



## Product Test Report

**PTR-3561**

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

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November 2018  
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### TITLE

Low-Temperature Thermal Cycling and Hydrostatic Proof Test of Tungum® Tubing with Stainless Steel Swagelok® Tube Fittings

### PRODUCT TESTED

Samples Tested	Tungum Tubing Size OD x Wall in.	Tubing Hardness 15-T	Part Description Ordering Number	Part Description Ordering Number
4	1/4 x 0.028	82	Union Straight SS-400-6	Union Elbow SS-400-9
4	1/4 x 0.065	81	Union Straight SS-400-6	Union Elbow SS-400-9
4	3/8 x 0.035	84	Union Straight SS-600-6	Union Elbow SS-6400-9
4	3/8 x 0.065	82	Union Straight SS-600-6	Union Elbow SS-600-9
4	1/2 x 0.049	82	Union Straight SS-810-6	Union Elbow SS-810-9
4	1/2 x 0.083	83	Union Straight SS-810-6	Union Elbow SS-810-9
4	3/4 x 0.065	84	Union Straight SS-1210-6	Union Elbow SS-1210-9
4	3/4 x 0.109	84	Union Straight SS-1210-6	Union Elbow SS-1210-9
4	1 x 0.109	83	Union Straight SS-1610-6	Union Elbow SS-1610-9
4	1 x 0.120	84	Union Straight SS-1610-6	Union Elbow SS-1610-9

### PURPOSE

These assemblies were tested under laboratory test conditions to observe the leak-tight performance (during and after thermal cycling) of stainless steel Swagelok tube fittings when installed on Tungum tubing.

### TEST CONDITIONS

Original test date: January 2014

Laboratory environment



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### TEST METHOD

#### Hardness Measurements of Tubing:

1. Performed five hardness measurements equally spaced apart on each tube OD using the 15-T scale with the 1/16-inch diameter ball penetrator.
2. Reported the average of the five measurements.
3. Added the tubing cylindrical values taken from the Wilson Chart #53 Cylindrical Conversion Table.

#### Low Temperature Thermal Cycling Procedure:

1. Assembled one tube length with one union straight and one union elbow according to the Swagelok tube fitting installation instructions.
2. Placed test samples in an environmental chamber and pressurized to test pressure with nitrogen.
3. Decreased the samples to test temperature of  $-40^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$ ) within a period of one hour. The samples were allowed to stabilize at temperature for a minimum of 2 hours while being monitored for pressure decay.
4. The temperature was then increased to laboratory room temperature (within one hour) while the test pressure was maintained. Samples were then stabilized at room temperature for a minimum of two hours while being monitored for pressure decay.
5. Repeated the above cycle two additional times.
6. Recorded any pressure decay; the pass criterion was no pressure decay.

#### Hydrostatic Proof Test Procedure:

1. Upon completion of the low-temperature thermal cycling procedure, the samples were subjected to a hydraulic proof test at ambient laboratory temperature.
2. Samples were pressurized to 100 psig (6.8 bar) and held for a period of five minutes.
3. After 5 minutes at 100 psig (6.8 bar), the samples were pressurized to test pressure (1.5 times ambient working pressure) and held for an additional period of 5 minutes.
4. Monitored the samples for leakage throughout the test; the pass criterion was no visible leakage.



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### TEST RESULTS

#### Low-Temperature Thermal Cycle Test

Tungum Tubing Size OD x Wall in.	Ambient Working Pressure psig (bar)	Test Pressure at -40°F (-40°C) psig (bar)	Test Results
1/4 x 0.028	4000 (275)	4000 (275)	Pass
1/4 x 0.065	10 200 (702)	10 200 (702)	Pass
3/8 x 0.035	3300 (227)	3300 (227)	Pass
3/8 x 0.065	6500 (447)	6500 (447)	Pass
1/2 x 0.049	3700 (254)	3700 (254)	Pass
1/2 x 0.083	6700 (461)	6700 (461)	Pass
3/4 x 0.065	3300 (227)	3300 (227)	Pass
3/4 x 0.109	5800 (399)	5800 (399)	Pass
1 x 0.109	4200 (165)	4200 (165)	Pass
1 x 0.120	4700 (323)	4700 (323)	Pass

#### Hydrostatic Proof Test

Tungum Tubing Size OD x Wall in.	Test Pressure psig (bar)	Test Results
1/4 x 0.028	6000 (413)	Pass
1/4 x 0.065	15 300 (1054)	Pass
3/8 x 0.035	4950 (341)	Pass
3/8 x 0.065	9750 (671)	Pass
1/2 x 0.049	5550 (382)	Pass
1/2 x 0.083	10 050 (692)	Pass
3/4 x 0.065	4950 (340)	Pass
3/4 x 0.109	8700 (599)	Pass
1 x 0.109	6300 (434)	Pass
1 x 0.120	7050 (485)	Pass



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

These tests were performed to consider a specific set of conditions and should not be considered valid outside those conditions. 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. See the product catalog for technical data.

### **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.

### **Referenced Documents**

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