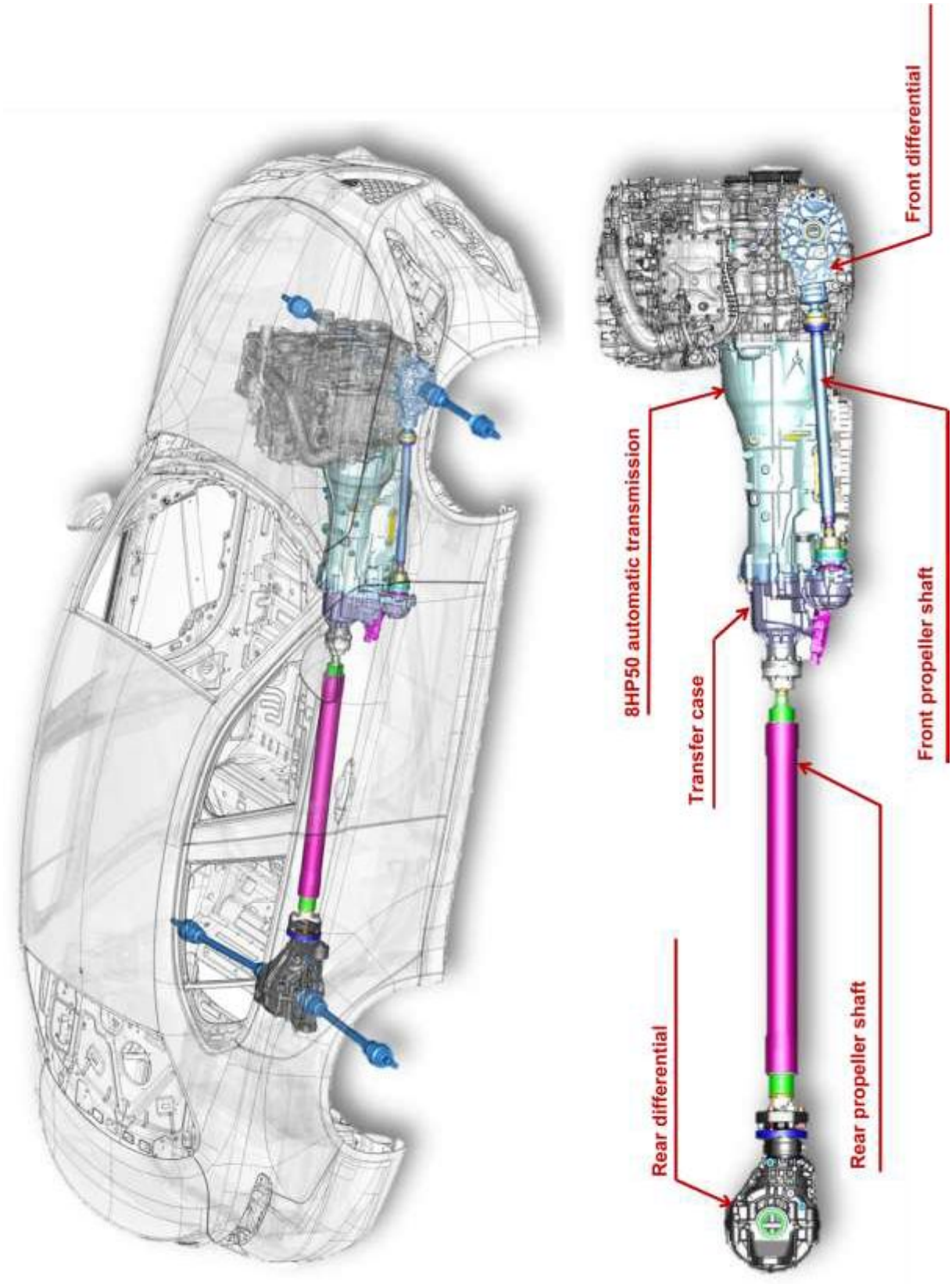
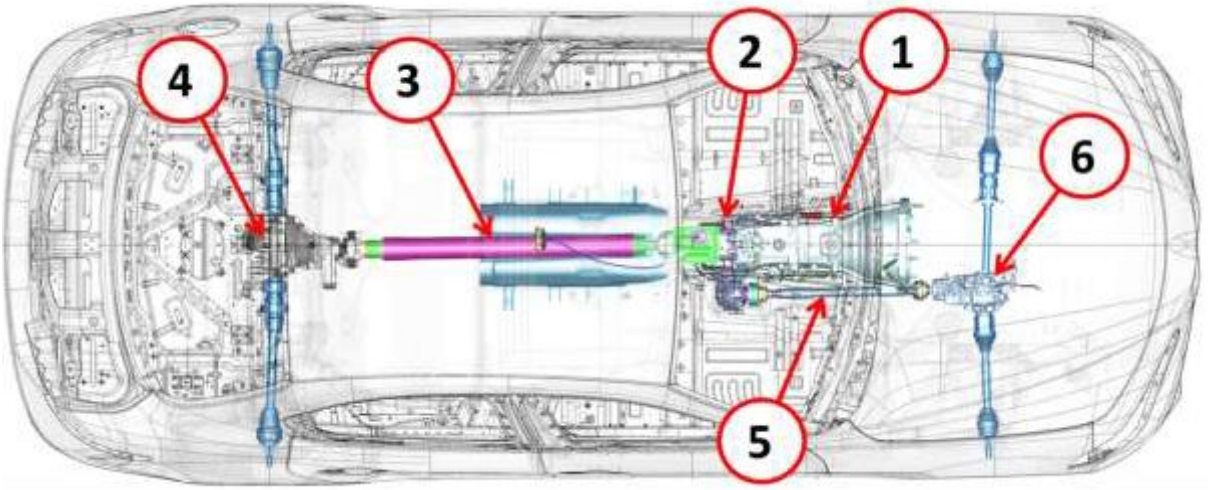
TRANSMISSION COMPONENTS



