

NEWASIA
ASIAJOINT

Grooved Joint & Pipe Fittings

Piping Manual



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Piping manual

Grooved Joint Piping Manual

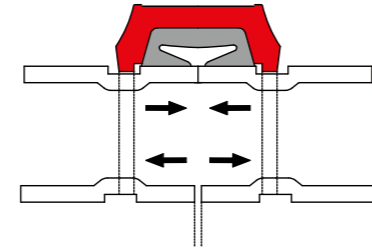
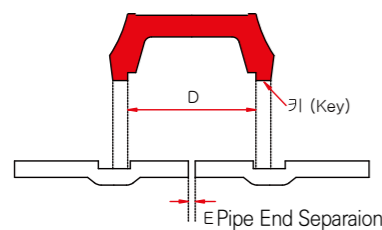
1. Flexible Joint

The flexible joint is structured to provide contraction, expansion, bending, and rotation when combined with the pipe. The joint cover's (key) contacts the groove of the pipe.

Even after tightening bolts and nuts, the (key) can move as much as the width of the groove of the pipe. As the key moves, a clearance(E) occurs between the grooved end and the grooved end of the pipe. Considering this(E), the characteristics of the flexible joint can be sufficiently utilized.

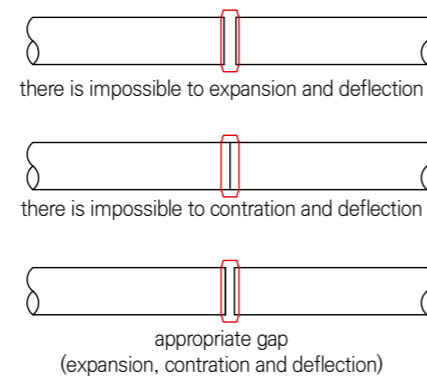
A. Contraction and Expansion

The contraction and expansion of the piping occur with axial force and temperature changes. The displacement of such a pipe may be absorbed in the joint portion by setting a clearance of the joint. The maximum allowable clearance varies for each specification of the joint. The allowable clearance (E) is described in the allowable clearance (E) dimension of the "NEWASIA" catalog, but since the dimension is a design value, it is desirable to reduce the allowable value in actual design and construction, also consider Length tolerances with pipe cutting.



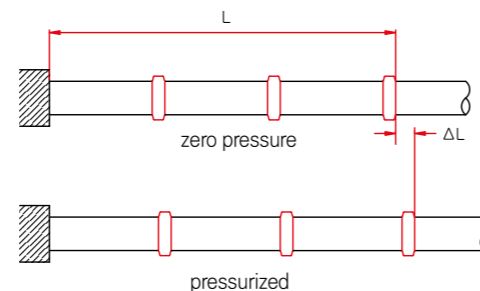
► Clearance (E) setting, effect of joint

The flexible joint is structured to provide contraction, expansion, bending, and rotation when combined with the pipe according to clearance value(E) setting. Therefore, in case of fixed pipe line. The clearance (E) of the pipe shall be considered so that all fluidity is sufficiently absorbed from the joint, if there is non-fixed pipe line, ensure that the joint installation point is not too heavy.



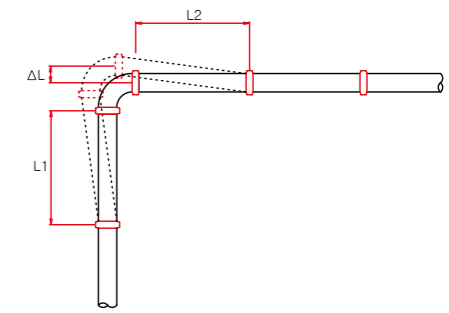
► The contraction and expansion according to pressure in pipe line.

As shown in the figure, when pressure is applied to the joint pipe line, the pipe expands by the allowable (E) clearance value of the joint connection and should not allow expansion of these pipes to affect the piping. also considering the length of contraction and expansion as the temperature of the piping changes.



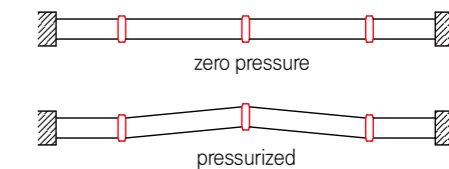
► The contraction and expansion of the pipeline at the change of direction

As shown in the figure, the pressure within the curved(elbow) pipe causes the pipe to move. Therefore, make sure that the fixation and support in the curved(elbow) portion are stable. If the expected movement of the pipe is outside the range of absorption at the joint connection, the X or Y point must be secured.



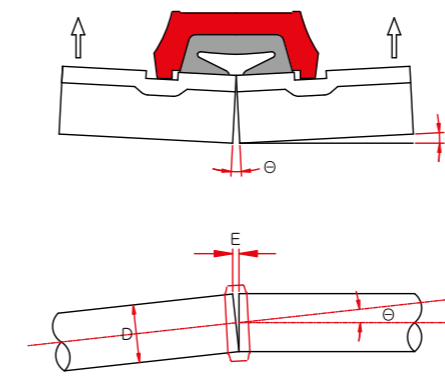
► The contraction and expansion of fixed pipeline at the installed joint

As shown in the figure, when both ends of the pipe are fixed, the joint connection is bent by the pressure in the pipe. The movement of the pipe only occurs enough to absorb at the joint connection and does not affect the piping system, and proper fixing and support should be made in consideration of whether the movement of the piping.



