



## Product Test Report

Swagelok Company  
29500 Solon Road  
Solon, Ohio 44139 U.S.A.

**PTR-1258**  
Rev. A  
October 12, 2006  
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### TITLE

Evaluation of Swagelok® Medium-Pressure Tube Fittings with Annealed 316/316L Stainless Steel Tubing

### PRODUCT TESTED

Ordering Number	Quantity Tested	Tubing Size in.
SS-4FK0-1-4	3	1/4 × 0.049
SS-4FK0-C	3	
SS-4FK0-1-4	3	1/4 × 0.065
SS-4FK0-C	3	
SS-6FK0-1-4	3	3/8 × 0.065
SS-6FK0-C	3	
SS-6FK0-1-4	3	3/8 × 0.083
SS-6FK0-C	3	
SS-8FK0-1-4	3	1/2 × 0.083
SS-8FK0-C	3	

### PURPOSE

The Swagelok medium-pressure tube fittings assembled to annealed 316/316L stainless steel tubing were tested to observe the gas pressure sealing and hydraulic burst pressure capability of the assemblies under laboratory conditions.

### TEST CONDITIONS

Each sample tested consisted of one tube length and two test fittings. The fittings were assembled according to the Swagelok medium-pressure tube fitting assembly instructions of one turn past finger-tight.

### TEST METHOD

#### O.D. and Wall Measurement

1. Three O.D. measurements were taken at 120° increments to obtain maximum and minimum readings.
2. Three wall thickness measurements were taken at 120° increments to obtain maximum and minimum readings.

#### Tubing Hardness Test

1. Hardness measured on each O.D. as skin hardness check.
2. Placed tubing samples on stand using 15T scale with 1/16 in. diameter ball.
3. Took five hardness measurements and used averages as actual readings.
4. Used Wilson Cylindrical Correction Chart #53 to add cylindrical conversion factors to actual 15T readings.
5. Used United Hardness Scale Conversions Chart to convert from 15-T to HRB readings.



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### Nitrogen Gas Bubble Leak Test

1. The test samples were attached to a gas test stand, submerged in water.
2. The samples were pressurized to the working pressure of the tubing with nitrogen for 10 minutes and monitored for leakage.
3. The judgment criterion was no visually detectable leakage.

### Hydraulic Pressure Test

1. Each sample was attached to a hydraulic test stand and pressurized.
2. The pressure was recorded when tube slip, material rupture or leakage which prevented applying higher pressure occurred, whichever came first.
3. Results were compared to the tubing working pressure.

## TEST RESULTS

### O.D., Wall and Hardness Measurements

Tubing size in.	Minimum/Maximum O.D. in. (mm)	Minimum/Maximum Wall in. (mm)	Hardness RB
1/4 x 0.049	0.248 / 0.249 (6.30 / 6.32)	0.047 / 0.049 (1.19 / 1.24)	77
1/4 x 0.065	0.249 / 0.250 (6.32 / 6.35)	0.063 / 0.064 (1.60 / 1.63)	82
3/8 x 0.065	0.373 / 0.374 (9.47 / 9.50)	0.063 / 0.064 (1.60 / 1.63)	84
3/8 x 0.083	0.373 / 0.374 (9.47 / 9.50)	0.082 / 0.083 (2.08 / 2.11)	82
1/2 x 0.083	0.498 / 0.499 (12.65 / 12.67)	0.084 / 0.085 (2.13 / 2.16)	81

### Nitrogen Gas Bubble Leak Test and Hydraulic Burst Pressure Test

Tubing Size in.	Samples Tested	Tubing Working Pressure psig (bar)	Leak Test Results	4 x Tubing Working Pressure psig (bar)	Samples Attaining 4 x W.P.	Failure Mode
1/4 x 0.049	3	7500 (516)	Pass	30 000 (2067)	1/3 <sup>①</sup>	Tubing burst
1/4 x 0.065	3	10 200 (702)	Pass	40 800 (2811)	3/3	Tubing burst
3/8 x 0.065	3	6500 (447)	Pass	26 000 (1791)	3/3	Tubing burst
3/8 x 0.083	3	7500 (516)	Pass	30 000 (2067)	3/3	Tubing burst
1/2 x 0.083	3	6700 (461)	Pass	26 800 (1846)	3/3	Tubing burst

① Two samples obtained pressures greater than 3.75 times the working pressure when the tubing burst.



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These tests do not simulate any specific application and are not a guarantee of performance in actual service. Swagelok Company makes no representation or warranties regarding these selected conditions or the results attained there from. Laboratory tests cannot duplicate the variety of actual operating conditions. Data presented is not offered as statistically significant test results. See the product catalog for technical data.

These tests were conducted beyond the product's recommended operating parameters and do not modify the published product ratings.

### **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.

#### Reference Documents

*Wilson Cylindrical Correction Chart # 53*, Wilson Instrument Division, 929 Connecticut Avenue, Bridgeport, CT 06602

*United Hardness Scale Conversions Chart*, United Testing Systems, 5171 Exchange Drive, Flint MI 48507

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