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Replacing GB 16897-1997

Brake hose –

Structure, performance and test methods

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Foreword

Requirements for performance in Table 1, Table 6 and Table 9 in this Standard as well as Clause 8 are mandatory; the rest are recommendatory.

The consistency between this Standard and FMVSS 106-1993 *Brake hoses*.

This Standard replaces GB 16897-1997 *Brake hose*.

Compared with GB 16897-1997, the main modifications in this Standard are as follows:

- added English names for terms (see Clause 3 of this Edition);
- added the number of test samples (see Table 1, Table 6, Table 9 of this Edition);
- added the “high temperature pulse resistance” test of hydraulic brake hose assembly (see Table 1 of this Edition);
- added the equation of “rupture strength” of plastic hose (see Table 6 of this Edition);
- modified the marks used for vacuum brake hose (see Clause 8 of this Edition);
- deleted the terms of “permanently connected pipe fittings” and “vacuum pipe connector” (see Sub-clauses 3.6, 3.8 of Edition 1997);
- deleted the “air tightness” in “cold resistance” of pneumatic brake hose assembly (see Sub-clause 6.2.8 of Edition 1997);
- modified the evaluation indicators for burst strength of hydraulic brake hose assembly with inside diameter of Φ3.2 mm (see Table 1 of this Edition);
- modified the vacuum brake hose size and test requirements for some items (see Clause 7).

This Standard was proposed by National Development and Reform Commission, People's Republic of China.

This Standard shall be under the jurisdiction of National Technical Committee on Automobiles of Standardization Administration of China (SAC/TC 114).

Main drafting organization of this Standard: China First Automobile Group Corporation Technology Center.

Brake hose –

Structure, performance and test methods

1 Scope

This Standard specifies the structure, performance requirements, test methods and marking of brake hose, brake hose end fitting and brake hose assembly for automobiles (including motorcycles) and trailers.

This Standard is applicable to hydraulic, pneumatic, vacuum brake hose, brake hose end fitting and brake hose assembly for automobiles (including motorcycles) and trailers.

2 Normative references

The following standards contain the provisions which, through reference in this Standard, constitute the provisions of this Standard. For dated references, subsequent amendments (excluding corrections) or revisions do not apply to this Standard. However, the parties who enter into agreement based on this Standard are encouraged to investigate whether the latest versions of these documents are applicable. For undated reference documents, the latest versions apply to this Standard.

GB/T 1690-2006, *Rubber vulcanized or thermoplastic - Determination of the effect of liquids*

GB/T 7129-2001, *Rubber or plastics hoses - Determination of volumetric expansion*

GB/T 10125-1997, *Corrosion tests in artificial atmospheres - Salt spray tests*

GB 12981, *Motor vehicle brake fluids*

GB/T 14905-1994, *Rubber and plastics hose - Determination of adhesion between components*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 brake hose

a flexible hydraulic, pneumatic, or vacuum conduit for the transmission or storage of automotive brake force, in addition to a pipe joint in the braking system

3.2 brake hose end fitting

in addition to the clamp, the connection to the end of the brake hose

3.3 brake hose assembly

brake hose mounted with brake hose connector; the brake hose can be with or without armor

3.4 armor

a protective device for improving the anti-scratch or impact resistance of a brake hose outside the brake hose

3.5 free length

the straight length of the exposed brake hose between the end fittings when the brake hose assembly is in the vertical position

3.6 rupture

a failure resulting in brake hose disengaged from pipe fitting or leakage

3.7 nominal inside diameter

a specification used to describe the size of brake hose; for rubber hose, use an inside diameter in “Φ” and millimeters to represent, for example, “Φ3.2 mm hose” refers to the plastic hose of which the nominal inside diameter is 3.2 mm; for plastic hose, use an outside diameter in “Φ” and millimeters to represent, for example, “Φ8 mm hose” refers to the plastic hose of which the nominal outside diameter is 8 mm.

4 General requirements

4.1 The brake hose assembly used for test shall be manufactured at least 24 hours prior to use and not used. Before the test, the brake hose assembly shall be kept at a temperature of 15°C ~ 32°C for at least 4h.

