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# Powertrain

Model: E70

Production: From Start of Production

# OBJECTIVES

After completion of this module you will be able to:

- Describe the E70 Powertrain
- Understand changes to the X-drive Transfer Case

## Transfer Case, Axles and Output Shafts

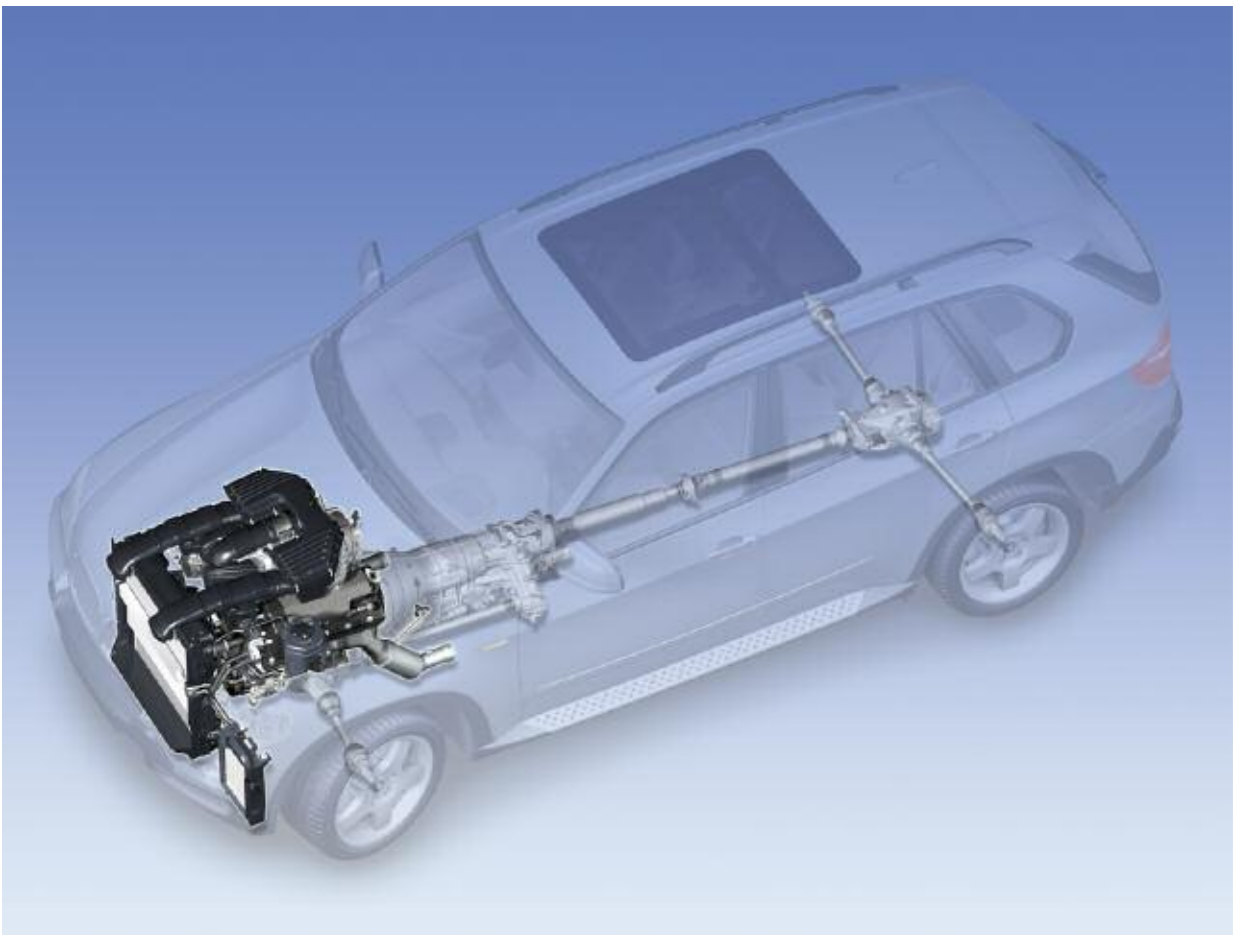
In many aspects, the transfer box, axle drive units, propeller shafts and the output shafts in the E70 represent a further development of known components and technologies.

One of the main objectives of this development was to increase efficiency in the drive train.

