



TECHNICAL BULLETIN

Choosing the Right Brake Fluid

Issue: June 2017

What do you think is most important when choosing a brake fluid?

Most drivers today probably don't have much of an idea of what brake fluid or type of brake fluid they have in the vehicle. Some may be concerned with the boiling temperature of their brake fluid (such as race drivers who only use their cars at the race circuit) and others if it meets the DOT specification as per their owners or service manual. Everyday drivers and riders who frequently drive their vehicles on ordinary streets may need to be more concerned if their fluid meets current DOT specification. Brake fluids that do not meet current DOT specifications can speed up the deterioration of brake components and can also lead to the malfunctioning of ABS during cold weather. Most people do not know much about brake fluid, and it can be difficult to find relevant information to learn more about it.

Following is a guide to better understanding Brake Fluid.

What is DOT specification?

DOT is the abbreviation for the '**Department of Transportation**', which is an American government transportation department. The DOT set standards such as FMVSS (Federal Motor Vehicle Safety Standard) very similar to the JIS in Japan or DIN in Germany. The following table shows the DOT brake fluid specifications:

Specification	Specification	Dry Boiling Temp	Wet Boiling Temp	Viscosity (100°)	Viscosity (-40°)	Ph Value
DOT 3	Synthetic	over 205°	over 140°	over 1.5cst	under 1500cst	7.0-11.5
DOT 4	Synthetic	over 230°	over 155°	over 1.5cst	under 1800cst	7.0-11.5
DOT 5.1	Synthetic	over 260°	over 180°	over 1.5cst	under 900cst	7.0-11.5
DOT 5	Silicone	over 260°	over 180°	over 1.5cst	under 900cst	7.0-11.5

Dry Boiling Temp: Boiling point when the fluid is brand new, no moisture absorption.

Wet Boiling Temp: Boiling point with fluid that has 3.7% water by volume. After 1-2 years of fluid use.

Viscosity: a measure to represent the brake fluid flow property. Higher the value, the more difficult for the fluid to flow. If the value is high when the air temperature is low, the fluid can have a negative effect on ABS performance.

pH Value: value to show acidity / basicity of a solution. If the pH value is lower than 7.0 (strong acidity), the fluid can accelerate corrosion of other brake components

What is boiling point temperature?

The temperature at which the fluid boils. Water boils at 100° whereas brake fluid with high boiling point will boil at over 300°C, and low boiling point brake fluid will boil around 140°C depending on condition of fluid.

Why is a low boiling point temperature not acceptable?

When driving a vehicle, brake pad temperature can reach extremely high temperatures (up to 300 °C). This heat gets passed onto the brake fluid through the brake callipers, which can raise the fluid temperature over 200°C. If the brake fluid is repeatedly heated past its boiling point, some of the fluid vaporizes and creates air bubbles within the brake lines. This can lead to a very dangerous situation where the brake lines are carrying air instead of brake fluid. Air can be compressed which is why it is bled out of brake systems so that the fluid can compress the pistons inside the brake calliper, applying the brakes.

What is percent water by volume?

The most common ingredient of brake fluid is glycol-ether. This fluid is hygroscopic which mean it absorbs moisture from the atmosphere. The 'percent by volume' is a measure of the water content in the brake fluid.

The higher the DOT number, the higher the brake fluid performance?

This is not exactly correct. The DOT numbers categorizes the fluids by various uses.

Specification Application use

DOT 3	Cars with small to medium sized engines
DOT 4	Cars with larger sized engine and/or for use in competition
DOT 5.1	Cars with larger sized engine and/or for use in competition and or in Cold Climate regions
DOT 5	Silicone , Special application cars and motorcycles (Hummer, Harley-Davidson)

What are the major differences between types of brake fluids?

DOT 3 versus DOT 4	Boiling point temperature
DOT 4 versus DOT 5.1	Boiling point temperature & viscosity at low temperature

DOT 5.1 has strict viscosity standards at lower temperature in addition to having a high boiling point temperature. Therefore, in cold climate areas, the DOT 5.1 brake fluid is very commonly used on most cars. The most widely distributed brake fluid is the DOT 4, which has a dry boiling point temperature around 270° and a wet boiling point temperature around 170°. The boiling point temperatures of DOT 4 is very similar to those of DOT 5.1. The major difference is the viscosity at low temperatures. Today, cars

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are commonly equipped with ABS, and DOT 5.1 fluid is used since the viscosity of it helps the ABS work consistently even in cold climates.

Which DOT specification is best for race circuit use?

Racing brake fluids are developed to cope with excessive heat from the brake callipers and brake pads. Hence they are designed to have a higher boiling point than standard fluids.. The boiling point temperatures easily exceeds DOT 5.1 specification but the viscosity and pH levels do not pass DOT 5.1 specification. This is why racing brake fluids do not pass DOT 5.1 specification.

Is it safe to use racing brake fluid for street-use?

The use of racing brake fluid that exceeds DOT specification is safe for street-use. The use of racing brake fluid that do not meet DOT specification can speed up the deterioration of brake components over a extended period time. It can also lead to the malfunctioning of ABS during cold weather.

How frequently should brake fluid be replaced?

For everyday drivers, who use brake fluid that exceed DOT 4 specification, fluid replacement once every 2 years is acceptable. For people who use DOT 3 fluid, fluid replacement every year is recommended. For people who drive aggressively on winding roads, fluid replacement every six month to a year is recommended. For people who drive their cars on the race circuit, replacement before each event is recommended.

What is Super DOT 4?

Super Dot 4's, meet the DOT 5.1 boiling temperature specification but, their low temperature viscosity characteristics is DOT 4.

Do brake fluids contribute to pedal feel?

There is no major interrelationship between a fluid's adhesive (viscosity) and pedal touch. The pedal touch depend on the moisture absorbed and lower the moisture volume more solid touch and higher the moisture volume softer (sponge like) touch.

Is it safe to mix old and new fluid? Or, mix different grades of fluid?

This is not recommended. By adding new brake fluid to old brake fluid, you are mixing water absorbed brake fluid with new product lessening the effect and lowering the lifespan of the newer fluid. If both products are glycol based DOT approved fluids, the mixing is possible with no major functional problems. Complete replacement of the fluid at the correct life span is the safest option.

What is Mineral Brake Fluid?

Mineral brake fluid are products not made from Glycol-Ether. DOT fluids are nearly all synthetic products. Mineral based brake fluids as used by Rolls Royce in a few of its models during the 1980's are suspension and brake fluids that have different properties to DOT fluids.

Can I put Silicone Brake Fluid in my vehicle?

This is not recommended especially when the vehicle has been set up the run with normal DOT type brake fluid. Silicone fluids need different valving sizes to DOT fluid and can cause brake failure in a system designed to run on DOT fluid. Alternatively, systems designed to be used with Silicone Brake Fluid, should not have DOT fluid placed into them.



Penrite recommend "The Right Oil for the Right Application"

[Click Here](#) to visit the Penrite Recommendation Guide, which will ensure you receive the correct oil for your application

