Service Training



Self-study Programme 449

# The Touareg 2011



The new Touareg, in its second generation, is a completely new development. As a luxury class off-road vehicle, it combines technical innovations, high comfort, sporty performance, a stylish design, outstanding quality and unrestricted off-road capabilities. The new Touareg is an all-rounder, which unifies the requirements of both on- and off-road driving even more perfectly than before.

With its front end in the style of the new Volkswagen design, its low ride height with almost identical vehicle width and a multitude of aerodynamic details, the new Touareg has increased significantly in terms of dynamics whilst simultaneously improving its aerodynamics.

All of the new Touareg's assemblies have been consistently developed further with regard to reduced fuel consumption and improved exhaust emissions.

- The gross vehicle weight of the basic version has been reduced by approx. 200kg whilst torsional rigidity has been increased at the same time.
- A V6 FSI engine and the turbodiesel engines, the V6 TDI and for the first time the V8 TDI, are combined with the new 8-speed automatic gearbox as standard.
- Curtain airbags for the front and rear passengers, airbags for the driver and front passenger, side airbags and seat belt pre-tensioners in the front offer a high level of passive safety as standard.
- With 4 cameras, the new "Area View" all-round monitoring system directly detects the area surrounding the vehicle and transmits this bird's eye view onto the radio/navigation system display.

The new Touareg – a stylish, dynamic and authentic off-roader.





The self-study programme portrays the design and function of new developments! The contents will not be updated. For current testing, adjustment and repair instructions, refer to the relevant after sales literature.

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# The Touareg 2011

The standard products and equipment differ depending on the engines which are fitted. Whilst the basic equipment is only for the V6 engines, the vehicles with V8 engines are fitted with higher-quality equipment. The overview shows important standard and optional equipment in the new Touareg. Deviations are possible depending on the country.

- Dynamic light assist
- Rotating electronic ignition/starter switch
- Bi-xenon headlights with AFS and LED daylight driving lights, optional
- 8-speed automatic gearbox
- Dash panel insert with 7" display

- Start-stop system for 6-cylinder engines
  - Electromechanical parking brake
    - "Area View" all-round view, optional
      - Adaptive Cruise Control ACC "Stop and Go" and "Front Assist" front monitoring system.



- Panoramic sliding roof, optional
- Air suspension with closed-loop air supply
  - Longitudinally adjustable rear seat system
    - Luggage compartment cover with comfort opening
      - Electrical rear lid drive
      - Lane departure warning system
  - Lane Change Assist
  - 4XMOTION four-wheel drive with transfer box, optional

S449\_003

 4MOTION four-wheel drive with Torsen differential

- Knee airbag on the driver side, optional
- Longitudinally and height adjustable front head restraints
- Radio/navigation system RNS 850, optional

# Weight reduction

One specification during the development of the new Touareg was a significant reduction in weight. Significant reductions were achieved particularly thanks to the use of aluminium in the running gear components and hot-formed, high-strength and corrosion resistant steels for the body. A multitude of individual measures enabled the weight to be reduced by over 200 kg in comparison with the predecessor.

Some of these measures are listed in the following graphic.



S449\_103

# **Driving off-road**

The Touareg 2011 has the technical prerequisites for very good off-road capability. The following data refer to a vehicle with standard equipment, a 3.6 | 206 kW V6 FSI engine and 235/65 R17 E50 tyres plus a driver. (The weight of the driver corresponds to 75kg.)



Maximum gradability: 4MOTION - 31° 4XMOTION - 45°

S449\_083



Ground clearance when stationary: Steel suspension - 205mm Air suspension max.- 233mm

S449\_091



Maximum possible lateral inclination: 35°

Possible gradient entry/exit angle: Steel suspension max. - 25° Air suspension max. - 27°

S449\_081

S449\_087



Possible breakover angle: Steel suspension max. - 20° Air suspension max. - 22°

S449\_085



Possible fording depth: Steel suspension - 500mm Air suspension max.- 580mm

S449\_089

# Technical data

### Exterior dimensions and weights

The data for the Touareg 2011 refer to a vehicle without a driver and with standard equipment; with a 3.61 206 kW V6 FSI engine, with 4MOTION and with 235/65 R17 E50 tyres.



#### **Exterior dimensions**

	Touareg 2011	Touareg 2003
Length	4795mm	4754mm
Width	1940 mm	1928 mm
Height	1709mm	1726mm
Wheelbase	2893mm	2855 mm
Track width at front	1656 mm	1653mm
Track width at rear	1676 mm	1665mm

#### Weights/further data

	Touareg 2011	Touareg 2003
Permissible	2750 kg	2945 kg
gross vehicle weight		
Kerb weight	2043kg	2214kg
Trailed load	3500 kg	3500 kg
Max. roof load	100 kg	100 kg
Tank capacity	851	1001
Drag coefficient	0.36 c <sub>d</sub>	0.38 c <sub>d</sub>

### Interior dimensions





#### Interior dimensions and volumes

	Touareg 2011	Touareg 2003
Interior length	1819mm	1777 mm
Luggage compartment volume	5801	5551
Luggage compartment volume with rear seat backrest folded down	16421	15701
Knee space - 2nd row of seats	81mm	36 m m

	Touareg 2011	Touareg 2003
Front headroom	1041mm	1032 mm
Rear headroom	989mm	987mm
Width at shoulder height, front	1520mm	1465 mm
Elbow width, front	1549mm	1504mm

# Body

# **Body structure**

The body of the Touareg 2011 is a completely new development. The main development objective was to increase the body's stiffness whilst simultaneously reducing its weight.





