



Determination of Water Permeability of Brake Hoses

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. Testing of the water permeability of brake hoses. As heat stability of brake fluids decreases with increasing water content, the water permeability of brake hoses shall be determined.

1.2 Applicability. All brake hoses in vehicle applications.

1.3 Remarks. Water permeability of a brake hose material is the amount of water absorbed by the brake fluid dependent on the exposure time.

2 References

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

2.1 External Standards/Specifications.

ISO 12937

2.2 GM Standards/Specifications.

None

2.3 Additional References.

3 Resources

3.1 Facilities.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment.

3.2.1 Climate Chamber capable of maintaining the required temperature and humidity.

3.2.2 Karl-Fischer Titration Equipment to determine the water content to ISO 12937.

3.2.1 Glass tubes, ≈ 20 ml content, to be sealed air tight.

3.3 Test Vehicle/Test Piece. Finished brake hoses with fittings and free length of (150 to 400) mm. At least 2 brake hoses shall be tested for each test time.

3.4 Test Time.

Calendar time: 10, 20, 30, 40 and 50 days

Test hours: 2 h

Coordination hours: 2 h

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Technicians (operators) with basic chemistry lab skills are suitable for this procedure.

4 Procedure

4.1 Preparation. Tests are performed with brake hoses in delivery condition. Before starting the test, the water content of the brake fluid shall be determined. Discard brake fluids with water content > 0.15 % by mass.

4.2 Conditions.

4.2.1 Environmental Conditions. Climate with $(+40 \pm 2)$ °C temperature and (95 ± 3) % relative humidity (RH).

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.3 Instructions.

4.3.1 Determine water content of new brake fluid.

4.3.2 Rinse brake hoses with ≈ 30 ml brake fluid.

4.3.3 Mount brake hoses in vertical direction and close lower end fluid tight.

4.3.4 Fill in brake fluid in brake hoses without air bubbles until overflow and close upper end fluid tight.

4.3.5 The required amount of prepared brake will be freely suspended vertically in the climate chamber at $(+40 \pm 2)$ °C and (95 ± 3) % RH.

4.3.6 After the respective test time (10, 20, 30, 40 or 50 days), two (2) brake hose test set ups will be removed from the climate chamber and cooled down for 30 minutes to +23 °C.

4.3.7 Open the lower lock, place the glass tube to 3.2.1 below the brake hose, open the upper lock and transfer the brake fluid from the hose into the glass tube.

4.3.8 Determine water content of brake fluid to Karl-Fischer-Method according to ISO 12937.

5 Data

5.1 Calculations. Subtract the water content of the new brake fluid from the water content of the brake fluid removed from the brake hoses after respective storage time to the following equation.

$$WP_{10} = W_2 - W_1$$

Where:

WP₁₀ (or **WP₂₀**, **WP₃₀**, **WP₄₀**, **WP₅₀**) is the water permeability after storage in climate for 10 (20, 30, 40 or 50) days in % by mass.

W₂ is the water content of the brake fluid from the brake hose in % by mass.

W₁ is the water content of the brake fluid in delivery condition in % by mass.

5.2 Interpretation of Results. The water content of the brake fluid shall be expressed in % by mass. If the difference of both single values after the defined storage period differ > 10 %, the test shall be repeated with new brake hoses.

5.3 Test Documentation. The test report shall indicate the water content of the brake fluid after each of the 5 storage periods.

6 Safety

This standard may involve hazardous materials, operations, and equipment. This standard does not propose to address all the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

7 Notes

7.1 Glossary. Not applicable.

7.2 Acronyms, Abbreviations, and Symbols.

8 Coding System

This standard shall be referenced in other documents, drawings, etc., as follows:

Test to GMW17436