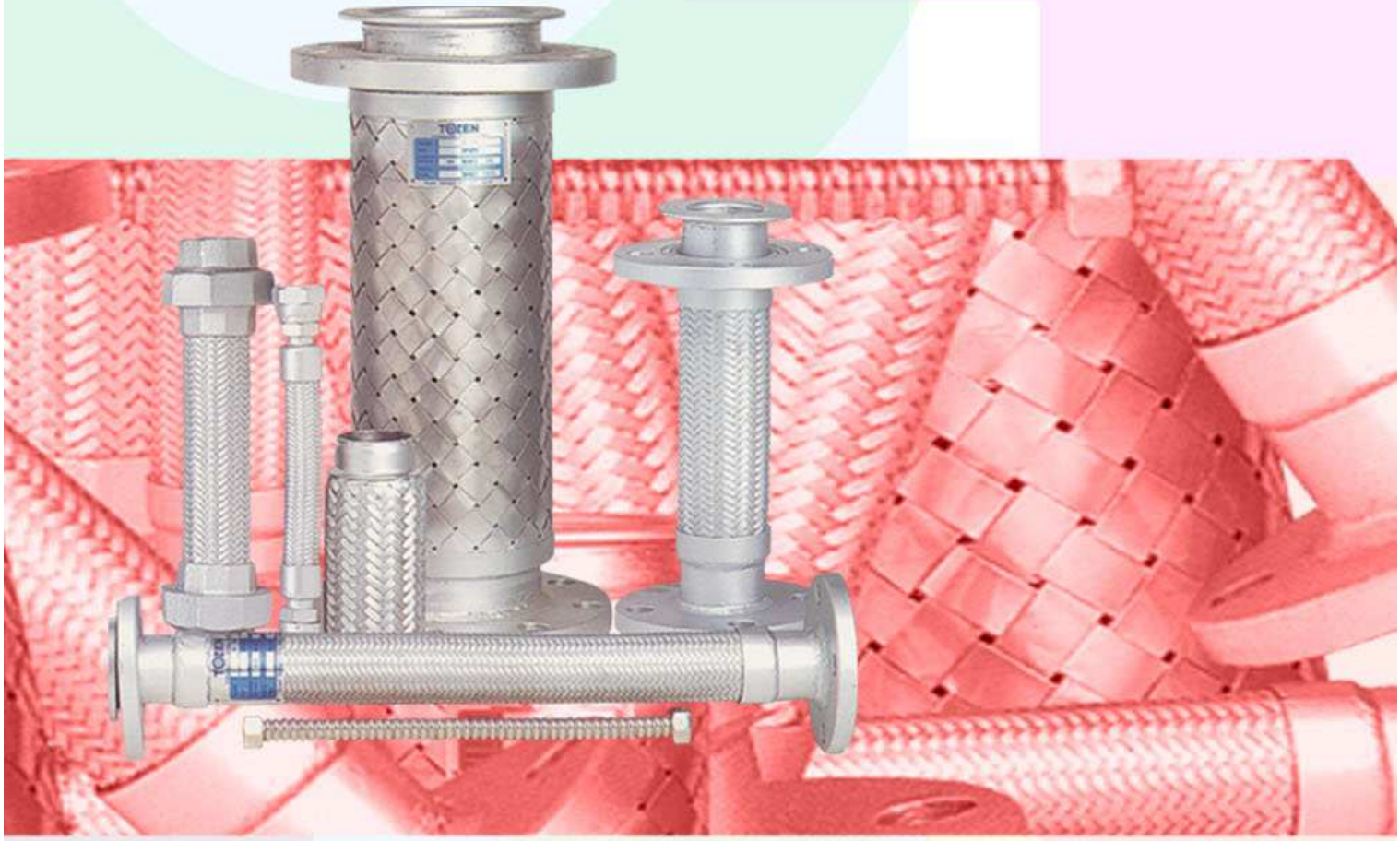
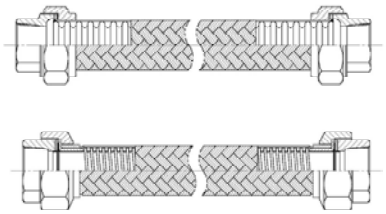
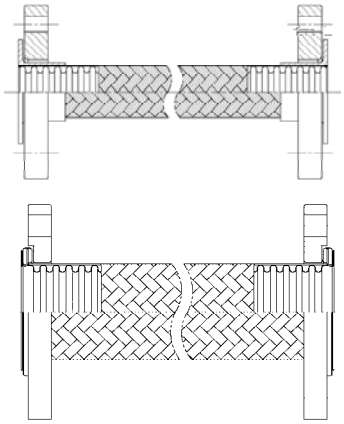
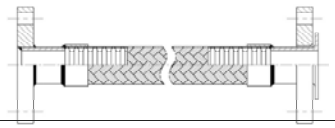
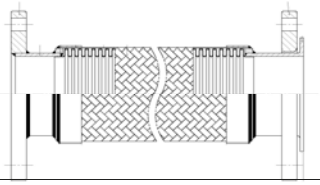
TOZEN
A joint reliance

FLEXIBLE HOSE

STAINLESS STEEL FLEXIBLE HOSE



Selection Criteria for Flexible Hose

Type	Construction	Nominal Diameter (A)	Max. Working Temperature °C	Features
SF100		15-50 (Welding Type) 15-50 (Non Welding Type)	200	Both ends union female thread. Material FCMB. Easy piping work and low cost. Standard length: 300mm., 400mm., 500mm.
SF300		15-50	250	Both ends union female thread and suitable for high pressure. Both union material can be selected depending on fluids. (Example: Material of SS400, S25C, SUS304) Standard length: 300mm., 400mm., 500mm.
SF6700		15-100 (Socket Welded Type) 65-300 (Non Welding Type	250	Both ends loose flange. All contacting fluid parts are stainless steel. Longer effective length enable higher lateral movement.
SF7800		25-400	250	One end fixed and the other loose flange high pressure type for more than 0.98MPa {10kgf/cm^2}. Besides, it can be matched to high pressure inserting steel ring to the waist of tube. Standard length: 300mm., 400mm., 500mm.
SF9800		350-600 And above	250	One end fixed and the other loose flange. Construction of ribbon braid tightened with braid band. Large diameter and suitable for absorption of large movement. Standard length: 800mm., 1000mm., 1200mm.

