



Hebei Dikai Piping Products Co., Ltd.

Add: No.2 East Weisan Rd., Economic Development Zone,
Mengcun County, Cangzhou City, Hebei Province. China.

Tel: +86-(0)317-6817801 6817802

Fax: +86-(0)317-6817803

Web: [Http://www.cngruv.cn](http://www.cngruv.cn)



GROOVED COUPLINGS AND FITTINGS

Be a leading invisible grooved couplings
and fittings manufacturer and piping systematic solution supplier

COMPANY PROFILE

◆ Condor(China-Grooved)brand Grooved products are manufactured by Hebei Dikai Piping Products Co., Ltd., which is established in 2002 and most professional manufacturing enterprise of piping products. DIKAI is the one of first grooved products manufacturer in China, equipped with most advanced casting, milling, painting and assembling facilities, including 3 DISA automatic molding line, semi-automatic casting machine, precision casting line, large size floor molding system and relevant comprehensive testing equipment.

- Company registered capital with 5 million USD, total investment over 80 million USD;
- Owns 2 casting factories, one rubber milling facility and 2 assembling centers
- Over 500 employees, annual casting production capacity 100,000 tons
- Company total floor space over 110,000m², annual turnover exceeds 120 million USD Company services

Multiple markets served

DIKAI Piping Systems Solutions span many markets. Our piping system are found worldwide in multiple applications-from commercial comfort piping system; industrial process and utility piping; petrochemical and metallurgy industries; coal and mineral mining operations; water and wastewater plants and facilities.

DIKAI Piping Systems Solution covers fire-hydrant and sprinkler system, water spray and water mist system, foam and gas system. For all systems DIKAI offers unique solution for each individual practice and actual problem.

Certificates & approvals

- ◆ Condor(brand Grooved products are designed, manufactured, managed strictly by ISO quality management system under Hebei Dikai Piping Products Co., Ltd.
- ISO 9001:2000 Quality Management System certificated
- ISO 14001 Environmental Management System certificated
- OHSAS 18001 Occupational Health and Safety Assessment Series certificated
- cULus(UL/cUL)listed and FM approved
- VdS and LPC approvals under process

Registered capital
\$5,000,000

Total investment over
\$80,000,000

Total construction area exceeds
110,000m²

Annual turnover exceeds
\$150,000,000



CERTIFICATE

Certificate of Compliance

This certificate is issued for the following:

Pipe Couplings and Fittings for Aboveground Fire Protection Systems

Model XGQT1 Rigid Coupling	Model GKS Rigid Coupling	Model XGQT2 Flexible Coupling	Model XGQT3 Reducing Flexible Coupling
Model XGQT91 90° Elbow	Model XGQT11L 90° Long Radius Elbow	Model XGQT13 11.25° Elbow	Model XGQT12 22.5° Elbow
Model XGQT11 45° Elbow	Model XGQT11L 45° Long Radius Elbow	Model XGQT14 90° Reducing Elbow	

Prepared for:
Henan Condor Machinery Imp & Exp Co Ltd
1701 Yonghe International Building,
9 Wenhua Road, Zhengzhou City,
450003 Henan
China

FM Approvals Class: 1920 – "Pipe Couplings and Fittings for Aboveground Fire Protection Systems"
Approval Identification: 3059409 Approval Granted: August 23, 2016

To verify the availability of the Approved product, please refer to www.approvals.com

Said Approval is subject to satisfactory field performance, continuing follow-up Facilities and Procedures Audits, and strict conformity to the construction as shown in the Approval Guide, an online resource of FM Approvals.

David H. Fuller
AVP, Manager – Fire Protection
FM Approvals
1151 Boston-Providence Turnpike
Norwood, MA 02062 USA

Member of the FM Global Group

Certificate of Compliance

This certificate is issued for the following:

Pipe Couplings and Fittings for Aboveground Fire Protection Systems

Model XGQT83 Equal Tee	Model XGQT83L Long Radius Equal Tee	Model XGQT83-R3 Reducing Tee
Model XGQT83S Reducing Tee Threaded	Model XGQT84G Grooved Outlet Mechanical Tee	Model XGQT84 Threaded Outlet Mechanical Tee
Model L922 Threaded Outlet Mechanical Tee	Model 041 U-Bolt Mechanical Tee	

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Pipe Couplings and Fittings for Aboveground Fire Protection Systems

Model XGQT16 End Cap	Model XGQT81 End Cap with Eccentric Hole	Model XGQT85 Equal Cross
Model XGQT17 Grooved Concentric Reducer	Model XGQT87S Threaded Concentric Reducer	Model XGQT88 Flange Adapter
Model L981 Flange Adapter	Model XGQT89 Grooved Split Flange	

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Multiple Listing Correlation Sheet

Issued: 2016-05-27 ML FILE NO. EX27157

MULTIPLE LISTING
of
FITTINGS, RUBBER GASKETED
(VIZM)
for

[1597330] HENAN CONDOR MACHINERY IMP & EXP CO LTD

Basically Listed products covered by Procedure and/or Reports under File No. EX15228, Volume 1

Products Covered	Report Date	Basic Applicant's (Supplier's) Product Designation	Multiple Listee's Product Designation
Coupling	2008-12-23	GKS	GKS
		XGQT1	XGQT1
		XGQT2	XGQT2
Reducing Coupling	2008-12-23	XGQT3	XGQT3
Coupling	2008-12-23	XGQT1-M1	M1
Side outlet	2008-12-23	XGQT04G	XGQT04G
		XGQT04	XGQT04
		041	041
		L922	L922
Flange Adapter	2008-12-23	XGQT09	XGQT09
		L991	L991

MARKING: Same as that described in Follow-Up Service Procedure and/or Report except for Multiple Listee's name, file number, Trademark / Tradename, when applicable, and product designation. The Control Number remains [38TX].

LITERATURE: If literature is packaged with the Multiple Listed product(s) it shall be in compliance with the requirements outlined in the appropriate UL Standard(s).

Page: 1

Multiple Listing Correlation Sheet

Issued: 2016-05-27 ML FILE NO. EX27156

MULTIPLE LISTING
of
FITTINGS, GROOVED AND PLAIN END
(VIZA)
for

[1597330] HENAN CONDOR MACHINERY IMP & EXP CO LTD

Basically Listed products covered by Procedure and/or Reports under File No. EX15229, Volume 1

Products Covered	Report Date	Basic Applicant's (Supplier's) Product Designation	Multiple Listee's Product Designation
	2009-02-11	XGQT01(90 Degree Elbow, Long radius)	XGQT01(90 Degree Elbow, Long radius)
		L01(90 Degree Elbow, Long radius)	L01(90 Degree Elbow, Long radius)
		XGQT01(90 Degree Elbow)	XGQT01(90 Degree Elbow)
		XGQT014	XGQT014
		XGQT011 (45 Degree Elbow)	XGQT011
		011	011
		XGQT012	XGQT012
		XGQT013	XGQT013
		XGQT03(Tee, Long Height)	XGQT03(Tee, Long Height)
		XGQT03(Tee)	XGQT03(Tee)
		XGQT03(reducing tee)	XGQT03(grooved reducing tee)

MARKING: Same as that described in Follow-Up Service Procedure and/or Report except for Multiple Listee's name, file number, Trademark / Tradename, when applicable, and product designation. The Control Number remains [39ME].

LITERATURE: If literature is packaged with the Multiple Listed product(s) it shall be in compliance with the requirements outlined in the appropriate UL Standard(s).

Page: 1

Multiple Listing Correlation Sheet

Issued: 2016-05-27

M/L [1597330] HENAN CONDOR MACHINERY IMP & EXP CO LTD

Products Covered	Report Date	Basic Applicant's (Supplier's) Product Designation	Multiple Listee's Product Designation
	2009-02-11	XGQT03S	XGQT03S
		XGQT05	XGQT05
		XGQT08	XGQT08
		L981	L981
		XGQT07	XGQT07
		XGQT07S	XGQT07S
		XGQT06	XGQT06
		XGQT061	XGQT061

MARKING: Same as that described in Follow-Up Service Procedure and/or Report except for Multiple Listee's name, file number, Trademark / Tradename, when applicable, and product designation. The Control Number remains [39ME].

LITERATURE: If literature is packaged with the Multiple Listed product(s) it shall be in compliance with the requirements outlined in the appropriate UL Standard(s).

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PRODUCTION EQUIPMENTS

DIKAI has the most advanced production equipment. Including Inductotherm , Denmark import automatic casting line, domestic 416 automatic casting line, automatic Disa sand mixer, CNC processing center, automatic thread processing machine, SWESS Gema automatic spray line, automatic sealing machine and stereoscopic warehouse. These equipments increase the capacity of production, improve working efficiency & guaranteed the product quality.



TESTING EQUIPMENTS-RELIABLE QUALITY ASSURANCE

DIKAI has own independent laboratory & completed testing equipment. They are rubber laboratory, metal laboratory, chemical laboratory, Comprehensive Laboratory, hydraulic testing laboratory, piping system laboratory, etc. Those labs and advanced equipment guaranteed for our products development, supplier evaluation, purchasing inspection, process inspection and final product inspection



01



05



02



04



06



07

Metallography detection 01 |

Spectrum detection 02 |

The physical properties of metal detection 03 |

Physical properties of rubber gasket detection 04 |

Rubber gasket Synthetic high temperature aging test 05 |

Rubber vulcanization detection 06 |

The compression stress relaxation tests 07 |

Rubber hardness testing 08 |



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Introduction

Condor General Catalog has been written for the piping system installer, designer, specification writer and owner as a basic reference guide for data about Condor mechanical piping methods. This catalog is organized to provide information in the context and form most readily usable. For easy identification of major sections of interest, see the condensed table of contents, for a fully detailed index. For more detailed information, consult Design Data.

Important Information

After more than a decade of experience in grooved-connected pipelines, Condor has developed multi-gauge and multi-pressure ratings of grooved products for use with different pipe materials.

Condor standard grooved piping system products are designed for use only with pipes and fittings that conform to the global groove standard as AWWA C606. Piping must be prepared in accordance with the groove specifications published by Condor and the performance data listed in this catalog is based on the correct preparation of the piping. In particular, installer must choose the right rubber seal material to suit applications. It should be noted that some special applications are not recommended to use the standard sealing material. Please refer to the "Rubber Gasket" section of this catalog for a list of applications where rubber sealant materials are recommended, as well as applications not recommended for use. Condor rubber gasket must be lubricated to facilitate proper installation and use. The seal lubricant must comply with Condor regulations or approval. Fully lubricate the outer surface of the gasket, including the lips and tube ends, and the housing cavity for lubrication, which will help prevent the rubber gasket from crinkling during installation.

Notice

The technical and performance data, weights, dimensions and specifications published in this catalog supersede all previously published data.

Condor Company maintains a policy of continual product improvement and, therefore, reserves the right to change product specifications, designs, and standard equipment without notice and without incurring obligation.

For the most up-to-date Condor product information, please visit www.cngruv.cn.

All data & information presented in this catalog is intended for piping design reference in utilization of Condor products for their intended application. It is not intended as a substitute for competent, professional assistance which is an obvious requisite to any specific application.

Design

Reference should always be made to design information available at no charge on request from Condor. Good piping practices should always prevail. Specific pressures, temperatures, external or internal loads, performance standards and tolerances must never be exceeded. Many applications require recognition of special conditions, code requirements and use of safety factors. Qualified engineers must make these decisions.

While every effort has been made to ensure its accuracy, Condor Company, its subsidiaries and affiliated companies, make no express or implied warranty of any kind respecting the information contained in this catalog or the material referred to herein.

Anyone making use of the information or material contained herein does so at their own risk and assumes any and all liability resulting from such use.

Designations of global pipe sizes

Condor product data is utilized worldwide and all technical data is shown in both imperial (U.S.) and metric terms. The following chart shows a comparison between typical metric and IPS pipe sizes.

Size		Design Date	ISO	ANSI	BS	DIN	JIS	GB
Nominal Dia.		Actual O.D.	Actual O.D.	Actual O.D.	Actual O.D.	Actual O.D.	Actual O.D.	Actual O.D.
Metric	Inches	Metric mm	Metric mm	Metric mm	Metric mm	Metric mm	Metric mm	Metric mm
15	1/2	21.3	21.3	21.3	21.3	21.3	21.7	21.3
20	3/4	26.9	26.9	26.7	26.9	26.9	27.2	26.9
25	1	33.4	33.7	33.4	33.7	33.7	34.0	33.7
32	1 1/4	42.4	42.4	42.2	42.4	42.4	42.7	42.4
40	1 1/2	48.3	48.3	48.3	48.3	48.3	48.3	48.3
50	2	54.0	-	-	-	-	-	54.0
		57.0	-	-	-	-	-	57.0
		60.3	60.3	60.3	60.3	60.3	60.5	60.3
65	2 1/2	73.0	-	73.0	-	-	-	73.0
		76.1	76.1	-	76.1	76.1	76.3	76.1
80	3	88.9	88.9	88.9	88.9	88.9	89.1	88.9
90	3 1/2	101.6	-	101.6	101.6	101.6	101.5	102.0
100	4	108.0	-	-	-	-	-	108.0
		114.3	114.3	114.3	114.3	114.3	114.3	114.3
120	4 1/2	127.0	-	127.0	-	-	-	127.0
125	5	133.0	-	-	-	-	-	133.0
		139.7	139.7	-	139.7	139.7	139.8	139.7
		141.3	-	141.3	-	-	-	141.3
150	6	152.4	-	152.4(60D)	-	-	-	152.0
		159.0	-	-	-	-	-	159.0
		165.1	-	-	165.1	-	165.2	165.1
		168.3	168.3	168.3	-	168.3	-	168.3
175	7	194.0	-	193.7	193.7	193.7	-	194.0
200	8	203.2	-	203.2(80D)	-	-	-	203.0
		216.3	-	-	-	-	216.3	-
		219.1	219.1	219.1	219.1	219.1	-	219.1
225	9	241.8	-	-	-	-	241.8	-
		245.0	-	245.0	-	-	-	245.0
250	10	254.0	-	254.0(100D)	-	-	-	-
		267.4	-	-	-	-	267.4	267.0
		273.0	273.0	273.0	273.0	273.0	-	273.0
275	11	299.1	-	299.1	-	-	-	299.0
300	12	304.8	-	304.8(120D)	-	-	-	-
		318.5	-	-	-	-	318.5	318.5
		323.9	323.9	323.9	323.9	323.9	-	325.0
350	14	355.6	355.6	355.6	355.6	355.6	355.6	356.0
		377.0	-	-	-	-	-	377.0
400	16	406.4	406.4	406.4	406.4	406.4	406.4	406.0
		426.0	-	-	-	-	-	426.0
450	18	457.2	457.2	457.2	457.2	457.2	457.2	457.0
		480.0	-	-	-	-	-	480.0
500	20	508.0	508.0	508.0	508.0	508.0	508.0	508.0
		530.0	-	-	-	-	-	530.0
550	22	558.8	-	558.8	559.0	558.8	558.8	560.0
600	24	609.6	610.0	609.6	610.0	609.6	609.6	610.0
		630.0	-	-	-	-	-	630.0
700	28	711.2	711.0	711.2	711.0	711.2	711.2	711.0
		720.0	-	-	-	-	-	720.0
800	32	812.8	813.0	812.8	813.0	812.8	812.8	813.0
900	36	914.4	914.0	914.4	914.0	914.4	914.4	914.0
1000	40	1016.0	1016.0	1016.0	1016.0	1016.0	1016.0	1016.0
1050	42	1066.8	1067.0	1066.8	-	1066.8	-	1067.0
1100	44	1117.6	1118.0	1117.6	-	1117.6	1117.6	1118.0
1200	48	1219.2	-	1219.2	-	1219.2	1219.2	1219.0

Metric / Inch Conversion Chart

This chart is provided as a guide for converting imperial and metric measurements provided within this catalog.

	Metric		Conversion		Conversion		Inch
Length	mm	X	0.03937	⇔	25.4	X	In
	m	X	3.28084	⇔	0.3048	X	Feet(ft.)
	km	X	0.621371	⇔	1.609344	X	mile
Area	mm ²	X	0.00155	⇔	645.16	X	in ²
	m ²	X	10.7639	⇔	0.0929	X	ft ²
LIQUID	m ³	X	264.172	⇔	0.0037854	X	usgal
	m ³	X	61023.7	⇔	0.0000164	X	In. ³
	m ³	X	35.303	⇔	0.02832	X	ft ³
Pressure	kpa	X	0.145	⇔	6.8948	X	PSI
	kpa	X	0.01	⇔	100	X	bar
	bar	X	14.5	⇔	0.068948	X	PSI
Temperature	°C	X	°C X 1.8 +32	⇔	(°F-32)/1.8	X	°F
Torque	N-m	X	0.7375	⇔	1.356	X	ft-lbf
Force	N	X	0.2248	⇔	4.4482	X	lbs.
Mass	g	X	0.035274	⇔	28.3495	X	oz.
	kg	X	2.2026	⇔	0.4536	X	lbs.
Power	W	X	0.001341	⇔	745.7	X	hp
	W	X	0.737562	⇔	1.35582	X	ft-lbf/s
Quantity of Flow	L/min	X	0.2642	⇔	3.785	X	Gal. per Min. (GPM)
	m ³ /min	X	264.2	⇔	3.7865	X	10 ⁻³ Gal. per Min.(GPM)

Products Presentation

Three traditional methods to connect steel pipes, namely welding, flange connection and screw connection.

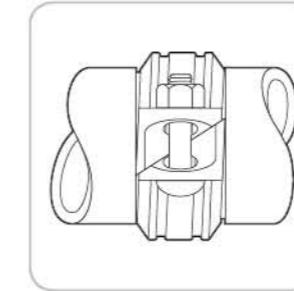
Condor grooved piping system use the grooved couplings & branch outlet fittings as the key, supplemented by a variety of non-gasket pipe fittings. This is a pipe connection revolution. At present, Condor manufactures all kinds of grooved branch outlet fittings and non-gasket fittings. In order to meet the needs of customers, Condor also developed extended products such as grooved end valves, filters, etc. Condor will continue to improve and optimize so that the company's product line can fulfill demands in civil construction, municipal and industrial fields..

Condor groove piping system is an universal, economic, safe and practical piping system components, the installation process will not bring any pollution to the pipeline. It is an environmentally friendly green product.

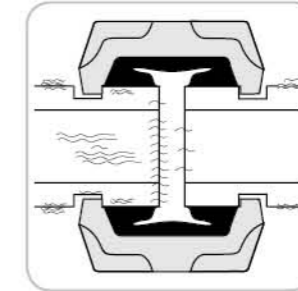
Condor groove piping system builds pipe connection on the external surface of steel pipes. The inner diameter & interior surface of the pipe has no matter of the connection, which makes the range of application of this product much more extended.

