AEGIS®

HPLP Series

ISO 9001:2008

High Performance Lined Piping Systems

BIO-TECHOLOGY - CHEMICAL - CHLOR ALKALI - PETRO CHEMICAL - PHARMACEUTICAL - PULP & PAPER - SEMICONDUCTOR

AEGIS FLOW TECHNOLOGIES **WWW.AEGISVALVES.COM**

PHARMACEUTICAL - PULP & PAPER - SEMICONDUCTOR - BIO-TECHOLOGY - CHEMICAL - CHLOR ALKALI - PETRO CHEMICAL

Features of Aegis® HPLP Series Lined Piping

Aegis's HPLP series fully lined high performance piping systems feature industry's **most innovative** and **comprehensive** solution for transferring highly corrosive, toxic and ultra-pure process fluids and gasses. Designed using the **ASTM F 1545** specifications as a minimum requirement, our innovative fluoropolymer processing technology incorporated with the structural strength of steel assures the highest level of quality and safety that are essential to providing reliable long-term performance. Our in-depth knowledge of materials and industrial processes allows us to advise our customers on the selection of the most appropriate system for their applications. As a result our products are routinely specified for the most severe services associated with the following industries:

Bio-Technology	**Mining**	**Pulp & Paper**
Chemical	**Petro Chemical**	**Semiconductor**
Chlor Alkali	**Pharmaceutical**	**Textile**

Quality Assurance

Aegis's HPLP series lined piping systems are designed and manufactured under a company committed quality assurance process that has been audited and certified by **ISO 9001:2008** for Quality Management Systems and the **P.E.D. (Pressure Equipment Directive)** for mechanical integrity. Featuring innovative **Iso-statically Molded, Paste Extrusion** and **Transfer Molding** technologies, our high performance lined piping systems yield a heavy wall, extremely dense and highly crystalline lining that reduces the effects of permeation and is full vacuum rated. Our homogeneous one piece linings are molded into our fittings after the steel component has been completely fabricated. Our pipe linings are oversized relative to the inside diameter of the steel piping and are temperature compensated to relieve any residual stresses.

Each component is hydro-tested and spark tested with **25,000 volts** to assure complete lining integrity. In addition, each component is permanently identified by a unique numbering system that allows complete traceability and identifies the lining material. Every flange sealing surface is visually inspected to assure that they are free of any defects that would impair the sealing effectiveness. Imperfections greater than 5% of the flare thickness are rejected. All components are shipped with wooden end covers to protect the faces of the liners. The external surfaces of the pipe and fittings are coated with an industrial primer to provide external corrosion protection. Special painting systems are available upon request.

Reduced Cold Flow

All **Aegis® HPLP series** lined fittings and pipe spools are engineered to reduce the effects of liner cold flow associated with the installation of the system and extreme temperature cycling. Our liner sealing faces are securely anchored to the faces of the metal flanges by a series of machined concentric serrations resulting in a significant reduction of radial movement.

HPLP Series

Linings

Paraflon®

A molecular and mechanically enhanced PTFE homopolymer, formulated from premium grade resin, featuring excellent chemical resistance, low void content, optimal crystallinity, and superior physical properties. Paraflon® is the ultimate lining material when process conditions involve transferring highly corrosive acids at elevated temperatures and when combating permeation problems associated with processing **Halogens and Hydrochloric Acid**. Its superior surface finish makes it an ideal material for the pharmaceutical and semiconductor industries. Paraflon® is virtually inert to all chemicals with the exception of elemental fluorine and molten alkali metals and is rated from -20°F to 500°F.

PTFE

(Polytetrafluoroethylene) PTFE is the most commonly used fluoropolymer featuring excellent chemical resistance and is virtually inert to all chemicals with the exception of elemental fluorine and molten alkali metals. Its non-stick properties are ideal for eliminating residue build up within the pipe and fittings. PTFE is rated from -20°F to 500°

PFA

(Perfluoroalkoxy) PFA is a melt- processible fluoropolymer resin that features excellent chemical resistance and is virtually inert to all chemicals with the exception of elemental fluorine and molten alkali metals. It is ideally used for transfer or injection molding resin into complex geometries. PFA is rated from -20° F to 500° F.

PVDF

(Polyvinylidene Fluoride Copolymer) PVDF is a melt- processible fluoropolymer resin that features excellent physical properties and is inert to most chemicals. It has good stability and is resistant to radiation, abrasion, cold temperatures and stress cracking. PVDF is rated from 0° F to 275° F.

Comprehensive Product Portfolio

Complementing our **HPLP series** lined piping products, **Aegis® Flow Technologies** offers a complete lined valve and lined accessory portfolio. Associated products are:

BFV Series Lined Butterfly Valves
LBR & LBF Series Lined Ball Valves
LPG Series Lined Plug Valves
LDV Series Lined Diaphragm Valves
SVL Series Lined Sample Valves
VNRA Series Lined Ball Check Valves
LSCV Series Lined Swing Check Valves
BESG Series Lined Sight Glasses
FPCV Series Lined Piston Check Valves

HPLP Series Liner / Pipe / Fitting Specifications

Size	Paraflon® Standard	Paraflon® Heavy Duty	PTFE Standard	PTFE Heavy Duty	PFA	PVDF	Spool Weight (Lbs.) First Ft	Spool Weight (Lbs.) Each Add'l
1/2	.110	.120	.110	.120	.110	O/A	5	1
3/4	.110	.120	.110	.120	.110	O/A	6	1
1	.130	.130	.130	.130	.125	.130	6	2
1 1/4	.130	.130	.130	.130	.125	.130	8	3
1 1/2	.150	.150	.150	.150	.125	.150	9	3
2	.160	.160	.160	.160	.125	.160	15	5
3	.160	.160	.160	.160	.125	.160	27	8
4	.180	.280	.180	.280	.140	.200	40	12
5	.180	.280	.180	.280	.140	.200	46	15
6	.270	.310	.270	.310	.160	.250	63	22
8	.285	.390	.285	.390	.160	.250	100	32
10	.320	.450	.320	.450	N/A	N/A	130	40
12	.320	.450	.320	.450	N/A	N/A	182	54

Standard Duty: 1/2" – 3" Full Vacuum Rated through 450° F
Heavy Duty: 4" – 12" Full Vacuum Rated through 450° F

Liners

Paraflon® - Molecular/Mechanically Enhanced PTFE
PTFE - Polytetrafluoroethylene (ASTM F1545 & F423)
PFA - Perfluoroalkoxy (ASTM F781)
PVDF - Polyvinylidene Fluoride (ASTM F491)

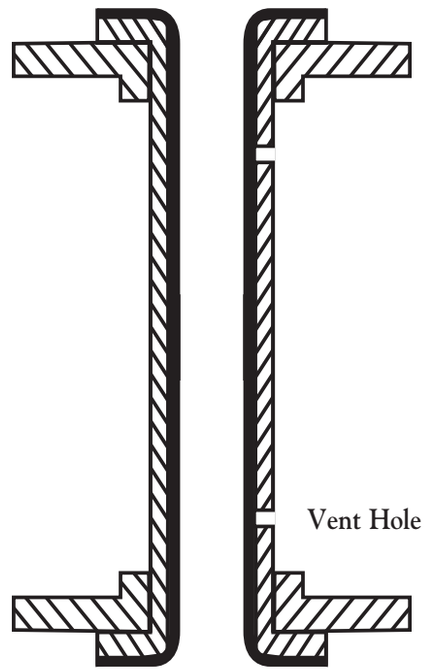
Pipe

ERW pipe can damage the liner during fabrication.
Aegis uses only **SEAMLESS** pipe.
Carbon Steel ASTM A106
Stainless Steel 304 & 316 ASTM A312
Schedule 40 for 1"-10"; Schedule 40S for 12"

Fittings

Cast Steel: ASTM A216 WCB, A395 DI
Fabricated Steel: ASTM A234, A587, A181, A105 and A53
Dimensional Conformances: ASTM B16.42 and B16.5
Stainless Steel: ASTM A312, 304 & 316, ASTM A403

Lined Spool



NOTES

Construction Tolerances:

- Pipe Spools **+/- 1/8"**
- Fixed Flange Bolt Alignment **+/- 1/16"**
- Perpendicularity of flange with the centerline of the pipe **3/32** in/ft of the pipe diameter
- All dimensions are in inches.
- Other materials are available upon request.
- Upon request fittings and spools are available with welded vent extension couplings.

