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Passenger Cars • Comfort and Passive Safety
New Products/Features in the Electrical,
Comfort and Support Systems • Model 212 •
Run
Participant Document



PEKA-ME154
As at 01.07.09

Mercedes-Benz



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Note: The term "employee" always refers to both female and male members of staff.

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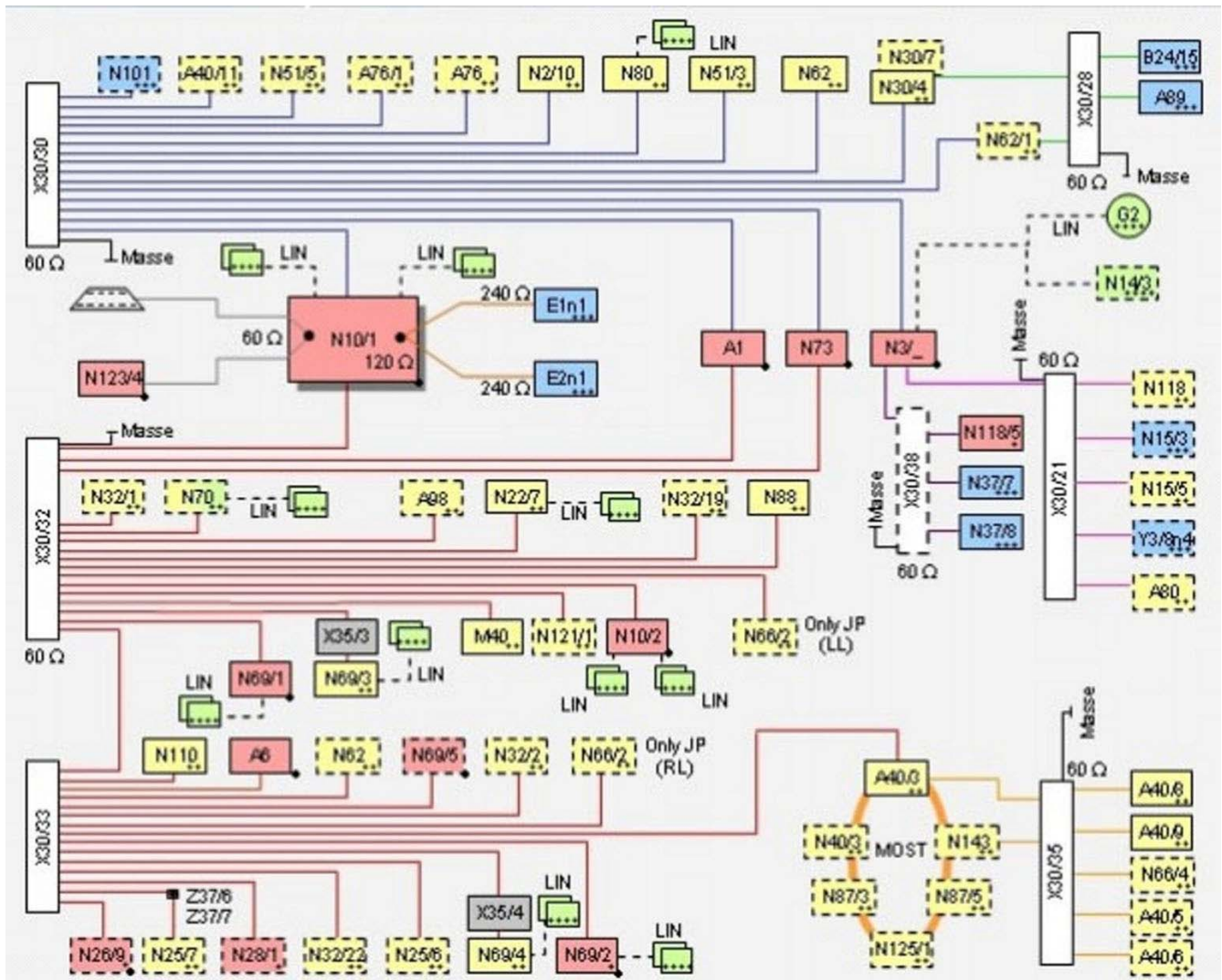


1 Orientation

N15/3	Electronic transmission control control unit (on transmission 722.6)
N15/5	ESM control unit (with transmission 722.6)
N22/7	Comfort automatic air conditioning control and operating unit
N25/6	Rear seat heaters control unit
N25/7	Steering wheel heater control unit
N26/9	Special-purpose vehicle multifunction control unit
N28/1	Trailer recognition control unit
N30/4	ESP control unit without DISTRONIC PLUS
N30/7	ESP control unit with DISTRONIC PLUS
N32/1	Driver seat control unit
N32/2	Front passenger seat control unit
N32/19	Left front active multicontour seat control unit
N32/22	Right front active multicontour seat control unit
N37/5	Left nitrogen oxides control unit (with engine 272.98)
N37/6	Right nitrogen oxides control unit (with engine 272.98)
N40/3	Sound system amplifier control unit
N51/3	AIRMATIC control unit
N62	PARKTRONIC control unit
N62/1	Radar sensors control unit
N66/2	Reversing camera control unit
N69/1	Left front door control unit
N69/2	Right front door control unit
N69/3	Left rear door control unit
N69/4	Right rear door control unit
N69/5	KEYLESS-GO control unit
N70	Overhead control panel control unit
N73	Electronic ignition lock control unit
N80	Steering column tube module control unit
N87/3	Digital Audio Broadcasting control unit
N87/8	SDAR control unit
N88	Tire pressure monitor control unit
N101	Night View Assist control unit
N110	Weight sensing system (WSS) control unit (USA)
N118	Fuel system control unit
N121	Trunk lid control control unit
N123/4	Emergency call system control unit
N125/1	Media interface control unit
Y3/8n4	Fully integrated transmission control control unit (with transmission 722.9)
CAN B	125 Kbit/s
CAN E	500 kbit/s
CAN C	500 kbit/s
CAN I	500 kbit/s
CAN G	500 kbit/s
CAN H	500 kbit/s
CAN D	500 kbit/s
CAN A	125 Kbit/s
MOST	20 Mbit/s

2 Networking in model series 212

2.1 Networking in model series 212



Block diagram

TT_00_19_001843_FA

A1	Instrument cluster
A6	Stationary heater
A40/3	COMAND APS
A40/5	Rear left display
A40/6	Rear right display
A40/8	Audio/COMAND display
A40/9	Audio/COMAND control panel
A40/11	Multifunction camera
A76	Left front reversible emergency tensioning retractor
A76/1	Front right reversible emergency tensioning retractor
A80	Intelligent servo module for DIRECT SELECT (with transmission 722.9)
A89	DISTRONIC control unit
A98	Panoramic sliding roof control module
B24/15	Yaw rate, lateral and longitudinal acceleration sensor
E1n1	Left bi-xenon light control unit
E2n1	Right bi-xenon light control unit
G2	Alternator
M40	Multicontour seat pneumatic pump
N2/10	Supplemental restraint system control unit

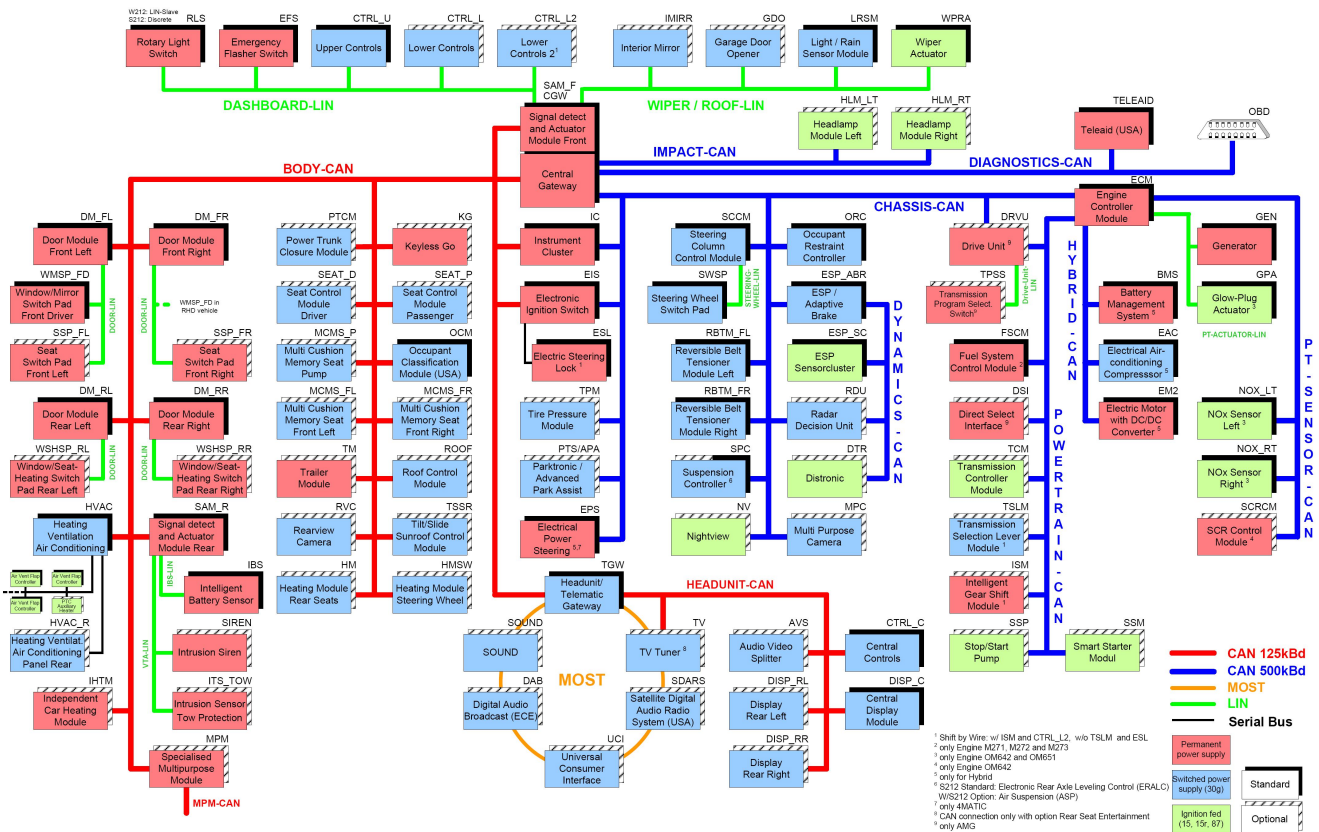


N3/9	CDI control unit
N3/10	ME control unit
N10/1	Front SAM control unit
N10/2	Rear SAM control unit
N14/3	Glow output stage
N15/3	Electronic transmission control control unit (on transmission 722.6)
N15/5	Electronic selector lever module control unit (with transmission 722.6)
N22/7	Comfort automatic air conditioning control and operating unit
N25/6	Rear seat heaters control unit
N25/7	Steering wheel heater control unit
N26/9	Special-purpose vehicle multifunction control unit
N28/1	Trailer recognition control unit
N30/4	ESP control unit without DISTRONIC PLUS
N30/7	ESP control unit with DISTRONIC PLUS
N32/1	Driver seat control unit
N32/2	Front passenger seat control unit
N32/19	Left front active multicontour seat control unit
N32/22	Right front active multicontour seat control unit
N37/7	Nitrogen oxides control unit downstream of diesel particulate filter
N37/8	Nitrogen oxides control unit downstream of diesel particulate filter
N40/3	Sound system amplifier control unit
N51/3	AIRMATIC control unit
N62	PARKTRONIC control unit
N62/1	Radar sensors control unit
N66/2	Reversing camera control unit (Japan)
N66/4	Rear entertainment unit control unit
N69/1	Left front door control unit
N69/2	Right front door control unit
N69/3	Left rear door control unit
N69/4	Right rear door control unit
N69/5	KEYLESS-GO control unit
N70	Overhead control panel control unit
N73	Electronic ignition lock control unit
N80	Steering column tube module control unit
N87/3	Digital Audio Broadcasting control unit
N87/5	Satellite digital audio radio (SDAR) control unit
N88	Tire pressure monitor control unit
N101	Night View Assist control unit
N110	Weight sensing system (WSS) control unit (USA)
N118	Fuel system control unit
N118/5	AdBlue® control unit
N121/1	Trunk lid control control unit
N123/4	Emergency call system control unit
N125/1	Media interface control unit
Y3/8n4	Fully integrated transmission control control unit (with transmission 722.9)
X30/21	Drive train CAN potential distributor
X30/28	Vehicle dynamics CAN potential distributor

2 Networking in model series 212

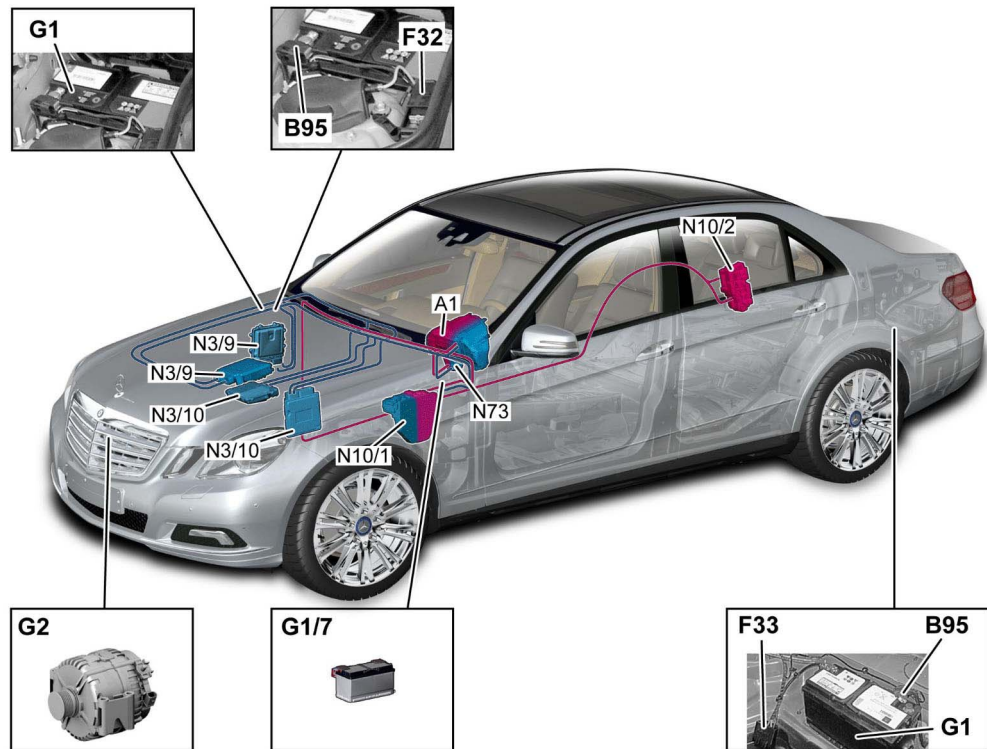
2.1 Networking in model series 212

X30/30	Chassis CAN potential distributor
X30/32	Left vehicle floor interior CAN potential distributor
X30/33	Right vehicle floor interior CAN potential distributor
X30/35	Telematics CAN potential distributor
X30/38	Potential distributor (CAN I)
X35/3	Left rear door connector
X35/4	Right rear door connector
Y3/8n4	Fully integrated transmission control control unit



