



Product Test Report

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

PTR-390
Ver 06
November 2022
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TITLE

Hydrostatic Pressure Test of Swagelok® Tube Fittings with 1 Turn and 3/4 Turn of Fitting Nut Assembly on Normal to Extra-Hard Tubing with Tubing Bottomed and Not Bottomed

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 in.	81 to 82
SS-400-9	Forging		100+
SS-600-1-4	Bar stock	3/8 × 0.065 in.	83 to 88
SS-600-9	Forging		100+
SS-600-1-4	Bar stock	3/8 × 0.083 in.	78 to 80
SS-600-9	Forging		100+
SS-810-1-4	Bar stock	1/2 × 0.083 in.	86 to 88
SS-810-9	Forging		98, 100+
Metric, mm			
SS-6M0-1-4	Bar stock	6 × 1.5 mm	93
SS-6M0-9	Forging		
SS-8M0-1-4	Bar stock	8 × 1.5 mm	88
SS-8M0-9	Forging		
SS-10M0-1-4	Bar stock	10 × 2.0 mm	90
SS-10M0-9	Forging		
SS-12M0-1-4	Bar stock	12 × 2.0 mm	100+
SS-12M0-9	Forging		

PURPOSE

These assemblies were tested to observe the performance of Swagelok tube fittings with advanced geometry back ferrules when installed at 1 turn and 3/4 turn past finger-tight on normal to extra-hard tubing under hydrostatic pressure when assembled with tubing both bottomed and not bottomed on the tube shoulder of the fitting body.

This testing evaluates the tube gripping ability of assembled tube fittings to sustain hydraulic over pressure, attaining up to 3.5 × working pressure without hydraulic leakage and up to 4.0 × working pressure without fitting material rupture or tube slippage.



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TEST CONDITIONS

Original test date: December 2001

Tube preparation:

Tubing lengths were cut using a tube cutter for 1/2 in. diameter and under. Each tube length assured a minimum of three diameter lengths between fittings after assembly.

Fitting assembly:

- Each sample tested consisted of one tube length and two test fittings, one bar stock and one forged body, assembled 1 turn and 3/4 turn past finger-tight.
- Prior to pull-up, assemblies with tubing not bottomed had the tubing withdrawn from the tube shoulder by 1/16 to 1/8 in. (1.6 to 3.2 mm).

TEST METHOD

The fittings were leak tested using the following controlled laboratory conditions:

1. Each sample was attached to a hydraulic test stand.
2. The tubing was restricted from burst by clamping blocks thereby forcing a failure at the fitting-to-tubing engagement.
3. Pressure was gradually increased and the pressure was recorded when loss of tube grip, material rupture or leakage that prevented applying higher pressure occurred, whichever came first.
4. Results were compared to the tubing working pressure.

TEST RESULTS

Swagelok Tube Fittings, 1 Turn Assembly, Normal to Extra-Hard Tubing, Tubing Bottomed

Fractional

Tubing Size in.	Tubing Hardness HRB	Samples Tested	Working Pressure (WP) psig (bar)	Samples Attaining 3.0 x WP Without Leakage	Samples Attaining 3.5 x WP Without Leakage	Samples Attaining 4 x WP Without Tube Slip
1/4 x 0.065	81 to 82	16	10 200 (702)	16 / 16	16 / 16	16 / 16
	100+	6	10 200 (702)	5 ^① / 6	5 / 6	5 / 6
3/8 x 0.065	83 to 88	16	6500 (447)	16 / 16	16 / 16	16 / 16
	100+	6	6500 (447)	6 / 6	6 / 6	5 / 6
3/8 x 0.083	78 to 80	24	7500 (516)	24 / 24	24 / 24	24 / 24
	100+	4	7500 (516)	4 / 4	4 / 4	4 / 4
1/2 x 0.083	86 to 88	24	6700 (461)	24 / 24	24 / 24	24 / 24
	98	34	6700 (461)	34 / 34	34 / 34	34 / 34
	100+	18	6700 (461)	18 / 18	17 / 18	16 / 18

① Lowest observed was 2.6 x W.P.



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TEST RESULTS

Swagelok Tube Fittings, 1 Turn Assembly, Normal to Extra-Hard Tubing, Tubing Bottomed Metric

Tubing Size mm	Tubing Hardness HRB	Samples Tested	Working Pressure (WP) bar (psig)	Samples Attaining 3.0 × WP Without Leakage	Samples Attaining 3.5 × WP Without Leakage	Samples Attaining 4 × WP Without Tube Slip
6 × 1.5	93	6	710 (10 304)	6 / 6	6 / 6	6 / 6
8 × 1.5	88	8	520 (7547)	8 / 8	8 / 8	8 / 8
10 × 2.0	90	31	580 (8417)	31 / 31	31 / 31	30 / 30
12 × 2.0	100+	16	470 (6821)	16 / 16	16 / 16	15 / 16

Swagelok Tube Fittings, 3/4 Turn Assembly, Normal to Extra-Hard Tubing, Tubing Bottomed

Fractional

Tubing Size in.	Tubing Hardness HRB	Samples Tested	Working Pressure (WP) psig (bar)	Samples Attaining 3.0 × WP Without Leakage	Samples Attaining 3.5 × WP Without Leakage	Samples Attaining 4 × WP Without Tube Slip
1/4 × 0.065	82	4	10 200 (702)	4 / 4	4 / 4	4 / 4
	100+	4	10 200 (702)	4 / 4	4 / 4	4 / 4
3/8 × 0.065	83	4	6500 (447)	4 / 4	4 / 4	4 / 4
	100+	4	6500 (447)	4 / 4	4 / 4	3 / 4
1/2 × 0.083	88	4	6700 (461)	4 / 4	4 / 4	4 / 4
	98	4	6700 (461)	4 / 4	4 / 4	4 / 4



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Swagelok Tube Fittings, 1 Turn Assembly, Normal to Extra-Hard Tubing, Tubing Not Bottomed

Fractional

Tubing Size in.	Tubing Hardness HRB	Samples Tested	Working Pressure (WP) psig (bar)	Samples Attaining 3.0 x WP Without Leakage	Samples Attaining 3.5 x WP Without Leakage	Samples Attaining 4 x WP Without Tube Slip
1/4 x 0.065	81 to 82	12	10 200 (702)	12 / 12	12 / 12	12 / 12
3/8 x 0.065	86 to 88	12	6500 (447)	12 / 12	12 / 12	12 / 12
3/8 x 0.083	100+	4	7500 (516)	2 ^⓪ / 4	2 / 4	2 / 4
1/2 x 0.083	86 to 87	20	6700 (461)	20 / 20	20 / 20	19 / 19
	100+	4	6700 (461)	4 / 4	3 / 4	3 / 4

⓪ Lowest observed was 2.8 x W.P.

Metric

Tubing Size mm	Tubing Hardness HRB	Samples Tested	Working Pressure (WP) bar (psig)	Samples Attaining 3.0 x WP Without Leakage	Samples Attaining 3.5 x WP Without Leakage	Samples Attaining 4 x WP Without Leakage
6 x 1.5	93	4	710 (10 304)	4 / 4	4 / 4	4 / 4
10 x 2.0	90	15	580 (8417)	15 / 15	15 / 15	15 / 15

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.