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E83 Drive

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Initial Print Date: 10/03 Revision Date:

Drive

Model: E83/ E53 MU (Model Update)

Production: E83 - Start of Production MY 2004
E53 MU - 9/03

OBJECTIVES

After completion of this module you will be able to:

- Describe the drive train modifications in the E83
- Locate and access the fuel system serviceable items
- Diagnose the fuel delivery and evaporative containment systems
- Visually identify the rear driveshaft variants
- Explain the difference between the left and right rear output shafts

Purpose of the System

Drive

The E83 is available with the following engine and transmission variants in the US market:

Engine	Manual Transmission	Automatic Transmission	Transfercase	Final Drive
M54B25 M54B30	GS6X37BZ	GA5R390R	ATC400	188K i = 3.64 (man. and auto.)

The vehicles are all fitted with the VAG 174 front axle drive.

Drive Modifications

Please reference to ST045 E85 and ST046 E60 Training Handouts for additional details on the M54 engine and MS45.0/MS45.1 Engine Management systems.

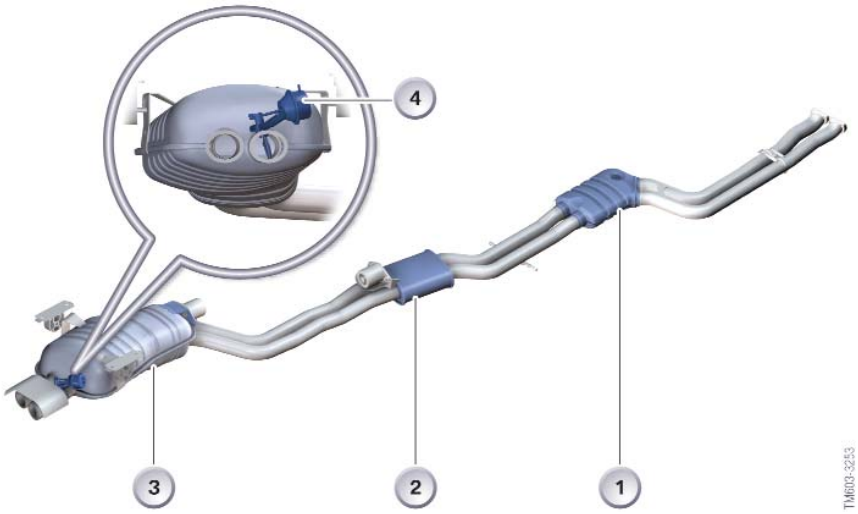
The following modifications have been made to the engine for use in the E83:

- Modified Belt Drive - the position of the deflection pulley on the alternator (150 A Bosch/Valeo) has been modified slightly.
- M54B25 manual and automatic transmission and M54B30 manual transmission equipped vehicles use Siemens MS45.0 engine management system. This system is LEV emission compliant.
- M54B30 automatic transmission equipped vehicles use Siemens MS45.1 engine management system. This system is ULEV II emission compliant.

Exhaust System

The following exhaust system is used at the start of E83 series production:

1. Front silencer
2. Center silencer
3. Rear silencer
4. Diaphragm chamber to operate the exhaust flap



The E83 exhaust system is made of stainless steel. The exhaust system connected to the M54 engine is one piece from the exhaust manifolds to the rear silencer (muffler). However, the system is available in sections for service replacement.

As on current BMW M54 engines, each exhaust manifold is equipped with metal base catalytic converters, 2 pre-catalyst and 2 post catalyst oxygen sensors.

The rear silencer is equipped with an exhaust flap (similar to the E46). It reduces noise in the lower engine rpm range. The exhaust flap is operated by a Diaphragm (4). It is controlled by a solenoid valve, which is controlled in turn by the ECM (DME). The rear silencer has an 18.5 liter volume.

