



## Product Test Report

PTR-1403

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

Ver 05  
September 2022  
Page 1 of 4

### TITLE

Rotary Flex and Pressure Impulse Test of 316 Stainless Steel Swagelok® Tube Fittings with Stainless Steel Tubing

### PRODUCT TESTED

Ordering Number	Product Form	Tube Size in.	Working Pressure psig (bar)
SS-810-6	Bar stock	1/2 × 0.083	6700 (461)
SS-1610-6	Bar stock	1 × 0.120	4700 (323)
SS-3200-6	Bar stock	2 × 0.188	3600 (248)

### PURPOSE

These assemblies were tested to observe the rotary flex and pressure impulse performance of the 316 stainless steel Swagelok tube fitting under laboratory conditions.

### TEST CONDITIONS

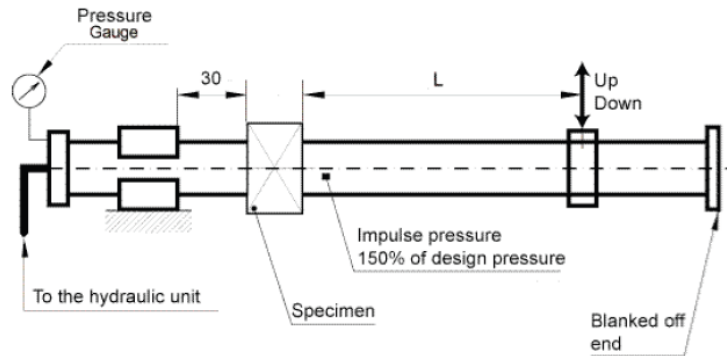
Original test date: February 2007

- Each sample tested consisted of one tube length and one test fitting. The fitting was assembled according to the Swagelok tube fitting installation instructions.
- All tests were conducted at room temperature in a laboratory environment.

### TEST METHOD

- The testing in this report was performed in accordance with *Requirements Concerning Pipes and Pressure Vessels*, P2: "Rules for Piping Design, Construction, and Testing".
- The free end of each test sample was mounted to a rotary flex test stand. See Figure 1—Test Set-Up. This method applies a completely reversed bending stress on the fitting connection while pressurized with hydraulic oil. Simultaneously, an internal pressure impulse was applied to the test sample.
- The test ceased when the fitting leaked, the tube fractured or when 10 000 000 rotary cycles and 500 000 impulse cycles were achieved.

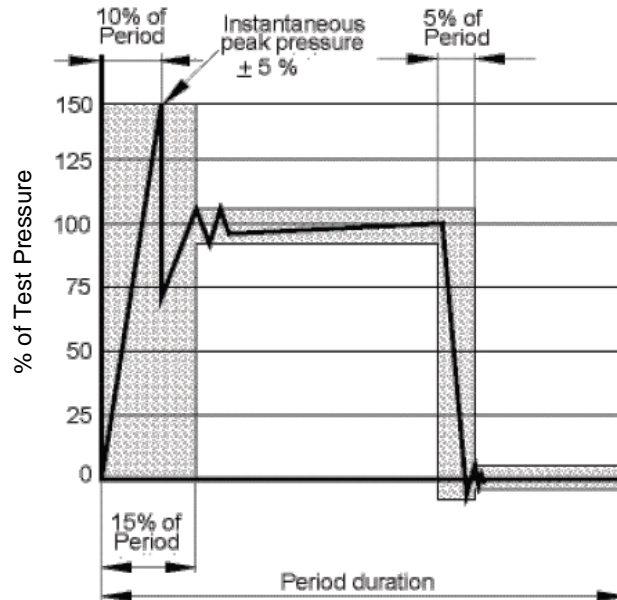
**Figure 1—Test Set-Up**



The following procedure was followed:

1. Each test sample was attached to a rotary flex test stand.
2. A bending stress was applied to each sample by a gimbaled rotary offset. The stress level supports a highly accelerated life test protocol and is not indicative of any specific application. The frequency of the applied bending stress was 10 – 20 Hz.
3. Test samples were pressurized with hydraulic oil to the test pressure. An internal pressure impulse was applied. The impulse pressure was 0 to 1.5 times the test pressure with a frequency of 30 to 60 cycles per minute. See Figure 2—Impulse Pressure Diagram.
4. Test samples were flexed until either the fitting leaked, the tube fractured, or 10 000 000 rotary cycles and 500 000 impulse cycles, whichever occurred first. An in-line pressure transducer stopped the test if fitting leakage or tube fatigue fracture occurred.
5. The judgment criterion was each test sample must attain 10 000 000 rotary cycles and 500 000 impulse cycles at the indicated amplitude without leakage.

**Figure 2—Impulse Pressure Diagram**



### TEST RESULTS

Sample	Test Pressure psig (bar)	Peak Pressure (1.5 × Test Pressure) psig (bar)	Amplitude at L (Length) in. (mm)	Calculated Bending Stress <sup>①</sup> lb/in. <sup>2</sup> (bar)	Test Result
1	6700 (461)	10 050 (692)	±0.029 at 9.0 (±0.74 at 230)	7500 (516)	Passed
2	4700 (323)	7050 (485)	±0.028 at 12.5 (±0.71 at 320)	7500 (516)	Passed
3	3600 (248)	5400 (372)	±0.023 at 16.0 (±0.58 at 405)	7500 (516)	Passed

① Requirements Concerning Pipes and Pressure Vessels, P2: “Rules for Piping Design, Construction, and Testing”, P2.11.5.4.2a

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

This test was 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.



## Product Test Report

**PTR-1403**

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

Ver 05  
September 2022  
Page 4 of 4

---

### **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**

Requirements Concerning Pipes and Pressure Vessels, P2: *Rules for Piping Design, Construction, and Testing*, Rev. 5, November, 2003 published by International Association of Classification Societies (IACS), 36 Broadway, London, SW1H 0BH, <http://www.iacs.org.uk/>

Swagelok—TM Swagelok Company