ZIOFLEX®

FLUOROPLASTIC SPECIALIST

PRODUCT CATALOG

PTFE LINING PRODUCTS

Fluoroplastic Lined Piping, Fittings and Equipment for Corrosive Chemical Applications



- Superior Chemical Resistance
- Wide Operating Temperature
- Longer Service Life & Lower TCO
- Reliable for Chemical Plant Operation

PT Zioflex Mandiri Indonesia

Advance Reliable Corrosion Protection Solution.

Banten - Indonesia | www.zioflex.co.id

PT. Zioflex Mandiri Indonesia is an Indonesian engineering and manufacturing specialist company focusing on **fluoroplastics PTFE LINED, industrial corrosion protection, and flexible connection systems**. The company provides custom-engineered solutions designed to withstand aggressive chemicals, high temperatures, thermal expansion, and mechanical vibrations in heavy industrial environments.

Location:
Workshop & Office: Jl. Cikerut No. 83, RT.4/RW.6, Kec. Cilegon, Kota Cilegon,
Banten 42416, Indonesia
Contact: info@zioflex.co.id | Phone: (0254) 2410142

Core Business Areas & Products

1. Corrosion Protection Products (PTFE & Fluoropolymer Lining)

Zioflex specializes in internal lining solutions designed to protect metallic industrial bodies (pipes, fittings, and vessels) from highly corrosive fluids and chemicals:

- **Products:** PTFE-lined and fluoropolymer-lined spools, elbows, tees, reducers, laterals, dip pipes, tanks, vessels, and custom process components.
- **Applications:** Chemical processing plants, power generation, fertilizer production, oil & gas, mining, and general manufacturing.

2. Fabric Expansion Joint Solutions

The company designs and manufactures multi-layer technical fabric flexible connectors for industrial ducting and exhaust networks:

- **Products:** Fabric expansion joints available in various configurations, including **Type Belt, Type Flange, Rectangular, Round, with Bolster, with Frame, and Fabric-Only** options.
- **Applications:** Ducting systems, exhaust systems, gas lines, boilers, fans, and areas subjected to thermal movement, vibration, and high operational temperatures.

Engineering & Quality Standards

- **Custom Fabrication:** Products are engineered precisely to client specifications, technical drawings, operational conditions, and standard industrial flange configurations.
- **Quality Control & Testing:** Depending on project requirements, quality assurance protocols include visual inspections, dimensional checks, spark testing (pinhole detection), hydrotesting, and flange face checks.
- **Traceability:** The company implements production coding and a product traceability framework accessible via its digital platform.

Target Industries

PT. Zioflex Mandiri Indonesia supports major industrial sectors across Indonesia, including:

- Chemical & Petrochemical Plants
- Power Plants (Power Generation)
- Fertilizer Industry
- Oil & Gas Upstream and Downstream facilities
- Mining & General Manufacturing Sectors

Terminology and Standards

LINER MATERIALS

PTFE	Polytetrafluoroethylene
PFA	Perfluoro alkoxy
PTFE	Ethylene tetrafluoroethylene

ASTM F1545-15a TABLE 3 STANDARD LINER COLOR

PTFE	White (natural color - no pigment added; also available as electrically conductive black)
PVDF	Black (available unpigmented for high-purity applications)
PFA	Natural - off white
ETFE	Natural - shiny, milky white

INDUSTRY ASSOCIATIONS &STANDARDS

ASME	American Society of Mechanical Engineers
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
ASTM F1545-15a	Standard Specification for Plastic-Lined Ferrous Metal Pipe, Fittings, and Flanges
A53	ASTM standard specification for carbon steel pipe
A105	ASTM standard specification for forged carbon steel used for flanges Carbon Steel Pipe for High-Temperature Service
A106	ASTM standard specification for Standard Specification for Seamless
A182	ASTM standard specification for forged stainless steel used for flanges
A216	ASTM standard specification for carbon steel castings for fittings
A234	ASTM standard specification for wrought carbon steel weld fittings
A312	ASTM standard specification for stainless steel pipe
A395	ASTM standard specification for ferritic ductile iron castings for flanges and fittings.
A403	ASTM standard specification for wrought stainless steel weld fittings
A513	ASTM standard specification for electric-resistance-welded carbon and alloy steel mechanical tubing
A587	ASTM standard specification for electric-resistance-welded low-carbon steel pipe for use as process lines in chemical industries.

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1. Standard Specifications for 1/2" (DN 15) - 12" (DN 300) Pipe and Fittings

Pipe and fittings manufactured by Zioflex are in full compliance with: ASTM F1545-15a, Standard Specification for Plastic-Lined Ferrous Metal Pipe, Fittings, and Flanges as follows

PT Zioflex Mandiri Indonesia certifies that all manufactured pipes and fittings strictly comply with **ASTM F1545-15a** standards by ensuring:

- Use of approved ASTM-designated resins for liner fabrication.
- Utilization of ASTM-compliant materials for flanged housing construction.
- Strict adherence to minimum dimensional requirements, often exceeding standard tolerances.
- Successful completion of required qualification tests, such as steam/cold water, temperature aging, and vacuum testing.
- Mandatory 100% proof-testing on all finished goods following approved testing procedures.

To maintain the highest standards of quality and performance, PT Zioflex Mandiri Indonesia products are fully compliant with the following specifications and technical requirements:

Component	Description
Liner	PTFE — Polytetrafluoroethylene, ASTM D4894 and D4895
Pipe	Carbon Steel: • 1" (DN25) – 12" (DN300) A53 Grade B Sch40 Seamless • More than 12" (DN300) A53 Grade B Sch20 Seamless Stainless Steel 304 / 316: • 1" (DN25) – 12" (DN300) A53 Grade B Sch40 Seamless • More than 12" (DN300) A53 Grade B Sch20 Seamless
Flanges	ASTM A105 Ansi 150 / 300 SORF
Fittings	ASTM A234WPB Sch40 Seamless
Half Coupling	Carbon Steel / Stainless Steel ¼" NPT Class 3000 lbs.
Plug	PTFE ¼" NPT Class 3000

2. PT Zioflex Mandiri Indonesia Quality Testing Statement

PT Zioflex Mandiri Indonesia conducts rigorous quality testing on 100% of finished products prior to dispatch, strictly performing:

- **Electrostatic Pinhole Test:** Performed on plastic liners to ensure liner integrity and zero defect in accordance with ASTM F1545.
- **Hydrostatic Pressure Test:** Applied to all finished lined pipes and fittings at 1.5 times the maximum working pressure to guarantee mechanical strength and leak-tight reliability.

3. Engineering Support Services

- **Bill of Material Take-Off for Quotes:** PT Zioflex Mandiri Indonesia provides complimentary Bill of Material (BOM) generation based on customer isometric or orthographic drawings.

BOMs derived from orthographic drawings are provided for budgetary purposes. Drawings may be submitted in PDF or .dwg format.

- **Isometric Drawing Service:** We offer professional isometric drawing development based on orthographic drawings or field measurement sketches. This service is available on a fee basis.
- **Installation Training & Certification:** To ensure proper installation of plastic-lined piping systems—specifically regarding torque specifications and flange assembly—PT Zioflex Mandiri Indonesia provides comprehensive on-site installation training and certification.
- **Field Fabrication Training & Certification:** We offer technical training and certification for field fabrication using approved tools and procedures. We strongly recommend training operators in specific liner types and size ranges prior to commencing field assembly.

4. Standard and Custom Coatings

Standard Coating Specification All pipes and fittings manufactured by PT Zioflex Mandiri Indonesia are finished with International Coatings Intergard 345, a high-solids polyamide epoxy primer containing zinc phosphate anti-corrosive pigmentation.

- **Standard Color: RAL 7037 Dusty Gray.**
- **Surface Preparation: SSPC-SP10 Near-White Blast Cleaning.**

Optional High-Performance Coating Systems PT Zioflex Mandiri Indonesia offers four standardized high-performance paint systems designed to optimize pricing, reduce lead times, and satisfy major end-user requirements:

System 1:	
Primer	Alkyd Primer QD
Topcoat	Pilot II
Supplier	Jotun

System 2:	
Primer	Interrzinc 22
Intermediate	Intergard 475HS
Top Coat	Interthane 990
Supplier	International Coatings

Custom Coating Notes & Site Touch-Up

- Custom client-specified coatings (including inorganic zinc silicates, epoxy phenolics, siloxanes, and electrically conductive polyamine-cured epoxies) are available upon request. PT Zioflex Mandiri Indonesia reserves the right to review product data sheets for VOC compliance, manufacturing compatibility, or technical feasibility prior to quoting.
- Factory shop-painted systems are subject to handling and transit wear. On-site touch-up painting following delivery is the responsibility of the Buyer.

5. 1/2" (DN 15) - 12" (DN 300) Flange and Pipe Dimensional Data

ASME B16.5 Flange Dimensions

Standard dimensional data for Pipe Flanges and Flanged Fittings (Class 150 and Class 300).

Size NPS (DN)	Class 150 - Outside Diameter in. (mm)	Class 150 - Thickness in. (mm)	Class 150 - No. and Diameter of Bolt Holes	Class 150 - Bolt Circle Diameter in. (mm)	Class 300 - Outside Diameter in. (mm)	Class 300 - Thickness in. (mm)	Class 300 - No. and Diameter of Bolt Holes	Class 300 - Bolt Circle Diameter in. (mm)
1/2 (15)	3 1/2 (89)	7/16 (11)	(4) 5/8	2 3/8 (60)	3 3/4 (95)	9/16 (14)	(4) 5/8	2 5/8 (67)
3/4 (20)	3 7/8 (98)	1/2 (13)	(4) 5/8	2 3/4 (70)	4 5/8 (117)	5/8 (16)	(4) 3/4	3 1/4 (83)
1 (25)	4 1/4 (108)	9/16 (14)	(4) 5/8	3 1/8 (79)	4 7/8 (124)	11/16 (17)	(4) 3/4	3 1/2 (89)
1 1/2 (40)	5 (127)	11/16 (17)	(4) 5/8	3 7/8 (98)	6 1/8 (156)	13/16 (21)	(4) 7/8	4 1/2 (114)
2 (50)	6 (152)	3/4 (19)	(4) 3/4	4 3/4 (121)	6 1/2 (165)	7/8 (22)	(8) 3/4	5 (127)
3 (80)	7 1/2 (191)	15/16 (24)	(4) 3/4	6 (152)	8 1/4 (210)	1 1/8 (29)	(8) 7/8	6 5/8 (168)
4 (100)	9 (229)	15/16 (24)	(8) 3/4	7 1/2 (191)	10 (254)	1 1/4 (32)	(8) 7/8	7 7/8 (200)
6 (150)	11 (279)	1 (25)	(8) 7/8	9 1/2 (241)	12 1/2 (318)	1 7/16 (37)	(12) 7/8	10 5/8 (270)
8 (200)	13 1/2 (343)	1 1/8 (29)	(8) 7/8	11 3/4 (298)	15 (381)	1 5/8 (41)	(12) 1	13 (330)
10 (250)	16 (406)	1 3/16 (30)	(12) 1	14 1/4 (362)	17 1/2 (445)	1 7/8 (48)	(16) 1 1/8	15 1/4 (387)
12 (300)	19 (483)	1 1/4 (32)	(12) 1	17 (432)	20 1/2 (521)	2 (51)	(16) 1 1/4	17 3/4 (451)

Pipe Dimension ASME B36.10

Size NPS inch	Size DN	Outside Diameter, mm	Schedule	Wall thickness mm
1	25	33.4	40	3.4
1-1/2	40	48.3	40	3.7
2	50	60.3	40	3.9
2-1/2	65	73	40	5.16
3	80	88.9	40	5.49
4	100	114.3	40	6.02
5	125	141.3	40	6.55
6	150	168.3	40	7.11
8	200	219.1	40	8.18

10	250	273	30	7.8
12	300	323.8	20	6.35
14	350	355.6	20	7.92
16	400	406.4	20	7.92
18	450	457	20	7.92
20	500	508	20	9.53
24	600	610	20	9.53

6. Pressure Ratings and Liner Data

The pressure and temperature ratings of plastic-lined piping products are designed to comply with ASME B16.5 Class 150 requirements, based on the applicable flange material. Refer to Table 1 for the corresponding pressure and temperature ratings.