HPLP Series

Properties of Plastic Linings

Property	Unit	Paraflon®	PFA	PTFE	PVDF
Density	g/cm^3	2.15 - 2.18	2.14 - 2.17	2.14 - 2.16	1.76 - 1.78
Maximum Continuous Operating Temperature	° F	500	450	450	275
Minimum Continuous Operating Temperature	° F	-20	-20	-20	0
Ball Pressure Hardness	N/mm^2	25 - 30	25 - 30	23 - 28	62 - 68
Shore Hardness D	Sh. D	58 - 65	60 - 65	54 - 60	72 - 82
Water Absorption	%	0.005	0.02	0.01	0.03
Coefficient of Friction V Steel Dynamic	N/A	0.15	0.25	0.10	0.45
Elongation of Break (23 ° C)	%	450 - 600	250 - 350	250 - 400	200 - 250
Tensile Strength (23 ° C)	N/mm^2	28 - 40	25 - 30	25 - 42	38 - 50
Tensile Modulus (23 ° C)	N/mm^2	600 - 700	600 - 700	400 - 800	800 - 1800
Liner Color	N/A	White	Natural	White	Black
Thermal Conductivity ("K" Factor) of Liner BTU-in./hr-sq. ft.-°F	N/A	1.7	1.3	1.7	1.18

Conductive linings are available upon request.

Welded & Rotating Flanges

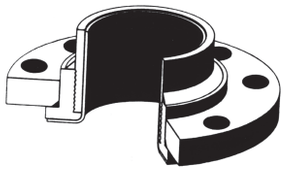
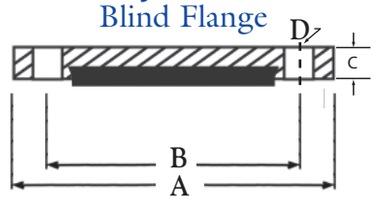


Figure 1700
Blind Flange



150 lb. Class ANSI B 16.42 & B 16.5 Flange Dimensions					Size	300 lb. Class ANSI B 16.5 Flange Dimensions				
A Outside Diameter	B Diameter Bolt Crcl	C Thickness	D No./Size Bolt Hole	Blind Fig Thickness w/ Plastic		A Outside Diameter	B Diameter Bolt Crcl	C Thickness	D No./Size Bolt Hole	Blind Fig Thickness w/ Plastic
3 1/2	2 3/8	7/16	4 - 5/8	9/16	1/2	3 3/4	2 5/8	9/16	4 - 5/8	11/16
3 7/8	2 3/4	1/2	4 - 5/8	5/8	3/4	4 5/8	3 1/4	5/8	4 - 3/4	3/4
4 1/4	3 1/8	9/16	4 - 5/8	11/16	1	4 7/8	3 1/2	11/16	4 - 3/4	13/16
4 5/8	3 1/2	5/8	4 - 5/8	3/4	1 1/4	5 1/4	3 7/8	3/4	4 - 3/4	7/8
5	3 7/8	11/16	4 - 5/8	13/16	1 1/2	6 1/8	4 1/2	13/16	4 - 7/8	15/16
6	4 3/4	3/4	4 - 3/4	7/8	2	6 1/2	5	7/8	8 - 3/4	1
7	5 1/2	7/8	4 - 3/4	1	2 1/2	7 1/2	5 7/8	1	8 - 7/8	1 1/8
7 1/2	6	15/16	4 - 3/4	1 1/16	3	8 1/4	6 5/8	1 1/8	8 - 7/8	1 1/4
9	7 1/2	15/16	8 - 3/4	1 1/16	4	10	7 7/8	1 1/4	8 - 7/8	1 3/8
11	9 1/2	1	8 - 7/8	1 1/8	6	12 1/2	10 5/8	1 7/16	12 - 7/8	1 9/16
13 1/2	11 3/4	1 1/8	8 - 7/8	1 1/4	8	15	13	1 5/8	12 - 1	1 3/4
16	14 1/4	1 3/16	12 - 1	1 15/16	10	17 1/2	15 1/4	1 7/8	16 - 1 1/8	2
19	17	1 1/4	12 - 1	1 3/8	12	20 1/2	17 3/4	2	16 - 1 1/4	2 1/8

ANSI 150 lb. ductile iron flanges conform to ASTM A-395 or A-536
ANSI 150 lb. and 300 lb. forged steel flanges conform to ASTM A-105.
ASTM A 182 (304 L) Stainless Steel

NOTES

All dimensions are in inches.