Cooling System

This section describes the cooling module installed in the E83 in conjunction with the M54B25 and M54B30. The following components of the cooling module were adopted from the E46 and E85:

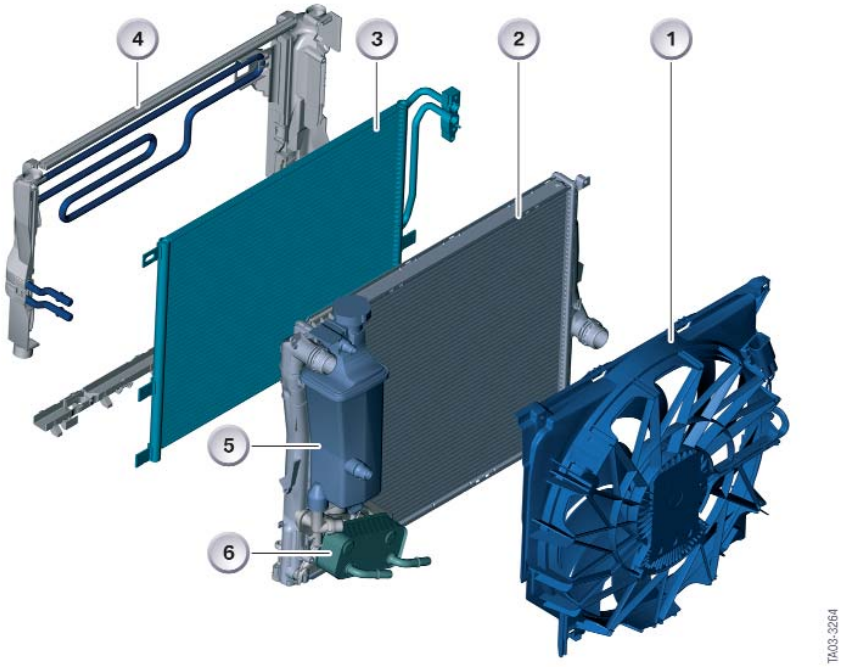
- Module carrier
- Fan
- Transmission oil cooler (oil-water heat exchanger)
- Expansion tank

The following components were physically modified for use in the E83:

- Radiator - performance increased
- Fan shroud
- A/C condenser - performance increased
- PS cooler - performance increased

Cooling Module Components

1. Electric fan (600 W) and shroud
2. Radiator
3. A/C condenser
4. P/S cooler (hose loop)
5. Expansion tank
6. Automatic transmission cooler (heat exchanger)



E83 Fuel System Modifications

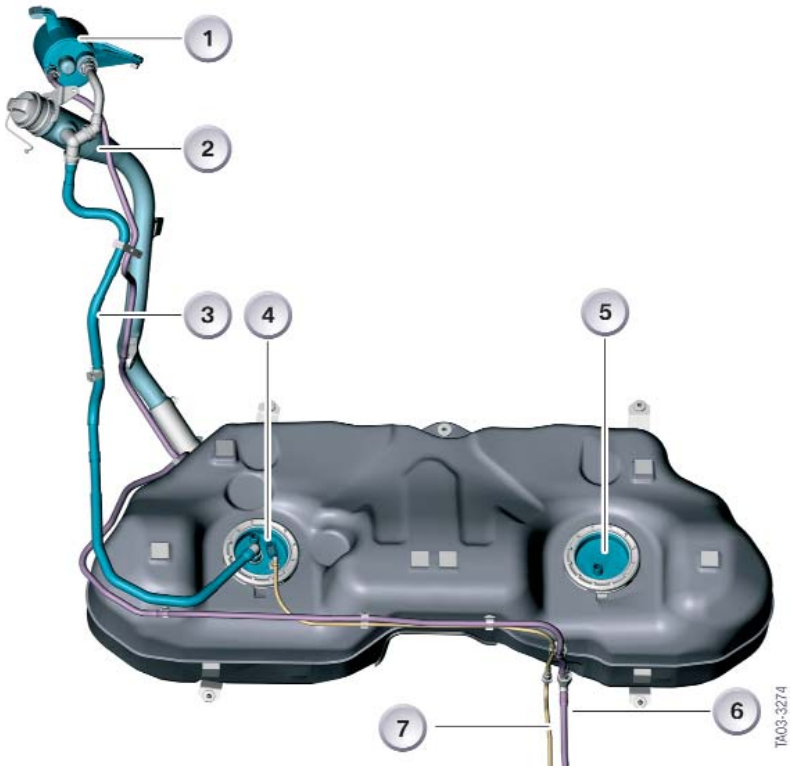
To comply with ever increasing emissions laws, the E83 fuel system has a further decrease in the number of openings and ports over previous series production. On the E83, the filler valves and service breather valves are completely encapsulated by the fuel tank.