For lined piping products equipped with ASME B16.5 Class 300 flanges, the allowable pressure and temperature ratings are lower than the standard Class 300 ratings. This limitation is due to the use of a plastic raised-face sealing surface on lined pipes and fittings.

Table 1. Pressure and Temperature Ratings for Plastic-Lined Pipes and Fittings, Sizes 1"–48"

TABLE 2–150 CLASS 150 PRESSURE–TEMPERATURE RATINGS

Pressures are in pounds per square inch, gage (psig)

Material Group	1.1	1.2	1.3	1.4	1.5	1.7	1.9	1.10	1.13	1.14	2.1	2.2	2.3	2.4	2.5	2.6	2.7
Materials / Temp., °F	Carbon				C-½Mo	½Cr-½Mo, Ni-Cr-Mo	1Cr-½Mo, 1¼Cr-½Mo	2¼Cr-1Mo	5Cr-½Mo	9Cr-1Mo	Type 304	Type 316	Types 304L, Types 316L	Type 321	Types 347, 348	Type 309	Type 310
−20 to 100	285	290	265	235	265	290	290	290	290	290	275	275	230	275	275	260	260
200	260	260	250	215	260	260	260	260	260	260	235	240	195	235	245	230	230
300	230	230	230	210	230	230	230	260	260	260	205	215	175	210	225	220	220
400	200	200	200	200	200	200	200	200	200	200	180	195	160	190	200	200	200
500	170	170	170	170	170	170	170	170	170	170	170	170	145	170	170	170	170
600	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140
650	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
700	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110
750	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
800	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
850	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65
900	50	50	50	50	50	50	50	50	50	50	50	50	···	50	50	50	50
950	35	35	35	35	35	35	35	35	35	35	35	35	···	35	35	35	35
1000	20	20	20	20	20	20	20	20	20	20	20	20	···	20	20	20	20

TABLE 2–300 CLASS 300 PRESSURE–TEMPERATURE RATINGS

Pressures are in pounds per square inch, gage (psig)

Material Group	1.1	1.2	1.3	1.4	1.5	1.7	1.9	1.10	1.13	1.14	2.1	2.2	2.3	2.4	2.5	2.6	2.7
Materials / Temp., °F	Carbon				C-½Mo	½Cr-½Mo, Ni-Cr-Mo	1Cr-½Mo, 1¼Cr-½Mo	2¼Cr-1Mo	5Cr-½Mo	9Cr-1Mo	Type 304	Type 316	Type 304L, Type 316L	Type 321	Types 347, 348	Type 309	Type 310
−20 to 100	740	750	695	620	695	750	750	750	750	750	720	720	600	720	720	670	670
200	675	750	655	560	680	750	710	715	750	750	600	620	505	610	635	605	605
300	655	730	640	550	655	730	675	675	730	730	530	560	455	545	590	570	570
400	635	705	620	530	640	705	660	650	705	705	470	515	415	495	555	535	535
500	600	665	585	500	620	665	640	640	665	665	435	480	380	460	520	505	505
600	550	605	535	455	605	605	605	605	605	605	415	450	360	435	490	480	480
650	535	590	525	450	590	590	590	590	590	590	410	445	350	430	480	465	465
700	535	570	520	450	570	570	570	570	570	570	405	430	345	420	470	455	455
750	505	505	475	445	530	530	530	530	530	530	400	425	335	415	460	445	445
800	410	410	390	370	510	510	510	510	500	510	395	415	330	415	455	435	435
850	270	270	270	270	485	485	485	485	440	485	390	405	320	410	445	425	425
900	170	170	170	170	450	450	450	450	355	450	385	395	···	405	430	415	415
950	105	105	105	105	280	345	380	380	260	370	375	385	···	385	385	385	385
1000	50	50	50	50	165	215	225	270	190	290	325	365	···	355	365	335	350
1050	···	···	···	···	···	190	140	200	140	190	310	360	···	345	360	290	335
1100	···	···	···	···	···	···	95	115	105	115	260	325	···	300	325	225	290
1150	···	···	···	···	···	···	50	105	70	75	195	275	···	235	275	170	245
1200	···	···	···	···	···	···	35	55	45	50	155	205	···	180	170	130	205
1250	···	···	···	···	···	···	···	···	···	···	110	180	···	140	125	100	160
1300	···	···	···	···	···	···	···	···	···	···	85	140	···	105	95	80	120
1350	···	···	···	···	···	···	···	···	···	···	60	105	···	80	70	60	80
1400	···	···	···	···	···	···	···	···	···	···	50	75	···	60	50	45	55
1450	···	···	···	···	···	···	···	···	···	···	35	60	···	50	40	30	40
1500	···	···	···	···	···	···	···	···	···	···	25	40	···	40	35	25	25

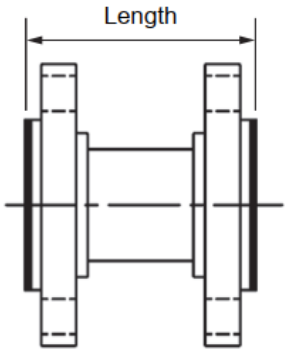
Plastic-Liner Data

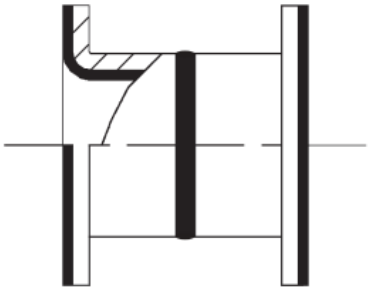
Liner Characteristics	PTFE	PFA	PP	PVDF (homopolymer)	PVDF (copolymer)	ETFE
Service Temperature Range, °F[1]	-20°F to 450°F	0°F to 450°F	0°F to 225°F	0°F to 275°F	-20°F to 275°F	-20°F to 300°F
Liner Color	White	Natural	Orange[2]	Black[2]	Black[3]	Natural
Color of Liner Identification Band	White with Black Lettering	Brown w/ White Lettering	Orange w/ Black Lettering	Black w/ White Lettering	Black w/ White Lettering	Gray w/ White Lettering
Coefficient of Thermal Expansion of Pipe Liner Prior to Lining, in./in./°F	5.5×10^{-5}	7.8×10^{-5}	4.8×10^{-5}	6.6×10^{-5}	7.8×10^{-5}	7.4×10^{-5}
Thermal Conductivity ("K" Factor) of Liner, BTU-in./hr.-sq. ft.-°F	1.7	1.3	0.8	0.9	1.18	1.65
Tensile Strength of Liner at Yield, psi	3,000 - 4,000	3,800 - 4,500	4,000 - 4,500	5,000 - 6,000	4,500 - 5,500	6700
Elongation of Liner at Yield, %	250 - 350	300 - 350	10 - 13	8 - 10	10 - 20	150 - 300
Compressive Strength of Liner at Yield, psi	1,700	3,500	5,500 - 8,000	10,000 - 16,000	5000 - 8500	2,500
Specific Gravity of Liner	2.14 - 2.19	2.12 - 2.17	0.90 - 0.92	1.75 - 1.78	1.76 - 1.78	1.70 - 1.72

PTFE = polytetrafluoroethylene
PFA = perfluoroalkoxy
PP = polypropylene
PVDF = polyvinylidene fluoride
ETFE = ethylene tetrafluoroethylene

[1] Max. allowable temperature depends on the specific contact chemicals.
[2] Available unpigmented as a special option.

Minimum Spool Pipe Lengths





For filling spaces greater in length than the maximum spacer (3") but less than the minimum flanged pipe spool, a distance piece is used. A distance piece does not have flanges, but is held in place by using long bolts or studs between the adjacent flanges.

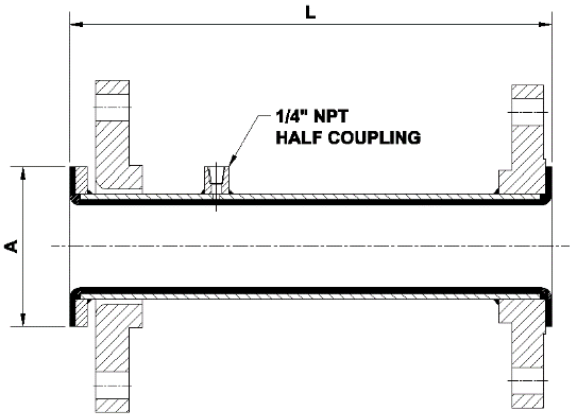
NPS	DN	Class 150	Class 300
		mm	mm
1	25	98	117
1-1/2	40	111	127
2	50	117	133
2-1/2	65	122	
3	80	127	152
4	100	140	168
6	150	156	181
8	200	165	200
10	250	181	244
12	300	187	251

Spool PTFE Lined

Material:

- A105 Ansi 150 / 300 Fixed Flange
- A53 Grade BSch40 Seamless Pipe
- Carbon Steel Swivel Ring
- ¼" Half Coupling
- Surface Preparation SA 2-1/2 SP10
- Primer Alkyd Primer QD
- Top Coat Jotun Pilot II

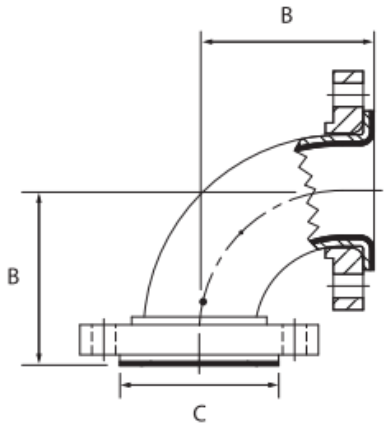
Note: Other Material, Flange Standard, type of flange also Available upon request



ANSI CLASS 150 LBS

NPS	A	L, min	L, max	Ring Thickness, mm	Weight, kg	
					Flange 2 ea.	Pipe 1m
¾	43	80	6000	5	1.5	2.03
1	51	85	6000	5	2.3	3.05
1-1/2	73	90	6000	5	3.2	5.36
2	92	105	6000	5	3.8	7.5
2-1/2	105	115	6000	7	5.3	11.71
3	127	115	6000	7	5.5	16.05
4	157	115	6000	8	6.4	24.28
5	186	120	6000	8	9.8	34.67
6	216	120	6000	8	13.1	28.26
8	270	140	6000	10	15.6	74.81
10	324	150	6000	10	26.1	111.11
12	381	170	6000	12	28.4	151.86
14	413	180	6000	12	37.5	181.77
16	470	190	6000	14	51.8	237.26
18	533	250	6000	14	99.4	299.91
20	584	250	6000	14	131	362.65
24	692	250	6000	14	181	515

90 Degree Elbow PTFE Lined



Material:

- **A234WPB 90 Degree Elbow Long Radius for 1" to 3" Sch40 Seamless**
- **A234WPB 90 Degree Elbow Short Radius for 4" to 14"**
- **A105 Ansi 150 / 300 Fixed Flange**
- **A53 Grade BSch40 Seamless Pipe**
- **Surface Preparation SA 2-1/2 SP10**
- **Primer Alkyd Primer QD**
- **Top Coat Jotun Pilot II**

Note: Other materials, flange class, pipe schedule is available upon request

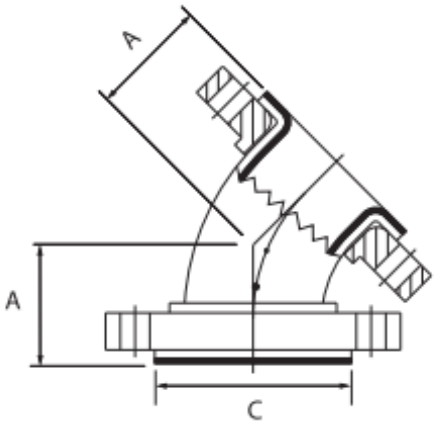
ANSI CLASS 150 LBS

NPS	DN	RADIUS	B	C	WEIGHT, kg
1	25	Long	102	51	2.7
1-1/2	40	Long	114	73	4
2	50	Long	127	92	6.4
2-1/2	65	Long	130	105	8
3	80	Long	140	127	9
4	100	Short	165	157	13
5	125	Short	194	186	20
6	150	Short	203	216	26
8	200	Short	228	270	38
10	250	Short	280	324	64
12	300	Short	305	381	90
14	350	Short	356	413	124
16	400	Short	381	470	159

