TEP and PEP Series

Introduction

TEP/PEP series are suitable for high purity and ultra high purity fluid systems such as in the semiconductor industry. FITOK adopts strict specifications for materials, machining and electropolishing processes, etc., as well as eliminates undesired contaminant residues through high standard cleaning and packaging process to meet high cleanliness and high performance requirements of valves, fittings and tubing in the semiconductor manufacturing industry.

Features

◎ Materials: TEP series: 316L, 316L VAR
PEP series: 316L

◎ Standards: ASTM A269, A632, A312 or JIS G3459

◎ Sizes: TEP series ASTM A269/A632: 1/4"-2 1/2"
PEP series JIS G3459: 6A-50A
PEP series ASTM A312: NPS 1/8-NPS 2

◎ Process: internal surface electropolished to roughness of Ra≤10 μin (0.25 μm), Ra≤7 μin (0.18 μm), Ra≤5 μin (0.13 μm); external surface roughness of Ra≤40 μin (1 μm)

◎ Inspection: visual inspection, surface roughness measurement, particle test, moisture test, scanning electron microscopy (SEM), Auger electron spectroscopy (AES), X-ray photoelectron spectroscopy (ESCA or XPS)

◎ Cleaning: ultrasonically cleaned, washed, rinsed, and purged and dried with high purity hot nitrogen in ISO 6 cleanroom

◎ Packaging: packaged in ISO 4 cleanroom, cleaned with ultra high pressure nitrogen, tubing ends are capped and tubing is packed in double polyethylene bags with inner bag filled with 99.999% nitrogen

◎ Marking: packing bags are marked with brand, material grade, specification and heat number

◎ Standard length: 20 ft, 4 m and 6 m

Materials

Grade	Standard	FITOK Designator	Composition %							
			C	Mn	P	S	Si	Ni	Cr	Mo
316L	ASTM	6L	≤0.035①	≤2.00	≤0.045	≤0.03	≤1.00	10.0-15.0	16.0-18.0	2.0-3.0
	JIS G3459		≤0.03					12.0-16.0		
316L VAR	ASTM	6LV		≤1.50	≤0.045	≤0.01		10.0-15.0		

① The carbon content of tubing with outside diameter smaller than 1/2" or wall thickness smaller than 0.049" is allowed up to 0.04%.

Surface Roughness

Tube O.D. (D) mm	External Surface μin. (μm)	Internal Surface μin. (μm)		
	TEP/PEP	TEP/PEP		
		A	B	C
6.35≤D≤63.5	Ra≤40 (1.0)	Ra≤5 (0.13)	Ra≤7 (0.18)	Ra≤10 (0.25)

Tubing

Dimensional Tolerance and Scope of Supply

ASTM A269/A632 Compliant TEP Series							
Tube O.D.	Wall Thickness	O.D. Tolerance	Wall Thickness Tolerance	Tubing Length		Process	
in.	in.	in. (mm)	%	m	ft	Seamless	Welded
1/4	0.035	+/-0.004 (0.10)	+/-10	4 or 6	20	√	√
	0.039						
3/8	0.035						
	0.039						
	0.049						
1/2	0.035						
	0.039						
	0.049						
3/4	0.049						
	0.065						
1	0.049						
	0.065						
1 1/2	0.065	+/-0.008 (0.20)					
2	0.065	+/-0.010 (0.25)					
2 1/2	0.065						

Working Pressure at Ambient Temperature

For seamless tubing, working pressures are calculated in accordance with ASME B31.3: for single butt weld tubing, multiply the pressure rating by 0.8.