Products Strong Point

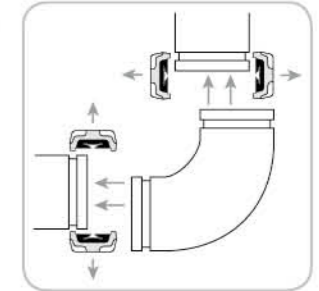
Compared with the traditional piping methods such as welded, flanges or threaded connection, the grooved and mechanical outlet fittings has very significant advantages, mainly in the following aspects:



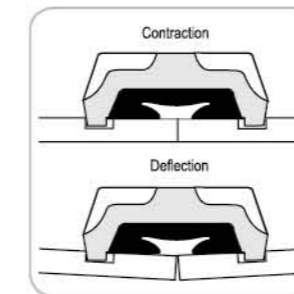
◆ Rigid
Rigid coupling provides enough rigidity to resist tube twisting and bending moment.



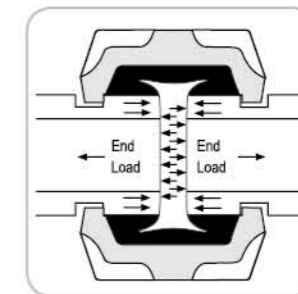
◆ Noise and vibration
The separation between pipe ends reduces the transmission of noise and vibration, provides the entire system a significant dampening effect.



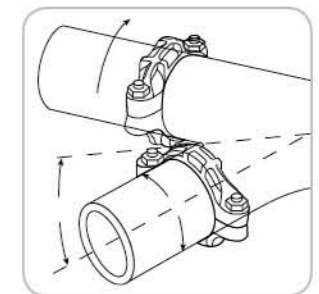
◆ system maintenance
System unit can be disassembled without moving the pipeline, thus facilitating system maintenance and modification.



◆ Flexibility
Flexible coupling provides radial and axial deflection. It absorbs expansion, contraction, deflection and vibration.



◆ Earthquake stress
The full circumferential engage between couplings and pipe grooves provides sufficient internal pressure and pipe end load capacity to withstand pipe movement.



◆ Easy alignment
Groove system allows free rotation of pipe and system components prior final fixing.

Warning

Before attempting to install, disassemble, and adjust any Condor product, please depressurize and drain the plumbing system. Failure to do this may result in personal injury, property damage, leaks, and / or other potential function failure.

Products Type

Condor grooved piping system covers following categories:

● **Grooved Couplings**

Grooved couplings are designed as a ring self-centering connector, the inner key area of the housing engages in the pipe grooves to provide a pipe connection. When the flexible coupling is assembled in the pipeline, a gap is formed between the pipe ends to allow axial displacement and lateral deflection. Rigid coupling locks the pipes directly without deflection.

● **Mechanical Outlets**

The housing of branch outlet fittings has two different parts, respectively, the outlet housing and the cover. The mechanical outlets can be composed of two outlet housing (said the mechanical cross), or one outlet housing plus one cover (said as mechanical tee). The outlet housing is designed as a self-positioning structure, to build a branch outlet on the main pipe run.

● **Grooved Non-Gasket Fittings**

Grooved fittings have a variety of styles, to provide flow direction turning, diameter reducing, branching and other functions.

Products Component

● **Housing**

Material: Ductile cast iron conforming to ASTM A-536, Grade 65-45-12.

Surface Finish: Standard: Epoxy powder coating

Optional: Galvanized (Zinc Plated, HDG), Dip painted

Surface Color: Variable colors for choice

● **Rubber Gasket**

Standard: EPDM.

Optional: Nitrile, Silicone, Fluoroelastomer, Neoprene

The sealing mechanism of grooved couplings and mechanical outlets is basically the same, the main structure of the gasket has "C" shape, forming a triple seal function. The first seal is formed by the elasticity of the gasket during the static state. After the coupling is installed, the gasket is confined by the housing of groove coupling or the mechanical outlet, the second seal is formed. Medium inside the pipe system press the "C" cavity after pressurizing, it increases the adhesion between gasket lip and steel pipe surface, so as to achieve the third reactive seal. The greater the pressure of the fluid within the pipe, The better the sealing of the coupling.



The material of the gasket must be chosen to follow the characteristics of the fluid medium below. The commonly used gasket are shown in the following table:

Grade	Temperature Range	Rubber Compound	Color Code	General Service Recommendations
E	-30°F to +230°F -34°C to +110°C	EPDM	Green Stripe	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°C and hot +180°F/+82°C potable water service. NOT RECOMMENDED FOR PETROLEUM SERVICES.
T	-20°F to +180°F -29°C to +82°C	Nitrile	Orange Stripe	Recommended for petroleum products, hydrocarbons, air with oil vapors, vegetable and mineral oils within the specified temperature range; except hot dry air over +140°F/+60°C and water over +150°F/+66°C. NOT RECOMMENDED FOR HOT WATER SERVICES.
O	-20°F to +300°F -29°C to +149°C	Fluoroelastomer	Blue Stripe	Recommended for many oxidizing acids, petroleum oils, halogenated hydrocarbons, lubricants, hydraulic fluids, organic liquids and air with hydrocarbons to +300°F/+149°C.
L	-30°F to +350°F -34°C to +177°C	Silicone	Body white	Recommended for dry heat, air without hydrocarbons to +350°F/+177°C and certain chemical services.
V	-30°F to +180°F -34°C to +82°C	Neoprene	Yellow Stripe	Recommended for hot lubricating oils and certain chemicals. Good oxidation resistance. Will not support combustion.

For specific compound and temperature compatibility, see this book Chemical Application Table

● **Bolt/Nut**

Heat treated and electro galvanized bolts with oval neck, and heavy duty hexagon nuts.

Track head meeting the physical and chemical requirements of ASTM A-449 and physical requirements of ASTM A-183.



As the manufacturer and innovator of grooved coupling technology, Condor offers a variety of coupling sizes and styles for almost any piping application.

All grooved couplings are made up of four parts, namely housing, gasket, bolt and nut. Housing is made of ductile iron, surface finish is orange, but also for a variety of fluid piping system to provide matching color scheme; standard gasket material is EPDM, also prepared for a variety of pipeline media rubber material. The bolt's tensile rating is class 8.8 and the nut's rating 8.0.

Condor couplings provide pipe system with versatility not found in other pipe connection methods. Condor rigid and flexible couplings can be combined to allow for thermal growth within the system. Additionally, the use of three consecutive flexible couplings reduces noise and vibration and eliminates costly noise dampeners.



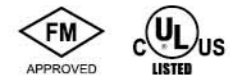
Style 1GS Rigid Coupling
DN25~DN300 1"~12"
33.4mm~323.9mm



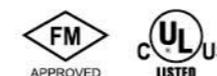
Style 1X Angle-pad Rigid Coupling
DN25~DN300 1"~12"
33.4mm~323.9mm



Style 1N Flexible Coupling
DN25~DN300 1"~12"
33.4mm~323.9mm



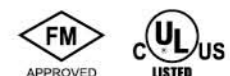
Style 1NH H.D. Flexible Coupling
DN25~DN300 1"~12"
33.4mm~323.9mm



Style 1NR Reducing Flexible Coupling
DN32~DN200 1 1/4"~8"
42.4mm~219.1mm



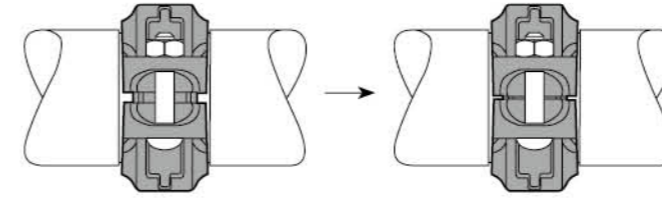
Style 321 Split Flange Adaptor
DN50~DN200 2"~8"
60.3mm~219.1mm



Rubber Gasket Types

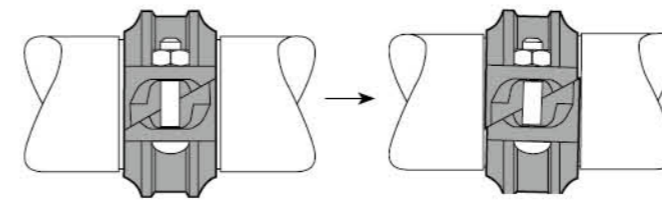
Rubber Gasket Types		Style 1GS	Style 1X	Style 1N	Style 1NR	Style 321
CG1		*	*	*		
RCG1					*	
CG4		*	*	*		
FG1						*

Rigid coupling connection & performance



The structure of the socket type rigid coupling is compact, with the inner and outer female and male teeth, socket type, meshing design, the use of the gap between the female and male port socket combination of pipe and joint meshing to achieve the rigid requirements.

Due to the improved interface structure, it is not easy to make the gasket to produce transverse and oblique twists and turns, the positioning of the gasket is more accurate, the abnormal pressing and destructive pressure loss of the gaskets are avoided, the sealing property is increased, and the overall joint is increased service life.



The Angle-pad rigid coupling is designed to sliding rather than vertical moving when tightening the housing. So the pipe tightly stuck to form a rigid connection. This 60° diagonal sliding also forces the coupling housing keys to make double sided contact on the inside and outside edges of the groove so that axial and radial movement of the tube cannot occur and the effect of rigid connecting pipe is truly achieved. No deflection after installation.

This rigid coupling allows for more accurate positioning of the tube end forming a fixed tube end separation that should be considered in the design and installation (see the following list of parameters).

Allow. Pipe End Sep.

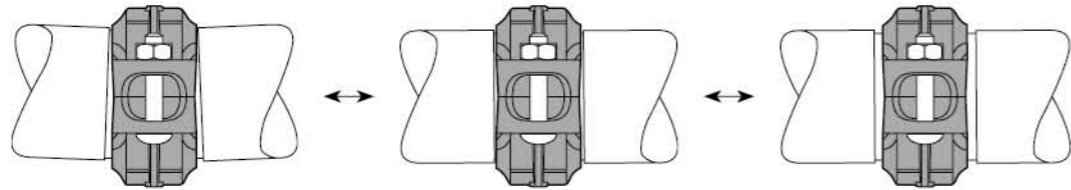
Size		Allow. Pipe End Sep.	
Nominal Dia.	Actual O.D.	Style 1GS	Style 1X
DN	mm	mm	mm
Inches	Inches	Inches	Inches
25	33.4	2.3	2.2
1	1.315	0.091	0.087
32	42.4	2.3	2.2
1 ¹ / ₄	1.660	0.091	0.087
40	48.3	2.3	2.2
1 ¹ / ₂	1.900	0.091	0.087
50	60.3	2.3	2.2
2	2.375	0.091	0.087
65	73.0	2.3	2.7
2 ¹ / ₂	2.875	0.091	0.106
65	76.1	2.3	2.7
2 ¹ / ₂	3.000	0.091	0.106
80	88.9	2.7	2.7
3	3.500	0.106	0.106
100	108.0	2.7	3.3
4	4.250	0.106	0.130
100	114.3	2.7	3.3
4	4.500	0.106	0.130

Size		Allow. Pipe End Sep.	
Nominal Dia.	Actual O.D.	Style 1GS	Style 1X
DN	mm	mm	mm
Inches	Inches	Inches	Inches
125	133.0	2.7	3.3
5	5.250	0.106	0.130
125	139.7	2.7	3.3
5	5.500	0.106	0.130
125	141.3	2.7	3.3
5	5.563	0.106	0.130
150	159.0	2.7	3.3
6	6.250	0.106	0.130
150	165.1	2.7	3.3
6	6.500	0.106	0.130
150	168.3	2.7	3.3
6	6.625	0.106	0.130
200	219.1	4.9	4.9
8	8.625	0.193	0.193
250	273.0	4.9	4.9
10	10.750	0.193	0.193
300	323.9	4.9	4.9
12	12.750	0.193	0.193

- Rigid couplings cannot be used to absorb any piping system movement.
- For the absorption of pipe system movement, please use flexible couplings.

Flexible Coupling Systems & Performance

Using of flat joint design, flexible coupling keeps a separation between pipe ends to achieve flexibility of pipeline. This structure ensures the strength without fully holding the pipes, allows axial and radial displacement, suitable for deflection requirements of the pipeline. The flexible coupling is designed to absorb the deviation of the pipe outer diameter without affecting the joint performance

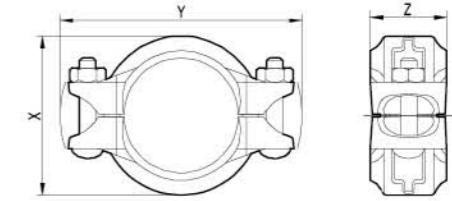


Allow. Pipe End Sep. & Flexibility

Size			Flexibility		Size			Flexibility	
Nominal Dia.	Actual O.D.	Allow. Pipe End Sep.	Max. Degrees	Misalignment	Nominal Dia.	Actual O.D.	Allow. Pipe End Sep.	Max. Degrees	Misalignment
DN Inches	mm Inches	mm Inches	Degree(°)	mm/m In./Ft.	DN Inches	mm Inches	mm Inches	Degree(°)	mm/m In./Ft.
25 1	33.4 1.315	2.2 0.087	2.7	47 0.57	125 5	133.0 5.250	3.6 0.142	1.3	22 0.27
32 1 1/4	42.4 1.660	2.2 0.087	2.2	38 0.46	125 5	139.7 5.500	3.6 0.142	1.3	22 0.27
40 1 1/2	48.3 1.900	2.2 0.087	2.0	34 0.42	125 5	141.3 5.563	3.6 0.142	1.3	22 0.27
50 2	60.3 2.375	2.2 0.087	1.9	33 0.40	150 6	159.0 6.250	3.9 0.154	1.1	19 0.23
65 2 1/2	73.0 2.875	2.4 0.094	1.8	31 0.38	150 6	165.1 6.500	3.9 0.154	1.1	19 0.23
65 2 1/2	76.1 3.000	2.4 0.094	1.8	31 0.38	150 6	168.3 6.625	3.9 0.154	1.1	19 0.23
80 3	88.9 3.500	2.8 0.110	1.7	29 0.36	200 8	219.1 8.625	4.9 0.193	0.85	14 0.18
100 4	108.0 4.250	3.3 0.130	1.6	27 0.34	250 10	273.0 10.750	4.9 0.193	0.67	11 0.14
100 4	114.3 4.500	3.3 0.130	1.6	27 0.34	300 12	323.9 12.750	4.9 0.193	0.58	10 0.12

- All the parameters in the above table are the maximum tolerance of each flexible coupling.
- These values are based on standard roll grooved pipe. Figures for standard cut grooved pipe may increase.
- All the parameters in the above table are the maximum performance parameters. When designing and installing, the corresponding safety factor should be considered. It is suggested that the pipe diameter of DN25 ~ DN80 should be reduced to 50% and the pipe diameter of DN100 ~ DN300 should be reduced to 75%.

Style 1GS Rigid Coupling

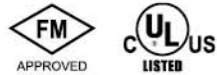
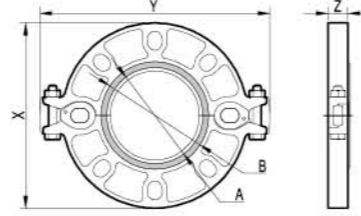


- Model 1GS rigid coupling, socketed & meshing design
- Female and male port socket design is not easy to make the horizontal and horizontal seal twists and turns, the gasket is not exposed, increasing the sealing and improve the overall service life of the joint
- Enhanced body resists 4 times working pressure.

Size		Max. Work Pressure	Max. End Load	Allow. Pipe End Sep.	Dimensions			Bolt/Nut Size	Approx. Wgt. Each
Nominal Dia.	Actual O.D.				X	Y	Z		
DN Inches	mm Inches	KPa PSI	N Lbs.	mm Inches	mm Inches	mm Inches	mm Inches	kg Lbs.	
25	33.4	5170	4530	2.3	54	98	44	M10X50	0.55
1	1.315	750	1020	0.091	2.126	3.858	1.732	3/8X2	1.21
32	42.4	5170	7300	2.3	63	109	44	M10X50	0.58
1 1/4	1.660	750	1620	0.091	2.480	4.291	1.732	3/8X2	1.28
40	48.3	5170	9470	2.3	69	115	44	M10X50	0.60
1 1/2	1.900	750	2130	0.091	2.717	4.528	1.732	3/8X2	1.32
50	60.3	4140	11820	2.3	83	128	45	M10X50	0.71
2	2.375	600	2660	0.091	3.268	5.039	1.772	3/8X2	1.56
65	73.0	3780	15820	2.3	97	142	46	M10X55	0.88
2 1/2	2.875	550	3570	0.091	3.819	5.591	1.811	3/8X2 1/4	1.94
65	76.1	3780	17190	2.3	100	145	46	M10X55	0.90
2 1/2	3.000	550	3890	0.091	3.937	5.709	1.811	3/8X2 1/4	1.98
80	88.9	3780	23460	2.7	113	159	47	M10X75	1.01
3	3.500	550	5290	0.106	4.449	6.260	1.850	3/8X2 1/4	2.22
100	108.0	3450	31610	2.7	136	192	49	M12X70	1.44
4	4.250	500	7090	0.106	5.354	7.559	1.929	1/2X2 1/4	3.17
100	114.3	3450	35400	2.7	142	198	49	M12X70	1.48
4	4.500	500	7950	0.106	5.591	7.795	1.929	1/2X2 1/4	3.26
125	133.0	3450	47930	2.7	163	224	50	M12X75	1.95
5	5.250	500	10820	0.106	6.417	8.819	1.969	1/2X3	4.30
125	139.7	3450	52880	2.7	169	230	50	M12X75	2.00
5	5.500	500	11880	0.106	6.654	9.055	1.969	1/2X3	4.41
125	141.3	3450	54100	2.7	171	232	50	M12X75	2.02
5	5.563	500	12150	0.106	6.732	9.134	1.969	1/2X3	4.45
150	159.0	3450	68500	2.7	190	249	51	M12X75	2.20
6	6.250	500	15340	0.106	7.480	9.803	2.008	1/2X3	4.85
150	165.1	3450	73860	2.7	196	254	51	M12X75	2.24
6	6.500	500	16590	0.106	7.717	10.000	2.008	1/2X3	4.93
150	168.3	3450	76750	2.7	199	257	51	M12X75	2.27
6	6.625	500	17240	0.106	7.835	10.118	2.008	1/2X3	5.00
200	219.1	2750	103680	4.9	256	328	58	M16X85	4.00
8	8.625	400	23370	0.193	10.079	12.913	2.283	3/8X3 1/4	8.81
250	273.0	2500	146340	4.9	311	397	59	M20X115	5.17
10	10.750	350	31770	0.193	12.244	15.630	2.323	3/8X4 1/2	11.39
300	323.9	2500	205990	4.9	365	451	60	M20X115	6.86
12	12.750	350	44690	0.193	14.370	17.756	2.362	3/8X4 1/2	15.11

- **Housing material:** Ductile iron conforming to ASTM A-536, grade 65-45-12.
- **FM Approved & UL Listed:** R.W.P. rated working pressure 300PSI(2.065MPa / 20.65bars)
- **Housing Finish:** Fusion Bonded Epoxy Coated (Optional: Hot Deep Galvanized and Others)
- **Coupling gasket material:** EPDM (Optional: Nitrile NBR, Silicone and Others)
- **Bolts and Nuts:** Heat treated and electro galvanized bolts with oval neck, and heavy duty hexagon nuts. Track head meeting the physical and chemical requirements of ASTM A-449 and physical requirements of ASTM A-183.
- **Size Range:** DN25 through DN300 (1" through 12")

Style 321 Split Flange

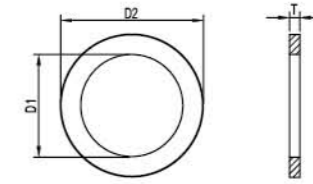


- Style 321 split flange mainly use for the flange connection with the valve, equipment or pipe conversion connection to solve the groove connection and flange connection conversion, installation is simple and fast.
- Model 321 split flange's bolt holes designed into oval hole. ANSI Class 125 & 150 and PN16 grade flanges are universally available, with DN50 to DN80 (2" to 3") for both PN10 and PN25 nominal flanges; DN100 to DN150 (4" to 6") for both flanges PN10 nominal grade flange.
- In addition to the standard flanges described above, it is also available to provide flanges under other standards such as JIS 10K and ANSI Class 300.