Mould-hardened steels have also been used in the Touareg 's body for the first time:

- Upper A-pillar
- Parts of the roof side member
- Inner B-pillar
- Bench seat cross member
- Roof cross member in vehicles without panoramic sliding roof

#### Vehicle with panoramic sliding roof



S449\_039

The roof cut-out for the panoramic sliding roof is stabilised by a bonded reinforcement frame consisting of tailored blanks. This is necessary to guarantee safety in the event of a side impact.

# Wings



The Touareg 2011's wings consist of steel. These are secured at the sides on separate retaining plates. This results in a deforming wing edge. This is important with regards to pedestrian protection.

# Doors

The doors' internal components are pre-assembled on a plastic assembly carrier. This is then installed into the doors as a whole. The front assembly carriers are bolted, whilst the rear ones are secured using a plastic clip which can be rotated by 90°.



The exterior mirrors are bolted to the door outer skin. A small quarter light is located in the front section of



# Body

# Towing bracket



The folding towing bracket on the Touareg 2011 is unlocked electrically. The unlocking button is located in the right-hand luggage compartment trim.



S449\_106



# Panoramic sliding roof

The panoramic sliding roof in the Touareg 2011 consists of two glass panels. The front panel can be moved and guided externally; the rear one is firmly bolted in place. Efficient heat-insulating glass is used for both glass panels. An electrically adjustable sun blind is also included. Operation is carried out via a central operating switch. The wind deflector is extended and retracted mechanically.





# Electrically opening and closing rear lid

The Touareg 2011 can be optionally equipped with an electrically opening and closing rear lid. The system is made up of the following components:



- The radio remote control
- The rear lid remote release button E233 in the driver door lining
- The rear lid handle release button E234
- One spindle drive on each side
- The power latching system in the lock
- The button to close rear lid in luggage compartment E406
- The sensor strips
- The rear lid control unit

The rear lid can be opened and closed via two electric spindle drives from the driver's seat, using the rear lid handle release button E234, the button to close rear lid in luggage compartment E406 or using the radio remote control. Sensor strips are installed in the side areas of the rear lid for more sensitive pinch protection.



S449\_007

### Programming the opening angle

The rear lid opening angle can be set individually. To achieve this, the rear lid is moved electrically or manually to the desired end position. The button to close rear lid in luggage compartment E406 is then pressed and held for longer than three seconds. The current position of the rear lid is now stored as the upper end position. Successful setting is acknowledged by the hazard warning lights flashing once and by an audible signal. The rear lid cannot be programmed in the opening angle range from 0° to 20°.

### **Pinch protection**

Due to reasons of safety, dual pinch protection is available, firstly via what is called the excessive force detection system and secondly via pinch protection strips.

#### **Excessive force detection system**

The rear lid control system specifies a nominal speed to the spindle drives and sends the actual speed back into the spindle drives via Hall sensors. Deviations between the nominal and actual speed are evaluated by an algorithm.

If sluggishness is detected, the speed is readjusted. If trapping is detected during closing, the rear lid moves back by approx. 10°. If trapping is detected during opening, the rear lid stops.

#### **Pinch protection strips**

Pinch protection strips, whose electrical resistance changes due to pressure, are located at the sides of the rear lid to detect trapping during closing.

This resistance is monitored whilst the rear lid is being closed. Trapping exists if the resistance falls below a specific value. The rear lid reverses, i.e. it moves back and opens by approx. 10°. The pinch protection strips are not monitored whilst the rear lid is being opened.

If a protection strip is defective, the rear lid can only be operated using the rear lid handle release button E234 and the button to close rear lid in the luggage compartment E406.

The radio remote control and the rear lid remote release button E233 in the driver door lining are deactivated.

#### **Emergency operation function**

On failure of a spindle drive's Hall sensor, the rear lid can continue to be moved electrically. However, the motors are then actuated with a modified characteristic curve. If both Hall sensors fail, the rear lid is no longer actuated electrically. The rear lid can then be opened and closed manually with slightly increased force.



# Body

### Spindle drive

#### **Design and function**



The spindle drive consists of a spindle actuator with electric motor and gear, a coil spring for force support plus a brake element and the wrap spring brake, for securely holding in each opening position. The electric motor drives the spindle via a two-stage planetary gear. The spindle moves the outer tube via the spindle nut.



### Wrap spring brake

#### **Design and function**

As the spindle drive's holding torque is not sufficient to hold the open rear lid in position, a brake element is installed within the drive.

The brake element is designed as a wrap spring brake. If the springs are tensioned by rotating the drive or output levers, their dimension is reduced. This reduces the friction torque to the outer housing. As soon as the rotational movement stops, the springs relax and the friction torque increases. The movement is stopped.



# Front light concept



Fog light

The front light concept in the Touareg 2011 encompasses two different headlight modules. The halogen front headlights form part of the standard equipment. Xenon headlights are optionally available. If the vehicle is equipped with a V8 engine, the xenon headlights are fitted as standard. The headlight modules are equipped with a turn signal, side light, daylight driving light, dipped beam and main beam headlight.

Thanks to the familiar one-touch system, the headlight modules' bulbs can be released and removed with one "touch".

The front light concept also includes fog lights.

### Fog light



The fog light with cornering light is located in the front spoiler.

The fog light's bulb is changed via a flap in the wheel housing liner.



# Body

### Halogen headlights





#### Daylight driving lights



S449\_181

The daylight driving light bulb lights up when daylight driving lights are actuated.

#### Side light



When the side light is switched on, the side light bulb lights up.

#### Turn signal



S449\_149

S449\_183

The turn signal bulb flashes when the turn signal is actuated.

#### Dipped beam



S449\_185

The dipped beam bulb and the side light bulb light up when dipped beam is actuated.

#### Main beam



S449\_187

When main beam is switched on, the main beam bulb, the dipped beam bulb and the side light bulb light up.