Applicable Fluid: **Oil, Water, Hot Water, Steam, Gas, Air**

Purpose of Application:

- **Making pipe alignment.**
- **Absorption of pipe thermal deformation.**
- **Absorption of machine vibration.**
- **Connection with machine and pipe.**
- **Prevention for damage of pipe and equipment by ground sinking, earthquake, etc**

Classification of Stainless Steel Flexible Hose

SF [ ] [ ] [ ] [ ] – [ ]

Material of Tube	
(none)	SUS304
316L	SUS316L

Type	
1	Union (Socket Welding)
3	Union (Butt Welding)
4	Screwed (Butt Welding)
5	Bevel (Butt Welding)
6	Flange (Socket)
7	Flange (Butt Welding)
9	Flange (Band)

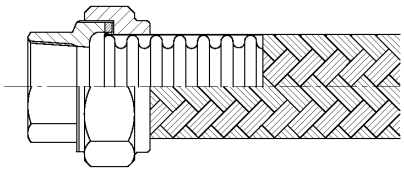
Material of Connection	
0	Mild Steel
1	SUS304
2	SUS304 (Wet Part) + SS400 (Dry Part)
3	SUS316
4	SUS316 (Wet Part) + SS400 (Dry Part)
5	Carbon Steel
6	SUS304 (Dry Part) + SUS316 (Wet Part)
S	User defined

Standard of Flanges	
(none)	Screwed
1	JIS B 2220 10K
2	JIS B 2220 20K
3	ANSI B16.5 Class 150
4	ANSI B16.5 Class 300
5	BS EN1092 PN10
6	BS EN1092 PN16
7	BS EN1092 PN25
8	ANSI B16.47 Series A
9	ANSI B16.47 Series B
S	Customer defined

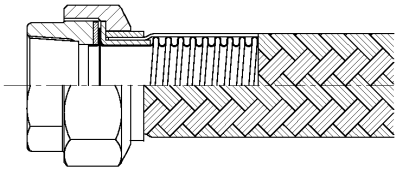
Standard of screw fittings	
(none)	Female Swivel Hexagon Nut
F	Female Swivel Hexagon Nut (Flat Head)
H	Female Swivel Hydraulic
P	Female Swivel Pin Lug Nut

Combination of fitting & flange
0 Both Ends Female Union or Both ends bevel (end pipe)
1 Both Ends Male Union (Swivel Nut+Male Adaptor)
2 One End Male Nipple, One End Female Union
3. One End Male Nipple, One End Male Union
4 Both Ends Male Nipple
5 Both Ends Female Swivel Nut.
6 One End Female Swivel Nut, One End Male Nipple
7. Both Ends Loose Flange
8. One End Fixed Flange, One End Loose Flange
9 Both Ends Fixed Flange

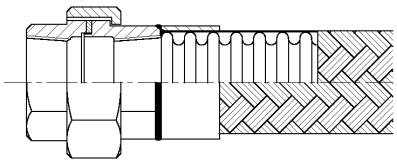
Available Type of Connection



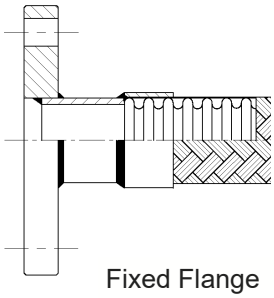
Female Union (Socket Welded)



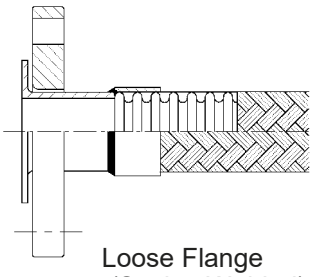
Union (Non Welding)



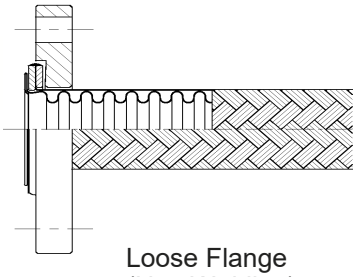
Union (Butt Welded)



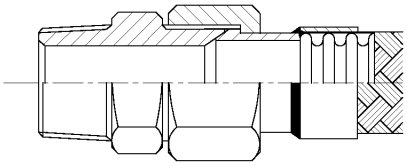
Fixed Flange



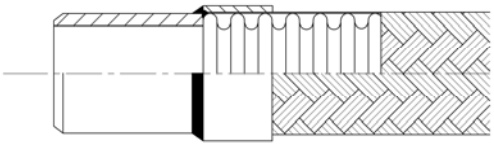
Loose Flange
(Socket Welded)



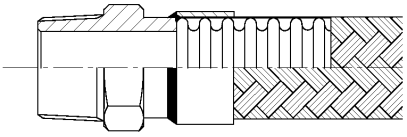
Loose Flange
(Non Welding)