3 Energy management in model series 212

3.1 Energy management in model series 212



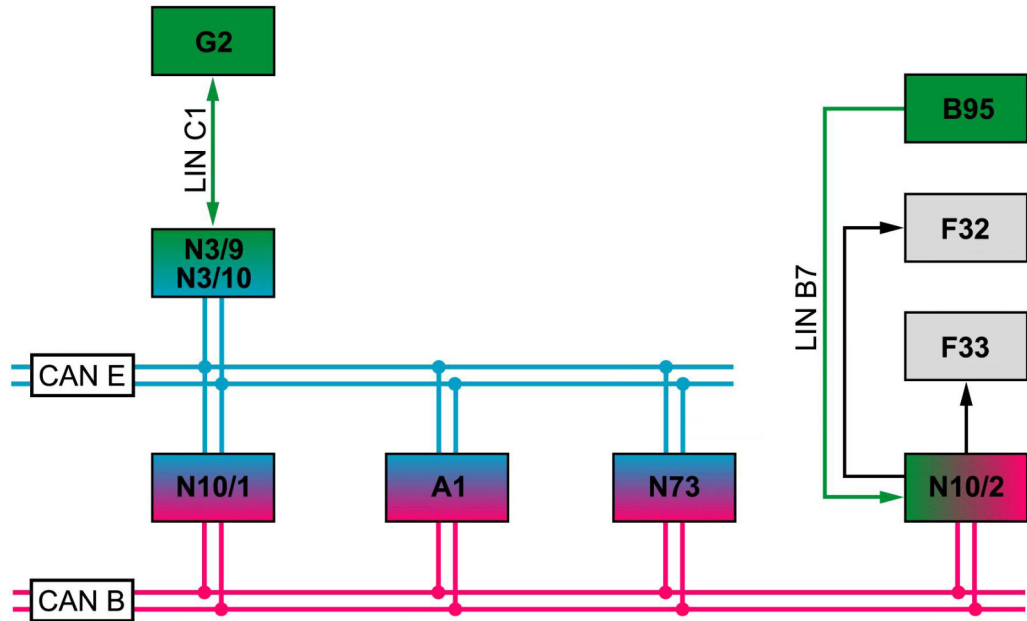
Location of components

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A1	Instrument cluster
B95	Battery sensor
F32	Front electrical prefuse box
F33	Rear prefuse box
G1	On-board electrical system battery
G1/7	Additional battery (with transmission 722.9)
G2	Alternator
N3/9	CDI control unit
N3/10	ME control unit
N10/1	Front SAM control unit
N10/2	Rear SAM control unit
N73	Electronic ignition lock control unit

3 Energy management in model series 212

3.1 Energy management in model series 212

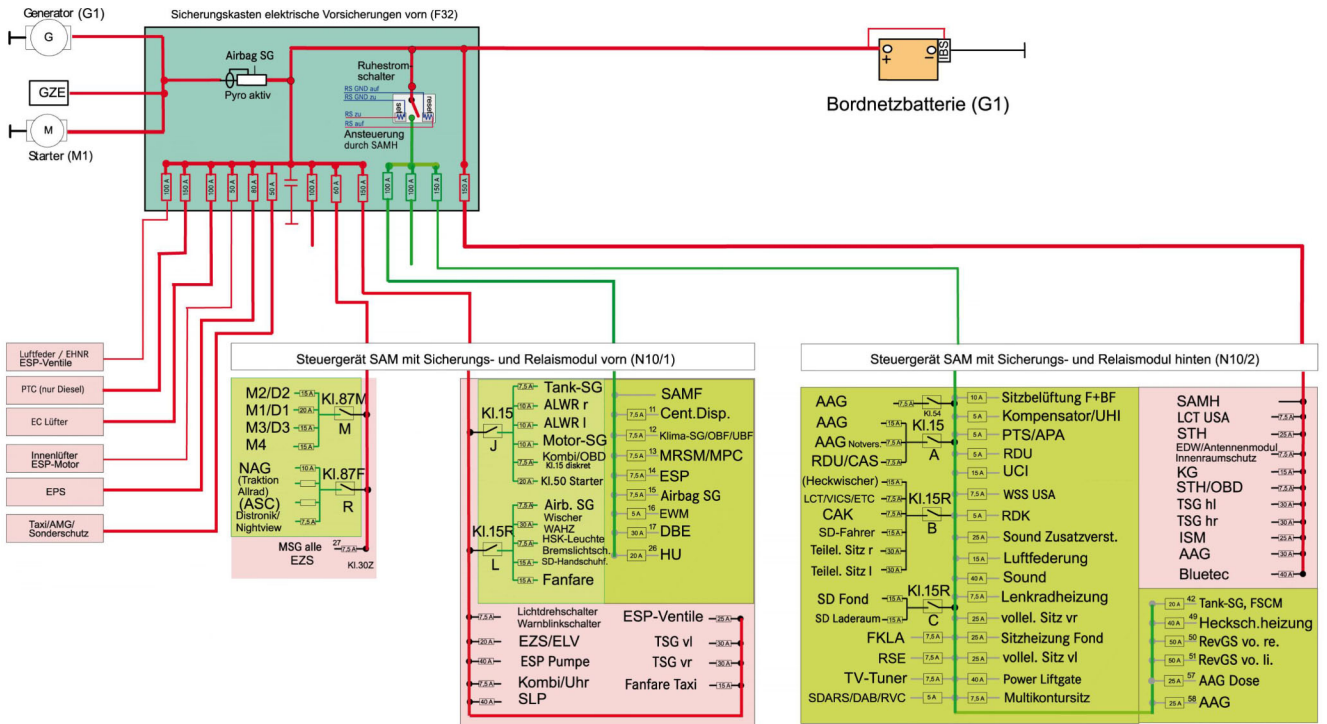


Block diagram

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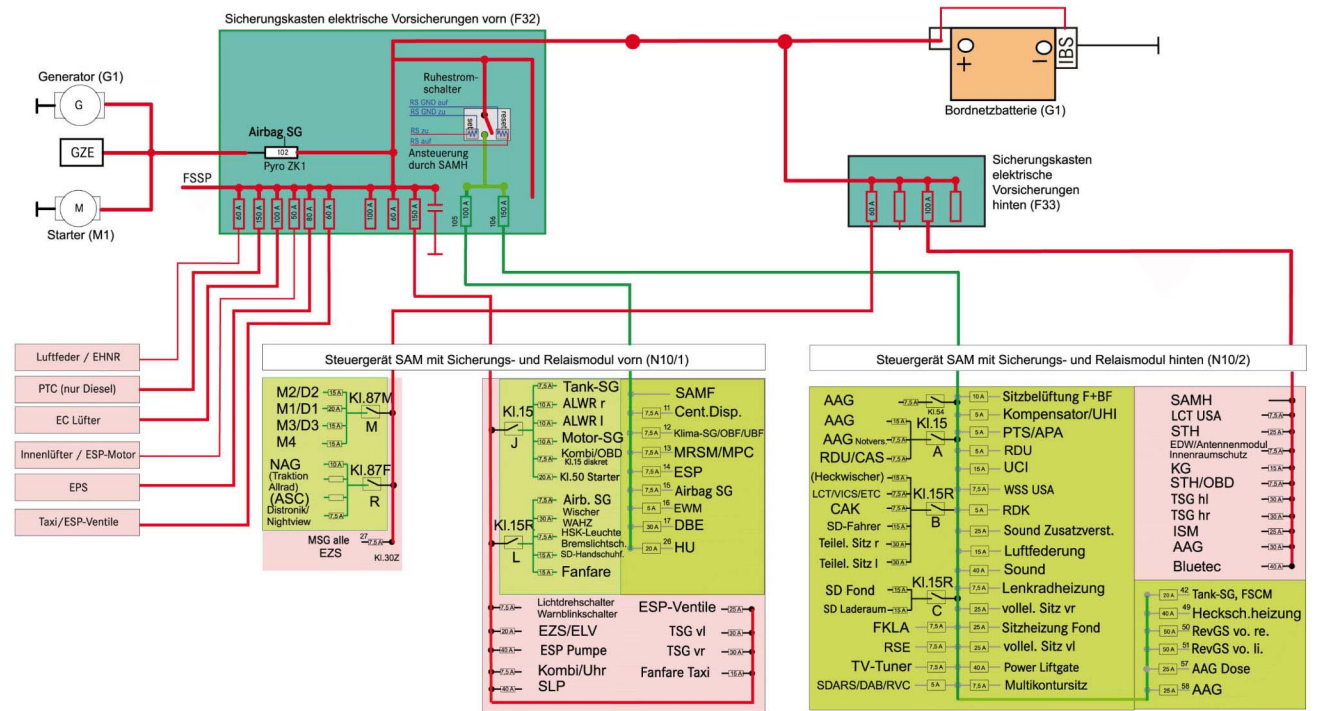
A1	Instrument cluster
B95	Battery sensor
F32	Front electrical prefuse box
F33	Rear prefuse box
G2	Alternator
N3/9	CDI control unit
N3/10	ME control unit
N10/1	Front SAM control unit
N10/2	Rear SAM control unit
N73	Electronic ignition lock control unit
CAN B	Interior CAN
CAN E	Chassis CAN
LIN B7	On-board electrical system LIN
LIN	Drive train LIN





Energy management with on-board electrical system battery in the engine compartment

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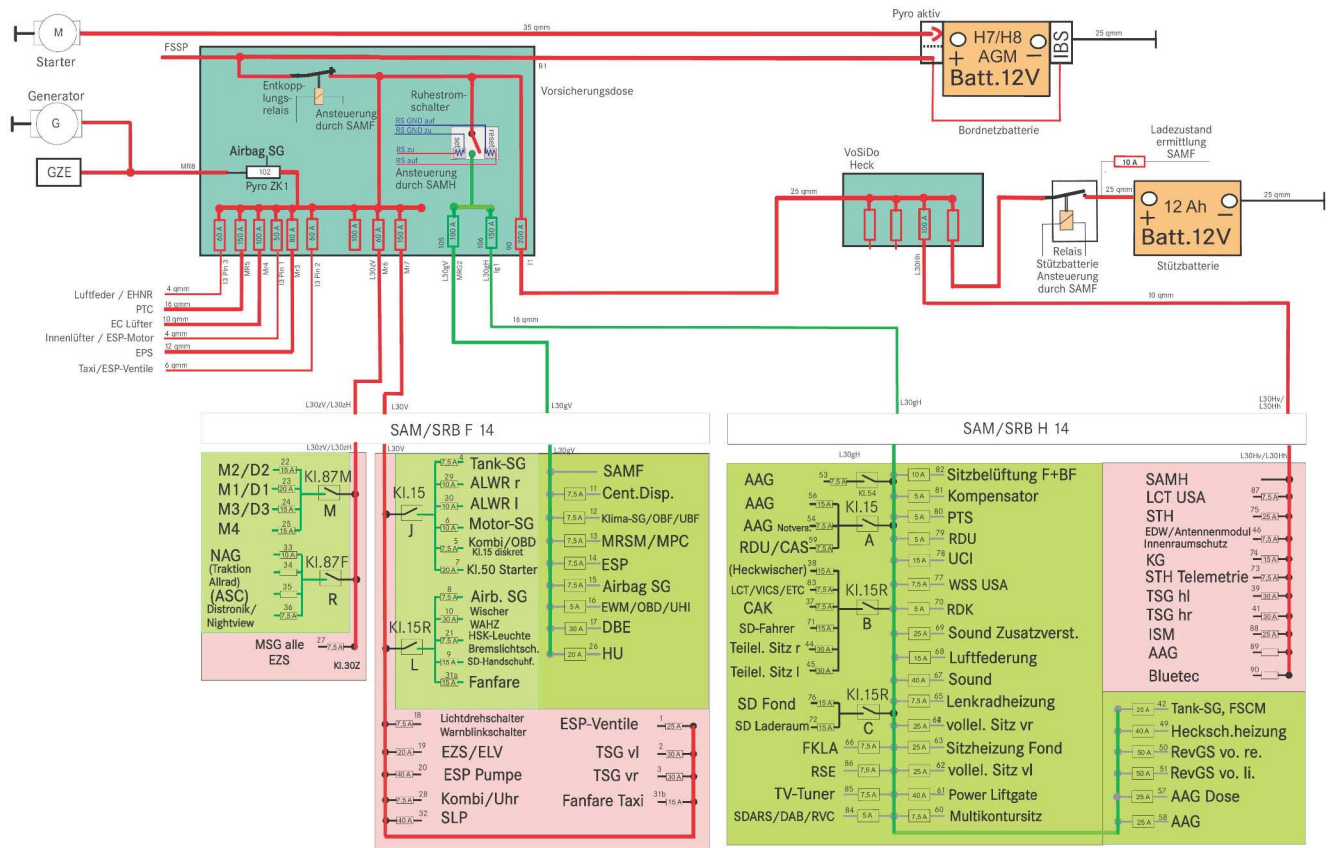


Energy management with on-board electrical system battery in the trunk (V8 engines) and transmission 722.9

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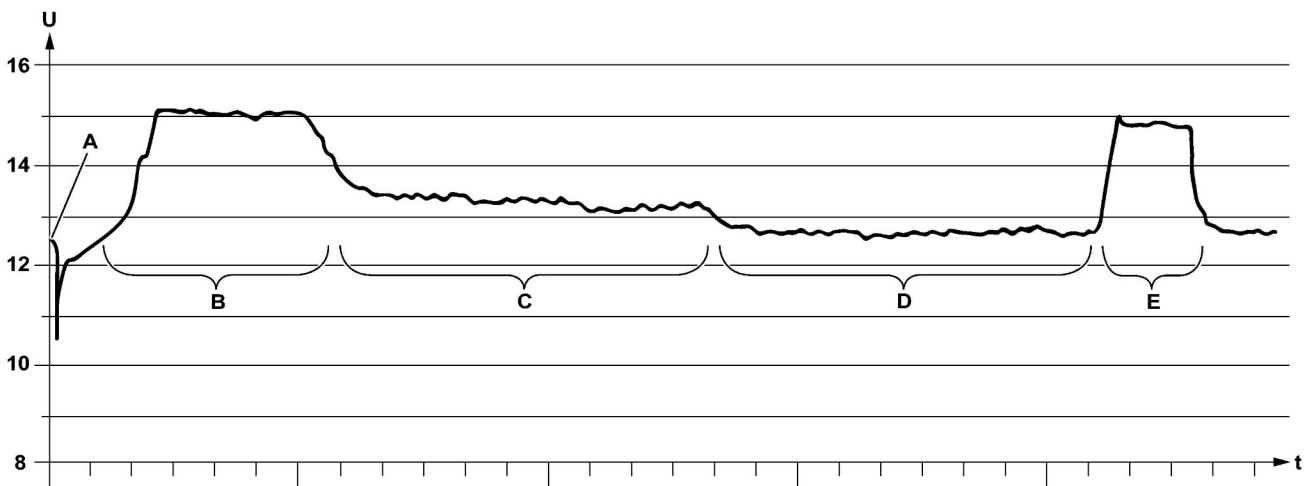
3 Energy management in model series 212

3.1 Energy management in model series 212



Energy management with ECO start/stop function

TT_00_19_001848_FA



Battery charging cycles

P_54_10_003013_SW

A Engine start (circuit 50 on)

B Rapid charging

- Voltage up to 15 V
- Once after engine start
- Optimized charging of on-board electrical system battery even during short-distance driving
- Duration: 20 s to 1 h
- Rapid charging ends at when on-board electrical system battery reaches a charge level of 80 %
- No rapid charging when driving with a trailer



Transition to alternator management

- Rapid charging ended
- Stable engine operation
- Temperature of on-board electrical system battery above 15 °C
- Outside temperature above 15 °C
- Charge level of on-board electrical system battery over 70 %
- No trailer operation

C Temperature-guided charging

- Rapid charging ended, alternator management not possible
- Voltage range of 13.5 to 15 V
- Linear charging characteristic

D Alternator management

- Voltage of 12.6 V, 13.5 V for some outside light functions
- Charge level of on-board electrical system battery at 80 %
- Reduced current consumption of consumers
- Air conditioning ON and high blower setting U=14.3 V

Switch to charging when in deceleration mode

- Stable engine operation
- Engine control unit detects deceleration mode
- Full voltage range up to 15 V
- Battery charge SOC up to 100 %

E Charging in deceleration mode

- Voltage up to 15 V
- Activated by CDI control unit or ME-SFI [ME] control unit
- Charging of battery when energy provided "free of charge"

3.2 ECO start/stop function in model series 212

At market launch in September 2009, the M271 EVO will come with the ECO start/stop function, initially in combination with the manual transmission.

