

# Škoda Octavia III Electronic Systems

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## Self-study Programme









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You will find the instructions for assembly and disassembly, repairs, for diagnostics plus detailed user information in the VAS diagnostic instruments and in the on-board literature.

#### Editorial closing date was in 4/2013.

This Book is not subject to updating.



## 1. Radar

## ŠKODA

#### 1.1 Basic Description

The radar of the ŠKODA Octavia III model is installed in the vehicle's longitudinal axis in the front bumper. Its task is to monitor the area ahead of the vehicle. Radar data trigger the following intelligent functions:

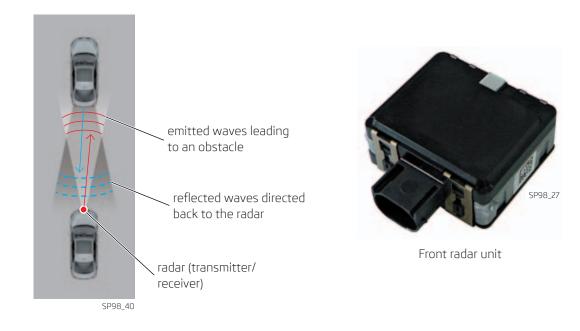
- Adaptive Cruise Control ACC
- Front Assist FA.



Radar Position

#### The Principle

The ŠKODA Octavia III vehicle features the Bosch front radar, which works on the principle of sending and receiving microwave electromagnetic rays in the range of 76-77 GHz. The radar transmits and simultaneously receives waves reflected from obstacles located within its field of vision. Based on the received reflected waves, the radar calculates distance and also the relative velocity of moving objects identified by the radar.



## 1.2 Adaptive Cruise Control

The adaptive cruise control function is one of the convenient assistance systems that facilitate driving.

The adaptive cruise control is the extended function of the regular cruise control system. The cruise control system maintains a set vehicle velocity. The adaptive cruise control expands this system through the function of selected or pre-set distance from the followed vehicle.

#### 1.2.1 Operation description

The driver uses the adaptive cruise control to set the required constant speed. As soon as the driver's vehicle reaches any other vehicle driving at a lower speed, the vehicle automatically brakes and then maintains the pre-set distance from the followed vehicle. Therefore, both vehicles proceed at the same speed. The preset distance is measured by the radar sensor located in the front bumper.

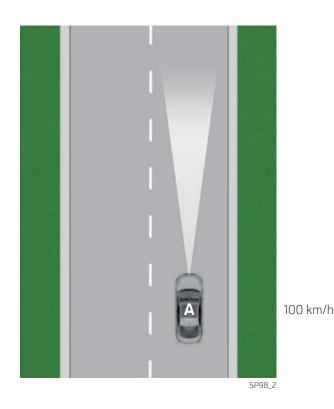
A specific distance between vehicles can also be set through the adaptive cruise control. The pre-set distance between driving vehicles depends on their speed. Therefore, it is not constant. It becomes greater with the increasing vehicle speed. The adaptive cruise control allows the setting of this distance through time parameters in the form of the five time intervals.

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#### 1.2.2 Driving situations

#### **Constant speed**

If there is no vehicle within the radar sensor's field of vision, the adaptive cruise control maintains the pre-set constant speed.



#### Deceleration

If the vehicle A, featuring a radar sensor, reaches slower vehicle B, driving in the same lane, then the adaptive cruise control decelerates vehicle A in order to maintain the time separation from vehicle B. The time separation setting is one of the adaptive cruise control functions, and the driver can control it.

The vehicle decelerates through engine braking or additional regular slight braking.

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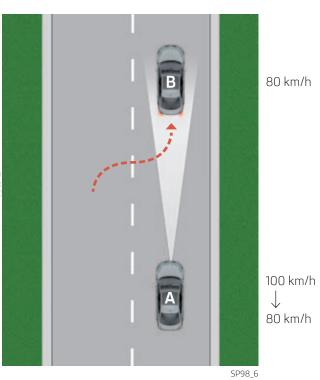
100 km/h ↓ 80 km/h

80 km/h

SP98\_3

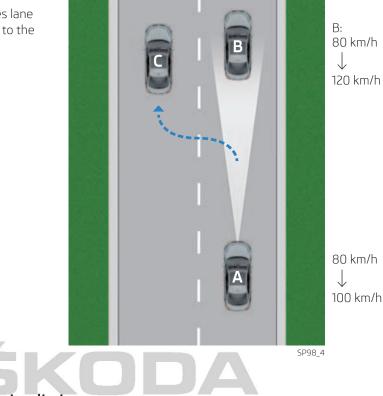
If a slower vehicle joins the lane, the adaptive cruise control responds through deceleration. Vehicle A speed adapts to vehicle B speed again.

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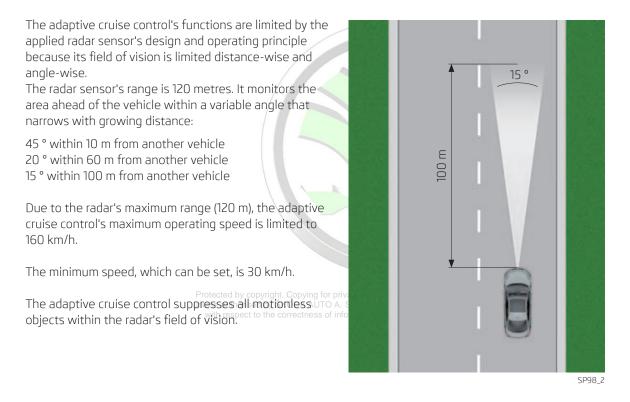


#### Acceleration

If the followed vehicle accelerates (B) or changes lane (C), the adaptive cruise control accelerates back to the pre-set speed.



#### 1.2.3 Adaptive cruise control operating limits





The radar sees standing objects, but the ACC function does not react to them.

#### 1.2.4 ACC Basis, ACC Follow to Stop

The adaptive cruise control functions depend on the type of transmission installed, manual or automatic. With the adaptive cruise control, we differentiate the adjustable range of the speeds and the range of speeds in which the ACC cruise control is **active** (hereinafter referred to as the "active range of speed"). These intervals are not identical.

