FLEXIBLE TUBES

ASAHI METAL CO.,LTD.

THAILAND

INTRODUCTION.

Asahi Metal (ASM) has over double decades of experience in metal forming and machining and focuses on serving flexible hose and expansion joint with wide range of connecting joints and fittings for use in the Generator exhaust, boiler flue, automotive and general industries.

Our location in a suburb of Great Bangkok metropolis, where is the center of abundant industrial estates and general factories, benefits us to conveniently serve domestic and overseas markets. ASM facilities and extensive inventory of raw materials help to production in short lead time and reliable delivery. Every order is carefully handled and verified to meet the requirements and standards.

ASM also provides machining of precision components in a variety of materials including refractory insulation for molten aluminium for O.E.M. assembly and manufacturing plants.

Our skilled and experienced workforce sustains product's quality for either customized batch job or mass production quantity. ASM Quality policy ensures customer's satisfaction and leads the others in this field.

For years, ASM has been working along with our customers to meet their tight specifications and requirements. We have built quality and trust among our business partners and committed ourselves as a driven part of Thailand industry and economy.

ASAHI METAL CO.,LTD.

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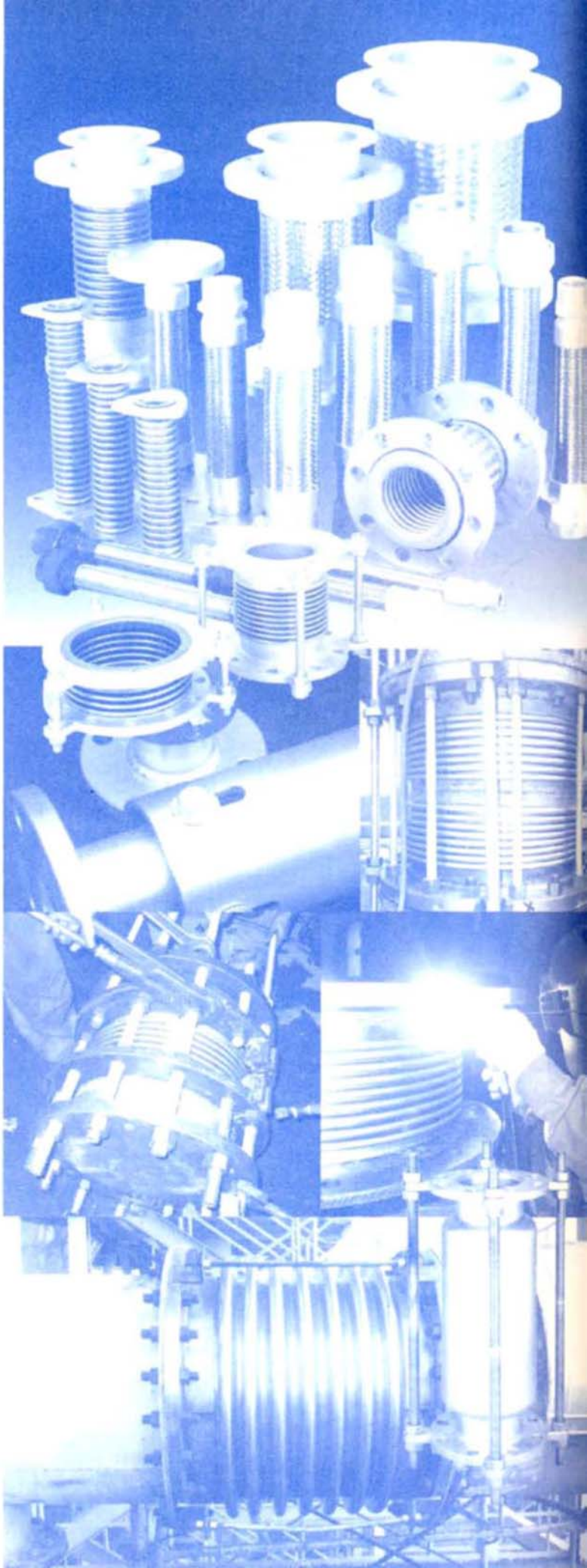
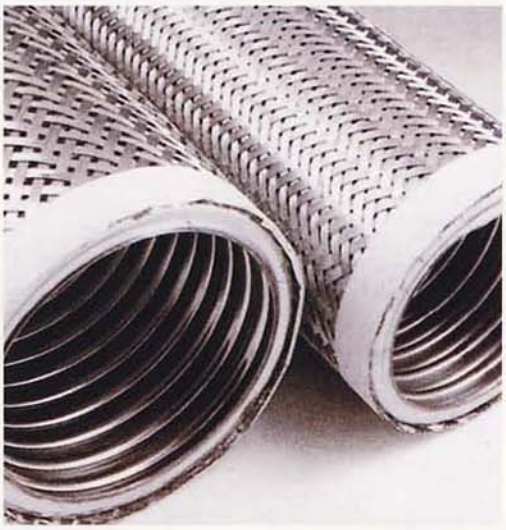
Website: www.asahi-metal. co.th



Flexible Bellows Controlling Movement

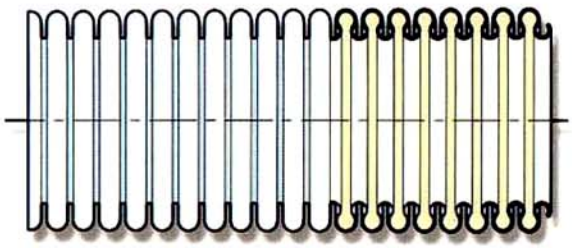
Flexible bellows perform a wide variety of engineering by controlling and absorbing movement in the board definition of pipe work. A bellows can accommodate lateral displacement, axial movement, or angular rotation, caused by internal or external forces.It will attenuate and decouple vibration, including noise, and can act as a pressure tight seal. It will perform these functions under wide variations of pressure and temperature and, with the use of selected materials, can handle almost any fluid. A prime characteristic of a flexible bellows is the high flexibility given by the use of the thin wall tubing, with deep omega shaped corrugations.The use of multiple plies gives a high pressure capability without loss of flexibility. Drawn or welded-seam tube is corrugated by combination of mechanical pressing and rolling or hydraulic forming; material range from stainless steel to exotic alloys.



FLEXIBLE TUBES

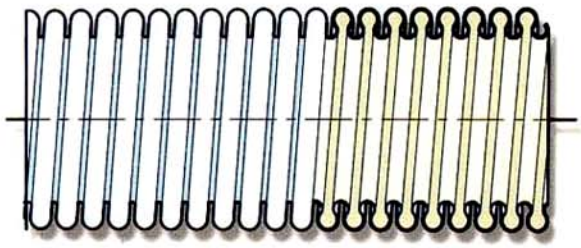
ASAHI METAL CO.,LTD.

OMAGA TYPE (OB)



These tubes are excllent in dynamic character and pressure proof. Its flexibility alters the physical image of a metalli tubes.

HELICAL TYPE (HB)



These tubes are pressure proof and flexible. It is suitable for general application and cal be offered in length.

(A) Size	TYPE	DIMENSION		BEND RADIUS (mm.)		WEIGHT (Kgf/m)		Max working Pressure at 20°C (kgf/cm^2)	BURST PRESSURE (kgf/cm^2) (WITH SINGLE WIRE BRAID)
		I.D.	O.D.	Constant Flexing	Static Bend	UNBRAIDED	WITH SINGLE BRAID		
8	HB 8	7.4	11	105	25	0.13	0.26	56	350
10	HB 10	10.4	15.2	105	25	0.18	0.36	56	350
15	HB 15	13.5	19.0	140	30	0.26	0.45	40	280
20	HB 20	19.0	25.5	170	35	0.32	0.57	36	200
25	HB 25	26.0	33.0	205	45	0.40	0.70	30	200
32	HB 32	32.5	41.0	260	50	0.60	0.95	22	140
40	HB 40	38.0	47.5	310	80	0.85	1.43	20	110
50	HB 50	50.5	61.5	360	105	1.25	2.05	11	60
65	OB 65	65.5	87.5	255	140	1.85	3.05	18	90
80	OB 80	79.5	101.5	250	200	1.91	3.11	12	65
100	OB 100	102.5	127.5	300	240	2.56	4.12	10	40
125	OB 125	129.5	154.5	350		3.78	5.78	11	45
150	OB 150	153.5	182.5	400		4.80	7.45	10	40
200	OB 200	201.5	232.3	600		7.2	15.17	10	40
250	OB 250	249.5	281.5	700		10.3	17.82	10	40
300	OB 300	300	336.5	900		14.13	23	12	50

Classification of Stainless Steel Flexible Hose

Size
10A-300A

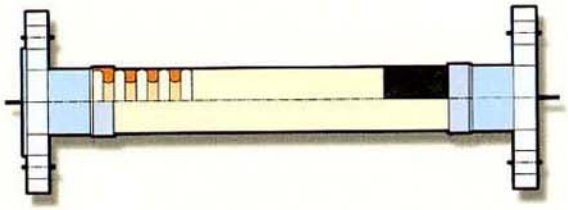
Materials of Connection
1. SS400,S25C,FCMB
2. SUS304
3. Make to order

Working pressure
1. 10 bars
2. 20 bars

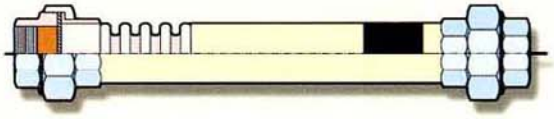
ASAHI METAL CO.,LTD.

Combination

1. Both Ends Flanges

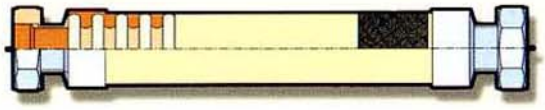


2. Both Ends Union

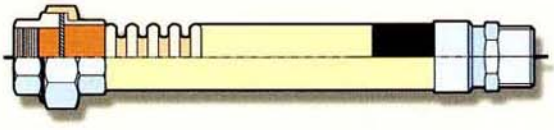


3. Both Ends Nipple

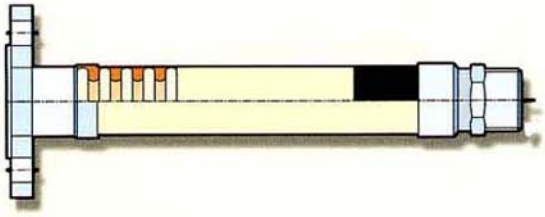
4. Both Ends Swivel Nut



5. One End Union + One End Nipple



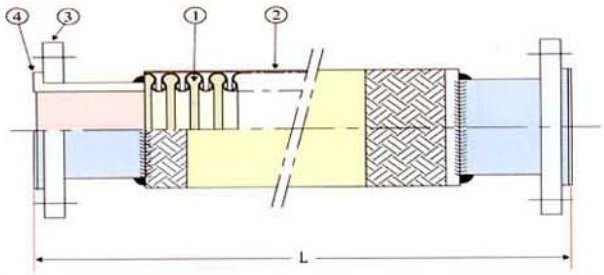
6. One End Flange + One End Nipple



TYPE OF FLEXIBLE TUBES AND ACCESSORY

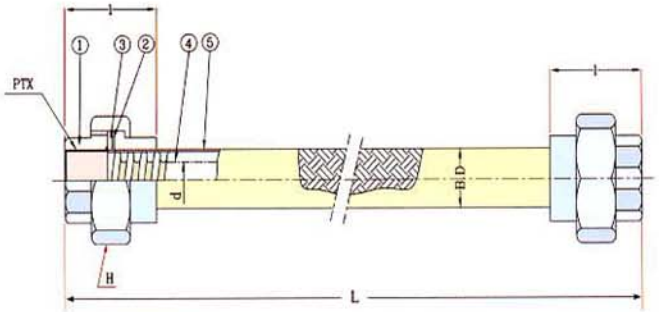
ASAHI METAL CO.,LTD.

FLANGE END
SIZE 15A - 300A



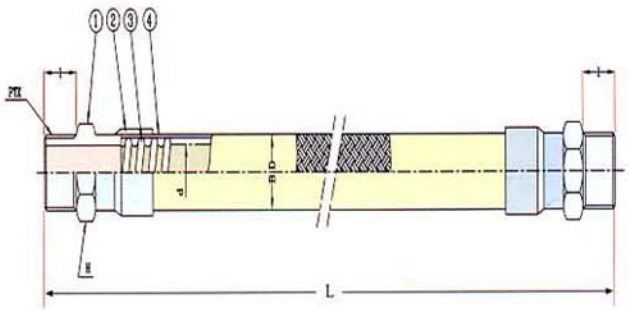
ITEM	PART	MATERIAL
1	TUBE	SUS304
2	BRAID	SUS304
3	FLANGE	SUS304,SS41
4	STUB ENDS	SUS304,SS41

UNION END
SIZE 15A~50A



ITEM	PART	MATERIAL
1	UNION	FCMB,SUS304,SS41
2	P - RING	SUS304
3	GASKET	CAF/CNAF/RUBBER
4	TUBE	SUS304
5	BRAID	SUS304

NIPPLE END
SIZE 15A~50A

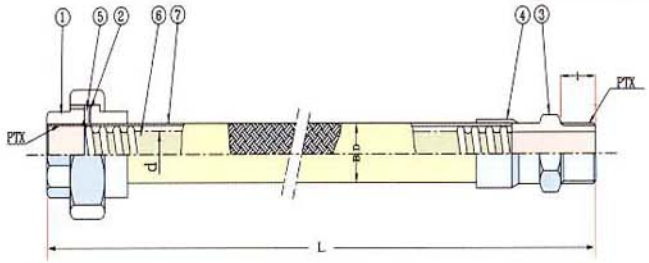


ITEM	PART	MATERIAL
1	NIPPLE	FCMB,SUS304,SS41
2	SLEEVE	SUS304
3	TUBES	SUS304
4	BRAID	SUS304

TYPE OF FLEXIBLE TUBES AND ACCESSORY

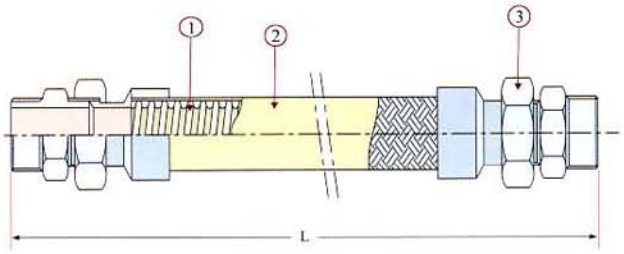
ASAHI METAL CO.,LTD.

