Part Number	Max. Working Pressure psi / MPa	Allow. Pipe End Separation in./mm	Max. Deflection From Center Line 5° in./mm	No. Bolt/Nut Repl. Size Inch. Ø	Dimensions (inch./mm)			Approx. Wt. Each in./kg		
							A	B	C			
1"	1.315 33.8	125100	300	0.10	5/26	1.14	95	2/2 - 3/8x2-1/8	2.19	3.54	1.72	1.4
1 1/4"	1.660 42.2	125125	300	0.10	4/19	0.90	75	2/2 - 3/8x2-1/8	2.56	3.90	1.73	1.4
1 1/2"	1.900 48.3	125150	300	0.10	3/46	0.79	66	2/2 - 3/8x2-1/8	2.80	4.21	1.73	1.5
2"	2.375 60.3	125200	300	0.10	3/11	0.62	52	2/2 - 3/8x2-1/8	3.29	4.72	1.79	1.8
2 1/2"	2.875 73.0	125250	300	0.10	2/23	0.52	43	2/2 - 3/8x2-1/8	3.83	5.28	1.79	2.1
3"	3.500 88.9	125300	300	0.10	2/13	0.43	36	2/2 - 3/8x2-7/8	4.49	5.96	1.79	2.5
4"	4.500 114.3	125400	300	0.16	3/11	0.67	56	2/2 - 3/8x2-7/8	5.83	7.20	1.99	4.3
5"	5.563 141.3	125500	300	0.16	2/9	0.54	45	2/2 - 1/2x3-3/8	6.91	8.66	1.99	5.4
6"	6.625 168.3	125600	300	0.16	3/10	0.46	38	2/2 - 1/2x3-3/8	8.07	9.80	1.99	7.0
8"	8.625 219.1	125800	300	0.19	1/40	0.34	29	2/2 - 5/8x4-1/2	10.26	12.40	2.32	13.3

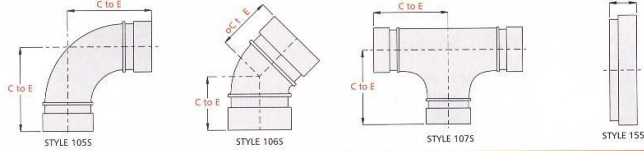


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"a step up in value, a step down in cost"

STAINLESS STEEL GROOVED FITTINGS
STYLES 1055, 1065, 1075, 1555, 1155 & 1405

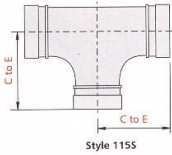
Fittings are full flow design with shorter center to end distances to ease installation and handling. Precision cast thru lost wax process, assures dimensional tolerances and gasket seat finish. ASTM A351 grade 304 is standard, grade 316 and 316T are optionally available. Pressure ratings will correspond to coupling ratings. Grooving to AWWA C-606.



Pipe Inch		Max. Working Pressure psi/kPa	90°Elbow - No.1055			45°Elbow - No.1065			Equal Tee - No.1075			End cap - No.1555		
Nominal Size	Actual Size in./mm		Part Number	C to E in./mm	Approx. Wgt. Ea. lb./kg	Part Number	C to E in./mm	Approx. Wgt. Ea. lb./kg	Part Number	C to E in./mm	Approx. Wgt. Ea. lb./kg	Part Number	E to E in./mm	Approx. Wgt. Ea. lb./kg
1-1/4"	1.660 42.2	300 2070	1055125	2.25 57.2	0.9 0.4	1065125	1.75 44.5	0.6 0.3	1075125	2.25 57.2	1.2 0.5	1555125	1.00 25.4	0.5 0.2
1-1/2"	1.900 48.3	300 2070	1055150	2.50 63.5	1.3 0.6	1065150	1.75 44.5	1.1 0.5	1075150	2.50 63.5	1.8 0.8	1555150	1.00 25.4	0.6 0.3
2"	2.375 60.3	300 2070	1055200	2.75 69.8	1.5 0.7	1065200	2.00 50.8	1.3 0.6	1075200	2.75 69.8	2.2 1.0	1555200	1.00 25.4	0.7 0.3
2 1/2"	2.875 73.0	300 2070	1055250	3.00 76.2	2.2 1.0	1065250	2.25 57.2	2.0 0.9	1075250	3.00 76.2	3.1 1.4	1555250	1.00 25.4	0.8 0.4
3"	3.500 88.9	300 2070	1055300	3.38 85.9	3.1 1.4	1065300	2.50 63.5	2.6 1.2	1075300	3.38 85.9	4.8 2.2	1555300	1.00 25.4	1.3 0.6
4"	4.500 114.3	300 2070	1055400	4.00 101.6	5.9 2.7	1065400	3.00 76.2	4.6 2.1	1075400	4.00 101.6	7.7 3.5	1555400	1.06 27.0	2.0 0.9
5"	5.563 141.3	300 2070	1055500	4.88 124.0	8.0 3.6	1065500	3.25 82.6	7.5 3.4	1075500	4.88 124.0	10.5 4.8	1555500	1.06 27.0	3.5 1.6
6"	6.625 168.3	300 2070	1055600	5.50 139.7	14.9 6.8	1065600	3.50 88.9	10.8 4.9	1075600	5.50 139.7	24.2 11.0	1555600	1.06 27.0	4.8 2.2
8"	8.625 219.1	300 2070	1055800	6.81 173.0	26.5 12.0	1065800	4.25 107.9	18.9 8.6	1075800	6.95 176.5	38.4 17.4	1555800	1.20 30.1	9.3 4.2