Size		Max. Work Pressure	Max. End Load	Gasket Seat		Dimensions			Bolt/Nut Size	Approx. Wgt. Each
Nominal Dia.	Actual O.D.			A	B	X	Y	Z		
DN Inches	mm Inches	KPa PSI	N Lbs.	mm Inches	mm Inches	mm Inches	mm Inches	mm Inches	mm Inches	kg Lbs.
50	60.3	3450	9852	64	78	165	218	20	M10X70	1.76
2	2.375	500	2215	2.520	3.071	6.496	8.583	0.787	3/8x2 1/4	3.87
65	73.0	3450	14440	77	91	178	228	22	M10X70	2.04
2 1/2	2.875	500	3246	3.031	3.583	7.008	8.976	0.866	3/8x2 1/4	4.50
65	76.1	3450	15692	80	94	185	238	22	M10X70	2.41
2 1/2	3.000	500	3534	3.150	3.701	7.283	9.370	0.866	3/8x2 1/4	5.30
80	88.9	3450	21415	93	107	200	250	22	M10X70	2.55
3	3.500	500	4811	3.661	4.213	7.874	9.843	0.866	3/8x2 1/4	5.62
100	114.3	3450	35400	119	133	229	280	24	M10X70	3.24
4	4.500	500	7952	4.685	5.236	9.016	11.02	0.945	3/8x2 1/4	7.14
125	139.7	3450	52881	145	159	250	313	22	M12X70	3.49
5	5.500	500	11879	5.709	6.260	9.843	12.32	0.866	1/2x2 1/4	7.68
125	141.3	3450	54100	146	160	254	321	26	M12X70	4.39
5	5.563	500	12153	5.748	6.299	10.00	12.64	1.024	1/2x2 1/4	9.67
150	165.1	3450	73859	171	185	285	347	24	M12X70	4.55
6	6.500	500	16592	6.732	7.283	11.22	13.66	0.945	1/2x2 1/4	10.02
150	168.3	3450	76750	174	188	285	345	26	M12X70	4.73
6	6.625	500	17236	6.850	7.402	11.22	13.58	1.024	1/2x2 1/4	10.42
200	219.1	2750	103683	225	242	343	404	30	M12X70	6.95
8	8.625	400	23371	8.858	9.528	13.50	15.91	1.181	1/2x2 1/4	15.31

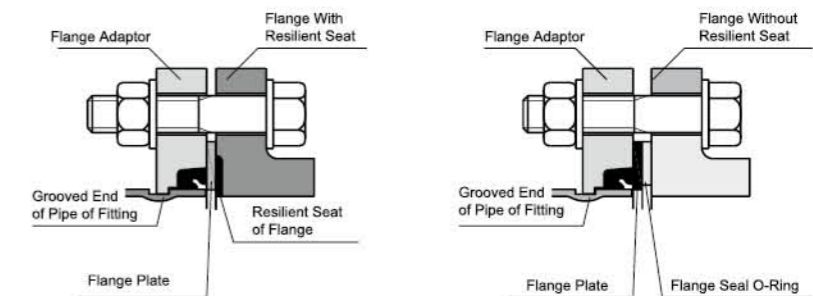
- **Housing material:** Ductile iron conforming to ASTM A-536, grade 65-45-12.
- **FM Approved & UL Listed:** R.W.P. rated working pressure 300PSI(2.065MPa / 20.65bars)
- **Housing Finish:** Fusion Bonded Epoxy Coated (Optional: Hot Deep Galvanized and Others)
- **Coupling gasket material:** EPDM (Optional: Nitrile NBR, Silicone and Others)
- **Bolts and Nuts:** Heat treated and electro galvanized bolts with oval neck, and heavy duty hexagon nuts. Track head meeting the physical and chemical requirements of ASTM A-449 and physical requirements of ASTM A-183.
- **Size Range:** DN50 through DN200 (2" through 8")

Style FW Flange Steel Plate



- Suitable for all variety of style 321 split flanges.
- Hot -dip galvanized surface
- Size: DN50~DN200
2" ~ 8"

Size		Dimensions			Approx. Wgt. Each
Nominal Dia.	Actual O.D.	D1	D2	T	
DN Inches	mm Inches	mm Inches	mm Inches	mm Inches	kg Lbs.
50	60.3	60	99	3	0.11
2	2.375	2.362	3.898	0.118	0.25
65	73.0	73	118	3	0.16
2 1/2	2.875	2.874	4.646	0.118	0.35
65	76.1	76	118	3	0.15
2 1/2	3.000	2.992	4.646	0.118	0.33
80	88.9	89	132	3	0.17
3	3.500	3.504	5.197	0.118	0.38
100	108.0	108	156	4	0.31
4	4.250	4.252	6.142	0.157	0.68
100	114.3	114	156	4	0.28
4	4.500	4.488	6.142	0.157	0.61
125	133.0	133	184	5	0.49
5	5.250	5.236	7.244	0.197	1.09
125	139.7	140	184	5	0.44
5	5.500	5.512	7.244	0.197	0.96
125	141.3	140	184	5	0.44
5	5.563	5.512	7.244	0.197	0.96
150	159.0	159	211	5	0.59
6	6.250	6.260	8.307	0.197	1.30
150	165.1	165	211	5	0.53
6	6.500	6.496	8.307	0.197	1.17
150	168.3	168	211	5	0.50
6	6.625	6.614	8.307	0.197	1.10
200	219.1	219	273	6	0.98
8	8.625	8.622	10.748	0.236	2.15



- Model 321 split flange assembled on a flange with a soft sealing surface, a steel plate will be added in the middle.
- Model 321 split flanges are connected with the flange without soft sealing surface, the middle of the flange should be attached metal flange gasket and rubber flange.

General



Grooved pipe fittings mainly include groove elbows, tee, cross, head, end cap and flange adaptor, etc., is an indispensable accessory in the grooved piping system, widely used in the whole system. Due to the grooved pipe fittings, making the site on-site installation and piping becomes quick and easy, is a very ideal way of piping.

The commonly used grooved fittings are made by the casting process. Most of the groove parts are made by casting. The advanced equipment and exquisite casting technology ensure the dimension accuracy of the groove. Machined grooves used, high precision machining, to ensure the reliability of the pipe system connection.

The material of the grooved pipe fitting is ductile iron, which has the same performance as the connector shell. It has very high strength and toughness, and is a high-quality and long-life product.

The power of the pipeline system is provided by the pump. After passing through the entire piping system, it is ensured that sufficient pressure will be obtained on reaching the water equipment or appliances, and the pressure loss of the piping system will be minimized and the energy saving effect of the system will also be achieved.

The pressure loss of the pipe system is mainly caused by the pressure loss of pipes, pipe fittings, valves and some other fittings or accessories. The most serious pressure loss is the fittings of the pipe fittings. Therefore, it is very necessary to effectively control and improve the pressure loss of pipe fittings.

Condor groove fittings have carried out the calculation of the flow coefficient, to ensure product safety and life expectancy, but also to ensure adequate flow path diameter, turning radius and the smoothness of the inner surface, so as to ensure The pressure loss of the entire pipeline system is reduced, and the energy saving effect is achieved.

The pressure loss of Condor grooved pipe fittings can be estimated by referring to the flow coefficient table on the next page..

Condor groove fittings in addition to the standard ductile iron parts, there are other types of pipe fittings.

- lined plastic grooved pipe fittings
- The lining plastic is lined with a layer of PTFE material on the inner surface of the pipe fitting, which is tasteless and non-toxic, and is an environmentally friendly food-grade material. Plastic pipe fittings are mainly used in domestic water piping systems or food-grade requirements of the pipeline system, such as pharmaceutical, food and other industries process pipeline.
- hot galvanized groove pipe fittings
- Steel grooved pipe fittings

Flow Date

The chart expresses the frictional resistance of various Condor fittings as equivalent feet of straight pipe. Fittings not listed can be estimated from the data given, for example, a 22.5° elbow is approximately one-half the resistance of a 45° elbow. Values of mid-sizes can be interpolated.

Size		90° Elbow		45° Elbow		Tee		Size		90° Elbow		45° Elbow		Tee	
Nominal Dia.	Actual O.D.	Style 90	Style 9015D	Style 120	Style 9015D	Branch	RUN	Nominal Dia.	Actual O.D.	Style 90	Style 9015D	Style 120	Style 9015D	Branch	RUN
DN	mm	m	m	m	m	m	m	DN	mm	m	m	m	m	m	m
Inches	Inches	Feet	Feet	Feet	Feet	Feet	Feet	Inches	Inches	Feet	Feet	Feet	Feet	Feet	Feet
25	33.4	0.5	—	0.2	—	1.3	0.5	125	133.0	2.5	1.9	1.2	0.8	6.2	2.5
1	1.315	1.6	—	0.7	—	4.3	1.6	5	5.250	8.2	6.2	3.9	2.6	20.3	8.2
32	424.	0.8	—	0.4	—	1.8	0.8	125	139.7	2.6	2.0	1.3	0.8	6.4	2.6
1¼	1.660	2.6	—	1.3	—	5.9	2.6	5	5.500	8.5	6.6	4.3	2.6	21.0	8.5
40	48.3	0.9	—	0.4	—	2.0	0.9	125	141.3	2.6	2.0	1.3	0.8	6.4	2.6
1½	1.900	3.0	—	1.3	—	6.6	3.0	5	5.563	8.5	6.6	4.3	2.6	21.0	8.5
50	60.3	1.1	0.8	0.5	0.3	2.6	1.1	150	159.0	2.9	2.2	1.5	0.9	7.6	2.9
2	2.375	3.6	2.6	1.6	1.0	8.5	3.6	6	6.250	9.5	7.2	4.9	3.0	24.9	9.5
65	73.0	1.2	0.9	0.6	0.4	3.2	1.2	150	165.1	2.9	2.3	1.5	0.9	7.6	3.0
2½	2.875	3.9	3.0	2.0	1.3	10.5	3.9	6	6.500	9.5	7.2	4.9	3.0	24.9	9.5
65	76.1	1.3	1.0	0.7	0.4	3.3	1.3	150	168.3	3.0	2.3	1.5	0.9	7.6	3.0
2½	3.000	4.3	3.3	2.3	1.3	10.8	4.3	6	6.625	9.8	7.5	4.9	3.0	24.9	9.8
80	88.9	1.5	1.2	0.8	0.5	4.0	1.5	200	219.1	4.0	3.0	2.0	1.2	10.1	4.0
3	3.500	4.9	3.9	2.6	1.6	13.1	4.9	8	8.625	13.1	9.8	6.6	3.9	33.1	13.1
100	108.0	2.0	1.4	0.9	0.6	4.7	2.0	250	273.0	5.2	3.7	2.5	1.5	12.5	5.2
4	4.250	6.6	4.6	3.0	2.0	15.4	6.6	10	10.750	17.1	12.1	8.2	4.9	41.0	17.1
100	114.3	2.1	1.5	1.0	0.6	4.9	2.1	300	323.9	6.1	4.4	3.0	1.8	15.2	6.1
4	4.500	6.9	4.9	3.3	2.0	16.1	6.9	12	12.750	20.0	14.4	9.8	5.9	49.9	20.0

Note: The flow data listed is based upon the pressure drop of Schedule 40 pipe.

Material Specifications

Housing :

A: Ductile cast iron, QT450-12.conforming to ASTM A—536, Grade 65—45—12. Ductile cast iron material is not easy to rust, high strength & toughness, good extensibility, but also has strong shock absorption properties.

B: Steel, steel groove pipe fittings made of high-quality cold-rolled steel pipe, the groove is made of rolled (also according to customer requirements for cutting groove) ,

Housing color:

Standard color: orange red paint

Electrostatic powder epoxy resin powder, salt spray time more than 600 hours, superior corrosion resistance.

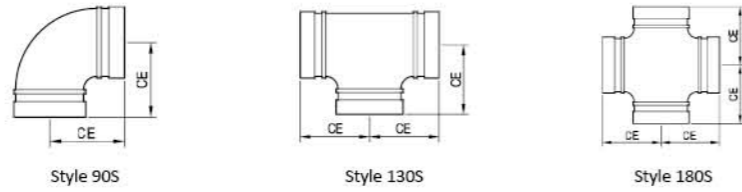
Other Optional: blue paint, gray paint, galvanized, etc. (order must be specified)

- The rated pressure of all standard pipe fittings is equal to the rated pressure of the coupling is used
- All pipe fittings are cut groove ends, as well as thread, flange and other conversion ends.
- Housing Finish: Fusion Bonded Epoxy Coated(Optional:Hot Deep Galvanized and Others)

<p>Style 90S 90° Short Elbow DN50~DN200 2"~8" 60.3mm~219.1mm</p> <p>FM APPROVED UL LISTED</p>	<p>Style 130S Short Equal Tee DN50~DN200 2"~8" 60.3mm~219.1mm</p> <p>FM APPROVED UL LISTED</p>	<p>Style 180S Short Equal Cross DN50~DN200 2"~8" 60.3mm~219.1mm</p> <p>FM APPROVED UL LISTED</p>	<p>Style 90RT 90° Reducing Elbow GxT DN25~DN65 1 1/4"~2 1/2" 42.4mm~76.1mm</p> <p>FM UL LISTED</p>
<p>Style 90 90° Std. Elbow DN25~DN300 1"~12" 33.4mm~323.9mm</p> <p>FM APPROVED UL LISTED</p>	<p>Style 130 Std. Equal Tee DN25~DN300 1"~12" 33.4mm~323.9mm</p> <p>FM APPROVED UL LISTED</p>	<p>Style 180 Std. Equal Cross DN25~DN300 1"~12" 33.4mm~323.9mm</p> <p>FM APPROVED UL LISTED</p>	<p>Style 90DE 90° Drain Elbow DN50~DN200 2"~8" 60.3mm~219.1mm</p> <p>FM UL LISTED</p>
<p>Style 120 45° Elbow DN25~DN300 1"~12" 33.4mm~323.9mm</p> <p>FM APPROVED UL LISTED</p>	<p>Style 110 22.5° Elbow DN25~DN300 1"~12" 33.4mm~323.9mm</p> <p>FM APPROVED UL LISTED</p>	<p>Style 105 11.25° Elbow DN25~DN300 1"~12" 33.4mm~323.9mm</p> <p>FM APPROVED UL LISTED</p>	<p>Style 321G Flange Adaptor Nipple DN50~DN300 2"~12" 60.3mm~323.9mm</p> <p>FM UL LISTED</p>
<p>Style 018GG Grooved X Grooved Nipple DN25~DN300 1"~12" 33.4mm~323.9mm</p>			<p>Style 018GT Grooved X Threaded Nipple DN25~DN300 1"~12" 33.4mm~323.9mm</p>
<p>Style 300 End Cap DN25~DN300 1"~12" 33.4mm~323.9mm</p> <p>FM APPROVED UL LISTED</p>	<p>Style 300CH End Cap With Center Hole DN50~DN300 2"~12" 60.3mm~323.9mm</p> <p>FM APPROVED UL LISTED</p>	<p>Style 300EH End Cap With Eccentric Hole DN50~DN300 2"~12" 60.3mm~323.9mm</p> <p>FM APPROVED UL LISTED</p>	<p>Style 018GB Grooved X Bevel Nipple DN25~DN300 1"~12" 33.4mm~323.9mm</p>

<p>Style 240 Grooved Concentric Reducer DN32X25~DN300X250 1 1/4"X1"~12X10" 42.4X33.4mm~323.9X273.0mm</p> <p>FM APPROVED UL LISTED</p>	<p>Style 240N Threaded Concentric Reducer DN32X15~DN300X80 1 1/4"X1/2"~12X3" 42.4X21.3mm~323.9X88.9mm</p> <p>FM APPROVED UL LISTED</p>	<p>Style 9015D Long Radius 90° Elbows 1.5 D DN50~DN300 2"~12" 60.3mm~323.9mm</p>
<p>Style 131 Grooved Reducing Tee DN32X25~DN300X250 1 1/4"X1"~12X10" 42.4X33.4mm~323.9X273.0mm</p> <p>FM APPROVED UL LISTED</p>	<p>Style 131N Threaded Reducing Tee DN32X15~DN300X80 1 1/4"X1/2"~12X3" 42.4X21.3mm~323.9X88.9mm</p> <p>FM APPROVED UL LISTED</p>	<p>Style 4515D Long Radius 45° Elbows 1.5 D DN50~DN300 2"~12" 60.3mm~323.9mm</p>
<p>Style 230 Grooved Eccentric Reducer DN32X25~DN300X250 1 1/4"X1"~12X10" 42.4X33.4mm~323.9X273.0mm</p> <p>FM APPROVED UL LISTED</p>	<p>Style 230N Threaded Eccentric Reducer DN32X15~DN300X80 1 1/4"X1/2"~12X3" 42.4X21.3mm~323.9X88.9mm</p> <p>FM APPROVED UL LISTED</p>	<p>Style 9030D Long Radius 90° Elbows 3D DN50~DN300 2"~12" 60.3mm~323.9mm</p>
		<p>Style 4530D Long Radius 45° Elbows 3D DN50~DN300 2"~12" 60.3mm~323.9mm</p>

