

Clutch bleeding procedure

All BMW Motorrad R-series and K-series models, model-years 2004 onward

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Introduction and rationale

BMW R-series and K-series motorcycles dating from 2004 onward possess a hydraulically-actuated clutch system. This system differs from 'normal' practice by utilizing a conventional mineral-based hydraulic fluid instead of DOT 3 or DOT 4 brake fluid.

Such mineral-based fluids have the advantage of greatly-extended replacement intervals, since mineral oils are not hygroscopic (i.e. do not absorb moisture). However, perhaps due to the high cost and relative scarcity of the BMW-branded hydraulic fluid, a misconception exists that bleeding and maintenance of these hydraulic clutches is beyond the scope of most owners and ordinary enthusiasts.

As will be demonstrated in this article, this notion is false. Any enthusiast possessing a reasonable level of technical competence and a level of previous experience in bleeding hydraulic brake and/or clutch systems, should not find these tasks unusually difficult.

This document illustrates the procedure whereby the hydraulic clutch circuit on 2004-onward BMW Motorrad products is flushed and bled of air.

This procedure was written with extensive reference to a 2006 R1200GS. However, it is also applicable to all other BMW R-series models utilizing the mineral-oil hydraulic clutch system, as the entire flush and bleeding procedure is identical for all such models.

With appropriate modifications, this procedure is also applicable to the mineral-oil hydraulic clutch system used on 2004-onward K-series models.

The information in this technical article is used and adapted at the readers' personal discretion, as is any deviation from the technical standards stipulated by BMW.

Since this procedure will be carried out beyond the control of the author, the author accepts no liability whatsoever for any consequences as a result of following steps contained in this article, whether intended or unintended.

This procedure was compiled and documented by independent enthusiasts, and is not sanctioned or supported in any way by Bayerische Motorenwerke (BMW), BMW Motorrad or any other BMW subsidiary or affiliate.

You are warned that BMW Motorrad do not consider this procedure an appropriate 'DIY' task, and do not recommend that this procedure be undertaken by any party not officially sanctioned by BMW Motorrad. Undertaking this procedure will void the motorcycle's warranty (if present). Therefore, it is recommended that this conversion be carried out only on motorcycles on which the factory warranty period has expired. By proceeding with this procedure, the party maintaining and/or repairing the motorcycle(s) accepts unconditional responsibility for their actions, and undertakes to hold the author of this document blameless in the event of any consequences which may arise as a result of said procedure.

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Cautions: Do not use fluids other than those specified in this article for clutch maintenance or repair. Incompatible fluids may damage the rubber parts used in BMW Motorrad clutch circuits.

It is strongly recommended that this procedure be undertaken only by persons possessing advanced

knowledge of motor-vehicle technicalities. In particular, knowledge of workshop safety principles and current hydraulic clutch-system trends is essential.

All tools, consumables and work areas used to perform this conversion must be scrupulously clean. Hydraulic clutch systems utilize precision components which are intolerant of dirt and dust. Even minute foreign particles have the potential to cause clutch malfunction or failure.

Equipment List

- 1x 10ml hypodermic syringe.

Caution: Only use syringes which are clearly marked 'Latex-free' or are otherwise free of natural rubber. Natural-rubber syringe plungers will swell and become inoperable when exposed to mineral oils.

- 1x 8 mm ring-set spanner.
- 1x 100mm length of clear oil-resistant 5mm inside-diameter plastic hose.
- 1x 1m length of clear oil-resistant 5mm inside-diameter plastic hose.
- 1x suitable plastic container for waste fluid.

Consumables List

Warning: Do not attempt to use ethylene glycol-based brake fluids in the clutch hydraulic circuit of any BMW manufactured from 2004 onward. These hydraulic clutches require a specialized mineral-based hydraulic fluid. Clutch hydraulics designed for mineral-based fluids are not compatible with conventional brake fluids – the use of such brake fluids may result in clutch hydraulic failure.

