Swagelok Company
29500 Solon Road
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TITLE

Positive Pressure Helium Leak Test / Nitrogen Gas Seal Test with Repeated Reassembly of 316 Stainless Steel Swagelok® Tube Fittings with Heavy-Wall Stainless Steel Tubing

PRODUCT TESTED

The following bar stock and forged body Swagelok tube fittings were tested with 316 stainless steel seamless tubing.

Ordering Number	Part Form	Tubing Size	Tubing Hardness HRB
Fractional, in.			
SS-400-1-4	Bar stock	1/4 × 0.065	82
SS-400-9	Forging		
SS-500-1-4	Bar stock	5/16 × 0.065	81
SS-500-9	Forging		
SS-600-1-4	Bar stock	3/8 × 0.065	83
SS-600-9	Forging		
SS-810-1-4	Bar stock	1/2 × 0.083	85
SS-810-9	Forging		
Metric, mm			
SS-6M0-1-4	Bar stock	6 × 1.5	79
SS-6M0-9	Forging		
SS-8M0-1-4	Bar stock	8 × 1.5	78
SS-8M0-9	Forging		
SS-10M0-1-4	Bar stock	10 × 2.0	84
SS-10M0-9	Forging		
SS-12M0-1-4	Bar stock	12 × 2.0	84
SS-12M0-9	Forging		

PURPOSE

These assemblies were tested to observe the performance of stainless steel Swagelok tube fittings with advanced geometry back ferrules with heavy-wall stainless steel tubing during a gas seal test with repeated reassembly under laboratory conditions.

TEST CONDITIONS

Original test date: December 2001

Tube preparation:
Tubing samples were cut to length using a tube cutter for 1/2 in. diameter and under.

Fitting assembly:
The test fittings and tubing were initially assembled 1 1/4 turns past finger-tight according to Swagelok tube fitting installation instructions.

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TEST METHOD

1. The assemblies were attached to a positive pressure gas test stand, submerged in water, pressurized to 1.5 times the working pressure with helium gas for at least 10 minutes, and monitored for leakage.
2. The pressure was dropped, and fittings were then re-pressurized to working pressure with nitrogen gas for at least 10 minutes, and monitored for leakage.
3. The fittings were disassembled and reassembled according to the proper Swagelok reassembly specifications.
4. The fittings were leak tested using nitrogen gas at the working pressure for at least 10 minutes at every fifth reassembly.
5. A total of 25 reassemblies were conducted on each test end.

TEST RESULTS

Fractional

Size in.	**Samples Tested**	**Working Pressure** psig (bar)	**1.5 × Working Pressure** psig (bar)	**Results**
1/4 × 0.065	32	10 200 (702)	15 300 (1054)	Pass
5/16 × 0.065	8	8000 (551)	12 000 (826)	Pass
3/8 × 0.065	16	6500 (447)	9750 (671)	Pass
1/2 × 0.083	16	6700 (461)	10 500 (692)	Pass

Metric

Size mm	**Samples Tested**	**Working Pressure** bar (psig)	**1.5 × Working Pressure** bar (psig)	**Results**
6 × 1.5	8	710 (10 304)	1065 (15 457)	Pass
8 × 1.5	4	520 (7547)	780 (11 320)	Pass
10 × 2.0	24	580 (8417)	870 (12 626)	Pass①
12 × 2.0	16	470 (6821)	705 (10 232)	Pass

① One 10 mm sample experienced an estimated 0.03 std cm^3/min leak rate at the 25^{th} reassembly due to improper re-tightening of the nut. After an additional tightening, the sample was re-tested with no detectable leakage.

No detectable leakage (except as indicated) was observed on any of the products tested during initial testing and after the 5^{th}, 10^{th}, 15^{th}, 20^{th}, and 25^{th} reassemblies.

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

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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.