3.2.1 Functional principle

With the ECO start/stop function, the engine can be shut down automatically (autostop function) at very low speeds and at standstill provided certain conditions are met by the vehicle and by the vehicle operator. This makes it possible to further reduce fuel consumption. The starter can then restart the engine automatically (autostart function) when required. The ECO start/stop function uses a crankshaft Hall sensor with rotation direction detection capability as well as a modified starter. The engine control unit uses the modified crankshaft Hall sensor to detect the position of the crankshaft. This means that during restarts a reduced amount of fuel can be directly injected into the first cylinder and thus ensure rapid startups at traffic lights, for example.

3.2.2 Function requirements

The following requirements must be met for the ECO start/stop function to trigger an autostop:

- Operator conditions:
 - The transmission is in neutral
 - The clutch and accelerator pedals are not applied
 - The service brake is applied
 - The vehicle speed is below a certain limit speed
- ECO start/stop system not switched off by means of ECO button (system is on by default following initial start)
- Required limit speed exceeded following a key start or, for example, while maneuvering the vehicle
- Vehicle conditions are fulfilled for the following systems:
 - Air conditioning
 - On-board electrical system
 - Brake system
 - Suspension
 - Other sensor systems, e.g. door, seat belt and engine hood contacts



1	ECO button
2	Indicator lamp

3.2.3 Engine stop function

The engine is switched off by the ME-SFI [ME] control unit when the following function conditions are met:

- The transmission is in neutral
- The clutch and accelerator pedals are not applied
- The service brake is applied
- The vehicle speed is below a certain limit speed

3.2.4 Engine start function

An automatic engine start can occur if the engine is in the autostop mode, meaning that the engine was switched off by means of the engine stop function and circuit 15 is still energized (ignition is ON). In addition, one of the following function conditions must be fulfilled:

- The accelerator pedal is applied.



- The clutch is applied
- The ECO start/stop function is switched off using the ECO button
- The vehicle speed is above a certain limit speed
- The driver activates a function that requires the engine to be running, e.g. vehicle level lifting

To restart the engine, the engine control unit requests an engine start (autostart).

3.2.5 Forced engine start

Another type of automatic engine start is a protective function known as the forced engine start. This can only occur if the drivetrain is open.

Here, the engine is started automatically (without intervention by the driver) by the ME-SFI [ME] control unit when one of the following function conditions occurs:

- The driver releases his/her seat belt or opens the driver door
- A vehicle-side condition in one of the following systems is no longer fulfilled:
 - Air conditioning
 - On-board electrical system
 - Brake system
 - Suspension
 - Other sensor systems

3.2.6 Instrument cluster displays

On vehicles with the ECO start/stop function, additional messages are stored in the instrument cluster's multifunction display. The ECO symbol tells the driver that the autostop function is available.



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1

ECO symbol in the multifunction display

4 Climate control in model series 212

4.1 Climate control in model series 212

Two climate control systems are offered for model series 212:

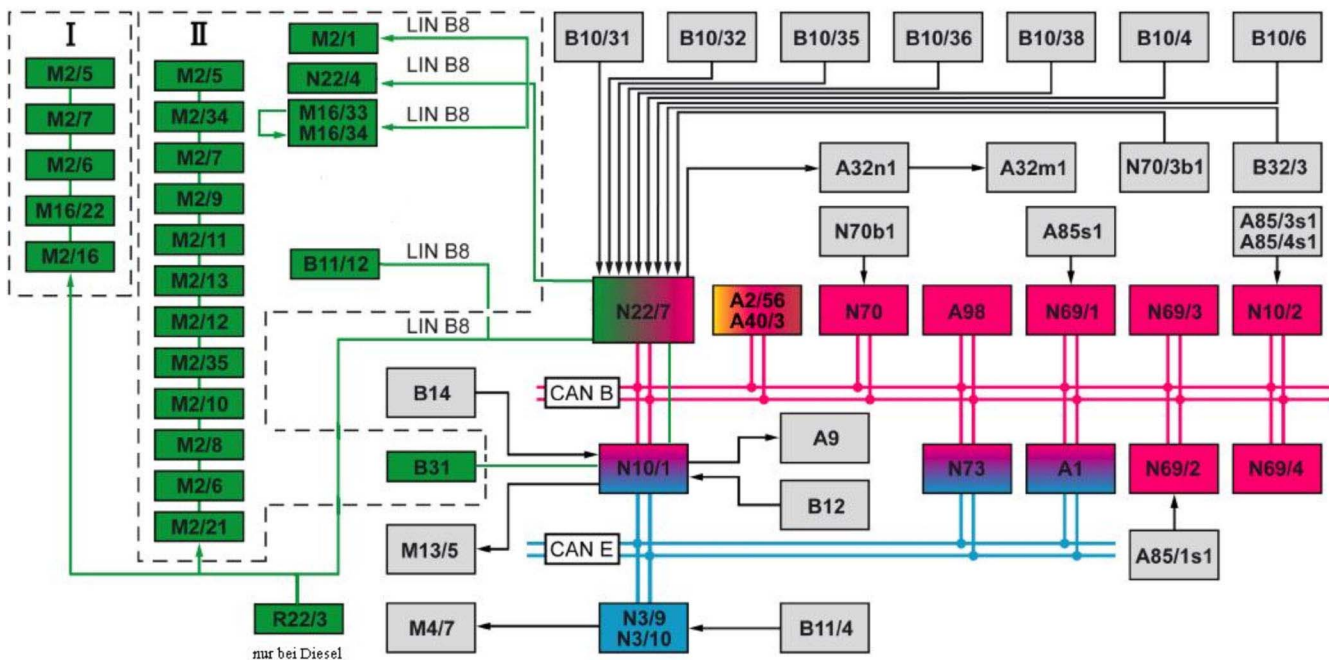
- THERMATIC 2-zone automatic climate control (code 580)
- THERMOTRONIC 3-zone comfort automatic climate control (code 581)

The sun sensor installed as standard on the instrument panel near the windshield is designed as a dual sensor and records the intensity of the solar radiation and its angle of incidence on the vehicle. The recorded intensity values are also used for closed-loop regulation of the climate control system. If there is only solar radiation on one side, the system will adjust the left and right temperature settings accordingly.

To determine the concentration of gaseous pollutants, the 3-zone comfort automatic air conditioning system is equipped with an air quality sensor whose readings can, where necessary, trigger the closing of the fresh air flap and completely isolate the vehicle interior from the outside air.

A dew point sensor in this variant allows targeted, needs-based regulation of the refrigerant compressor.

The glove compartment is cooled as a standard feature. The air flow can be regulated using a separate control wheel located in the upper left of the glove compartment.



Block diagram

P_83_40_003829_FA

I	Climate control (code 580)
II	Comfort climate control (code 581)
A1	Instrument cluster
A2/56	Radio with auto pilot system
A9	Refrigerant compressor
A32m1	Blower motor



A32n1	Blower regulator
A40/3	COMAND control unit
A85s1	Left front door rotary tumbler switch
A85/1s1	Right front door rotary tumbler switch
A85/3s1	Left rear door rotary tumbler switch
A85/4s1	Right rear door rotary tumbler switch
A98	Panoramic sliding roof control module
B10/4	Interior temperature sensor
B10/6	Evaporator temperature sensor
B10/31	Left side air outlet temperature sensor
B10/32	Right side air outlet temperature sensor
B10/35	Left front footwell air outlet temperature sensor
B10/36	Right front footwell air outlet temperature sensor
B10/38	Rear footwell air outlet temperature sensor
B11/4	Coolant temperature sensor
B11/12	Dew point sensor
B12	Refrigerant pressure sensor
B14	Outside temperature sensor
B31	Pollutant sensor
B32/3	Sun sensor
M2/1	Rear blower motor
M2/5	Fresh air/air recirculation flap actuator motor
M2/6	Left blend air flap actuator motor
M2/7	Right blend air flap actuator motor
M2/8	Left defroster vent flap actuator motor
M2/9	Right defroster vent flap actuator motor
M2/10	Left footwell flap actuator motor
M2/11	Right footwell flap actuator motor
M2/12	Left center outlet flap actuator motor
M2/13	Right center outlet flap actuator motor
M2/16	Defroster vent flap actuator motor
M2/21	Diffuse flap actuator motor
M2/34	Ram air flap actuator motor
M2/35	Rear blend air flap actuator motor
M4/7	Combustion engine and air conditioning with integrated control fan motor
M13/5	Coolant circulation pump
M16/22	Air distribution flap actuator motor
M16/33	Left B-pillar air distribution actuator motor
M16/34	Right B-pillar air distribution actuator motor
N3/9	CDI control unit
N3/10	ME control unit
N10/1	Front SAM control unit with fuse and relay module
N10/2	Rear SAM control unit with fuse and relay module
N22/4	Rear automatic air conditioning operating unit
N22/7	Automatic air conditioning control and operating unit
N69/1	Left front door control unit
N69/2	Right front door control unit

N69/3	Left rear door control unit
N69/4	Right rear door control unit
N70	Overhead control panel control unit
N70b1	Interior temperature sensor with integrated fan
N70/3b1	Interior temperature sensor with integrated fan
N73	Electronic ignition lock control unit
R22/3	PTC heater booster
CAN B	Interior CAN
CAN E	Chassis CAN
LIN B8	Climate control LIN

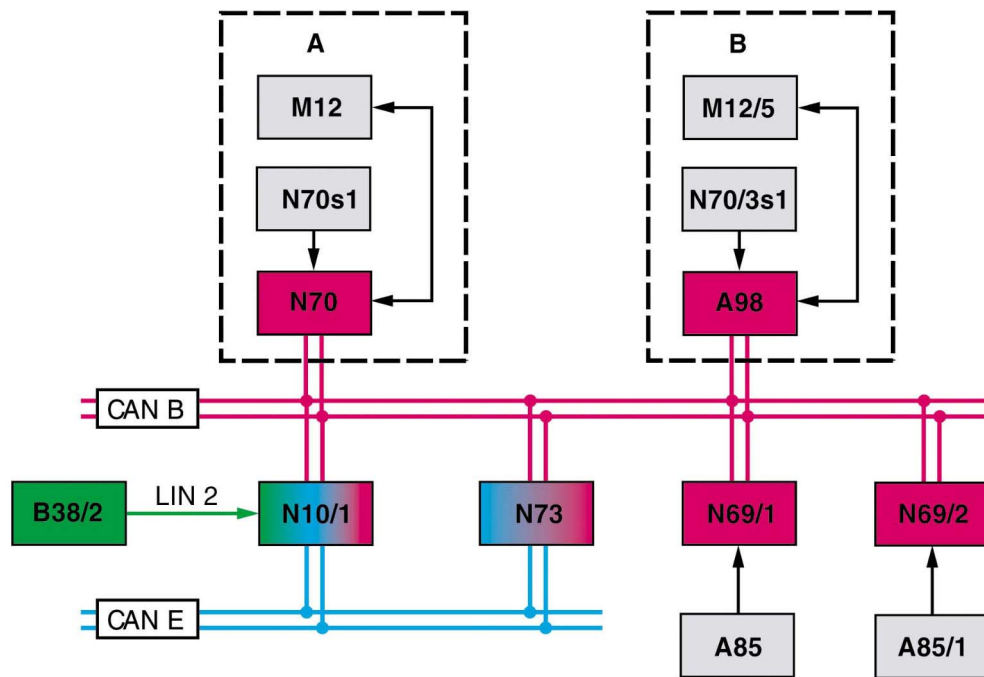
4.1.1 Tilting/sliding roof (code 414)

The special equipment power tilting/sliding roof is equipped with anti-pinch protection and is available only in glass. A new feature here is the "automatic operation" function. Here, the switch is moved in the "Open" direction past the actuation point and then released. This causes the tilting/sliding roof to move to the position it was in prior to last being closed. To move it to a different position, the operator needs to press the switch again in the desired direction. When the tilting/sliding roof is open and the switch is moved past the actuation point in the "Close" direction, the roof will close automatically. If the tilting/sliding roof is obstructed during closing, the excess force limiter will interrupt the operation and the glass element will be moved back slightly. This is to ensure that body parts do not get caught in moving parts.

4.1.2 Panoramic sliding sunroof (code 413)

A "panoramic top sliding sunroof" is also available as special equipment. The operating logic of the panoramic sliding sunroof corresponds to that of the tilting/sliding roof, including the anti-pinch protection. To provide sun protection, the glass areas can be screened on the inside by two electrically driven roller blinds. The roller blinds also feature anti-pinch protection.

4.1.3 Actuation of tilting/sliding roof and panoramic sliding sunroof



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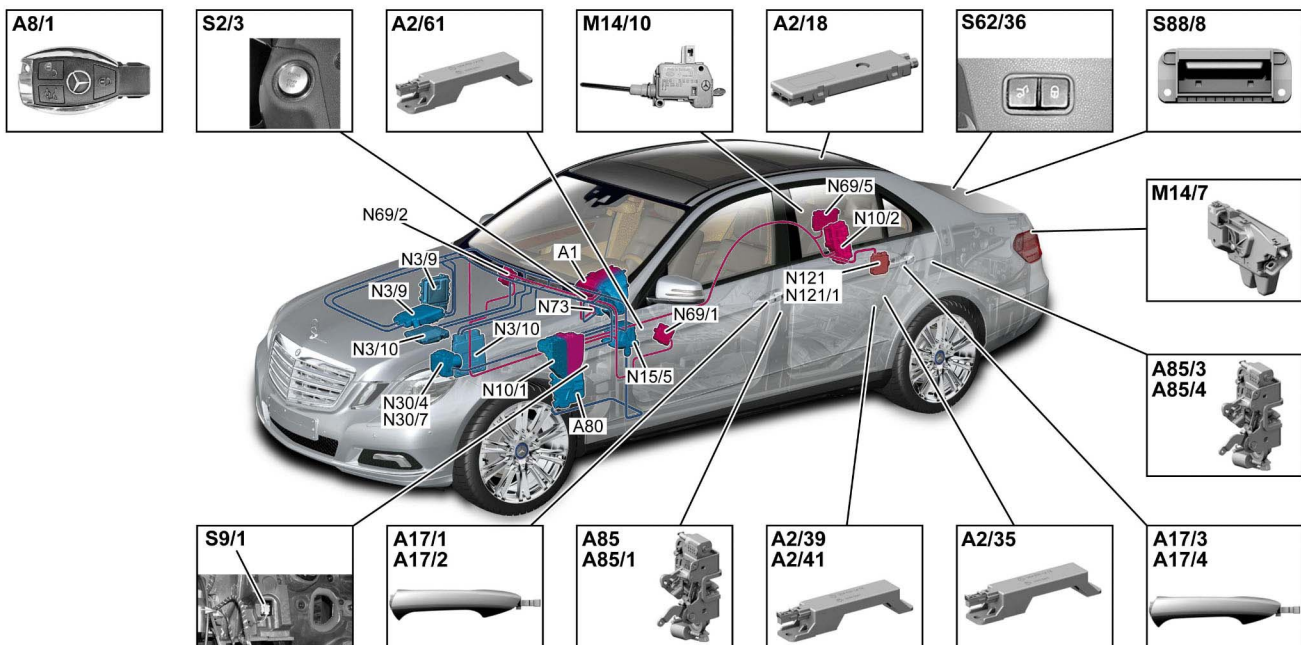
A	Tilting/sliding roof
B	Panoramic sliding roof
A85	Left front door lock
A85/1	Right front door lock
A98	Panoramic sliding sunroof control module (code 413)
B38/2	Rain/light sensor
M12	Tilting/sliding roof drive unit (code 414)
M12/5	Panoramic sliding roof roller sun blind drive unit (code 413)
N10/1	Front SAM control unit with fuse and relay module
N69/1	Left front door control unit
N69/2	Right front door control unit
N70	Overhead control panel control unit
N70s1	Tilting/sliding roof switch
N70/3s1	Panoramic sliding roof switch
N73	Electronic ignition lock control unit
CAN B	Interior CAN
CAN E	Chassis CAN
LIN 2	Wiper/inside rearview mirror LIN

5 Drive authorization and locking systems in model 212

5.1 Drive authorization and locking systems in model 212

5.1.1 KEYLESS-GO

The KEYLESS GO system makes it possible to access the vehicle and start the engine without using the transmitter key (A8/1). It is sufficient to just have the transmitter key on your person. Operation of the central locking (CL) system using the transmitter key remains possible parallel to the KEYLESS-GO functions. The determined position is transmitted by the transmitter key via radio signal. The FM1, AM, CL and KEYLESS-GO antenna amplifier (A2/18) processes the signal and forwards it to the KEYLESS-GO control unit (N69/5).