### Changes

Changes and modifications have been made to the known transfer box, axle drive and shaft systems in the E70:

- Re-engineered transfer box
- New front axle gearbox
- Final drive unit with optimized friction loss
- Propeller shaft fitted in a plug-on arrangement to the final drive unit
- Output shafts fitted in a plug-on arrangement to the final drive unit



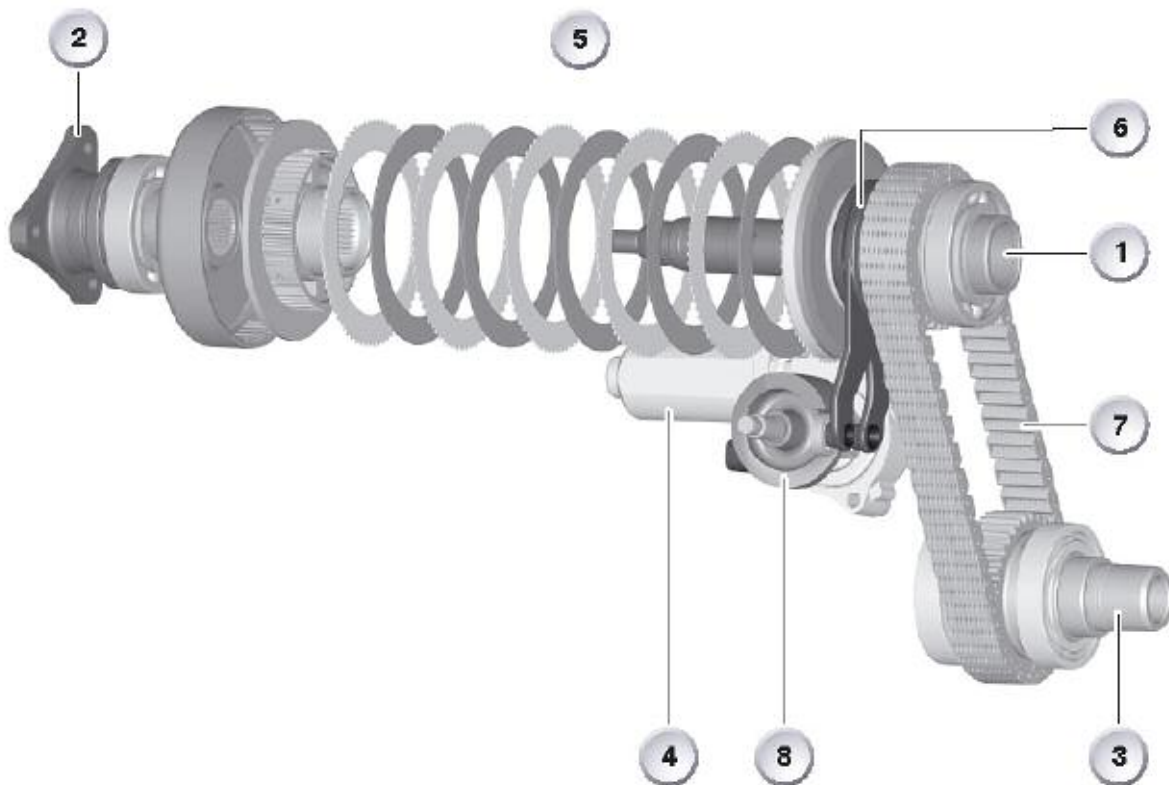
## Transfer Box ATC700

The transfer box ATC700 is a further development of the ATC500 that was fitted in the E53. The power is output via a chain to the propeller shaft to the front axle and apportioned by a multi-disc clutch.

The torque transmission efficiency of the multi-disc package has remained the same compared to the ATC500.

Only slight changes have been made compared to the ATC500.

- Installation position of coding resistor
- Optimized lifetime gear oil
- New ventilation system
- Transfer box control unit (VGSG).