Reducing Tee - No. 1155

Nominal Size	Part Number	Max. Working Pressure psi/kPa	C to E Inch/mm	Approx. Wt. Ea. lb./kg
1 1/2"x1 1/2"x1"	1155150100	300 2070	2.50 63.5	1.4 0.6
1 1/2"x1 1/2"x1/2"	1155150125	300 2070	2.50 63.5	1.5 0.7
2"x2"	1155200100	300 2070	2.75 69.8	2.4 1.1
2"x2"x1/4"	1155200125	300 2070	2.75 69.8	1.6 0.7
2"x2"x1/2"	1155200150	300 2070	2.75 69.8	2.7 1.2
2 1/2"x2 1/2"x1"	1155250100	300 2070	3.00 76.2	3.4 1.6
2 1/2"x2 1/2"x1/2"	1155250125	300 2070	3.00 76.2	3.8 1.7
2 1/2"x2 1/2"x1/4"	1155250150	300 2070	3.00 76.2	3.5 1.6
2 1/2"x2 1/2"x1/2"	1155250200	300 2070	3.00 76.2	4.1 1.9
3"x3"	1155300100	300 2070	3.38 85.9	4.2 1.9
3"x3"x1/4"	1155300125	300 2070	3.38 85.9	5.2 2.4
3"x3"x1/2"	1155300150	300 2070	3.38 85.9	4.8 2.2
3"x3"x2"	1155300200	300 2070	3.38 85.9	5.2 2.4
3"x3"x2 1/2"	1155300250	300 2070	3.38 85.9	5.2 2.4
4"x4"x1"	1155400100	300 2070	4.00 101.6	7.0 3.2
4"x4"x1 1/4"	1155400125	300 2070	4.00 101.6	8.6 3.9
4"x4"x1 1/2"	1155400150	300 2070	4.00 101.6	9.2 4.2
4"x4"x2"	1155400200	300 2070	4.00 101.6	10.1 4.6
4"x4"x2 1/2"	1155400250	300 2070	4.00 101.6	10.3 4.7
4"x4"x3"	1155400300	300 2070	4.00 101.6	10.4 4.7

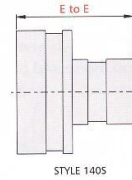


Reducing Tee - No. 1155

Nominal Size	Part Number	Max. Working Pressure psi/kPa	C to E Inch/mm	Approx. Wt. Ea. lb./kg
6"x6"x2"	1155600200	300 2070	5.50 139.7	23.8 10.8
6"x6"x2 1/2"	1155600250	300 2070	5.50 139.7	23.9 10.8
6"x6"x3"	1155600300	300 2070	5.50 139.7	23.9 10.8
6"x6"x4"	1155600400	300 2070	5.50 139.7	22.5 10.2
6"x6"x5"	1155600500	300 2070	5.50 139.7	20.9 9.5
8"x8"x2"	1155800200	300 2070	6.95 176.5	30.2 13.7
8"x8"x2 1/2"	1155800250	300 2070	6.95 176.5	35.1 15.9
8"x8"x3"	1155800300	300 2070	6.95 176.5	30.2 13.7
8"x8"x4"	1155800400	300 2070	6.95 176.5	45.0 20.4
8"x8"x6"	1155800600	300 2070	6.95 176.5	38.1 17.3

Concentric Reducer - No. 1405

Nominal Size	Part Number	Max. Working Pressure psi/kPa	E to E Inch/mm	Approx. Wt. Ea. lb./kg
1 1/2"x1"	1405150100	300 2070	2.50 63.5	0.9 0.4
1 1/2"x1 1/4"	1405150100	300 2070	2.50 63.5	1.2 0.5
2"x1"	1405150100	300 2070	2.50 63.5	0.8 0.4
2"x1 1/4"	1405150100	300 2070	2.50 63.5	1.4 0.6
2"x1 1/2"	1405150100	300 2070	2.50 63.5	1.2 0.5
2 1/2"x1"	1405150100	300 2070	2.50 63.5	4.2 1.9
2 1/2"x1 1/4"	1405150100	300 2070	2.50 63.5	3.9 1.8
2 1/2"x1 1/2"	1405150100	300 2070	2.50 63.5	4.2 1.9
2 1/2"x2"	1405150100	300 2070	2.50 63.5	4.6 2.1
3"ODx1"	1405150100	300 2070	2.50 63.5	2.9 1.3
3"ODx1 1/4"	1405150100	300 2070	2.50 63.5	3.5 1.6
3"ODx1 1/2"	1405150100	300 2070	2.50 63.5	3.5 1.6
3"ODx2"	1405150100	300 2070	2.50 63.5	1.9 0.8
3"x1"	1405150100	300 2070	2.50 63.5	1.5 0.7
3"x1 1/4"	1405150100	300 2070	2.50 63.5	3.5 1.6
3"x1 1/2"	1405150100	300 2070	2.50 63.5	6.0 2.7
3"x2"	1405150100	300 2070	2.50 63.5	1.9 0.9
3"x2 1/2"	1405150100	300 2070	2.50 63.5	2.2 1.0



