



ISO 9001  
International Standards  
Certifications  
ISO 9001:2008

# PFA Lined Stainless Steel Pipe and Fittings

for Semiconductor Industry



**上品綜合工業股份有限公司**  
**ASC ALLIED SUPREME CORP.**

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## 前言

上品綜合工業股份有限公司為了服務半導體工業的需求，逐步完成技術開發各種氟素樹脂產品，並在2000年興建完成的彰濱新廠內，我們自己開發製作氟素樹脂內襯板材與焊接材料，規劃完成的無塵室分別自Class 1,000 至 100,000，做為半導體EL桶槽Teflon sheet lining標準施工環境，已獲得半導體業界一致的認可。

使用新廠內於無塵室押製的PFA管來製作PFA內襯不銹鋼直管與管件，再加上TEFPASS® PFA flexible hose和TEFPASS® 排氣耐蝕風管，已獲得客戶很高的滿意度無論在高純度化學品供酸系統管材、桶槽與槽車、廢酸排放系統，甚至於半導體製程反應所產生的腐蝕性氣體排放管路，上品公司都能夠提供半導體工業一系列有效高純度要求、耐蝕高品質與高信賴度的解決方案。

### Preface:

To meet demands from semiconductor industry, Allied Supreme Corp. keeps developing & manufacturing different kind of fluorocarbon serial products gradually. Until the Changhua new factory has been built & completed in the year of 2000, we started manufacturing fluorocarbon glass fabric back sheet and welding material with great success. In the meantime, we also built up clean rooms from Class 1,000 to 10,000 to be our standard environment for EL grade Teflon sheet lining processing. Our specialty efforts have obtained a very good reputation in semiconductor field.

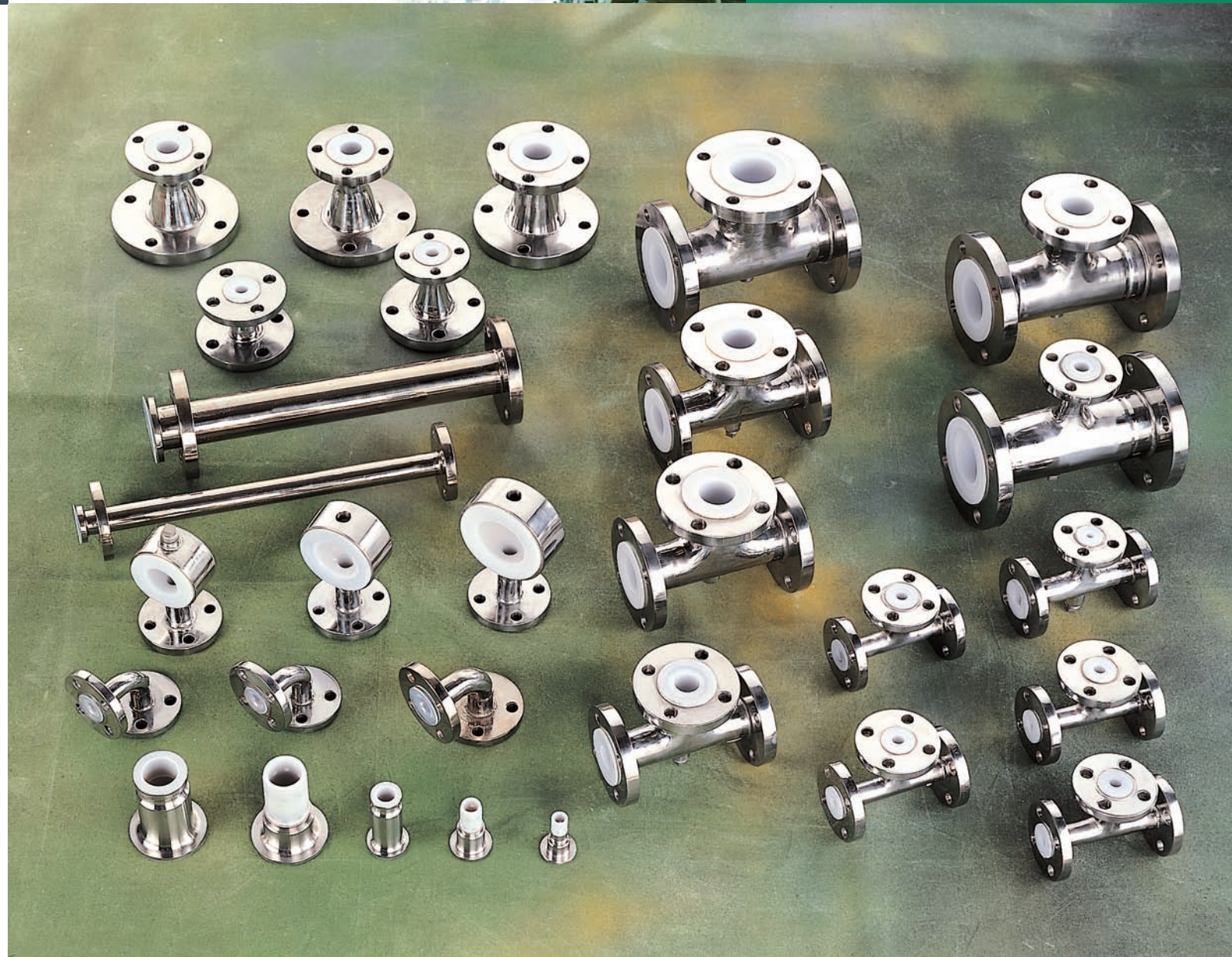
Moreover, we fabricated PFA lined stainless steel pipe and fittings with our own extruded PFA tube in clean room. In addition, we also fabricate TEFPASS® PFA flexible hose and TEFPASS® ductwork, and has obtained good satisfaction from worldwide customers. No matter what it is in high purity chemical delivering/piping system, EL lined tank, ISO container and waste recovery system or even the waste gas exhaust system, Allied Supreme is able to offer these systems with high purity, strict corrosion-resistance quality and extreme reliability, as a series of total solution for clients in semiconductor industry.

