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4th Generation M3 Drivetrain

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4th Generation M3 Drivetrain

Model: E90, E92

Production: 2/2008

OBJECTIVES

After completion of this module you will be able to:

- Identify the components used in the drivetrain of the M3

Introduction

Via the self-adjusting SAC double-disc clutch, the power flow from the S65B40 engine is forwarded to the 6-gear manual gearbox (GS6-53BZ). This gearbox is based on the 6-speed transmission used in the E60 M5. In contrast to this gearbox, however, the M3 features electrically controlled transmission oil cooling.

A further highlight of the M range is located behind the M3 drive shaft.

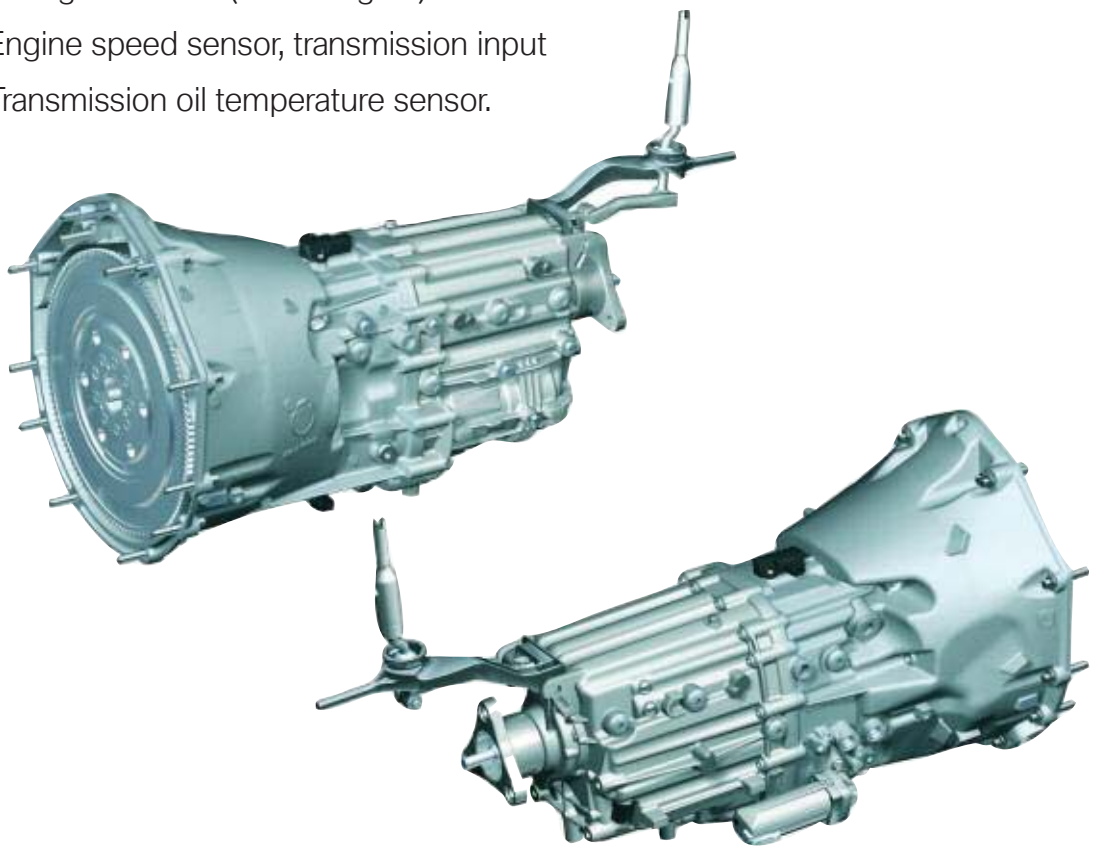
This is the fully-variable limited slip differential transmission, which was first used in the E46 M3, and has now been adapted to the demands of the E92 M3.

Appropriately adjusted output shafts ensure the distribution of power flow to the rear wheels.

GS6-53BZ Manual Transmission

The following sensors are fitted on manual gearbox housings:

- Zero gear sensor (selector gate)
- Engine speed sensor, transmission input
- Transmission oil temperature sensor.

