

# Biopharm Fittings

For the Bioprocessing and Pharmaceutical Industries



## TS Series

- Virtually eliminates fluid holdup
- Improves drainability
- Enhances cleanability
- Provides easy assembly
- 1/2 through 4 in. outside diameter

## TS Series Biopharm Fittings

Swagelok® TS series biopharm fittings are designed to solve problems inherent in conventional ISO 2852 sanitary fittings: gasket extrusion and the resulting fluid holdup.

### Features

- Boreline seal and metal-to-metal stop virtually eliminate fluid holdup and improve drainability and cleanability.
- Seals remain leak-tight throughout pressure-temperature ratings range.
- Clamp and ferrule assemble easily as ferrule captures self-aligning gasket.
- TS series adapter gasket allows an existing ISO 2852 ferrule to mate with a TS series ferrule.
- TS series end connections are available on Swagelok BPE series fittings; see the *Biopharm Fittings for the Bioprocessing and Pharmaceutical Industries—BPE Series catalog*, MS-03-02. Contact your authorized Swagelok sales and service representative for ordering information.

### Technical Data

#### Design Specifications

- TS series 316L stainless steel ferrules meet ASME-BPE and 3-A requirements.
- Short ferrules meet ASME-BPE with the exception of overall length.

#### Internal Surface Finish

- Mechanical finish—20 µin. (0.51 µm) maximum  $R_a$ , in accordance with ASME-BPE SFF1
- Electropolished finish—15 µin. (0.38 µm) maximum  $R_a$ , in accordance with ASME-BPE SFF4

#### External Surface Finish

- 64 µin. (1.63 µm)  $R_a$

### Pressure-Temperature Ratings

#### Pressure Ratings

Pressure ratings are based on tests conducted using:

- 2-piece clamps for 1/2 and 3/4 in. fittings
- 3-piece clamps for 1 through 4 in. fittings
- high-pressure, two-bolt clamps for 2 1/2 and 3 in. fittings with PTFE gaskets.

Pressure ratings for connections using an adapter gasket or any other manufacturer's component default to the lowest pressure rating of all the components.

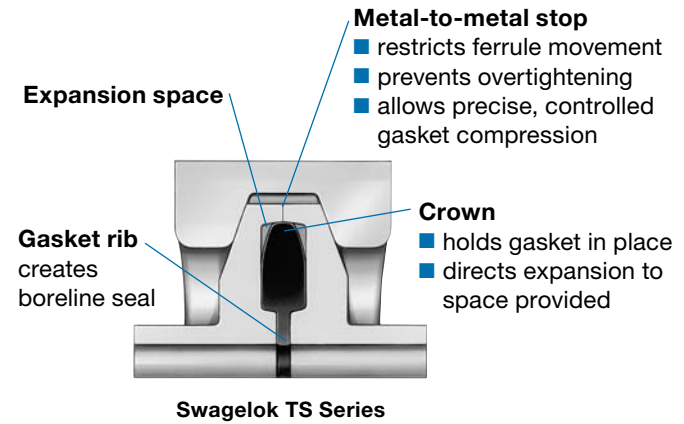
Gasket Material	Tube OD in.	Working Pressure, psig (bar)		
		At 70°F (20°C)	At 275°F (135°C)	At 350°F (176°C)
PTFE	1/2 to 3	200 (13.7)		—
	1/2	3100 (213)	300 (20.6)	300 (20.6) (FKM only)
3/4	2800 (192)			
EPDM and Fluorocarbon FKM	1	1200 (82.6)		
	1 1/2			
	2	650 (44.7)		
	2 1/2	450 (31.0)		
3	350 (24.1)			
4	200 (13.7)		200 (13.7) (FKM only)	

#### Temperature Ratings

Gasket Material	Temperature Range °F (°C)
PTFE	60 to 275 (15 to 135)
EPDM	-50 to 275 (-45 to 135)
Fluorocarbon FKM	-10 to 350 (-23 to 176)

#### Vacuum Rating

Gasket Material	Vacuum Rating
EPDM	10 <sup>-3</sup> torr
Fluorocarbon FKM	



### Materials of Construction

Item	Material	Specification
Ferrules	316L stainless steel	ASME-BPE 3-A 63-
Gaskets	PTFE (white)	FDA 21CFR Part 177.1550 3-A 20-
	EPDM (black)	FDA 21CFR Part 177.2600 3-A 18-
	Fluorocarbon FKM (brown)	ISO 10993 part 5 (cytotoxicity test), USP 23, Section 88, Class VI

### Material Specifications

All wetted components are traceable. Ferrules are heat traceable and gasket materials are lot traceable.

### Cleaning

Ferrules are cleaned to ensure components are free of burrs, chips, loose particles, oil, grease, and other contaminants. Electropolished ferrules are passivated.

## Ordering Information and Dimensions

To order, add an internal surface finish designator to a basic ordering number.

Example: 316L-8TS-L-SFF1

Dimensions are for reference only and are subject to change.

