



Product Test Report

PTR-3223

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

Ver 02
November 2022
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TITLE

Outboard Helium Leak Test of 316 Stainless Steel Swagelok® Tube Fittings with Stainless Steel Tubing

PRODUCT TESTED

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

Ordering Number	Description	Quantity Tested	Tubing Size ^① OD x Wall
SS-100-6	Union	1	1/16 x 0.010 in.
SS-100-9	Union Elbow	1	
SS-100-P	Plug	1	
SS-6M0-6	Union	1	6 x 0.8 mm
SS-6M0-9	Union Elbow	1	
SS-6M0-P	Plug	1	
SS-600-6	Union	1	3/8 x 0.035 in.
SS-600-9	Union Elbow	1	
SS-600-P	Plug	1	
SS-810-6	Union	1	1/2 x 0.049 in.
SS-810-9	Union Elbow	1	
SS-810-P	Plug	1	
SS-16M0-6	Union	1	16 x 1.5 mm
SS-16M0-9	Union Elbow	1	
SS-16M0-P	Plug	1	
SS-1410-6	Union	1	7/8 x 0.083 in.
SS-1410-9	Union Elbow	1	
SS-1410-P	Plug	1	
SS-1610-6	Union	1	1 x 0.083 in.
SS-1610-9	Union Elbow	1	
SS-1610-P	Plug	1	

① The tubing met the dimensional and hardness guidelines described in the Swagelok *Tubing Data* sheet, MS-01-107.

PURPOSE

These assemblies were tested under laboratory conditions to observe the outboard leak performance of 316 stainless steel Swagelok tube fittings when pressurized with helium at the working pressure of the tubing.



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TEST CONDITIONS

Original test date: November 2012

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 (Outboard Leakage Test—Bell Jar Method)

1. The test sample was placed inside the bell jar and pressurized with helium to the working pressure of the tubing at room temperature.
2. The bell jar was attached to the helium leak detector (HLD) and the bell jar was evacuated to detect helium.
3. The test sample was observed for at least 5 minutes before the reading on the HLD was recorded.
4. The test sample was removed from the bell jar, disassembled, reassembled. The test was repeated 10 times.
5. The judgment criteria were leakage less than the values listed in industry regulations, *ECE Regulation No. 110* and *EIHP Rev. 12B Draft*.
 - *ECE Regulation No. 110* lists a maximum leak rate of 15 cm³/h (4.2×10^{-3} std cm³/s)
 - *EIHP Rev. 12B Draft* lists a maximum leak rate of 10 cm³/h (2.8×10^{-3} std cm³/s)

TEST RESULTS

See test results table on the next page.



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TEST RESULTS

The Swagelok tube fitting meets and outperforms these industry regulation leak rate requirements while experiencing disassembly and reassembly at the published working pressure of the tubing.

Mass Spectrometry (Outboard Leakage Helium)				
Ordering Number	Quantity Tested	Tubing Size OD x Wall	Test Pressure psig (bar)	Test Result After 10 Reassemblies
SS-100-6	1	1/16 x 0.010 in.	5600 (385)	Passed
SS-100-9	1			
SS-100-P	1			
SS-6M0-6	1	6 x 0.8 mm	4500 (310)	Passed
SS-6M0-9	1			
SS-6M0-P	1			
SS-600-6	1	3/8 x 0.035 in.	3300 (227)	Passed
SS-600-9	1			
SS-600-P	1			
SS-810-6	1	1/2 x 0.049 in.	3700 (254)	Passed
SS-810-9	1			
SS-810-P	1			
SS-16M0-6	1	16 x 1.5 mm	3340 (230)	Passed
SS-16M0-9	1			
SS-16M0-P	1			
SS-1410-6	1	7/8 x 0.083 in.	3600 (248)	Passed
SS-1410-9	1			
SS-1410-P	1			
SS-1610-6	1	1 x 0.083 in.	3100 (213)	Passed
SS-1610-9	1			
SS-1610-P	1			

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.



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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.

References

ECE Regulation No. 110, *Uniform provisions concerning the approval of specific components of motor vehicles using compressed natural gas (CNG) in their propulsion system, dated 2001-06-19, incl. Corrigendum 2 of 2001-08-03*, UNECE United Nations Economic Commission for Europe

EIHP Rev. 12B Draft, *Uniform provisions concerning the approval of specific components of motor vehicles using compressed gaseous hydrogen, dated 2003-12-10*, UNECE United Nations Economic Commission for Europe

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