## PFA Lined Stainless Steel Pipe and Fittings

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for Semiconductor Industry



## Index

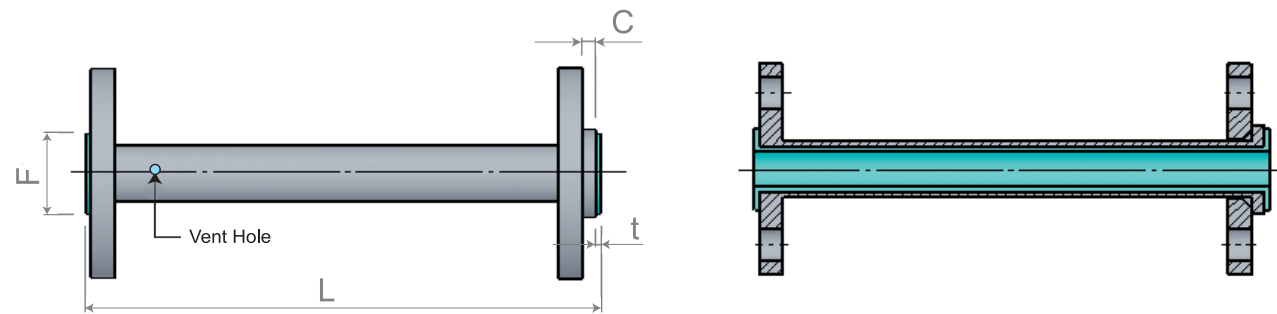
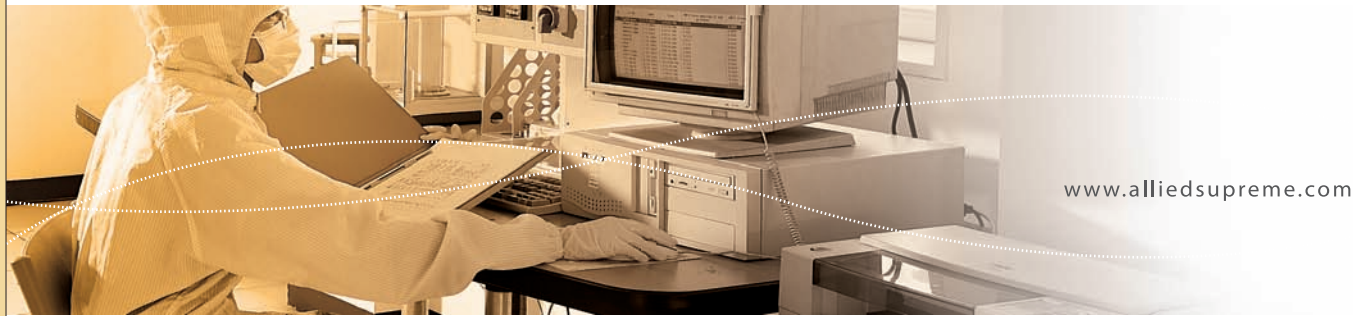
PFA Lined Pipe .....	2
PFA Lined 90° Elbow .....	3
PFA Lined 45° Elbow .....	3
PFA Lined Equal Tee .....	4
PFA Lined Reducing Tee .....	5
PFA Lined Concentric Reducer .....	6
PFA Lined Eccentric Reducer .....	7
PFA Lined Instrument Tee .....	8
TEFPASS®-G Gasket .....	9
PFA 內襯不銹鋼直管管件規範 .....	10
Specification of PFA Lined Pipe and Fittings .....	11
管線組合安裝時注意要點 .....	12
Instructions for Assembling Pipes and Fittings .....	12



PFA Lined Pipe



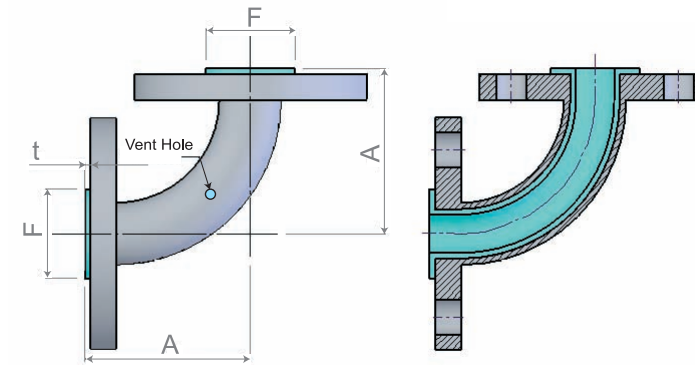
## PFA Lined Pipe



Flange: JIS 10K unit: mm

Nominal size		F	C	t		L (Min.)	L (Max.)	G.W. (kg)	
Inch	mm			Standard	Heavy			Standard	Heavy
1/2"	15	32	8	2	3	100	6000	1.49×M+1.1	1.57×M+1.1
3/4"	20	40	8	2	3	100	6000	1.97×M+1.4	2.08×M+1.4
1"	25	48	8	2	3	100	6000	2.88×M+2.2	3.03×M+2.2
1-1/2"	40	68	8	2	3	100	6000	4.62×M+3.1	4.87×M+3.1
2"	50	87	8	2	3	150	6000	6.19×M+3.7	6.52×M+3.7
2-1/2"	65	100	8	2	3	150	6000	9.57×M+5.2	9.97×M+5.2
3"	80	117	8	2	3	150	6000	12.4×M+5.2	12.95×M+5.2
4"	100	151	8	2	3	150	6000	17.6×M+6.3	18.54×M+6.3
6"	150	203	8	3	4	150	6000	31.5×M+14.4	32.5×M+14.4