1/2 and 3/4 in. OD ferrules and cap are based on commonly available fitting assemblies (25 mm), not ISO 2852 (34 mm).

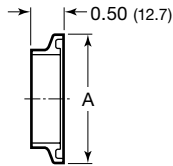
BPE Code	Internal Surface Finish Roughness Average ( $R_a$ )	Designator
SFF1	20 $\mu\text{in.}$ (0.51 $\mu\text{m}$ ) max, machined finish	SFF1
SFF4	15 $\mu\text{in.}$ (0.38 $\mu\text{m}$ ) max, electropolished finish	SFF4

## End Connection Sizes

End connections are available in the sizes and wall thicknesses shown below.

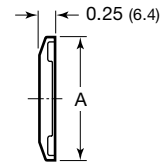
End Connection Size, in.	Tube Wall in.
1/2 to 3	0.065
4	0.083

## Short Ferrules



Tube OD in.	Basic Ordering Number	A in. (mm)
1/2	316L-8TS-S-	0.98 (24.9)
3/4	316L-12TS-S-	
1	316L-16TS-S-	1.98 (50.3)
1 1/2	316L-24TS-S-	
2	316L-32TS-S-	2.52 (64.0)

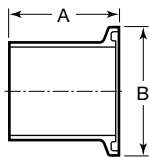
## Caps



Tube OD in.	Basic Ordering Number	A in. (mm)
1/2	316L-8TS-C-	0.98 (24.9)
3/4	316L-12TS-C-	
1	316L-16TS-C-	1.98 (50.3)
1 1/2	316L-24TS-C-	
2	316L-32TS-C-	2.52 (64.0)
2 1/2	316L-40TS-C-	3.05 (77.5)
3	316L-48TS-C-	3.58 (90.9)
4	316L-64TS-C-	4.68 (119)

## Automatic Tube Weld Ferrules

BPE Table DT-22



Tube OD in.	Basic Ordering Number	Dimensions, in. (mm)	
		A	B
1/2	316L-8TS-L-	1.75 (44.4)	0.98 (24.9)
3/4	316L-12TS-L-		
1	316L-16TS-L-		
1 1/2	316L-24TS-L-	2.25 (57.2)	1.98 (50.3)
2	316L-32TS-L-		2.52 (64.0)
2 1/2	316L-40TS-L-		3.05 (77.5)
3	316L-48TS-L-		3.58 (90.9)
4	316L-64TS-L-		4.68 (119)

## Options and Accessories

### Gaskets

To order, add a gasket material designator to a basic ordering number.

Example: **TM-8TS-G**

Gasket Material	Designator
PTFE	TM
EPDM	EP
Fluorocarbon FKM	VT

### Standard Gaskets



Tube OD in.	Basic Ordering Number
1/2	-8TS-G
3/4	-12TS-G
1	-16TS-G
1 1/2	-24TS-G
2	-32TS-G
2 1/2	-40TS-G <sup>①</sup>
3	-48TS-G <sup>①</sup>
4	-64TS-G <sup>②</sup>

<sup>①</sup> High-pressure, two-bolt clamp required for fittings with PTFE gaskets.

<sup>②</sup> Not available in PTFE.

### Adapter Gaskets

Adapter gasket allows an existing ISO 2852 ferrule to mate with a TS series ferrule, with TS series geometry on one face and ISO 2852 geometry on the other face.



Tube OD in.	Basic Ordering Number
1/2	-8TS-GA
1	-16TS-GA
1 1/2	-24TS-GA
2	-32TS-GA
2 1/2	-40TS-GA <sup>①</sup>
3	-48TS-GA <sup>①</sup>
4	-64TS-GA <sup>①</sup>

<sup>①</sup> Not available in PTFE.

### Clamps

Standard and high-pressure 304 stainless steel clamps are available. See the *Swagelok Accessories for the Sanitary Industries catalog*, MS-03-09.

### Welding

- Note: Manual welding is not recommended for short ferrules. Welding caution: Excess heat may alter the ferrule shape and affect seal integrity.
- Contact your authorized Swagelok representative for additional information on recommended welding practices.

### Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit [swagelok.com](http://swagelok.com) or contact your authorized Swagelok representative.

#### Safe Product Selection

**When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.**

### Wing Nut Tightening Tool

The Swagelok wing nut tightening tool eases tightening and loosening wing nuts and protects from hot wing nuts.

Ordering number: **NY-TS-TL**



### Documentation

The following are included with all third-party-inspected TS series biopharm fittings.

- Inspection and test report certificate verifying:
  - 100 % visual inspection of inside and outside component surfaces
  - Dimensional inspection on at least 20 % of lot, depending on lot size
  - Chemical composition meets ASME-BPE Table DT-3
  - 100 % component marking in accordance with ASME-BPE
- Material test report

The following can be provided on request.

- Certification of gasket material compliance with FDA 21CFR Part 177 and applicable 3-A standards
- Certification of gasket material compliance with USP 23 Class VI where applicable
- Quality assurance manual
- ISO 9001 certification