

VAPOUR LOCK N°1

LOSS OF BRAKING EFFICIENCY HAS MANY FACES

Drivers can experience loss of braking efficiency in many different ways: overheating, brake fade, and brake pad degradation are but a few. Vapour lock is one of the most frightening and most dangerous of all. This leaflet explains the problem, and offers some ways to prevent this from happening.

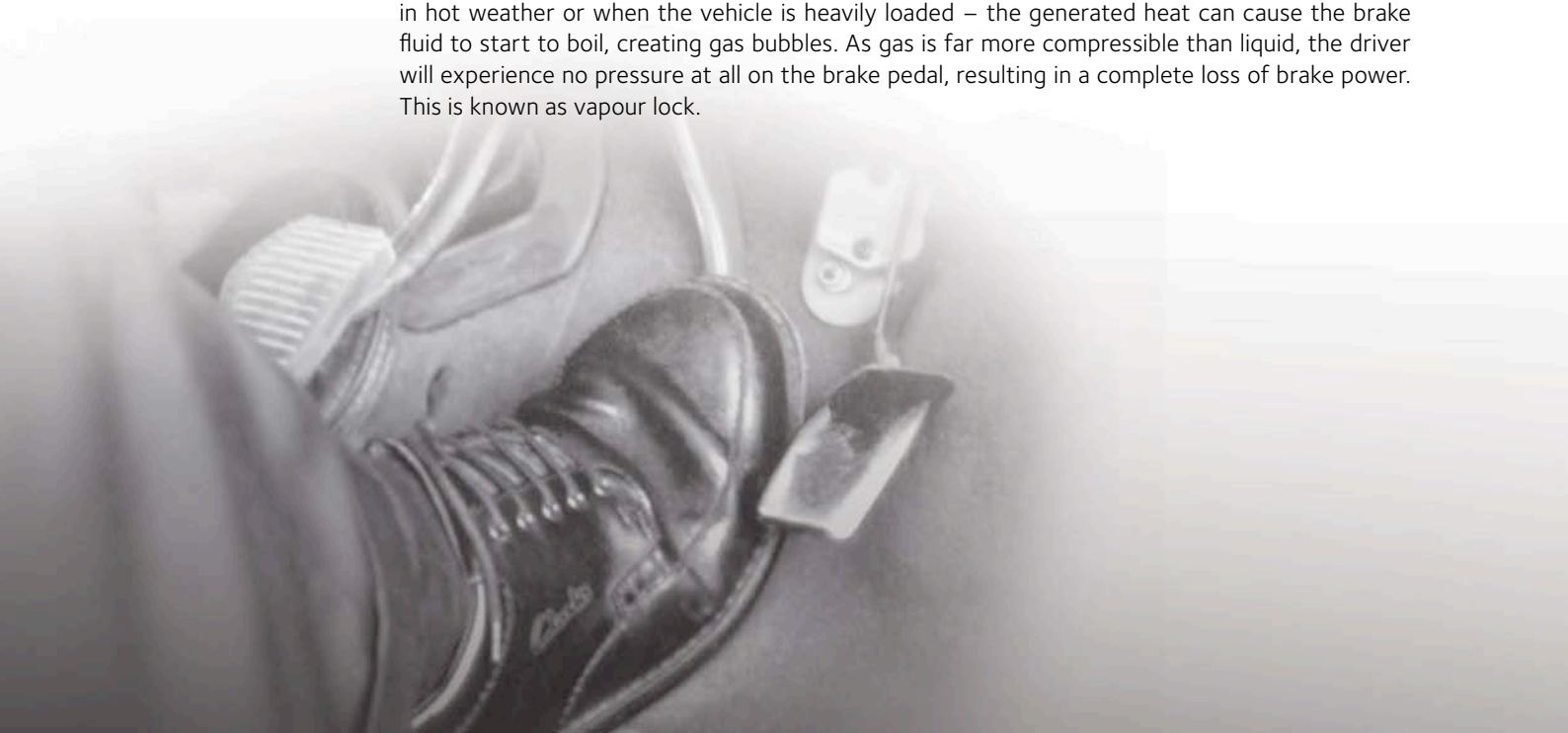
WHAT IS BRAKE FLUID?