UNION-NIPPLE
SIZE 15A~50A



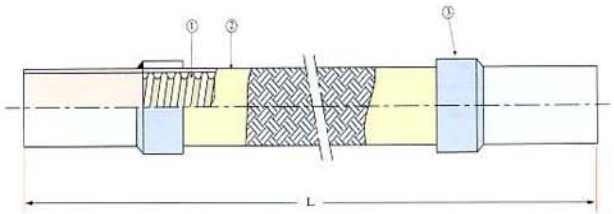
ITEM	PART	MATERIAL
1	UNION	FCMB,SUS304,SS41
2	P - RING	SUS304
3	NIPPLE JOINT	FCMB,SUS304,SS41
4	SLEEVE	SUS304
5	GASKET	CAF/CNAF/RUBBER
6	TUBE	SUS304
7	BRAID	SUS304

SWIVEL END
SIZE 15A~50A



ITEM	PART	MATERIAL
1	TUBE	SUS304
2	BRAID	SUS304
3	SWIVEL	SUS304,SS41

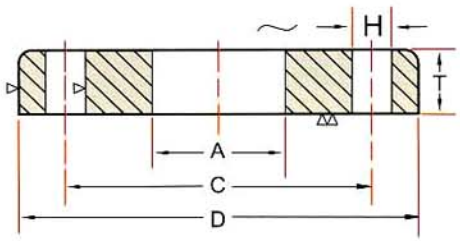
TUBE END
SIZE 15A~50A



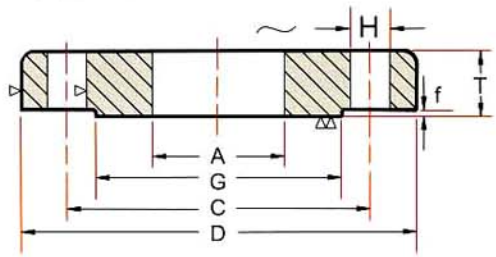
ITEM	PART	MATERIAL
1	TUBE	SUS304
2	BRAID	SUS304
3	TUBE	SUS304,SS41

PLATE FLANGES for JIS 5 kg /cm^2

Flat Face



Raised Face



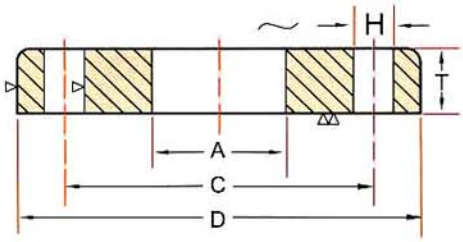
ASAHI METAL CO.,LTD.

JIS Standard B 2212

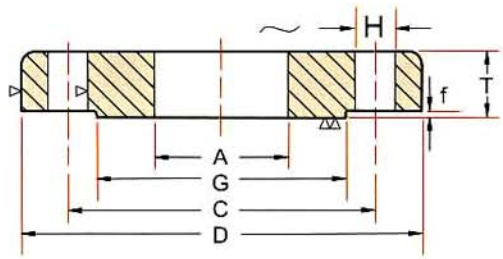
PIPE SIZE	I.D.	O.D.	THICK NESS	THICK of RS	O.D. of RF	BOLT CIRCLE	DRILLING		WEIGHT	
	A	D	T	f	G	C	H	N	Plate	Blind
3/8	18.0	75	9	1	42	55	12	4	0.27	0.29
½	22.5	80	9	1	48	60	12	4	0.3	0.33
¾	28.0	85	10	1	52	65	12	4	0.37	0.42
1	34.5	95	10	1	62	75	12	4	0.45	0.53
1 ¼	43.5	115	12	2	72	90	15	4	0.8	0.94
1 ½	50.0	120	12	2	78	95	15	4	0.83	1.1
2	61.5	130	14	2	88	105	15	4	1.1	1.5
2 ½	75.5	155	14	2	112	130	15	4	1.5	2.1
3	90.5	180	14	2	125	145	19	4	2.0	2.7
3 ½	103.0	190	14	2	135	155	19	4	2.2	3.1
4	116.0	200	16	2	145	165	19	8	2.4	3.8
5	142.0	235	16	2	180	200	19	8	3.3	5.3
6	167.0	265	18	2	210	230	19	8	4.5	7.5
7	192.0	300	18	2	235	260	23	8	5.6	9.8
8	218.0	320	20	2	255	280	23	8	6.4	12.2
9	244.0	345	20	2	280	305	23	12	8.5	15.9
10	270.0	385	22	2	320	345	23	12	9.0	19.0
12	320.0	430	22	3	365	390	23	12	10.7	24.7
14	358.0	480	24	3	405	435	25	12	15.0	37.0
16	409.0	540	24	3	465	495	25	16	18.0	43.0
18	459.0	605	24	3	525	555	25	16	23.0	54.0
20	510.0	655	24	3	575	605	25	20	26.0	63.0
22	561.0	720	26	3	630	655	27	20	32.0	82.0
24	612.0	770	26	3	680	715	27	20	35.0	95.0

PLATE FLANGES for JIS 10kg /cm²

Flat Face



Raised Face



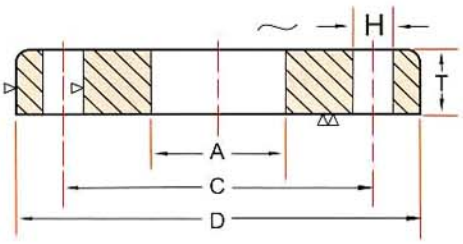
JIS Standard B 2212

ASAHI METAL CO.,LTD.

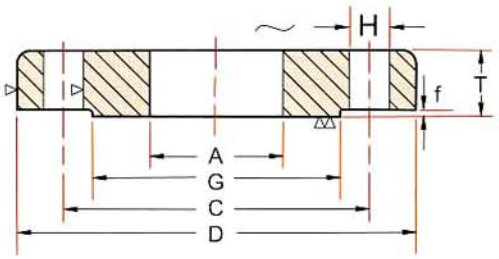
PIPE SIZE	I.D.	O.D.	THICK NESS	THICK of RS	O.D. of RF	BOLT CIRCLE	DRILLING		WEIGHT	
	A	D	T	f	G	C	H	N	Plate	Blind
3/8	18.0	90	12	1	48	65	15	4	0.52	0.55
½	22.5	95	12	1	52	70	15	4	0.57	0.61
¾	28.0	100	14	1	58	75	15	4	0.74	0.8
1	34.5	125	14	1	70	90	19	4	1.2	1.4
1 ¼	43.5	135	16	2	80	100	19	4	1.5	1.7
1 ½	50.0	140	16	2	85	105	19	4	1.6	1.9
2	61.5	155	16	2	100	120	19	4	1.9	2.3
2 ½	77.5	175	18	2	120	140	19	4	2.6	3.3
3	90.5	185	18	2	130	150	19	8	2.65	3.6
3 ½	103.0	195	18	2	140	160	19	8	2.8	4.0
4	116.0	210	18	2	155	175	19	8	3.2	4.7
5	142.0	250	20	2	185	210	23	8	4.9	7.4
6	167.0	280	22	2	215	240	23	8	6.3	10.1
7	192.0	305	22	2	240	265	23	12	7.3	12.3
8	220	330	22	2	265	290	23	12	8.6	15.0
9	244.0	350	22	2	285	310	23	12	10.5	19.3
10	270.0	400	24	2	325	355	25	12	11.0	22.0
12	320.0	445	24	3	370	400	25	16	12.0	27.0
14	358.0	490	26	3	415	445	25	16	17.5	35.5
16	409.0	560	28	3	475	510	27	16	25.0	58.0
18	459.0	620	30	3	530	565	27	20	33.0	70.0
20	510.0	675	30	3	585	620	27	20	36.0	84.0
22	561.0	745	32	3	640	680	33	20	49.0	110.0
24	612.0	795	32	3	690	730	33	24	52.0	125.0

PLATE FLANGES for JIS 20 kg /cm^2

Flat Face



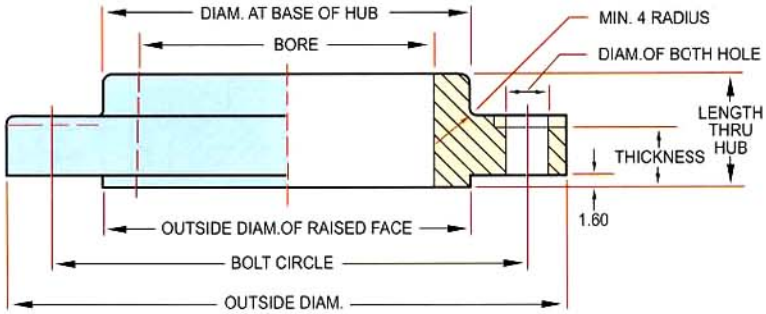
Raised Face



ASAHI METAL CO.,LTD.

PIPE SIZE	I.D. A	O.D. D	THICK NESS T	BOLT CIRCLE C	DRILLING	
					H	N
½	22.5	95	14	70	15	4
¾	28	100	16	75	15	4
1	34.50	125	16	90	19	4
1 ¼	43.50	135	18	100	19	4
1 ½	50	140	18	105	19	4
2	61.50	155	18	120	19	8
2 ½	77.50	175	20	140	19	8
3	90.50	200	22	160	23	8
4	115	225	24	185	23	8
5	142	270	26	225	25	8
6	167	305	28	260	25	12
8	218	350	30	305	25	12
10	270	430	34	380	27	12
12	320	480	36	430	27	16

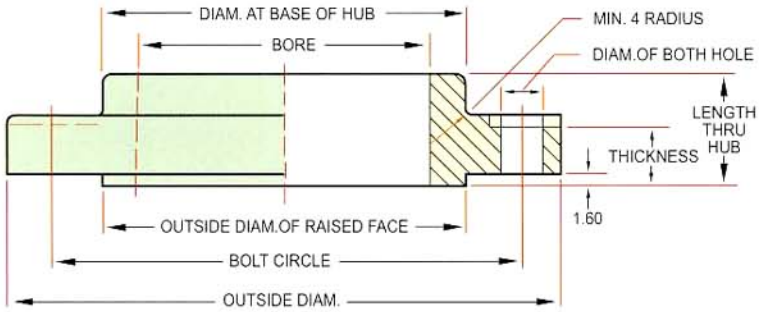
150 lbs SLIP ON FLANGE



ASAHI METAL CO.,LTD.

NOMINAL PIPE SIZE	OUTSIDE DIAM	THICK NESS (MIN)	O.D. OF RAISED FACE	DIAM AT BASE OF HUB	BORE	LENGTH THRU HUB	BOLT CIRCLE DIAM	NUNBER OF HOLES	DIAM OF HOLES	UNIT WEIGHT (APPROX)	PRICE (FOB)
½	88.9	11.11	34.92	30.16	22.35	15.87	60.32	4	15.87	10.16	
¾	98.42	12.7	42.86	38.1	27.68	15.87	69.85	4	15.87	15.24	
1	107.95	14.28	50.8	49.21	34.54	17.46	79.37	4	15.87	20.32	
1 ¼	117.47	15.87	63.5	58.73	43.18	20.63	88.9	4	15.87	25.4	
1 ½	127	17.46	73.02	65.08	49.53	22.22	98.42	4	15.87	33.02	
2	152.4	19.05	92.07	77.78	61.97	25.4	120.65	4	19.05	53.34	
2 ½	177.8	22.22	123.82	90.48	74.67	28.57	139.7	4	19.05	81.28	
3	190.5	23.81	127	107.95	90.67	30.16	152.4	4	19.05	99.06	
3 ½	215.9	23.81	139.7	122.23	103.37	31.75	177.8	8	19.05	124.46	
4	228.6	23.81	157.16	134.93	116.07	33.33	190.5	8	19.05	134.62	
5	254	23.81	185.73	163.51	143.76	36.51	215.9	8	22.22	157.48	
6	279.4	25.4	215.9	192.08	170.68	39.68	241.3	8	22.22	195.58	
8	342.9	28.57	269.87	246.06	221.48	44.45	298.4	8	22.22	317.5	
10	406.4	30.16	323.85	304.8	276.35	49.21	361.95	12	25.4	444.5	
12	482.6	31.71	381	365.12	327.15	55.56	431.8	12	25.4	695.96	
14	533.4	34.92	412.75	400.05	359.15	57.15	476.25	12	28.57	881.38	
16	596.9	36.51	469.9	457.2	410.46	63.5	539.75	16	28.57	1127.76	
18	635	39.68	533.4	504.82	461.77	68.26	577.85	16	31.75	1318.26	
20	698.5	42.86	584.2	558.8	513.08	73.02	635	20	31.75	1567.18	
22	749.3	46.03	641.35	615.95	564.38	79.37	692.15	20	34.92	2131.06	
24	812.8	47.62	692.15	663.57	615.95	82.55	749.3	20	34.92	2219.96	
26	869.95	50.8	742.95	723.9	666.75	85.72	806.45	24	34.92	2877.82	
28	927.1	52.38	793.75	781.05	717.55	87.31	863.6	28	34.92	3281.68	
30	984.25	53.98	857.25	831.85	768.35	88.9	914.4	28	34.92	3627.12	
32	1060.45	57.15	908.05	889	819.15	92.07	977.9	28	34.92	4549.14	
34	1111.25	58.73	958.85	939.8	869.95	93.66	1028.7	32	41.27	4838.7	
36	1168.4	60.32	1022.35	996.95	920.75	95.25	1085.85	32	41.27	5529.58	
42	1346.2	66.67	1193.8	1168.4	1073.15	101.6	1257.3	36	41.27	6680.2	

300 lbs SLIP ON FLANGE

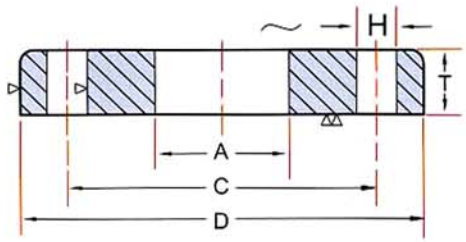


ASAHI METAL CO.,LTD.