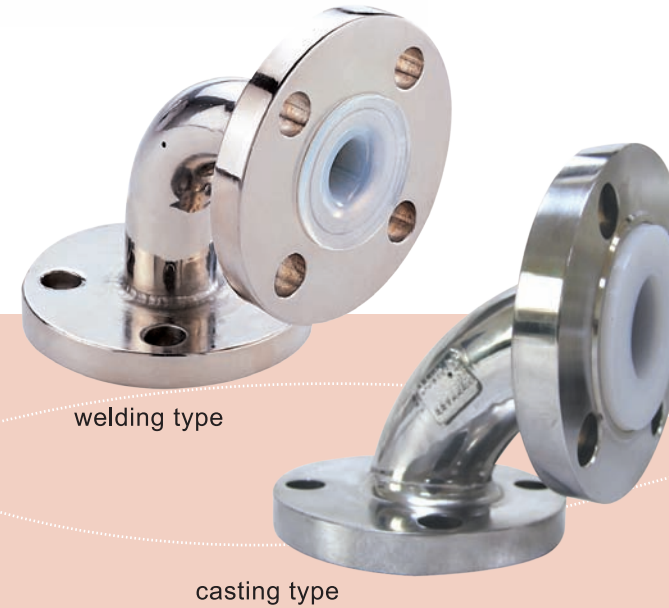
## PFA Lined 90° Elbow



Flange: JIS 10K unit: mm

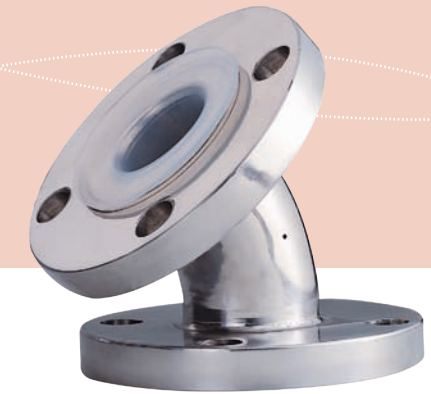
Nominal size		F	A	t	G.W. (kg)
Inch	mm				
1/2"	15	32	70	3	1.2
3/4"	20	40	80	3	1.8
1"	25	48	89	3	3.0
1-1/2"	40	68	102	3	4.0
2"	50	87	114	3	7.0
2-1/2"	65	100	127	3	9.8
3"	80	117	140	3	11.8
4"	100	151	165	3	16.2
6"	150	203	203	4	26.0

Welding and casting types are both available upon request



welding type

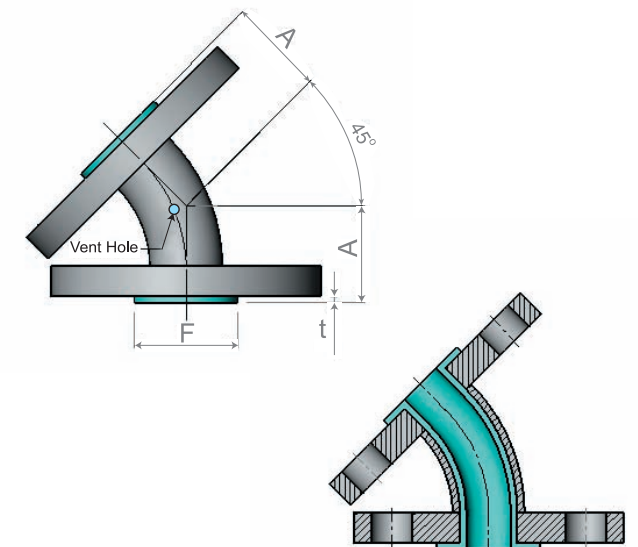
casting type



## PFA Lined 45° Elbow

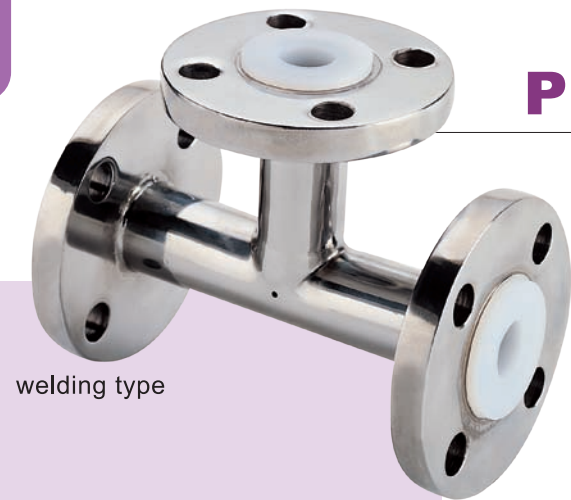
Flange: JIS 10K unit: mm

Nominal size		F	A	t	G.W. (kg)
Inch	mm				
1/2"	15	32	45	3	1.0
3/4"	20	40	45	3	1.6
1"	25	48	45	3	2.2
1-1/2"	40	68	58	3	3.6
2"	50	87	64	3	4.8
2-1/2"	65	100	76	3	8.4
3"	80	117	76	3	10.5
4"	100	151	102	3	14.6
6"	150	203	127	4	25.1

