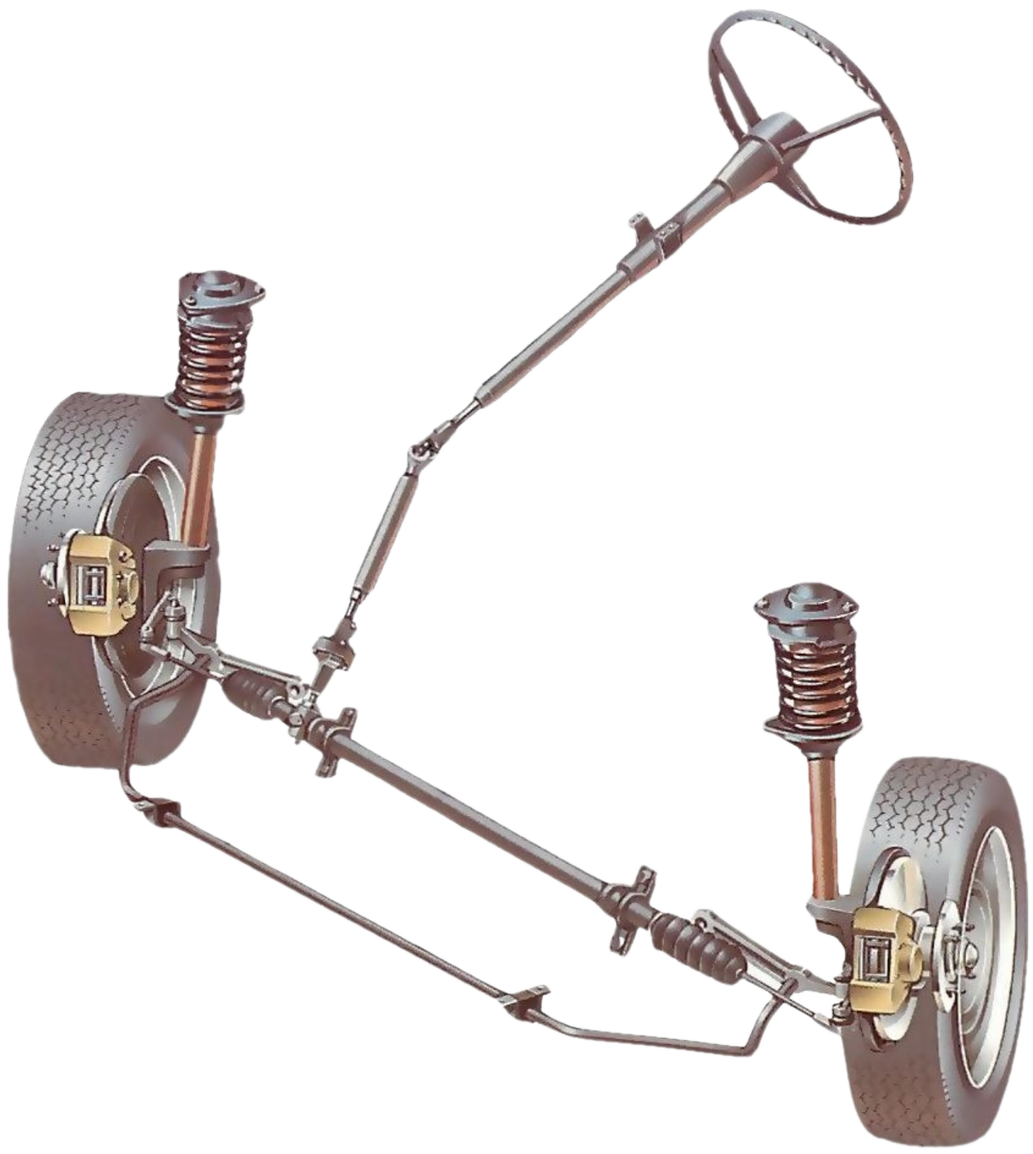
STEERING

Mechanic Steering System

The most conventional steering arrangement is to turn the front wheels using a hand–operated steering wheel which is positioned in front of the driver, via the steering column, which may contain universal joints (which may also be part of the collapsible steering column design), to allow it to deviate somewhat from a straight line. Other arrangements are sometimes found on different types of vehicles, for example, a tiller or rear–wheel steering.Tracked vehicles such as bulldozers and tanks usually employ differential steering — that is, the tracks are made to move at different speeds or even in opposite directions, using clutches and brakes, to bring about a change of course or direction.



Hydraulic Speed Sensitive Steering System

An outgrowth of power steering is speed sensitive steering, where the steering is heavily assisted at low speed and lightly assisted at high speed. The auto makers perceive that motorists might need to make large steering inputs while manoeuvering for parking, but not while traveling at high speed. The first vehicle with this feature was the Citroën SM with its Diravi layout, although rather than altering the amount of assistance as in modern power steering systems, it altered the pressure on a centring cam which made the steering wheel try to "spring" back to the straight-ahead position. Modern speed-sensitive power steering systems reduce the mechanical or electrical assistance as the vehicle speed increases, giving a more direct feel. This feature is gradually becoming more common.

Electric Steering System

Electric power assisted steering (EPS/EPAS) or motor driven power steering (MDPS) uses an electric motor to assist the driver of a vehicle. Sensors detect the position and torque of the steering column, and a computer module applies assistive torque via the motor, which connects to either the steering gear or steering column. This allows varying amounts of assistance to be applied depending on driving conditions. Engineers can therefore tailor steering-gear response to variable-rate and variable-damping suspension systems, optimizing ride, handling, and steering for each vehicle. On Fiat group cars the amount of assistance can be regulated using a button named "CITY" that switches between two different assist curves, while most other EPS systems have variable assist. These give more assistance as the vehicle slows down, and less at faster speeds.

A mechanical linkage between the steering wheel and the steering gear is retained in EPAS. In the event of component failure or power failure that causes a failure to provide assistance, the mechanical linkage serves as a back-up. When EPAS fails, the driver encounters a situation where heavy effort is required to steer. This heavy effort is similar to that of an inoperative hydraulic steering assist system. Depending on the driving situation, driving skill and strength of the driver, steering assist loss may or may not lead to a crash. The difficulty of steering with inoperative power steering is compounded by the choice of steering ratios in assisted steering gears vs. fully manual. NHTSA has assisted car manufacturers, such as Ford, with recalling EPAS systems prone to failure.

Electric systems have an advantage in fuel efficiency because there is no belt-driven hydraulic pump constantly running, whether assistance is required or not, and this is a major reason for their introduction. Another major advantage is the elimination of a belt-driven engine accessory, and several high-pressure hydraulic hoses between the hydraulic pump, mounted on the engine, and the steering gear, mounted on the chassis. This greatly simplifies manufacturing and maintenance. By incorporating electronic stability control electric power steering systems can instantly vary torque assist levels to aid the driver in corrective maneuvers.