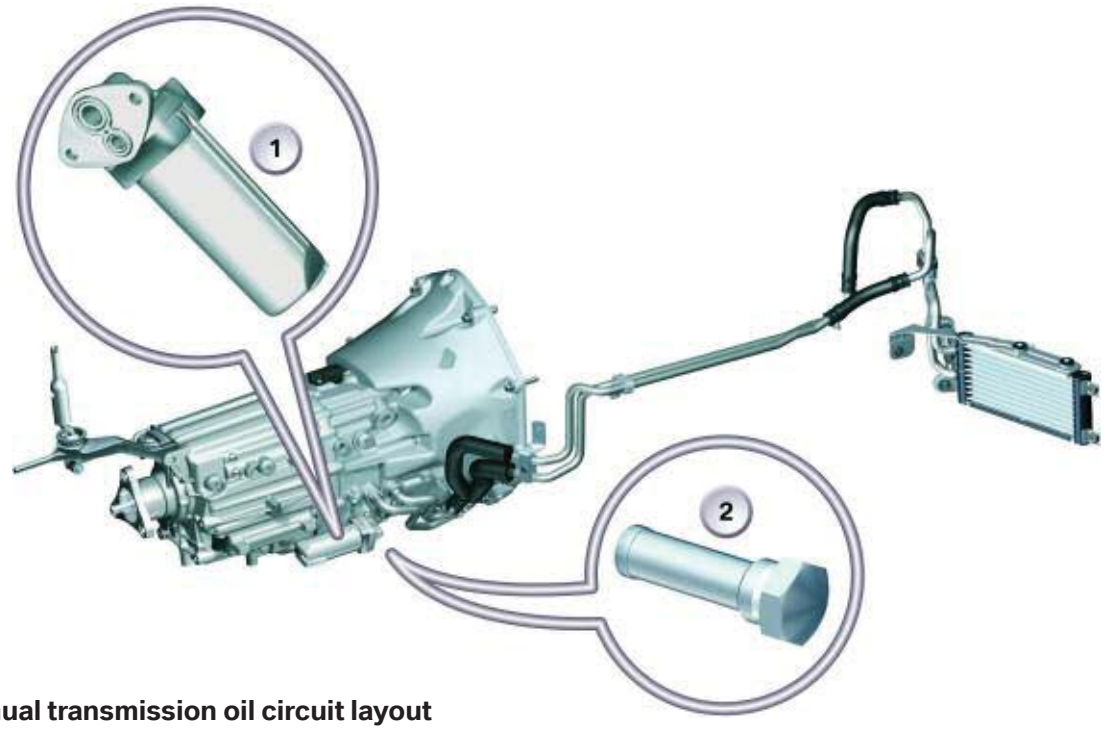


The signals of these sensors are monitored and evaluated by the MSS60.

When reverse gear is engaged, the reversing light switch mounted on the gearbox issues an earth signal to the footwell module (FRM) to activate the reversing lights.

The transmission oil pump is controlled by the MSS60 depending on the transmission oil temperature.

Model	E92 M3	Gear Ratio (1/2/3/4/5/6)	Gear Ratio (reverse)
E92 M3	GS6-53BZ	4.055/2.396/1.582/1.192/1/0,872	3.678
E46 M3 Coupé	S6S420G	4.227/2.528/1.669/1.226/1/0.828/	3.746
E92 335i	GS6-53BZ	4.055/2.396/1.582/1.192/1/0.872/	3.678



Manual transmission oil circuit layout

Index	Explanation
1	Gearbox oil pump
2	Screw oil filter

The activation threshold for the pump is approximately 130°C and the deactivation threshold is approximately 110°C.

Should the transmission oil temperature rise above approx. 145°C due to a fault, the temperature value is gradually reduced in accordance with the engine speed in increments of 150-500 rpm, to a minimum of 5,000 rpm. 5,000 rpm is also the value in the event of a failure of the ATF temperature sensor.

