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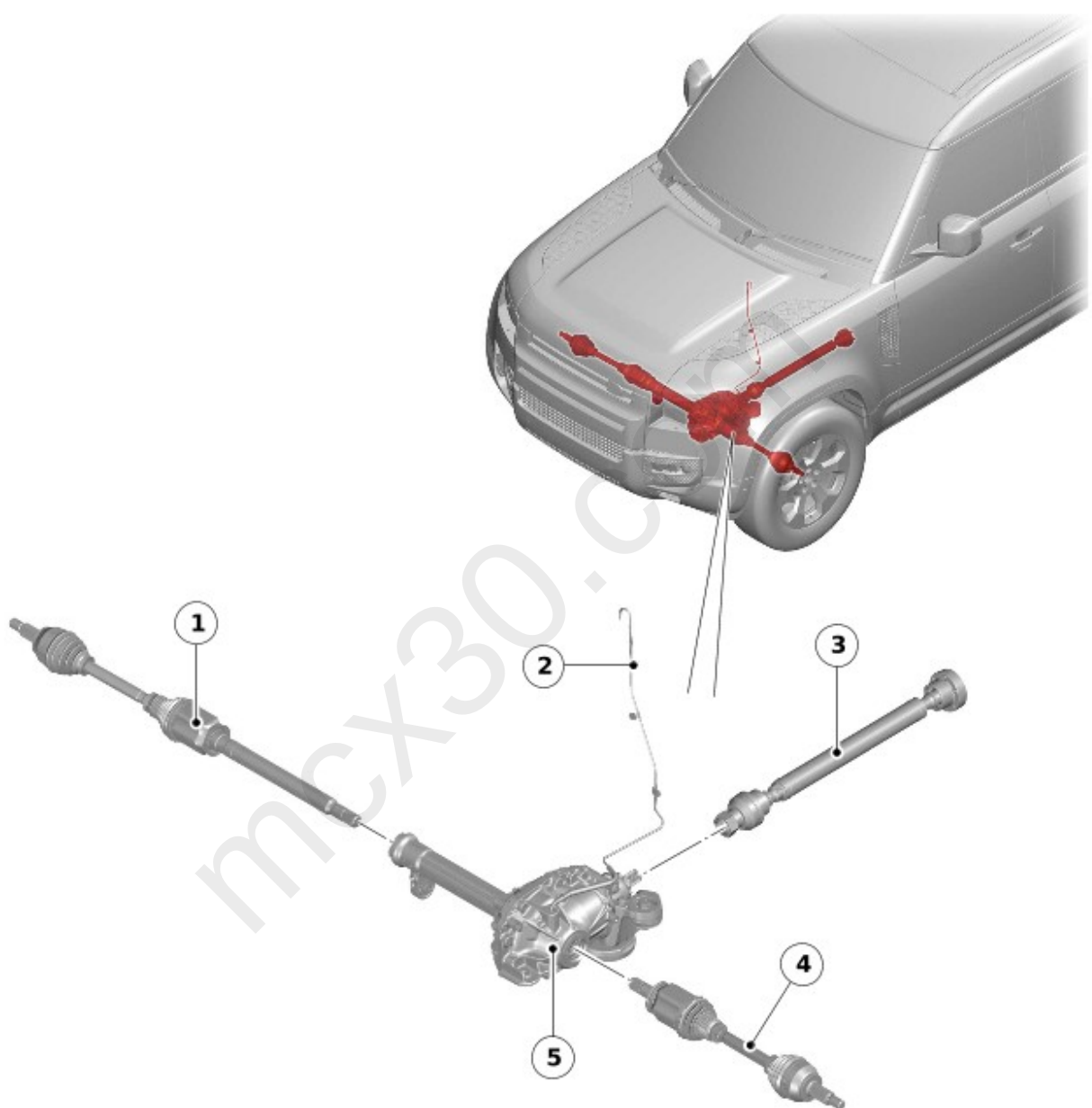
FRONT DRIVE AXLE/DIFFERENTIAL

FRONT DRIVE AXLE AND DIFFERENTIAL (G2341730)