90° Short Elbow, Short Equal Tee & Short Equal Cross



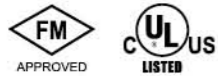
Style 90S 90° Short Elbow



Style 130S Short Equal Tee



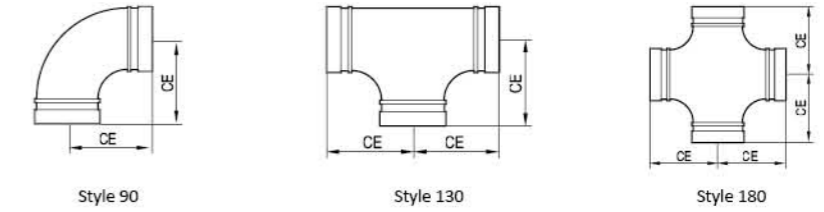
Style 180S Short Equal Cross



Size		Style 90S 90° Short Elbow		Style 130S Short Equal Tee		Style 180S Short Equal Cross	
Nominal Dia.	Actual O.D.	CE	Approx. Wgt.	CE	Approx. Wgt.	CE	Approx. Wgt.
DN	mm	mm	kg	mm	kg	mm	kg
Inches	Inches	Inches	Lbs.	Inches	Lbs.	Inches	Lbs.
50	60.3	70	0.6	70	0.9	70	1.1
2	2.375	2.75	1.32	2.75	1.98	2.75	2.42
65	73.0	76	0.8	76	1.2	76	1.5
2½	2.875	3.00	1.76	3.00	2.64	3.00	3.30
65	76.1	76	1.0	76	1.4	76	1.8
2½	3.000	3.00	2.20	3.00	3.08	3.00	3.96
80	88.9	86	1.3	86	1.7	86	2.3
3	3.500	3.40	2.86	3.40	3.74	3.40	5.07
100	108.0	102	2.0	102	2.6	102	3.3
4	4.250	4.00	4.41	4.00	5.73	4.00	7.27
100	114.3	102	2.1	102	2.8	102	3.6
4	4.500	4.00	4.63	4.00	6.17	4.00	7.93
125	133.0	124	3.4	124	4.3	124	5.8
5	5.250	4.88	7.49	4.88	9.47	4.88	12.78
125	139.7	124	3.5	124	4.4	124	6.0
5	5.500	4.88	7.71	4.88	9.69	4.88	13.22
125	141.3	124	3.6	124	4.5	124	6.1
5	5.563	4.88	7.93	4.88	9.91	4.88	13.44
150	159.0	140	5.2	140	6.7	140	8.7
6	6.250	5.50	11.45	5.50	14.76	5.50	19.16
150	165.1	140	5.4	140	7.0	140	9.0
6	6.500	5.50	11.89	5.50	15.42	5.50	19.82
150	168.3	140	5.6	140	7.2	140	9.2
6	6.625	5.50	12.33	5.50	15.86	5.50	20.26
200	219.1	173	10.5	173	14.0	173	16.5
8	8.625	6.80	23.13	6.80	30.84	6.80	36.34

- Housing material: Ductile iron conforming to ASTM A-536, grade 65-45-12.
- FM Approved & UL Listed: R.W.P. rated working pressure 300PSI(2.065MPa / 20.65bars)
- Housing Finish: Fusion Bonded Epoxy Coated(Optional: Hot Deep Galvanized and Others)
- Size Range: DN50 through DN200 (2" through 8")

90° Standard Elbow, Standard Equal Tee & Standard Equal Cross



Style 90 90° Standard Elbow



Style 130 Standard Equal Tee



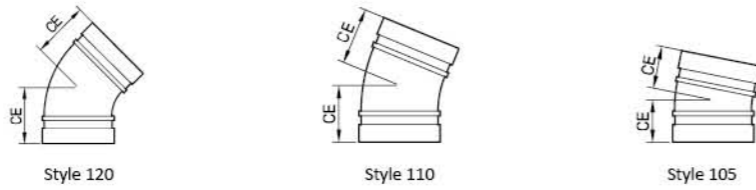
Style 180 Standard Equal Cross



Size		Style 90 90° Std. Elbow		Style 130 Std. Equal Tee		Style 180 Std. Equal Cross	
Nominal Dia.	Actual O.D.	CE	Approx. Wgt.	CE	Approx. Wgt.	CE	Approx. Wgt.
DN	mm	mm	kg	mm	kg	mm	kg
Inches	Inches	Inches	Lbs.	Inches	Lbs.	Inches	Lbs.
25	33.4	57	0.3	57	0.5	57	0.6
1	1.315	2.25	0.66	2.25	1.10	2.25	1.32
32	42.4	70	0.5	70	0.7	70	1.0
1½	1.660	2.75	1.10	2.75	1.54	2.75	2.20
40	48.3	70	0.5	70	0.9	70	1.1
1½	1.900	2.75	1.10	2.75	1.98	2.75	2.42
50	60.3	83	0.8	83	1.4	83	1.7
2	2.375	3.25	1.76	3.25	3.08	3.25	3.74
65	73.0	95	1.5	95	2.2	95	2.7
2½	2.875	3.75	3.30	3.75	4.85	3.75	5.95
65	76.1	95	1.7	95	2.4	95	2.8
2½	3.000	3.75	3.74	3.75	5.29	3.75	6.17
80	88.9	108	2.0	108	3.0	108	4.8
3	3.500	4.25	4.41	4.25	6.61	4.25	10.57
100	108.0	127	3.0	127	5.2	127	7.1
4	4.250	5.00	6.61	5.00	11.45	5.00	15.64
100	114.3	127	3.2	127	5.4	127	7.2
4	4.500	5.00	7.05	5.00	11.89	5.00	15.86
125	133.0	140	5.3	140	8.0	140	9.0
5	5.250	5.50	11.67	5.50	17.62	5.50	19.82
125	139.7	140	5.3	140	8.1	140	9.1
5	5.500	5.50	11.67	5.50	17.84	5.50	20.04
125	141.3	140	5.3	140	8.1	140	9.2
5	5.563	5.50	11.67	5.50	17.84	5.50	20.26
150	159.0	165	7.8	165	10.1	165	12.6
6	6.250	6.50	17.18	6.50	22.25	6.50	27.75
150	165.1	165	7.8	165	10.3	165	12.7
6	6.500	6.50	17.18	6.50	22.69	6.50	27.97
150	168.3	165	7.8	165	10.4	165	12.7
6	6.625	6.50	17.18	6.50	22.91	6.50	27.97
200	219.1	197	13.6	197	21.6	197	24.8
8	8.625	7.75	29.96	7.75	47.58	7.75	54.62
250	273.0	229	28.7	229	44.9	229	55.1
10	10.750	9.00	63.21	9.00	98.90	9.00	121.36
300	323.9	254	33.6	254	60.3	254	72.9
12	12.750	10.00	74.01	10.00	132.82	10.00	160.57

- Housing material: Ductile iron conforming to ASTM A-536, grade 65-45-12.
- FM Approved & UL Listed: R.W.P. rated working pressure 300PSI(2.065MPa / 20.65bars)
- Housing Finish: Fusion Bonded Epoxy Coated(Optional: Hot Deep Galvanized and Others)
- Size Range: DN25 through DN300 (1" through 12")

45° Elbow, 22.5° Elbow & 11.25° Elbow



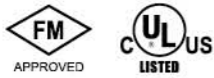
Style 120 45° Elbow



Style 110 22.5° Elbow



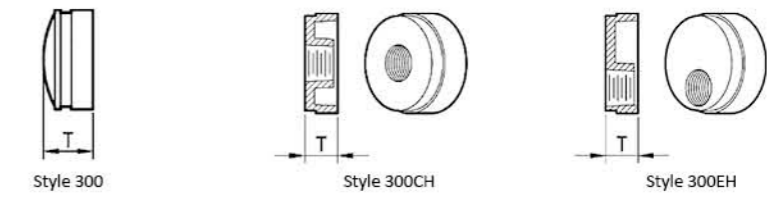
Style 105 11.25° Elbow



Size		Style 120 45° Elbow		Style 110 22.5° Elbow		Style 105 11.25° Elbow	
Nominal Dia.	Actual O.D.	CE	Approx. Wgt.	CE	Approx. Wgt.	CE	Approx. Wgt.
DN	mm	mm	kg	mm	kg	mm	kg
Inches	Inches	Inches	Lbs.	Inches	Lbs.	Inches	Lbs.
25	33.4	44	0.3	44	0.2	35	0.2
1	1.315	1.75	0.66	1.75	0.44	1.38	0.44
32	42.4	44	0.3	44	0.3	35	0.2
1 1/4	1.660	1.75	0.66	1.75	0.66	1.38	0.44
40	48.3	44	0.4	44	0.4	35	0.2
1 1/2	1.900	1.75	0.88	1.75	0.88	1.38	0.44
50	60.3	51	0.5	51	0.6	35	0.5
2	2.375	2.00	1.10	2.00	1.32	1.38	1.10
65	73.0	57	0.6	51	0.7	38	0.5
2 1/2	2.875	2.25	1.32	2.00	1.54	1.50	1.10
65	76.1	57	0.8	51	0.8	38	0.8
2 1/2	3.000	2.25	1.76	2.00	1.76	1.50	1.76
80	88.9	64	1.1	57	1.0	38	1.0
3	3.500	2.50	2.42	2.25	2.20	1.50	2.20
100	108.0	76	1.6	73	1.7	44	1.4
4	4.250	3.00	3.52	2.87	3.74	1.75	3.08
100	114.3	76	1.7	73	1.8	44	1.6
4	4.500	3.00	3.74	2.87	3.96	1.75	3.52
125	133.0	83	2.6	73	2.4	51	2.0
5	5.250	3.25	5.73	2.87	5.29	2.00	4.41
125	139.7	83	2.7	73	2.5	51	2.1
5	5.500	3.25	5.95	2.87	5.51	2.00	4.63
125	141.3	83	2.8	73	2.6	51	2.2
5	5.563	3.25	6.17	2.87	5.73	2.00	4.85
150	159.0	89	3.8	79	3.6	51	3.0
6	6.250	3.50	8.37	3.11	7.93	2.00	6.61
150	165.1	89	4.2	79	3.8	51	3.2
6	6.500	3.50	9.25	3.11	8.37	2.00	7.05
150	168.3	89	4.4	79	4.0	51	3.2
6	6.625	3.50	9.69	3.11	8.81	2.00	7.05
200	219.1	108	8.4	83	6.4	51	4.6
8	8.625	4.25	18.50	3.25	14.10	2.00	10.13
250	273.0	121	13.0	89	10.4	54	5.3
10	10.750	4.75	28.63	3.50	22.91	2.15	11.67
300	323.9	133	18.0	102	18.1	57	13.5
12	12.750	5.25	39.65	4.00	39.87	2.25	29.74

- **Housing material:** Ductile iron conforming to ASTM A-536, grade 65-45-12.
- **FM Approved & UL Listed:** R.W.P. rated working pressure 300PSI(2.065MPa / 20.65bars)
- **Housing Finish:** Fusion Bonded Epoxy Coated (Optional: Hot Deep Galvanized and Others)
- **Coupling gasket material:** EPDM (Optional: Nitrile NBR, Silicone and Others)
- In addition to the points listed in this table, but also according to customer requirements to provide a variety of special point of the elbow
- **Size Range:** DN25 through DN300 (1"through 12")

End Cap & End Cap with Hole



Style 300 End Cap



Style 300CH End Cap With Center Hole



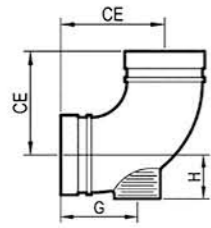
Style 300EH End Cap With Eccentric Hole



Size		Style 300 End Cap		Style 300CH End Cap With Center Hole		Style 300EH End Cap With Eccentric Hole	
Nominal Dia.	Actual O.D.	T	Approx. Wgt.	T	Approx. Wgt.	T	Approx. Wgt.
DN	mm	mm	kg	mm	kg	mm	kg
Inches	Inches	Inches	Lbs.	Inches	Lbs.	Inches	Lbs.
25	33.4	28	0.1	---	---	---	---
1	1.315	1.10	0.22	---	---	---	---
32	42.4	28	0.13	---	---	---	---
1 1/4	1.660	1.10	0.29	---	---	---	---
40	48.3	28	0.15	---	---	---	---
1 1/2	1.900	1.10	0.33	---	---	---	---
50	60.3	37	0.22	25	0.31	25	0.25
2	2.375	1.46	0.48	1.00	0.68	1.00	0.55
65	73.0	37	0.3	25	0.36	25	0.36
2 1/2	2.875	1.46	0.66	1.00	0.79	1.00	0.79
65	76.1	37	0.32	25	0.38	25	0.38
2 1/2	3.000	1.46	0.7	1.00	0.84	1.00	0.84
80	88.9	41	0.41	25	0.52	25	0.52
3	3.500	1.61	0.9	1.00	1.15	1.00	1.15
100	108.0	51	0.69	25	0.8	25	0.8
4	4.250	2.00	1.52	1.00	1.76	1.00	1.76
100	114.3	51	0.71	25	0.82	25	0.82
4	4.500	2.00	1.56	1.00	1.81	1.00	1.81
125	133.0	51	1.04	25	1.15	25	1.15
5	5.250	2.00	2.29	1.00	2.53	1.00	2.53
125	139.7	51	1.11	25	1.23	25	1.23
5	5.500	2.00	2.44	1.00	2.71	1.00	2.71
125	141.3	51	1.12	25	1.24	25	1.24
5	5.563	2.00	2.47	1.00	2.73	1.00	2.73
150	159.0	55	1.38	25	1.56	25	1.56
6	6.250	2.17	3.04	1.00	3.44	1.00	3.44
150	165.1	55	1.45	25	1.68	25	1.68
6	6.500	2.17	3.19	1.00	3.7	1.00	3.7
150	168.3	55	1.51	25	1.72	25	1.72
6	6.625	2.17	3.33	1.00	3.79	1.00	3.79
200	219.1	68	3.13	30	3.71	30	3.71
8	8.625	13.00	6.89	1.18	8.17	1.18	8.17
250	273.0	75	5.52	32	6.17	32	6.17
10	10.750	2.95	12.16	1.25	13.59	1.25	13.59
300	323.9	81	8.44	32	9.73	32	9.73
12	12.750	3.20	18.59	1.25	21.43	1.25	21.43

- **Housing material:** Ductile iron conforming to ASTM A-536, grade 65-45-12.
- **FM Approved & UL Listed:** R.W.P. rated working pressure 300PSI(2.065MPa / 20.65bars)
- **Housing Finish:** Fusion Bonded Epoxy Coated (Optional: Hot Deep Galvanized and Others)
- End cap standard thread is 1", for other specifications, please indicate on the order
- **Size Range:** DN25 through DN300 (1" through 12")

Style 90DE 90° Drain Elbow with 1" Threaded



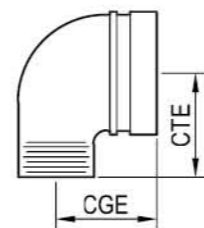
Style 90DE



Size		Style 90DE 90° Drain Elbow			
Nominal Dia.	Actual O.D.	CE	G	H	Approx. Wgt.
DN	mm	mm	mm	mm	kg
Inches	Inches	Inches	Inches	Inches	Lbs.
50	60.3	83	57	40	0.68
2	2.375	3.25	2.25	1.57	1.5
65	73.0	95	70	40	1.08
2½	2.875	3.75	1.79	1.57	2.38
65	76.1	95	70	40	1.12
2½	3.000	3.75	1.79	1.57	2.47
80	88.9	108	70	49	1.47
3	3.500	4.25	1.79	1.93	3.24
100	108.0	127	70	63	2.38
4	4.250	5.00	1.79	2.48	5.24
100	114.3	127	70	63	2.41
4	4.500	5.00	1.79	2.48	5.31
125	133.0	140	70	76	4.26
5	5.250	5.50	1.79	3.00	9.38
125	139.7	140	70	76	4.34
5	5.500	5.50	1.79	3.00	9.56
125	141.3	140	70	76	4.38
5	5.563	5.50	1.79	3.00	9.65
150	159.0	165	70	90	5.53
6	6.250	6.50	1.79	3.54	12.18
150	165.1	165	70	90	5.6
6	6.500	6.50	1.79	3.54	12.33
150	168.3	165	70	90	5.71
6	6.625	6.50	1.79	3.54	12.58
200	219.1	197	84	114	10.79
8	8.625	7.75	3.31	4.50	23.77

- **Housing material:** Ductile iron conforming to ASTM A-536, grade 65-45-12.
- **FM Approved & UL Listed:** R.W.P. rated working pressure 300PSI(2.065MPa / 20.65bars)
- **Housing Finish:** Fusion Bonded Epoxy Coated (Optional: Hot Deep Galvanized and Others)
- Hydrophobic port thread standard size is 1", for other specifications, please indicate on the order.
- **Size Range:** DN50 through DN200 (2"through 8")

Style 90RT 90° Reducing Elbow with Threaded Small End (Add-a-cap)



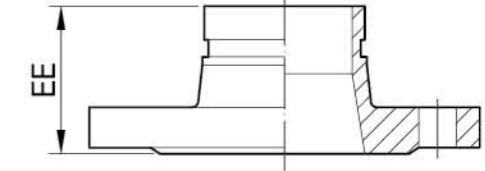
Style 90RT



Size		Style 90RT 90° Reducing Elbow			
Run Pipe	X Branch Pipe	C to GE	C to GE	Approx. Wgt.	
mm	X	mm	mm	kg	
Inches	X	Inches	Inches	Lbs.	
42.4	X	21.3	48	32	0.2
1¼		½	1.90	1.26	0.44
		¾	51	34	0.2
		1	2.00	1.34	0.44
48.3	X	21.3	48	35	0.5
		½	1.90	1.38	1.10
		¾	51	37	0.5
		¾	2.00	1.46	1.10
		1	33.4	55	40
60.3	X	21.3	48	41	0.8
		½	1.90	1.60	1.76
		¾	51	43	0.8
		¾	2.00	1.70	1.76
		1	33.4	55	46
73.0	X	21.3	48	48	1.2
		½	1.90	1.90	2.64
		¾	51	50	1.3
		¾	2.00	1.97	2.86
		1	33.4	55	53
76.1	X	21.3	48	51	1.3
		½	1.90	2.00	2.86
		¾	51	53	1.4
		¾	2.00	2.10	3.08
		1	33.4	55	56
1		21.3	48	56	1.5
		1	2.17	2.20	3.30

- **Housing material:** Ductile iron conforming to ASTM A-536, grade 65-45-12.
- **FM Approved & UL Listed:** R.W.P. rated working pressure 300PSI(2.065MPa / 20.65bars)
- **Housing Finish:** Fusion Bonded Epoxy Coated (Optional: Hot Deep Galvanized and Others)
- **Size Range:** DN32 X DN15 through DN65 X DN25 (1¼" X ½" through 2½" X 1")

Style 321G Flange Adaptor Nipple

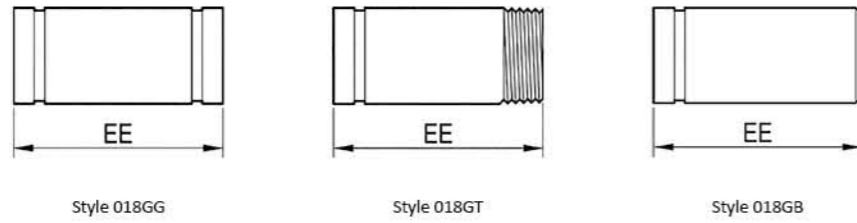


- Model 321G flanged adaptor is mainly used for the conversion connection of valves, equipment or pipes which interface with some flanges, which solves the conversion of the grooved connection and the flanged connection, and the installation is quick and easy.
- Model 321G flanged adaptor has bolt hole designed into an oval shape. ANSI Class 125 & 150 and PN16 grade flanges are universally available, with DN50 to DN80(2"to 3") for both PN10 and PN25 nominal flanges; DN100 to DN150 (4"to 6") for both flanges PN10 nominal grade flange.
- In addition to the above standard flanged short pipe products, other flange standards such as JIS 10K and ANSI Class 300 can also be supplied.