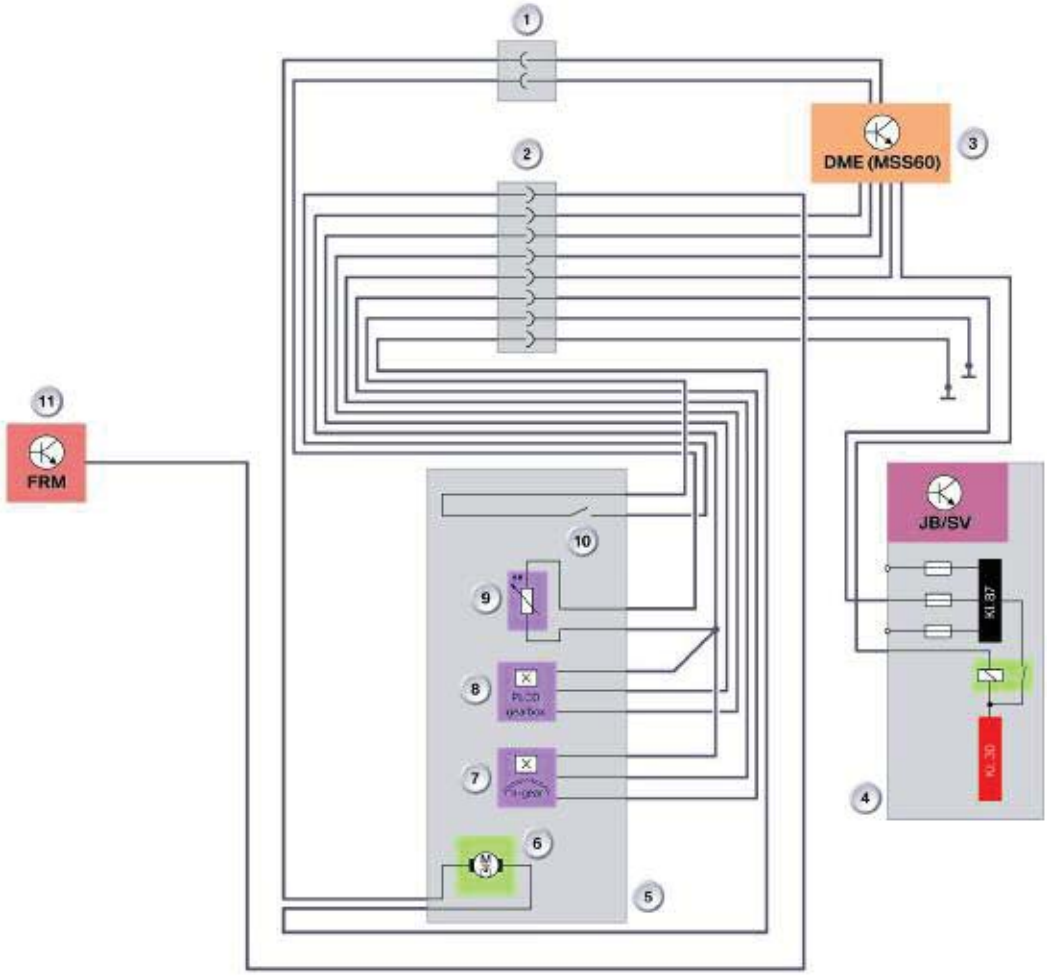
An electrical gear-oil pump is used to pump gear oil from the gearbox to the gearbox oil cooler. A screw oil filter is located below the oil pump.

The transmission housing has been adapted for the oil cooler connection. The oil pump is mounted on the manual transmission housing.

The gear oil is replaced and the screw oil filter is checked or cleaned during the running-in inspection, and later according to service specifications (estimated after every third engine oil change).

Note: For fault symptoms with engine speed limitation, the gear oil temperature should also be considered as a possible cause.

Manual transmission system circuit diagram



Index	Explanation	Index	Explanation
1	Plug-in connection for engine wiring harness	7	Engine speed sensor, transmission input
2	Plug-in connection for vehicle wiring harness	8	Zero gear sensor (selector gate)
3	MSS60 Engine control system	9	Transmission oil temperature sensor
4	Junction box/distribution box	10	Reversing light switch
5	Transmission housing	11	Footwell module
6	Electrical transmission oil pump		

Clutch

It is the first time that a double drive plate clutch has been used on an M3.