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DESCRIPTION AND OPERATION

COMPONENT LOCATION



E250144

ITEM	DESCRIPTION
1	Front right halfshaft
2	Breather tube
3	Front driveshaft

ITEM	DESCRIPTION
4	Front left halfshaft
5	Front differential

OVERVIEW

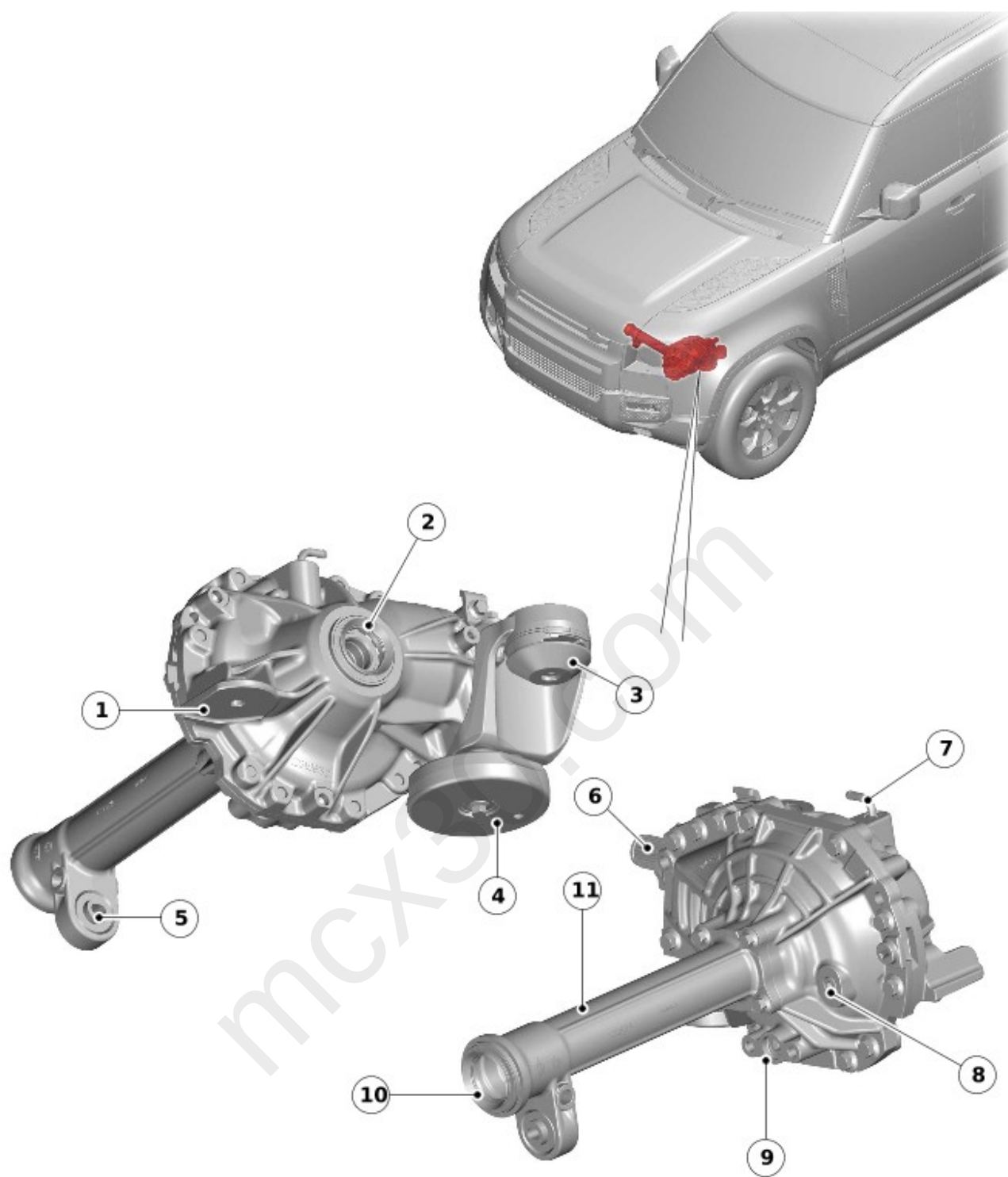
The front differential has two functions:

- to convert the 'angle of drive' through 90° and distribute drive, via the front drive halfshafts, to the front wheels.
- to compensate for differences in the rotational speeds of the vehicle's front wheels during cornering.