HPLP Series Plastic Lined Flanged Fittings

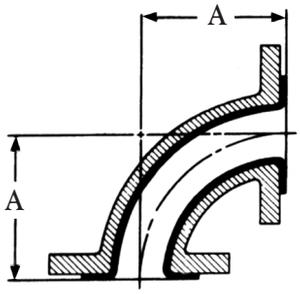


Figure 1000
90° Elbow

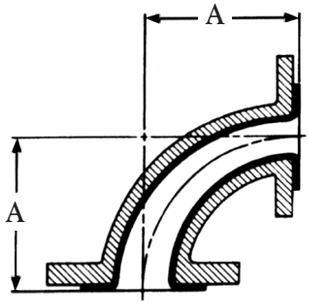


Figure 1000 R
90° Red. Elbow

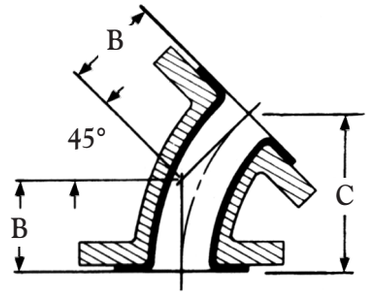


Figure 1100
45° Elbow

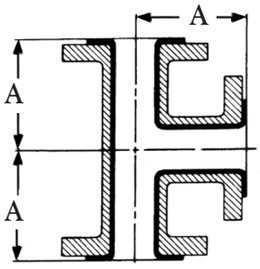


Figure 1200
Equal Tee

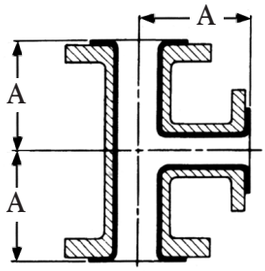


Figure 1200 R
Red. Tee

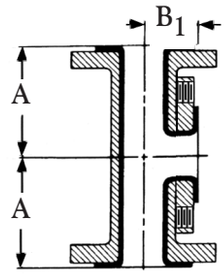


Figure 1800
Short Stack Tee

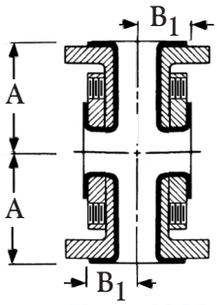


Figure 1900
Short Stack Cross

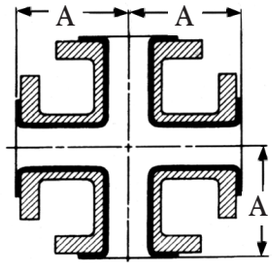


Figure 1500 - Cross
Figure 1500R - Reducing Cross

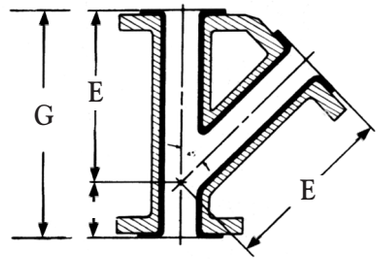


Figure 1600 - Lateral
Figure 1600R - Reducing Lateral

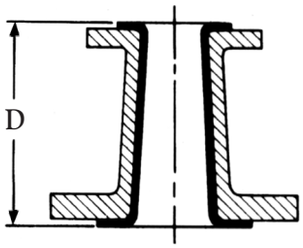


Figure 1300
Concentric Reducer

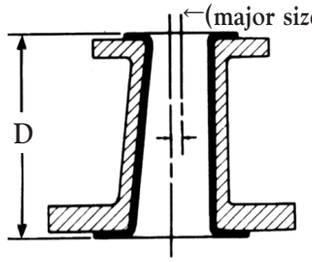


Figure 1400
Eccentric Reducer

NOTES
Fittings are available with fixed & rotating flanges.
Fittings are also available with DIN dimensions.

HPLP Series ANSI 150 Lb Flanged Fitting Dimensions

Size	A	B	C	D	E	G	B_1
1/2	3 1/2	1 3/4	3	4 1/2	5 3/4	7 1/2	—
3/4	3 1/2	1 3/4	3	4 1/2	5 3/4	7 1/2	—
1	3 1/2	1 3/4	3	4 1/2	5 3/4	7 1/2	1 1/4
1 1/4	3 3/4	2	3 13/22	4 1/2	6 1/4	8	—
1 1/2	4	2 1/4	3 27/32	4 1/2	7	9	1 1/2
2	4 1/2	2 1/2	4 1/4	5	8	10 1/2	1 3/4
2 1/2	5	3	5 1/8	5 1/2	9 1/2	12	—
3	5 1/2	3	5 1/8	6	10	13	2 1/4
4	6 1/2	4	6 13/16	7	12	15	2 3/4
6	8	5	8 9/16	9	14 1/2	18	3 3/4
8	9	5 1/2	9 3/8	11	17 1/2	22	5
10	11	6 1/2	11 1/8	12	20 1/2	25 1/2	6
12	12	7 1/2	12 13/16	14	24 1/4	30	7

* ANSI 150 lb. fittings are available with 300 lb. flanges

ANSI 300 Lb Flanged Fitting Dimensions

Size	A	B	C	D	E	G
1/2	4	2 1/4	3 13/16	4 1/2	6 1/2	8 1/2
3/4	4	2 1/4	3 13/16	4 1/2	6 1/2	8 1/2
1	4	2 1/4	3 13/16	4 1/2	6 1/2	8 1/2
1 1/2	4 1/2	2 3/4	4 11/16	4 1/2	8 1/2	11
2	5	3	5 1/8	5	9	11 1/2
2 1/2	5 1/2	3 1/2	6	5 1/2	10 1/2	13
3	6	3 1/2	6	6	11	14
4	7	4 1/2	7 11/16	7	13 1/2	16 1/2
6	8 1/2	5 1/2	9 3/8	9	17 1/2	21 1/2
8	10	6	10 1/4	11	20 1/2	25 1/2

NOTES

All dimensions are in inches and include the lining. Tolerance +/- 1/8".
All fittings conform to ANSI B16.42 or B16.5 dimensions after lining.

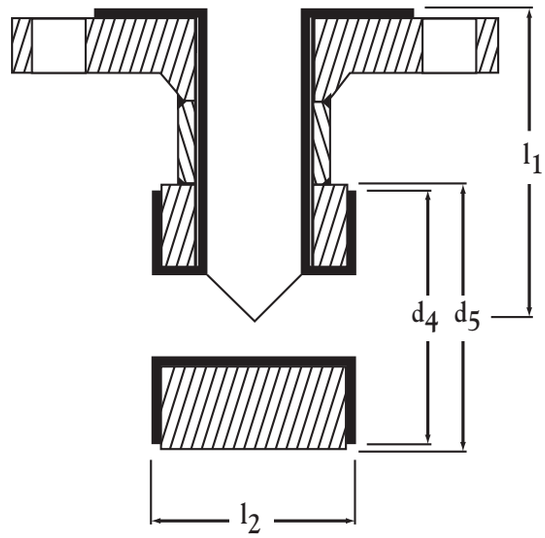
HPLP Series

Instrument Tees

Branch	1	1 ½	2
l_2	2	3	3 9/16

	150#			300#		
Size	d_4	d_5	l_1	d_4	d_5	l_1
1	2	2 ½	3 ½	2	2 5/8	4 ¼
1 ¼	2 ½	2 13/16	3 ¾	-	-	-
1 ½	2 7/8	3 ¼	4	2 7/8	3 3/8	4 ¾
2	3 5/8	4	4 ½	3 5/8	4 1/8	5 1/8
2 ½	4 1/8	4 11/16	5	-	-	-
3	5	5 3/16	5 ½	5	5 3/16	5 ½
4	6 3/16	6 ¾	6 ½	6 3/16	6 7/8	7 1/8
5	7 5/16	7 9/16	7 ½	-	-	-
6	8 ½	8 9/16	8	8	8 ¾	8 ½
8	10 5/8	10 13/16	9	10 ¼	11	9
10	12 ¾	13 ¼	11			
12	15	16	12			

Figure 2000



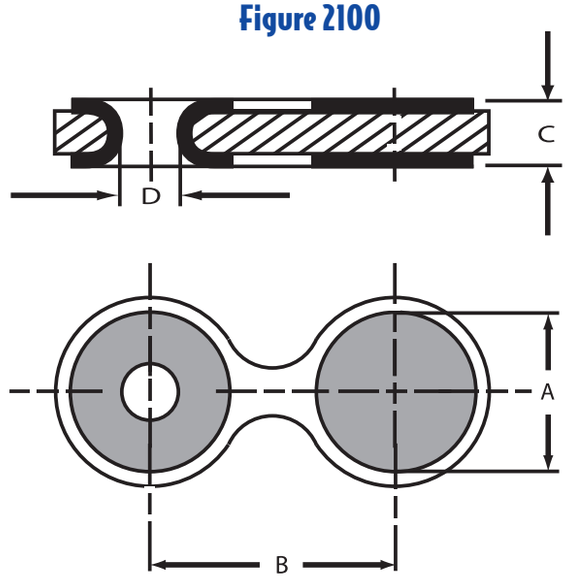
NOTES

*Also available with lug style body.