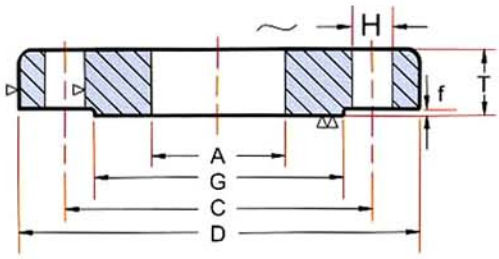
NOMINAL PIPE SIZE	OUTSIDE DIAM	THICK NESS (MIN)	O.D. OF RAISED FACE	DIAM AT BASE OF HUB	BORE	LENGTH THRU HUB	BOLT CIRCLE DIAM	NUNBER OF HOLES	DIAM OF HOLES	UNIT WEIGHT (APPROX)	PRICE (FOB)
½	95.25	14.28	34.92	38.1	22.35	22.22	66.67	4	15.87	15.24	
¼	117.47	15.87	42.86	47.62	27.68	25.4	82.55	4	19.05	27.94	
1	123.82	17.46	50.8	53.97	34.54	26.98	88.9	4	19.05	35.56	
1 ¼	133.35	19.05	63.5	63.5	43.18	26.98	98.42	4	19.05	43.18	
1 ½	155.57	20.63	73.02	69.85	49.53	30.16	114.3	4	22.22	63.5	
2	165.1	22.22	92.07	84.13	61.97	33.33	127	8	19.05	73.66	
2 ½	190.5	25.4	104.77	100.01	74.67	38.1	149.22	8	22.22	106.68	
3	209.55	28.5	127	117.47	90.67	42.86	168.27	8	22.22	149.86	
3 ½	228.6	30.16	139.7	133.35	103.37	44.45	184.15	8	22.22	187.96	
4	254	31.75	157.16	146.05	116.07	47.62	200.02	8	22.22	246.38	
5	279.4	34.92	185.73	177.8	143.76	50.8	234.95	8	22.22	312.42	
6	317.5	36.51	215.9	206.37	170.68	52.38	269.87	12	22.22	403.86	
8	381.	41.27	269.87	260.35	221.48	61.91	330.2	12	25.4	627.38	
10	444.5	47.62	323.85	320.67	276.35	66.67	387.35	16	28.57	906.78	
12	520.7	50.8	381	374.65	327.15	73.02	450.85	16	31.75	1310.64	
14	584.2	53.97	412.75	425.45	359.15	76.2	514.35	20	31.75	1772.92	
16	647.7	57.15	469.9	482.6	410.46	82.55	571.5	20	34.92	2225.04	
18	711.2	60.32	533.4	533.4	461.77	88.9	628.65	24	34.92	2760.98	
20	774.7	63.5	584.2	587.37	513.08	95.25	685.8	24	34.92	3416.3	
22	838.2	66.67	641.35	641.35	564.38	101.6	742.95	24	41.27	4262.12	
24	914.4	69.85	692.15	701.67	615.95	106.36	812.8	24	41.27	5156.2	
26	971.55	79.37	863.6	715.96	666.75	184.15	876.3	28	44.45	6565.9	
28	1035.05	85.72	800.1	774.7	717.55	196.85	939.8	28	44.45	8293.1	
30	1092.2	92.07	857.25	827.08	768.35	209.55	996.95	28	47.62	9331.96	
32	1149.35	98.42	914.4	881.06	819.15	222.25	1054.1	28	50.8	10253.98	
34	1206.5	101.6	965.2	936.62	869.95	231.77	1104.9	28	50.8	12420.6	
36	1270	104.77	1022.35	990.6	920.75	241.3	1168.4	32	53.97	13825.22	

FLANGE DIN PN 10

Flat Face



Raised Face



Flange Serie PN 10 . UNI 2281 . DIN 2632

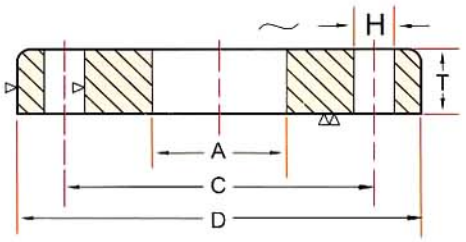
Flange Serie PN10 UNI 6092 DIN 2527

ASAHI METAL CO.,LTD.

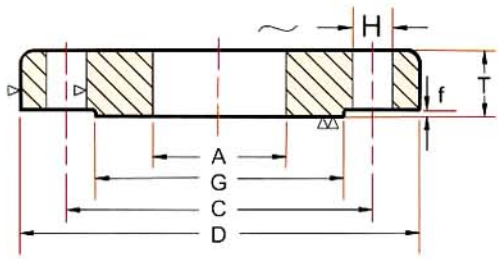
PIPE SIZE	I.D. A	O.D. D	THICK NESS T	THICK of RS f	O.D. of RF G	BOLT CIRCLE C	DRILLING		WEIGHT	
							H	N	Plate	Blind
10	17.8	90	14	2	40	60	14	4	0.63	0.65
15	22.2	95	14	2	45	65	14	4	0.71	0.73
20	27.7	105	16	2	58	75	14	4	1.01	1.03
25	34.5	115	16	2	68	85	14	4	1.22	1.23
32	43.2	140	16	2	78	100	18	4	1.80	1.80
40	49.1	150	16	3	88	110	18	4	2.08	2.09
50	61.1	165	18	3	102	125	18	4	2.78	2.87
65	77.1	185	18	3	122	145	18	4	3.40	3.65
80	90.0	200	20	3	138	160	18	8	4.20	4.81
100	115.4	220	20	3	158	180	18	8	4.75	5.85
125	141.2	250	22	3	188	210	18	8	6.45	8.12
150	166.6	285	22	3	212	240	22	8	8.0	10.5
200	218.0	340	24	3	268	295	22	8	11.4	16.5
250	269.5	395	26	3	320	350	22	12	15.2	24.1
300	321.0	445	26	4	370	400	22	12	18.0	30.8
350	358.1	505	26	4	430	460	22	16	22.5	39.6
400	409	565	26	4	482	515	25	16	27.8	49.6
450	460	615	26	4	532	565	25	20	32.3	58.6
500	511	670	28	4	585	620	25	20	40.4	75.3
600	613	780	28	5	685	725	30	20	50.0	-
700	715	895	30	5	800	840	30	24	66.4	-
800	817	1015	32	5	905	950	33	24	89.3	-
900	919	1115	34	5	1005	1050	33	28	104	-
1000	1021	1230	34	5	1110	1160	36	28	121	-

FLANGE DIN PN 16

Flat Face



Raised Face



Flange Serie PN 16 . UNI 2281 . DIN 2633

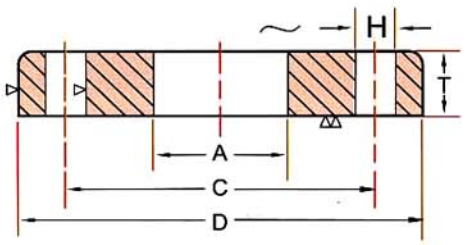
Flange Serie PN16 UNI 6032 DIN 2527

ASAHI METAL CO.,LTD.

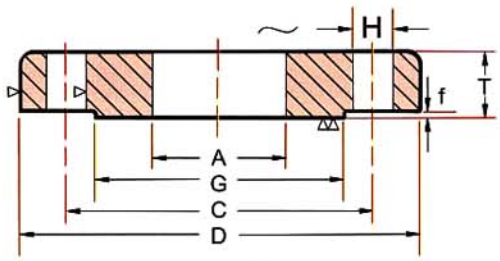
PIPE SIZE	I.D.	O.D.	THICK NESS	THICK of RS	O.D. of RF	BOLT CIRCLE	DRILLING		WEIGHT	
	A	D	T	f	G	C	H	N	Plate	Blind
10	17.8	90	14	2	40	60	4	14	0.63	0.65
15	22.2	95	14	2	45	65	4	14	0.71	0.73
20	27.7	105	16	2	58	75	4	14	1.01	1.03
25	34.5	115	16	2	68	85	4	14	1.22	1.23
32	43.2	140	16	2	78	100	4	18	1.80	1.80
40	49.1	150	16	3	88	110	4	18	2.08	2.09
50	61.1	165	18	3	102	125	4	18	2.78	2.87
65	77.1	185	18	3	122	145	4	18	3.40	3.65
80	90.0	200	20	3	138	160	8	18	4.20	4.61
100	115.4	220	20	3	158	180	8	18	4.75	5.65
125	141.2	250	22	3	188	210	8	18	6.45	8.12
150	166.6	285	22	3	212	240	8	22	8.0	10.5
200	218.0	340	24	3	268	295	12	22	11.1	16.2
250	269.5	405	26	3	320	355	12	25	16.3	25.1
300	321.0	460	28	4	378	410	12	25	21.8	35.2
350	358.1	520	30	4	438	470	16	25	29.2	48.2
400	409	580	32	4	490	525	16	30	37.0	63.5
450	460	640	32	4	550	585	20	30	45.4	77.2
500	511	715	34	4	610	650	20	33	61.1	102
600	613	840	36	5	725	770	20	36	84.6	-
700	715	910	36	5	795	840	24	36	87.4	-
800	817	1025	38	5	900	950	24	39	109	-
900	919	1125	40	5	1000	1050	28	39	129	-
1000	1021	1255	42	5	1115	1170	28	42	175	-

FLANGE DIN PN 40

Flat Face



Raised Face



Flange Serie PN 40 . UNI 2284 . DIN 2635

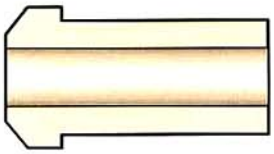
Flange Serie PN 40 UNI 6095 DIN 2527

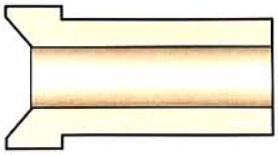
ASAHI METAL CO.,LTD.

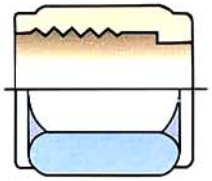
PIPE SIZE	I.D. A	O.D. D	THICK NESS T	THICK of RS f	O.D. of RF G	BOLT CIRCLE C	DRILLING		WEIGHT	
							H	N	Plate	Blind
10	17.8	90	16	2	40	60	14	4	0.72	0.74
15	22.2	95	16	2	45	65	14	4	0.81	0.83
20	27.7	105	18	2	58	75	14	4	1.14	1.15
25	34.5	115	18	2	68	85	14	4	1.38	1.38
32	43.2	140	18	2	78	100	18	4	2.01	2.03
40	49.1	150	18	3	88	110	18	4	2.33	2.35
50	61.1	165	20	3	102	125	18	4	3.08	3.20
65	77.1	185	22	3	122	145	18	8	3.95	4.29
80	90.0	200	24	3	138	160	18	8	4.98	5.53
100	115.4	235	24	3	162	190	22	8	6.70	7.59
125	141.2	270	26	3	188	220	25	8	9.20	10.8
150	166.6	300	28	3	218	250	25	8	12.0	14.7
200	218.0	375	34	3	285	320	30	12	20.8	27.2
250	269.5	450	38	3	345	385	33	12	33.8	44.4
300	321.0	515	42	4	410	450	33	16	47.4	64.2
350	358.1	580	46	4	465	510	36	16	65.0	89.5
400	409	660	50	4	535	585	39	16	81.6	127
450	460	685	50	4	560	610	39	20	91.6	141
500	511	755	52	4	615	670	42	20	117	172

Flare (Female Swivel) JIC NUT

ASAHI METAL CO.,LTD.

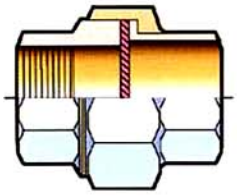


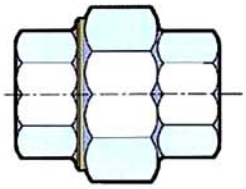




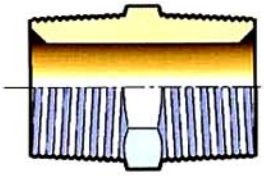
PART NO.	TH	THERAD
		JIC UNF
HN - 04	1/4"	7/16" - 20
HN - 05	5/6"	1/2" - 20
HN - 06	3/8"	9/16" - 18
HN - 08	1/2"	3/4" - 16
HN - 10	5/8"	7/8" - 14
HN - 12	3/4"	1-1/16" - 12
HN - 16	1"	1-5/16" - 12
HN - 20	1-1/4"	1-5/8" - 12
HN - 24	1-1/2"	1-7/8" - 12
HN - 30	2"	2-1/4" - 12
HN - 32	2"	2-1/2" - 12

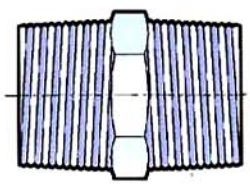
UNION





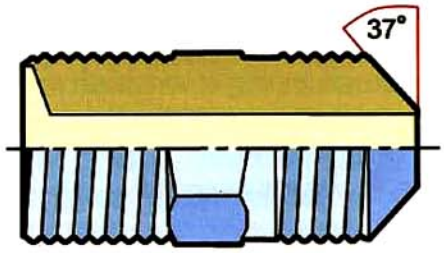
NIPPLE





SIZE	THREADS	THREADS
	BSPT	NPT
¼	19	18
⅜	19	18
½	14	14
¾	14	14
1	11	11½
1¼	11	11½
1½	11	11½
2	11	11½
2½	11	8
3	11	8
4	11	8

MALE ADAPTER
JIC 37°



ASAHI METAL CO.,LTD.