Also, do not attempt to use the mineral-based hydraulic fluid used for BMW clutches in any braking circuit for which DOT 3, DOT 4, DOT 5 or DOT 5.1 fluid is specified. This hydraulic fluid will severely damage all rubber parts of the braking circuits, possibly causing catastrophic brake failure.

- Approximately 300 millilitres of suitable mineral-based hydraulic fluid.
For long-term use, any of the following fluids can be used:
 - Aral Vitamol V10 (Factory BMW fitment. Available from BMW Motorrad parts counters and reputable hydraulics suppliers.)
 - Magura Royal Blood (available from bicycle stores equipped to perform work on hydraulic brakes.)
 - Shimano hydraulic fluid (available from bicycle stores equipped to perform work on hydraulic brakes.)
 - Castrol LHM or LHM+ (available from good automotive parts stores; also available from certain automotive franchises equipped to work on cars featuring hydropneumatic suspension. Some examples include Citroën, Mercedes-Benz and Rolls-Royce.)
 - Branded, high-quality 2.5W or 5W fork oil (available from good motorcycle parts stores and franchised motorcycle dealerships.)
- For short-term emergency use, any of the following fluids can be used, but it is strongly recommended that the clutch circuit be flushed and filled with approved fluid as soon as possible:
 - Baby oil (available from supermarkets and pharmacies.)
 - Automatic-transmission fluids, such as ATF Dexron II (available from good automotive parts stores.)
 - Transformer oil (available from engineering-supply wholesalers, good hardware stores and welding-consumable stores.)
- Clean rags.

Procedure

Initial Disassembly

1. 2010 TO 2013 R-SERIES ONLY: To gain access to the clutch release-cylinder bleed nipple, the exhaust noise-suppression valve actuation servo will need to be temporarily relocated using the following procedure:
 - a. Ensure that the ignition is switched off.
 - b. Place a clean shop rag over the left-hand rider's footpeg.
 - c. Disconnect the four-pin servo electronic multi-plug located forward of the actuation servo.
 - d. Using a T30 Torx wrench, remove the screw securing the servo to the rear frame.
 - e. Slide the servo rearwards and out of the rear frame, taking care not to snag the two actuation cables. Rest the servo on the left-hand rider's footpeg.
2. Remove the rubber bleed nipple cap from the clutch release-cylinder bleed nipple. The nipple is located between the rear of the gearbox and the rear suspension swingarm spindle. Clean the bleed nipple well with a soap solution, rinse well with clean water, and allow to dry.
3. Clean the clutch fluid reservoir with a soap solution, rinse well with clean water, and allow to dry.
4. Remove the clutch fluid reservoir cap by pressing in the two anti-tamper pins on either side of, and just below, the fluid reservoir cap, then unscrewing the reservoir cap by turning it anti-clockwise.

Bleed procedure

Note: BMW Motorrad recommend that, under normal circumstances, the clutch hydraulic fluid be regarded as a 'lifetime' fitment.

Outside of BMW Motorrad, opinions differ. Certain facts are indisputable: the clutch fluid comes into contact with metal alloys and synthetic rubber, and is exposed to much heat within the clutch release cylinder. These factors may result in fluid breakdown and contamination.

With these points in mind, certain owners may find it advisable to replace the clutch fluid more frequently. This includes riders covering higher mileages, and those whose riding style necessitates that the clutch be slipped while riding.

Under such circumstances, it is recommended that the clutch circuit be flushed and bled every 24 to 36 months.

If a 'dry' installation has been made (for example, the clutch master cylinder, release cylinder or hydraulic line have been replaced) and the hydraulic circuit is contaminated with air from any source:

1. Open the clutch fluid reservoir by pressing the twin lugs of the plastic anti-tamper lock inward, and rotating the reservoir cap anti-clockwise. Remove the plastic anti-tamper lock and black rubber diaphragm from the reservoir.
2. Securely connect the 100mm length of plastic hose to the outlet of the syringe.
3. Place the end of the hose into the container of hydraulic fluid. Draw back the plunger to fill the syringe.
4. Hold the syringe/tubing assembly with the syringe outlet facing upward, and the end of the tubing leading into the waste container. Allow time for any air bubbles in the mineral oil to rise towards the outlet.