### Top xenon headlights



#### Daylight driving lights



The LED daylight driving light bulbs light up when the daylight driving light is actuated.

#### Side light



The LED side light bulbs and the side light bulb light up when the side light is actuated.

#### Turn signal



S449\_142

The turn signal bulb flashes when the turn signal is actuated.

#### Dipped beam



S449\_193

The dipped beam bulb, the side light bulb and the LED side light bulbs light up when dipped beam is actuated.

#### Main beam



S449\_195

When main beam is switched on, the main beam bulb and the side light bulb light up.

# Body

# **Rear light concept**

The rear light concept in the Touareg 2011 encompasses the split rear lights, one section of which is located in the side panel and the other section in the rear lid, plus the rear fog lights in the rear spoiler.

### **Rear lights**

The rear lights on the Touareg 2011 are split into two sections The bulbs for the inner light can be renewed without removal. The outer light has to be removed to remove the bulbs. It is secured using a central bolt.







# **Interior equipment**

### **Front seats**

Sports and luxury seats are available in addition to the basic seats. The sports and luxury seats are equipped with electropneumatic backrest lateral support adjustment as standard. Active climate control is additionally available as an option for the luxury seats.





### Active climate control seat

Air flows through the seat cushions and backrests by means of radial fans. The air is routed through integrated ducts in the foam padding and through air-permeable foam cushions.

### Backrest lateral support adjustment

Adjustment is carried out via a combination of a pneumatic drive and a mechanical adjustment facility.



#### **Head** restraints

The head restraints on the luxury and sports seats are longitudinally and height adjustable.

Operation is carried out via a central button for both adjustment directions.

# Body

### Rear seat system

The rear seat system is split as standard and can be moved 160 mm in the longitudinal direction. The backrests can be locked in three inclination positions. An electric backrest release function is optionally available.





### **Electric backrest release function**

Operation is carried out via buttons in the right-hand luggage compartment trim.



### Luggage compartment

As the rear seat system can be longitudinally moved 160 mm, the variability of the interior and the achievable cargo space increase significantly. The maximum effective load compartment width has been increased by 190 mm to 1350 mm, which allows up to 4 golf bags to be loaded easily. Depending on the position of the rear seat bench, the luggage compartment volume ranges from 580 to 660 litres, increasing to 1642 litres when the rear seat bench is folded down.



The variable load floor leads to the creation of a flat load surface, enabling bulky objects to be loaded more easily. Space for securely storing many utensils, such as an umbrella, torch or even a folding spade, is also available beneath the load floor. The load floor can be removed, rotated by 180° degrees, and its lower side is coated with film (for soiled cargo).





# **Occupant Protection**

# Safety equipment

The new Touareg is equipped with two front, side and curtain airbags as standard. To protect the lower extremities, it also offers an optional knee airbag on the driver side.



### **Crash sensors**

Crash sensors for detecting an accident at an early stage are located beneath the headlights.



### Knee airbag

The knee airbag forms part of the front airbag system. In the event of an accident, this airbag is activated together with the driver and front passenger airbag in order to avoid injuries to the knees and lower legs. In the event of an impact at an offset angle, the feet are also better protected against lateral twisting. In the case of a crash, the 21-litre airbag inflates in less than 25 milliseconds in front of the driver's knees. With interaction of the seat belt and the driver airbag, the knee airbag absorbs the majority of the energy being dissipated in the pelvis area.



### Side crash sensors

Pressure sensors for detecting a side crash are located in the front doors.

Lateral acceleration sensors for detecting a side crash are located in the area of the rear wheel housings.

# Proactive occupant protection system

The characteristic feature of this occupant protection system is the connection of active and passive safety elements. The basis of this is the use of dynamic handling control system sensors, such as e.g. Front Assist, Brake Assist and ESP, in order to detect critical vehicle dynamics situations with an increased accident potential.

The proactive occupant protection system is activated when one of the following criteria is met:

- An object is detected by Front Assist in the area at risk of collision
- Emergency braking (very fast brake pedal actuation)
- Hazard braking (sharp increase in brake pedal pressure during braking)
- Unstable vehicle conditions, such as e.g. excessive vehicle under/oversteering



If a potential accident situation is detected, the occupants and the vehicle are prepared for a possible accident. Tensioning of the seat belts by means of electric motors secures the driver and front passenger in their seats, in order to therefore achieve optimal protection via the airbag and seat belt system.

In the event of excessive vehicle under/oversteering, the panoramic sliding roof and the side windows are additionally closed until a residual gap remains.

Once the driver has regained control of the vehicle and it has been returned to a stable dynamic handling condition, the seat belts are relaxed again. At the start of a journey (> 15km/h), the seat belts are also gently tensioned once in order to reduce belt slack.





### **Reversible seat belt pre-tensioners**



Reversible seat belt pre-tensioners are fitted for the driver and front passenger seat belts. These seat belt pre-tensioners consist of a pyrotechnical and an electric reversible seat belt pre-tensioner and a control unit.

The control units are integrated into the CAN data bus system.

When the corresponding information is available on the data bus, the electric, reversible seat belt pretensioners are actuated. The pyrotechnical seat belt pre-tensioners are triggered by the airbag control unit.



#### Pyrotechnical seat belt pre-tensioner



#### Electric, reversible seat belt pre-tensioner



Three different force levels are available:

- 1. Low force = reduction of belt slack at the start of a journey
- 2. Medium force = partial tensioning in the event of critical lateral and longitudinal dynamics
- 3. High force = full tensioning in the event of very critical lateral and longitudinal dynamics

### Start-stop system

When equipped with the following engines, the new Touareg 2011 is fitted with a start-stop system as standard:

- 3.6 | 206 kW V6 FSI engine
- 3.0 | 176 kW V6 TDI engine

The start-stop system serves to reduce consumption, emissions and noise by automatically shutting off the engine during stationary phases and restarting it automatically when the driver wishes to move off. In the Touareg, control is carried out via the brake. When the driver brakes to a standstill, the engine is shut off. When the driver releases the brake again, the engine starts. Whether and how frequently the combustion engine is deactivated is determined by the engine control unit on the basis of numerous signals.

