



# Brake fluid

Good brakes are vital for your safety every time you take your motorbike on the road. While many bikers remember to check

their brake pads, they often forget that the brake fluid in a hydraulic braking system needs to be changed regularly. Why?

## 1. What you should know about brake fluid

Most brake fluids contain glycol, which is hygroscopic. This means that over time it will absorb moisture from the air – even in a closed system. This has the effect of lowering the boiling point (as you know, water turns to steam at temperatures above 100°C). When you brake, the friction of the brake pad rubbing against the disc produces considerable heat – just think of how much you use the brakes on a mountain descent. If there is too much moisture in the brake fluid, the intense heat can cause vapour bubbles to form. These bubbles are not able to transport the pressure in the hydraulic system, so the brake pressure point is lost. In other words, the brake pedal or hand lever goes soft and the brakes fail. You then have to pump the lever or pedal until you feel a pressure point again.

For this reason, in the interest of safe biking, it is essential to change glycol-based brake fluid at regular intervals, as specified by the manufacturer (every 1-2 years). If you're not sure how long the brake fluid has been in the sys-

tem, there are testers you can use that will tell you. If you do not have a tester, the colour of the fluid also gives you an idea of how old it is: new glycol-based brake fluid is a transparent yellowy colour, and the older it is, the darker it looks. Opaque, dirty brown fluid should always be changed. This rule also applies to the hydraulic fluid in a hydraulic clutch, which is generally filled with DOT4 brake fluid.

**The American Department of Transportation (DOT) has specified the following DOT classifications for glycol-based brake fluids for vehicles:**

DOT3: Wet boiling point approx. 140°C

DOT4: Wet boiling point approx. 160°C

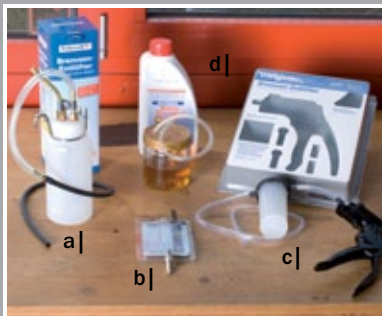
DOT5.1: Wet boiling point approx. 180°C

Racing formula: even higher wet boiling point (values provided by manufacturers tend to vary slightly). These days, DOT4 is by far the most widely used glycol-based hydraulic fluid in the automotive sector, while the qualitatively inferior DOT3 fluid is now rarely used. The brake fluids mentioned above can be intermixed, i.e. if you wanted to switch

from DOT4 to the higher quality DOT5.1 fluid, you would not necessarily have to flush the entire system, although that would, of course, give you the best performance. Generally speaking, you can replace DOT3 with DOT4, although caution is advised if you have a classic motorbike, as DOT4 has proven somewhat more aggressive on rubber parts than DOT3 (if in doubt, consult a classic motorbike specialist).

In addition to the above glycol-based hydraulic fluids, the DOT5 brake fluid (not to be confused with T 5.1!) is also commercially available. This fluid is silicone-based and is used in many Harley-Davidson and Buell motorcycles, in particular. Never mix this fluid with any of the fluids mentioned above, as this would cause flocculation (clumping) and clogging of the system. Silicone-based brake fluid is not hygroscopic and can therefore be left in the system for longer (depending on the vehicle manufacturer's specifications). To switch a DOT3 or DOT4 braking system to DOT5 you would first have to thoroughly flush the entire hydraulic system, and also obtain approval from the vehicle and/or brake manufacturer.

1



A range of tools are available for bleeding the system

2



Check cap for correct brake fluid

3



Align brake fluid reservoir horizontally...

As a rule, the correct brake fluid is indicated on the original cap of the brake fluid reservoir (see Fig.2). If in doubt, check your maintenance manual or ask your local motorcycle dealer.

Whenever you change the brake fluid, you should also bleed the braking system. The brake will only have a firm pressure point, and thus effective braking action, if the hydraulic system is completely free of air bubbles. If the brake is still spongy even though the hydraulic system is mechanically in good working order, you may need to bleed the system again. A malfunction in the hydraulic clutch can also be caused by air in the system.

Any work on the braking system is critical to roadworthiness and safe biking, and requires a sound understanding of vehicle mechanics. Don't put your safety at risk! If you have even the slightest doubt about whether you're up to the job, you should leave it to the professionals!

## Method 1

### 2. Changing the brake fluid

When working on your brake hydraulics, please bear in mind that glycol-based brake fluid is toxic, irritates the skin and damages paintwork. So try to ensure that it does not come into contact with either. Failing that, always be sure to thoroughly wash the affected area immediately with plenty of water. While silicone-based brake fluid DOT5 does not damage paintwork, it leaves behind a stubborn film of grease and should be kept well clear of brake discs and pads.

