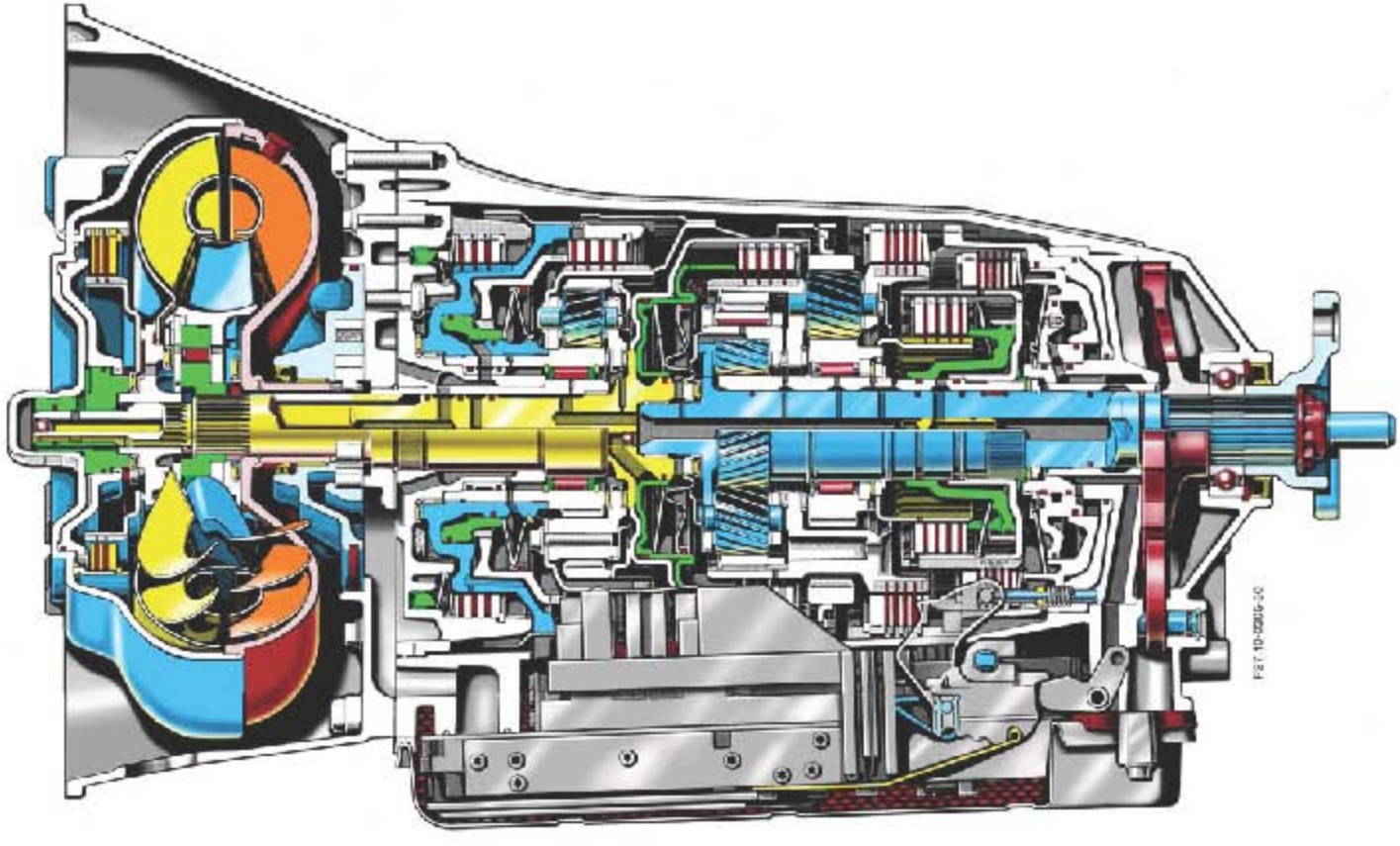
Transmission



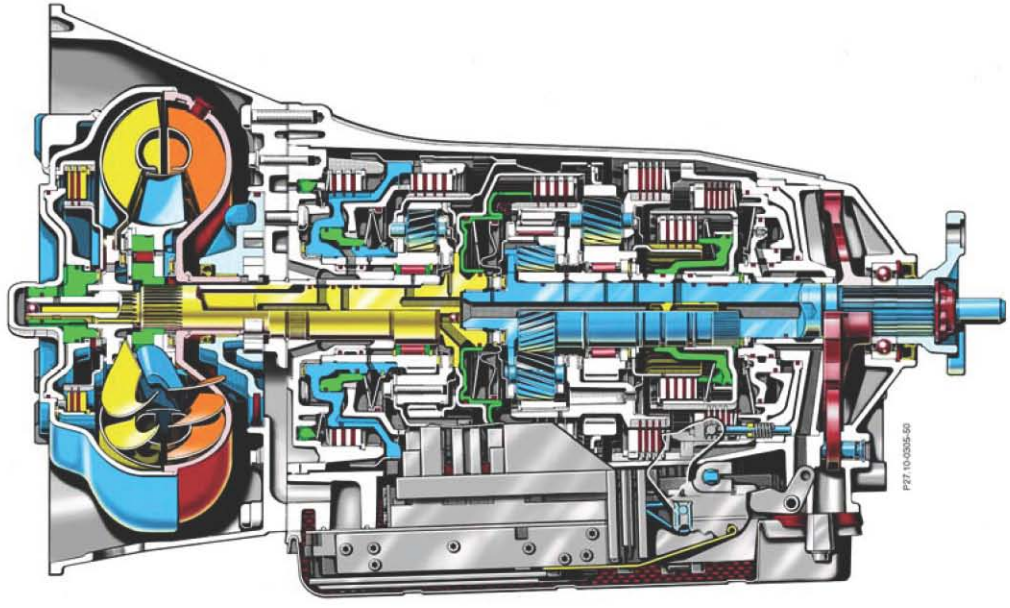
Transmission Designations

722 . 6 83

- 83 — Version
- 6 — Sales designation
- 722 — Automatic transmission passenger car

W 5 A 380

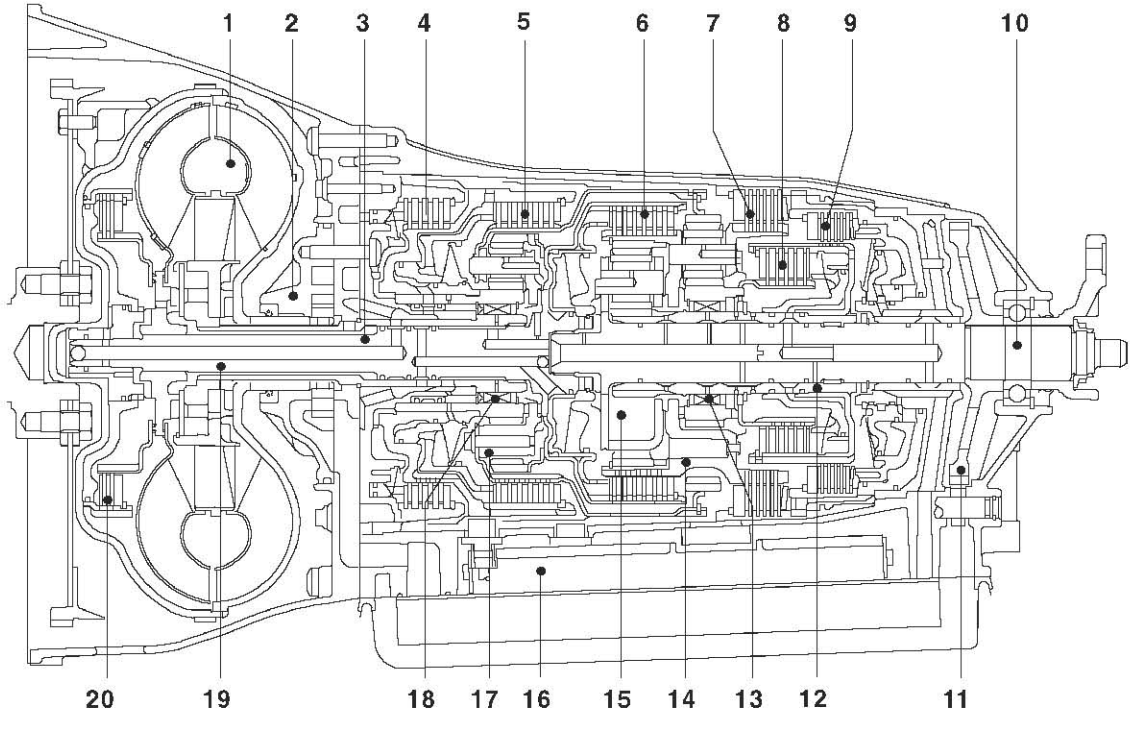
- 380 — Maximum input torque in NM
- A — Version (internal)
- 5 — Number of forward gears
- W — Torque converter



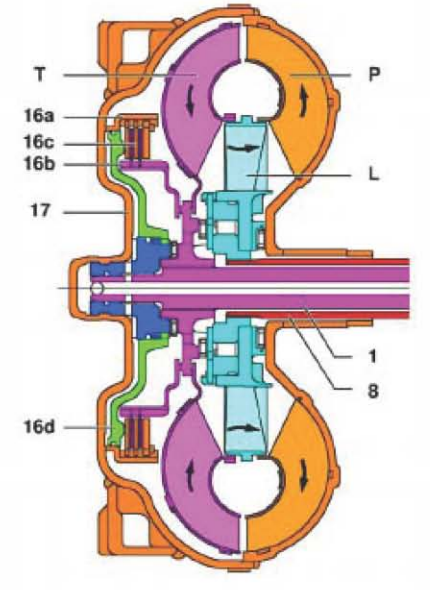
Components and Subsystems

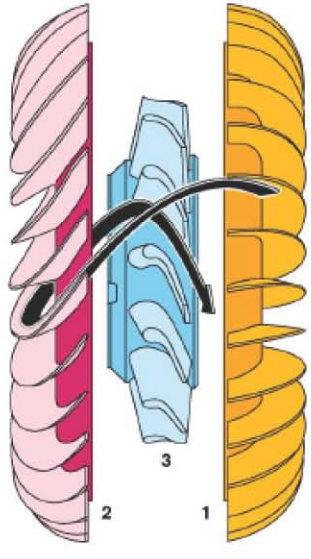
Mechanical transmission components and torque converter

1 – Torque converter
2 – Oil pump
3 – Input shaft
4 – Mulitdisk B1
5 – Mulitdisk K1
6 – Multidisk K2
7 – Multidisk B3
8 – Multidisk K3
9 – Multidisk B2
10 – Output shaft
11 – Park Pawl gear
12 – Intermediate shaft
13 – F2 freewheel
14 – Rear planetary gearset
15 – Middle planetary gearset
16 – Electrohydraulic control unit
17 – Front planetary gearset
18 – F1 freewheel
19 – Input shaft
20 – Torque converter lockup clutch



Torque Converter





- The torque converter is equipped with a torque converter lockup clutch, which is implemented as a multi-disk clutch.

- The torque converter has its own oil drain plug because, when the transmission oil is changed, the oil of the torque converter also has to be changed.

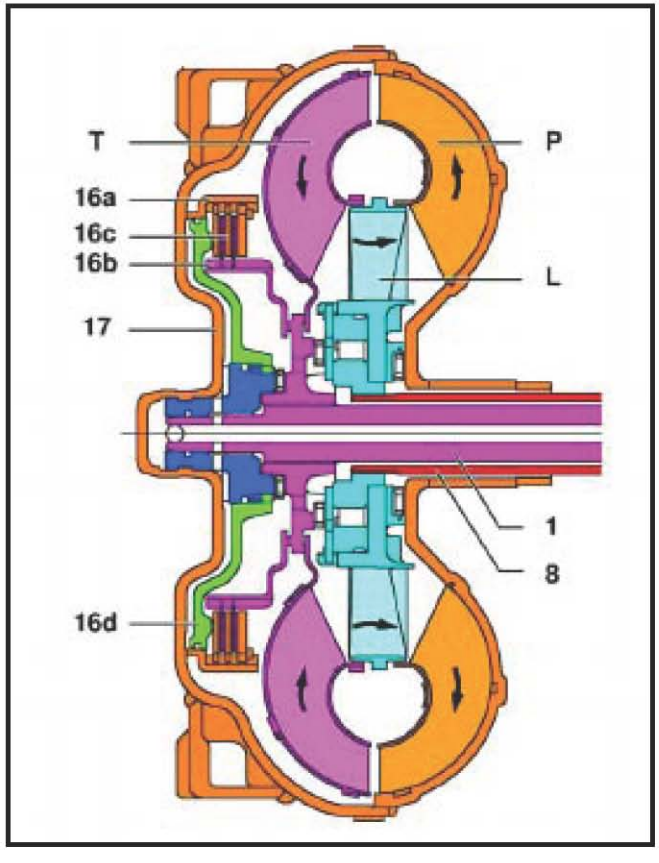
Torque Converter Lockup Clutch

The slip occurring in the torque converter and causing a difference between the engine speed and the transmission input speed is reduced with the help of the torque converter lockup clutch.

This lowers the engine speed and improves the transmission efficiency.

The cut-in of the torque converter lockup clutch takes place depending on the transmission input and output speed as well as the accelerator pedal position in all gears. It is operated map-controlled.

The torque converter lockup clutch operates with a slip of approx. 3 % when "closed".



1 - Input shaft
8 - Stator shaft
16a - External plate carrier
16b – Internal plate carrier
16c – Clutch pack
16d – Piston
17 - Cover shell
L – Stator
P – Impeller
T – Turbine wheel

Checking Oil Level

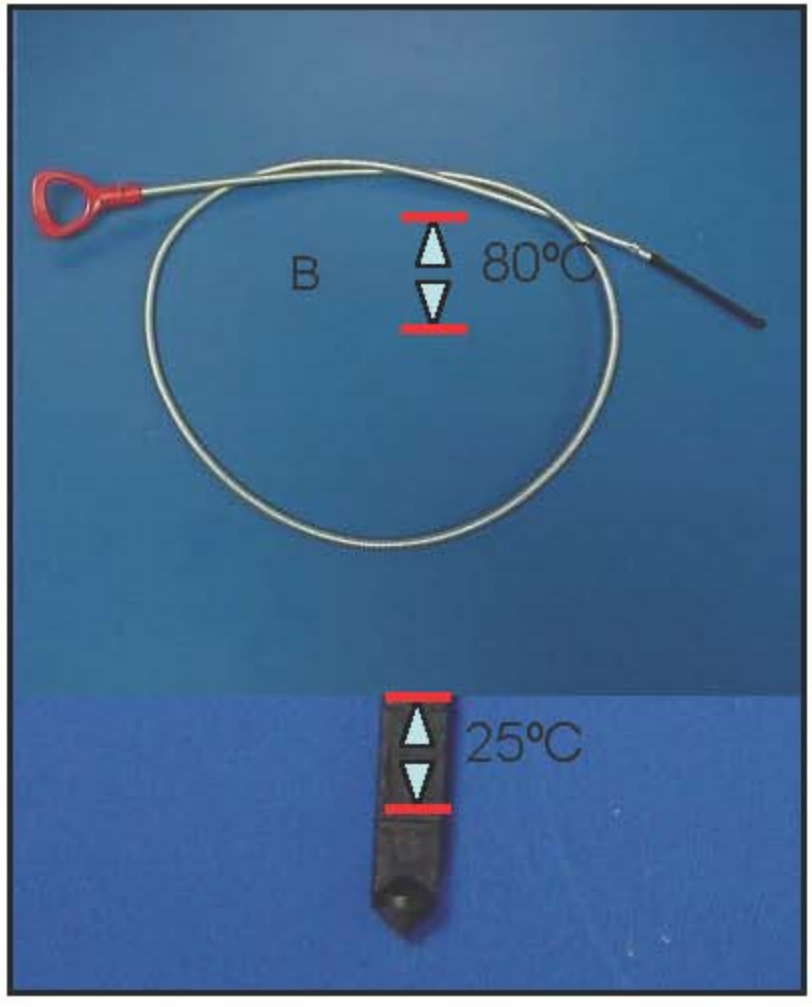
The oil dipstick is a special tool.

Check the transmission oil level at a transmission oil temperature of > 80 ° C to assure the oil level measurement is correct.

The oil level at the dipstick must be read at the marking "B".

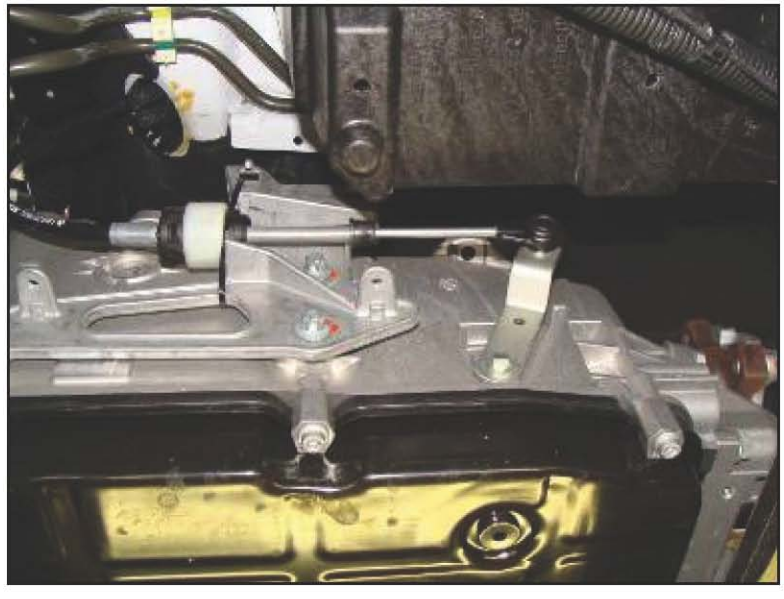
The cap on the oil fill tube is secured with a tamper-proof seal.

Install a new tamper-proof seal after checking transmission fluid level.



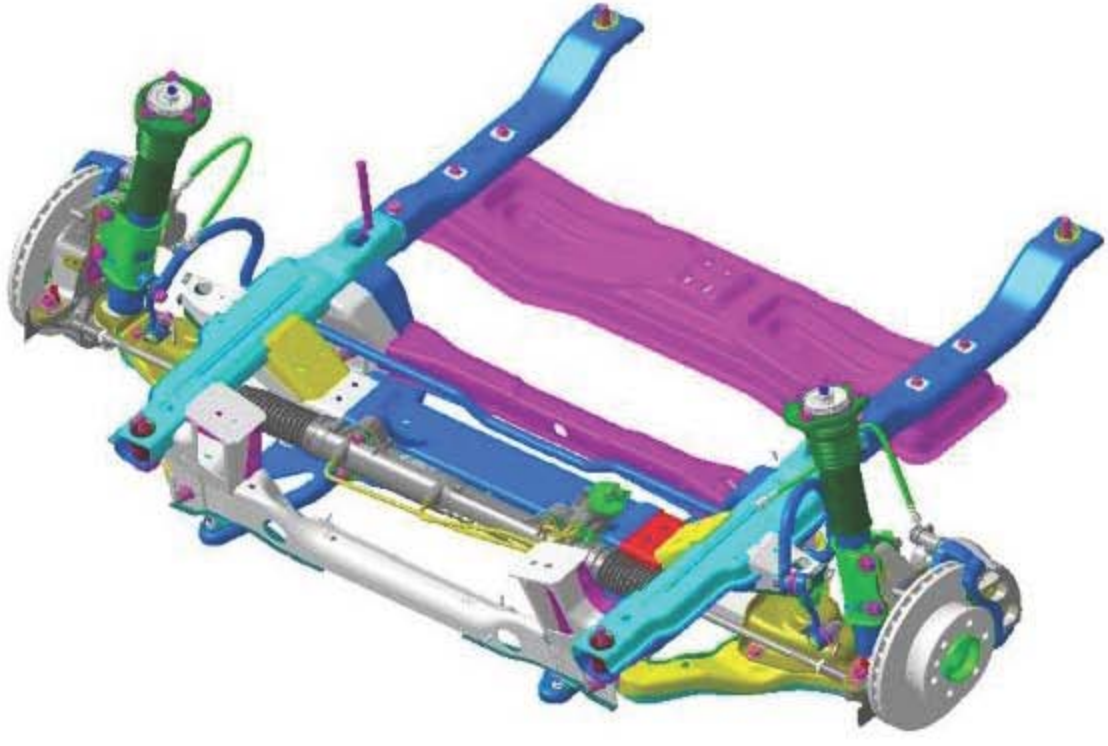
Shift Linkage

Shift lock release is located under an access plug just below the shifter



The shift lever is connected to the transmisision by a cable.

Chassis



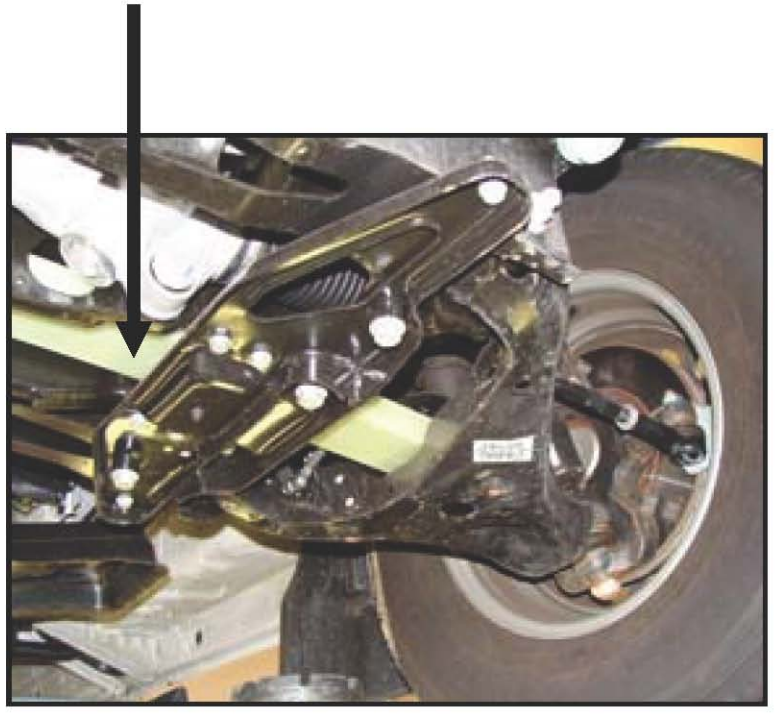
Front Suspension

Shock absorber strut front suspension

Lower control arm

Transverse fiberglass-reinforced plastic leaf spring

Rack and Pinion steering



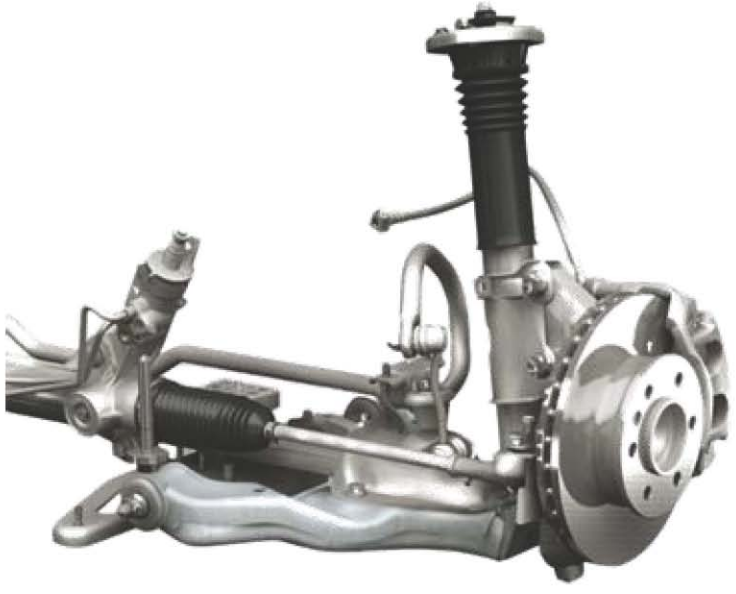
Front Suspension

Reinforced front axle (Code A50) has a higher load rating

- On 3500 series vehicles, load capacity of the front axle increased GAWR from 4,080 lbs to 4,410 lbs.
- Allows heavier loads on front axle