The basic requirement is that the occupants' comfort and driving safety must be maintained. In these cases, the combustion engine is not deactivated. If necessary, it continues to operate the comfort- and safety-relevant components.

The start-stop system uses a multitude of signals to check its activation and deactivation conditions and to carry out its function. The graphic provides an overview of the essential sensors, actuators and control units involved in the start-stop system's function.



Further information on the start-stop system can be found in self-study programme No. 426 "The Start-stop System 2009".

# 3.61 206kW V6 FSI engine

The basic layout of the 3.6 | V6 FSI engine from the Touareg 2011 corresponds to the familiar and proven 3.6 | VR6 engine which is fitted in the Passat, for example.

#### **Technical features**

- Oil level/oil temperature sender with ultrasonic measurement principle
- Start-stop system •
- Innovative thermal management in the engine with • switched water pump





S449\_023



Further information on this engine can be found in self-study programme No. 360 "The 3,2ltr and 3,6ltr FSI-Engine".

#### **Technical data**

Engine code	CGRA
Туре	VR engine
Displacement	3597 cm <sup>3</sup>
Bore	89mm
Stroke	96.4mm
Valves per cylinder	4
Compression ratio	12 : 1
Maximum output	206kW at 6200 rpm
Maximum torque	360 Nm at 3000 - 4000 rpm
Engine management	BOSCH MED 17.1.6
Fuel	Premium plus unleaded RON 98 (slightly reduced output with premium unleaded RON 95)
Exhaust gas treatment	Three-way catalytic converter with Lambda control
Emissions standard	EU5

#### Output and torque curves



# 3.0 | 176 kW V6 TDI engine

Based on the V6 TDI engine which was first introduced in 2005 and was upgraded to the EU5 emissions stage in 2007, this engine has been further developed for the new Touareg.

#### **Technical features**

- Common rail fuel injection system with piezo injectors and a maximum injection pressure of up to 1800 bar
- Requirement-controlled fuel delivery unit\*
- Low-temperature exhaust gas recirculation\*
- Volumetric flow-controlled oil pump\*
- Oil level/oil temperature sender with ultrasonic measurement principle\*
- Start-stop system
- These technical features are described in self-study programme No. 467 "The 4.2I TDI Engine with Common Rail Fuel Injection System".





Basic information on the V6 TDI engine can be found in self-study programme No. 350 "The 3.0I V6 TDI Engine".

#### Technical data

Engine code	CASA
Туре	6-cylinder V engine
Displacement	2967 cm <sup>3</sup>
Bore	91.4mm
Stroke	83mm
Valves per cylinder	4
Compression ratio	16.8 : 1
Maximum output	176kW at
	4000 - 4400 rpm
Maximum torque	550Nm at
	2000 - 2250 rpm
Engine management	BOSCH EDC 17
Fuel	Diesel fuel according to EN 590
Exhaust gas treatment	Exhaust gas recirculation,
	oxidising catalytic converter,
	diesel particulate filter
Emissions standard	EU5
CO <sub>2</sub> emission	195g/km

#### Output and torque curves



# 4.2 | 250 kW V8 TDI engine

In the 4.2 I V8 TDI engine, Volkswagen has a diesel engine which, with 250 kW at 4000 rpm and 800 Nm as of 1750 rpm, offers outstanding output values and superior performance.

The engine achieves the desired emission targets and complies with the EU5 standard.

#### **Technical features**

- Bosch common rail fuel injection system with piezo injectors
- Diesel particulate filter/oxidising catalytic converter
- Turbocharger with speed sensor
- Low-temperature exhaust gas recirculation
- Requirement-controlled fuel delivery unit
- Innovative thermal management (ITM)
- Volumetric flow-controlled oil pump
- Oil level/oil temperature sender with ultrasonic measurement principle

#### **Technical data**

Engine code	CKDA
Туре	8-cylinder V engine
Displacement	4134 cm <sup>3</sup>
Bore	83mm
Stroke	95.5mm
Valves per cylinder	4
Compression ratio	16.4 : 1
Maximum output	250kW at 4000 rpm
Maximum torque	800Nm at
	1750 - 2750 rpm
Engine management	BOSCH EDC 17
Fuel	Diesel fuel at least 51 CN
Exhaust gas treatment	Exhaust gas treatment Oxidising catalytic converter, exhaust gas recirculation with exhaust gas cooling, diesel particulate filter
Emissions standard	EU5
CO <sub>2</sub> emission	249g/km







Further information on this engine can be found in self-study programme No. 467 "The 4.2 I V8 TDI Engine with Common Rail Fuel Injection System".

#### Output and torque curves



# 3.0 | 245 kW V6 TSI engine with supercharging (in the Touareg Hybrid 2011 only)

With the 3.0 l 245 kW V6 TSI engine and mechanical charging (supercharger), Volkswagen has introduced a new engine which will only be fitted in the Touareg Hybrid 2011.



