



Product Test Report

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

PTR-1910
Ver 02
November 2022
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TITLE

Impulse Testing of Strain-Hardened 316 Stainless Steel NPT End Connections for Swagelok® Medium-Pressure Fittings

PRODUCT TESTED

The following male and female NPT end connection sizes were tested.

Male and Female NPT End Connection Size in.
1/16
1/8
1/4
3/8
1/2
3/4
1

Swagelok medium-pressure fittings are manufactured from strain-hardened 316 stainless steel material with minimum mechanical properties of 75 000 psi (517 MPa) 0.2% yield strength and 95 000 psi (655 MPa) tensile strength.

Female and male NPT test samples were manufactured with cut threads. Male NPT test samples were manufactured using the maximum allowable internal thru hole diameter. Female NPT test samples were manufactured using the minimum allowable external boss diameter.

PURPOSE

The assemblies were tested to observe the performance of male and female NPT end connections made from strain-hardened 316 stainless steel material when subjected to impulse testing under laboratory conditions.

TEST CONDITIONS

Original test date: January 2009

Each sample tested consisted of one male NPT end connection and one female NPT end connection. The male and female NPT end connections were assembled together and were hydrostatically impulse tested. Gas seal proof tests were completed before and after the impulse cycling. Testing was conducted at room temperature.



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TEST METHOD

The test samples were assembled as follows:

1. Two wraps of Swagelok PTFE tape (manufactured according to A-A-58092) were applied in a clockwise direction to each male NPT connection.
2. Male and female NPT end connections were assembled together and tightened to the torque values shown in table 1.

Table 1

End Connection Size in.	Assembly Torque Used for Test Samples in·lb (N·m)	Measured Minimum Threads Engaged After Assembly	Swagelok PTFE Tape Ordering Number
1/16	175 (19.8)	3 1/8	MS-STR-4
1/8	300 (33.9)	3 1/4	
1/4	600 (67.8)	3 1/2	
3/8	950 (107)	3 5/8	
1/2	1600 (180)	4 1/4	MS-STR-8
3/4	2500 (282)	4 1/4	
1	3000 (339)	4 1/2	

3. The test samples were attached to a gas test stand, submerged in water, pressurized to 18 750 psig (1291 bar) with helium gas for five minutes, and monitored for leakage. The judgment criterion was less than 1 bubble per minute at the applied pressure.
4. Any connection that displayed leakage was disassembled, re-taped, and reassembled repeating step 1 and 2.
5. Reassembled fittings were retested according to step 3.
6. The samples were attached to an impulse test stand, pressurized with hydraulic oil to the working pressure ($\pm 5\%$) of the connection, and then depressurized to a pressure less than 20% of the working pressure. This constituted one impulse cycle. The samples were cycled at a rate of approximately 60 impulse cycles per minute. The judgment criterion was no visible leakage during the impulse cycles.
7. After the completion of 250 000 impulse cycles, the samples were attached to a gas test stand, submerged in water, pressurized with helium gas to 22 500 psig (1550 bar) for 5 minutes, and monitored for leakage. The judgment criterion was less than 1 bubble per minute at the applied pressure.



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TEST RESULTS

NPT End Connection Size in.	Samples Tested	Working Pressure (WP) psig (bar)	Pre-Impulse Proof Test at 18 750 psig	Impulse Results after 250 000 Cycles at WP	Post-Impulse Proof Test at 22 500 psig
1/16	22	15 000 (1034)	Pass	Pass	Pass
1/8	22		Pass	Pass	Pass
1/4	22		Pass	Pass	Pass
3/8	22		Pass	Pass	Pass
1/2	22		Pass	Pass	Pass
3/4	22	10 000 (689)	Pass	Pass	Pass
1	22		Pass	Pass	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. 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

A-A-58092, *Commercial Item Description (CID) for Tape, Antiseize, Polytetrafluorethylene*, U.S. General Services Administration, Engineering & Commodity Management Division (9FTE-10), 400 15th St. SW, Auburn, WA 98001