4.2 Before the brake hose assembly used for flex fatigue test and cold resistance test is installed on the test equipment, all accessories shall be removed, such as steel armor, rubber armor, etc.

3 - copper tube;
4 - fitting;
5 - brake hose for test
6 - cock.

Figure 2 -- Compatibility test device

5.3.4.2 Test procedures

The test procedures are as follows:

a) place the brake hose assembly at a temperature of 90°C ± 1°C for 70h ± 2h;

b) exhaust the brake fluid from the brake hose assembly; remove the brake hose assembly and cool at room temperature for 30min ± 5min;

c) check the bore-through-volume after necking according to 5.3.1;

d) carry out the rupture strength test of brake hose assembly according to 5.3.3 within 3h.

5.3.5 Flexion fatigue

5.3.5.1 Test equipment

The test equipment is mainly composed of rotating part and fixed part. The equipment diagram shown in Figure 3. The rotating part consists of a movable horizontal connecting rod and a turntable. Both ends of the movable horizontal connecting rod are mounted vertically on the turntable by bearings. The center of the turntable is 101.6 mm from the center of the bearing. The fixed part is an adjustable non-moving horizontal connecting rod. The non-moving horizontal connecting rod is parallel to the movable horizontal connecting rod in the same horizontal plane as the turntable center. Both horizontal connecting rods are equipped with several connectors that can be fitted with a parallel brake hose assembly. When the turntable is rotated at a rate of 800 r/min ± 10 r/min, the end of the brake hose fixed to the movable horizontal connecting rod shall also rotate at this rate to form a circular trajectory of 203.20 mm ± 0.25 mm while the other end of the hose is fixed. The connector on the movable horizontal connecting rod is closed. The fittings on the non-moving horizontal connecting rod shall be connected to the hydraulic source. The hydraulic fluid volume and piping settings of the test equipment are not allowed to affect the test results. When the brake hose is damaged and the pressure drops to the set value, the test equipment shall be able to automatically shut down while recording the operating time and the system pressure in the line.

the brake hose.

5.3.9.2 Test procedures

The test procedures are as follows:

a) place the mandrel that is wound with the brake hose assembly for more than 24 hours at room temperature; and then place it in an ozone test aging box with the ozone concentration of (50±5) ×10-8, with the box temperature of 40°C ± 2°C; and maintain for 70h ± 2h;

b) check whether the outer surface of the brake hose is chapped or cracked under a 7x magnifying glass; the strap part or the part near the strap part shall be negligible.

5.3.10 High temperature pulse resistance

5.3.10.1 Test device

The test devices are as follows:

a) the pressure recirculation device shall be capable of applying 11 MPa of pressure and automatically control the pressure application and pressure relief cycle;

b) a heating system with a suitable thermostatic control device and a thermally insulated air oven capable of maintaining a temperature of 143°C ± 3°C.

5.3.10.2 Test procedures

The test procedures are as follows:

a) connect the brake hose assembly to a pressure cycler capable of producing 0 MPa ~ 11 MPa;

b) fill the pressure cycle device and brake hose assembly with HZY3 brake fluid specified in GB 12981, and exhaust air;

c) place the brake hose assembly in an oven and make the oven temperature reach a temperature of 143°C ± 30°C;

d) apply a pressure of 11 MPa ~ 11.5 MPa to the brake hose assembly, maintain for 60s ± 6s and then drop to 0 MPa, then maintain for 60s ± 6s; achieve the required pressure (from 0 MPa to 11 MPa, from 11 MPa to 0 MPa) within 2s; the pressure cycle of the brake hose assembly shall be performed for at least 150 times;

e) remove the brake hose assembly from the device and drain the liquid;

6.3.9 Resistance to 3 # standard oil volume change rate

6.3.9.1 Sample preparation

Extract a rectangular sample having a length of 50 mm, a width of 8 mm and a thickness of not more than 1.6 mm from the inner rubber layer of the rubber hose of the brake hose assembly. The sample surface shall be smooth.