#### 1.2.4.1 Configurable range of speed

Both variants - ACC Basis – for manual transmission and ACC Follow to Stop – for automatic transmission - have the same configurable range of speed **30–160** km/h.

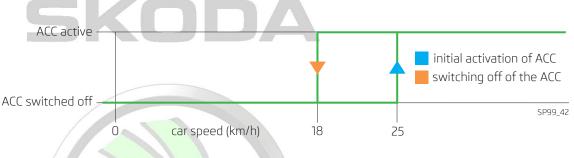
The driver can pre-select the values of the configurable range via the adaptive cruise control.

#### 1.2.4.2 Active range of speeds

#### ACC Basis - for combination with manual transmission

Variant of adaptive cruise control - ACC Basis is active in the range of the vehicle speeds:

- 25\*-160 km/h (during acceleration)
- 160-18 km/h (during deceleration)
- \* This value applies only for initial activation of the adaptive cruise control. If during driving with activated ACC the speed of the vehicle drops to below 25 km/h (as a result of regulation of the speed using ACC functions, the system will remain active up to a speed of 18 km/h, see the graph of hysteresis SP99\_42:



#### ACC Follow to Stop - in combination with automatic transmission

The adaptive cruise control variant called - ACC Follow to Stop is active within the following vehicle speeds.

- **2\*-160** km/h (during acceleration)
- **160-0** km/h (during deceleration)
- \* This value of 2 km/h applies only for initial activation of the adaptive cruise control. If during driving with activated ACC the speed of the vehicle drops to below 2 km/h (as a result of regulation of the speed using ACC functions, the system will remain active until the vehicle comes to a complete stop- and reaches 0 km/h (see the graph of hysteresis SP99\_43). If the vehicle travelling in front immediately begins to accelerate again after stopping, the vehicle with ACC will also accelerate, and the ACC functions will continue to control its speed. If standing lasts longer, the control is automatically interrupted.



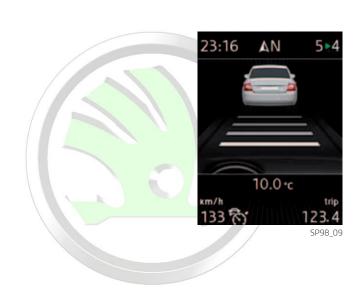
#### 1.2.5 Controls

For controlling the adaptive cruise control in the ŠKODA Octavia III vehicle, a special third lever under the steering wheel is used.



**Speed**: It allows speed setting from 30-to 160 km/h. **Distance:** It allows setting the distance from a followed vehicle within the five time intervals.

The adaptive cruise control actual setting is communicated to the driver through the Maxi DOT display. The display shows a pre-set time separation. The pre-set cruise control speed is indicated in the left bottom corner.

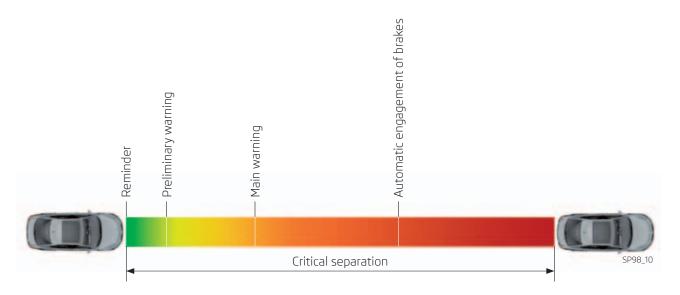


Automatic control of speed and distance between vehicles increases driving comfort. However, the adaptive cruise control does not replace the driver. The driver is still fully responsible for driving.

#### 1.3 Front Assist

Front Assist is one of the safety assistance systems. The function strives to avoid collision or to minimise its consequences. This function is available within the vehicle's range of speeds from 5 km/h.

The system identifies the critical distance from a followed vehicle or other obstacle and helps shorten the vehicle's necessary braking distance. Front Assist also reacts to standing objects. If the driver starts braking, the function switches into its driver-support mode (intensified braking) - see the table below.



The critical separation is a variable distance that depends on the actual speeds of both vehicles. Similarly to safe separation, critical separation can also be expressed as a time constant.

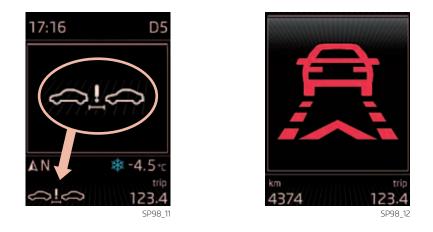
The table shows a list of activities of the Front Assist function, based on the individual steps indicated in the SP98\_10 diagram.

	Reminder	Preliminary warning	Main warning	Automatic brake engagement
Brake preparation		Brake pressurisation	Increased brake sensitivity	Increased brake sensitivity
Driver warning	Visual warning	Visual warning Acoustic warning	Warning vibration of brakes	-
<b>Braking</b> (Speed over 30 km/h)		0	Beginning of the automatic partial braking (approx. 3.5 m/s²)	Automatic intense braking (approx. 6.0 m/s²)
<b>Braking</b> (Speed up to 30 km/h)*				Automatic intense braking (approx. 8.0 m/s²)
The driver brakes in response to the situation less authorised by	ght. Copying for private or comr y ŠKODA AUTO A. S. ŠKODA /	Driver-induced intensified braking mercial purposes, in part of ing AUTO A. S. does not guarantee or AUTO A. S. does not guarantee or	Driver-induced intensified braking accept any liability	Driver-induced intensified braking

\* Applies to the City mode.

#### Visual warning on the Maxi DOT display

The first step during intervention of the Front Assist function is to display a separation warning (image SP98\_11) on the Maxi DOT display. During the second step –, Preliminary Warning, the visual on the display (image SP98\_12) is accompanied by a sound signal as well.



#### Setting the FA function

The front Assist can be set via the infotainment menu. The function can be entirely suppressed by switching it off in the infotainment menu or via the Maxi DOT display.