45 Degree Elbow PTFE Lined

Material:

- A234WPB 45 Degree Elbow Long Radius for 1" to 3" Sch40 Seamless
- A234WPB 45 Degree Elbow Short Radius for 4" to 14"
- A105 Ansi 150 / 300 Fixed Flange
- A53 Grade BSch40 Seamless Pipe
- ¼ NPT Half Coupling #3000 lbs.
- Surface Preparation SA 2-1/2 SP10
- Primer Alkyd Primer QD
- Top Coat Jotun Pilot II



Note: Other materials, flange class, pipe schedule is available upon request

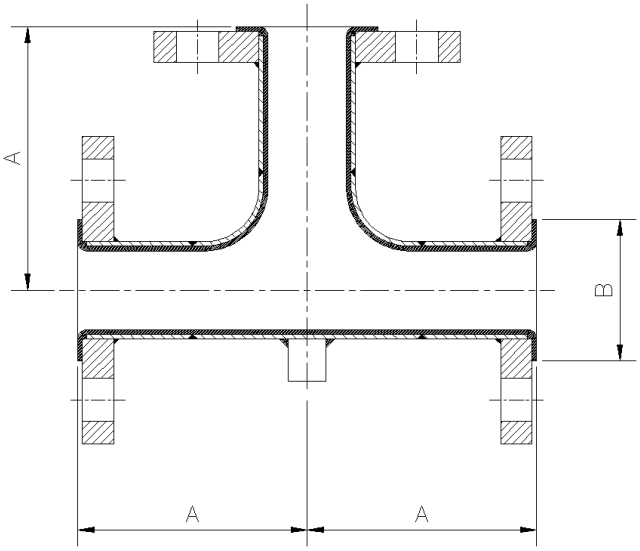
ANSI CLASS 150 LBS

NPS	DN	RADIUS	A	C	WEIGHT, kg
1	25	Long	58	51	2.5
1-1/2	40	Long	58	73	3.7
2	50	Long	64	92	4.6
2-1/2	65	Long	76	105	6.9
3	80	Long	76	127	7.3
4	100	Short	102	157	10.3
5	125	Short	114	186	15.8
6	150	Short	127	216	21.4
8	200	Short	140	270	28.4
10	250	Short	165	324	48.1
12	300	Short	191	381	62.8
14	350	Short	191	413	85
16	400	Short	203	470	121.5

Equal Tee PTFE Lined

Material:

- Equal Tee A234WPB Sch40 Seamless
- Fixed Flange A105 Ansi 150 / 300
- Pipe A53 Grade BSch40 Seamless
- ¼ NPT Half Coupling #3000 lbs.
- Surface Preparation SA 2-1/2 SP10
- Primer Alkyd Primer QD
- Top Coat Jotun Pilot II



Note: Other materials, flange class, swivel flange, pipe schedule is available upon request

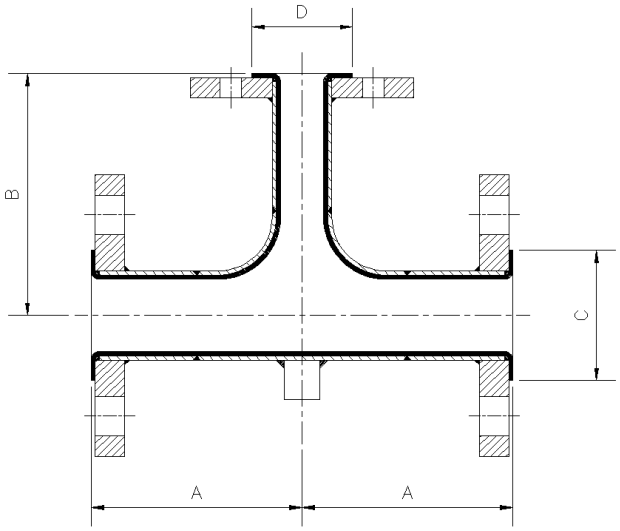
ANSI CLASS 150 LBS

NPS	DN	A	B	WEIGHT, kg
1	25	89	51	4
1-1/2	40	102	73	6
2	50	114	92	8
2-1/2	65	130	105	12
3	80	140	127	16
4	100	165	157	28
5	125	194	186	40
6	150	203	216	52
8	200	228	270	85
10	250	280	324	96
12	300	305	381	124
14	350	356	413	169
16	400	381	470	181

Reducer Tee PTFE Lined

Material:

- Reducer Tee A234WPB Sch40 Seamless
- Fixed Flange A105 Ansi 150 / 300
- Pipe A53 Grade BSch40 Seamless
- ¼ NPT Half Coupling #3000 lbs.
- Surface Preparation SA 2-1/2 SP10
- Primer Alkyd Primer QD
- Top Coat Jotun Pilot II

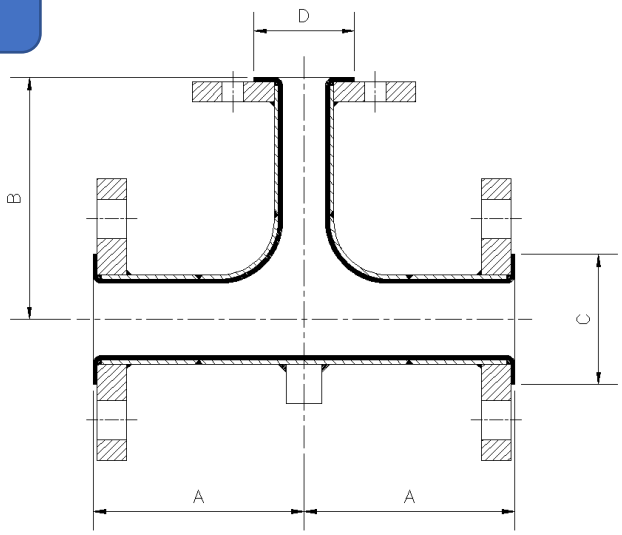


Note: Other materials, flange class, swivel flange, pipe schedule is available upon request

ANSI CLASS 150 LBS

NPS	DN	A	B	C	D	T1	T2	WEIGHT, KG
1 x ¾	25 x 20	89	89	51	43	3	3	4
1-1/2 x ¾	40 x 20	102	102	73	43	3	3	5
1-1/2 x 1	40 x 25	102	102	73	51	3	3	7
2 x ¾	50 x 20	114	114	92	43	3	3	6
2 x 1	50 x 25	114	114	92	51	3	3	7
2 x 1-1/2	50 x 40	114	114	92	73	3	3	7
2-1/2 x 1	65 x 25	127	127	105	51	3	3	10
2-1/2 x 1-1/2	65 x 40	127	127	105	73	3	3	10
2-1/2 x 2	65 x 50	127	127	105	92	3	3	11
3 x 1	80 x 25	140	140	127	51	3	3	11
3 x 1-1/2	80 x 40	140	140	127	73	3	3	11
3 x 2	80 x 50	140	140	127	92	3	3	12

Reducer Tee PTFE Lined



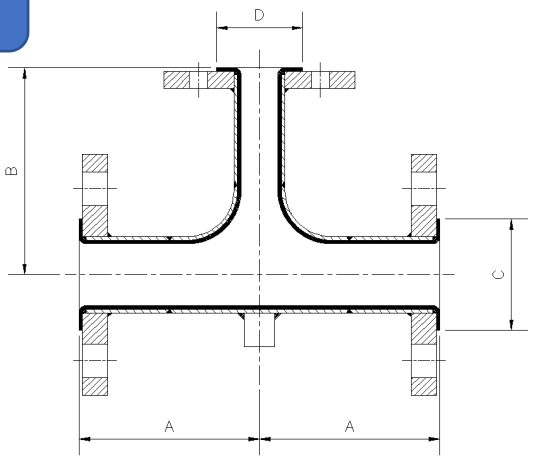
Material:

- Reducer Tee A234WPB Sch40 Seamless
- Fixed Flange A105 Ansi 150 / 300
- Pipe A53 Grade BSch40 Seamless
- ¼ NPT Half Coupling #3000 lbs.
- Surface Preparation SA 2-1/2 SP10
- Primer Alkyd Primer QD
- Top Coat Jotun Pilot II

ANSI CLASS 150 LBS

NPS	DN	A	B	C	D	T1	T2	WEIGHT, KG
3 x 2-1/2	80 x 65	140	140	127	105	3	3	13
4 x 1	100 x 25	165	165	157	51	3	3	14
4 x 1-1/2	100 x 40	165	165	157	73	3	3	15
4 x 2	100 x 50	165	165	157	92	3	3	16
4 x 2-1/2	100 x 65	165	165	157	105	3	3	17
4 x 3	100 x 80	165	165	157	127	3	3	17
5 x 2	125 x 50	194	194	186	92	3	3	23
5 x 2-1/2	125 x 65	194	194	186	105	3	3	25
5 x 3	125 x 80	194	194	186	127	3	3	25
5 x 4	125 x 100	194	194	186	157	4.5	4.5	27
6 x 2	150 x 50	203	203	216	92	4.5	4.5	30
6 x 2-1/2	150 x 65	203	203	216	105	4.5	4.5	31
6 x 3	150 x 80	203	203	216	127	4.5	4.5	32
6 x 4	150 x 100	203	203	216	157	4.5	4.5	33

Reducer Tee PTFE Lined



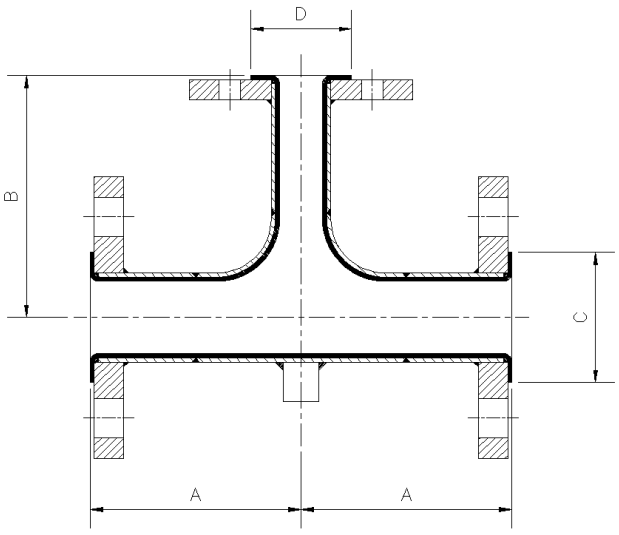
Material:

- Reducer Tee A234WPB Sch40 Seamless
- Fixed Flange A105 Ansi 150 / 300
- Pipe A53 Grade BSch40 Seamless
- ¼ NPT Half Coupling #3000 lbs.
- Surface Preparation SA 2-1/2 SP10
- Primer Alkyd Primer QD
- Top Coat Jotun Pilot II

ANSI CLASS 150 LBS

NPS	DN	A	B	C	D	T1	T2	WEIGHT, KG
8 x 2	200 x 50	228	228	270	92	4.5	4.5	41
8 x 3	200 x 80	228	228	270	127	4.5	4.5	44
8 x 4	200 x 100	228	228	270	157	4.5	4.5	45
8 x 6	200 x 150	228	228	270	216	4.5	4.5	52
10 x 2	250 x 50	280	280	324	92	4.5	4.5	68
10 x 3	250 x 80	280	280	324	127	4.5	4.5	70
10 x 4	250 x 100	280	280	324	157	4.5	4.5	73
10 x 6	250 x 150	280	280	324	216	4.5	4.5	80
10 x 8	250 x 200	280	280	324	270	4.5	4.5	86
12 x 2	300 x 50	305	305	381	92	4.5	4.5	86
12 x 3	300 x 80	305	305	381	127	4.5	4.5	89
12 x 4	300 x 100	305	305	381	157	4.5	4.5	91
12 x 6	300 x 150	305	305	381	216	4.5	4.5	99
12 x 8	300 x 200	305	305	381	270	4.5	4.5	105
12 x 10	300 x 250	305	305	381	324	4.5	4.5	114