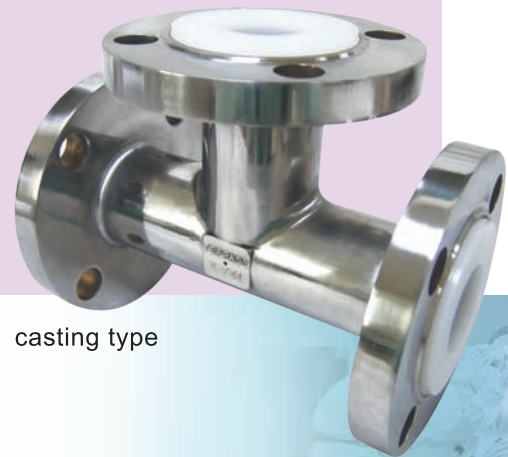




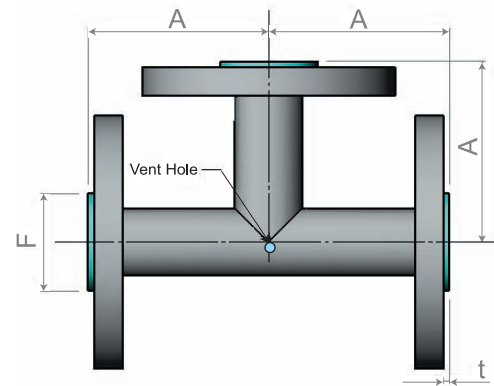
## PFA Lined Equal Tee



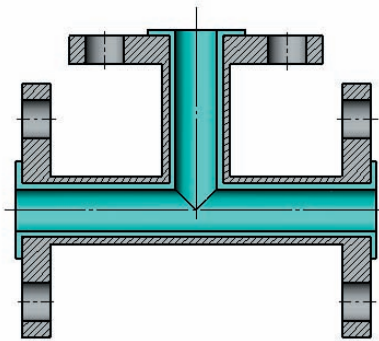
welding type



casting type



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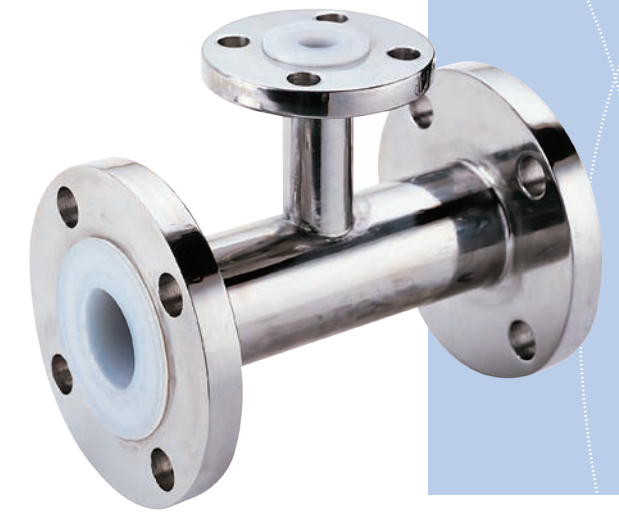
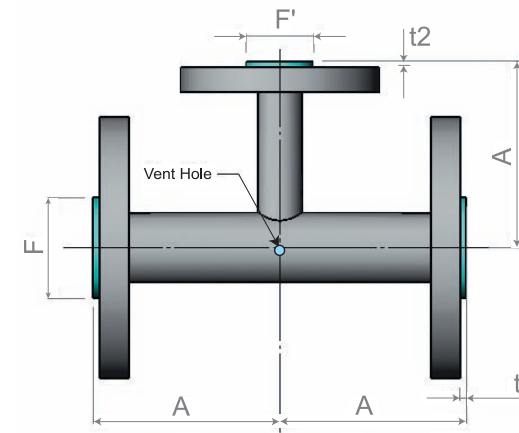
Flange: JIS 10K

unit: mm

Nominal size		F	A	t	G.W. (kg)
Inch	mm				
1/2"	15	32	70	3	2.10
3/4"	20	40	80	3	2.70
1"	25	48	89	3	3.80
1-1/2"	40	68	102	3	6.28
2"	50	87	114	3	7.95
2-1/2"	65	100	127	3	11.54
3"	80	117	140	3	13.38
4"	100	151	165	3	18.19
6"	150	203	203	4	41.20

Welding and casting types are both available upon request

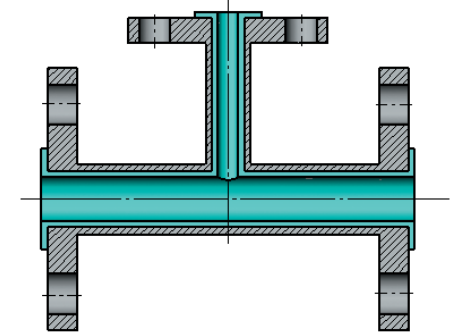
## PFA Lined Reducing Tee



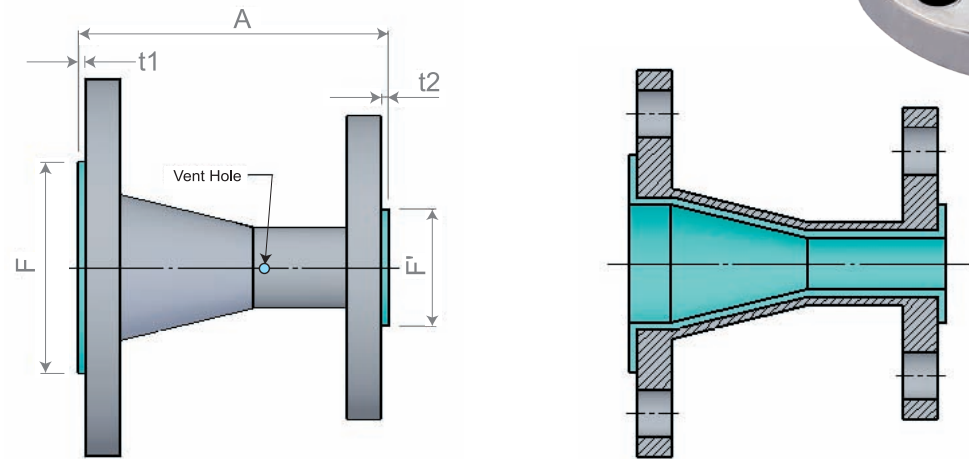
Flange: JIS 10K

unit: mm

Nominal size		F	F'	A	t1	t2	G.W. (kg)
Inch	mm						
3/4"x1/2"	20x15	40	32	80	3	3	2.52
1"x1/2"	25x15	48	32	89	3	3	3.63
1"x3/4"	25x20	48	40	89	3	3	3.82
1-1/2"x3/4"	40x20	68	40	102	3	3	5.18
1-1/2"x1"	40x25	68	48	102	3	3	5.70
2"x3/4"	50x20	87	40	114	3	3	6.36
2"x1"	50x25	87	48	114	3	3	6.89
2"x1-1/2"	50x40	87	68	114	3	3	7.49
2-1/2"x1"	65x25	100	48	127	3	3	9.42
2-1/2"x1-1/2"	65x40	100	68	127	3	3	10.03
2-1/2"x2"	65x50	100	87	127	3	3	10.51
3"x1"	80x25	117	48	140	3	3	10.81
3"x1-1/2"	80x40	117	68	140	3	3	11.43
3"x2"	80x50	117	87	140	3	3	11.93
4"x1"	100x25	151	48	165	3	3	14.37
4"x1-1/2"	100x40	151	68	165	3	3	15.03
4"x2"	100x50	151	87	165	3	3	15.55
4"x3"	100x80	151	117	165	3	3	17.10
6"x2"	150x50	203	87	203	4	3	32.00
6"x3"	150x80	203	117	203	4	3	35.20
6"x4"	150x100	203	151	203	4	3	37.00