#### **Technical features**

- Six-cylinder V engine with mechanical charging
- Volumetric flow-controlled oil pump
- Fuel system regulated according to requirements
- Intake manifold flaps
- Secondary air system to comply with exhaust emissions legislation
- Belt drive to drive the supercharger
- Supercharger with charge air coolers
- Variable valve timing on the intake side only
- Oil level/oil temperature sender with ultrasonic measurement principle
- Oil gauge in the infotainment system
- Innovative thermal management (ITM)
- The following components are driven electrically:
  - Vacuum pump for the brake servo (in addition to the mechanical vacuum pump)
  - Power steering pump
  - Air conditioner compressor

#### Technical data

Engine code	CGEA
Туре	6-cylinder V engine
Displacement	2995 cm <sup>3</sup>
Bore	84.5mm
Stroke	89mm
Valves per cylinder	4
Compression ratio	10.5 : 1
Maximum output	245kW at 5500-6500 rpm
Max. torque in petrol mode	420Nm at 3000-5250 rpm
Engine management	BOSCH MED 17.1.6
Fuel	Super unleaded RON 95
Exhaust gas treatment	Cylinder bank-selective Lambda control with a broadband probe before catalytic converter per cylinder bank, two ceramic catalytic converters with Lambda probe (transient probe) after the catalytic converter
Emissions standard	EU5

#### Torque/output graph



In kick-down, the drive output of the combustion engine and the electric motor are added in the output curve to give a maximum total output of 279 kW. This means that the output curve is increased by the amount of the electric motor's driving power, 34 kW. This occurs over almost the entire speed range. Whilst the combustion engine is running, a mixed mode occurs.



Further information on this engine can be found in self-study programme No. 452 "The 3.0 I 245 kW TSI Engine with Supercharging".

# **Electric hybrid drive**

For the first time at Volkswagen, an electric hybrid drive, i.e. a combination of a combustion engine and an electric motor, will be available for use at the start of production in the Touareg 2011.

The Touareg Hybrid is a conventional vehicle concept which has been "hybridised". The hybrid system is combined into the existing and tried-and-tested technology. During vehicle development, focus was placed on technician safety when handling the high-voltage technology.

Numerous shut-off functions and back-up facilities in the hybrid system prevent undesired dangers for workshop employees.

The combination of new high-voltage components and tried-and-tested technology from Volkswagen means that the Touareg Hybrid is leading the way into an increasingly electrified future.



Retention of the driving performance of the conventional drive train in combination with the extensively available technical components from series production was an essential criteria on selection of the parallel hybrid concept. The standard Touareg's familiar characteristics are retained.

These include

- its gradability,
- its off-road capability,
- its trailed load of 3500 kg,
- its high-powered drive and
- occupant comfort.

### Overview of the drive train



The drive train on the Touareg Hybrid consists of:

- The 3.0 | 245 kW TSI engine with supercharging,
- A separating clutch between the combustion engine and the electric motor,
- The electric motor,
- The automatic 8-speed gearbox OC8 from Aisin,
- The drive shafts,
- The transfer box on the rear and front axles,
- The Torsen differential.

The combustion engine, the clutch, the electric motor and the automatic gearbox are located behind one another on a common shaft. This method enabled installation space and weight caused by additional hybrid components to be saved.

In addition to drive components, the electric motor, power electronics and the high-voltage battery in the Touareg Hybrid, the air conditioner compressor is a further component which is operated by the highvoltage system.



Further information on the electric hybrid drive can be found in self-study programme No. 450 "The Touareg Hybrid".

# Oil gauge in the infotainment system

A realistic oil gauge will be implemented for the first time in the Touareg. The previously used oil dipstick will be omitted.

The customer is only provided with warnings regarding the oil level via the dash panel insert. The oil level is displayed on the infotainment display in the centre console.





A new oil gauge tester T40178 is available. Further information on the oil gauge can be found in SSP 452. Display range:

A =Oil level OK, do not replenish oil

B =Oil level too low, replenish oil urgently (approx. 1 l)

C =Oil can be replenished (approx. 0.5 l)

D =Overfilling warning, urgently reduce oil



The display contents which are shown correspond to the infotainment system with German system setting and serve merely as an example. Please refer to the corresponding operating manuals for the text contents in the relevant national languages for the display in the dash panel insert.

To measure the oil level:

- The vehicle must be positioned horizontally.
- The oil temperature must lie between 60°C and 120°C.
- After stopping the engine, wait briefly and allow the oil to flow back into the oil pan.
- Switch on the ignition, press the "CAR" infotainment button, press the "Service" function button.

The oil pressure/oil level display in the dash panel insert is maintained as follows:

		Possible cause	Remedy
<b>**</b> *	Lights up	Engine oil level too low	Switch off engine. Check oil level.
<u>[</u> ]	Lights up	Problem with the engine oil pressure	Drive to a dealership at the maximum engine speed indicated in the dash panel insert and have the system checked.
9 <b>1</b> %	Flashes	Engine oil pressure too low	STOP! Do not continue driving! Switch off engine. Check oil level. Do not continue driving if the warning lamp flashes, although the oil level is OK. Seek professional help.
<b>1</b> 74	Flashes	Engine oil system malfunction	Visit a dealership. Have the engine oil sensor checked.

# Transfer box

The Touareg 2011 will be available with two different transfer boxes. The basic distribution of both transfer boxes is 40:60 (front axle:rear axle). The customer has the option of choosing between two types of drive train:

### 4MOTION



4XMOTION



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The Torsen transfer box will be available in the basic equipment. The self-locking centre differential has permanent four-wheel drive.

The transfer box operates purely mechanically and reacts without delay to changes in driving situations. Its compact design, low weight and lifetime oil filling mean that the transfer box is maintenance-free and reliable. The Touareg will be available with the familiar centre differential as m-equipment.

In terms of its functions, the centre differential has not been modified. It has an electronic lock in the centre and rear differential plus a reduction stage. The flanged shafts have been omitted.



Further information can be found in self-study programme No. 469 "The Touareg 2011 Running Gear and Four-wheel Drive Concept".



Further information can be found in self-study programme No. 302 "Touareg - Chassis and four-wheel drive concept".