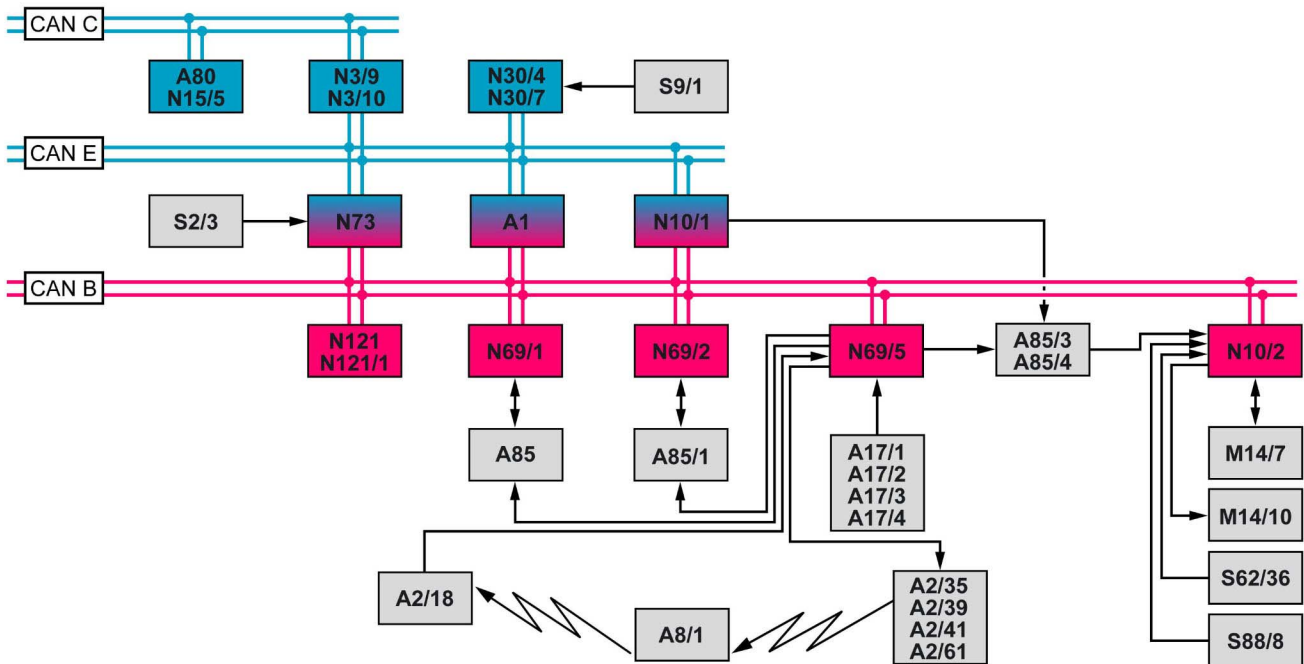
Location of components

P_80_61_002340_FA

A1	Instrument cluster
A2/18	FM1, AM, ZV and KEYLESS-GO antenna amplifier
A2/35	Trunk KEYLESS-GO antenna
A2/39	Left rear door KEYLESS GO antenna
A2/41	Right rear door KEYLESS GO antenna
A2/61	Interior KEYLESS GO antenna
A8/1	Transmitter key
A17/1	Left front KEYLESS GO door handle
A17/2	Right front KEYLESS GO door handle
A17/3	Left rear KEYLESS GO door handle
A17/4	Right rear KEYLESS GO door handle
A80	Intelligent servo module for DIRECT SELECT (with transmission 722.9)
A85	Left front door lock
A85/1	Right front door lock
A85/3	Left rear door lock
A85/4	Right rear door lock



M14/7	Trunk lid central locking motor (model 212.0), liftgate central locking motor (model 212.2)
M14/10	Tank cap central locking motor
N3/9	CDI control unit
N3/10	ME control unit
N10/1	Front SAM control unit
N10/2	Rear SAM control unit
N15/5	ESM control unit (with transmission 722.6)
N30/4	ESP control unit without DISTRONIC PLUS
N30/7	ESP control unit with DISTRONIC PLUS
N69/1	Left front door control unit
N69/2	Right front door control unit
N69/5	KEYLESS-GO control unit
N73	Electronic ignition lock control unit
N121	Remote trunk closing (HDFS) control unit (model 212.0)
N121/1	Liftgate control unit (model 212.2)
S2/3	KEYLESS GO start/stop button
S9/1	Brake light switch
S62/36	Remote trunk closing (HDFS) button (model 212.0), liftgate control button (model 212.2)
S88/8	External operation switch



Block diagram

P_80_61_002291_FA

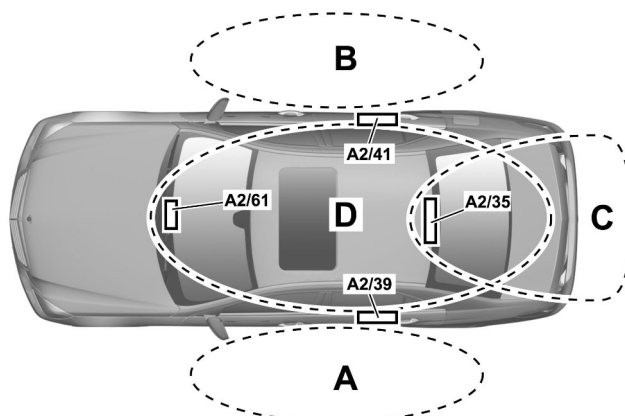
A1	Instrument cluster
A2/18	FM1, AM, ZV and KEYLESS-GO antenna amplifier
A2/35	Trunk KEYLESS-GO antenna
A2/39	Left rear door KEYLESS GO antenna
A2/41	Right rear door KEYLESS GO antenna
A2/61	Interior KEYLESS GO antenna
A8/1	Transmitter key
A17/1	Left front KEYLESS GO door handle

5 Drive authorization and locking systems in model 212

5.1 Drive authorization and locking systems in model 212

A17/2	Right front KEYLESS GO door handle
A17/3	Left rear KEYLESS GO door handle
A17/4	Right rear KEYLESS GO door handle
A80	Intelligent servo module for DIRECT SELECT (with transmission 722.9)
A85	Left front door lock
A85/1	Right front door lock
A85/3	Left rear door lock
A85/4	Right rear door lock
M14/7	Trunk lid central locking motor (model 212.0), liftgate central locking motor (model 212.2)
M14/10	Tank cap central locking motor
N3/9	CDI control unit
N3/10	ME control unit
N10/1	Front SAM control unit
N10/2	Rear SAM control unit
N15/5	ESM control unit (with transmission 722.6)
N30/4	ESP control unit without DISTRONIC PLUS
N30/7	ESP control unit with DISTRONIC PLUS
N69/1	Left front door control unit
N69/2	Right front door control unit
N69/5	KEYLESS-GO control unit
N73	Electronic ignition lock control unit
N121	Remote trunk closing (HDFS) control unit (model 212.0)
N121/1	Liftgate control unit (model 212.2)
S2/3	KEYLESS GO start/stop button
S9/1	Brake light switch
S62/36	Remote trunk closing (HDFS) button (model 212.0), liftgate control button (model 212.2)
S88/8	Trunk lid external operation switch (model 212.0), liftgate external operation switch (model 212.2)
CAN B	Interior CAN
CAN C	Drive train CAN
CAN E	Chassis CAN

Certain functions require the determination of the transmitter key's position. Activation of the components listed below allows the transmitter key to determine the area (A, B, C or D) in which it is currently located.



Coverage area of the antennas

P_80_61_002341_FA



A2/35	Trunk
A2/39	Left rear door
A2/41	Right rear door
A2/61	Interior
A	Left area
B	Right area
C	Rear end area
D	Interior area

5.1.2 Remote trunk closing (HDFS)

The remote trunk closing feature is used to automatically close the trunk lid. On vehicles with KEYLESS-GO, the remote trunk closing button (S62/36) has two sections. Pressing the left button activates the function sequence described above. Pressing the right button activates the function sequence described above and then also locks the vehicle.

Function sequence for position determination:

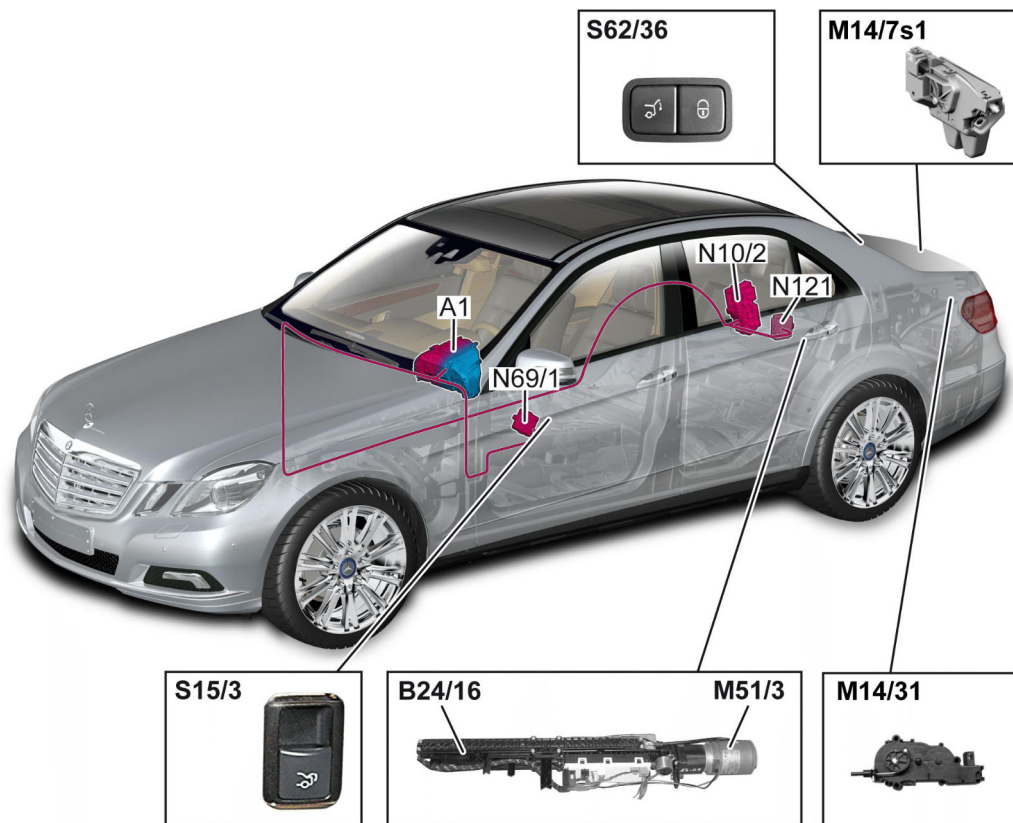
- If the trunk lid is closed by the remote trunk closing electric motor, the current position of the trunk lid is detected by the trunk lid position sensor (B24/16) and passed on to the remote trunk closing control unit

Function sequence for anti-blockage protection

- If the remote trunk closing position sensor tells the remote trunk closing control unit that an obstacle is present, the control unit immediately aborts the closing sequence and reverses the drive direction of the trunk lid control electric motor. Upon reversal of the drive direction of the trunk lid control electric motor, the trunk lid is not opened electrically but rather mechanically by means of spring force. The trunk lid control electric motor is moved back to its starting position. If the remote trunk closing control unit, the trunk lid control electric motor or the trunk lid position sensor is replaced, the remote trunk closing system has to be reset

5 Drive authorization and locking systems in model 212

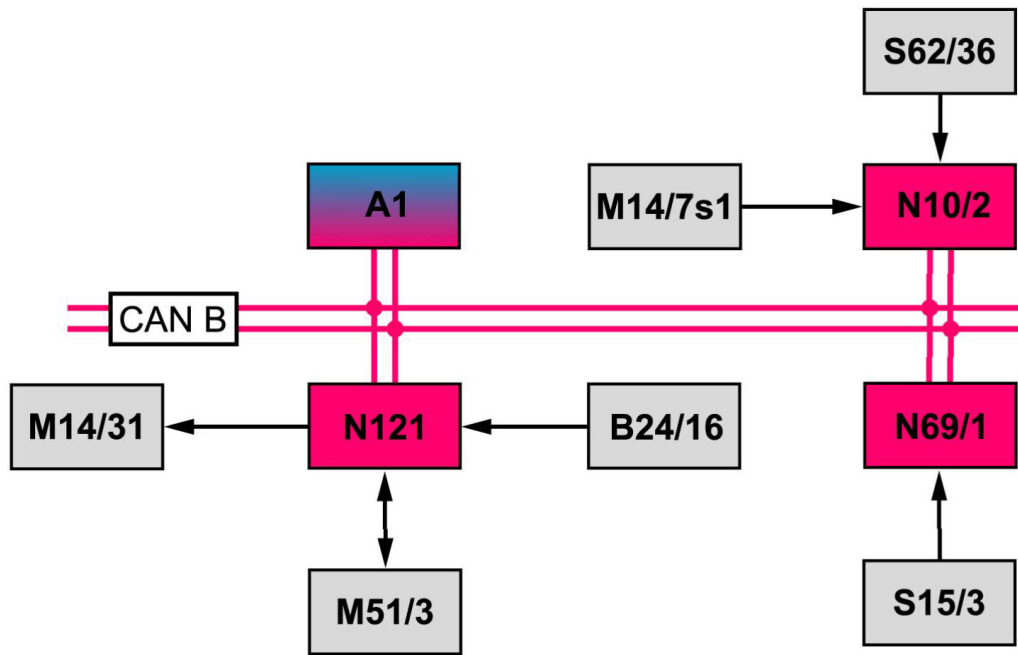
5.1 Drive authorization and locking systems in model 212



Location of components

P_80_20_003270_FA

A1	Instrument cluster
B24/16	Trunk lid position sensor
M14/7s1	Trunk lid rotary tumbler switch
M14/31	Trunk lid locking element
M51/3	Trunk lid drive unit
N10/2	Rear SAM control unit
N69/1	Left front door control unit
N121	Remote trunk closing control unit (model 212.0)
N121/1	Liftgate control unit (model 212.2)
S15/3	Driver trunk lid control button
S62/36	Trunk lid control button



Block diagram

P_80_20_003047_FA

A1	Instrument cluster
B24/16	Trunk lid position sensor
M14/7s1	Trunk lid rotary tumbler switch
M14/31	Trunk lid locking element
M51/3	Trunk lid control drive unit
N10/2	Rear SAM control unit
N69/1	Left front door control unit
N121	Remote trunk closing control unit
S15/3	Driver trunk lid control button
S62/36	Trunk lid control button
CAN B	Interior CAN

