



Product Test Report

PTR-3263

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

Ver 03
October 2023
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TITLE

Nitrogen Gas Seal Test with Repeated Reassembly of Super Austenitic 6Mo Stainless Steel (6-moly) Tubing with 6Mo Stainless Steel (6-moly) Swagelok® Tube Fittings

PRODUCT TESTED

Samples Tested	6Mo SS Tubing Size OD x Wall in.	Tubing Hardness HRB	Working Pressure ^① psig (bar)	Description / Ordering Number	Description / Ordering Number
12	1/4 x 0.028	87	5400 (372)	Union Straight 6Mo-400-6	Union Elbow 6Mo-400-9
12	1/4 x 0.065	92	13 900 (957)	Union Straight 6Mo-400-6	Union Elbow 6Mo-400-9
12	1/2 x 0.035	88	3500 (241)	Union Straight 6Mo-810-6	Union Elbow 6Mo-810-9
12	1/2 x 0.083	95	9000 (620)	Union Straight 6Mo-810-6	Union Elbow 6Mo-810-9

① Working pressures were calculated from an S value of 27 100 psig (186.7 MPa) for ASTM A213 tubing at -20 to 100°F (-28 to 37°C), as listed in ASME B31.1.

PURPOSE

These assemblies were tested under laboratory test conditions to observe the gas seal reassembly performance of stainless steel 6Mo Swagelok tube fittings when installed on 6Mo stainless steel tubing.

TEST CONDITIONS

Original test date: October 2012

- Each sample tested consisted of one tube length and two test fittings. The fittings were assembled according to Swagelok assembly procedures.
- Testing was completed in a room temperature laboratory environment.

TEST METHOD

Hardness Measurements of Tubing:

1. Performed five measurements equally spaced apart on each tube OD with the United Hardness Tester 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 ASTM E18-*Standard Test Methods for Rockwell Hardness of Metallic Materials*.
4. Used the ASTM E140 Table 6—*Approximate Hardness Conversion Numbers for Austenitic SS* to convert the 15-T readings to the HRB values.



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Gas Remake Testing:

1. The samples were attached to a positive pressure gas test stand, submerged in water, and pressurized to working pressure with nitrogen gas for at least 10 minutes.
2. If leakage was observed, the pressure was dropped and samples showing leaks were tightened with a 1/8 turn-of-the-nut tightening. Step 1 was then repeated.
3. If leakage was not observed, the pressure was increased to 1.25 times working pressure for at least 10 minutes.
4. The pressure was dropped, and all samples were disassembled and reassembled one time according to Swagelok tube fitting installation instructions. This constitutes 1 reassembly of the fitting. Steps 1 and 3 were then repeated.
5. Samples were reassembled according to step 4 and tested for at least 10 minutes at 1 times working pressure and 1.25 times working pressure at the following reassembly points: 5 and 10.
6. Samples were monitored for leakage throughout the test. The acceptance criterion was less than 1 bubble per minute at the applied pressure.

TEST RESULTS

Tubing Size OD x Wall in.	1.25 x WP psig (bar)	End Connections Tested	Number of Acceptable Samples	
			After Standard Assembly and Initial Test	After 1, 5, and 10 Reassemblies
1/4 x 0.028	6750 (465)	24	24 / 24	24 / 24
1/4 x 0.065	17 375 (1197)	24	24 / 24	24 / 24
1/2 x 0.035	4375 (301)	24	24 / 24	24 / 24
1/2 x 0.083	11 250 (775)	24	24 / 24	24 / 24

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. 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.



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Referenced Documents

ASTM E18—*Standard Test Methods for Rockwell Hardness of Metallic Materials*, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428

ASTM E140, *Table 6—Approximate Hardness Conversion Numbers for Austenitic SS*, ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2858

ASME B31.1, *Power Piping*, The American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5590.

ASME B31.3, *Process Piping*, The American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5590.

ASTM A312, *Standard Specification for Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater, and Heat-Exchanger Tubes*, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428

ASTM F1387-99, *Standard Specification for Performance of Piping and Tubing Mechanically Attached Fittings*, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428

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