B. Bending and Eccentric

The flexible joint is designed to allow for a slight allowable bending angle. The allowable bending angle of the joint can be obtained by the following mathematical formula

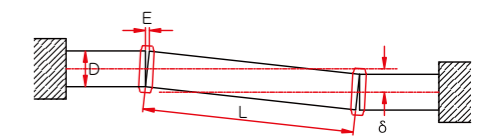


$\theta = \text{Tan}^{-1}E/O.D$
 θ =Maximum allowable bending angle
 G=Maximum allowable Clearance
 O,D=Pipe O,D

► Eccentric of piping

The eccentricity of the piping requires at least two joints. If each joint has the allowable angle, Eccentricity can be adjusted. The eccentricity is calculated according to the below formula,

$\delta = \theta \cdot XL/O,D$ 또는 $\delta = L \sin \theta$
 δ =eccentricity value L=pipe length θ =Allowable angle of joint O,D=Pipe O,D

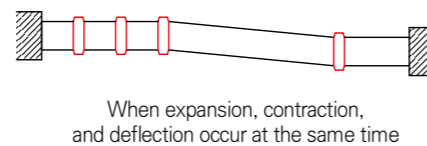
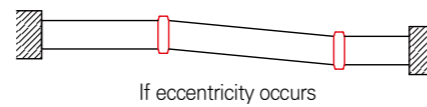


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Seismic allowable displacement angle				Seismic allowable displacement angle			
Nominal Size(A)	Allow Pipe End Separation(E)	Allowable angle of joint(θ)	Displacement per six meter(δ)	Nominal Size(A)	Allow Pipe End Separation(E)	Allowable angle of joint(θ)	Displacement per six meter(δ)
50	1,6 mm	1,52°	158,7	250	3,2 mm	0,68°	71,8
65	1,6 mm	1,20°	125,8	300	3,2 mm	0,58°	60,3
80	1,6 mm	1,03°	107,7	350	3,2 mm	0,52°	54
100	3,2 mm	1,60°	168	400	3,2 mm	0,45°	47,2
125	3,2 mm	1,31°	137,3	450	3,2 mm	0,40°	42
150	3,2 mm	1,11°	116,2	500	3,2 mm	0,36°	37,8
200	3,2 mm	0,85°	88,8	600	3,2 mm	0,30°	31,5

► When contraction, expansion, and eccentricity of piping occur simultaneously

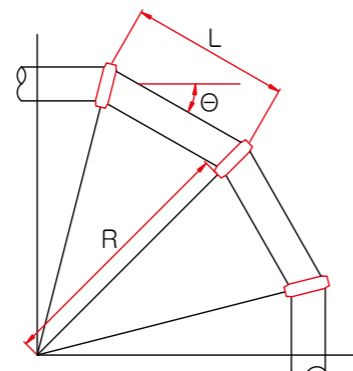
The flexible joint cannot simultaneously absorb the maximum allowable angle and the maximum allowable clearance. Therefore, if the pipes can be contraction, expansion, and eccentric simultaneously, the joint must be increased in quantity to allow each of these stresses to be shared by the joint connections.



► curved piping

Such as round stadiums and curved paths, is possible only through intuition without using the curved pipe using the allowable angle of the joint.

Therefore, if the bending and contraction of the joint is required, this action can only be absorbed effectively by installing the joint after an accurate calculation and taking into account sufficient free dimensions.



$$R=L/2\tan\theta / 2$$

R=radius of curvature L=pipe length θ =Allowable angle of joint

► The rotation of a pipeline

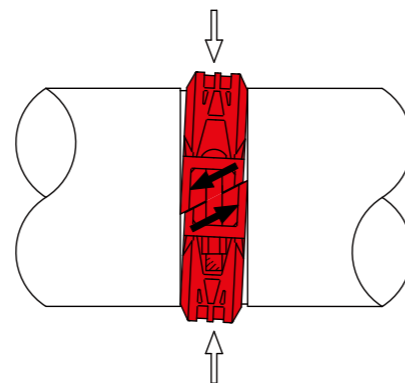
The flexible joint enables the pipe to rotate. It can be easily adjusted if the pipe needs to be rotated after installed the pipe. The part where the pipe continues to rotate shall be fixed.

2. Rigid Joint

The Rigid joint is designed with an angle pad on the joint cover to secure the pipe.

Joint cover(key) shifted by the force of the comb side holds both the inside and outside of the groove, enabling a fixed connection of the pipe. It should be used to minimize pipe movement, such as contraction, expansion, and bending.

Rigid joints must be properly taken to absorb excessive force.