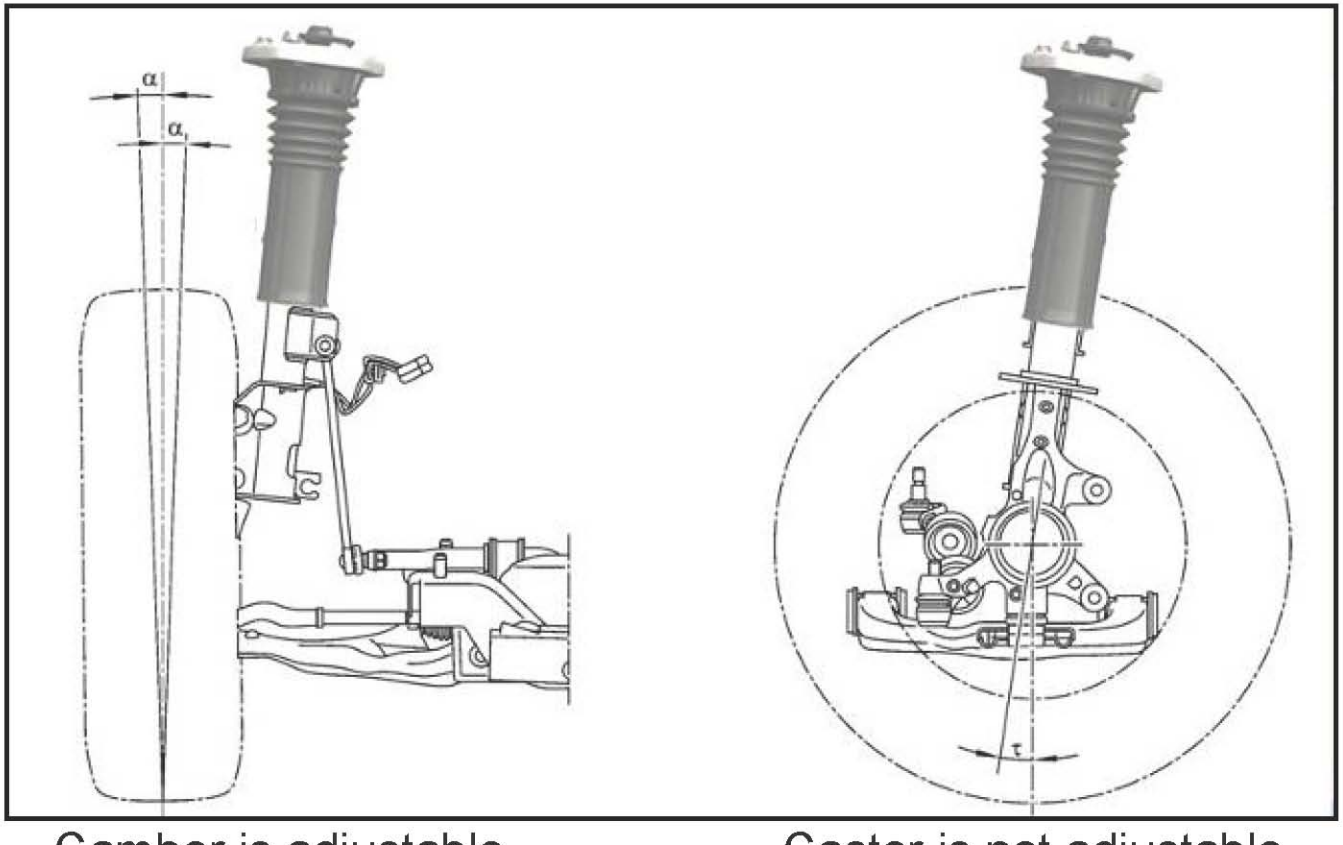
Recommended for:

- RV's
- Armored Vehicles
- Ambulances
- Shuttles



GWAR: Gross axle weight rating

Front Wheel Alignment



Camber is adjustable

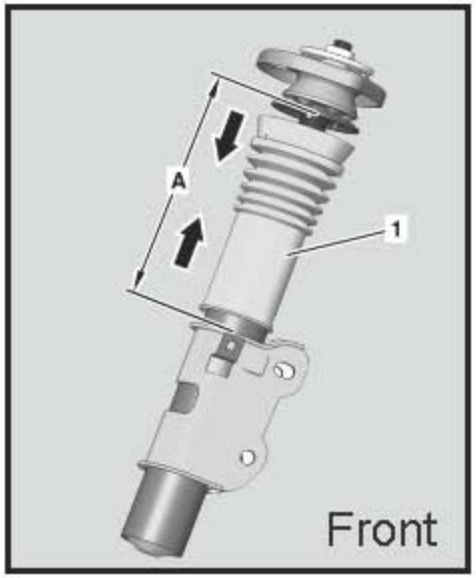
Caster is not adjustable
(Measure to determine
chassis alignment)

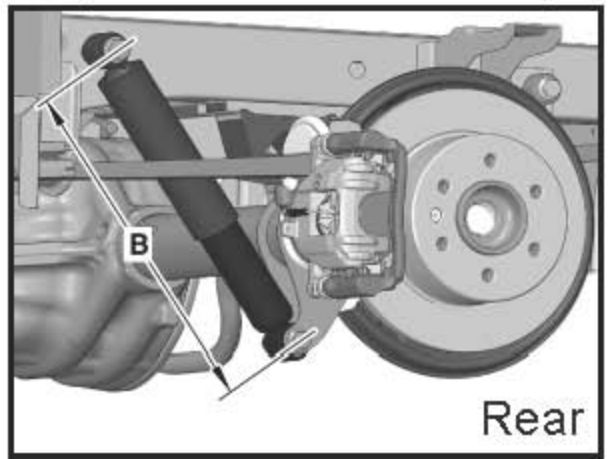
Front Wheel Alignment

To obtain alignment specifications the ride height must first be determined by taking the measurements “A” (Front shock) and “B” (Rear shock)

Using these measurements, refer to the chart in WIS for Camber and Caster specifications

Example:
Camber – If dimension “A” is 227 mm then the camber settings is 0^0 00’

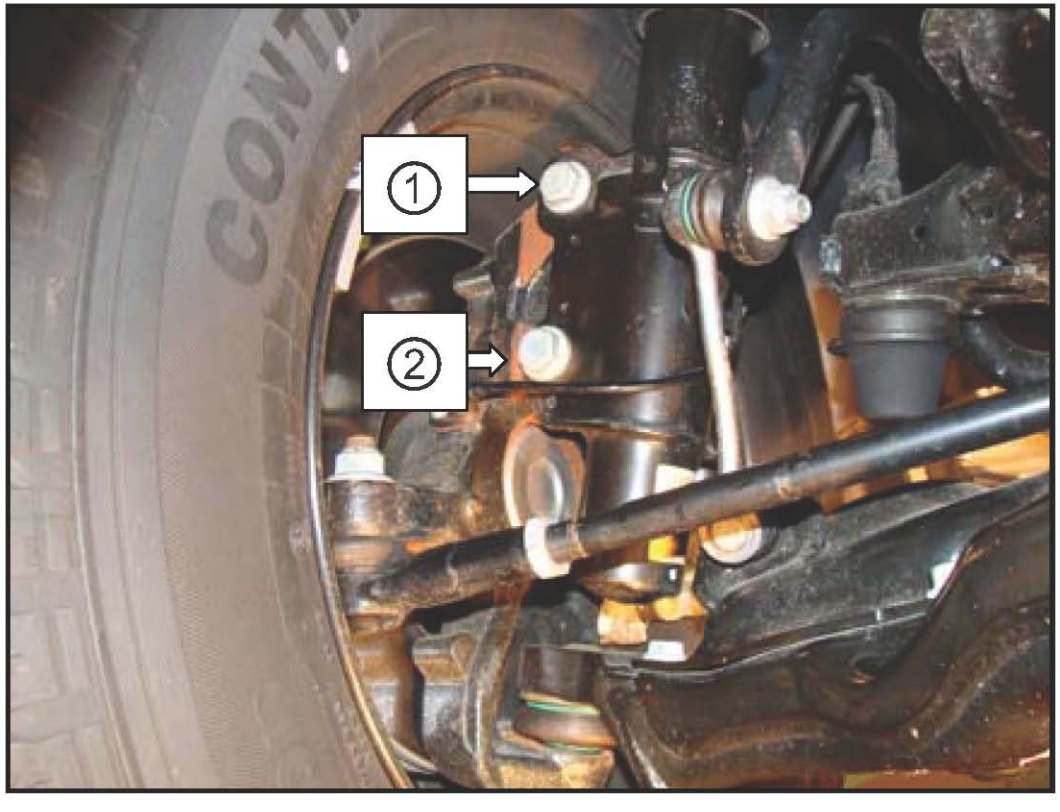




Front Wheel Alignment

Camber is adjusted by replacing the eccentric bolts on the strut. (1)

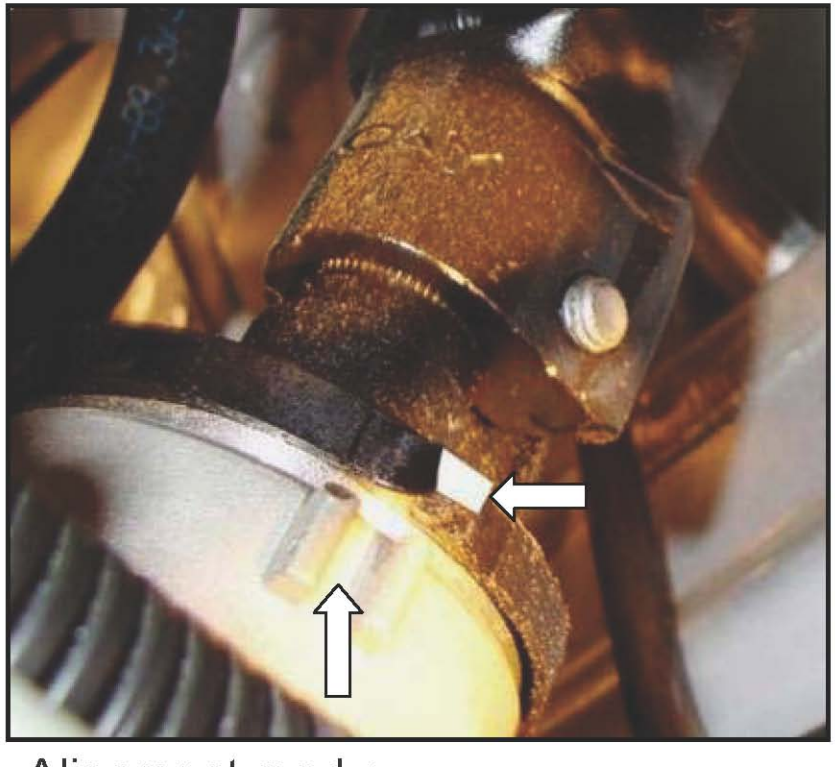
Both bolts (1 & 2) must be replaced.



Front Wheel Alignment

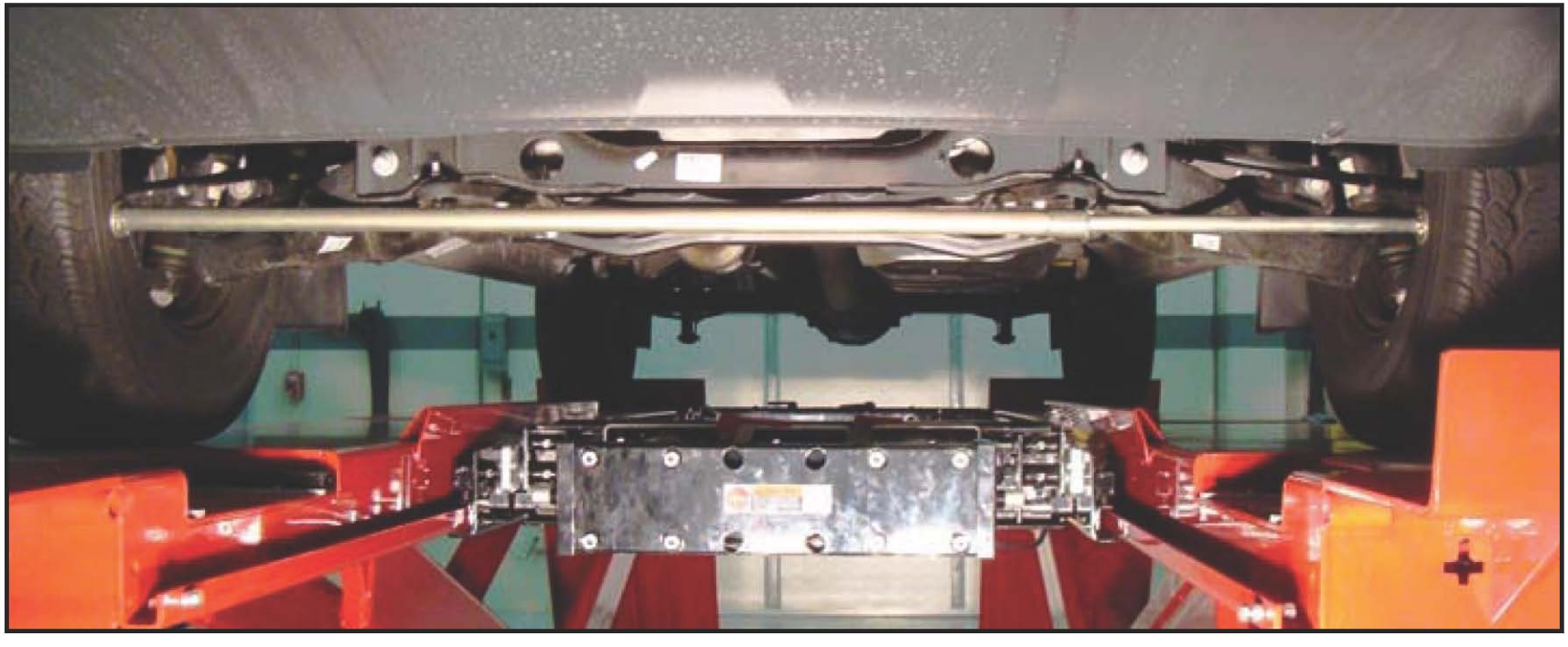
Toe-in adjustment should include aligning the marks on the steering rack.

Toe out on turns may be incorrect if this step is not performed.



Alignment marks
(upper mark highlighted for clarity)

Front Wheel Alignment

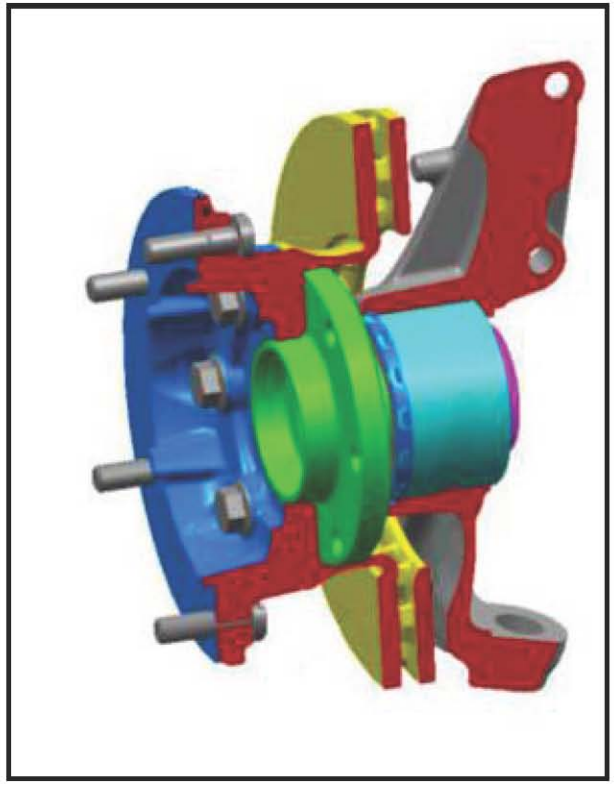


Due to the elasticity of the lower control arm bushings, a spread bar (Tool number 900-589-01-27-00) should be used during toe adjustment.

Front Axle Hub

The front axle steering knuckle can only be replaced as a complete unit together with the wheel hub and wheel bearing

The wheel bearing contains a multipole ring with permanent magnet for the wheel speed sensor



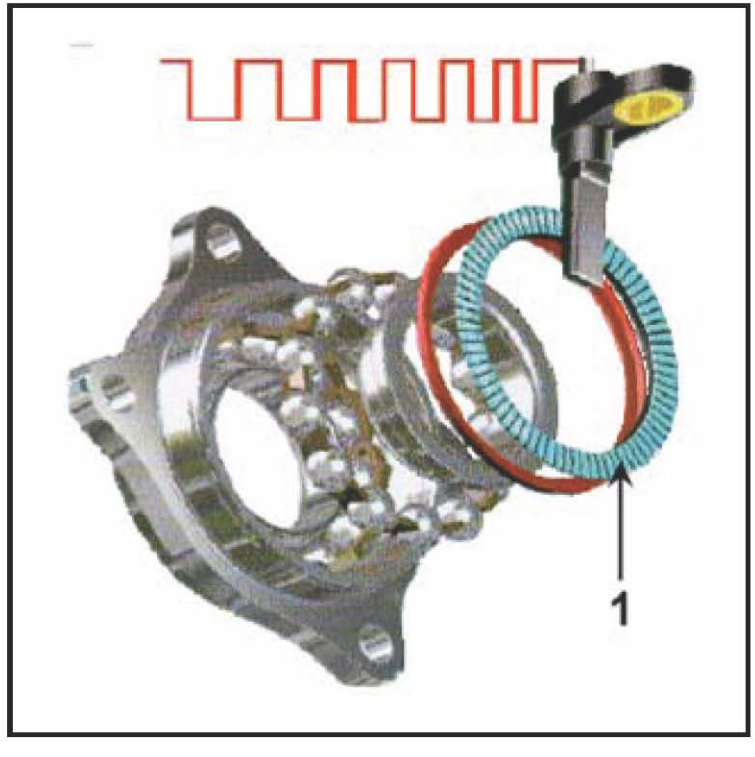
Wheel Speed Sensors

Active wheel speed sensors design:

- Two integrated Hall sensors
- Voltage supplied from ESP control unit
- Triggered by the magnets in the wheel bearing (1)
- Creates a square wave signal

Advantages (Compared to analog sensor)

- Very low speed recognition (~0.3 km/h)
- Direction of travel
- Standstill detection
- Uniform speed signals at all speeds

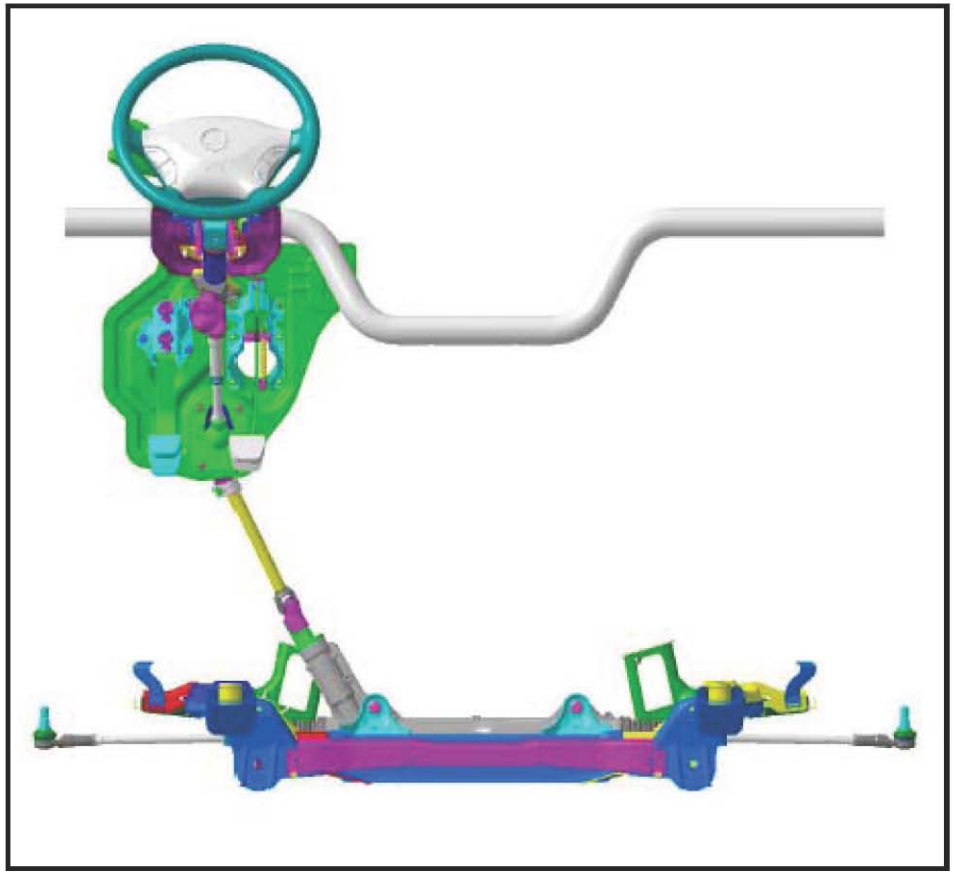


Rear wheel bearing shown

Steering Column

The steering column is equipped with 2 telescoping sections

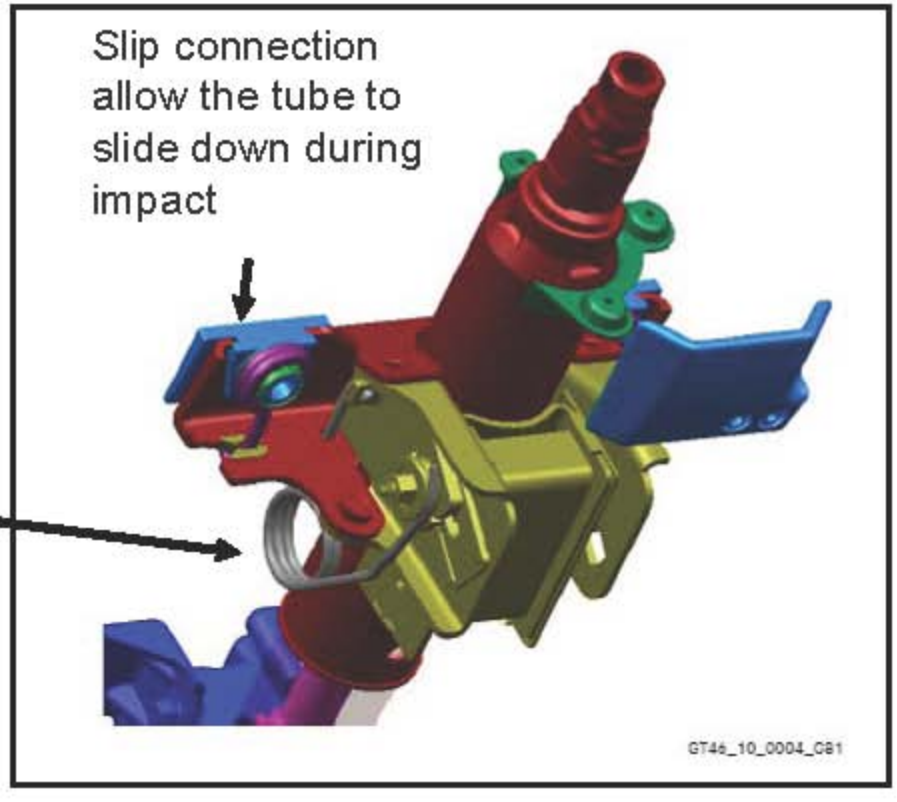
The lower section is located between 2 universal joints



Steering Column

The upper section is located in the upper column tube and has ~60 mm travel

The energy absorption is constant, controlled by unwinding of the steel wire as the tube compresses

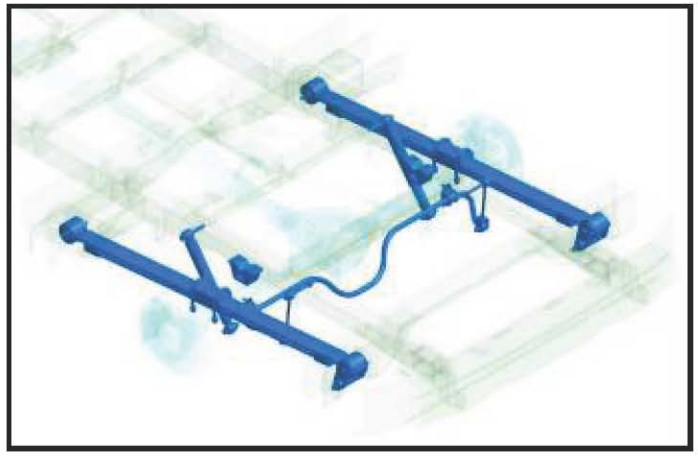


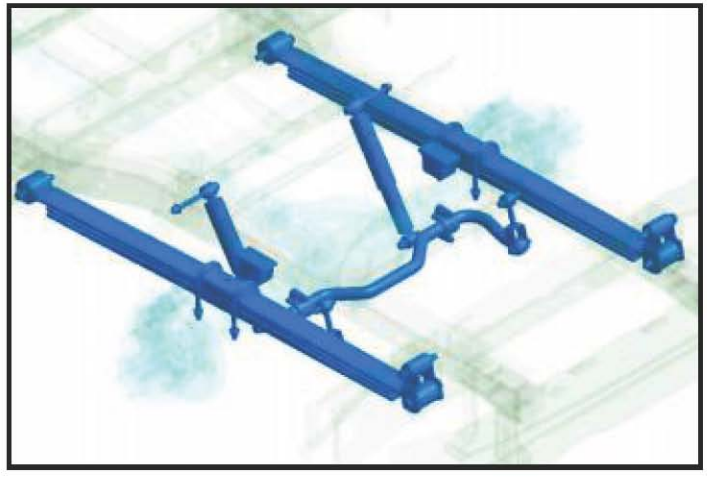
Rear Suspension

The rear axle is equipped with a stabilizer and progressive-rate parabolic multi-leaf springs

Various suspension packages are available:

- CF2 - Front & rear stabilizer
- CF3 – Larger stabilizer diameter
- CF4 – Reinforced front & rear stabilizer bars, different shocks
- CF5 – Harder single stage springs

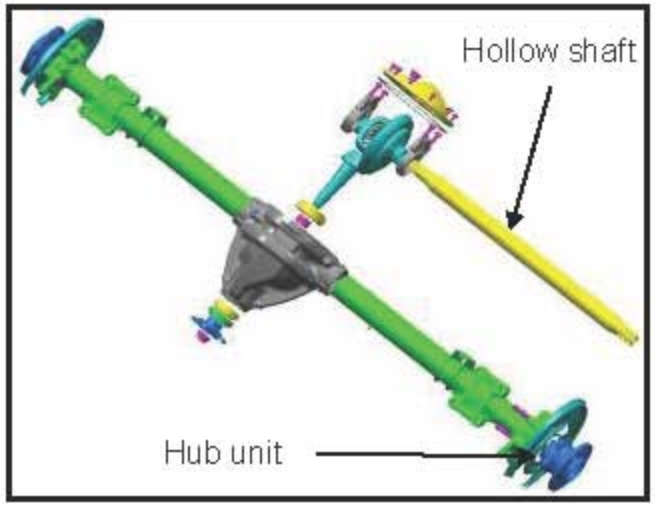




Rear Axle

Axle up to 8550 lbs GVWR

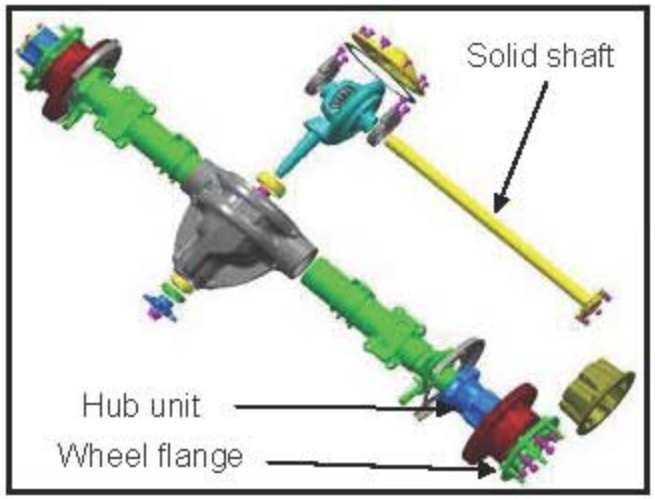
- Hollow shaft pressed into wheel bearing unit
- Hub unit contains a maintenance-free compact compressed bearing
- Hub unit bolted to axle tube
- ABS ring integrated into bearing unit



Axle up to 11,030 lbs

- Solid shaft
- Hub unit contains two double-tapered roller bearings
- ABS ring integrated into bearing unit
- Twin wheels use wheel studs

Note: Spare wheel can be used to replace any of the wheels. Due to the wheel offset, the front hub has an additional flange to provide clearance.