Reducer Tee PTFE Lined



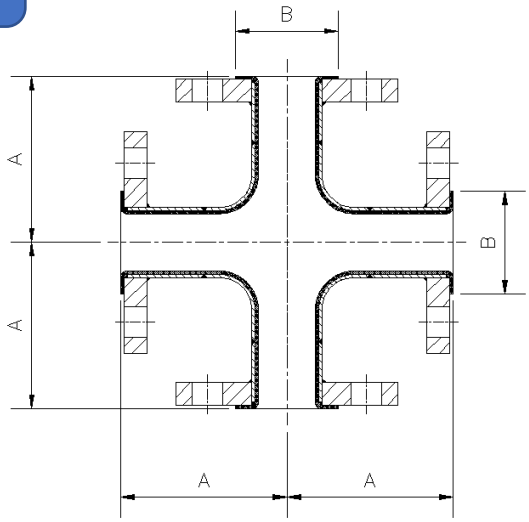
Material :

- Reducer Tee A234WPB Sch40 Seamless
- Fixed Flange A105 Ansi 150 / 300
- Pipe A53 Grade BSch40 Seamless
- ¼ NPT Half Coupling #3000 lbs
- Surface Preparation SA 2-1/2 SP10
- Primer Alkyd Primer QD
- Top Coat Jotun Pilot II

ANSI CLASS 150 LBS

NPS	DN	A	B	C	D	T1	T2	WEIGHT, KG
14 x 2	350 x 50	356	356	413	92	4.5	4.5	117
14 x 3	350 x 80	356	356	413	127	4.5	4.5	120
14 x 8	350 x 200	356	356	413	270	4.5	4.5	138
14 x 10	350 x 250	356	356	413	324	4.5	4.5	150
14 x 12	350 x 300	356	356	413	381	4.5	4.5	159
16 x 8	400 x 200	407	407	470	270	4.5	4.5	190
16 x 10	400 x 250	407	407	470	324	4.5	4.5	203
16 x 12	400 x 300	407	407	470	381	4.5	4.5	213
16 x 14	400 x 350	407	407	470	413	4.5	4.5	224

Cross Tee PTFE Lined



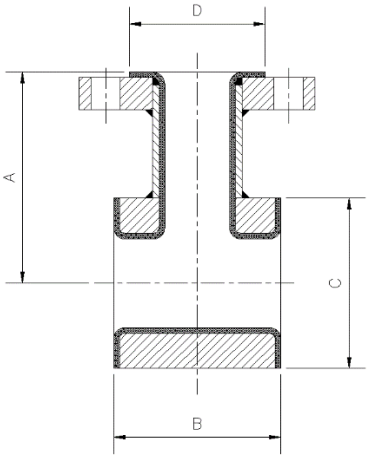
Material :

- Cross Tee A234WPB Sch40 Seamless
- Fixed Flange A105 Ansi 150 / 300
- Pipe A53 Grade BSch40 Seamless
- ¼ NPT Half Coupling #3000 lbs
- Surface Preparation SA 2-1/2 SP10
- Primer Alkyd Primer QD
- Top Coat Jotun Pilot II

ANSI CLASS 150 LBS

NPS	DN	A	B	T1	T2	WEIGHT, KG
1	25	89	51	3	3	6
1-1/2	40	102	73	3	3	8
2	50	114	92	3	3	11
2-1/2	65	130	105	3	3	16
3	80	140	127	3	3	18
4	100	165	157	3	3	25
5	125	194	186	3	3	40
6	150	203	216	4.5	4.5	53
8	200	228	270	4.5	4.5	76
10	250	280	356	4.5	4.5	128
12	300	305	381	4.5	4.5	165
14	350	356	413	4.5	4.5	225
16	400	381	470	4.5	4.5	242

Instrument Tees PTFE Lined



Material :

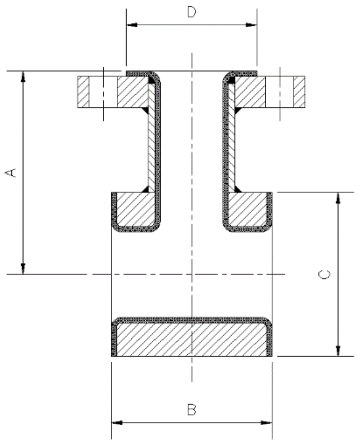
- Solid Body Carbon Steel
- Fixed Flange A105 Ansi 150 / 300
- Pipe A53 Grade BSch40 Seamless
- ¼ NPT Half Coupling #3000 lbs
- Surface Preparation SA 2-1/2 SP10
- Primer Alkyd Primer QD
- Top Coat Jotun Pilot II

ANSI CLASS 150 LBS

NPS	A	B	C	D	T	WEIGHT, kg
1 x ¾	89	60	51	43	3	3.5
1-1/2 x ¾	102	60	73	43	3	5.1
1-1/2 x 1	102	60	73	51	3	6.6
2 x ¾	114	60	92	43	3	6.3
2 x 1	114	60	92	51	3	6.8
2 x 1-1/2	114	90	92	73	3	7.4
2-1/2 x ¾	130	60	105	43	3	7.2
2-1/2 x 1	130	60	105	51	3	7.8
2-1/2 x 1-1/2	130	90	105	73	3	8.4
2-1/2 x 2	130	90	105	92	3	8.7
3 x ¾	140	60	127	43	3	7.5
3 x 1	140	60	127	51	3	8
3 x 1-1/2	140	90	127	73	3	8.7
3 x 2	140	90	127	92	3	9
4 x ¾	165	60	157	43	3	9.2
4 x 1	165	60	157	51	3	9.8
4 x 1-1/2	165	90	157	73	3	10.5
4 x 2	165	90	157	92	3	11

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Instrument Tees PTFE Lined



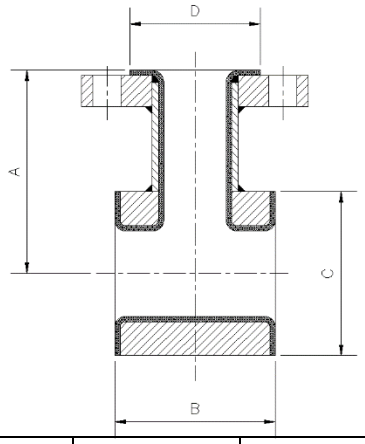
Material :

- Solid Body Carbon Steel
- Fixed Flange A105 Ansi 150 / 300
- Pipe A53 Grade BSch40 Seamless
- ¼ NPT Half Coupling #3000 lbs
- Surface Preparation SA 2-1/2 SP10
- Primer Alkyd Primer QD
- Top Coat Jotun Pilot II

ANSI CLASS 150 LBS

NPS	A	B	C	D	T	WEIGHT, kg
5 x ¾	190	60	186	43	4.5	13.3
5 x 1	190	60	186	51	4.5	13.9
5 x 1-1/2	190	90	186	73	4.5	14.7
5 x 2	190	90	186	92	4.5	16
6 x 3/4	203	60	216	43	4.5	17.2
6 x 1	203	60	216	51	4.5	17.8
6 x 1-1/2	203	90	216	73	4.5	18.6
6 x 2	203	90	216	92	4.5	20.9
8 x ¾	228	60	270	43	4.5	21.2
8 x 1	228	60	270	51	4.5	21.8
8 x 1-1/2	228	90	270	73	4.5	22.7
8 x 2	228	90	270	92	4.5	23.3
10 x ¾	280	60	324	43	4.5	33.5
10 x 1	280	60	324	51	4.5	34.2
10 x 1-1/2	280	90	324	73	4.5	35.1
10 x 2	280	90	324	92	4.5	36.1
12 x ¾	305	60	381	43	4.5	37.8
12 x 1	305	60	381	51	4.5	38.5
12 x 1-1/2	305	90	381	73	4.5	39.5

Instrument Tees PTFE Lined



Material :

- Solid Body Carbon Steel
- Fixed Flange A105 Ansi 150 / 300
- Pipe A53 Grade BSch40 Seamless
- ¼ NPT Half Coupling #3000 lbs
- Surface Preparation SA 2-1/2 SP10
- Primer Alkyd Primer QD
- Top Coat Jotun Pilot II

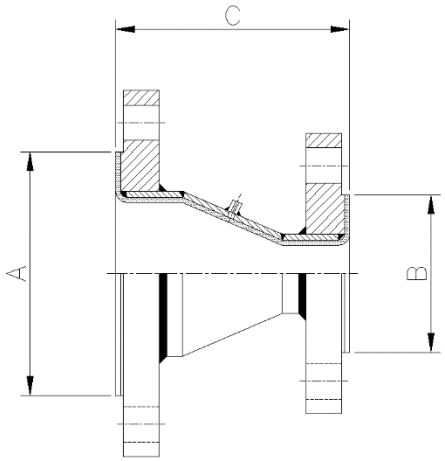
ANSI CLASS 150 LBS

NPS	A	B	C	D	T	WEIGHT, kg
12 x 2	305	90	381	92	4.5	40.5
14 x ¾	356	60	413	43	4.5	48.5
14 x 1	356	60	413	51	4.5	49
14 x 1-1/2	356	90	413	73	4.5	50.3
14 x 2	356	90	413	92	4.5	51.3

Concentric Reducer PTFE Lined

Material :

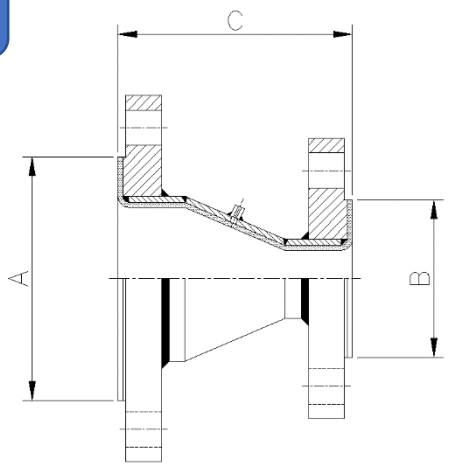
- A234WPB Concentric Reducer Sch40 Seamless
- Fixed Flange A105 Ansi 150 / 300
- Pipe A53 Grade B Sch40 Seamless
- ¼ NPT Half Coupling #3000 lbs
- Surface Preparation SA 2-1/2 SP10
- Primer Alkyd Primer QD
- Top Coat Jotun Pilot II



ANSI CLASS 150 LBS

NPS	A	B	C	T	WEIGHT, kg
1 x ¾	51	35	100	3	4
1-1/2 x ¾	73	35	100	3	5
1-1/2 x 1	73	51	100	3	5.8
2 x 1	92	51	130	3	6.8
2 x 1-1/2	92	73	130	3	7.7
2-1/2 x 1-1/2	105	73	130	3	9.4
2-1/2 x 2	105	92	130	3	10.2
3 x 1	127	51	152	3	8.8
3 x 1-1/2	127	73	152	3	9.8
3 x 2	127	92	152	3	10.6
3 x 2-1/2	127	105	152	3	12.4
4 x 1-1/2	157	73	152	3	11.4
4 x 2	157	92	152	3	12.2
4 x 2-1/2	157	105	152	3	13.9
4 x 3	157	127	152	3	14.2
5 x 2	186	92	180	4.5	16.6
5 x 2-1/2	186	105	180	4.5	18.4

Concentric Reducer PTFE Lined



Material :

- A234WPB Concentric Reducer Sch40 Seamless
- Fixed Flange A105 Ansi 150 / 300
- Pipe A53 Grade B Sch40 Seamless
- ¼ NPT Half Coupling #3000 lbs
- Surface Preparation SA 2-1/2 SP10
- Primer Alkyd Primer QD
- Top Coat Jotun Pilot II

