



DOT 4 Brake Fluid

1 Scope

1.1 Material Description. Materials covered in this specification are motor vehicle hydraulic DOT 4 brake fluids composed of a suitable mixture of polyglycols, polyglycolether, boric acid ester, corrosion inhibitors and any necessary additives. Castor oil, mineral oil dirt and other contaminants are not permitted.

1.2 Symbols. Not applicable.

1.3 Applicability. This specification details the material and performance requirements for DOT 4 brake fluids for use in the braking system of motor vehicles.

2 References

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

2.1 External Standards/Specifications.

ASTM D92	ASTM D1193	ISO 4925
ASTM D1121-98	CMVSS 116	SAE J1703
ASTM D1123	FMVSS 116	SAE J1704

2.2 GM Standards/Specifications.

GMW3059	GMW14270	GMW14934
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2.3 Additional References.

Safety and Industrial Hygiene (S&IH) Technical Standard (TS), S&IH TS 3.4-160-02 (available at www.gmsupplypower.covisint.com)

3 Requirements

3.1 All materials supplied to this standard must comply with GMW3059, Restricted and Reportable Substances, including the requirement to submit a full material composition disclosure to GM via the International Material Data System (IMDS) or via a completed GMW3059 report form.

3.1.1 General. Materials furnished to this specification shall conform to all requirements published in the latest date of issue of FMVSS 116 and CMVSS 116 and specifications SAE J1704 and ISO 4925. This specification also contains additional restrictive requirements.

3.2 Properties. See Table 1.

Table 1: Material Requirements

Properties	Requirement	Test Methods
1. Boron Content	1.2% maximum	Appendix E or equivalent method
2. Color	Colorless to Amber	Visual
3. Flash Point	100 °C minimum	ASTM D92
4. Equilibrium Reflux Boiling Point (ERBP)	265 °C minimum	FMVSS 116
5. Wet ERBP	170 °C minimum	FMVSS 116

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Properties	Requirement		Test Methods
6. Water content upon delivery, percent (%) mass	0.15 maximum		ASTM D1123
7. pH Value	7.0 to 11.5		FMVSS 116
8. Kinematic Viscosity			FMVSS 116
at -40 °C, mm ² /s (cSt) ^{Note 1}	800 maximum		
at 20 °C, mm ² /s (cSt)	12 to 50		
at 100 °C, mm ² /s (cSt)	1.5 minimum		
9. Fluid Stability			FMVSS 116
High Temperature (ERBP Change) and Chemical (ERBP Change)	Shall not change by more than 3 °C. An additional 0.05 °C for each degree that the ERBP of the fluid exceeds 225 °C is allowed, however, the total change shall not exceed 5 °C per SAE J1704		
10. Fluidity and Appearance at Low Temperatures			FMVSS 116
Time for bubble to rise up to top of fluid upon inversion of sample bottle			
at -40 °C for 144 h	5 s maximum		
at -50 °C for 6 h	15 s maximum		
Appearance of Fluid	No sludging, sedimentation, crystallization or stratification		
11. Water Tolerance			FMVSS 116
at -40 °C			
Fluidity (time for bubble to rise to top of fluid)	5 s maximum		
Appearance of Fluid	No sludging, sedimentation, crystallization or stratification		
at 60 °C			
Sedimentation, percent (%)	0.05 maximum		
Appearance of Fluid	No stratification		
12. Resistance to Oxidation			FMVSS 116
(Mass Loss, mg/cm ²) ^{Note 1}			
Aluminum Strip	0.05 maximum		
Cast Iron Strip	0.3 maximum		
Appearance of Strips	No discernable pitting or etching and no more than a trace of gum on surface		
13. Fluid Compatibility with Styrene-Butadiene Rubber (SBR) Cups 70 h			FMVSS 116
Change in Hardness maximum, IRHD ^{Note 1}	70 °C	120 °C	
Change in Volume, percent (%)	-10 to 0	-15 to 0	
	0 to 10	0 to 10	

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Properties	Requirement	Test Methods
Sedimentation, percent (%)	1.5 maximum	See Appendix A
Appearance	No formation of gels	
21. Reserve Alkalinity (RA)	30.0 minimum	
22. Reserve Alkalinity Retention, (%)		
After Thermal Oxidation Procedure, percent (%)	20 maximum depletion-median 3 tests	See Appendix B
After Volatization Procedure, percent (%)	20 maximum depletion-median 3 tests	See Appendix C
23. Elastomer Compatibility after Aging		FMVSS 116 except per Holden requirement add 2% water and age at 70 °C for 5 weeks
Volume increase. Master cylinder seals from production materials	0% to +10%	
24. Hydrogen Evolution Test	Nil gas generation	Appendix F

Note 1: mm²/s= square millimeter per second; mg/cm² = milligram per square centimeter; IRHD = International Rubber Hardness Degree; mm = millimeter

3.3 Corrosion Characteristics. Brake fluid shall be tested for 120 h at 100 °C, per a modified SAE J1704 corrosion test. The test is modified by the addition of 25 ppm chloride and 5% water. Dissolve 0.033 g of sodium chloride (NaCl) in 40 mL water and add to 760 mL of brake fluid. The requirements are shown in Tables 2 and 3.