The only ports/openings except the fuel filler neck are located in the two service access cover plates.

Components

The fuel tank is located above the drive shaft in front of the rear axle (similar to E46) and is secured by two tensioning straps. The fuel tank capacity is 67 liters, including 8 liters of reserve fuel. It is made of plastic (multi-layer HDPE) with an intermediate layer (barrier layer).

Access to the fuel filter, pressure regulator, the two fuel level sensors and the electric fuel pump are through the two service access covers. The fuel filler neck is secured to the right hand side of the fuel tank with hose clamps.



1. Activated charcoal filter with DM TL
2. Filler pipe
3. Vent line
4. Right service access cover
5. Left service access cover
6. Evaporative purge line
7. Fuel delivery line

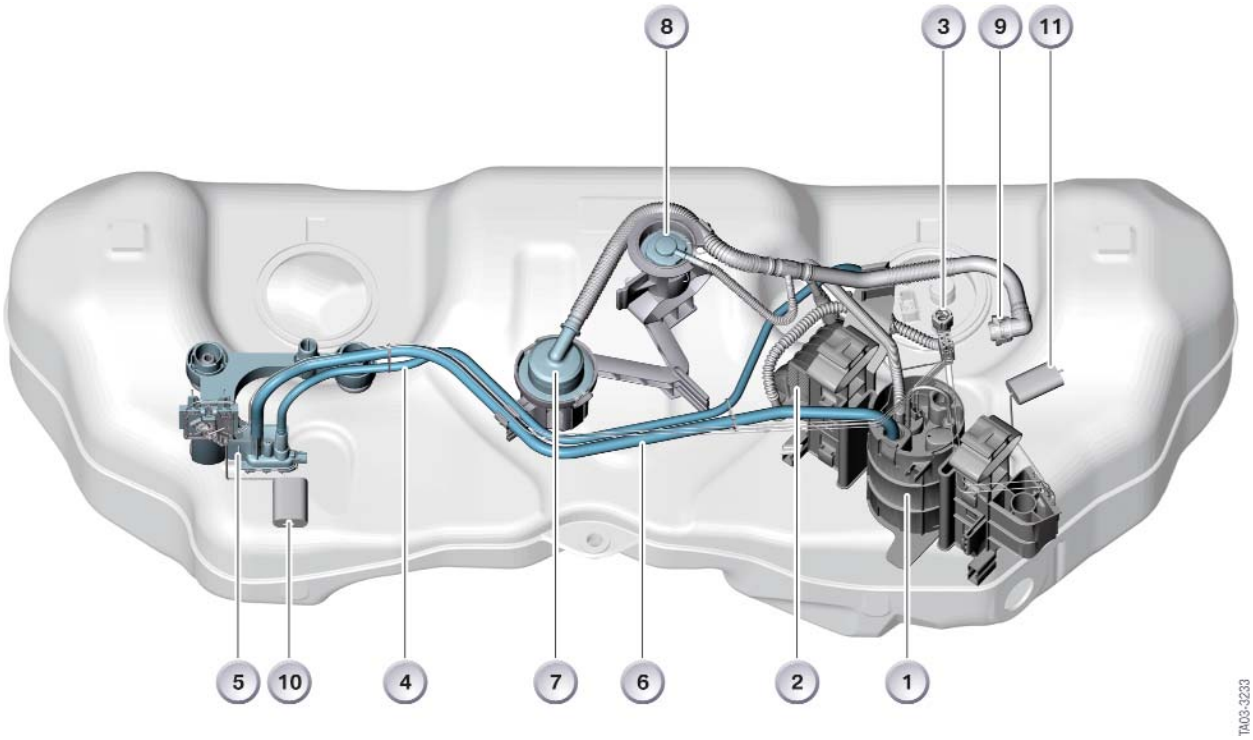
The fuel delivery unit comprises the following components in the right hand side of the fuel tank:

- Fuel baffle with electric fuel pump and right hand suction-jet pump
- Right hand fuel level sensor
- Fuel filter with pressure regulator.

In the left hand side of the fuel tank:

- Left hand fuel level sensor
- Left hand suction-jet pump

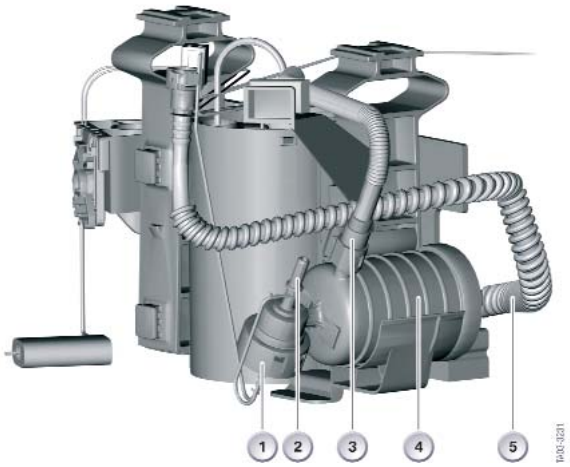
The components are accessible through the two service access covers.



1. Fuel baffle chamber with electric fuel pump (EKP)
2. Fuel filter with pressure regulator (3.5 bar)
3. Fuel feed (port in the service access cover)
4. Return flow from the pressure regulator for the left hand suction-jet pump
5. Left hand suction-jet pump
6. Return flow from the left hand suction-jet pump into the fuel baffle chamber
7. Filler breather valve
8. Service breather valve
9. Vent line (port in the service access cover)
10. Left hand fuel level sensor
11. Right hand fuel level sensor

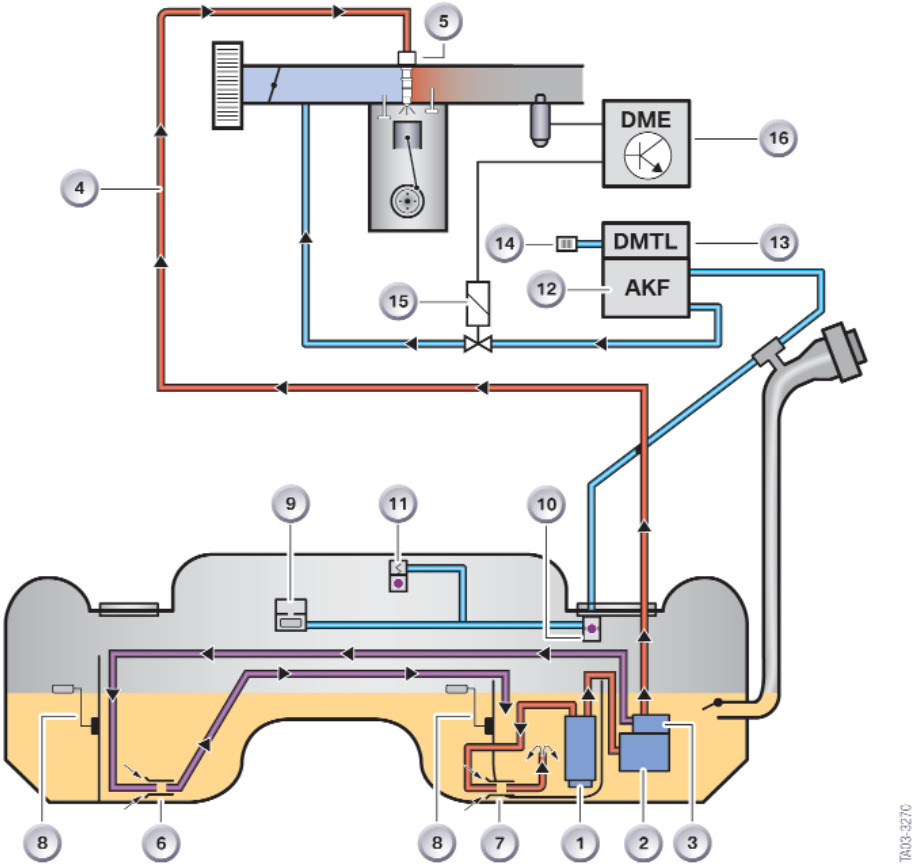
The fuel filter and the pressure regulator form one component, the pressure regulator for the M54 engines are 3.5 bar.

