

## SAFEBRAKES



### **Brake fluids of Clariant**

#### **Safety comes first...**

Clariant's Safebrakes offer a maximum of safety even under extreme conditions. In cooperation with the automobile industry our Safebrakes were tested regarding their first-class functionality.

#### **Why do you need a brake fluid?**

Brake fluids play an especially important role for the safety of a car. Their functionality is to transmit force from the master cylinder hydraulically to the individual wheel cylinders, which force out the brake pads to the brake discs in order to stop the car. During this brake process a bigger part of kinetic energy is transferred into heat, forming temperatures between 400°C and 600°C at the brake discs. The amount of transferred heat to the brake fluid depends on several factors e.g. driving behaviour, construction characteristics of the brakes, status of the brake pads or heat dissipation at airflow and stops. These extreme temperatures may lead to a bubbling up of the brake fluid. As a consequence incompressible gas bubbles arise leading to a breakdown of the brake system. Therefore, achieving a high boiling point is a development and production goal. In addition brake fluids must, close to numerous other physical and chemical requirements, be compatible with all available materials in the brake system e.g. metals, gaskets and rubber materials. Clariant's brake fluids have been developed in close cooperation to the automobile industry in order to widely exceed the requirements of the international standards FMVSS 116, SAE J1703, SAE J1704 and ISO 4925. Because safety comes first...

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Clariant looks back on a more than 50 years long experience in developing brake fluids operating as one of the world-wide biggest players in brake fluid production. Our own quality requirements are yearly approved by the international Certificate of the ISO TS 16949:2002.

Clariant exclusively produces brake fluids based on glycols, glycol ethers and their borate esters, which account for more than 95 percent on the world market. Our brake fluid portfolio covers all three qualities DOT 3, DOT 4 und DOT 5.1 of the FMVSS 116 (Table 1). All Safebrakes meet or even exceed the requirements of the international standards ensuring the best possible safety for all passengers. Safebrake 20 M is characterized by its high Wet ERBP and its low viscosity at cold temperatures. Therefore, it also fulfils the high DOT 5.1 requirements.

**Table 1:**

DOT 3	DOT 4	DOT 5.1
3 M	6 M 8 M 9 M 10 M 16 M LV 20 M LV	20 M LV

### Safety inside the car

Brake fluids of Clariant offer a maximum of safety regarding all risks appearing during the brake process:

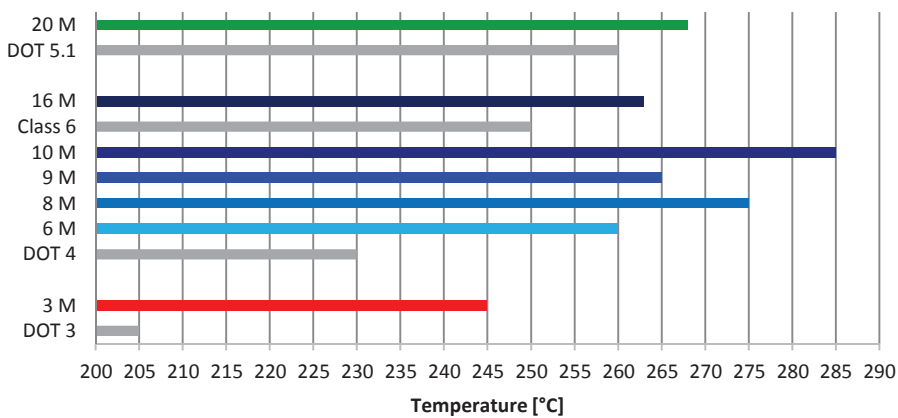
- Breakdown of the brake system through extremely high boiling points
- Decrease of the brake response behaviour **through low low-temperature viscosity**
- Corrosion of the brake system through a well designed inhibitor package
- Abrasion of the brake system components through optimal lubricates
- Brake fluid attrition through ideal rubber compatibility

## Physical Properties

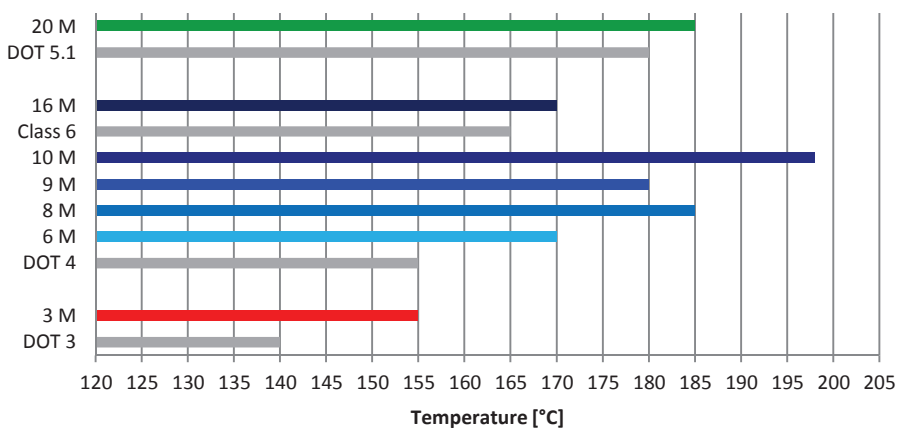
### High Boiling Point

Due to their constituent components, brake fluids are hygroscopic, absorbing water by diffusion through the brake hoses, or through the openings in the brake system. Thereby the boiling point decreases permanently until it reaches a critical temperature of approx. 140°C causing dangerous gas bubbles (Vapour Lock). Brake fluids of Clariant are characterized by their extreme high boiling points offering a maximum of safety to the driver (Picture 1 and 2, extreme minimum values are shown).

