



Low Pressure Brake Fluid Hose

1 Scope

This specification defines the requirements for light wall hose for use in braking systems of vehicles. The brake fluid will be at atmospheric pressure, under normal conditions. The operating pressure of the hose shall not exceed 300 kPa. Not to be used with hydrocarbon based fluids or vacuum brake applications.

1.1 Material Description.

1.1.1 Inner Tube. The inner tube of the hose shall consist of a smooth bore tube of ethylene propylene diene monomer (EPDM) elastomer. There shall be no materials in the tube compound extractable through exposure to either DOT 3 or DOT 4 brake fluids, as evidenced by 0 or positive values for volume change when the hose is tested to the requirements of 3.4.7 for each of the two (2) fluids, DOT 3 and DOT 4.

1.1.2 Reinforcement. The reinforcement for the hose shall consist of a ply or plies of braided, knit, spiral or woven rayon, aramid fibers, or other vendor approval fabric.

1.1.3. Cover The outer cover of the hose shall consist of EPDM elastomer.

1.1.4 Dimensions and Tolerances. Hose furnished to this specification shall conform to the dimensions and tolerances shown in Table 1.

Table 1: Dimensions and Tolerances

Size - Millimeters (mm)	Inside Diameter (mm)		Outside Diameter (mm)	
	Minimum	Maximum	Minimum	Maximum
7.94	7.54	8.34	15.34	16.54
12.0	11.2	12.7	19.8	21.3

1.1.5 Material Identification and Marking. To properly define the hose, refer to GMW17506. The hose marking must conform to labeling requirements specifying government regulations such as Federal Motor Vehicle Safety Standard 106 (FMVSS 106). For China usage, the supplier is responsible to contact the China Quality Certificate Center for China Compulsory Certificate (CCC) activities and ensure light wall hoses for use in braking systems meet the China Compulsory Certificate requirements, (reference CNCA-02C-063). All saleable parts shall have CCC markings after proper authorization. A copy of the certificate for the part shall be sent to GM Engineering before the Production Part Approval Process (PPAP) required date. This applies to both production parts and parts for service. This requirement applies to all saleable hoses including those for service.

1.2 Symbols. Not applicable.

1.3 Applicability. Light wall hoses for use in braking systems.

1.4 Remarks. Hose shall be black unless otherwise specified. Polymer used for both inner tube and cover compounds shall be 100% EPDM.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ASTM D380	ASTM D573	FMVSS 106	ISO 48
ASTM D412	ASTM D2240	ISO 36	ISO 188
ASTM D413	CNCA-02C-063	ISO 37	ISO 7619-1

2.2 GM Standards/Specifications.

GMW3059	GMW3221	GMW14270	GMW16955
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3 Requirements

3.1 Requirements on Test Specimens. Reference GMW3221.

3.1.1 General Test Requirements. Ambient temperature test conditions shall be held to $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$. All other temperatures except $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ shall be held to $\pm 3\text{ }^{\circ}\text{C}$, and all pressures to $-0\text{ kPa}/+690\text{ kPa}$ unless otherwise noted. Where DOT 3 fluid is referenced for test purposes, brake fluid meeting GMW16955 Fluid A2 shall be used. Where DOT 4 fluid is referenced for test purposes, brake fluid meeting GMW16955 Fluid A1 shall be used. Samples are to be finished parts or to be taken from finished parts. Where the dimensions on the finished parts do not allow preparing of test pieces, tests are to be performed on sheet material of same production batch. The same state of cure between slabs or buttons and finished parts must be ensured by appropriate tests, which must be described in the test report.

3.2 Burst Test. When tested in accordance with ASTM D380, the minimum bursting strength shall be 2.0 MPa.

3.3 Adhesion Test. When tested in accordance with ASTM D413 (Machine Method, 180° peel) or ISO 36, the minimum force required to separate a 25 mm wide sample of the cover from the reinforcement and tube and of the tube from the reinforcement and the cover shall be 1.4 N/mm of width.

3.4 As-Received Physical Properties.

3.4.1 Hardness Testing. When tested in accordance with ASTM D2240 or ISO 7619-1, the original hardness of tube and cover, Durometer, Shore A, shall be 70 points ± 8 points. If samples are taken from finished parts, ISO 48 shall be used as the test method.