# 8-speed automatic gearbox 0C8

An 8-speed automatic gearbox will be introduced for the first time at Volkswagen passenger cars with the Touareg 2011.

The 8-speed automatic gearbox OC8 is a further development of the 6-speed automatic gearbox O9D.

The eight forwards gears (smaller gear ratio steps) have enabled the consumption and emissions values to be further reduced in comparison with the 09D automatic gearbox. Once again, the eight forwards gears is made possible by the proven Lepelletier gear set concept.

The OC8 automatic gearbox can be optionally equipped with the start-stop system, and is also designed for use with the hybrid drive. All engine variants in the Touareg will be exclusively available with this gearbox.







Further information on the 8-speed automatic gearbox is available in self-study programme No. 466 "8-speed Automatic Gearbox 0C8".

# Technical data

Developer/ manufacturer	AISIN AW CO. LTD Japan
Designation	<ul> <li>Within Volkswagen AG: AL 1000-8Q</li> <li>In the service department: Automatic gearbox 0C8</li> </ul>
Gearbox features	<ul> <li>Electrohydraulically controlled 8-speed planetary gearbox with a simple primary planetary gear set and a downstream Ravigneaux planetary gear set as a secondary planetary gear set</li> <li>Hydrodynamic torque converter with slip-controlled torque converter lock-up clutch</li> <li>Designed for longitudinal installation in combination with a transfer box</li> </ul>
Control system	<ul> <li>Hydraulic control unit (valve chest) in the oil sump with external electronic control unit</li> <li>Dynamic Shift Program DSP with separate sports programme in "position S" and "Tiptronic" mode for manual gear changes</li> <li>Special feature: Starting off in 2nd gear is possible in Tiptronic mode</li> </ul>
Torque	Depending on version, up to 1000 Nm
ATF service	Gearbox oil change, see ELSA
Weight	Depending on adaptation of the gearbox to the engine, between 91 kg and 108 kg
Speed	Depending on engine, the top speed can be achieved in 6th, 7th or 8th gear



(for hybrid drive) or auxiliary hydraulic pump 2 for gearbox oil V476 (for start-stop system)

# Overview

Thanks to its running gear tuning, the Touareg 2011 offers outstanding off-road qualities. However, it also guarantees maximum ride comfort on normal roads. The running gear therefore combines the following characteristics:

- Very good vibration and wheel and tyre comfort
- Low tendency to roll
- Agile performance
- High dynamic stability
- Very good off-road capabilities
- Leather or wood steering wheel, with multi-function buttons as standard



• Lightweight running gear

Lane Assist

- ABS/ESP with MK25 A-XT
- Torsen transfer box or optionally, a transfer box with reduction stage and lockable centre and rear differential



#### • Electromechanical parking brake

ET C

Further information on the running gear can be found in self-study programme No. 469 "The Touareg 2011 Running Gear and Four-wheel Drive Concept".

# Overview

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• Adaptive Cruise Control ACC "Stop and Go" and "Front Assist" front monitoring system



• 5th generation immobiliser

- Radio/navigation system RNS 850
- Premium preparation for telephone installation with separate SIM card which can be used as a fixed-installation telephone.



Further information on the electrical system can be found in self-study programme No. 470 "The Touareg 2011 Electrical/ Electronics System".

# Air conditioning

The new Volkswagen Touareg is equipped with the Climatronic automatic air conditioner as standard. The Climatronic system is a combination of a heating and ventilation system plus a cooling system. In order to meet different comfort requirements, customers can choose between two different Climatronic variants:

- The 2-zone Climatronic
- The 4-zone Climatronic





At first glance, the systems are distinguished by the rear air conditioner control panel which is or is not installed.

The front air conditioner control panels are identical for both systems, and only differ from each other due to their coding.

The temperature control range of both systems lies between 16°C and 29.5°C.

# Operation

### Front operating and display unit



S449\_116

The following functions are available at the front operating unit:

- OFF switching off the control panel \_
- AUTO automatic function \_
- AC on/off
- Temperature regulation for the front right and left seats
- Air distribution setting for the front row of seats -
- Blower intensity setting for the front row of seats
- Manual recirculated air function
- Synchronisation with the driver's climatic zone
- Max. defrost
- Residual heat function -
- Instant heat button (optional) -
- Left and right seat heating (optional) -
- Left and right seat ventilation (optional) -
- Heated rear window

### Rear operating and display unit



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The following functions are available at the rear operating unit:

- OFF switching off the rear control panel \_
- AUTO automatic operation
- Temperature regulation for the two rear right and \_ left seats
- Air distribution setting for the rear row of seats
- Blower intensity setting for the rear row of seats \_
- Right and left seat heating (optional) \_

### Display in radio/navigation system RNS 850

The Climate button is used to activate the mode for the climate settings in the radio/navigation system RNS 850 display. The display is designed as a touch screen.



#### Front climate settings

The following functions are available:

- Air distribution setting
- Electric steering wheel heating
- Electric windscreen heater
- Blower intensity setting for the front seats
- AUTO, automatic temperature, blower and air distribution regulation plus climate profile setting
- Extras
- Auxiliary heater
- Rear settings, switch to the rear climate settings



S449\_022



The following settings are possible under the "Extras" menu:

- Three different climate profiles "Low", "Medium" and "High"
- Activation/deactivation of automatic recirculated air
- Activation/deactivation of the automatic windscreen heater

#### "Extras" menu



S449\_024

The following settings are possible under the "Auxiliary heater" menu:

- Activation/deactivation of the auxiliary heater
- Run time programming (activation via the radio remote control or via "Immediate activation")
- Timer programming (the point in time at which the interior is to be heated is programmed)

#### "Auxiliary heater" menu



S449\_026

#### **Rear climate settings**

The following functions are available:

- OFF, switching off the rear control panel
- AUTO, automatic temperature, blower and air distribution regulation
- Temperature regulation for the two rear right and left seats
- Air distribution setting for the rear row of seats
- Blower intensity setting for the rear row of seats







The display contents which are shown correspond to the infotainment system with German system setting and serve merely as an example. Please refer to the corresponding operating manuals for the text contents shown on the display in the relevant national languages.

