



Product Test Report

PTR-3090

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

Ver 07
May 2024
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TITLE

Hydrostatic Pressure Testing of 6MABT and 4ABT Series Stainless Steel Swagelok® Assembly-by-Torque (AbT) Tube Fitting Assembled to Stainless Steel Tubing and Stainless Steel Tube Adapters

PRODUCT TESTED

Ordering Number	Part Form	Swagelok Hardware Set	Stainless Steel Tubing Size	Catalog Assembly Torque
Metric, mm				
Male Connector SS-6M0-1-4BO	Bar stock	SS-6MABT-NFSET	6 × 1.0	150 ±13 in.·lb (17.0 ±1.5 N·m)
Male Elbow SS-6M0-9BO	Forging			
Cap SS-6M0-CBO	Bar stock			
Male Connector Elbow SS-6M0-2-4BO	Forging			
Tube Adapter Connector SS-6-MTA-1-4	Bar Stock		N/A	
Fractional, in.				
Male Connector SS-400-1-4BO	Bar stock	SS-4ABT-NFSET	1/4 × 0.028	170 ±13 in.·lb (19.0 ±1.5 N·m)
Male Elbow SS-400-9BO	Forging			
Male Connector SS-400-1-4BO	Bar stock	SS-4ABT-NFSET	1/4 × 0.035	150 ±13 in.·lb (17.0 ±1.5 N·m)
Male Elbow SS-400-9BO	Forging			
Cap SS-400-CBO	Bar stock			
Male Connector Elbow SS-400-2-4BO	Forging			
Male Connector SS-400-1-4BO	Bar stock	SS-4ABT-NFSET	1/4 × 0.049	170 ±13 in.·lb (19.0 ±1.5 N·m)
Male Elbow SS-400-9BO	Forging			
Cap SS-400-CBO	Bar stock			
Male Connector Elbow SS-400-2-4BO	Forging			



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Dimensional and Hardness Measurements of Tubing

Stainless Steel	Outside Diameter Minimum/Maximum in. (mm)	Wall Thickness Minimum/Maximum in. (mm)	Tubing Hardness HRB
Metric, mm			
316/316L	0.235 / 0.236 (5.99 / 6.00)	0.035 / 0.040 (0.90 / 1.01)	82
Fractional, in.			
316/316L	0.249 / 0.250 (6.32 / 6.35)	0.030 / 0.034 (0.76 / 0.86)	77
316/316L	0.248 / 0.251 (6.30 / 6.37)	0.034 (0.86)	78
316/316L	0.249 / 0.250 (6.32 / 6.35)	0.046 / 0.048 (1.17 / 1.22)	77

PURPOSE

The assemblies were tested under laboratory conditions to observe the tube grip performance of the 6MABT and 4ABT series stainless steel Swagelok tube fittings when assembled to stainless steel tubing and tube adapters.

TEST CONDITIONS

Original test dates: November 2019, and November 2020.

- Each tubing assembly tested consisted of one tube length and two test fittings or one tube adapter and one test fitting.
- Tube assemblies were preswaged and installed into fitting bodies according to *Assembly-by-Torque (AbT) Fittings* catalog, MS-02-466.
- Preswaged tube assemblies and tube adapters were installed into the fitting bodies tightened to the specified assembly torque.
- Tests were conducted at room temperature.

TEST METHOD

1. All nuts and ferrules were preswaged onto the tubing before assembling into the fitting bodies.
2. Preswaged tube assemblies were installed into the fitting end connections and torqued as follows:
 - For the metric assemblies, 12 of 36 were tightened to a torque of 137 in.·lb (15.5 N·m) and 24 of 36 were tightened to a torque of 150 in.·lb (17.0 N·m).
 - For the fractional assemblies with 1/4 × 0.028 tube, 6 of 12 were tightened to a torque of 157 in.·lb (17.7 N·m) and 6 of 12 were tightened to a torque of 183 in.·lb (20.6 N·m).
 - For the fractional assemblies with 1/4 × 0.035 tube, 12 of 36 were tightened to a torque of 137 in.·lb (15.5 N·m) and 24 of 36 were tightened to a torque of 150 in.·lb (17.0 N·m).
 - For the fractional assemblies with 1/4 × 0.049 tube, 24 of 24 were tightened to a torque of 170 in.·lb (19.0 N·m).



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3. Each assembly was attached to a hydraulic test stand.
4. The tubing was restricted from burst by clamping blocks, thereby forcing a failure at the fitting-to-tube engagement.
5. Pressure was gradually increased at a rate no greater than 2000 psig/second, and the pressure was recorded when loss of tube grip, material rupture or leakage that prevented applying higher pressure occurred, whichever came first.
6. Results were compared to the working pressure rating.

TEST RESULTS

Stainless Steel	Tubing Size	Ordering Number	End Connections Tested	Working Pressure (WP) psig (bar)	4 × Working Pressure psig (bar)	End Connections Attaining 4 × WP
Fractional, in.						
316/316L	1/4 × 0.028	SS-400-1-4BO	12	4000 (275)	16 000 (1103)	12 of 12
		SS-400-9BO	12			12 of 12
316/316L	1/4 × 0.035	SS-400-1-4BO	6	5100 (351)	20 400 (1404)	6 of 6
		SS-400-9BO	6			6 of 6
		SS-400-CBO	6			6 of 6
		SS-400-2-4BO	6			6 of 6
316/316L	1/4 × 0.049	SS-400-1-4BO	6	7500 (516)	30 000 (2068)	6 of 6
		SS-400-9BO	6			6 of 6
		SS-400-CBO	6			6 of 6
		SS-400-2-4BO	6			6 of 6
Metric, mm						
316/316L	6 × 1	SS-6M0-1-4BO	6	6092 (419)	24 368 (1679)	6 of 6
		SS-6M0-9BO	6			6 of 6
		SS-6M0-CBO	6			6 of 6
		SS-6M0-2-4BO	6			6 of 6
316 Tube Adapter	N/A	SS-6-MTA-1-4	12	6092 (419)	24 368 (1679)	12 of 12
	SS-6M0-CBO					

These tests were conducted beyond the product's recommended operating parameters and do not modify the published product ratings.



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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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