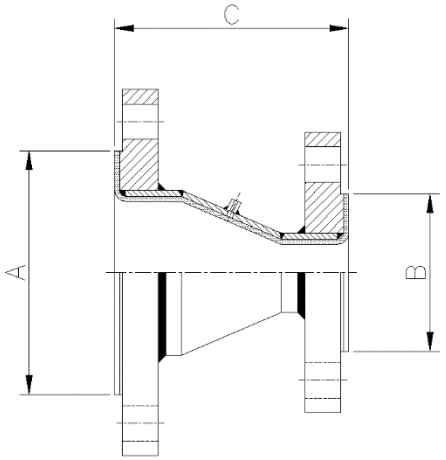
ANSI CLASS 150 LBS

NPS	A	B	C	T	WEIGHT, kg
5 x 3	186	127	180	4.5	18.6
5 x 4	186	157	180	4.5	20.3
6 x 2	216	92	200	4.5	20.8
6 x 2-1/2	216	105	200	4.5	22.7
6 x 3	216	127	200	4.5	22.9
6 x 4	216	157	200	4.5	24.7
8 x 4	270	157	200	4.5	28.8
8 x 6	270	216	200	4.5	36.8
10 x 3	324	127	250	4.5	41.5
10 x 4	324	157	250	4.5	43.4
10 x 6	324	216	250	4.5	51.8
10 x 8	324	270	250	4.5	56.3
12 x 6	381	216	300	4.5	59.7
12 x 8	381	270	300	4.5	64.6
12 x 10	381	324	300	4.5	78
14 x 6	413	216	350	4.5	74.8
14 x 8	413	270	350	4.5	80

Concentric Reducer PTFE Lined

Material :

- A234WPB Concentric Reducer Sch40 Seamless
- Fixed Flange A105 Ansi 150 / 300
- Pipe A53 Grade B Sch40 Seamless
- ¼ NPT Half Coupling #3000 lbs
- Surface Preparation SA 2-1/2 SP10
- Primer Alkyd Primer QD
- Top Coat Jotun Pilot II



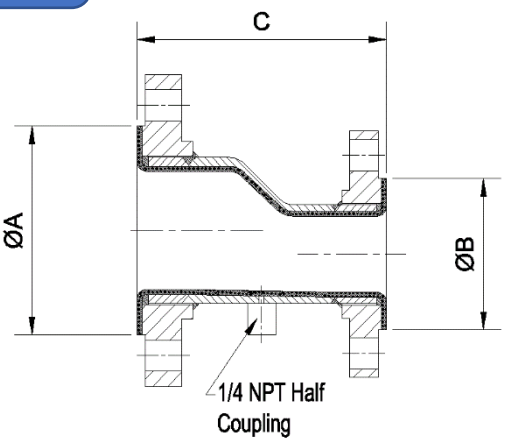
ANSI CLASS 150 LBS

NPS	A	B	C	T	WEIGHT, kg
14 x 10	413	324	350	4.5	94
14 x 12	413	381	350	4.5	100
16 x 10	470	324	400	4.5	119
16 x 12	470	381	400	4.5	125
16 x 14	470	413	400	4.5	138

Eccentric Reducer PTFE Lined

Material :

- A234WPB Concentric Reducer Sch40 Seamless
- Fixed Flange A105 Ansi 150 / 300
- Pipe A53 Grade B Sch40 Seamless
- ¼ NPT Half Coupling #3000 lbs
- Surface Preparation SA 2-1/2 SP10
- Primer Alkyd Primer QD
- Top Coat Jotun Pilot II



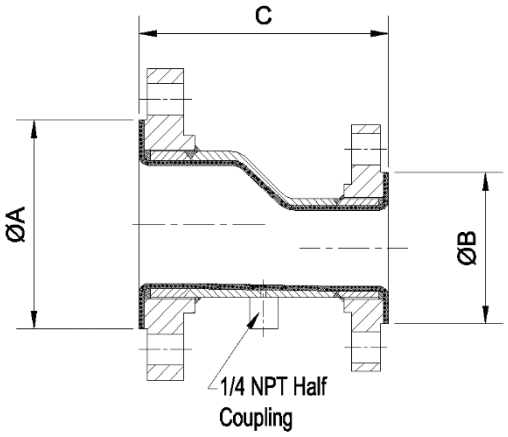
ANSI CLASS 150 LBS

NPS	A	B	C	T	WEIGHT, kg
1 x ¾	51	35	100	3	4
1-1/2 x ¾	73	35	100	3	5
1-1/2 x 1	73	51	100	3	5.8
2 x 1	92	51	130	3	6.8
2 x 1-1/2	92	73	130	3	7.7
2-1/2 x 1-1/2	105	73	130	3	9.4
2-1/2 x 2	105	92	130	3	10.2
3 x 1	127	51	152	3	8.8
3 x 1-1/2	127	73	152	3	9.8
3 x 2	127	92	152	3	10.6
3 x 2-1/2	127	105	152	3	12.4
4 x 1-1/2	157	73	152	3	11.4
4 x 2	157	92	152	3	12.2
4 x 2-1/2	157	105	152	3	13.9
4 x 3	157	127	152	3	14.2
5 x 2	186	92	180	4.5	16.6
5 x 2-1/2	186	105	180	4.5	18.4

Eccentric Reducer PTFE Lined

Material :

- A234WPB Concentric Reducer Sch40 Seamless
- Fixed Flange A105 Ansi 150 / 300
- Pipe A53 Grade B Sch40 Seamless
- ¼ NPT Half Coupling #3000 lbs
- Surface Preparation SA 2-1/2 SP10
- Primer Alkyd Primer QD
- Top Coat Jotun Pilot II



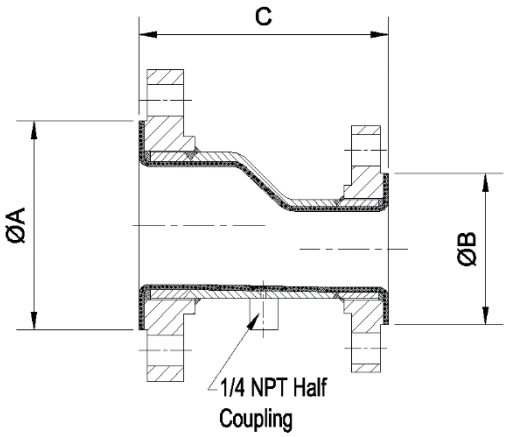
ANSI CLASS 150 LBS

NPS	A	B	C	T	WEIGHT, kg
5 x 3	186	127	180	4.5	18.6
5 x 4	186	157	180	4.5	20.3
6 x 2	216	92	200	4.5	20.8
6 x 2-1/2	216	105	200	4.5	22.7
6 x 3	216	127	200	4.5	22.9
6 x 4	216	157	200	4.5	24.7
8 x 4	270	157	200	4.5	28.8
8 x 6	270	216	200	4.5	36.8
10 x 3	324	127	250	4.5	41.5
10 x 4	324	157	250	4.5	43.4
10 x 6	324	216	250	4.5	51.8
10 x 8	324	270	250	4.5	56.3
12 x 6	381	216	300	4.5	59.7
12 x 8	381	270	300	4.5	64.6
12 x 10	381	324	300	4.5	78
14 x 6	413	216	350	4.5	74.8
14 x 8	413	270	350	4.5	80

Eccentric Reducer PTFE Lined

Material :

- **A234WPB Concentric Reducer Sch40 Seamless**
- **Fixed Flange A105 Ansi 150 / 300**
- **Pipe A53 Grade B Sch40 Seamless**
- **¼ NPT Half Coupling #3000 lbs**
- **Surface Preparation SA 2-1/2 SP10**
- **Primer Alkyd Primer QD**
- **Top Coat Jotun Pilot II**



ANSI CLASS 150 LBS

NPS	A	B	C	T	WEIGHT, kg
14 x 10	413	324	350	4.5	94
14 x 12	413	381	350	4.5	100
16 x 10	470	324	400	4.5	119
16 x 12	470	381	400	4.5	125
16 x 14	470	413	400	4.5	138

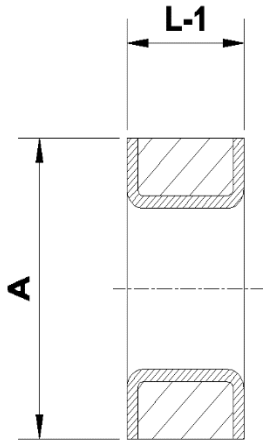
Spacer PTFE Lined

Material Type-1 :

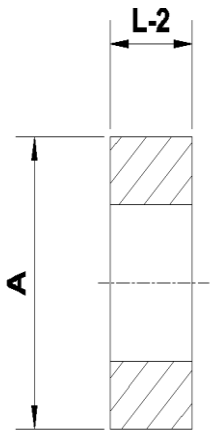
- Housing Carbon Steel Plate
- Surface Preparation SA 2-1/2 SP10
- Primer Alkyd Primer QD
- Top Coat Jotun Pilot II

Material Type-2 :

- Full PTFE



TYPE "1"



TYPE "2"

NPS	A	L-1, min	L-1, max	L-2, min	L-2, max	PTFE Thickness
¾	43	30	80	3	30	3
1	51	30	85	3	30	3
1-1/2	73	30	90	3	30	3
2	92	30	105	3	30	3
2-1/2	105	30	115	3	30	3
3	127	30	115	3	30	3
4	157	30	115	3	30	3
5	185	30	120	3	30	3
6	216	30	130	3	30	4.5
8	270	30	140	3	30	4.5
10	324	30	150	3	30	4.5
12	381	30	170	3	30	4.5
14	413	30	180	3	30	3
16	470	30	190	3	30	3
18	533	30	200	3	30	3
20	584	30	210	3	30	3
24	692	30	220	3	30	3

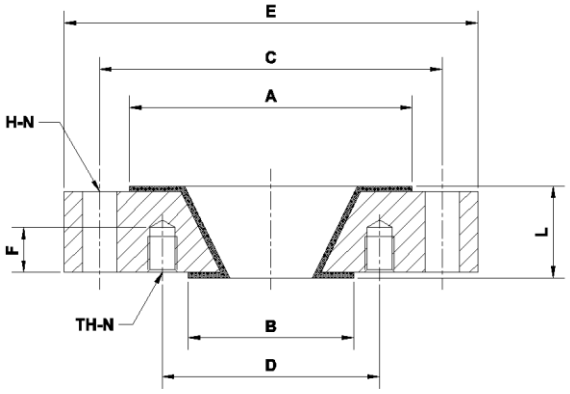
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Reducer Flange PTFE Lined

Material:

- Carbon Steel Flange ANSI 150 lbs.
- PTFE Lined
- Surface Preparation SA 2-1/2 SSPC-SP10
- Primer Jotun Alkyd Primer QD
- Top Coat Jotun Pilot II

Note:
Other material and specification are Available upon request



REFER TO ANSI 150 LBS

NPS		A	B	C	D	E	L	H-N	TH-N
In	Out								
1	½	51	35	79.2	60.5	108	38	15.7-4	15.7-4
	¾		43		69.9				
1-1/2	1	73	51	98.6	79.2	127			
2	1	92	51	120.7	79.2	152			
	1-1/2		73		190.5				
3	1	127	51	152.4	79.2	191		19.1-4	
	1-1/2		73		190.5				
	2		92		120.7				19.1-4
4	1	157	51	190.5	79.2	229	51	19.1-8	15.7-4
	1-1/2		73		190.5				
	2		92		120.7		38		19.1-4
	3		127		152.4				
6	1-1/2	216	73	241.3	190.5	279	51	22.4-8	15.7-4
	2		92		120.7				19.1-4
	3		127		152.4				
	4		157		190.5		38		19.1-8
8	3	270	127	298.5	152.4	343	51		19.1-4
	4		157		190.5				19.1-8
	6		216		241.3		38		22.4-8
10	3	324	127	362	152.4	406	51	25.4-12	19.1-4
	4		157		190.5				19.1-8
	6		216		241.3				22.4-8
	8		270		298.5				
12	6	381	216	431.8	241.3	483			
	8		270		298.5				
	10		324		362				25.4-12