# Networking

In the Touareg, not all sender and sensor signals are read directly into the Climatronic control unit.

The signals from the senders for refrigerant pressure, the air quality sensor and the rain/light/humidity sensor on the windscreen are transmitted to the onboard supply control unit via a separate LIN bus, and are placed onto the CAN convenience bus. The data is then forwarded to the Climatronic control unit via the gateway control unit.

The air conditioner compressor regulating valve N280 is also linked to the onboard supply control unit. In this case, the control signals are transmitted from the Climatronic control unit to the onboard supply control unit via the gateway control unit.



### **4-zone Climatronic**



- E87 Operating and display unit for Climatronic air conditioning system
- E265 Rear Climatronic operating and display unit
- G17 Ambient temperature sensor
- G65 High-pressure sender
- G107 Sunlight penetration photosensor
- G238 Air quality sensor
- G261 Left footwell vent temperature sender
- G262 Right footwell vent temperature sender
- G308 Evaporator temperature sensor
- G385 Front left chest vent temperature sensor
- G386 Front right chest vent temperature sensor
- G397 Rain and light sensor
- G635 Rear left chest vent temperature sender
- G636 Rear right chest vent temperature sender
- J255 Climatronic control unit
- J364 Auxiliary heater control unit
- J519 Onboard supply control unit
- J520 Onboard supply control unit 2
- J533 Data bus diagnostic interface
- J708 Residual heat relay (for water pump)
- N82 Coolant shut-off valve
- N280 Air conditioner compressor regulating valve
- V2 Fresh air blower
- V80 Rear fresh air blower
- V107 Defroster flap control motor
- V108 Left footwell flap control motor
- V110 Left centre vent control motor
- V158 Left temperature flap control motor
- V159 Right temperature flap control motor
- V211 Right B-pillar and footwell shut-off flap control motor
- V212 Left B-pillar and footwell shut-off flap control motor
- V213 Indirect ventilation flap control motor
- V240 Right rear air quantity flap control motor
- V299 Left side vent control motor
- V313 Rear left temperature flap control motor
- V316 Rear right chest vent control motor
- V314 Rear right temperature flap control motor
- V425 Fresh air/recirculated air, air flow flap control motor
- V453 Right indirect ventilation flap control motor
- Z1 Heated rear window
- Z2 Heated windscreen



Left rear

seat heating

G636



V313

V314

V211

V316

LIN data bus line

### 2-zone Climatronic



#### Legend



- G17 Ambient temperature sensor
- G65 High-pressure sender
- G107 Sunlight penetration photosensor
- G238 Air quality sensor
- G261 Left footwell vent temperature sender
- G262 Right footwell vent temperature sender
- G308 Evaporator temperature sensor
- G385 Front left chest vent temperature sensor
- G386 Front right chest vent temperature sensor
- G397 Rain and light sensor
- J255 Climatronic control unit
- J364 Auxiliary heater control unit
- J519 Onboard supply control unit
- J520 Onboard supply control unit 2
- J533 Data bus diagnostic interface
- J708 Residual heat relay (for water pump)
- N82 Coolant shut-off valve
- N280 Air conditioner compressor regulating valve

- V2 Fresh air blower
- V107 Defroster flap control motor
- V108 Left footwell flap control motor
- V110 Left centre vent control motor
- V158 Left temperature flap control motor
- V159 Right temperature flap control motor
- V299 Left side vent control motor
- V425 Fresh air/recirculated air, air flow flap control motor
- Z1 Heated rear window
- Z2 Heated windscreen
- Z35 Auxiliary air heater element

	CAN convenience data bus
	CAN operation and display data bus
	CAN data bus line
	' LIN data bus line

### Auxiliary coolant heater/pre-heater

The Touareg 2011 can be fitted with an optional, fuel-operated auxiliary coolant heater (auxiliary heater) from Eberspächer. This enables the vehicle interior to be pre-heated and the windows to be defrosted in the case of low exterior temperatures. The auxiliary coolant heater is actuated with the radio remote control or with the aid of the menu guidance in the central display, or can be pre-programmed to a set time.



#### Designation of vehicles with:

- Diesel engineD5W-F
- Petrol engine B5W-F

#### Legend

- E87 Operating and display unit for Climatronic air conditioning system
- J255 Climatronic control unit
- J364 Auxiliary heater control unit N279 Heater coolant shut-off valve
- (3/2-way directional control valve)
- R149 Remote control receiver for auxiliary coolant heater
- V54 Metering pump



Vehicles with a diesel engine and 4-zone Climatronic are fitted with a preheater as standard.



# **Coolant circuit**

To a large extent, the coolant circuit corresponds to that in the Touareg 2003.

The so-called "internal heat exchanger" is new. This involves a refrigerant pipe which forms a "pipe-in-pipe system". With the refrigerant pipe, the low-pressure pipe is routed, spatially separated, through the high-pressure pipe. In this system, the refrigerant flow in the outer pipe moves to the expansion valve and that in the inner pipe from the expansion valve back in the direction of the air conditioner compressor.

This design increases the system's efficiency, and contributes towards minimising fuel consumption.



### **Control motors**



The control motors for the flap drives are all of an identical design and can therefore basically be used on any flap. The motors are stepper motors. In comparison with the control motors used so far, these do not require a potentiometer.