Size		EE	Approx. Wgt.	Size		EE	Approx. Wgt.
Nominal Dia.	Actual O.D.			Nominal Dia.	Actual O.D.		
DN	mm	mm	kg	DN	mm	mm	kg
Inches	Inches	Inches	Lbs.	Inches	Inches	Inches	Lbs.
50	60.3	70	1.5	125	141.3	80	4.0
2	2.375	2.75	3.30	5	5.563	3.15	8.80
65	73.0	70	1.9	150	165.1	100	5.9
2½	2.875	2.75	4.18	6	6.500	3.94	12.98
65	76.1	70	1.9	150	168.3	100	5.9
2½	3.000	2.75	4.18	6	6.625	3.94	12.98
80	88.9	70	2.3	200	219.1	100	9.2
3	3.500	2.75	5.06	8	8.625	3.94	20.24
100	114.3	80	3.5	250	273.0	100	21.5
4	4.500	3.15	7.70	10	10.750	3.94	67.3
125	139.7	80	4.0	300	323.9	100	31.5
5	5.500	3.15	8.80	12	12.750	3.94	69.3

- **Housing material:**Ductile iron conforming to ASTM A-536, grade 65-45-12.
- **FM Approved & UL Listed:**R.W.P. rated working pressure 300PSI(2.065MPa / 20.65bars)
- **Housing Finish:**Fusion Bonded Epoxy Coated(Optional:Hot Deep Galvanized and Others)
- **Size Range:**DN50 through DN300 (2"through 12")

Nipple



- The table EE value is the standard value, but can also be customized according to user requirements length
- Nipple's wall thickness is the standard US' SCH40 thickness, weight is based on the wall thickness, but also according to user requirements choose a different wall thickness
- Standard cutting groove, but also can do the rolling groove

Size		Style 018GG Grooved X Grooved Nipple		Style 018GT Grooved X Threaded Nipple		Style 018GB Grooved X Bevel Nipple	
Nominal Dia.	Actual O.D.	EE	Approx. Wgt.	EE	Approx. Wgt.	EE	Approx. Wgt.
DN Inches	mm Inches	mm Inches	kg Lbs.	mm Inches	kg Lbs.	mm Inches	kg Lbs.
25	33.4	76	0.19	76	0.19	76	0.19
1	1.315	3.00	0.42	3.00	0.42	3.00	0.42
32	42.4	102	0.35	102	0.35	102	0.35
1 1/4	1.660	4.00	0.77	4.00	0.77	4.00	0.77
40	48.3	102	0.41	102	0.41	102	0.41
1 1/2	1.900	4.00	0.91	4.00	0.91	4.00	0.91
50	60.3	102	0.55	102	0.55	102	0.55
2	2.375	4.00	1.22	4.00	1.22	4.00	1.22
65	73.0	102	0.88	102	0.88	102	0.88
2 1/2	2.875	4.00	1.94	4.00	1.94	4.00	1.94
65	76.1	102	0.92	102	0.92	102	0.92
2 1/2	3.000	4.00	2.03	4.00	2.03	4.00	2.03
80	88.9	102	1.15	102	1.15	102	1.15
3	3.500	4.00	2.54	4.00	2.54	4.00	2.54
100	108.0	152	2.3	---	---	152	2.3
4	4.250	6.00	5.07	---	---	6.00	5.07
100	114.3	152	2.44	---	---	152	2.44
4	4.500	6.00	5.38	---	---	6.00	5.38
125	133.0	152	3.1	---	---	152	3.1
5	5.250	6.00	6.84	---	---	6.00	6.84
125	139.7	152	3.27	---	---	152	3.27
5	5.500	6.00	7.2	---	---	6.00	7.2
125	141.3	152	3.31	---	---	152	3.31
5	5.563	6.00	7.29	---	---	6.00	7.29
150	159.0	152	4.05	---	---	152	4.05
6	6.250	6.00	8.92	---	---	6.00	8.92
150	165.1	152	4.21	---	---	152	4.21
6	6.500	6.00	9.27	---	---	6.00	9.27
150	168.3	152	4.3	---	---	152	4.3
6	6.625	6.00	9.46	---	---	6.00	9.46
200	219.1	152	6.47	---	---	152	6.47
8	8.625	6.00	14.25	---	---	6.00	14.25
250	273.0	203	12.24	---	---	203	12.24
10	10.750	8.00	26.96	---	---	8.00	26.96
300	323.9	203	16.19	---	---	203	16.19
12	12.750	8.00	35.65	---	---	8.00	35.65

- Housing material: Steel
- Housing Finish: Fusion Bonded Epoxy Coated (Optional: Hot Deep Galvanized and Others)
- Size Range: DN25 through DN300 (1" through 12")

Concentric Reducer



Size			Style 240 Concentric Reducer		Style 240N Concentric Reducer	
Run Pipe	X	Branch Pipe	EE	Approx. Wgt.	EE	Approx. Wgt.
mm Inches	X	mm Inches	mm Inches	kg Lbs.	mm Inches	kg Lbs.
42.4	X	33.4	64	0.2	64	0.3
1 1/4		1	2.50	0.44	2.50	0.66
48.3	X	33.4	64	0.3	64	0.3
1 1/2		1	2.50	0.66	2.50	0.66
		42.4	64	0.3	64	0.4
		1 1/4	2.50	0.66	2.50	0.88
60.3	X	33.4	64	0.3	64	0.4
2		1	2.50	0.66	2.50	0.88
		42.4	64	0.4	64	0.4
		1 1/4	2.50	0.88	2.50	0.88
		48.3	64	0.4	64	0.4
		1 1/2	2.50	0.88	2.50	0.88
73.0	X	33.4	64	0.5	64	0.5
2 1/2		1	2.50	1.10	2.50	1.10
		42.4	64	0.5	64	0.5
		1 1/4	2.50	1.10	2.50	1.10
		48.3	64	0.5	64	0.5
		1 1/2	2.50	1.10	2.50	1.10
		60.3	64	0.5	64	0.5
		2	2.50	1.10	2.50	1.10
76.1	X	33.4	64	0.5	64	0.5
2 1/2		1/2	2.50	1.10	2.50	1.10
		42.4	64	0.5	64	0.5
		1 1/4	2.50	1.10	2.50	1.10
		48.3	64	0.5	64	0.6
		1 1/2	2.50	1.10	2.50	1.32
		60.3	64	0.6	64	0.6
		2	2.50	1.32	2.50	1.32
88.9	X	33.4	64	0.6	64	0.6
3		1	2.50	1.32	2.50	1.32
		42.4	64	0.6	64	0.6
		1 1/4	2.50	1.32	2.50	1.32
		48.3	64	0.6	64	0.7
		1 1/2	2.50	1.32	2.50	1.54

- Housing material: Ductile iron conforming to ASTM A-536, grade 65-45-12.
- FM Approved & UL Listed: R.W.P. rated working pressure 300PSI(2.065MPa/20.65bars)
- Housing Finish: Fusion Bonded Epoxy Coated(Optional: Hot Deep Galvanized and Others)
- Size Range: DN32 X DN25 through DN300 X DN250 (1 1/4" X 1" through 12" X 10")

Size			Style 240 Concentric Reducer		Style 240N Concentric Reducer	
Run Pipe	X	Branch Pipe	EE	Approx. Wgt.	EE	Approx. Wgt.
mm Inches	X	mm Inches	mm Inches	kg Lbs.	mm Inches	kg Lbs.
88.9	X	60.3	64	0.7	64	0.7
3		2	2.50	1.54	2.50	1.54
		73.0	64	0.7	64	0.7
		2 1/2	2.50	1.54	2.50	1.54
		76.1	64	0.7	64	0.7
		2 1/2	2.50	1.54	2.50	1.54
114.3	X	33.4	76	0.9	76	0.9
4		1	3.00	1.98	3.00	1.98
		42.4	76	0.9	76	1.0
		1 1/4	3.00	1.98	3.00	2.20
		48.3	76	1.0	76	1.0
		1 1/2	3.00	2.20	3.00	2.20
		60.3	76	1.0	76	1.1
		2	3.00	2.20	3.00	2.42
		73.0	76	1.1	76	1.1
		2 1/2	3.00	2.42	3.00	2.42
		76.1	76	1.1	76	1.1
		2 1/2	3.00	2.42	3.00	2.42
		88.9	76	1.1	76	1.1
		3	3.00	2.42	3.00	2.42
139.7	X	33.4	89	1.4	89	1.4
5		1	3.50	3.08	3.50	3.08
		42.4	89	1.4	89	1.4
		1 1/4	3.50	3.08	3.50	3.08
		48.3	89	1.4	89	1.5
		1 1/2	3.50	3.08	3.50	3.30
		60.3	89	1.5	89	1.5
		2	3.50	3.30	3.50	3.30
		76.1	89	1.5	89	1.6
		2 1/2	3.50	3.30	3.50	3.52
		88.9	89	1.6	89	1.6
		3	3.50	3.52	3.50	3.52
		114.3	89	1.7	--	--
		4	3.50	3.74	--	--
141.3	X	33.4	89	1.4	89	1.4
5		1	3.50	3.08	3.50	3.08
		42.4	89	1.4	89	1.4
		1 1/4	3.50	3.08	3.50	3.08
		48.3	89	1.4	89	1.5
		1 1/2	3.50	3.08	3.50	3.30
		60.3	89	1.5	89	1.5
		2	3.50	3.30	3.50	3.30
		73.0	89	1.5	89	1.6
		2 1/2	3.50	3.30	3.50	3.52
		88.9	89	1.6	89	1.6
		3	3.50	3.52	3.50	3.52
		114.3	89	1.7	--	--
		4	3.50	3.74	--	--



- ◆ Branch outlet fitting is a supplement to the grooved piping system. It is a very important piping unit in the mechanical piping system. The appearance of the branch outlet fitting makes the installation of the piping system more convenient and quick. Branch outlet fittings replaced welding and reducing Tee, to solve the problem of the connection branch.
- ◆ Branch outlet fitting is another way of piping innovation, is the use of bolted connections branch pipe fittings. No need to weld directly from the supervisor on the branch pipe. The method used is in the need to take over the main branch pipe processing a round hole, fitted with branch outlet housing. The opening must be secured on the centerline of the pipe and be mechanically performed by a dedicated opening.
- ◆ Condor branch outlet fitting, including mechanical tee, mechanical cross, U-bolt.

Mechanical Cross



Mechanical cross description:

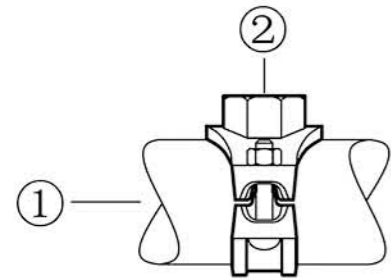
- ◆ Model 3GG grooved mechanical cross is built by 2 pieces of model 3G's outlet housing.
- ◆ Model 3JJ threaded mechanical cross is built by 2 pieces of model 3J's outlet housing

Flow Date

The flow coefficient and flow resistance of the product at 16 °C (60 F) are shown in the table on the right.

Since the pressure of the medium varies across the manifolds, the connection of the product functions best when the medium flows between ① and ②. As shown below.

The physical relationship between the various parameters under different pressures can be calculated from the formula on the right and from the data on the right.



Formulas for CV Values:

$$\Delta P = \frac{Q^2}{C_v^2}$$

$$Q = C_v \times \sqrt{\Delta P}$$

注:

ΔP : Pressure Drop, MPa

Q : Flow, L/min

C_v : Flow Coefficient

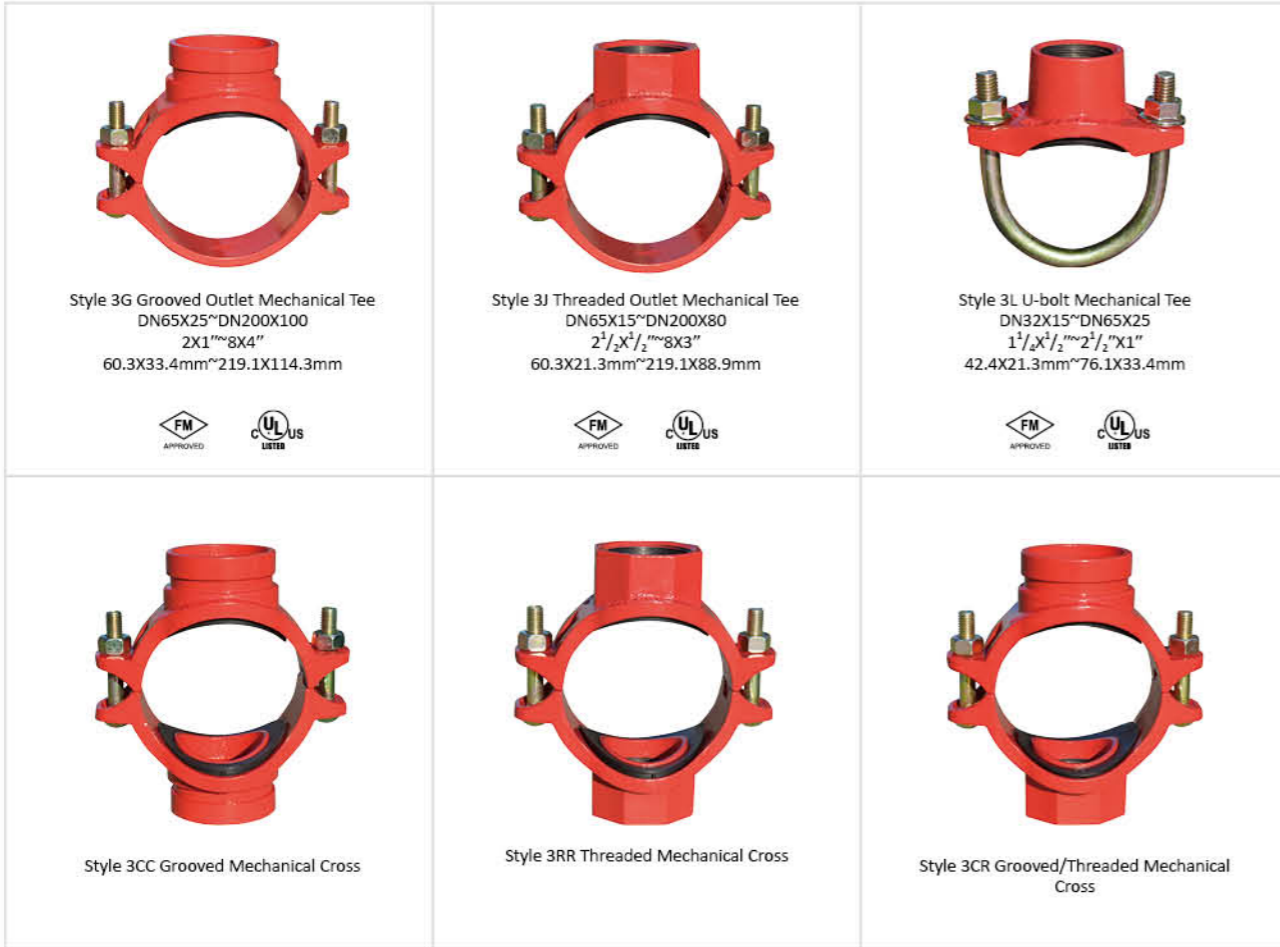
Size		C _v Values	Equiv. of Pipe		Size		CV Values	Equiv. of Pipe	
Nominal Dia.	Actual O.D.		Grooved	Threaded	Nominal Dia.	Actual O.D.		Grooved	Threaded
DN Inches	mm Inches		m Feet	m Feet	DN Inches	mm Inches		m Feet	m Feet
15	21.3	775	---	0.6	65	73.0	6154	3.4	3.8
1/2	0.840		2.0	2 1/2	2.875	11.0		12.5	
20	26.9	957	---	1.2	65	76.1	6154	3.4	3.8
3/4	1.050		4.0	2 1/2	3.000	11.0		12.5	
25	33.4	1140	---	1.5	80	88.9	9117	4.1	4.7
1	1.315		5.0	3	3.500	13.5		15.5	
32	42.4	2051	1.7	1.8	100	108.0	18234	6.1	6.7
1 1/4	1.660		5.5	6.0	4	4.250		20.0	22.0
40	48.3	2735	2.1	2.4	100	114.3	18234	6.1	6.7
1 1/2	1.900		7.0	8.0	4	4.500		20.0	22.0
50	60.3	4558	2.7	3.2					
2	2.375		9.0	10.5					

In the sprinkler system, the use of mechanical cross should be in accordance with the following principles, otherwise it will affect the strength of the pipeline:

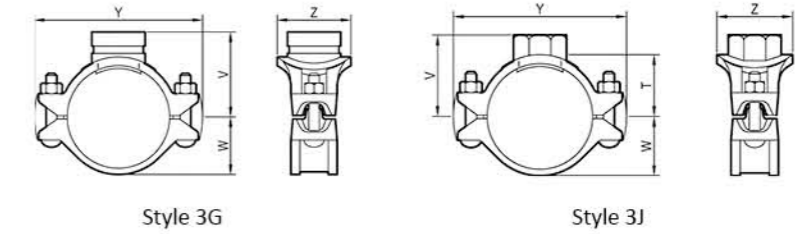
All sizes of 3G / 3J mechanical tee can be combined into a mechanical cross, but must be combined according to certain principles, otherwise it will affect the strength of the pipeline, see the table on the right.