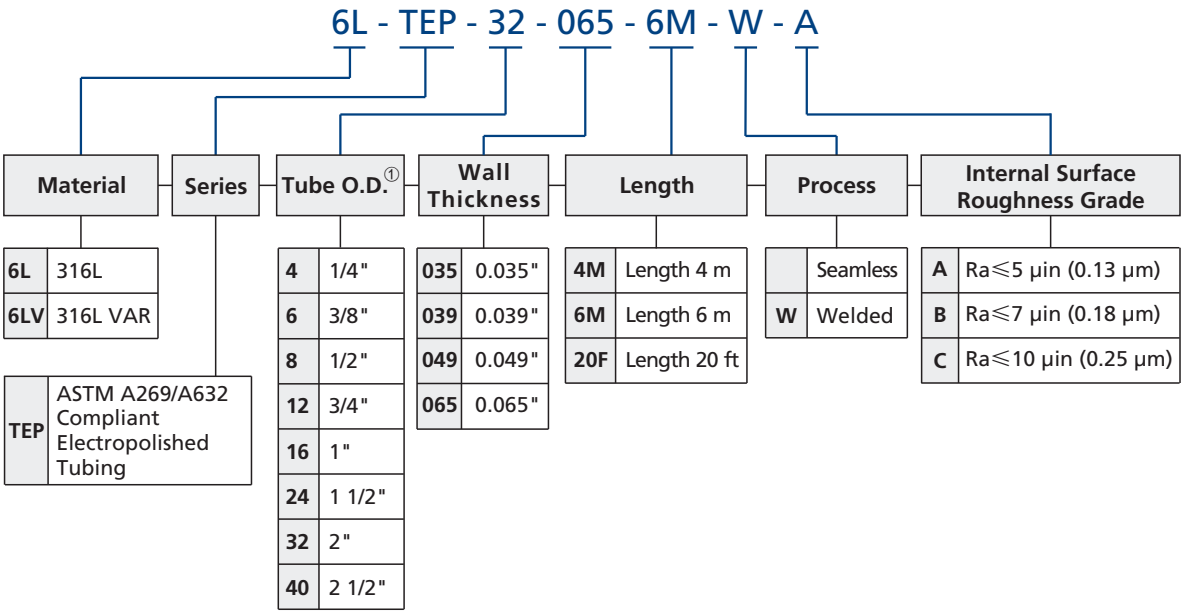
ASTM A269/A632 Compliant TEP Series				
Tube O.D.	Wall Thickness in.			
	0.035	0.039	0.049	0.065
	Working Pressure psig			
1/4	5100	5700	-	-
3/8	3300	3700	4800	-
1/2	2600	3000	3700	-
3/4	-	-	2400	3300
1	-	-	1800	2400
1 1/2	-	-	-	1600
2	-	-	-	1200
2 1/2	-	-	-	950

Elevated Temperature Factors

Temperature		Factor
°F	°C	316L
200	93	1.00
400	204	0.96
600	315	0.85
800	426	0.79
1000	537	0.76

Example:
1/2 in. O.D. × 0.035 in. wall thickness EP tubing at 600 °F (315 °C):
1. Working pressure is 2600 psig at -20 °F to 100 °F (-28 °C to 37 °C);
2. Elevated temperature factor is 0.85 at 600 °F (315 °C);
2600 psig × 0.85 = 2210 psig
conclude the working pressure of 1/2 in. O.D. × 0.035 in. wall thickness EP tubing at 600 °F (315 °C) is 2210 psig.

Ordering Number Description



① To order metric sizes, please contact FITOK Group.

Notes:
1. "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
2. Purity test reports are available. Please contact FITOK Group for more information.

Pipes

Dimensional Tolerance and Scope of Supply

JIS G3459 Compliant PEP Series

Nominal O.D.	Pipe O.D.	Nominal Wall Thickness		O.D. Tolerance	Wall Thickness Tolerance	Pipe Length		Process	
		SCH5S	SCH10S						
A Size	mm	Wall Thickness, mm		in. (mm)	%	m	ft	Seamless	Welded
6A	10.5	1. 0	1.2	+/-0.004 (0.10)	+/-10	4 or 6	-	√	√
8A	13.8	1. 2	1.65						
10A	17.3	1. 2	1.65						
15A	21.7	1. 65	2.1						
20A	27.2	1.65	2.1						
25A	34.0	1.65	2.8						
32A	42.7	1.65	2.8	+/-0.012 (0.30)					
40A	48.6	1.65	2.8						
50A	60.5	1.65	2.8	+/-0.020 (0.50)					