Wheel Torque

Wheel torque specs:

Wheel bolts
- Steel wheel 177 lb-ft (240 Nm)
- Alloy wheel 133 lb-ft (180 Nm)

Wheel nuts (Twin wheels)
- 133 lb-ft (180 Nm)

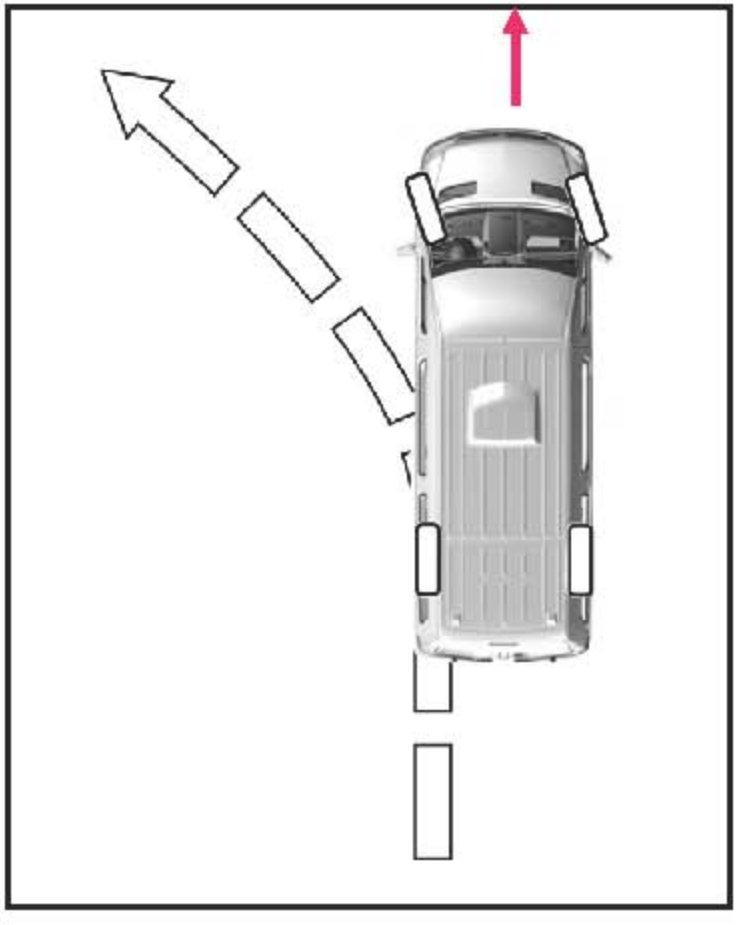
Tightening Torque Pattern

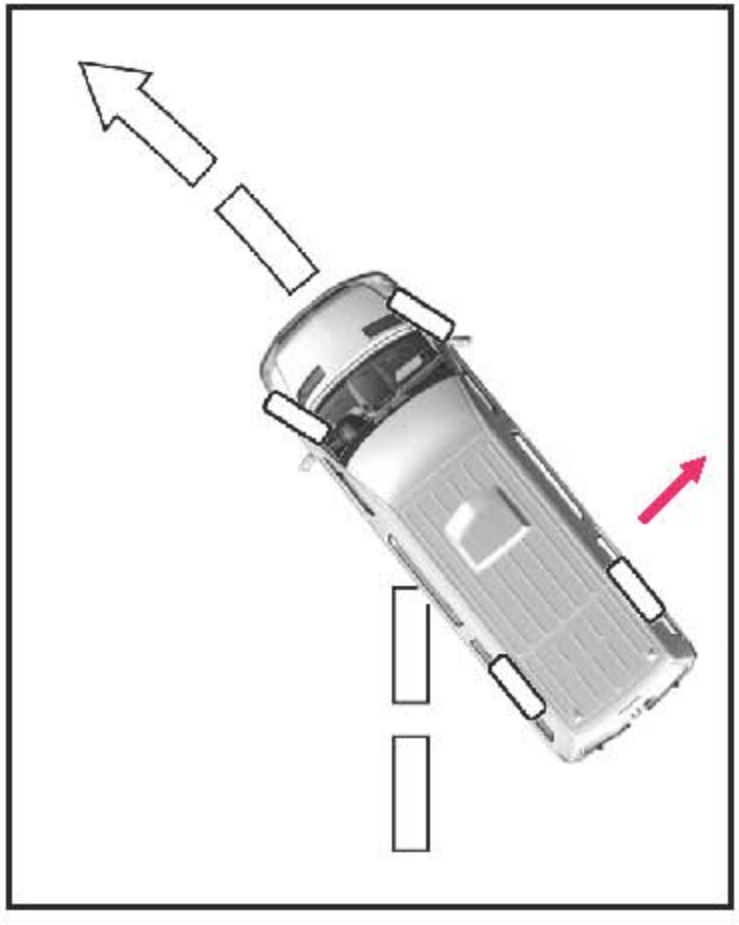
Acronym List

These acronyms are either used in this presentation or are listed in the Owner's manual.

ABS	Antilock Brake System
ESP	Electronic Stability Program
GAWR	Gross Axle Weight Rating
GCWR	Gross Combination Weight
GTW	Gross Trailer
GVWR	Gross Vehicle Weight Rating
TWR	Trailer Tongue Weight Rating

ESP

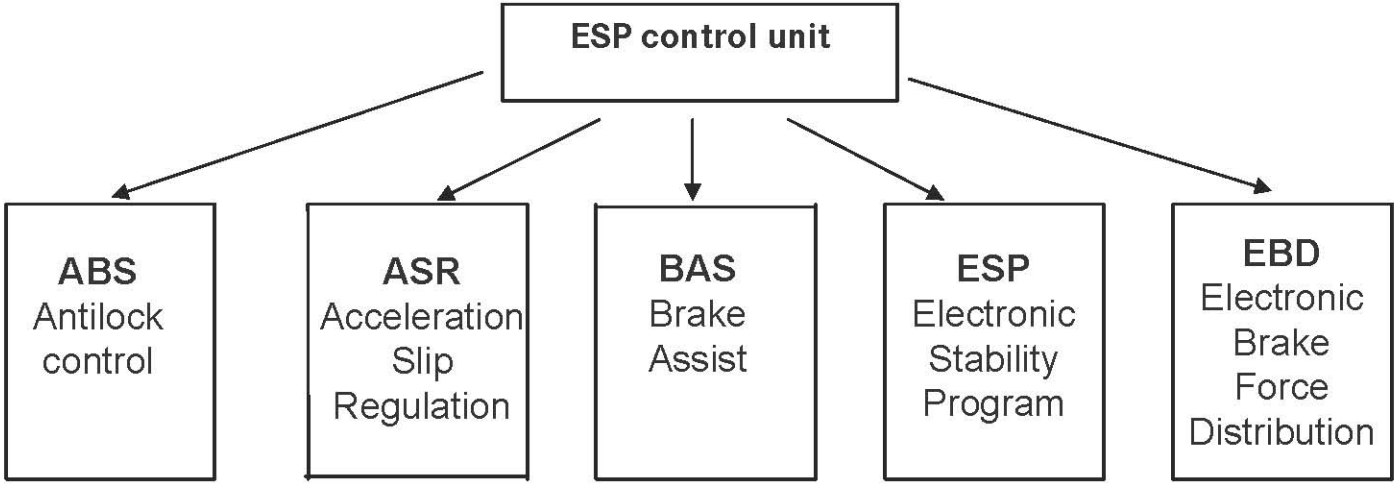




Electronic Stability Program (ESP)

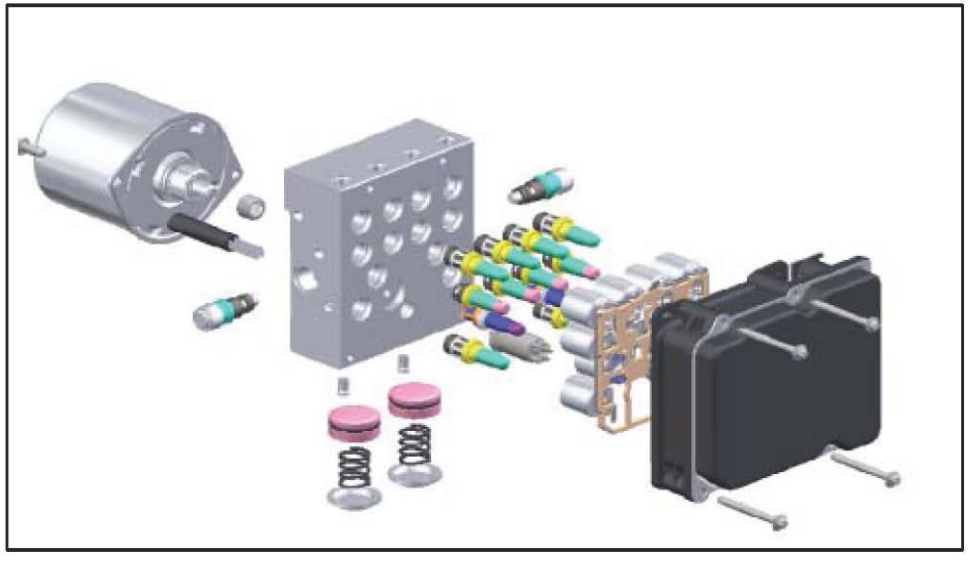
ESP is installed as standard in the ***Sprinter*** model designation 906.

The term ESP includes various subsystems and control functions, all of which are integrated into the ESP control unit.



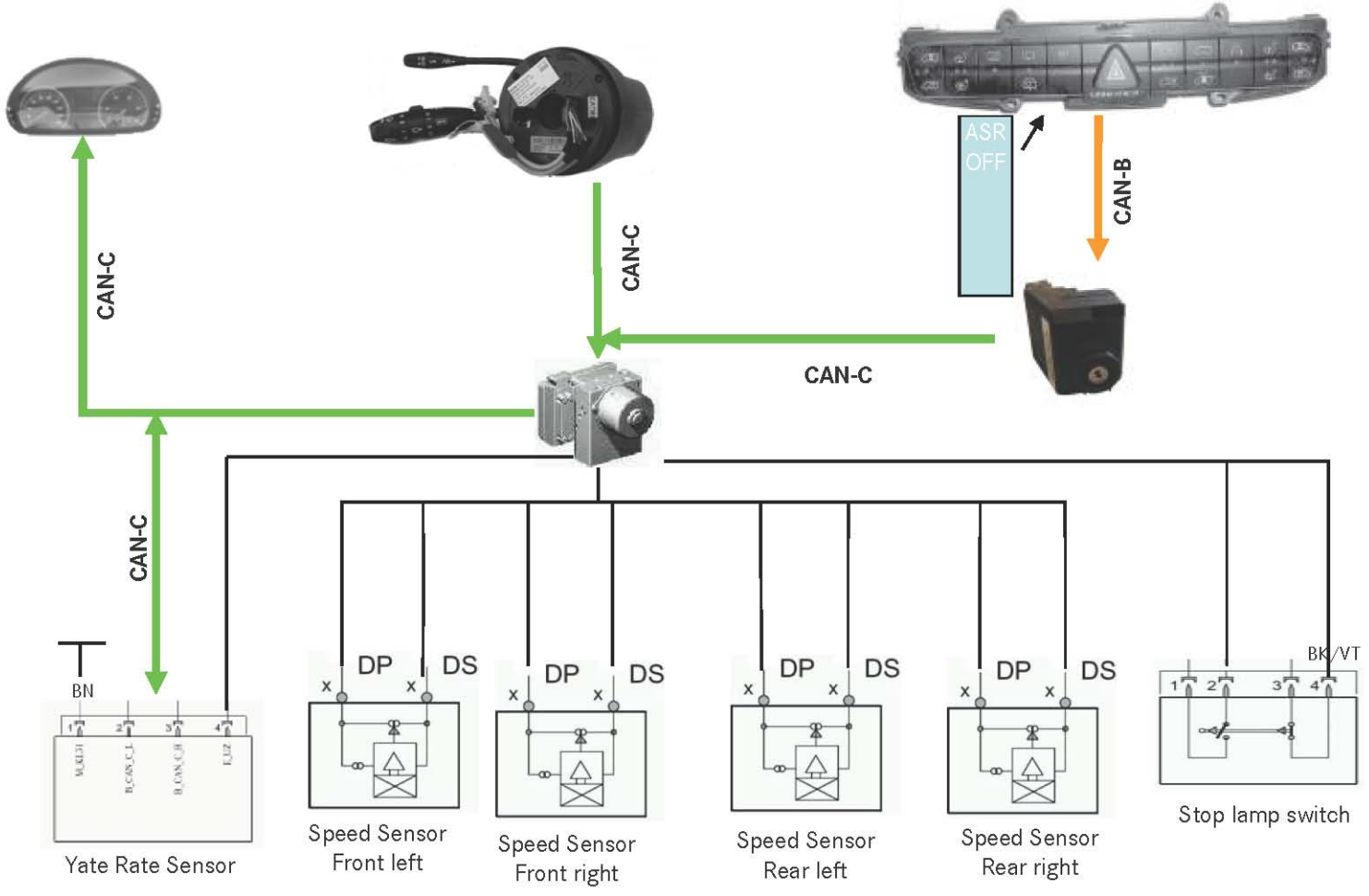
ESP Components

- ESP hydraulic unit
- ESP control unit
- 4 wheel sensors
- Yaw rate sensor
- Stop lamp switch
- Steering angle sensor



The hydraulic unit and the control unit are bolted together

ESP Components



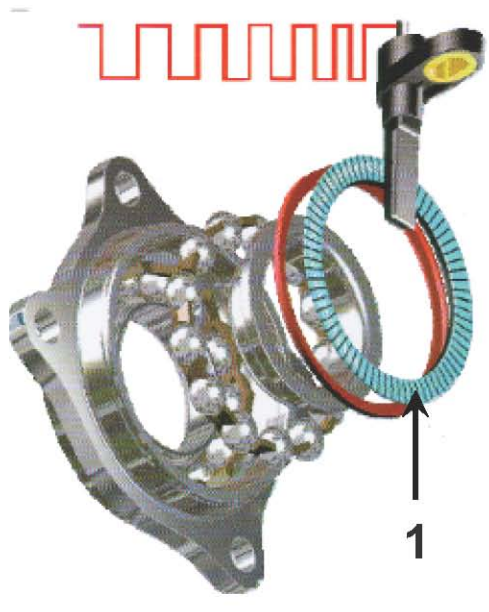
Active ESP Wheel Speed Sensors

The Active wheel speed sensors:

- receives the supply voltage from the control unit.
- are triggered by permanent magnets integrated into the wheel bearing (1)
- Creates a square wave signal to the ESP control unit

Advantages of Active sensors:

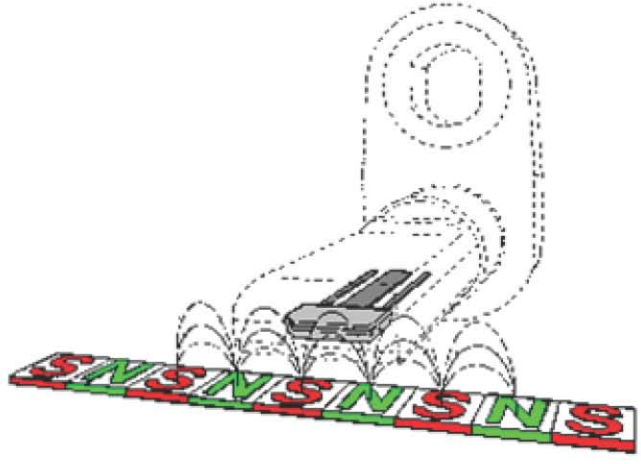
- recognition of lower speeds (approx. 0.3 km/h).
- direction of travel recognition
- standstill detection
- uniform wheel speed signals throughout all vehicle speed ranges; only the frequency changes.



Active ESP Wheel Speed Sensors

The active speed sensor monitors changes in magnetic flux. Magnets arranged in alternating poles, as the wheel rotates, the sensor is exposed to the north-south magnetic fields.

The assembly consists of two sensing elements mounted side-by-side with an amplifier chip built into the assembly. The output from each element is processed by an amplifier which converts the input to digital voltage signals. The switching frequency is directly proportional to wheel speed, and because the signal is always present, zero wheel speed can be detected. Since the sensing elements are next to each other, the two voltage signals are always slightly out of phase. This allows the sensor to detect the direction of rotation.



Supply Voltage (DC): 4,5 V ... 20V
Signal current: I low 7mA ± 20%
I high 14mA ± 20%
Operating temperature: -40°C ... +150°C

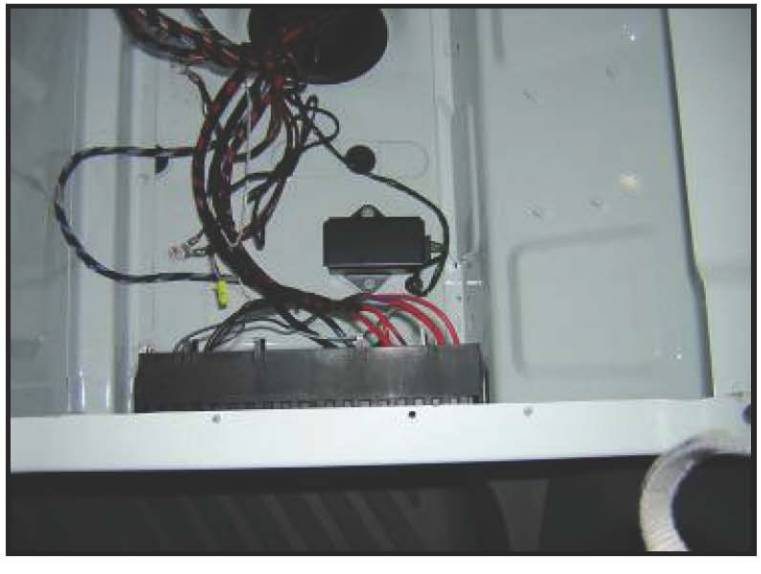
DRS Sensor

DRS turn rate sensor with integrated lateral and longitudinal acceleration sensor

The turn rate sensor is equipped with:

- longitudinal acceleration sensor
- yaw rate sensor
- acceleration sensor
- fault monitoring (diagnosis takes place in the ESP control unit)

Communicates with the ESP via the CAN



Installation location: Driver seat box

Stop lamp switch

- information from the stop lamp switch is one of the requirements for the activation of BAS and ASR

Steering Angle Sensor

Steering angle sensor

- The steering angle sensor provides steering angle status to the ESP control unit
- The steering angle sensor is integrated into the steering column module N80.
- The correct installation must be observed for the steering angle sensor. The installation is described in WIS. No initialization is necessary.

Steering column module N80

Indicator Lamps

ESP warning lamp (yellow) - flashes during driving when ESP or ASR is active on at least 1 wheel
lights during driving when the ASR system has been switched off by the driver with the ASR OFF switch.

ABS indicator lamp (yellow) - lights on running engine when ABS is inoperative or has switched itself off due to an onboard power supply < 10 V

BAS/ESP indicator lamp (yellow) - lights on running engine when driving safety systems ASR, ESP or BAS are disrupted or have switched themselves off due to an onboard power supply < 10 V

Brake fluid/EBD indicator lamp (red) - Illuminates while the engine is running if the electronic brake force distribution is inoperative or is switched off due to an on-board power supply < 10 V or insufficient brake fluid is contained in the reservoir

ESP Subsystems

The following subsystems are integrated into the ESP system.

Antilock brake system (ABS)

- During braking, if the wheels speed sensors indicate a lock up condition the ABS control actively intervenes in the brake circuit.

- Thanks to individual regulation of the brake pressure at each wheel, wheel locking and therefore possible vehicle instability are counteracted, maintaining steerability and directional control during deceleration

ESP Subsystems

Acceleration Skid Regulation (ASR)

If the ESP electronics recognizes one or both of the drive wheels spinning when driving off, accelerating or during drive operation, an intervention in the brake and/or engine control circuit takes place through the ASR control.

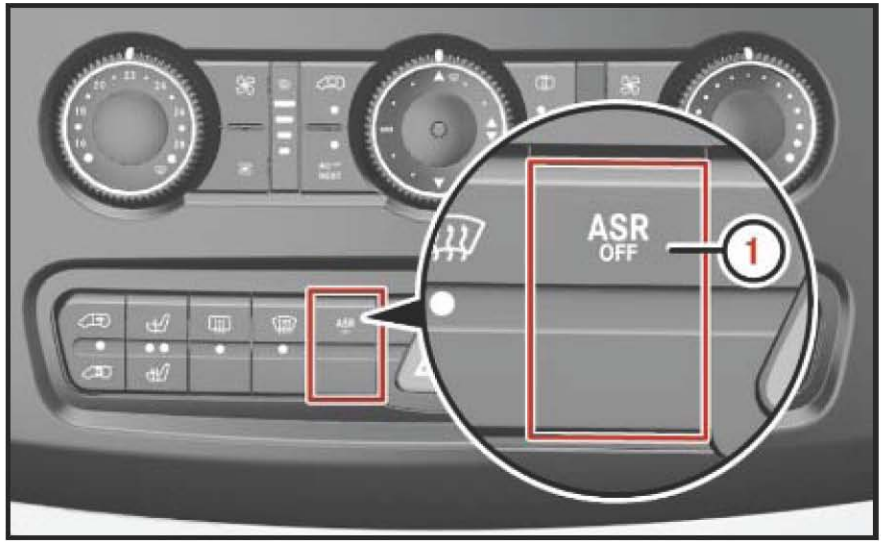
By specifically braking a spinning wheel, the drive axle's other wheel is able to transmit the optimal driving power specified via the friction value. This regulation takes place up to negative deviation from a specific slip and until both drive axle wheels are able to transmit power again. If both wheels spin, despite brake intervention, the engine torque is reduced, even if the accelerator pedal is in the full-load position.