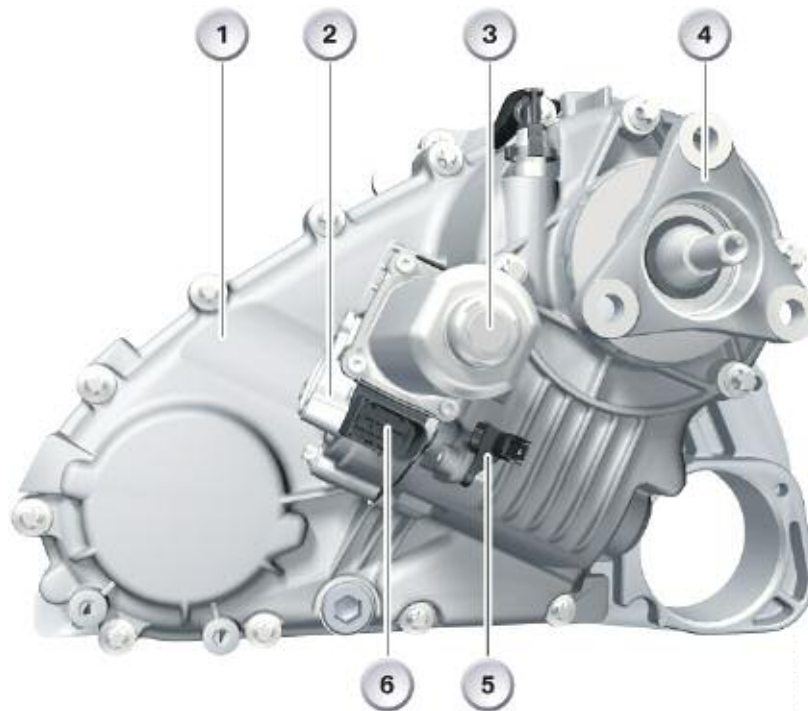
Index	Explanation	Index	Explanation
1	Input from automatic gearbox	5	Multi-disc package
2	Output to rear axle	6	Actuator lever with ball ram
3	Output to front axle	7	Chain
4	Actuator motor	8	Control wheel

## Coding Resistor

The locking power characteristic of the multi-disc clutch can vary slightly due to the mechanical tolerances in the production process. After measuring the actual locking power on the clutch test rig, a resistor is fitted to the actuator motor with its value representing a reference regarding the progression of the locking power.

Every time the engine is started, the transfer box control unit measures the resistance and correspondingly selects the optimum characteristic map for the installed transfer box.

To facilitate accessibility, the coding resistor is no longer fitted on the casing of the worm drive but rather on the casing of the transfer box.



Index	Explanation	Index	Explanation
1	Transfer box casing	4	Flange to rear propeller shaft
2	Worm gear casing	5	Coding resistor
3	Electric motor	6	Connectors

### ■ Transfer Box Control Unit

The transfer box control unit is known from the E60 and E90 all-wheel drive models. It has a new housing that is not water-tight. It is arranged under the luggage compartment floor on the left next to the battery.

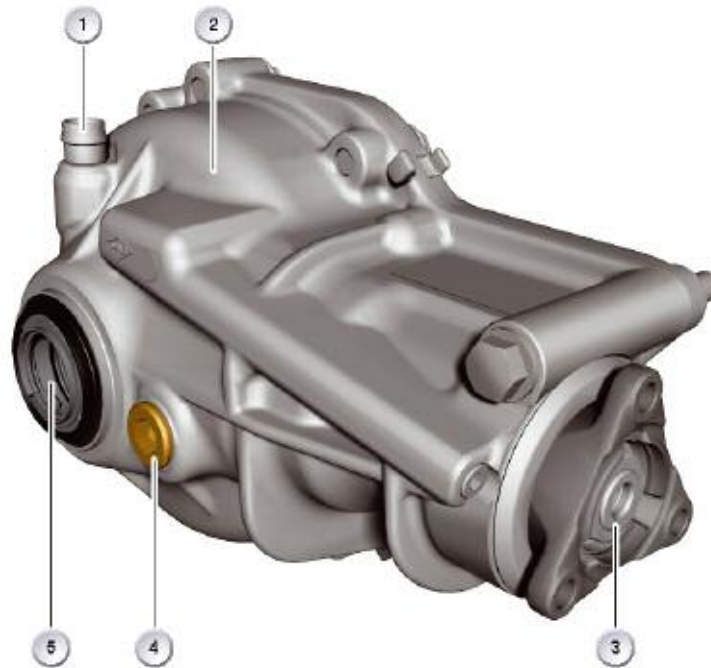
## Axle Drive

### Front Axle Gearbox VAG180A

The front axle gearbox is a new design with an aluminum casing. As before, it is centered and mounted as part of the oil pan. In terms of function, the front axle gearbox remains the same as that in the E53 predecessor.

Two different drive flange variants are used for 6-cylinder and 8-cylinder engines.

- In connection with the N52B3001 engine, the propeller shaft is connected by means of a flexible coupling to the front axle gearbox.
- In connection with the N62B4801 engine, the propeller shaft is pivoted further downward due to the catalytic converters.



Index	Explanation	Index	Explanation
1	Ventilation connection		Oil drain plug
2	Casing		Output flange
3	Drive flange		

The front axle gearbox is adapted accordingly. For this reason, a universal joint is used as the drive flange in this case. The oil filler and drain plug is located in the same position as on the E53. The filler pipe is now equipped with a quick-release coupling.

The E70 with the N52B3001 engine is equipped with the familiar final drive unit HAG188K. The HAG188L is fitted on the E70 with N62B4801 engine. The use of angular contact ball bearings reduces friction loss and heat generation.

