

If speed differences occur at the wheels, the four-wheel drive is engaged in drive and overrun mode when driving backwards and forwards.

Essentially the following criteria apply for the engagement and disengagement of the four-wheel drive and the two differential locks:

- Drive skid
- Vehicle speed
- Acceleration
- Steering angle
- Time
- Operating the service brake

The 4MATIC control unit (N30/3) receives the necessary signals via:

- Speed sensors on the front wheels and on
- Rear axle center piece assembly
- Steering angle sensor on steering wheel
- Stop lamp switch

The following 4MATIC shift stages are engaged in accordance with a predetermined logic using these signals:

- 0 - Rear-wheel drive (basic drive)
- 1 - Four-wheel drive compensated with 35/65% front/rear torque distribution
- 2 - Four-wheel drive locked inter-axle
- 3 - Four-wheel drive locked inter-axle and inter-wheel

The incoming signals are processed in accordance with the following criteria in the logic section of the 4MATIC control unit (N30/3):

Drive skid

If differences between the mean front and rear-wheel speeds occur, this is recognized as skid and the front-wheel drive shift stage 1 is engaged.

If there are still speed differences, shift stage 2 is engaged as the next step and shift stage 3 below 38 km/h, if required.

The following shift thresholds are determinate for engagement of stage 1:

Speed difference (wheel speed difference)	Vehicle speed
>2 km/h	<100 km/h
>2%	>100 km/h

Four-wheel drive and differential locks remain engaged provided the engagement criteria exist. If they no longer exist, the differential locks are released in sequence after a brief holding time of approx. 0.7 s.

Alarming effect for starting-off is included in the 4MATIC control unit (N30/3):

The 4MATIC control unit (N30/3) recognizes an unsuccessful attempt at starting off such that a speed of 5 km/h is not exceeded within 0.5 s. It then engages both differential locks (shift stage 3) in addition to the permanent four-wheel drive (shift stage 1) for the next start. The ASD/4MATIC function indicator lamp (A1e25) comes on permanently and only goes out 0.5 s after shifting back into shift stage 0 (rear-wheel drive). The differential locks are released at 10 km/h if the engagement criteria no longer exist.

Vehicle speed

When starting off, up to a speed of at least 20 km/h, the four-wheel drive, i.e. shift stage 1 is engaged (no function indicator!). Shift stage 3 is no longer engaged over 35 km/h.

Acceleration

When starting off with rapid acceleration (more than 0.5 m/s²) the four-wheel drive (shift stage 1) remains engaged at more than 20 km/h provided the acceleration is maintained.

Steering angle

If transverse skid occurs due to a sudden change of road surface adhesion whilst cornering or due to sharp steering movements, the compensated four-wheel drive shift stage 1

engages at speeds above 30 km/h, thus stabilizing the vehicle during cornering. A deviation of the radius of the curve driven to the course preselected by the driver is detected by the 4MATIC control unit (N30/3) from the speed differential between the left and right front wheel and the recorded steering angle. If the speed differential between the front wheels exceeds the speed-dependent value calculated from the steering angle, shift stage 1 is engaged.

Time

If shift stages 1, 2 or 3 are engaged more often within a predetermined time period, the holding times for the respective shift stages are extended thus avoiding a constant engagement and disengagement of the front-wheel drive and differential locks.

Operating the service brake

The 4MATIC control unit (N30/3) receives signals via the stop lamp switch (S9/1) that the driver is braking and immediately engages shift stage 0 (rear-wheel drive). The driving stability during braking and full ABS function is thus retained. Only when braking from speeds below

5 km/h and when starting off is interrupted by braking up to a speed of 10 km/h, does shift stage 1 remain engaged.