



## Product Test Report

Swagelok Company  
29500 Solon Road  
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**PTR-1369**  
Ver 04  
September 2022  
Page 1 of 2

### TITLE

Inboard Helium Leak Test of 316 Stainless Steel Swagelok® Tube Fittings at Cryogenic Temperature

### PRODUCT TESTED

The following 316 stainless steel Swagelok tube fittings were tested with the identified stainless steel tubing.

Ordering Number	Quantity Tested	Tubing in.	Tubing Hardness HRB
SS-400-6	8	1/4 × 0.028	85
SS-400-9	8		
SS-400-P	8		
SS-600-6-4	8	3/8 × 0.035	77
SS-600-9	8		
SS-600-P	8		
SS-810-6-4	8	1/2 × 0.049	75
SS-810-9	8		
SS-810-P	8		
SS-1210-6-4	8	3/4 × 0.065	75
SS-1210-9	8		
SS-1210-P	8		
SS-1610-6-4	8	1 × 0.083	77
SS-1610-9	8		
SS-1610-P	8		

### PURPOSE

These assemblies were tested to observe the performance of 316 stainless steel Swagelok tube fittings at cryogenic temperature under laboratory conditions.

### TEST CONDITIONS

Original test date: February 2007

Each sample tested consisted of one tube length and two test fittings. The fitting was assembled according to the Swagelok tube fitting installation instructions.

### TEST METHOD

#### Mass Spectrometry (Inboard leakage)

1. The test sample was connected to the mass spectrometer, and a vacuum pressure of less than  $1 \times 10^{-3}$  torr ( $1.33 \times 10^{-7}$  MPa) was applied to the test sample.
2. The helium background was measured.
3. The spray probe was used to introduce helium to each connection in turn.
4. The leak rate was measured at each connection.
5. The test sample was submerged into the liquid nitrogen at  $-325^{\circ}\text{F}$  ( $-200^{\circ}\text{C}$ ).
6. The test sample was soaked for at least 10 minutes to assure thermal stabilization.



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Page 2 of 2

7. After stabilization the test sample was raised to just above the surface of the liquid nitrogen and the spray probe was used to introduce helium to each connection in turn. The test sample temperature stabilized at  $-304^{\circ}\text{F}$  ( $-186^{\circ}\text{C}$ ) when raised above the surface of the liquid nitrogen.
8. The test sample was exposed to ambient room temperature until all frost and condensation was removed.
9. The test sample was cycled from room temperature to cryogenic temperature 3 times and was tested for leakage each time.
10. The judgment criterion was no detectable leakage above the measured helium background.

### TEST RESULTS

For all samples tested, the helium leak rate did not change from the measured helium background indicating no leakage detected during the three cryogenic cycles.

Mass Spectrometry (Inboard Leakage Helium)				
Ordering Number	Quantity Tested	Tubing in.	Helium Background std $\text{cm}^3/\text{s}$	Test Result
SS-400-6	8	1/4 x 0.028	$1.5 \times 10^{-5}$	Passed
SS-400-9	8			
SS-400-P	8			
SS-600-6-4	8	3/8 x 0.035	$1.2 \times 10^{-5}$	Passed
SS-600-9	8			
SS-600-P	8			
SS-810-6-4	8	1/2 x 0.049	$5.0 \times 10^{-5}$	Passed
SS-810-9	8			
SS-810-P	8			
SS-1210-6-4	8	3/4 x 0.065	$9.8 \times 10^{-5}$	Passed
SS-1210-9	8			
SS-1210-P	8			
SS-1610-6-4	8	1 x 0.083	$1.8 \times 10^{-6}$	Passed
SS-1610-9	8			
SS-1610-P	8			

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. Laboratory tests cannot duplicate the variety of actual operating conditions. Test results are not offered as statistically significant. 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.

Swagelok—TM Swagelok Company