ESP Subsystems

ASR Off

- The "ASR-Off" button (1) is used to switch ASR engine intervention off. All other ESP functions remain fully active. This limitation of the control operation is displayed by the permanent lighting of the ASR/ESP indicator lamp.

- The CAN information "ASR-Off" is transmitted from the upper control panel to the ESP control unit.



ESP Subsystems

Brake Assist (BAS)

- The Brake Assist System supports the driver during braking in critical situations. If the brakes are applied very quickly, the BAS system automatically provides full brake boost, potentially reducing the braking distance.

ESP Subsystems

Electronic Stability Program (ESP)

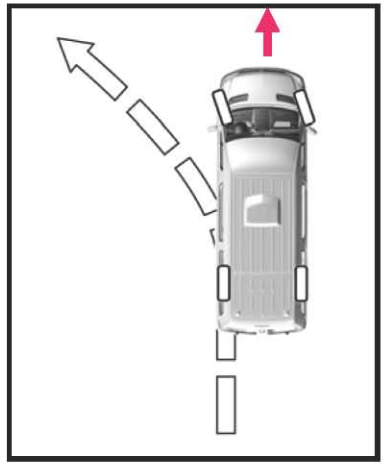
During an understeer condition, ESP stabilizes the vehicle by:

- applying the brake to an inside rear wheel

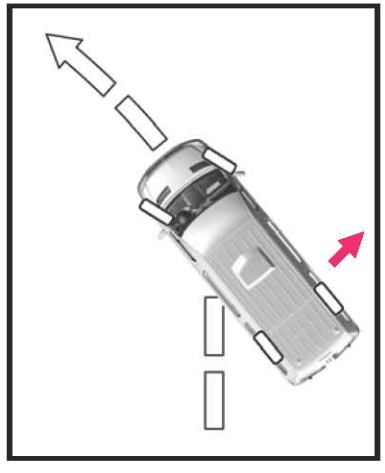
During an oversteer condition, the ESP stabilizes the vehicle by:

- applying the brake to an outside front wheel

Throttle, brake and transmission interventions may also be used to stabilize the vehicle.



Understeer



Oversteer

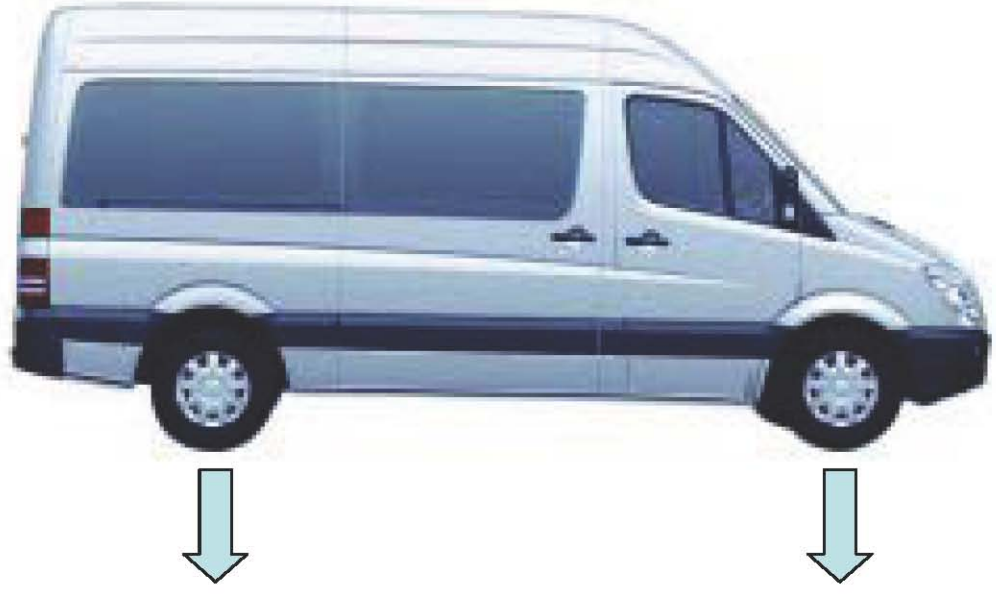
Click to play movie

ESP Subsystems

Electronic Brake power Distribution (EBD)

EBD regulates the rear wheel brake pressure.

If the rear wheels start to slide (reduced traction) compared to the front axle, the brake pressure at the rear wheels is held constant or reduced.



Vehicle load and vehicle dynamics effect rear wheel traction

ESP Subsystems

Engine drag torque control (MSR)

- On release of the accelerator or on shifting down, the drive wheels may lock up in deceleration mode under slippery road conditions.

- The drive axle wheels which are tending to lock up are detected by the ESP system. The ESP control unit transmits a data bus signal to the engine control unit. The engine control unit increases the engine torque and thereby prevents the drive wheels from locking up.

ESP Subsystems

Load Adaptive Control (LAC)

- A self-learning algorithm integrated in ESP to determine vehicle masses and center of gravity and to detect driving resistance on the basis of various sensor values. LAC improves hill starts with μ split as well as the braking response. LAC indirectly contributes to a reduction in the tendency to roll over.

ESP Subsystems

Roll Over Mitigation (ROM)

- Improves the handling characteristics in the event of increasing steering angle and a fast speed. The ROM recognizes critical lateral acceleration as soon as it starts to occur. The rollover tendency is reduced through a specific increase of the brake pressure on the corresponding wheels. ROM is supported by the LAC vehicle mass detection.

ESP Subsystems

Roll Movement Intervention (RMI)

- Increases the effectiveness of ESP in highly dynamic manoeuvres by further increasing tilt stability via brake intervention at the outer wheel in the event of critical lateral acceleration.

Understeering Control (USC):

- Stabilizes on strong understeering, as occurs when driving fast through small curve radii. The USC subsystem attempts, by building up brake pressure at all wheels, to reduce speed in order to return the vehicle to a driving condition in which stabilizing brake forces can again be implemented.

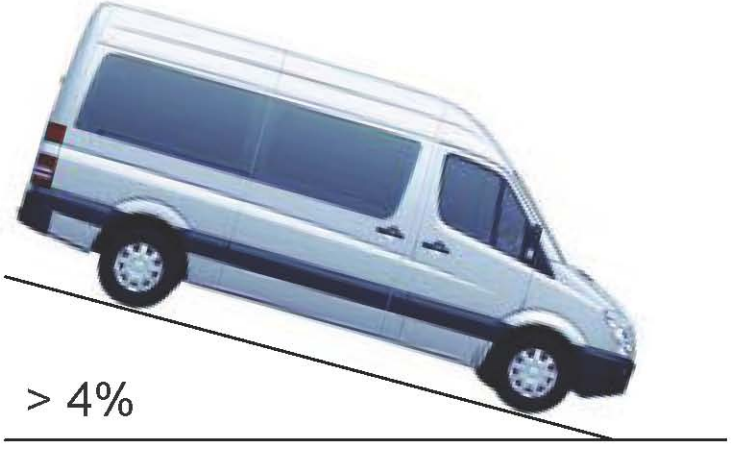
ESP Subsystems

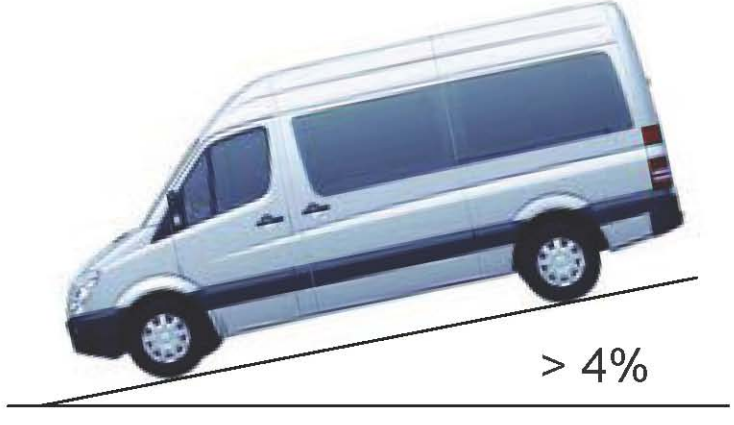
Cruise control function (TPM):

The cruise control switch input signals are processed in the ESP control unit and corresponding actuations are generated by the ESP control unit to the CDI control unit N3/30

Start-off assist (AAS):

For hill starts, brake pressure applied by the driver is held for a further 2 s after the brake pedal has been released. This function is only activated on inclines > than 4% with a driving gear engaged. Even when reverse gear is engaged.





ESP Subsystems

Trailer Stability Control

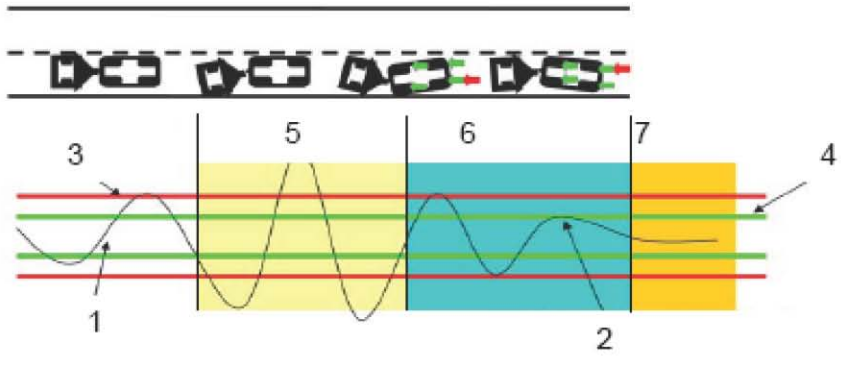
Task

- Detect when a trailer is being towed
- Detect and eliminate sway

Function

First stage – brake intervention at the front wheels on alternating sides to counteract sway

Second stage – engine torque reduced and brake pressure applied to all four wheels as well as control interventions at individual wheels (brake lights activated)

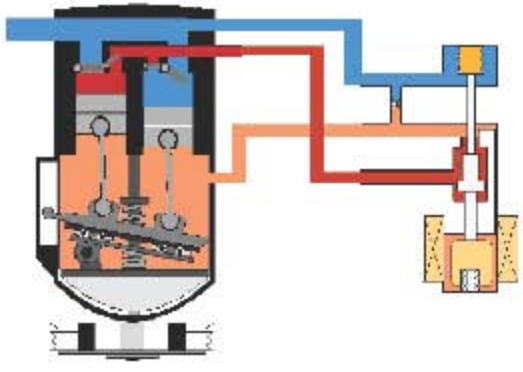


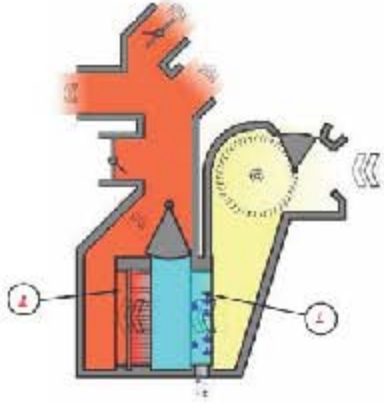
TSA function schematic

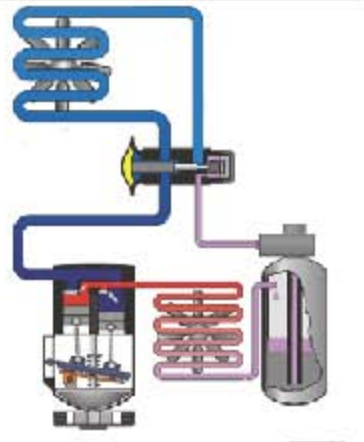
1 Vibration signal
2 Vibration less than entry threshold
3 Entry threshold
4 Exit threshold
5 Detection
6 Control
7 End of control

Acronyms

AAS – Start off assist
ABS – Antilock Brake System
ASR – Anti Skid Regulation
BAS – Brake Assist System
EBD – Electronic Brake Distribution
ESP – Electronic Stability Program
DSR – Turn rate sensor
LAC – Load Adaptive Control
MSR – Engine drag torque control
RMI – Roll Movement Intervention
ROM – Roll Over Mitigation
TPM – Tempomat cruise control
USC – Understeering Control
WIS – Workshop Instruction System

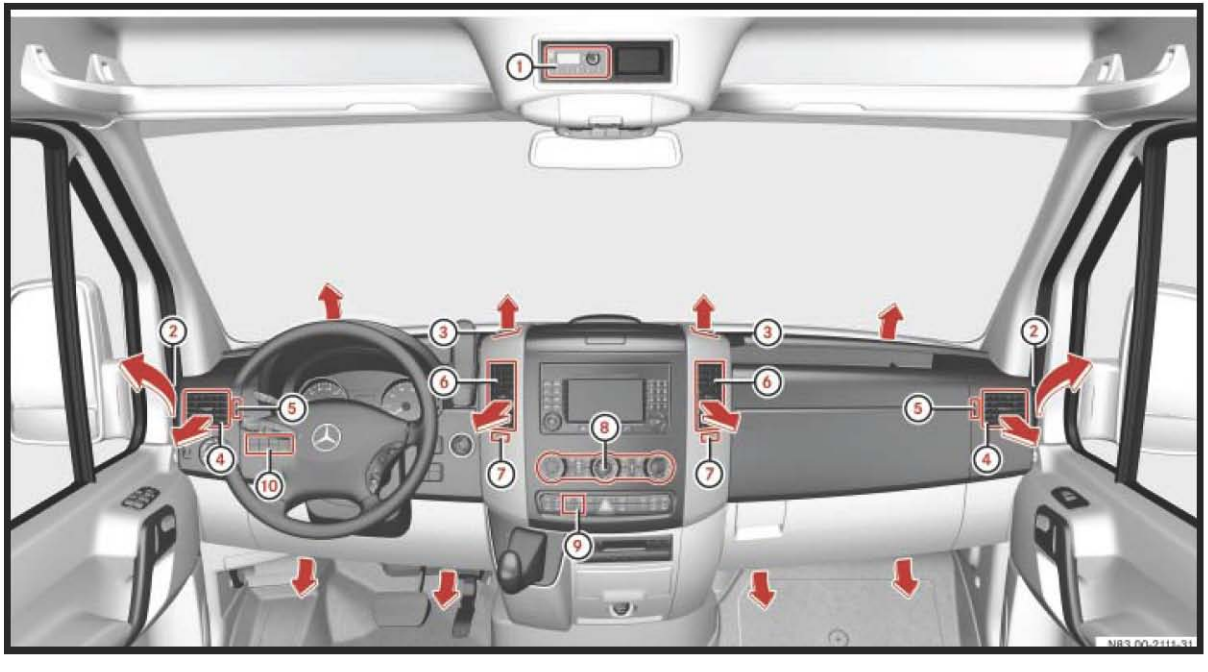






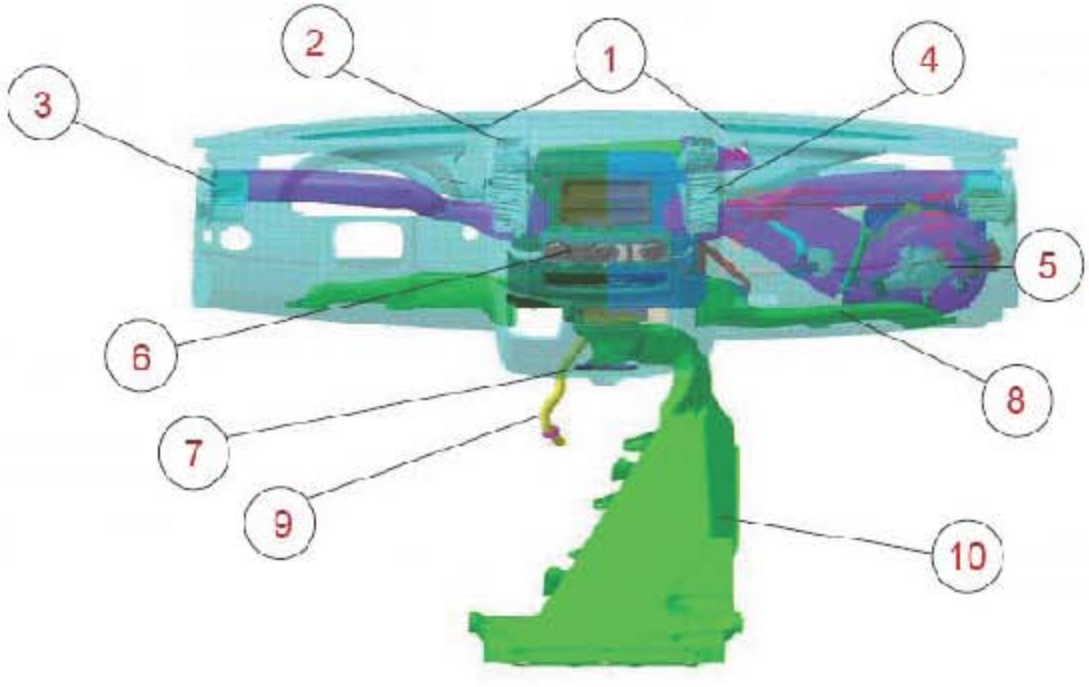
Climate Control

1 Stationary heater timer
2 Side window defroster vents
3 Adjustment wheel for air vents
4 Side air vents
5 Adjustment wheel for side and defroster vents
6 Swiveling center vents
7 Adjustment wheel for center vents
8 Operating unit for heater / rear heater
9 Heated rear window / heated windshield switch
10 Stationary heater / booster heater switch



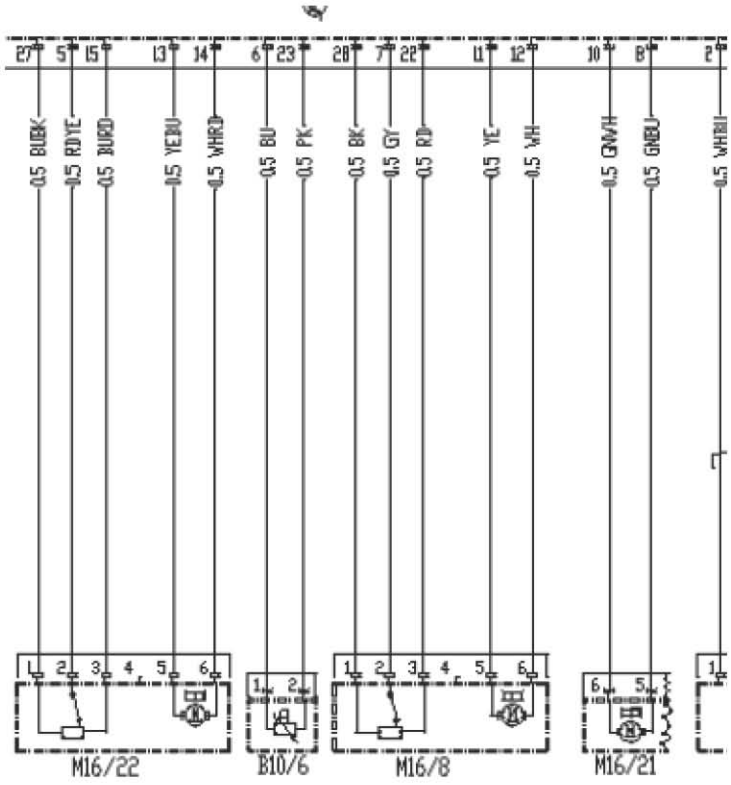
Climate Control

1 Defroster nozzle
2 Long-range nozzles
3 Side air vents
4 Center vents
5 Blower motor
6 Operating unit
7 Center tower outlet
8 Footwell duct
9 Condensation water drain hose
10 Floor air duct



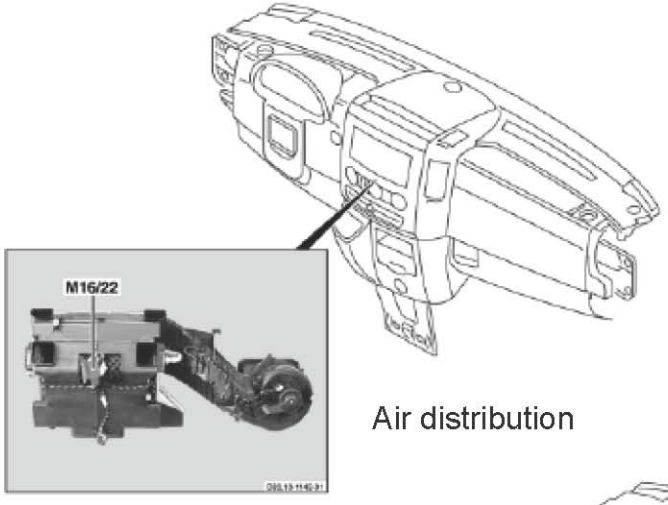
Actuator Motors

- 3 Actuator motors on ventilation box
- 2 with potentiometers
  - M16/8 Blending air flap actuator motor
  - M16/22 Air distribution actuator motor
- 1 without a potentiometer
  - M16/21Fresh air/recirculated air flap actuator

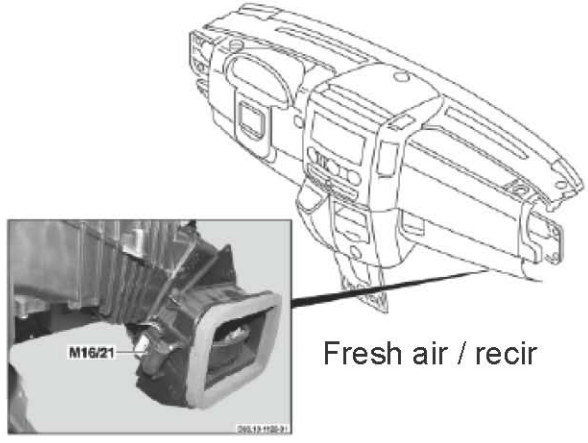


- Additional temperature blend actuator motor on advanced roof mounted auxiliary A/C also controlled via ACC control module

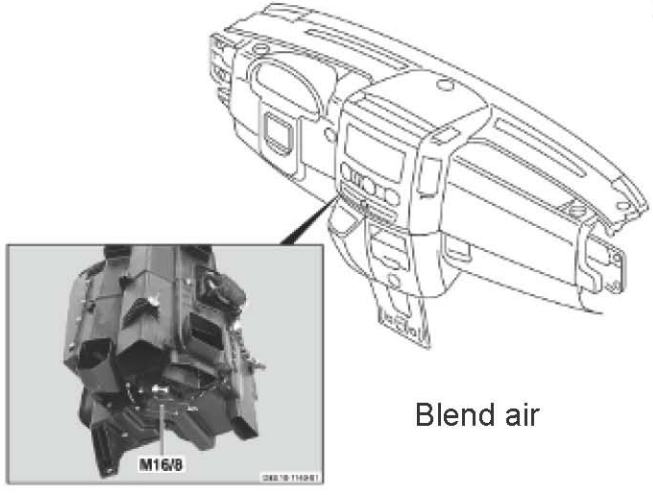
Actuator Motor Locations



Air distribution



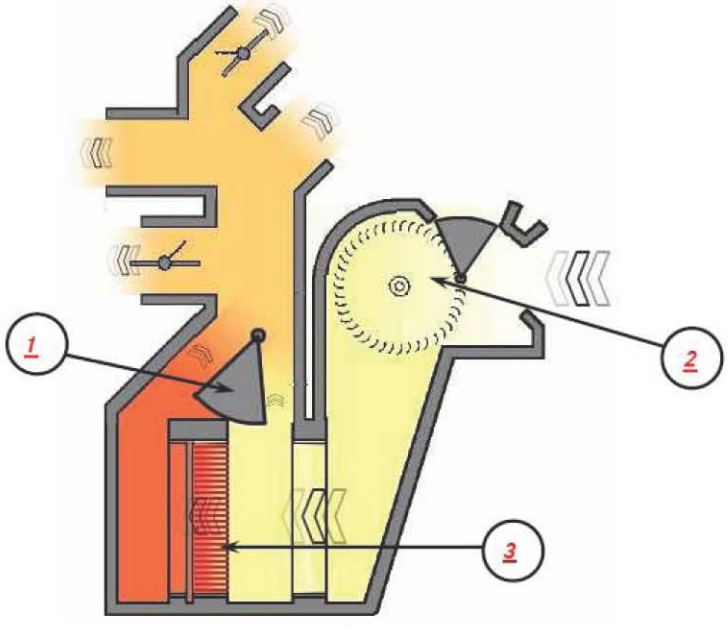
Fresh air / recir



Blend air

Temperature Regulation

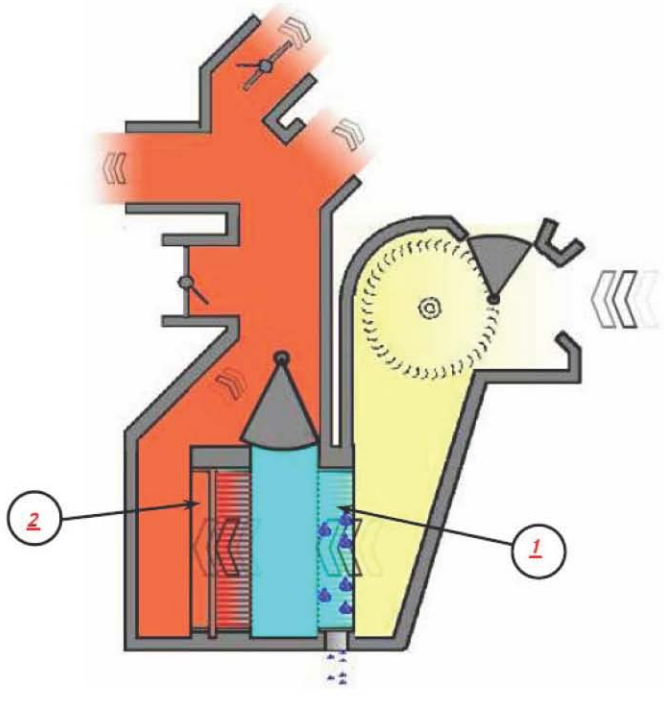
- Early Sprinter (901 – 905 series) heater core regulated via a water control valve
- 906 series uses a blend air flap