Run Pipe Size		Max. Branch Pipe Size			
Nominal Dia.	Actual O.D.	Mechanical Tee		Mechanical Cross	
		Nominal Dia.	Actual O.D.	Nominal Dia.	Actual O.D.
DN Inches	mm Inches	DN Inches	mm Inches	DN Inches	mm Inches
50	60.3	25	33.4	25	33.4
2	2.375	1	1.315	1	1.315
65	73.0	40	48.3	32	42.4
2 1/2	2.875	1 1/2	1.900	1 1/4	1.660
65	76.1	40	48.3	32	42.4
2 1/2	3.000	1 1/2	1.900	1 1/4	1.660
80	88.9	50	60.3	40	48.3
3	3.500	2	2.375	1 1/2	1.900
100	108.0	65	76.1	50	60.3
4	4.250	2 1/2	3.000	2	2.375
100	114.3	80	88.9	50	60.3
4	4.500	3	3.500	2	2.375
125	133.0	80	88.9	76.1	40
5	5.250	3	3.500	3.000	1 1/2
125	139.7	80	88.9	76.1	40
5	5.500	3	3.500	3.000	1 1/2
125	141.3	80	88.9	73.0	40
5	5.563	3	3.500	2.875	1 1/2
150	159.0	100	114.3	88.9	50
6	6.250	4	4.500	3.500	2
150	165.1	100	114.3	88.9	50
6	6.500	4	4.500	3.500	2
150	168.3	100	114.3	88.9	50
6	6.625	4	4.500	3.500	2
200	219.1	100	114.3	100	114.3
8	8.625	4	4.500	4	4.500

- ◆ With mechanical outlet fittings, the branch pipe can be built directly from the main pipe without welding.
- ◆ Gasket designed with the pipe arc to pipe surface, so as to achieve a more ideal sealing effect.
- ◆ Hole cut must be ensured on the center line of the pipe and be perforated by hole saw.



Mechanical Tee



Style 3G Grooved Outlet Mechanical Tee



Style 3J Threaded Outlet Mechanical Tee



- By using the bolting method, the branch pipe is directly connected with the main pipe without welding.
- All products have 21.3mm (1/2") outlets and 26.9mm (3/4") outlets. All sizes is the same with 33.4mm (1") outlets.
- Enhanced body resists 4 times working pressure.

Size		Branch Pipe	Max. Work Pressure	Hole Size	Dimensions						Bolt/Nut Size	Approx. Wgt.		
Run Pipe	X				W	Y	Z	3G V	3J V	3J T		mm	kg	lbs.
mm	Inches	mm	KPa	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg	lbs.
60.3	X	33.4	3450	38	37	134	70	64	62	46	M12X65	0.85	0.81	
		1	500	1.50	1.46	5.28	2.76	2.52	2.44	1.81	1/2 X 2 1/2	1.87	1.78	
		42.4	3450	44.5	37	134	77	65	65	46	M12X65	0.89	0.92	
		1 1/2	500	1.75	1.46	5.28	3.03	2.56	2.56	1.81	1/2 X 2 1/2	1.96	2.03	
		48.3	3450	44.5	37	134	77	65	65	46	M12X65	0.91	0.98	
		1 1/2	500	1.75	1.46	5.28	3.03	2.56	2.56	1.81	1/2 X 2 1/2	2.00	2.16	
73.0	X	33.4	3450	38	43	148	68	74	64	46	M12X75	1.25	1.16	
		1	500	1.50	1.69	5.83	2.68	2.91	2.52	1.81	1/2 X 3	2.75	2.56	
		42.4	3450	44.5	43	148	76	74	67	46	M12X75	1.28	1.33	
		1 1/2	500	1.75	1.69	5.83	2.99	2.91	2.64	1.81	1/2 X 3	2.82	2.93	
		48.3	3450	51	43	148	83	74	67	46	M12X75	1.39	1.52	
		1 1/2	500	2.00	1.69	5.83	3.27	2.91	2.64	1.81	1/2 X 3	3.06	3.35	
76.1	X	33.4	3450	38	45	151	68	76	66	47	M12X75	1.19	1.17	
		1	500	1.50	1.77	5.94	2.68	2.99	2.60	1.85	1/2 X 3	2.62	2.58	
		42.4	3450	44.5	45	151	76	76	68	47	M12X75	1.22	1.27	
		1 1/2	500	1.75	1.77	5.94	2.99	2.99	2.68	1.85	1/2 X 3	2.69	2.80	
		48.3	3450	51	45	151	83	76	69	47	M12X75	1.27	1.33	
		1 1/2	500	2.00	1.77	5.94	3.27	2.99	2.72	1.85	1/2 X 3	2.80	2.93	
88.9	X	33.4	3450	38	52	161	68	82	72	54	M12X75	1.28	1.25	
		1	500	1.50	2.05	6.34	2.68	3.23	2.83	2.13	1/2 X 3	2.82	2.75	
		42.4	3450	44.5	52	161	75	82	74	54	M12X75	1.31	1.36	
		1 1/2	500	1.75	2.05	6.34	2.95	3.23	2.91	2.13	1/2 X 3	2.89	3.00	
		48.3	3450	51	52	161	82	82	75	54	M12X75	1.37	1.43	
		1 1/2	500	2.00	2.05	6.34	3.23	3.23	2.95	2.13	1/2 X 3	3.02	3.15	
108.0	X	33.4	3450	38	62	182	69	93	84	65	M12X75	1.48	1.44	
		1	500	1.50	2.44	7.17	2.72	3.66	3.31	2.56	1/2 X 3	3.26	3.17	
		42.4	3450	44.5	62	182	75	93	86	65	M12X75	1.52	1.56	
		1 1/2	500	1.75	2.44	7.17	2.95	3.66	3.39	2.56	1/2 X 3	3.35	3.44	
		48.3	3450	51	62	182	83	93	86	65	M12X75	1.59	1.64	
		1 1/2	500	2.00	2.44	7.17	3.27	3.66	3.39	2.56	1/2 X 3	3.50	3.61	
114.3	X	33.4	3450	38	65	188	69	96	87	68	M12X75	1.52	1.45	
		1	500	1.50	2.56	7.40	2.72	3.78	3.43	2.68	1/2 X 3	3.35	3.19	
		42.4	3450	44.5	65	188	75	96	89	68	M12X75	1.55	1.58	
		1 1/2	500	1.75	2.56	7.40	2.95	3.78	3.50	2.68	1/2 X 3	3.41	3.48	
		48.3	3450	51	65	188	83	96	89	68	M12X75	1.62	1.67	
		1 1/2	500	2.00	2.56	7.40	3.27	3.78	3.50	2.68	1/2 X 3	3.57	3.68	
127.0	X	33.4	3450	38	75	203	69	106	93	68	M12X75	1.75	1.86	
		1	500	1.50	2.95	8.10	2.72	4.23	3.82	2.68	1/2 X 3	3.85	4.10	
		42.4	3450	44.5	75	203	75	106	93	68	M12X75	1.91	2.02	
		1 1/2	500	1.75	2.95	8.10	3.27	4.23	3.82	2.68	1/2 X 3	4.21	4.45	
		48.3	3450	51	75	203	83	106	93	68	M12X75	1.93	2.05	
		1 1/2	500	2.00	2.95	8.10	3.59	4.23	3.82	2.68	1/2 X 3	4.25	4.52	
152.4	X	33.4	3450	38	93	229	69	122	100	68	M12X75	2.07	2.31	
		1	500	1.50	3.66	9.11	2.72	4.80	4.44	2.68	1/2 X 3	4.56	5.09	
		42.4	3450	44.5	93	229	75	122	100	68	M12X75	2.15	2.31	
		1 1/2	500	1.75	3.66	9.11	3.27	4.80	4.44	2.68	1/2 X 3	4.64	5.09	
		48.3	3450	51	93	229	83	122	100	68	M12X75	2.21	2.31	
		1 1/2	500	2.00	3.66	9.11	3.59	4.80	4.44	2.68	1/2 X 3	4.72	5.09	




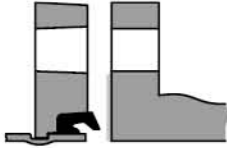


- **Housing material:** Ductile iron conforming to ASTM A-536, grade 65-45-12.
- **FM Approved & UL Listed:** R.W.P. rated working pressure 300PSI(2.065MPa / 20.65bars)
- **Housing Finish:** Fusion Bonded Epoxy Coated(Optional:Hot Deep Galvanized and Others)
- **Coupling gasket material:** EPDM(Optional:Nitrile NBR,Silicone and Others)
- **Bolts and Nuts:** Heat treated and electro galvanized bolts with oval neck, and heavy duty hexagon nuts. Track head meeting the physical and chemical requirements of ASTM A-449 and physical requirements of ASTM A-183.
- **Size Range:** DN50 X DN25 through DN200 X DN100 (2" X 1" through 8" X 4")

Rubber Gasket



Condor gaskets are designed to provide life-of-the-system service in a wide variety of applications. Gasket materials are available to meet most piping applications. For a list of service recommendations by gasket type see pg 45-47

Rubber Gasket Styles

 <p>Standard C type: Usually with grooved fittings. 1GS, 1X, 1N, 1NH, such as no special requirements are supporting this type of rubber seals</p>	 <p>E type: Usually with grooved fittings. 1GS, 1X, 1N, 1NH can be matched with this type of rubber seal</p>	 <p>Reducing type: Usually with grooved reducing fitting. 1NR supporting this type of rubber ring.</p>
 <p>Flange type: 321-type slip flange are matched with this type of rubber ring</p>	 <p>Opening reaction type: 3G, 3J are optional matching this type of rubber ring</p>	 <p>Hole labyrinth type: 3G, 3J are optional matching this type of rubber ring</p>

Rubber Gasket Materials


As elastomer technology advanced, superior gasket materials became available and were added to the Condor line. This allows Condor to presently offer a variety of synthetic rubber gaskets to provide the option of selecting Condor products for the widest variety of applications. For most water system piping applications, Condor grade EPDM rubber is recommended. Condor E-grade rubber gasket material with excellent performance in anti-aging and heat resistance, the material at 125 °C (257°F) temperature, the material for hot air aging test, the physical properties of the basic unchanged. When the rubber in a non-air environment, such as water piping system, its anti-aging properties will be further strengthened. Since water has no deteriorating effect on the elastomer, temperature is the only limiting factor to be considered in determining the life expectancy of the elastomer in water service. The superior performance of the Grade "E" elastomer permits its use for hot water service up to +230°F/+110°C. The Grade "E" gasket is superior to previous gasket materials by all performance barometers, including high and low temperature limits, tensile strength, chemical resistance and shelf life.

Rubber Gasket Date

To assure the maximum life for the service intended, proper gasket selection and specification in ordering is essential. Many factors must be considered in determining the optimum gasket for a specific service. The foremost consideration is temperature, along with concentration of product, duration of service and continuity of service. Temperatures beyond the recommended limits have a degrading effect on the polymer. Therefore, there is a direct relationship between temperature, continuity of service and gasket life. Services listed are General Service Recommendations only. It should be noted that there are services for which these gaskets are not recommended. For a list of application-specific and non-recommended application recommendations, reference should be made to the latest selection guide for seals. The use of gasket only for the selection of rubber materials in the product, does not involve the selection of metal shell, fittings and bolts and nuts. For the housing, accessories and bolts and nuts selection, should be selected according to the actual application environment.

Rubber Gasket Lubricant

When installing the product, the outer surface of the gasket should be lubricated, this will help prevent the gasket from being crushed during installation. It is recommended to lubricate the outer surface of the gasket, including the lip and / or tube end, and the housing cavity, and the lubricated aprons surface will help to properly install the product. Under normal circumstances recommended the use of special lubricants, if necessary, consult the relevant Condor institutions. Also available household human body can be directly exposed to the washing products, add water after modulation, such as detergents, soap, detergent, etc., avoid using mechanical lubricants, such as butter and so on.

 **Warning**

To ensure that the rubber seal in the application of the longest life expectancy, the correct choice when ordering rubber seal material and specifications are the most basic requirements. Failure to select the right rubber seal material can result in personal injury or property damage, joint leakage, or connection failure.

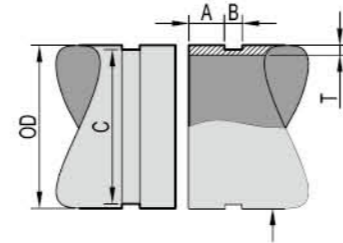
Rubber Gasket Materials

The material of the gasket must be determined according to the characteristics of the fluid medium. The commonly used sealing rings are shown in the following table:

Grade	Temperature Range	Rubber Compound	Color Code	General Service Recommendations
E	-30°F to +230°F -34°C to +110°C	EPDM	Green Stripe	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°C and hot +180°F/+82°C potable water service. NOT RECOMMENDED FOR PETROLEUM SERVICES.
T	-20°F to +180°F -29°C to +82°C	Nitrile	Orange Stripe	Recommended for petroleum products, hydrocarbons, air with oil vapors, vegetable and mineral oils within the specified temperature range; except hot dry air over +140°F/+60°C and water over +150°F/+66°C. NOT RECOMMENDED FOR HOT WATER SERVICES.
O	-20°F to +300°F -29°C to +149°C	Fluoroelastomer	Blue Stripe	Recommended for many oxidizing acids, petroleum oils, halogenated hydrocarbons, lubricants, hydraulic fluids, organic liquids and air with hydrocarbons to +300°F/+149°C.
L	-30°F to +350°F -34°C to +177°C	Silicone	white	Recommended for dry heat, air without hydrocarbons to +350°F/+177°C and certain chemical services.
V	-30°F to +180°F -34°C to +82°C	Neoprene	Yellow Stripe	Recommended for hot lubricating oils and certain chemicals. Good oxidation resistance. Will not support combustion.

For specific compound and temperature compatibility, see this book Chemical Application Table

Cut Groove Parameters



Standard Roll Groove Specifications-Steel and Other IPS Pipe

Size			Gasket Seat	Grv. Width	Grv. Diameter C		Grv. Depth	Min. Wall	
Nominal Dia.	Actual O.D.	Tolerance		A	B	Std.	Tolerance	D(Ref.)	T
DN	mm	mm	mm	± 0.76mm	± 0.76mm	mm	mm	mm	mm
Inches	Inches	Inches	Inches	± 0.03In.	± 0.03In.	Inches	Inches	Inches	Inches
20	26.9	0.25	0.25	15.88	7.95	23.83	-0.38	1.42	2.87
3/4	1.050	0.01	0.01	0.625	0.313	0.938	-0.015	0.056	0.113
25	33.4	0.33	0.33	15.88	7.95	30.23	-0.38	1.6	3.38
1	1.315	0.013	0.013	0.625	0.313	1.19	-0.015	0.063	0.133
32	42.4	0.041	0.041	15.88	7.95	38.99	-0.38	1.6	3.56
1 1/2	1.660	0.016	0.016	0.625	0.313	1.535	-0.015	0.063	0.140
40	48.3	0.048	0.048	15.88	7.95	45.09	-0.38	1.6	3.68
1 1/2	1.900	0.019	0.019	0.625	0.313	1.775	-0.015	0.063	0.145
50	57.0	0.57	0.57	15.88	7.95	53.85	-0.38	1.6	3.91
2	2.250	0.022	0.022	0.625	0.313	2.12	-0.015	0.063	0.154
50	60.3	0.61	0.61	15.88	7.95	57.15	-0.38	1.6	3.91
2	2.375	0.024	0.024	0.625	0.313	2.25	-0.015	0.063	0.154
65	73.0	0.74	0.74	15.88	7.95	69.09	-0.46	1.98	4.78
2 1/2	2.875	0.029	0.029	0.625	0.313	2.72	-0.018	0.078	0.188
65	76.1	0.76	0.76	15.88	7.95	72.26	-0.46	1.98	4.78
2 1/2	3.000	0.03	0.03	0.625	0.313	2.845	-0.018	0.078	0.188
80	88.9	0.89	0.79	15.88	7.95	84.94	-0.46	1.98	4.78
3	3.500	0.089	0.031	0.625	0.313	3.344	-0.018	0.078	0.188
90	101.6	1.02	0.79	15.88	7.95	97.38	-0.51	2.11	4.78
3 1/2	4.000	0.04	0.031	0.625	0.313	3.834	-0.02	0.083	0.188
100	108.0	1.07	0.79	15.88	9.53	103.73	-0.51	2.11	5.17
4	4.250	0.042	0.031	0.625	0.375	4.084	-0.02	0.083	0.203
100	114.3	1.14	0.79	15.88	9.53	110.08	-0.51	2.11	5.17
4	4.500	0.045	0.031	0.625	0.375	4.334	-0.02	0.083	0.203
120	127	1.27	0.79	15.88	9.53	122.78	-0.51	2.11	5.17
4 1/2	5.000	0.05	0.031	0.625	0.375	4.834	-0.02	0.083	0.203
125	133.0	1.32	0.79	15.88	9.53	129.13	-0.51	2.11	5.17
5	5.250	0.052	0.031	0.625	0.375	5.084	-0.02	0.083	0.203
125	139.7	1.42	0.79	15.88	9.53	135.48	-0.51	2.11	5.17
5	5.500	0.056	0.031	0.625	0.375	5.334	-0.02	0.083	0.203
125	141.3	1.42	0.79	15.88	9.53	137.03	-0.56	2.13	5.17
5	5.563	0.056	0.031	0.625	0.375	5.395	-0.022	0.084	0.203
6	152.4	1.42	0.79	15.88	9.53	148.08	-0.56	2.16	5.56
6OD	6.000	0.056	0.031	0.625	0.375	5.83	-0.022	0.085	0.219
150	159.0	1.6	0.79	15.88	9.53	154.5	-0.56	2.16	5.56
6	6.250	0.063	0.031	0.625	0.375	6.082	-0.022	0.085	0.219
150	165.1	1.6	0.79	15.88	9.53	160.9	-0.56	2.16	5.56
6	6.500	0.063	0.031	0.625	0.375	6.334	-0.022	0.085	0.219
150	168.3	1.6	0.79	15.88	9.53	163.96	-0.56	2.16	5.56
6	6.625	0.063	0.031	0.625	0.375	6.455	-0.022	0.085	0.219
200	216.3	1.6	0.79	19.05	11.13	211.61	-0.64	2.34	6.05
8	8.500	0.063	0.031	0.75	0.438	8.331	-0.025	0.092	0.238
200	219.1	1.6	0.79	19.05	11.13	214.4	-0.64	2.34	6.05
8	8.625	0.063	0.031	0.75	0.438	8.441	-0.025	0.092	0.238
250	267.4	1.6	0.79	19.05	12.7	262.6	-0.69	2.39	6.35
10	10.500	0.063	0.031	0.75	0.500	10.339	-0.027	0.094	0.250
250	273.0	1.6	0.79	19.05	12.7	268.28	-0.69	2.39	6.35
10	10.750	0.063	0.031	0.75	0.500	10.562	-0.027	0.094	0.250
300	318.4	1.6	0.79	19.05	12.7	312.9	-0.76	2.77	7.09
12	12.500	0.063	0.031	0.75	0.500	12.319	-0.03	0.109	0.279
300	323.9	1.6	0.79	19.05	12.7	318.29	-0.76	2.77	7.09
12	12.750	0.063	0.031	0.75	0.500	12.531	-0.03	0.109	0.279

- Pipe standard OD and tolerance OD: Confirmed before rolling the groove pipe, if not, then the pipe is not suitable for rolling groove;
- Sealing surface A: confirm the sealing surface size in line with the requirements of the above table, if it is too large, it will affect the joint installation, too small will affect the joint sealing performance;
- Groove width B: Confirm that the width of the groove conforms to the above requirements, if it exceeds the requirement, it will affect the flexibility of the flexible coupling;
- Groove bottom diameter C: The standard value is its maximum, which has only negative tolerances. It affect the pressure bearing capacity and the various indicators of sex, if C is too large will appear the possibility of joint tripping;
- Groove depth D: for reference only. When the pipe outer diameter is the standard outer diameter, it is the minimum depth of the groove.
- Minimum wall thickness T: control the quality of the pipeline after rolling groove, if it is too small, there will be pipeline cracking or lowering pipe pressure capacity;

Design Considerations

The Condor piping method may be used for joining a variety of piping systems for a wide variety of services. It may be utilized for varied pipe sizes, pipe materials and wall thickness. Products are available to provide rigid or flexible systems. For specific product information relating to use on varied pipe materials refer to the appropriate sections of this catalog.