Concentric Reducer - No. 1405

Nominal Size	Part Number	Max. Working Pressure psi/kPa	E to E Inch/mm	Approx. Wt. Ea. lb./kg
4"x2"	1405400200	300 2070	3.00 76.2	2.8 1.3
4"x2 1/2"	1405400250	300 2070	3.00 76.2	3.2 1.4
4"x3"	1405400300	300 2070	3.00 76.2	3.7 1.7
6"x2"	1405600200	300 2070	4.00 101.6	7.7 3.5
6"x2 1/2"	1405600250	300 2070	4.00 101.6	7.5 3.4
6"x3"	1405600300	300 2070	4.00 101.6	7.5 3.4
6"x4"	1405600400	300 2070	4.00 101.6	7.6 3.4



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GASKET DATA
STANDARD IPS GASKETS

Grade	E	T				
Temperature Range	-30°F to +230°F -34°C to +110°C	-20°F to +180°F -29°C to +82°C				
Compound	EPDM Conforming to ASTM D2000 (2CA615A25B24F17Z)	NITRILE (BUNA - N)				
General Service Recommendations	Recommended for hot water service within the specified temperature range plus a variety of dilute acids, oil-free air and many chemical services. UL classified in accordance with ANSI /NSF 61 for cold +86°F (+30°) and hot +180° F (+82°C) portable water service. Not recommended for petroleum services.	Recommended for petroleum products, air with oil vapors, vegetables and mineral oils within the specified temperature range. Not recommended for hot water services over +150° F (+66° C) or hot dry air over +140° F (+60° C).				
Chemical Services	Acetaldehyde Acetic Acid up to 10% 100°F (38°C) Acetic Anhydride Acetone Acetophenone Acetylene Alkalis Allyl Alcohol to 96% Alums Aluminum Chloride Aluminum Fluoride Aluminum Hydroxide Aluminum Nitrate Aluminum Phosphate Aluminum Salts Aluminum Sulfate Ammonia Gas, Cold Ammonia Gas, Hot Ammonia, Liquid Ammonium Carbonate Ammonium Fluoride Ammonium Hydroxide Ammonium Metaphosphate Ammonium Nitrate Ammonium Persulfate to 10% Ammonium Sulfate Ammonium Sulfide Ammonium Thioacetate Ammonium Thiocyanate Amyl Acetate Amyl Alcohol Aniline Aniline Dyes Aniline Hydrochloride Aniline Oil Antimony Chloride Antimony Trichloride Argon Gas Barium Carbonate Barium Chloride Barium Hydroxide Benzaldehyde Benzoic Acid Benzyl Alcohol Benzyl Benzoate	Bleach, 12% Active CP Borax Bordeaux Mixture Boric Acid Butanol (see Butyl Alcohol) Butyl Acetate Butyl Acetyl Ricinoleate Butyl Alcohol Butyl "Cellulosolve Adipate" Butyl Phenol Butylene Glycol Calcium Chloride Calcium Hydroxide (Lime) Calcium Hypochlorite Calcium Hypochloride Calcium Nitrate Calcium Sulfide Carbotol Carbon Dioxide, Dry Carbon Dioxide, Wet Carbon Monoxide Caustic Potash Cellulosolve Acetate Cellulosolve (Alcohol Ether) Cellulose Acetate Cellulube 220 (Tri-Aryl-Phosphate) Cellulube Hydraulic Fluids Chloric Acid to 20% Chlorine, Water Chloroacetic Acid Chloroacetone Citric Acid Copper Fluoride Copper Nitrate Copper Sulfate Cyclohexanone Deionized Water Dibutyl Phthalate Diethyl Sebacate Diethylene Glycol Dioctyl Phthalate Diozane Dowtherm SR-1 Ethanolamine Ethyl Acetoacetate Ethyl Alcohol	Ethyl Cellulose Ethyl "Cellulosolve" Ethyl Chloride Ethyl Oxalate Ethylene Chlorohydrin Ethylene Glycol Ferric Chloride, to 35% Ferric Chloride, Saturated Ferric Hydroxide Fluoboric Acid Fly Ash Foam Formaldehyde Formic Acid Freon 134a, 176°F (86°C) Fumaric Acid Furfuryl Alcohol Glue Glycerin Glycerol Gittcol Glycolic Acid Halon Hexaldehyde Hydrobromic Acid, to 40% Hydrochloric Acid, to 36%, 75°F (240°C) Hydrocyanic Acid Hydrogen Gas, Cold Hydrogen Gas, Hot Hydrogen Sulfide Hydroxylamine Sulfate Hydrochlorous Acid, Dilute Isobutyl Alcohol Isopropyl Acetate Isopropyl Alcohol Ketones Lead Chloride Lime and H ₂ O Magnesium Chloride Magnesium Hydroxide Magnesium Sulfate Mercuric Chloride	ASTM #3 Oil Acetamide Acetonitrile Acetylene Adipic Acid Alums Aluminum Chloride Aluminum Fluoride Aluminum Nitrate Aluminum Oxide Aluminum Sulfate Ammonium Bifluoride Ammonium Chloride Ammonium Nitrate Ammonium Phosphate Ammonium Sulfamate Amyl Chloronaphthalene Arsenic Acid, to 75% Barium Chloride Barium Hydroxide Barium Sulfide Barium Sulfate Black Sulfate Liquor Blast Furnace Gas Boric Acid Butane Gas Butanol (see Butyl Alcohol) Butyl Alcohol Butyl "Cellulosolve Adipate" Butyl Stearate Butylene Calcium Acetate Calcium Bisulphate Calcium Bisulphite Calcium Fluosphosphate Calcium Hydroxide Calcium Hydroxide (Lime) Calcium Sulfate Caliche Liquors Carbitol Carbon Dioxide, Dry Carbon Dioxide, Wet China Wood Oil, Tung Oil Chlorinated Paraffin	Chrome Alum Coke Oven Gas Copper Chloride Copper Cyanide Copper Nitrate Copper Sulfate Cupric Fluoride Cupric Sulfate Dextrin Dichloro Diflora Methane Dichloro Hexamine Diesel Oil Diethyl Ether Diethylene Glycol Dimethylamine Dipentene (Terpene Hydrocarbon) Dipropylene glycol Dowtherm SR-1 Ethyl Alcohol Ethyl Ether Ethyl Silicate Ethylene Diamine Ethylene Glycol F Ferric Chloride, to 35% Ferric Sulfate Fog Oil Formaldehyde Formamide Freon 11, 130°F (54°C) Freon 12, 130°F (54°C) Freon 113, 130°F (54°C) Freon 114, 130°F (54°C) Freon 134a, 176°F (80°C) Fructose Fuel Oil Gasoline, Refined Glue Glycerin Glycerol Glycol Grease Green Sulfate Liquor	Heptane Hexane Hexanol Tertiary Hexyl Alcohol Hexylene Glycol Hydrofluosilicic Acid Hydrogen Gas, Cold Hydroquinone Iso Octane, 100°F (38°C) Isopropyl Ether JP-3 JP-4 JP-5 Kerosene Lauric Acid Lavender Oil Lead Acetate Lead Sulfate Lime and H ₂ O Lithium Bromide Lithium Chloride Lubricating Oil, Refined Lubricating Oil, Sour Lubricating Oil, To 150° F (66°C) Magnesium Chloride Magnesium Hydroxide Magnesium Sulphate Maleic Acid Maleic Acid Mercuric Chloride