1 Blend air flap
2 Blower
3 Heat exchanger

Temperature Regulation

- Interior temp brought to desired point via stepper motor control of blend air flap
- No duct temp sensors
- Interior temp sensor on ACC control module
- Evaporator temp sensor to prevent evap freezing



1 Evaporator
2 PTC heater booster

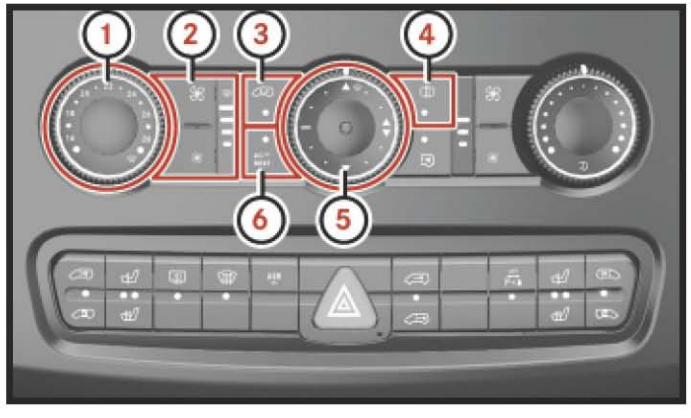
Tempmatic Control Unit

Tempmatic

Tempmatic with rear AC/rear heater

- CAN B component
- Control of
  - Actuator motors
  - AC compressor (s)
  - Blower motors

Tempmatic Control Unit



1 Temp selector switch
2 Blower speed / air flow switch
3 Air recirc. mode switch
4 Reheat function switch
5 Air distribution dial
6 AC OFF / residual warmth switch*

1 Rear AC
2 Rear airflow control
3 Rear temp. regulation

*As of 09/2008 vehicles have no REST function, switch change from AC OFF to AC switch AC ON when LED is illuminated

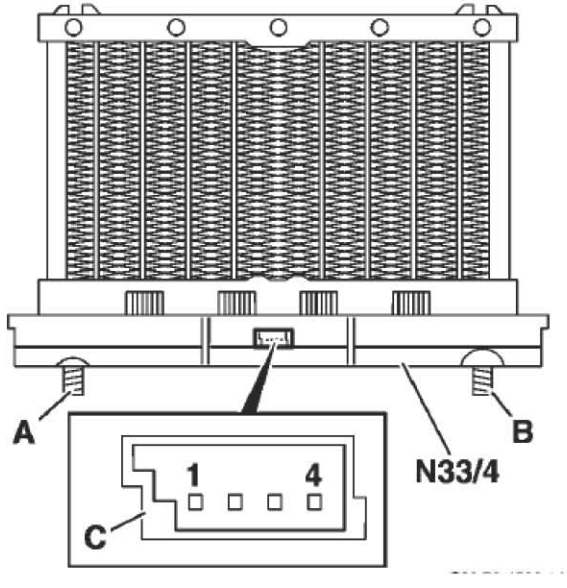
Reheat Function

- ACC control module maintains temperature but AC compressor is regulated to 100%
- Dehumidifies air keep windows fog free

4 Reheat function button

PTC (Positive Temperature Coefficient) Heater

- Compensates for reduction of residual heat from CDI engines
- Necessary to fulfill legal requirements for de-icing windshield as well as heating comfort
- 1800 watt (150 amp fuse protected)
- Regulated via pulsed signal to 4 heating register grids operated simultaneously (50Hz)
- High electrical load signal via alternator signal can reduce or shut off PTC



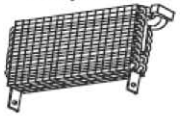
A	Ground 25 mm²
B	Positive 25 mm²
C	Connector
1	CAN low (CAN B)
2	CAN high (CAN B)
3	Ter. 30
4	Alternator DF signal

PTC (Positive Temperature Coefficient) Heater

- PTC heater controlled as needed
- Control unit integrated into PTC activated by ACC control unit
  - Regulated internally
  - Deactivated in stages when interior temp has been reach
- Cut-in conditions for start up of PTC heater
  - Alternator / idle stable
  - Coolant temp < 176°F (80°C)
  - Outside temp < 50°F (10°C)
- Cut-out conditions
  - Coolant temp >176°F (80°C)
  - Outside temp > 50°F (10°C)
  - RPM = 0
  - High electrical load via alternator
  - Overheat protection (AC and PTC will be shut off)
  - AC compressor and PTC may momentary shut off during hard acceleration

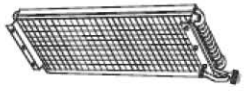
Refrigerant Circuit

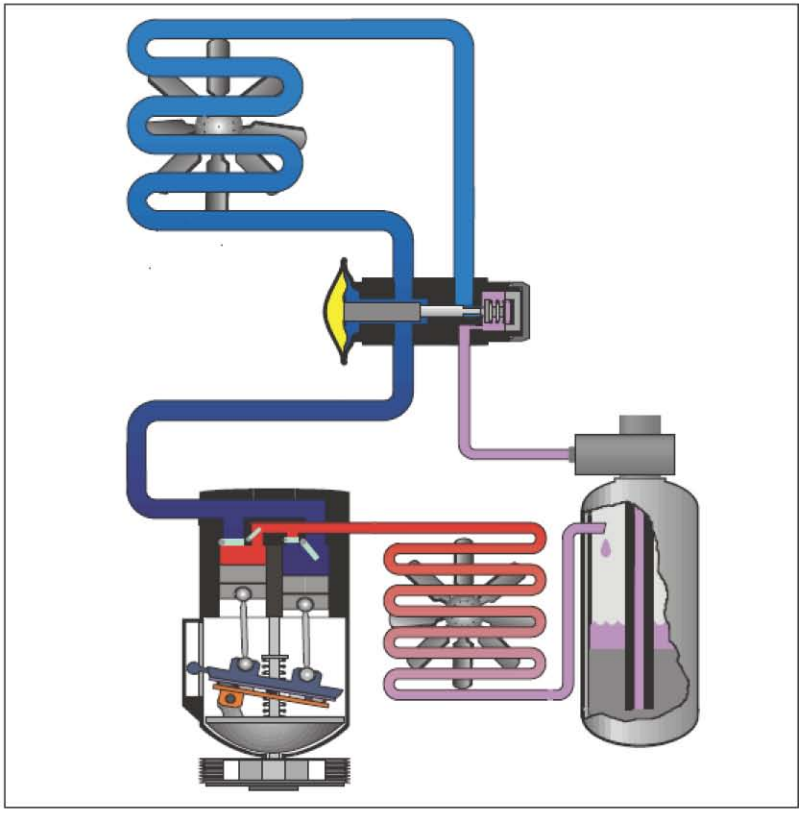
Evaporator



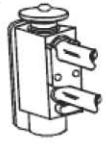
Compressor

Condenser

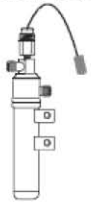




Expansion valve

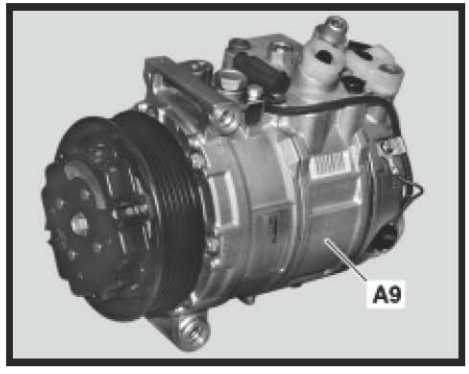


Filter drier

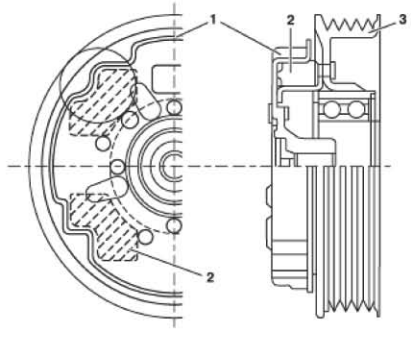


Main Refrigerant Circuit

- Denso 7SEU 17 compressor
  - Controlled via electronic pressure regulator
  - Output power varied between 2% - 100%



- Belt pulley
  - Acts as torque damper and torque limiter
  - Pulley hub fixed to AC compressor shaft via rubber elements with belt pulley
  - If compressor locks, pulley continues to turn and rubber elements deform

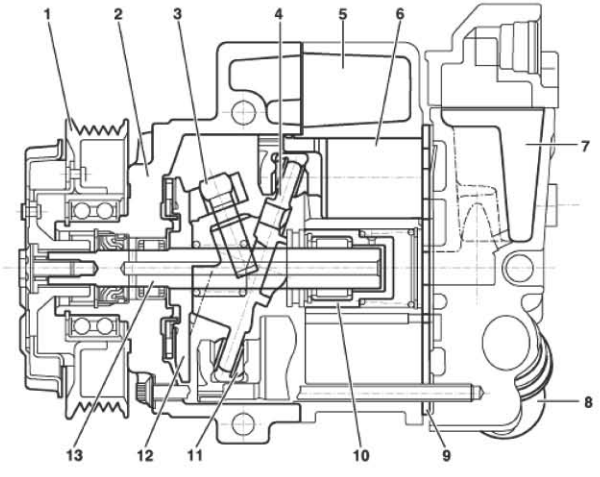


1 Pulley hub
2 Rubber elements
3 Belt pulley

Main Refrigerant Circuit

Refrigerant compressor design 7SEU 17

- There are seven pistons in the compressor that are connected to the swash plate by means of sliding shoes.
- The swash plate is connected to the stop plate in the crankcase and mounted moveably on the refrigerant compressor shaft.
- The stop plate and the belt pulley are fixed to the refrigerant compressor shaft.
- The control valve actuated externally to adjust the swash plate is located in the rear housing part.



P83.55-0220-06

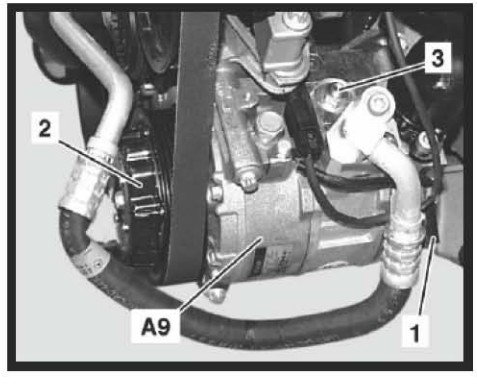
1	Belt pulley	8	Refrigerant compressor control valve
2	Crankcase	9	Valve plate
3	Guide pin	10	Coil body
4	Swash plate	11	Sliding shoe
5	Damping reservoir (pressure side)	12	Stop plate
6	Pistons	13	Refrigerant compressor shaft
7	Damping reservoir (suction side)		

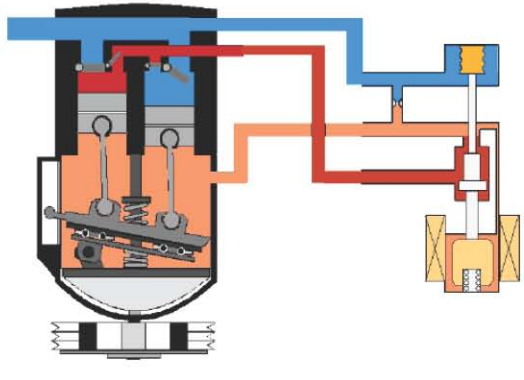
Protection function of the compressor:

- From 24 bar refrigerant pressure the compressor is regulated down
- From a coolant temperature of 115°C the compressor output is regulated down and at 125°C turned completely off.
- From an engine rpm of 4400 rpm the compressor output is regulated down and from 5500 rpm it is held at 50%.

AC Compressor Control

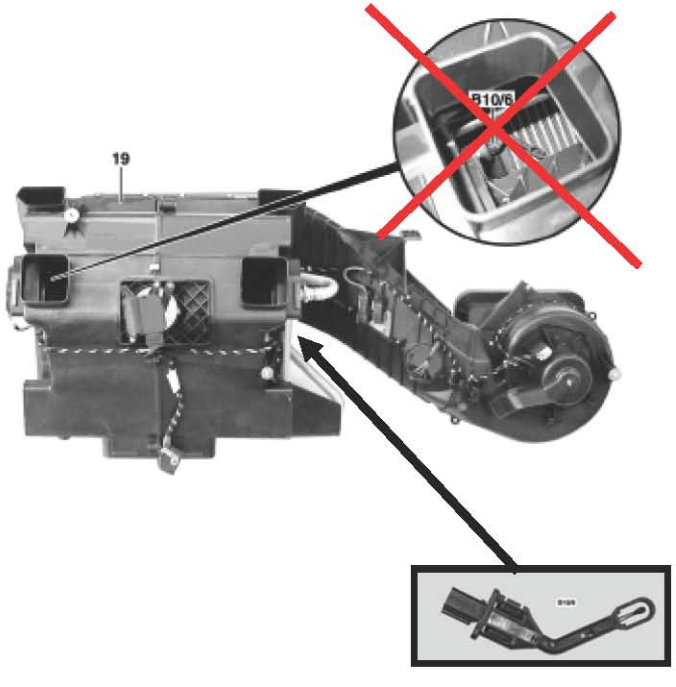
- Compressor relief valve (3)
  - Protection from overpressure
  - Spring loaded / opens at >40 bar
- Compressor control valve
  - Regulates compressor output volume by controlling swept volume of compressor between 2% and 100%
  - PWM signal at 400Hz
  - Coil resistance 6Ω
  - 0.2 A turn on (PWM at approx 20%)
  - 0.8 A max cooling (PWM at approx. 80%)



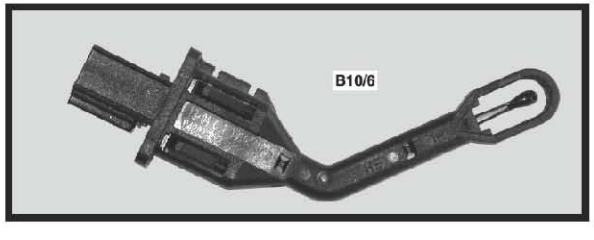


Evaporator Temperature Sensor (B10/6)

- NTC (Negative temperature coefficient) resistor
- Located right side of AC housing in front of evaporator
- Wired directly to ACC control module
- Used to prevent evaporator freezing

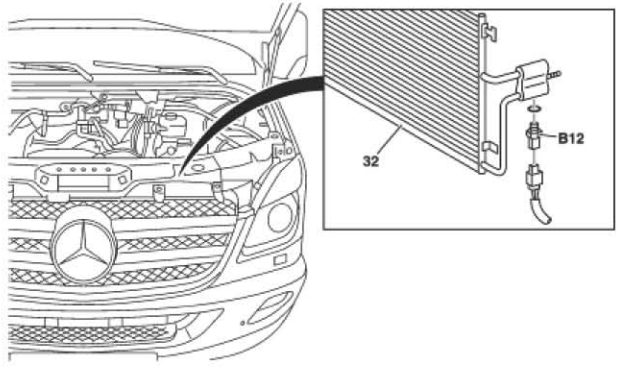


Location shown in WIS in incorrect
Arrow shows correct location



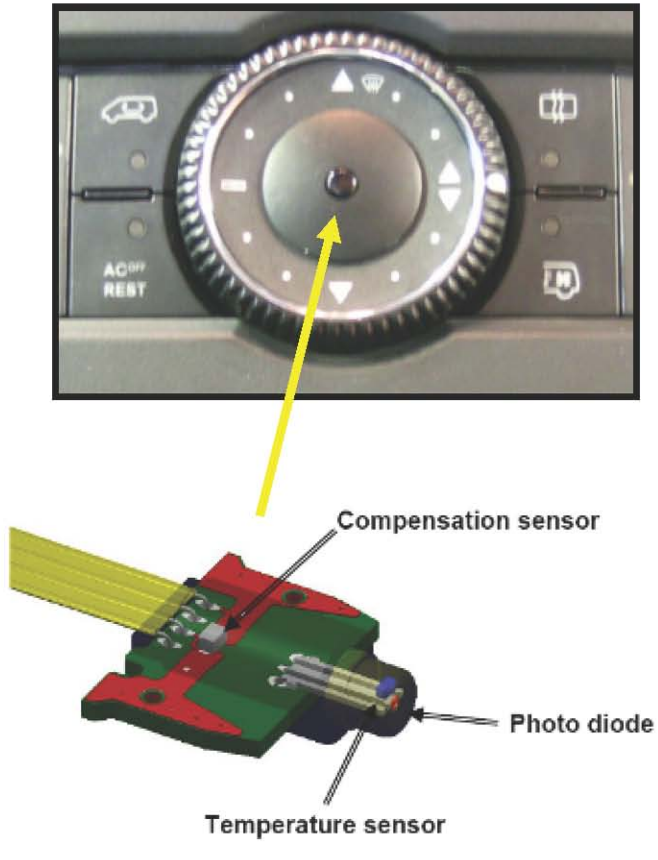
Refrigerant Pressure Sensor (B12)

- Located at top of condenser in high pressure line
- Monitor high side pressure
  - < 2 bar or >30 bar system turned off
  - From 24 bar ACC regulates compressor for pressure reduction



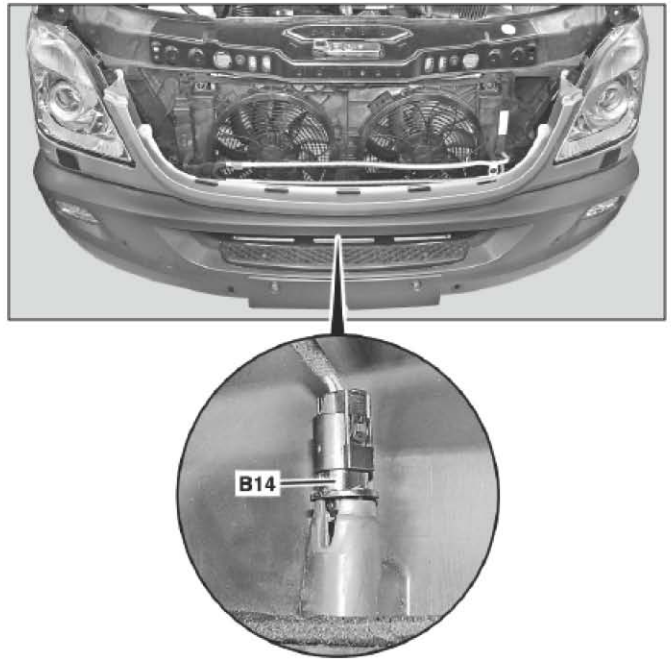
Interior Temperature Sensor

- Integrated into ACC control module
- Measure interior temp. 2-3 cm in front of NTC resistor
- Solar radiation is determined via photo diode
- Another NTC resistor measures sensor circuit board temperature (compensation sensor)
- Non ventilated



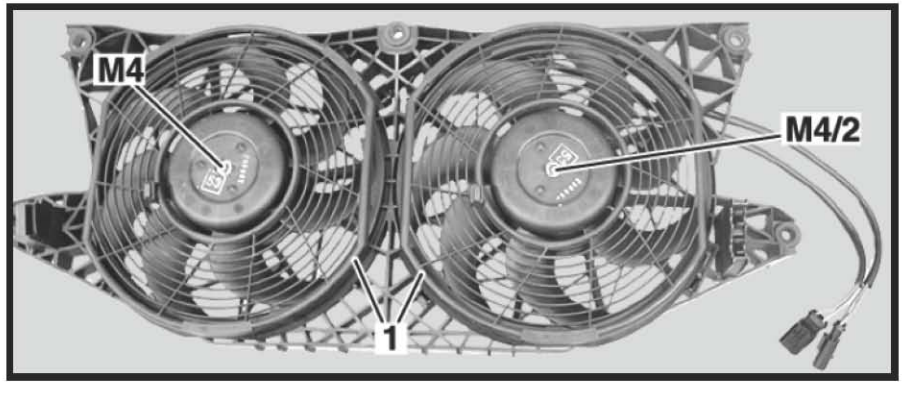
Outside Temperature Sensor (B14)

- NTC thermistor
- Wired to SAM
- CAN signal to ACC control module

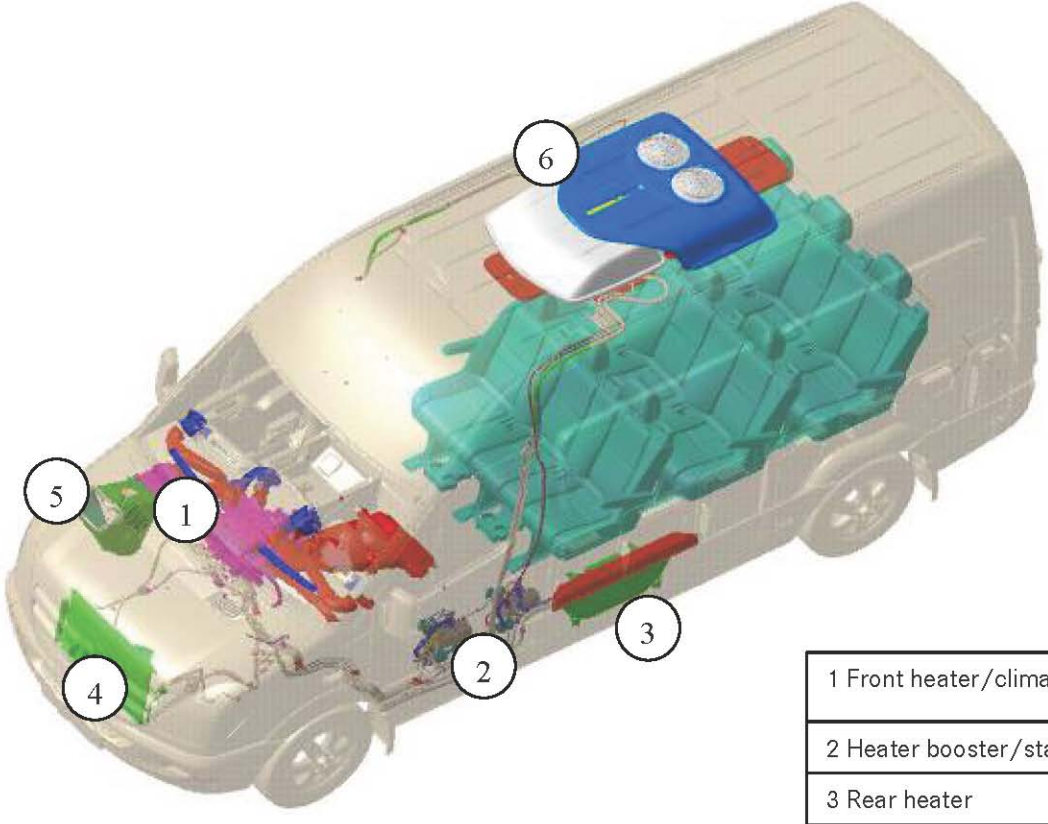


Auxiliary Fan (M4/2)

- ONLY on non-OM642 engine vehicles
- 2 stage
- Stage1 activated at
  - Coolant temp 224°F (107°C) or 16 bar refrigerant pressure
- Stage 2 activated at
  - Coolant temp 239°F (115°C) or 20 bar refrigerant pressure