The following items are available in the infotainment menu:

- Front Assist switch on/switch off entire system.
- Acoustic/visual warning on/off
- Distance warning on/off

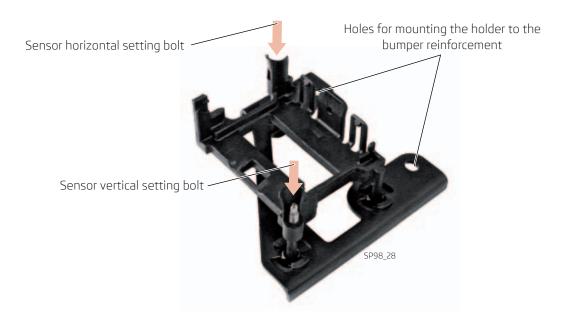




#### 1.4 Front Radar Alignment

#### Radar holder

The front radar unit installed in the ŠKODA Octavia III vehicle is mounted using a special holder featuring two bolts used to adjust the radar sensor position in two axes; therefore, to align the radar with the vehicle axis. The detection field axis must be set both horizontally and vertically.

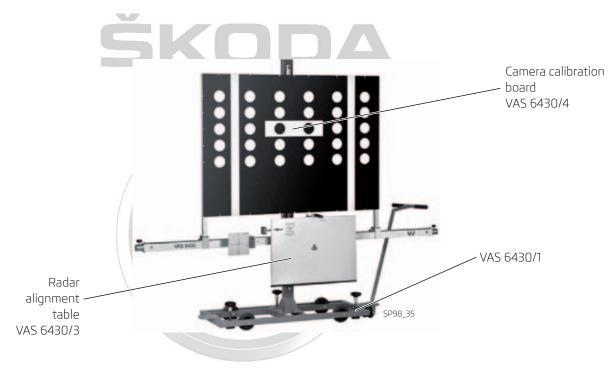




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#### 1.4.1 Setting procedure

For proper configuration of the radar sensor, equipment for wheel alignment is used along the VAS 6430/1 and /3 special tools for radar alignment.



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The detailed procedure for aligning the radar is described in the diagnostic software (ODIS Service). Adjusting the board is described in the workshop manual and in the wheel alignment device. Here we are presenting only a brief overview of the procedure:

- Proper radar alignment requires that complete wheel alignment is performed first.
- Then the special tool is set to the distance of 120 cm ± 2.5 cm from the radar.
- During the next step, the radaralignment plate must be set. It is part of the VAS 6430/3 fixture figure SP98\_35 in two axes.
- Next based on the measured blocks in the self-diagnostics of the control unit, the mechanic adjusts the bolts for deflection of the sensor, see figure SP98\_28 on page 13 hereof.



During the turning of these radar sensor bolts, each of the bolts is usually turned four of five times. If it becomes necessary to turn any bolt more times than that during the diagnostics, make sure the radar holder is not deformed. If any bolt is tightened beyond the limit, the radar holder may get damaged.

## 2. Fatigue recognition assistant

The driver's increased fatigue may jeopardise driving safety; therefore, the ŠKODA Octavia III features the Fatigue recognition assistant function. The Gateway control unit runs this function.

The driver fatigue is recognised through his responses - specifically through the steering wheel handling. A tired driver makes unintended direction corrections. Such a driver holds the steering wheel very firmly and applies quick corrections with high amplitudes. The accumulation of such a behaviour indicates impending fatigue. In such a case, the function warns the driver.

In the first fifteen minutes of driving, the Fatigue Detection Assistant evaluates how the driver controls the steering wheel. Then, it compares this data with the actual steering wheel handling. If the assistant identifies any steering wheel handling changes possibly caused by the driver's fatigue, it will suggest breaks.

The function resets driver fatigue identification if one of the following conditions is met:

- The driver stops and turns the ignition off.
- The driver stops, unbuckles the seatbelt and opens the door.
- The driver stops for more than 15 minutes.

If at least one of these conditions is not met, the function warns the driver once again.

As soon as the driver's fatigue is recognised, a visual warning will be displayed on the Maxi DOT display, and the driver will hear an acoustic warning as well.



In some driving situations, the system can make erroneous conclusions and recommend unnecessary breaks (during sports driving, in bad weather conditions, driving on a bad road).

The function disengagement / engagement can be set in the infotainment menu.



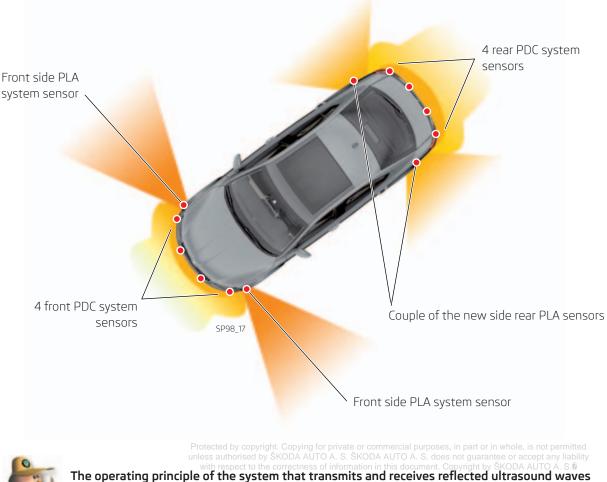
## 3. Parking systems

#### 3.1 Parking assistant (PLA)

The parking assistant (PLA) assists the driver through automatic steering wheel turning in order to follow a calculated trajectory that is necessary to properly park the vehicle between other parked vehicles. During parking, the driver controls the gas and brake pedals.

The ŠKODA Octavia III vehicle uses the new generation 2.0 parking assistant. The parking assistant uses twelve sensors. Compared to the generation 1.5, the new system features two side sensors installed in the rear bumper.

#### Diagram of the parking assistant sensor locations:

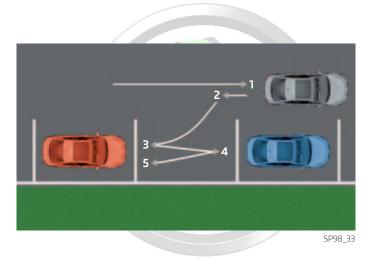


remains the same as in the previous generations of parking assistants - see self-study programme (SSP) No. 66 and 72.