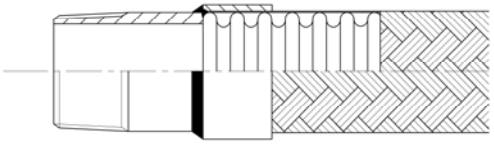
Male Union
(Swivel Nut + Male Adaptor)



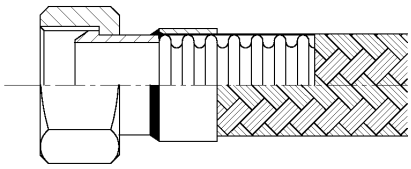
Bevelled End



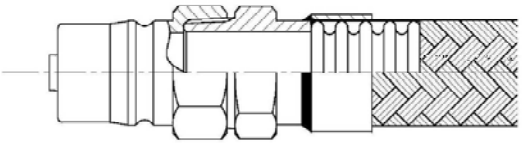
Male Nipple



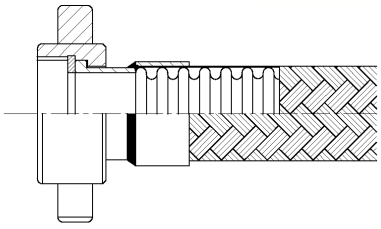
Thread End



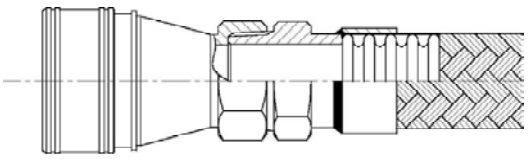
Female Swivel Nut



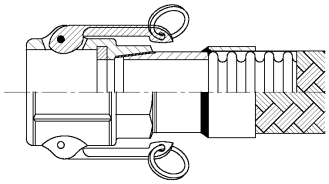
Male Nipple + -Quick Release Coupling–Male



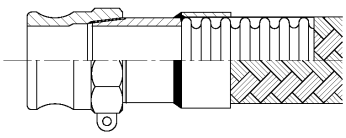
Pinlug Swivel Nut



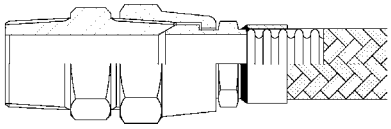
Male Nipple + Quick Release Coupling-Female



Thread End +
Camlock Part D



Thread End +
Camlock Part A



(Male Union)
Hydraulic Fitting

Specification of Stainless Steel Tube

Annular Tube (SUS304,SUS316L) with SUS 304 wire braid

- **Pressure rating 25 bars or up**

Size A (Inch)	Type code	Type	ID (mm)	OD (mm)	Minimum Bending Radius (mm)	Max. W/P at room temp. (kgf/cm^2)
10A(3/8”)	ANR-010	Annular-R	10.8	15.2	150	75.8
12A(1/2”)	ANR-012	Annular-R	13.4	17.6	165	50.7
20A(3/4”)	ANR-020	Annular-R	19.1	25.2	225	33.1
25A(1”)	ANR-025	Annular-R	25.2	32.7	260	25.1
32A (1-1/4”)	ANR-032	Annular-R	32.9	40.6	300	26.6
40A (1-1/2”)	ANR-040	Annular-R	39.3	47.6	340	31.3
50A (2”)	ANR-050	Annular-R	50.8	61.0	390	25.7

- **Pressure rating 10 bars**

Size A (Inch)	Type code	Type	ID (mm)	OD (mm)	Minimum Bending Radius (mm)	Max. W/P at room temp. (kgf/cm^2)
65A (2-1/2”)	AN-065	Annular	65	77	460	19.8
80A (3”)	AN-080	Annular	79	94	660	11.4
100A (4”)	AN-100	Annular	100	116	750	10.0
125A (5”)	AN-125	Annular	125.2	146	1000	10.5
150A (6”)	AN-150	Annular	150.2	173	1250	10.4
200A (8”)	AN-200	Annular	200.1	229	1600	11.0
250A (10”)	AN-250	Annular	250.3	281	2000	10.2
300A (12”)	AN-300	Annular	300.4	331	2400	10.0
350A (14”)	AN-350	Annular	350	385	2700	13.8
400A (16”)	AN-400	Annular	400	440	3050	10.5

Hose specification will change without noticed
***Bending Radius according to ISO 10380**

Specification of Stainless Steel Tube

Annular Tube (SUS304,SUS316L) with SUS 304 wire braid

- **Pressure rating 16 bars**

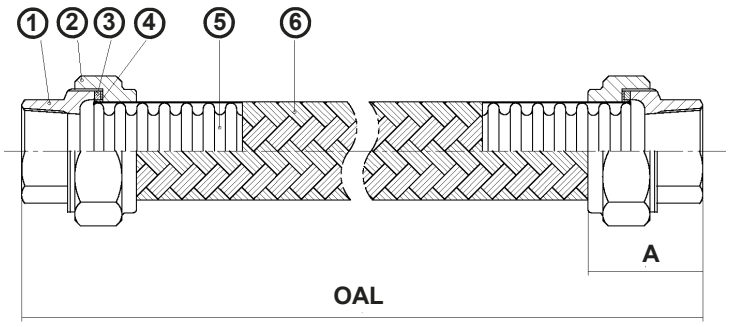
Size A (Inch)	Type code	Type	ID (mm)	OD (mm)	Minimum Bending Radius (mm)	Max. W/P at room temp. (kgf/cm^2)
65A(2-1/2")	AN-065	Annular	65	77	460	19.8
80A (3")	AN-080S	Annular-S	79	94	660	20.7
100A (4")	AN-100S	Annular-S	99.9	116.5	750	16.1
125A (5")	AN-125S	Annular-S	124.8	149	1000	16.2
150A (6")	AN-150S	Annular-S	150.0	173	1250	17.0
200A (8")	AN-200S	Annular-S	199.8	228	1600	16.2
250A (10")	AN-250S	Annular-S	250	282	2000	16.5
300A (12")	AN-300S	Annular-S	300	333	2400	16.1
350A (14")	AN-350S	Annular-S	349.6	385	2700	20.2
400A (16")	AN-400S	Annular-S	399.8	440	3050	16.3