5. When all air has risen to the top of the syringe outlet, slowly press the plunger until all air bubbles have been expelled from the syringe and tubing, and the fluid level is exactly at the entrance to the tubing.

Note: Do not attempt to bleed a 'dry' clutch hydraulic line by filling the reservoir with fluid and attempting to flush air through the release cylinder bleed nipple: this approach will not be successful. Air rises to the top of any hydraulic installation, meaning that you will be attempting to force fluid through the system against an 'air lock'.

6. The clutch release cylinder bleed nipple is likely to have 'seated' in place over time. Using an 8mm ring wrench, slowly relieve seating pressure on the bleed nipple by turning it anti-clockwise until fluid just begins to seep from the nipple. Gently 'nip' it closed.
7. Without wiping the waste fluid from the bleed nipple, connect the plastic hose to the bleed nipple. If this has been done correctly, no air will have entered the bleed line. Ensure that the plastic tubing is securely seated on the bleed nipple.
8. Open the clutch release cylinder bleed nipple approximately one-quarter turn. Simultaneously, press the syringe plunger to inject fluid into the clutch release cylinder. Do not operate the clutch lever at this time.
9. Repeat the step above until fluid begins to fill the open clutch master cylinder fluid reservoir. Continue filling with fluid until no more air bubbles are visible from the clutch master cylinder fluid reservoir fluid orifice. If the fluid reservoir becomes over-full, draw off and dispose of the waste fluid.
10. Gently 'nip' the bleed nipple closed.
11. Operate the clutch lever. If there is no air in the clutch hydraulic circuit, the clutch lever will feel firm, with even resistance throughout its range of travel. If the lever feels spongy, or lever resistance is uneven or weak, there is still air in the system. Continue injecting fluid into the system until no more air bubbles are visible in the clutch master cylinder fluid reservoir, drawing off waste fluid as necessary.
12. At this point, any remaining air can be purged from the system in conventional fashion:
 - a. Fill the clutch master cylinder fluid reservoir with fluid to the 'Full' mark.
 - b. Attach the one-metre length of plastic tubing to the clutch release cylinder bleed nipple. Route the open end into the waste fluid container.
 - c. 'Pump' the clutch lever as rapidly as possible at least ten times, to assimilate any residual air into the clutch fluid.
 - d. Holding in the clutch lever, open the clutch release cylinder bleed nipple approximately one-eighth of a turn until pressure on the lever has almost ceased, and waste fluid flow through the tubing has almost stopped. At this point, gently 'nip' the bleed nipple closed.
 - e. Repeat steps c. and d. above until no air bubbles or discolouration are visible in the waste clutch fluid. If the clutch master cylinder fluid reservoir's fluid level should fall below an imaginary 'halfway' mark, re-fill the reservoir with fluid to the 'Full' mark.
 - f. Ensure that the bleed nipple is securely closed.
13. Upon completing the clutch bleed, fill the clutch master cylinder fluid reservoir with fluid to the 'Full' mark.
14. Remove the plastic tubing from the release cylinder bleed nipple. Wipe the nipple dry until it is free of all traces of fluid.
15. Replace the bleed nipple cap.
16. Ensure that the clutch master cylinder fluid reservoir's rubber sealing diaphragm, white plastic anti-tamper lock and fluid reservoir cap are thoroughly clean and dry. Replace these components in the order described.

17. Try to remove the fluid reservoir cap. It should not rotate anti-clockwise unless the twin lugs of the plastic anti-tamper lock are pressed inward.
18. 2010 TO 2013 R-SERIES ONLY: Replace the exhaust noise-suppression valve actuation servo by following step 1 of the 'Initial Disassembly' section in reverse.
19. Take the motorcycle for a test ride, paying attention to the operation of the clutch.

If a filled system with no air contamination is being flushed or bled for maintenance purposes:

1. Fill the clutch master cylinder fluid reservoir with fluid to the 'Full' mark.
2. Disregard steps 1 through 11 above. Remove the clutch fluid reservoir cap, and follow the flush and bleed procedure from step 12a to step 19.