### 3.1.1 Longitudinal parking

The current longitudinal parking function has been significantly improved:

- The speed of passing parking vehicles during the search for available spot has been increased from 30 km/h to 40 km/h.
- The minimum parking spot length has been decreased to the vehicle length + 60 cm (PLA 1.5 version: Vehicle length + 80 cm).
- Now, the system is also able to park on a slightly curved street and also between smaller objects (for example trees, containers, etc.).



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- The system assists the driver through automatic braking.

#### Automatic braking to avoid speeding

To avoid exceeding the speed of 7 km/h and, therefore, interrupting the parking process, the vehicle may activate brakes automatically. Parking process can be resumed after the automatic braking. Automatic braking may happen only once during every parking.

#### Automatic braking to minimize damages

If the system recognizes a danger of collision based upon the car speed and the distance from an obstacle, it will brake automatically. The parking system function is terminated following this automatic braking to minimize damages.



Automatic braking does not replace the driver's responsibility for the control of the throttle, brake and clutch.

Compared to the previous generation, the 2.0 parking assistant features new functions:

- Transversal parking function
- Leaving a longitudinal parking spot function

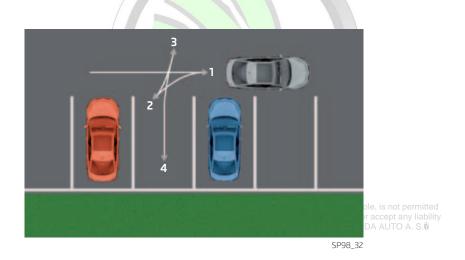
#### 3.1.2 Transverse parking



The two new sensors installed on the rear bumper sides support the semi-automatic function that allows entering a spot between transversally parked vehicles.

The range of the front side sensors is limited (approx. 4 m); therefore, automatic lot depth evaluation is impossible; therefore, it must be completed by the driver.

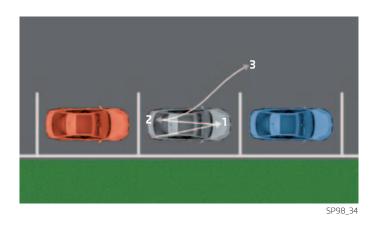
The driver activates the transversal parking function by double-pushing the parking assistant button.



#### 3.1.3 Leaving a longitudinal parking spot

The driver activates the new function of leaving a longitudinal parking spot by pushing the parking assistant button and shifting to reverse gear.

By activating the given applicable turn indicator, the driver determines the direction of leaving the parking spot.



#### 3.1 Parking Distance Control (PDC)

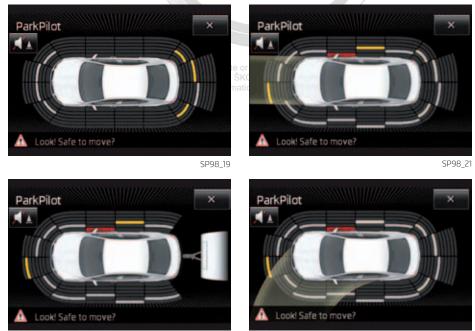
The Parking assistant (PLA) also includes the Parking Distance Control (PDC). During parking, the parking assistance system informs the driver of obstacle distance, both visually on the infotainment display and acoustically. The highest PDC variant combined with the PLA function in the ŠKODA Octavia III vehicle uses all the twelve sensors:

#### - Parking assistance in the rear and the front (12 sensors - 6 rear and 6 front sensors)

The algorithm associated with the four side sensors (primarily used for the PLA function) is able to calculate the distance from obstacles on the sides, which are not covered with sensor signals. Consequently, the driver sees warning zones all around the whole vehicle on the infotainment system.



The displayed Assistant function during parking on the infotainment display:



SP98\_22

The ŠKODA Octavia III may also be equipped with the Parking Distance Control (PDC) separately (without PLA assistant) through these two variants:

Rear and front parking assistance

- Parking assistant in the rear (4 rear sensors)

Rear parking assistance

- Parking assistance in the rear and the front (8 sensors - 4 rear and 4 front sensors)





The PDC sensor locations in the diffusor, which is part of the rear bumper

## 4. BCM on-board network control unit

#### 4.1 Basic description

The BCM on-board network control unit in the ŠKODA Octavia III vehicle communicates with the rest of control units through CAN-Bus data lines and its own three LIN-Bus data lines. All the CAN-Bus lines in the ŠKODA Octavia III vehicle feature the uniform transmission rate of 500 kbit/s. The LIN transmission rate is 19.2 kbit/s.

The BCM unit is connected to a group of CAN convenience control units through the CAN-Bus.

#### CAN convenience:

- -BCM on-board network control unit
- -Instrument cluster
- -Steering column electronics control unit
- -Steering column electronic lock control unit (ELV)
- Trailer recognition control unit (AAG)
- Driver seat position and rear view mirrors control unit
- Front door control unit driver's side
- Front door control unit passenger's side
- The KESSY access and ignition authorization control unit
- Climatronic control unit

The following electronics is connected to the BCM unit through the three independent LIN-Bus units:

#### LIN-Bus 1:

- Panoramic sunroof
- -Inclination and interior motion detection

#### LIN-Bus 2:

– Alarm horn

#### LIN-Bus 3:

- Wipers motor unit
- Air humidity, rain, and light sensor

The on-board unit is connected to the vehicle's other electronics through GATEWAY.

The BCM on-board network unit controls the vehicle's interior and exterior lighting directly through semiconductor inputs. (Except for the adaptive headlights system, which is connected to the BCM unit through the Convenience CAN-Bus and CAN-Bus Extended that communicate through GATEWAY.)

The BCM unit also controls central locking, including the blocking of the fuel tank lid. Another function controlled by the on-board unit is the remote control system and KESSY.

The BCM unit also features the front seat heating system.