- **Pressure rating 25 bars**

Size A (Inch)	Type code	Type	ID (mm)	OD (mm)	Minimum Bending Radius (mm)	Max. W/P at room temp. (kgf/cm^2)
65A (2-1/2")	AN-065X	Annular-X	64.9	77	460	25.1
80A (3")	AN-080X	Annular-X	79	94	660	25.1
100A (4")	AN-100X	Annular-X	99.7	116.5	750	25.3
125A (5")	AN-125X	Annular-X	124.5	147	1000	27.2
150A (6")	AN-150X	Annular-X	149.6	173	1250	30.4
200A (8")	AN-200X	Annular-X	199.6	228.5	1600	25.7
250A (10")	AN-250X	Annular-X	249.6	282	2000	25.8
300A (12")	AN-300X	Annular-X	299.6	333	2400	25.1

Hose specification will change without noticed
***Bending Radius according to ISO 10380**

SF100 Union Type Flexible Hose (Welding Type)



Max Working Temperature : 200°C
(For higher temperature, please consult us)

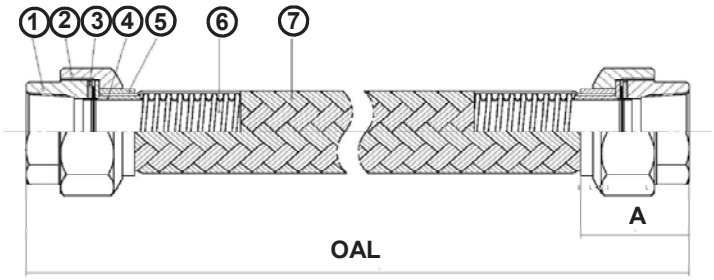
No.	Parts	Materials
1	Union End	FCMB
2	Union Nut	FCMB
3	Gasket	Non Asbestos
4	Union Ring	SUS304
5	Flexible Tube	SUS304
6	Wire Braid	SUS304

-SUS 304/SUS316L also available upon requested*
-Product size 15A design to use 12A hose
(ID Hose 13.4 mm)

Max Working Pressure : 25 bars

Nominal Diameter A (Inch)	Thread Rc (Inch)	Min.Bending Radius (mm)	Overall Length			Ineffective Length Ax2 (mm)
			300mm	400mm	500mm	
			Lateral Movement (mm)			
15A (1/2”)	1/2	165	51	100	161	70
20A (3/4”)	3/4	225	33	70	117	85
25A (1”)	1	260	28	59	101	90
32A (1.1/4”)	1.1/4	300	22	49	85	100
40A (1.1/2”)	1.1/2	340	18	40	72	110
50A (2”)	2	390	14	33	60	120

SF100 NW Union Type Flexible Hose (Non Welding)



Product size 15A design to use 12A hose (ID hose 13.4 mm
Max Working Temperature : 200°C
(For higher temperature, please consult us)

No.	Parts	Materials
1	Union End	FCMB
2	Union Nut	FCMB
3	Union Gasket	Non Asbestos
4	Lap Ring	SS400
5	Collar	SS400
6	Flexible Tube	SUS304,SUS316L
7	Wire Braid	SUS304

Max Working Pressure : 16bars

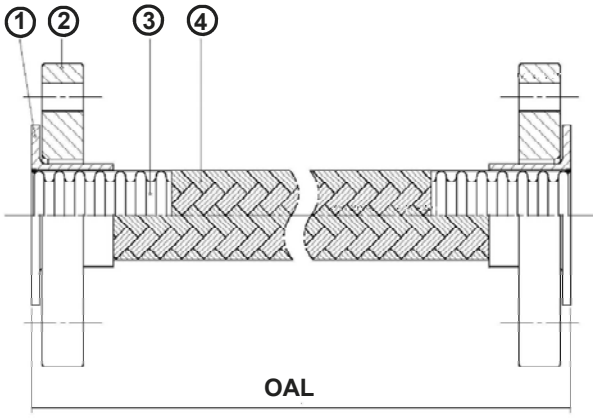
Nominal Diameter A (Inch)	Thread Rc (Inch)	Min.Bending Radius (mm)	Overall Length			Ineffective Length Ax2 (mm)
			300mm	400mm	500mm	
			Lateral Movement (mm)			
15A (1/2”)	1/2	165	45	92	151	85
20A (3/4”)	3/4	225	32	68	115	90
25A (1”)	1	260	23	52	92	110
32A (1.1/4”)	1.1/4	300	20	46	81	110
40A (1.1/2”)	1.1/2	340	17	39	70	115
50A (2”)	2	390	15	34	62	115

Applicable fluid	**Oil, Water, Hot Water, Steam, Gas, Air**
Working pressure	**Please refer to spiral & annular tube and fitting.**
Standard test pressure	**1.5 Times of working pressure**
Bursting pressure	**4 Times of working pressure**

SF 6700 Series Stainless Steel Flexible Hose (Contacting Fluid All Stainless Steel)