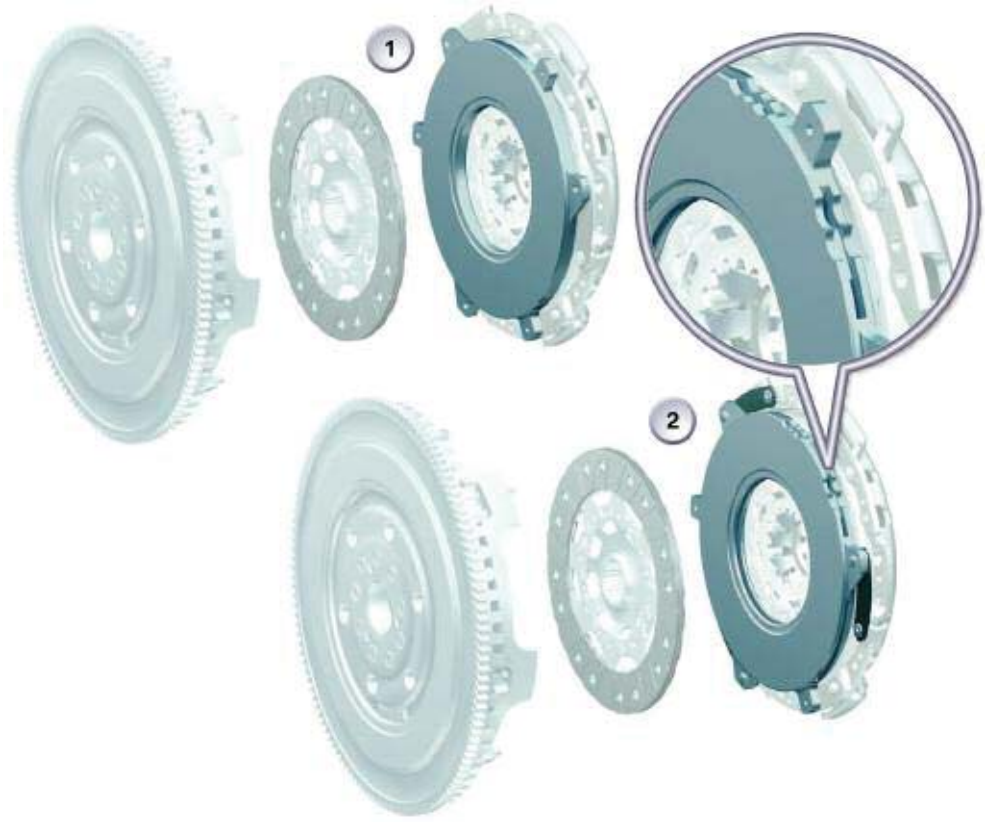
The clutch and the dual-mass flywheel are based on the E60 M5 and E63/E64 M6 (manual gearbox), but their combined weight has been reduced by 4 kg.

The contact plate and the transfer plate form a single unit with the integrated clutch driving plate.

The following changes have been made:

- The weight of the clutch and the dual-mass flywheel has been reduced.
- The transfer plate is hollow cast and shaped, similar to an internally ventilated brake rotor/disc. This increases heat dissipation and hence the permissible thermal load of the clutch.

Comparison of the S65B40 double-disc clutch and the S85B50 manual clutch



Index	Explanation	Index	Explanation
1	E6x M5/M6 SAC Clutch	2	E92 M3 Clutch

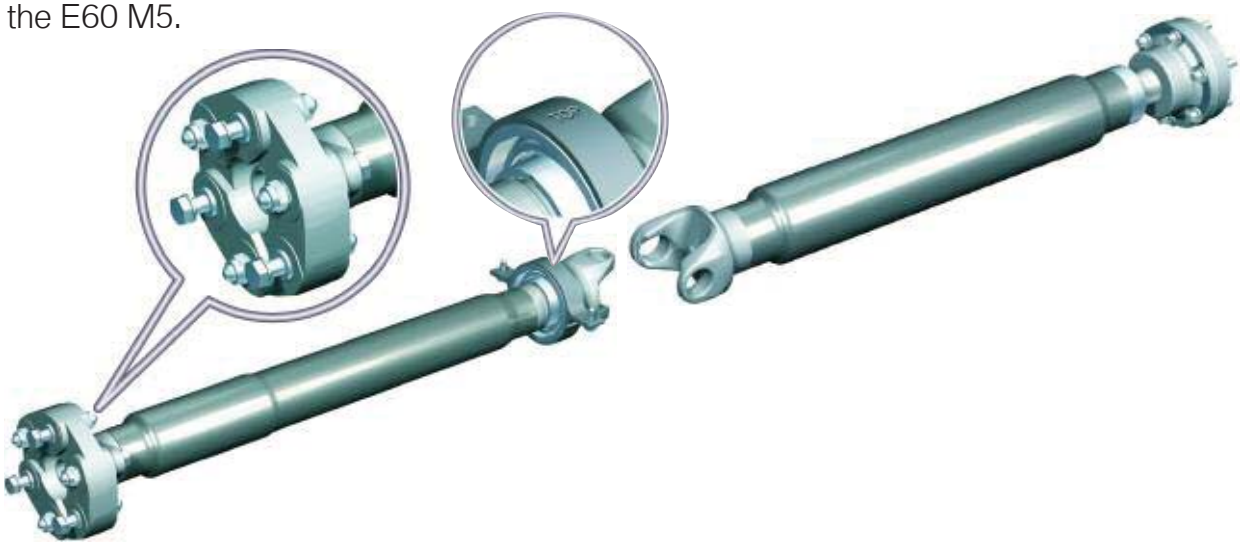
Note: The clutch and the dual-mass flywheel are permanently connected and are balanced as a single unit. They can only be replaced in a set.