#### 4.2 New BCM unit functions

- The new bus structure and transmission rate:
  - The CAN Convenience BUS with the high transmission rate of 500 kbit/s
- Separate LIN Bus units
- Direct control of front seat heating
- Service liquid level sensing (coolant, brake, and washer liquid)
- Brake pad wear sensing
- New encryption of the wireless communication of keys with remote controls
- The lock/unlock button uses the Toggle system (the LED button has replaced the rocker switch)

#### 4.3 BCM unit location

The BCM unit in the ŠKODA Octavia III vehicle is located under its dashboard on the left side. The central unit's placement is the same for both the right-hand and left-hand steering.



The BCM unit is supplied in the four variants:

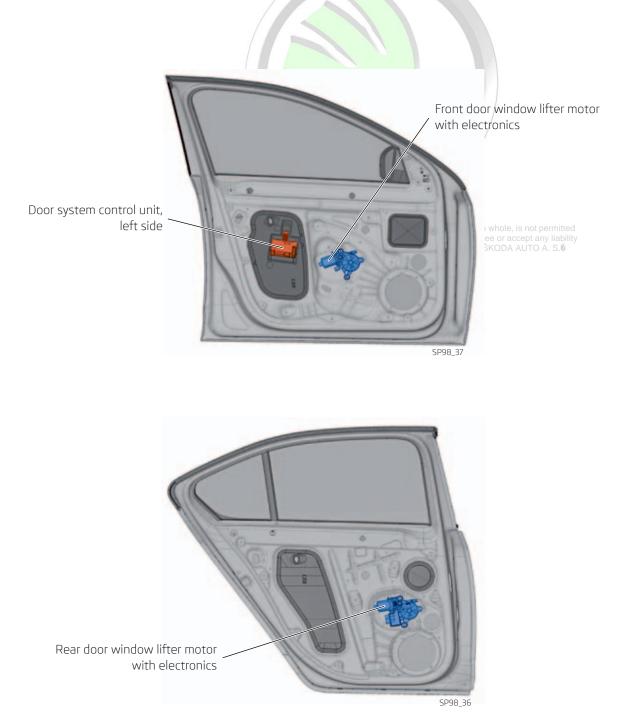
Compared to the lower version:
Fog light control, alarm control, panoramic sunroof control
Seat heating control
Headlight washing control (SRA),
BI-xenon headlight control

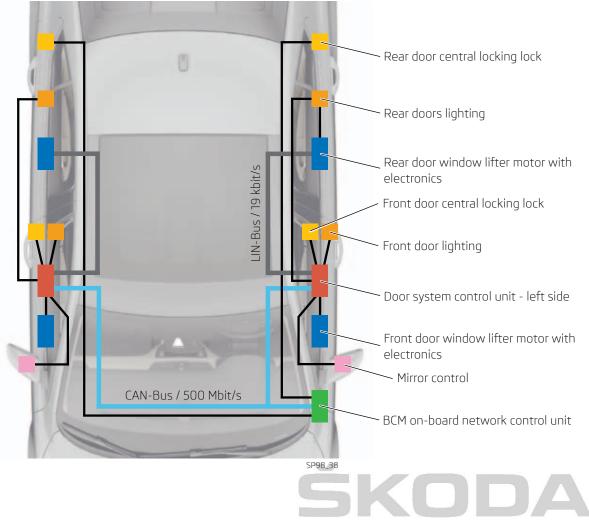
## 5. Door systems



The ŠKODA Octavia III vehicle features the new MQB door system control concept.

Now, both the front and rear doors are controlled **through a separately** located joint control unit in the front door. The control unit communicates with the BCM unit through the CAN-bus. The window lifter motor and the rear window control electronics are connected to the CU in the front door through the LIN-bus.