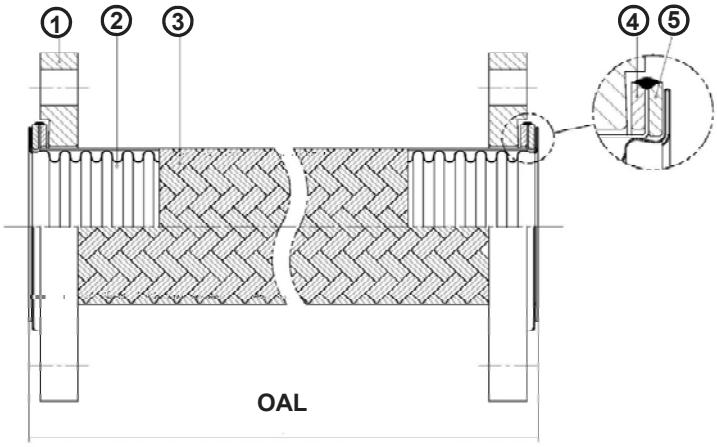
SF67X1, FLANGE JIS10K
SF67X2, FLANGE JIS20K
SF67X3, FLANGE ANSI150
SF67X4, FLANGE ANSI 300
SF67X5, FLANGE PN10
SF67X6, FLANGE PN16
SF67X7, FLANGE PN25

For 15A-100A (SW Type)



No.	Parts	Materials
1	Lap Ring	SUS304
2	Loose Flange	SS400 (Zinc-plate)
3	Flexible Tube	SUS304, SUS316L
4	Wire Braid	SUS304

For 65A-300A (NW Type)



No.	Parts	Materials
1	Non Welding Flange	SS400 (Zinc-Plated)
2	Flexible tube	SUS304 or SUS316L
3	Wire braid	SUS 304
4	Back rings	SUS 304
5	Front rings	SUS 304

*Product size 15A design to use 12A hose (ID Hose 13.4 mm)

*Max Working Temperature : 250°C
*Max working pressure: 25 bars

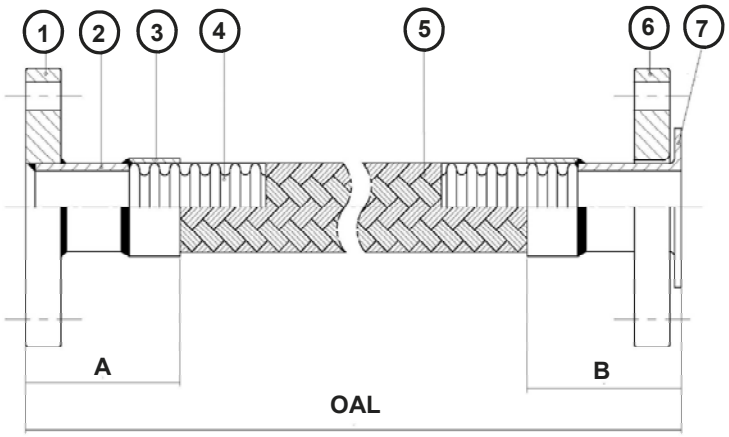
Type	Nominal Diameter A (Inch)	Min bending radius (mm)	Max static Lateral Movement			Ineffective Length (mm)
			300mm OAL	400mm OAL	500mm OAL	
SW	15A(1/2")	165	66	119	183	36
	20A(3/4")	225	50	92	144	36
	25A(1")	260	43	81	128	36
	32A(1.1/4")	300	37	69	111	40
	40A(1.1/2")	340	32	61	98	43
	50A(2")	390	28	53	86	43
	65A(2.1/2")	460	22	44	72	50
	80A(3")	660	15	30	50	54
	100A(4")	750	13	26	44	54
NW	65A(2.1/2")	460	21	42	70	56
	80A(3")	660	15	29	49	59
	100A(4")	750	13	26	43	59
	125A(5")	1000	9	19	32	62
	150A(6")	1250	7	14	24	73
	200A(8")	1600	5	11	18	80
	250A(10")	2000	4	8	14	84
	300A(12")	2400	3	7	12	90

- **Protect Galvanic Corrosion of contacting fluid steel parts.**

Applicable fluid	**Oil, Water,Hot Water,Steam, Gas,Air**
Limited Working pressure	**Limited of flange and hose rating**
Standard test pressure	**1.5 times of working pressure**
Bursting pressure	**4 times of working pressure**

Noted: SF6700 have more lateral movement than 7800 & 7700 for the same size and total length.

SF 7700 & 7800 Series Flange Type Flexible Hose (Wire Braid Type)



SF77X1, SF78X1 FLANGE JIS10K
SF77X2, SF78X2 FLANGE JIS20K
SF77X3, SF78X3 FLANGE ANSI150
SF77X4, SF78X4 FLANGE ANSI 300
SF77X5, SF78X5 FLANGE PN10
SF77X6, SF78X6 FLANGE PN16
SF77X7, SF78X7 FLANGE PN25

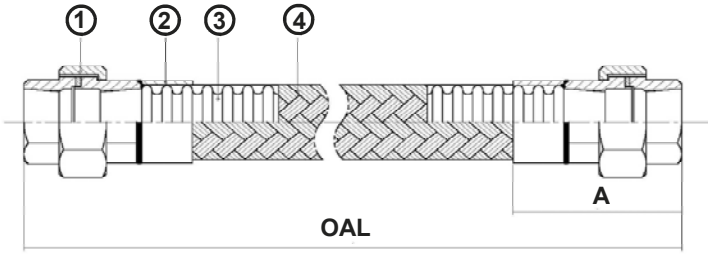
No.	Part	Material
1	Fixed Flange	SS400, SUS304
2	Short Pipe	SS400, SUS304
3	Collar	SUS304
4	Flexible Tube	SUS304
5	Wire Braid	SUS304
6	Loose Flange	SS400,SUS304
7	Lap Joint / Stub End	CS,SUS304