ANSI 150 Lb Lined Spectacle Blind flanges

Size	A	B	C	D
1	2	2 7/8	13/16	13/16
1 1/2	2 7/8	3 11/16	15/16	1 3/8
2	3 5/8	4 7/16	1	1 13/16
3	5	5 3/4	1 3/16	2 13/16
4	6 3/16	7	1 3/16	3 13/16
6	8 1/2	9 1/8	1 1/4	5 5/8
8	10 5/8	11 3/8	1 3/8	7 1/2
10	12 3/4	13 7/8	1 3/8	9 1/2
12	15	16 1/2	1 1/2	11 7/16

Figure 2100

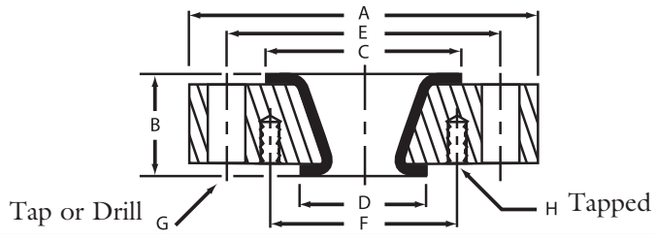


NOTES

All dimensions are in inches.

Plastic Lined Reducing Flanges

Figure 2200



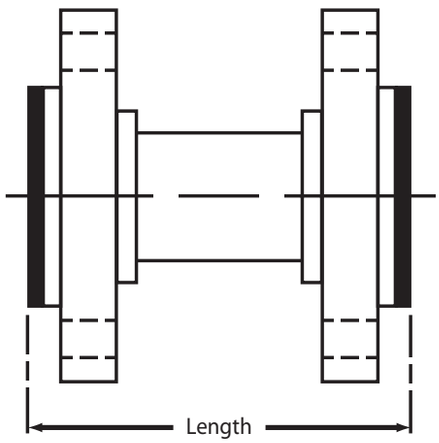
Sizes	Dimensions A	Dimensions B	G Bolt Holes #	G Bolt Holes Size	H Bolt Holes #	H Bolt Holes Size	Bolt Circle–Diameter E	Bolt Circle–Diameter F	Flare Diameters C	Flare Diameters D
* 1 x 1/2	4 1/4	1 1/2	4	1/2	4	1/2-13	3 1/8	2 3/8	2	1 3/8
* 1 x 3/4	4 1/4	1 1/2	4	1/2	4	1/2-13	3 1/8	2 3/4	2	1 11/16
* 1 1/2 x 1	5	1 1/2	4	1/2	4	1/2-13	3 7/8	3 1/8	2 11/16	2
2 x 1	6	1 1/2	4	5/8	4	1/2-13	4 3/4	3 1/8	3 5/8	2
* 2 x 1 1/2	6	1 1/2	4	5/8	4	1/2-13	4 3/4	3 7/8	3 5/8	2 7/8
2 1/2 x 1	7	1 1/2	4	5/8	4	1/2-13	5 1/2	3 1/8	4 1/8	2
2 1/2 x 1 1/2	7	1 1/2	4	5/8	4	1/2-13	5 1/2	3 7/8	4 1/8	2 7/8
* 2 1/2 x 2	7	1 1/2	4	5/8	4	5/8-11	5 1/2	4 3/4	4 1/8	3 5/8
3 x 1	7 1/2	1 1/2	4	5/8	4	1/2-13	6	3 1/8	5	2
3 x 1 1/2	7 1/2	1 1/2	4	5/8	4	1/2-13	6	3 7/8	5	2 7/8
* 3 x 2	7 1/2	1 1/2	4	5/8	4	5/8-11	6	4 3/4	5	3 5/8
* 3 x 2 1/2	7 1/2	1 1/2	4	5/8	4	5/8-11	6	5 1/2	5	4 1/8
4 x 1	9	2	8	3/4	4	1/2-13	7 1/2	3 1/8	6 3/16	2
4 x 1 1/2	9	2	8	3/4	4	1/2-13	7 1/2	3 7/8	6 3/16	2 7/8
4 x 2	9	1 1/2	8	5/8	4	5/8-11	7 1/2	4 3/4	6 3/16	3 5/8
4 x 2 1/2	9	1 1/2	8	5/8	4	5/8-11	7 1/2	5 1/2	6 3/16	4 1/8
4 x 3	9	1 1/2	8	5/8	4	5/8-11	7 1/2	6	6 3/16	5
6 x 1	11	2	8	7/8	4	1/2-13	9 1/2	3 1/8	8 1/2	2
6 x 1 1/2	11	2	8	7/8	4	1/2-13	9 1/2	3 7/8	8 1/2	2 7/8
6 x 2	11	2	8	7/8	4	5/8-11	9 1/2	4 3/4	8 1/2	3 5/8
6 x 2 1/2	11	2	8	7/8	4	5/8-11	9 1/2	5 1/2	8 1/2	4 1/8
6 x 3	11	2	8	7/8	4	5/8-11	9 1/2	6	8 1/2	5
6 x 4	11	1 1/2	8	3/4	8	5/8-11	9 1/2	7 1/2	8 1/2	6 1/8
8 x 1	13 1/2	2	8	7/8	4	1/2-13	11 3/4	3 1/8	10 5/8	2
8 x 1 1/2	13 1/2	2	8	7/8	4	1/2-13	11 3/4	3 7/8	10 5/8	2 7/8
8 x 2	13 1/2	2	8	7/8	4	5/8-11	11 3/4	4 3/4	10 5/8	3 5/8
8 x 2 1/2	13 1/2	2	8	7/8	4	5/8-11	11 3/4	5 1/2	10 5/8	4 1/8
8 x 3	13 1/2	2	8	7/8	4	5/8-11	11 3/4	6	10 5/8	5
8 x 4	13 1/2	2	8	7/8	8	5/8-11	11 3/4	7 1/2	10 5/8	6 1/8
8 x 6	13 1/2	1 1/2	8	3/4	8	3/4-10	11 3/4	9 1/2	10 5/8	8 1/2
10 x 1	16	2	12	1	4	1/2-13	14 1/4	3 1/8	12 3/4	2
10 x 1 1/2	16	2	12	1	4	1/2-13	14 1/4	3 7/8	12 3/4	2 7/8
10 x 2	16	2	12	1	4	5/8-11	14 1/4	4 3/4	12 3/4	3 5/8
10 x 2 1/2	16	2	12	1	4	5/8-11	14 1/4	5 1/2	12 3/4	4 1/8
10 x 3	16	2	12	1	4	5/8-11	14 1/4	6	12 3/4	5
10 x 4	16	2	12	1	8	5/8-11	14 1/4	7 1/2	12 3/4	6 1/8
10 x 6	16	2	12	1	8	3/4-10	14 1/4	9 1/2	12 3/4	8 1/2
10 x 8	16	1 1/2	12	7/8	8	3/4-10	14 1/4	11 3/4	12 3/4	10 5/8
12 x 1	19	2	12	1	4	1/2-13	17	3 1/8	15	2
12 x 1 1/2	19	2	12	1	4	1/2-13	17	3 7/8	15	2 7/8
12 x 2	19	2	12	1	4	5/8-11	17	4 3/4	15	3 5/8
12 x2 1/2	19	2	12	1	4	5/8-11	17	5 1/2	15	4 1/8
12 x 3	19	2	12	1	4	5/8-11	17	6	15	5
12 x 4	19	2	12	1	8	5/8-11	17	7 1/2	15	6 1/8
12 x 6	19	2	12	1	8	3/4-10	17	9 1/2	15	8 1/2
12 x 8	19	2	12	1	8	3/4-10	17	11 3/4	15	10 5/8
12 x 10	19	1 1/2	12	7/8	12	7/8-9	17	14 1/4	15	12 3/4

Note: Only one set of bolt holes is on the vertical center line. The other set straddles the center line. Dimensions are in inches.