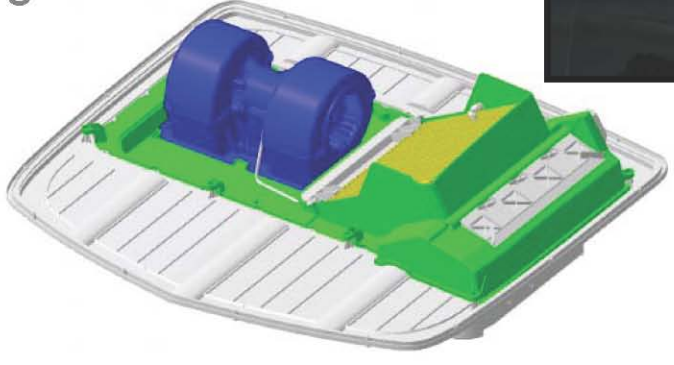
Auxillary Rear Heating and AC Systems



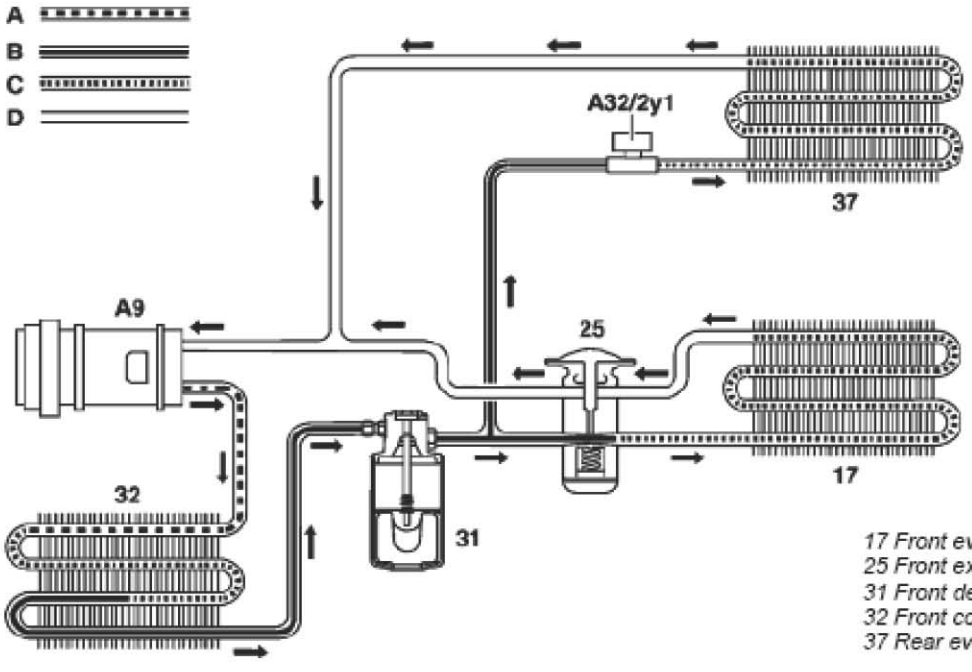
1 Front heater/climate control with electric heater booster (PTC)
2 Heater booster/stationary heater/tandem heating
3 Rear heater
4 condenser
5 Air intake with filter
6 Rear AC system

Rear AC

- This version not available for MY10 NAFTA version vehicles
- Integrated into front AC circuit
- No independent temp sensor
  - Regulated via ACC temp sensor
- Operating requirements
  - Rear AC ON
  - Engine running



Rear AC



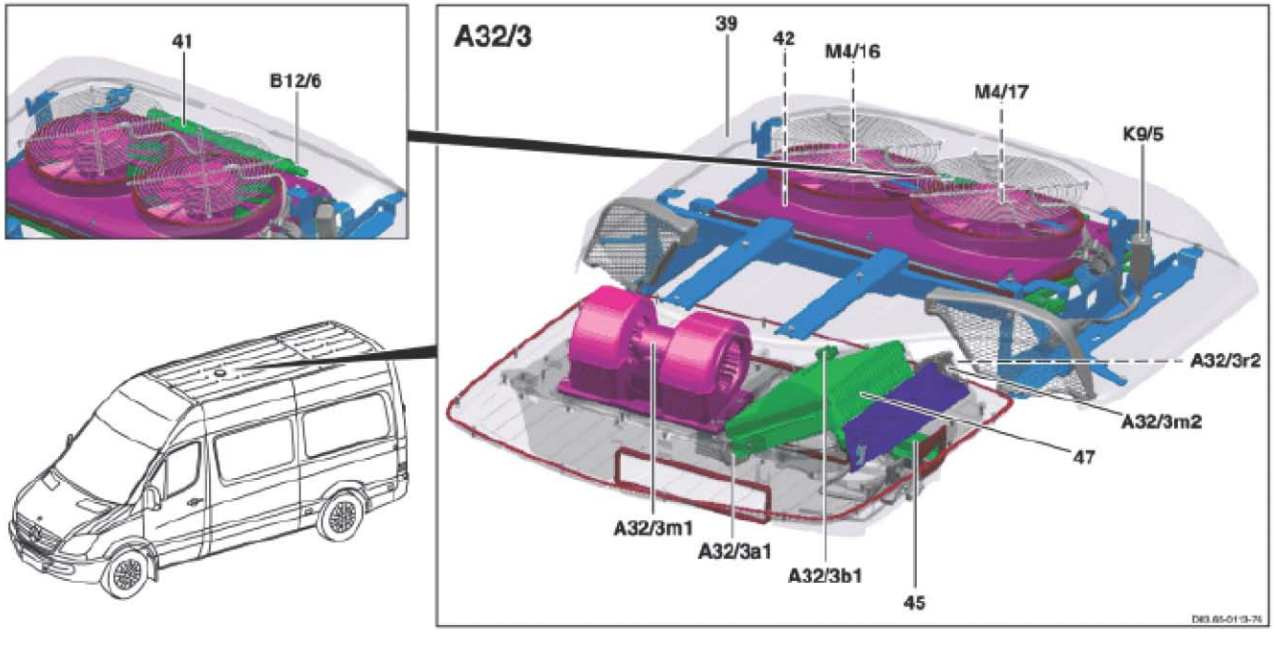
17 Front evaporator
25 Front expansion valve
31 Front desiccant cartridge
32 Front condenser
37 Rear evaporator

A High pressure (gaseous)
B High pressure (liquid)
C Low pressure (liquid)
D Low pressure (gaseous)

A9 Refrigerant compressor
A32/2y1 Refrigerant shutoff valve

High Performance Rear AC (H08)

- Available rear AC option for MY10



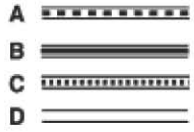
39 Cover panel
41 Roof air conditioning desiccant cartridge
42 Roof air conditioning condenser
45 Roof air conditioning expansion valve
47 Roof air conditioning evaporator

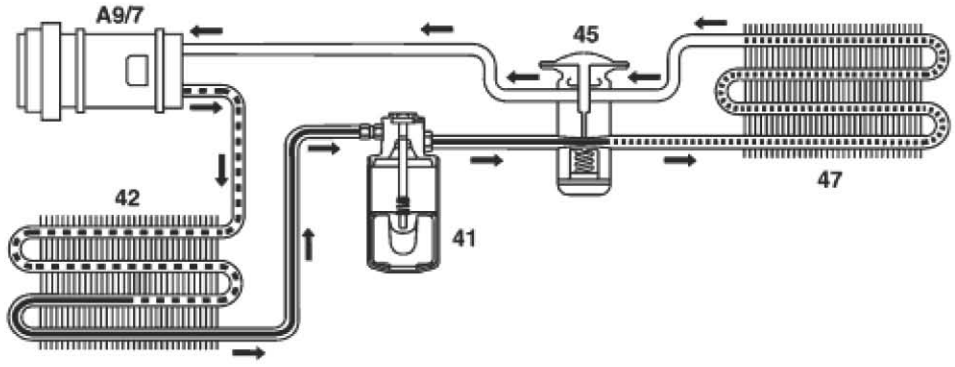
A32/3 Rear heavy duty automatic air conditioning recirculation unit
A32/3a1 Blower regulator
A32/3b1 Evaporator temperature sensor
A32/3m1 Blower motor

A32/3m2 Blend air flap actuator motor
A32/3r2 Blend air flap potentiometer
B12/6 Roof refrigerant pressure sensor
K9/5 Roof additional fan relay
M4/16 Roof air conditioner 1 additional fan
M4/17 Roof air conditioner 2 additional fan

High Performance Rear AC (H08)

- Separate:
  - AC compressor w/ clutch
  - Evaporator
  - Condenser
  - Expansion valve
  - Drier
  - Blend air flap actuator



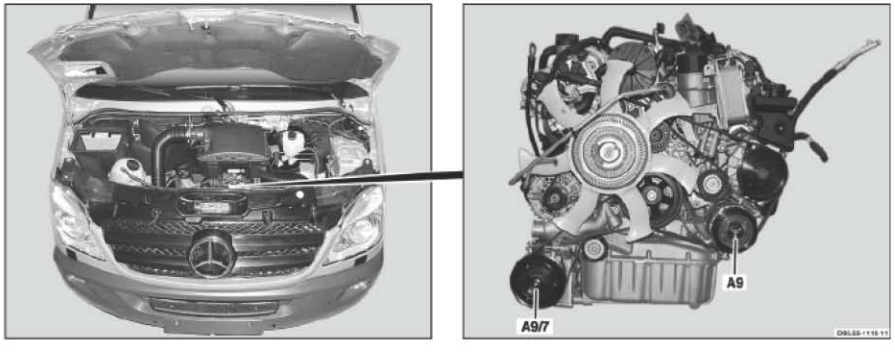


41 Roof air conditioning desiccant cartridge
42 Roof air conditioning condenser
45 Roof air conditioning expansion valve
47 Roof air conditioning evaporator

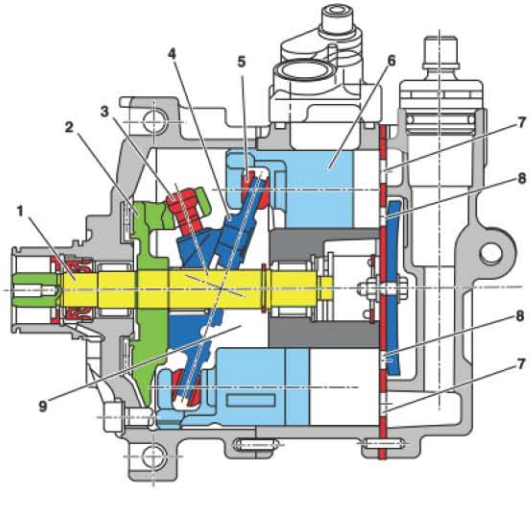
A High pressure (gaseous)
B High pressure (liquid)
C Low pressure (liquid)
D Low pressure (gaseous)

A9/7 2nd refrigerant compressor

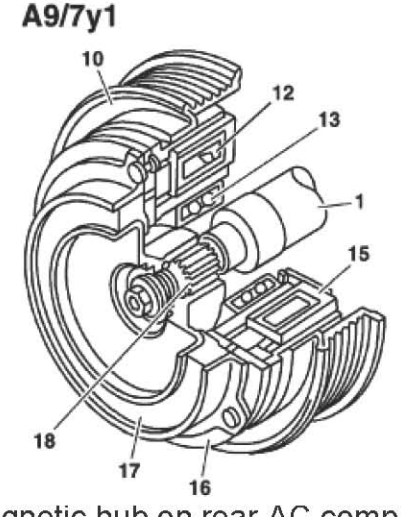
High Performance Rear AC (H08)



Rear AC compressor location



1 Refrigerant compressor shaft
2 Clutch plate
3 Alignment pin
4 Swash plate
5 Sliding shoe
6 Piston
7 Intake valve
8 Pressure control valve
9 Swash-plate chamber



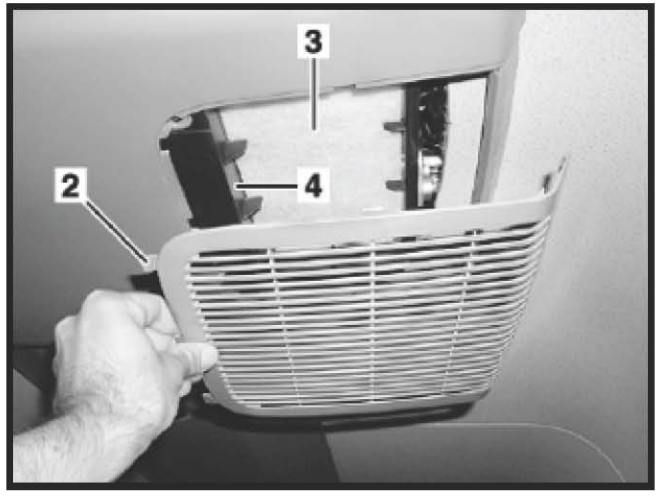
Magnetic hub on rear AC compressor

1 Refrigerant compressor shaft
10 Belt pulley
12 Fuse
13 Ball bearing
15 Solenoid
16 Pressure plate
17 Rubber insert
18 Spline

A9/7y1 2nd refrigerant compressor magnetic clutch

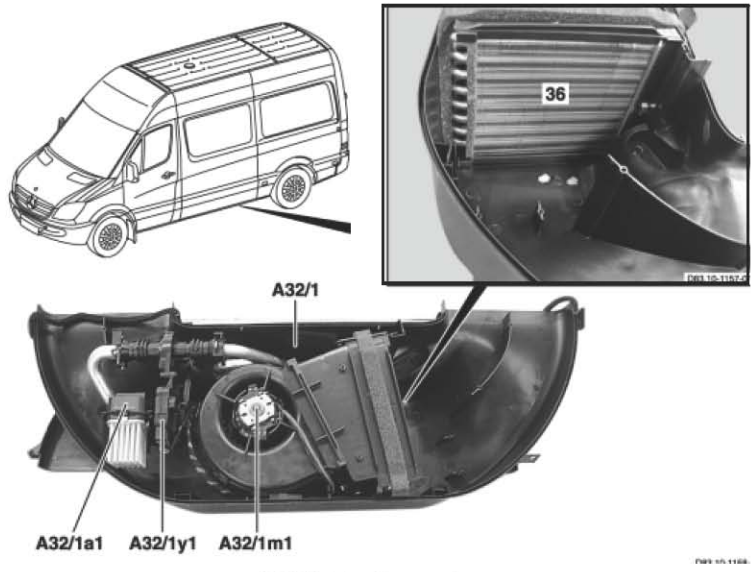
Rear AC

- Does not take in fresh air – only recirc
- Dust filter installed behind rear AC grill panel
- Must be replace at each maintenance service
  - Also applies to non-high performance rear AC systems

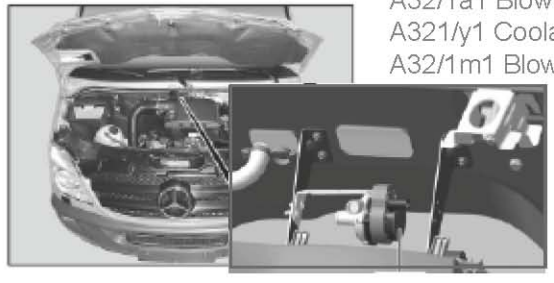


Rear Heater (H13)

- Additional heater core connected in parallel with front heater core
- Behind B pillar / left side / under-floor
- Temp and air volume controlled on ACC control module
- No temp sensors
- Coolant control valve A321/y1used to regulate flow thru heater core based upon driver demand
- Recirculation coolant pump (M13/4) utilized
- PWM controlled coolant control valve in housing

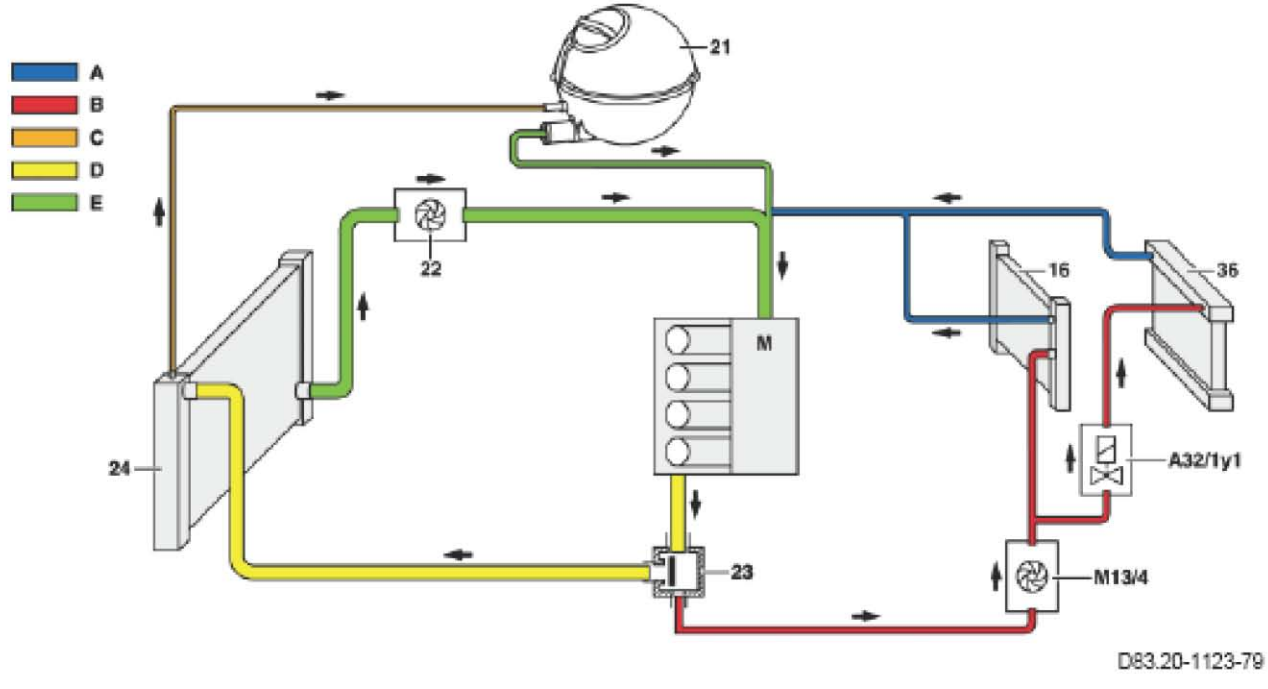


A32/1 Heater unit
A32/1a1 Blower motor regulator
A321/y1 Coolant control valve
A32/1m1 Blower motor



M13/4

Rear Heater (H13)



16 Front heater heat exchanger
21 Radiator expansion tank
22 Water pump
23 Thermostat
24 Radiator
36 Rear heating system heat exchanger

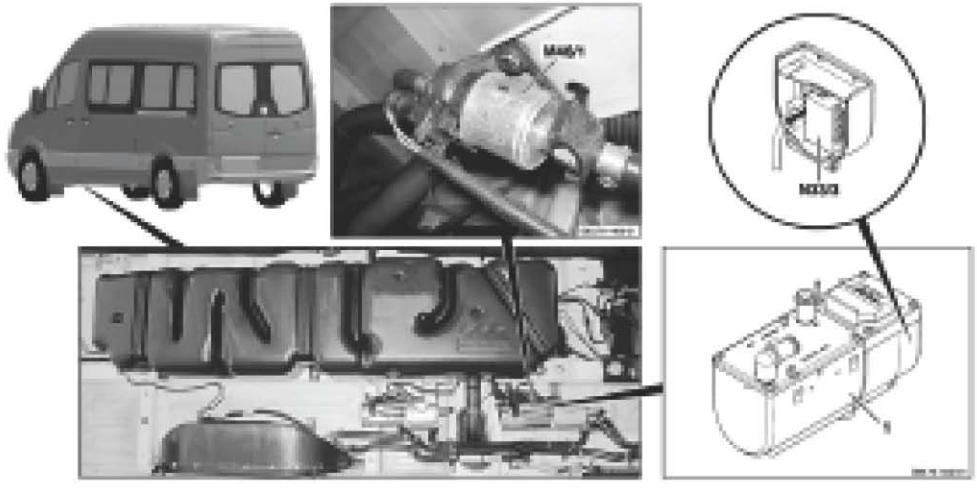
A Heater water return
B Heater water supply
C Vent line
D Coolant feed
E Coolant return

M Engine

A32/1y1 Rear heater water valve
M13/4 Circulation pump

Fuel Fired Auxilary Heating

- Variant of the stationary heater (STH)
  - HZ9 Water additional heater while driving (5kW)
  - H12 Water stationary heater (5kW)
  - HZ5 Tandem Water stationary heater (10kW)
  - H11 Warm air stationary heater
    - 3.5kW passenger / cargo van
    - 2 kW cab chassis
  - HY1 Radio remote control



Water Heater While Driving 5kW (HZ9)

- Only be used with engine running
- Components installed under left floor in front of fuel tank
- Connected to engine coolant circuit
- Heater warms coolant up to 185°F (85°C) the switches off, restarts at 163°F (73°C)
- Activated via button below head lamp switch
- Driver can only switch on/off, no regulation

Water Stationary Heater 5kW (H12)

- Can be used without engine running
- Same components as HZ9 except:
  - Control module
  - Switches
  - Timer in IC
- Heater warms coolant up to 185°F (85°C) the switches off, restarts at 163°F (73°C)
- Activated via button below head lamp switch
- Timer in IC allows 3 preset times
- Driver can only switch on/off, no temp. regulation
- Max run time for MY10 = 60 minutes

1 Water stationary heater
2 Water stationary heater while driving

The switch has 2 LEDs (red/yellow):

Red	heater function active
Yellow	preset time active

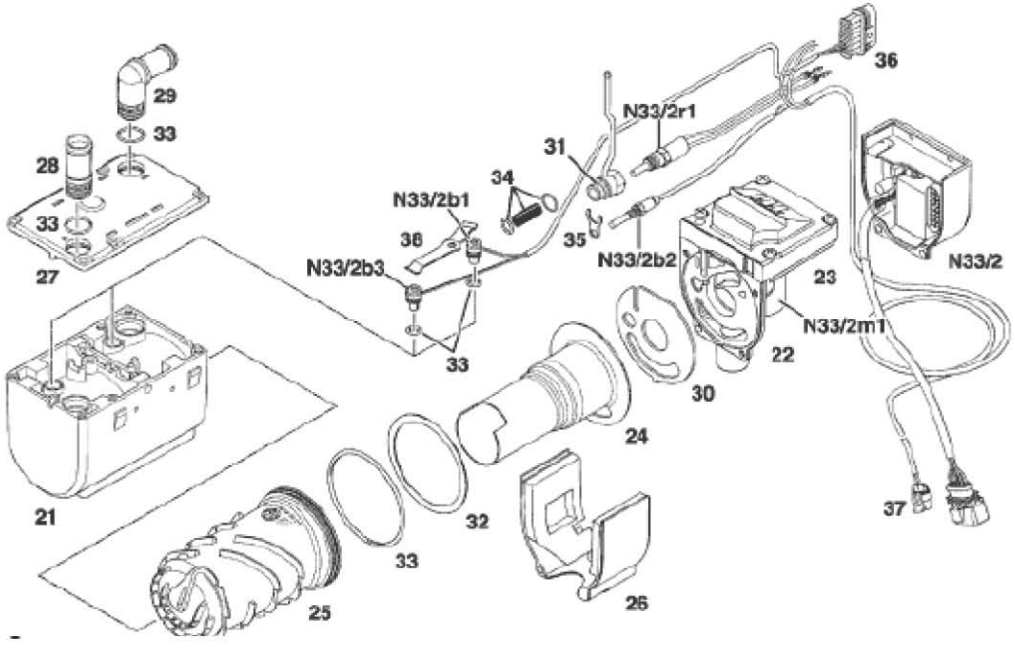
Water Heater (HZ9 and H12)

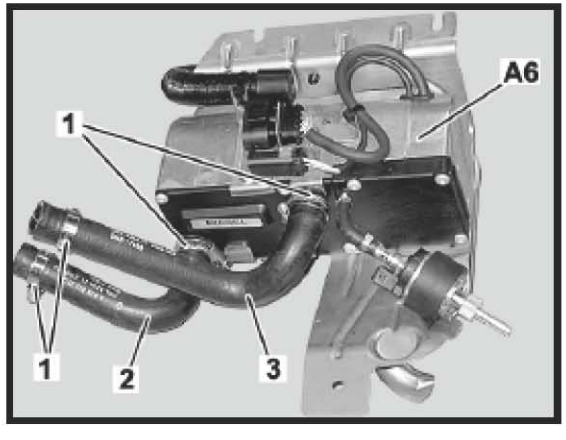
- Conditions for switching On
  - Coolant temp < 176°F (80°C)
  - *Outside temp < 39°F (4°C) only for MY10*
  - Terminal 61 ON
- Start cycle
  - Combustion air blower, coolant recirculation pump and glow pin are activated when system switched On
  - Metering pump (delivers fuel to burner housing) actuated after a preheating time
  - Metering pump controlled via pulse generator in stationary heater control unit
  - If heater booster does not ignite with 90 sec. after fuel feed is started, the start cycle is repeated

