

Function overview

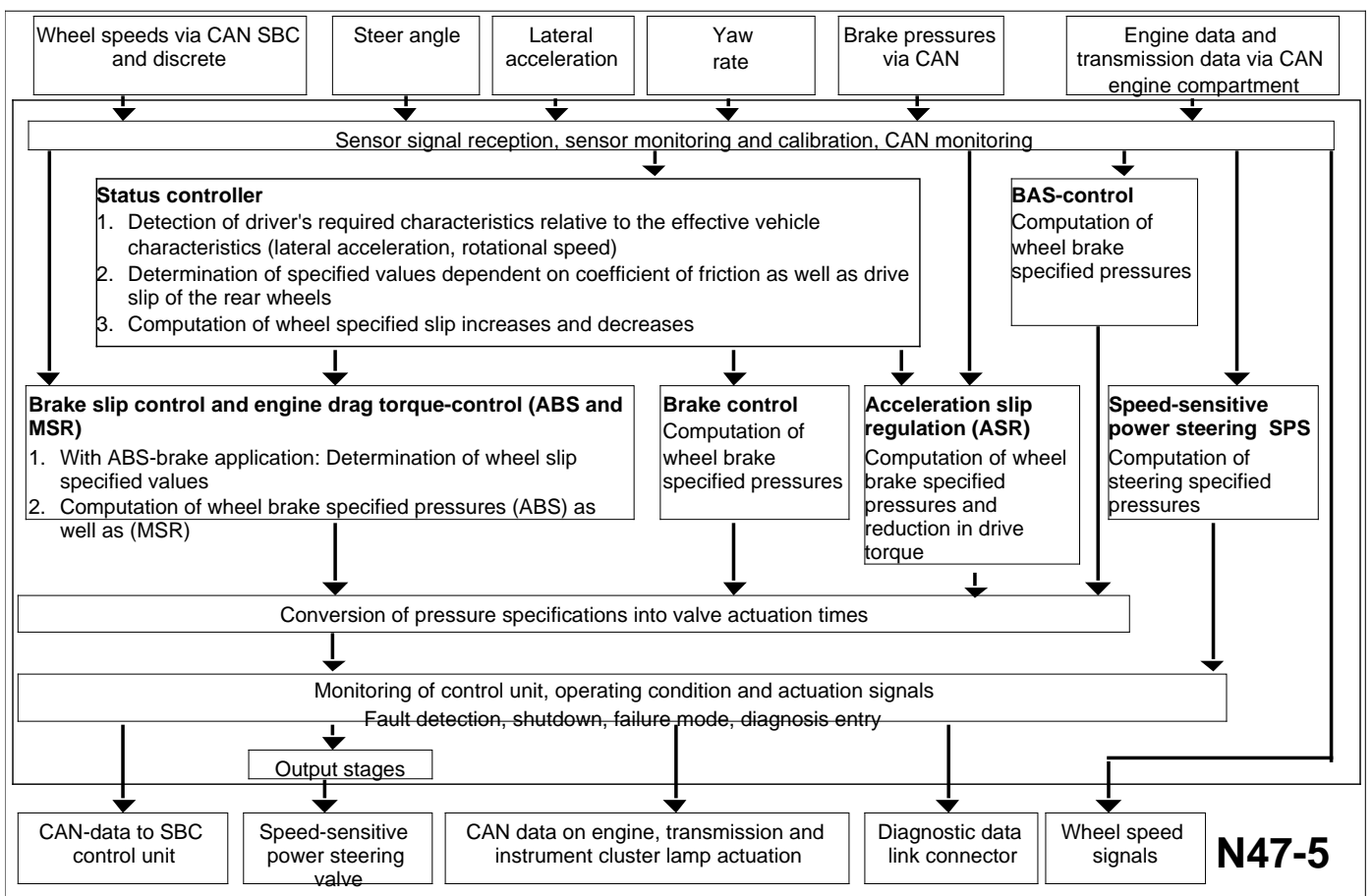
The ESP control unit (N47-5) receives the data from the SBC pedal value sensor (driver's braking requirement) from the SBC (A7/3n1) control unit via the CAN-SBC (own CAN-connection). The ESP control unit takes these values as the basis for the computation for the individual wheel pressures. The required individual wheel pressure is computed by the ESP control unit taking into account the algorithms of the ESP, ABS, ASR, EBV or "multiple value functions" and conveyed to the SBC control unit via CAN-SBC. The pressure regulators of the SBC control unit adjust the required brake pressure in each brake caliper. In the event of failure of the ESP control unit, the CAN-SBC or missing data between the control units, only a basis brake function without functionality of the ESP control unit and a set brake force distribution is available. With regard to the multiple value function SBC-Hold, all the specified pressures requested by the ESP control unit are monitored by the SBC control unit so that a possible pressure takeover by the SBC control unit can take place at any time.