ASTM A312 Compliant PEP Series

Nominal O.D.	Pipe O.D.	Nominal Wall Thickness				O.D. Tolerance	Wall Thickness Tolerance	Pipe Length		Process	
		B36.19M		B36.10M							
		SCH5S	SCH10S	SCH5	SCH10						
NPS	mm	Wall Thickness, mm				in. (mm)	%	m	ft	Seamless	Welded
1/8	10.3	-	1.24	-	1.24	+0.016 (0.40)/ -0.031 (0.80)	+20/ -12.5	4 or 6	20	√	√
1/4	13.7	-	1.65	-	1.65						
3/8	17.1	-	1.65	-	1.65						
1/2	21.3	1. 65	2.11	1. 65	2.11						
3/4	26.7	1.65	2.11	1.65	2.11						
1	33.4	1.65	2.77	1.65	2.77						
1 1/4	42.2	1.65	2.77	1.65	2.77						
1 1/2	48.3	1.65	2.77	1.65	2.77						
2	60.3	1.65	2.77	1.65	2.77	+/-0.031 (0.80)					

Working Pressure at Ambient Temperature

For seamless pipes, working pressures are calculated in accordance with ASME B31.3: for single butt weld pipes, multiply the pressure rating by 0.8.

JIS G3459 Compliant PEP Series

Nominal Diameter A Size	Pipe O.D. mm	Wall Thickness	
		SCH5S	SCH10S
		Working Pressure psig	
6A	10.5	3300	4000
8A	13.8	3000	4300
10A	17.3	2400	3300
15A	21.7	2600	3400
20A	27.2	2100	2700
25A	34.0	1600	2900
32A	42.7	1300	2200
40A	48.6	1100	2000
50A	60.5	910	1600