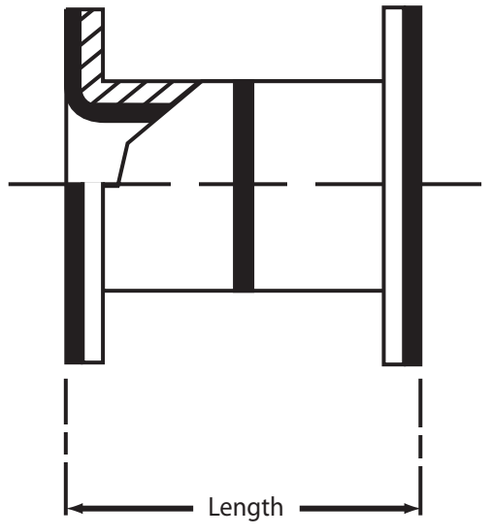
HPLP Series Minimum Spool Length and Distance Piece

Size	Minimum Spool Length			
	2 Rotating		1 Fixed & 1 Rotating	
	Class 150	Class 300	Class 150	Class 300
1	6 ½	6 ½	3	3
1 ½	7	7 5/8	3 ¼	3 3/8
2	7 ½	8 1/8	4	4 1/8
3	10 ½	11 ½	4 ½	4 ¾
4	10 7/8	12	4 ½	4 ¾
6	16 ½	17 ½	5 ½	6
8	17	17 7/8	5 ¾	6 ¼
10	-	-	6	6 ¾
12	-	-	6	6 ¾

Minimum Spool Length



Distance Piece



A distance piece is used for filling spaces greater in length than the maximum spacer length of (3") but less than the minimum flanged pipe spool length. The minimum length of a distance piece is three inches (3") for any size. The exact length of the distance piece must be specified.

NOTES

All dimensions are in inches.

HPLP Series Spacers - PARAFLON®, PFA, PTFE & PVDF

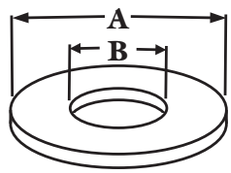
Class 150						
Size (NPS)	Ring A	B	D	Full Face Bolt Holes No.	Full Face Bolt Holes Size	Full Face Bolt Circle Dia F
1	$2^5/_8$	1	$4^1/_4$	4	$^5/_8$	$3^1/_8$
$1^1/_2$	$3^3/_8$	$1^1/_2$	5	4	$^5/_8$	$3^7/_8$
2	$4^1/_8$	2	6	4	$^3/_4$	$4^3/_4$
$2^1/_2$	$4^7/_8$	$2^1/_2$	7	4	$^3/_4$	$5^1/_2$
3	$5^3/_8$	3	$7^1/_2$	4	$^3/_4$	6
4	$6^7/_8$	4	9	8	$^3/_4$	$7^1/_2$
6	$8^3/_4$	6	11	8	$^7/_8$	$9^1/_2$
8	11	8	$13^1/_2$	8	$^7/_8$	$11^3/_4$
10	$13^3/_8$	10	16	12	1	$14^1/_4$
12	$16^1/_8$	12	19	12	1	17

Class 300						
Size (NPS)	Ring A	B	D	Full Face Bolt Holes No.	Full Face Bolt Holes Size	Full Face Bolt Circle Dia F
1	$2^7/_8$	1	$4^7/_8$	4	$^3/_4$	$3^1/_2$
$1^1/_2$	$3^3/_4$	$1^1/_2$	$6^1/_8$	4	$^7/_8$	$4^1/_2$
2	$4^3/_8$	2	$6^1/_2$	8	$^3/_4$	5
$2^1/_2$	$5^1/_8$	$2^1/_2$	$7^1/_2$	8	$^7/_8$	$5^7/_8$
3	$5^7/_8$	3	$8^1/_4$	8	$^7/_8$	$6^5/_8$
4	$7^1/_8$	4	10	8	$^7/_8$	$7^7/_8$
6	$9^7/_8$	6	$12^1/_2$	12	$^7/_8$	$10^5/_8$
8	$12^1/_8$	8	15	12	1	13

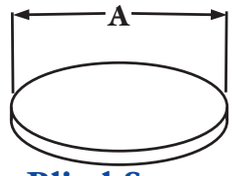
Spacers are available with many different dimensions. They may be supplied as tapered, special bored, orifice tapered, taper bored for butterfly valves, reducing, blind, etc. The exact length of the spacer should be specified.

NOTES

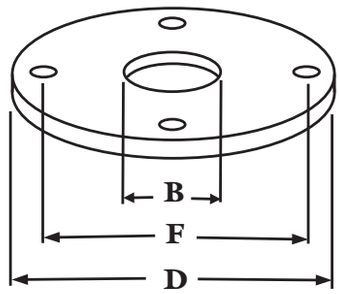
All dimensions are in inches.



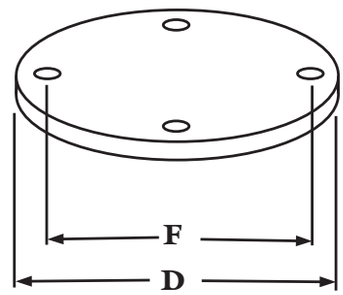
Ring Spacer



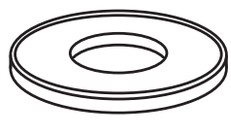
Blind Spacer

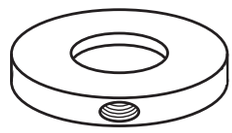


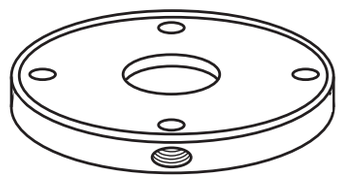
Full Face Spacer

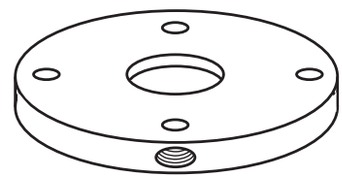


Blind Full Face Spacer


Armored Ring Spacer

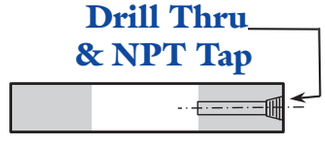

Orifice Ring Spacer


Armored Spacer Full Face

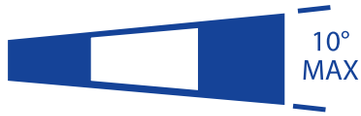

Orifice Spacer Full Face

Steel Reinforcement Plastic Spacer

Drill Thru & NPT Tap



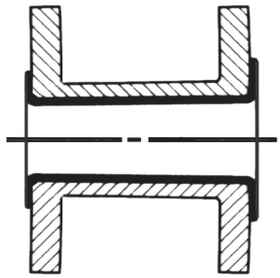
Single Taper Spacer



Double Taper Spacer


Taper Bore Spacer

HPLP Series Large Diameter PTFE Lined Pipe & Fittings



Pipe Spool

Size	Weight 1st Foot	Each Additional Foot	Liner Thickness
14	241	66	.275
16	276	77	.275
18	352	83	.275
20	441	92	.275
24	555	111	.275

Available through size 48”