## Final Drive Unit HAG188K/188L

The final drive unit (rear axle differential) HAG188K is already known from the previous model series. The HAG188L represents a further development that is fitted on the E70 with N62B48O1 engine.

The output shafts are now also fitted in a plug-on arrangement to the final drive unit as known from the front axle gearbox of the E53. Since there is now no flange for the output shafts, the final drive unit is supplied without an oil fill for replacement purposes.

As on the front axle gearbox, a plastic ring protects the shaft seal while installing the output shaft. This ring must then be removed after installation.

The propeller shaft is also fitted in a plug-on arrangement to the final drive unit and therefore also has no drive flange. Instead, the SAE gearing of the drive pinion extend out of the casing of the final drive unit. The propeller shaft is fitted onto the spline.



Index	Explanation	Index	Explanation
1	Drive pinion	3	Output flange
2	Casing		

### ■ HAG188L

Angular contact ball bearings are used in the HAG188L instead of the taper roller bearings in the HAG188K. The ball bearings greatly reduce friction losses. In addition to contributing to lowering fuel consumption, this measure also reduces power loss in the thermal balance of the axle drive.

The HAG188L is 7.5 mm longer than the HAG188K. In view of the heat generated as the result of the higher load, the HAG188L final drive unit is installed in connection with the N62B48O1 engine.

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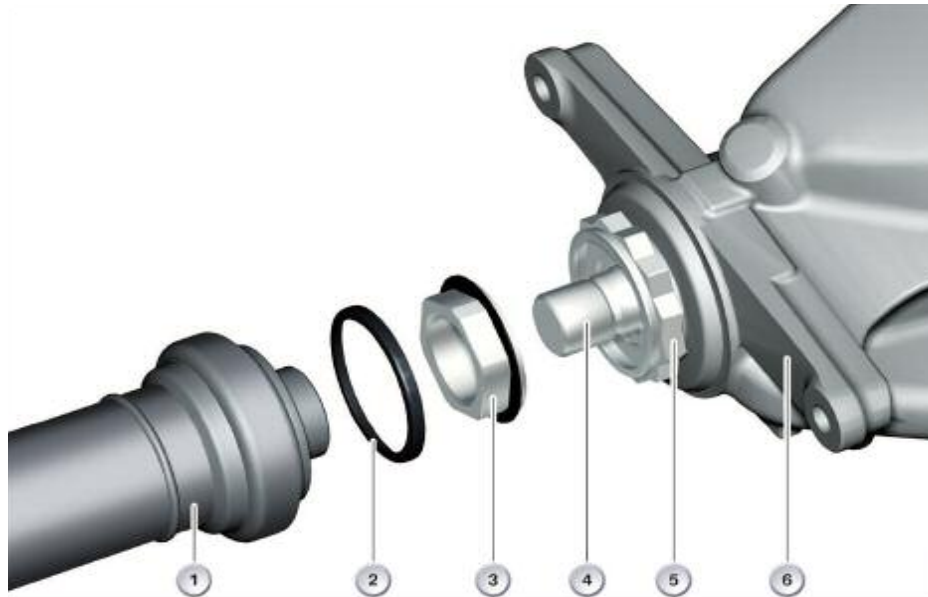
## Shafts

### Propeller Shafts

A new connection arrangement of the rear propeller shaft to the final drive unit (rear axle differential) is used on the E70. The constant velocity joint of the propeller shaft is now bolted to the flange of the final drive unit but rather it is fitted onto the unit.

This arrangement offers various advantages:

- Reduced overall size
- Improved balance characteristics
- Shorter assembly time
- Quieter running
- Higher torsional rigidity



Index	Explanation	Index	Explanation
1	Propeller shaft	4	Drive pinion
2	Retaining clip	5	Flange nut
3	Nut	6	Casing of final drive unit

The rear propeller shaft in the E70 is fitted onto the final drive unit. This arrangement provides many advantages regarding function and assembly.

The output shafts are also fitted in a plug-on arrangement to the final drive unit as already known from the front axle gearbox.



### Output Shafts

The rear output shafts are now fitted in a plug-on arrangement to the final drive unit as already known from the front output shafts. The two gaiters on the constant velocity joints cannot be replaced.

The housings of the constant velocity joints for the front and rear output shafts are no longer powder-coated but now have a bright finish.



Index	Explanation	Index	Explanation
1	Shaft end at final drive unit	4	Gaiter
2	Constant-velocity joint (gearbox end)	5	Constant-velocity joint (wheel end)
3	Gaiter	6	Shaft end at wheel