PART NO.	PT * TH	THREAD PT	THREAD JIC : UNF
PH – 0404 – S	1/4 * 1/4	1/4 – 19	7/16" – 20
PH – 0405 – S	1/4 * 5/16	1/4 – 19	1/2" – 20
PH – 0406 – S	1/4 * 3/8	1/4 – 19	9/16" – 18
PH – 0408 – S	1/4 * 1/2	1/4 – 19	3/4" – 16
PH – 0604 – S	3/8 * 1/4	3/8 – 19	7/6" – 20
PH – 0605 – S	3/8 * 5/16	3/8 – 19	1/2" – 20
PH – 0606 – S	3/8 * 3/8	3/8 – 19	9/16" – 18
PH – 0608 – S	3/8 * 1/2	3/8 – 19	3/4" – 16
PH – 0610 – S	3/8 * 5/8	3/8 – 19	7/8" – 14
PH – 0612 – S	3/8 * 3/4	3/8 – 19	1-1/16" – 12
PH – 0804 – S	1/2 * 1/4	1/2 – 14	7/16" – 20
PH – 0806 – S	1/2 * 3/8	1/2 – 14	9/16" – 18
PH – 0808 – S	1/2 * 1/2	1/2 – 14	3/4" – 16
PH – 0810 – S	1/2 * 5/8	1/2 – 14	7/8" – 14
PH – 0812 – S	1/2 * 3/4	1/2 – 14	1-1/16" – 12
PH – 0816 – S	1/2 * 1"	1/2 – 14	1-5/16" – 12
PH – 1206 – S	3/4 * 3/8	3/4 – 14	9/16" – 18
PH – 1208 – S	3/4 * 3/12	3/4 – 14	3/4" – 16
PH – 1210 – S	3/4 * 5/8	3/4 – 14	7/8" – 14
PH – 1212 – S	3/4 * 3/4	3/4 – 14	1-1/16" – 12
PH – 1216 – S	3/4 * 1"	3/4" – 14	1-5/16" – 12
PH – 1220 – S	3/4 * 1-1/4"	3/4" – 14	1-5/8" – 12
PH – 1608 – S	1" * 12	1" – 11	3/4" – 16
PH – 1610 – S	1" * 5/8	1" – 11	7/8" – 14
PH – 1612 – S	1" * 3/4	1" – 11	1-1/16" – 12
PH – 1616 – S	1" * 1"	1" – 11	1-5/16" – 12
PH – 1620 – S	1" * 1-1/4"	1" – 11	1-5/8" – 12
PH – 1624 – S	1" * 1-1/2"	1" – 11	1-7/8" – 12
PH – 2012 – S	1-1/4" * 3/4	1-1/4" – 11	1-1/16" – 12
PH – 2016 – S	1-1/4" * 1"	1-1/4" – 11	1-5/16" – 12
PH – 2020 – S	1-1/4" * 1-1/4"	1-1/4" – 11	1-5/8" – 12
PH – 2024 – S	1-1/4" * 1-1/2"	1-1/4" – 11	1-7/8" – 12
PH – 2030 – S	1-1/4" * 2"	1-1/4" – 11	2-1/4" – 12
PH – 2032 – S	1-1/4" * 2"	1-1/4" – 11	2-1/2" – 12
PH – 2416 – S	1-1/2" * 1"	1-1/2" – 11	1-5/16" – 12
PH – 2420 – S	1-1/2" * 1-1/4"	1-1/2" – 11	1-5/8" – 12
PH – 2424 – S	1-1/2" * 1-1/2"	1-1/2" – 11	1-7/8" – 12
PH – 2430 – S	1-1/2" * 2"	1-1/2" – 11	2-1/4" – 12
PH – 2432 – S	1-1/2" * 2"	1-1/2" – 11	2-1/2" – 12
PH – 3224 – S	2" * 1 -1/2"	2" – 11	1-7/8" – 12
PH – 3230 – S	2" * 2"	2" – 11	2-1/4" – 12
PH – 3232 – S	2" * 2"	2" – 11	2-1/2" – 12

Chemical resistance

ASAHI METAL CO.,LTD.

0 = resistant to general corrosion
1 = slight susceptibility to general corrosion
2 = low resistance to general corrosion
3 = no resistance to general corrosion
L = risk of pitting, crevice corrosion or stress-corrosion cracing

Corrosive agent	concentration	304	316
Acetic acid	10%	0	0
Acetic acid	10%	0	0
Acetic acid	50%	0	0
Acetic acid	50%	1	0
Acetic acid with hydrogen peroxide	10%and50%	0	0
Acetic acid with hydrogen peroxide	10%and50%	0	0
Acetic acid with hydrogen peroxide	10%and50%	0	0
Acetic anhydride		0	0
Acetic anhydride		0	0
Acetochloride		1L	0L
Acetone	all concentrations	0	0
Acetone	all concentrations	0	0
Acetosalicylic acid		0	0
Activin			
Alcoho			
Alum			
Aluminium		3	3
Aluminium acetate		0	0
Aluminium acetate		0	0
Aluminium ammonium sulphate	all concentrations	0	0
Aluminium ammonium sulphate		3	2
Aluminium chloride	5%	2L	1L
Aluminium chloride	25%	3L	2L
Aluminium nitrate		0	0
Aluminium sulphate	10%	0	0
Aluminium sulphate	10%	1	0
Aluminium sulphate		1	0
Aluminium sulphate		2	1
Ammonia		0	0
Ammonium alum			
Ammonium bicarbonate		0	0
Ammonium bifluoride	all concentrations	0	0
Ammonium caborbonate		0	0
Ammonium caborbonate		0	0
Ammonium chloride (sal ammoniac)		0L	0L
Ammonium chloride (sal ammoniac)	10%	1L	1L
Ammonium chloride (sal ammoniac)	25%	2L	1L
Ammonium chloride (sal ammoniac)	50%	0L	0L
Ammonium chloride (sal ammoniac)		2L	1L
Ammonium chloride (sal ammoniac)		3L	3L
Ammonium hexachlorostannare (pink salt)		1L	0L
Ammonium hexachlorostannare (pink salt)		3L	3L
Ammonium hydroxide	all concentration	0	0
Ammonium nitrate		0	0
Ammonium nitrate		0	0
Ammonium oxalate		0	0
Ammonium oxalate		0	0
Ammonium perchlorate	10%	0	0
Ammonium perchlorate		0	0
Ammonium sulphate		0	0
Ammonium sulphate		1	1
Ammonium sulphate	with 5%sulphuric acid	1	1
Ammonium sulphite		0	0
Ammonium sulphite		0	0
Aniline		0	0
Aniline hydrochloride	5%	3L	3L
Antichlor			
Antimony		3	3
Antimony chloride		3L	3L

Corrosive agent	concentration	304	316
Aqua regia		3	3
Aqueous ammonia			
Arsenic acid	all concentration	0	0
Aspirin			
Atmosphere [1])		0	0
Barium chloride		3	3
Barium chloride		0L	0L
Barium chloride		1L	0L
Barium hydroxide		0	0
Barium hydroxide		0	0
Barium nitrate	all concentration	0	0
Beer [2])		0	0
Benzoic acid	all concentration	0	0
Benzole		0	0
Bleach liquor			
Bleach solution			
Bleaching lye			
Blood [3])		0L	0
Bonder's solution			
Borax			
Boric acid	all concentration	0	0
Boric acid	all concentration	0	0
Brandy [1])		0	0
Bromine		3L	3L
Bromine water	0.03%	0L	0L
Bromine water	0.3%	1L	1L
Bromine water	1%	3L	3L
Buttermilk		0	0
Butyric acid	100%	0	0
Butyric acid	100%	1	0
Cadmium		2	2
Calcium bisulphite [2]) (sulphite lye)		0	0
Calcium bisulphite (sulphite lye)		2	0
Calcium bisulphite (sulphite lye)		3	0
Calcium chloride		0L	0L
Calcium chloride		1L	1L
Calcium hydroxide (slaked lime)		0	0
Calcium hydroxide (slaked lime)		0	0
Calcium hypochloriste		2L	1L
Calcium sulphate		0	0
Calcium sulphite		0	0
Camphor		0	0
Carbolic acid			
Carbon dioxide (carbonic acid)		0	0
Carbon dioxide (carbonic acid)		0	0
Carbon disulphide		0	0
Carbon tetrachloride [3])		0	0
Carbon tetrachloride [3])		0	0
Carnallite			
Carnallite		1L	1L
Caustic potash solution			
Caustic soda solution			
Cheese		0	0
Chloramine-T			
Chloric acid	concentrated	3L	3L
Chlorinnated lime		0	0
Chlorinnated lime		1L	1L
Chlorinnated lime (bleach solution)	2.5g Cl/l	1L	0L
Chlorine (damp gas)		3L	3L

Chemical resistance

ASAHI METAL CO.,LTD.

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Corrosive agent	concentration	304	316
Chlorine (damp gas)		3L	3L
Chlorine (dry gas)		0	0
Chlorine water		1L	1L
Chloroacetic acid			
Chlorobenzene [1])		0	0
Chlorobenzene [1])		0	0
Chloroform [1])		0	0
Chlorosulphonic aicd	10%	3L	3L
Chlorosulphonic aicd	100%	0L	0L
Chocolate		0	0
Chrome alum			
Chrome sulphate		0	0
Chromic acid	10% pure,freeof SO_3	0	0
Chromic acid	10% pure,freeof SO_3	1	1
Chromic acid	50% pure,freeof SO_3	1	1
Chromic acid	50% pure,freeof SO_3	2	2
Chromic acid		1	1
Chromic acid	50%trch.,containing SO_3	3	3
Cider	50%trch.,containing SO_3	0	0
Citric acid	1%	0	0
Citric acid	1%	0	0
Citric acid	10%	0	0
Citric acid	10%	0	0
Citric acid	25%	0	0
Citric acid	25%	2	0
Citric acid	50%	0	0
Citric acid	50%	2	1
Citric acid	5%	1	0
Coffee		0	0
Copper acetate		0	0
Copper acetate		0	0
Copper carbonate	all concentrations	0	0
Copper chloride		3L	3L
Copper cyanide		0	0
Copper nitrate	50%	0	0
Copper nitrate	50%	0	0
Copper sulphate	all concentrations	0	0
Copper sulphate (blue vitriol+3% H_2SO_4)		0	0
Copper sulphate (blue vitriol+3% H2SO4)		2	2
Creosote		0	0
Creosote		0	0
Cresol		0	0
Crude oil		0	0
Developer			
Dichloroethane [1])		0	0
Dichloroethylene[1])		0	0
Disulphur dichloride[1])		0	0
Disulphur dichloride[1])		0	0
Dripping		0	0
Dye bath (alkaline or neutral)		0	0
Dye bath (organic acid)		0	0
Dye bath (organic acid)		0	0
Dye bath (strong sulphuric acid or organic + strong sulphuric acid)(H_2SO_4 more than 1%)		1	0
Dye bath (strong sulphuric acid or organic + strong sulphuric acid)(H_2SO_4 more than 1%)		1	1
Dye bath (weak sulphuric acid or organic + sulphuric acid)(H_2SO_4 less more than 1%)		0	0
Dye bath (weak sulphuric acid or organic + sulphuric acid)(H_2SO_4 less more than 1%)		1	0
Epsom salts			
Ethyl chloride [1])		0	0
Ethyl ether		0	0
Ethyl glycol		0	0

Corrosive agent	concentration	304	316
Ethylalcohol (spirit)	all concentrations	0	0
Ethylene chloride			
Fatty acid (oleic acid) + traces of H_2SO_4		2	1
Fatty acid (oleic acid)	technical	0	0
Fatty acid (oleic acid)	technical	1	0
Fatty acid (oleic acid)	technical	1	0
Fatty acid (oleic acid)	technical	2	0
Ferric chloride	30%	3L	2L
Ferric chloride	50%	3L	3L
Ferric nitrate	all concentrations	0	0
Ferric sulphate [2])	10%	0	0
Ferric sulphate [2])	10%	0	0
Ferrous sulphate	all concentrations	0	0
Fixing salt			
Fluosilicic acid		1	1
Formaldehyde (formalin = methyl aldehyde)	40%	0	0
Formic acid	10%	0	0
Formic acid	10%	1	0
Formic acid	10%	2	1
Formic acid	50%	0	0
Formic acid	50%	2	1
Formic acid	50%	3	1
Formic acid	80%	0	0
Formic acid	80%	2	1
Formic acid	100%	0	0
Formic acid	100%	2	1
Formic acid		0	0
Fruit juices and fruit acids		0	0
Fruit pulp (contining SO_2)		0	0
Gallic acid		0	0
Gallic acid		0	0
Glacial acetic acid	100%	0	0
Glacial acetic acid	100%	1	1
Glaube's salt			
Glue (also acid)		0	0
Glycerine		0	0
Hydrazine sulphate	10%	0	0
Hydrochloric acid			
Hydrochloric acid	0.50%	1L	1L
Hydrochloric acid	0.50%	3L	3L
Hydrochloric acid		0	0
Hydrochloric acid	40%	3	3
Hydrogen chloride gas		1L	1L
Hydrogen chloride gas		1L	1L
Hydrogen chloride gas		2L	1L
Hydrogen chloride gas		3	3
Hydrogen fluoride		1	1
Hydrogen peroxide [2])		0	0
Hydrogen sulphide	<4%	0	0
Hydrogen sulphide	<4%	0	0
Hydrogen sulphide	<4%	0	0
Hydrogen sulphide	<4%	0	0
Hydroxylamine sulphate	10%	0	0
Industrial air			
Ink			
Iodine		0	0
Iodine		1L	0L
Iodofrom [3])		0	1
Iron gallate ink [4])		0L	0
Iron phosphate [5])		0	0

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Corrosive agent	concentration	304	316
Lactic acid	2%	0	0
Lactic acid	2%	0	0
Lactic acid	10%	0	0
Lactic acid	10%	1	0
Lactic acid	80%	0	0
Lactic acid	80%	2	1
Lactic acid	concentrated	0	0
Lactic acid	concentrated	2	1
Lead[1])	molten	1	
Lead acetate (sugar of lead)	all concentrations	0	0
Lead acetate (sugar of lead)	all concentrations	0	0
Lead nitrate		0	0
Lemon juice		0	0
Linseed oil (+3 % H_2SO_4)		0	0
Linseed oil (+3 % H_2SO_4)		0	0
Liqueurs		0	0
Lubricating oils			
Lysoform		0	0
Lysol		0	0
Magnesium carbonate	all concentrations	0	0
Magnesium chloride	10%	0L	0L
Magnesium chloride	30%	0L	0L
Magnesium sulphate (Epsom saots)		0	0
Magnesium sulphate (Epsom saots)		0	0
Maleic acid	50%	0	0
Malic acid	up ot 50%	0	0
Malic acid	up ot 50%	0	0
Malic acid	up ot 50%	1	0
Manganese chloride	10%	0L	0L
Manganese chloride	50%	0	0L
Manganese sulphate		0	0
Meat		0	0
Mercuric acetate		0	0
Mercuric acetate		0	0
Mercuric chloride	0.10%	0L	0L
Mercuric chloride	0.10%	1L	0L
Mercuric chloride	0.70%	1L	1L
Mercuric chloride	0.70%	2L	2L
Mercurousj nitrate	all concentrations	0	0
Mercury		0	0
Mercury cyanide	all concentrations	0	0
Methyl alcohol	all concentrations	0	0
Methyl aldehyde			
Methyl chlirude[2])		0	0
Methylene chloride[2])		0	0
Milk		0	0
Milk		0	0
Milk of lime			
Mixedf acids (nitrating acids)	50 % H_2SO_4 + 50 % HNo_3	0	0
Mixedf acids (nitrating acids)	50 % H_2SO_4 + 50 % HNo_3	1	1
Mixedf acids (nitrating acids)	50 % H_2SO_4 + 50 % HNo_3	2	2
Mixedf acids (nitrating acids)	75 % H_2SO_4 + 25 % HNo_3	1	0
Mixedf acids (nitrating acids)	75 % H_2SO_4 + 25 % HNo_3	1	1
Mixedf acids (nitrating acids)	75 % H_2SO_4 + 25 % HNo_5	3	3
Mixedf acids (nitrating acids)	20 % H_2SO_4 + 15 % HNo_3	0	0
Mixedf acids (nitrating acids)	20 % H_2SO_4 + 15 % HNo_3	1	0
Mixedf acids (nitrating acids)	70 % H_2SO_4 + 10 % HNo_3	0	0
Mixedf acids (nitrating acids)	70 % H_2SO_4 + 10 % HNo_3	1	0
Mixedf acids (nitrating acids)	70 % H_2SO_4 + 10 % HNo_3	3	3
Mixedf acids (nitrating acids)	30 % H_2SO_4 + 5 % HNo_3	0	0
Mixedf acids (nitrating acids)	30 % H_2SO_4 + 5 % HNo_3	1	0