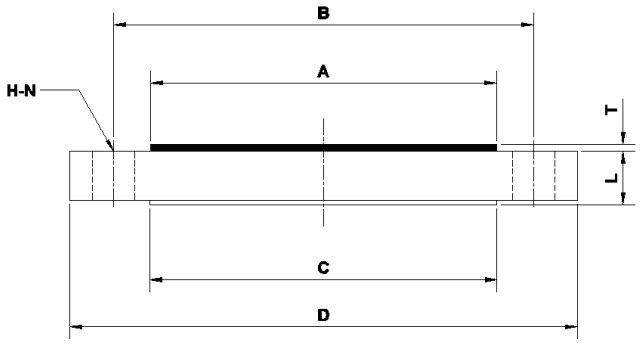
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Blind Flange PTFE Lined

Material:

- **A105 Carbon Steel Blind Flange**
- **Flange drilling as per ANSI 150 lbs.**
- **Surface Preparation SSPC-SP10**
- **Primer Jotun Alkyd Primer QD**
- **Top Coat Jotun Pilot II**

Note:
Other Material and specification are Available upon request



REFER TO ANSI 150 LBS

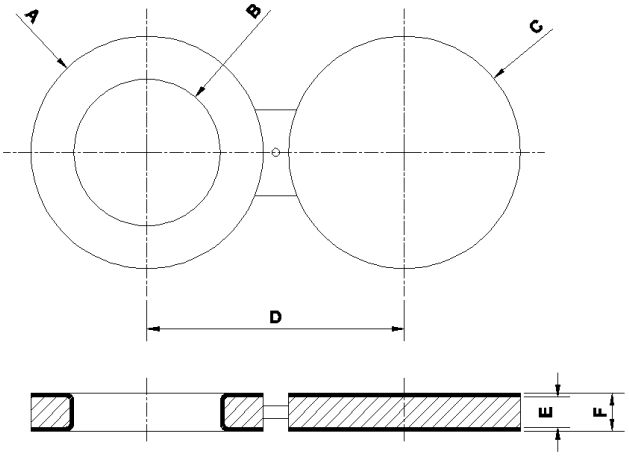
NPS	A	B	C	D	H-N	L	T	WEIGHT, kg
¾	43	69.9	42.9	99	15.7-4	12.7	3	0.63
1	51	79.2	50.8	108		14.2	3	0.94
1-1/2	74	98.6	73.2	127		17.5	3	1.62
2	92	120.7	91.9	152	19.1-4	19.1	3	2.64
2-1/2	105	139.7	104.6	178		22.4	3	4.06
3	127	152.4	127	191		23.9	3	4.9
4	157	190.5	157.2	229	19.1-8		3	5.75
5	186	215.9	185.7	254	22.4-8		3	6.22
6	216	241.3	215.9	279		25.4	3	7.38
8	270	298.5	269.7	343		28.4	3	12.36
10	324	362	323.9	406	25.4-12	30.2	3	17.1
12	381	431.8	381	483		31.8	3	27.68
14	413	476.3	412.8	533		35.1	3	35.2
16	470	539.8	469.9	597	28.4-16	36.6	3	42.18
18	535	577.9	533.4	635		39.6	3	49.7
20	585	635	584.2	699	31.8-20	42.9	3	65.5
24	693	749.3	692.2	813	35.1-20	47.8	3	90.5

Spectacle Blind PTFE Lined

Material:

- **Carbon Steel Spectacle Blind**
- **PTFE Lined 3mm thick as per ASTM 1545**
- **Surface Preparation SSPC-SP10**
- **Primer Jotun Alkyd Primer QD**
- **Top Coat Jotun Pilot II**

Note:
Other Material and specification are Available upon request



REFER TO ANSI 150 LBS

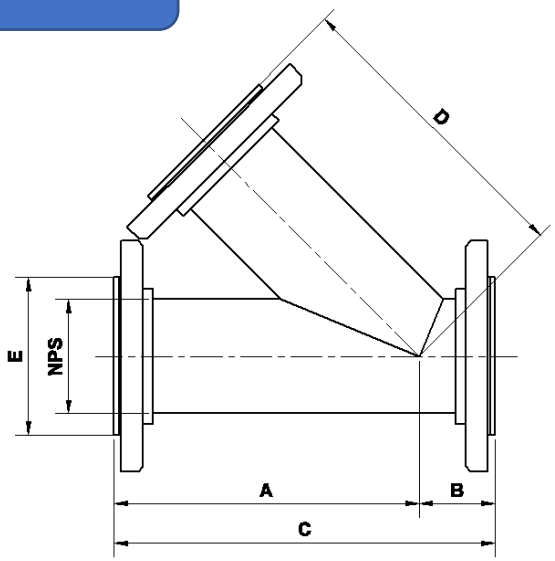
NPS	A	B	C	D	E	F	WEIGHT, kg
½	45	10	45	60	3	9	0.07
¾	54	15	54	70	3	9	0.1
1	64	21	64	80	3	9	0.14
1-1/2	83	42	83	100	6.4	12.4	0.46
2	102	55	102	120	6.4	12.4	0.68
2-1/2	107	67	107	140	6.4	12.4	0.7
3	133	83	133	150	6.4	12.4	1.1
4	172	108	172	190	9.7	15.7	2.81
5	194	135	194	215	9.7	15.7	3.37
6	219	162	219	240	12.7	18.7	5.39
8	276	213	276	300	12.7	18.7	8.32
10	337	267	337	360	15.7	21.7	15.04
12	406	318	406	430	19.1	25.1	26.95
14	448	350	448	475	19.1	25.1	32.94
16	511	400	511	540	22.4	28.4	50.27
18	546	451	546	580	25.4	31.4	61.79
20	603	502	603	635	28.4	34.4	83.67
24	714	604	714	750	31.8	37.8	129.3

45 Lateral Tee PTFE Lined

Material:

- A015 SORF Flange ANSI 150 LBS
- A53 grade B Sch40 Seamless Pipe
- PTFE Lined 3mm thick as per ASTM 1545
- Surface Preparation SSPC-SP10
- Primer Jotun Alkyd Primer QD
- Top Coat Jotun Pilot II

Note:
Other Material and specification are Available upon request



REFER TO ANSI 150 LBS

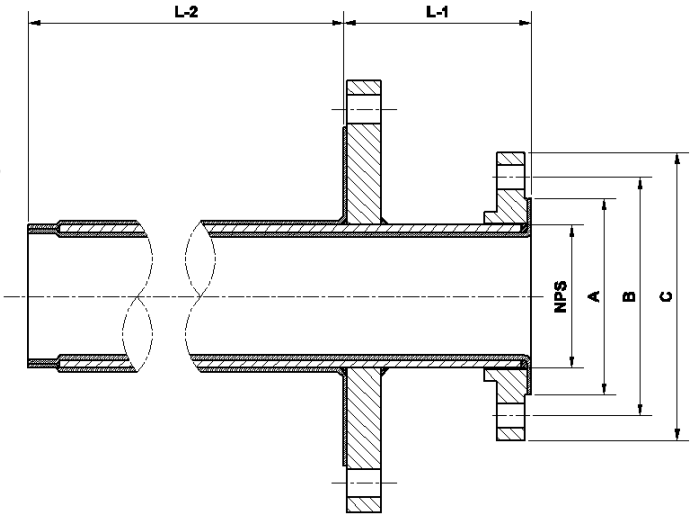
NPS	A	B	C	D	E	WEIGHT, kg
1	147	44	191	146	51	5.2
1-1/2	178	51	229	178	73	8
2	203	64	267	203	92	11.4
3	254	76	330	254	127	24
4	305	76	381	305	157	44
6	368	89	457	368	216	65.9
8	415	144	559	445	270	99.5

Dip Pipe PTFE Lined

Material:

- A015 SORF Flange ANSI 150 LBS
- A53 grade B Sch40 Seamless Pipe
- PTFE Lined 3mm thick as per ASTM 1545
- Surface Preparation SSPC-SP10
- Primer Jotun Alkyd Primer QD
- Top Coat Jotun Pilot II

Note:
Other Material and specification are Available upon request



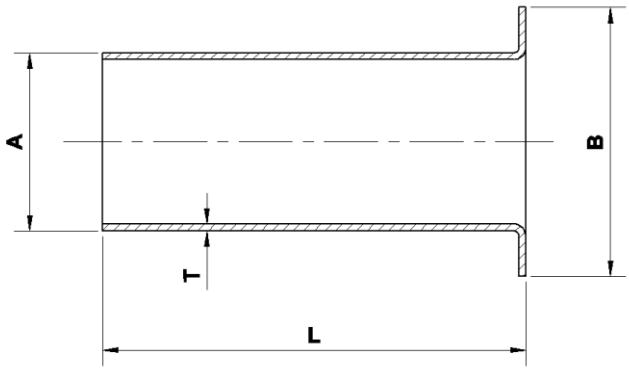
REFER TO ANSI 150 LBS

NPS	A	B	C	L-1	L-2
1	53	79.2	108	150	5000
1-1/2	73	98.6	127	150	5000
2	92	120.7	152	150	5000
3	127	152.4	191	150	3500
4	157	190.5	229	150	3500
6	216	241.3	279	150	3500
8	270	298.5	343	150	3500
10	324	362	406	150	3500
12	381	431.8	483	150	3500
14	413	476.3	533	150	3500
16	470	539.8	597	150	3500

PTFE Liner

Material:

- **PTFE Lined as per ASTM 1545**



REFER TO ANSI 150 LBS

NPS	A	B	T	L	WEIGHT, kg
1	27	53	3	6000	3
1-1/2	42	73	3	6000	4.87
2	56	92	3	6000	6.62
2-1/2	65	105	3.5	6000	8.97
3	81	127	3.5	4000	7.56
4	104	157	4	4000	11.15
6	154	216	4	4000	16.75
8	204	270	5	4000	27.78
10	257	324	5	3500	30.82
12	305	381	5	3500	36.74
14	359	413	6	3500	51.67
16	382	470	6	3500	55.35

Understanding Pressure Drop in PTFE-Lined Pipes

1. **Introduction**
   Pressure drop is an important factor in piping system design, especially when selecting pipes for industrial applications. It refers to the reduction in fluid pressure as the fluid flows through a pipe.

   In PTFE-lined pipes, pressure drop is influenced by several factors, including fluid velocity, pipe diameter, pipe length, fluid properties, and internal surface characteristics. Understanding pressure drop helps engineers select the correct pipe size, evaluate system performance, and determine the required pump capacity.

2. **Factors Affecting Pressure Drop**
   Several factors influence pressure drop in PTFE-lined piping systems:
   a. **Fluid Velocity**
      Higher fluid velocity generally results in higher pressure drop. Increasing the flow rate without increasing the pipe diameter can significantly increase friction losses.

   b. **Pipe Diameter**
      Pipe diameter has a major influence on fluid velocity. A larger pipe diameter reduces fluid velocity at the same flow rate, which generally results in lower pressure drop.

   c. **Pipe Length**
      Pressure drops increases with pipe length. The longer the straight pipe, the greater the friction loss.

   d. **Fluid Properties**
      Fluid density, viscosity, and operating temperature affect flow characteristics and pressure loss. Therefore, pressure drop calculations should consider the actual process fluid.