Silicone, Neoprene, Viton gaskets for services not listed above are available optionally. Always use proper lubricant for coupling assembly.



NATIONAL

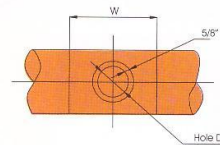
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PIPE PREPARATION FOR MECHANICAL BRANCHLETS

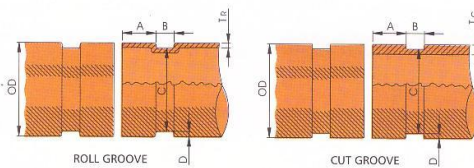
Cut or drill the hole in pipe. Hole diameter for each size is listed in Table. Holes must be drilled on centerline of pipe. Remove the cut piece and cutting chips. Check pipe surface within 5/8" of the hole. This surface must be clean, smooth and free from indentation or projection, which would affect proper sealing. The pipe around entire circumference within the 'W' dimension must be free from any dirt and scale, which might affect sealing performance on the pipe surface (See Table).

Run Size Inches	Branch Size Inches	Hole Diameter Inches +1/8 -0	W Dimension Inches
All	1/2, 3/4, 1	1 1/2	3 1/2
2	1 1/4, 1 1/2	1 3/4 *	4
All	1 1/4, 1 1/2	2	4
All	2	2 1/2	4 1/2
All	2 1/2	2 3/4	4 3/4
All	3	3 1/2	5 1/2
All	4	4 1/2	6 1/2

* 2 X 1 1/4, 2 X 1 1/2 - Hole size 1-3/4 ± 1/16 O.D.



PIPE GROOVING SPECIFICATIONS



Nominal Size	Pipe Outside Diameter OD in./mm		3 Gasket Seat A in./mm	4 Groove Width C in./mm		5 Groove Diameter D in./mm		6 Groove Depth E in./mm		7 Min. Allowable Wall Thickness in./mm		8 Max. Allowable Flare Dia. in./mm
	Actual Size	Tolerance		Roll groove	Cut groove	Actual Size	Tolerance	Roll Groove Te	Cut Groove Tc	Roll Groove	Cut Groove	
1"	1.315	+0.013 -0.013	0.625	0.281	0.313	1.190	-0.015	0.063	0.065	0.133	1.43	1.43
1 1/4"	1.660	+0.016 -0.016	0.625	0.281	0.313	1.525	-0.015	0.063	0.065	0.140	1.77	1.77
1 1/2"	1.900	+0.019 -0.019	0.625	0.281	0.313	1.775	-0.015	0.063	0.065	0.145	2.01	2.01
2"	2.375	+0.024 -0.024	0.625	0.344	0.313	2.250	-0.015	0.063	0.065	0.154	2.48	2.48
2 1/2"	2.875	+0.029 -0.029	0.625	0.344	0.313	2.720	-0.018	0.078	0.083	0.168	2.98	2.98
3"OD	3.000	+0.030 -0.030	0.625	0.344	0.313	2.845	-0.018	0.078	0.083	0.168	3.10	3.10
3"	3.500	+0.035 -0.031	0.625	0.344	0.313	3.344	-0.018	0.078	0.083	0.168	3.60	3.60
4"	4.500	+0.045 -0.031	0.625	0.344	0.375	4.334	-0.020	0.083	0.083	0.203	4.60	4.60
5"	5.563	+0.056 -0.031	0.625	0.344	0.375	5.395	-0.022	0.084	0.109	0.203	5.66	5.66
5 1/2"OD	5.500	+0.056 -0.031	0.625	0.344	0.375	5.334	-0.020	0.083	0.109	0.203	5.60	5.60
6"OD	6.000	+0.056 -0.031	0.625	0.344	0.375	5.830	-0.022	0.085	0.109	0.219	6.10	6.10
6"	6.625	+0.063 -0.031	0.625	0.344	0.375	6.455	-0.022	0.085	0.109	0.219	6.73	6.73
6 1/2"OD	6.500	+0.063 -0.031	0.625	0.344	0.375	6.330	-0.022	0.085	0.109	0.219	6.60	6.60
8"	8.625	+0.063 -0.031	0.750	0.469	0.438	8.441	-0.025	0.092	0.109	0.238	8.80	8.80
10"	10.750	+0.063 -0.031	0.750	0.469	0.500	10.562	-0.027	0.094	0.134	0.250	10.92	10.92
12"	12.750	+0.063 -0.031	0.750	0.469	0.500	12.531	-0.030	0.109	0.156	0.279	13.22	13.22
14"OD	14.000	+0.063 -0.031	0.938	0.469	0.500	13.781	-0.030	0.109	0.165	0.312	14.10	14.10
15"OD	15.000	+0.063 -0.031	0.938	0.469	0.500	14.781	-0.030	0.109	0.165	0.312	15.10	15.10
16"OD	16.000	+0.063 -0.031	0.938	0.469	0.500	15.781	-0.030	0.109	0.165	0.312	16.10	16.10
18"OD	18.000	+0.063 -0.031	1.000	0.469	0.500	17.781	-0.030	0.109	0.165	0.312	18.16	18.16
20"OD	20.000	+0.063 -0.031	1.000	0.469	0.500	19.781	-0.030	0.109	0.165	0.312	20.16	20.16
22"OD	22.000	+0.063 -0.031	1.000	0.500	0.563	21.656	-0.030	0.172	0.188	0.375	22.20	22.20
24"OD	24.000	+0.063 -0.031	1.000	0.500	0.563	23.656	-0.030	0.172	0.278	0.375	24.20	24.20