The 2-zone Climatronic has 7 control motors on the air conditioner unit.

The 4-zone Climatronic is equipped with 2 additional control motors in the dash panel for indirect ventilation. 5 additional control motors are installed for the second row of seats; these are linked to the rear air conditioner control panel via a separate LIN bus.

The control motors are connected in series, and are actuated via a separate LIN bus by the Climatronic control unit.



So that the Climatronic control unit can assign the individual control motors to the various flaps, addresses have to be assigned to them. The individual control motors are addressed using the VAS diagnostic tester in the "Guided Fault Finding" or "Guided Functions" programmes. In this case, the addresses of all of the control motors are initially reset. The Climatronic control unit then transmits the signal for automatic addressing. The addresses are assigned to the individual control motors in this case. Basic setting using the VAS diagnostic tester can only be carried out following addressing. Addressing must be carried out each time after a control motor has been exchanged.



### **Blower module**

The Touareg 2011 is equipped with a blower module. The module consists of a combination of a blower regulation motor and a blower regulation sender. The components can only be exchanged together. Two different modules are available. One blower module is fitted with both front Climatronic variants and the other with the rear 4-zone Climatronic system.

### Sensors

The majority of the Climatronic sensors in the Touareg 2011 correspond to those fitted in the Touareg 2003. The humidity sender G355 is new in the Touareg 2011.

### Humidity sender G355

The humidity sender G355 for windscreen moisture and temperature is intended to prevent windscreen fogging. Window fogging occurs on negative deviation from the dew point temperature, in the case of environmental conditions involving high humidity in the passenger compartment and a low ambient temperature.

For this purpose, the air's moisture content and the temperature directly at the windscreen are measured.





The humidity and the temperature at the windscreen are measured using a capacitive thin-layer sensor. The humidity sender G355 for windscreen moisture and temperature functions in the manner similar to a plate capacitor; measurement of the capacity reveals the degree of humidity.

The sensor electronics convert the measured capacity into a voltage value. The temperature of the windscreen is determined directly by attaching the humidity sender G355 with the windscreen.

#### Signal use

The signal is transmitted to the onboard supply control unit via a LIN bus, and is forwarded to the Climatronic control unit via the convenience CAN. The Climatronic system controls the supply of air to the windscreen so that fogging is reduced.

#### Effect in the event of failure

Without the sensor's signal, the control unit is no longer able to calculate the point in time from which moisture settles on the windows. The automatic defrost function fails.

## Hybrid air conditioner compressor



Due to its connection to the high-voltage system, the electric air conditioner compressor can also be operated, in driving mode, when the combustion engine has come to a stop. If the high-voltage battery's charge falls below a defined limit value in this case, the system automatically starts the combustion engine.

The air conditioner compressor in the Touareg Hybrid is supplied with 288 V DC voltage. The compressor contains a DC/AC inverter, which converts the direct current into alternating current in order to operate the asynchronous AC current motor.

The air conditioner compressor is connected to the power electronics via a 2 x 4 mm<sup>2</sup> cable. This is also the location of the high-voltage system's protection in the form of a 30 A fuse. This cannot be renewed. The connector is mechanically coded, and cables are colour-coded in orange. On removal of the connector, the pilot line routed in the cable is interrupted, and the high-voltage system is therefore shut-off.





When working on the air conditioner compressor, the high-voltage system's voltage must be switched off by a Volkswagen high-voltage technician.

### **Technical features**

- The compressor's delivery rate is regulated via the motor speed of the air conditioner compressor's electric drive in stages of 50 rpm.
- The rotational speed range lies between 0 and 8600 rpm, and is regulated via the air conditioner control unit. In order to reduce operating noise, the rotational speed of the electronic air conditioner compressor is reduced to a minimum when stationary.
- The compressor has a mean electrical power consumption of approx. 1.5 kW; its maximum electrical power consumption is approx. 7 kW.
- The heat incurred due to the inverter and the motor coils is dissipated via the through-flow of the refrigerant return line (intake side).
- The compressor complies with protection class IP 67

(protected against access to dangerous parts with wire and dust-proof, against the effect of being temporarily immersed in water)



### Communication

The air conditioner compressor is connected to the powertrain CAN/extended CAN, (deactivatable CAN, as the AC compressor lies in the crash area.)

As feedback to the air conditioner control unit, the electronic compressor transmits the following data:

- Actual rotational speed
- Current consumption (0-25 A)
- Component temperature (inverter PCB)
- Status messages on internal communication, current, voltage and load monitoring.

The diagnostic address in the VAS diagnostic tester is: 040





In the event of a defect, the air conditioner compressor can only be exchanged completely.

### Function

The air conditioner compressor is a so-called "scroll compressor".

In a scroll compressor, compression takes place between two scroll elements. These elements are two nested spirals, one of which is stationary and the second of which is moved in circles in the first. Due to this movement, the spirals form several increasingly smaller chambers within the coils. In these chambers, the material which is to be compressed reaches the centre, where it then emerges at the side.





# Thermal management system

The heat exchanger for the interior heating is also connected to the innovative thermal management system.

In the case of low ambient temperatures of e.g. 0°C and a desired temperature setting of 22°C in the interior, the heating is only provided with "warm coolant" when the coolant temperature is at least 20°C.

This process takes approx. 60 seconds, upto a maximum of 120 seconds. During this period of time, the vehicle is driven with "stationary water". This means that the water pump is not in operation and no coolant circulation is yet taking place.

This has the advantage that the coolant is able to heat up faster.

Once coolant shut-off valve N82 has opened the coolant access to the heat exchanger, all of the heated coolant is initially used to heat the interior.

Depending on the interior temperature, the heat output is gradually reduced by the air conditioner control unit.







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