Product Test Report

Swagelok Company
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TITLE

Tensile Pull Test of 316 Stainless Steel Swagelok® Tube Fittings with Stainless Steel Tubing

PRODUCT TESTED

The following bar stock body Swagelok tube fittings were tested:

Ordering Number	Form	Tubing Size	Tubing Hardness HRB
Fractional, in.			
SS-400-3	Forging	1/4 × 0.065	80 to 82
SS-400-6	Bar stock		
SS-400-1-4	Bar stock		
SS-600-6	Bar stock	3/8 × 0.065	83 to 86
SS-600-3	Forging		
SS-600-1-4	Bar stock		
SS-810-3	Forging	1/2 × 0.083	85 to 87
SS-810-6	Bar stock		
SS-810-1-4	Bar stock		
SS-810-1-6	Bar stock		
SS-1010-1-8	Bar stock	5/8 × 0.095	79
SS-1210-1-8	Bar stock	3/4 × 0.109	83 to 86
SS-1410-1-8	Bar stock	7/8 × 0.109	76 to 83
SS-1610-1-8	Bar stock	1 × 0.120	81 to 85
Metric, mm			
SS-6M0-6	Bar stock	6 × 1.5	75
SS-6M0-3	Forging		
SS-8M0-6	Bar stock	8 × 1.5	87
SS-8M0-3	Forging		
SS-10M0-6	Bar stock	10 × 2.0	84
SS-10M0-3	Forging		
SS-12M0-6	Bar stock	12 × 2.0	85 to 87
SS-12M0-3	Forging		
SS-14M0-1-8	Bar stock	14 × 2.2	86
SS-15M0-1-8	Bar stock	15 × 2.2	84
SS-16M0-1-8	Bar stock	16 × 2.5	82
SS-18M0-1-8	Bar stock	18 × 2.5	82
SS-20M0-1-8	Bar stock	20 × 2.8	90
SS-22M0-1-8	Bar stock	22 × 2.8	76
SS-25M0-1-8	Bar stock	25 × 3.0	78

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PURPOSE

The assemblies were tested to observe the tensile pull performance of the 316 stainless steel Swagelok tube fitting with advanced geometry back ferrules under laboratory conditions.

TEST CONDITIONS

Original test date: January 2016

Each non-pressurized sample tested consisted of one tube length and two test fittings. The fitting was assembled according to the Swagelok tube fitting installation instructions. Testing was conducted at ambient room temperature.

TEST METHOD

1. Each sample was attached in turn to a tensile test stand.
2. Samples were tensile pulled at a rate of 3/8 in. (9.5 mm) per minute until either the tube pulled out of the fitting or the tube fractured.
3. The judgment criterion is taken from ASTM F1387, Annex A7.
   Calculated tensile load = Ap x Sy; where:
   Ap = cross-section area of the tube based on wall thickness
   Sy = minimum specified yield strength of tube.
4. The test result should exceed the calculated tensile load.

TEST RESULTS

Tubing Size	Samples Tested	ASTM F1387 Calculated Tensile Load lb (kg)	Samples Attaining ASTM F1387 Calculated Tensile Load
Fractional, in.			
1/4 × 0.065	24	1237 (561)	24 / 24
3/8 × 0.065	24	2079 (943)	24 / 24
1/2 × 0.083	20	3560 (1614)	20 /20
5/8 × 0.095	12	4745 (2152)	12 / 12
3/4 × 0.109	12	6585 (2986)	12 / 12
7/8 × 0.109	12	7869 (3569)	12 / 12
1 × 0.120	12	9130 (4141)	12 / 12
Metric, mm			
6 × 1.5	4	984 (446)	4 / 4
8 × 1.5	16	1590 (721)	16 / 16
10 × 2.0	4	2542 (1153)	4 / 4
12 × 2.0	4	3178 (1441)	4 / 4
14 × 2.2	6	3792 (1720)	6 / 6
15 × 2.2	6	4114 (1866)	6 / 6
16 × 2.5	6	4930 (2236)	6 / 6
18 × 2.5	6	5661 (2567)	6 / 6
20 × 2.8	6	7035 (3191)	6 / 6
22 × 2.8	6	7854 (3562)	6 / 6
25 × 3.0	6	10 236 (4642)	6 / 6

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The stainless steel Swagelok tube fitting achieved a tensile load in excess of the calculated load under laboratory conditions.

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

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