6.3.9.2 Test procedures

Carry out the test according to 7.3 of GB/T 1690-2006. Place it in a 100°C ± 5°C incubator for 70h ± 2h. The test medium is the 3# standard oil specified in Table A.3 of Annex A of GB/T 1690-2006.

6.3.10 Tensile strength after water resistance

Immerse the brake hose assembly in room temperature distilled water for 70h ± 2h. Then take it out from the eater. Carry out the tensile strength test according to 5.3.6 within 30 min.

6.3.11 Resistance to ozone

Carry out the test according to 5.3.9.

6.3.12 Resistance to zinc chloride

immerse the nylon pneumatic brake hose assembly in a 50% chlorinated bowl (chemically pure) aqueous solution at room temperature for 200h ± 2h. After taking out from this solution, under the magnifying glass, observe the crack on the outer surface of the brake hose.

6.3.13 Corrosion resistance of fitting

Carry out the test according to the provisions of 5.3.11.

7 Vacuum brake hose assembly

7.1 Performance requirements

Carry out the test of brake hose assembly or corresponding part according to 7.2. Its test results shall meet requirements for each performance specified in Table 9.

Table 9 -- Vacuum brake hose assembly performance

No.	Test item	Unit	Performance requirement	Quantity piece	Test method
1	Bore-through-volume after necking	-	Gauges all	10	7.2.1

specified in Table 12; select the gauge that passes through the full length of the sample; measure and record the outside diameter of deformation sample D1;

b) place the sample longitudinally on the pressure application device;

c) as shown in Figure 7, gradually apply the pressure P to the sample so that the sample size D reaches the value specified in Table 12;

d) maintain the compressed state for 5s after unloading the load; record the maximum load applied;

e) repeat c), d) operation four times, with every two times between the allowable interval of 10s;

f) after placing it at room temperature for 60s, measure and record the outside diameter of sample D2;

g) calculate the outside diameter retention rate of brake hose assembly according to equation (3):

$$\Delta D = \frac{D_2}{D_1} \times 100 \qquad \cdots\cdots(3)$$

where,

ΔD - outside diameter retention rate, %;

D_1 - outside diameter before test, in millimeters (mm);

D_2 - outside diameter after test, in millimeters (mm).

content shall be represented in printed capital letters or numbers. The font height shall be greater than 3.2 mm.

8.1.3 Marking contents

The marking contents are as followings:

a) reference number “GB 16897”;

b) date of manufacture;

c) manufacturer or its abbreviation;

d) nominal size, for example, “3.2 mm” represents that the nominal inside diameter of rubber brake hose is 3.2 mm; “12 mm OD” represents that the nominal outside diameter of nylon hose is 12 mm;

e) “HR” represents the hydraulic brake hose of standard expansion; “HL” refers to the hydraulic brake hose of low expansion;

f) “A” is specified and used for the brake hose;

g) "V" is specified and used for the vacuum brake system, of which “VH” refers to the vacuum brake hose of overload conditions, “VL” representing the vacuum brake hose of light load conditions.

8.2 Brake hose end fitting

In addition that it uses crumple, cold extrusion, thermal bonding, compression process to make the end fitting equipped with the brake hose assembly, at least one fitting in the brake hose end fittings shall have mark represented in corrosion, embossing or pasting method, corresponding to the brake hose. This mark shall be represented in printed capital letters or numbers. The font height shall not be less than 1.6 mm. The marking contents shall be the abbreviation of manufacturer or traceable manufacturer mark.

8.3 Brake hose assembly

8.3.1 The brake hose assembly of which the fitting is installed with crushing, cold extrusion, thermal bonding, press fit process shall be marked according to the provisions of 8.3.2 or 8.3.3.

8.3.2 According to the location recommended by the assembly manufacturer, a ring mark shall be added on in the brake hose assembly. The ring mark shall be free to move between the ends of the end fitting along the longitudinal axis of the brake hose assembly. The ring mark shall be represented in the method of corrosion, embossing or pasting, in printed capital letters or numbers not higher than 3.2 mm. The marking contents are

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