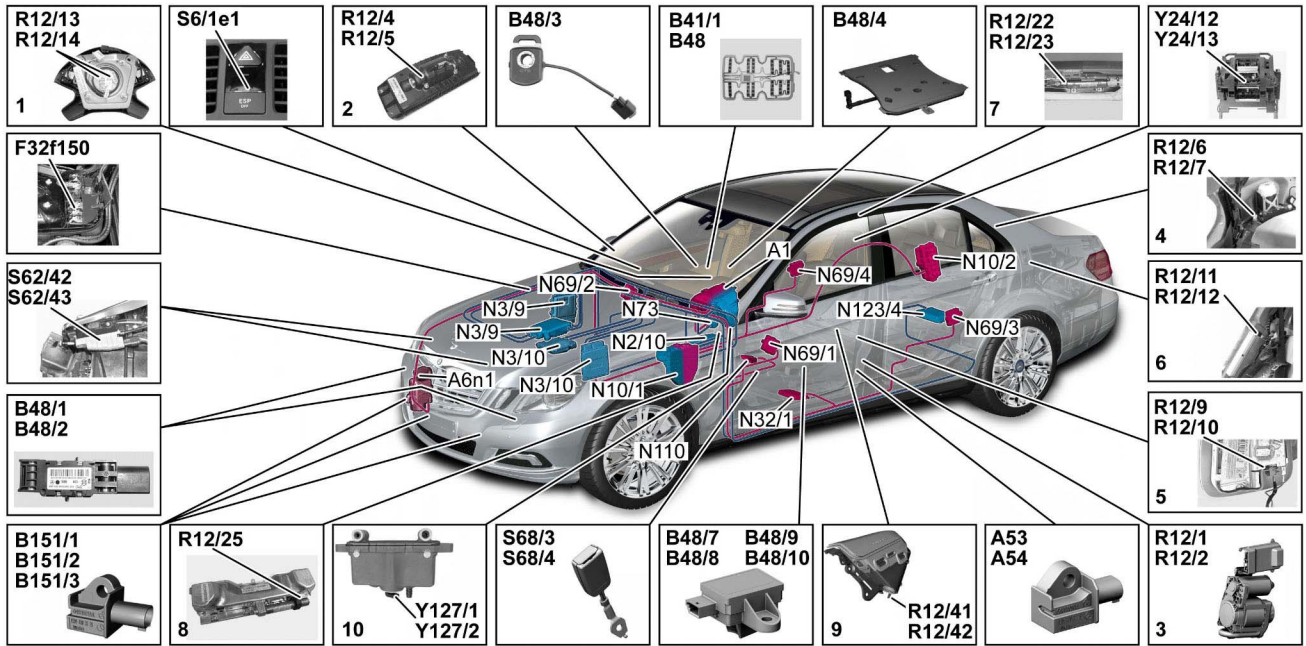
6 Restraint systems in model series 212

6.1 Restraint systems in model series 212

The supplemental restraint systems form an essential element of a vehicle's passive safety concept:

- Driver and front passenger airbags with two-stage, situation-sensitive triggering
- Optimally positioned front passenger airbag in the upper area of the instrument panel
- Reversible electric seat belt retractors with PRE-SAFE® function for driver and front passenger
- Deactivation of the front passenger airbag, emergency tensioning retractor and sidebag when the front passenger seat is determined to be occupied by an automatic child seat recognition system (special equipment)
- Kneebag (knee airbag) on the driver side
- Sidebags in front
- Pelvis airbag (special equipment)
- Belt force limitation in rear passenger compartment
- Rear belt status indication in instrument cluster
- Three-point seat belt in rear passenger compartment with reel tensioner
- Seat belt reminder warning for driver and front passenger
- Windowbags between the A-pillar and C-pillar
- Active NECK-PRO head restraints in front
- ISOFIX and Top Tether for securing suitable child seats in the outer rear compartment seats
- Two integrated child seats with side head restraints (special equipment)





Location of components

P_91_60_003903_FA

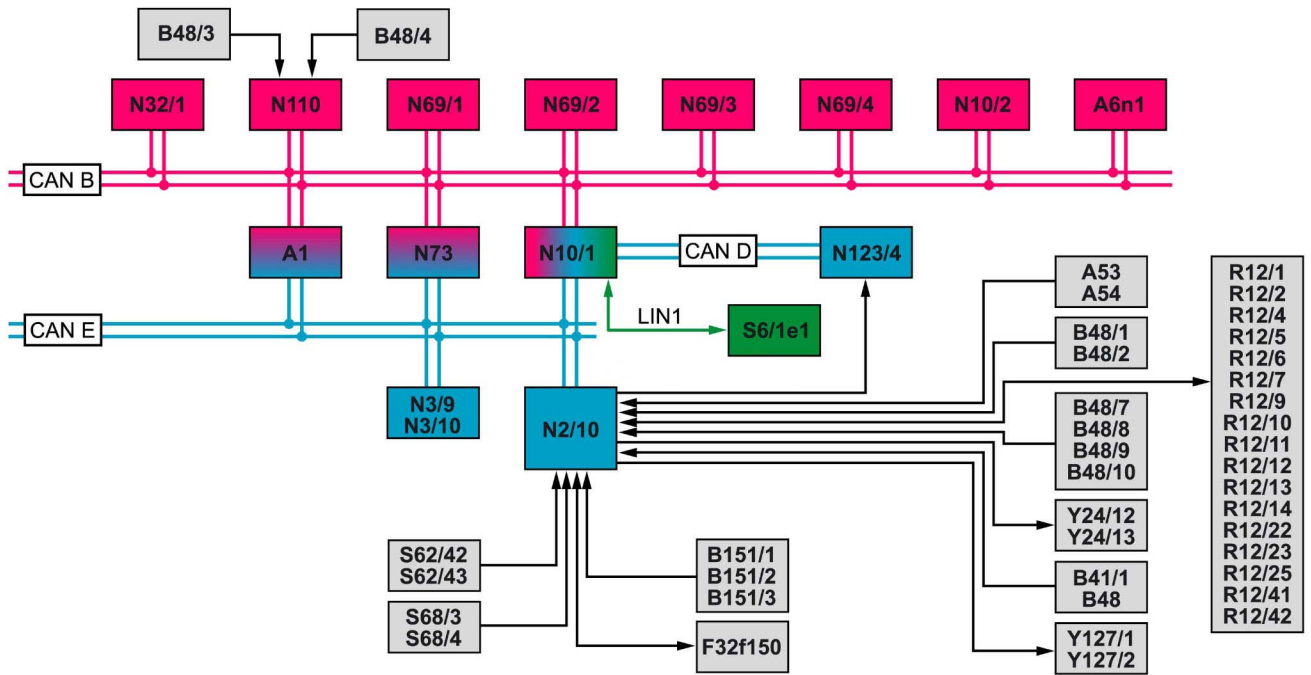
1	Driver airbag unit
2	Front passenger airbag unit
3	Front emergency tensioning retractor unit
4	Rear emergency tensioning retractor unit
5	Sidebag unit
6	Rear sidebag unit
7	Windowbag unit
8	Kneebag unit
9	Pelvis airbag
10	Engine hood lifter unit
A1	Instrument cluster
A6n1	Stationary heater control unit
A53	Left sidebag sensor
A54	Right sidebag sensor
B41/1	Front passenger seat occupied recognition
B48	Front passenger seat occupied recognition and ACSR
B48/1	Left frontal acceleration sensor
B48/2	Right frontal acceleration sensor
B48/3	Belt tension sensor (USA)
B48/4	Seat occupied recognition pressure sensor (USA)
B48/7	Left front door pressure sensor
B48/8	Right front door pressure sensor
B48/9	Left rear door pressure sensor
B48/10	Right rear door pressure sensor
B151/1	Left front bumper pedestrian protection sensor (vehicles with pedestrian protection)
B151/2	Central front bumper pedestrian protection sensor (vehicles with pedestrian protection)
B151/3	Right front bumper pedestrian protection sensor (vehicles with pedestrian protection)
F32f150	Pyrofuse 150

6 Restraint systems in model series 212

6.1 Restraint systems in model series 212

N2/10	Supplemental restraint system control unit
N3/9	CDI control unit
N3/10	ME control unit
N10/1	Front SAM control unit
N10/2	Rear SAM control unit
N32/1	Driver seat control unit
N69/1	Left front door control unit
N69/2	Right front door control unit
N69/3	Left rear door control unit
N69/4	Right rear door control unit
N73	Electronic ignition lock control unit
N110	Weight sensing system control unit (USA)
N123/4	Emergency call system control unit (USA)
R12/1	Driver emergency tensioning retractor squib
R12/2	Front passenger emergency tensioning retractor squib
R12/4	Front passenger airbag squib 1
R12/5	Front passenger airbag squib 2
R12/6	Left rear emergency tensioning retractor squib
R12/7	Right rear emergency tensioning retractor squib
R12/9	Driver sidebag squib
R12/10	Front passenger sidebag squib
R12/11	Left rear sidebag squib
R12/12	Right rear sidebag squib
R12/13	Driver airbag squib 1
R12/14	Driver airbag squib 2
R12/22	Left windowbag squib
R12/23	Right windowbag squib
R12/25	Driver kneebag squib
R12/41	Driver pelvis airbag squib
R12/42	Front passenger pelvis airbag squib
S6/1e1	Automatic child seat recognition warning lamp
S62/42	Right engine hood contact switch (vehicles with pedestrian protection)
S62/43	Left engine hood contact switch (vehicles with pedestrian protection)
S68/3	Driver seat belt buckle restraint system switch
S68/4	Front passenger seat belt buckle restraint system switch
Y24/12	Driver seat NECK-PRO head restraint solenoid
Y24/13	Front passenger seat NECK-PRO head restraint solenoid
Y127/1	Left rear engine hood lifter
Y127/2	Right rear engine hood lifter





Block diagram

P_91_60_003904_FA

A1	Instrument cluster
A6n1	Stationary heater control unit
A53	Left sidebag sensor
A54	Right sidebag sensor
B41/1	Front passenger seat occupied recognition
B48	Front passenger seat occupied recognition and ACSR
B48/1	Left frontal acceleration sensor
B48/2	Right frontal acceleration sensor
B48/3	Belt tension sensor (USA)
B48/4	Seat occupied recognition pressure sensor (USA)
B48/7	Left front door pressure sensor
B48/8	Right front door pressure sensor
B48/9	Left rear door pressure sensor
B48/10	Right rear door pressure sensor
B151/1	Left front bumper pedestrian protection sensor (vehicles with pedestrian protection)
B151/2	Central front bumper pedestrian protection sensor (vehicles with pedestrian protection)
B151/3	Right front bumper pedestrian protection sensor (vehicles with pedestrian protection)
F32f150	Pyrofuse 150
N2/10	Supplemental restraint system control unit
N3/9	CDI control unit
N3/10	ME control unit
N10/1	Front SAM control unit
N10/2	Rear SAM control unit
N32/1	Driver seat control unit
N69/1	Left front door control unit
N69/2	Right front door control unit
N69/3	Left rear door control unit
N69/4	Right rear door control unit

6 Restraint systems in model series 212

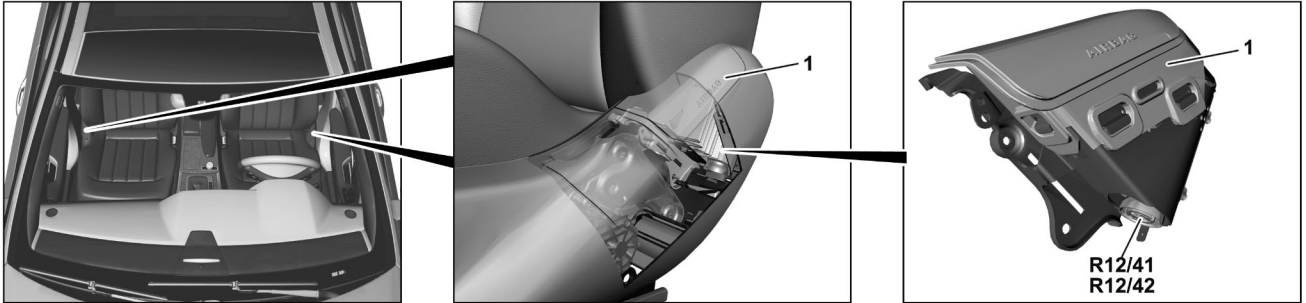
6.1 Restraint systems in model series 212

N73	Electronic ignition lock control unit
N110	Weight sensing system control unit (USA)
N123/4	Emergency call system control unit (USA)
R12/1	Driver emergency tensioning retractor squib
R12/2	Front passenger emergency tensioning retractor squib
R12/4	Front passenger airbag squib 1
R12/5	Front passenger airbag squib 2
R12/6	Left rear emergency tensioning retractor squib
R12/7	Right rear emergency tensioning retractor squib
R12/9	Driver sidebag squib
R12/10	Front passenger sidebag squib
R12/11	Left rear sidebag squib
R12/12	Right rear sidebag squib
R12/13	Driver airbag squib 1
R12/14	Driver airbag squib 2
R12/22	Left windowbag squib
R12/23	Right windowbag squib
R12/25	Driver kneebag squib
R12/41	Driver pelvis airbag squib
R12/42	Front passenger pelvis airbag squib
S6/1e1	Automatic child seat recognition warning lamp
S62/42	Right engine hood contact switch (pedestrian protection)
S62/43	Left engine hood contact switch (pedestrian protection)
S68/3	Driver seat belt buckle restraint system switch
S68/4	Front passenger seat belt buckle restraint system switch
Y24/12	Driver seat NECK-PRO head restraint solenoid
Y24/13	Front passenger seat NECK-PRO head restraint solenoid
Y127/1	Left rear engine hood lifter
Y127/2	Right rear engine hood lifter
CAN B	Interior CAN
CAN D	Diagnostic CAN
CAN E	Chassis CAN
LIN 1	Instrument panel LIN

6.1.1 Pelvis airbag (depending on country)



The pelvis airbag units protect occupants from injury in case of a side impact affecting the pelvis region. The pelvis airbag units and their squibs are located in the seat on the outboard side. They are ignited together with the sidebags and windowbags. The airbag has a volume of approximately 3.65 liters.



P_91_60_003507_SW

1	Pelvis airbag cover
R12/41	Left pelvis airbag squib
R12/42	Right pelvis airbag squib

6.1.2 Left front reversible emergency tensioning retractor



P_91_40_002807_SW

A76	Left front reversible emergency tensioning retractor
A76/1	Front right reversible emergency tensioning retractor
M68	Left front reversible emergency tensioning retractor actuator motor
M68/1	Right front reversible emergency tensioning retractor actuator motor

Evaluation of input factors

The read input factors are evaluated by the integrated microprocessor and the affected components are actuated.

The following signals are read in via the chassis CAN:

- Request for reversible belt tensioning from ESP control unit
- Status of driver seat belt buckle restraint systems switch (S68/3)
- Status of front passenger seat belt buckle restraint systems switch (S68/4)

6.2 Pedestrian protection in model series 212

WARNING!

Risk of injury caused by active engine hood due to spring loading of engine hood lifter

- In the event of improper handling (banging or dropping), the engine hood lifter must be replaced
- When installed, no acceleration (striking with a hammer) must occur when working in the area of the engine hood lifter. This also applies to the engine hood hinge. There is a danger that the engine hood lifter may trigger without obvious cause
- If the replacement part packaging is damaged, the engine hood lifter must not be installed

Installation note:

- Disconnect battery!
- Install the engine hood lifter immediately after removing it from the replacement part packaging!
- Observe assembly note in the WIS!
- Adhere to the assembly sequence!

Indicators for need to replace the engine hood lifter

- Fault message in the diagnostic system
- Engine hood lifter visibly damaged in triggered, closed or removed state
- Hinge damaged
- Damage to the upper longitudinal member in the area of the engine hood lifter
- If the triggered engine hood lifter is severely soiled, e.g. due to sand, sludge, glass splinters



Fundamentally the following applies: If the engine hood lifter is reversible, it is OK and need not be replaced!

To reduce the intensity of accidents for pedestrians and cyclists, a crash-active engine hood is installed as standard equipment and in compliance with statutory requirements. If a collision occurs, e.g. with a pedestrian, sensors can trigger the raising of this engine hood in the A-pillar area. If the head of a pedestrian hits the engine hood, raising the hood produces more deformation space and can help to reduce the intensity of the impact.