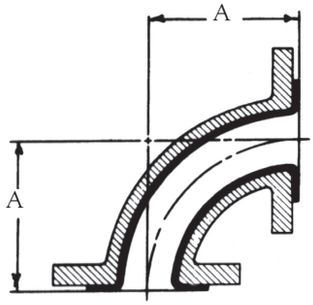


Figure 2300 90° Elbow

Size	A	Weight
14	14	335
16	15	388
18	$16^1/_2$	490
20	18	615
24	22	813

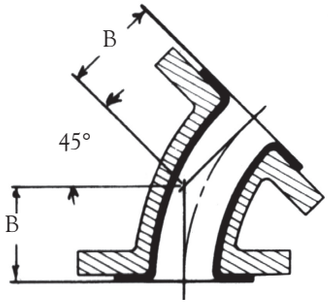


Figure 2400 45° Elbow

Size	B	Weight
14	$7^1/_2$	309
16	8	354
18	$8^1/_2$	443
20	$9^1/_2$	560
24	11	734

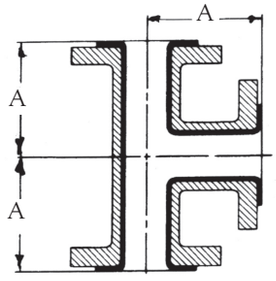


Figure 2500 Equal Tee

Size	A	Weight
14	14	435
16	15	489
18	$16^1/_2$	603
20	18	777
24	22	1230

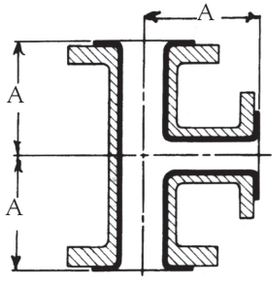
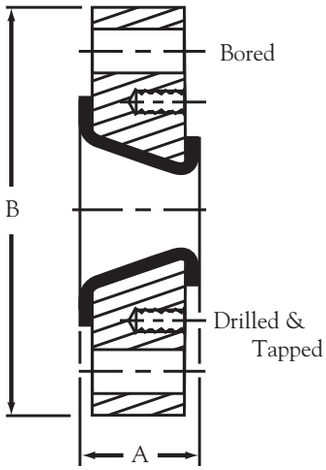


Figure 2500R Reducing Tee

Size	A	Weight
14	14	370
16	15	416
18	$16^1/_2$	512
20	18	660
24	22	1046

Figure 2600 Reducing Flange



Size	A	B	Type	Weight
14 x 6	2 3/4	21	1	149
14 x 8	2 3/4	21	1	152
14 x 10	2 3/4	21	1	121
14 x 12	2 3/4	21	2	111
16 x 10	2 7/8	23 1/2	1	182
16 x 12	2 7/8	23 1/2	1	179

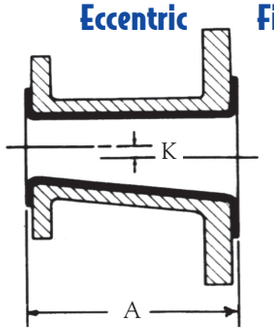
18” - 24” are available upon request

Size	Flare Dia. (Min.)	No. Bolt Holes	Dia. Bolt Circle	Drilled Size	Tapped Size
6	8 3/8	8	9 1/2	7/8	3/4 - 10
8	10 1/2	8	11 3/4	7/8	3/4 - 10
10	12 5/8	12	14 1/4	1	7/8 - 9
12	14 5/8	12	17	1	7/8 - 9
14	16 1/4	12	18 3/4	1 1/8	1 - 8
16	18 1/8	16	21 1/4	1 1/8	1 - 8

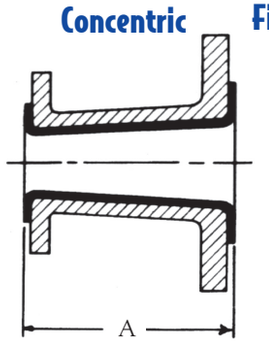
TYPE 1 All bolt holes straddle centerline

TYPE 2 One set holes straddle, one set is centerline

Eccentric Figure 2700 Concentric and Eccentric Reducers



Concentric Figure 2800



Size	A	K	Weight
14 x 12	16	1	231
14 x 10	16	2	214
16 x 14	18	1	282
16 X 12	18	2	251
18 X 16	19	1	336
18 X 14	19	2	324
20 x 18	20	1	468
20 x 16	20	2	439
24 x 20	24	2	570
24 x 18	24	3	529

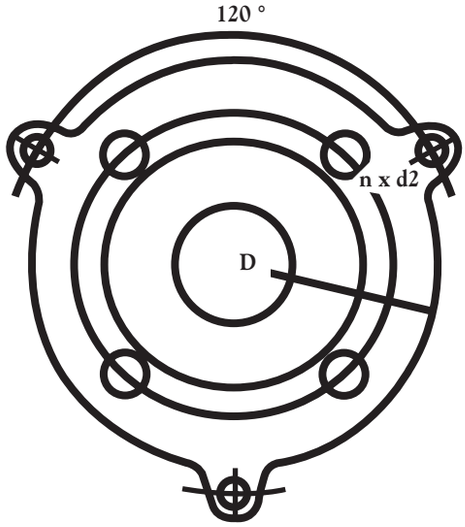
PIPE

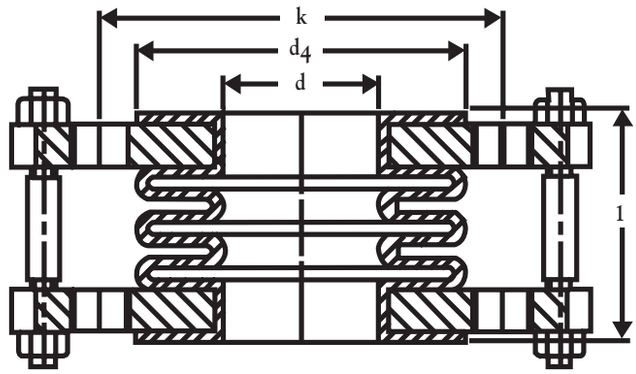
Flanges	A105/ANSI B16.5
Pipe	375 Wall - A53
Liner	PTFE