As with any piping method, the nature of the method should be considered in designing the piping systems. This design data applies primarily to grooved end pipe, however, much of the information applies to other piping products used in conjunction with grooved components.

The material presented is intended solely for piping design reference in utilization of Condor products for their intended application. It is not intended as a replacement for competent, professional assistance which is an obvious requisite to any specific application. Good piping practice should always prevail. Specific pressures, temperatures, external or internal loads, performance standards and tolerances must never be exceeded.

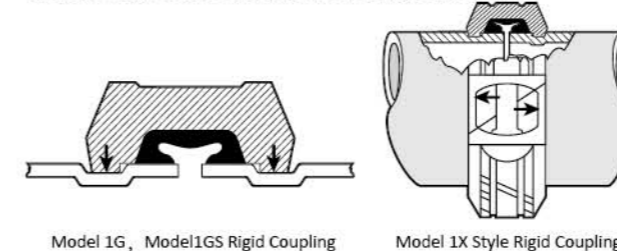
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Rigid Coupling

Rigid grooved end piping systems (including Styles 1G, 1GS, 1X, and others) provide a mechanical and frictional interlock onto the pipe ends sufficient to result in a rigid joint.

1G type, 1GS type rigid coupling adopts internal and external male and female mouth, socket type and meshing design. It uses the gap between the male and female mouth socket and the pipe to mesh with the joint to form a rigid coupling.

Type 1X rigid coupling is designed with a 60° angle pad design. This design assembles and tightens the coupling housing obliquely rather than vertically, resulting in a smaller internal diameter, which holds the pipe tightly and creates a rigid connection. This oblique sliding also forces the joint housing keys to form double-sided contact on opposite sides of the inner and outer edges of the groove so that axial and radial movements cannot be generated after the tubes are connected, and the rigid connecting pipe is actually achieved.



These products can be considered to have system behavior characteristics similar to those of welded or flanged systems, in that all piping remains in strict alignment and is not subject to deflections during operation. For this reason, these products require support techniques similar to those used in traditional flanged or welded systems.

Systems incorporating rigid couplings require the calculated thermal growth/contraction of the piping system to be fully compensated for in the design of the piping system. This requires adequate use of flexible components, (i.e. flexible couplings, expansion joints, expansion loops using flexible couplings at the elbows, etc.) such that no bending moments can be developed and imparted at the pipe joints. Please refer to The following sections for further details.

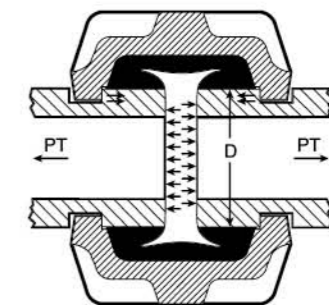
Flexible Coupling

The following factors must be considered when designing or installing flexible grooved end piping systems (including Styles 1G, 1GS, 1X, and others).

Pressure Thrust

When a flexible grooved type mechanical coupling is sustaining forces trying to separate the pipe ends, the shoulder of the groove is pulled hard against the inside face of the coupling key. This is what prevents the pipes from separating.

The allowable force which a joint can sustain varies for different types of couplings, pipe wall thickness, types of pipes and grooving. The product data under the column "Maximum Permissible End Load" shows the maximum allowable end force due to internal pressure and external loading that different couplings will sustain.



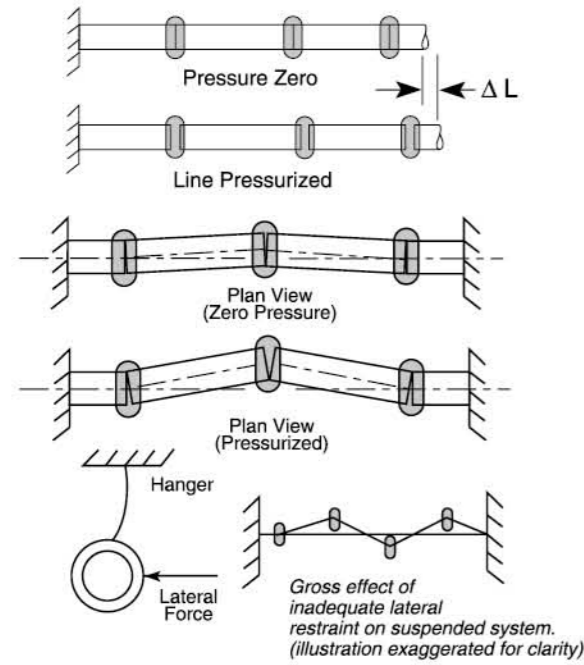
When this end force is due to a closed end or change in direction, the pressure thrust transmitted by the joint can be computed from the formula:

$$PT = \frac{\pi}{4} D^2 p$$

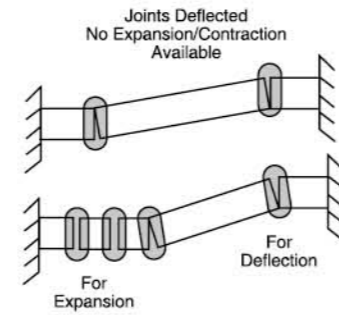
Where:

- PT = Pressure thrust or end load (lbs.)
- D = Outside diameter of pipe (inches)
- p = Internal pressure (psi)

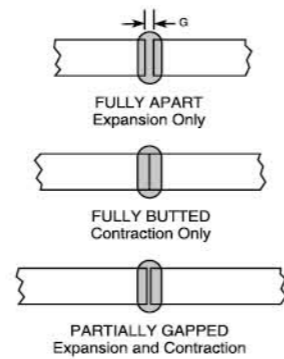
Pipe will be moved to the full extent of the available pipe end gaps when allowed to float. Ensure resulting movement of randomly installed systems is not harmful to joints at changes in directions or branch connections or to parts of structure or other equipment. Note also that thermal expansion of pipes will add to total movement in these cases.



The grooved piping method will not allow both maximum linear movement and maximum angular movement simultaneously at the same joint. If both are expected simultaneously, systems should be designed with sufficient joints to accommodate both, including allowance for recommended tolerances. Flexible couplings do not automatically provide for expansion or contraction of piping. Always consider best setting for pipe end gaps. In anchored systems, gaps must be set to handle combinations of expansion and contraction. In free floating systems offsets of sufficient length must be used to accommodate movement without over deflecting joints.

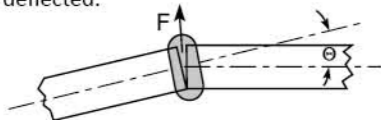


For anchored systems, where pressure thrusts do not act to hold the joints in tension, or in systems where the joints have been intentionally deflected (e.g., curves), provide lateral restraint to prevent movement of the pipes due to pressure thrusts acting at deflections. Lightweight hangers are not adequate in preventing sideways movement of pipes. It should be anticipated that small deflections will occur in all straight lines and side thrusts will be exerted on the joints.

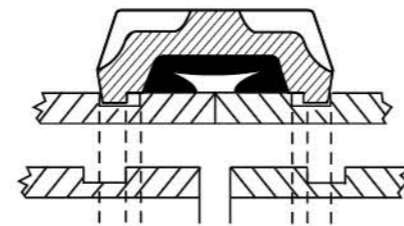


Linear movement available at flexible grooved pipe joints is published under performance data for each Condor coupling style. These values are MAXIMUMS. For design and installation purposes, these figures should be reduced by the following factors to allow for pipe groove tolerances.

Angular deflection at butted or fully spaced joints is not possible unless the ends of the pipes are free to move as required. Unrestrained deflected joints will straighten up under the action of axial pressure thrusts or other forces acting to pull pipes apart. If joints are to be maintained deflected, then lines must be anchored to restrain pressure thrusts and end pull forces, otherwise sufficient lateral force must be exerted to keep joint deflected.



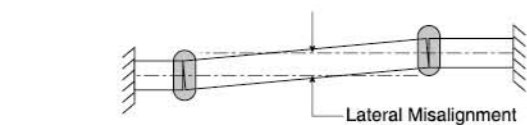
Lateral forces (F) will always act on deflected joints due to internal pressure. A fully deflected joint will no longer be capable of providing the full linear movement normally available at the joint.



Suggest:

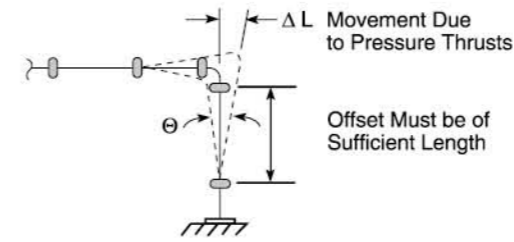
DN25~DN80(1"~3") Reduce published figures to 50%,
DN100~DN300(4"~12") Reduce published figures to 75%

Standard cut grooved pipe will provide double the expansion/contraction or deflection capabilities of the same size standard roll groove pipe.



At least two flexible couplings are required to provide for lateral misalignment of pipes. Angular deflection of each joint must not exceed Maximum Deflection From Centerline published for each Condor coupling style

OFFSETS AND BRANCH CONNECTIONS

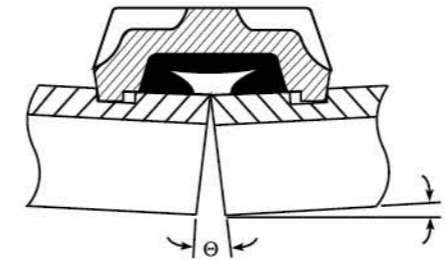


Ensure that branch connections and offsets are sufficiently long so that the maximum angular deflection of coupling (shown in Performance Data for each coupling style) is never exceeded and can accommodate anticipated total movement of pipes. Otherwise, anchor system to direct movement away from these. Also ensure that adjacent pipes can move freely to provide anticipated movements. (Refer to the following sections for more details.)

Angular Deflections

Angular deflection available at flexible grooved pipe joints is published under Performance Data for each Condor coupling style. These values are MAXIMUMS. For design and installation purposes these figures should be reduced by the following factors to allow for pipe grooving tolerances.

θ = Maximum angular deflection between center lines as shown under Performance Data.



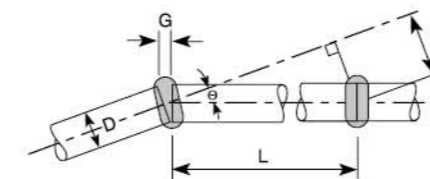
DN25~DN80(1"~3") Reduce published figures to 50%.
DN100~DN300(4"~12") Reduce published figures to 75%.

Standard cut grooved pipe will provide double the expansion/contraction or deflection capabilities of the same size standard roll groove pipe.

The angular deflection available at a Condor flexible grooved pipe joint is useful in simplifying and speeding installation.

NOTE: Joints which are fully deflected can no longer provide linear movement. Partially deflected joints will provide some portion of linear movement.

NOTE: Pressure thrusts will tend to straighten deflected pipe.



Where:

Y = Misalignment (Inches)

G = Maximum Allowable Pipe End Movement (Inches) as shown under Performance Data (Published value to be reduced by Design Tolerance.)

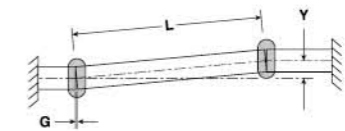
θ = Maximum Deflection (Degrees) from Center Line as shown under Performance Data (Published value to be reduced by Design Tolerance.)

D = Pipe Outside Diameter (Inches)

L = Pipe Length (Inches)

Misalignment

Pipe misalignment can be accommodated with a Condor flexible grooved piping system. Note that at least two flexible couplings must be used for the combined lateral displacement and angular deflection (Y). (Refer belowing sections for details.)



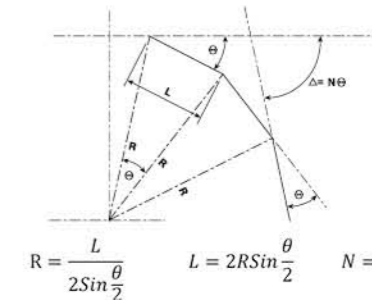
The movement available can be calculated from the flexible coupling Performance Data.

Curve Layout

Curves may be installed with straight pipe lengths utilizing the angular deflection (under performance data) available at each flexible coupling.

Note that if the maximum angle of deflection at the couplings is used to lay the curve, no allowance is left for expansion/contraction.

NOTE: Pressure thrusts will tend to straighten the curve. Consideration must be given to proper anchoring.



Where:

N = Number of Couplings

R = Radius of Curve (Feet)

L = Pipe Length (Feet)

θ = Deflection from Centerline (°) of each Coupling (See Data Sheets- Published value to be reduced by Design Tolerance)

Δ = Combined Angular Deflection of all couplings

For curves of less than 90° total deflection, the data shown on the previous page can be used to determine:

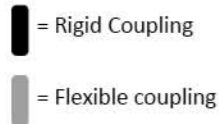
1. The radius of curvature that can be made using pipes of a given length and utilizing either the full or partial angle of deflection available from the couplings used. Alternatively, the maximum length of pipe that can be used to negotiate a curve of a certain radius using either the maximum or partial angle of deflection available from the couplings.
2. The total number of flexible couplings required to negotiate a curve having a given deflection angle.

Pipe Support Anchorage and Guidance

Rigid Coupling & Flexible Coupling

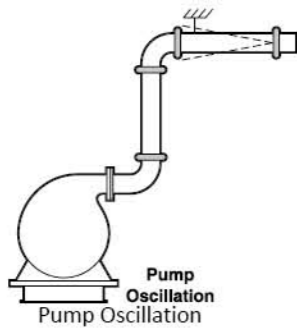
When designing anchorage, support and guidance systems for piping joined with flexible or rigid mechanical grooved type couplings, it is necessary to give consideration to certain characteristics of these couplings. These characteristics distinguish flexible grooved type couplings from other types and methods of pipe joining. When this is understood, the designer can utilize the many advantages that these coupling provide.

Coupling Key:



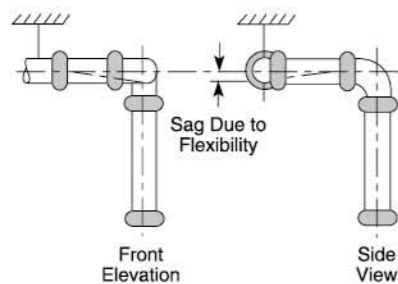
USE OF HANGERS AND SUPPORTS

The use of hangers and supports offering freedom of movement in one or more directions has to be considered to allow pipes to move freely. Spring hangers are good practice at change of direction to allow freedom of pipe movement.

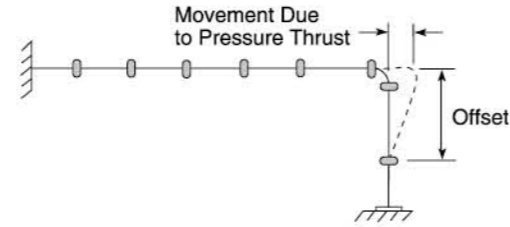


Accommodating Coupling Flexibility

Flexible grooved type couplings allow angular flexibility and rotational movement to take place at joints. These features provide advantages in installing and engineering piping systems, but must be considered when determining hanger and support spacing.



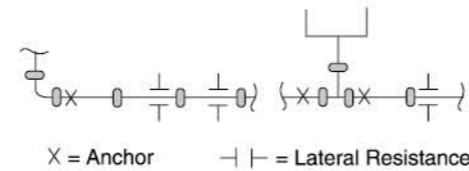
As illustrated, it is obvious that this system would require further hangers to eliminate the drooping of the pipes that would occur. Hanger positions must therefore be considered in relation to the angular and rotational movement that will occur at joints. Good use can be made of 1X style rigid couplings in boiler and machinery rooms. These will increase rigidity where needed.



In the system illustrated, if the joints had all been installed butted or only partially open when pressurized, the pipe ends would all move to the maximum extent allowed by the coupling and this movement would all accumulate at the end of the system. The offset would have to be capable of deflecting sufficiently, otherwise harmful bending moments would be induced in the joints of the offset.

Note, if the pipes were to expand due to thermal changes, then further growth of the pipes would also take place at the ends.

Anchorage and Support



Ensure anchorage and support is adequate. Use anchors to direct movement away from or to protect critical changes in direction, branch connections and structure. Spacing and types of supports should consider anticipated pipe movements. If rigid couplings are used, consideration must be given to use of expansion joints if thermal movement is expected.

Rules Applicable to Long Runs of Pipe

For long pipe runs incorporating flexible couplings, it is normal practice to anchor or block all changes in direction of piping to prevent pressure thrusts from creating linear growth at the flexible joints. It may be necessary to guide the pipe to prevent lateral movement of the pipe between the anchors. Intermediate anchors can be installed to control pipe movement in selected areas and to reduce pipe end forces on joints. When changes in direction are located in a structure (i.e. pump room) a main anchor can be used at the change in direction to handle loads created by pressure thrusts. The anchor would also prevent unwanted movement of the piping at equipment connections.

Pipe Support

Rigid Coupling & Flexible Coupling

Piping joined with grooved type couplings, like all other piping systems, requires support to carry the weight of pipes, equipment and fluid. Like all other methods of joining pipes, the support or hanging method must be such as to eliminate undue stresses on joints, piping and other components. Additionally, the method of support must be such as to allow movement of the pipes where required and to provide for other special requirements such as drainage, etc. as may be required by the designer. The support system for flexible mechanical grooved type pipe couplings must consider some of the special requirements of these couplings. The tables show suggested maximum span between pipe supports for horizontal straight runs of standard weight steel pipe carrying water or similarly dense liquids. They are not intended to be used as specifications for all installations. These DO NOT apply where critical calculations are made or where there are concentrated loads between supports.

Do not attach supports directly to the couplings. Support adjoining pipe and equipment only.