## PFA Lined Concentric Reducer



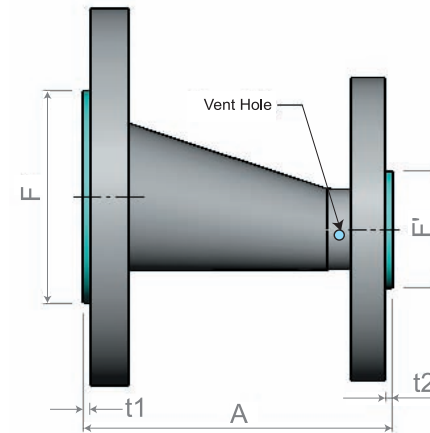
Flange: JIS 10K

unit: mm

Nominal size		F	F'	A	t1	t2	G.W. (kg)
Inch	mm						
1"x1/2"	25x15	48	32	100	3	3	1.6
1"x3/4"	25x20	48	40	100	3	3	2.0
1-1/2"x3/4"	40x20	68	40	100	3	3	2.4
1-1/2"x1"	40x25	68	48	100	3	3	2.7
2"x3/4"	50x20	87	40	127	3	3	3.4
2"x1"	50x25	87	48	127	3	3	3.5
2"x1-1/2"	50x40	87	68	127	3	3	4.0
2-1/2"x1"	65x25	100	48	127	3	3	5.4
2-1/2"x1-1/2"	65x40	100	68	127	3	3	6.2
2-1/2"x2"	65x50	100	87	127	3	3	7.0
3"x1"	80x25	117	48	152	3	3	6.2
3"x1-1/2"	80x40	117	68	152	3	3	7.0
3"x2"	80x50	117	87	152	3	3	7.6
3"x2-1/2"	80x65	117	100	152	3	3	9.0
4"x1"	100x25	151	48	152	3	3	8.0
4"x1-1/2"	100x40	151	68	152	3	3	8.8
4"x2"	100x50	151	87	152	3	3	10.0
4"x3"	100x80	151	117	152	3	3	11.8
6"x2"	150x50	203	87	200	4	3	14.8
6"x3"	150x80	203	117	200	4	3	16.8
6"x4"	150x100	203	151	200	4	3	18.6



## PFA Lined Eccentric Reducer

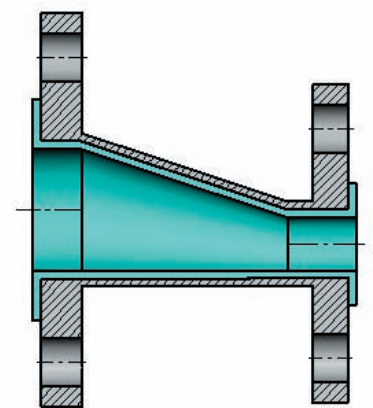


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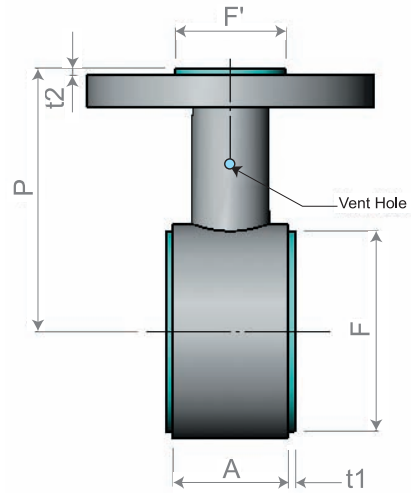
Flange: JIS 10K

unit: mm

Nominal size		F	F'	A	t1	t2	G.W. (kg)
Inch	mm						
1"x1/2"	25x15	48	32	100	3	3	2.0
1"x3/4"	25x20	48	40	100	3	3	2.2
1-1/2"x3/4"	40x20	68	40	100	3	3	2.7
1-1/2"x1"	40x25	68	48	100	3	3	3.0
2"x1"	50x25	87	48	127	3	3	4.0
2"x1-1/2"	50x40	87	68	127	3	3	4.3
2-1/2"x1"	65x25	100	48	127	3	3	5.4
2-1/2"x1-1/2"	65x40	100	68	127	3	3	5.6
2-1/2"x2"	65x50	100	87	127	3	3	6.5
3"x1"	80x25	117	48	152	3	3	6.8
3"x1-1/2"	80x40	117	68	152	3	3	7.2
3"x2"	80x50	117	87	152	3	3	7.8
3"x2-1/2"	80x65	117	100	152	3	3	9.0
4"x1-1/2"	100x40	151	68	152	3	3	9.0
4"x2"	100x50	151	87	152	3	3	10.0
4"x3"	100x80	151	117	152	3	3	12.8
6"x2"	150x50	203	87	200	4	3	15.6
6"x3"	150x80	203	117	200	4	3	17.0
6"x4"	150x100	203	151	200	4	3	18.7



## PFA Lined Instrument Tee



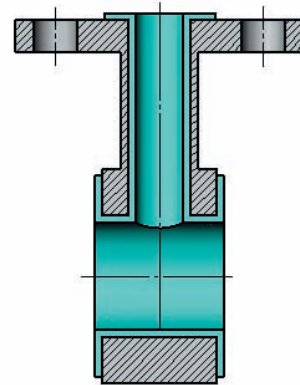
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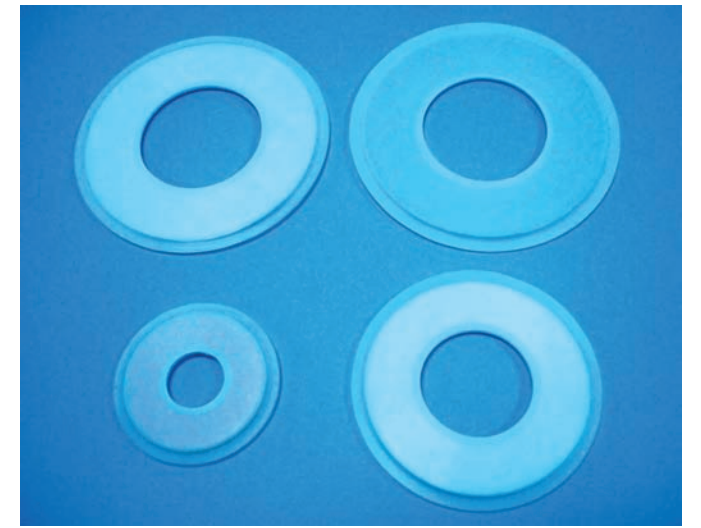
Flange: JIS 10K

unit: mm

Nominal size		F	F'	A	P	t1	t2	G.W. (kg)
Inch	mm							
1"x1"	25x25	48	48	50	90	3	3	1.9
1-1/2"x1"	40x25	68	48	50	100	3	3	3.0
2"x1"	50x25	87	48	50	114	3	3	3.2
2-1/2"x1"	65x25	100	48	50	127	3	3	3.5
3"x1"	80x25	117	48	50	140	3	3	4.3
4"x1"	100x25	151	48	50	165	3	3	7.2
6"x1"	150x25	203	48	50	200	4	3	9.8