The front differential is mounted upon the front subframe on three mounts. The differential has a pinion nose bracket situated at the rear left, which incorporates a bush with a limiter washer. The differential is bolted through this bush into the subframe. The front left hand mount has the bush situated in the subframe. The differential has a tube on the right side of the differential carrier, this tube limits the torque steer.

DESCRIPTION

Front Differential External View

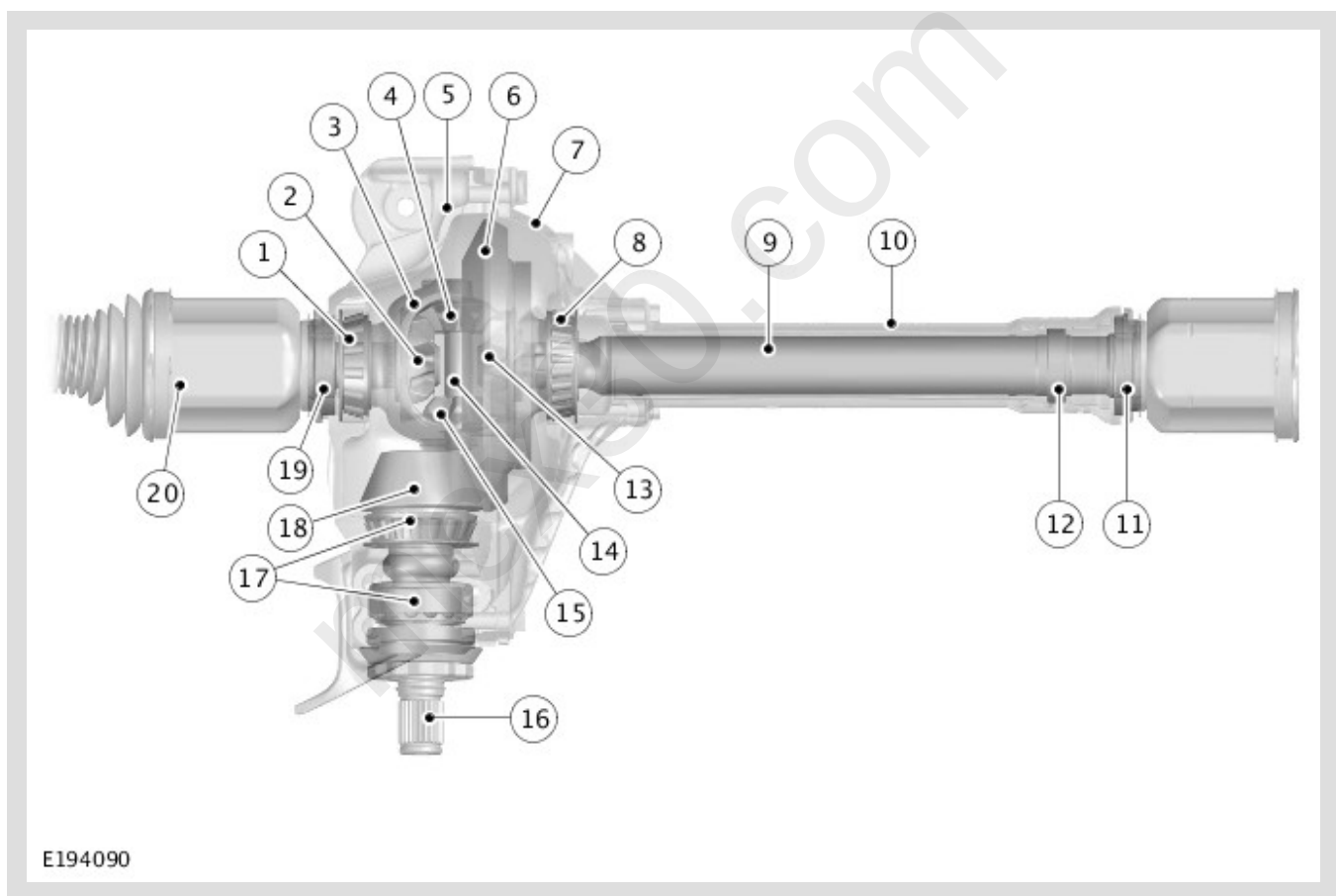


E250145

ITEM	DESCRIPTION
1	Front left mounting point
2	Halfshaft oil seal
3	Rear mounting bush

ITEM	DESCRIPTION
4	Noise, Vibration and Harshness (NVH) damper
5	Front right mounting bush
6	Pinion shaft
7	Breather
8	Filler/Level plug
9	Magnetic drain plug
10	Halfshaft oil seal
11	Right halfshaft carrier tube

Front Differential Sectional View



ITEM	DESCRIPTION
1	Left differential case bearing
2	Sun gear
3	Differential case
4	Planet gear

ITEM	DESCRIPTION
5	Carrier
6	Crown wheel
7	Cover
8	Right differential case bearing
9	Front right halfshaft
10	Right halfshaft carrier tube
11	Right halfshaft seal
12	Right halfshaft support bearing
13	Sun gear
14	Planet gear shaft
15	Planet gear
16	Pinion shaft
17	Pinion shaft bearing (quantity 2)
18	Pinion gear
19	Left halfshaft seal
20	Front left halfshaft

The casing comprises two halves with machined mating faces. When assembled, the alloy casing halves are sealed with a thin film of recommended sealant and secured together with 14 bolts. The left casing is the carrier for all the rotating parts and the right casing is a cover to close the unit and a support for the right carrier bearing. A breather tube is fitted to the carrier. This allows a plastic tube to be fitted and routed to a high point in the engine compartment, preventing the ingress of water when the vehicle is wading.

The differential is a conventional design using a hypoid gear layout. This employs a hypoid bevel pinion gear and crown wheel, with the pinion offset above the center line of the crown wheel. This design allows for a larger pinion gear to be used, which has the advantages of increased gear strength and reduced operating noise.

The output ratio of the front differential varies depending on the engine variant.

For additional information, refer to: [Specifications](#) (205-03 Front Drive Axle/Differential, Specifications).

The ratio is changed by changing the amount of teeth between the crown wheel drive gear and pinion gear. For example, with a ratio of 3.21:1, the crown wheel drive gear will have 3.21 times more teeth than the pinion gear.

The differential comprises a pinion shaft and hypoid bevel gear, a crown wheel drive gear with an integral cage, which houses two planet gears. Two sun gears are also located in the differential case and pass the rotational drive to the drive halfshaft shafts.

The spacer is used to hold the bearings in alignment and collapses at a predetermined rate due the torque applied to the pinion nut. The remaining load is carried as preload in the bearings and is set with the pinion nut to give the desired assembly torque-to-turn. This can only be performed during first assembly when new bearings are coated with friction modifier.

An oil seal is pressed into the left casing and seals the input flange to the differential unit. The pinion shaft has a hypoid bevel gear at its inner end, which mates with the crown wheel drive gear.

The crown wheel drive gear is located on the differential case and secured with 10 screws. On some variants of the differentials the crown wheel drive gears are laser welded to the differential case. The differential case is mounted on taper roller bearings located in each casing half. The bearings are press fitted into the casing and a spacer is located on the outside face to apply preload to the bearing.

The differential case is fitted with a shaft onto which the two planet gears are mounted. The shaft is secured in the differential case with a roll pin. The sun gears are located in pockets within the differential case and mesh with the planet gears. Curved plates are located between the differential case and the sun gears and hold the sun gears in mesh with the planet gears. Each sun gear has a machined, splined, bore to accept the drive halfshaft. A groove is machined in the bore to locate the circlip fitted to the drive halfshaft, providing positive drive halfshaft location.

OPERATION

Rotational input from the front driveshaft is passed via the pinion shaft and pinion gear. The angles of the pinion gear to the crown wheel drive gear moves the rotational direction through 90°.

The transferred rotational motion is passed to the crown wheel drive gear, which in turn rotates the differential case. A shaft, which is secured to the case, rotates at the same speed as the case. The planet gears, which are mounted on the shaft, also rotate with the case. In turn, the planet gears transfer their rotational motion to the left and right sun gears, rotating the left and right halfshafts.

When the vehicle is moving in the straight forward direction, the torque applied through the differential to each sun gear is equal. In this condition both drive halfshafts rotate at the same speed and the planet gears do not rotate.

If the vehicle is turning, the outer wheel will be forced to rotate faster than the inner wheel by having a greater distance to travel. The differential senses the torque difference between the sun gears. The planet gears rotate on their axes to allow the outer wheel to rotate faster than the inner one.