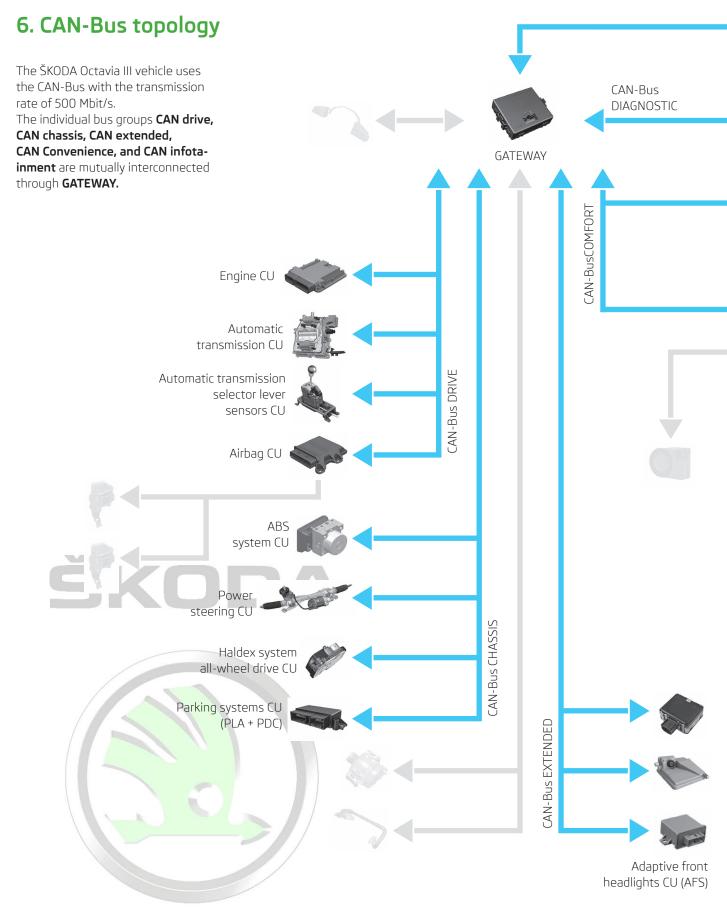


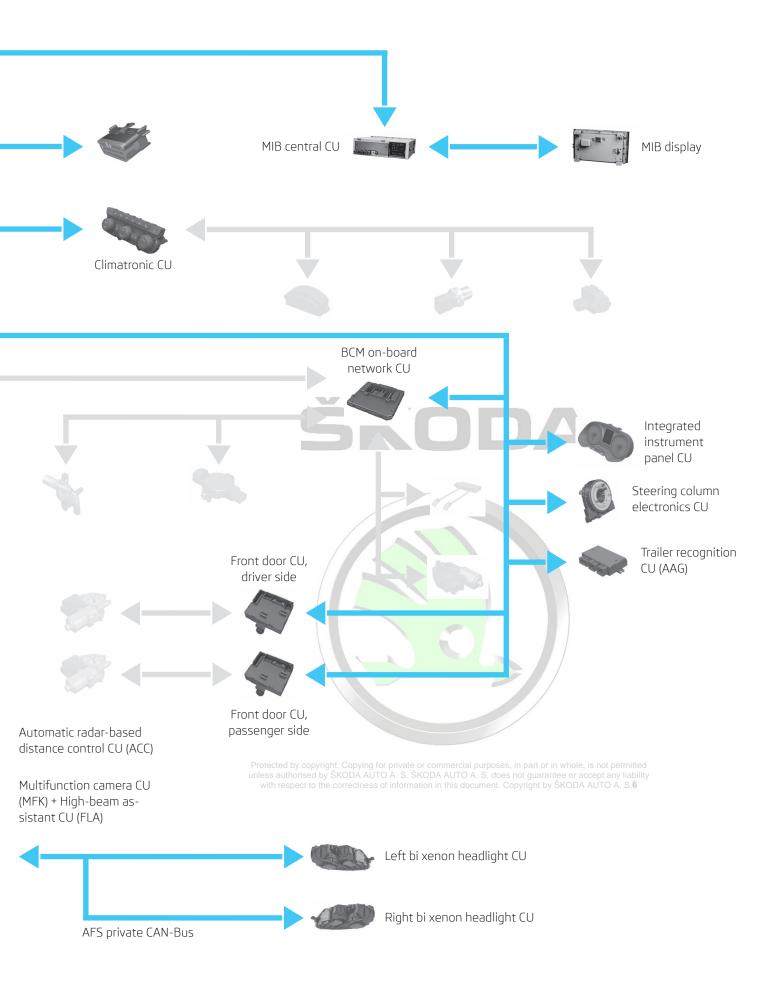


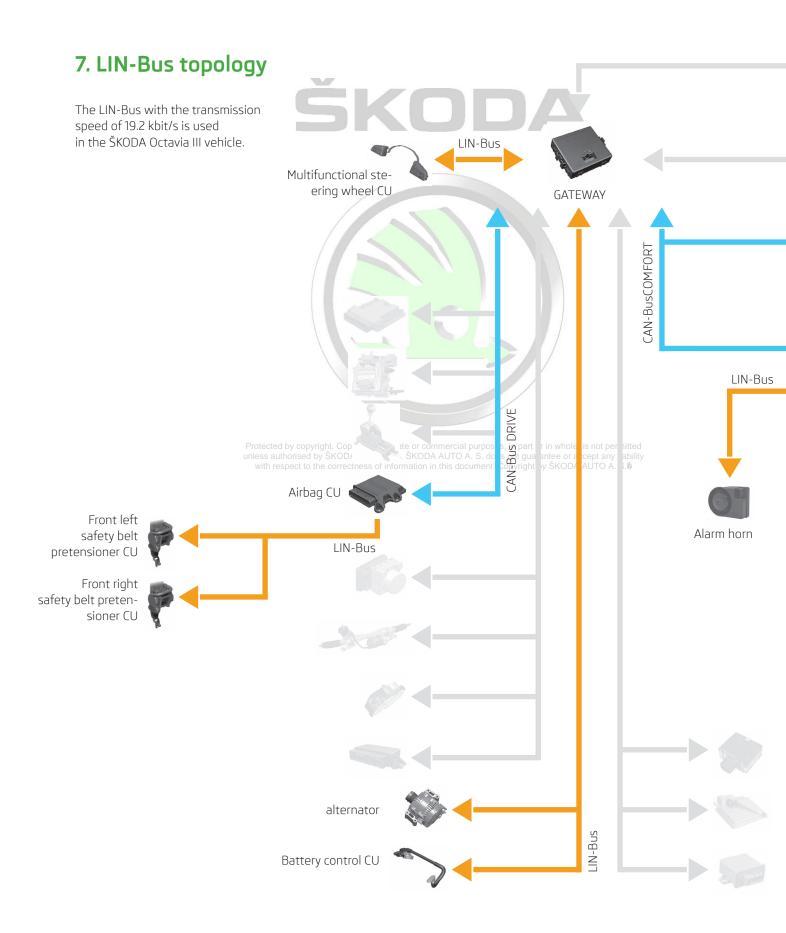


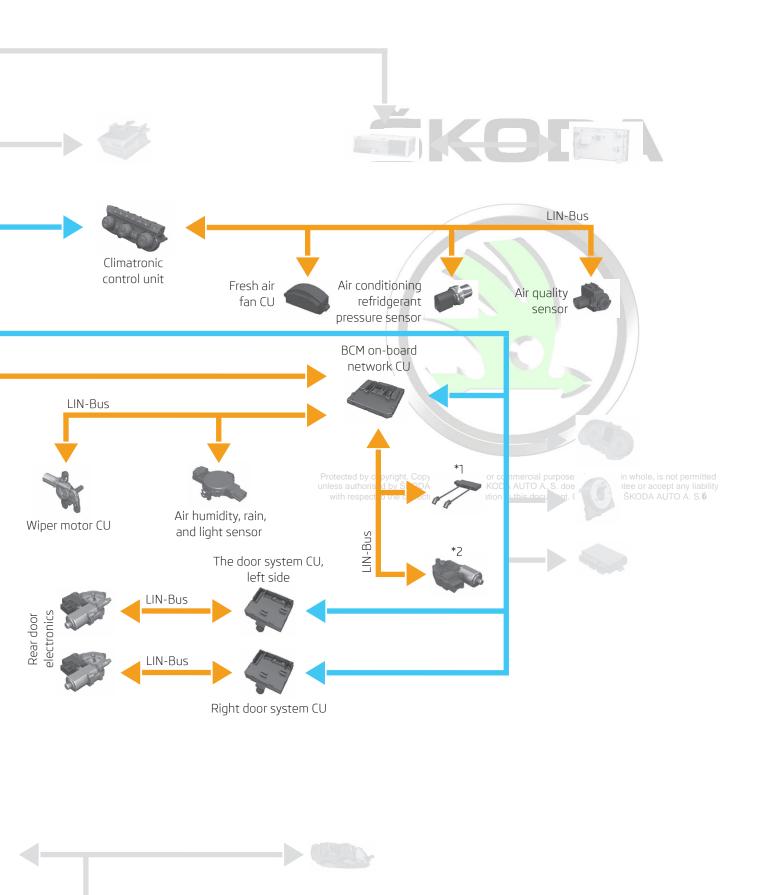
While the door system CU locks the front doors, the rear door central locks are directly controlled by the BCM on-board control unit.