COLUMN 1

Nominal IPS pipe outside diameter.

COLUMN 2

Maximum Deviation from square cut ends for 1.25" thru 3" is 0.03"; for 4" thru 6" is 0.045" and for 8" and above is 0.06".

COLUMN 3

To provide a leak tight seal, the gasket seating area on pipe shall be free from roll marks, indentations, paint scale, dirt, chips, grease and rust etc.

COLUMN 4

Groove width - Groove bottom to be free from loose dirt, chips, rust and scales. Bottom of grooves to be radius and the vertical wall of grooves must provide at least 0.03" vertical side for proper assembly of coupling.

COLUMN 5

Groove outside diameter - The groove must be concentric to the pipe circumference. Groove must be within the diameter tolerance indicated.

COLUMN 6

Groove Depth - for reference only. Refer to Column 5

COLUMN 7

Minimum allowable wall thickness to which the pipe may be roll grooved or cut grooved.

COLUMN 8

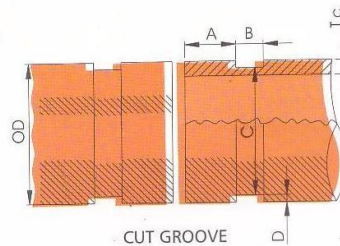
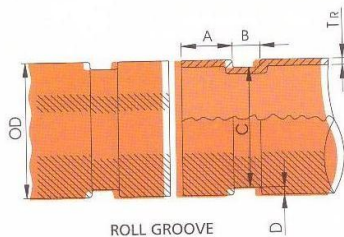
Maximum allowable pipe end flare diameter. Measured at the most extreme pipe ends.



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LARGE DIAMETER PIPE GROOVING SPECIFICATION



1 Nominal Size	2 Pipe Outside Diameter O.D. in/mm		3 Gasket Seat A in/mm +0.03/ 0.06 +0.8/ -1.5	4 Groove Width B in/mm ±0.03/±0.76		5 Groove Diameter C in/mm		6 Groove Depth (Ref.) D in/mm	7 Min. Allow. Wall Thickness in/mm		8 Max. Allow. Flare Dia. in/mm	
	Actual Size	Tolerance		Roll Groove	Cut Groove	Actual Size	Tol. +0.000 +0.00		Roll Groove Tr	Cut Groove Tc		
26 O.D.	26.00 660.4	+0093 +2.36	-0.031 -0.79	1.75 44.45	0.625 15.88	0.625 15.88	25.50 647.7	-0.063 -1.60	0.250 6.35	0.250 6.35	0.625 15.88	26.20 665.5
28 O.D.	28.00 711.0	+0.093 +2.36	-0.031 -0.79	1.75 44.45	0.625 15.88	0.625 15.88	27.50 698.50	-0.063 -1.60	0.250 6.35	0.250 6.35	0.625 15.88	28.20 716.3
30 O.D.	30.00 762.0	+0.093 +2.36	-0.031 -0.79	1.75 44.45	0.625 15.88	0.625 15.88	29.50 749.30	-0.063 -1.60	0.250 6.35	0.250 6.35	0.625 15.88	30.20 767.1
32 O.D.	32.00 813.0	+0.093 +2.36	-0.031 -0.79	1.75 44.45	0.625 15.88	0.625 15.88	31.50 800.10	-0.063 -1.60	0.250 6.35	0.250 6.35	0.625 15.88	32.20 817.9
36 O.D.	36.00 914.0	+0.093 +2.36	-0.031 -0.79	1.75 44.45	0.625 15.88	0.625 15.88	35.50 901.70	-0.063 -1.60	0.250 6.35	0.250 6.35	0.625 15.88	36.20 919.5
42 O.D.	42.00 1067.0	+0.093 +2.36	-0.031 -0.79	2.00 50.80	0.625 15.88	0.625 15.88	41.50 1054.10	-0.063 -1.60	0.250 6.35	0.250 6.35	0.625 15.88	42.20 1071.8