The fuel filter is replaced together with the pressure regulator for service repairs.



1. Pressure regulator
2. Port for return line
3. Supply from the electric fuel pump (EKP)
4. Fuel filter
5. Supply to fuel rail

Fuel System Overview



1. Electric fuel pump (EKP)
2. Fuel filter
3. Pressure regulator **(3.5 bar)**
4. Delivery line
5. Fuel injector
6. Left hand suction-jet pump
7. Right hand suction-jet pump
8. Fuel level sensor
9. Filler breather valve
10. Roll over valve
11. Service breather valve
12. Activated charcoal filter (AKF)
13. Diagnostic module for tank leakage (DMTL)
14. Dust filter
15. Tank ventilation valve (TEV)
16. ECM (DME)

Fuel Delivery

The fuel is supplied to the engine from the fuel tank as follows:

- From the right hand half of the fuel tank
- Through the non-return valve inside the fuel baffle chamber (only for initial filling of the fuel baffle)
- Into the fuel baffle chamber
- Pumped out by the electric fuel pump (EKP)
- Into the fuel filter
- Through the line in the right hand service access cover to the engine
- Pumped out by the electric fuel pump in parallel through a separate fuel line to the right hand suction-jet pump, then from the right hand half into the fuel baffle (level increase)

Fuel Pressure Regulation

With pressure regulation, fuel is fed through the fuel tank as follows:

- Fuel pressure controlled by the pressure regulator (3.5 bar)
- To the suction-jet pump in the left hand half of the fuel tank
- Into the fuel baffle chamber

At the same time, the suction-jet pumps draw the fuel from the right and left hand sides of the fuel tank. This ensures that the fuel baffle and the electric fuel pump are supplied with fuel at all times.

Filler Venting

To provide filler venting, there is a breather unit in the fuel tank consisting of a service breather valve (11) and filler breather valve (9). There is also a roll over valve (10) on the right hand service access cover. The filler breather valve allows air and fuel vapors to escape from the fuel tank when the vehicle is refuelled (venting).

When the vehicle is refuelled, the air and fuel vapors vent via:

- The filler breather valve
- Through the vent line
- To the roll over valve
- Through the T-fitting on the fuel filler neck
- Into the activated charcoal filter

When the maximum capacity is reached, the filler breather valve is closed by the fuel lifting the internal float valve. The fuel level rises in the fuel filler neck and trips the fuel pump nozzle. A vapor barrier (approximately 15 liters) remains in the tank above the filler breather valve after the tank has been filled. This provides internal liquid/vapor separation.

Service Breather Valve
The fuel vapors produced are vented:

- Through the filler breather valve
- Through the service breather valve if the filler breather valve is closed
- To the roll over valve
- Through the vent line
- Through the T-fitting on the fuel filler neck
- Into the activated charcoal filter (AKF)
- Through the evaporative purge line
- Through the evaporative purge valve (TEV)
- To the engine intake manifold

The service breather valve only opens if the filler breather valve is closed (fuel tank full to capacity). The service breather valve location is higher in the tank than the filler breather valve and opens at a pressure of 50 mbar. When the fuel tank is not full, vapors are vented through the filler breather valve.