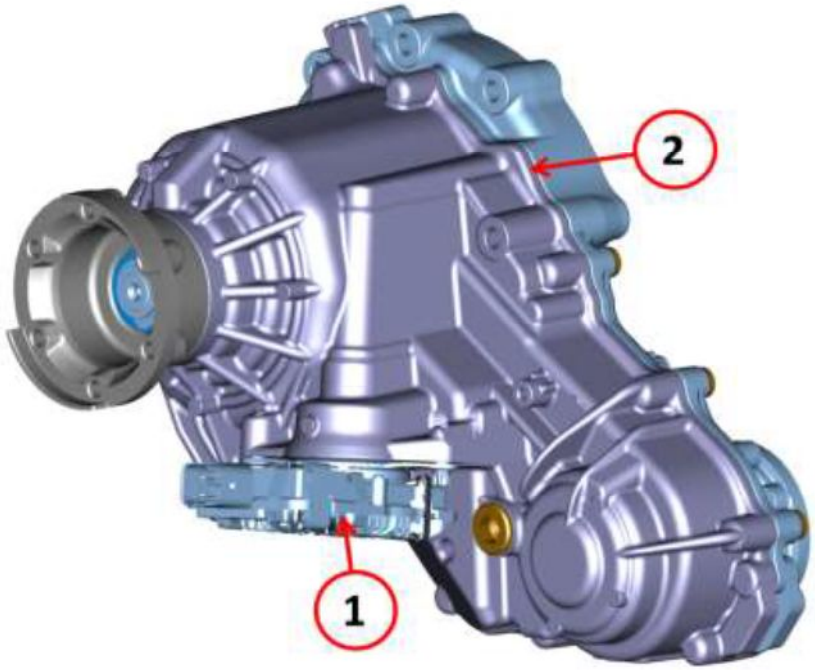
Q4 SYSTEM



Key:

1 - 8HP automatic transmission
2 - Transfer case
3 - Rear propeller shaft
4 - Rear differential
5 - Front propeller shaft
6 - Front differential

The vehicle's Q4 drive system is composed of an electronically controlled transfer case (to distribute the torque from the gearbox), a rear differential, a front differential and two transmission shafts.



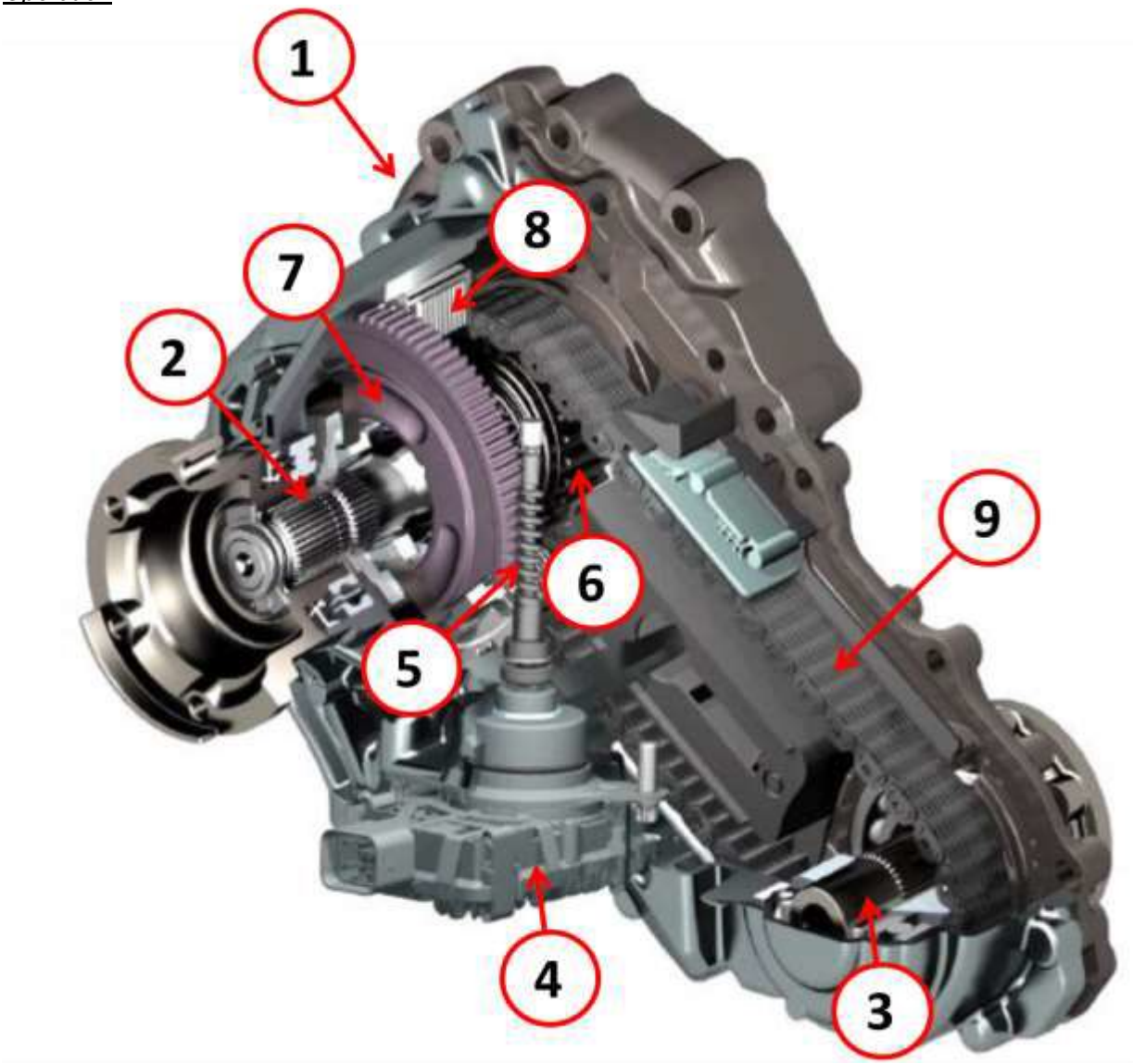
Key:

1 - DTCM control module
2 - Transfer case

The DTCM is installed on the transfer case, which also includes the control actuator to transfer the torque to the front axle.

Transfer case

Operation



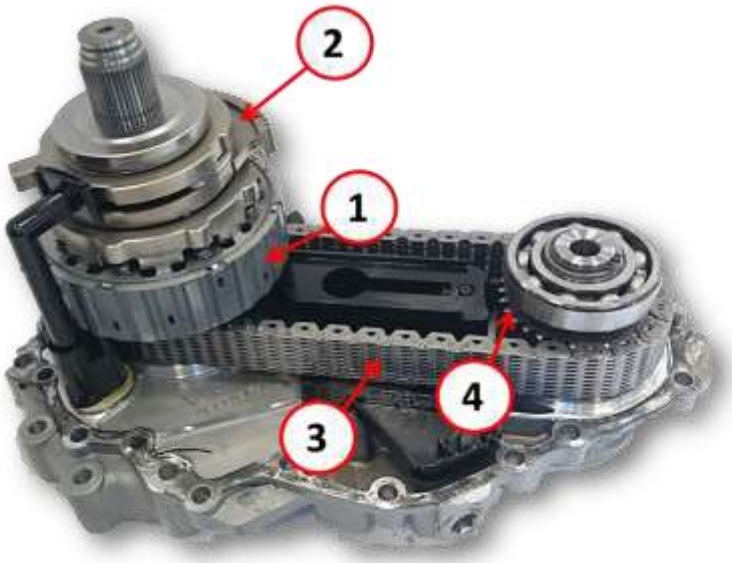
Key:

1 - Transfer case
2 - Input shaft
3 - Output shaft
4 - DTCM control module
5 - Worm gear
6 - Idler gear
7 - Ramp drive ring
8 - Bell housing and clutch plates
9 - Chain

The transfer case is supplied by MAGNA. Two aluminium shells enclose the input shaft, the output shaft and the parts needed to transfer the torque to the front axle

The torque is transferred to the front axle as the two shafts have sprockets united by a chain.

The sprocket on the input shaft is idle and fixed to the clutch plate bell housing. When the clutch plates are closed, controlled by the DTCM, the idler wheel is connected to the input shaft because the clutch plates are fixed to the input shaft when the steel discs, interposed between the clutch plates, are fixed to the bell housing.



Key:

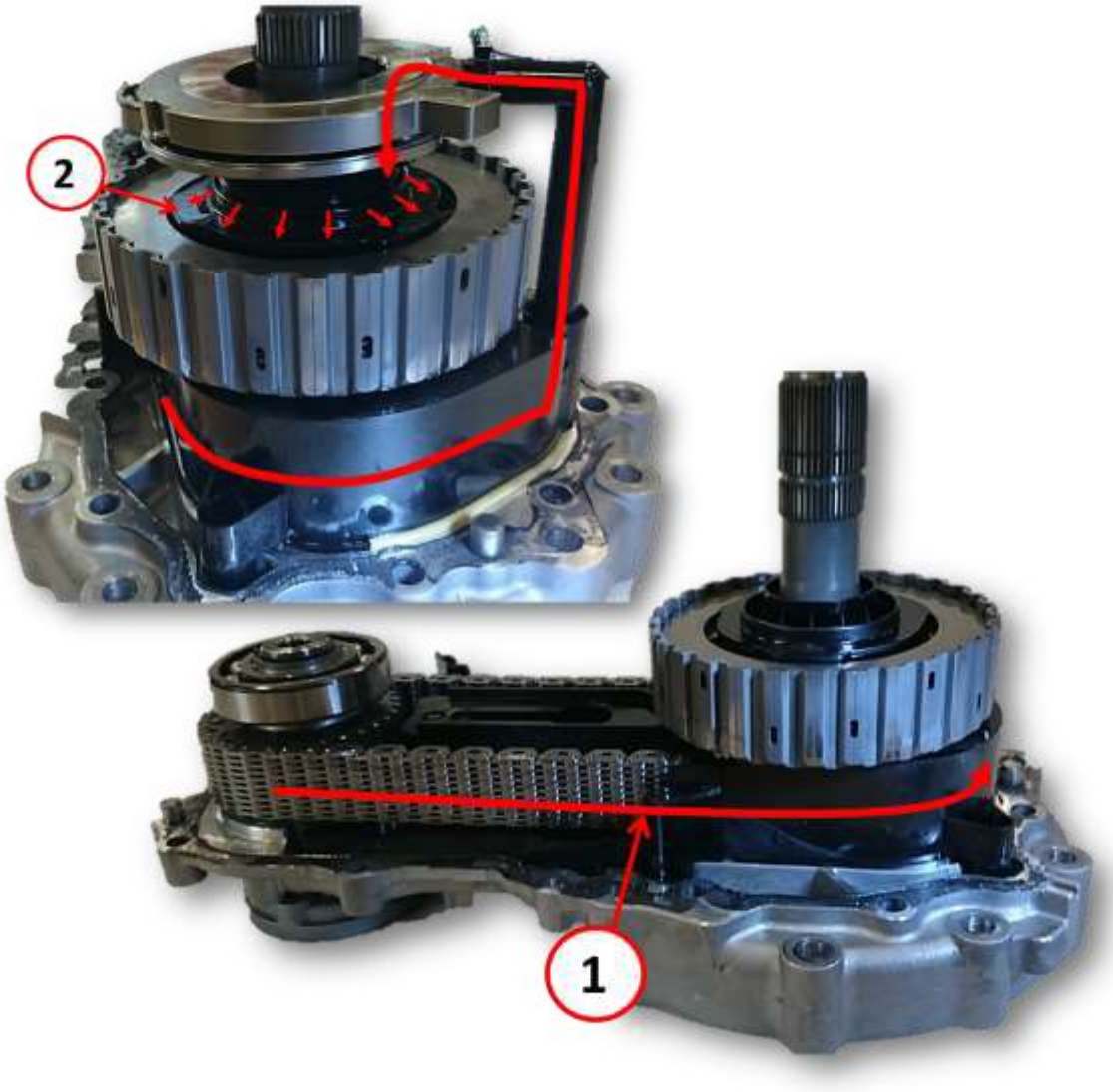
1 - Clutch bell housing
2 - Lower ramp drive ring
3 - Chain
4 - Sprocket on the output shaft

When engagement of front axle traction is requested, the control module commands the actuator that will drive a system of ramps and balls to close the clutch pack to connect the input shaft to the idler wheel, which can thereby transmit the torque to the output shaft

Key:

1 - Input shaft
2 - Bell housing
3 - Point at which the clutch plates are fastened to the input shaft
4 - Steel discs

The gear ratios are different between the front axle and the rear axle. The difference in rotation speed between the two axles is dissipated by the clutch plates slipping. This feature is called “overslip”. The maximum overslip that can be achieved is 2.5%.
Because of the overslip, the clutch plates must be continuously lubricated. As the chain moves, it transfers a quantity of oil by means of a plastic conveyor, delivering it to the plates and preventing them from being damaged by overheating.
The conveyor allows the oil to reach a distributor, made of plastic, which is fastened to the input shaft and located inside the bell housing. The distributor's rotation distributes the oil homogeneously inside the bell housing and therefore to the plates.



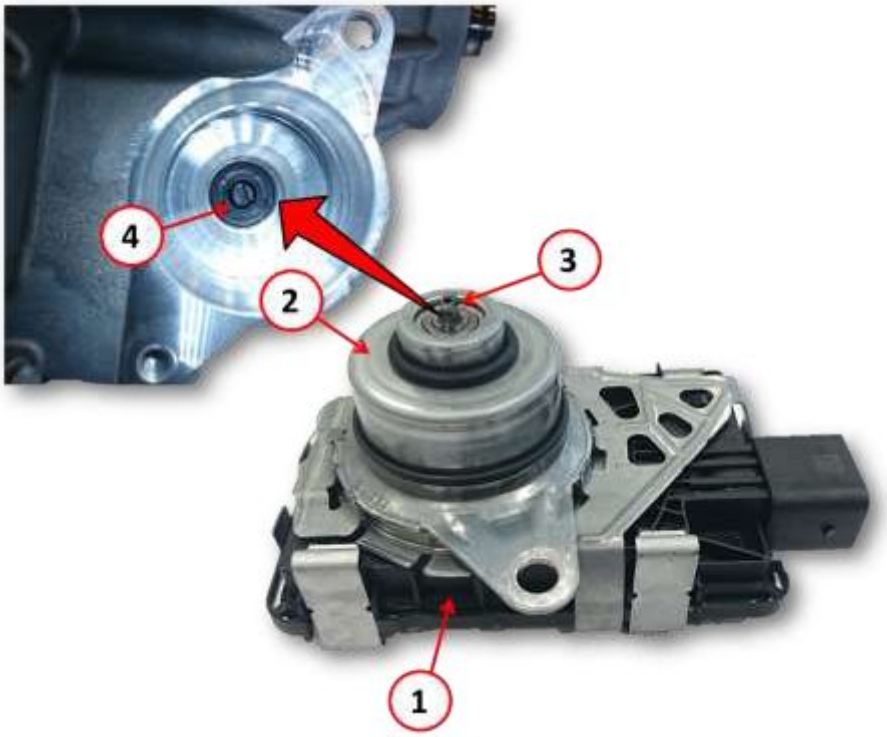
Key:

1 - Oil flow
2 - Oil distributor

System of ramps and balls

Operation

The DTCM has a built-in electric motor, which turns on command.
When the motor turns, it moves the worm gear that enters through the transfer case shell.