0	









\*1 – The interior guard and inclination sensor CU

\*2 – Panoramic roof CU

## 8. ŠKODA Octavia III - Data bus - Overall summary

**Diagnostic CAN CAN** Drive **CAN** extended **CAN** chassis J533 Jxxx J104 J428 J285 J743 **J500** J852 **J527** 1587 1492 1844 1764 1234 1446 1745 1345 LIN 1426 1543 J854 1855 1427 Diagnostic CAN 500 kbit/s CAN drive train data line 500 kbit/s 1386 CAN chassis data line 500 kbit/s LIN CAN extended data line 500 kbit/s CAN convenience data line 500 kbit/s CAN infotainment data line 500 kbit/s 1388 MOST data line 150 Mbit/s LIN data line 19.2 kbit/s **J387** LIN J533 - GETAWAY 1389 **CAN Drive** 

- Jxxx Engine CU
- J743 Automatic transmission CU
- J587 Automatic transmission control lever sensor CU
- J234 Airbag CU
- J854 Front left safety belt pretensioner CU Protected by cop
- J855 Front right safety belt pretensioner CUnless authorised by

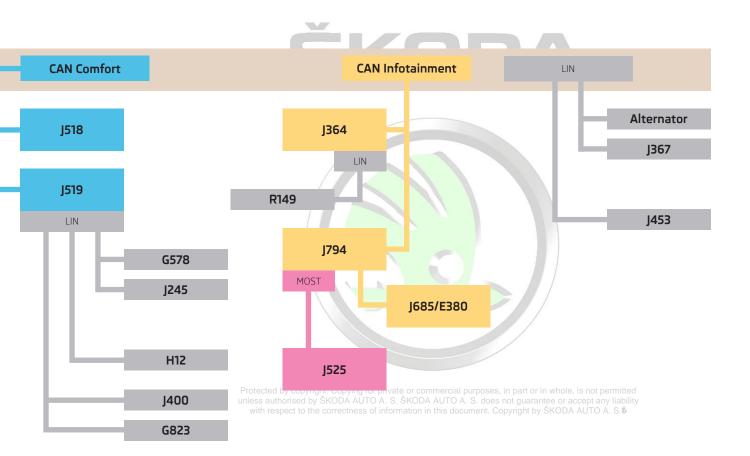
#### **CAN** chassis

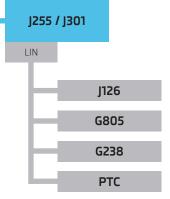
- J104 ABS system CU
- J500 Power steering CU
- J492 Haldex System all-wheel drive CU
- J446 Parking systems CU (PLA + PDC)

#### CAN extended

J428 – Automatic radar-based distance control CU (ACC)

- J852 Multi-function camera CU (MFK)
- J844 High-beam assistant CU (FLA)
- J745 Adaptive front headlights CU (AFS)
- J426 Left bi xenon headlight CU
- J427 Right bi xenon headlight CU