Max Working Temperature : 250°C
Max working pressure: 25 bars
(16 bar for size 350A-400A)

Nominal Diameter A (Inch)	Min. Bending Radius (mm)	Overall Length			Ineffective Length A + B (mm)
		300mm	400mm	500mm	
		Eccentric (mm)			
25A (1”)	260	14	39	75	150
32A (1.1/4”)	300	10	30	60	165
40A (1.1/2”)	340	7	23	49	180
50A (2”)	390	6	21	43	180
65A (2.1/2”)	460	5	17	37	180
80A (3”)	660	3	10	23	200
100A (4”)	750	2	9	20	200
125A (5”)	1000	2	7	15	200
150A (6”)	1250	1	5	12	200
200A (8”)	1600	1	3	8	230
250A (10”)	2000	-	2	6	230
300A (12”)	2400	-	2	5	230

Precaution : “The use of mild steel lap joint and pipe collar in water system may cause galvanic corrosion a severe corrosion on the base metal and cause leakage in very short period. The joint with all stainless steel wet parts is strongly recommended.”

SF300 Series Union Type Flexible Hose



No.	Part	Material
1	Female Union	SUS304 ,SS400,S25C
2	Collar	SUS304
3	Flexible Tube	SUS304
4	Wire Braid	SUS304

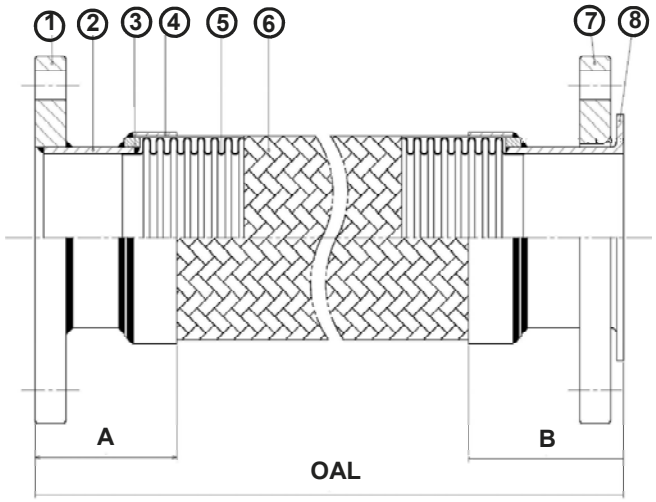
*Product size 15A design to use 12A hose (ID Hose 13.4 mm)

*Max Working Temperature : 250°C
*Max working pressure: 25 bars

Nominal Diameter A (Inch)	Min. Bending Radius (mm)	Overall Length			Ineffective Length A x 2 (mm)
		300mm	400mm	500mm	
		Eccentric (mm)			
15A (1/2”)	165	34	77	133	114
20A (3/4”)	225	19	49	91	138
25A (1”)	260	13	37	72	158
32A (1.1/4”)	300	7	26	54	184
40A (1.1/2”)	340	4	18	42	206
50A (2”)	390	3	14	33	220

SF 9800 Series Flange Type Flexible Hose (Ribbon Braid Type)

SF98X1- FLANGE JIS10K
SF98X3- FLANGE ANSI150



No.	Parts	Materials
1	Fixed Flanges	SS400, SUS304
2	Short pipe	SS400, SUS304
3	Band	SS400,SUS304
4	Collar	SUS304
5	Flexible Tube	SUS304
6	Ribbon Braid	SUS304
7	Loose Flange	SS400,SUS304
8	Lap Joint / Stub End	SS400.SUS304

Max. Working Temperature : 250°C
Max working pressure: 150 PSI (10 bars)
* Please consult us for bigger size

Nominal Diameter A (Inch)	Min.Bending Radius (mm)	Overall Length			Ineffective Length A x B (mm)
		800mm	1000mm	1200mm	
		Eccentric (mm)			
350A(14”)	2700	16	31	51	290
400A(16”)	3050	14	28	45	290
450A(18”)	3200	10	21	36	370
500A(20”)	3550	9	19	32	370
600A(24”)	3850	8	17	30	370

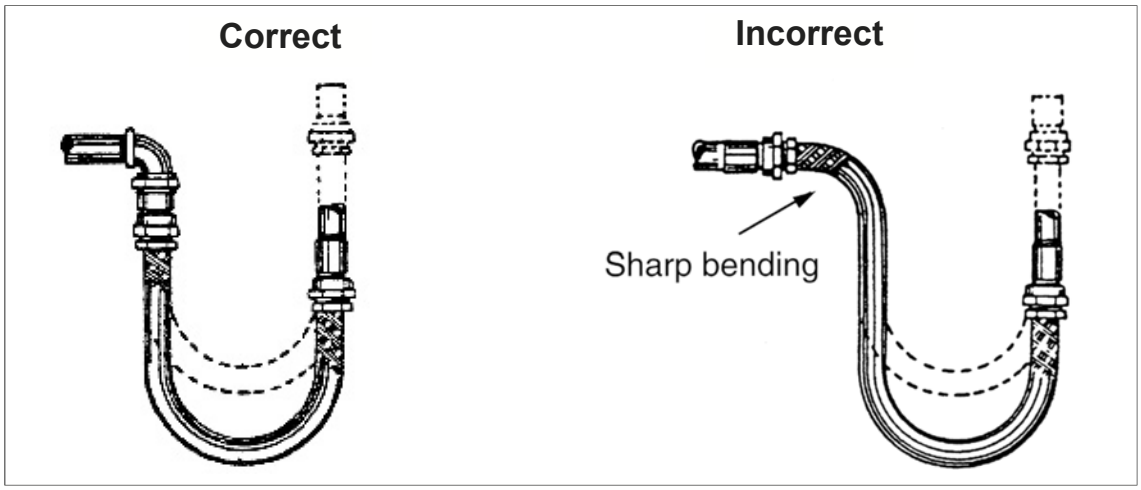
Applicable Fluid	**Oil, Water,Hot Water,Steam, Gas,Air**
Limited Working pressure	**Limited of flange and hose rating**
Standard test pressure	**1.5 Times of working pressure**
Bursting pressure	**4 Times of working pressure**