### 3. Bleeding the brakes

To change the brake fluid and bleed the system, there are basically two methods: You can either pump the old fluid out of the hydraulic system using the handbrake lever or foot pedal, or you can suction it out using a vacuum pump (see Fig. 9). To pump it out using the lever, you can simply use a hose to drain it into an empty jam jar. Before you start, pour enough brake fluid into the jar to cover the hose end so that no air is drawn in when you release the lever/pedal. Make sure the jar stays upright and that the hose remains immersed in the fluid all the time. This job is considerably easier with an inexpensive brake bleeder with a check valve (see Fig. 1a). Alternatively, you can swap the original bleed screw for a Stahlbus bleeder valve (see Fig. 1b). When pumping out the old fluid, never allow the brake fluid reservoir to run dry - always top up in good time in order to prevent air entering the hydraulic system.

Vacuum pumping is particularly advantageous for long, complex brake systems, as it quickly and effectively suctions the old fluid and air out of the system. However, in exceptional cases, using a vacuum pump can cause problems, e.g. if the piston in the main brake cylinder is not firmly attached to the lever and is sucked by the vacuum. You could also potentially have problems with bikes that have single disc braking systems and very small fluid reservoirs, such as enduros or scooters - in which case the pump completely empties the reservoir in seconds and starts to draw in air.

### 4. Procedure for changing the brake fluid via hand lever/ foot pedal

For this job, jack up the motorcycle and align the still closed brake fluid reservoir (e.g. on the handlebar) so that it is approximately horizontal (see Fig 3). Protect the tank and all surrounding paintwork with a waterproof sheet or workshop mat. Keep some water handy to wash off any splashes of brake fluid. Fit the right size of box-end wrench over the bleed screw of the brake caliper and attach the hose for the brake bleeder or jam jar (see Fig. 4). Unscrew the cap of the brake fluid reservoir and, together with the rubber insert, place it somewhere clean (see Fig. 5). Then turn the bleed screw approx. ½ a turn with the box-end wrench (see Fig. 6). Now expel the old brake fluid from the system by pumping the brake lever/brake pedal (see Fig. 7), while simultaneously topping up the brake fluid reservoir with new brake fluid if you see the level drop noticeably (see Fig. 8) - like we said, no air must be allowed to get into the system.

If you're having trouble drawing out the fluid (particularly if you are dealing with a long and complex brake system), or if the fluid retreats again as soon as you release the lever, you will need to bleed the system in individual steps. After each pump action, close the bleed screw before releasing the lever/pedal, then open the bleeder screw again and carry out the next pump action, etc.

Repeat this step until you can see only new, clean fluid without any air bubbles flowing out of the transparent hose. And don't forget to keep your eye on the level in the brake fluid reservoir (see Fig. 10)!

Continue bleeding, as described above, at the second bleed screw on the brake caliper or, in the case of dual disc brakes, at the second caliper.

Finally, while the reservoir is still positioned horizontally, top it up to the "Max." mark and replace the rubber insert and cap after cleaning and drying them. The cross-head screws are generally very soft, so make sure you use the right size of cross-head screwdriver and tighten gently. If you strip the screw heads, you will have all sorts of problems the next time you have to undo them. Use plenty of clean water to wash off any brake fluid that leaked at the seal while you were working.

Now operate the brake pedal or lever several times. After a short free travel, there must be a clearly defined pressure point. On the handlebar, it must not be possible to pull the brake lever all the way to the grip with spongy resistance. An inadequate pressure point may mean there is still air in the system (in which case, repeat the bleeding process), although a leak in the area of the brake caliper or a worn piston in the hand pump are also possible causes.

## Method 2

### 5. Alternative: Procedure with a vacuum pump

Prepare your bike as described above (see Fig. 3). Fit the right size of box-end wrench over the bleed screw of the brake caliper and attach the hose of the vacuum pump (see Fig. 4). Open the cap of the brake fluid reservoir (see Fig. 5). Then turn the bleed screw approx. ½ a turn with the box-end wrench (see Fig. 6). Using the vacuum pump, draw the old brake fluid and air out of the reservoir (see Fig. 9). New brake fluid must be poured into the reservoir before it is completely empty (see Fig. 8). Keep an eye on the fluid level in the reservoir, and continue operating the vacuum pump until only new, clean fluid without any air bubbles flows through the transparent hose (see Fig. 10).