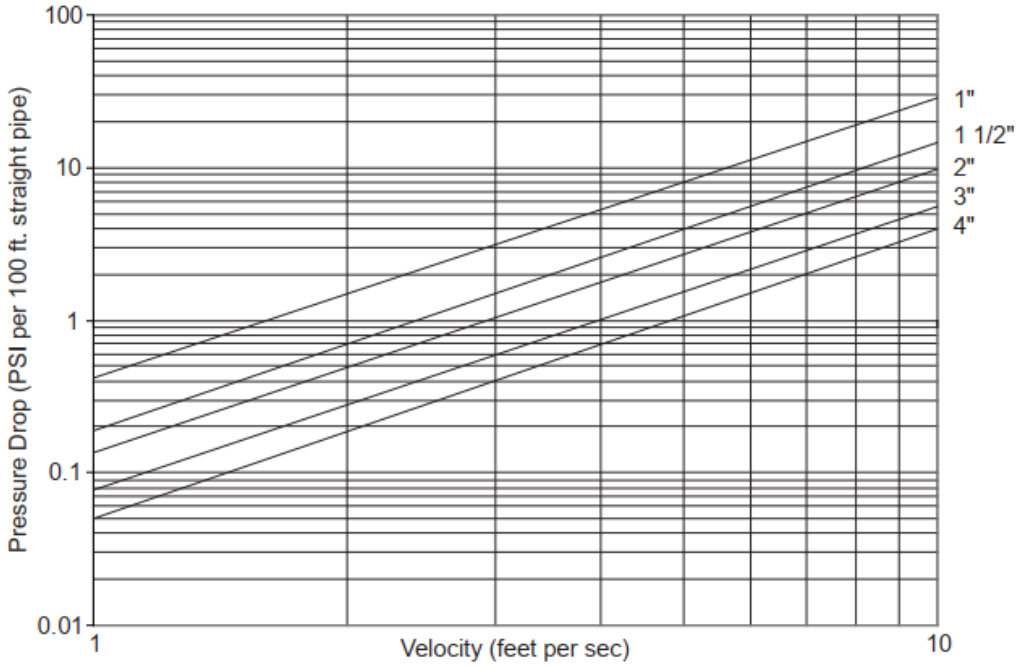
   e. **Internal Surface Characteristics**
      The internal surface condition of the pipe also affects flow resistance. PTFE has a smooth, non-stick surface that helps reduce friction resistance and minimize material adhesion.

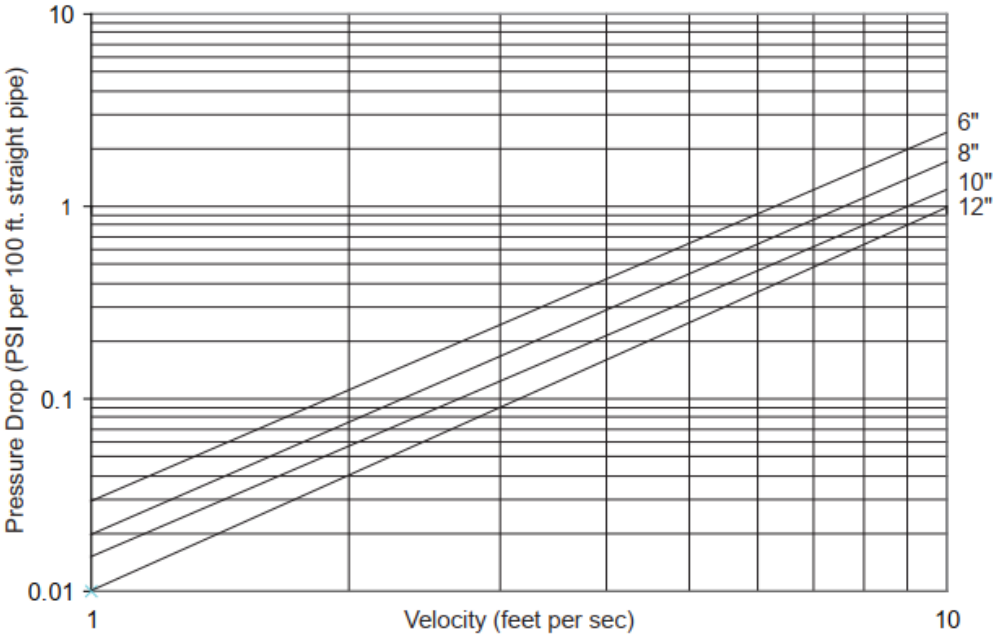
3. **Pressure Drop in PTFE-Lined Pipes**
   PTFE-lined pipes are widely used in chemical processing industries because of their excellent chemical resistance and smooth internal surface.
   The smooth surface of PTFE can provide favorable flow characteristics and help reduce friction losses in piping systems.
   The pressure drop chart provided illustrates the relationship between fluid velocity and pressure drop for different nominal pipe sizes (NPS).
   The chart is based on water at 60°F and expresses pressure drop in PSI per 100 feet of straight pipe.
   It covers:
   - Pipe sizes from 1 inch to 12 inches.
   - Fluid velocity from approximately 1 to 10 feet per second.

- Pressure drops from approximately 0.01 to 100 PSI per 100 feet.

The chart can be used as a practical reference for preliminary piping calculations.

PTFE Lined Pipe Pressure Drop
Water at 60°F





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4. **How to Calculate Pressure Drop**
   To determine pressure drop using the chart, follow these steps:
   - **Step 1 – Determine the Flow Rate**
     Identify the required fluid flow rate in gallons per minute (GPM).

   - **Step 2 – Calculate Fluid Velocity**
     If the fluid velocity is unknown, use the following conversion factor:
     - Fluid Velocity (FPS) = Flow Rate (GPM) × Conversion Factor (CF)
     - The conversion factor depends on the nominal pipe size.

   - **Step 3 – Read the Pressure Drop Chart**
     Locate the calculated fluid velocity on the horizontal axis. Follow the corresponding pipe size curve to determine the pressure drop on the vertical axis.

   - **Step 4 – Calculate Total Straight Pipe Pressure Drop**
     Multiply the pressure drop per 100 feet by the actual straight pipe length.
     Pressure Drop = Chart Value × (Actual Pipe Length / 100)
     Additional pressure losses from fittings, valves, and other components should be calculated separately.

5. **Calculation Example**
   Consider the following piping conditions:
   - Pipe size: 2 inches NPS
   - Flow rate: 60 GPM
   - Fluid: Water at 60°F

   Based on the conversion factor for a 2-inch pipe:
   - CF = 0.1322
   - Fluid Velocity: 60 × 0.1322 = 7.93 FPS

   Based on the pressure drop chart, the estimated pressure drop is approximately:
   - 4.5 PSI per 100 feet of straight pipe.
   - For a straight pipe length of 200 feet: Pressure Drop = 4.5 × (200 / 100)
   - Total Pressure Drop = 9 PSI

   This calculation represents straight pipe friction loss only. Additional losses from fittings, valves, and other piping components must also be considered.

6. **Important Considerations**
   The pressure drop chart is intended as a general engineering reference for preliminary calculations.
   For actual piping system design, engineers should consider the following:
   - Actual internal pipe diameter.
   - Fluid density and viscosity.
   - Operating temperature and pressure.
   - Actual flow rate and velocity.
   - Pressure losses through fittings, valves, and equipment.

   For fluids other than water, appropriate hydraulic calculations should be performed using the actual fluid properties.

7. Conclusion

Understanding pressure drop is essential for designing an efficient and reliable piping system. PTFE-lined pipes offer a smooth internal surface, excellent chemical resistance, and favorable flow characteristics, making them suitable for demanding chemical processing applications.

Proper pipe sizing and pressure drop evaluation help optimize system performance, reduce unnecessary energy consumption, and ensure reliable long-term operation.

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FLANGE BOLT TORQUING

Procedure and Guidelines for Plastic-Lined Piping and Equipment

1. PURPOSE

This procedure provides guidelines for proper bolt tightening and torquing of flange connections on Zioflex plastic-lined piping and equipment.

Proper bolting practices are essential to achieve uniform gasket compression, prevent leakage, ensure reliable joint performance, and avoid damage to plastic lining and sealing surfaces.

2. SCOPE

This procedure applies to flange connections used in Zioflex-lined piping, fittings, valves, and equipment, including PTFE, PFA, ETFE, and other plastic-lined systems.

Typical bolting materials include:

- ASTM A193 Grade B7 (Carbon Steel)
- ASTM A320 Grade B8 (Stainless Steel)
- ASTM A193/A320 Grade B8M (Stainless Steel)

The applicable bolt grade and torque requirements shall be confirmed according to project specifications.

3. PRE-TORQUING INSPECTION

Before tightening the flange connection, perform the following checks:

1. Ensure flange faces are clean, smooth, and free from dirt, debris, and mechanical damage.
2. Verify the lining material, gasket type, thickness, and condition.
3. Check that bolts, nuts, and washers comply with the specified material grade and dimensions.
4. Ensure all threads are clean, undamaged, and properly lubricated where applicable.
5. Use flat washers on both sides of the flange connection.
6. Prepare a calibrated torque wrench suitable for the specified torque range.

4. TORQUING PROCEDURE

Follow the steps below to achieve proper and uniform flange tightening:

1. Install all bolts, nuts, and flat washers. Hand-tighten all bolts to ensure proper alignment.
2. Tighten the bolts using a calibrated torque wrench.

3. Apply a cross-tightening (crisscross) sequence, tightening bolts located approximately 180° apart alternately.
4. Increase the tightening torque progressively in increments of approximately 20% of the final specified torque.
5. Repeat the tightening sequence until approximately 80% of the final torque is achieved.
6. Complete the final tightening by proceeding clockwise around the flange until all bolts reach the specified torque.
7. Avoid excessive tightening, as over-torquing may damage plastic lining, deform sealing surfaces, or compromise gasket performance.

5. RECOMMENDED BOLT TORQUE VALUES

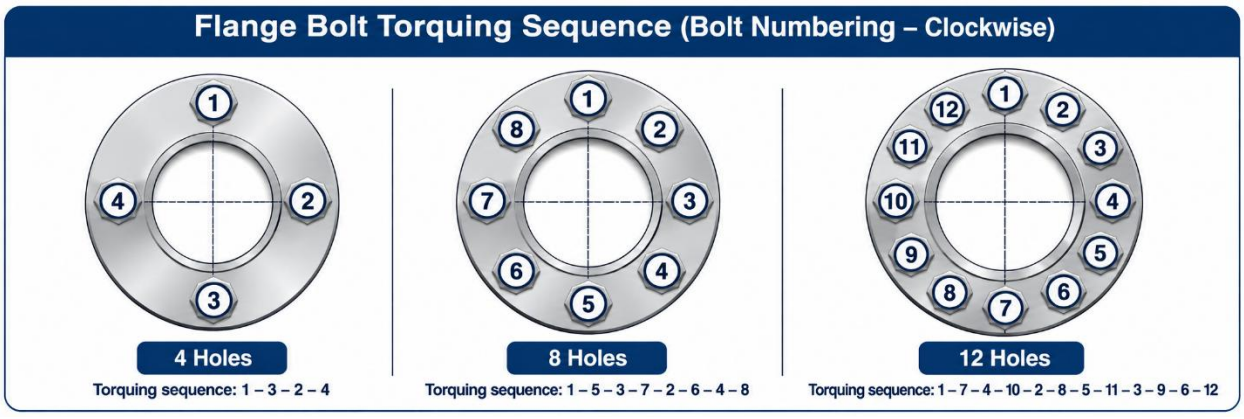
The following values are general torque references for lightly lubricated bolts (e.g., WD-40® or equivalent).

Bolt Size	A193-B7 Carbon Steel	A320 Gr. B8 (304 SS)	A193-B8M (316 SS)
1/2"	75 lb.-ft (102 Nm.)	55 lb.-ft (75 Nm.)	60 lb.-ft (81 Nm.)
5/8"	150 lb.-ft (203 Nm.)	110 lb.-ft (149 Nm.)	120 lb.-ft (163 Nm.)
3/4"	265 lb.-ft (359 Nm.)	190 lb.-ft (258 Nm.)	210 lb.-ft (285 Nm.)
7/8"	420 lb.-ft (569 Nm.)	300 lb.-ft (407 Nm.)	330 lb.-ft (447 Nm.)
1"	640 lb.-ft (868 Nm.)	460 lb.-ft (624 Nm.)	500 lb.-ft (678 Nm.)

Important: These values are general reference values only. Actual torque requirements shall be verified against the applicable flange design, gasket specifications, bolt material, lubrication condition, and project requirements.

6. TORQUE TIGHTENING PATTERN

All flange bolts shall be tightened using a cross-tightening (crisscross) pattern to ensure uniform gasket compression.