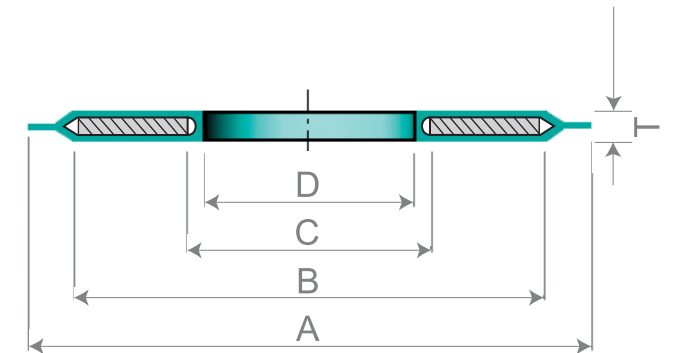
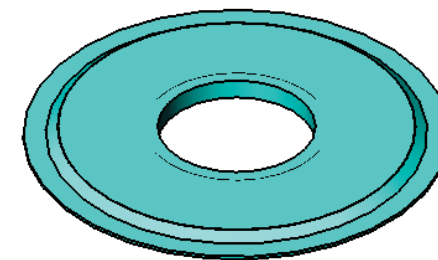


## TEFPASS®-G Gasket



- TEFPASS®-G 全密封墊片使用Modified PTFE做為墊片表面密封材料，表面較一般PTFE平滑，所以比較能夠防止異物附著。
- Modified PTFE有高純度和耐化學特性。
- Modified PTFE有較高的比重，能夠有效降低滲透。內部墊片材質完全被Modified PTFE包覆，墊片材質不僅不會污染管內高純度化學品，也能防止污染管路外部環境。

- TEFPASS®-G Modified PTFE encapsulated gasket is smoother than PTFE. This smooth surface is able to prevent any contamination.
- Modified PTFE has excellent high purity property and excellent chemical resistance.
- Modified PTFE has denser polymer structure, which reduce permeability.
- Internal gasket material is totally sealed up and protected by Modified PTFE. It is not only pollute delivering chemicals inside pipes, but also avoid gasket material polluting outside pipes.



### Specification

unit: mm

Nominal Size		ANSI 150 LBS				JIS 10K				T			
INCH	MM	Part No.	A	B	C	D	Part No.	A	B	C	D	Standard	Heavy
1/2"	15A	G-1/2"	43	33	16	12	G-15	54	44	16	12	3	3.8
3/4"	20A	G-3/4"	54	44	22	18	G-20	62	52	22	18	3	3.8
1"	25A	G-1"	62	52	27	23	G-25	71	61	27	23	3	3.8
1-1/2"	40A	G-1-1/2"	82	72	41	37	G-40	82	72	41	37	3	3.8
2"	50A	G-2"	101	91	53	49	G-50	101	91	53	49	3	3.8
2-1/2"	65A	G-2-1/2"	119	109	66	62	G-65	119	109	66	62	3	3.8
3"	80A	G-3"	131	121	78	74	G-80	131	121	78	74	3	3.8
4"	100A	G-4"	170	160	102	98	G-100	160	150	102	98	3	3.8
6"	150A	G-6"	218	208	151	147	G-150	218	208	151	147	3	3.8

TEFPASS® is a registered trademark of Allied Supreme Corp.



# PFA 內襯不鏽鋼直管管件規範

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## 1. 範圍

- 1.1 本規範適用於傳送腐蝕性流體之PFA不鏽鋼內襯直管及管件，內容包括施工材料、尺寸以及標準的測試程序。
- 1.2 本內容包含ANSI 150 LBS 及JIS 10K 規範的PFA內襯直管及管件，口徑由1/2" 到 6"。

## 2. 材料結構

### 2.1 PFA 特性

#### 2.1.1 溫度限制

連續使用溫度	260° C
融點	310° C

#### 2.1.2 耐化學性

能抵抗大部分的化學品，關於詳細之資料，請詢問本公司的銷售工程師。

2.1.3 比重 ASTM D792 or D1505 2.12 ~ 2.17

2.1.4 抗拉強度 ASTM D3307 267kg/cm<sup>2</sup>以上

2.1.5 延伸率 ASTM D3307 300% 以上

2.1.6 吸水性 ASTM D570 < 0.01%

### 2.2 PFA內襯

2.2.1 此內襯根據ASTM D3307 及少於總重量0.3%之添加物所製成。

2.2.2 比重  
此PFA樹脂內襯根據ASTM D792之規範，比重界於2.12到2.17 之間。

2.2.3 標準PFA內襯直管管材是不添加色料，所以顏色是透明，PFA管件內襯則為半透明。

2.2.4 原料等級為杜邦PFA 451HP或其他廠牌同級原料。

### 2.3 白鐵件

#### 2.3.1 直管及管件

直管及管件由不鏽鋼無縫管製成，厚度根據Schedule 40，材料等級客戶未指定情況下，一般皆使用SUS304，其他等級、碳鋼或其他金屬材料待詢。

依據規範如下：

直管	ASTM A312
管件	ASTM A403
法蘭	ASTM A182

#### 2.3.2 焊接

所有焊接的製作根據ASME Boiler 及 Pressure Vessel Code 之第九款的規定。

#### 2.3.3 表面處理

所有鐵件之內側的表面要乾淨且沒有模具的凸凹痕、鱗片狀或其他可能對內襯品質有負面的影響因素。

## 3. 設計要求

### 3.1 尺寸

#### 3.1.1 PFA內襯直管之厚度標準

尺寸1/2" ~ 6" 內襯厚度 2 ~ 4 mm

#### 3.1.2 PFA 內襯管件之厚度

尺寸1/2" ~ 6" 內襯厚度 3 ~ 4 mm

#### 3.1.3 內襯擴口尺寸之最小外徑標準

Unit: mm

管件口徑	15	20	25	40	50	65	80	100	150
	1/2"	3/4"	1"	1-1/2"	2"	2-1/2"	3"	4"	6"
擴口外徑	32	40	48	68	87	100	117	151	203

