



Product Test Report

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

PTR-3564
Ver 02
November 2018
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TITLE

Tensile Pull Test of Tungum® Tubing with Stainless Steel Swagelok® Tube Fittings

PRODUCT TESTED

| Samples Tested | Tungum Tubing Size OD x Wall in. | Tubing Hardness 15-T | Part Description Ordering Number |
|----------------|--|-------------------------|--|
| 6 | 1/4 x 0.065 | 81 | Male Connector SS-400-1-4 |
| 6 | 3/8 x 0.065 | 82 | Male Connector SS-600-1-4 |
| 6 | 1/2 x 0.083 | 83 | Male Connector SS-810-1-4 |
| 6 | 3/4 x 0.109 | 84 | Male Connector SS-1210-1-4 |
| 6 | 1 x 0.120 | 84 | Male Connector SS-1610-1-4 |

PURPOSE

These assemblies were tested under laboratory conditions to observe the tube grip performance of stainless steel Swagelok tube fittings when installed on heavy-wall Tungum tubing under tensile load.

TEST CONDITIONS

Original Test Date: January 2014

Laboratory environment

TEST METHOD

Hardness Measurements of Tubing:

1. Performed five hardness measurements equally spaced apart on each tube OD 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 the Wilson Chart #53 Cylindrical Conversion Table.



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Tensile Pull Test:

1. The fitting was assembled according to the Swagelok tube fitting installation instructions.
2. Each sample was attached in turn to a tensile test stand.
3. Samples were tensile pulled at a rate of 1/8 in. (3.2 mm) per minute until either the tube pulled out of the fitting or the tube fractured.
4. The judgment criterion is taken from ASTM F1387, Annex A7.

$$\text{Calculated tensile load} = A_p \times S_y$$

where:

A_p = cross-section area of the tube based on wall thickness

S_y = minimum specified yield strength of tube.

5. The test result should exceed the calculated tensile load.

TEST RESULTS

Tensile Pull Test

| Tungum Tubing Size OD x Wall in. | ASTM F1387 Calculated Tensile Load lb (kg) | Samples Attaining ASTM F1387 Calculated Tensile Load | Results |
|---|---|--|---------|
| 1/4 x 0.065 | 1280 (580.6) | 6 / 6 | Pass |
| 3/8 x 0.065 | 2150 (975.2) | 6 / 6 | Pass |
| 1/2 x 0.083 | 3680 (1669) | 6 / 6 | Pass |
| 3/4 x 0.109 | 7410 (3361) | 6 / 6 | Pass |
| 1 x 0.120 | 11 220 (5089) | 6 / 6 | Pass |

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 there from. Laboratory tests cannot duplicate the variety of actual operating conditions. 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.

Referenced Documents

Wilson Cylindrical Correction Chart # 53, Wilson Instrument Division, 929 Connecticut Avenue, Bridgeport, CT 06602

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