Model all (CAR)

Overview

This document contains information on:

- **General**
- **Function requirements**
- **Function**

General

Steering makes it possible to turn the front wheels with different steer angles. An actuator motor provides the assistance force required for the servo effect and transfers it via an angled worm gear or a belt drive to the steering gear.

Function requirements

- Ignition ON (circuit 15)
- Engine in operation

Function

Electric power steering, general

The electric power steering consists of the following components:

- Rack-and-pinion steering
- Torque sensor
- Actuator motor
- Electrical power steering control unit

Electric power steering performs continuous, speed-dependent regulation of the power steering system.

The advantages compared to hydraulic power steering are:

- Improved steering feel
- Fuel saving
- Hydraulic fluid not required
- Compact design
- Speed-dependent power assistance
- Steering return is assisted
- Diagnosis capability

i On vehicles with the Direct-Steer system, a rack and pinion steering gear with variable gear ratio is used.

The Direct-Steer system has the following features:

- Agile steering behavior, particularly in urban traffic, when maneuvering or on twisty roads. This is achieved by the design of the toothed rack and as a result of the associated sharp increase in gear ratio from the center position as of approx. 6° steering angle.
- Improved comfort, especially when parking, by reducing the lock-to-lock steering wheel turns to 2.5.

Power steering

The electrical power steering control unit requires the following information to calculate the steering force assistance required:

- Current steering torque, from the torque sensor.
- Current wheel speeds. They are provided by the ESP® control unit. They are detected by the left and right front axle rotational speed sensors as well as the left and right rear axle rotational speed sensors.
- Steering wheel angle and steering speed from the steering wheel angle sensor in the steering column tube module control unit.
- Current engine speed > 400 rpm from the combustion engine control unit.

The electrical power steering control unit uses this information to calculate the assistance to be set from the stored characteristics map and actuates the electric power steering actuator motor.

The direction of rotation of the actuator motor depends on the movement direction of the steering wheel.

The actuator motor transfers the electric power steering to the rack-and-pinion steering and thus assists the driver's steering torque.

i No power steering is available on stationary vehicles with the engine and ignition switched off. With the ECO start/stop function, reduced power steering is available at standstill if the engine was switched off using the ECO start/stop function. The electric power steering is deactivated after the ignition is switched off. If the vehicle is maneuvered at a speed of at least 1.75 km/h when the engine and ignition are switched off, the power steering system is active.

Steer Assist

The steering assistance function helps the driver to achieve an optimum steering reaction in critical driving situations. Steering assistance is provided with the aid of the electrical power steering control unit and the ESP® control unit.

The following functions are performed here:

- Driver support through countersteering for a vehicle with oversteer
- Driver support for braking on varying road surfaces

The current driving condition is recorded by the ESP® control unit.

If necessary, the message "Steer Assist torque request" is transmitted to the electric power steering control unit, which then actuates the actuator motor.

When parking, the parking system control unit (with CODE 220 (PARKTRONIC) or with CODE 235 (Active Parking Assist with PARKTRONIC)) transmits the following signals to the electrical power steering control unit:

- Current status of parking system control unit
- Vehicle stop signal, at which the vehicle stops at a maneuver point during the parking process
- Requested toothed rack position

The following signals are transmitted by the electrical power steering control unit to the parking system control unit (with CODE 220 (PARKTRONIC) or with CODE 235 (Active Parking Assist with PARKTRONIC)):

- Current status of the electrical power steering control unit

Reducing holding torque

If a holding torque is applied by the driver when driving the vehicle straight ahead, e.g. for crosswind or on a roadway inclined on one side, the electrical power steering control unit detects it. The applied holding torque is partially compensated for by the electric power steering.

To rule out incorrect compensation (e.g. highway bend with large radius), the electrical power steering control unit receives the turn rate (vehicle speed about the vertical axis) as well as the vehicle's lateral acceleration from the ESP® control unit.

The reduction of the vehicle's holding torque depends on the speed.

Limp-home mode

When the electrical power steering is switched on (via circuit 15 ON), the electric power steering control unit carries out a self-test. If a fault is detected, the electric power steering does not switch on. The vehicle can be steered by hand with increased force.

During operating status, the electrical power steering control unit checks the signals from the torque sensor. If these signals are outside of a defined upper or lower limit, the support of the steering is switched off by the electrical power steering control unit. The vehicle can be steered by hand with increased force.
The electric power steering control unit transmits the request for a warning message to the instrument cluster.
The multifunction display of the instrument cluster then shows the warning message "Power steering defective! Service Required".

	Function schematics		
	Function schematic for electric power steering	Model 118, 167, 177, 247	PE46.35-P-2500-97A
	Further basic functions		
	Mechanical steering components, basic function	Model all (CAR)	GF46.00-P-1000B
	Steering column adjustment, basic function	Model all (CAR)	GF46.15-P-1000B
	Rear axle steering, basic function	Model all (CAR) with code 201 (Rear axle steering) Model all (CAR) with code 216 (Rear axle steering with large steering angle)	GF46.80-P-9900A
	Components		
	Electric power steering control unit, basic function	Model all (CAR)	GF46.35-P-9890A
	Parking system control unit, basic function	Model all (CAR) with code 220 (PARKTRONIC system (PTS)) Model all (CAR) with code 235 (Active Parking Assist)	GF54.65-P-9890A