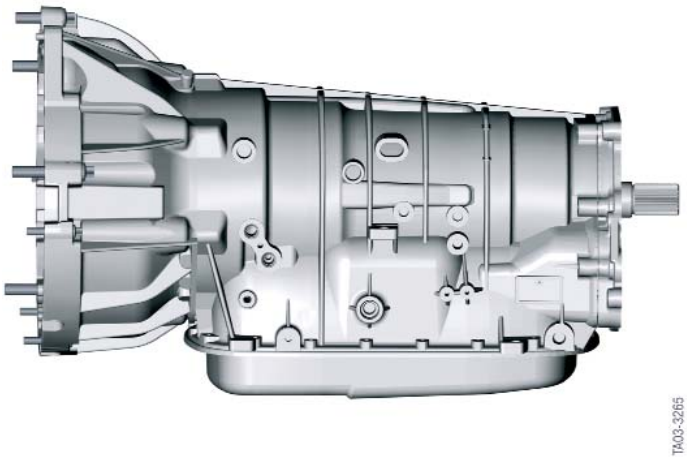
Notes:

Automatic Transmission

The previously used 5-speed GM5 automatic transmission is used in the E83 and E53 MU.

The transmission designation is GA5R390R.

Modifications have been made to the output shaft and tail housing to accommodate the ATC 400/500 transfer case.



Technical Data

Index	Explanation
Type	Automatic gearbox with five forward gears. 5th gear is designed as an overdrive gear.
Power transmission	The maximum torque is 390Nm in 1st/2nd/3rd and 5th gear and 410Nm in 4th gear with the converter clutch closed.
Torque converter	With M54B30 = W245 with controlled converter clutch
Gear ratios	1st gear 3.24 2nd gear 2.22 3rd gear 1.60 4th gear 1.00 5th gear 0.75 Reverse gear 3.03
Selector positions	P-R-N-D and Steptronic
Control	Electrohydraulic with adaptive shift characteristic control
Weight with oil*	77 to 78 kg depending on the version

*** Lifetime oil fill**

Transmission control

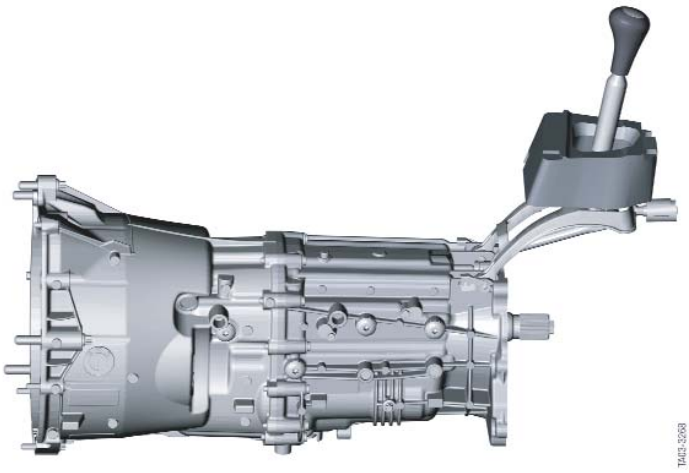
The transmission control has been adopted from the E46. The transmission control unit (GS20 as on E46) is located in the electronics box in the engine compartment and is on the PT-CAN.

Manual Transmission

The 6 speed manual transmission in the E83 and E53 MU was previously used in series production.

The transmission designation is GS6X37BZ (H-gearbox) with the M54 engine.

Modifications have been made to the external gearshift mechanism as well as the output shaft and tail housing to accommodate the ATC 400/500 transfer case.