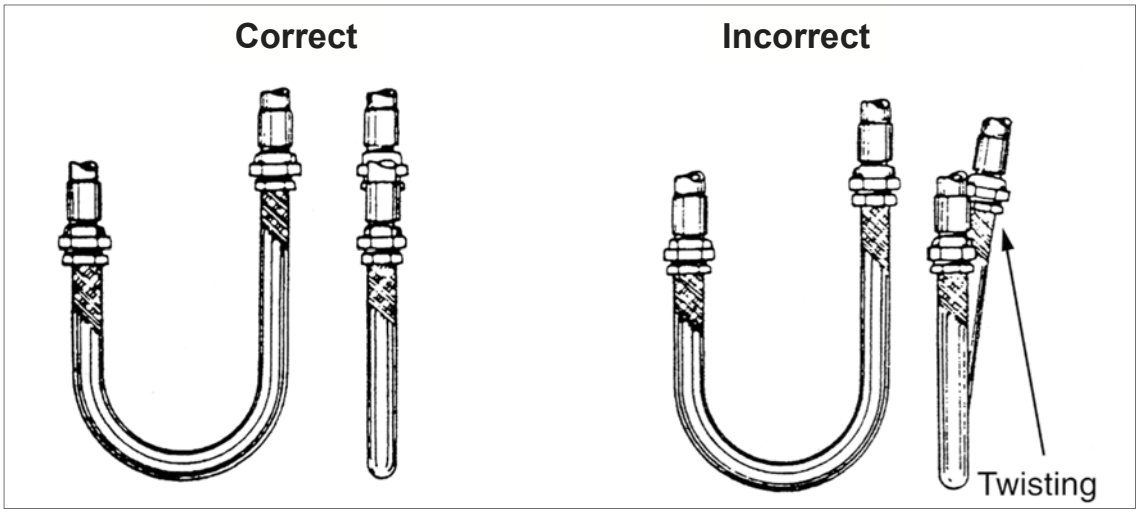
Precaution in Piping Method

To make flexible hoses function properly and last longer, the followings are guides to correct installation.

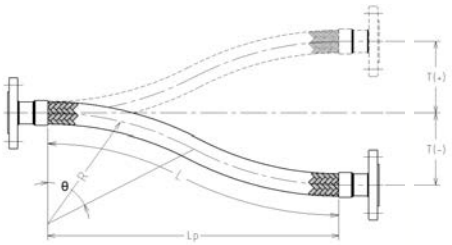
- Metal flexible hoses should not be bent to a radius smaller than recommended in their specifications, otherwise fatigue and premature failure will occur.
- Avoid twisting of metal flexible hoses.
- Always install metal flexible hoses so that movement originates in the same plane as the centerline.

1 Proper Flexible Hose Installation





2 Calculation for Hose Length (L) with Movement

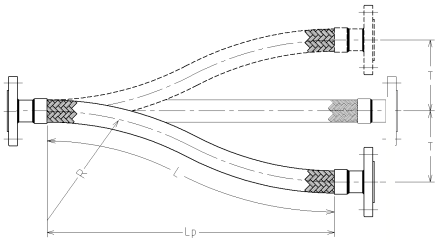


1.Lateral offset Movement

1.1. Theoretical displacement by geometric calculation

Max. offset distance by geometric calculation

Bend Angle $\theta = 28.65\ L/R$
$L = 0.035R \times COS^{-1}\ (1-T/2R)$
$Lp = 2R\ SIN\ (COS^{-1}\ (1-T/2R))$

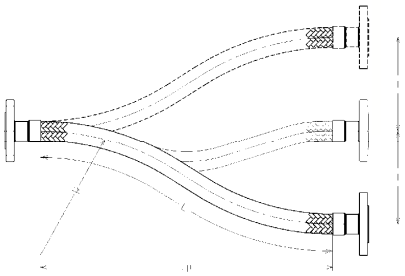


1.2. Practical application with a free retractable end

Recommended Length (L) for offset movement (Static with one end free)

$$L = \sqrt{6(RT) + T^2}$$

$$Lp = \sqrt{L^2 - T^2}$$



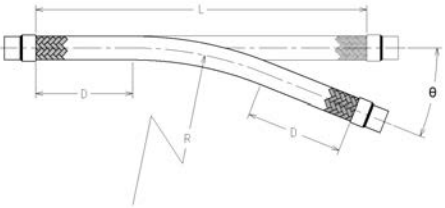
1.3 Practical application with both fixed ends

Recommend Length (L) for offset movement (Static with both end fixed)

$$L = \sqrt{20(RT)}$$

$$Lp = \sqrt{L^2 - T^2}$$

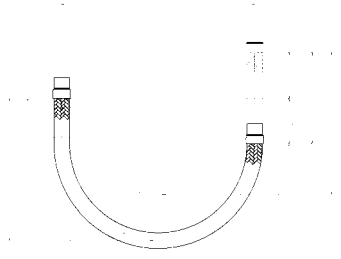
(For repeatedly or dynamic movement "T" should not exceed 25% of "R")