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FIRE PROTECTION LISTINGS / APPROVAL

Style Product	UL/ULC Listed		FM Approved	
	Size Inches	Rating PSI	Size Inches	Rating PSI
5 Rigid Coupling	1 - 18	300	1 - 12 14 - 18	300 175
10 Medium Flexible Coupling	1 1/4 - 2 1/2, 3 4	500 400	1 1/4 - 2 1/2, 3, 4 6	500 300
11 Standard Flexible Coupling	3 OD, 5 - 10 12	300 175	3 OD, 6 1/2 - 12 14-18	300 175
12 Light Flexible Coupling	1 1/4 - 4 3OD, 5 - 12	500 300	1 1/4 - 8 10-12	500 300
13 Snap Tee	1-8	300	1 - 8	300
14 Grooved-Flange	1 1/4X1/2 - 4X1	300	1 1/4X1/2-2 1/2X1	175
15 Grooved Snap Tee	2 - 8 10 - 12	300 175	2 - 8 10 - 12	300 175
16 Threaded Snap Tee	2X1 1/4 - 8X4	300	2x1 1/2 - 4x3 6 1/2x1 1/4 - 6 1/2x4 6x1 1/2 - 6x4 8x2 - 8x4	300 300 300 300
25 Reducing Coupling	2X1/2 - 6X4 8X2 - 8X4 8X3 OD	300 250 300	2x1/2 5x3 6 1/2x2 1/2 - 6 1/2x4 6x1 1/2 - 6x4 8x2 - 8x4	300 300 300 300
100, 101, 110 Standard 90° Elbow, 45° Elbow, Tee	2X1 1/2 - 4X3 6X4, 6 1/2X4 8X6 1/2, 8X6	300 250 175	2X1 1/2 - 4X3 6X4, 6 1/2X4 8X6 1/2, 8X6	300 300 300
150 Standard Cap	1 1/4 - 8 3OD, 5 1/2, 6 1/2 10, 12 14, 16, 18	500 300 175 300	1 1/4 - 8 3OD, 6 1/2, 10, 12 14 - 18	500 300 175
115 Reducing Tee	10, 12 14, 16	175 300	10, 12	300
140 Concentric Reducer Grooved	2X2X1 - 12X12X8	300	2X2X1-12X12X10	300
140 TM Concentric Reducer Threaded	2X1 1/2-8X6 10X4 - 12X10	300 175	2X1 1/4 - 12X10 10X3 - 12X10	300 300
105, 106, 107 Short Pattern 90° Elbows, 45° Elbow, Tee	2X1 - 6X4	300	2X1 6X4	300
135 Short Pattern Cross	1 1/4 - 4, 6 - 8	300	1 1/4 - 4, 6-8	300
155 Short Pattern Cap	2-4, 6, 6 1/2 8	300 175	2-4, 6, 6 1/2 8	300 175
105D Drain Elbow	1 - 8	300	1 - 8	300
111 Bull Head Tee	2 - 4 6	300 250	2 - 6	300
127 Stand Pipe Tee	1 1/2X1 1/2X2- 4X4X6	300	1 1/2X1 1/2X2 - 4X4X6	300
125 90° Elbow Flanged Adapter	4X4X2 1/2, 4X4X3OD 6X6X2 1/2, 6X6X3OD 8X8X2 1/2, 8X8X3OD	300 250 175	4X4X2 1/2 6X6X2 1/2 8X8X2 1/2	300 300 175
126 Reducing Elbow Adapter	3 - 8	175	3 - 8	500
130 Std. Flange Adapter Nipple	6X4 8X6	175	6X4 - 8X6	500
109 Reducing Flange Adapter	2 - 8	175	2 - 8	500
	6x4 - 8x6	175	6X4 - 8X6	500

NOTES:

- All the above products have been approved by MEA, New York City.
- Rubber gasket styles are UL Listed and FM Approved with standard grade 'E' gasket. Temperature range -30°F to +230°F. Not suitable for dry system. Recommend TRI Seal gasket for freezer and dry systems.
- Light wall pipe shall have minimum wall thickness in accordance with Sch. 10 and shall be roll grooved as per National Specification.
- UL/FM Listed pressure rating under roll groove specification for style 5, 10, 12, 14, 15, 16 & 25.
 - 300 PSI : 1-1/4 THRU 4 XL& SUPER FLOW BY ALLIED TUBE & CONDUIT CORP.
 - : 1-1/4 THRU 2 LS BY CENTURY TUBE CORP. IDOD GAL7
 - : 1 THRU 4 SL & HIGH FLOW BY WESTERN TUBE CORP.
 - : 1-1/4 THRU 2 EDDIE LIGHT BY BULL MOOSE TUBE CO.
 - : 1-1/4 THRU 4 CENTRAL SPRINKLER TL PIPE.
 - : 1-1/4 THRU 4 WESTERN INTERNATIONAL
 - : 1 1/4 THRU 4 WELDED TUBE-BERKEY LLC STEADY FLOW
 - : 1 1/4 THRU 6 NORTH WEST-EZ-FLOW, TEX TUBE, TEX FLOW
 - : 1 1/4 THRU 8 BRITISH STANDARD BS 1387 PIPE, MED AND HEAVY
 - 175 PSI : 1-1/4 THRU 4 DYNA FLOW BY AMERICAN TUBE CO, WHEAT LAND SH. 5, IDOD GAL 5
 - : 1- 1/4 THRU 2 BLT BY AMERICAN TUBE CO.