法蘭擴口面PFA厚度為管內內襯厚度80%以上。

#### 3.1.4 誤差

直管、法蘭及管件之誤差規定如下：

##### 3.1.4.1 直管

長度誤差 +/- 1/8" (+/- 3.2 mm)

兩端法蘭螺孔偏心誤差 +/- 1/16" (+/- 1.6 mm)

##### 3.1.4.2 法蘭

根據ANSI B16.5

##### 3.1.4.3 管件

根據ANSI B16.5

### 3.2 排氣孔

每一直管及管件都有排氣孔以釋放內襯與鐵件之間的壓力，直管至少要有兩個直徑0.08"(2mm)之排氣孔，直管500mm長以上為2個排氣孔，位於兩端法蘭面2"(50mm)之位置，500mm長以下則為一個排氣孔；其他每一個管件則為一個排氣孔。

## 4. 檢測要求

每一支直管或管件在出廠前，都必須通過壓力測試或針孔測試，這兩個試驗事先依客戶使用條件指定要求擇一或兩者都做測試。

### 4.1 壓力測試

內部壓力測試為最大工作壓力之150%，1分鐘內達到全壓並持續3分鐘。

### 4.2 針孔測試

使用沒有破壞性之高壓裝置 10,000 伏特之電壓做測試。如果電流接通後，探針傳出火花或聽見測試器的針孔警告聲，則表示內襯有瑕疵，此工件將無法通過品檢。

### 4.3 目測檢查及外觀拋光處理

表面需沒有氣泡、針孔及其他瑕疵，任何瑕疵必須在裝運前修補好。一般工件未特別指定，不鏽鋼工件外觀不做任何處理，外觀如需拋光則由客戶在訂購之前提出要求之標準。

## 5. 儲存、運輸及確認

### 5.1 包裝與儲存

每一端之法蘭內襯面先以圓貼紙封住內襯擴口面，再以塑膠板保護；如為半導體高清潔度要求，在無塵室內經過特殊步驟內部清洗後，以圓貼紙封口，再以塑膠板保護，最後以塑膠袋包覆封口。因此，產品能在正常之運輸過程中免於被破壞與污染。

### 5.2 標示

需註明品名、規格尺寸、製造廠商及訂單號碼。

### 5.3 運輸

所有項目需根據所訂之重量，尺寸提供堅固的木箱或外銷紙箱包裝。木箱之煙證證明可依客戶要求提供。

# Specification of PFA Lined Pipe and Fittings

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## 1. Scope

1.1 This specification is for Perfluoroalkoxy (PFA) lined stainless steel pipe and fitting for the purpose of conveying corrosive liquid. The contents include material, dimension and standard testing procedure.

1.2 Both ANSI 150LBS and JIS10K are available. The nominal diameter ranges from 1/2" to 6"

## 2. Material

### 2.1 PFA property

Temperature range	
Max. continuous operation temperature	260°C
Melting point	310°C

### 2.1.2 Chemical resistance

PFA lined pipe withstands most of chemicals. For further information, please contact our sales engineers.

2.1.3 Specific gravity ASTM D792 or D1505 2.12 ~ 2.17

2.1.4 Tensile strength ASTM D3307 267kg/cm<sup>2</sup> up

2.1.5 Elongation ASTM D3307 300% up

2.1.6 Water absorption ASTM D570 < 0.01%

### 2.2 PFA liner

2.2.1 The liner is made of PFA and less than 0.3% of other additives per ASTM D3307

2.2.2 Specific gravity  
According to ASTM D792, the specific gravity of PFA liner is between 2.12 ~2.17.

2.2.3 The standard liner is transparent without adding any pigment.

2.2.4 The material is DuPont's PFA 451HP or other brands with the same grade.

### 2.3 Housing

#### 2.3.1 Pipe and fitting

The pipe and fitting are normally made of stainless steel 304 per Schedule 40 thickness. Other materials are available on request.

Specification:

Pipe	ASTM A312
Fitting	ASTM A403
Flange	ASTM A182

#### 2.3.2 Welding

The procedure of welding is done complying with provisions of Section 9 of the ASME Boiler and Pressure Vessel Code.

#### 2.3.3 Surface finish

All the internal surface of housings should be completely smooth without any protuberance, indent and scratch.

## 3 Design requests

### 3.1 Dimension

3.1.1 Thickness of PFA liner for piping  
O.D.: 1/2" ~ 6" thickness: 2 ~ 4 mm

3.1.2 PFA wall thickness of lined fitting  
O.D.: 1/2" ~ 6" thickness: 3 ~ 4 mm

3.1.3 The standard for minimum O.D. of flare

Unit: mm

Nominal Dimension	15	20	25	40	50	65	80	100	150
	1/2"	3/4"	1"	1-1/2"	2"	2-1/2"	3"	4"	6"
OD of flare	32	40	48	68	87	100	117	151	203

The thickness of flare on the flange is 80% up of the liner

#### 3.1.4 Tolerance

The tolerance among pipe, flange and fitting are as list below:

##### 3.1.4.1 Pipe

Length +/- 1/8" (+/-3.2 mm)

Flange bolt hole alignment +/- 1/16" (+/-1.6 mm)

##### 3.1.4.2 Flange

As per ANSI B16.5

##### 3.1.4.3 Fitting

As per ANSI B16.5

### 3.2 Vent hole

There are vent holes in each end of the pipe and fitting in order to release gas pressure between PFA lining and metal housing. As to other fittings, there is one hole. On the longer than 500mm pipe side, there are at least two diameter 0.08" (2mm) vent holes at least on each end of flange face at 2" (50mm) to each flange. Shorter than 500mm pipe has one hole.

## 4 Inspection requirements

Each pipe and fitting has to pass pressure test or electrostatic test before delivery. Customers can assign either or both tests.

### 4.1 Pressure test

The internal test pressure is 150% of maximum recommended working pressure. The test reaches full pressure within 1 minute and maintains for 3 minutes.

### 4.2 Electrostatic test

The test is conducted by 10,000 voltages. If a visible or an audible spark occurred after conducting the current, it means there may exist some lining defects. Thus, the lining objects should be rejected.

### 4.3 Visual inspection and surface finish

The surface should be completely smooth and free from blister, porosity and scratch, etc. before shipment. The ordinary order, external surface of stainless steel housing, would not be polished unless with customers request. If needed, the surface will be polished in accordance with customer's requirements.