Water Heater (HZ9 and H12)

- Conditions for switching OFF
  - Coolant temp > 176°F (80°C)
  - *Outside temp > 39°F (4°C) ONLY for MY10*
  - Terminal 61 OFF
  - Key turned position 0
- 120 sec run on time to cool combustion chamber
- Problems during heater operation
  - Under / over voltage
  - Flame-out
  - Overheating
  - Defective flame sensor
  - Defective temperature sensor
  - Fuel level in tank < 4 gallons (15 liters)

Water Heater (HZ9 and H12)





20 Heater booster unit
21 Casing
22 Combustion air blower with blower motor (N33/2m1)
23 Cover of combustion air blower with blower motor (N33/2m1) (22)
24 Combustor with downpipe
25 Heat exchanger
26 Cover of blower motor (N33/2m1)
27 Cover for casing (21)
28 Coolant inlet connection
29 Coolant outlet connection

32 Gasket between combustor with downpipe (24) and combustion air blower with blower motor (N33/2m1) (22)
33 O-ring
34 Soft trim with O-rings for the fitting of glow pin (N33/2r1) with fuel feed line (31)
35 Bracket for fitting of glow pin (N33/2r1) with fuel feed line (31)
36 14-pin connector for warm water auxiliary heater 2 control unit (N33/2)
37 Line for circulation pump (M13/4)

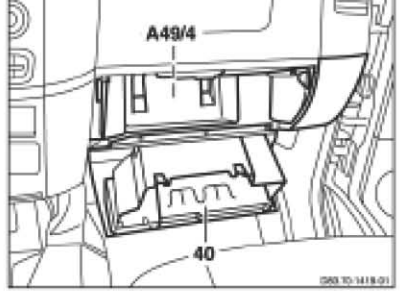
N33/2 Warm water auxiliary heater 2 control unit
N33/2b1 Temperature sensor
N33/2b2 Flame sensor
N33/2b3 Overheating sensor
N33/2m1 Blower motor
N33/2r1 Glow pin

HZ5 Tandem Water Stationary Heater (10kW)

- Two 5kW heater units connected in series
- Stationary heater mode = 5kW output
- Auxiliary heater mode while driving = 10kW output
- Max operating time:
  - 60 minutes MY10
  - 120 min MY09 and previously

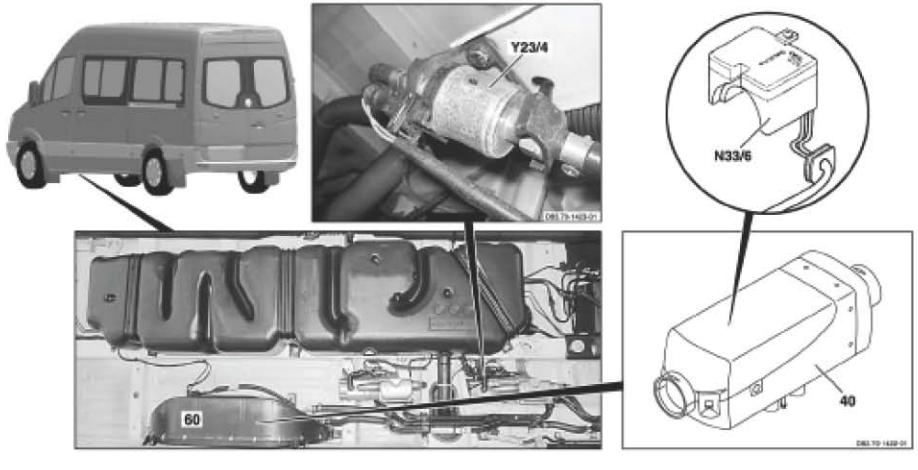
Optional Remote Control for H12 / HZ5 (HY1)

- Can be used to switch on/off
  - Max distance 600 meters
- Max on time 60 minutes
- Will shut off if battery voltage drops below threshold
- Receiver mounted behind glove box



Warm Air Auxiliary Heater (H11)

- Located inside rear heater box
- Heats air inside box
- No CAN connection
- Programmed and activated timer mounted near OCP



Acronyms

AAC	Automatic air conditioning control module
CAN	Controller Area Network
IC	Instrument cluster
OCP	Overhead control module
SAM	Signal Acquisition Module
PWM	Pulse width modulated

SRS

The SRS system consist of the following:

- SRS warning lamp
- Emergency tensioning retractors
  (R12/1, R12/2, R12/34)
- Belt force limiters
- Airbag control unit (N2/14 or N2/15)
- Airbags
  - airbags – Driver side
    (R12/3 via N80)
    Passenger side
    (R12/4)
- Window bags (R12/16, R12/17)
- Thorax bags (R12/32, R12/33)
- Side airbag sensors (A53, A54)
- Door pressure sensors (B48/7, B48/8)
- Driver's buckle switch (S68/1)

SRS

The driver and passenger side airbags are both single stage airbags

The SRS control unit is located below the center of the dash

SRS control unit:

- N2/14 – control unit with no Thorax bags
- N2/15 – control unit with Thorax bags

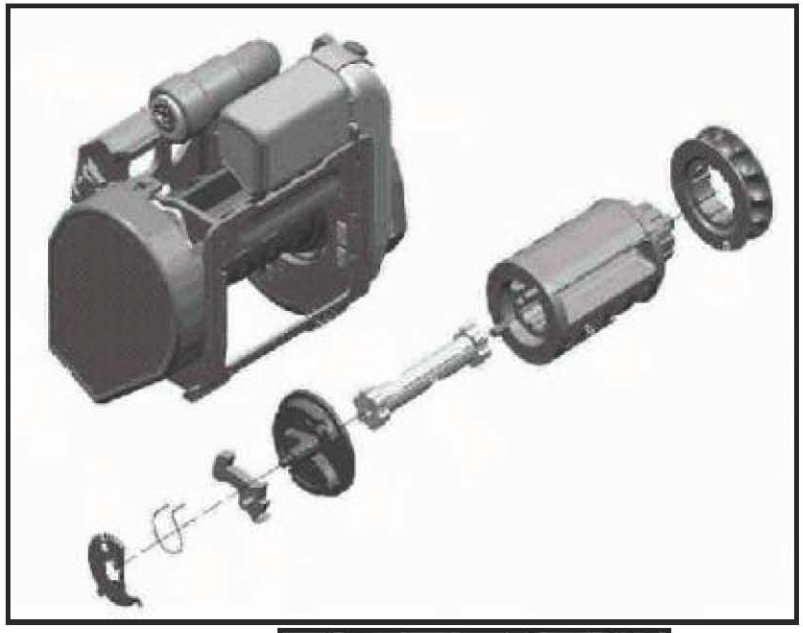
Side impact sensors (A53, A54) are located near the base of the B-pillars

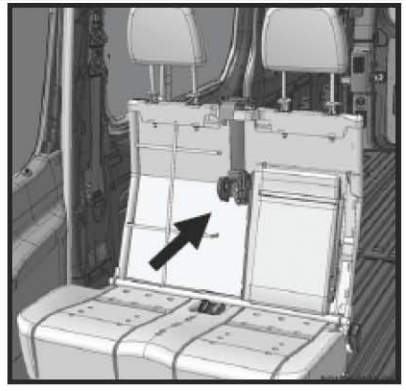
Emergency Tensioning Retractors

There are three possible emergency tensioning retractors

- Driver side - R12/1
- Passenger side - R12/2
- Front center - R12/34

The retractor units include a belt force limiting device





R12/34

Options

The window bag units (R12/16 and R12/17) are mounted in the A-pillars

The Thorax bags (1) are located in the outside edge of the front seats

With the side protection option, door pressure sensors (B48/7 and B48/8) are used as inputs

Repair Notes

Remove the ignition key prior to starting:

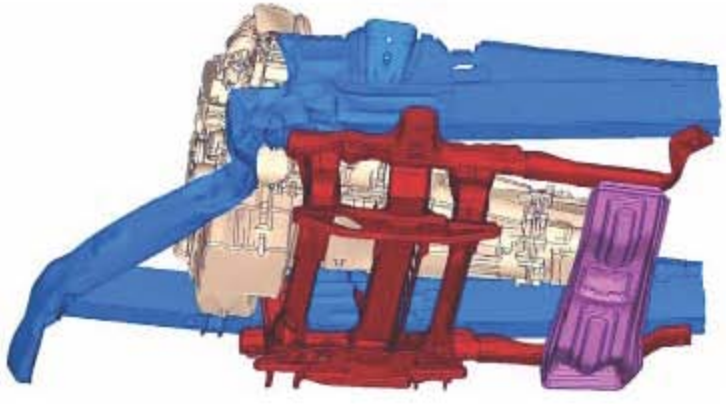
- bodywork
- work on airbag or ETRs (removal or installation)
- work associated with airbag or ETRs that involve electrical circuits (Example: removal of the steering wheel

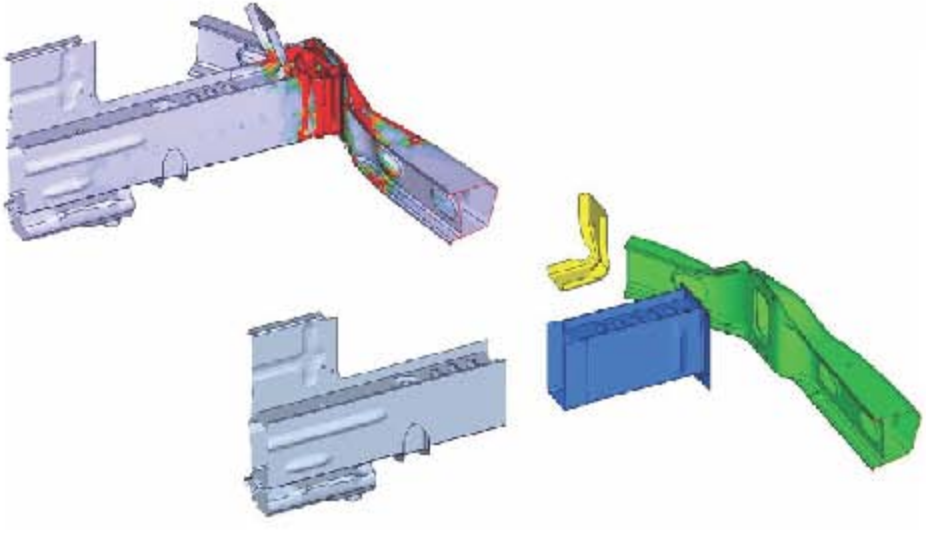
Before welding:

- remove ignition key and disconnect the battery
- remove connector from the airbag control unit

Airbag and ETRs that have fallen from a height > 0.5 m must be replaced

Body



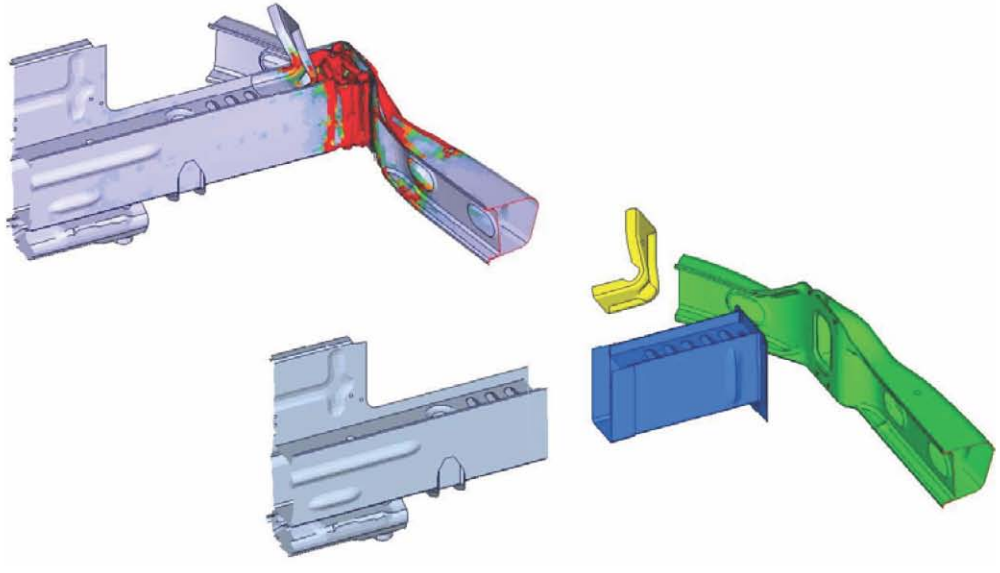


Repair Shoe

With light accidents, a so-called repair shoe (1) is available.

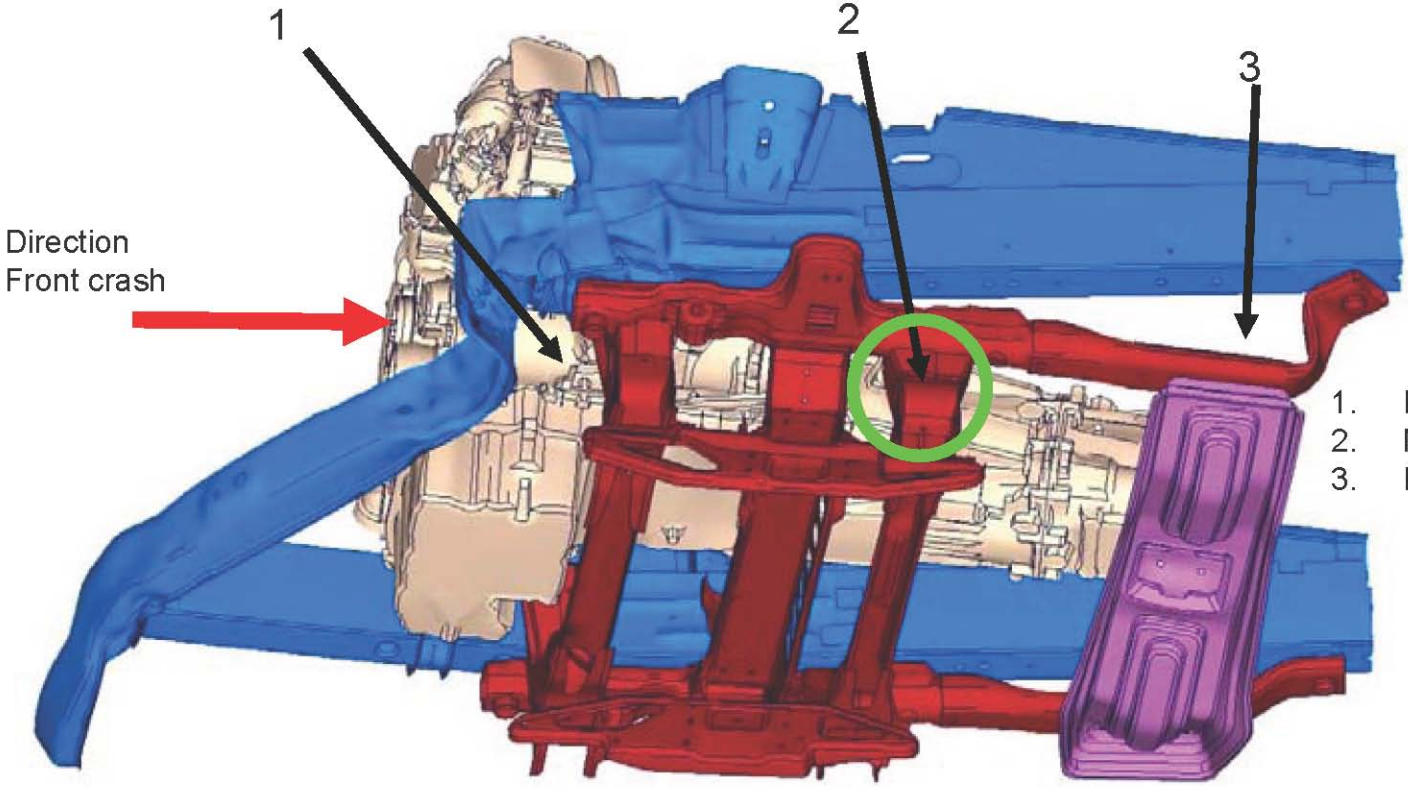
The repair shoe is slid on a longitudinal member, cut at a defined disconnection point, and welded.

This repair will be possible without a straightening bench.



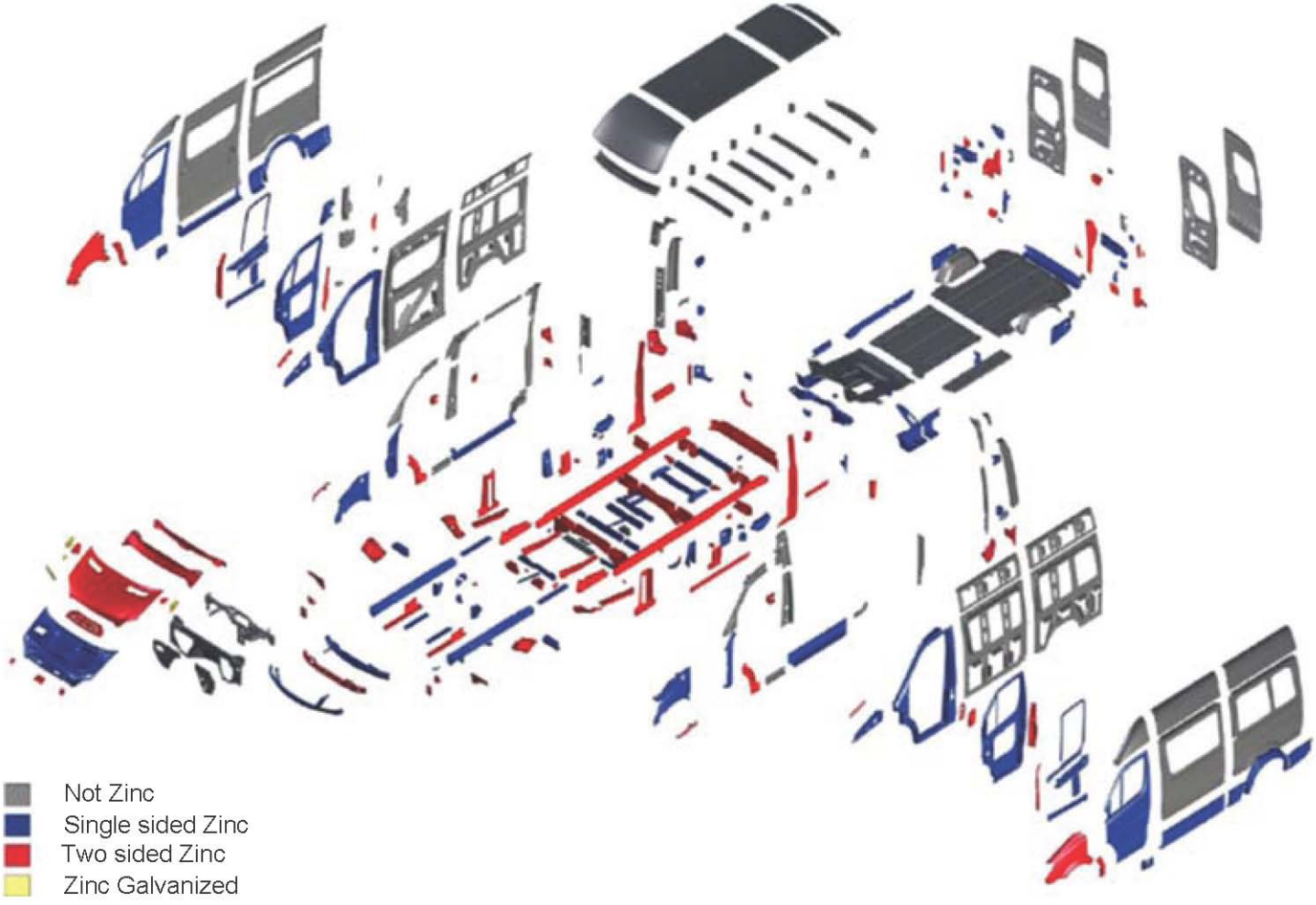
Special Features of the Front Axle Module

A main feature in a front-end crash is the “disconnectable” middle threaded connection of the front axle module, witch releases additional deformation zones in the longitudinal frame member when a particular force level is reached.