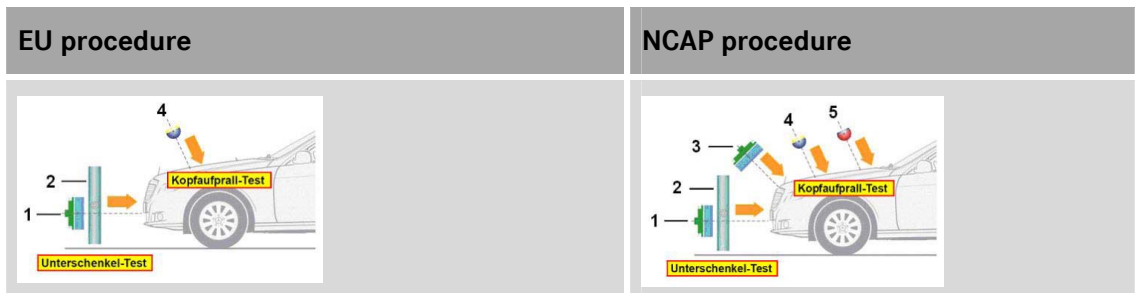
In case of a collision with a pedestrian, an array of sensors in the front bumper actuates the spring-loaded engine hood lifter in the vicinity of the hood hinges, which then lift the hood approximately 50 mm. The additional space created between the engine hood and the components in the engine compartment serves to efficiently retard and protect the head of a pedestrian upon impact. The deformation properties of the engine hood were specifically developed to meet the requirements of this feature.

The use of aluminum combined with the homogeneous reinforcement found on the inside of the engine hood can help to further reduce the intensity of an impact.

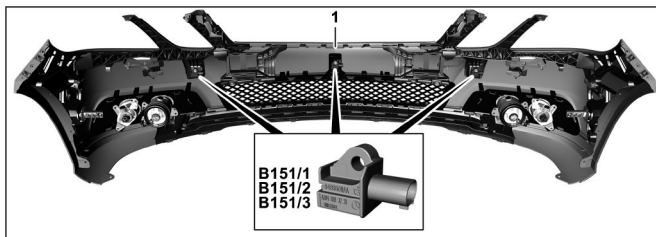
It is possible to continue driving after the engine hood has been deployed in order to bring the vehicle to a qualified specialized workshop. If the release handle of the engine hood was pulled, the engine hood has to be relatched before driving on. Provided the ignition is on, a symbol in the multifunction display will indicate that the engine hood is open.



Legal requirements regarding pedestrian protection



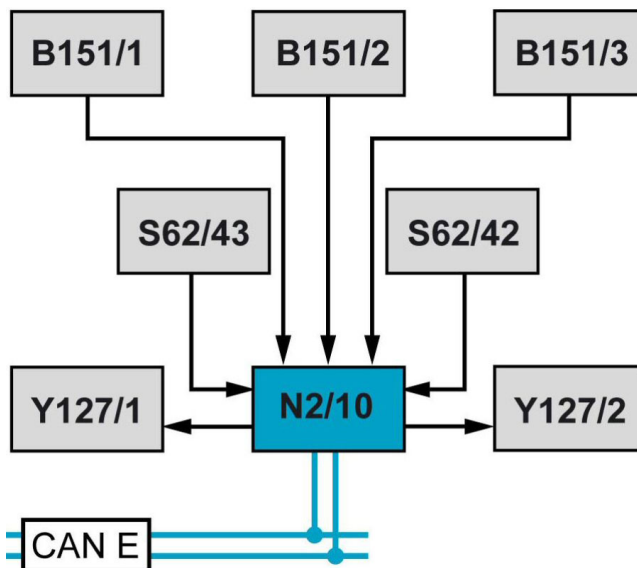
No.	Description
1	Hip impactor for SUV (40 km/h)
2	Leg impactor (40 km/h)
3	Hip impactor (40 km/h)
4	Child head impactor (2.5 kg; 40 km/h)
5	Adult head impactor (4.8 kg; 40 km/h)



Location of sensors

P_91_60_003506_SW

1	Front bumper
B151/1	Left front bumper pedestrian protection sensor
B151/2	Center front bumper pedestrian protection sensor
B151/3	Right front bumper pedestrian protection sensor



Block diagram

P_91_60_003907_FA

B151/1	Left front bumper pedestrian protection sensor
--------	--

B151/2	Center front bumper pedestrian protection sensor
B151/3	Right front bumper pedestrian protection sensor
N2/10	Supplemental restraint systems control unit
S62/42	Right engine hood contact switch
S62/43	Left engine hood contact switch
Y127/1	Left rear engine hood lifter
Y127/2	Right rear engine hood lifter
CAN E	Chassis CAN



The pedestrian protection may be triggered by mistake on collision with other objects (e.g. guide posts or thick branches).

Before setting the engine hood upright, the engine hood clamping levers must be unhooked and then rehooked prior to closing the engine hood.

Please refer to the operator's manual for the proper procedure for returning the engine hood to its original position, including all accident and injury prevention information, as well as for information about when it is possible to continue driving with the engine hood deployed.



7 Seats in model series 212

7.1 Seats in model series 212

7.1.1 Multicontour seat (code 409)

The multicontour seat allows for the individual and stepless adjustment of the seat cushion length and backrest contour to suit the build of the driver and front passenger and thus improve seating comfort. The adaptation of the seat contour to the needs of the driver and front passenger is done by moving air in and out of the air chambers found in the front of the seat cushion and in the backrest face. An air chamber for leg support is found in the seat cushion, and there is one each on the left and right side of the backrest and in the backrest face. The controls are located next to the seat cushion between the seat's side cheeks and the center console.

7.1.2 Active multicontour seat (code 432)



The active multicontour seat is a further development of the multicontour seat. Besides being able to adjust the seat's contours, the active multicontour seat also has a massage function and can automatically adapt the backrest's side supports to the current driving situation. When the vehicle dynamics function is activated, an electropneumatic system adjusts the air pressure in the backrest's side bolsters depending on the steering wheel angle, lateral acceleration and vehicle speed. There are two intensity settings. When the operator deactivates the vehicle dynamics function, the pressure in the backrest chambers returns to the level that was present prior to activation of the vehicle dynamics function.

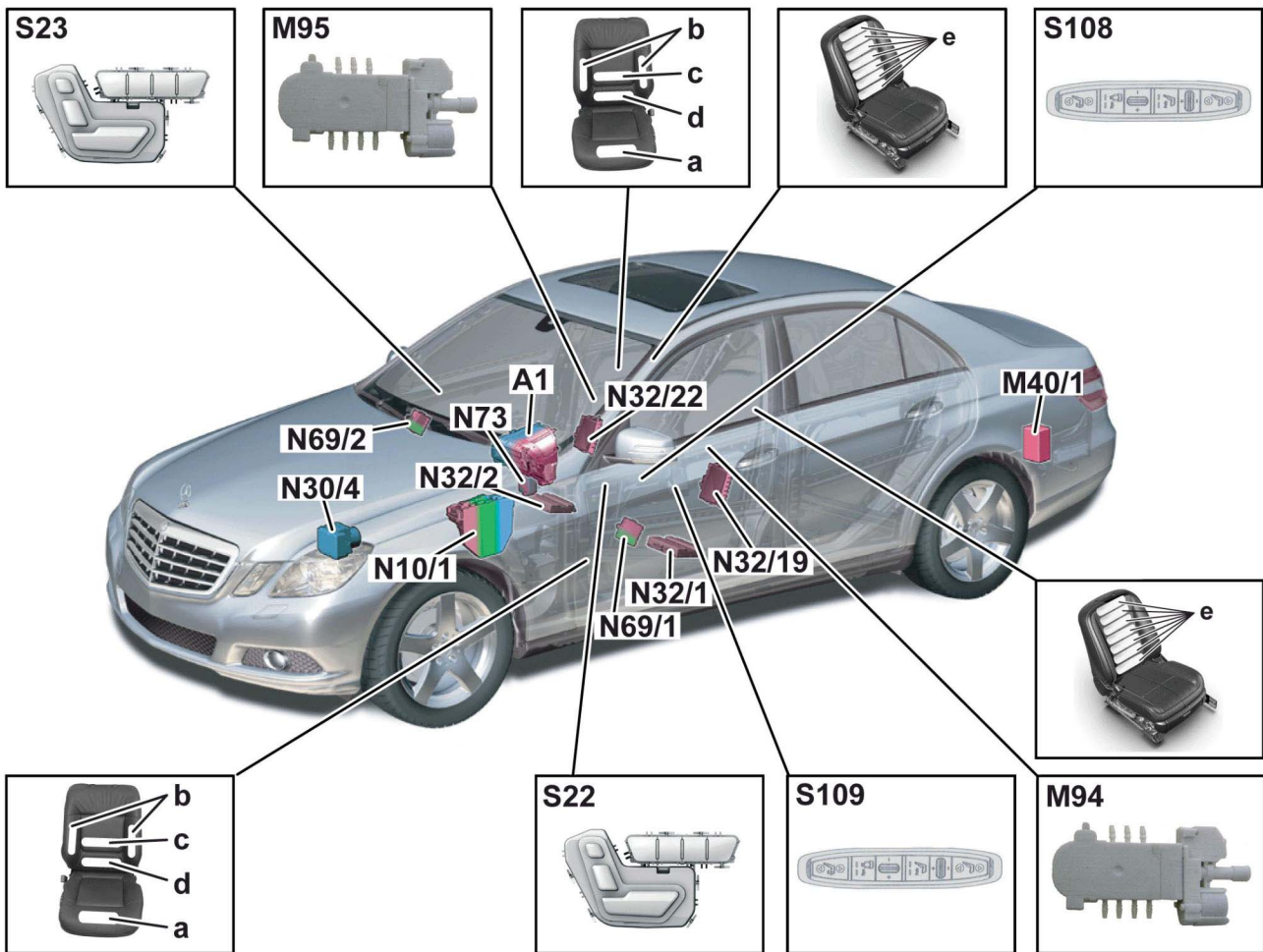
To prevent back tension during longer trips, the multicontour seat comes with a massage function (pulse mode). While the massage function is active, pressure is added, held and released in the 7 rows of the massage insert to sequentially change its contour. There are two intensity settings. Pulsation occurs as upward or downward leaps of pressure. The dwell time can be set using the Diagnosis system. A continuous regulation system ensures that the set pressure values and the specified pressure levels in the various sections of the cushion are

maintained. The different air cushions can be manually actuated using the active multicontour seat button group.

In critical situations (PRE-SAFE®), the air cushions in the side area are inflated before the impending accident in order to move the occupants to a favorable position in the center of the seat and hold them there.

If several buttons are pressed simultaneously, only the adjustment with the highest priority will be carried out.

- Priority 1: Lateral support, backrest
- Priority 2: Lumbar support
- Priority 3: Seat cushion
- Priority 4: Active multicontour seat
- Priority 5: Massage function (pulse)



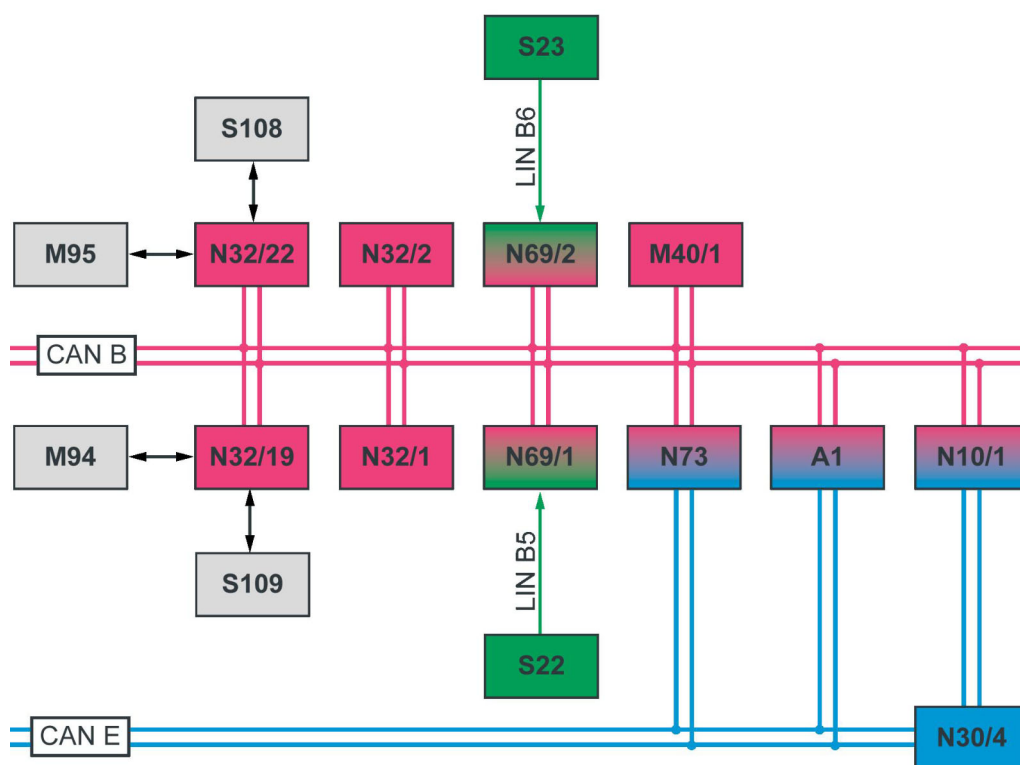
Location of components

P_91_25_002391_FA

a	Seat cushion length air cushion
b	Air cushions in the sides of the backrest
c	Air cushion in the upper lumbar support area of the backrest
d	Air cushion in the lower lumbar support area of the backrest
e	Air cushions for the massage insert
A1	Instrument cluster
M40/1	Active multicontour seat pneumatic pump



M94	Left front seat massage function actuator motor
M95	Right front seat massage function actuator motor
N10/1	Front SAM control unit with fuse and relay module
N30/4	ESP control unit without DISTRONIC PLUS, in vehicles with DISTRONIC PLUS the ESP control unit (N30/7) with DISTRONIC PLUS is installed instead of control unit N30/4.
N32/1	Driver seat control unit, memory package, electrically adjustable front seats
N32/2	Front passenger seat control unit, memory package, electrically adjustable front seats
N32/19	Left front active multicontour seat control unit
N32/22	Right front active multicontour seat control unit
N69/1	Left front door control unit
N69/2	Right front door control unit
N73	Electronic ignition lock control unit
S22	Left front seat adjustment switch group
S23	Right front seat adjustment switch group
S108	Front passenger active multicontour seat button group
S109	Driver active multicontour seat button group



Block diagram

P_91_25_002392_FA

A1	Instrument cluster
M40/1	Active multicontour seat pneumatic pump
M94	Left front seat massage function actuator motor
M95	Right front seat massage function actuator motor
N10/1	Front SAM control unit with fuse and relay module
N30/4	ESP control unit without DISTRONIC PLUS, in vehicles with DISTRONIC PLUS the ESP control unit (N30/7) with DISTRONIC PLUS is installed instead of control unit N30/4.
N32/1	Driver seat control unit, memory package, electrically adjustable front seats
N32/2	Front passenger seat control unit, memory package, electrically adjustable front seats
N32/19	Left front active multicontour seat control unit
N32/22	Right front active multicontour seat control unit

7 Seats in model series 212

7.1 Seats in model series 212

N69/1	Left front door control unit
N69/2	Right front door control unit
N73	Electronic ignition lock control unit
S22	Left front seat adjustment switch group, memory package, electrically adjustable front seats
S23	Right front seat adjustment switch group, memory package, electrically adjustable front seats
S108	Front passenger active multicontour seat button group
S109	Driver active multicontour seat button group
CAN B	Interior CAN
CAN E	Chassis CAN
LIN B5	Left front door LIN
LIN B6	Right front door LIN



8 Diagnosis/practice

8.1 Networking/energy management

Exercise 1 Prepare a diagnosis based on the customer complaint. Show the diagnostic path to fault elimination. Use all of the testing and informational media you know of to help you. Document your test steps.

Impairment of the active engine hood, restraint system, speed limit assistant and PRE-SAFE® functions. All systems show malfunctions.

DISTRONIC PLUS system, Lane Keeping Assist, ABS, ESP, Blind Spot Assist, COMAND APS, seat adjustment and THERMOTRONIC are nonfunctional.



Exercise 2 The customer complains that the multicontour seat isn't working.

Prepare a diagnosis based on the customer complaint. Show the diagnostic path to fault elimination. Use all of the testing and informational media you know of to help you.