Corrosive agent	concentration	304	316
Mixedf acids (nitrating acids)	15 % H_2SO_4 + 5 % HNo_3	1	1
Mixedf acids (nitrating acids)	2 % H_2SO_4 + 1 % HNo_3	2	0
Monochloracetic acid	50%	1L	1L
Mustard		0L	0L
Nickel chloride		1L	1L
Nickel nitrate		0	0
Nickel sulphate		0	0
Nitrating acid			
Nitric acid	7%	0	0
Nitric acid	7%	0	0
Nitric acid	10%	0	0
Nitric acid	10%	0	0
Nitric acid	25%	0	0
Nitric acid	25%	0	0
Nitric acid	37%	0	0
Nitric acid	37%	0	0
Nitric acid	50%	0	0
Nitric acid	50%	1	1
Nitric acid	66%	0	0
Nitric acid	66%	1	1
Nitric acid	99 % (high concentration)	1	2
Nitric acid	99 % (high concentration)	2	2
Nitrosylsulphuric acid 60 °Be with 4-5% nitro content		0	0
Nitrosylsulphuric acid 60 °Be with 4-5% nitro content			1
Nitrous acid	concentrated	0	0
Novocain		0	0
Oil (lubricating oil)		0	0
Oil (vegetable oil)		0	0
Oleic acid			
Oxalic acid	5%	0	0
Oxalic acid	5%	1	1
Oxalic acid	10%	1	0
Oxalic acid	10%	2	2
Oxalic acid	25%	2	2
Oxalic acid	50%	2	2
P-toluene sulfonchloramid sodium (chloramin T)		1L	0L
P-toluene sulfonchloramid sodium (chloramin T)	cold and hot concentrated	1L	0L
Paraffin		0	0
Persil		0	0
Petrol	all concentrations	0	0
Petroleum		0	0
Petroleum ether		0	0
Phenol (carbolic acid)	pure	1	0
Phenol (carbolic acid)	with 10 % H_2O	1	0
Phenol (carbolic acid)	raw90%phenol	1	0
Phosphate detergents		0	0
Phosphoric acid	1%	0	0
Phosphoric acid	1%	0	0
Phosphoric acid	10%	0	0
Phosphoric acid	10%	0	0
Phosphoric acid	45%	0	0
Phosphoric acid	45%	2	1
Phosphoric acid	60%	0	0
Phosphoric acid	60%	2	1
Phosphoric acid	70%	0	0
Phosphoric acid	70%	2	2
Phosphoric acid	80%	1	0
Phosphoric acid	80%	3	2
Phosphoric acid	concentrated	1	0
Phosphoric acid		3	3
Phosphoric acid anhydride (phosphorus-pentoxide, dry or moist)		1	0

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Corrosive agent	concentration	304	316
Photographic developer (Agfa-glycine developer)		0	0
Photographic fixing bath [1])		0L	0L
Pickling liquid		0L	0L
Picric acid	all concentrations	0	1
Pink salt			
Potash			
Potassium acetate		0	0
Potassium aluminium sulphate (alum)	10%	0	0
Potassium aluminium sulphate (alum)	10%	1	0
Potassium aluminium sulphate (alum)		0	0
Potassium aluminium sulphate (alum)		1	0
Potassium bifluoride		0	0
Potassium bisulphate	2%	3	2
Potassium bisulphate	5%	1	2
Potassium bisulphate	5%	3	0
Potassium bisulphate	15%	3	1
Potassium bitartrate (tartar)		0	0L
Potassium bitartrate (tartar)		2	0
Potassium bromide		0L	0
Potassium carbonate (potash)		0	0
Potassium carbonate (potash)		0	0L
Potassium chlorate		0	0L
Potassium chloride		0L	0
Potassium chloride		0L	3
Potassium chrome sulphate (chrome alum)		0	0
Potassium chrome sulphate (chrome alum)		3	0
Potassium cyanate		0	0
Potassium cyanide	5%	0	0
Potassium dichromate	25%	0	0
Potassium dichromate	25%	0	0
Potassium ferricyanide		0	0
Potassium ferricyanide		0	0
Potassium ferrocyanide		0	0
Potassium hydroxide (caustic potash solution)	20%	0	0
Potassium hydroxide (caustic potash solution)	20%	0	0
Potassium hydroxide (caustic potash solution)	50%	0	0
Potassium hydroxide (caustic potash solution)	50%	0	0
Potassium hydroxide (caustic potash solution)		0	0
Potassium hydroxide (caustic potash)		3	3
Potassium hypochlorite	approx. 15% free chlorine	2L	1L
Potassium hypochlorite		2L	1L
Potassium iodide		0	0L
Potassium nitrate (saltpetre)	25%	0	0
Potassium nitrate (saltpetre)	25%	0	0
Potassium nitrate (saltpetre)	50%	0	0
Potassium nitrate (saltpetre)	50%	0	0
Potassium nitrate (saltpetre)		0	0
Potassium oxalate	all concentrations	0	0
Potassium oxalate	all concentrations	0	0
Potassium permanganate	all concentrations	1	0
Potassium permanganate	all concentrations	0	0
Potassium sulphate			
Precipitation bath			
Prussic acid			
Pulp			
Pyrogallic acid (pyrogallol)	all concentrations	0	0
Quinine sulphate		0	0
Sal ammoniac			
Salicylic acid	all concentrations	0	0
Salt of hartshorn		0	0
Salt/ acid mixtures		0	0
Salt/ acid mixtures		1	1

Corrosive agent	concentration	304	316
Saltpetre			
Sauerkraut liquor		2L	1L
Schweinfurt green		0	0
Seawater [1])		0L	0L
Seawater [1])		2L	1L
Silver bromide		0L	0L
Silver chloride		1L	1L
Silver nitrate	10%	0	0
Silver nitrate		0	0
Slaked lime			
Soap		0	0
Soda			
Sodium acetate		0	0
Sodium bicarbonate	all concentrations	0	0
Sodium bisulphate	10%	1	0
Sodium bisulphite	50%	0	0
Sodium bromide	20%		
Sodium carbonate (soda)	10%	0	0
Sodium carbonate (soda)		0	0
Sodium carbonate (soda)		3	3
Sodium chlorate	30%	0	0
Stannous chloride		1L	0L
Stannous chloride		3L	3L
Steam		0	0
Stearic acid		0	0
Stearic acid		0	0
Sublimate			
Sugar of lead			
Sugar solution		0	0
Sulphite liquor			
Sulphur chlorid			
Sulphur dioxide			
Sulphur, dry		0	0
Sulphur, dry		2	2
Sulphur, wet		1	0
Sulphuric acid [1])	1%	1	0
Sulphuric acid [1])	1%	1	0
Sulphuric acid [1])	1%	1	1
Sulphuric acid [1])	2.50%	1	0
Sulphuric acid [1])	2.50%	1	0
Sulphuric acid [1])	2.50%	2	2
Sulphuric acid [1])	5%	1	0
Sulphuric acid [1])	5%	1	1
Sulphuric acid [1])	5%	3	2
Sulphuric acid [1])	7.50%	1	0
Sulphuric acid [1])	7.50%	1	1
Sulphuric acid [1])	7.50%	2	2
Sulphuric acid [1])	10%	2	1
Sulphuric acid [1])	10%	2	2
Sulphuric acid [1])	10%	3	2
Sulphuric acid [1])	20%	1	1
Sulphuric acid [1])	20%	2	2
Sulphuric acid [1])	20%	3	3
Sulphuric acid [1])	40%	1	1
Sulphuric acid [1])	40%	2	2
Sulphuric acid [1])	40%	3	3
Sulphuric acid [1])	60%	3	2
Sulphuric acid [1])	60%	3	3
Sulphuric acid [1])	60%	3	3
Sulphuric acid [1])	80%	1	1
Sulphuric acid [1])	80%	3	2
Sulphuric acid [1])	80%	3	3

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Corrosive agent	concentration	304	316
Sulphuric acid [1])	98%(concentrated)	0	0
Sulphuric acid [1])	98%(concentrated)	2	2
Sulphuric acid [1])	98%(concentrated)	2	2
Sulphuric acid [1])	98%(concentrated)	3	3
Sulphuric acid [1])		0	0
Sulphuric acid [1])		1	0
Sulphuric acid [1])		0	0
Sulphuric acid [1])		0	0
Sulphurous acid		0	0
Sulphurous acid		1	0
Sulphurous acid		2	1
Sulphurous acid		2	1
Sulphurous acid, gas (SO_2)		0	0
Sulphurous acid, gas (SO_2)		1	0
Sulphurous acid, gas (SO_2)		1	1
Sulphurous acid, gas (SO_2)		3	2
Super phosphate		0	0
Tannic acid (tannin)	5%	0	0
Tannic acid (tannin)	5%	0	0
Tannic acid (tannin)	10%	0	0
Tannic acid (tannin)	10%	0	0
Tannic acid (tannin)	50%	0	0
Tannic acid (tannin)	50%	0	0
Tannin			
Tar, pure		0	0
Tatar			
Tartaric acid	10%	0	0
Tartaric acid	10%	0	0
Tartaric acid	50%	0	0
Tartaric acid	50%	2	1
Thioglycolic acid			1
Thioglycolic acid			1
Tin		0	0
Tin		1	1
Tin		3	3
Tincture of iodine		1L	1L
Toluene		0	0
Trichloroacetic acid	80%	2L	1L
Trichloroethylene [2])		0	0
Trisodium phosphate			
Turpentine		0	0
Urea		0	0
Urine		0L	0L
Varnish (copal varnish)		0	0
Vaseline		0	0
Vaseline		0	0
Vegetables		0	0
Vinegar (wine vinegar)		0	0
Vinegar (wine vinegar)		0	0
Washing power		0	
Water [1]) (tap water)		0	0
Water [2]) [pit water (acid water)]		0L	0L
Water glass		0	0
Water glass		0	0
Wine [3])(white and red wines)		0	0
Wine [3])(white and red wines)		0	0
Wine vinegar			
Xylene		0	0
Zinc		3	3
Zinc chloride		0L	0L
Zinc chloride		2L	1L
Zinc chloride		3L	2L
Zinc sulphate		0	0
Zinc sulphate		0	0
Zinc sulphate		0	0
Zink cyanide		0	0

GUIDE TO THE USE
FLEXIBLE TUBES

INTRODUCTION

If a length of steel pipe, fixed at both ends, is heated uniformly through 100° C a stress of approximately 15 tons pre square inch is generated by the natural desire of the pipe to expand. In practice, this means that as a result of this thermal expansion, either one of the fixed ends becomes "unfixed" or the pipe buckles to accommodate the resultant expansion and thus relive the stress. Either of these situations is totally unacceptable in actual pipe work systems. Fortunately, engineers have devised "spring tubes" in the from of metal or rubber bellows which are capable of remaining pressure tight whilst they are compressed (or extended) axially, or, while one end moves laterally or angularly in relation to the other. Flexible bellows, have been the heart of pipe work and are capable of operating under exactly theme conditions as the pipe work. Continuous active development has meant that today the most advanced technology allied to proven experience is available to solve all modern pipe line expansion problem.

GENERAL PIPELINE SYSTEM DESIGN

Natural Flexibility

Flexibility tubes need only be used generally where the expansion of the pipe work can not be accommodated by the natural flexibility of the pipe this is sometimes referred to as spring the pipe and is the lowest cost method of accommodating expansion. Pipes naturally flexible the approximate amount which a pipe can safely bent relative to length and diameter. If pipe distance is considered long, then the type of hangers and support must be carefully chosen to allow for the guidance of the pipe axially whilst allowing appropriate lateral movement. Using the same calculation loops can be constructed where the two lengths at right angles to the line of pipe are added together to give available length and the amount of spring can be augmented by the use of long radius elbows. The use of natural flexibility presupposes adequate space in which to allow the pipe to move for the installation of loops. Loops will not prove generally cheaper than expansion joints and certainly require considerably more space, and may will generate greater anchor thrusts.

SELECTION

WHICH TYPE OF JOINT SHOULD I USE ?

The decision is NOT arbitrary. The most important question is what kind of provision does the pipe work have for ANCHORS AND GUIDES ?

ANCHORS

In a badly designed pipe work system the greatest single problem is lack of sufficient knowledge to relating to anchors.

ANCHOR- THRUST-BRIEF SUMMARY

When designing anchor points for pipelines incorporating ASAHIFLEX axial motion stainless steel bellows type expansion joints, there are two main factors to take into consideration. Firstly the thrust generated by internal pressure and secondly the force required to compress the expansion joint to minimum length. The internal pressure thrust may be found by multiplying "effective area" (listed in the appropriate data table, in square inches) by the maximum pressure (in lb. pre square inch). Maximum pressure should allow for testing in excess of the working pressure, if required, and the test pressure should never exceed 50 percent above the design working pressure. The force required to compress any axial motion expansion joint is also listed in the appropriate data table. With ASAHIFLEX stainless steel bellows type joints this factor is constant and can be positively ascertained a distinct advantage over gland or slip type joints where frictional resistance may vary considerably.
Example: 6 in. normal bore expansion joint for maximum pressure of 180lb per sq. in.

Effective area (35.26sq. in) x pressure (180lb.)	=	6346.8
Thrust to compress	=	2435.0
Total		8781.8

Allowance must, of course, also be made for frictional resistance of alignment guides and pipe supports and a safety factor included.

ANCHOR-THRUST-DETAILED CALCULATION

Anchors serve to divide a pipe line into separately expanding sections and the prime purpose of an anchor is to prevent the pipe work moving at that point and therefore direct the expansion movement towards the associated located in that section. Anchor must therefore be designed to withstand the forces action on them. It is the nature and type of these forces, designed to accept the thrust due to the internal pressure in the bellows. If the anchors are not required to do this they are termed INTERMEDIATE ANCHORS.
The general rule is AXIAL joint only require INTERMEDIATE ANCHORS.

GUIDE TO THE USE
MAIN ANCHORS

MAIN ANCHORS are essential when using AXIAL joints and must withstand the following forces.

TOTAL LOAD ON MAIN ANCHOR

FMA = FS+FM+FG+FP

Where FS = Thrust due to internal pressure in the bellows.

FM = Thrust due to the spring rate of the bellows.

FG = Frictional force due to pipe alignment guides.

And FP = Centrifugal force if the anchor is at an elbow.

MAIN ANCHORS should be installed at the following location:

1. A change in direction of the pipe
2. Between two axial expansion joints of different size in a straight pipe run.
3. At a side branch containing an axial expansion joint where it may be in the form of the directional restraint.
4. At a valve installed in a straight pipe run between two axial expansion joints.
5. At the blind end of a pipe.