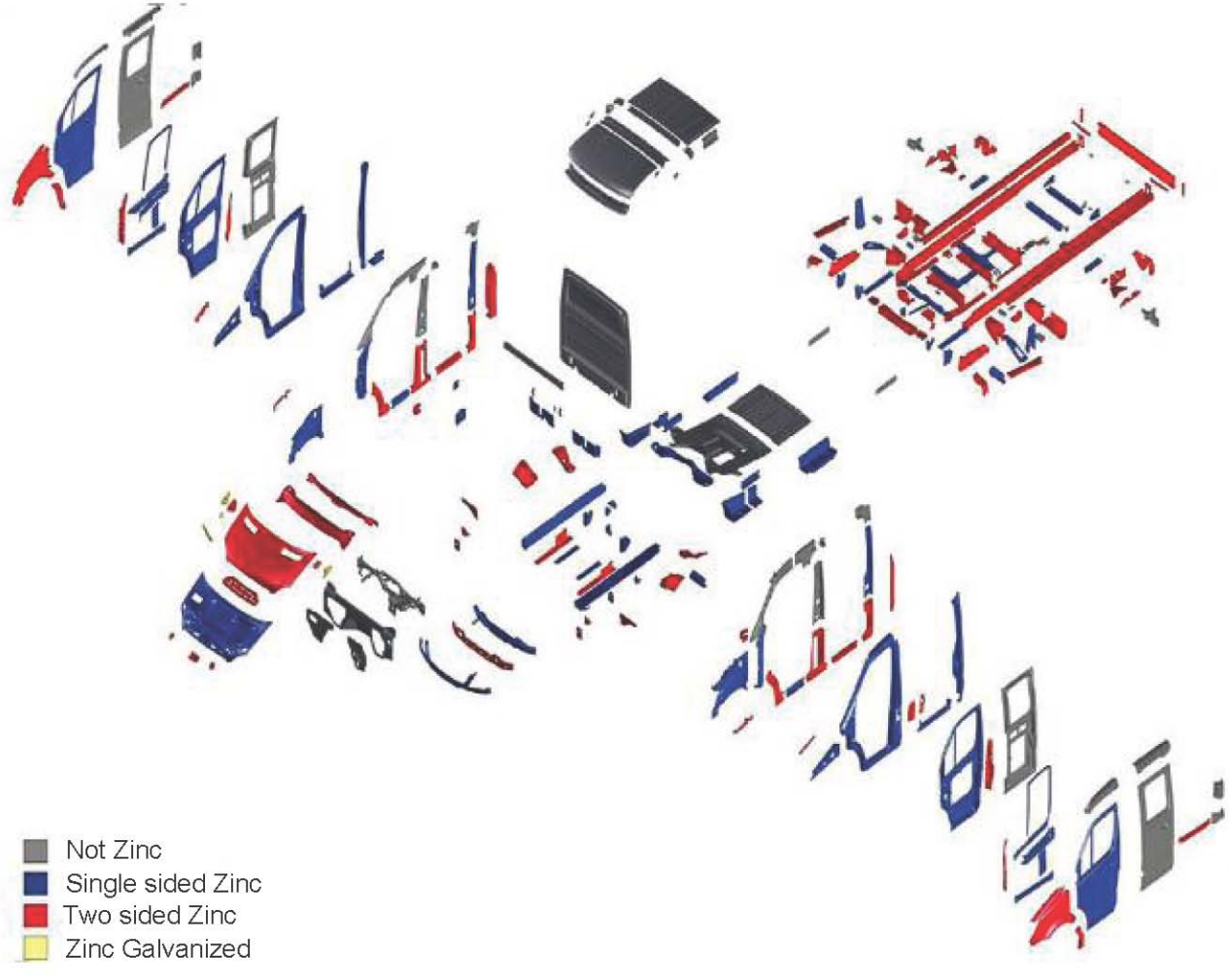


1. Front threaded connection
2. Middle threaded connection
3. Rear threaded connection

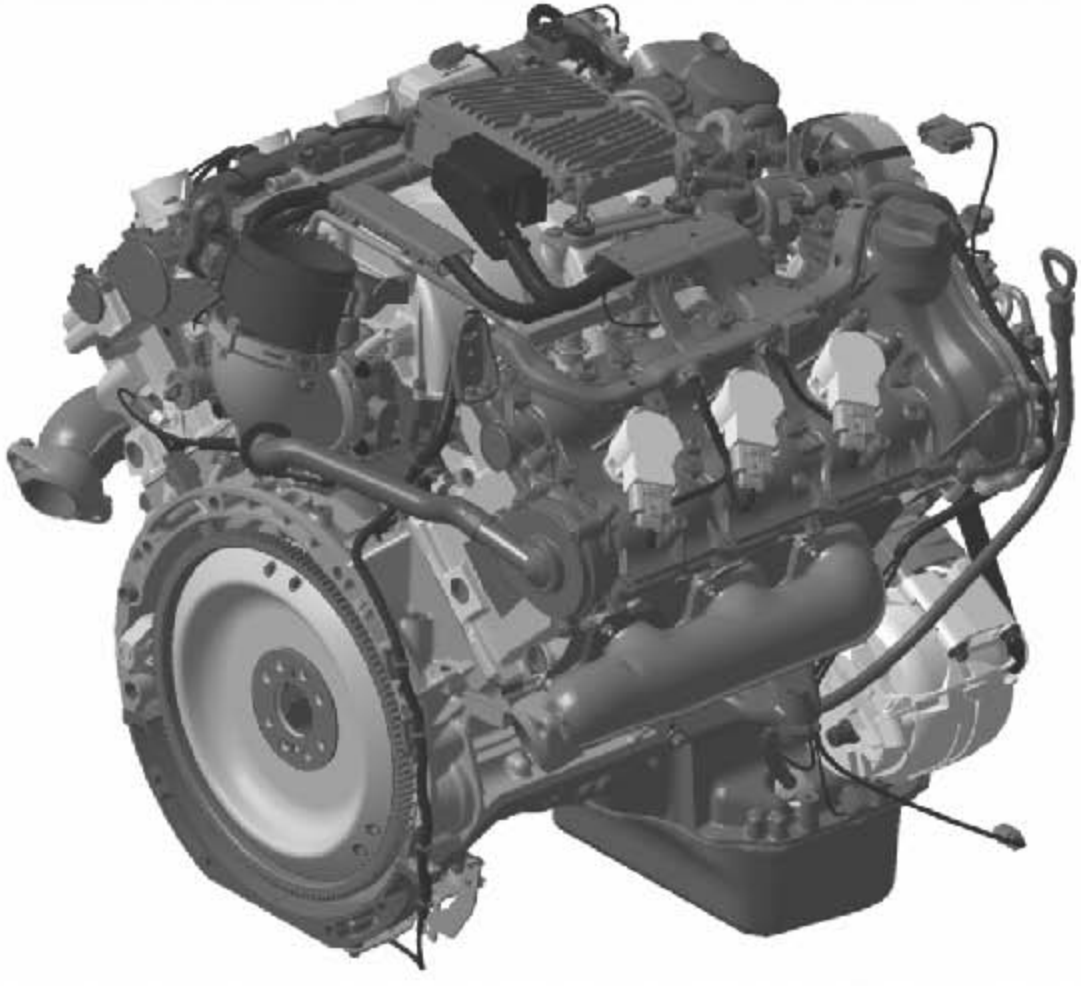
Sheet Metal Coatings



Sheet Metal Coatings



M272 Engine

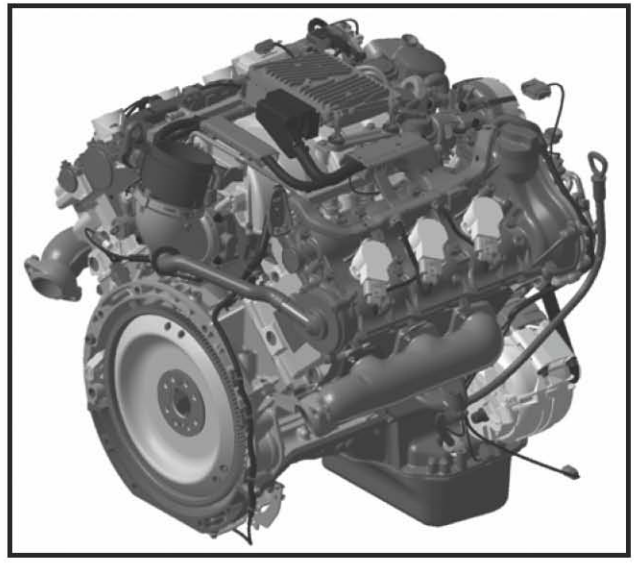


Gasoline Engines M272

In addition to the familiar OM646 and OM642 diesel versions, a gasoline engine variant M272 is also available in the ***Sprinter*** model designation 906.
In the gasoline engine, the engine control unit (ME), is installed directly on the engine in contrast to the diesel variants.

Technical data for the M272 in the ***Sprinter*** model design **906**:

Engine model design:	272.979
Engine power:	190 kW at 5900 rpm
Engine torque	340 Nm (251 lb ft) from 2500 to 5000 rpm
Bore:	92.9 mm
Stroke:	86.0 mm
Total displacement:	3498 cm^3
Compression ratio:	10.7:1
Cylinder arrangement:	6 cylinder V-engine with a 90° cylinder angle
Valves:	Two intake valves, two exhaust valves
Camshaft:	Variable valve timing (40°)
Combustion system:	Spark ignition, variable intake manifold
Injection system:	Multi-point injection
Engine control:	Electronic engine management system
Ignition coils:	One ignition coil per cylinder on the spark plug



Main Features

- Compact aluminum die-cast engine block with cast-in cylinder liners made of the new aluminum-silicon alloy SILITEC.
- Three-layer steel no-retorque cylinder head gaskets.
- A timing-chain-driven counter rotating balance shaft between the cylinder banks to offset the inertia forces which are an inherent in a V6 engine
- Four valve-per-cylinder design
- Valve train with cam followers and hydraulic, maintenance-free valve clearance compensation.
- The exhaust valves are sodium-filled.
- By means of fast-acting actuators, the intake and exhaust camshafts are continuously adjusted for flexible control of valve timing

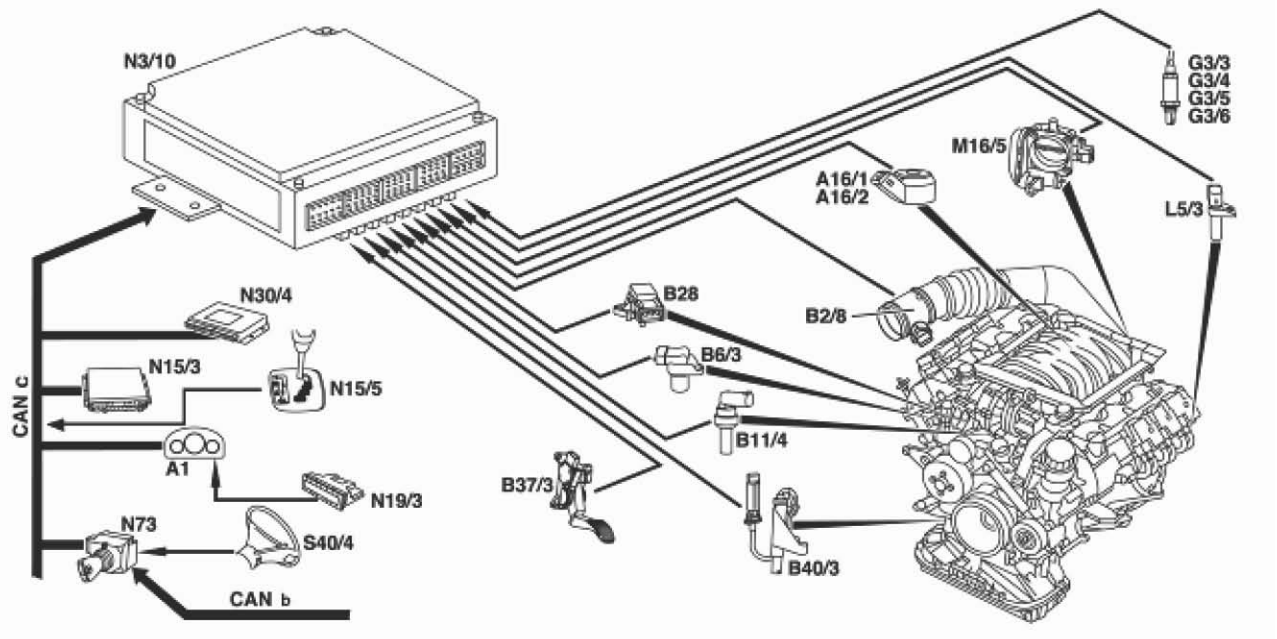
Main Features

- Front duplex timing chain directly drives the overhead intake camshafts and the exhaust camshafts are driven by a pair of gears from the intake cams
- The oil filter and oil-water heat exchanger are mounted at the front of the engine
- Auxiliaries such as the alternator, coolant pump, power steering pump and refrigerant compressor (optional equipment) are driven by a poly-V-belt with an automatic tensioner.
- A sensor monitors the engine oil and warns if the level is too low.
- Electronically controlled internal exhaust gas recirculation
- Secondary air injection and two close-coupled catalytic converters ensure compliance with the LEV Bin8 emission regulations.

Main Features

- Full-load volumetric efficiency is ensured by a two-stage variable intake manifold, resulting in a smooth, continuous torque curve.
- Part-load volumetric efficiency is assisted by swirl flaps which retract fully into the side of the intake port, increasing turbulence in the cylinders for improved combustion.
- Coolant circulation while the engine is warming up is regulated by an electronically controlled thermostat, to further improve heating, exhaust emissions and fuel consumption.
- This engine requires premium fuel with minimum 90 octane posted at the pump.

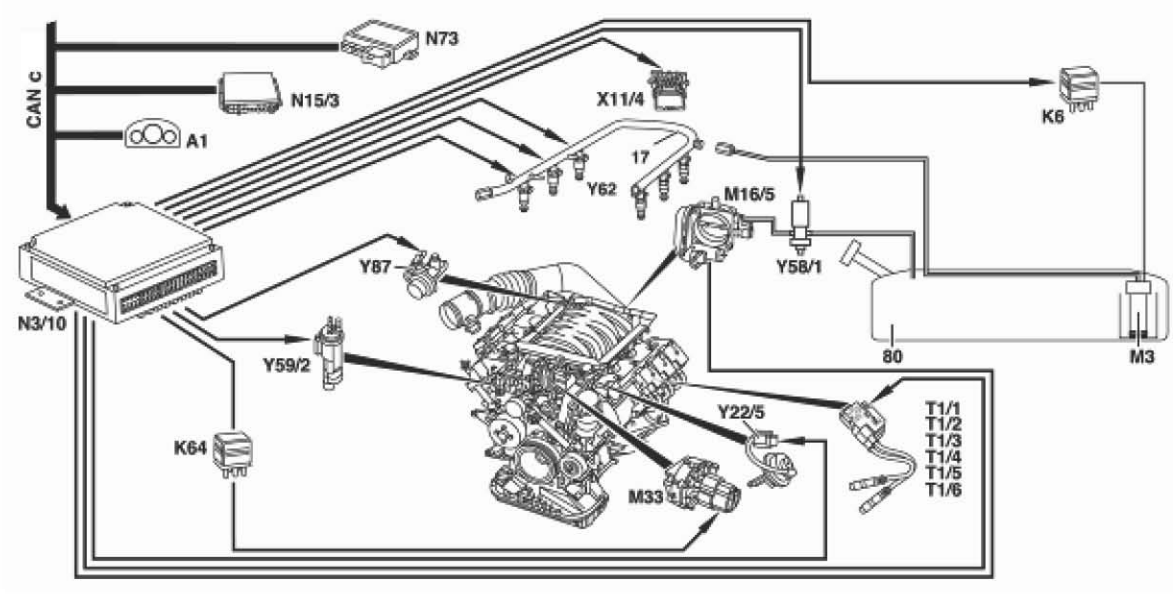
Input Signals



Legend

A1	Instrument cluster
A16/1	Knock sensor 1
A16/2	Knock sensor 2
B2/8	Hot film mass air flow sensor (HFM)
B6/3	Camshaft sensor
B11/4	Coolant temperature sensor
B28	Intake manifold pressure sensor
B37/3	Pedal value sensor
B40/3	Engine oil sensor
G3/3 – 6	Oxygen sensors
L5/3	Crankshaft position sensor
M16/5	Throttle valve setting sensor
N3/10	ME 2.8 control unit
N15/3	Electronic gearshift (EGS) control unit
N15/5	Electronic selector lever module control module (ESM)
N19/3	Climate control control unit (AAC)
N30/4	Electronic stability program (ESP) control unit
N73	Electronic ignition/starter switch (EIS) control unit
S40/4	Cruise control switch
CAN b	Interior bus (I-CAN)
CAN c	Engine bus (M-CAN)

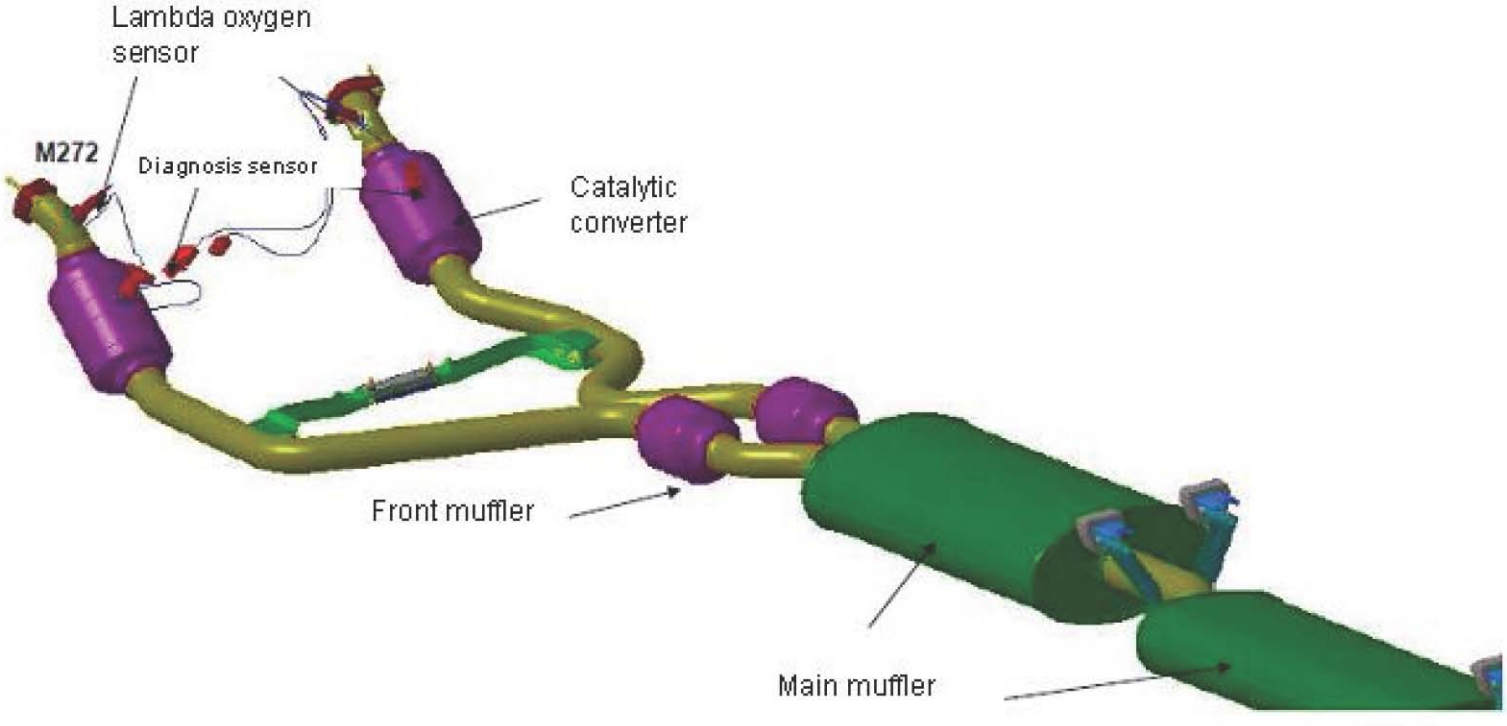
Output Signals



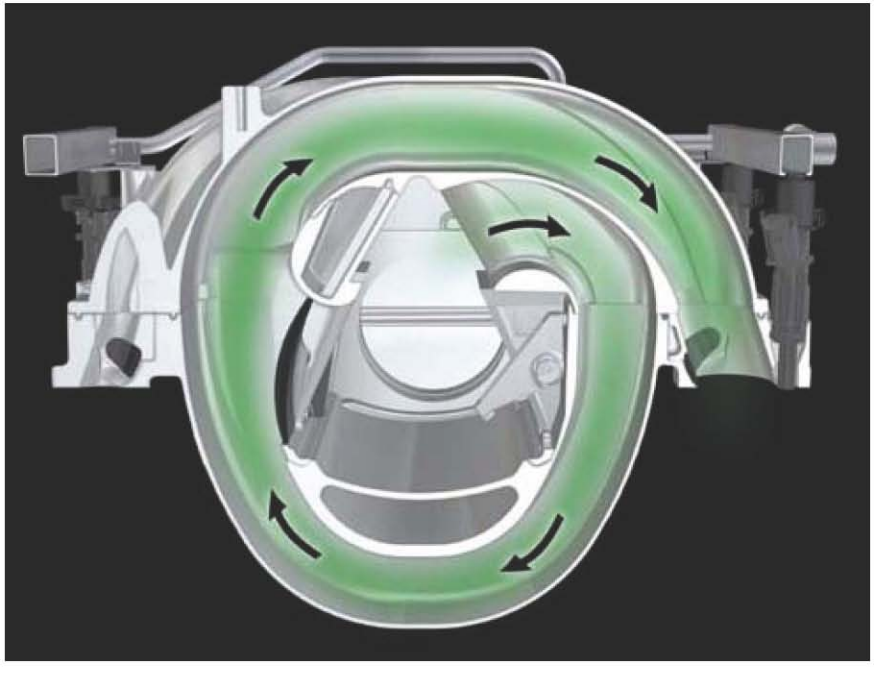
Legend

17	Fuel distributor rail
80	Fuel tank
A1	Instrument cluster
K6	Fuel pump relay
K64	Secondary air pump relay
M16/6	Throttle valve actuator
M3	Electric fuel pump
M33	Secondary air pump
N3/10	ME 2.8 control unit
N15/3	Electronic gearshift (EGS) control unit
N73	Electronic ignition/starter switch (EIS) control unit
T1/1 – 6	Ignition coils
X11/4	Diagnostic socket
Y22/5	Intake manifold switchover valve
Y58/1	Regeneration switchover valve
Y59/2	Secondary air switchover valve
Y62/1 – 6	Injection valves
Y87	Exhaust gas recirculation pressure transducer
CAN c	Engine bus (M-CAN)

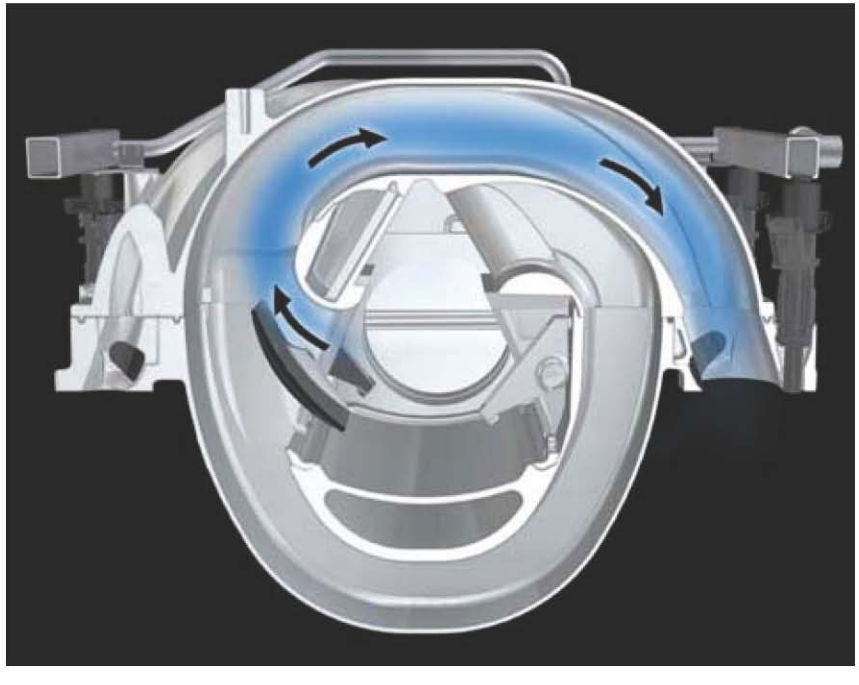
Catalytic Converter



Variable Intake Manifold

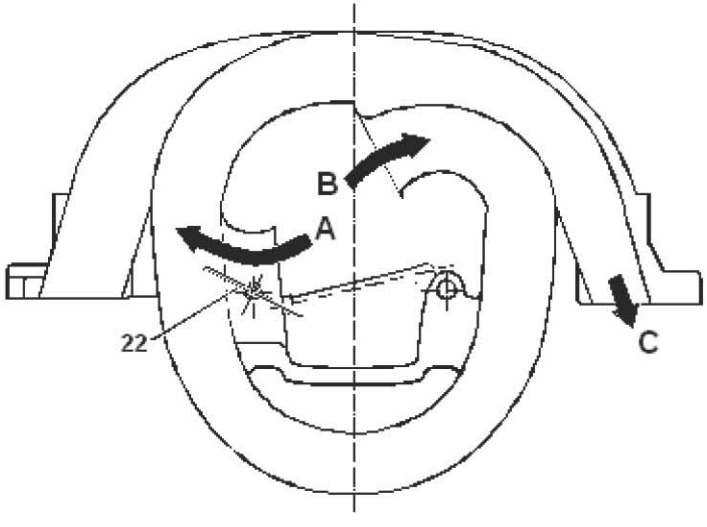


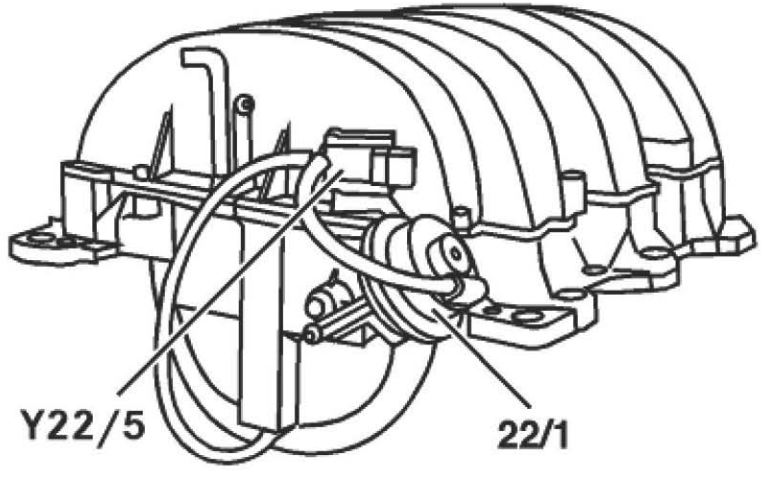
Short path
+ high rpm = high engine power



long path
+ low and middle rpm = high torque

Variable Intake Manifold

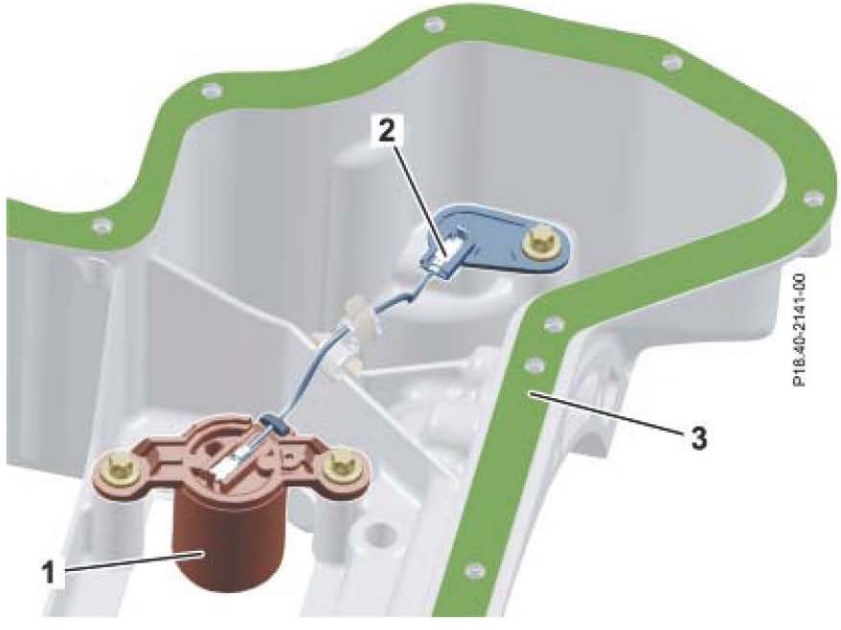




Legend

A	Short intake manifoldidle up to 1700 rpm
B	Long intake manifold 1700 to 3900 rpm
A	Short intake manifoldfrom 3900 rpm to maximum rpm
C	to cylinder (engine)
22	Flap
1	Vacuum tank
Y22/5	Variable intake manifold switchover valve
22/1	Vacuum cell

Oil Level Switch (S43)



Oil level check switch (S43)

1. Float chamber
2. Plug contact
3. Oil pan bottom section sealing flange