This monitoring is confirmed by a signal which the SBC control unit sends back to the multiple value module via the CAN SBC (software module in the ESP control unit) and confirms a takeover or monitoring of the specified pressures.

If no specified pressures can be sent by the ESP control unit to the SBC control unit (CAN SBC inactive due to ignition "OFF" or the case of a CAN-SBC fault), the last specified pressures are taken over by the SBC control unit and also kept by it. This is signaled to the SBC control unit via a fault signal. Temporary faults in the ESP control unit are processed by the multiple value module.

Variants

- with speed-sensitive power steering (SPS [PML])
- without speed-sensitive power steering (SPS [PML])
- National version :
In (USA) / (CN) the "multiple value function" SBC-Hold" is deactivated by coding.
The detection takes place via the corresponding national code by the CAN-engine compartment.



The ESP control unit (N47-5) is divided up functionally as follows:

- Signal conditioning
- Function logic component
- Safety circuit
- Additional functions
- Calculation of longitudinal forces
 - CAN message for engine torque from CDI control unit (N3/9) (diesel engine) or ME-SFI [ME] control unit (N3/10) (gasoline injection engine)
 - CAN message for current gear (from the fully integrated transmission control (VGS) control unit (Y3/8n4) (series production) or EGS control unit (N15/3) (AMG vehicles only))
 - CAN message for actual brake pressures (via CAN-SBC from SBC control unit)
- Information signals (operation)
 - Stop lamp switch signal (via CAN-SBC)
 - Parking brake indicator switch signal (S12) (CAN message from driver-side SAM control unit with fuse and relay module (N10/1))
 - ESP Off switch signal (CAN message from upper control panel control unit)
 - SBC pedal value sensor (via CAN SBC)

Function logic component

The conditioned input signals are processed in the logic section and converted into output signals.

- Rpm sensor signals via CAN SBC and direct from SBC control unit:

The processed 4 wheel speed signals are constantly compared with each other and with slip thresholds at the front and rear wheels, depending on the vehicle speed.

The following values and controlled variables are determined by this comparison process:

- Vehicle speed
- Acceleration/deceleration
- Wheel slip (with normal braking and ABS control)
- Drive slip (for ASR control)
- Decel slip (for MSR control)
- Steering angle sensor signal via CAN engine compartment from Steering column module (N80):

The change in the direction of driving or cornering is detected via the steering angle sensor signal and the different wheel speeds of the front wheels

- CAN message for engine torque:

Via the CAN engine compartment the ESP control unit (N47-5) is informed by the engine control unit about the engine torque delivered.

In ASR and ESP closed-loop operation the function-logic section of the ESP control unit (N47-5) requests from the engine control unit the adjustment of a reduced engine torque. In MSR closed-loop operation there is a slight increase in engine torque.

- CAN message for current gear:

Via the CAN engine compartment the function logic section (ESP) is continuously informed by the EGS control unit (N15/3) (AMG only) or fully integrated transmission control (VGS) control unit (Y3/8n4) about the current gear. The current gear is used to calculate the drive forces acting on the drive wheels and for drive torque control.

- Stop lamp switch signal (via CAN-SBC):

comes from the SBC control unit via CAN SBC. There it is formed from the values of pedal travel, pressure and stop lamp switch. It is detected and evaluated by the function logic section. Output of the signal from the ESP control unit (N47-5) to the CAN engine compartment for use in other systems.

- Parking brake indicator switch signal (CAN message from the driver-side SAM):

If a signal from the parking brake indicator switch exists, then no engine braking regulation-closed-loop operation is permitted. Likewise the SBC multiple value functions "SBC-Hold" can only be activated when the parking brake is released.

- ESP Off switch signal (N72/1s1) (CAN message from upper control panel control unit)

N72/1s1 If a signal is applied from the ESP OFF switch, the drive torque control circuit is switched off and the ESP and ABS warning lamp (A1e41) actuated permanently.

Indicator lamp actuation

The N47-5 signals for the ABS indicator lamp, ESP and ABS warning lamp and the multifunction display (A1p13) are recorded by the ESP control unit and via the CAN-engine compartment passed on to the instrument cluster (A1) which actuates the corresponding displays.

Additional functions

These two detection values in combination with the vehicle speed provide the ESP control unit (N47-5) with the information about the driver's required characteristics of the vehicle.

- Yaw rate and lateral acceleration sensor signal:

The ESP control unit determines the lateral forces occurring when cornering from the yaw rate and lateral acceleration sensor signal. The drive status regulator in the ESP control unit (N47-5) detects an oversteering vehicle from the lateral acceleration signal and rotational speed signal.

The movements (rotational speed) which want to turn the vehicle about the vertical axis (yawing) as they occur when a vehicle skids are recorded in the ESP control unit (N47-5) by the rotational speed and lateral acceleration sensor. The ESP control unit (N47-5) thus detects the effective handling characteristics of the vehicle from the signals from the yaw rate and lateral acceleration sensor.

- CAN message for current gear:

Via the CAN engine compartment the function logic section (ESP) is continuously informed by the EGS control unit (N15/3) (AMG only) or fully integrated transmission control (VGS) control unit (Y3/8n4) about the current gear. The current gear is used to calculate the drive forces acting on the drive wheels and for drive torque control.

- CAN message for brake pressure

The ESP control unit (N47-5) is informed by the SBC control unit about the current brake pressures via the CAN SBC.

With the brake pressure sensors integrated in the SBC hydraulic unit the brake pressure is recorded and used by the function logic section for computing the wheel brake forces (longitudinal forces). If an ESP-control is necessary during the brake application, then the existing wheel brake forces (longitudinal forces) are used at the same time to compute the lateral stability (lateral forces).

Safety circuit

The task of the safety circuit is to detect faulty sensor signals, faults in the ESP control unit (N47-5) and in the electrical line system. The actuation of the high pressure/return flow pump in the SBC hydraulic unit is monitored during the control process. The solenoid valves and wheel speed sensors are monitored permanently via the CAN-SBC. If a fault is detected, then the corresponding system is switched off and this is shown to the driver in the multifunction displays. In addition a fault code is stored in the ESP control unit (N47-5). This is stored in the fault memory in the case of faults which occur sporadically.

The safety circuit also constantly monitors the battery voltage. When the voltage drops below 10.0 V or when 17.0 V is exceeded, the complete system is switched off until the voltage is in the specified range again.

Partial function of speed-sensitive power steering

From the vehicle speed existing internally and the status signal, the ESP control unit (N47-5) calculates speed-dependent specified current set in a performance map for actuating the SPS [PML] solenoid valve (Y10) of the parameter steering.

Distronic control function

Wheel speeds and speed status signal outputs

- Output of wheel speeds: For systems which require a wheel speed signal the ESP control unit (N47-5) supplies the current wheel speed from each wheel via the CAN engine compartment. In addition the left front wheel speed is output discretely.
 - Output of rotational speed status signal: For systems which require information on the current vehicle status (vehicle stationary, vehicle is being driven, rpm sensor defective) the ESP control unit (N47-5) supplies the rotational speed status signal via the CAN engine compartment.
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The ESP control unit (N47-5) receives via the CAN engine compartment messages about the distance and relative speed of the objects recorded by the DTR control unit (N63/1). Based on this information the ESP control unit (N47-5) decides whether the engine torque has to be reduced or increased and has this carried out via the ME-SFI [ME] control unit (N3/10) or CDI control unit (N3/9). If it is necessary to brake the vehicle or downshift, the ESP control unit (N47-5) initiates a brake application via the SBC control unit (A7/3n1) or a shift down via the fully integrated transmission control (VGS) control unit (Y3/8n4) of the EGS control unit (N15/3) (AMG only).

Partial function of tire pressure loss warning (RDW)

On vehicles with code (477) Tire pressure loss warning the ESP control unit (N47-5) warns about pressure losses in the tires by actuating the multifunction display in the instrument cluster (A1). For this evaluation the ESP control unit (N47-5) compares the wheel speed of the left wheel on an axle with the right wheel on an axle. As the tire inner pressure reduces the rolling circumference of the wheel decreases and the wheel speed of the damaged wheel increases compared with the speed of the other wheel.

As further driving dynamics variables, such as slip or slip angle, the dynamic rolling circumference as well as cornering influence the wheel speed, the signals from the yaw rate and lateral acceleration sensor (yaw rate and lateral acceleration) as well as wheel torques are included in the computation at the same time.