INTERMEDIATE ANCHORS

an anchor has an axial flexible tube of the same size on each side of it then the thrust from the bellows generated by the line pressure acting on the effective areas is equal and opposite. Therefore such anchors do not have to be as strong as main anchors. Such anchors are termed INTERMEDIATE ANCHORS and need only be designed to withstand the force imposed on them by the spring rate bellows and the friction forces of the guides imposed on them by each of the pipe section to which they are attached. In theory if these were exactly the same the resultant force would be zero. In practice, since the pipe will usually heat up gradually from one end, the anchor should be designed to withstand the force exerted by the pipe section imposing the greater forces.

LOAD ON INTERMEDIATE ANCHOR

FIA = FM+FG calculated as for main anchor

Anchors which are used in conjunction with ANGULAR JOINTS that is HINGE, GIMBAL OR ARTICULATED joints do not withstand the thrust generated by the line pressure times the effective area, since these types of joints have restraining mechanisms with built in tie bars or braid. Hence the forces acting on an anchor used in conjunction with a restrained ANGULAR joint of any kind are those for an INTERMEDIATE ANCHOR

MAIN ANCHOR LOADING CALCULATION

	FMA	=	FS+FM+FG+FP
Where	FS	=	Thrust due to internal pressure in the bellows.
		=	aP
	FM	=	thrust due to the spring rate of the bellows
	FG	=	Friction force due to pipe alignment guides.
		=	L (WP+WL+WM) μ
and	FP	=	centrifugal force it the anchor is at an elbow
		=	2ApV2 / g Sin/2
		=	Zero in straight pipe
Where	a	=	effective area of bellows.
		=	Can be taken as 1.1 x o/d Area of Pipe.
	P	=	Design pressure.
	L	=	Length of pipe between anchors.
	WL	=	Weight of Lagging per unit length.
	Wp	=	Weight of pipe per unit length.
	WM	=	Weight of medium unit length.
	μ	=	Coefficient of Friction usually taken as 0.3 steel contact.
	A	=	internal area of pipe.
	P	=	Density of medium.
	V	=	Velocity of medium in pipe
	g	=	Acceleration due to gravity.
		=	Angle of pipe bend

LOAD ON INTERMEDIATE ANCHOR

FIA=FM+FG

Calculated as for main anchor.

DESIGN AND INSTALLATION CONSIDERATION

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Flexible metal hose is usually flexed in accordance with one or a combination of the modes shown on this page. To obtain maximum reliability it is essential to calculate the length of an assembly such that it will not be flexed bellow the minimum bend radius. The following

Formula give a guide in determining the length of hose required. They are based on standard application using our current product range. Variations should be discussed with our engineering sales office

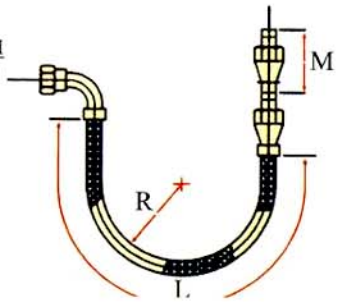
Design

Avoid sharp bends and torsional twisting.
Keep flexing in one plane.
L = Manimum live length excluding end-fitting ferrule
R = Manimum bend radius
M = Movement
= 3.142
X = Extra non-flexed length of hose (given below)

I.D.	6	10	15	20	25	32	40	50	65	80
X	50	75	100	125	150	175	200	250	275	300

Vertical loop
Vertical travel

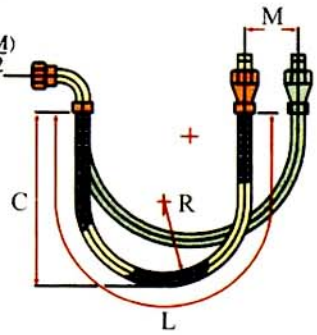
$$L = X + \pi R + \frac{M}{2}$$



Vertical loop
Horizontal travel

$$L = X + \pi(R + \frac{M}{2})$$

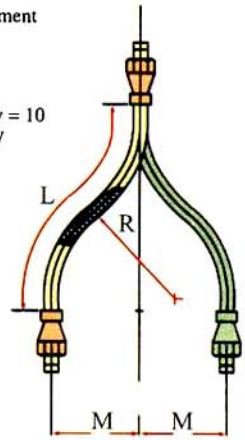
$$c = \frac{L - \pi R}{2} + R$$



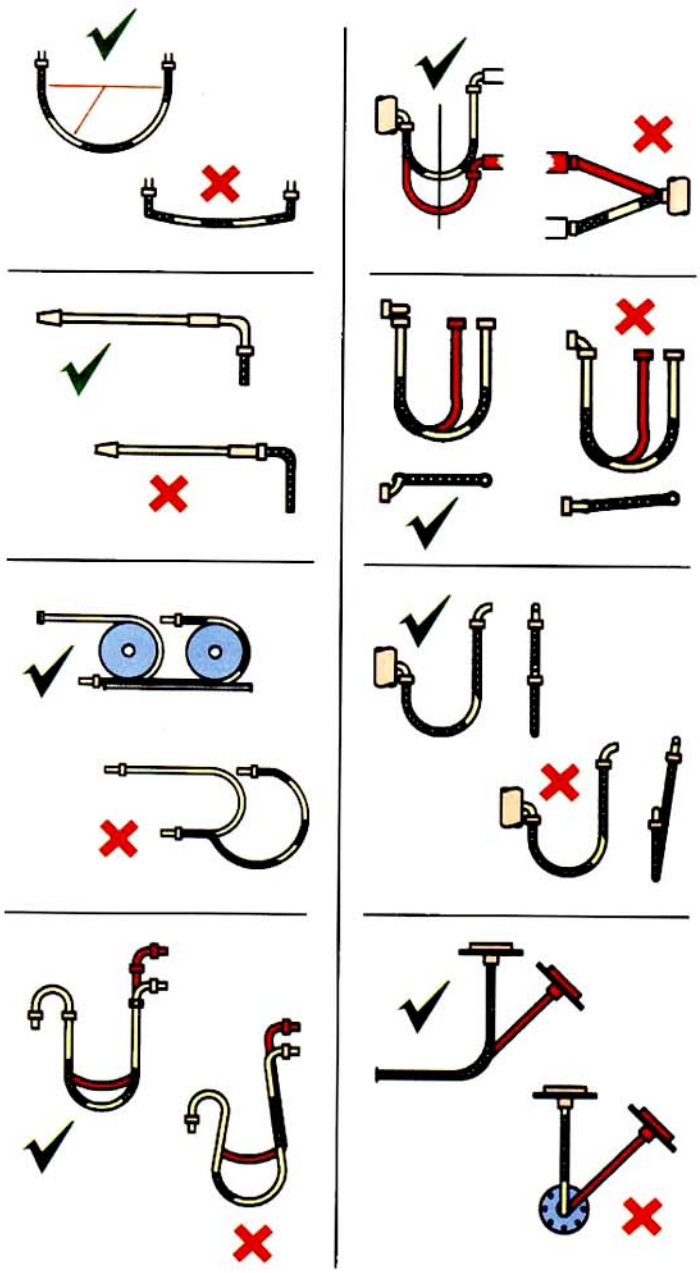
Offsetr or lateral movement

$$L = \sqrt{R \times M \times n}$$

r for static offset = 5
n for dynamic one way = 10
n for dynamic two way (as shown) = 20

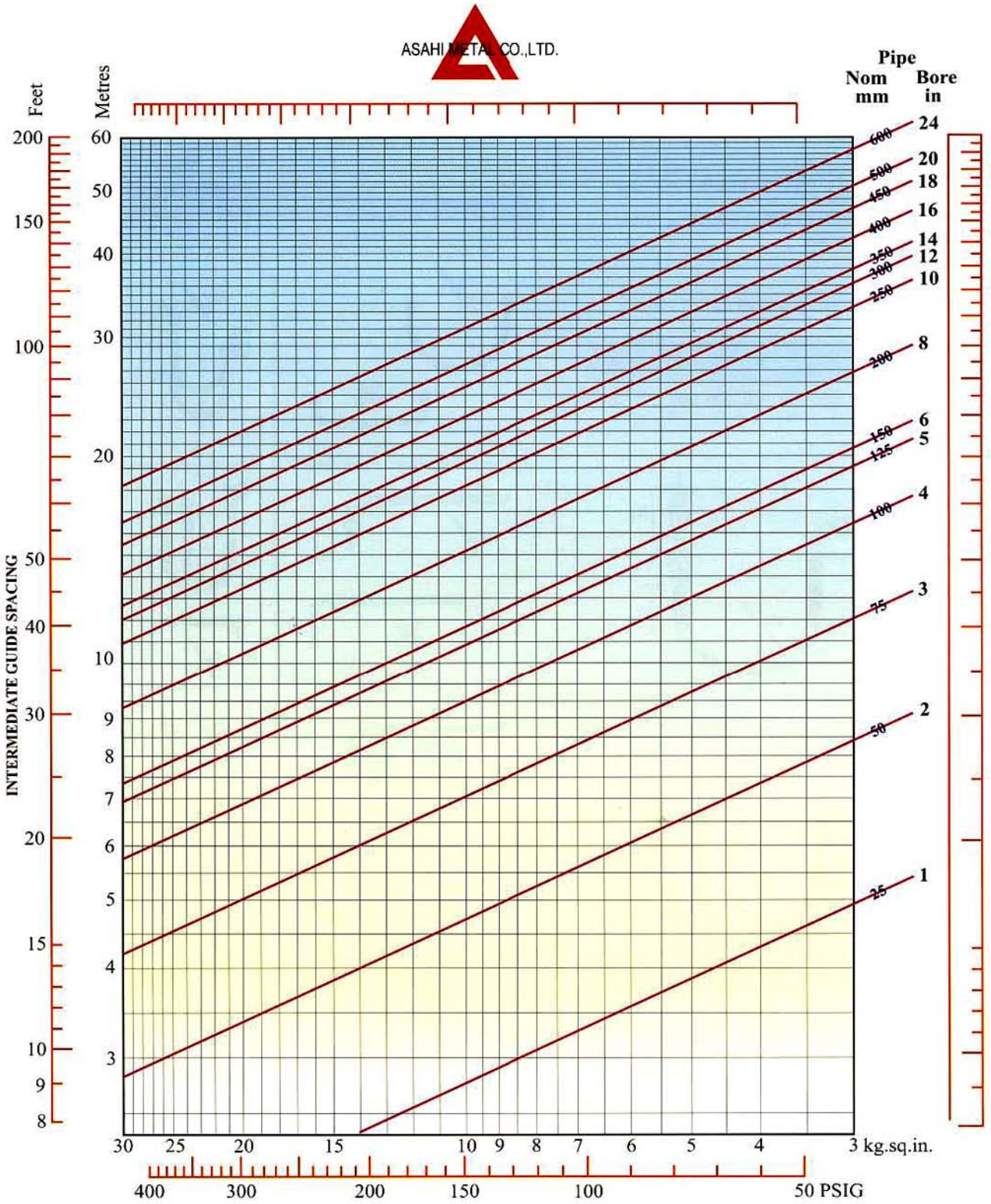


Installation



This information is provided to assist in the selection and application of flexible metal hose. We recommend all application are discussed with our engineering sales office. As we do not supervise or control installation. We can not assume responsibility for product performance.

MAXIMUM SPACING OF INTERMEDIATE PIPE GUIDES



This graph gives the recommended maximum spacing of the intermediate Pipe Guides for application involving AXIAL MOVEMENT Expansion joint line ONLY.

The first pipe guide must be located within a distance of four pipe diameters or 300 mm. (12 in). Which is the less, form the Expansion Joint.

The second guide must be located within a distance of fourteen pipe diameters from the frist pipe guide.This graph is application to pipe of standard weight equal to or better than API-SL- Grade A or BS 3601 Steel 22

EXPANSION JOINTS

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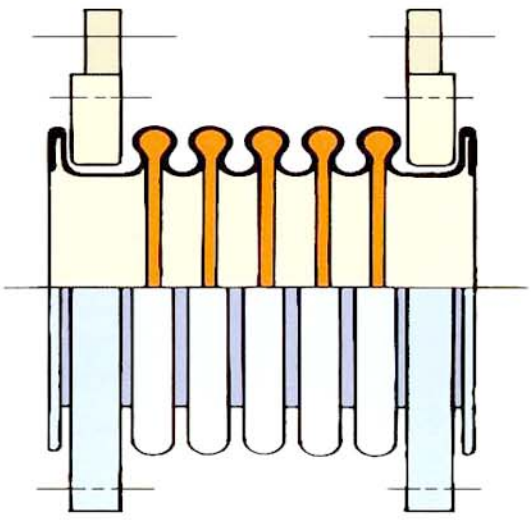
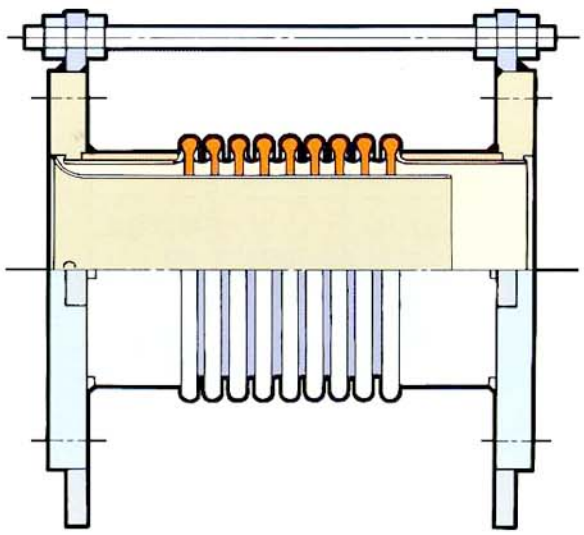
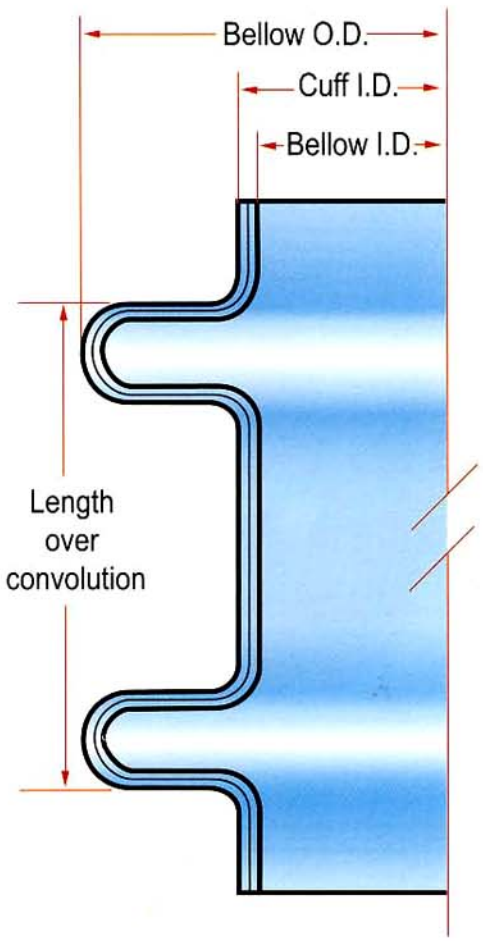