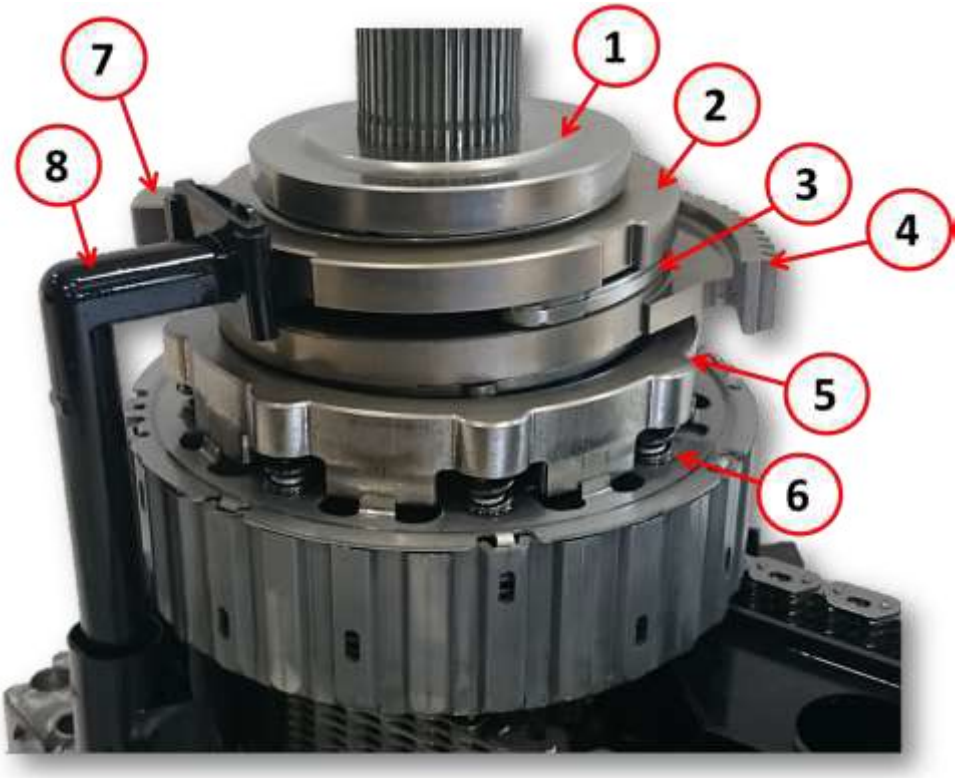


Key:

1 - DTCM control module
2 - Electric motor
3 - Connection with the worm gear
4 - Worm gear

Key:

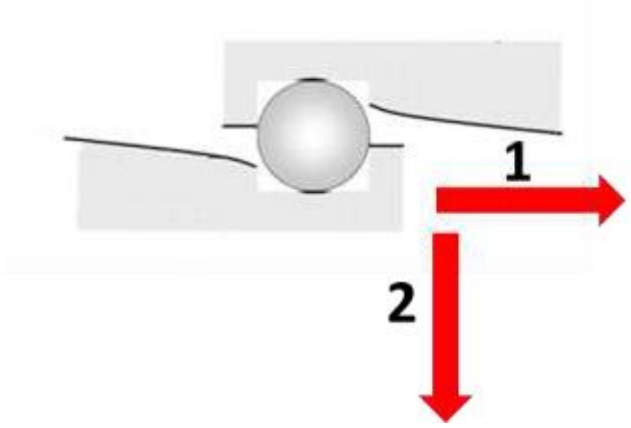
1 - Worm gear



Key:

1 - Bearing
2 - Upper ramp drive ring
3 - Ball bearing
4 - Worm gear contact teeth on the lower ramp drive ring
5 - Clutch pressure plate
6 - Springs
7 - Tooth for fixing the upper ring too the transfer case shell
8 - Oil conveyor for lubricating the clutch plates

The worm gear only contacts the lower ramp drive ring, while the upper ring cannot turn because it is fixed to the transfer case shell. When the worm gear rotates, it moves the two ramp drive rings.
The balls are interposed between the two rings. As they slide along the ramps, the balls transform the rotary movement of the input ring into an axial movement of the output ring.
The axial movement of the output ring compresses the clutch pack.



Key:

1 - Lower ring rotation
2 - Lower ring movement

Main components of the clutch pack drive

Upper ramp drive ring

Key:

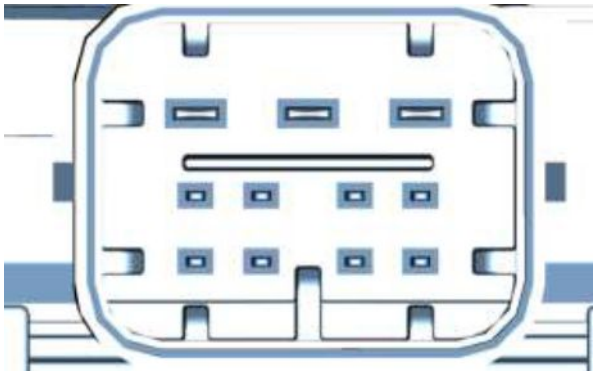
1 - Ball bearing
2 - Balls
3 - Upper ring ramps
4 - Tooth for locking the upper ring
5 - Oil conveyor for lubricating the clutch plates

Lower ramp drive ring

Key:

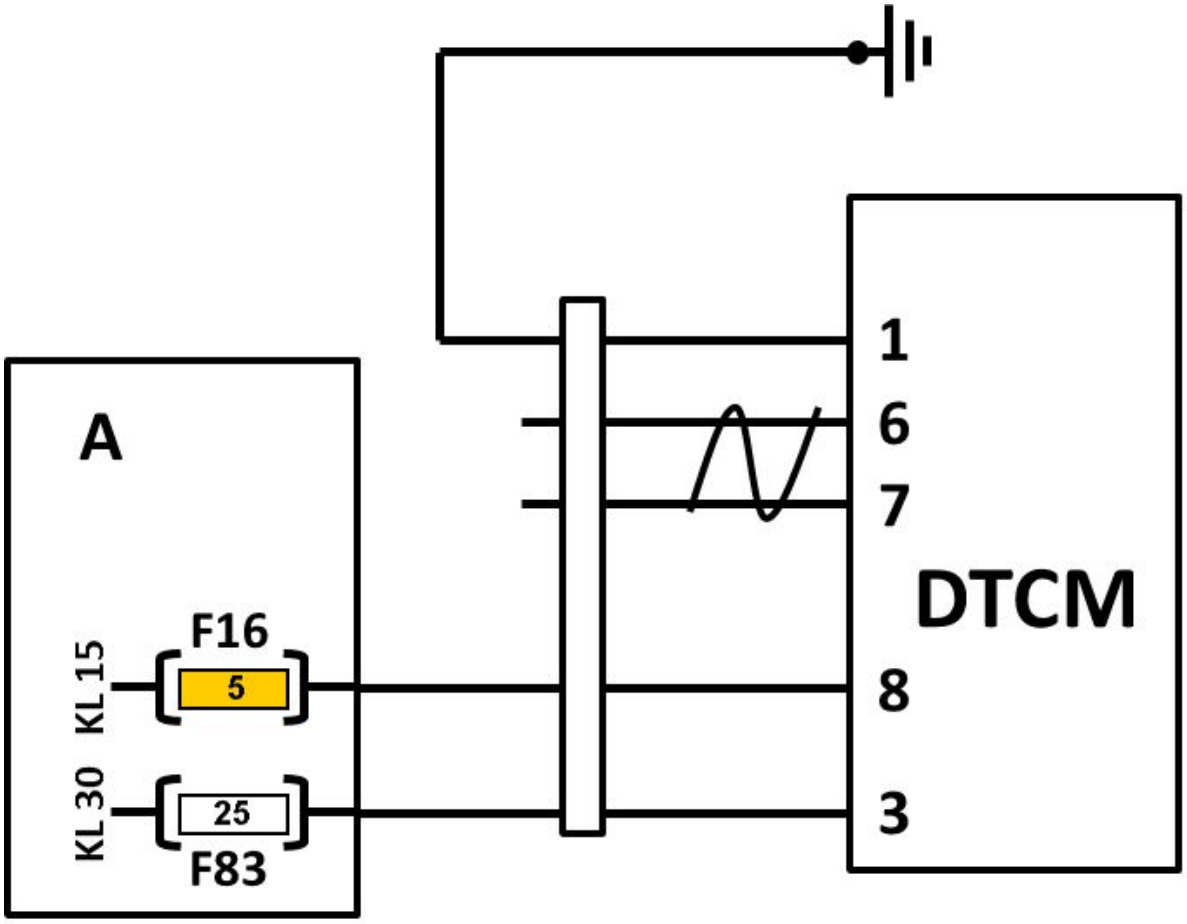
1 - Lower ring ramps
2 - Teeth for the worm gear

DTCM pin-out



Pin	Function
1	Earth
3	KL 30 power supply
6	Can C1 H
7	Can C1 L
8	KL 15 power supply