ASTM A312 Compliant PEP Series

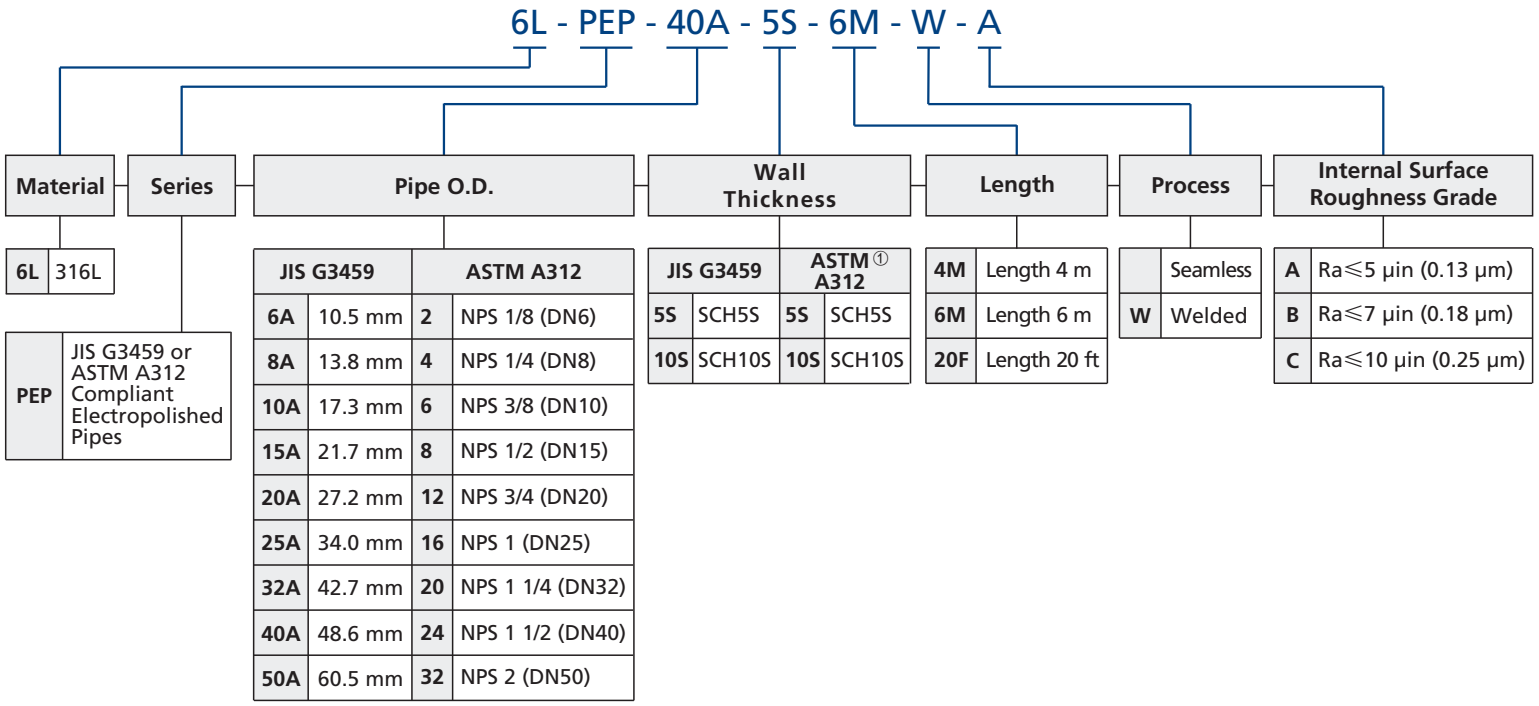
Nominal Diameter NPS	Wall Thickness			
	B36.19M		B36.10M	
	SCH5S	SCH10S	SCH5	SCH10
	Working Pressure psig			
1/8	-	4600	-	4600
1/4	-	4600	-	4600
3/8	-	3600	-	3600
1/2	2800	3700	2800	3700
3/4	2300	2900	2300	2900
1	1800	3100	1800	3100
1 1/4	1400	2400	1400	2400
1 1/2	1200	2100	1200	2100
2	970	1700	970	1700

Elevated Temperature Factors

Temperature		Factor
°F	°C	316L
200	93	1.00
400	204	0.96
600	315	0.85
800	426	0.79
1000	537	0.76

Example:
10A O.D. × SCH55 wall thickness EP pipes at 600 °F (315 °C):
1. Working pressure is 2400 psig at -20 °F to 100 °F (-28 °C to 37 °C);
2. Elevated temperature factor is 0.85 at 600 °F (315 °C);
2400 psig × 0.85 = 2040 psig
conclude the working pressure of 10A O.D. × SCH55 wall thickness EP pipes at 600 °F (315 °C) is 2040 psig.

Ordering Number Description



① Wall thickness complies with ASME B36.19M. For ASME B36.10M compliant wall thickness, please contact FITOK Group.

Notes:
1. "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
2. Purity test reports are available. Please contact FITOK Group for more information.

Ordering Information

To order, add material designator, series, length, process, internal surface roughness grade and report to get a complete ordering number.

Examples:

1. Seamless tubing, 316L stainless steel, ASTM A269 compliant, TBA series, 1/4" O.D. x 0.035" wall thickness, 6 m length, standard report, the ordering number is 6L-TBA-4-035-6M.

1. Seamless tubing, 316L stainless steel, ASTM A269 compliant, TEP series, 1/4" O.D. x 0.035" wall thickness, 6 m length, internal surface roughness of Ra≤0.25 μm, standard report, the ordering number is 6L-TEP-4-035-6M-C.

2. Seamless pipe, 316L stainless steel, JIS G3459 compliant, PEP series, 8A O.D. x SCH105 wall thickness, 6 m length, internal surface roughness of Ra≤0.13 μm, the ordering number is 6L-PEP-8A-10S-6M-A.