3.4.2 Tensile Strength. When tested in accordance with ASTM D412, Method A or ISO 37, (Type 2 dumbbell), the minimum tensile strength of the tube and cover shall be 8.0 MPa.

3.4.3 Tensile Modulus. When tested in accordance with ASTM D412, Method A or ISO 37, (Type 2 dumbbell), the minimum tensile modulus of the tube and cover at 100% elongation shall be 3.0 MPa.

3.4.4 Elongation. When tested in accordance with ASTM D412, Method A or ISO 37, (Type 2 dumbbell), the minimum elongation of the tube and cover shall be 250%.

3.4.6 Dry Heat Resistance. Any change in hardness, tensile strength and elongation of specimens taken from the tube and cover and then heat aged for 168 h in an air oven at $125\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$ per ASTM D573 (or ASTM D865, or ISO 188 Method B) shall meet the values specified in Table 2.

Table 2: Dry Heat Resistance

Test	Requirement
Hardness change, tube and cover	+10/-0 points (Shore A or IRHD)
Tensile strength change, tube and cover, percent (%) maximum	-15
Elongation change, tube and cover, % maximum	-40

IRHD = International Rubber Hardness Degree

3.4.7 Brake Fluid Resistance. Age test specimens taken from the tube only for 168 h at $125\text{ }^{\circ}\text{C}$ in each of two (2) brake fluids, DOT 3 brake fluid meeting GMW16955 Fluid A2 and DOT 4 brake fluid meeting GMW16955 Fluid A1. Remove samples from the heated brake fluids and allow to cool to room temperature in fresh DOT 3

brake fluids and DOT 4 brake fluids for 30 minutes $\pm$ 5 minutes. The hardness, tensile strength, elongation and volume values of these tube specimens shall conform to the values specified in Table 3.

Table 3: Brake Fluid Resistance

Test	Requirement
Hardness change, tube and cover	± 10 points (Shore A or IRHD)
Tensile strength change, tube and cover, % maximum	-15
Elongation change, tube and cover, % maximum	-40
Volume change, tube, % maximum	(-2 /+5)

3.5 Heat Resistance. Conduct heat resistance testing on DOT 3 brake fluid meeting GMW16955 Fluid A2 and DOT 4 brake fluid meeting GMW16955 Fluid A1 as follows:

3.5.1 One (1) hose shall be filled with DOT 3 brake fluid, and another shall be filled with DOT 4 brake fluid. With the hoses filled with each specified brake fluid, expose the formed hoses in their free states and straight hoses as shown in Figure 1 for a period of 168 h in an air oven at $125^{\circ}\text{C} \pm 3^{\circ}\text{C}$. Drain fluid from each hose at $24^{\circ}\text{C} \pm 3^{\circ}\text{C}$, then within 6 h after removing from the heat, the hoses shall show no crack, charring or disintegration externally and internally when straightened. See Table 4 for the dimensions for the heat aging test.

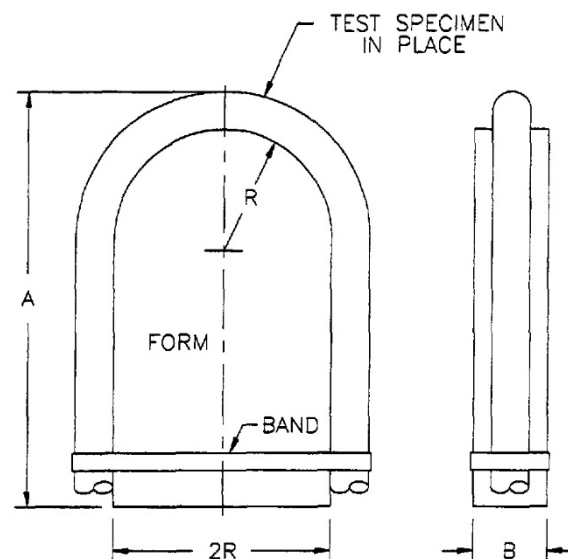


Figure 1: Test Sample on Form for Heat Aging Test (See Table 4)