

SURFACE VEHICLE INFORMATION REPORT

SAE J1709

**CAN-
CELLED
JUL2006**

Issued 1993-06
Cancelled 2006-07

Superseding J1709 NOV1999

European Brake Fluid Technology

Foreword—The SAE has established engineering guidelines which describe the tests and minimum performance properties for motor vehicle brake fluids. Such information is contained within SAE J1703 (Motor Vehicle Brake Fluid), SAE J1704 (Borate Ester Based Brake Fluid), and SAE J1705 (Low Water Tolerant Brake Fluids). Brake fluids which meet the criteria set forth by these documents are non-mineral oil based. Common compositions may include synthetic glycol ethers, borate esters, or silicone.

The requirements for brake fluids are further described within the Federal Motor Vehicle Safety Standard 116, prepared by the National Highway Traffic Safety Administration. Within this Standard, motor vehicle brake fluids are classified as DOT 3, DOT 4, DOT 5, or DOT 5.1 based upon minimum wet and dry boiling points, viscosity characteristics, and in the DOT 5/5.1 case, base fluid chemistry.

Developments in Europe have resulted in the introduction of brake fluids which offer enhanced wet and dry boiling point performance. Employing both conventional and novel chemistry, these fluids are becoming an increasingly important factor in the European marketplace. The purpose of this document is to provide an overview of the performance and characterization of these fluids and the general trend toward the utilization of such technology. In utilizing the information provided, it should be recognized that field experience and engineering knowledge is greatest for DOT 4 followed by Super DOT 4. DOT 5.1 fluids have more recently been introduced and application experience continues to be gained. Additionally, the silicon ester technology described has well-established experience in racing and continues to be evaluated for use in passenger cars.

1. Scope—This SAE Information Report provides an overview of brake fluid technology developed and marketed in Europe which offers enhanced wet and dry boiling point performance. The information contained within this document applies to hydraulic brake fluids utilized in automotive braking systems which are designed to be compatible with SAE J1703 (DOT 3) and SAE J1704 (DOT 4) fluids. The report reflects details received as of September 1998.

1.1 Rationale—Document J1709 no longer reflects current European technologies for brake fluid products. As this is only an information report, the committee has decided to cancel the document.

2. References

2.1 Applicable Publications—The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2006 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER:

Tel: 877-606-7323 (inside USA and Canada)
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
<http://www.sae.org>

SAE WEB ADDRESS:

AVA Documents
Document Sharing Hub

- 2.1.1 SAE PUBLICATION—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J1703—Motor Vehicle Brake Fluid
SAE J1704—Borate Ester Based Brake Fluid
SAE J1705—Low Water Tolerant Brake Fluids

- 2.1.2 FMVSS PUBLICATION—Available from the Superintendent of Documents, U.S. Government Printing Office, Mail Stop: SSOP, Washington, DC 20402-9320.

FMVSS No. 116—Motor Vehicle Brake Fluids

- 2.2 **Related Publications**—The following publications are provided for information purposes only and are not a required part of this document.

- 2.2.1 SAE PUBLICATION—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE 740126—Brake Fluid Temperatures Obtained in Alpine Vehicle Trials

- 2.2.2 ISO PUBLICATION—Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ISO 4925—Road vehicle—Non petroleum based brake fluids

3. **Background**—Borate ester based DOT 4 brake fluids developed between 1960 to 1970 have been commonplace in Europe, and to a lesser extent North America, for many years. The requirements established within the FMVSS 116 dictate that these fluids possess a higher dry and wet equilibrium reflux boiling point than fluids classified as DOT 3. Introduction of DOT 4 fluids in Europe was designed to better accommodate the engineering trends and service requirements of European vehicles which are operated more often at high-speed conditions and are subject to regular safety inspections.

Since 1970, there has been an extension of the borate ester technology such that a wide range of fluids is now available offering higher wet and dry boiling point performance compared to DOT 4. Brake fluids are now being manufactured and marketed in Europe with properties which bridge the gap between DOT 4 and DOT 5 fluids.

These so called Super DOT 4 fluids are gaining increased acceptance and are now utilized by some original equipment manufacturers in Europe for initial and service fill applications.

In the 1980's, brake fluids based upon silicon esters were introduced which offer further improvement to the boiling point properties beyond Super DOT 4 fluids. Such fluids possess very high wet and dry boiling point performance and have been utilized successfully in racing applications.

Also in the 1980's, fluids were developed in Europe which meet the performance requirements of DOT 5, but do not utilize silicone-based chemistry. These fluids are now classified as non-silicone-based fluid DOT 5.1. Such fluids employ borate ester bases resulting in formulations which are miscible with SAE J1703 fluids and meet the performance criteria of all established DOT categories. Non-silicone-based DOT 5.1 brake fluids are being offered in the aftermarket in small but increasing quantities.

4. **European Market Trends**—It is estimated that over three-quarters of the European market for brake fluid is represented by DOT 4 product. In Germany close to 100% of the brake fluid market is covered by DOT 4, Super DOT 4, and DOT 5.1 fluids. DOT 4 fluids are recommended by most European vehicle manufacturers. DOT 3 fluids represent a minor percentage and are utilized in commercial applications and in certain passenger car vehicles.