ASTM A269/A632 Compliant TBA/TEP Series

Tube O.D. in.	Wall Thickness in.	Basic Ordering Number	
1/4	0.035	□□-TBA-4-035-□□-□	□□-TEP-4-035-□□-□-□
	0.039	□□-TBA-4-039-□□-□	□□-TEP-4-039-□□-□-□
3/8	0.035	□□-TBA-6-035-□□-□	□□-TEP-6-035-□□-□-□
	0.039	□□-TBA-6-039-□□-□	□□-TEP-6-039-□□-□-□
	0.049	□□-TBA-6-049-□□-□	□□-TEP-6-049-□□-□-□
1/2	0.035	□□-TBA-8-035-□□-□	□□-TEP-8-035-□□-□-□
	0.039	□□-TBA-8-039-□□-□	□□-TEP-8-039-□□-□-□
	0.049	□□-TBA-8-049-□□-□	□□-TEP-8-049-□□-□-□
3/4	0.049	□□-TBA-12-049-□□-□	□□-TEP-12-049-□□-□-□
	0.065	□□-TBA-12-065-□□-□	□□-TEP-12-065-□□-□-□
1	0.049	□□-TBA-16-049-□□-□	□□-TEP-16-049-□□-□-□
	0.065	□□-TBA-16-065-□□-□	□□-TEP-16-065-□□-□-□
1 1/2	0.065	□□-TBA-24-065-□□-□	□□-TEP-24-065-□□-□-□
2	0.065	□□-TBA-32-065-□□-□	□□-TEP-32-065-□□-□-□
2 1/2	0.065	□□-TBA-40-065-□□-□	□□-TEP-40-065-□□-□-□

JIS G3459 Compliant PEP Series

Nominal Diameter A Size	Nominal Wall Thickness	
	SCH5S	SCH10S
	Basic Ordering Number	
6A	□□-PEP-6A-5S-□□-□-□	□□-PEP-6A-10S-□□-□-□
8A	□□-PEP-8A-5S-□□-□-□	□□-PEP-8A-10S-□□-□-□
10A	□□-PEP-10A-5S-□□-□-□	□□-PEP-10A-10S-□□-□-□
15A	□□-PEP-15A-5S-□□-□-□	□□-PEP-15A-10S-□□-□-□
20A	□□-PEP-20A-5S-□□-□-□	□□-PEP-20A-10S-□□-□-□
25A	□□-PEP-25A-5S-□□-□-□	□□-PEP-25A-10S-□□-□-□
32A	□□-PEP-32A-5S-□□-□-□	□□-PEP-32A-10S-□□-□-□
40A	□□-PEP-40A-5S-□□-□-□	□□-PEP-40A-10S-□□-□-□
50A	□□-PEP-50A-5S-□□-□-□	□□-PEP-50A-10S-□□-□-□

ASTM A312 Compliant PEP Series		
Nominal Diameter NPS	Nominal Wall Thickness	
	SCH5S	SCH10S
	Basic Ordering Number	
1/8	-	□□-PEP-2-10S-□□-□-□
1/4	-	□□-PEP-4-10S-□□-□-□
3/8	-	□□-PEP-6-10S-□□-□-□
1/2	□□-PEP-8-5S-□□-□-□	□□-PEP-8-10S-□□-□-□
3/4	□□-PEP-12-5S-□□-□-□	□□-PEP-12-10S-□□-□-□
1	□□-PEP-16-5S-□□-□-□	□□-PEP-16-10S-□□-□-□
1 1/4	□□-PEP-20-5S-□□-□-□	□□-PEP-20-10S-□□-□-□
1 1/2	□□-PEP-24-5S-□□-□-□	□□-PEP-24-10S-□□-□-□
2	□□-PEP-32-5S-□□-□-□	□□-PEP-32-10S-□□-□-□