## 5 Storage, transportation and confirmation

### 5.1 Package and storage

The face of each flange is protected by a plastic plate. Before covering a plastic plate, we put a piece of sticker to protect the PFA flare of flange. If it is the high purity demand from semi-conductor industry, we will process the product in clean room, clean inside of each pipe or fitting by demanded procedure, seal a piece of sticker and then cover a plastic plate on each flange. Finally, protect the product by poly bag in order to prevent the product from contamination and damage.

### 5.2 Mark

There is a clear mark on the package such as items, specifications, sizes, the manufacturers and customer's order numbers, etc.

### 5.3 Transportation

According to the weight and size of the product, all items are packed by firm wooden case or carton. The fumigation certificate for wooden case are available upon request.

### 管線組合安裝時注意要點:

1. 尚未準備與配管連接前，不可隨意移開法蘭保護蓋板以免因溫差或異物造成法蘭面損壞或扭曲。如果因檢驗而必須移開法蘭面，也應在檢驗完成後立即將保護蓋板蓋上。
2. PFA內襯管件之連接需要使用TEFPASS®-G墊片以保護法蘭面。
3. 螺絲應以適當的力矩鎖緊，力矩值請參考右表。
4. 螺牙需保持乾淨，同時需使用墊圈以確保正確之轉矩。此外，螺絲必須依序均勻地鎖緊。順序如右圖。
5. 如果法蘭面發生洩露但洩露一方之螺絲已被適當地鎖緊，則勿再逼緊螺絲，以免造成法蘭面永久的傷害。正確的方法是，將對角線的螺絲同時放鬆半圈，然後再將洩露一方之螺絲施以相同之力矩鎖緊。如果洩露的情況持續，應將螺絲鬆開，檢查整個法蘭面是否因刮痕或凹陷而造成洩露。所有的刮痕或凹陷若未超過整個內襯厚度的20%，則以機械加工方式將法蘭面加工平整再重新安裝。
6. 如果系統在高溫使用下發生洩露，則應降溫到常溫狀態後，再施以檢查或維修。
7. PFA內襯管請勿在靠近鐵件的地方做焊接或乙炔切割以免造成PFA內襯管之永久性的損壞，除非事前已做好適當之預防措施避免過熱的情況發生。
8. 安全排氣孔不可被其他物質阻塞。這些排氣孔是用來釋放可能在高溫中產生並殘留於內襯與白鐵件之間之氣體。如果這些氣體沒有被釋放出來，則可能造成PFA內襯管坍塌的情況。在洩露到達危險比率之前，排氣孔內直徑之變化同時也提供內襯管遭到任何意外損壞前之警示作用。

圖：鎖緊順序

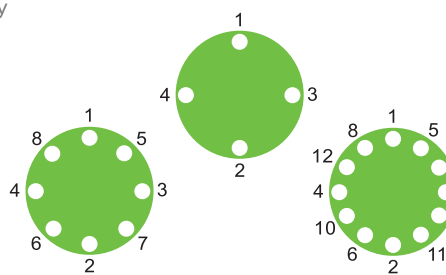


表1：鎖緊力矩

Unit: kgf-m

ANSI 150LBS			JIS 10K		
NPS	MIN.	MAX.	NPS	MIN.	MAX.
1/2"	0.7	1.0	15mm	0.5	0.7
3/4"	0.9	1.3	20mm	0.7	1.0
1"	1.2	1.8	25mm	1.2	1.8
1-1/2"	1.9	2.8	40mm	2.1	3.1
2"	3.5	5.3	50mm	3.2	4.8
3"	5.6	8.3	80mm	2.8	4.2
4"	3.9	5.9	100mm	4.4	6.5
6"	7.9	11.8	150mm	9.2	13.7

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### Instructions for Assembling Pipes and Fittings

1. Flange covers should not be removed until flanges are ready to be bolted into position or sealing faces may become damages or distorted. If covers are removed for inspection, they should be replaced immediately.
2. To protect flange surface, TEFPASS®-G Gaskets are required with PFA lined piping components.
3. Bolts should be tightened using proper bolt torque, the torque values in the tables as below.
4. Threads must be clean and washers should be used to ensure correct torque. Bolt should be tightened alternately and evenly, following the sequence shown in the charts.
5. If a flange leak occurs and the bolts of the leaking side have been properly tightened, they should not be tightened further or permanent damage to the sealing face may result. Instead, the bolts on the opposite side should be loosened a half turn at a time and then the bolts on the leaking side should be tightened by the same amount. If the leak persists, the bolts should be removed and the sealing faces should be examined for scratches or dents across and entire face that could produce a leak path. Any scratches or dents that do not exceed 20% of the liner thickness can be eliminated by machining.
6. If leakage occurs after the system has been cycled in an elevated temperature, it should be cool down to ambient temperature, to have a further inspection and maintenance.
7. No welding, brazing, soldering or flame cutting which can permanently damage the PFA liner should be done close to the metal housings unless adequate precautions are taken to prevent exposure to excessive heat.
8. Safety vent holes should not be plugged. The vent holes are essential to release gases that may be generated at elevated temperatures and trapped between the liner and the housing. If not vented, these gases may collapse the liner. Vent holes also serve to warn of any accidental damage to the liner before leakage reaches dangerous proportions.

Chart : Bolts tightened method

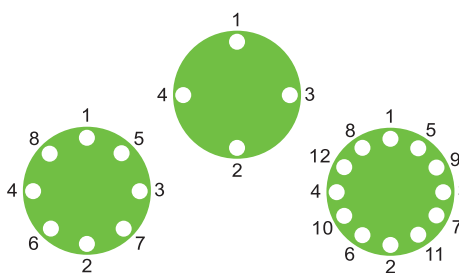


Table: Tightened Torque

Unit: kgf-m

ANSI 150LBS			JIS 10K		
NPS	MIN.	MAX.	NPS	MIN.	MAX.
1/2"	0.7	1.0	15mm	0.5	0.7
3/4"	0.9	1.3	20mm	0.7	1.0
1"	1.2	1.8	25mm	1.2	1.8
1-1/2"	1.9	2.8	40mm	2.1	3.1
2"	3.5	5.3	50mm	3.2	4.8
3"	5.6	8.3	80mm	2.8	4.2
4"	3.9	5.9	100mm	4.4	6.5
6"	7.9	11.8	150mm	9.2	13.7



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