SPECIFICATION
NOMINAL PRESSURE: 5 Bars
CONNECTION: FLANGE
MATERIAL: BELLOWS: SUS 304, 316L



SPECIFICATION
NOMINAL PRESSURE: 10 Bars, 16 Bars
CONNECTION: FLANGE
MATERIAL: BELLOWS: SUS 304, 316L
: INNER SLEEVE: SUS 304
: SET BOLTS: SS 400

LENGTH OVER CONVOLUTIONS



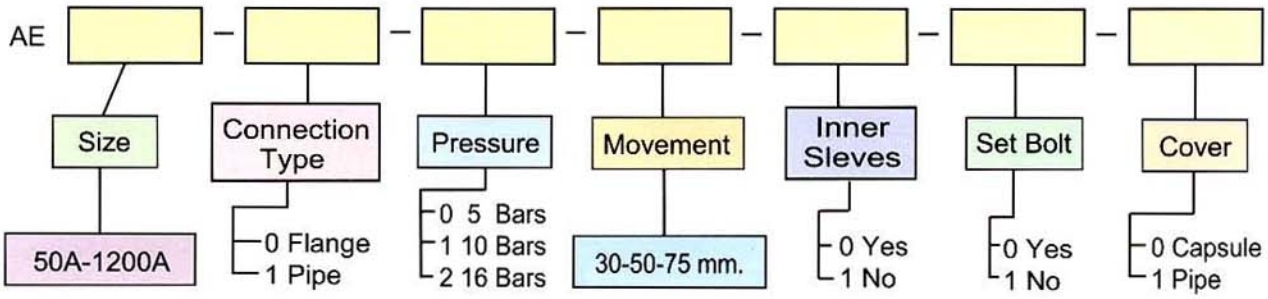
Diamension - mm.

SIZE	BELLOW O.D.	CUFF I.D.
50	79.5	59.5
65	92	72
80	107.5	87.5
100	142.5	112.5
125	169	139
150	197	167
200	247.7	217.7
250	303.3	273.3
300	363.8	323.8
350	395.6	355.6
400	446.4	406.4
450	497.2	457.2
500	548	508
550	598.8	558.8

SIZE	WORKING PRESSURE 5 BARS			WORKING PRESSURE 10 BARS			WORKING PRESSURE 16 BARS		
	BELLOW I.D.	NO. OF PLIES	THICKNESS PER PLY	BELLOW I.D.	NO. OF PLIES	THICKNESS PER PLY	BELLOW I.D.	NO. OF PLIES	THICKNESS PER PLY
50	58.7	1	0.4	57.7	3	0.3	56.3	4	0.4
65	71.2	1	0.4	70.2	3	0.3	68.8	4	0.4
80	86.5	1	0.5	85.1	4	0.3	84.5	3	0.5
100	111.5	1	0.5	110.1	4	0.3	109.5	3	0.5
125	137.8	1	0.6	135.8	4	0.4	135.4	3	0.6
150	165.8	1	0.6	163.8	4	0.4	163.4	3	0.6
200	216.5	1	0.6	214.5	4	0.4	214.1	3	0.6
250	272.1	1	0.6	270.1	4	0.4	270.9	2	0.6
300	322.6	1	0.6	320.6	4	0.5	321.4	2	0.6
350	354	1	0.8	351.6	4	0.5	350.8	3	0.8
400	404.8	1	0.8	402.4	4	0.5	400	4	0.8
450	455.6	1	0.8	452.4	4	0.6	450.8	4	0.8
500	506.4	1	0.8	503.2	4	0.6	501.6	4	0.8
550	557.2	1	0.8	554	4	0.6	552.4	4	0.8

Number of convolution must be desizned corresponding to the degree of required movement

Classification of Bellow Expansion Joint



Expansion Joint Design Sheet

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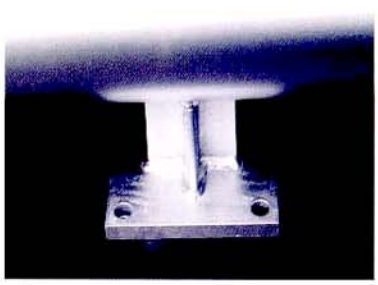
Item No.					
Nominal Diameter					
Q' ty					
Type					
Pressure	Design MPa {kgf/cm^2}				
	Test MPa {kgf/cm^2}				
Temp	Design °C				
	Operating °C				
Fluid					
Axial Movement	Elongation (X)				
	Compression (X)				
Movement	Lateral (Y)				
	Lateral (Z)				
	Angle (θ)				
Connection	Flange Standard				
	Welding				
	Others				
Materials	Flange				
	Pipe				
	Bellows				
Restrained Items	Face-to-face Dimension L mm				
	Axial Reaction Force (kgf)				
	Lateral Reaction Force (kgf)				
Location of Installation					
Remarks					

COVERED EXPANSION

PIPE TYPE



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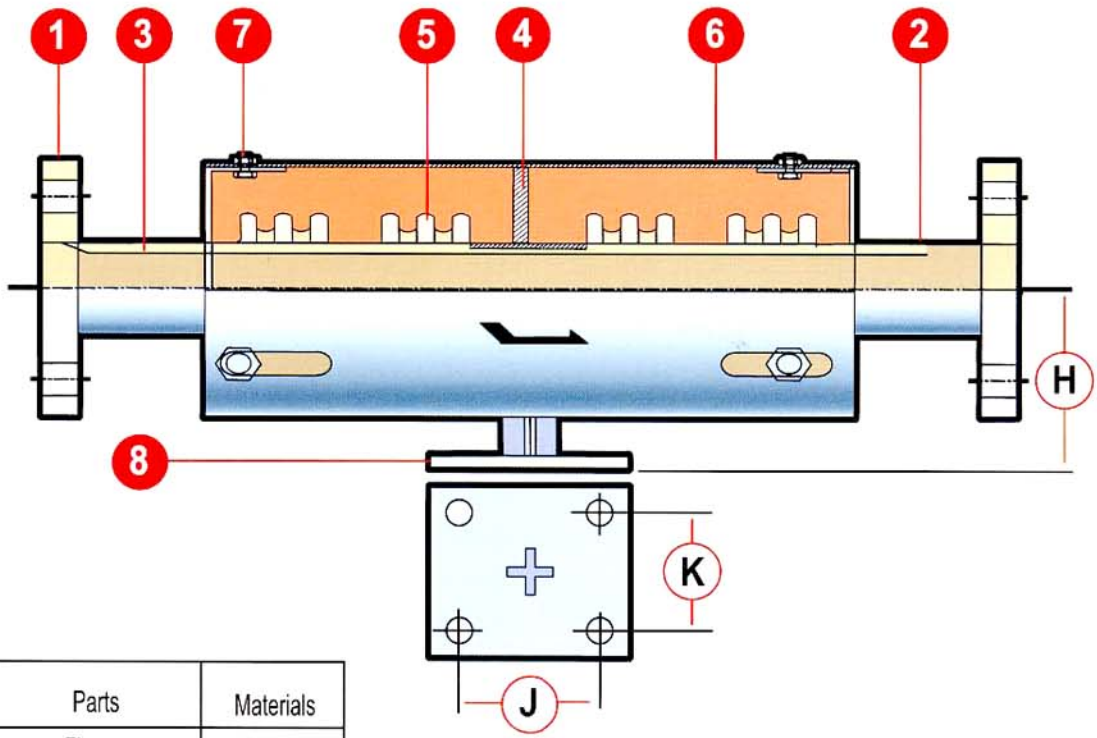
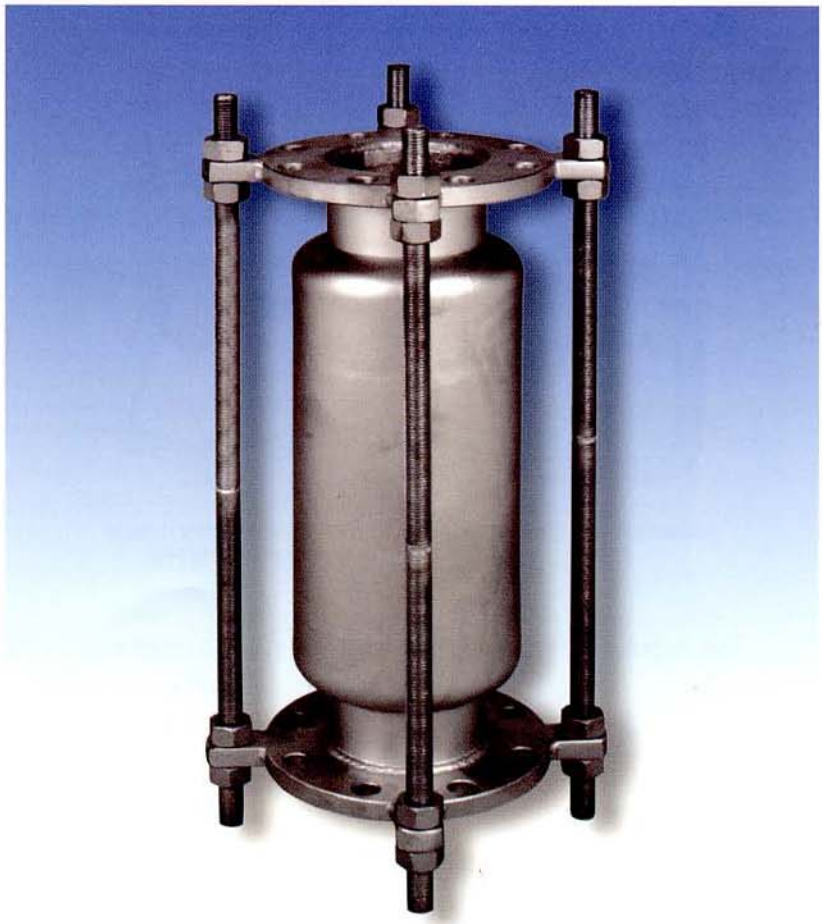


No.	Parts	Materials
1	Flange	SS400
2	Pipe	SGP
3	Internal Sleeve	SUS304
4	Neck Ring	SS400
5	Bellows	SUS304
6	External Sleeve	SS400
7	Set Bolt	SS400
8	Achor Base	SS400

Size / Items	40 (1.1/2)	50 (2)	65 (2.1/2)	80 (3)	100 (4)	125 (5)	150 (6)	200 (8)	250 (10)	300 (12)
H	120	130	140	150	170	200	220	250	300	350
J	100		120				160		180	200
K	70	80	100	110	130	150	180	220	280	300
Dia. Ø	12	15				23	25	27		

COVERED EXPANSION

CAPSULE TYPE



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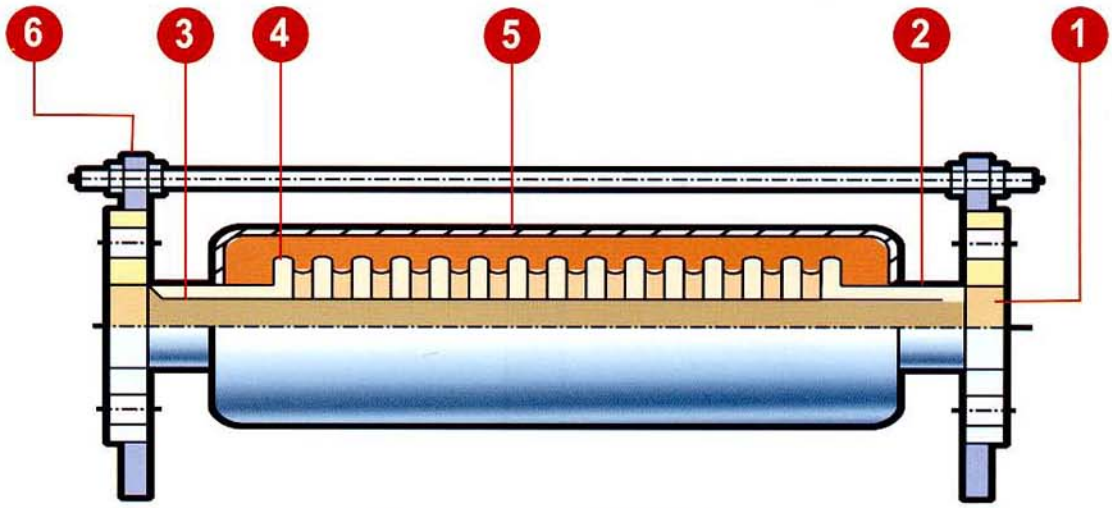

No.	Parts	Materials
1	Flange	SS400
2	Pipe	SGP
3	Internal Sleeve	SUS304
4	Bellows	SUS304
5	External Sleeve	SS400
6	Set Bolt	SS400

Expansion Joint Basics

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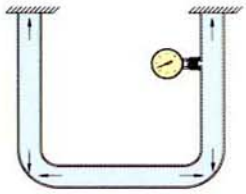
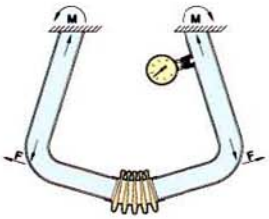
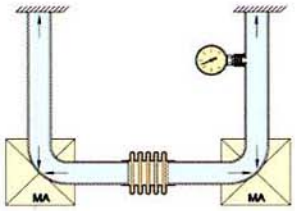
Design Variables
Pressure Thrust
Force created by pressure acting on a bellows.
Force is the system pressure times the effective area of the bellows.
Pressure thrust must be contained with either main anchors or restrained expansion joints designed.



PRESSURE THRUST CONTAINED BY PIPE.



PRESSURE THRUST NO LONGER CONTAINED BY PIPE.