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ROLL GROOVING MACHINE



Model: - RG - 140

Capacity : 1" - 4"
Power : 1 HP, 220 / 415 volts,
three phase, and 50 Hz



Model: - RG - 212

Capacity : 2" - 12"
Power : 1 HP, 220 / 415 volts,
three phase, and 50 Hz



Model: - RG - 224

Capacity : 2" - 24"
Power : 2 HP, 220 / 415 volts,
three phase, and 50 Hz

The grooving tool is a fully motorized shop tool for continuous Production roll grooving of pipes of wall thickness up to 0.375" (9.5mm)



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PIPING APPLICATIONS

FIRE PROTECTION

HEATING, VENTILATING
AND AIR CONDITIONING

PLUMBING

MUNCIPAL

MINING

OEM

PULP AND PAPER

CHEMICAL

OIL FIELD

POWER

STEEL

PHARMACEUTICAL

SHIP BUILDING



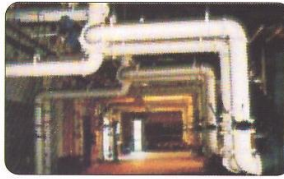
Reverse osmosis grooved end caps allow easy filter membrane service



Industrial Plant process piping



Compressed air



Heating



Mining



Tunneling Application

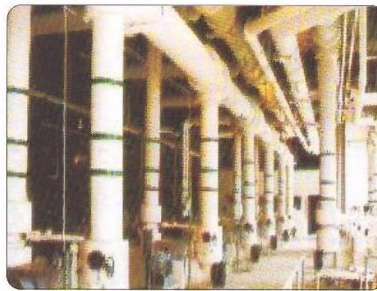


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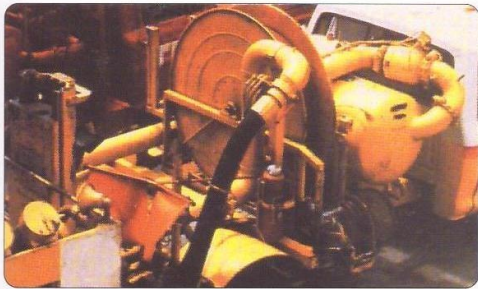
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HVAC piping



Air Conditioning



Mobile Equipment utilize vibration / flexibility characteristics



Oil Field



Fire Protection





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INSTALLATION INSTRUCTIONS

MECHANICAL GROOVED COUPLINGS STYLES 5, 10, 11, 12

1. Remove one nut and bolt from housings. Loosen the other nut until it is flush with the end of the bolt. Remove the gasket from the housings.
2. Check suitability of gasket for intended service and apply a thin coat of silicone or other compatible pipe lubricant to gasket lips and outside of the gasket, if the gasket surface does not have lubricity.
3. Insert and push the gasket over one of the grooved ends of the two pipes to be joined. Gasket lip should not overhang pipe end.
4. Align and bring the pipe ends together and slide gasket into position centered between the grooves on each pipe. Gasket should not extend into groove on either pipe.
5. Place housings over gasket and apply pressure by hands to engage the keys into the grooves. Insert bolts and apply nuts finger tight. Make sure on Style 5 the tongue and groove match to avoid product failure.
6. Tighten nuts alternately and equally until housing bolts pads are firmly together, metal-to-metal. Uneven tightening will pinch the gasket. On Style 5 there may be a slight gap at bolt pads.
7. **WARNING : DO NOT MAKE ADJUSTMENT TO GROOVED PRODUCTS WHILE THE PIPING SYSTEM IS UNDER PRESSURE.**

REDUCING COUPLING STYLE 25

1. Remove nuts and bolts from housings. Remove gasket from housings.
2. Check suitability of gasket for intended service and apply a thin coat of silicone or other suitable pipe lubricant to gasket lips and outside of gasket, if the gasket surface does not have lubricity.
3. Insert the large opening of the gasket over the larger pipe ends until the steel washer touches the pipe ends.
4. Align the pipe centerline and insert the smaller pipe end into the gasket. A slight twisting motion of the pipe eases assembly. Steel washer will prevent the movement of smaller pipe inside the larger pipe.
5. Position the housing halves over the gasket, making sure the housing keys engage the grooves on each pipe. Proper lubrication of the interior of the housing and exterior of the gasket is important to prevent gasket pinching.
6. Insert the bolts and start the nuts manually. Tighten the nuts uniformly, alternating side until housing bolts pads meet firmly metal-to-metal. Uneven tightening will pinch the gasket.
7. **WARNING : DO NOT MAKE ADJUSTMENT TO GROOVED PRODUCTS WHILE THE PIPING SYSTEM IS UNDER PRESSURE.**