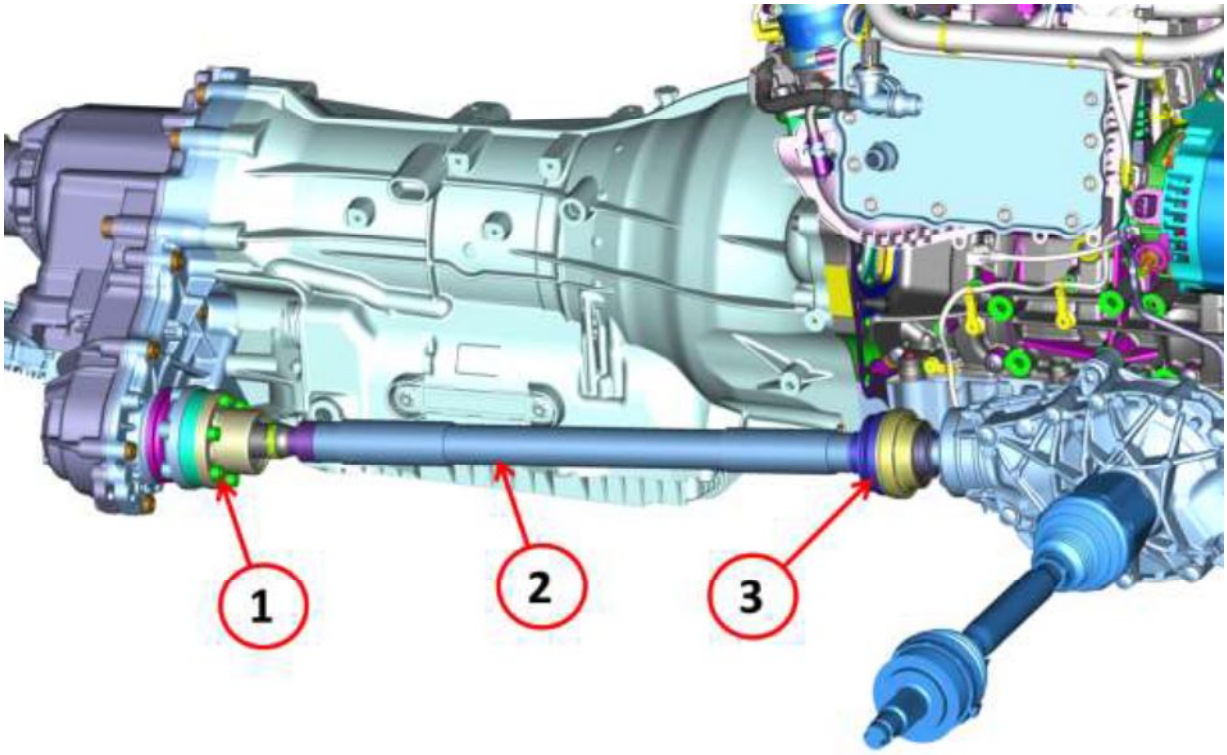
DTCM wiring diagram



Key:

A- Front PDC

Front transmission shaft



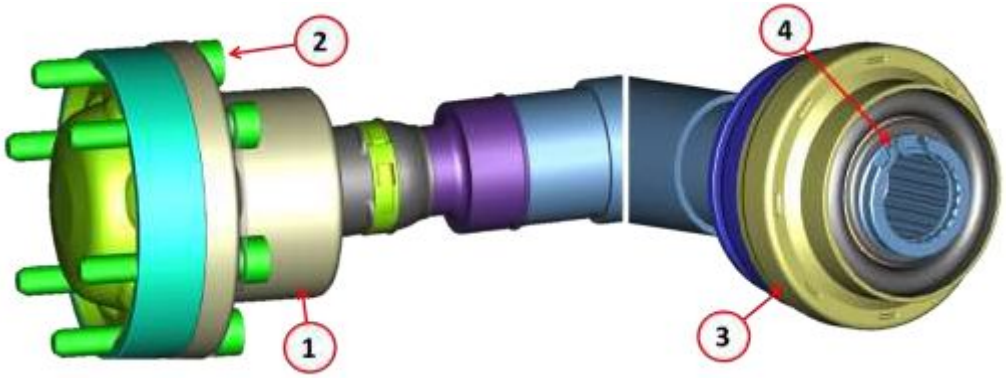
Key:

1 - Transmission shaft joint on the transfer case
2 - Propeller shaft
3 - Joint on the front differential

The front transmission shaft is made of steel and is manufactured by GKN.
Technical data

- Shaft length 642 mm
- Diameter 36 mm
- Weight ~3.7 kg

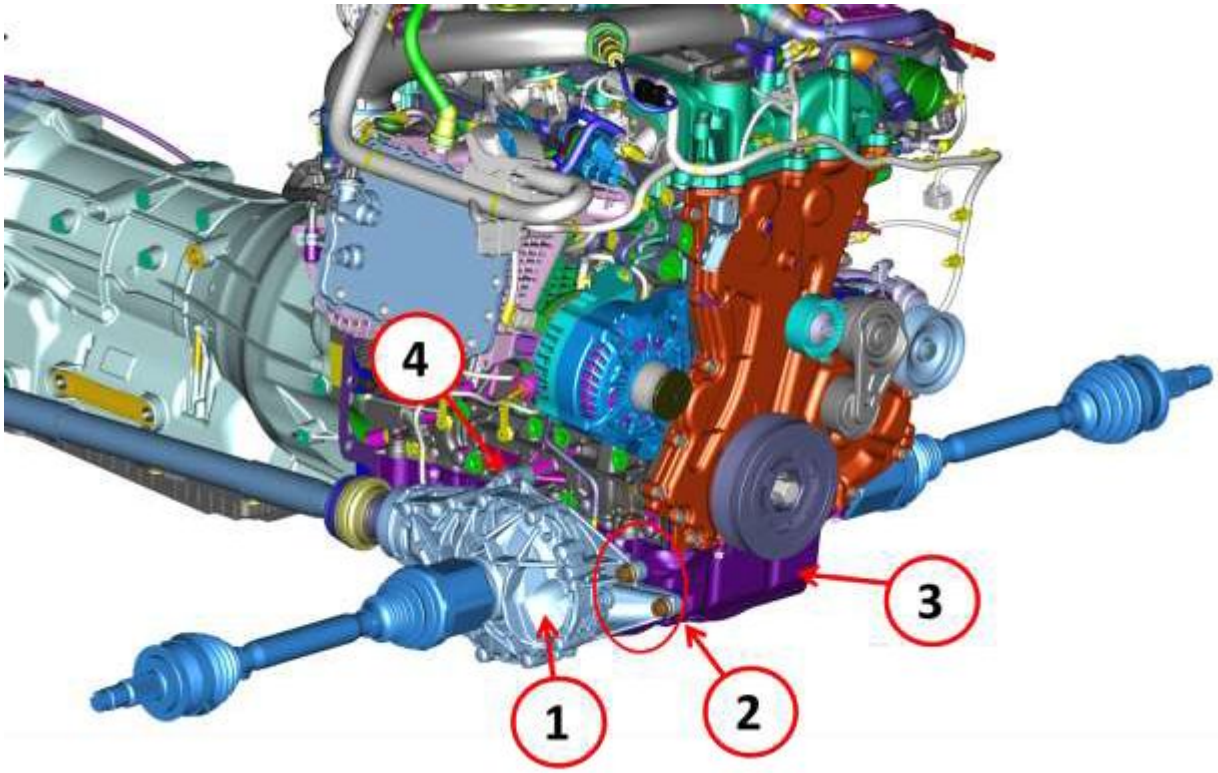
The two joints are welded to the ends. The transfer case joint is fixed to the output shaft by screws, while the second joint has a pinion that engages with the front differential and is locked with a circlip.