FITTINGS: Fabricated Carbon Steel

Flanges	A105/ANSI B126.5
Pipe	A234/ANSI B16.28
Liner	PTFE

HPLP Series Expansion Joints





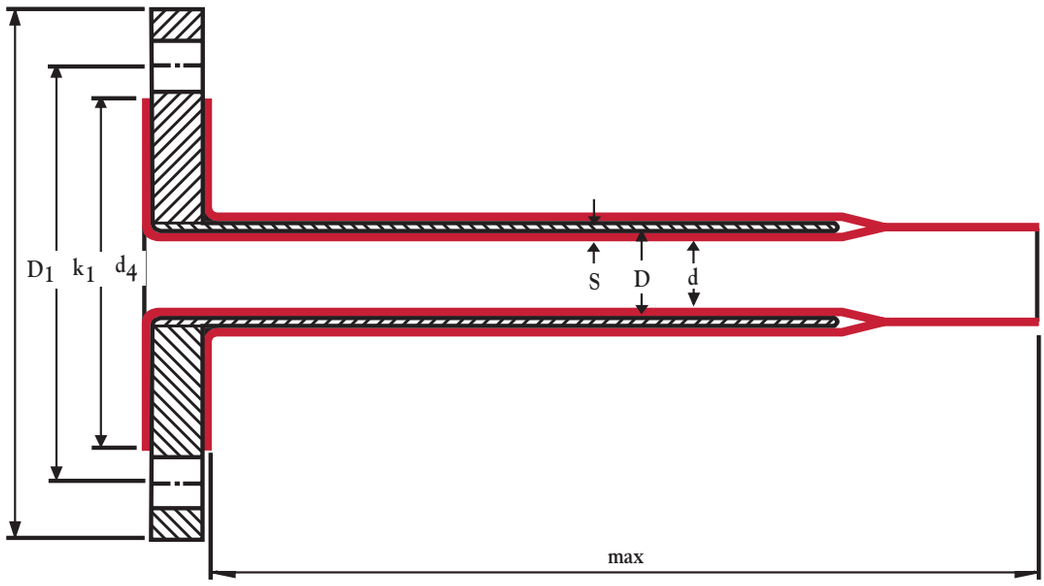
Size	d	d4	k	n x d2	D	l for 2 conv.	l for 3 conv.	l for 4 conv.	l for 5 conv.	l for 6 conv.	l for 7 conv.	l for 8 conv.
1/2"	.866	1.38	2.36	4 x 1/2"	3.50	1.50	2.00	2.25	2.91	3.30	3.86	4.33
3/4"	.866	1.69	2.76	4 x 1/2"	3.85	1.50	2.00	2.45	2.91	3.39	3.86	4.33
1"	.866	2.00	3.11	4 x 1/2"	4.25	1.60	2.16	2.72	3.27	3.82	4.38	4.92
1 1/4"	1.10	2.52	3.50	4 x 1/2"	4.60	1.60	2.16	2.72	3.27	3.82	4.38	4.92
1 1/2"	1.30	2.87	3.86	4 x 1/2"	5.00	2.00	2.56	3.11	3.66	4.22	4.76	5.32
2"	1.73	3.62	4.76	4 x 5/8"	5.98	2.20	2.75	3.30	3.86	4.41	4.96	5.51
2 1/2"	2.44	4.13	5.51	4 x 5/8"	7.00	2.13	2.75	3.38	4.02	4.65	5.28	6.00
3"	2.76	5.00	6.00	4 x 5/8"	7.50	2.13	2.75	3.38	4.02	4.65	5.28	6.00
4"	3.70	6.18	7.48	8 x 5/8"	9.00	3.22	4.00	4.65	5.35	6.06	6.77	7.48
5"	4.80	7.28	8.50	8 x 3/4"	10.00	3.22	4.00	4.65	5.35	6.06	6.77	7.48
6"	5.67	8.50	9.50	8 x 3/4"	11.00	3.43	4.14	4.84	5.55	6.27	6.97	7.68
8"	7.64	10.63	11.73	8 x 3/4"	13.50	3.39	4.14	4.88	5.63	6.38	7.13	8.00
10"	9.70	12.76	14.25	12 x 7/8"	16.00	3.08	4.14	5.20	6.26	7.32	n.a.	n.a.
12"	11.70	15.00	17.00	12 x 7/8"	19.00	3.08	4.14	5.20	6.26	7.32	n.a.	n.a.
14"	12.80	16.25	18.75	12 x 1"	21.00	3.08	4.14	5.20	6.26	7.32	n.a.	n.a.
16"	14.80	18.50	21.25	16 x 1"	23.50	3.66	4.72	5.79	6.85	7.91	n.a.	n.a.
18"	16.54	21.00	22.75	16 x 1 1/8"	25.00	3.66	4.72	5.79	6.85	7.91	n.a.	n.a.
20"	18.54	23.00	25.00	20 x 1 1/8"	27.50	3.66	4.72	5.79	6.85	7.91	n.a.	n.a.
24"	23.42	27.25	29.50	20 x 1 1/4"	32.00	3.20	4.00	n.a.	n.a.	n.a.	n.a.	n.a.

NOTES

All flanges are in accordance with ASME B16.5 dimensions and are provided with threaded holes. All expansion joints are manufactured from Paraflon® molecular and mechanically enhanced PTFE. Stainless steel limit bolts and reinforcing rings are supplied as a standard with each expansion joint. Upon request stainless steel flanges and special dimensions are available.

HPLP Series S F Series

ANSI 150 lb. Single Flange PTFE Lined Dip Pipes



Size	S	d_4	k_1	D_1	D	d	Max Length
1/2"	.120	1.38	2.37	3.50	1.49	.787	10' - 0"
3/4"	.120	1.69	2.75	3.87	1.49	.787	10' - 0"
1"	.120	2.00	3.12	4.25	1.73	.866	10' - 0"
1 1/4"	.120	2.51	3.50	4.63	2.13	1.22	10' - 0"
1 1/2"	.120	2.87	3.87	5.00	2.13	1.45	10' - 0"
2"	.120	3.62	4.75	6.00	2.75	1.89	10' - 0"
2 1/2"	.140	4.14	5.50	7.00	3.23	2.48	10' - 0"
3"	.160	5.00	6.00	7.50	4.21	2.95	110' - 0"
4"	.180	6.18	7.50	9.00	5.16	3.90	10' - 0"
5"	.180	7.28	8.50	10.00	6.26	4.80	10' - 0"
6"	.200	8.50	9.50	11.00	8.11	5.86	10' - 0"
8"	.240	10.62	11.75	13.50	9.37	7.63	10' - 0"
10"	.280	12.75	14.25	16.00	12.16	9.76	10' - 0"

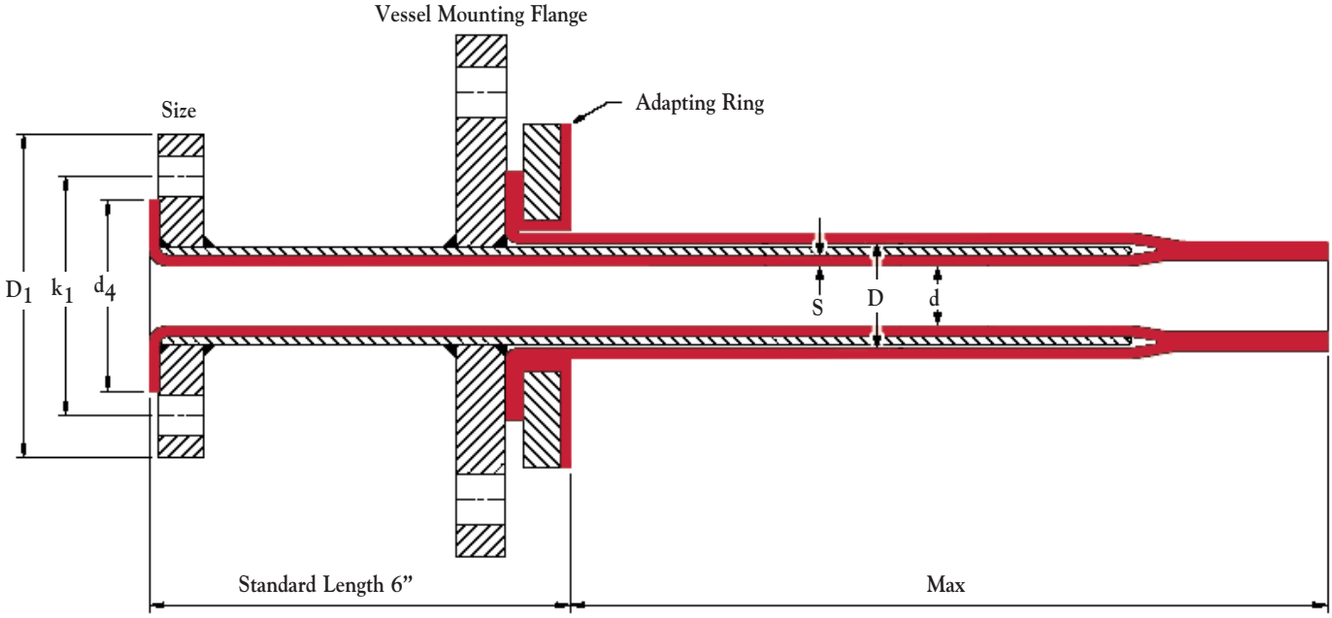
Flanges A105/ANSI B16.5
Steel Pipe ASTM A106 gr. B/ANSI B36.10
Liner Virgin PTFE/ASTM-D 4894

NOTES

Upon request, other sizes are available as well as custom dip pipes with bends and spray nozzles.