2. Angular Movement

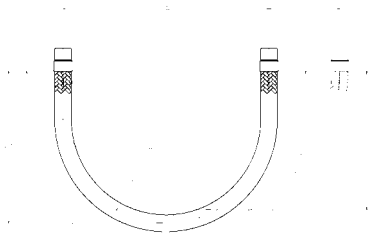
L = 2D + (θ/57.3)R

3. U-Loop arrangement



3.1 Traveling Loop "A"

L = 4R + 0.5T
K = 1.43R + 0.5T

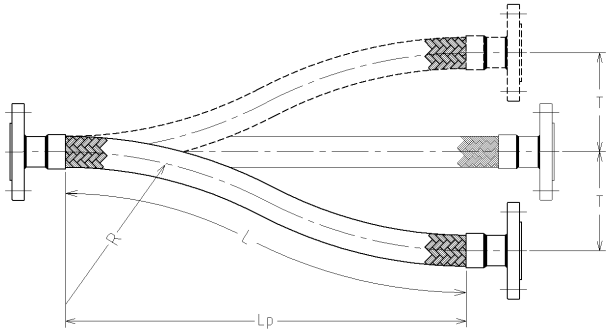


3.2 Travelling Loop "B"

L = 4R + 1.57T
K1 = 1.43R + 0.785T
K2 = 1.43R + 0.5T

Recommend Effective Length for Lateral offset Movement

Static application 1: with one end free or allowed to pull in

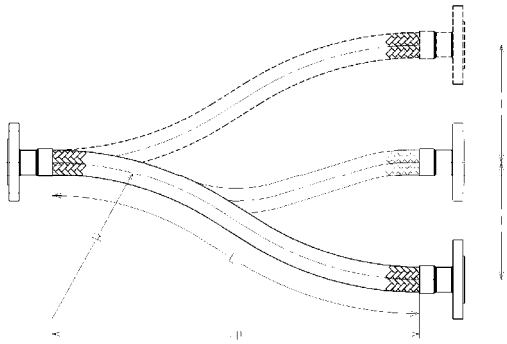


Nominal Diameter A (B)	Minimum Bending Radius (mm)	Lateral Movement in mm (T)									
		25	50	75	100	150	200	250	300	400	500
10A(3/8")	150	153	218	271	317	397	470	**546**	**656**	**874**	**1092**
12A(1/2")	165	160	229	283	331	414	488	**546**	**656**	**874**	**1092**
20A(3/4")	225	186	265	327	381	475	557	633	704	**874**	**1092**
25A(1")	260	200	284	351	408	507	594	673	747	886	**1092**
32A(1-1/4")	300	214	305	375	436	541	633	716	794	939	**1092**
40A(1-1/2")	340	228	324	399	463	574	670	757	838	988	1127
50A(2")	390	244	346	426	494	612	713	805	890	1047	1192
65A(2-1/2")	460	264	375	462	535	661	770	868	959	1125	1277
80A(3")	660	316	448	551	638	786	913	1026	1131	1321	1494
100A(4")	750	337	477	586	679	836	970	1090	1200	1400	1582
125A(5")	1000	389	550	675	782	961	1114	1250	1375	1600	1803
150A(6")	1250	434	615	754	872	1072	1241	1392	1530	1778	2000
200A(8")	1600	491	695	852	985	1210	1400	1570	1724	2000	2248
250A(10")	2000	549	777	952	1100	1350	1563	1750	1921	2228	2500
300A(12")	2400	601	850	1042	1205	1478	1709	1914	2100	2434	2730

- **Figures in blue color cells are limited for static movement**
- **Figures in bold fonts are adjusted with length retraction below 10%**

Recommend Effective Length for Lateral offset Movement

Static application 2: Crowded position with both end fixed and not allowed to move in



Nominal Diameter A (B)	Minimum Bending Radius (mm)	Lateral Movement in mm (T)									
		25	50	75	100	150	200	250	300	400	500
10A(3/8")	150	274	388	475	548	671	**815**	**1016**	**1220**	**1630**	**2035**
12A(1/2")	165	288	407	498	575	704	**815**	**1016**	**1220**	**1630**	**2035**
20A(3/4")	225	336	475	581	671	822	949	1061	**1220**	**1630**	**2035**
25A(1")	260	361	510	625	722	884	1020	1141	1249	**1630**	**2035**
32A(1-1/4")	300	388	548	671	775	949	1096	1225	1342	**1630**	**2035**
40A(1-1/2")	340	413	584	715	825	1010	1167	1304	1429	1650	**2035**
50A(2")	390	442	625	765	884	1082	1249	1397	1530	1767	**2035**
65A(2-1/2")	460	480	679	831	960	1175	1357	1517	1662	1919	2145
80A(3")	660	575	813	995	1149	1408	1625	1817	1990	2298	2570
100A(4")	750	613	867	1061	1225	1500	1733	1937	2122	2450	2739
125A(5")	1000	708	1000	1225	1415	1733	2000	2237	2450	2829	3163
150A(6")	1250	791	1119	1370	1582	1937	2237	2500	2739	3163	3536
200A(8")	1600	895	1265	1550	1789	2191	2530	2829	3099	3578	4000
250A(10")	2000	1000	1415	1733	2000	2450	2829	3163	3465	4000	4473
300A(12")	2400	1096	1550	1898	2191	2684	3099	3465	3795	4382	4899

- **Figures in blue color cells are limited for static movement**
- **Figures in bold fonts are adjusted with length elongation below 3%**

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