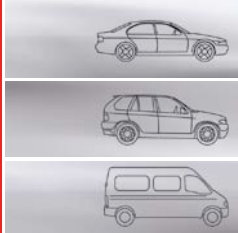
To understand vapour lock it is necessary to understand the function of brake fluid. Brake fluid – a mixture of synthetic organic chemicals – transmits hydraulic pressure from the brake pedal through hydraulic lines to the braking mechanism near the wheels. To make this possible, brake fluid must be incompressible. Because of the safety critical role of brake fluid, it is essential to manage the quality and specification of the fluid.

HOW IS BRAKE FLUID RELATED TO VAPOUR LOCK?

Braking generates considerable heat. To resist these high temperatures without boiling, brake fluid is designed with a high boiling point. But brake fluid is also hygroscopic, which means it absorbs water. In any hydraulic brake system, the brake fluid gradually absorbs moisture from the air through the flexible brake hoses or the reservoir breather. This moisture reduces the brake fluid's boiling point.

Once this moisture absorption reaches a certain level – under prolonged, hard braking, especially in hot weather or when the vehicle is heavily loaded – the generated heat can cause the brake fluid to start to boil, creating gas bubbles. As gas is far more compressible than liquid, the driver will experience no pressure at all on the brake pedal, resulting in a complete loss of brake power. This is known as vapour lock.





HOW TO AVOID VAPOUR LOCK





1. CHOOSE THE RIGHT BRAKE FLUID:

The brake fluid you choose to put in the hydraulic system is critical. Vehicle manufacturers always recommend a specific type of fluid; this should always be adhered to. Of course, the quality of the brake fluid is key.

A GOOD FLUID SHOULD

- > be incompressible to give solid pedal during braking
- > have a high boiling point
- > maintain performance during absorption of moisture
- > have a viscosity that remains within closely defined parameters
- > have the correct level of lubricity
- > prevent corrosion
- > have a controlled rubber swell to prevent shrinkage

In addition, it is essential to check the dry and wet boiling points of the brake fluid to ensure it meets minimum legal specifications. Ferodo brake fluids exceed legal requirements across the whole range.

FERODO FLUIDS		DRY BOILING POINT*		WET BOILING POINT**	
		Legal requirement	FERODO	Legal requirement	FERODO
	DOT 4 Synthetic	230	249	155	158
	DOT 5.1 Synthetic	260	269	180	183
	ESP DOT 4 Synthetic – Electronic Stability Program	260	270	165	170
	LHM Mineral Citroën Hydraulic System	240	250	NOT APPLICABLE (NON-HYGROSCOPIC BRAKE FLUID)	

*Dry Boiling Point is measured when the fluid is new

**Wet Boiling Point is measured after the fluid has been subjected to a specific moisture level for a specific time

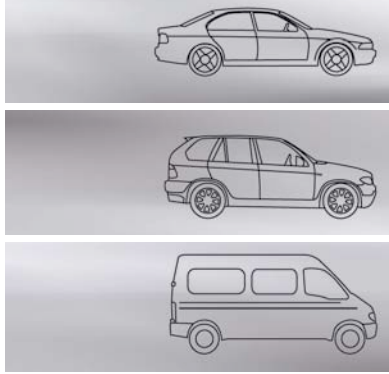
2. TEST THE BRAKE FLUID:

Test the brake fluid regularly to determine the actual boiling point.

3. CHANGE THE BRAKE FLUID:

Change the brake fluid when the boiling point is too low.

NOTE: Please see our next Technical tips leaflet Vapour Lock N°2 for more detail on these topics.



VAPOUR LOCK N°2

VAPOUR LOCK

In the previous leaflet **Vapour Lock N°1** we discussed the cause of vapour lock and provided some insights into choosing the correct fluid according to needs and highlighted the wet and dry boiling points. However, it is just as important to check brake fluid regularly and, when moisture content is too high, to replace the brake fluid.

TESTING BRAKE FLUID

Although many vehicle and brake manufacturers give minimum recommendations, the right time to change the brake fluid should not be based on the vehicle's mileage or age. The only real way to know is to test the brake fluid. And the only approved way to test it is by boiling it.