Key:

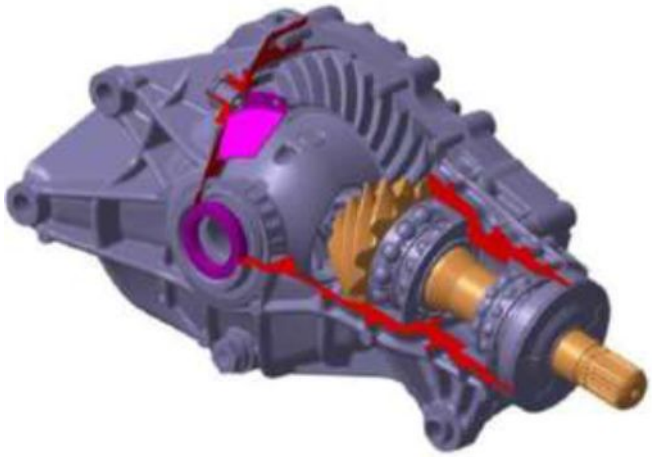
1 - Joint on the transfer case differential
2 - Fixing screws
3 - Joint on the front differential
4 - Pinion locking circlip

Front differential



Key:

1 - Front differential
2 - Fastening of the differential to the engine oil sump
3 - Engine oil sump
4 - Fastening of the differential to the crankcase

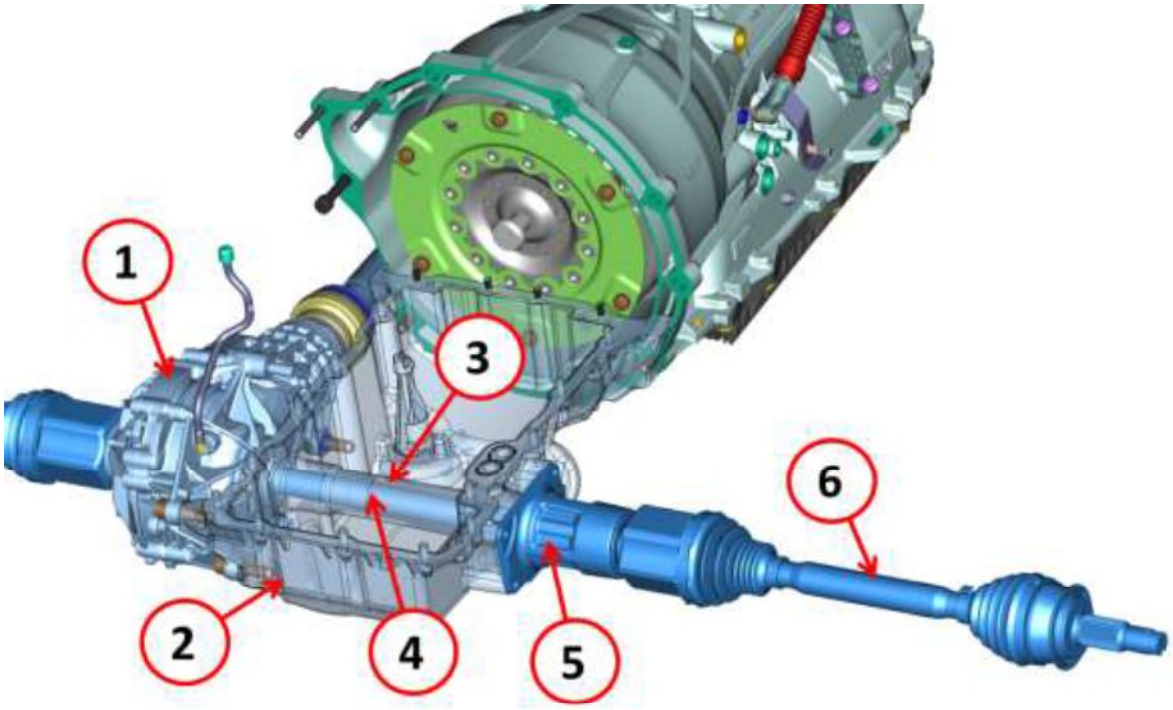


The front differential is of the open type and is manufactured by the supplier Magna.
The gear ratio is:

- 3.22 for diesel engines
- 3.67 for petrol engines

With a total weight of about 12.5 kg

Front differential location and fastening



Key:

1 - Differential
2 - Oil sump
3 - Duct in the sump for the intermediate shaft
4 - Intermediate shaft
5 - Intermediate shaft bearing mount
6 - Axle shaft

The differential is fastened to both the engine block and the oil sump by screws. Due to the fastening position of the differential, the engine oil sump on petrol and diesel engines have been changed with respect to the RWD version.
On the oil sump, in addition to the fastening point for the differential, there is a duct that allows the intermediate shaft to pass.
The intermediate shaft is connected to the left side gear of the differential, passes through the duct in the oil sump and connects to the bearing mount, fixed on the opposite side of the oil sump.
The left axle shaft tripod joint is on the intermediate shaft bearing mount.