Rigid Systems

For Condor rigid coupling Styles 1G, 1GS, 1X, and others, the Maximum Hanger Spacing below may be used.

Size		Suggested Maximum Span Between Supports					
Nominal Dia.		Water Service			Gas or Air Service		
DN	Inches	1	2	3	1	2	3
		m Feet	m Feet	m Feet	m Feet	m Feet	m Feet
25	1	2.1 7	2.7 9	3.7 12	2.7 9	2.7 9	3.7 12
32	1 1/4	2.1 7	3.4 11	3.7 12	2.7 9	3.4 11	3.7 12
40	1 1/2	2.1 7	3.7 12	4.6 15	2.7 9	4.0 13	4.6 15
50	2	3.1 10	4.0 13	4.6 15	4.0 13	4.6 15	4.6 15
65	2 1/2	--	--	--	--	--	--
80	3	3.7 12	4.6 15	4.6 15	4.6 15	5.2 17	4.6 15
100	4	4.3 14	5.2 17	4.6 15	5.2 17	6.4 21	4.6 15
125	5	--	--	--	--	--	--
150	6	5.2 17	6.1 20	4.6 15	6.4 21	7.6 25	4.6 15
200	8	5.8 19	6.4 21	4.6 15	7.3 24	8.5 28	4.6 15
250	10	5.8 19	6.4 21	4.6 15	7.3 24	9.5 31	4.6 15
300	12	7.0 23	6.4 21	4.6 15	9.1 30	10.1 33	4.6 15
350	14	7.0 23	6.4 21	4.6 15	9.1 30	10.1 33	4.6 15
400	16	8.2 27	6.4 21	4.6 15	10.7 35	10.1 33	4.6 15
450	18	8.2 27	6.4 21	4.6 15	10.7 35	10.1 33	4.6 15
500	20	9.1 30	6.4 21	4.6 15	11.9 39	10.1 33	4.6 15
600	24	9.8 32	6.4 21	4.6 15	12.8 42	10.1 33	4.6 15

1. Spacing corresponds to ASME B31.1 Power Piping Code.
 2. Spacing corresponds to ASME B31.9 Building Services Piping Code.
 3. Spacing corresponds to NFPA 13 Fire Sprinkler Systems

Flexible Systems

For coupling Styles including 1N, 1ZN. Standard grooved-type couplings allow angular, linear and rotational movement at each joint, to accommodate expansion, contraction, settling, vibration, noise and other piping system movement. These features provide advantages in designing piping systems but must be considered when determining hanger and support bracing and location.

Maximum Hanger Spacing

For straight runs without concentrated loads and where full linear movement is required.

Size	Average Hangers per Pipe Length Evenly Spaced									
	Pipe Length m Pipe Length Feet									
Nominal Dia.	2.1	3.0	3.7	4.6	6.1	6.7	7.6	9.1	10.7	12.2
DN Inches	7	10	12	15	20	22	25	30	35	40
20~25 3/4~1	1	2	2	2	3	3	4	4	5	6
32~50 1 1/4~2	1	2	2	2	3	3	4	4	5	5
65~100 2 1/2~4	1	1	2	2	2	2	3	4	4	4
125~200 5~8	1	1	1	2	2	2	3	3	3	3
250~300 10~12	1	1	1	2	2	2	3	3	3	3
350~400 14~16	1	1	1	2	2	2	3	3	3	3
450~600 18~24	1	1	1	2	2	2	3	3	3	3
700~1050 28~42	1	1	1	1	2	2	3	3	3	3

No pipe length should be left unsupported between any two couplings

Maximum Hanger Spacing

For straight runs without concentrated loads and where full linear movement is not required.

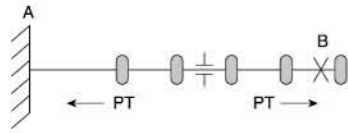
Pipe Size	Suggested Maximum Span Between Supports
Nominal Dia.	
DN Inches	M Feet
20~25 3/4~1	2.4 8
32~50 1 1/4~2	3.0 10
65~100 2 1/2~4	3.7 12
125~200 5~8	4.3 14
250~300 10~12	4.9 16
350~400 14~16	5.5 18
450~600 18~24	6.1 20
700~1050 28~42	6.4 21

Anchors

Rigid Coupling & Flexible Coupling

Anchors can be used to prevent movement due to pressure thrust. There are two types of anchors which are commonly used:

- A. Main anchors
- B. Intermed

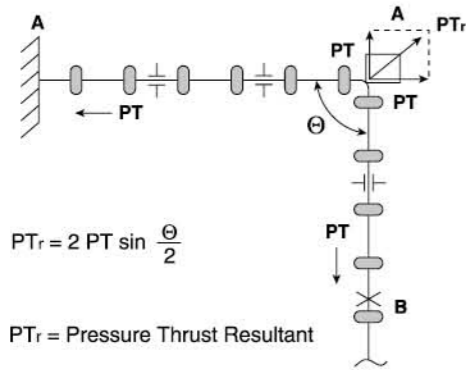


A. MAIN ANCHORS

Main anchors are installed at or near terminations and changes of direction of a pipe line. The forces acting on a main anchor will result from internal pressure thrust. These forces can generate substantial loads which may require structural analysis.

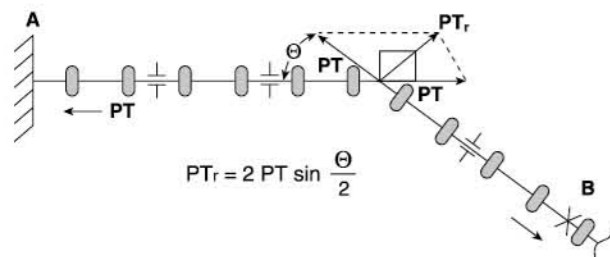
$$PT = \frac{\pi}{4} D^2 P$$

- PT = Pressure Thrust (Pounds)
- D = Outside Diameter of Pipe (Inches)
- P = Internal Pressure (PSI)



$$PTr = 2 PT \sin \frac{\theta}{2}$$

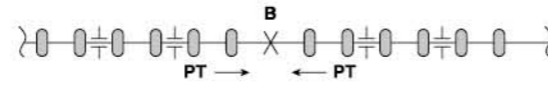
PTr = Pressure Thrust Resultant



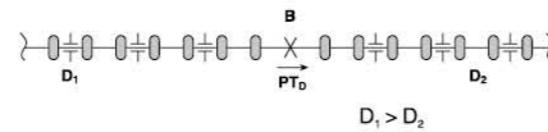
$$PTr = 2 PT \sin \frac{\theta}{2}$$

B. INTERMEDIATE ANCHORS

Intermediate anchors divide a long pipe run, with main anchors at each end, into individual expanding sections. The pressure thrust



Where there is a change in pipe diameter, there will be a differential pressure thrust acting on an intermediate anchor.



$$D_1 > D_2$$

The differential pressure thrust PTD is calculated by:

$$PTD = p \left(\frac{\pi D_1^2}{4} - \frac{\pi D_2^2}{4} \right)$$

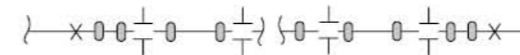
To keep pipe in alignment, guidance to prevent lateral movement or deflection at flexible coupling joints may be required. An alternative would be to use rigid couplings to keep joints from deflecting where not desired.

Pipe Support

The following are shown to call attention to the mechanical advantages of the grooved piping method; how they can be utilized to the piping systems designer's benefit. These are presented to stimulate thought and should not be considered as recommendations for a specific system. The Condor grooved piping method, when used in a piping system, should always be utilized in designs consistent with good piping practice. The design considerations for engineering and installing grooved piping systems covered elsewhere in this manual should always be referred to.

Thermal Expansion and/or Contraction

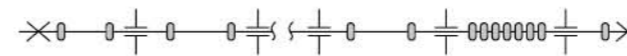
Movement in piping systems due to thermal changes can be accommodated with the grooved piping method. Sufficient flexible joints must be available to accommodate anticipated movement, including Movement Tolerance. If anticipated movement will be greater than provided by the total number of joints in the system, additional expansion must be provided. Rigid systems will necessitate use of expansion joints or flexible couplings at offsets where system movement is required.



Example 1

Example 1:

condition :120 M Long, straight piping system
 DN150(6",165.1)pipe ,Length 6m
 Maximum pipe end expansion of each coupling 3.2mm(1N-165flexible coupling)
 Lowest operating temperature 10°C
 The maximum operating temperature 43°C
 The known coefficient of thermal expansion of a steel pipe is 0.012mm/m°C
 So : Total length/Each tube length = 120/6 = 20Joints
 Total stretch 20 X 3.2 = 64mm
 Considering the safety factor, the pipeline can provide64 X 0.75 = 48mm stretch The total length of thermal expansion of the steel pipe is 120 X (43-10) X 0.012 = 47.5mm
 Therefore, the piping system can provide 48mm stretch and can withstand 33°C thermal expansion.

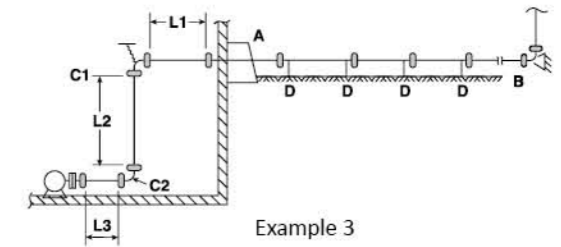


Example 2

Example 2:

Condition: 120 M Long, straight piping system
 DN150(6",165.1)pipe ,Length 6m
 Maximum pipe end expansion of each coupling 3.2mm(1N-165flexible coupling)
 Lowest operating temperature 15 °C ;The maximum operating temperature 80°C
 The known coefficient of thermal expansion of a steel pipe 0.012mm/m °C

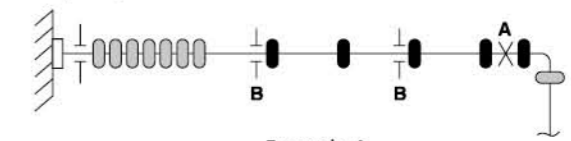
So: Total length/Each tube length = 120/6 = 20Joints
 Total stretch 20 X 3.2 = 64mm
 Considering the safety factor, the pipeline can provide64 X 0.75 = 48mm stretch
 The total length of thermal expansion of the steel pipe is 120 X (80-15) X 0.012 = 93.6mm
 Therefore, the pipe system can only provide 48mm of stretch , to be able to withstand 65OC thermal expansion. The expansion joint must be installed or a reasonable amount of extension should be made with multiple flex joints.



Example 3

Example 3:

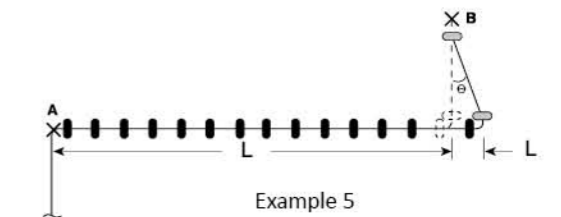
To properly restrain this system, it would be necessary to provide a pressure thrust anchor at "A" to prevent the piping outside being forced inside by the pressure thrust acting at the elbow "B." Inside, it would be necessary to provide a hanger at point C1, or a base support at point C2. Providing any expected pipe movements, no anchoring would be required and the self-restraining feature of the joints would hold the piping securely together. Outside, it would be necessary to ensure that the maximum end load of the joints was not exceeded due to thermal movement of the pipes. Intermediate anchors may be required. Pipe must be properly supported ("D") and guided. Where flexible couplings are not required, rigid couplings can reduce supports and offsets (except where thermal movement is anticipated).



Example 4

Example 4:

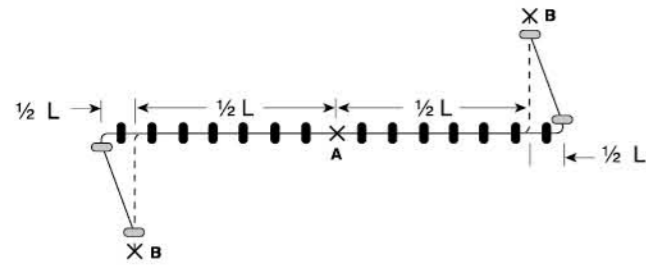
Anchor at "A" to prevent pressure thrust from moving expansion unit. Provide guides at points "B" to direct movement into expansion joint. See related section for pipe support suggestions.



Example 5

Example 5:

Anchor "A" at one end of the long run. A sufficiently long pipe between two flexible couplings, prior to a "fixed location" "B", may be used to accommodate the growth/contraction of the entire long run. Use rigid couplings on the long run to eliminate movement due to pressure thrust.



Example 6

Example 6:

Anchor "A" in the center of the long run. 1 / 2 of the movement will be directed towards each elbow. A sufficiently long pipe between two flexible couplings, prior to a "fixed location" "B", may be used to accommodate the growth/contraction of the long run. Use rigid couplings on the long run to eliminate movement due to pressure thrust.

Anchorage and Support of Vertical Pipes

Flexible System

Risers are commonly installed with anchors at the base and riser top with the piping in between guided at every other floor to prevent "snaking" of the line. Pre-gapping of the pipe ends will allow for thermal expansion up to the maximum published in our literature. Risers with branch connections should have intermediate anchors or offsets to prevent system movement at these locations which could cause shearing of components or branches.

Rigid System

Risers consisting entirely of rigid couplings can get treated similar to welded systems and, where thermal movement is required, expansion joints or offsets will be necessary to prevent system movement and damage to components. These systems are obviously most advantageous where rigidity is desired as in mechanical equipment rooms, at pump connections, etc.

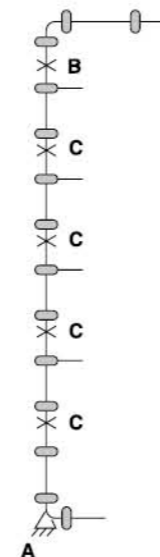
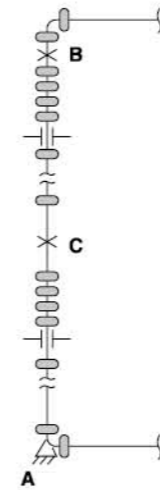
Combination System

By designing risers with the combination system, you can make use of the 1 X rigid couplings to reduce guiding requirements, and use a combination of flexible couplings to accommodate thermal movement as required.

1. Risers With Supplementary Thermal Compensators-When greater pipe movement is required, the movement at the joints can be supplemented by the use of combination of flexible couplings

A typical system is illustrated. Adequate guidance must be provided. This system will require pressure thrust anchors at "A" and "B" and also, dependent upon the length of the stack, intermediate anchors such as "C" to break up the pipe movement and carry some of the total weight if necessary. When using this method, it is necessary to consider that if pipes are stacked (i.e., end butted) then couplings joining pipes cannot accommodate expansion so that it may be necessary to consider hanging pipes from points "C" and "B." Also, consider movement so that shear forces are not added at any branches.

2. Treatment of Risers With Branch Connections—Free moving risers can cause shear forces at branch connections due to pressure thrusts and/or thermal movement. The pipe should be anchored at or near the base with a major pressure thrust anchor "A" capable of supporting the full pressure thrust and local weight of pipe and fluids. Any movement of horizontal pipe at the bottom of the riser must be considered independently with adequate provision for movement. When flexible couplings are used, the system can be anchored at the top "B" with an anchor capable of withstanding full pressure thrust at the top of the riser plus local weight of pipe. The use of this upper anchor prevents any possibility of closed joints opening under pressure and causing movement at the riser top.

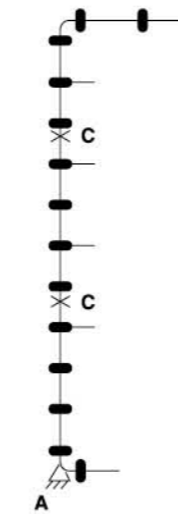


This method is often used for fire standpipe or similar systems where movement would cause shearing of intermediate components or branches.

Piping between upper "B" and lower "A" anchors should be supported by intermediate anchor ("C") capable of supporting local pipe weight and preventing lateral movement.

Intermediate clamps should be placed a minimum of every other pipe length. Proper gapping of pipe to allow adequate thermal movement should be considered depending on nature of movement expected. (Refer to Design Considerations.)

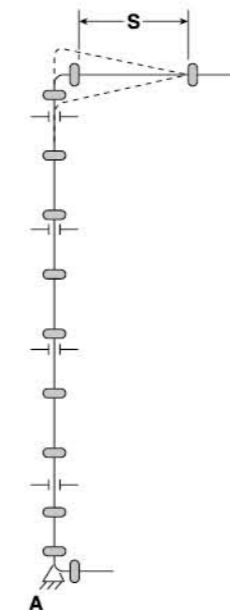
An alternative would be to use rigid couplings which would not allow "closed joints" to open. The system can be anchored at "A" also, and intermediate anchors at "C" can be used to support local pipe weight. Allowance for thermal movement should be considered depending on application.



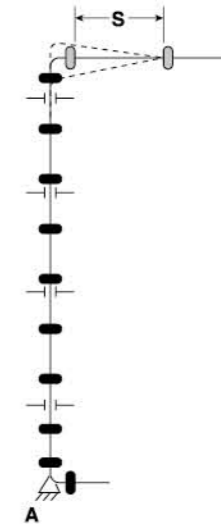
3. Treatment of Risers Without Branch Connections for Flexible Couplings

With this method, a major thrust anchor is again created at the bottom of the stack "A" supports the total weight of pipe and fluids.

Guidance is necessary at suitable intervals to prevent buckling of the riser.

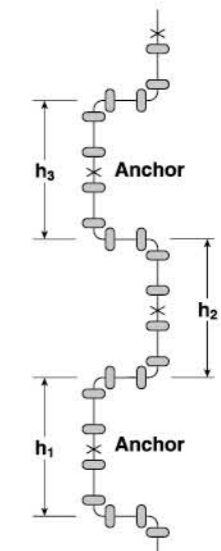


It is necessary that the pipe length "S" at the top of the stack be long enough to accommodate the total vertical movement. This movement is the result of the combined effect of pipe being moved to full extent of the available pipe end gaps due to pressure thrusts and thermal growth.



Rigid couplings also could be used to prevent opening of "closed joints." For offset "S" at the top of the stack to accommodate thermal growth, it would be necessary to use the required number of flexible couplings depending on the angular deflection.

4. Treatment of Risers To Eliminate Concentrated Anchor Loads



When structural requirements dictate that base anchor load or upper anchor loads must be minimized, then the use of a "looped" system (as shown) should be considered. In the system illustrated, each anchor carries the local weight of pipe. This method is often considered in tall buildings where high anchor loads would be generated. The offsets must be long enough to accommodate movement in the pipes due to flexible couplings opening up under pressure plus any thermal or other movements of pipes or supports. The use of rigid couplings could be considered to prevent joints from opening up and where thermal movement is anticipated, it should be accommodated with the use of flexible couplings or expansion joints.