TESTERS

Conductivity or "pen-type" testers do not boil the fluid. They estimate the water content electronically. In theory, conductivity (and/or capacitance) increases with moisture content, but these testers can potentially fail new fluid and pass contaminated fluid. This is because the conductivity of brake fluid varies hugely from manufacturer to manufacturer, from batch to batch, and from grade to grade. For your safety and that of your customers, make sure to use an adequate tester.



CONDUCTIVITY OR "PEN-TYPE" TESTER

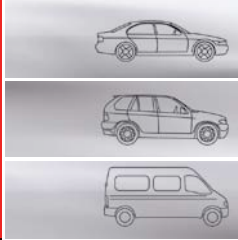
FERODO BRAKE FLUID TESTER

Ferodo has developed a high-quality brake fluid tester to ensure you can accurately measure the brake fluid of your customers. It is available under part number **FFT100A**.

In cases where customers require totally accurate water content, Ferodo can determine it by using industry standard techniques such as the well-known Karl Fisher method for water content.



FERODO BRAKE FLUID TESTER



REPLACING BRAKE FLUID

Caution: Prior to bleeding the system, conduct a master cylinder leak pass test. This is done by attaching a pressure gauge to the closest caliper brake pipe.

The system must then be pressurized to 50 bar for 45 seconds, during which there should be no more than a 4 bar loss of pressure. More than a 4 bar pressure drop indicates a master cylinder leak pass, requiring further attention. A second check can also be carried out but at a lower pressure of 10 bar still checking for loss of pressure and longer pedal travel to double-check for weaknesses in the system.

BLEEDING PROCESS – VEHICLES WITH FRONT AND REAR DISC BRAKES

All brake bleeding needs to be conducted in a set order, starting with the brake caliper furthest from the master cylinder (either left rear or right rear dependant on the vehicle configuration, i.e. Left-Hand Drive or Right-Hand Drive).



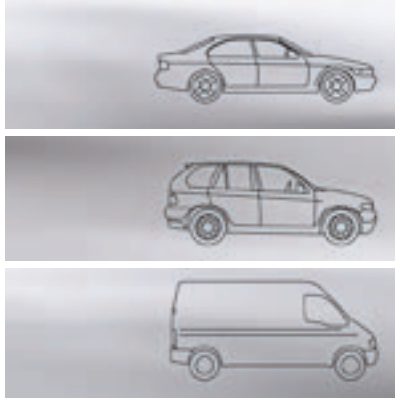
- > With all bleed nipples closed, fit a bleed pipe to the first caliper and loosen the nipple.
- > Using slow, full and firm strokes of the brake pedal continue until the brake fluid is visually (in the bleed pipe) clean, and clear of air bubbles.
- > With the pedal fully depressed tighten the bleed nipple, and remove the bleed pipe.
- > Continue to the opposite rear caliper and repeat the procedure.
- > After completing the rear calipers make certain the front calipers are also properly functioning and free of air bubbles by bleeding the front calipers starting also furthest from the master cylinder, and finishing closest to the master cylinder.
- > Finally ensure that an adequate pedal pressure is achieved.

BLEEDING PROCESS – VEHICLES WITH DRUM BRAKES

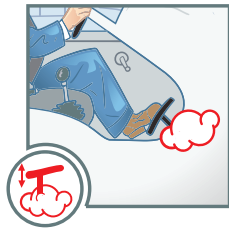
All brake bleeding needs to be conducted in a set order, starting with the wheel point furthest from the master cylinder (either left rear or right rear dependent on the vehicle configuration, i.e. Left-Hand Drive or Right-Hand Drive).

Prior to starting the bleeding process it is essential to ensure the correct manual adjustment (if present) is carried out on the brake shoes to brake drum clearance, to ensure the clearance is correct according to manufacturers specifications.

- > With all bleed nipples closed, fit a bleed pipe to the bleed nipple, of the wheel cylinder furthest from the master cylinder and loosen the nipple.
- > Using slow, full and firm strokes of the brake pedal, continue until the brake fluid is visually (in the bleed pipe) clean, and clear of air bubbles.
- > With the pedal fully depressed tighten the bleed nipple, and remove the bleed pipe.
- > Continue to the opposite rear wheel cylinder and repeat the procedure.
- > After completing the rear wheel cylinders make certain the front calipers are also properly functioning and free of air bubbles by bleeding the front calipers starting also furthest from the master cylinder, and finishing closest to the master cylinder.
- > Finally ensure that an adequate pedal pressure is achieved.