Technical Data

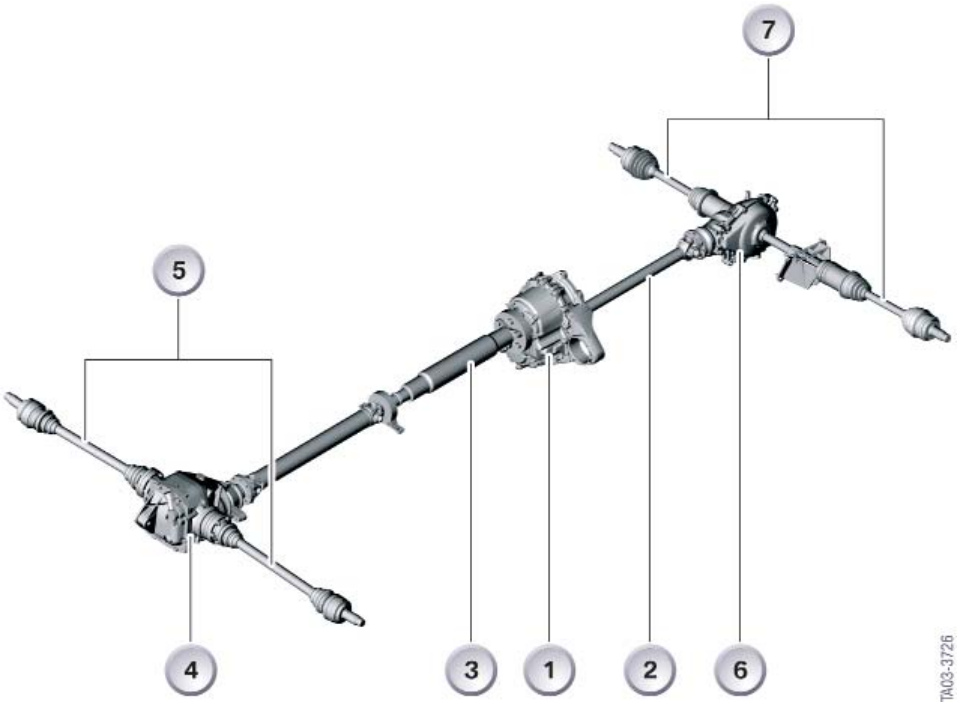
Gear	Gear ratio GS6-37BZ (H-gearbox)
1	4.35
2	2.50
3	1.67
4	1.23
5	1.00 (direct drive)
6	0.85 (overdrive)
R	3.93

*** Lifetime oil fill**

Notes:

Drive Train

The E83 drive train has been largely adopted from the E46/3-16 (3 Series, Touring, all wheel drive).



Components

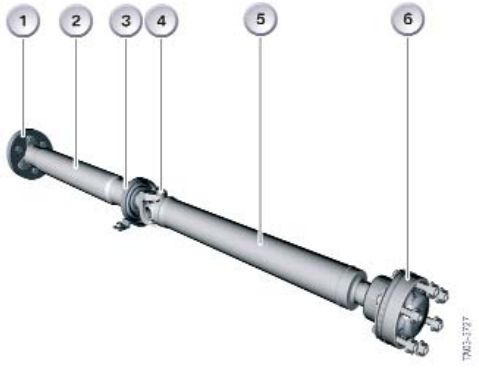
1. Transfer case
2. Front drive shaft
3. Rear drive shaft
4. Final drive
5. Rear output shafts
6. Front axle drive
7. Front output shafts

Rear Driveshaft

The rear drive shaft in the E83 with the M54 engine is a steel universal joint shaft (arrow on the right).

To minimize noise, a constant velocity joint shaft is used in the E53 MU.

1. Flexible coupling
2. Front section of drive shaft (collapsing tube)
3. Center bearing
4. Universal joint
5. Rear section of drive shaft
6. Constant velocity joint

