SAE International

SURFACE VEHICLE STANDARD

SAE J189 JUL2012

Issued 1970-08
Stabilized 2012-07

Superseding J189 JUN2003

Power Steering Return Hose - Low Pressure

RATIONALE

This document has been determined to contain basic and stable technology which is not dynamic in nature.

STABILIZED NOTICE

This document has been declared "Stabilized" by the SAE Automotive Brake and Steering Hose Standards Committee and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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Foreword—This document represents the minimum quality recognized by original equipment manufacturers and hose suppliers as essential for satisfactory and safe operation by the hose itself and other coacting parts of the power steering system. The original equipment manufacturer may, at his option, add or alter tests through OEM specifications.

1. Scope—This SAE Standard covers hose fabricated from fabric braid and synthetic rubber, assembled with end fittings or user applied clamps for use in automotive power steering applications as flexible connections within the temperature range of –40 °C to +120 °C (–40 °F to 250 °F) average and 135 °C (275 °F) maximum peaks. Hose assemblies shall be suitable for 1.72 MPa (250 psi) maximum working pressure with end fittings and 0.69 MPa (100 psi) maximum working pressure with user applied clamps.

2. References

2.1 Applicable Publications—The following publications form a part of this specification to the extent specified herein.

2.1.1 ASTM PUBLICATIONS—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 380—Methods of Testing Rubber Hose
ASTM D 413—Tests for Adhesion of Vulcanized Rubber (Friction Test)

3. Hose Construction—The construction of this hose embodies a smooth bore inner tube of suitable synthetic rubber material, reinforced with one ply of braided fabric and covered with a synthetic rubber outer cover.

4. Dimensions—Suggested hose dimensions are given in Table 1B, but it is not the intent of this document to exclude hose with different dimensions that comply with all other requirements of this document.

In addition, concentricity based on full indicator reading between the inside bore and the outer surface of the hose shall not exceed 0.076 cm (0.030 in).

TABLE 1A—HOSE DIMENSIONS (METRIC)

Nominal ID cm	Nominal OD, cm	ID Tolerance, cm	OD Tolerance, cm	Recommended Working Pressure, max, MPa With End Fittings	Recommended Working Pressure, max, MPa With User Applied Clamps	Tensile Load, min, lb With End Fittings	Tensile Load, min, N With User Applied Clamps	Burst Strength min, MPa
0.953	1.67	0.991/0.874	1.748/1.588	1.72	0.69	1112	Not Applicable	6.9

TABLE 1B—HOSE DIMENSIONS (ENGLISH)

Nominal ID in	Nominal OD, in	ID Tolerance, in	OD Tolerance, in	Recommended Working Pressure, max, psi With End Fittings	Recommended Working Pressure, max, psi With User Applied Clamps	Tensile Load, min, lb With End Fittings	Tensile Load, min, lb With User Applied Clamps	Burst Strength min, psi
3/8	21/32	0.390/0.344	0.688/0.625	250	100	250	Not Applicable	1000

5. ***Test Procedures***—Procedures described in ASTM D 380, shall be followed wherever applicable.

6. ***Qualification Tests***—To qualify hose under this document, all of the requirements shown in Section 9 must be met.

7. ***Inspection Tests***—Production shipments or lots of qualified hose shall be tested in accordance with Table 2 and shall conform to the applicable test requirements, but the user may test hose or hose assemblies from any or all such production shipments or lots to all the test requirements. Fourteen sample hose assemblies, selected at random, as listed in Table 2, are required to conduct a complete test. In the event of a failure, the test or tests that have failed shall be retested using twice the number of samples indicated in Table 2. Failure of any of the retested samples shall be cause for rejection of the entire lot.

TABLE 2—INSPECTION TESTS

Test	Samples Required
1. Length Change (9.10) followed by Bursting Strength (9.5)	3
2. Tensile (9.2)	3
3. Low Temperature Flexibility (9.3)	1
4. Adhesion (9.4)	1
5. Impulse (9.1)	6

8. ***Frequency of Testing for Inspection***—All inspection tests except impulse shall be performed on either a bulk hose lot or a coupled hose lot basis or tests may be split between a bulk hose lot and a coupled hose lot.

   A coupled hose lot shall not exceed 10 000 hose assemblies and a bulk hose lot shall not exceed 6096 m (20 000 ft) of bulk hose.

9. Test Requirements

9.1 Impulse Test—(Not applicable to hose assembled with user applied clamps.)

9.1.1 TEST CONDITIONS

a.	Oil Temperature:	135 °C (275 °F)
b.	Ambient Temperature:	135 °C ± 6 °C (275 °F ± 10 °F)
c.	Cycle Rate:	30 to 40 per minute
d.	Cycle Data:	Pressure rise time, 0.20 s ± 0.10 s. High pressure hold time, 0.65 s ± 0.20 s. Pressure drop time, 0.20 s ± 0.10 s.
e.	Pressure Variation:	0 to 172.4 kPa (0 to 25 psi) to the maximum recommended working pressure as specified in Table 1B.

9.1.2 HYDRAULIC FLUID AND TEST FIXTURE—As specified by the original equipment manufacturer.

9.1.3 CYCLE LIFE—Samples submitted to this test shall exceed 100 000 cycles for inspection acceptance and 225 000 cycles for qualification testing, without failure.

9.2 Tensile Test—When tested in accordance with ASTM D 380, end fittings shall withstand a minimum tensile load as shown in Table 1B without the fittings pulling off or rupture of the hose.

9.3 Low Temperature Flexibility—Samples shall be subjected to a temperature of –40 °C ± 1 °C (–40 °F ± 2 °F) for a period of 24 h, after which the hose shall be flexed in the cold chamber through 180 degrees from the centerline around a mandrel whose diameter is eight times the nominal hose OD. Flexing shall be accomplished within 3 to 5 s. Hose shall not fracture or show any cracks, checks, or breaks in the tube or cover.

9.4 Adhesion Test—When tested in accordance with ASTM D 413, a pull of not less than 35.586 N (8 lb) shall be required to separate a 1 in wide ring section of the bond between any adjacent layers of the hose.

9.5 Bursting Strength—Samples shall meet the minimum bursting strength requirements shown in Table 1B.

9.6 Ozone Resistance—The outer cover of the hose shall show no cracking when examining the cover of the hose under 7X magnification, ignoring the areas immediately adjacent to or within the area covered by the binding.

Bend the hose around a cylinder, the diameter of which shall be seven times the nominal outside diameter of the hose, and bind the ends. The cylinder and binding shall be made of metal or materials that prevent the consumption of ozone. If the hose collapses when bent around the cylinder, provide for internal support of the hose.

Condition the hose, on the cylinder, for 24.0 h ± 0.5 h at room temperature, and then place it in an exposure chamber containing air mixed with ozone in the proportion of 50 pphm ± 5 ozone in air by volume, for 70 to 72 h. Ambient air temperature in chamber during test shall be 40 °C ± 3 °C (104 °F ± 5 °F).

Examine the cover of the hose for cracks under 7X magnification, ignoring the areas immediately adjacent to or within the area covered by the binding.