SPONGY PEDAL FEEL



Spongy pedal feel is the experience where upon depressing the brake pedal, the brake is slow to respond, and the pedal feels spongy – softer than it should be, with excessive force required to decelerate the vehicle and excessive stroke of the pedal.

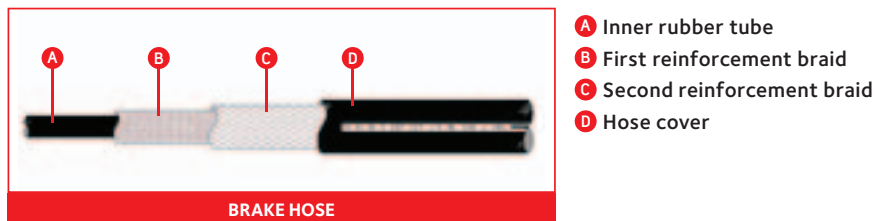
WHAT CAUSES SPONGY PEDAL FEEL AND HOW CAN YOU FIX IT?

Faulty brake hoses can cause brake fluid leaks, or ballooning of the hose itself which in turn means a poor brake pedal response.

1. AGING

During the life of a brake hose, it is subjected to different working conditions that could cause performance degradation or aging.

The brake hose is composed of 3 elements: a cover made of vulcanized rubber, a synthetic fibre reinforcement braid, and a vulcanized rubber inner tube.



The aging process can act differently on different parts of the hose.

- > The cover is affected by contact with external agents such as liquids, gases and heat radiation. Weather aging too has an impact, especially during cold winters when salt is spread on the road in large quantities.
- > The fibre reinforcement can be affected by thermal degradation (or heat damage).
- > The inner tube can be affected by both thermal degradation and contact degradation due to the chemical aggressiveness of the brake fluid.

Heat and chemical attack on any of the elements of the brake hose will result in cracking or splitting, which in turn means restricted fluid flow and poor brake response. ▶▶



2. FAULTY FITMENT

During installation it is easy to damage the hose through a variety of actions:

> Twisting



> Forced bending of the hose



> Contact of the exterior of the hose with fluid, mineral oil or grease

> Incorrect torque value

The metal fitting should be tightened to a torque value of between 13 and 20 Nm. Damage or leaks can be the result if the torque is too high or low.

> Ensure when fitting a hose that there is no contact with steering or braking parts.

While it can appear free with the vehicle on the lift, lowering the vehicle to the ground can alter the suspension position. Always conduct a secondary check on hose placement once the vehicle has been fully lowered. Turn the steering wheel to the lock position (left and right sides) to ensure no contact occurs.

HOW TO AVOID FAULTY BRAKE HOSES

1. AGING

- > Checks of flexible brake hoses should be a standard procedure. Brake hoses are an inexpensive component, but can have a serious impact on safety for any driver.
- > To ensure the maximum efficiency of the brake system and maintain safe and reliable performance, flexible brake hoses should be checked at regular intervals for chafing, cuts, general deterioration and leakage.
- > Some vehicle manufacturers recommend replacing hoses after 30,000 miles or at least every 5 years, however hoses should be checked during every service.

2. FITMENT

- > Ensure that during fitment brake hoses are not bent or twisted.
- > Ensure correct tightening torque is applied during fitment.
- > Ensure there is no contact between hoses and suspension components once vehicle has been lowered.

3. CHOOSE ONLY GOOD QUALITY BRAKE HOSES WHICH SHOULD SHOW THE FOLLOWING QUALITIES:

- > High resistance to the atmospheric conditions
- > High resistance to sudden temperature changes
- > Good flexibility and dynamic resistance
- > High compatibility with the brake fluids used in the applications concerned
- > Low moisture permeability
- > Low volumetric expansion under pressure

Ferodo offers a comprehensive range of high quality brake hoses. The part number structure is FHY1234.

WITH FERODO, YOU'RE IN CONTROL