Recommended tightening sequences:

- 4 Bolts: 1 – 3 – 2 – 4
- 8 Bolts: 1 – 5 – 3 – 7 – 2 – 6 – 4 – 8
- 12 Bolts: 1 – 7 – 3 – 9 – 5 – 11 – 2 – 8 – 4 – 10 – 6 – 12

For flanges with a different number of bolts, an appropriate alternating tightening sequence shall be applied.

7. RETORQUING PROCEDURE

Retorquing is recommended within 24 hours after the initial tightening or following the first thermal cycle.

The purpose of retorquing is to compensate for plastic material seating and relaxation of the bolted connection.

Recommended procedure:

1. For systems operating at elevated temperatures, circulate the process fluid at the maximum operating temperature, where practicable, for approximately 24 hours.
2. Allow the system to cool down to ambient temperature.
3. Retighten all bolts to the specified torque value.
4. Retorquing shall only be performed when the system is in an ambient-temperature and cooled condition.
5. Never disassemble or loosen a flange connection while the system is hot or pressurized.

8. HYDROSTATIC TESTING

After initial torquing and retorquing, perform hydrostatic testing in accordance with applicable codes, project specifications, and testing procedures.

If leakage is detected:

1. Check and verify the applied bolt torque.
2. Retighten the bolts in increments of approximately 10% above the specified torque, where permitted by the applicable design and gasket limitations.
3. If leakage persists, stop the test and inspect the flange connection.
4. If plastic lining or sealing surfaces are damaged, disassemble and repair the connection as necessary.
5. Repeat the hydrostatic test after corrective actions have been completed.

9. ANNUAL RETORQUING

Periodic retorquing should be considered at least annually, particularly for systems operating under elevated temperatures or extreme ambient conditions.

Retorquing must only be performed when the system is completely cooled down and at ambient temperature.

The maintenance frequency shall also consider the operating conditions and applicable maintenance requirements.

10. IMPORTANT NOTES AND RECOMMENDATIONS

- For 1/2" NPS to 12" NPS plastic-lined piping, gaskets are generally not required when the lining design provides an integral sealing face. For larger diameters, separate gaskets are recommended where required by the flange design.
- Zioflex recommends using flat washers on both sides of the flange connection.
- Lightly lubricate bolt threads with a suitable lubricant, such as WD-40® or an equivalent product, where compatible with the application.
- When bolting dissimilar materials, use the torque requirements applicable to the softer material.
- When connecting Zioflex plastic-lined components to other plastic-lined components with different mating diameters, install a 1/2" thick spacer between the components where required.
- For butterfly valves installed between lined pipes, use spacers on both sides of the valve to ensure full disc movement and proper valve operation.
- Always verify the compatibility of lubricants and other assembly materials with the process environment.

DISCLAIMER

The torque values and procedures provided in this document are general guidelines for Zioflex plastic-lined systems. Final installation requirements shall be evaluated based on the actual application, flange design, lining material, gasket specifications, bolt grade, and operating conditions.

Zioflex recommends that installation and maintenance be performed by qualified personnel in accordance with applicable engineering standards and project specifications.

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PRESSURE TESTING OF PLASTIC-LINED PIPING

ZIOFLEX – Quality Assurance & Testing

1. Introduction

Pressure testing is an essential quality control procedure for plastic-lined piping systems. It is performed to verify the pressure integrity of the piping assembly, including the steel substrate, lining material, joints, and connections.

At ZIOFLEX, pressure testing is an important part of our quality assurance process to ensure that every lined piping component meets applicable technical requirements and is suitable for its intended operating conditions.

The selection of the testing method depends on the piping design, service conditions, applicable standards, and project specifications.

2. Hydrostatic Pressure Test

Hydrostatic testing is the preferred method for pressure testing plastic-lined piping systems.

The test is performed by filling the piping system with water or another suitable liquid and gradually increasing the pressure to the specified test pressure. For piping systems designed in accordance with ASME B31.3, the hydrostatic test pressure is generally based on 1.5 times the design pressure, with applicable temperature-related stress adjustments.

The test pressure can be expressed as:

$$P_t = 1.5 \times P \times (S_t / S)$$

Where:

- P_t = Minimum hydrostatic test pressure
- P = Internal design pressure
- S_t = Allowable stress at test temperature
- S = Allowable stress at design temperature

When the allowable stress ratio is 1.0, the test pressure becomes:

$$P_t = 1.5 \times P$$

During testing, pressure should be increased gradually and maintained for the specified duration to allow proper inspection for leakage, pressure loss, or other abnormalities.

For plastic-lined piping, additional attention should be given to the lining material, temperature limitations, end connections, and potential effects of the test medium.

ZIOFLEX recommends performing the hydrostatic test after the lining process has been completed and the lining material has reached the required condition for testing.

3. Alternative Leak Testing

In certain circumstances, hydrostatic testing may not be desirable due to operational restrictions, potential chemical reactions with water, or other project-specific considerations.

Any alternative leak testing method must be evaluated and approved in accordance with applicable ASME B31.3 requirements and project specifications.

The selection of an alternative method must consider:

- Compatibility of the test medium with the lining material.
- Potential hazards associated with the test medium.
- Required leak detection sensitivity.
- Applicable design codes and project requirements.

Hydrostatic testing remains the recommended method whenever practical and technically suitable.

4. Initial Service Leak Test

An initial service leak test may be considered under the provisions of ASME B31.3 when all applicable requirements are satisfied.

This method uses the actual service fluid as the test medium under controlled operating conditions.

The following conditions should be considered:

- The fluid must be nonflammable, non-toxic, and non-damaging to personnel.
- The design gauge pressure must not exceed 150 psig.
- The design temperature must be between 20°F and 366°F.

The suitability of this method must be evaluated against the piping code, service conditions, and project requirements. It should not be treated as a general replacement for hydrostatic testing.

5. ZIOFLEX Quality Commitment

At ZIOFLEX, pressure testing is an integral part of our commitment to product quality and reliability.

Our testing procedures are established based on applicable industry standards, engineering requirements, and project-specific specifications.

Each testing activity is intended to verify the integrity of the piping assembly and provide confidence in the performance of the finished product.

ZIOFLEX® – Advanced Reliable Corrosion Protection Solutions

STORAGE, HANDLING & MAINTENANCE GUIDELINES

1. Storage Guidelines

To maintain the performance, reliability, and service life of Zioflex Plastic-Lined Piping Products, proper storage conditions must be maintained before installation.

The following guidelines should be observed:

- Store products indoors or under suitable protective cover to prevent direct exposure to sunlight, rain, moisture, and environmental contamination.
- Keep all flange faces and liner openings protected with the original protective end caps during storage and transportation.
- Store products in a clean, dry, and well-ventilated area.
- Avoid direct contact with sharp objects, abrasive materials, or other items that may damage the plastic liner.
- Do not stack products in a manner that may cause excessive mechanical loads, deformation, or damage to the liner.
- Avoid prolonged exposure to extreme temperatures. Plastic liners may become brittle at low temperatures and may be affected by excessive heat.
- Store pipes and fittings in a stable position to prevent rolling, falling, or accidental impact.
- Do not remove protective end caps until the product is ready for installation.
- Avoid prolonged exposure to ultraviolet (UV) radiation, particularly for products stored outdoors.

2. Handling and Transportation

Proper handling is essential to prevent damage to the plastic liner and external components.

- Always use suitable lifting equipment and soft slings when handling lined pipes and fittings.
- Never lift or support the product using the plastic liner or flange protective surfaces.
- Do not drag, drop, or impact lined piping products against hard surfaces.
- Avoid inserting lifting hooks, chains, or other metal objects into the pipe bore.
- Ensure that lifting points are properly selected based on the product's weight, dimensions, and center of gravity.
- Use adequate support during transportation to prevent excessive bending, vibration, or movement.
- Handle flange faces carefully to prevent scratches, dents, or damage to sealing surfaces.
- Ensure that protective end caps remain securely installed throughout transportation.

3. Safety Precautions for Field Fabrication

Field fabrication involving Zioflex Plastic-Lined Piping Products must be performed by qualified personnel under appropriate safety procedures.

- Welding or cutting operations must never be performed on completed plastic-lined piping products.

- Welding heat can cause extensive damage to the plastic liner, even when the external steel surface appears unaffected.
- If field modifications are required, they must be evaluated and approved by qualified engineering personnel before work begins.
- Ensure adequate ventilation when working with plastic-lined piping products.
- Never apply direct flame or excessive heat to the plastic liner.
- Avoid heating the liner using welding torches, hot-air guns, or other uncontrolled heat sources.

IMPORTANT: Never weld directly on finished flanged plastic-lined pipes or fittings. Heat generated during welding may cause permanent liner damage and compromise product integrity.

4. Maintenance and Inspection

Regular inspection is recommended to maintain the operational reliability of Zioflex Plastic-Lined Piping Products.

The following inspection activities should be considered:

4.1 Visual Inspection

- Inspect the external steel surface for corrosion, coating damage, or mechanical deformation.
- Check flange faces for scratches, dents, or other visible damage.
- Inspect accessible liner surfaces for cracks, blisters, peeling, deformation, or other visible defects.
- Check protective end caps and ensure they remain properly secured when the product is not in service.

4.2 Inspection Before Installation

Before installation, verify the following:

- Product identification, size, rating, and material specifications comply with the approved documentation.
- Liner surfaces are free from visible damage and contamination.
- Flange faces and bolt holes are in acceptable condition.
- No foreign objects or debris are present inside the pipe or fittings.
- Protective end caps are removed only when the product is ready for installation.

4.3 Inspection During Service

- Monitor operating temperature and pressure to ensure they remain within the specified design limits.
- Avoid operating conditions that may cause excessive thermal shock or mechanical stress.
- Investigate any signs of leakage, abnormal pressure drops, or unexpected process contamination.
- Perform periodic inspections according to the operating conditions and maintenance schedule.

5. Painting and External Surface Protection

Zioflex Plastic-Lined Piping Products may be supplied with an external protective coating to minimize corrosion during storage, transportation, and operation.

The following precautions should be observed:

- Inspect the external coating before installation.
- Any damaged coating should be repaired using a compatible coating system.
- During surface preparation and painting, protect the plastic liner and flange sealing surfaces from abrasive particles, paint, and other contaminants.
- Do not allow abrasive blasting materials to enter or damage the liner.
- Avoid excessive heating of the lined piping during painting or coating operations.
- Ensure that the selected coating system is suitable for the intended operating environment.

6. General Recommendations

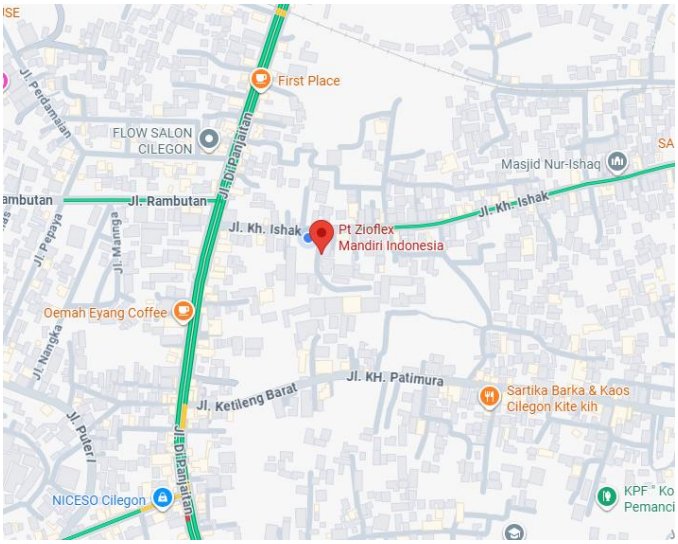
Proper storage, handling, installation, and maintenance are essential to achieving the intended service life of Zioflex Plastic-Lined Piping Products.

Always follow the approved technical specifications, applicable installation procedures, and operating limitations.

For special handling requirements, field modifications, or maintenance concerns, contact the Zioflex Technical Department for further assistance.

ZIOFLEX® – Advanced Reliable Corrosion Protection Solutions

Our Location:





Our Project :











Our Customer:













