

Fully integrated transmission control (FTC):

1. In contrast to NAG2, where the electronic FTC control unit is installed as a stand-alone control unit, the new fully electronic transmission control on NAG2 is mounted directly on the hydraulic control and is networked over the CAN data bus with the engine control module. This makes sensor signals, calculated data and control variables available simultaneously to all control units. Read into the transmission control unit over CAN are, among others:
 - *engine-relevant data, such as engine rpm, coolant temperature, accelerator pedal position, engine torque values*
 - *ESP signals about the engine and intervention by the brake system as well as the driving speed*
 - *cruise control signals*

Orders communicated bidirectionally between the engine control module and the transmission control unit are the decrease of the engine torque values during the shift processes and the moving of the shift point for faster catalytic converter heating-up time in the warm-up phase.

2. Directly acquired from the transmission control are:
 - *the position of the selector range switch*
 - *the transmission oil temperature*
 - *the transmission-internal revolutions*
 - *the transmission output rpm*
3. From the data, the transmission control unit calculates:
 - *the driver and vehicle-specific shift points*
 - *the various required specified transmission hydraulic pressures for the respective operating condition*
 - *the condition and control signals for the torque converter lockup clutch.*
4. The transmission control unit calculates further variables from the available data. Belonging to these are:
 - *Air drag and rolling resistance (influence of road gradient and payload)*
 - *The factor for the correction of parameters with variable atmospheric pressure (altitude correction) for the shift lines and pressure control*
 - *Driver actions (intensity of accelerator movement, frequency of manual touch shifts, vehicle longitudinal and lateral acceleration)*

Function

The fully integrated transmission control (Y3/8n4) - new automatic transmission 2 (NAG2) monitors and shifts the transmission in dependence of:

- *the vehicle speed*
- *the vehicle payload*
- *the drive resistance*
- *the accelerator pedal position and operation speed*
- *the position of the selector lever*
- *the switch positions "C" (comfort drive program) / "S" (sport drive program) / "M" (manual drive program) on the electronic selector lever module control unit (N15/5)*
- *the condition of the transmission*
- *the CAN signals*

Shifting processes

The transmission control unit (FTC) controls the actuators (control solenoid valves) electronically. The valves sit in the hydraulic shift plate.

This shift plate implements the hydraulic functionality. The oil feed of the hydraulic elements, such as the hydrodynamic torque converter, shift elements and hydraulic transmission control, takes place from an oil pump connected to the torque converter.

The electronic transmission control allows a precise adjustment of the pressures in the respective operating conditions and of the engine power during the shift phase, which leads to a significant increase in the shift quality.

The main function of the Y3/8n4 control unit (FTC) is the evaluation of various input signals relevant for the transmission function and the actuation of eight electromechanical hydraulic valves dependant on them (see internal output signals). These, in turn, set the working pressure and the bypass of the converter depending on the gear ratio of the transmission (gear selection).

The adjustment of the shift programs takes place by moving the characteristic dependent on:

- *The vehicle payload. (e.g Luggage)*
- *A change in the drive resistance (e.g Up/down hill airdrag)*
- *Pedal movement:*

Slow:	Unintended downshifts in the high vehicle speed range are prevented.
Fast release of the accelerator:	The upshift to the next gear is prevented and is only allowed again at low lateral vehicle acceleration.
Kickdown:	Bringing forward and raising of the downshift characteristic in the upper vehicle speed range.

The forced downshift to the next lowest gear is carried out at too-high transmission temperatures and lower vehicle speed.

The basic shifting program can be influenced by the driver using the program selector button (S16/12) on the electronic selector lever module control unit (N15/5). The driver can choose between the transmission modes "C" (Comfort) / "S" (Sport or Standard) or "M" (Manual). The transmission modes have different shifting strategies. In the transmission mode "S" (Sport or Standard), in contrast to the transmission mode "C" (Comfort), the engine rpm level is raised.

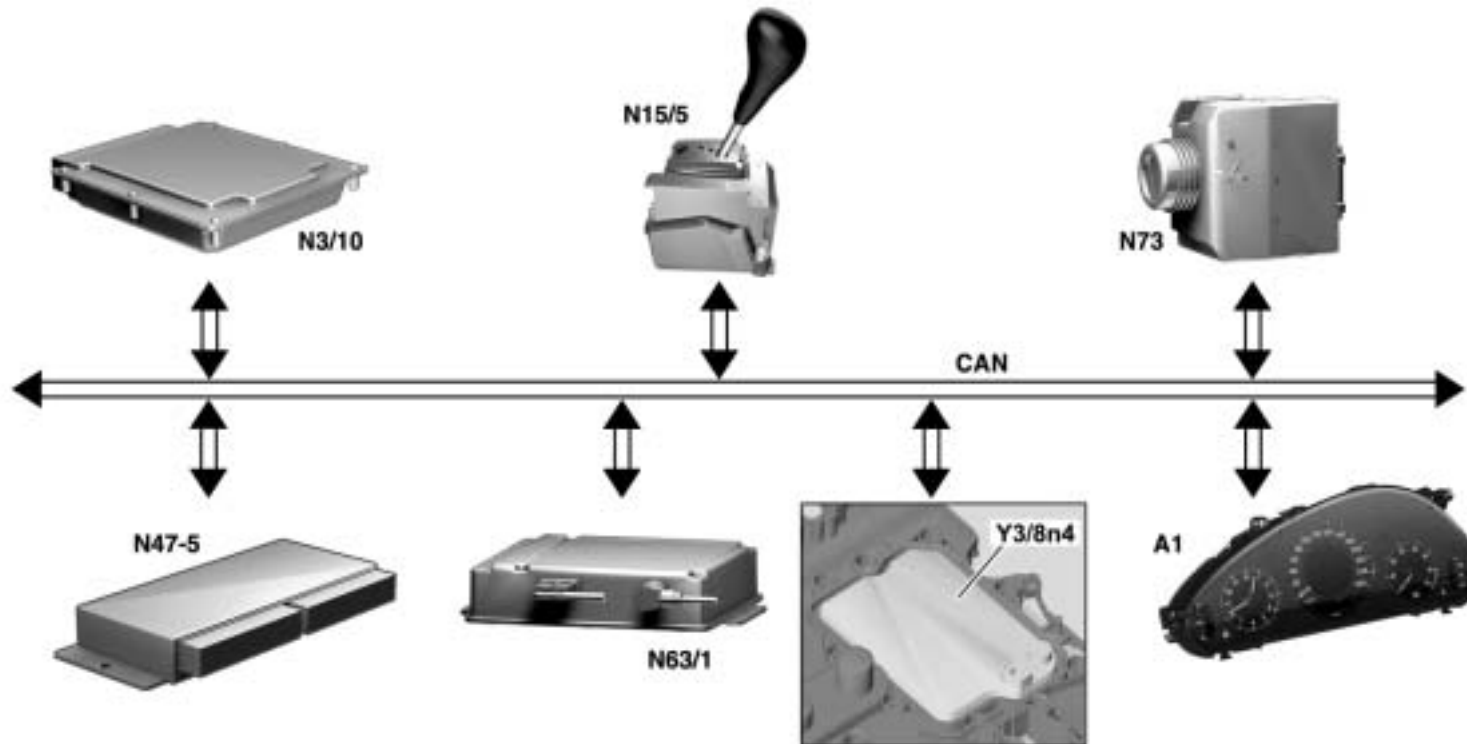
In the transmission mode "M", the driver has to initiate the shifts with the steering wheel buttons "+" and "-". In the exceptional situations "over rpm or under rpm" of the engine, the transmission shifts independently, also in "M". The gearshift linkage makes the mechanical connection between the electronic selector lever module control unit (N15/5) and the transmission in the selector lever positions "P", "R", "N" and "D". The shift range (1-6) is preselected by touching or holding the selector lever in direction "+" and "-" and displayed in the instrument cluster (A1) until upshift of the transmission is possible.

The shift ranges are transmitted by the electronic selector lever module control unit (N15/5) over CAN-C to the transmission control unit (Y3/8n4).

Data exchange over CAN-C

Exchange of data takes place over the engine compartment CAN (CAN-C) with the following control units:

- *Instrument cluster (A1)*
- *ME control unit (N3)*
- *Electronic selector lever module control unit (N15/5)*
- *ESP control unit, PML and BAS (N47-5)*
- *DTR control module (N63/1)*
- *EIS control unit (N73)*



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