**Picture 1: Boiling Point ERBP**



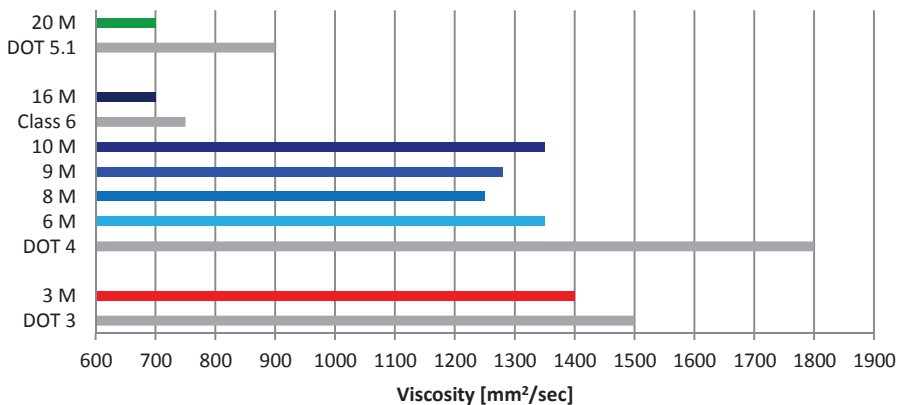
**Picture 2: Wet Boiling Point - Wet ERBP**



## Low Temperature Viscosity

During the brake process brake pedal force is transmitted by the brake fluid. In order to guarantee an immediate responding behaviour, brake fluids of Clariant are tested on their viscosity properties over a wide temperature range of -40°C to 100°C. Safebrakes pass or even exceed the requirements of the international standards FMVSS 116, SAE J1703, SAE J1704 and the ISO 4925 (Picture 3, extreme maximum values are shown).

**Picture 3**



## Corrosion Protection through a well designed Inhibitor Package

Due to the high thermal contamination and aging of the brake fluid metals e.g. alumina, cast iron and copper in the brake system start to corrode. Safebrakes of Clariant contain a highly effective inhibitor package, which protects these metals for oxidation and corrosion.

## Optimal Lubricity

Clariants` Safebrakes consist of highly effective components which avoid the abrasion of the brake system by friction.

## High Elastomer Compatibility

Rubber seals are used to avoid fluid loss through gasket seals in the brake cylinder. For his purpose Safebrakes of Clariant offer an effective protection by causing rubber swelling.

**Table 2:**

	<b>DOT 3</b>	<b>DOT 4</b>	<b>DOT 5.1</b>
<b>Boiling Point (°C)</b>	> 205	> 230	> 260
<b>Wet Boiling Point (°C)</b>	> 140	> 155	> 180
<b>Viscosity at -40°C (mm<sup>2</sup>/s)</b>	< 1.50	< 1800	< 900
<b>Viscosity at 100°C (mm<sup>2</sup>/s)</b>	> 1.5	> 1.5	> 1.5

FMVSS 116: Federal Motor Vehicle Safety Standard  
 SAE J 1703/ SAE J 1704: Society of Automotive Engineers

### **Automobile Approvals**

Clariant offers a brake fluid portfolio which is covering all quality requirements of the FMVSS 116 (Table 2). However the requirements of the automobile manufactures on a brake fluid are above all these ones of the international standards. Besides plant guidelines brake fluids must demonstrate their quality properties in endurance tests and fleet tests until achieving an approval by an automobile manufacture. Each brake fluid of our product portfolio was developed for definitely special requirements and is characterized by approvals at several well-known automobile manufactures (OEM).

## **Safebrake 16M (DOT 4) LV – a class for itself**

Safebrake 16M (DOT 4) LV was specially developed for vehicles with electronic ESP/DSC - driving stability systems. The fluid is characterized by an extreme low temperature viscosity, whereby a faster responding time of approx. 30% of the individual brake discs at low temperatures is guaranteed. As one of a few brake fluids world-wide, Safebrake 16M (DOT 4) LV exceeds the strong requirements of the standard ISO 4925, Class 6 and is characterized by following properties:

- Boiling Point: min. 265°C
- Wet Boiling Point: min. 175°C
- Viscosity (-40°C): max. 700mm<sup>2</sup>/s

For questions regarding our brake fluid portfolio please contact [automotive@clariant.com](mailto:automotive@clariant.com) or visit our home page [www.ics.clariant.com](http://www.ics.clariant.com).

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