Table 2: Corrosion Test Requirements

Test Strip	Mass Change of Test Strip, mg/cm ² of Surface
Tinned Iron	0.2 maximum
Steel	0.2 maximum
Aluminum	0.1 maximum
Cast Iron	0.2 maximum
Brass	0.4 maximum
Copper	0.4 maximum

Table 3: Additional Corrosion Test Requirements

Test	Requirement
Sedimentation of Fluid-Water Mixture, percent (%)	0.05 maximum
pH of Mixture after Test	7 to 10
Rubber Cup Hardness Decrease, point (IRHD)	15 maximum (SBR) 10 maximum (EPDM)
Volume Swell, percent (%)	10 maximum (EPDM)
Rubber Cup Base Diameter Increase, mm	1.4 maximum

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Test	Requirement
Appearance of Metal Strip	No pitting or etching
Appearance of Fluid-Water Mixture	No jelling
Appearance of Glass Jar Walls	No crystalline deposit
Appearance of Rubber Cups	No disintegration (tackiness, blistering or sloughing)

3.4 Bench Tests. Brake system components with the fresh and aged candidate fluid per Appendix D shall meet or exceed the baseline requirements of components stroking testing referenced in Table 1 with the current production brake fluid similarly aged per Appendix D.

3.5 Squeak Testing. The squeaking tendency of the candidate brake fluid shall be tested and approved by the GM Brake Group/Global Subsystem Leadership Team (GSSLT) per the Brake Master Cylinder High Frequency Noise test specified in GMW14934.

3.6 Brake Component Testing. The candidate brake fluid shall pass any brake system and/or component performance tests specified by the GM Brake Group/GSSLT.

3.7 Fleet Testing. Any brake fluid approved to this specification shall complete fleet testing and end of fleet fluid and component evaluation as determined by GM Materials Engineering and the GM Brake Group/GSSLT.

4 Manufacturing Process

Not applicable.

5 Rules and Regulations

5.1 Legal Regulations. All materials must satisfy applicable laws, rules, regulations and recommendations valid in the country of usage.

5.2 Language. In the event of conflict between the English and domestic language, the English language shall take precedence.

5.3 Inspection and Rejection. All shipments of material or parts under contract or purchase order manufactured to this specification shall be equivalent in every respect to the initial samples approved by Engineering. There shall be no changes in either formulation or manufacturing processes permitted without prior notification and approval by Engineering. Lack of notification by the supplier constitutes grounds for rejection of any shipment. While samples may be taken from incoming shipments and checked for conformance to this specification, the supplier shall accept the responsibility for incoming shipments meeting this specification without dependence upon purchaser's inspection.

The series of tests used to approve each batch of product along with acceptance limits will be agreed upon by the purchaser and seller. The laboratory providing the certificate of analysis must also participate in a proficiency testing program (round robin) that is approved by the Fuels, Fluids, and Lubricants Global Subsystem Leadership Team (GSSLT) or designate. The Fuels, Fluids, and Lubricants GSSLT or designate must receive copies of the proficiency testing reports directly from the test program administrator.

5.4 Initial Source Approval. No shipment shall be made by any supplier until representative initial production samples have been approved by the Fuels, Fluids, and Lubricants Global Subsystem Leadership Team or designees meeting the requirements of this specification.

5.5 Material Safety Data Sheets/Safety Data Sheets (MSDS/SDS). For new product submissions, or when a change in chemical composition of an existing product has occurred, a complete copy of the Material Safety Data Sheet/Safety Data Sheet must be submitted in compliance with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) requirements or other country-specific MSDS/SDS requirements. In addition, product MSDS/SDS submissions must be in compliance with specific country General Motors S&IH TS 3.4-160-02 where available.

6 Approved Sources

Materials supplied to this specification must be approved by General Motors.

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Documents

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The appropriate GM Materials Engineering department(s) must confirm material as meeting the requirements of this specification. Any test data sheets of material submitted to General Motors for such confirmation (e.g., during Production Part Approval Process (PPAP)) under this material specification must list all properties and must apply corresponding test methods of this material specification.

Engineering qualifications of an approved source are required for this standard. Only sources listed in the GM Materials File (i.e., GM SupplyPower) under this standard number have been qualified by engineering as meeting the requirements of this standard. To access this list, reference GMW14270 for latest location.

For other GM locations, the responsible engineering group should be contacted to obtain the approved source in that individual country.

7 Notes

7.1 Glossary. Not applicable.

7.2 Acronyms, Abbreviations, and Symbols.

AgCl	Silver Chloride
EPDM	Ethylene Propylene Diene Monomer
ERBP	Equilibrium Reflux Boiling Point
FEP	Fluorinated Ethylene-Propylene
GHS	Globally Harmonized System of Classification and Labeling of Chemicals
GSSLT	Global Subsystem Leadership Team
HCl	Hydrochloric Acid
ID	Inside Diameter
IMDS	International Material Data System
IRHD	International Rubber Hardness Degree
KCl	Potassium Chloride
LiCl	Lithium Chloride
MSDS	Material Safety Data Sheet
NaCl	Sodium Chloride
OD	Outside Diameter
PPAP	Production Part Approval Process
PTFE	Polytetrafluoroethylene
RA	Reserve Alkalinity
S&IH	Safety and Industrial Hygiene
SBR	Styrene-Butadiene Rubber
SDS	Safety Data Sheet
ssc	Standard Cubic Centimeter
TS	Technical Standard

8 Coding System

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

DOT 4 Brake Fluid per GMW3356