HPLP Series D F Series

ANSI 150 lb. Double Flanged PTFE Lined Dip Pipes



Size	S	d_4	k_1	D_1	D	d	Max Length
1/2”	.120	1.38	2.37	3.50	1.49	.787	10’ - 0”
3/4”	.120	1.69	2.75	3.87	1.49	.787	10’ - 0”
1”	.120	2.00	3.12	4.25	1.73	.866	10’ - 0”
1 1/4”	.120	2.51	3.50	4.63	2.13	1.22	10’ - 0”
1 1/2”	.120	2.87	3.87	5.00	2.13	1.45	10’ - 0”
2”	.120	3.62	4.75	6.00	2.75	1.89	10’ - 0”
2 1/2”	.140	4.14	5.50	7.00	3.23	2.48	10’ - 0”
3”	.160	5.00	6.00	7.50	4.21	2.95	10’ - 0”
4”	.180	6.18	7.50	9.00	5.16	3.90	10’ - 0”
5”	.180	7.28	8.50	10.00	6.26	4.80	10’ - 0”
6”	.200	8.50	9.50	11.00	8.11	5.86	10’ - 0”
8”	.240	10.62	11.75	13.50	9.37	7.63	10’ - 0”
10”	.280	12.75	14.25	16.00	12.15	9.75	10’ - 0”

Flanges A105/ANSI B16.5
Steel Pipe ASTM A106 gr. B/ANSI B36.10
Liner Virgin PTFE/ASTM-D 4894

NOTES

Upon request, other sizes are available as well as custom dip pipes with bends and spray nozzles.
Double wall dip pipes are available upon request.

HPLP Series PTFE Nozzle Liner

Size	S	d_A	d_4	Max Length
1/2"	.120	.630	1.38	10'-0"
3/4"	.120	.826	1.69	10'-0"
1"	.120	1.03	2.00	10'-0"
1 1/4"	.120	1.34	2.52	10'-0"
1 1/2"	.120	1.54	2.87	10'-0"
2"	.120	2.00	3.62	10'-0"
2 1/2"	.140	2.72	4.13	10'-0"
3"	.160	3.08	5.00	10'-0"
4"	.180	4.06	6.18	10'-0"
5"	.180	5.16	7.28	10'-0"
6"	.200	6.06	8.50	10'-0"
8"	.240	8.11	10.63	10'-0"
10"	.280	10.23	12.76	10'-0"
12"	.280	12.24	15.00	10'-0"

Lining Virgin PTFE/ASTM-D 4894

NOTES

Upon request other sizes are available as well as custom bends.

HPLP Series Installation & Maintenance Instructions

Do not remove the flange protectors until the piping system is ready to be installed. The flange protectors should be replaced after the lined piping system has been inspected. Scratches or impressions discovered on the liner sealing faces that do not exceed 15% of the liner thickness should be removed by hand polishing with fine emery grit paper.

The identical installation procedures used for ANSI 150 lb. flanged carbon steel piping systems can be used to install **Aegis® HPLP series** 150 lb. lined piping systems. Throughout the installation process it is recommended to use a new set of lightly oiled **A 193 Gr.B7** high strength machine bolts and **A 194 2H** nuts. In an effort to eliminate damage to the liner sealing surfaces it is recommended that a torque wrench and a criss-cross bolting sequence be used to tighten the flange bolts in accordance with our published bolt torques. Carefully check to make certain that the plastic sealing faces remain exactly parallel. Tighten the bolts in 20% increments until 80% of the final bolt torque is achieved. The final torque values should be reached by tightening the bolts sequentially around the flange in a clockwise direction to assure that the bolts are evenly loaded. It is recommended to check the torque values of each bolt after the initial 24-36 hours of the system's operation. Re-torque those that register below the published torque values. **The published torque values should only be exceeded when it is necessary to effect a seal.**

The use of gaskets is not required when installing lined piping systems. However in the event the lined pipe system will be flanged up to a dissimilar material, it is recommended to use a PTFE envelope gasket. In this case use the minimum published torque values.

Do not plug the vent holes and do not use sharp objects to clean plugged vent holes. These actions could result in damage to the liner.

It is not recommended to perform general welding operations on lined steel piping systems.

PVDF lined piping systems are susceptible to low temperature brittleness. It is not recommended to handle or store this material when the atmospheric temperature is 0° F or lower. Heat tracing should be considered at freezing temperatures.

Steam or electric heat tracing can be used if standoff strips or heat transfer cement is used to prevent direct contact with the pipe and fittings. The heat tracing temperature should never exceed the maximum temperature rating of the liner. Insulation can be used to augment the desired atmospheric temperature.

External painting of lined piping systems is acceptable provided that the protective end covers remain bolted to the flange faces. If the pipe and the fittings are to be sandblasted it is recommended that the blasting be directed away from the face of the flange.

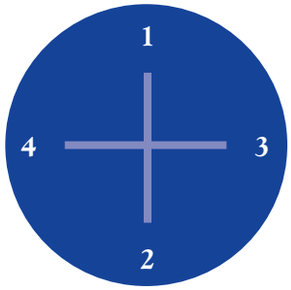
Grounding of the system should ideally be performed at the factory prior to the lining operation. However it can be performed in the field by welding threaded lugs or a connecting stud onto the pipe several inches behind each flange and by welding a single lug or connecting stud to each fitting. The system is then connected by a series of joining jumper cables. Extreme caution must be given to the welding process to eliminate possible thermal damage to the liner. It is recommended that a low resistance welding process be performed by well trained personnel.

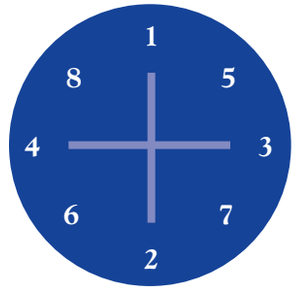
Bolt Torque (Ft. - Lbs.)

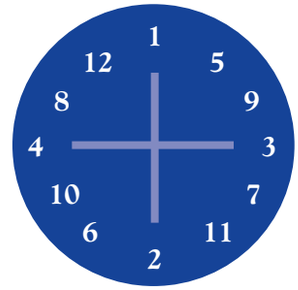
Pipe Size in Inches	1"	1 1/2"	2"	2 1/2"	3"	4"	6"	8"	10"	12"
PTFE, PFA Minimum	11	23	35	42	42	45	65	95	90	115
PTFE, PFA Maximum	25	55	76	110	125	125	125	150	200	200
Paraflon® Minimum	18	34	43	55	55	55	80	110	120	125
Paraflon® Maximum	25	58	80	124	135	135	143	165	210	220
PVDF Minimum	35	50	50	65	75	75	120	120	—	—
PVDF Maximum	55	60	125	125	125	125	225	225	—	—

Maximum torque values are recommended for process conditions where higher pressures and/or elevated temperatures exist.

Bolt Torquing Sequence







Mating flange faces must be parallel and bolts should be tightened as evenly as possible. Hand tight first then apply 20% of maximum torque in bolt torquing sequence repeatedly, increasing torque by 20% of maximum each time and without exceeding maximum torque.

HPLP Series Maximum Pressure Ratings (PSIG)

Temp °F	Class 150 Lb.	Class 300 Lb.
100	260	460
150	250	420
200	240	390
300	220	350
400	200	300
500	155	235

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