Document your test steps.

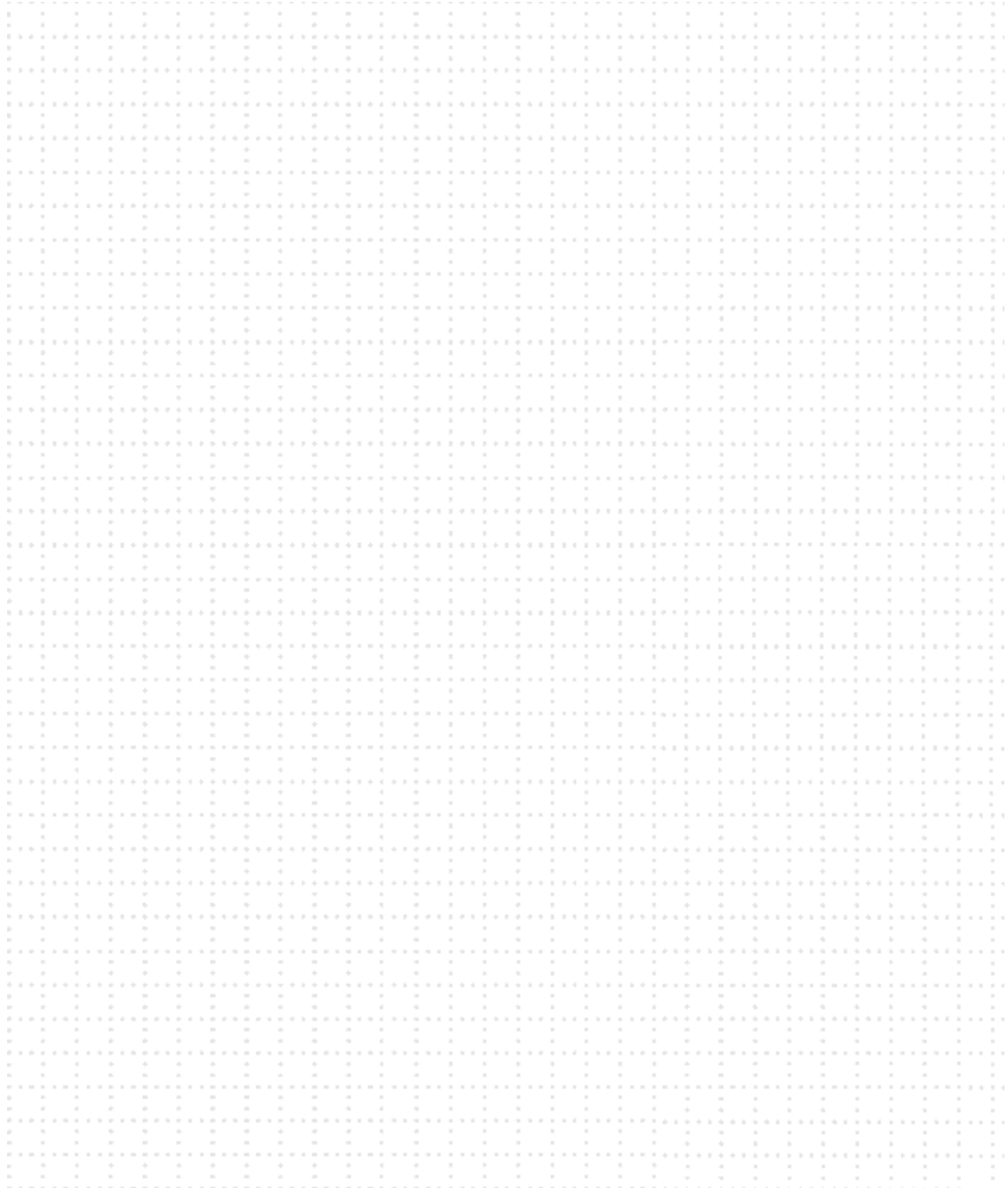


8.2 Climate control

Exercise 3 THERMOTRONIC (3-zone air conditioning) is nonfunctional.

Prepare a diagnosis based on the customer complaint. Show the diagnostic path to fault elimination. Use all of the testing and informational media you know of to help you.

Document your test steps!



8.3 Drive authorization and locking systems

Exercise 4 KEYLESS-GO is partially nonfunctional.

Prepare a diagnosis based on the customer complaint. Show the diagnostic path to fault elimination. Use all of the testing and informational media you know of to help you.

Document your test steps.



Exercise 5 The automatic remote trunk closing (HDFS) is nonfunctional.

Prepare a diagnosis based on the customer complaint. Show the diagnostic path to fault elimination. Use all of the testing and informational media you know of to help you.

Document your test steps.

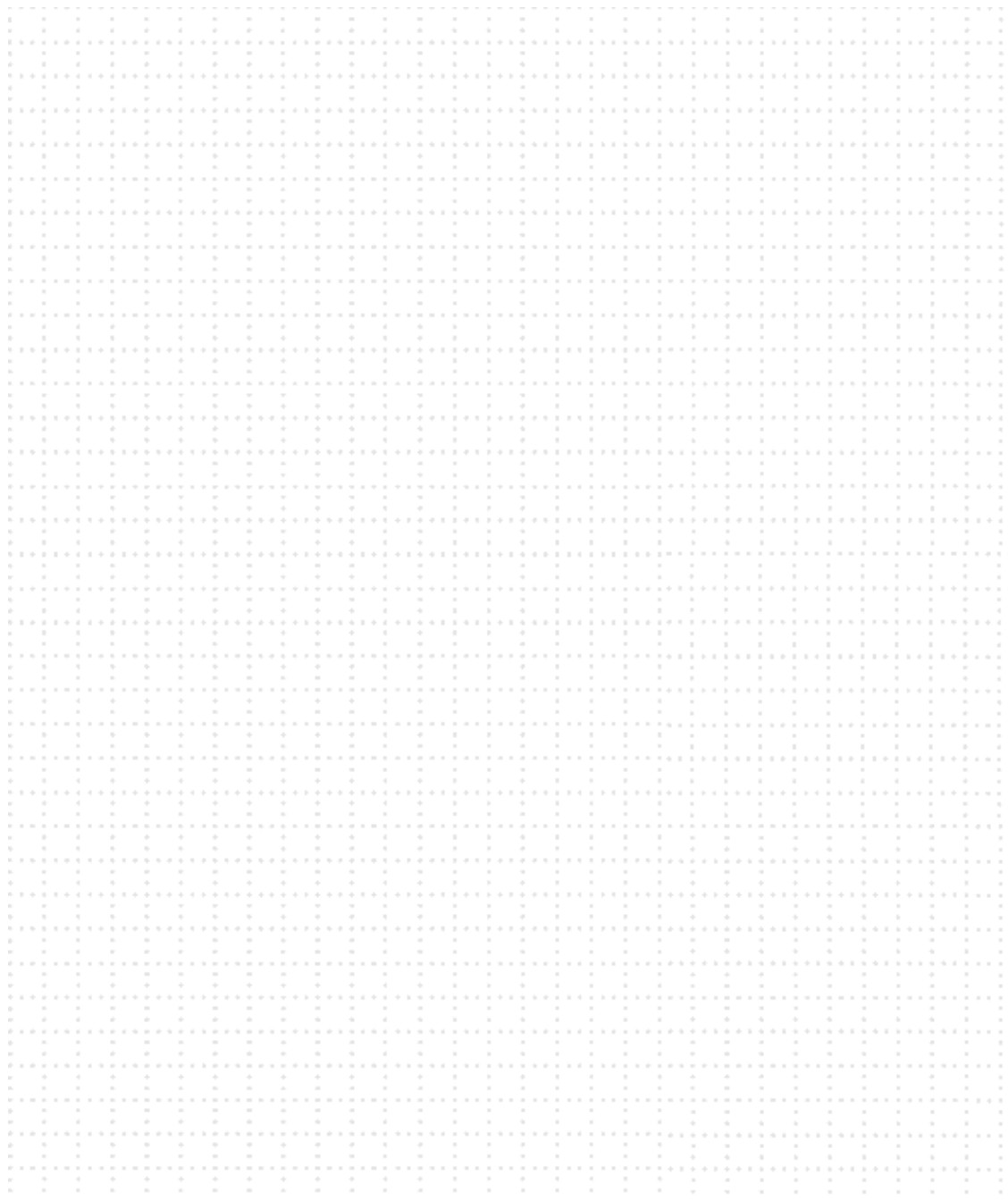


8.4 Restraint systems

Exercise 6 SRS indicator lamp is on.

Prepare a diagnosis based on the customer complaint. Show the diagnostic path to fault elimination. Use all of the testing and informational media you know of to help you.

Document your test steps.

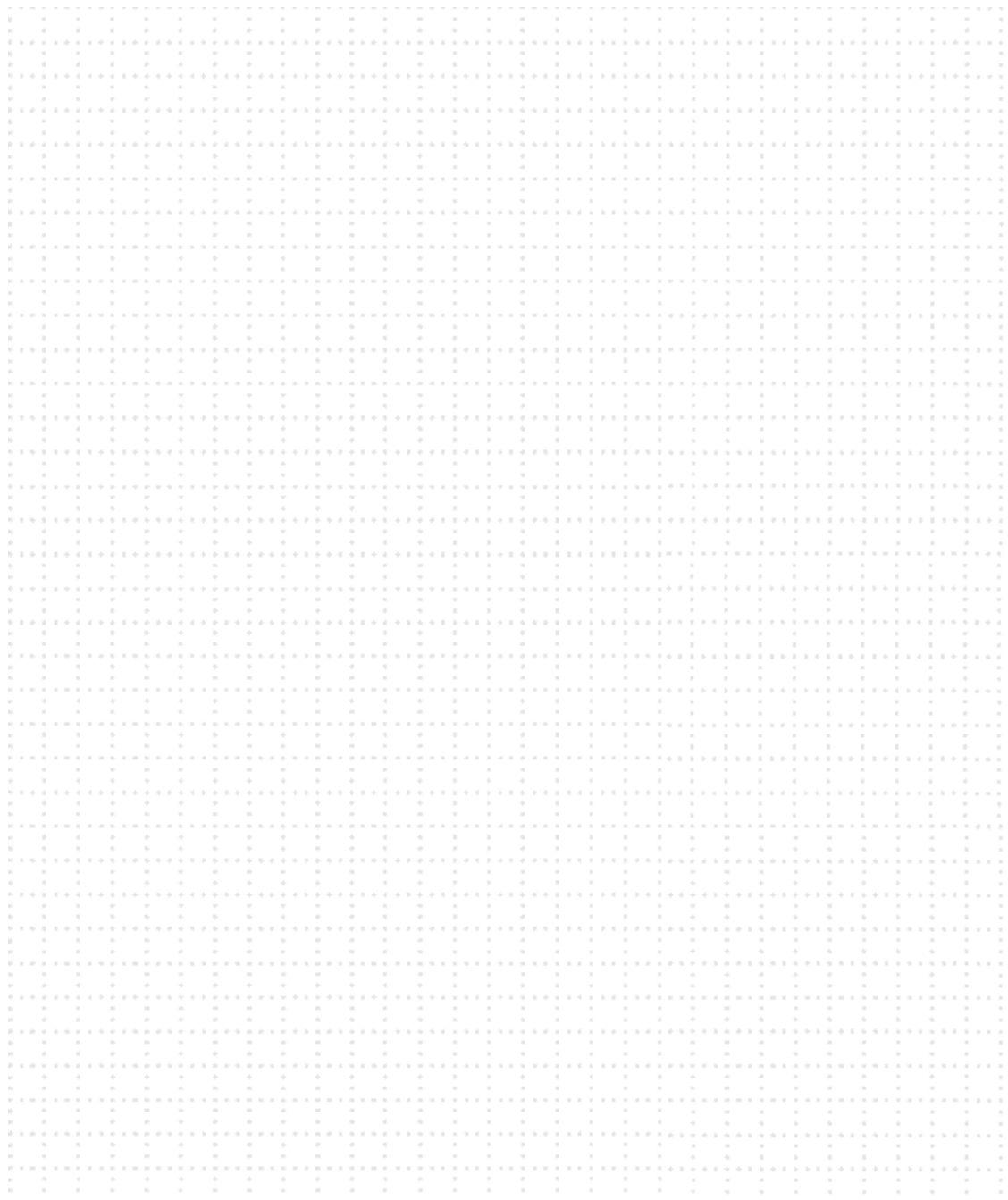


8.5 Seats

Exercise 7 Vehicle dynamic support is nonfunctional.

Prepare a diagnosis based on the customer complaint. Show the diagnostic path to fault elimination. Use all of the testing and informational media you know of to help you.

Document your test steps.



9 Adaptive Highbeam Assist

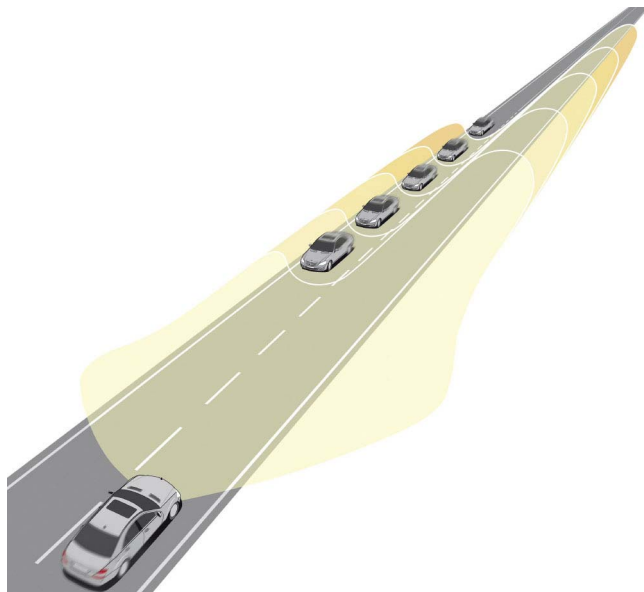
9.1 Adaptive Highbeam Assist

The Adaptive Highbeam Assist is special equipment (code P35) which forms part of the light package.

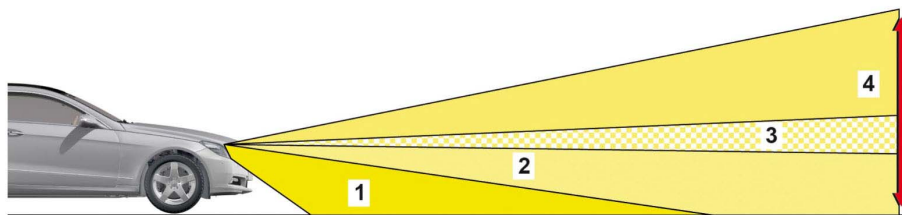
The system automatically adapts the range of the headlamps to the distance from preceding or oncoming vehicles. To do this, the traffic and environmental situation in front of the vehicle is scanned by the multifunction camera and is evaluated every 40 ms. The range of the light cone changes depending on the evaluated data from 70 to up to 300 meters by raising or lowering the light cone. Other car drivers are not dazzled in this case. The Adaptive Highbeam Assist system additionally takes the steering angle into consideration to dim the headlamps in tight curves.

Function requirements:

- Adaptive Highbeam Assist switched on in the instrument cluster
- Driving lights set to ON or AUTO on rotary light switch
- High beams switched on via the combination switch
- Vehicle speed above 55 km/h



9.1.1 Intelligent Light System (SA)



Highbeam Assist control

P82.10-005839-FA

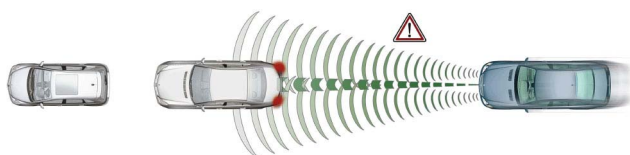
1	Low beams
2	Low beams, dynamic
3	Zone without high beam
4	High beams, dynamic



10 Brake Assist System PLUS

10.1 Brake Assist System PLUS

Brake Assist System PLUS is part of the DISTRONIC PLUS special equipment option. This technology supports the driver by assessing the potential danger of a situation and the Brake Assist System PLUS makes the computed brake servo assistance immediately available to the driver, even if the driver does not apply the brake pedal forcefully enough. Depending on the vehicle speed and the distance to the next vehicle, the Brake Assist System PLUS serves to achieve controlled, targeted braking and will increase the brake force to emergency braking levels if necessary.



