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

TITLE

Inboard 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 OD × Wall in.	Tubing Hardness HRB
SS-400-6	Union	8	1/4 × 0.028 in.	85
SS-400-9	Union Elbow	8		
SS-400-P	Plug	8		
SS-600-6-4	Reducing Union	8	3/8 × 0.035 in.	77
SS-600-9	Union Elbow	8		
SS-600-P	Plug	8		
SS-810-6-4	Reducing Union	8	1/2 × 0.049 in.	75
SS-810-9	Union Elbow	8		
SS-810-P	Plug	8		
SS-1210-6-4	Reducing Union	8	3/4 × 0.065 in.	75
SS-1210-9	Union Elbow	8		
SS-1210-P	Plug	8		
SS-1610-6-4	Reducing Union	8	1 × 0.083 in.	77
SS-1610-9	Union Elbow	8		
SS-1610-P	Plug	8		

PURPOSE

These assemblies were tested under laboratory conditions to observe the inboard leak performance of 316 stainless steel Swagelok tube fittings with helium at ambient temperature.

TEST CONDITIONS

Original test date: November 2012

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

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TEST METHOD

Mass Spectrometry (Inboard leakage)

1. The test sample was connected to the mass spectrometer, and a vacuum pressure of less than 1×10^{-3} torr (1.33×10^{-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 judgment criteria were leakage less than the values listed in industry regulations, *ECE Regulation No. 110* and *EHIP Rev. 12B Draft.*
    a. *ECE Regulation No. 110* lists a maximum leak rate of 15 cm^3/h (4.2×10^{-3} std cm^3/s)
    b. *EIHP Rev. 12B Draft* lists a maximum leak rate of 10 cm^3/h (2.8×10^{-3} std cm^3/s)

TEST RESULTS

The Swagelok tube fitting meets and outperforms these industry regulation leak rate requirements.

Ordering Number	Quantity Tested	Tubing Size OD × Wall in.	Test Result
SS-400-6	8	1/4 × 0.028 in.	Passed
SS-400-9	8		
SS-400-P	8		
SS-600-6-4	8	3/8 × 0.035 in.	Passed
SS-600-9	8		
SS-600-P	8		
SS-810-6-4	8	1/2 × 0.049 in.	Passed
SS-810-9	8		
SS-810-P	8		
SS-1210-6-4	8	3/4 × 0.065 in.	Passed
SS-1210-9	8		
SS-1210-P	8		
SS-1610-6-4	8	1 × 0.083 in.	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.

Referenced Documents

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