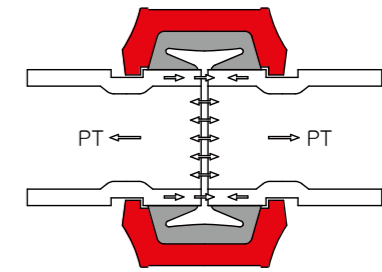
3. Pressure thrust or end load and temperature expansion of piping

► Pressure thrust or end load

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

The allowable force which a joint can sustain varies for different types of Joints, 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 Joints will sustain.



$$PT=\pi / 4 \times O.D^2 \times P$$

PT = Pressure thrust or end load
D = Outside diameter of pipe
p = Internal pressure

► Table for Pressure thrust or end load

Unit : Ton

size(A)	OD	Pressure kgf/cm ²								
		1	2	5	7.5	10	12.5	15	20	30
50	60,5	0,03	0,06	0,14	0,22	0,29	0,36	0,43	0,57	0,86
65	76,3	0,05	0,09	0,23	0,34	0,46	0,57	0,69	0,91	1,37
80	89,1	0,06	0,12	0,31	0,47	0,62	0,78	0,94	1,25	1,87
100	114,3	0,10	0,21	0,51	0,77	1,03	1,28	1,54	2,05	3,08
125	139,7	0,15	0,31	0,77	1,15	1,53	1,92	2,30	3,07	4,60
150	165,2	0,21	0,43	1,07	1,61	2,14	2,68	3,22	4,29	6,43
200	216,3	0,37	0,73	1,84	2,76	3,67	4,59	5,51	7,35	11,02
250	267,4	0,56	1,12	2,81	4,21	5,62	7,02	8,42	11,23	16,85
300	318,5	0,80	1,59	3,98	5,98	7,97	9,96	11,95	15,93	23,90
350	355,6	0,99	1,99	4,97	7,45	9,93	12,41	14,90	19,86	29,79
400	406,4	1,30	2,59	6,49	9,73	12,97	16,21	19,46	25,94	38,92
450	457,2	1,64	3,28	8,21	12,31	16,42	20,52	24,63	32,83	49,25
500	508,0	2,03	4,05	10,13	15,20	20,27	25,34	30,40	40,54	60,80
600	609,6	2,92	5,84	14,59	21,89	29,19	36,48	43,78	58,37	87,56

► Displacement due to temperature change of piping

Displacement of contraction and expansion occurs in the piping according to the temperature change.

Displacement due to these temperature changes can be absorbed by applying the flexible joint.

The displacement due to the temperature change of the piping can be calculated by the following formula

$$\lambda = L \times \alpha \times \Delta t$$

λ =The amount of extension of the pipe α =coefficient of linear expansion L=pipe length Δt=dt

* coefficient of linear expansion

carbon steel : 1,2 X 10⁻⁵

stainless steel : 1,7 X 10⁻⁵

► Table for the amount of expansion and contraction of piping according to the temperature change

Unit : Ton

temp (°C)	Pipe length(m)									
	1		3		6		9		12	
	C.S	STS	C.S	STS	C.S	STS	C.S	STS	C.S	STS
10	0.12	0.17	0.36	0.51	0.72	1.02	1.08	1.53	1.44	2.04
20	0.24	0.34	0.72	1.02	1.44	2.04	2.16	3.06	2.88	4.08
30	0.36	0.51	1.08	1.53	2.16	3.06	3.24	4.59	4.32	6.12
40	0.48	0.68	1.44	2.04	2.88	4.08	4.32	6.12	5.76	8.16
50	0.60	0.85	1.80	2.55	3.60	5.10	5.40	7.65	7.20	10.20
60	0.72	1.02	2.16	3.06	4.32	6.12	6.48	9.18	8.64	12.24
70	0.84	1.19	2.52	3.57	5.04	7.14	7.56	10.71	10.08	14.28
80	0.96	1.36	2.88	4.08	5.76	8.16	8.64	12.24	11.52	16.32
90	1.08	1.53	3.24	4.59	6.48	9.18	9.72	13.77	12.96	18.36
100	1.20	1.70	3.60	5.10	7.20	10.20	10.80	15.30	14.40	20.40

4. Pipe Support

Piping joined with grooved joint, 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.

► Pipe Support for rigid joint

Unit : Ton

type of pipeline	mat' l	size(A)	Suggested Maximum Span Between Supports
vertical pipeline	C.S STS		1 or more per floor
horizontal pipeline	C.S	20A or less	1.8m within
		25A~40A	2.0m within
		50A~80A	3.0m within
		100A~150A	4.0m within
		200A or more	5.0m within
	STS	20A or less	1.0m within
		25A~40A	1.5m within
		50A	2.0m within
		65A~100A	2.5m within
		125A or more	3.0m within

* The lower part of the vertical pipe shall be fixed with a support hanger or concrete support to prevent impact of the lower part due to the gross

► Pipe Support for flexible joint

Flexible grooved joint 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.

In the case of flexible joint piping, improper fixation and support may result in Snaking due to pressure in the piping.