Exercise 8 Explain the difference between the Brake Assist System (BAS) and the Brake Assist System PLUS (BAS PLUS).

--	--

Exercise 9 Which statement regarding the Brake Assist System PLUS (BAS PLUS) is true?

	Statement
<input type="checkbox"/>	BAS PLUS detects an emergency braking situation at the moment when the accelerator pedal is suddenly released
<input type="checkbox"/>	The BAS PLUS function is only activated when ESP is being deployed
<input type="checkbox"/>	In order to recognize an emergency braking situation, BAS PLUS needs to know how fast the brake pedal is being applied
<input type="checkbox"/>	BAS PLUS also responds to rapid steering movements by triggering emergency braking
<input type="checkbox"/>	BAS PLUS receives additional information from the radar system

11 PRE-SAFE® brake

11.1 PRE-SAFE® brake

Task

The PRE-SAFE® brake is an additional function of the DISTRONIC PLUS system which supports the PRE-SAFE® safety concept. The PRE-SAFE brake® continuously calculates the potential risk of a rear-end collision and, in critical situations where an accident is impending, initiates appropriate measures to warn the driver of the collision and to reduce the effects of a collision if possible.

Function

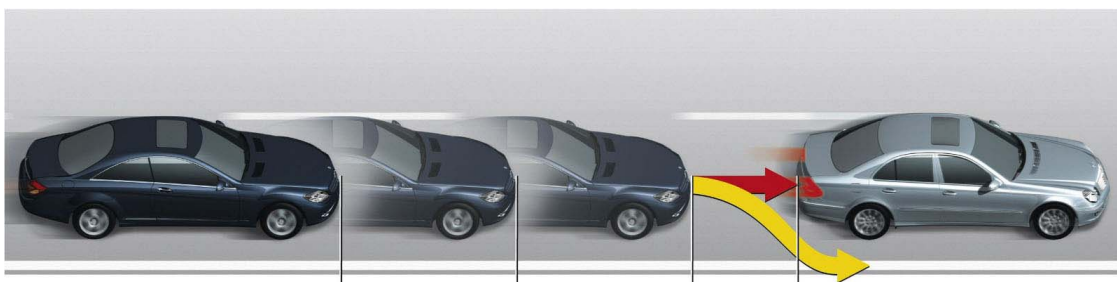
The data from the long and short range radar is used to continuously calculate the potential risk of a rear-end collision. If a situation is recognized as a critical impending accident situation, the system will first issue a visual and acoustic collision warning (lamp in instrument cluster and intermittent tone).

If the driver fails to react sufficiently, he is then prompted to act by an automatic partial braking process. If, despite the visual, acoustic and haptic warning, the driver still fails to respond, emergency braking is triggered in order to reduce the speed of the vehicle directly prior to impact.

Exercise 10 Place the following terms in the correct location in the table. For help, look at the picture below, which depicts the stages of a PRE-SAFE® braking action.

Autonomous partial braking - Acoustic warning - Autonomous emergency braking - Visual warning

Three acoustic collision warnings - Visual warning



approx. 2.6 s prior to the accident	approx. 1.6 s prior to the accident	approx. 0.6 s prior to the accident

Exercise 11 Which statement about the PRE-SAFE® brake is true?

	Statement



	At high differences in speed emergency braking occurs automatically
	The vehicle is decelerated by 4 m/s^2 during partial braking
	By triggering emergency braking, the PRE-SAFE® brake prevents rear-end collisions
	Emergency braking only occurs after the three acoustic warnings have been emitted
	If the driver does not respond to the optical and acoustic warnings, the system will first trigger a partial braking

12 Blind Spot Assist

12.1 Blind Spot Assist

Task

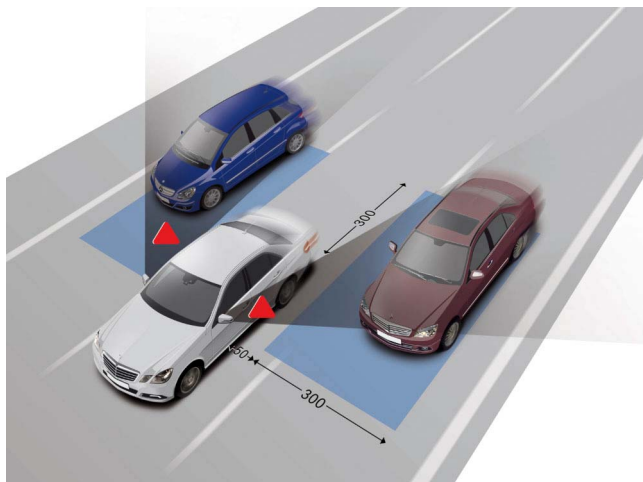
The Blind Spot Assist helps the driver to perform lane changes safely. The Blind Spot Assist delivers important information on activities in the rear and side areas of the vehicle (the blind spot).

Design

Two radar sensors located in the rear bumper monitor the area to the sides and rear of the vehicle. Detection, computation and warning is performed by the radar sensors control unit. Warning lamps integrated into the left and right outside mirrors are used to warn the driver.

Function

With the information provided by the radar sensors, the control unit detects vehicles (objects) in the "blind spot". A red triangle in the outside mirror warns the driver about these vehicles. If the turn signal is activated, an additional acoustic warning sounds.



13 DISTRONIC PLUS

13.1 DISTRONIC PLUS

Task

The DISTRONIC PLUS system uses a radar sensor system to maintain a specified distance, set by the driver, to the vehicle ahead. To achieve this, the vehicle electronics decelerate and accelerate the vehicle automatically. The driver is also given a visual and acoustic warning when the specified distance point is crossed. DISTRONIC PLUS serves to improve driving safety and driving comfort. It can furthermore help to reduce the frequency and severity of accidents.

Design

The DISTRONIC PLUS system basically consists of the radar sensors (long and short range radar), the operating lever, the warning and display instrument and the DISTRONIC control units.

Function

DISTRONIC PLUS regulates the vehicle speed and the distance to the vehicle ahead in line with the setting made by the driver and does so within a range of 0 to 200 km/h. If the lane ahead of the vehicle is clear, DISTRONIC PLUS regulates the set target speed in the same way as conventional cruise control.

As the car approaches a preceding vehicle, the speed is reduced in order to maintain the specified distance set by the driver. To this end, the following actions are initiated:

- Reducing the engine output
- Activation of brakes
- Shifting the gear

If the traffic situation allows the speed to be increased again, e.g. because the preceding vehicle accelerates or leaves the lane, DISTRONIC PLUS increases the speed back to the set target speed. Here, acceleration is limited to 2.5 m/s^2 and deceleration to 4 m/s^2 .

Exercise 12 What are the differences between the DISTRONIC and DISTRONIC PLUS systems?

Which subfunctions are integrated into which version? Complete the table.

Feature/Function	DISTRONIC	DISTRONIC PLUS
Acceleration	2	2
Deceleration	2	2
Vehicle speed range		
Tempomat	Present	Present
Distance control	Present	Present
Proximity warning		

13 DISTRONIC PLUS

13.1 DISTRONIC PLUS

BAS PLUS		
PRE-SAFE® brake		
Blind Spot Assist		

Exercise 13 When does the warning lamp (red triangle) in the instrument cluster come on?



14 Practical work with assist systems

14.1 Practical work with DISTRONIC PLUS

Exercise 14 How can you tell if the PRE-SAFE® brake is active?



Exercise 15 How can you tell if the Blind Spot Assist is installed?



Exercise 16 Which areas are monitored by the Blind Spot Assist and how does the system warn the driver?



Exercise 17 Which conditions must be fulfilled for DISTRONIC PLUS to be activated?



Exercise 18 In the E-Class, the fault message "DISTRONIC fault" is shown.

Work in your group to solve the exercise and describe your steps using keywords.



15 ATTENTION ASSIST

15.1 ATTENTION ASSIST

Task

The standard ATTENTION ASSIST system monitors the driving behavior of the driver in order to detect overtiredness.

The newly developed ATTENTION ASSIST monitors and evaluates over 70 different parameters. Continuous observation is important in order to detect flagging attention following long stretches of monotonous driving and to provide early warning to the driver.

Design

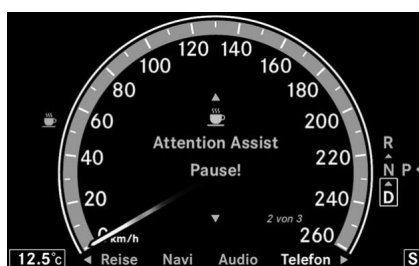
The ATTENTION ASSIST function is integrated into the ESP control unit.

Function

ATTENTION ASSIST analyzes driving behavior data to monitor driver activities and detect oncoming drowsiness or an increasing inattentiveness, e.g. during long stretches of monotonous driving on freeways and highways.

If the ATTENTION ASSIST function ascertains driver fatigue or increasing inattentiveness, it will suggest that the driver take a break. To assess driver fatigue or increasing inattentiveness, ATTENTION ASSIST analyzes steering behavior, vehicle movements not caused by the driver, and driving conditions (e.g. time of day, driving time). During the first 20 minutes of monotonous driving, the system identifies the individual parameters for the driver and sets a warning threshold. If this warning threshold is reached, the instrument cluster emits a visual and acoustic warning message.

An active warning can be acknowledged and canceled by pressing the OK button in the left multifunction steering wheel button group. The next warning can only be issued after 15 minutes has lapsed.



16 Lane Keeping Assist

16.1 Lane Keeping Assist

Task

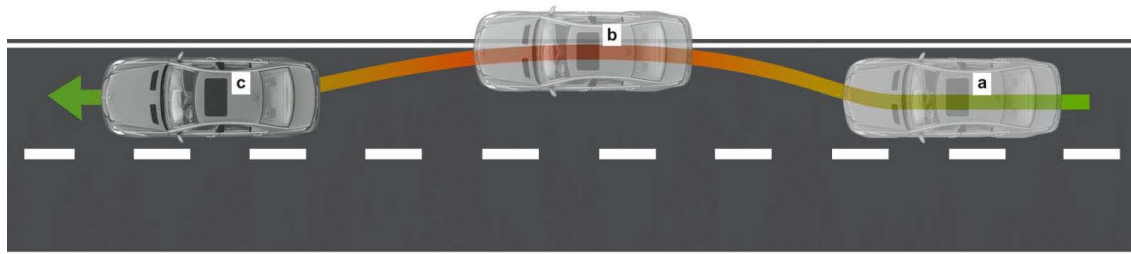
The Lane Keeping Assist system recognizes the lane boundaries on the road and warns the driver if the vehicle crosses the lane markings. The warning given depends on the particular situation.

Design

Lane recognition is done by means of a multifunction camera installed in the upper center area of the windshield. The camera's signals are evaluated by the control unit, which also issues the warning via the vibration motor in the steering wheel.

Function

The multifunction camera attached below the inside rearview mirror on the windshield observes the road space ahead of the vehicle. At the same time, measurements of the lane markings are taken. The system then uses the recorded image sequences and the lane marking measurements to compute the lane. This means that it can determine the position of the vehicle within the lane as well as the course of the lane in front of the vehicle. Based on this data, the multifunction camera can determine whether the driver crosses a lane marking. No lane information can be output if lane markings are absent or concealed (e.g. by dirt or snow), or if there is little contrast between the road surface and the lane markings.



c	b	a
The vehicle has returned to the lane.	The vehicle crosses the outer lane marking. The warning is issued.	The vehicle is in the lane.



17 Speed Limit Assist

17.1 Speed Limit Assist

Task

The newly developed Speed Limit Assist reminds the driver of the posted speed limit by displaying it in the instrument cluster.

Design







To recognize, compute and display the current speed limit, the Speed Limit Assist requires information from the multifunction camera and from the navigation system.

Function

The Speed Limit Assist function scans the posted speed limits on the stretch of road being driven. These are then shown in the multifunction display of the instrument cluster in the form of a traffic sign. The multifunction camera located in the upper part of the windshield scans the area in front of the vehicle. Navigation data are also used to help determine the permitted speed. These data are used to verify the plausibility of the object scanned by the multifunction camera and to cancel speed limit displays when the vehicle enters a town where fixed speed limits apply.

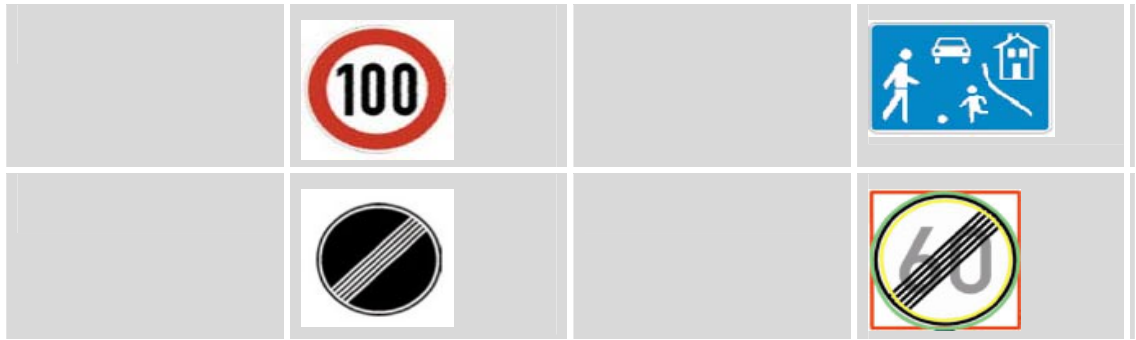
Exercise 19 What types of traffic signs can the Speed Limit Assist recognize?

Place a check next to the correct signs in the table.

	Traffic sign		Traffic sign
			
			
			

17 Speed Limit Assist

17.1 Speed Limit Assist



Exercise 20 A customer comes to you in the workshop with his E-Class. The customer says that a fault message is shown in the instrument cluster.

Work on in your group to solve the exercise and describe your steps using keywords.

A large grid of small dots for writing the solution to the exercise.



18 Night View Assist PLUS

18.1 Night View Assist PLUS

Task

The Night View Assist system scans the road ahead of the vehicle in the dark and shows it in the display. This allows for the early recognition of persons and obstacles before they become visible in the light of conventional low beams.

Design

The most important components of the Night View Assist PLUS are:

- Night vision camera
- Infrared headlamps
- Switch
- Control unit

Function

At night, and provided the vehicle is traveling at least 15 km/h, infrared light is beamed onto the road ahead of the vehicle in addition to the normal headlamps. The Night View Assist camera scans the area in front of the vehicle. This scan corresponds to the driver's view through the windshield with the high beams on. Infrared light is invisible to the human eye. This means that oncoming traffic is not blinded by it. The Night View Assist system detects persons moving on dark country roads outside of towns. The detected persons are highlighted in the display by corner markings. Persons in front of the vehicle can be detected up to a distance of 90 m.



Image in the multifunction display

P_54_30_009904_SW

1	Persons detected by the system (highlighted by corner markings)
2	Symbol for active person detection

19 Reversing camera

19.1 Reversing camera

Task

The reversing camera helps the driver during maneuvering and when backing up by feeding an image of the area behind the vehicle to the display monitor.

Function

Shifting the vehicle into reverse causes power to flow to the reversing camera from the reversing camera power supply module. Actuation of the reversing camera power supply module is performed by the rear SAM control unit as soon as it actuates the left and right backup lamps.



Exercise 21 A customer comes to you in the workshop with his company car (E-Class model series 212). He thinks that the reversing camera is defective. He is not sure, however, because the vehicles are exchanged a lot and driven by different drivers. Check his information and repair the vehicle, if necessary. Note your steps in keywords.

A large grid of small dots for taking notes.