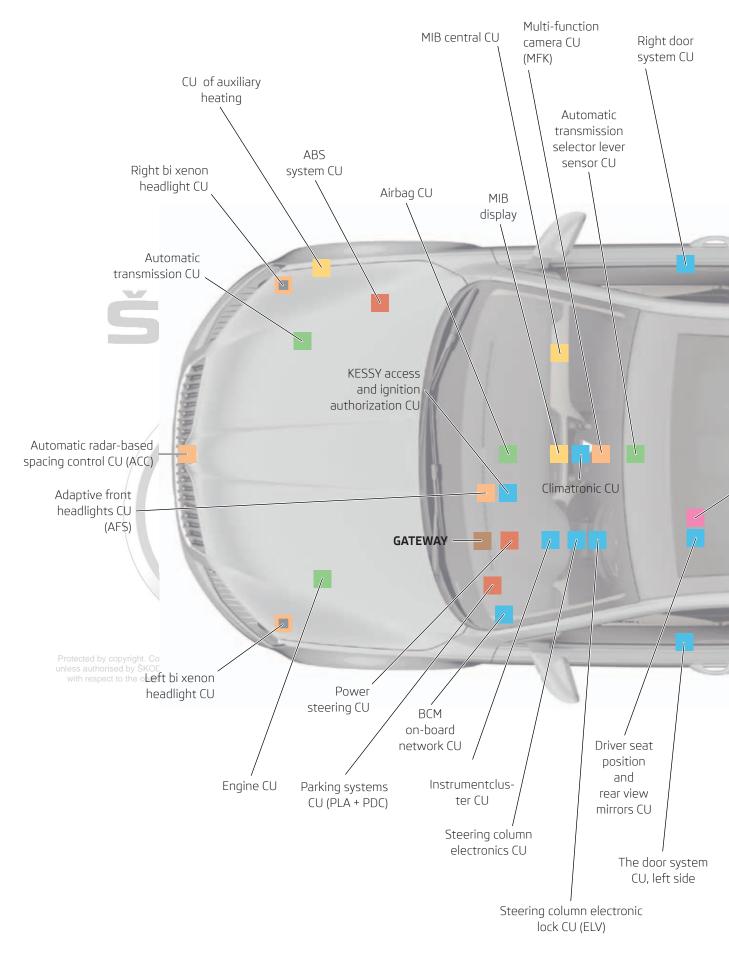
#### CAN Comfort

- J285 Instrument cluster CU
- J527 Steering column electronics CU
- J764 Steering column electronic lock CU (ELV)
- J345 Trailer recognition CU (AAG)
- J543 Driver seat position and rear view mirrors CU
- J386 Door system CU Left side
- J388 Left rear door electronics
- J387 Door system CU Right side
- J389 Right rear door electronics
- J518 KESSY access and ignition authorization CU
- J519 BCM on-board network CU
- G578 Inclination and interior guard sensor
- J245 Panoramic roof CU
- H12 Alarm horn
- J400 Wiper motor CU
- G823 Air humidity, rain, and light sensor
- J255 Climatronic CU (J301 Climatic CU)
- J126 Fresh air fan CU
- G805 Air conditioning refrigerant pressure sensor
- G238 Air quality sensor
- PTC Independent heating (without DO)

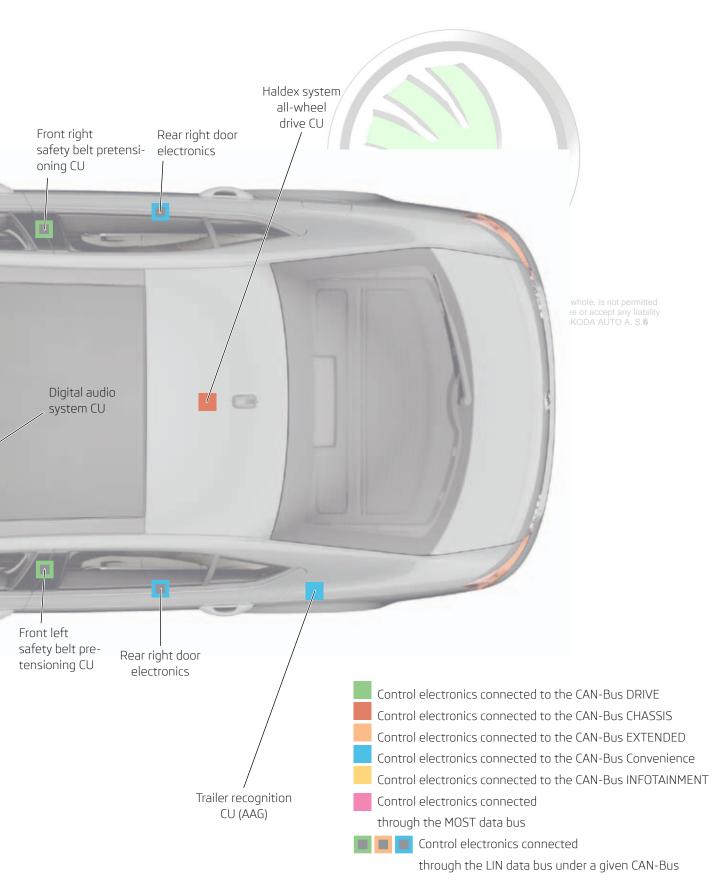
#### **CAN** Infotainment

- J364 CU of independent heating
- R149 Independent heating DO radio signal receiver
- J794 MIB central CU
- J685 MIB display (E380 Multimedia system control unit)
- J525 Digital audio system CU
- J367 Battery control CU (BDM)
- J453 Multifunctional steering wheel CU

## 9. Control electronics locations – Overall summary



## ŠKODA



## 10. Assistance systems summary

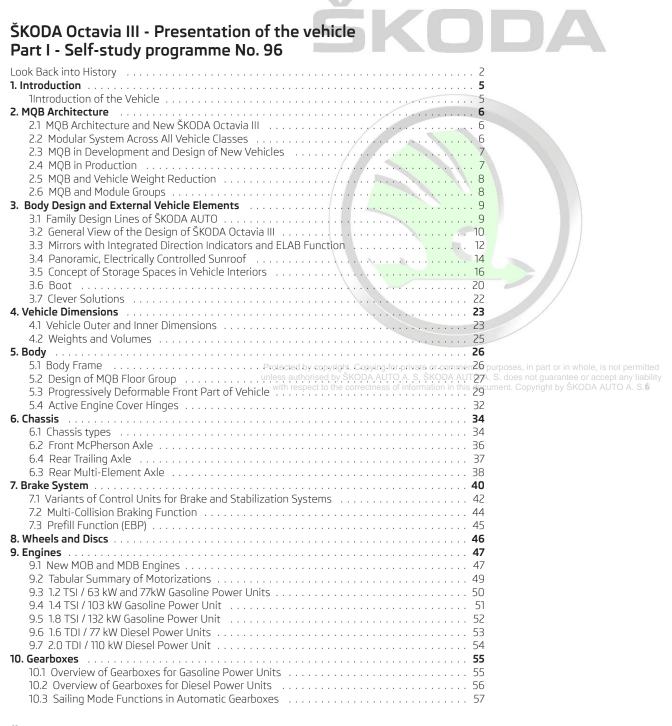
In the ŠKODA Octavia III vehicle, there are numerous assistance systems supporting the driver while driving and also various assistance systems enhancing comfort and safety based on infotainment. The individual assistance systems are described in the individual chapters of SSPs No. 96 – and 98 describing the individual vehicle parts or associated systems. Based on the list specified below, the assistance systems description can be easily retrieved and studied as a whole.

Multi-collision braking function (MKB)	No. 96	page 44
Prefill function (EBP)	No. 96	page 45
Pre Crash Basis System(PCB)	No. 97	page 10
High Beam Light Assistant (FLA)	No. 97	page 26
Road Sign Recognition (VZE)	No. 97	page 57
Automatic lane keeping control (LA)	No. 97	page 58
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- 56 DSG-02E Automatic Gearbox
- 57 Compression Ignition Engine; 2.0 I/103 kW TDI with Pump-Nozzle Units, 2.0 I/100 kW TDI with Pump-Nozzle Units
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