SYSTEM NOW REQUIRES MAIN ANCHORS

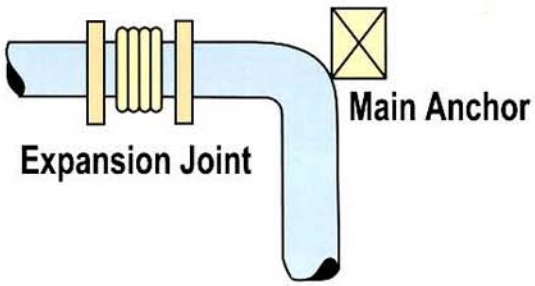
The magnitude of pressure thrust force (Fs) in lbs. Is determined by the by the following equation.

$$Fs = P\ a$$

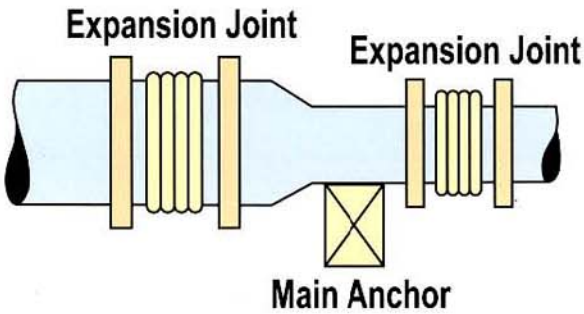
Where: (P) is the pressure (psig)
And: (a) is the effective area of the expansion joint

Installation Guidelines

Main Anchors
Designed to with stand the forces and moment imposed upon it by each of the pipe sections to which it is attached.
In systems containing expansion joints, main anchors are installed at any of the following locations:



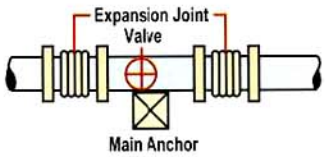
A . A changes of flow.



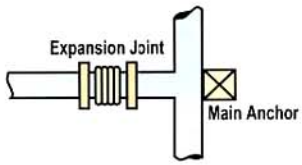
B. Between (2) expansion joints of different sizes installed in the same.

Expansion Joint Basics

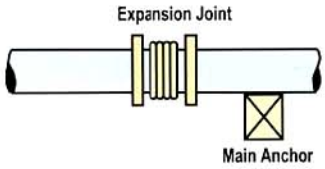
Main Anchors - (continued)
In systems containing expansion joints, main anchors are installed at any of the following locations:



C. At the entrance of a side branch containing an expansion joint into the main line.



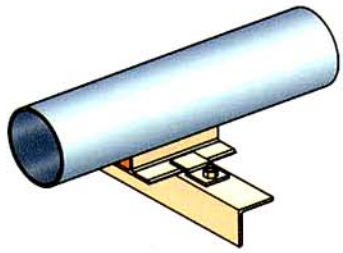
D. Where a shut-off pr pressure reduction valve is installed in a pipe run between two expansion joints.



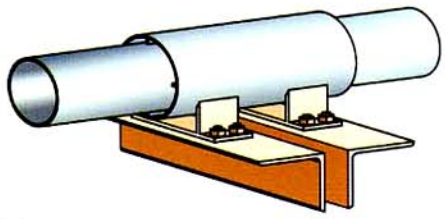
E. At a blind end of pipe

Use of Pipe Alignment Guides

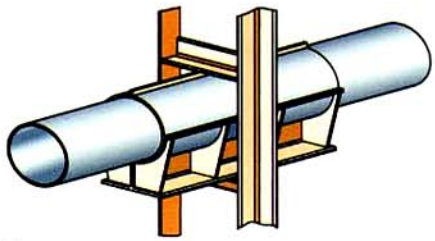
Pipe Alignment Guides are another essential part of a properly designed piping system. Thermal expansion in the system must be controlled so that the movement applied to the bellows assembly is axial only. Pipe alignment guides must be designed so they prevent bowing and buckling of the pipe. They should also keep frictional forces resulting from movement of pipe across the guide to a minimum.



Standard Pipe Alignment Guide



Strap Guide



Tee Guide

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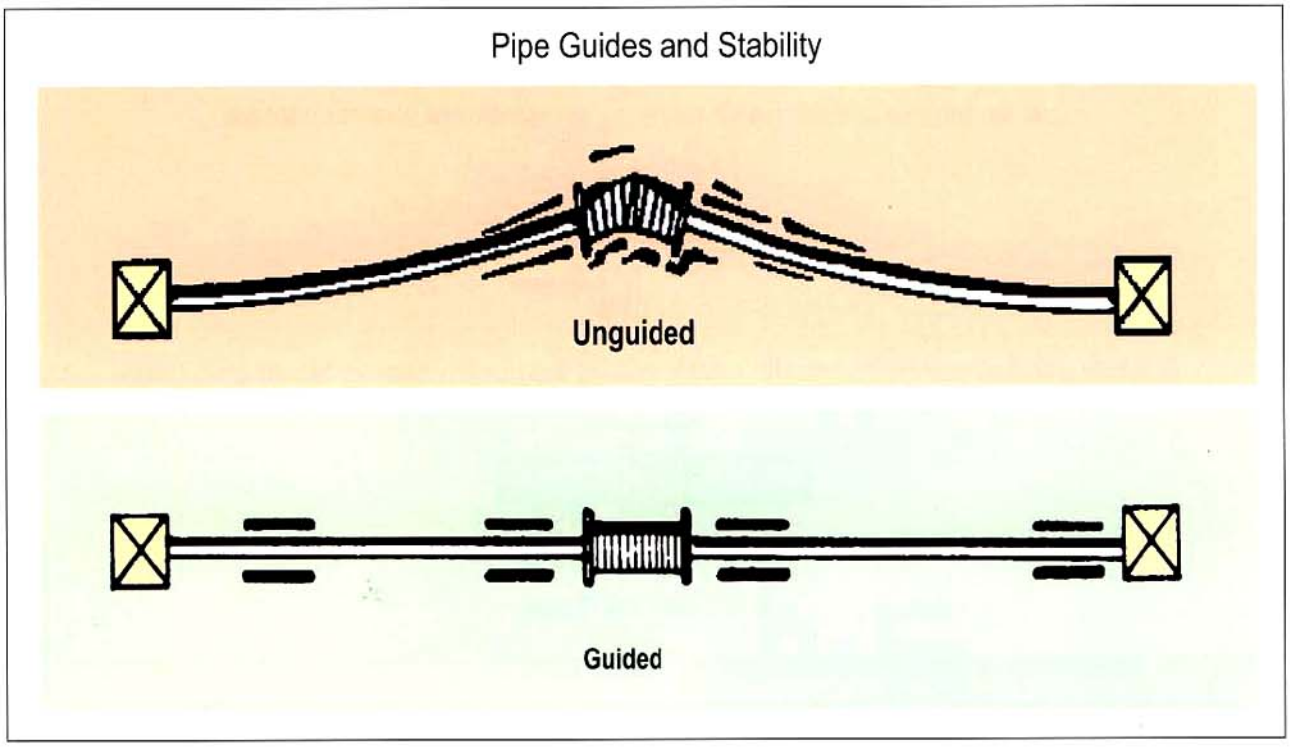
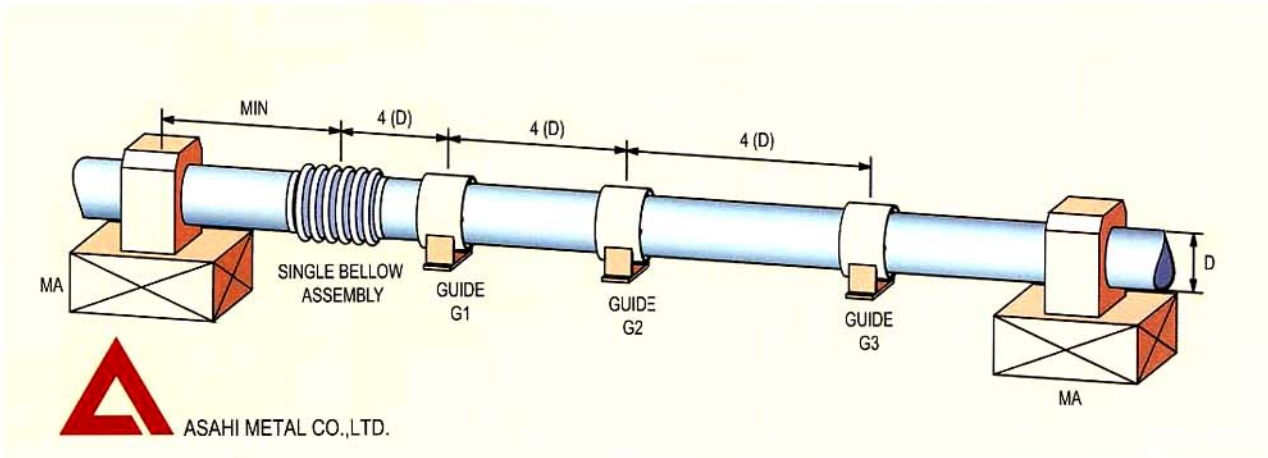
Expansion Joint Basics

Pipe Guides & Supports must withstand all of the non-pressure forces acting upon it by each of the pipe sections to which it is attached. Are not intended to withstand pressure thrust force.Pipe Guides & Supports correct alignment of the pipe adjoining an expansion and prevents buckling of the line. Buckling is caused by a combination of the expansion joint flexibility and the internal pressure loading on the pipe.



Pipe Guides: Single Expansion Joint

Single axial unrestrained expansion joints are not provided with attachments such as tie rods or hinges to restrain pressure thrust. Therefore, they can be used only in a piping system that incorporates correctly designed anchors and pipe alignment guides. These components prevent the bellows from over extension and damage due to distortion under operating conditions. This diagram shows the essential elements of a typical axial expansion joint installation which must be followed at all times. It is generally recommended that the expansion joint be located near an anchor and that the first guide be located a maximum of 4 pipe diameters away from the expansion joint.The distance between the first and second guide should not exceed 14 pipe diameters.



Application Engineering

Single Expansion Joint

Figure 1

Shows the most basic application of a single bellows unrestrained type expansion joints.

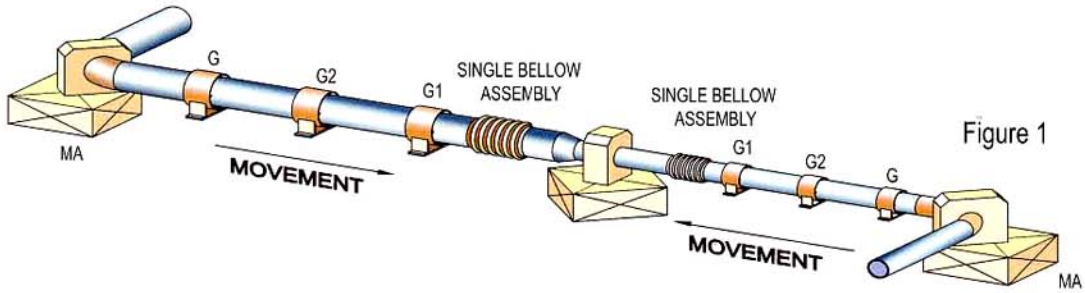


Figure 1

Figure 2

Shows a pipe system divided into smaller sections when thermal expansion between the main anchors (MA) exceeds the capacity of the single expansion joint.

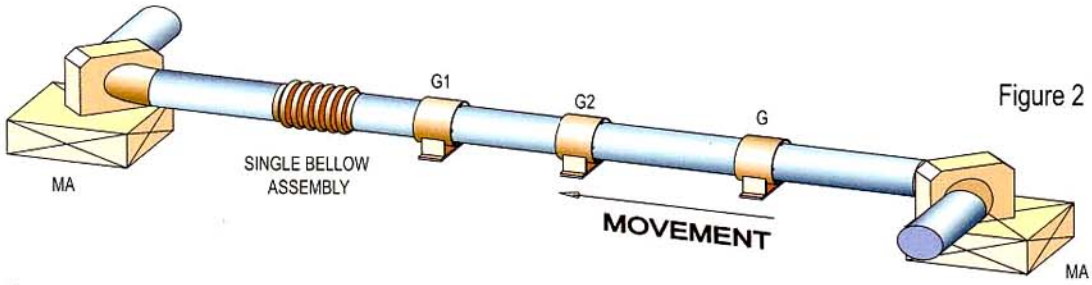


Figure 2

Figure 3

Ilustrates the use of a main anchor dividing two expansion joints of different pipe diameters to withstand the difference in pressure thrust. Pipe alignment guides and intermediate guices must be provided in the locations as shown.

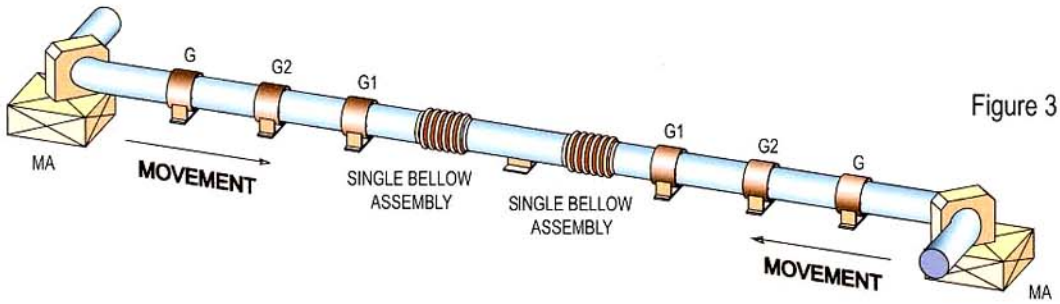


Figure 3

Figure 4

Shows how a tee piece located in a pipeline makes a convenient location for dividing the pipe systems into three separate expanding sections. Pipe guides are important in this configuration.

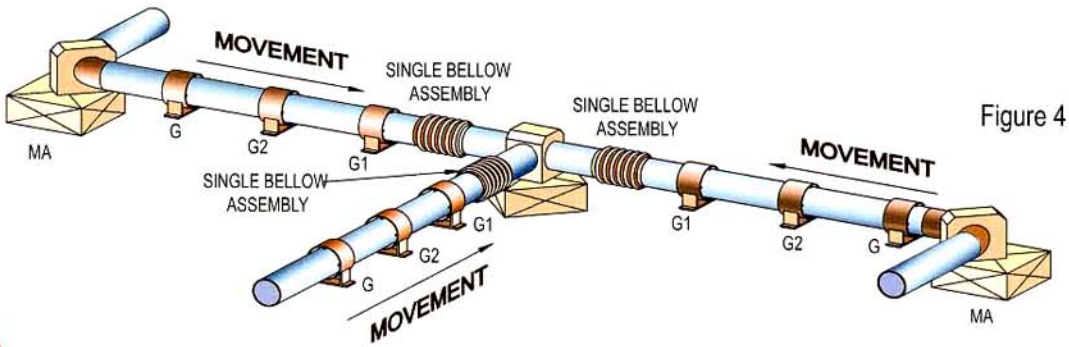


Figure 4

EXPANSION JOINTS

ASAHI METAL CO.,LTD.

THAILAND

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