Propeller Shaft and Output Shafts

The flexible clutch of the front propeller shaft is taken from the E6x M5/M6.

The front drive shaft is hollow and has a graduated cross section.

The rear propeller shaft is also a tubular construction and has an equal cross section along its entire length. The thickness of the tubing and the geometry of the front and rear propeller shaft have been adapted to handle the increased driving power. Both propeller shafts are fitted with the same constant velocity joints that are used on the E60 M5.



E92 M3 Axle drive components (Front propeller shaft with flexible clutch & rear)

Note: The center bearing can be mounted in two directions. It is important that the bearing is mounted with the word "TOP" facing the body.

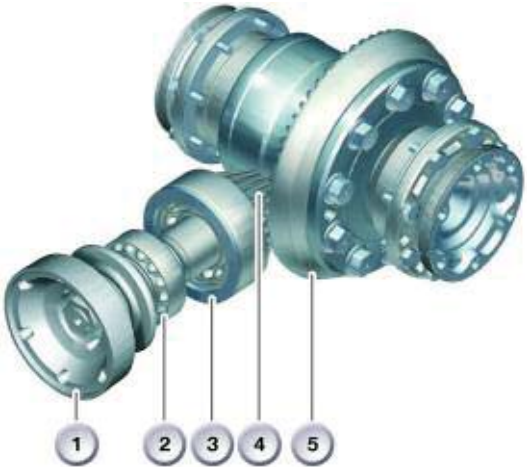
Both output shafts are hollow and have a graduated cross section. The external axle shaft joint is new. The internal axle shaft joint is based on the joint used in the E60 M5. The left and right output shafts are different in length.

Axle drive with output shafts

Final Drive

In principle, the final drive is assembled in the same way as in the E6x M5/M6. It is, however, a separate new development.

The bevel gear shaft bearing is a friction optimized, double-row, angular-contact ball bearing. The gear ratio between the bevel gear and the crown gear has been adapted to the engine speed and gearbox ratio of the M3.



Index	Explanation
1	Propeller flange
2	Front double-row angular contact ball bearing
3	Rear double-row angular contact ball bearing
4	Bevel gear
5	Crown gear

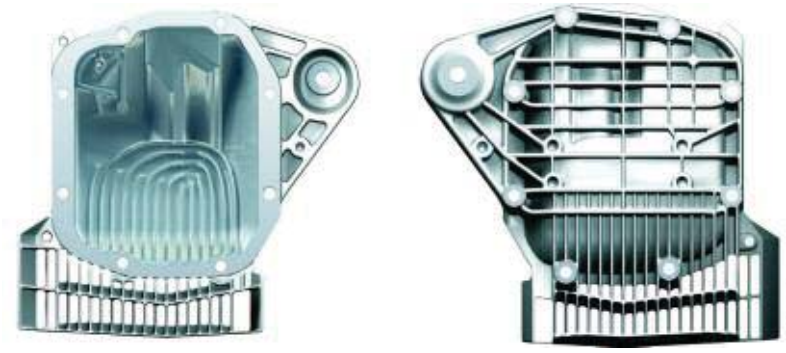
The final drive ratio is 3.85:1.

The 215 gear set (crown wheel diameter 215 mm) has been temperature and noise optimized. A friction-reduced gearing is used.

The housing of the final drive has been adapted to accommodate the double-row angular-contact ball bearing. The flanges for the propeller and drive shafts are the same as those used on the E6x M5 and M6.

Final gear housing

Note: Due to their function, the shafts of the right and left stub axles in the final drive have different lengths. In an idle state, this results in a noticeably different vertical clearance of both flanges, which is a feature of the design. This does not affect the function and is not a cause for complaint. This uneven clearance applies for all models with fully variable M slip differential and may affect either the right or the left flange, depending on the version and model.



Final drive end cover

The transmission housing end cover has been modified to ensure optimum gear oil cooling and bevel gear lubrication. The end cover has more ribs, which improves heat exchange.

The internal styling of the end cover is adapted according to the size of the differential and the final drive ratio.

This M final drive also has three bearings, with two front bearing and one rear bearing.

Fully Variable M Differential with Locking Action

This unique limited slip differential design is based on the E46 M3 and the E6x M5/M6 limited slip differential, where it is described in detail.

The function of the limited slip differential has been adapted to ensure that the M3 develops the best traction at different engine speeds and in every road situation.