MECHANICAL BRANCH OUTLETS STYLES 13,15,16

1. Cut or drill hole in pipe. Hole diameter for each mechanical branch out-let is listed on the chart pertaining to the product. Holes must be drilled on the center-line of the pipe. Remove the cut piece and cutting chips. Make sure that the pipe surface within 7/8" of the hole is clean, smooth and free of indentations or projections which would affect proper sealing.
2. Remove one nut and bolt from assembled housings. Loosen the other nut until it is flush with the end of bolt. Remove the tape and lift the gasket.
3. Check suitability of gasket for intended service. Reposition the gasket into the housing using alignment tabs on the sides for proper positioning.
4. Rotate the lower housing approximately 90 degrees away from the upper or outlet section. Place the upper on to the surface of the pipe in line with the outlet hole prepared per instructions and rotate the lower section around the pipe and close the two halves.
5. Insert bolt in its hole and finger tighten both nuts, making sure that the locating collar is in the outlet hole. Also make sure that the positioning lugs are aligned properly.
6. Tighten nuts uniformly until the gasket pocket area of the upper housing is in complete contact with pipe surface and the assembly is rigid. Nuts must be tightened with even gaps between bolt pads. Torque in excess of what is recommended is not desirable.
7. **WARNING : DO NOT MAKE ADJUSTMENT TO GROOVED PRODUCTS WHILE THE PIPING SYSTEM IS UNDER PRESSURE.**

GRUV FLANGE ADAPTER STYLE 14

1. Open the Flange Adapter and place hinged flange around the grooved pipe end with the circular key section locating into the groove.
2. Insert a standard bolt through the mating holes of the Flange to secure the Flange in the groove.
3. Check suitability of gasket for the intended service and apply a thin coat of silicone or other compatible lubricant to gasket lips and outside of the gasket, if the gasket surface does not have lubricity.
4. Press the gasket into cavity between the pipe O.D. and Flange recess.
5. Insert a standard Flange bolt in the hinge hole opposite the lock-bolt and direct the two bolt assembly to mate with the Flange of the device to be joined.
6. Add the remaining standard Flange bolts and tighten all nuts evenly until faces contact firmly or bolts attain recommended joint torque values.
7. **WARNING: DO NOT MAKE ADJUSTMENT TO GROOVED PRODUCTS WHILE THE PIPING SYSTEM IS UNDER PRESSURE.**



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GENERAL TERMS AND CONDITIONS

- GENERAL** These terms and conditions shall control with respect to any purchase order or sale of seller's products. No waiver, alteration or modification of these terms and conditions whether on Buyers's purchase order or otherwise shall be valid unless the waiver, alteration or modification is specifically accepted in writing and signed by an authorized representative of seller
- DELIVERY** Seller will make every effort to complete delivery of products as indicated on Seller's acceptance of an order, but Seller assumes no responsibility or liability, and will accept no back charge, for loss or damage due to delay or inability to deliver caused by acts of God, war labor difficulties, accident, delays or carriers, by contractors or suppliers, inability to obtain materials, shortages of fuel and energy, or any other causes of any kind whatsoever beyond the control of Seller. Seller may terminate any contract of sale of its Products without liability of any nature, by written notice to Buyer, in the event that the delay in the delivery or performance resulting from any of the aforesaid causes shall continue for a period of sixty(60)days. Under no circumstances shall Seller be liable for any special or consequential damages or for loss, damage, or expense (whether or not based on negligence) directly or indirectly arising from delays or failure to give notice of delay.
- WARRANTY** we warrant all products to be free from defects in materials and workmanship under normal conditions of use and service. Our obligation under this warranty is limited to repairing or replacing at our option at our factory any product which shall within one year after delivery to original buyer be returned with transportation charges prepaid, and our examination shall show to our satisfaction to have been defective.
- THIS WARRANTY IS MADE EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THE BUYER'S SOLE AND EXCLUSIVE REMEDY SHALL BE FOR THE REPAIR OR REPLACEMENT OF DEFECTIVE PRODUCTS AS PROVIDED HEREIN. THE BUYER AGREES THAT NO OTHER REMEDY (INCLUDING, BUT NOT LIMITED TO, INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR LOST PROFITS, LOST SALES, INJURY TO PERSON OR PROPERTY OR ANY OTHER INCIDENTAL OR CONSEQUENTIAL LOSS) SHALL BE AVAILABLE TO HIM.
- Seller neither assumes nor authorizes any person to assume for it any other liability in connection with the sale of any such products.
- This warranty shall not apply to any product which has been subject to misuse, negligence or accident, which has been repaired or altered in any manner outside of Seller's factory or which has been used in a manner contrary to Sellers's instructions or recommendations. Seller shall not be responsible for design errors Due to inaccurate or incomplete information supplied by Buyer or its representatives.
- LIABILITY** Seller will not be liable for any loss, damage, cost of repairs, incidental or consequential damages of any kind, whether based upon warranty(except for the obligation accepted by Seller under "Warranty" above), contract or negligence, arising in connection with the design, manufacture, sale, use or repair of the products or of the engineering designs supplied to Buyer
- RETURNS** Seller cannot accept return of any products unless its written permission has been first obtained, in which case same will be credited subject to the following: (a) All material returned must, on its arrival at Seller's plant, be found to be in first-class condition; if not, cost of putting in saleable condition will be deducted from credit memoranda; (b) A handling charge deduction of twenty five (25%) will be made from all credit memoranda issued for material returned; (c) Transportation charges, if not prepaid will be deducted from credit memoranda.
- SHIPMENTS** All products sent out will be carefully examined, counted and packed. The cost any special packing or special handling caused by Buyer's requirements or requests shall be added to the amount of the order. No claim for shortages will be allowed unless made in writing within ten(10) days of receipt of a shipment. Claims for products damaged or lost in transit should be made on the carrier, as Seller's responsibility ceases, and title passes, on delivery to the carrier.
- PRODUCTS** Orders covering special or non-standard products are not subject to cancellation except on such terms as Seller may specify on application.
- GOVERNING LAW** The contract shall be governed by, construed, and enforced in accordance with the laws of the Republic of India.

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