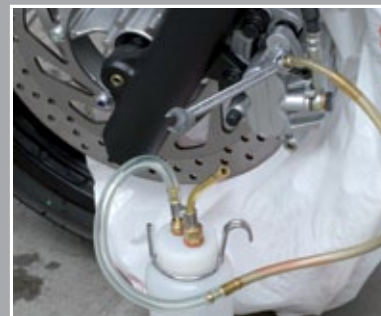
Make sure the hose is securely fitted to the bleed screw and that the screw is not loose in its thread - either of these situations can cause a thin line of air bubbles to form in the hose. Generally, this should not actually be a problem and you should still manage to create a solid brake pressure point. However, if you want to make doubly sure, wind a little Teflon tape from your local DIY store around the bleed screw down to the thread (make sure no Teflon tape enters the system!). Or it may be enough to simply apply a little grease around the brake caliper casing towards the bleed screw with your finger and wipe it off again later. You can also fix the hose, for example with a clip. While performing the last pump action with the vacuum pump, close the bleed screw on the brake caliper.



... Fit box-end wrench, attach hose ...



... and unscrew cap



Open bleed screw and pump out fluid

Continue bleeding at the second bleed screw on the brake caliper or, in the case of dual disc brakes, at the second caliper. Finally, as previously described, while the reservoir is still positioned horizontally, top it up to the "Max." mark and replace the rubber insert and cap after cleaning and drying them (see Fig. 10). Gently tighten the cross-head screws again and using plenty of water, wash off any residual brake fluid on the seal. Test the pressure point with the brake lever/pedal – after a short free travel, there must be a clearly defined, solid pressure point. This indicates that the brake has been properly bled.

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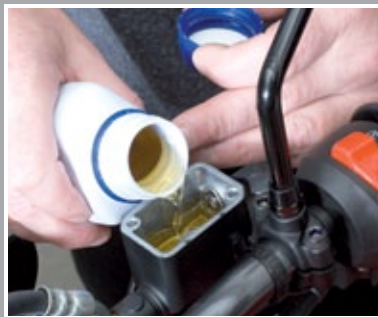
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7



Pump out with brake lever

8



Top up with fluid in good time

9



...or suction out with vacuum pump.

## We recommend:

### Stahlbus bleeder valve

Brake bleeding made simple ■ Simply replace the original bleeder screw with the Stahlbus bleeder valve ■ One-hand operation - no assistance required ■ Ideal when replacing rubber lines with steel-braided lines

■ CNC precision-machined from nickel-plated steel ■ Detailed illustrated instructions ■ No type approval or entry in vehicle documents required

**Please be sure to check that the thread size is correct!**  
Further thread sizes can be found at [www.louis.de](http://www.louis.de)

#### Threads

M6x1.0 **Order no. 10002856**

M7x1.0 **Order no. 10002855**

M8x1.25 **Order no. 10002854**

M10x1.0 **Order no. 10002853**

M12x1.0 - specifically for Brembo brake calipers with M12x1.0 thread ■ Also suitable for the rear brake caliper on KTM and BMW motorbikes with ABS II system (e.g. R1150 GS)

**Order no. 10002852**



### Rothewald brake bleeder

This collection bottle eliminates annoying spillages when changing the hydraulic fluid by pumping out with the brake or clutch lever. ■ A check valve prevents air from entering the system ■ The unit is easy to attach to the bike, has a filter and is unbreakable - far better than a jam jar! ■ Contains: 0.5 litre  
**Order no. 10009141**



Example use (may vary)



Example use

### Brake fluid tester

For all standard brake fluids (DOT4).

Simply dip the tester in the brake fluid and press the button on top. The LEDs quickly light up to indicate whether the brake fluid is OK.

**Features:** Battery-operated (1.5 V AAA battery included) ■ 3 coloured LEDs instantly show the condition of the brake fluid: green = optimal, yellow = borderline, rot = change ■ Small, lightweight, with handy clip  
**Order no. 10002683**

### Brake Fluid



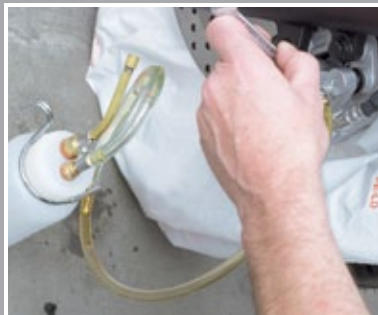
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When there are no air bubbles in the hose ...

10



... close the bleed screw.

11

**Please note!**

These tips for DIY mechanics contain general recommendations that may not apply to all vehicles or all individual components. As local conditions may vary considerably, we are unable to guarantee the correctness of information in these tips for DIY mechanics. Thank you for your understanding.