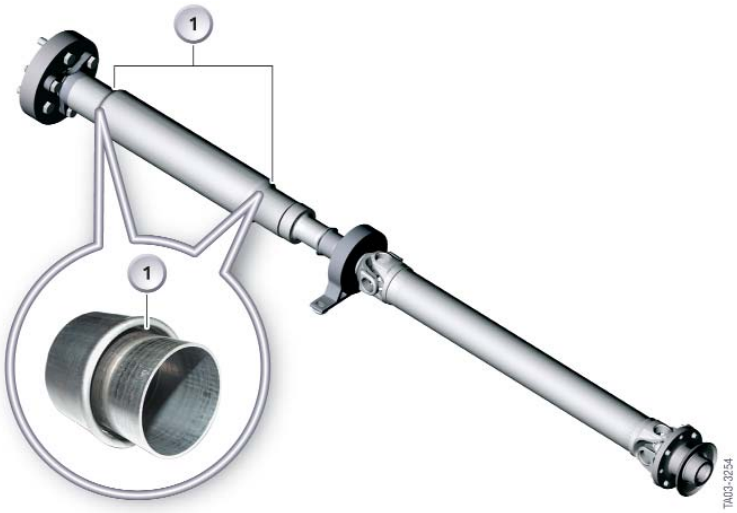


Both style rear drive shafts are equipped with a deforming element.

The front section of the drive shaft is designed as a collapsing tube (1).

When the drive shaft is compressed (collapsed) it absorbs a defined force.

After collision or accident repairs, the drive shafts must always be checked for compression of the collapsing tube (refer to Repair Instructions for additional details).



Note: When the collapsing tube is deformed, the drive shaft must be replaced.

Front Drive Shaft
The front drive shaft connects the transfer case to the front axle drive. It is designed as a one piece section without a center bearing and has two universal joints.

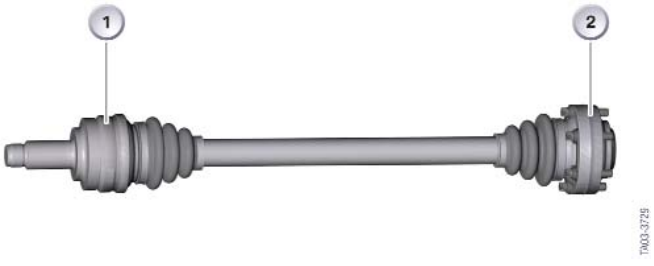
Rear Axle Final Drive
The 188 K (ring gear size) final drive is known from the previous model series productions. The final drive ratio varies depending on the engine/gearbox combination. For the US with M54 engines, the ratio is 3.64:1 for both automatic and standard transmissions.

Front Axle Drive
The vehicles are equipped with the familiar VAG 174 front axle drive, regardless of the engine and transmission variant. The front axle ratio is always identical to the final drive ratio (3.64:1 for US with M54 engines).

*** Lifetime oil fill on both axles**

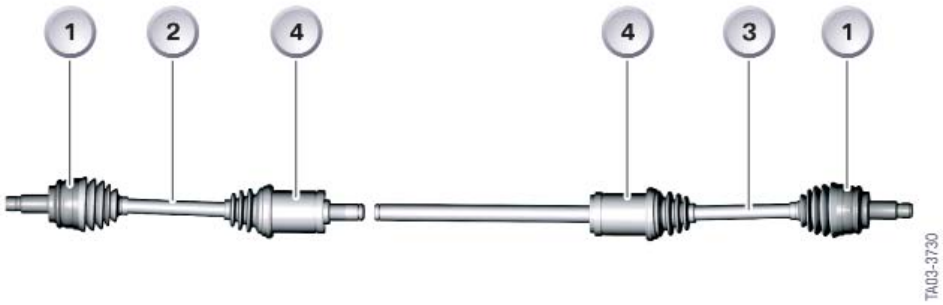
Rear Output Shafts
The rear output shafts have sliding joints for length compensation on both wheel side (1) and axle side (2).

Note: There is a difference in shaft tube length of approximately 54 mm between the right and left output shaft.



Front Output Shafts

The locking angle of wheel side fixed joint (1) is 50°. The axle side joint (4) slides to compensate for differences in length caused by suspension/axle movements.



1. Constant velocity joint (fixed joint), wheel side
2. Front left output shaft
3. Front right output shaft
4. Triple roller joint (sliding joint), axle side

Notes: