282

Service.

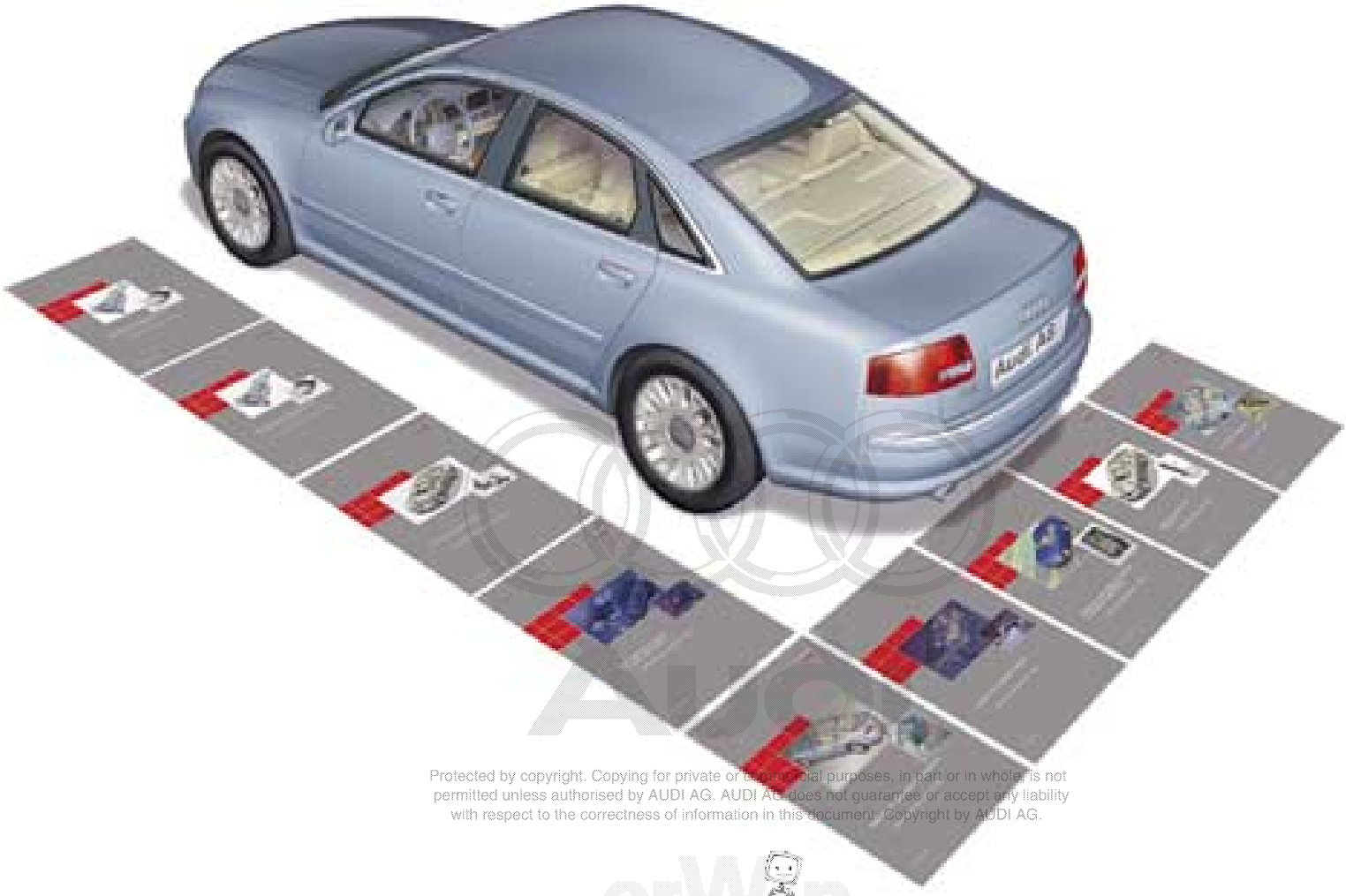
AUDI A8 ´03 - Technical Features

Self Study Programme 282

For internal use only

Complete vehicle information

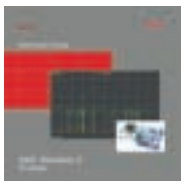
The design and operation of the Audi A8 ´03 are described in the following Self Study Programmes:



SSP 283 – 6-speed automatic gearbox 09E in the Audi A8 '03 - Part 1
SSP 284 – 6-speed automatic gearbox 09E in the Audi A8 '03 - Part 2
SSP 285 – Running gear in the Audi A8 '03
SSP 286 – New data bus systems - LIN, MOST, Bluetooth™
SSP 287 – Audi A8 '03 - Electrical components
SSP 288 – Audi A8 '03 - Distributed functions
SSP 289 – Adaptive cruise control in the Audi A8 '03
SSP 292 – Adaptive air suspension in the Audi A8 '03
SSP 293 – Audi A8 '03 - Infotainment

Other helpful information on the Audi A8 ´03 can be found on the adjacent CD ROMs.

Electrical system



CAN data bus 2

Contents

The Self Study Programme contains information on design features and functions.

The Self Study Programme is not intended as a Workshop Manual. Values given are only intended to help explain the subject matter and relate to the software version applicable at the time of SSP compilation.

Use should always be made of the latest technical publications when performing maintenance and repair work.

New

Attention Note

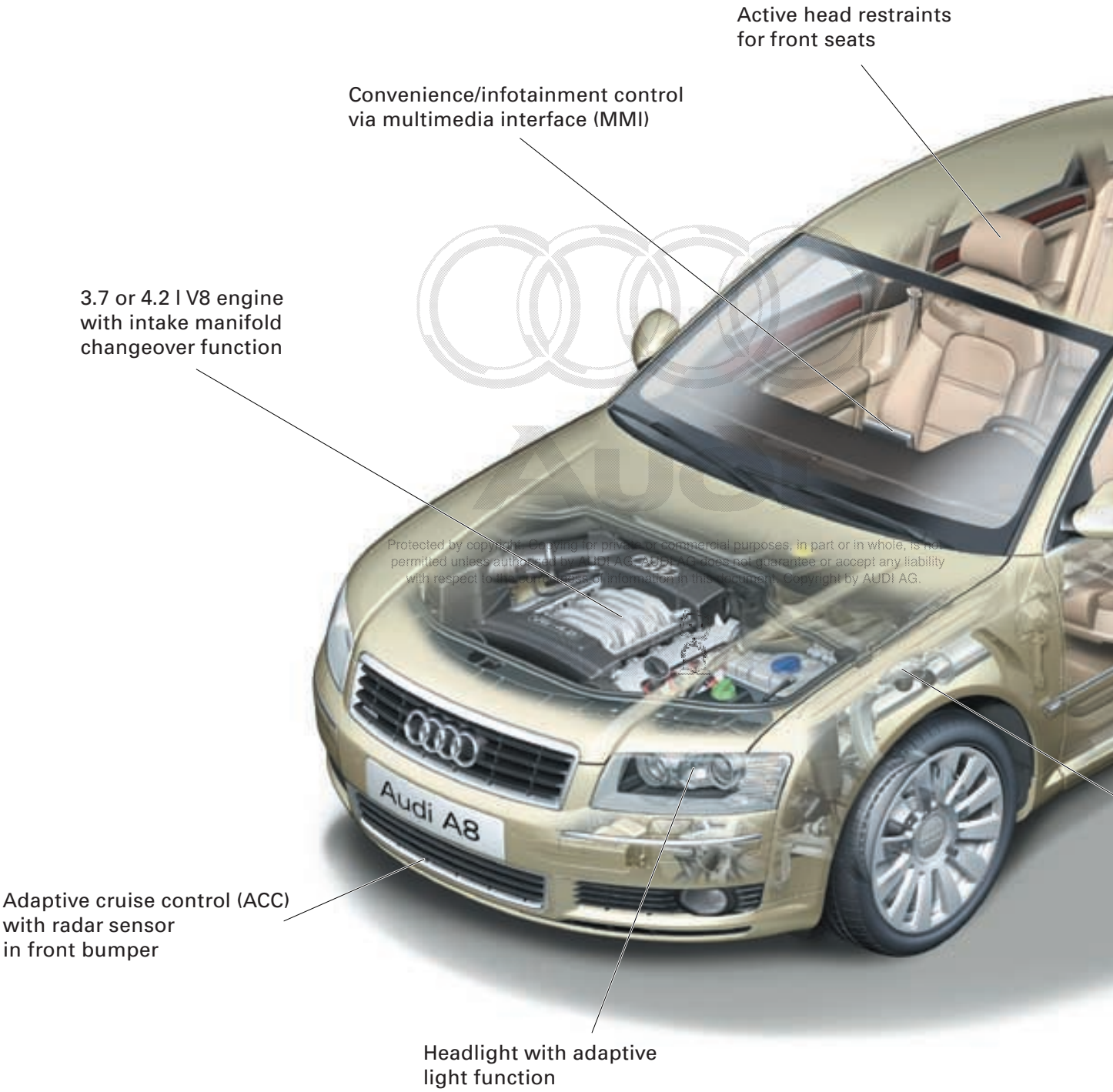
Introduction

The new Audi A8 is designed to replace its predecessor of the same name which achieved a total production figure of 105,092 since its introduction in June 1994. This was the first standard saloon with aluminium body and epitomised a new philosophy in the luxury vehicle sector.

The weight-saving Audi Space Frame ASF represented a major breakthrough in terms of enhanced vehicle dynamics, whilst at the same time solving the problem of increasing weight.

This body concept was further perfected in the Audi A2 and the design of the Audi A8 ´03 reflects the experience gained from both projects.

The aim when developing the Audi A8 ´03 was not merely to surpass its predecessor in terms of technical features and details.

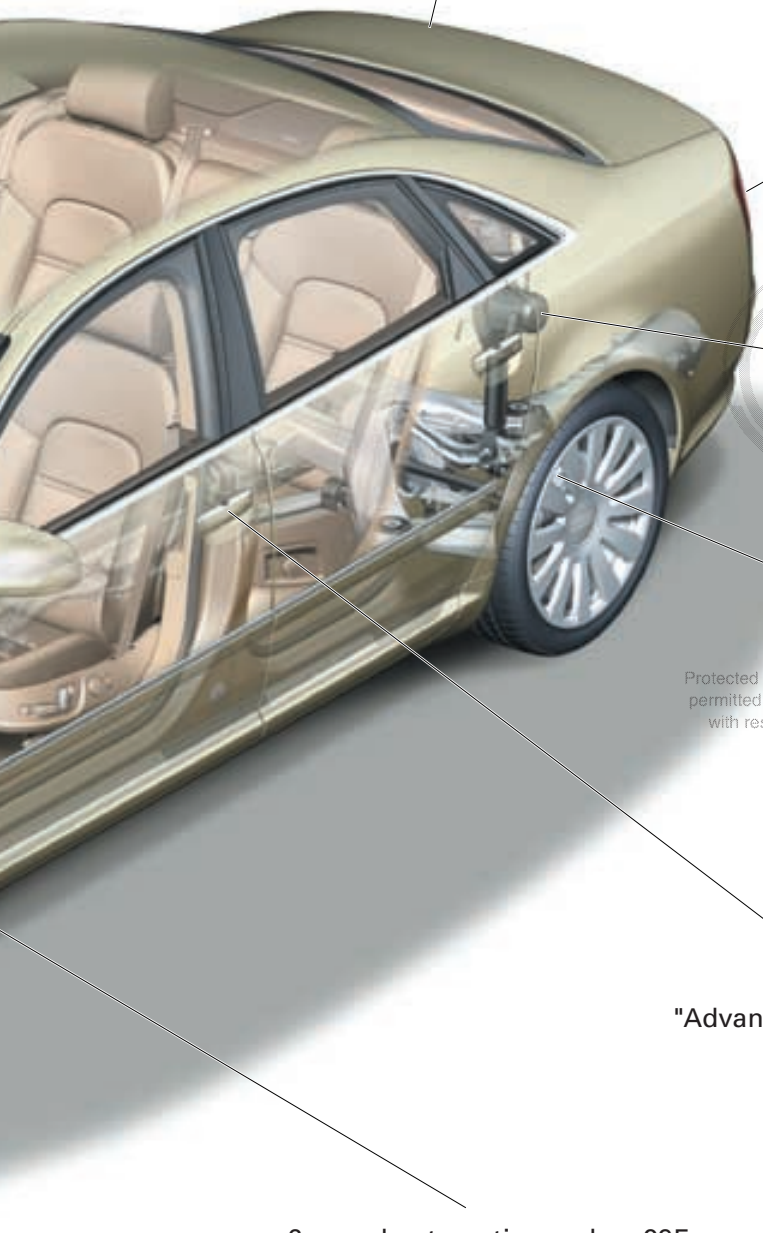


As the Audi flagship, the new Audi A8 is intended to symbolise the product identity of the next Audi generation.

An uncompromising sporty character, clear-cut design, innovative technological systems and the highest possible quality level combine to provide an unforgettable driving experience.

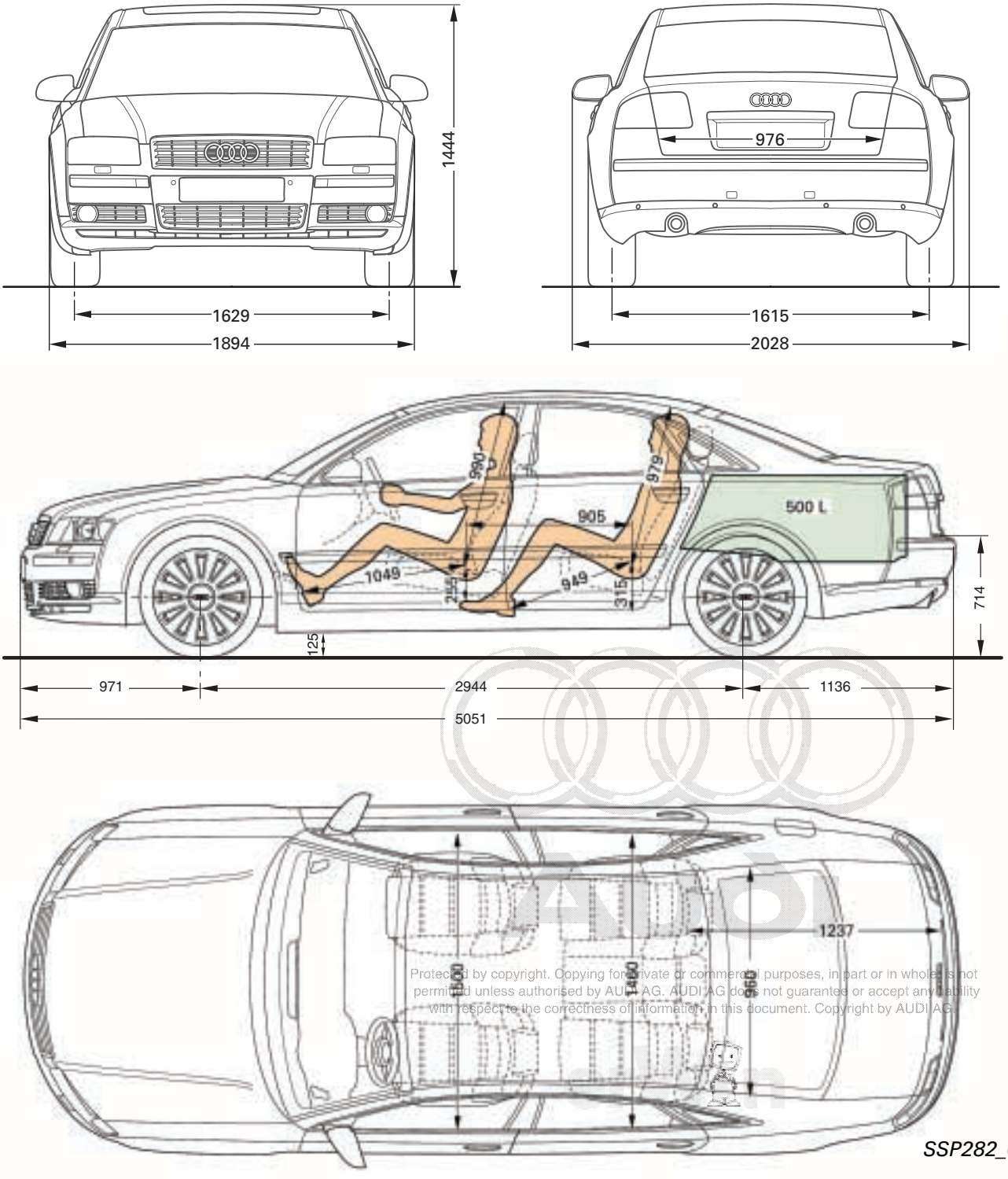
In other words:

Audi at its proverbial best.



SSP282_025

Brief outline



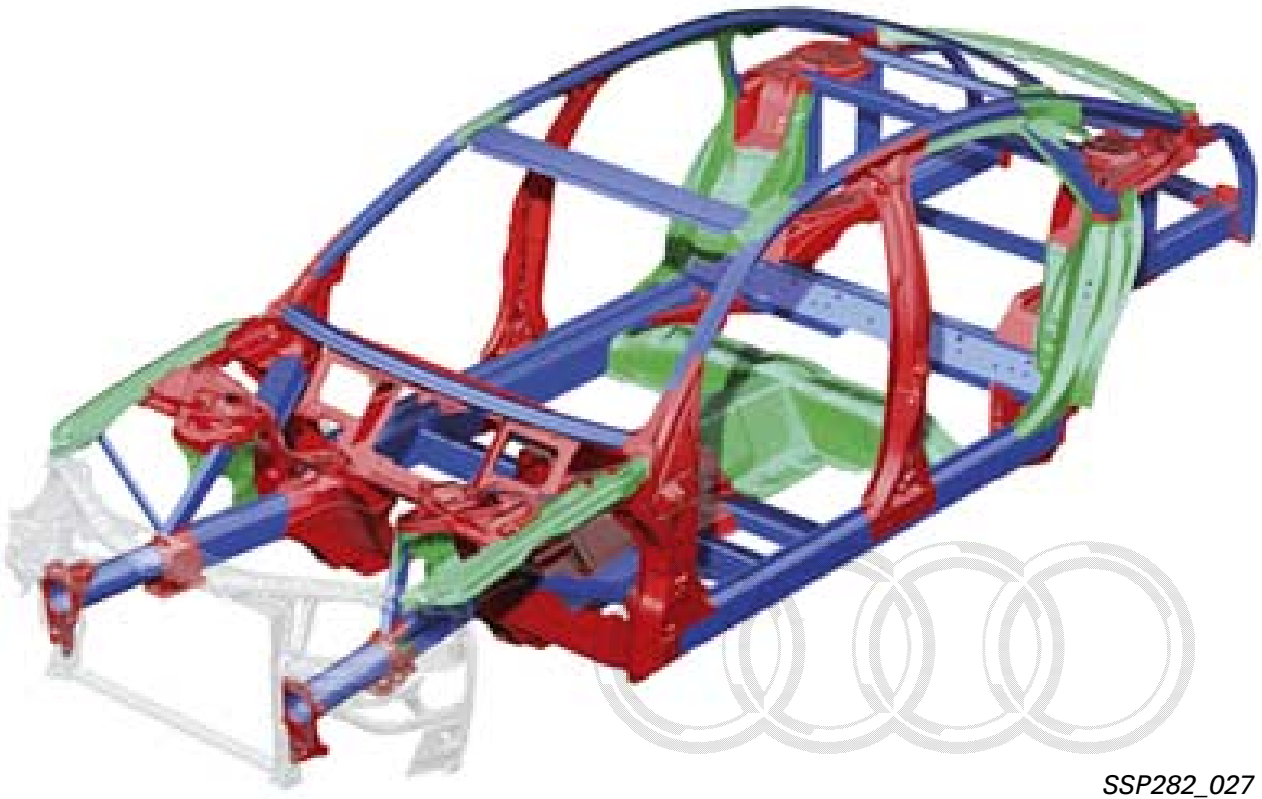
SSP282_026

Kerb weight	1,780 kg	Gross weight	2,380 kg
Turning circle	12 m	Luggage compartment volume	approx. 500 l
Tank capacity	approx. 90 litres	Drag coefficient	0.27 C_d

Body

The Audi A8 ´03 sets new standards in its class by combining lightweight construction with outstanding stability. This is achieved through the use of innovative Audi Space Frame technology for the body design of the Audi A8.
The technical progress reflected by the unique body concept stems from the consistent implementation of experience gained from the aluminium Audi A8 and A2 models.

Based on the findings obtained from these vehicles, it was possible to further reduce the number of body components and significantly increase the level of automation in the production process as compared to the Audi A8 predecessor model.



SSP282_027

The static torsional rigidity of the new Audi A8 body is 60 % higher than that of the previous Audi A8 body.
A crucial contribution is made to the increased rigidity level by the advanced Audi Space Frame structure.

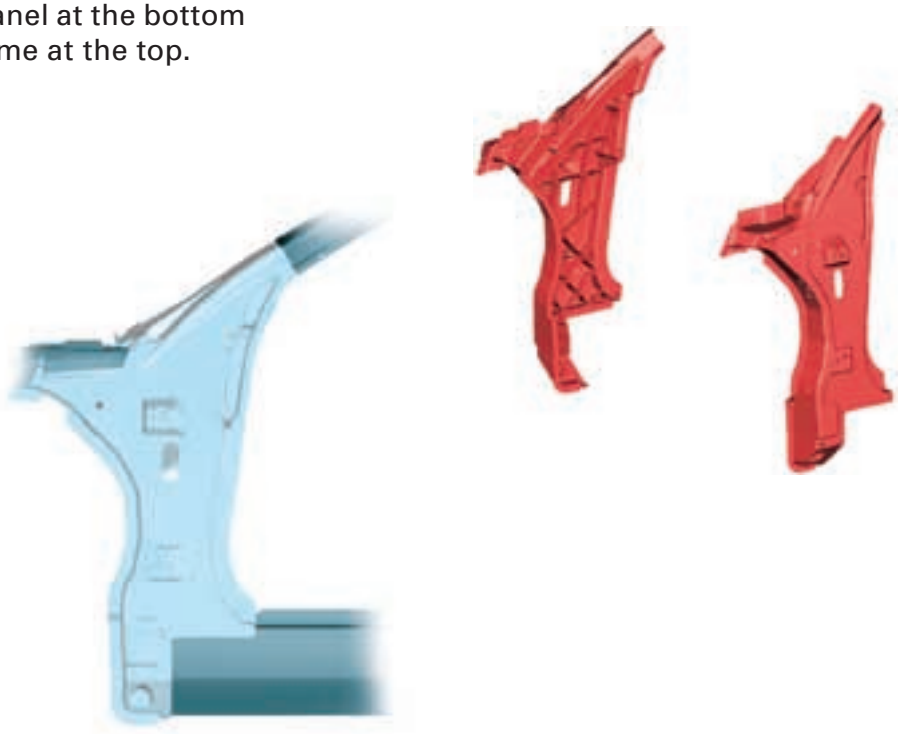
Characteristic features of the new structure:

- Large castings with numerous integrated functions and a high degree of joint strength
- IHF* sections – optimum cross sections at all locations, for example at side of roof frame
- Sheet metal panels with high levels of local rigidity thanks to the use of special technologies designed to achieve differing functional cross sections and structures

*IHF = Internal high-pressure forming

A-pillar

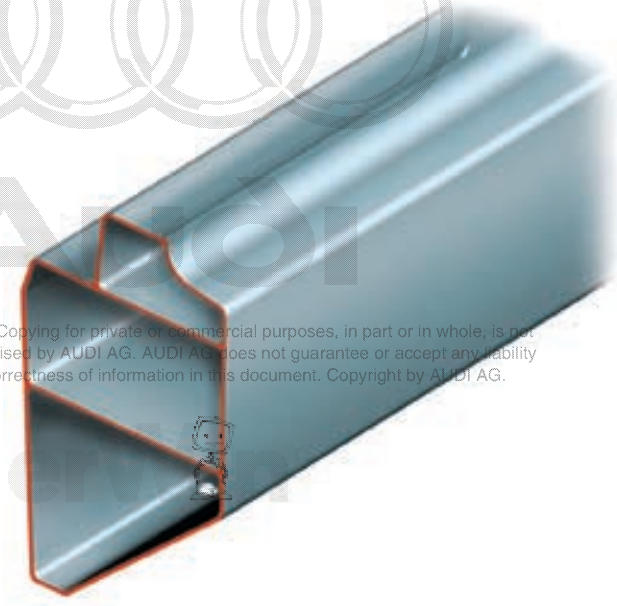
The A-pillar is made of two cast shells connected by rivets and welds.
The shells enclose the sill panel at the bottom and the continuous roof frame at the top.



SSP282_029

Sill panel

Use is made for the sill panel of a 3-piece extruded section.
The extruded section must be replaced in the event of sill panel damage.
Depending on the nature of the damage, either the entire section has to be replaced or parts of it by way of three separating sleeves.

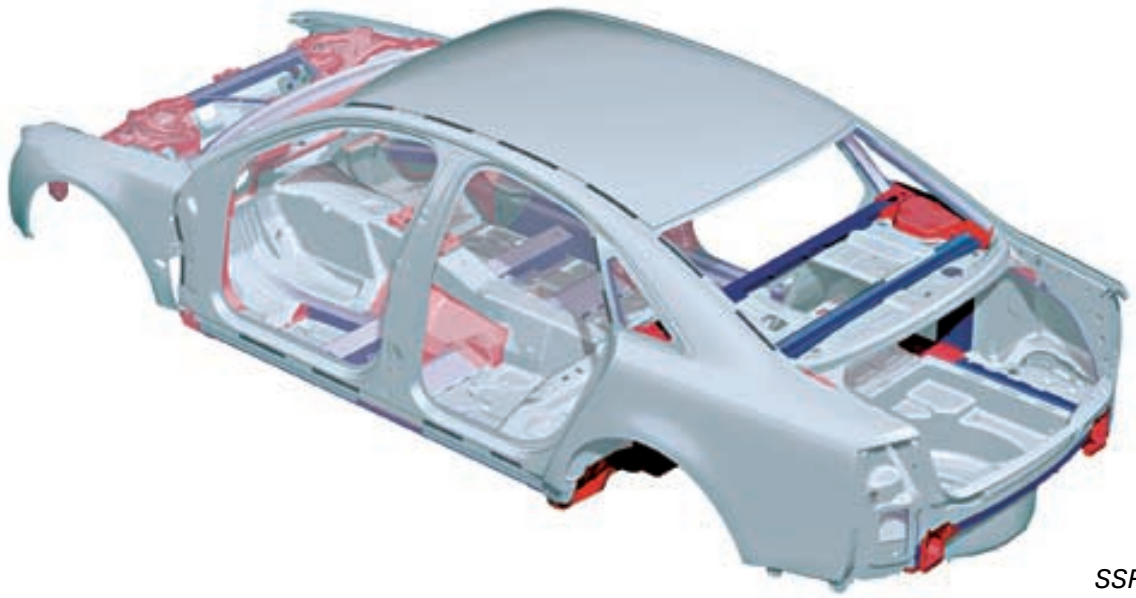


SSP282_030

Rear end

The rear end has been completely redeveloped. The two large central castings are the one connecting the sill panel/ longitudinal member and the C/D-pillar connecting element.

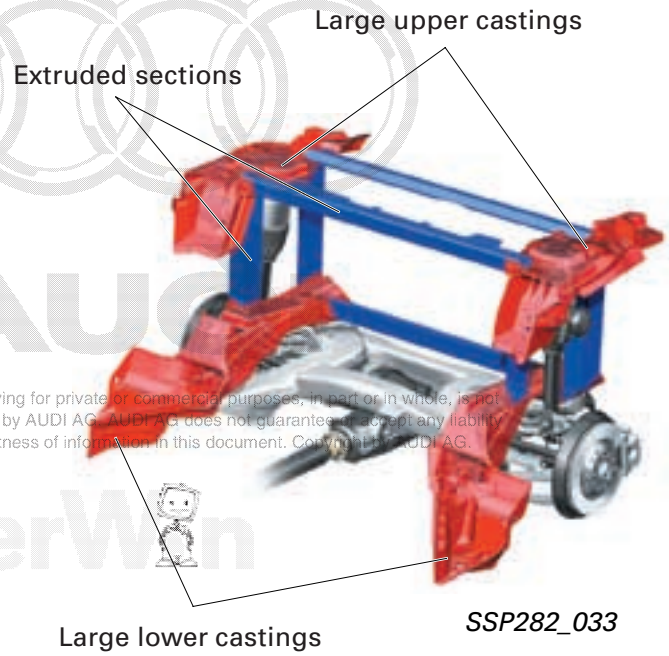
The sill panel/longitudinal member connecting element is the largest casting. It supports the entire rear sub-frame and links the rear longitudinal member to the sill panel. Its great rigidity is designed to protect the tank in between in the event of a rear-end collision.



SSP282_032

The C/D-pillar connecting element (large upper casting) accommodates the suspension strut at the top and the seat belt at the front, in addition to forming the terminating side section of the roof frame.

The large upper and lower castings are interlinked by way of two straight extruded sections and form the framework for the air suspension strut holder.



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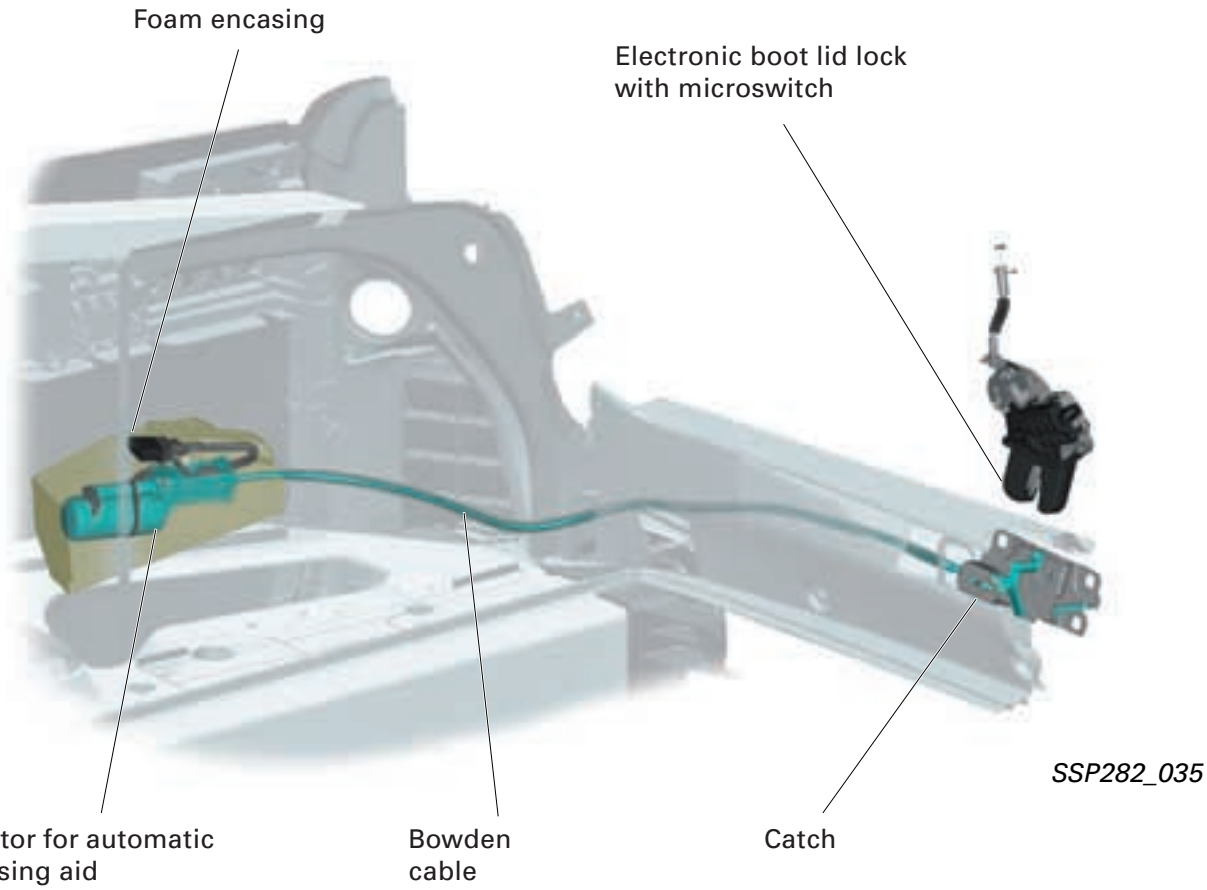
Boot lid



SSP282_035

A standard feature is an automatic closing aid, which is actuated by a Bowden cable separately from the catch. After the latch has closed, a mechanism pulls the catch downwards, overcoming the build-up of pressure occurring. On locking, a microswitch in the boot lid lock transmits a signal to the control unit to activate the automatic closing aid.

The drive unit is only encased in foam and inserted between side panel and battery.

Automatic boot lid

Button in driver's door

Button on boot lid

Vehicle key

SSP282_036

Pressing the button in the driver's door or on the boot lid, or remote control actuation, effects release and motor-driven opening of the boot lid. Automatic boot lid closing can only be implemented by way of the boot lid button.

An electric motor flanged directly to the swivel joint of the right boot lid hinge opens or closes the boot lid.

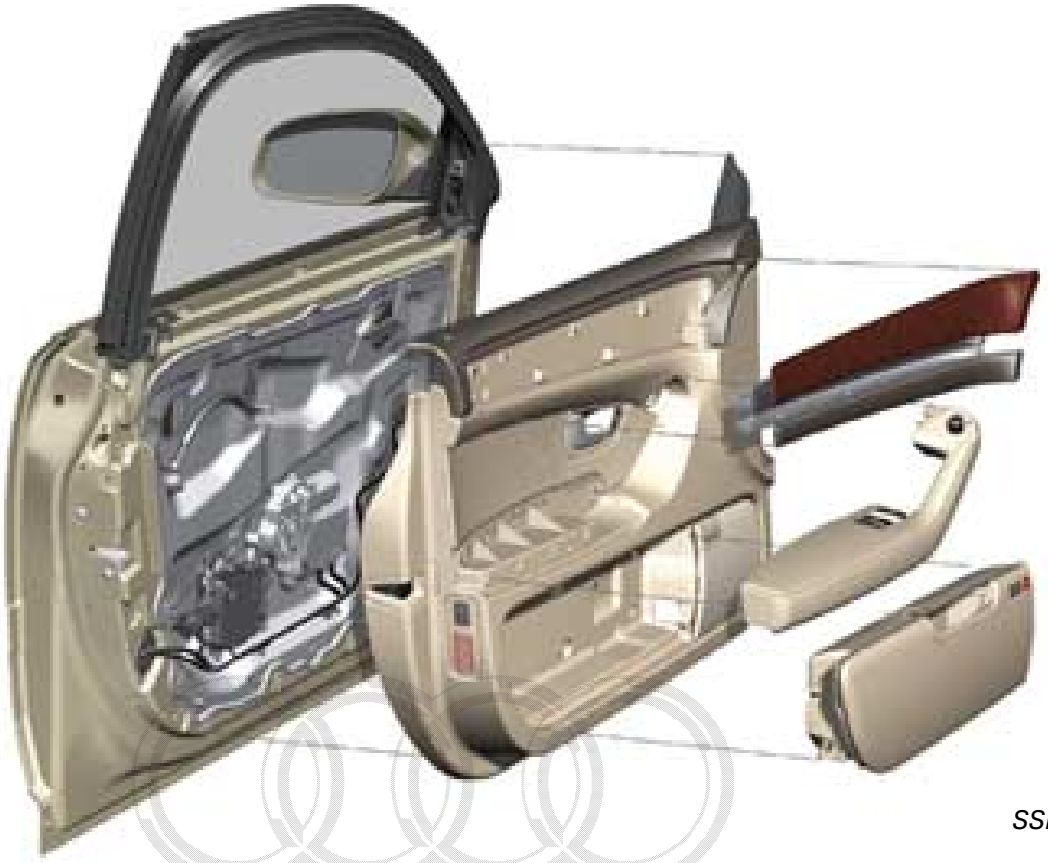
In the event of manual boot lid actuation, the electric motor is disconnected by way of a magnetic coupling, thus permitting the boot lid to be moved by hand. On closing the boot lid, the drive is deactivated via a microswitch at the latch and the automatic closing aid activated.

As a general rule, interruption of automatic actuation always causes the boot lid to be disconnected from the drive unit and thus set to manual mode.

Front doors

The doors are made up of a combination of aluminium panels, aluminium sections and aluminium castings.
Optimised rib geometry and wall thickness in the hinge and lock mounting castings formed the basis for ideal implementation of the lightweight construction concept.

Door shell and door frame are connected at the door pre-assembly stage by means of fitted bolts to ensure the accurate assignment of both components. Window lifter frame, window lifter motor/gear mechanism, door control unit and speaker are pre-assembled on a base plate and bolted to the door subframe.



SSP282_039

Rear doors

Large, high-strength side impact members are integrated into the door to provide even load distribution in the event of side impact.

Seats

A new seat concept was developed for the Audi A8 ´03.
The basic seat features the following standard functions:

- Electric seat length, height and angle adjustment
- Electric backrest angle adjustment
- Front crash-active head restraints (refer to Page 21)

The basic seat can additionally be fitted with

- Four-way lumbar support
- Seat memory for driver and front passenger
- Electrically adjustable head restraints
- Electric belt height adjusters

Extra features of sports and comfort seats:

- Electric top 1/3 backrest adjustment
- Electric seat depth adjustment

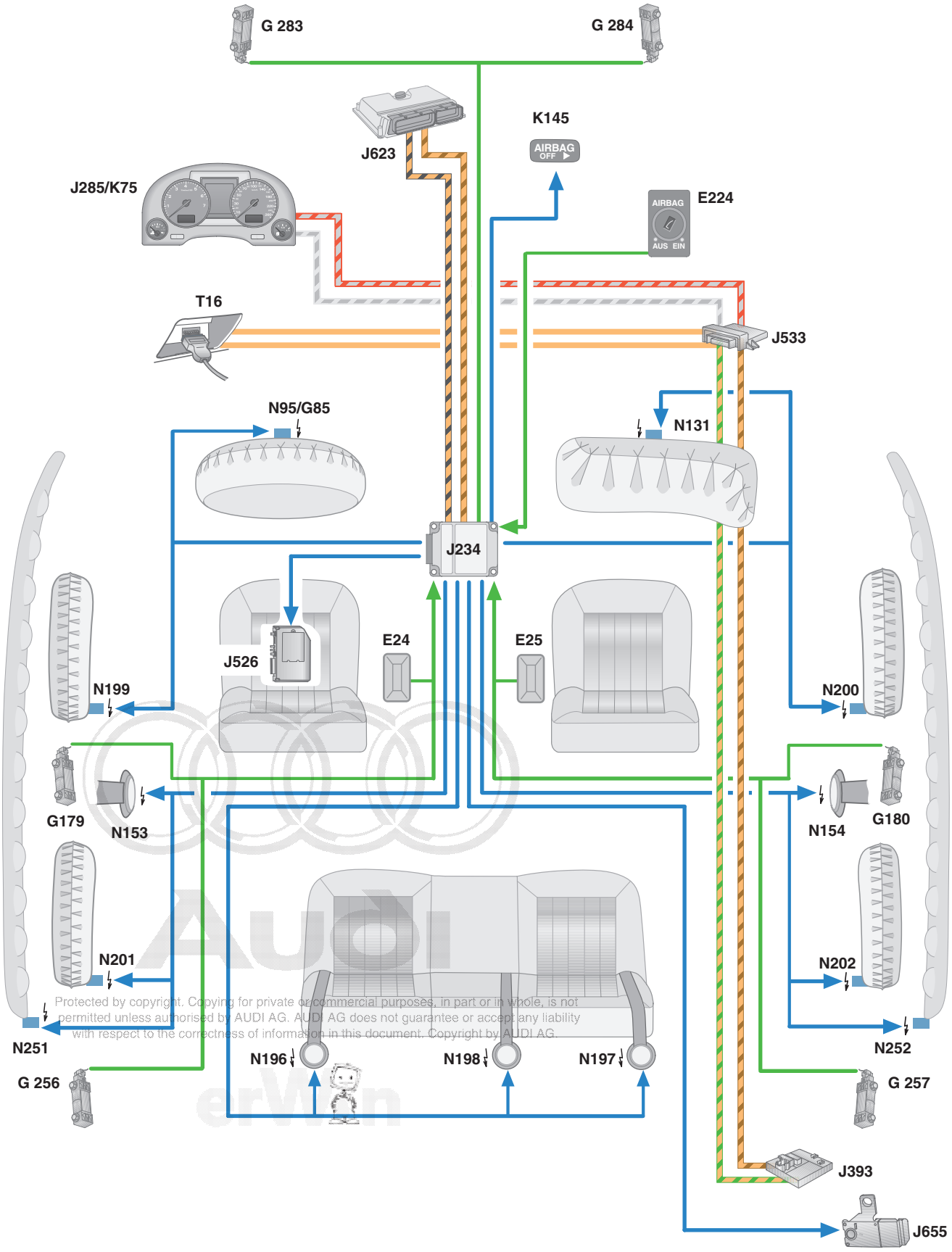
Optional extras for comfort seat:

- Climate function (refer to Page 85)
- and/or massage function

The massage function is implemented by way of rhythmic action of the electromechanical lumbar support, thus massaging and relaxing the back muscles.

The fixed rear seat bench versions correspond to those of the front seats, with the third head restraint being fully retractable. Electric individual seats are however only available as "Basic" and "Comfort" versions.

System layout



SSP282_068

Use is made in the Audi A8 ´03 of the 8.4E+ airbag system with the aim of attaining greater occupant safety whilst reducing the impact. This was achieved, for example, by way of two-stage front airbag triggering, active front head restraints and a battery cut-off element.

The wide range of sensors permits detection not only of head-on collision and side impact, but also of rear-end collisions.

Key

E24 Driver side belt switch
E25 Front passenger side belt switch
E224 Airbag disabling key switch, front passenger side

G85 Steering angle sender
G179 Side airbag crash sensor, driver side (B-pillar)
G180 Side airbag crash sensor, front passenger side (B-pillar)
G256 Rear side airbag crash sensor, driver side
G257 Rear side airbag crash sensor, front passenger side
G283 Front airbag crash sensor, driver side
G284 Front airbag crash sensor, front passenger side

J234 Airbag control unit
J285 Control unit with display in dash panel insert
J393 Convenience system central control unit
J526 Telephone/telematics control unit
J533 Data bus diagnostic interface (gateway)
J623 Engine control unit
J655 Battery cut-off relay

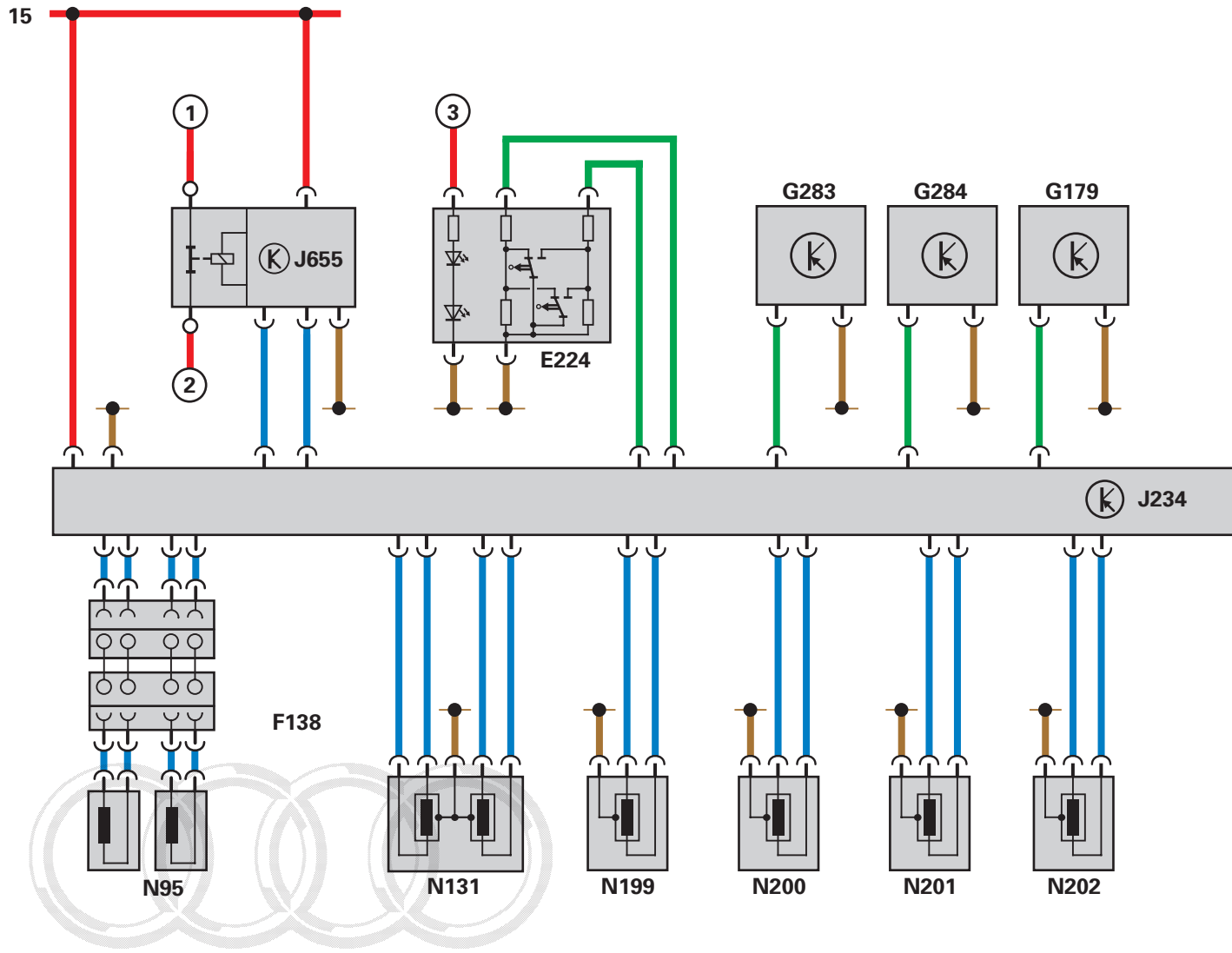
K75 Airbag warning lamp
K145 Airbag disabled warning lamp, front passenger side

N95 Driver side airbag igniter
N131 Airbag igniter 1, front passenger side
N153 Belt tensioner igniter 1, driver side
N154 Belt tensioner igniter 2, front passenger side
N196 Rear belt tensioner igniter, driver side
N197 Rear belt tensioner igniter, front passenger side
N198 Rear belt tensioner igniter, centre
N199 Side airbag igniter, driver side
N200 Side airbag igniter, front passenger side
N201 Rear side airbag igniter, driver side
N202 Rear side airbag igniter, front passenger side
N251 Curtain airbag igniter, driver side
N252 Curtain airbag igniter, front passenger side

T16 16-pin connector (diagnostic connection)

Passenger Protection

Block diagram



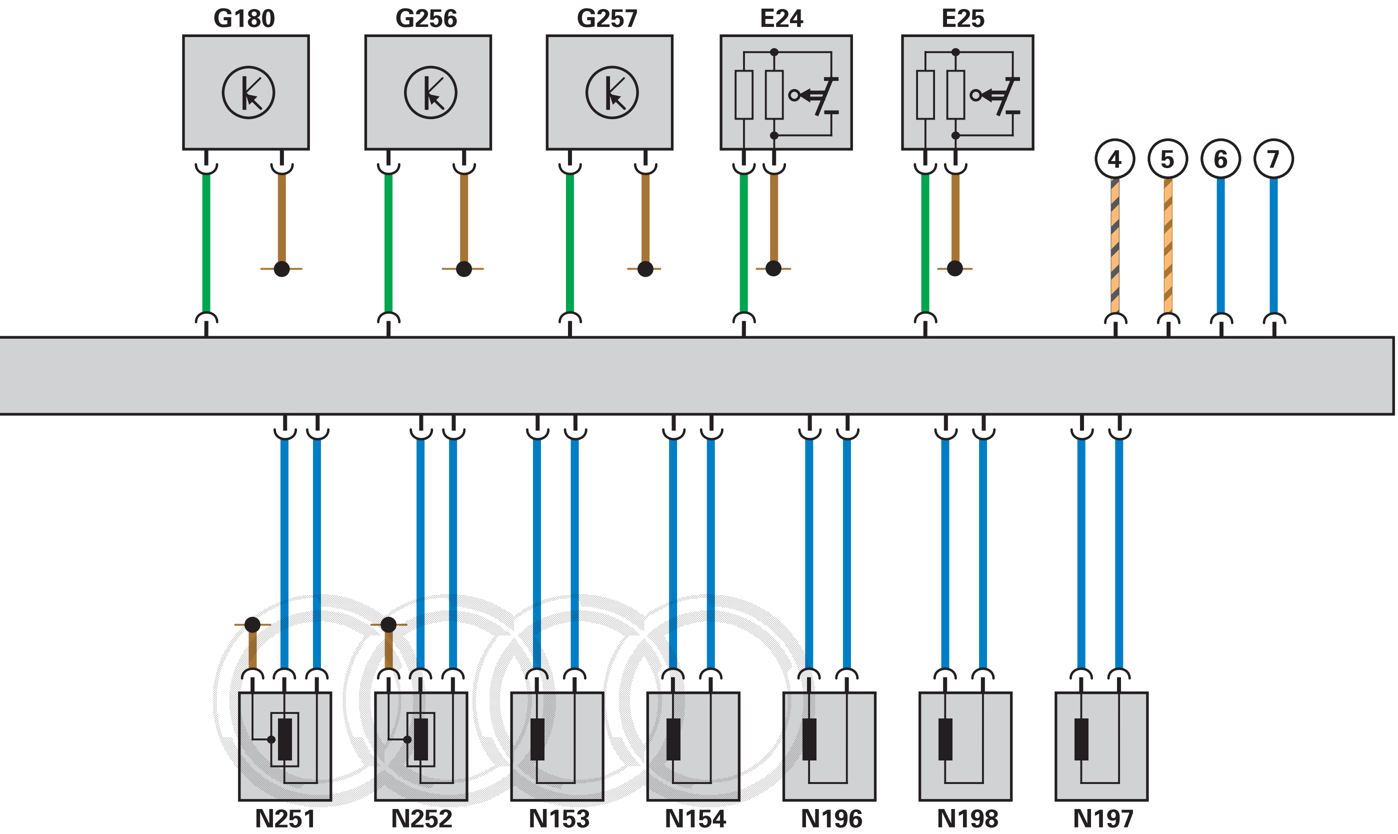
Key

E24 Driver side belt switch
E25 Front passenger side belt switch
E224 Airbag disabling key switch, front passenger side
F138 Airbag coil connector/return spring with slip ring

G179 Side airbag crash sensor, driver side
G180 Side airbag crash sensor, front passenger side
G256 Rear side airbag crash sensor, driver side
G257 Rear side airbag crash sensor, front passenger side
G283 Front airbag crash sensor, driver side
G284 Front airbag crash sensor, front passenger side

J234 Airbag control unit
J655 Battery cut-off relay

N95 Driver side airbag igniter
N131 Airbag igniter 1, front passenger side
N153 Belt tensioner igniter 1, driver side
N154 Belt tensioner igniter 2, front passenger side
N196 Rear belt tensioner igniter, driver side
N197 Rear belt tensioner igniter, front passenger side
N198 Rear belt tensioner igniter, centre
N199 Side airbag igniter, driver side
N200 Side airbag igniter, front passenger side
N201 Rear side airbag igniter, driver side
N202 Rear side airbag igniter, front passenger side



SSP282_069

N251 Curtain airbag igniter, driver side
N252 Curtain airbag igniter, front passenger side

Additional signals

1. Battery A (positive)
2. Positive connection to starter B and alternator C
3. Terminal 58s
4. Drive system CAN (High)
5. Drive system CAN (Low)
6. Crash signal
7. Airbag disabled warning lamp, front passenger side K145

Colour code

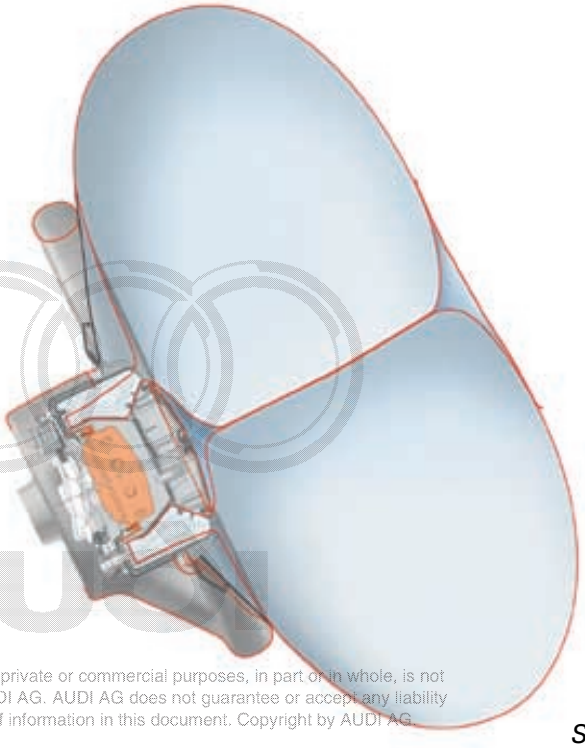
- Green = Input signal
- Blue = Output signal
- Red = Positive supply
- Brown = Earth

Safety systems

2-stage front airbags

The 2-stage triggering of the front airbags provides optimum restraint in crash situations at around 30 km/h. There is a separate firing pellet for each stage in the driver's and front passenger's airbag. These ignite successively at specified time intervals.

Ring airbag



SSP282_070

A so-called "ring airbag", which inflates like a life belt, is used on the driver's side. This radial inflation method affords particular protection to drivers sitting very close to the steering wheel. The centre of the steering wheel does not move as the airbag unfolds and is inflated in the form of a ring. A rectangular fabric layer is additionally sewn to three sides of the ring. One side is left free to allow the airbag to slide over the non-moving centre section of the steering wheel.

This airbag design satisfies the requirements of the latest American legislation and involves compliance with biomechanical values for so-called "Out Of Position" (OOP) driver posture. If the driver's head or upper part of the body is very close to the steering wheel at the time of airbag unfolding (OOP), this airbag concept can prevent serious injury.

Front passenger's airbag deactivation

An optional feature of the Audi A8 ´03 is a new airbag disabling key switch for the front passenger's side E224.
Two resistance paths are integrated into this switch to permit detection of individual faults.
A fault in the key switch is indicated by flashing of the front passenger's side airbag disabled warning lamp K145 located in the centre console next to the hazard warning switch.

SSP282_081

Front knee airbags (USA)

SSP282_114

The USA version of the Audi A8 ´03 is fitted with driver's and front passenger's knee airbags as standard, thus optimising driver and front passenger movement in a crash situation.

In this way, severe impact in the knee zone is avoided.
Knee airbags are required by legislation in the USA.

Passenger Protection

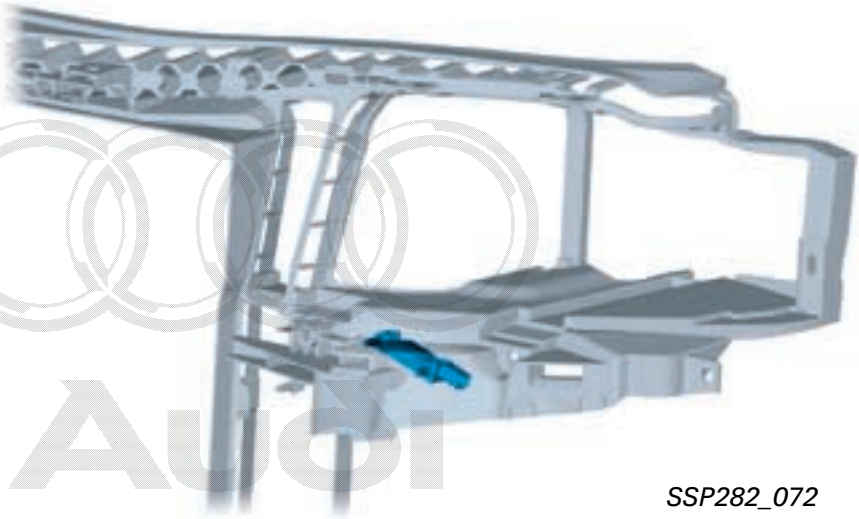
Detection of rear-end collision

Rear-end collisions are detected by way of a sensor in the airbag control unit J234 and a plausibility function involving the driver's and front passenger's front airbag crash sensors G283 and G284.

Up-front sensors

For the first time, use is made in the Audi A8 ´03 of so-called up-front sensors.

These take the form of two additional front-end acceleration sensors on the right and left beneath the corresponding headlight.



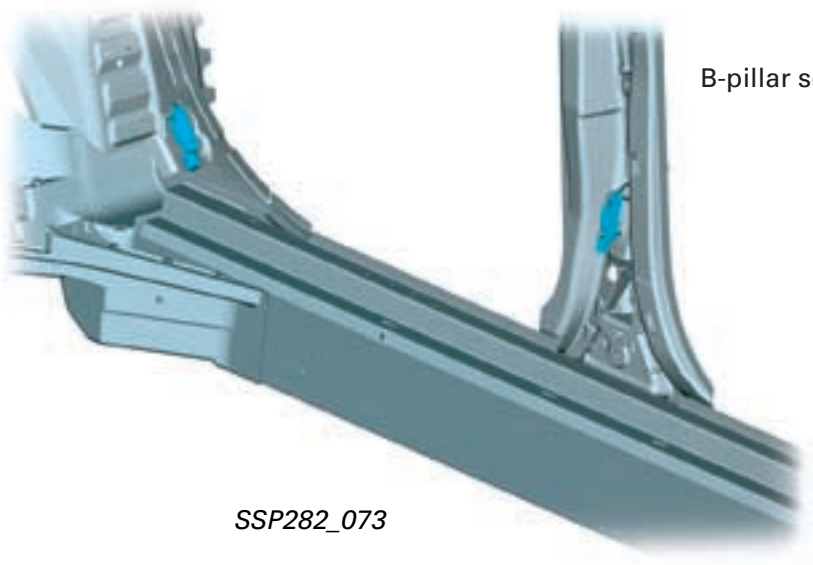
SSP282_072

Lateral acceleration sensors

Further acceleration sensors are located at the B and C-pillars.

C-pillar sensor

B-pillar sensor



SSP282_073

Active head restraints

The front seats of the Audi A8 ´03 are provided with active head restraints.
With this system, the head restraints move forwards in the event of a rear-end collision to shorten the distance between head and restraint.

The danger of cervical vertebrae injury is greatly diminished by reducing the relative acceleration between shoulder and head.
In head-on collision situations, the mechanics of centrifugal weight are neutralised.

SSP282_082

Belt tensioners

Five belt tensioners are fitted as standard.
There is no centre belt tensioner if the rear seats are electrically adjustable.

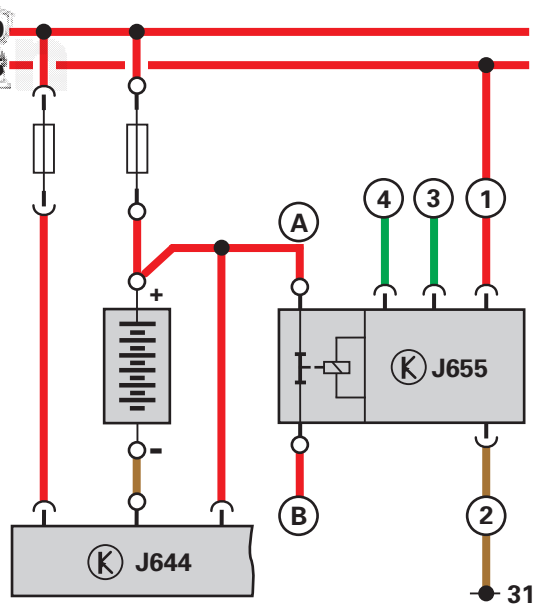
Battery cut-off relay J655

The battery cut-off relay is a battery isolating element designed to disconnect starter and alternator power from the electrical system in the event of a crash.

Terminal	Pin	Input/output	Description
30, battery	A	Input (screw connection)	$U_{bat.}$ term. 30/battery
87	B	Output (screw connection)	Output
Terminal 15	1	Input (plug connection)	Positive power supply, interruptible
Vehicle earth	2	Input (plug connection)	Earth from airbag control unit J234
Crash signal	3	Input (plug connection)	Crash signal from airbag control unit J234
Diagnosis	4	Input (plug connection)	Diagnostic wire from airbag control unit J234

Block diagram

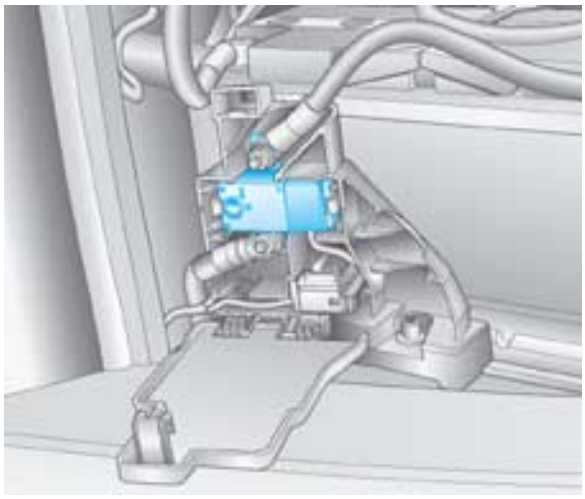
J644 Energy management control unit
J655 Battery cut-off relay



SSP282_076

Fitting location

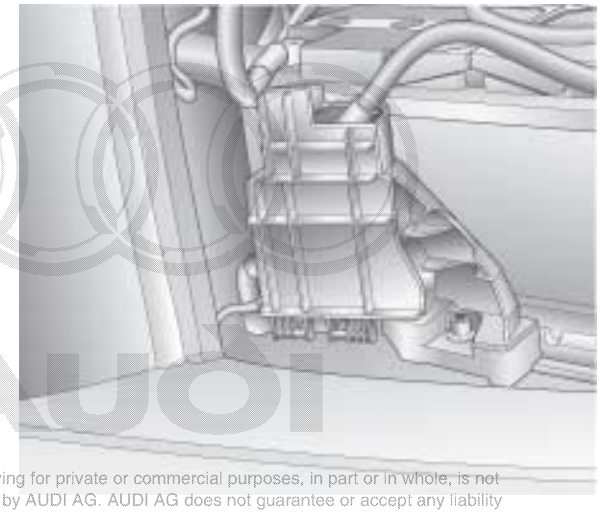
The battery cut-off relay is located in front of the battery.



SSP282_083

Triggering

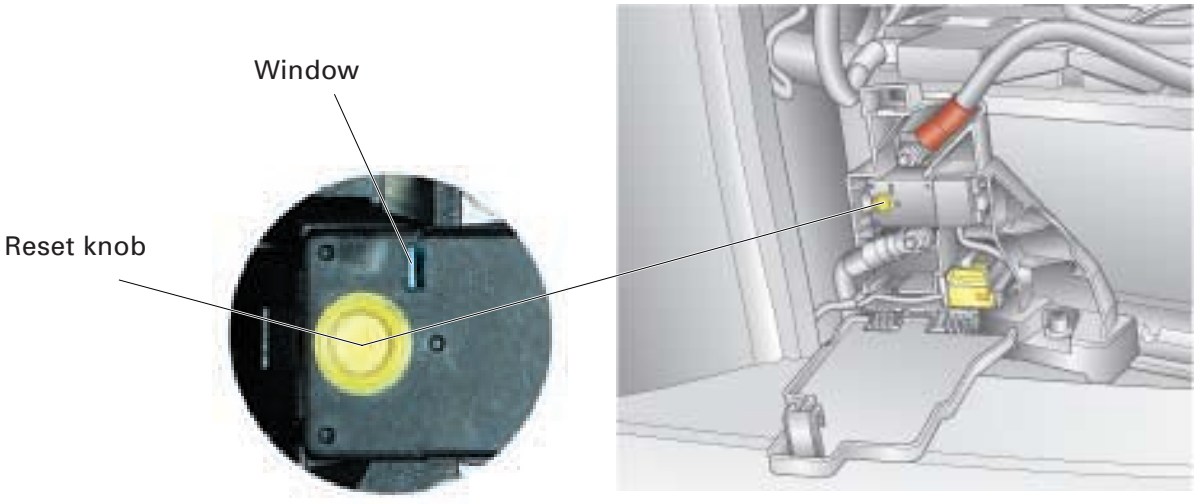
The airbag control unit J234 provides the battery cut-off element with the triggering command via a discrete wire.
Triggering of this element by the airbag control unit causes a white panel to appear in the element window instead of a copper coil. Following isolation, the battery cut-off element can be manually reset by way of the yellow knob.



SSP282_079

Control element test

The control element test in the airbag control unit also triggers the battery cut-off relay. It should be ensured that the relay is manually reset, as otherwise the battery cannot be charged.

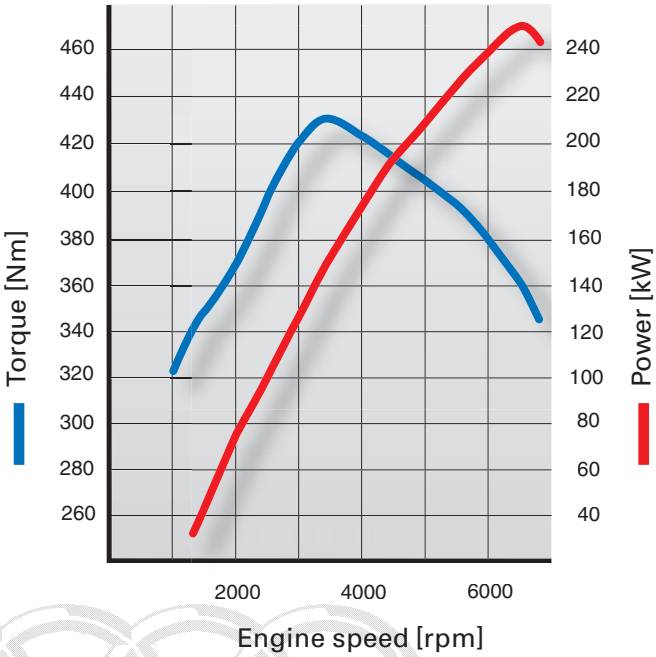


SSP282_077

Technical data

V8 4.2 l 5V engine

Engine code letters:	BFM
Capacity:	4,172 cm^3
Bore:	84.5 mm
Stroke:	93.0 mm
Compression ratio:	11 : 1
Power:	246 kW (335 hp) at 6,500 rpm
Torque:	430 Nm at 3,500 rpm
Camshaft adjustment range:	22° CS advance
Valves:	5 per cylinder
Engine management:	ME7.1.1
Emission standard:	EU 4
Firing order:	1 - 5 - 4 - 8 - 6 - 3 - 7 - 2
Capacities:	7.5 l engine oil (incl. filter)
Consumption:	Urban: 17.5 - 17.6 l/100 km Non-urban: 8.7 - 8.8 l/100 km Average: 11.9 - 12.0 l/100 km
Acceleration 0 - 100 km/h:	0 - 80 km/h – 4.8 s 0 - 100 km/h – 6.3 s
Fuel:	Premium Plus Unleaded 98/95 RON



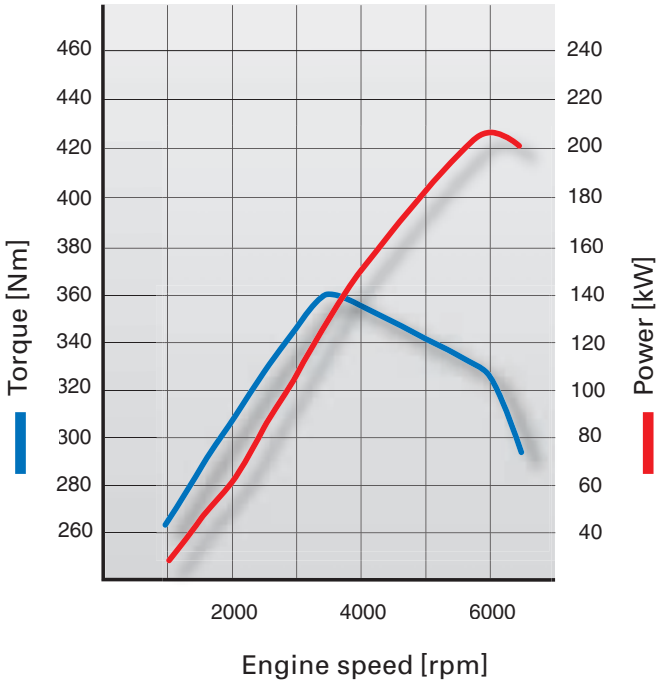
SSP282_002

SSP282_012

CS = Crankshaft

V8 3.7 l 5V engine

Engine code letters:	BFL
Capacity:	3,697 cm^3
Bore:	84.5 mm
Stroke:	82.4 mm
Compression ratio:	11 : 1
Power:	206 kW (280 hp) at 6,000 rpm
Torque:	360 Nm at 3,750 rpm
Camshaft adjustment range:	13° CS advance
Valves:	5 per cylinder
Engine management:	ME7.1.1
Emission standard:	EU 4
Firing order:	1 - 5 - 4 - 8 - 6 - 3 - 7 - 2
Capacities:	7.5 l engine oil (incl. filter)
Consumption:	Urban: 17.1 - 17.3 l/100 km Non-urban: 8.6 - 8.8 l/100 km Average: 11.7 - 11.9 l/100 km
Acceleration 0 - 100 km/h:	0 - 80 km/h – 5.6 s 0 - 100 km/h – 7.3 s
Fuel:	Premium Plus Unleaded 98/95 RON



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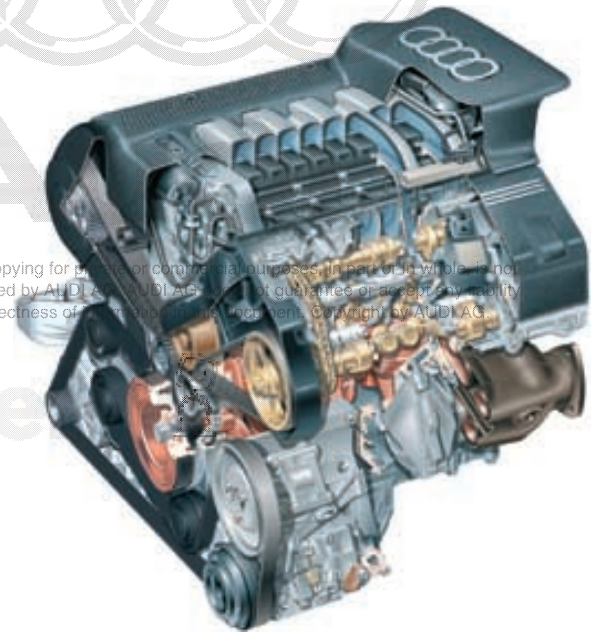


SSP282_011

V8 5V 3.7 l/4.2 l engine

The 3.7 l and 4.2 l V8 engines were adopted from the predecessor model with certain modifications.

These modifications relate to the intake and exhaust systems and are described in the following.

Design and operation are described in SSP 217.

Variable-intake manifold in 4.2 l engine

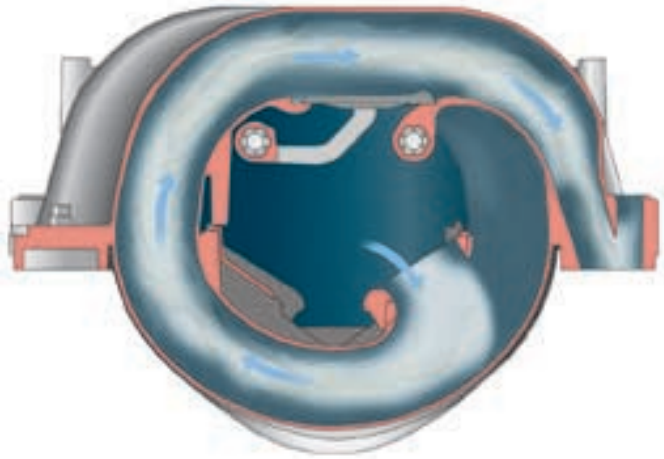
This takes the form of a 2-stage variable-intake manifold made of a die-cast magnesium alloy, bonded and bolted together in four sections.

The two-stage design permits the use of two intake paths with large cross section.

The intake manifold must be replaced as a complete unit when performing repairs.

SSP282_013

– Long intake path, 705 mm
– Changeover flap closed for high torque



SSP282_014

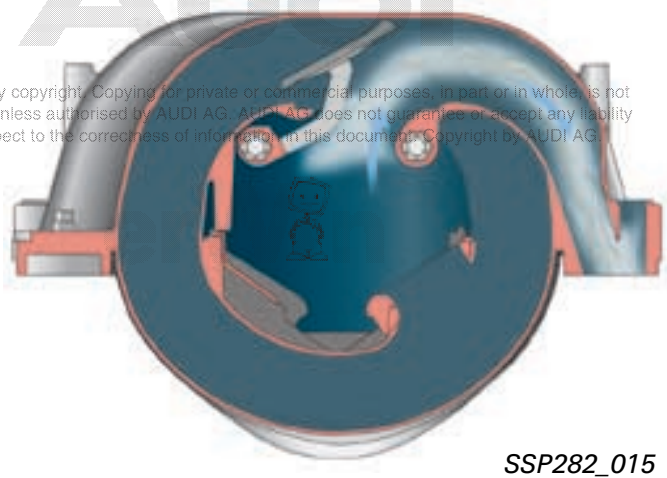
Each of the two splined shafts is fitted with four flaps per cylinder bank.
The shape of the rubber-encased flaps ensures unimpeded air flow in the torque position and reliable power position sealing of the duct. This is a prerequisite for utilisation of the gas-dynamic resonance effects. In the power position, the backs of the flaps take on the shape of the duct wall, thus allowing low-resistance intake air flow into the cylinders.

Mechanical couplings provide a link with the vacuum units for adjustment of the two shafts and thus the intake manifold flaps.

SSP282_016

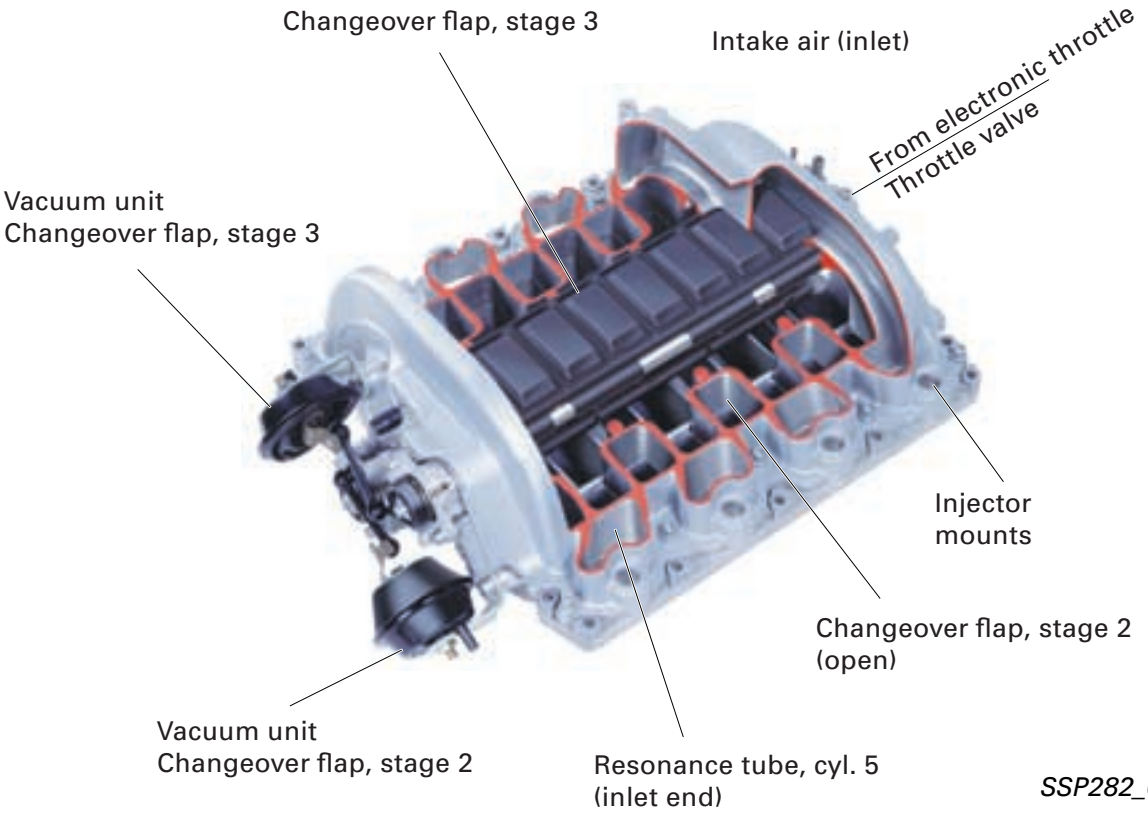
– Short intake path, 322 mm
– Changeover flap open for high power with high air throughput

Changeover from long to short at 4,480 rpm
Changeover from short to long at 4,320 rpm



SSP282_015

Variable-intake manifold in 3.7 l engine



This is the same 3-stage variable-intake manifold as previously fitted in the V8 engine.

Due to the piston stroke of only 82.4 mm, three resonance tube lengths are required to achieve resonance effects in the lower engine speed range.

Changeover points:

- Long to short at 3,280 rpm
- Short to long at 3,120 rpm
- Short to shorter at 5,120 rpm
- Shorter to short at 4,920 rpm

Operation of the 3-stage variable-intake manifold is described in SSP 217.

Air cleaner

A round filter is employed instead of a flat filter to achieve a larger filter surface area for more air throughput in view of the different amount of space available.

SSP282_018

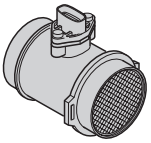
Furthermore, an additional intake air flap in the air cleaner is opened as a function of load at engine speeds as of 3,000 rpm to attain the large volume of air required at full throttle. This flap enables additional air to be drawn in from the engine compartment and reduces the air velocity in the air cleaner.

SSP282_019

System layout

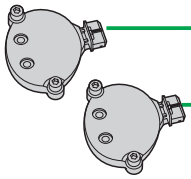
Actuators/sensors

Hot-film air-mass meter G70

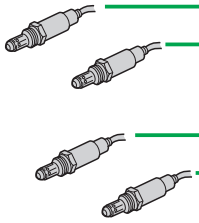


Engine speed sender G28

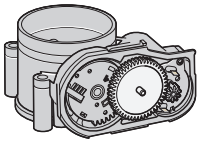
Hall sender G40 (bank 2) and
Hall sender 2 G163 (bank 1)



Lambda probe G39
(bank 1)
Lambda probe II G108
(bank 2)
Lambda probe after catalyst G130
(bank 1)
Lambda probe II after catalyst G131
(bank 2)

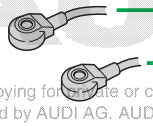


Throttle valve control
part J338 with
Throttle valve drive G186
(electric power control)
Throttle valve drive angle sender 1 G187
Throttle valve drive angle sender 2 G188

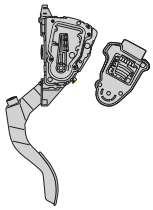


Coolant temperature sender G62

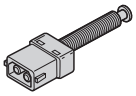
Knock sensor I G61 (bank 1) and
Knock sensor II G66 (bank 2)



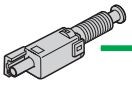
Additional signals:
- Air conditioner requirement
- Cruise control switch
- Term. 50, stage 1
- Automatic gearbox selector lever position



Pedal position sender/accelerator pedal module with accelerator pedal position sender G79 and accelerator pedal position sender 2 G185

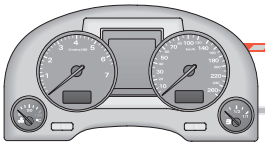


Brake light switch F and
Brake pedal switch F47



Clutch pedal switch F36
(manual gearbox only)

Dash panel insert CAN



Control unit with display in dash panel insert J285

Engine control unit J623

Steering
angle sender G85

Automatic
gearbox
control unit J217

ESP
control unit J104

Airbag
control unit J234

Data bus diagnostic
interface J533

Drive system CAN

Diagnosis CAN

Intake manifold changeover valve
N156 and
Intake manifold changeover valve 2
N261

Left electrohydraulic engine mounting
solenoid valve N144 and
Right electrohydraulic engine mounting
solenoid valve N145

Torque rod valve N382

Lambda probe heater Z19
(bank 1) and
Lambda probe 2 heater Z28
(bank 2)

Lambda probe 1 heater
after catalyst Z29
Lambda probe 2 heater
after catalyst Z30

Additional signals:
– Starter relay term. 50, stage 2
– Tank leakage pump (USA only)
– Air conditioner compressor (out)

Fuel pump relay J17
Fuel pump G6

Fuel pump II relay J49
Fuel pump G23

Injectors N30, N31, N32, N33 (bank 1)

Injectors N83, N84, N85, N86 (bank 2)

Ignition coils N (no. 1 cyl.), N128 (no. 2 cyl.),
N158 (no. 3 cyl.), N163 (no. 4 cyl.)

Ignition coils N164 (no. 5 cyl.), N189 (no. 6 cyl.),
N190 (no. 7 cyl.), N191 (no. 8 cyl.)

Activated charcoal filter system solenoid
valve 1 N80

Secondary-air pump relay J299 and
Secondary-air pump motor V101

Secondary air inlet valve N112

Throttle valve control part J338
With throttle valve drive G186

Inlet camshaft timing adjustment valve 1
N205 (bank 1)

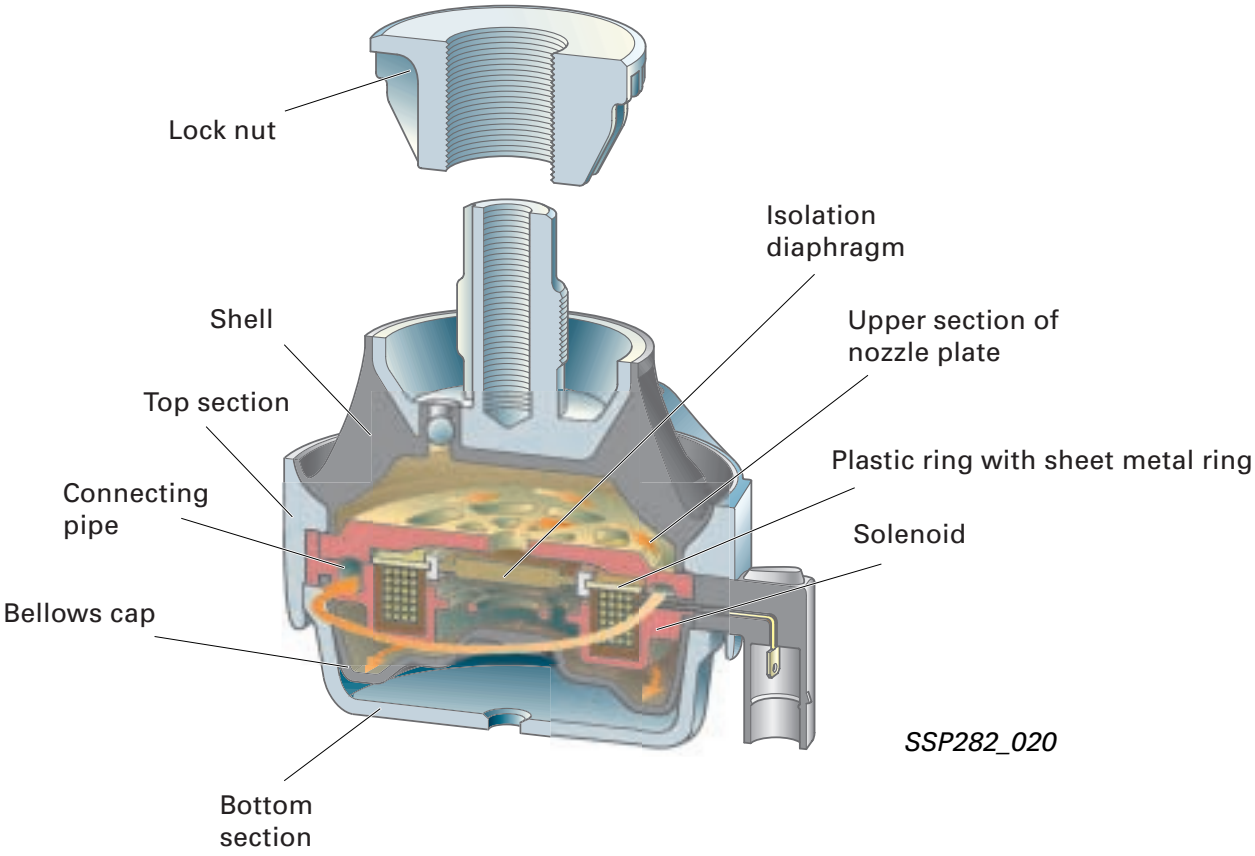
and

N208 (bank 2)

SSP282_091

Electrohydraulic torque reaction support

Stress-free alignment of the torque reaction support is implemented by way of the lock nut.



The purpose of torque reaction support is to cushion the drive shaft and propshaft torque. The position of the support bearing at the front right of the engine is ideal, as this is where the engine motion resulting from drive shaft and propshaft torque accumulates.

The torque reaction support is divided into two halves by the plastic ring, the sheet metal ring and the isolation diaphragm. Both halves are filled with fluid (glycol). The isolation diaphragm is flexibly linked to the plastic and sheet metal rings.

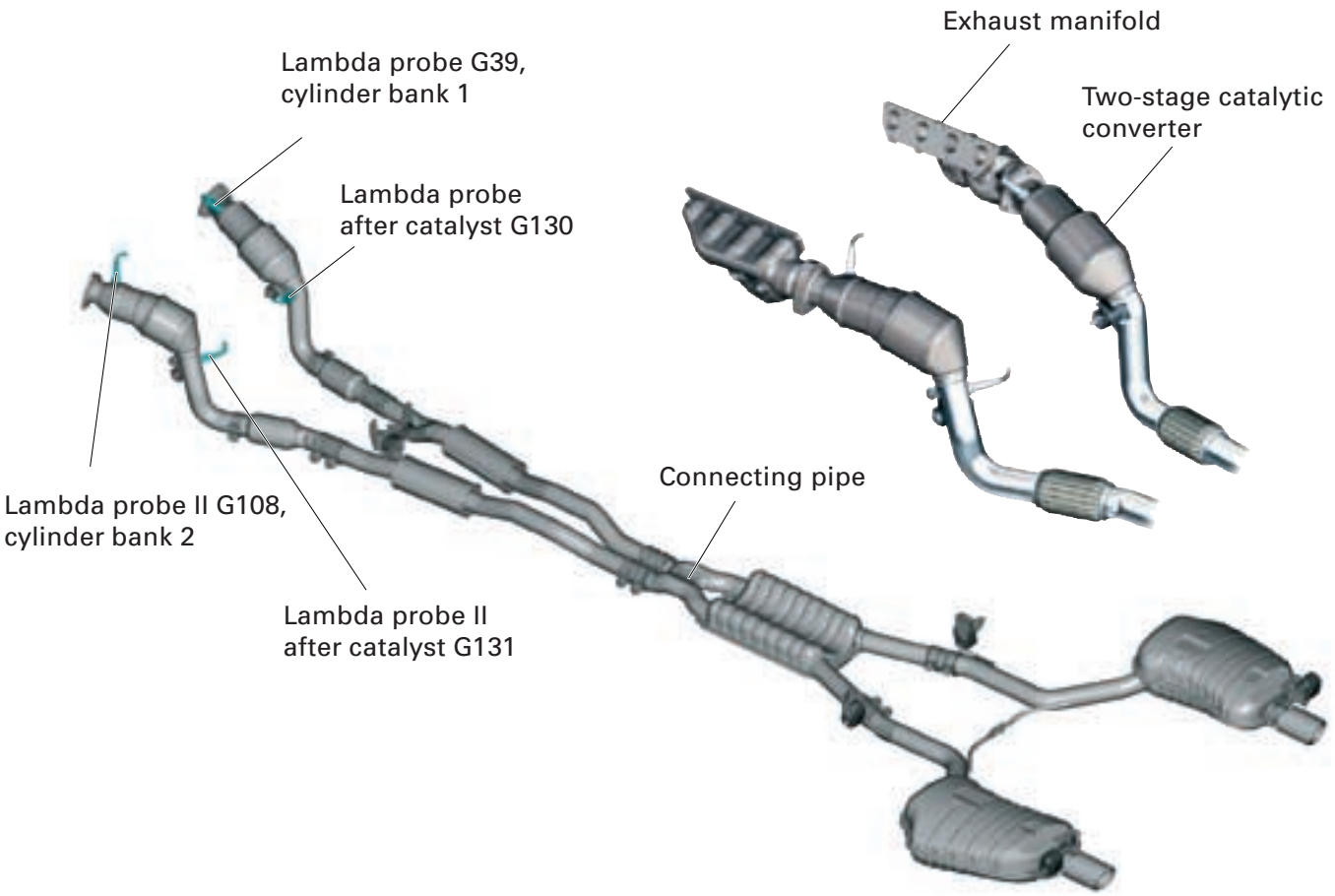
If the torque reaction support is subjected to load, the fluid can be displaced between the top and bottom section by way of a connecting pipe, the dimensions of which are such that it acts as a restrictor as of a defined frequency.

When the solenoid is deenergised, vibration causes the plastic ring with sheet metal ring and isolation diaphragm to oscillate as well. The moments are damped slightly and thus transmitted to a lesser extent to the body.

As of an engine speed of approx. > 1,100 rpm and a vehicle speed of > 5 km/h, the solenoid is energised and attracts the sheet metal ring together with the plastic ring.

This restricts the movement of the isolation diaphragm, which can then only vibrate slightly. In this case there is a high level of vibration damping and the torque reaction support is "hard".

Exhaust system



SSP282_028

With the 4.2 l and 3.7 l engines, the exhaust system is of the dual-flow type.
It consists of two underbonnet catalytic converters, two flexible decoupling elements, two reflection-type front silencers, an absorption-type centre silencer and two reflection-type rear silencers with visible tail pipes. The catalytic converters are of the two-stage type and fitted with a ceramic monolith.

Thin-walled ceramic monoliths are used to improve cold starting behaviour.
On environmental grounds, the centre silencer is fitted with long-fibre glass wool instead of basalt wool.
A connecting pipe is located directly upstream of the centre silencer.
This forms the joint between the two exhaust pipes required for acoustic reasons.

Fuel tank

The fuel tank capacity is approximately 90 litres.
The basic unit consists of two plasma-welded stainless steel shells. There are no differences between petrol and diesel engine versions.

The filler neck is a single piece and welded to the basic unit. For reasons of crash safety, the centre section of the filler neck takes the form of a corrugated tube.

In crash situations, this section is subject to defined deformation to prevent cracks and fuel spillage.

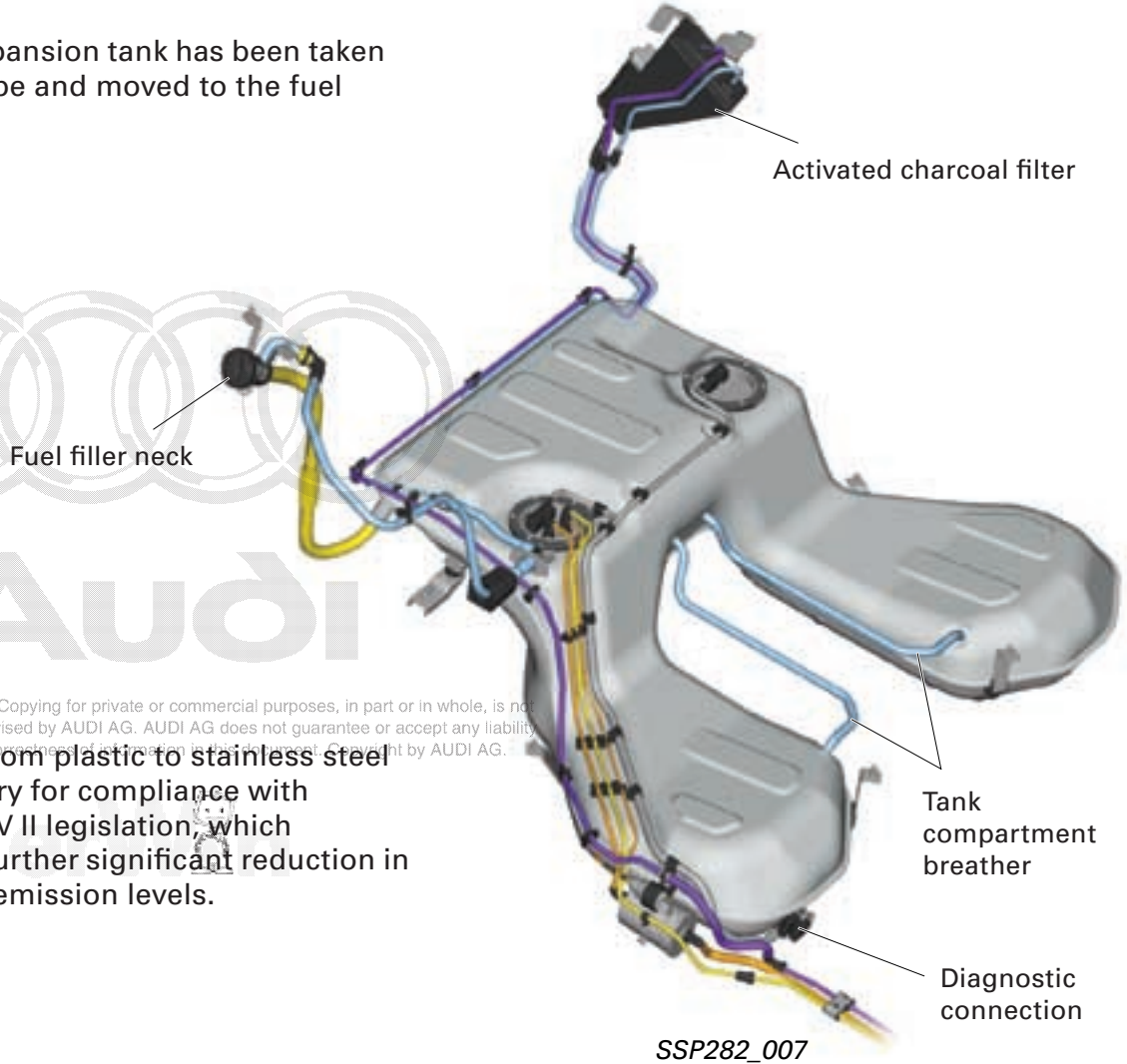
To create the best possible ergonomic conditions for the rear passengers in combination with maximum luggage compartment volume, the two tank compartments are shallower than in the predecessor model.

The additional expansion tank has been taken out of the filler pipe and moved to the fuel tank.

The tubing system for the tank breather at the filler pipe has been considerably simplified as compared to the predecessor model. With the exception of diesel vehicles, the pipe connections have been converted to quick-release couplings.

A new feature is the use of a 2-stage delivery pump for each tank chamber in separate reservoirs.

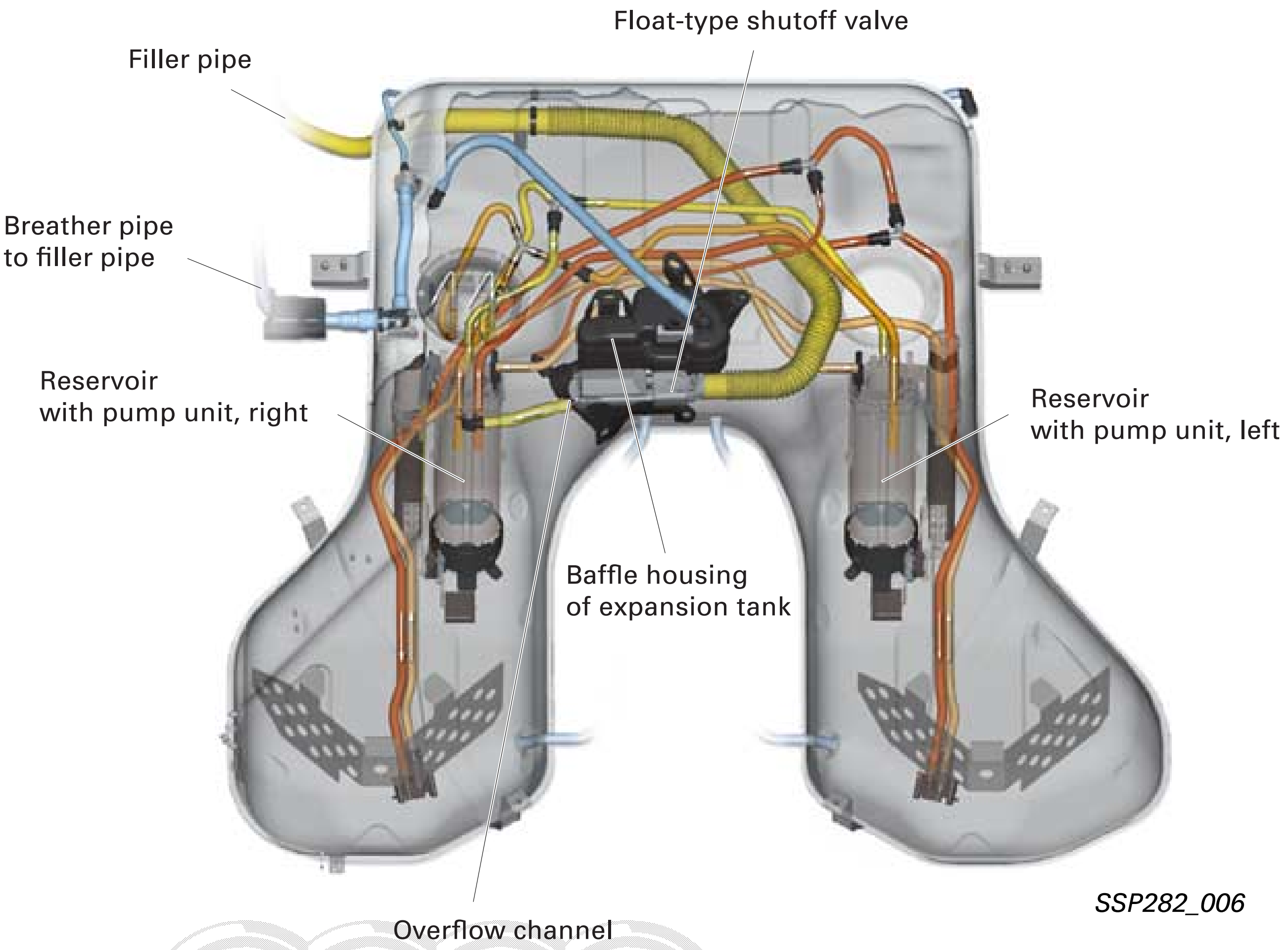
The fuel level is measured by two immersion tube senders combined with two angle senders.



SSP282_007

The switch from plastic to stainless steel was necessary for compliance with American LEV II legislation, which demands a further significant reduction in permissible emission levels.

Interior of fuel tank (filling)



SSP282_006

The fuel is conveyed via the filler pipe into the right tank chamber (as viewed in direction of travel). The fuel passes via an additional overflow channel at the end of the filler pipe predominantly into the right pump reservoir.

Use of the small overflow channel ensures that even small quantities of fuel (e.g. filling from canister) pass directly into the pump reservoir.

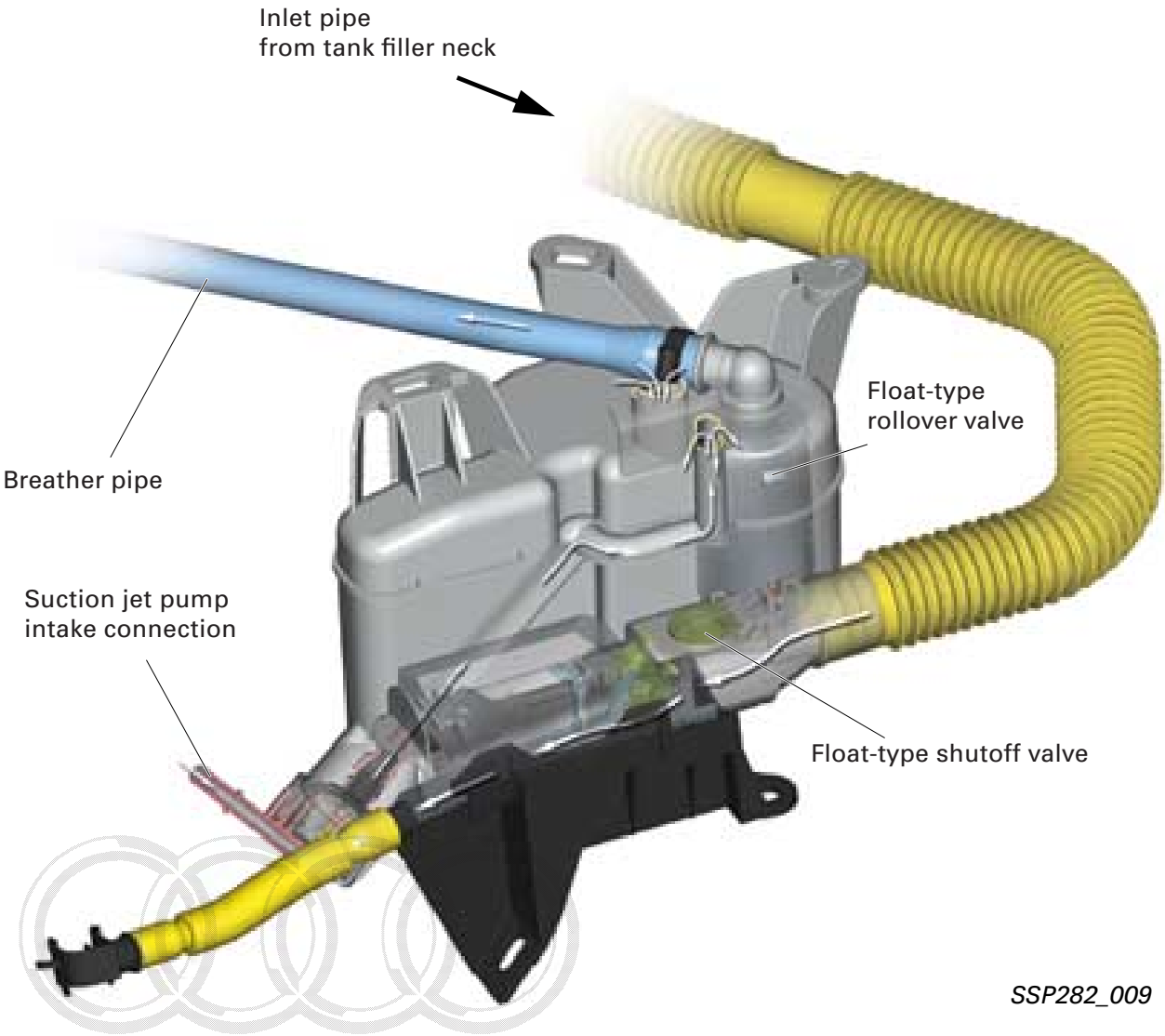
The breather function for the side compartments is provided by two breather pipes to the main chamber.

Routing the filler pipe beneath the longitudinal member means that the lowest point of the pipe is not at the connection to the fuel tank, thus producing a siphon effect.

A residual quantity of fuel remains in the filler pipe. This necessitates a separate pipe to the filler neck for the main chamber breather function and for OBD II leakage diagnosis.

When the tank is full, the filler hose is closed by a float-type shutoff valve at the end of the filler pipe.

Expansion tank



SSP282_009

The expansion tank (capacity approx. 2 litres) consists of a plastic housing clipped to the upper shell of the tank.

The internal expansion tank houses a float-type rollover valve and a small suction jet pump which constantly pumps the tank empty whilst driving.

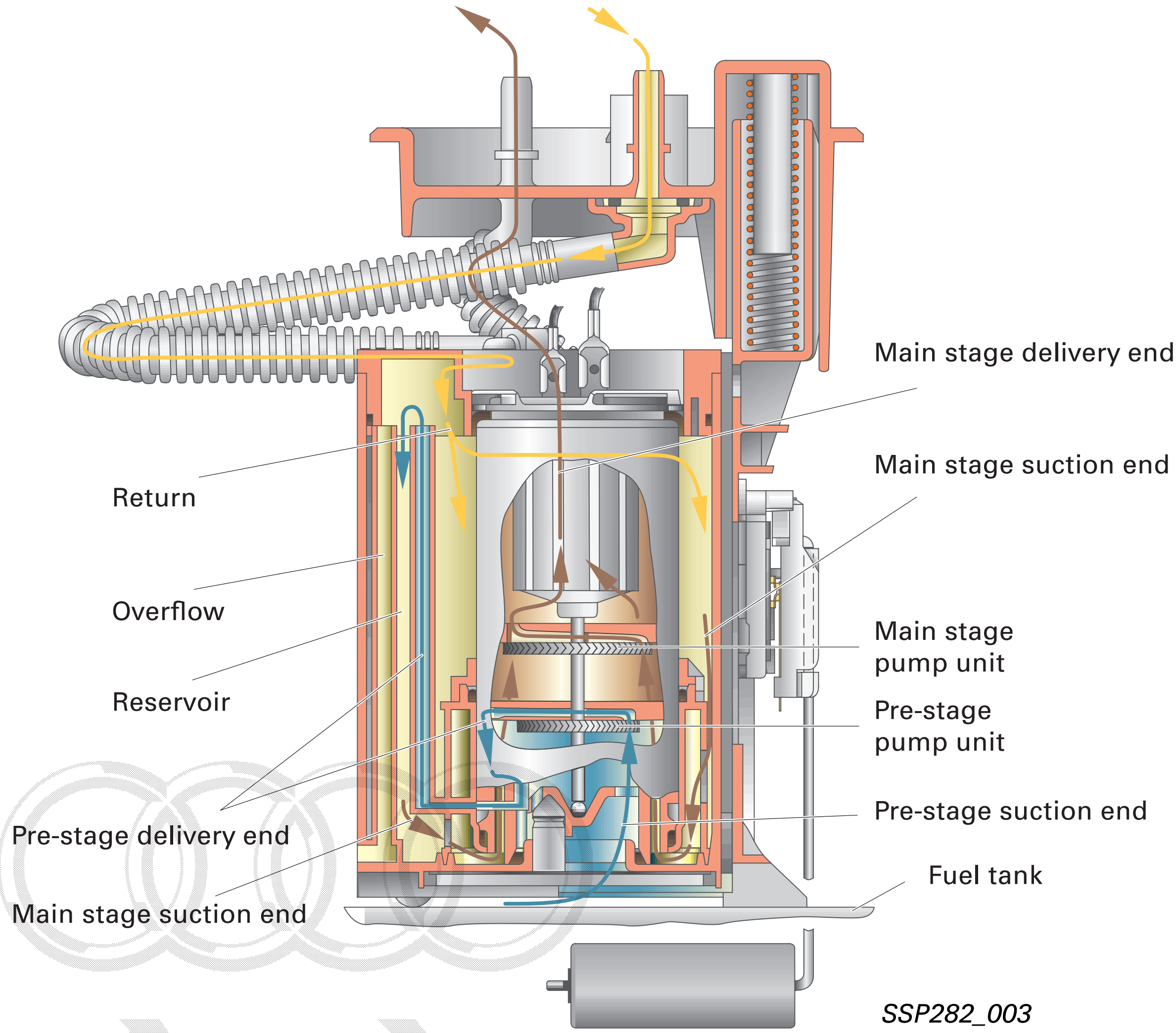
Function

The main functions of the float-type rollover valve are as follows:

- Closing-off of pipe to filler neck in the event of rollover
- Closing in dynamic driving mode
- Closing by rising of float in valve in the event of a brief excess of fuel in the tank due to sloshing

Closing-off of the pipe to the activated charcoal filter stops fuel overflowing into it.

Two-stage fuel pumps



SSP282_003

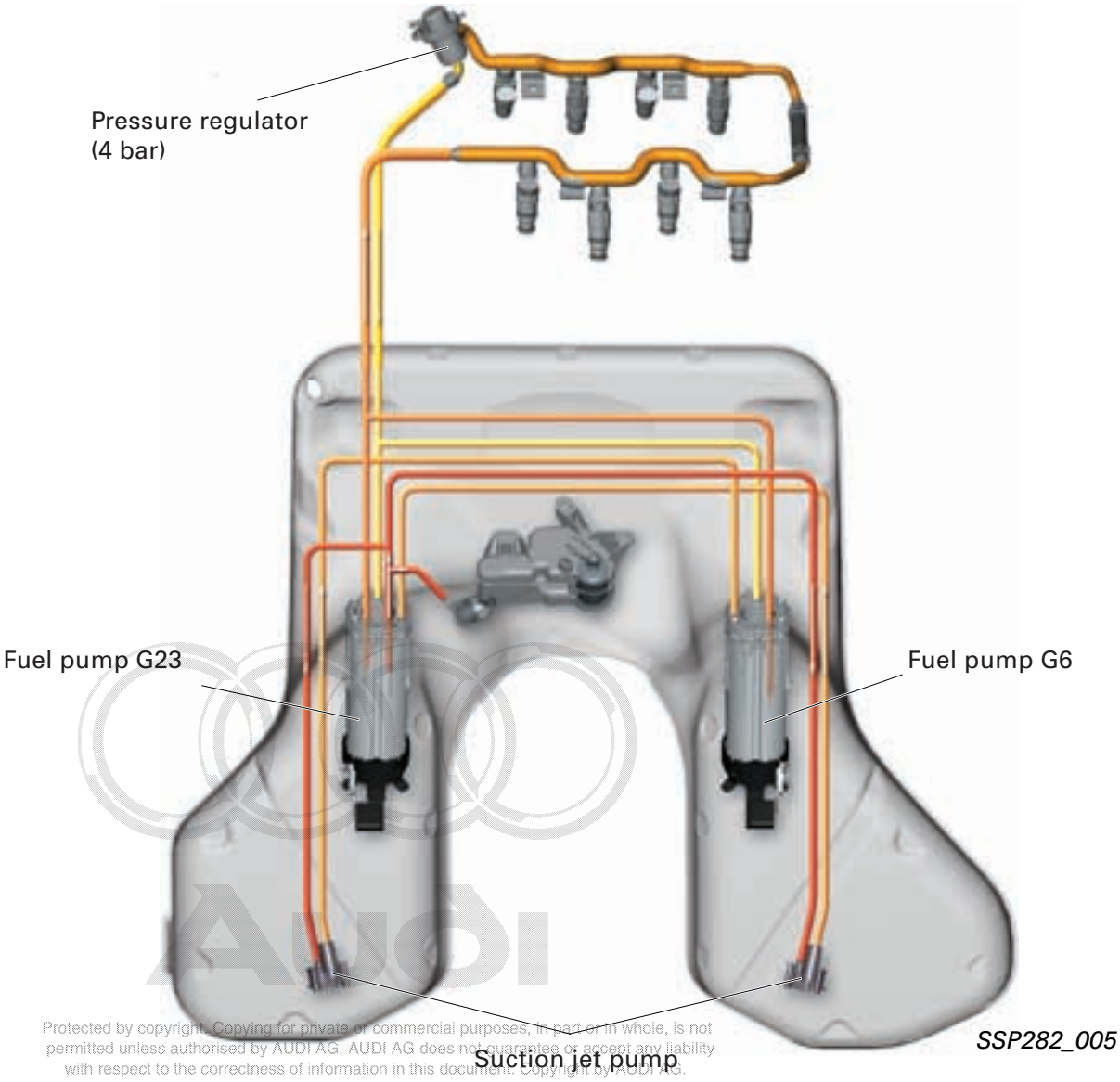
The two fuel pumps (petrol engine) are of the two-stage flow type.

The first stage (pre-stage) pump unit draws in fuel from the bottom of the tank and conveys it into the reservoir. This ensures that even small residual quantities can be transported. The second stage (main stage) pump unit draws in fuel directly from the reservoir.

The reservoirs with pumps and immersion tube senders rest on and are clipped to the bottom of the tank. Flanged covers provide access to the components.

Single-stage pumps are used for diesel engines (Common Rail). On account of the higher viscosity of diesel fuel, pre-delivery (extraction from bottom of tank) is not implemented by way of separate pump units, but rather by suction jet pumps.

Fuel system (hydraulics)



When the ignition is switched on (terminal 15), the fuel pump G23 conveys a maximum volume to the pressure regulator at the fuel rail to achieve short starting times.
The pump G6 also conveys fuel to the pressure regulator and additionally into the pipes for the two suction jet pumps in the side tank compartments.

The suction jet pumps convey the fuel from the side compartments "diagonally" into the pump reservoirs.

Such pipe routing prevents dry running of a pump in critical driving situations such as cornering or if the vehicle is at an extreme angle.
The return pipe is shared by both reservoirs.

If one reservoir is full, the pipe is closed by a non-return valve and the entire return volume runs into the second reservoir.

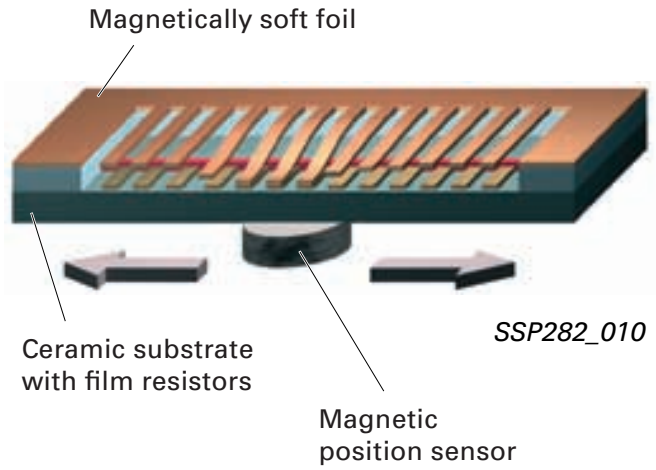
If both reservoirs are full, the non-return valves are overridden and the fuel runs into the tank.

Tank senders

The fuel level is sensed by two immersion tube senders and two angle senders. A new feature is the design of the angle sender, which is equipped with a magnetically passive position sensor.

The ceramic substrate is provided with 51 series-connected film resistors with individual pick-off. Fitted with a small clearance on top of this is a magnetically soft foil with the same number of spring contacts. The magnetic position sensor beneath the ceramic substrate pulls the spring contacts onto the pick-offs.
The electrical output signal varies proportionally as a function of the position of the magnet.

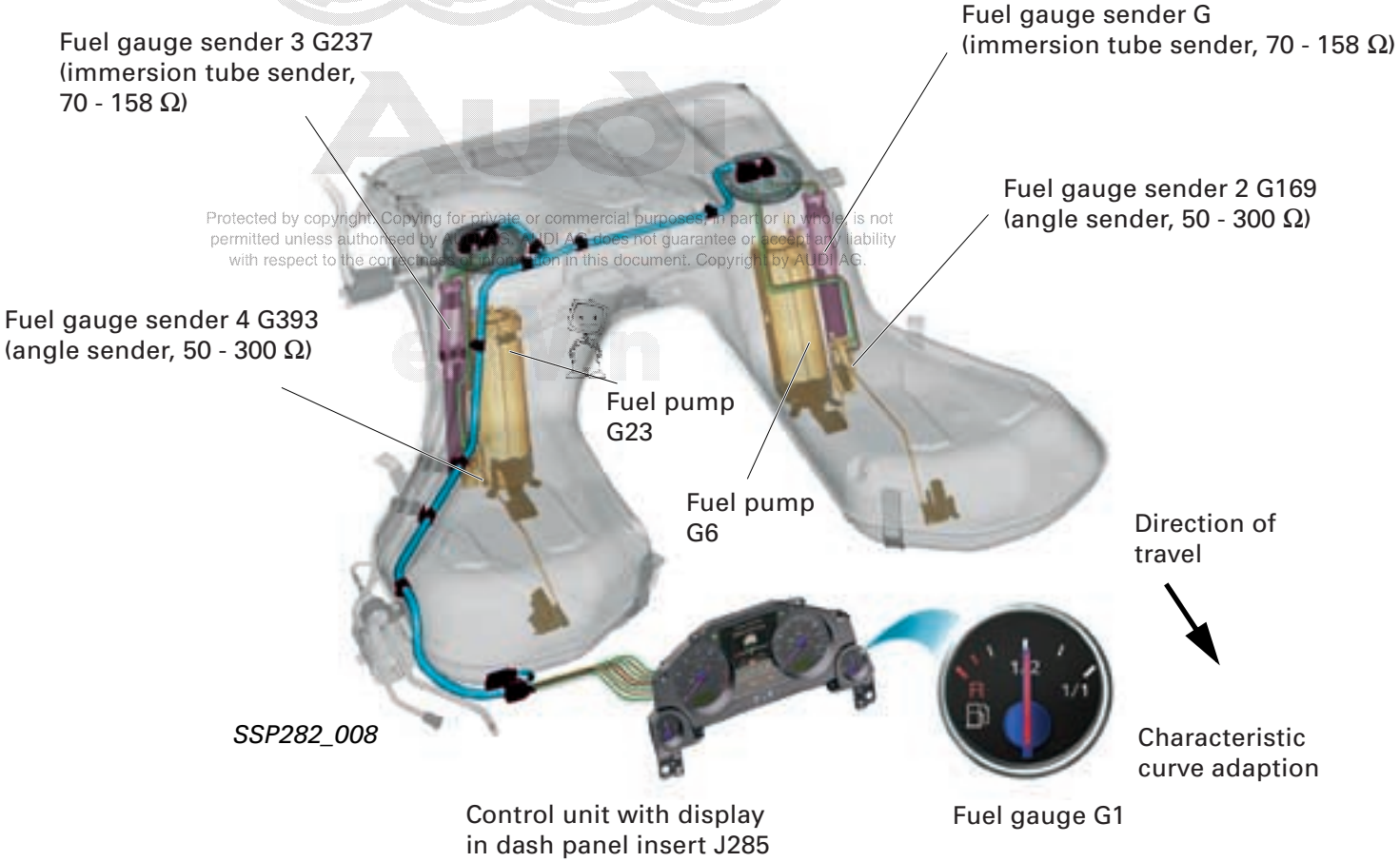
Thanks to the magnetic coupling it was possible to provide a hermetic seal for the measurement system.



SSP282_010

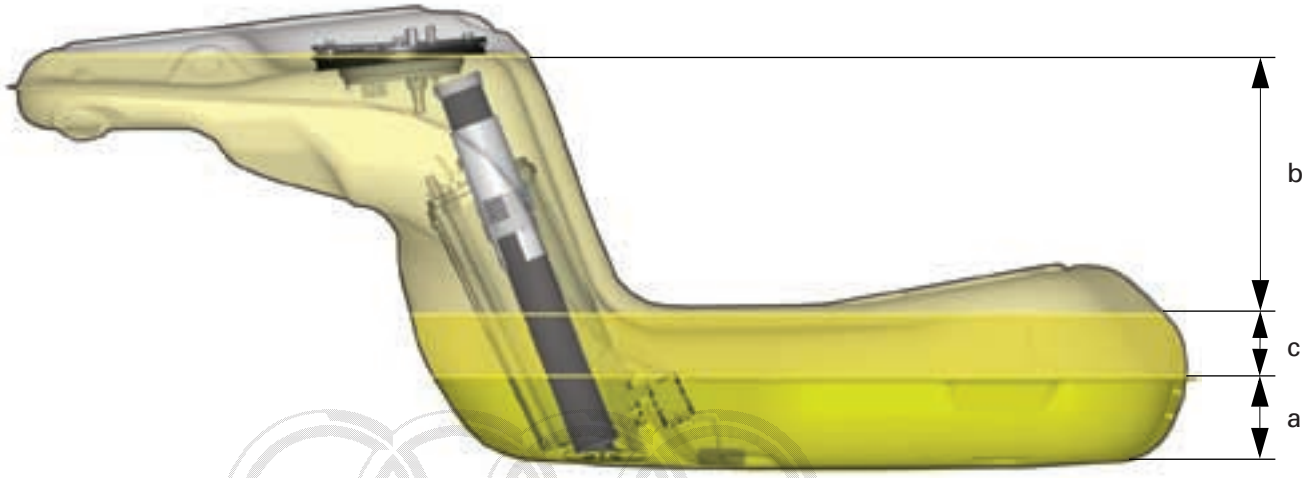
Advantages:

- Longer service life thanks to noncontacting measurement system
- Protection against dirt and deposits
- Low contact currents



SSP282_008

Determining fuel level



SSP282_004

The fuel level is determined by way of a logical system of immersion tube and angle sender signals.

a - Low levels are determined exclusively by way of the angle sender measured values

b - High levels are determined exclusively by way of the immersion tube sender measured values.

c - Medium levels are determined by a combination of all sender signals

The sender signals are evaluated by the dash panel insert. All senders are connected in parallel.

The wires are bunched beneath the fuel tank, thus enabling resistance measurements to be taken without the need for further dismantling.

Automatically controlled starting

The automatic start control is integrated into the engine control unit.

A new feature is that starter control is no longer implemented by way of the ignition/ starter switch D (switching of terminal 50), but rather it is performed automatically by the engine control unit.

Release for starter actuation is always transmitted by the entry and start authorisation control unit J518 to the engine control unit J623.

In addition to general release by the immobilizer, the following start release conditions also have to be satisfied:

- Start signal from entry and start authorisation switch E415 or entry and start authorisation button E408
- [1] Clutch pedal pressed, signal from clutch pedal switch F194 (manual gearbox only)
- [1] Selector lever position P or N (automatic gearbox control unit J217)
- [2] In the event of start signal via entry and start authorisation button E408, brake must be pressed (signal from brake light switch F via separate interface)

[1] As a safeguard, P/N signal or signal from clutch pedal switch F194 must be applied to the separate interfaces of the two control units (J623 and J518).

[2] Additional safeguard, as entry and start authorisation button E408 can be actuated by front passenger.

Sequence of operations

1 Entry and start authorisation switch E415/ entry and start authorisation button E408

The driver triggers a brief start signal (min. 20 ms) by turning the ignition key to start position or by pressing the entry and start authorisation button E408.

2 Entry and start authorisation control unit J518

The entry and start authorisation control unit checks for authorisation – in the form of information on selector slide position N or P – from the automatic gearbox control unit J217 and for brake application in the case of a start signal from the entry and start authorisation button E408.

If the start prerequisites have been satisfied, the entry and start authorisation control unit J518 transmits a start request – terminal 50 ON – to the engine control unit J623.

The entry and start authorisation control unit J518 also controls the terminal 15 and terminal 75x circuits.

3 Engine control unit J623

Application of selector slide position P/N or "clutch pressed" information to the engine control unit (separate interface) causes the two starter relays J53 and J695 to be actuated simultaneously. The relays then switch terminal 50 for starter actuation. The starter operates and cranks the engine. On exceeding a defined engine speed, the engine control unit J623 recognises that the engine has started and the relays are deenergised (thus terminating starting process).

As a safeguard, two relays are connected in series. In the event of fusion welding of the make contacts (relay remains closed following deenergisation), the engine control unit J623 can thus interrupt the circuit (terminal 50) by way of the other relay in each case.

The two relays are deenergised alternately in order to ensure even make contact wear (break spark) in both relays. The deenergisation sequence alternates.

Relay operation is monitored and faults diagnosed by evaluating the alternating deenergisation with the aid of the terminal 50R interface.

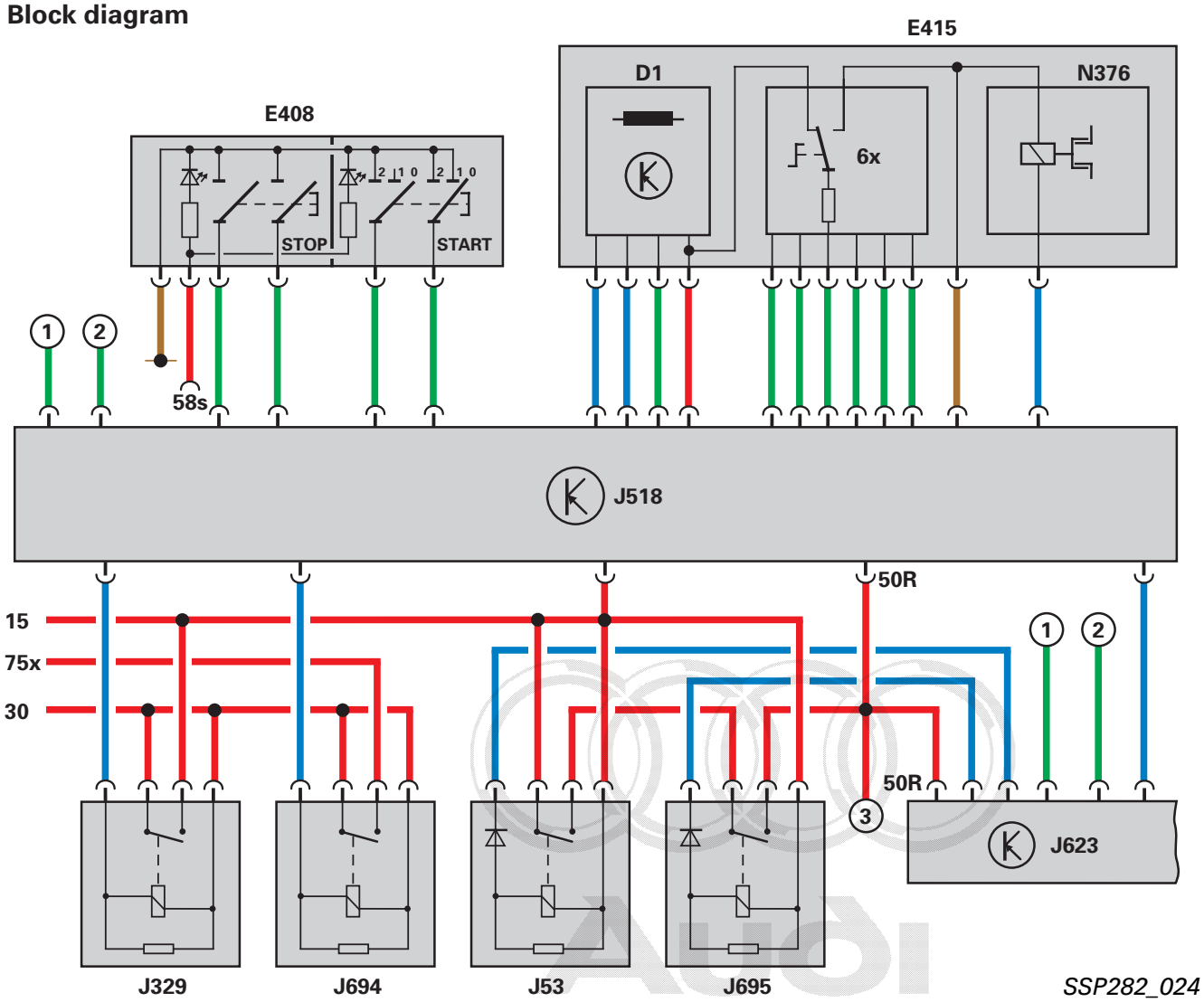
The terminal 50R interface represents a link with terminal 50 and provides the engine control unit J623 with feedback for start control/diagnosis.

Automatically controlled starting is not permitted in the event of undervoltage or a system fault.

The engine can however be started manually by way of corresponding start signal actuation.

To relieve the load on the starter and battery, the relay actuation time is limited to approx. 10 seconds per starting operation (automatic or manual starting).

Block diagram



D1 Inhibitor reading unit
E408 Entry and start authorisation button
E415 Entry and start authorisation switch
J53 Starter motor relay
J329 Terminal 15 voltage supply relay
J518 Entry and start authorisation control unit
J623 Engine control unit
J694 Terminal 75x voltage supply relay
J695 Starter relay 2
N376 Ignition key withdrawal lock magnet

Colour code

= Input signal

= Output signal

= Positive supply

= Earth

Additional signals

(1) F - Brake light switch

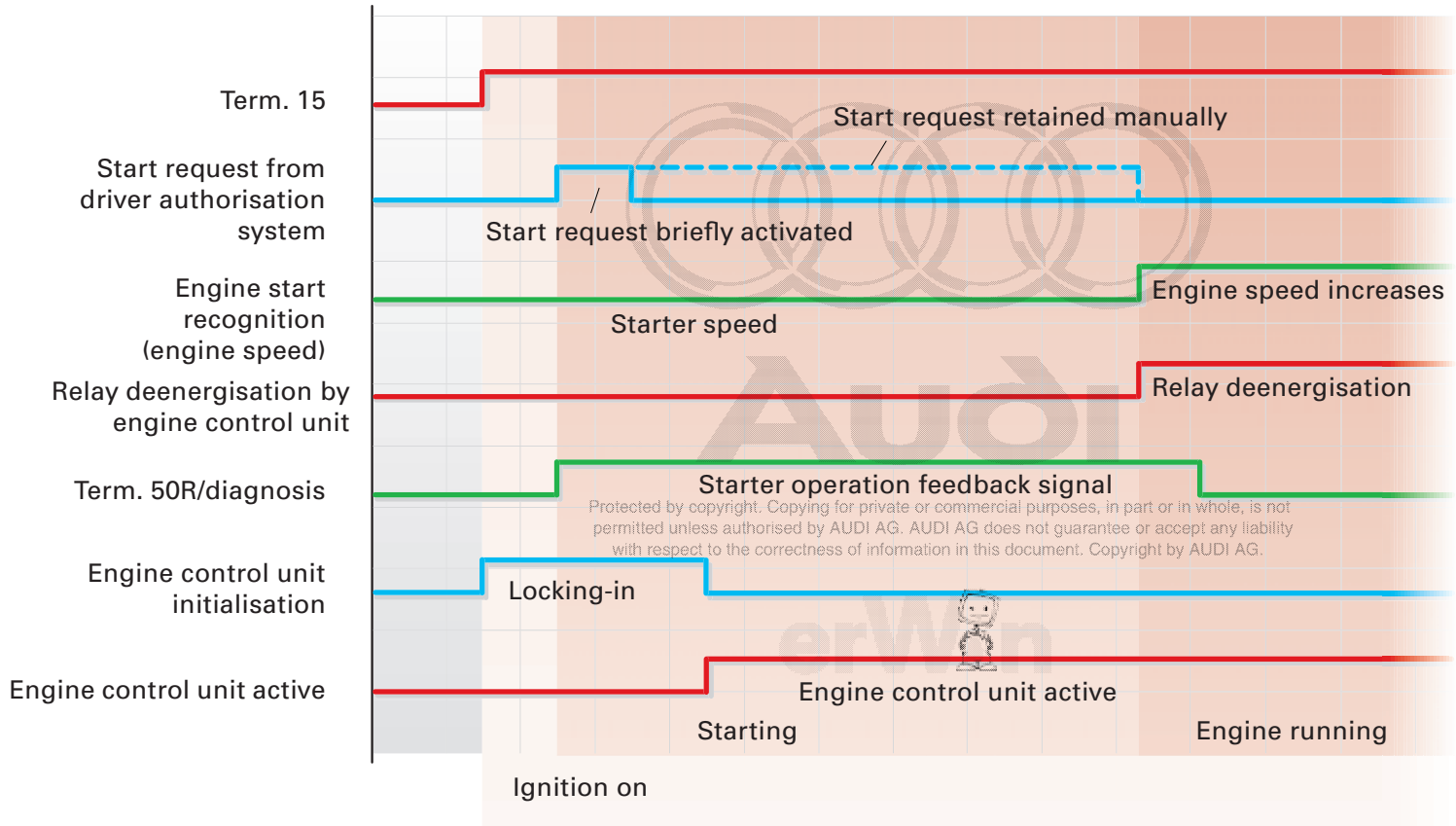
(2) Manual gearbox -> F194
Clutch pedal switch
Automatic gearbox -> Selector lever position from automatic gearbox control unit J217

(3) Terminal 50/starter

Explanatory notes on internal control unit sequence chart

Request for starting (terminal 50 ON from entry and start authorisation control unit J518) energises the two relays. Locking-in takes place during the initialisation phase of engine control unit J623.

After initialisation, the engine control unit assumes further starter control tasks as described under item 3.



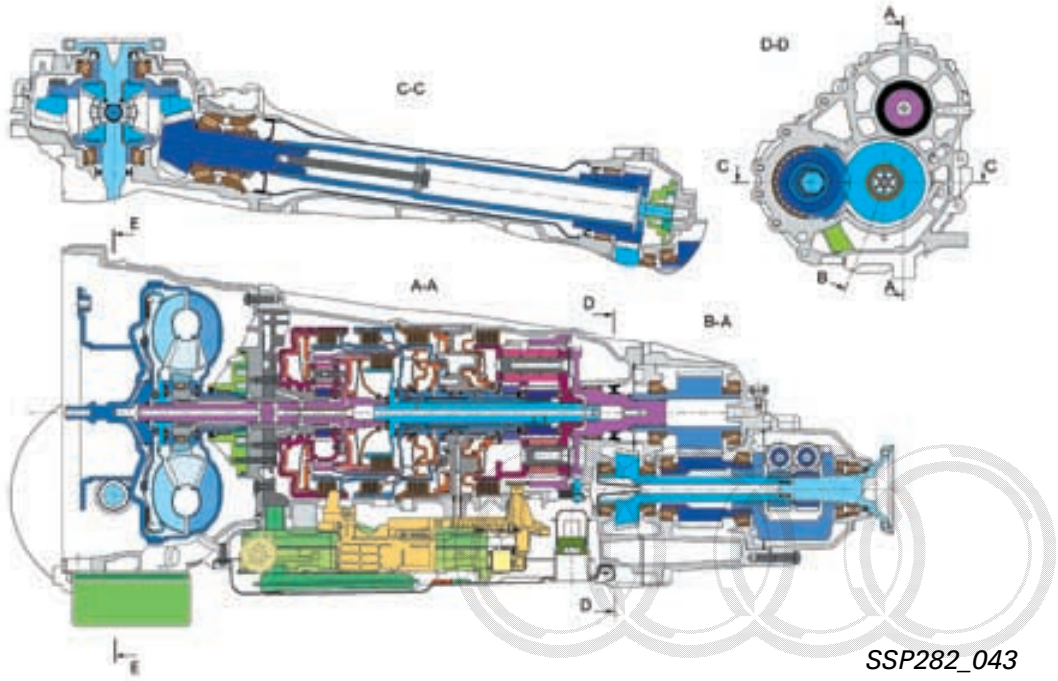
SSP282_064

To satisfy high comfort requirements, the Audi A8 ´03 features a new 6-speed automatic gearbox capable of handling a high engine torque of max. 600 Nm.

Two different versions are available:

– 420 Nm for the V8 5V 4.2 l or 3.7 l engine and
– 600 Nm for the V8 TDI 4.0 l or 6.0 l W12 engine

Design and operation of the 09E gearbox are described in SSP 283 (Part 1) and SSP 284 (Part 2).



SSP282_043

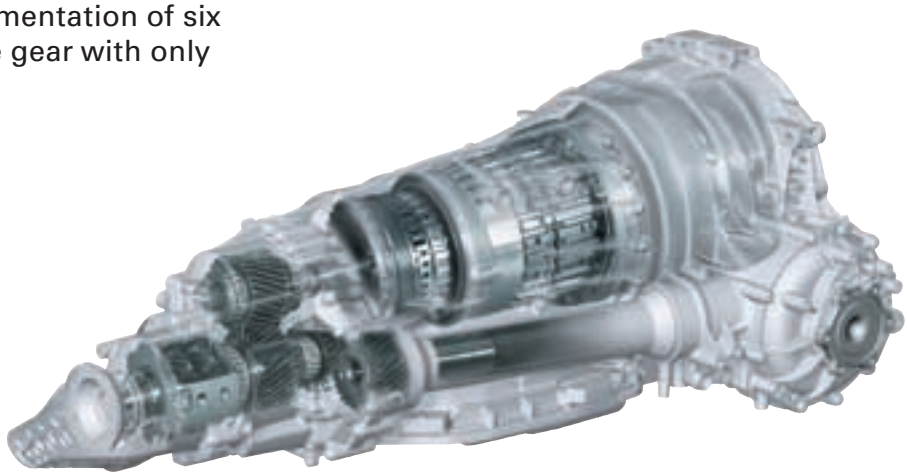
Technical data

Designation:	09E
Factory designation:	AL 600-6Q
ZF designation:	6HP-26 A61
Type:	6-speed planetary gearbox, featuring electro-hydraulic control with hydrodynamic torque converter and slip-controlled lock-up clutch
Control:	Via mechatronic system (integration of hydraulic control unit and electronic control to form one unit)
Max. torque transmission:	420 Nm for V8 5V 4.2 l /3.7 l engine 600 Nm for V8 TDI 4.0 l /W12 6.0 l engine
Front/rear axle torque distribution:	50/50
Gear oil capacity (total):	10.4 litres ATF
Gear oil capacity (replacement):	10 litres ATF
Total weight:	approx. 138 kg (420 Nm version) approx. 142 kg (600 Nm version)

Gearbox

Highlights of automatic gearbox 09E (AL 600-6Q)

The 6-speed planetary gearbox is based on the Lepelletier principle.
This concept is characterised by harmonic gear ratio steps and the implementation of six forward gears and one reverse gear with only five selector elements.



SSP282_044

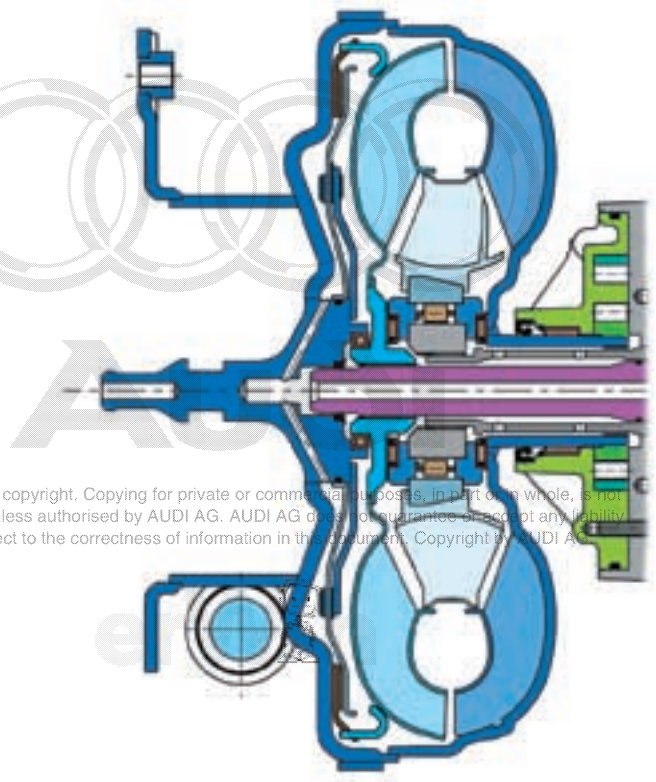
Use is made in this gearbox of a new internal gear oil pump featuring a lower delivery volume and reduced leakage.

In addition, it was possible to achieve optimisation of the oil supply with lower leakage rates in the hydraulic control system.

The "stationary disconnection" function reduces engine output when the vehicle is stopped with a gear engaged by interrupting power transmission.

A particularly noteworthy feature of the 09E automatic gearbox is the relocation of the front-axle differential (flange shaft) to in front of the torque converter.

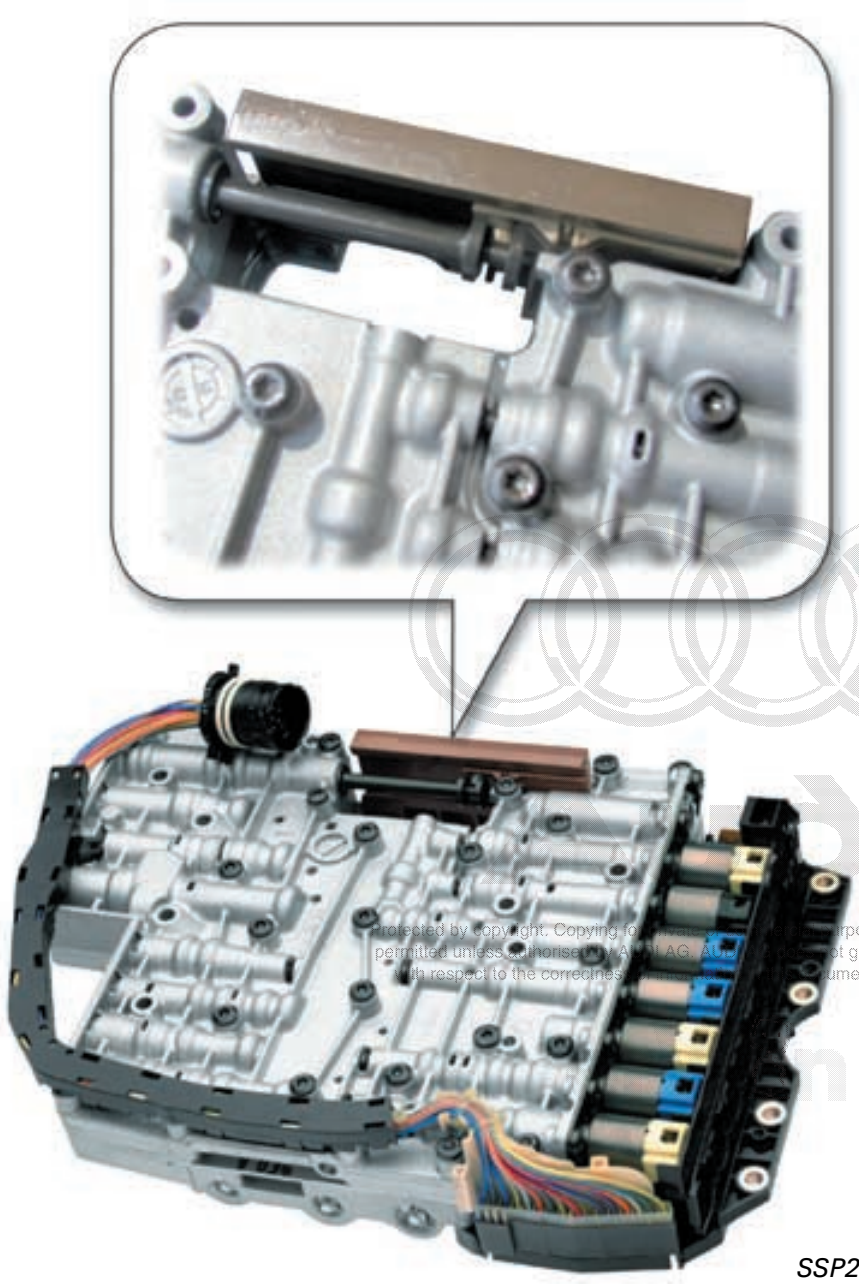
The distance between flange shaft and engine flange is now only 61 mm (01L = 164 mm).



SSP282_045

The mechatronic system integrated into the gearbox housing is a new development, combining the hydraulic control unit, sensors, actuators and electronic gearbox control unit in a coordinated assembly.

All data exchange with the vehicle periphery takes place via the drive system CAN, thus reducing the number of vehicle periphery interfaces to a minimum (11 pins) and at the same time enhancing operational reliability.



SSP282_046

Gearbox

In terms of the following functions, there are interesting new aspects to the shift mechanism in the new Audi A8 '03:

- Shift mechanism kinematics
- Ignition key removal lock
- Selector lever lock
- Selector lever lock emergency release
- Selector lever/lock button kinematics

Ignition key removal lock

Major modifications have been made to operation of the ignition key removal lock and selector lever lock (shiftlock). On account of the new entry and start authorisation switch E415, there is no mechanical link between the shift mechanism and ignition lock (locking cable).

Selector lever lock emergency release

This modification means that the selector lever remains locked in position "P" in the event of malfunctions or power supply failure (e.g. battery flat).
Selector lever lock emergency release is provided to enable the vehicle to be moved (e.g. towed) in such situations.

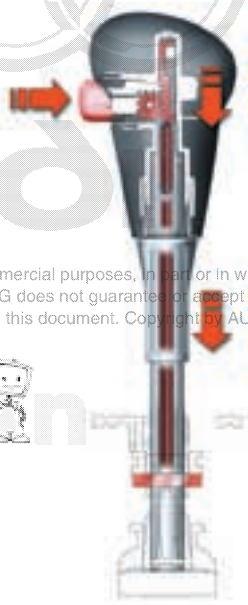
Selector lever/button kinematics

To prevent inadvertent shifting into selector lever position "S", a change has been made to the selector lever kinematics such that switching to "S" involves pressing the button in the gearstick knob.

A small gear mechanism is provided in the gearstick knob to reduce the required button operating force.

The locking rod is actuated by the application of pressure, which means changes have also been made to kinematics and gearstick knob assembly (refer to Workshop Manual).

SSP282_048



SSP282_049

Front axle

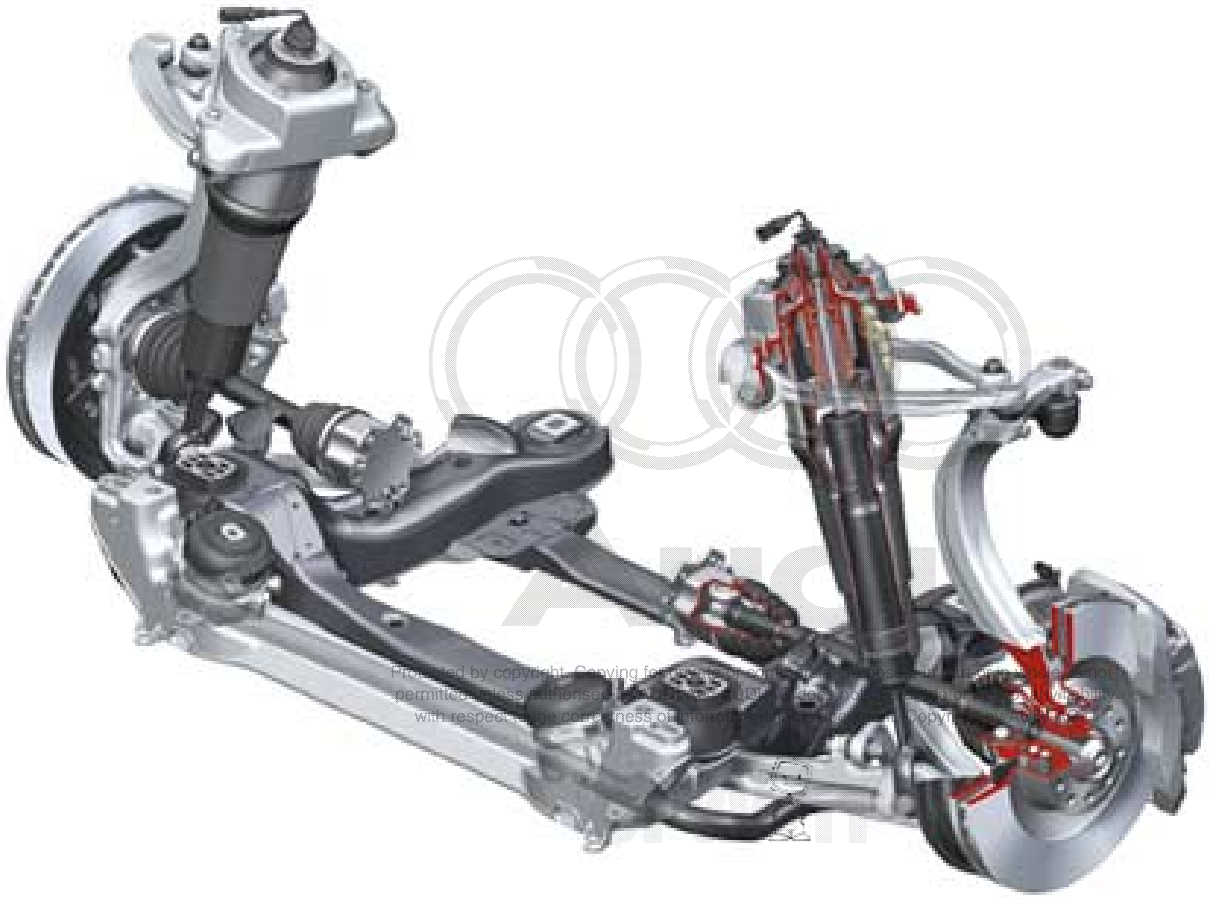
The familiar four-link front axle was retained for the Audi A8 '03.
A significant new feature is the air suspension in combination with electronically controlled dampers (refer to Section on air suspension).

All axle components are new on account of the geometric and kinematic modifications as compared to the predecessor model, the air suspension and the weight reductions achieved.

Front axle highlights

- Subframe
- Auxiliary frame
- Anti-roll bar
- Wheel bearing housing
- Wheel bearing with wheel speed sensing
- Mounting bracket for damper unit

Front axle design and operation are described in SSP 285.



SSP282_050

Rear axle

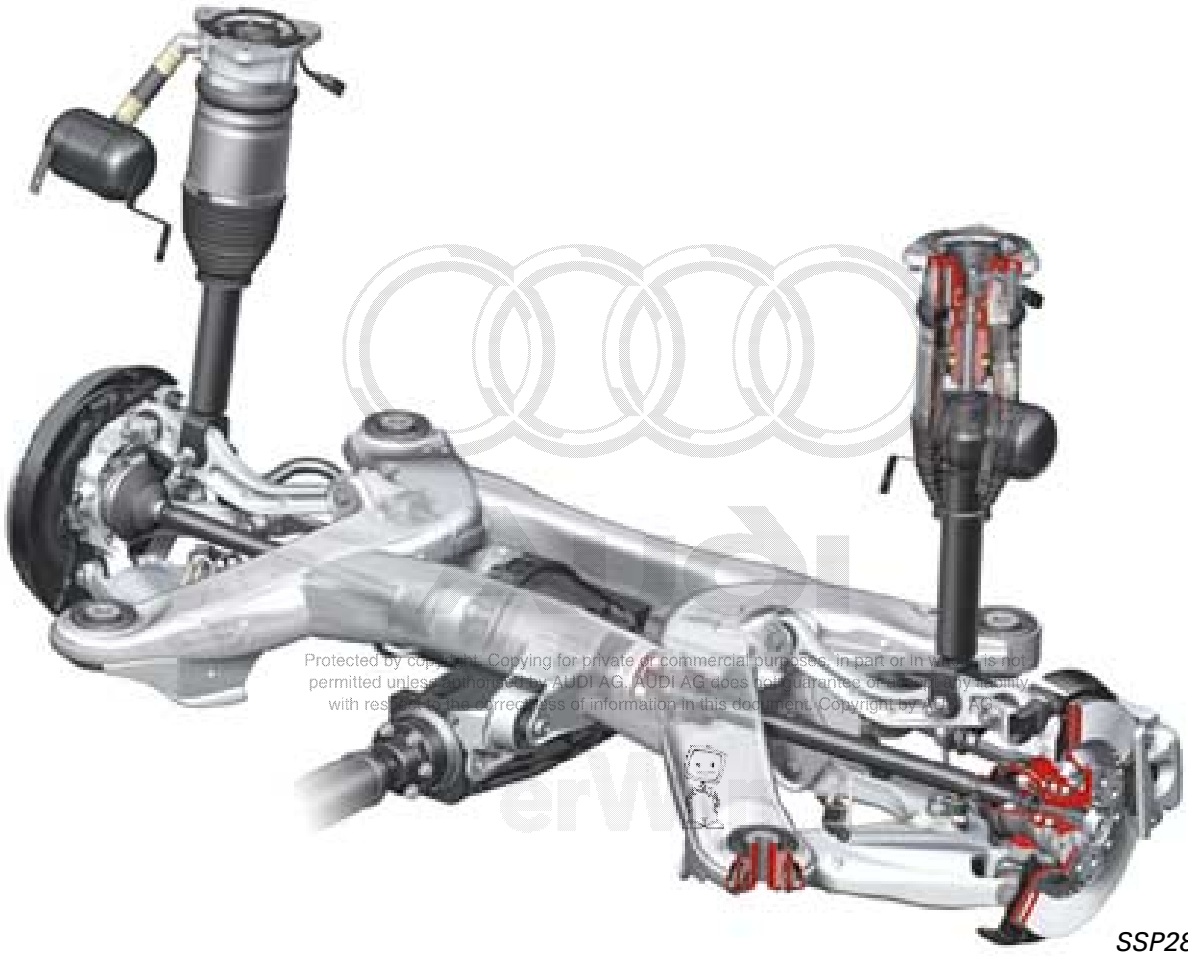
The rear axle is a more advanced version of the familiar Audi A8 trapezium-link axle.

All axle components are new on account of the geometric and kinematic modifications as compared to the predecessor model, the air suspension and the weight reductions achieved.

Rear axle highlights

- Use of air suspension in conjunction with electronically controlled damping
- Aluminium subframe to help reduce weight
- Connection of anti-roll bar to trapezium link
- Use of shorter track rod to reduce change in toe on compression and extension of suspension
- Use of ball studs to connect wheel bearing housing and track rod, thus reducing secondary spring rate
- Use of slotted bonded rubber bushes in upper transverse link and connection between trapezium link and subframe

Rear axle design and operation are described in SSP 285.



SSP282_051

4-level air suspension

The introduction of the Audi A8 ´03 is accompanied by a system featuring new technical details and functions. The major differences with respect to the familiar Audi allroad quattro® system are as follows:

EDC instead of PDC damping

The control system makes allowance for the currently applicable driving status. Wheel movement (unsprung masses) and body movement (sprung masses) are detected. Various damping characteristic curves are implemented within the scope of three selectable programs (modes) and each damper can be controlled individually.

Optimal comfort and road safety are thus always guaranteed whichever mode is set (comfort or sports).
The term "mode" thus describes a coordinated combination of adaptive suspension program and damping map.

Control concept

Integration into the MMI makes for convenient, logical and easy to remember control action.

SSP282_052

Extended range of sensors

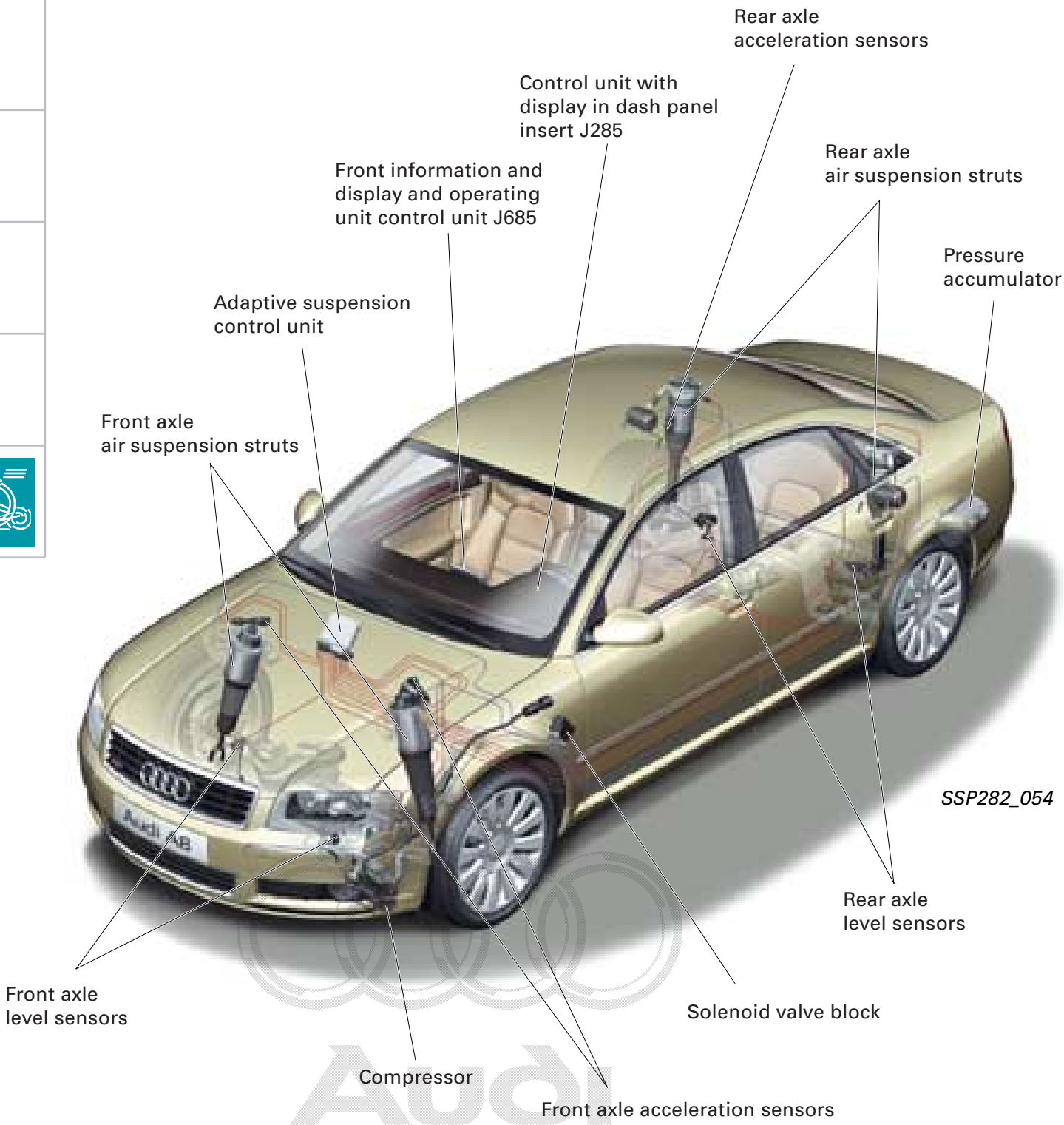
Use is made of three acceleration sensors to detect body movement.

External air springs

The air spring not only replaces the steel spring, it also offers major advantages (refer to SSP 242). The new external routing of the air spring through an aluminium cylinder permits the use of thinner-walled bellows. This results in an even more sensitive response to road surface irregularities.

SSP282_053

System layout



Design and operation of 4-level air suspension are described in SSP 292.

Electric parking brake

The brake pads are applied by way of a spindle mechanism.

Gear unit and motor are flanged to the brake caliper.

Implementation of the parking brake function involves translating the rotation of the drive motor into a very short brake piston stroke.

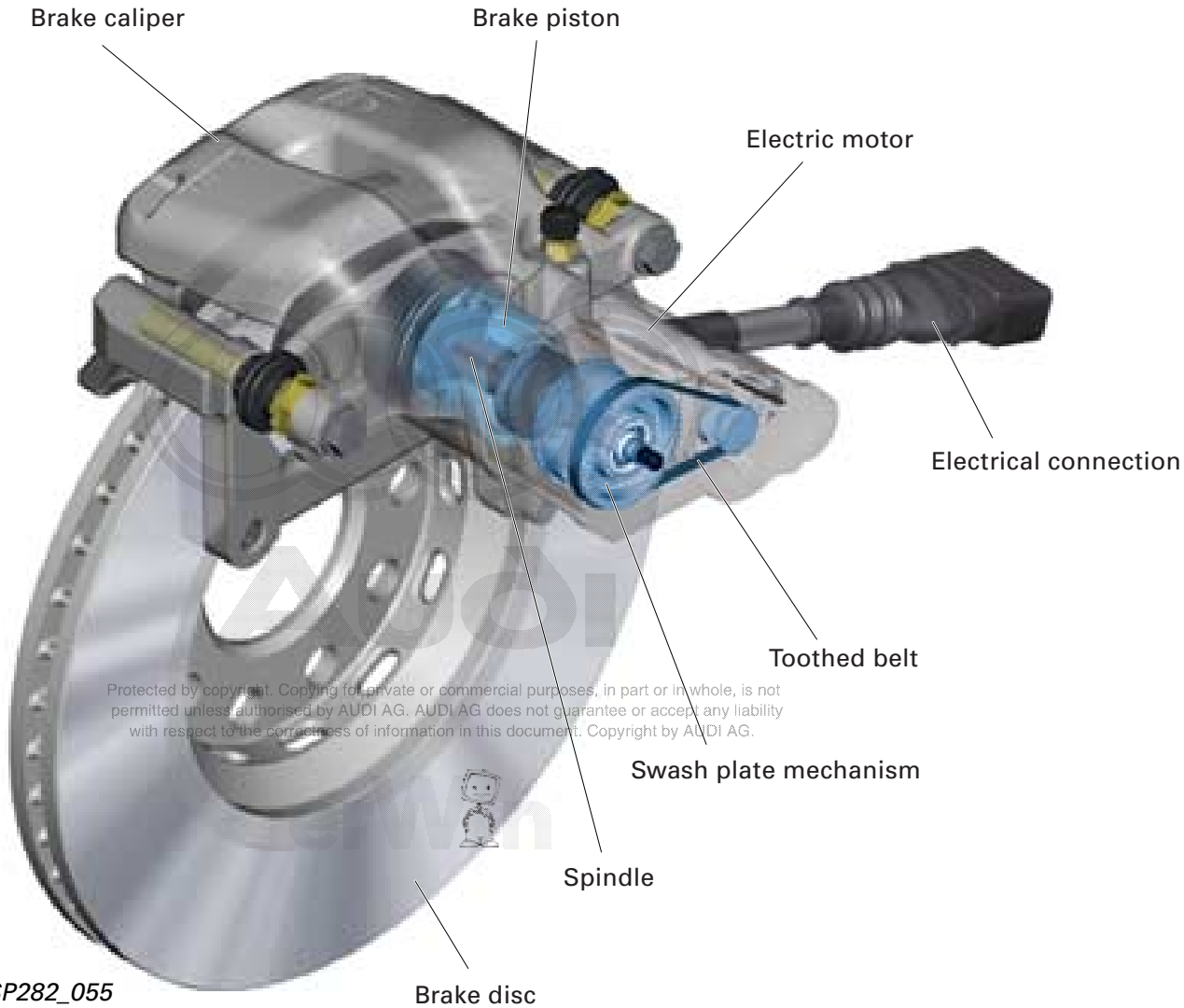
This is achieved through the use of a swash plate mechanism in combination with the spindle mechanism.

The emergency braking function is initiated via the parking brake button and transmitted to all four wheels by the brake hydraulics.

The following functions are provided by the electric parking brake:

- Parking brake function
- Emergency braking function
- Holding function when driving off on a hill
- Brake pad wear indicator

Design and operation of the electric parking brake are described in SSP 285.

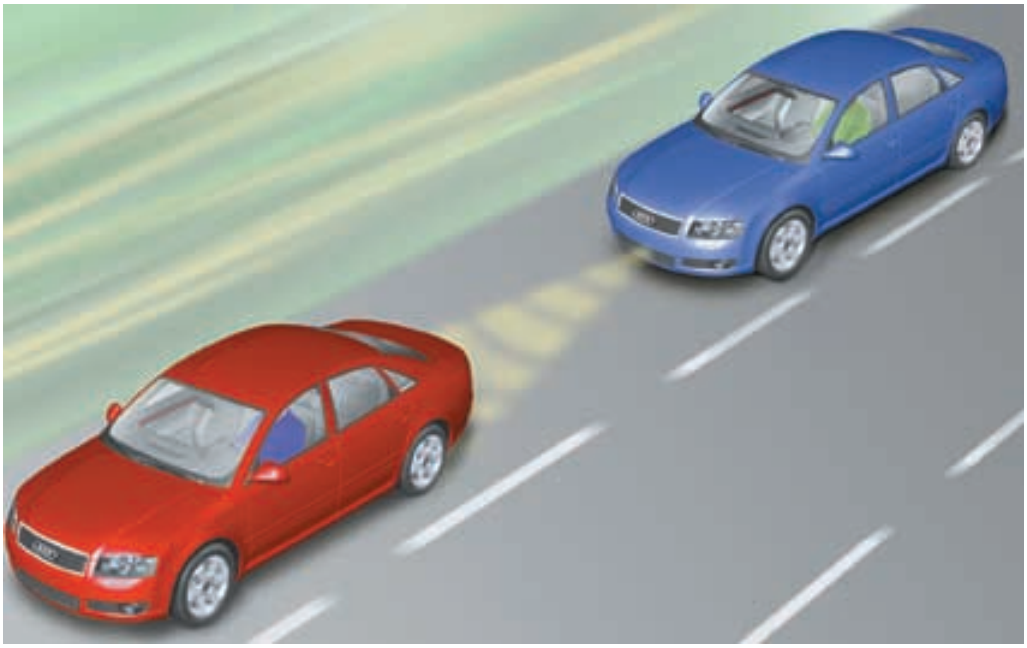


SSP282_055

ACC (Adaptive Cruise Control)

Adaptive Cruise Control is a new system designed to assist drivers and offers a much wider range of functions than the conventional Tempomat.

Driver convenience is further enhanced, as fewer accelerator and brake pedal operations are required. Speed restrictions and safety factors are reliably observed and the flow of traffic thus better regulated.



SSP282_057

Summary of Adaptive Cruise Control (ACC)

The basic Adaptive Cruise Control function is to maintain a driver-selectable distance from the vehicle in front. ACC thus represents the logical next step on from the original cruise control system.

The distance from and speed of the vehicle in front are determined by a radar sensor. If the distance is greater than desired, the vehicle is accelerated until the required speed input by the driver is achieved.

If the distance is less than desired, the vehicle is decelerated by reducing power, changing gear and if necessary applying the brakes.

In the interests of comfort, maximum possible braking is restricted to approx. 25 % of the maximum deceleration potential of the brake system (full braking).

The control action is designed to assist the driver and thus contributes to greater road safety.

In certain traffic situations, active braking by the driver may still be necessary.

ACC system limits

- ACC is designed to assist the driver and is not a safety system.
- ACC is not a fully autonomous driving system.
- ACC provides control in a speed range of 30 - 200 km/h.
- ACC does not react to stationary objects.
- Radar operation is impaired by rain, spray and slush.
- Tight bends may restrict operation on account of the limited radar detection range.

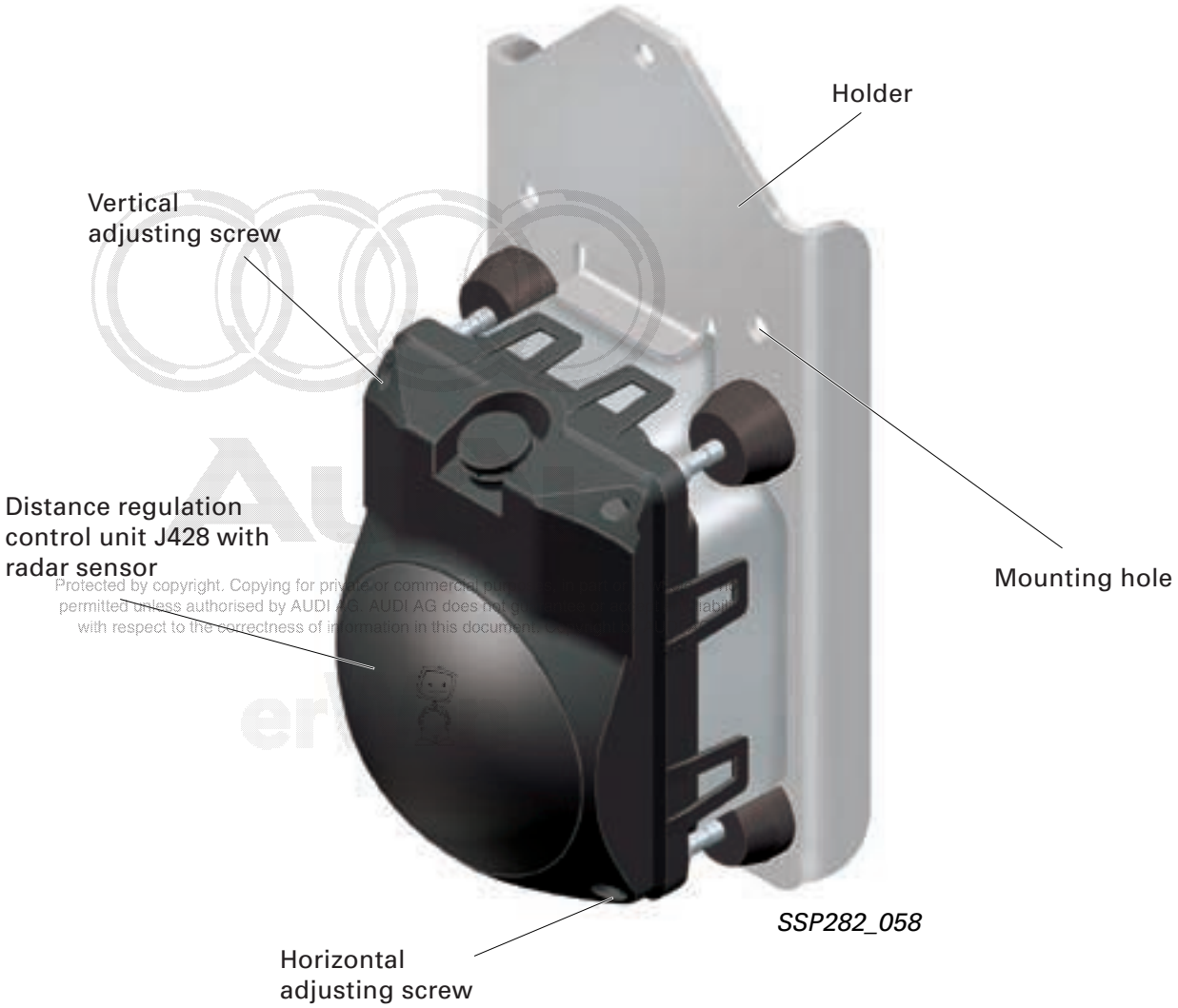
Radar sensor

An adapter plate permits fitting and adjustment at a holder bolted to the centre of the bumper bracket.

For details, refer to current Workshop Manual.

Design

Sender and control unit are integrated into one housing - the distance regulation control unit J428.
The entire assembly has to be replaced if the control unit is defective.



Setting desired speed

The desired speed is the maximum speed to be controlled by the ACC on an open road (corresponds to cruise control system function).

Pressing the SET button stores the current speed as desired speed.

SSP282_061

The set speed is displayed by a bright red LED in the speedometer rim and the "ACC active" symbol appears in the speedometer.

The "ACC active" status is indicated by faint red illumination of all LEDs in the range between 30 and 200 km/h.

SSP282_060

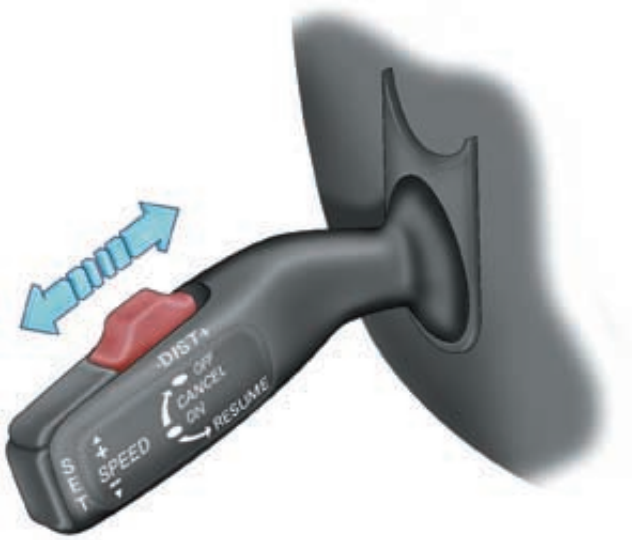
Setting desired distance

The desired distance from the vehicle in front can be set by the driver in four stages. The distance set by the ACC is governed by the respective vehicle speed. The distance increases with increasing vehicle speed.

The minimum setting ensures compliance with the permissible safety distance when travelling at a constant speed in traffic.

The desired distance from the vehicle in front is set by means of the sliding switch on the stalk. Actuation of the switch increases or reduces the distance by one stage each time.

The desired distance selected determines the vehicle acceleration dynamics.



SSP282_059

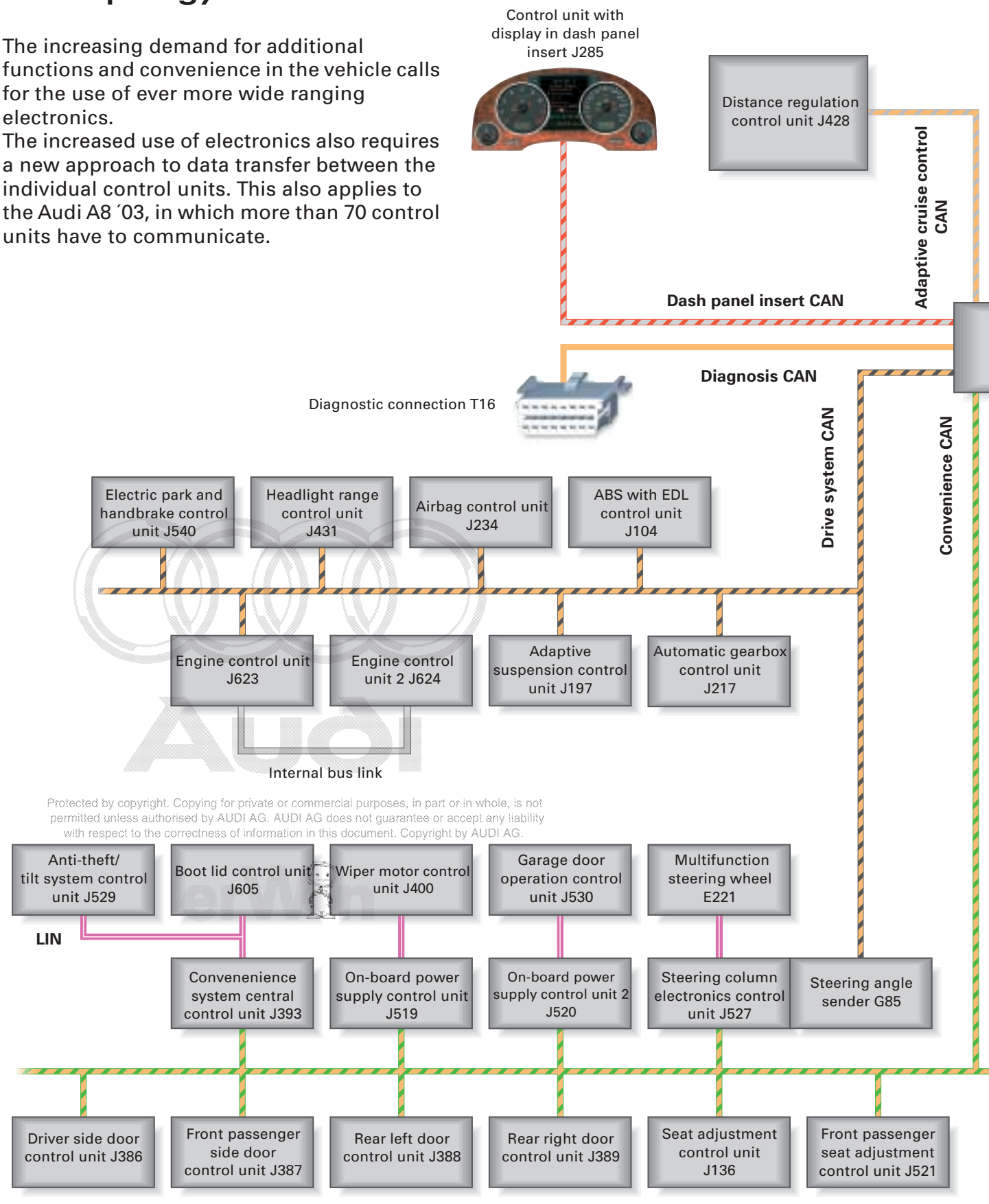
The chosen distance is briefly indicated on the info line in the speedometer centre display.
The centre display is activated the first time the button is pressed.
The number of bars between the vehicles displayed corresponds to the distance stage selected in each case.
The distance stage can be set for each driver.

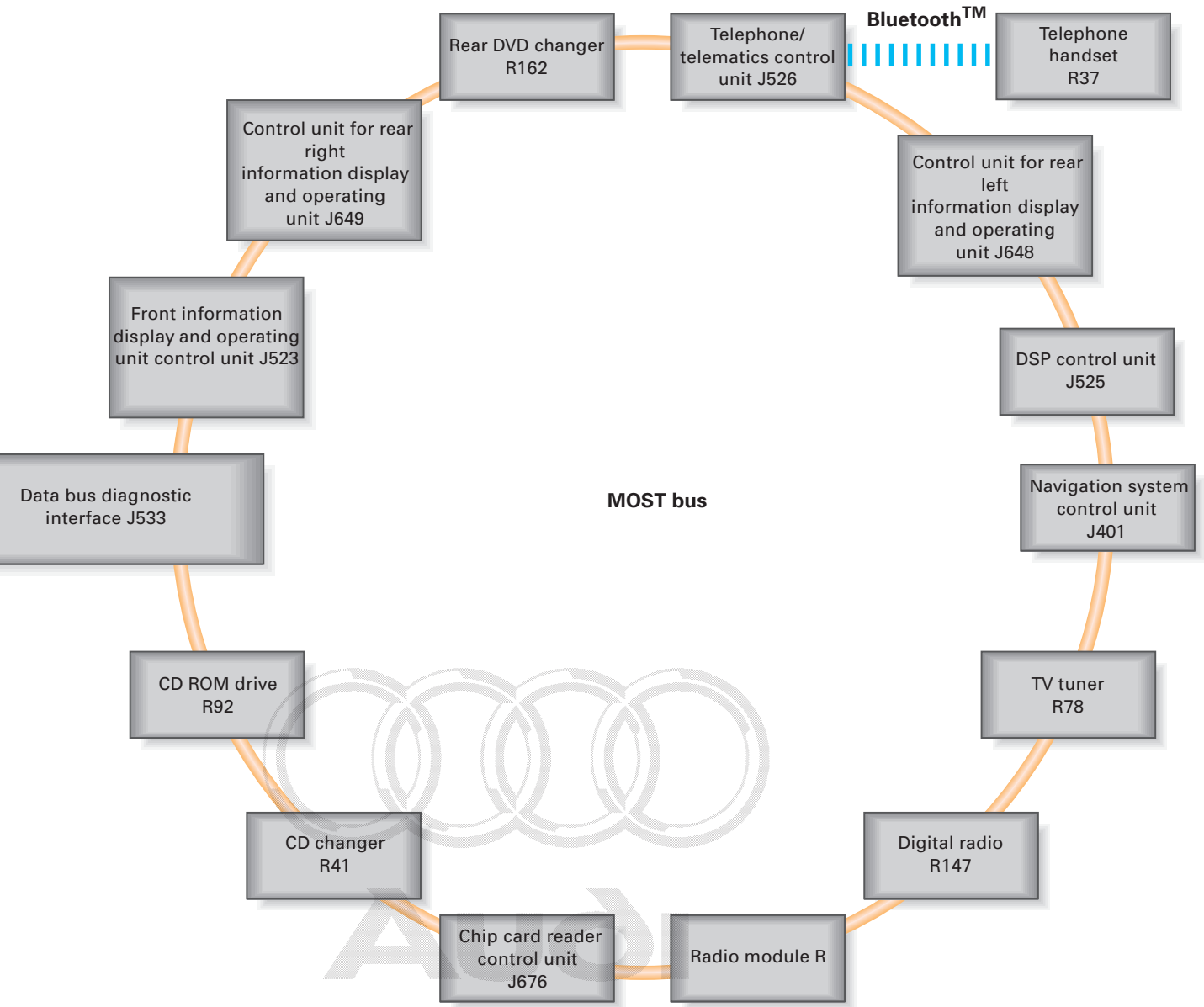
SSP282_062

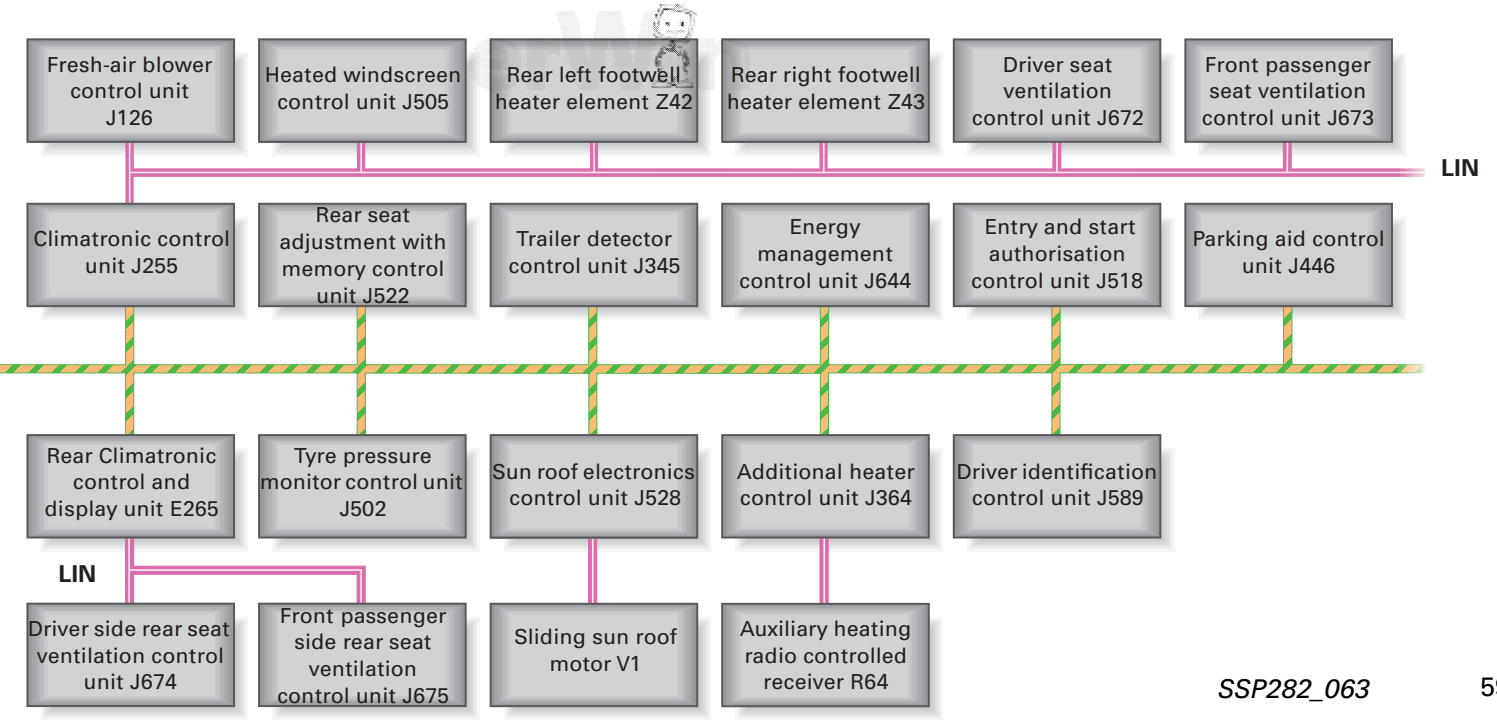
Design and operation of the ACC are described in SSP 289 – Adaptive Cruise Control.
Pay attention to operating instructions and manuals.

Bus topology

The increasing demand for additional functions and convenience in the vehicle calls for the use of ever more wide ranging electronics.
The increased use of electronics also requires a new approach to data transfer between the individual control units. This also applies to the Audi A8 ´03, in which more than 70 control units have to communicate.







Electrical System

The familiar CAN bus (two-wire bus) is supplemented by the following bus systems:

– LIN bus (single-wire data bus)
– MOST bus (optical data bus)
– Bluetooth™ (wireless data bus)

LIN bus

LIN stands for **L**ocal **I**nterconnect **N**etwork.

Local Interconnect means that all control units are located within a limited structural space (e.g. roof). This is also referred to as "local sub-system".

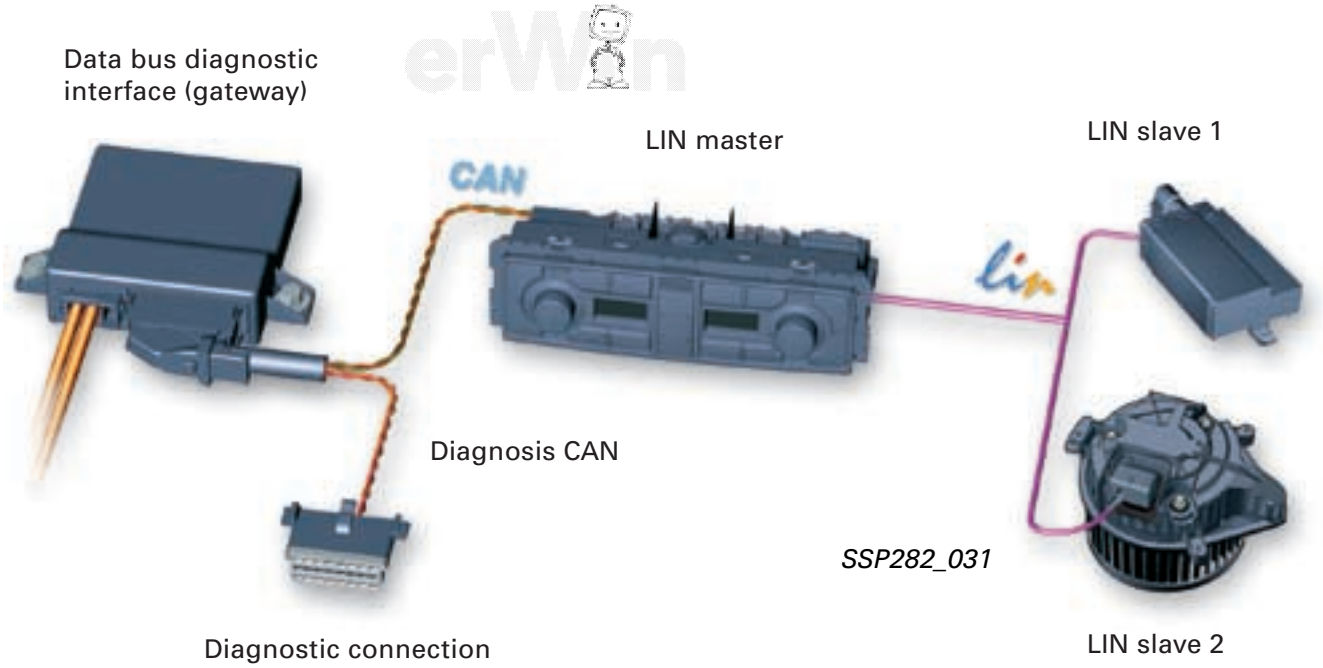
LOCAL INTERCONNECT NETWORK

Data are exchanged between the individual LIN bus systems in a vehicle by one control unit in each case using the CAN data bus.

The LIN bus system is a single-wire data bus. The wire has a basic colour (violet) and a code colour.
The wire cross-section is 0.35 mm^2. A screen is not necessary.

Design and operation of the LIN bus are described in SSP 286 – New data bus systems.

The system permits data exchange between one LIN master control unit and up to 16 LIN slave control units.



MOST bus

The term "**M**edia **O**riented **S**ystems **T**ransport" signifies a network featuring media-oriented data transport. This means that, in contrast to the CAN data bus, address-oriented messages are transmitted to a specific receiver.

Media **O**riented **S**ystems **T**ransport

This technique is used in Audi vehicles for the transfer of infotainment system data.

The infotainment system offers a wide range of modern **info**rmation and enter**tainment** media. In addition to the familiar CAN bus systems, use has been made for the first time in the Audi A8 ´03 of an optical data bus system.

The name of this data bus system is derived from "Media Oriented Systems Transport (MOST) Cooperation". This is an association formed by various motor vehicle manufacturers, their suppliers and software companies with a view to developing a standard high-speed data transfer system.

Design and operation of the MOST bus are described in SSP 286 – New data bus systems.

Bluetooth™

Bluetooth™ is an internationally standardised remote control data interface.
It permits control or monitoring of even minute units using radio waves.

The primary aim when developing this new type of interface was to create a wireless alternative to cable links, which used to be susceptible to interference and inconvenient and frequently featured incompatible connectors.

More and more manufacturers are making use of "Bluetooth™" radio wave technology for example for wireless interconnection of notebook and mobile phone accessories.

As initiator and main contributor to the development of this new transmission technology, the Swedish company Ericsson chose the name "Bluetooth".
The name originates from the Viking king Harald Blåtand II (Danish, literally meaning "Blue Tooth"), who lived around 1000 years ago in Denmark and Norway.

Design and operation of the Bluetooth™ are described in SSP 286 – New data bus systems.

Motor vehicle applications

- Wireless telephone receiver
- Wireless mobile phone
- Hands-free unit with no additional adapters
- Wireless internet access
- Access for PCs and Notepads

SSP282_037

Vehicle electrical system

A major factor in terms of vehicle reliability is one which is never even seen: the electrical system.

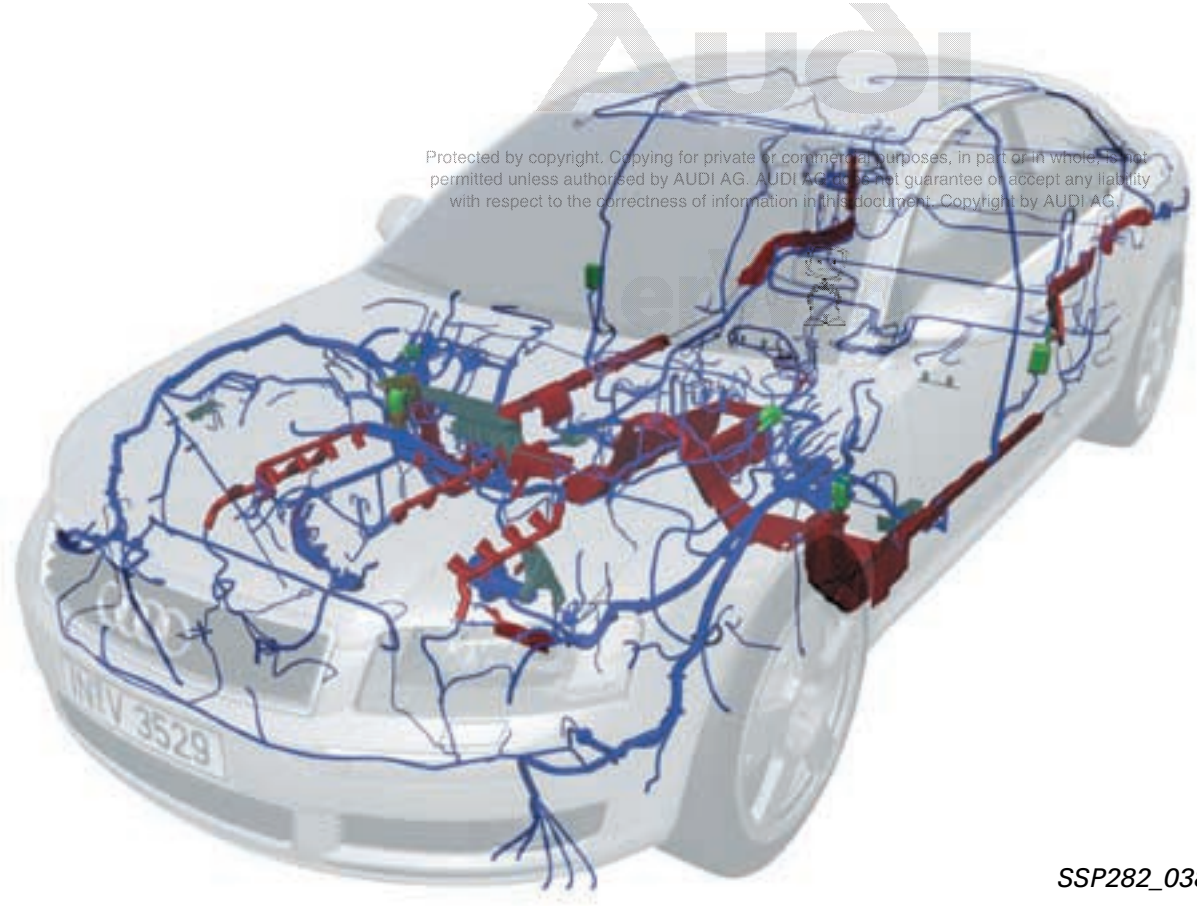
Use is made for the Audi A8 ´03 of a customer-specific one-piece modular wiring harness. "One-piece" means that power is supplied for all essential electrical functions from a single continuous wiring harness. The only isolating points are at the doors, roof module and engine.

"Customer-specific" means that each wiring harness is designed to serve exactly the equipment ordered by the customer. The wiring harness is subdivided into individual logic modules, each of which is responsible for a clearly defined range of functions.

A plastic optical fibre is fitted for the transmission of optical communication and infotainment signals.
Its advantages as compared to a copper conductor are its insusceptibility to electromagnetic interference, a high transmission capacity and less weight.

To achieve greater headroom, the wiring harness to the roof module has been extended to include the flexible flat cable (FFC). This represents a new method of solving the wiring problem in extremely confined spaces (max. 2 mm between headliner and body outer skin).

Design and operation of the optical fibre are described in SSP 286 – New data bus systems.



SSP282_038

Convenience and security electronics

"Advanced Key" entry and start authorisation system

"Advanced Key" can be taken to mean an "advanced locking and security system".

It takes the form of a non-contacting key recognition system. With the "Advanced Key" package, the "Vehicle unlocking" and "Vehicle locking" functions by way of a mechanical or remote control key are supplemented by the non-contacting functions "Vehicle unlocking" and "Vehicle locking".

Functions

Advanced Key "unlocking"

The key owner enters the key detection zone next to the vehicle (less than 1.5 m from door handle) and reaches into the recessed handle moulding. A proximity sensor starts a key scan by way of an aerial.
The key responds by way of radio waves and the vehicle is unlocked if authorised.

Advanced Key "starting"

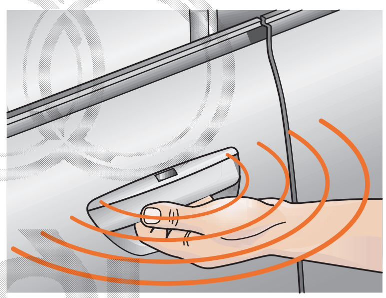
The driver presses the start button, which again initiates a key scan via the passenger-compartment aerials near the selector lever, at the rear centre vents and at the rear centre armrest.
The remote control key provides confirmation, with the result that the ignition is switched on on depressing the first stage of the start button and the engine started on depressing the second stage. The engine is switched off with the STOP button.

Advanced Key "locking"

If the vehicle is to be locked from the outside, it is sufficient to press the locking button in one of the door handles. Actuation of the locking button triggers a key scan via the door handle aerial and the vehicle is locked on confirmation of the remote control key.

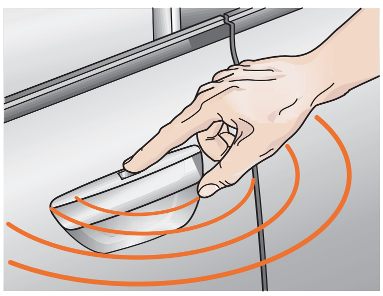
Design and operation are described in SSP 287 – Audi A8 ´03 Electrical Components.

In addition, the driver can start the engine with the START/STOP button (START/STOP function) without inserting the ignition key in the electronic ignition lock.



SSP282_093

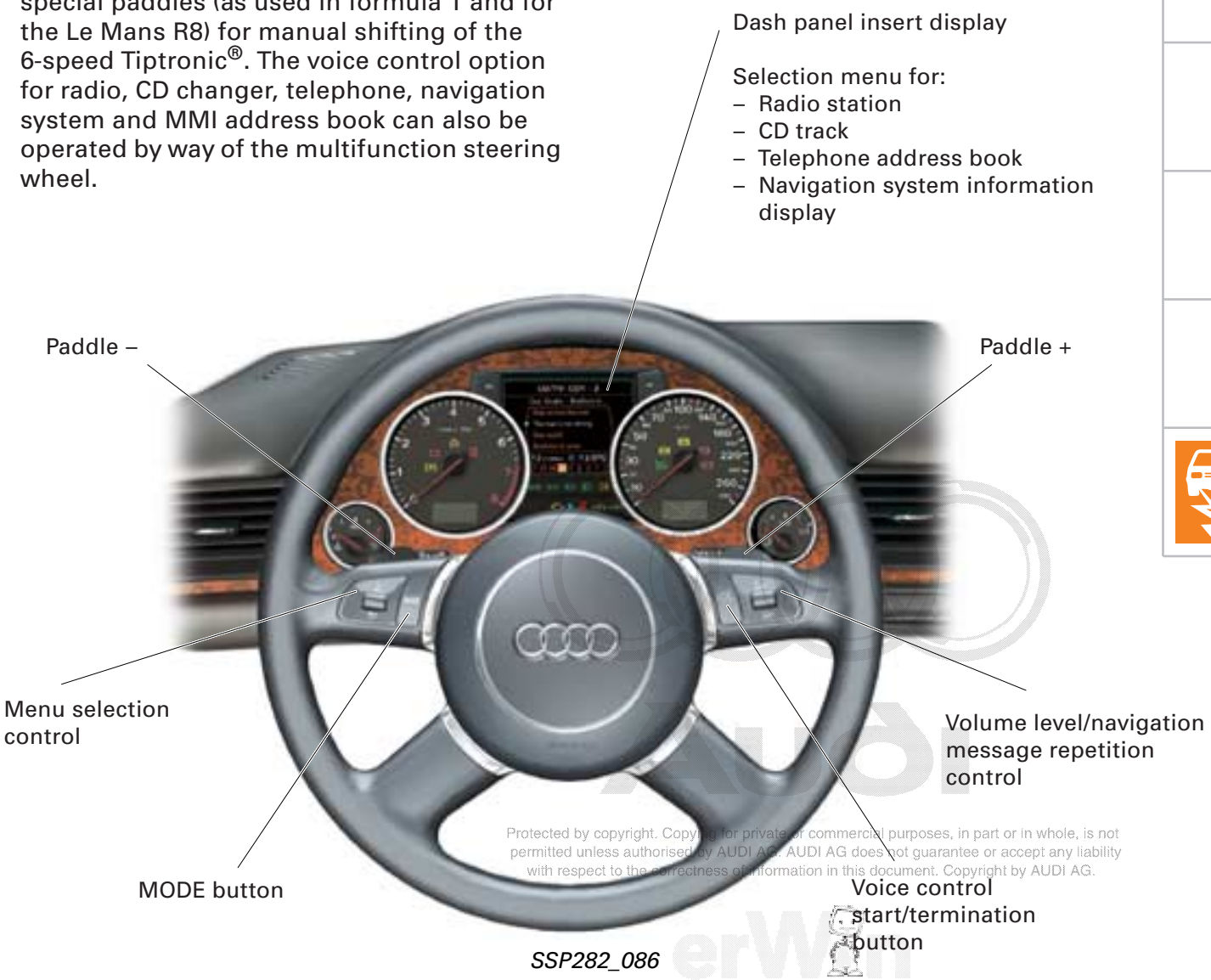
SSP282_094



SSP282_095

Multifunction steering wheel

A new multifunction steering wheel has been introduced as standard. This is equipped with special paddles (as used in formula 1 and for the Le Mans R8) for manual shifting of the 6-speed Tiptronic®. The voice control option for radio, CD changer, telephone, navigation system and MMI address book can also be operated by way of the multifunction steering wheel.



SSP282_086

Press MODE button:
For telephone, navigation system and radio/CD menu selection

Turn left function control:
To select menu item

Press left function control:
For selection within chosen menu item
To accept a telephone call

Press PTT (push to talk) button:
To activate/deactivate voice control

Turn right function control:
To regulate volume

Press right function control:
To repeat last navigation system message

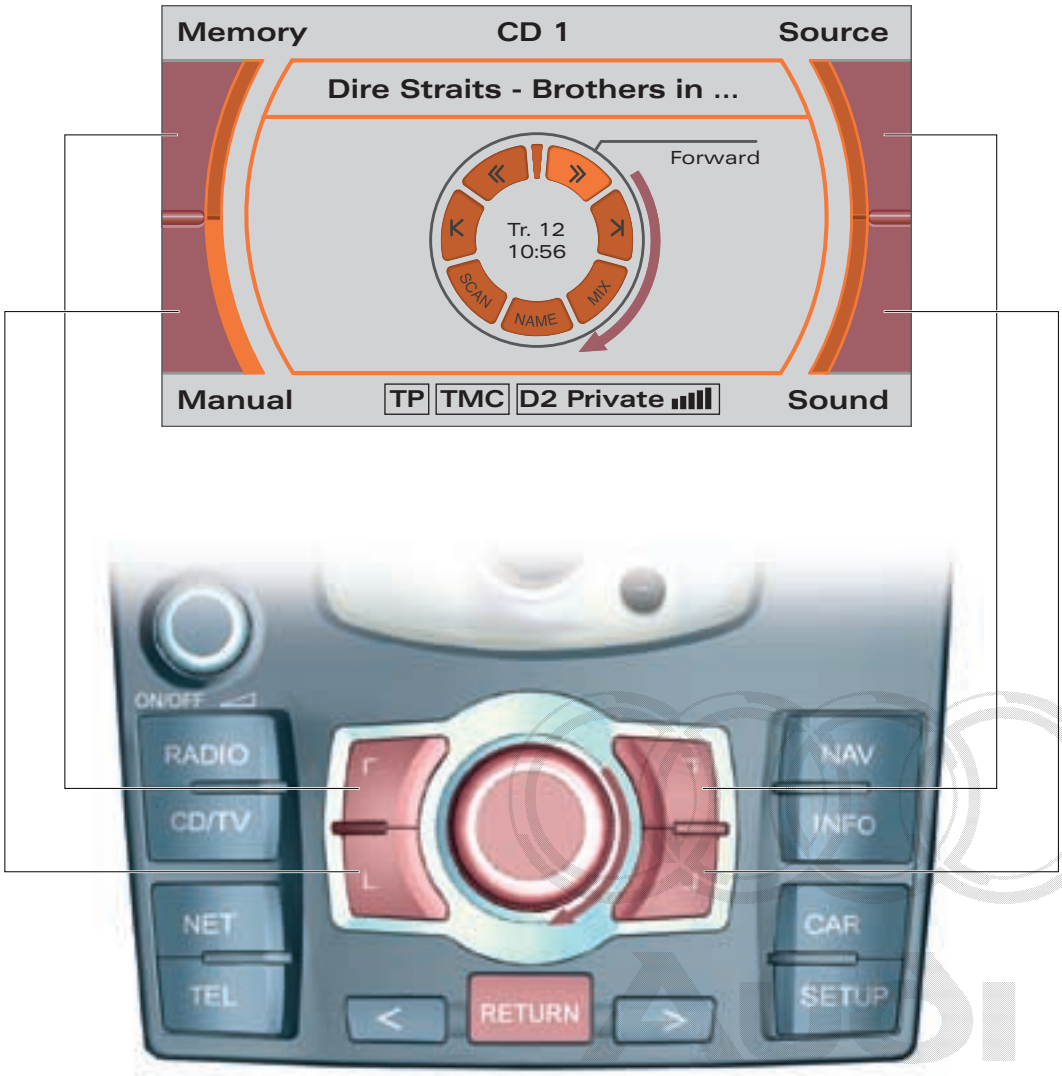
Infotainment

SSP282_090

Both in the modern business world and in the private domain, mobile **info**rmation and enter**tainment** are becoming ever more important.

In other words, vehicle occupants are becoming increasingly interested in enjoying the benefits of modern media.

With this in mind, the Audi A8 ´03 is fitted with an infotainment system offering a wide range of modern media.

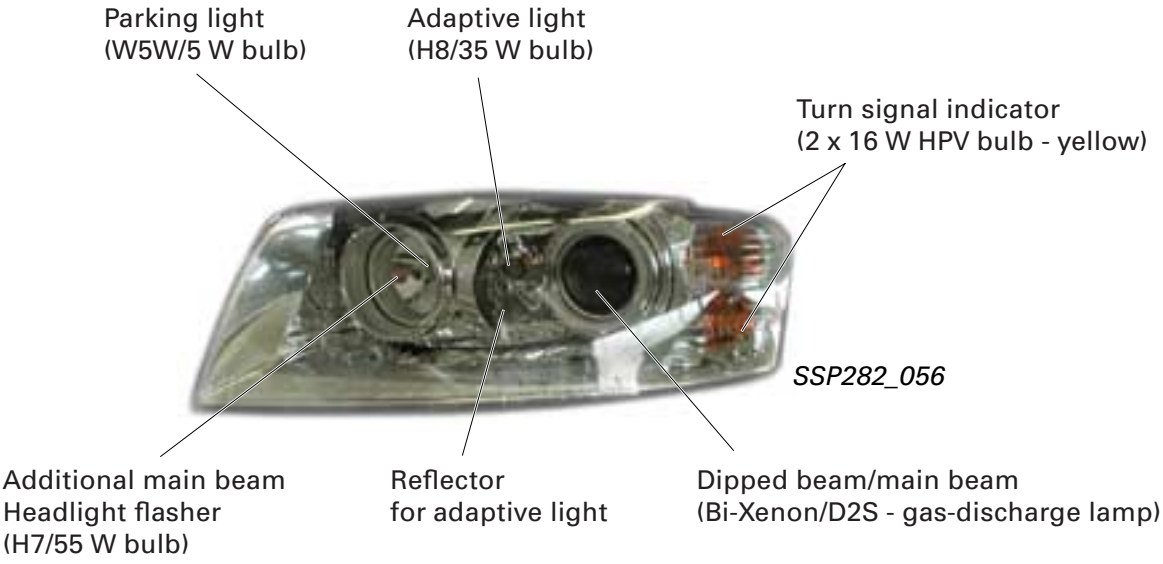


SSP282_096

Design and operation are described in SSP 293 - Audi A8 ´03 Infotainment.

Lighting system

Front lights



The headlight in the Audi A8 ´03 combines both design elements and innovative technology.

Headlight versions:

– Basic halogen version H7

  Dynamic headlight range control is not necessary with halogen headlights. The air suspension provides compensation for static load statuses and a thumbwheel is therefore also not required.

– Bi-xenon version

– Bi-xenon version with integrated adaptive light function

  The headlight range control unit J431 is responsible for providing static and dynamic compensation for vehicle tilting as well as actuation of the static adaptive light function. The sensor signals of the 4-level air suspension system are picked off by the drive system CAN for control purposes. A distinction is made between the two gas-discharge lamp versions by way of appropriate encoding (1 or 2) at the headlight range control unit.

Both bi-xenon versions feature an ellipsoid module with a moving screen to achieve both dipped beam and main beam with xenon light.

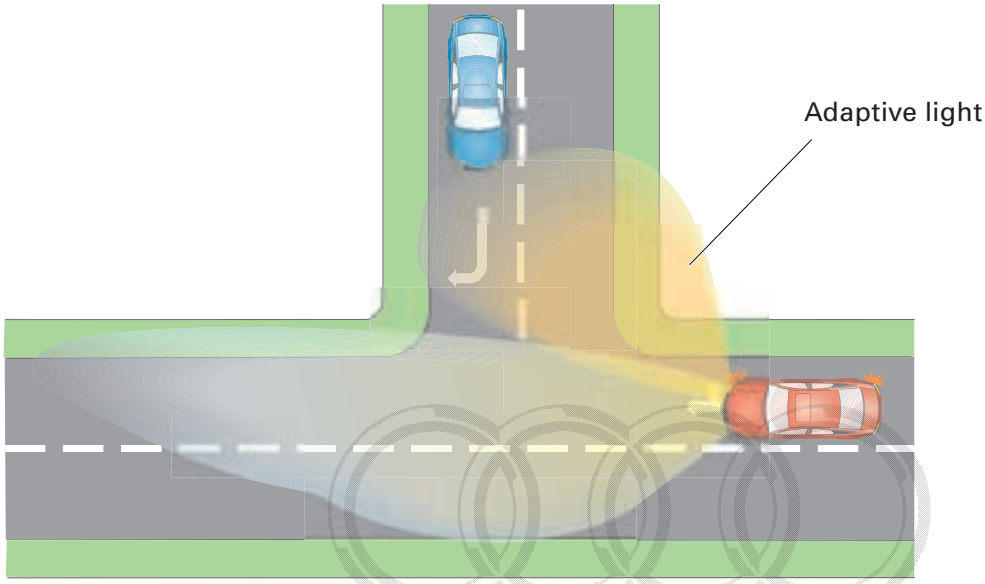
The automatic dynamic headlight range control represents a more advanced version of the standard automatic control system. It provides headlight tilt compensation not only for various load statuses but also as a dynamic function reacting to differences in running gear inclination caused by acceleration and deceleration.

HPV stands for high-performance bulbs, which are extremely compact and have a far longer service life. They have a 25 % lower power input than conventional bulbs. Such bulbs cannot be replaced by customers.

The optional headlights with adaptive light function are a clearly visible innovative feature in the Audi A8 ´03. To implement this function, the headlights are provided with an additional reflector between dipped beam and main beam.

SSP282_092

Light functions



SSP282_087

Adaptive light

The additional reflector with a 35 W H8 halogen bulb is actuated as the situation requires to ensure earlier perception of other road users or obstacles.

When reversing or parking, both adaptive lights are activated to provide the driver with a better overall view of the surrounding area.

Control of the headlight functions is a complex process. It involves real time evaluation of several signals (e.g. vehicle speed, steering angle and turn signal indicator) by the headlight range control unit J431.

Assistant lighting system

This system adapts the vehicle lighting to the prevailing light conditions. For this purpose the light switch must be set to AUTO. The rain and light detector sensor G397 establishes the prevailing light conditions and activates the vehicle lighting system if appropriate.

Assistant lighting applies to:

- Dipped beam
- Parking lights
- Tail lights
- Number plate light

SSP282_110

Operation of the assistant lighting system is described in SSP 288 – Audi A8 ´03 Distributed Functions.

Side lights

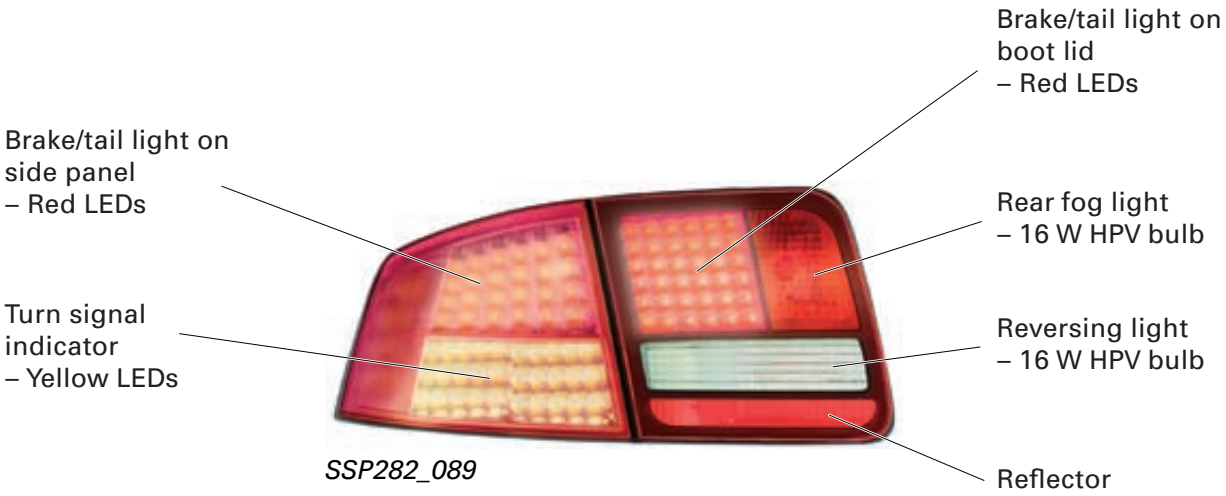
This is the first Audi vehicle to be fitted with LED-type lights. The individual LEDs are fitted in a graduated arrangement under a transparent glass lens and give off a yellow light when switched on. They appear neutral in colour when switched off.

LED technology offers numerous advantages:

- Rapid attainment of full power
- Up to 50 % energy saving as compared to bulbs
- Service life equal to that of the vehicle
- Shallow design
- Bright, distinct marking effect makes vehicle more noticeable

SSP282_088

Rear lights



SSP282_089

The newly designed rear lights are an ideal combination of design, function and ultra-modern technology.

Light-emitting diodes are used for the tail light, brake light and turn signal indicator functions. Newly developed "High-performance" bulbs are employed for the lesser used rear fog light and reversing light functions.
The high-level third brake light also features LEDs.

Rear light actuation is described in SSP 287 – Audi A8 ´03 Electrical Components.

Interior lighting

In addition to the usual interior, reading and door lights, the new Audi A8 also features new "ambiente" and door contour lights with variable functions depending on the lighting profile selected.

Users can choose between the following lighting profiles:

- Highway
- City
- Cockpit
- Fond = Rear

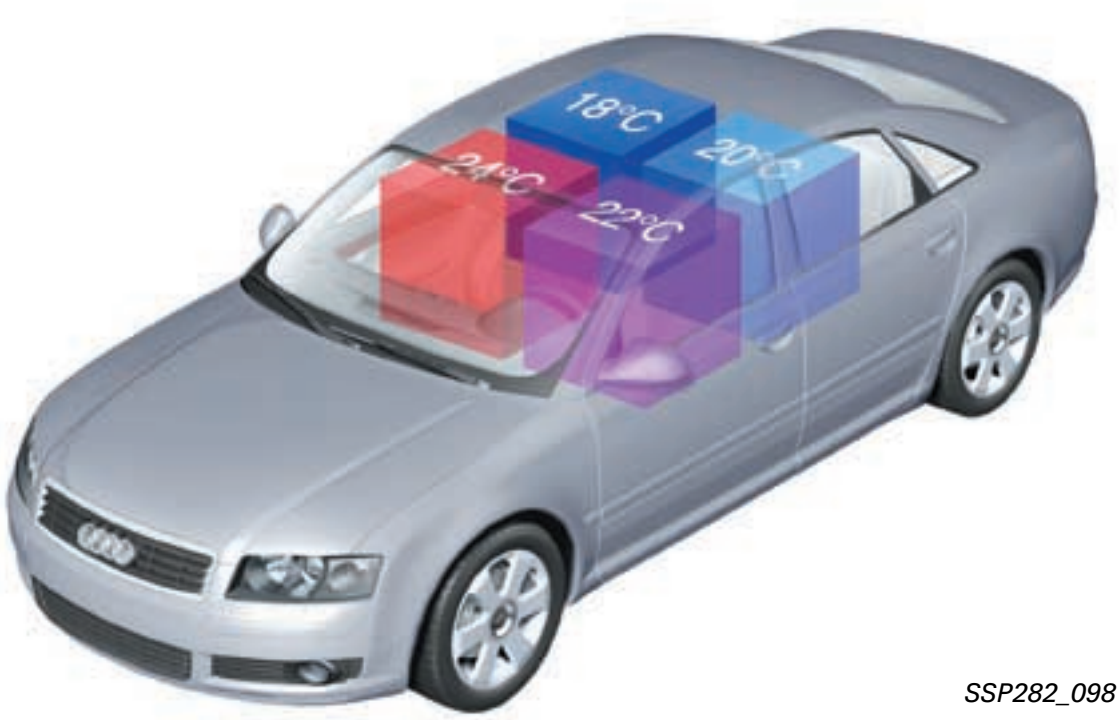
SSP282_111

Heating/Air Conditioner

Design and operation

The air conditioning system represents a more advanced version of the concept employed in the Audi A8 predecessor model with 2-zone climate control and features fully automatic regulation.

An optional feature for the Audi A8 ´03 is 4-zone climate control, enabling both driver and all passengers to make individual settings independently of the climate control level selected for the other occupants.

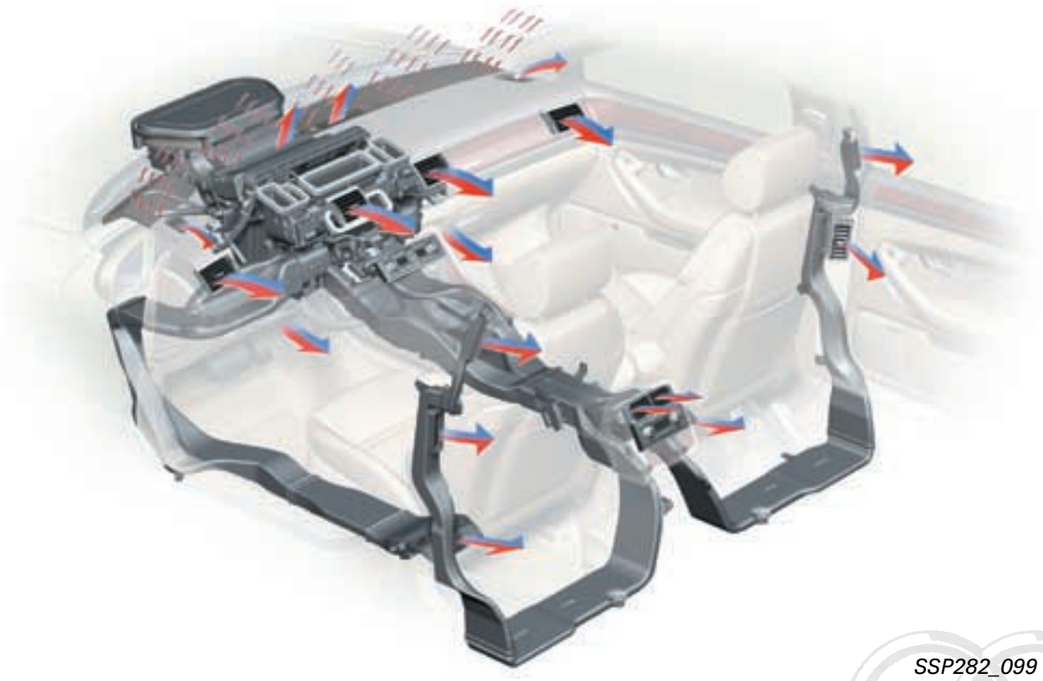


SSP282_098

The following components are new features as compared to the systems previously fitted in the Audi A8:

- Humidity sender G355
- Evaporator outflow temperature sender G263
- Two versions: 2-zone front climate control with 12 control motors and 4-zone front and rear climate control with 15 control motors
- Rear climate control with electric rear additional heater as additional equipment ("4-zone system") – rear left and rear right footwell heater element Z42 and Z43
- Second control and display unit with 4-zone climate control, Climatronic control unit J255, rear Climatronic control and display unit E265
- Climate control menu in MMI (Multimedia Interface) for display of climate control set values and basic settings
- Front and rear seat heating and seat ventilation
- Heated windscreen Z2
- Energy management control unit J644

The interaction of these components in coordination with the entire air conditioning system forms a control loop and permits comfortable front and rear climate control to suit all requirements.



SSP282_099

A distinction is made between two air conditioner unit versions

- 2-zone front and rear climate control
- 4-zone front and rear climate control

and three types of control and display unit

- Air conditioner control panel with no seat heating/ventilation
- Air conditioner control panel with seat heating
- Air conditioner control panel with seat heating and seat ventilation

(identified by part number index).

Self-diagnosis

Fault diagnosis and measured value blocks for air conditioner and seat heating system can be read out by way of address words 08 "Air conditioner/heater electronics" and 28 "Rear climate control". The functions of and exact procedure for self-diagnosis and assisted fault-finding with VAS 5051 can be found in the Heating/Air Conditioner Workshop Manual for the relevant vehicle model.

Operating principle

When the ignition is switched on, the Climatronic control unit J255 starts up with the same temperature, air distribution and fresh-air blower speed settings etc. as were applicable the last time the ignition was switched off by way of the appropriate key or using fingerprint recognition.
If fingerprint recognition has been implemented, this has priority over key recognition (refer also to SSP 287 – Audi A8 ´03 Electrical Components).

Key recognition takes place in the case of remote control (radio or key transponder), with the driver identification control unit providing the Climatronic control unit J255 with the appropriate information by way of the CAN bus.

Personalised settings

The following settings can be made for each climate control zone (front left, right and, optionally, with 4-zone climate control rear left and right):

- Left/right temperature
- Air flow
- Left/right air distribution
- Left/right seat heating
- Left/right seat ventilation
- Operating modes (AUTO for driver and front passenger, temperature-adjustable centre vents, automatically controlled recirculated-air mode, ECON)

The heated windscreen can be activated by way of the air conditioner defrost button or the air conditioner control unit automatically switches on the electric heated windscreen if the appropriate conditions are satisfied (windscreen defrost or automatic mode on cold starting).

The Climatronic J255 and heated windscreen J505 control units communicate by way of the LIN bus. The Climatronic control unit transmits the specified windscreen heating power to the heated windscreen control unit on the LIN bus.

The electrically heated windscreen is only supplied with the amount of power which can currently be drawn from the electrical system without draining the battery. This is monitored by the energy management control unit J644.

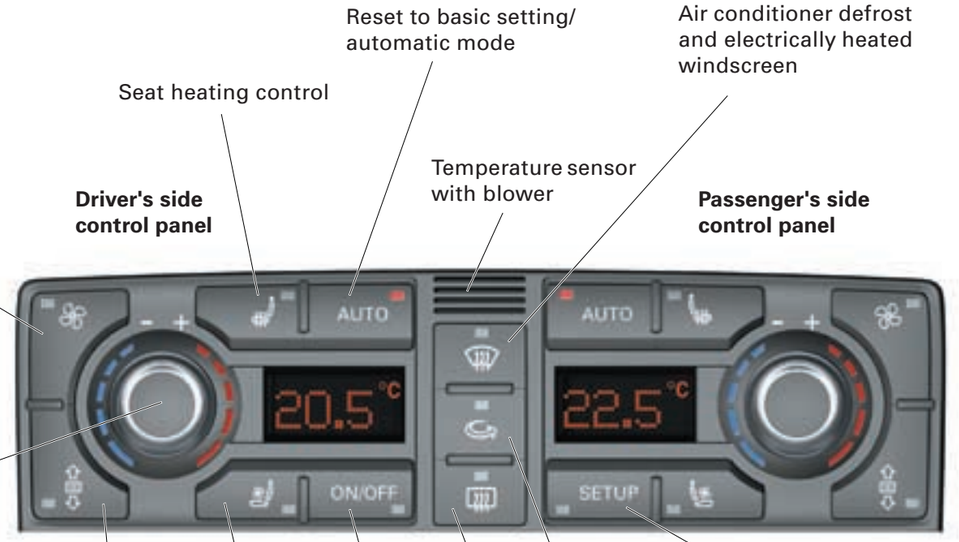
As is the case with the Audi A4, the windscreen is heated by applying voltage to a metallic foil fitted in the glass (refer to SSP 213).

The Climatronic control unit J255 is connected to the convenience CAN, via which diagnosis is also performed.

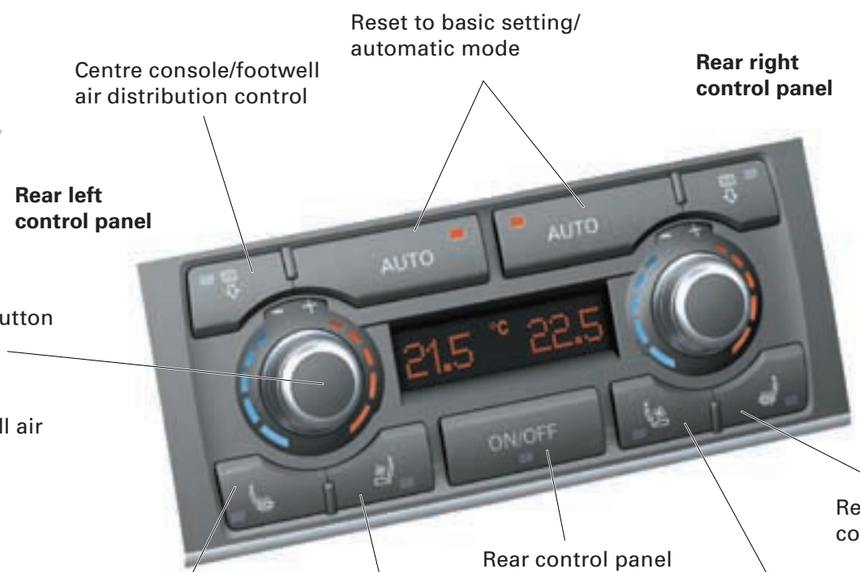
A manual air conditioning system is not available.

As in the Audi A4, the air conditioner compressor is regulated as a function of load and controlled externally by way of the compressor regulating valve (refer to SSP 240).

Climatronic control unit J255



Rear Climatronic control and display unit E265

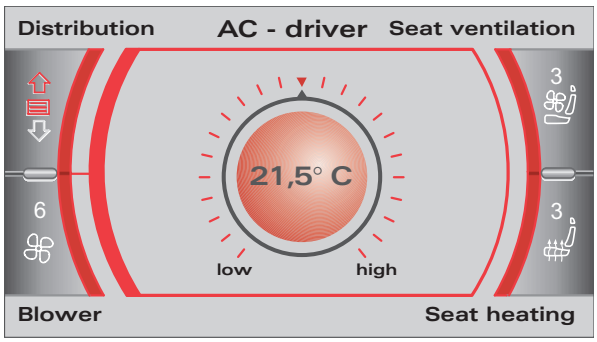


SSP282_100

Air conditioning system control via MMI

All air conditioning system set values and basic settings (setup) can be displayed by way of the MMI. This applies both to the Climatronic control unit button functions and to setup.

If the air conditioning system is activated with the MMI switched on, the air conditioner function settings can be called up and altered by way of the multimedia control panel. The functions indicated in the corners of the displayed mask are activated using the softkeys.



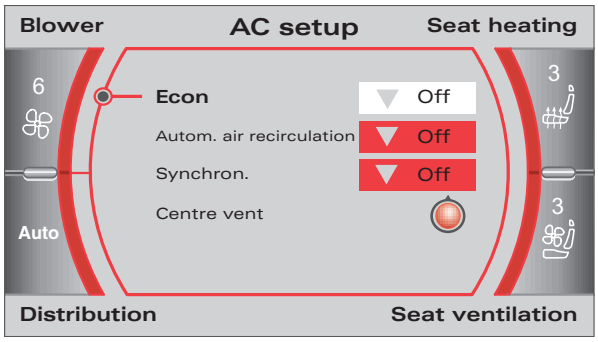
SSP282_112

Basic setting (setup)

The basic air conditioner settings can only be altered when the MMI is active. This involves pressing the SETUP button on the Climatronic control unit.

The following functions can be selected:

- ECON ON/OFF
- Automatic air recirculation active/inactive
- Synchronisation active/inactive
- Centre vent (temperature-adjustable) settings between - 3 and + 3
- Auxiliary heater active/inactive
- Auxiliary ventilation active/inactive
- Auxiliary heater/ventilation operating time 15 min./30 min./45 min./60 min.
- Auxiliary heater/ventilation timer status for timers T1, T2, T3 ON/OFF
- Solar mode active/inactive (solar cells C20)
- Rear control ON/OFF



SSP282_113

The desired settings can be called up and altered with the driver's/front passenger's control knob on the Climatronic control unit.

The current air conditioner settings are stored automatically and assigned to the appropriate remote control key. On vehicles with Audi one-touch memory (optional), the current setting is also assigned to the corresponding fingerprint.

Blower unit/air routing

As opposed to the predecessor model, the air conditioner features an additional evaporator outflow temperature sender G263. This is installed in the air duct downstream of the evaporator and constantly transmits the air temperature downstream of the evaporator to the Climatronic control unit J255.

If the left or right centre chest vent is closed manually, the left/right centre vent control motor V110/V111 is closed automatically by the centre left/centre right G347/G348 vent sensor signal.

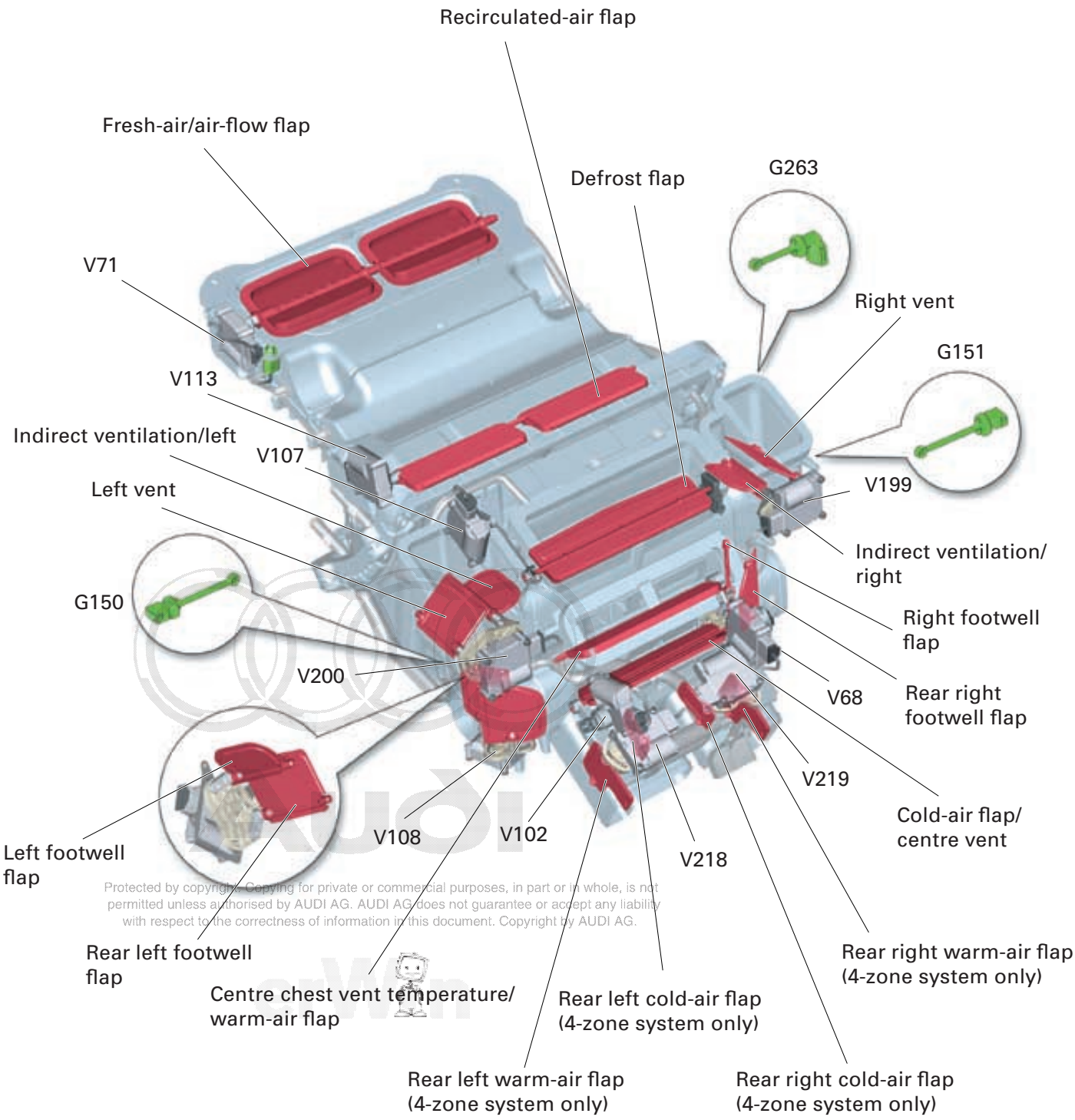
Automatically controlled recirculated air mode

Recirculated air mode is implemented automatically for a certain period

- If the windscreen washer system switch is actuated or
- In the event of actuation by the air quality sensor G238

When replacing control motors, attention must be paid to the assignment of the flaps in the cam plate guides.

G150 Left vent temperature sender
G151 Right vent temperature sender
G263 Evaporator outflow temperature sender
V68 Temperature flap control motor
V71 Air-flow flap control motor
V102 Centre vent control motor
V107 Defroster flap control motor
V108 Left footwell flap control motor
V109 Right footwell flap control motor (not illustrated)
V113 Air-recirculation flap control motor
V199 Front right defroster/chest vent shutoff flap control motor
V200 Front left defroster/chest vent shutoff flap control motor
V218 Rear left vent control motor (4-zone system only)
V219 Rear right vent control motor (4-zone system only)



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Electric rear additional heater

An electric rear additional heater is fitted under each front seat in the rear climate control footwell air ducts.

SSP282_102

Operation

Following a cold start or at low ambient temperatures, there is insufficient waste heat in the coolant to warm the rear of the vehicle by means of a conventional fluid-filled heater. In addition, the drop in temperature in the rear air duct is extremely high in the initial phase.

This problem has been solved by integrating two electric rear additional heaters into the rear footwell air duct.
These employ electrical energy from the vehicle electrical system to heat the air supplied to the passenger compartment.
In this way, the heating function is available immediately following cold starting.

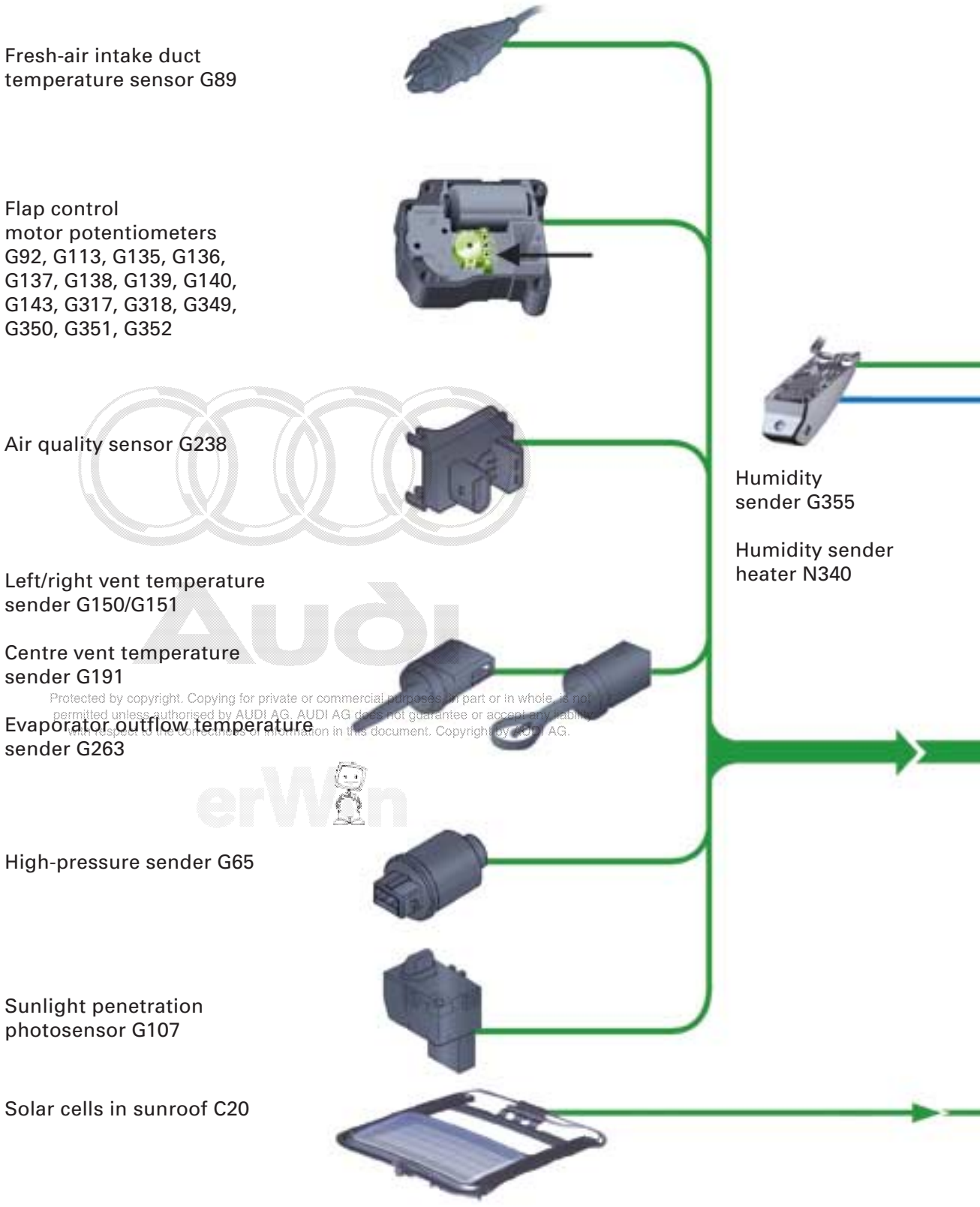
A further advantage is that independent temperature regulation (heating) can be provided for the rear footwell with the 4-zone system.
A supply of colder air to the rear climate zones as opposed to the front can be achieved by way of the centre chest vents.
The temperature can however only be reduced but not increased via these vents through the addition of cold air.

As in the predecessor model, two separately controlled heat exchangers permit the setting of different temperatures at front left/right. All occupants can therefore be provided with individual climate control.

As was the case with the predecessor model, in situ heat exchanger replacement is possible. The procedure involved is described in the current Workshop Manual.

Notes

System layout



Control unit with display in dash panel insert J285

MOST bus

Front information display and operating unit control unit J523

Front information and display and operating unit control unit J685

Diagnosis CAN

Data bus diagnostic interface J533

Engine control unit J623

Drive system CAN

Radiator fan control unit J293

Radiator fan V7

Energy management control unit J644

Sunroof electronics control unit J528

Air conditioning system compressor regulating valve N280

Rear Climatronic control and display unit E265

Flap control motors
V68, V71, V102, V107, V108, V109, V110, V111, V113, V199, V200, V220, V218, V219, V221

Climatronic control unit J255

Convenience CAN

Additional heater control unit J364

Coolant circulation pump V50

Left/right heat regulation valve N175/N176

Heated windscreen control unit J505

Heated windscreen Z2

Driver seat/front passenger seat ventilation control unit J672/J673

Front left/front right heated seat Z45/Z46

Temperature sender for front left/front right seat G344/G345

Fresh-air blower control unit J126 with fresh-air blower V2

Rear left footwell heater element Z42

Rear right footwell heater element Z43

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Humidity sender G355

SSP282_104

At low ambient temperatures, when the windscreen is extremely cold, the top third is particularly susceptible to fogging.
To cover this area, the humidity sender G355 is fitted in front of the base of the rear view mirror.

The sender is designed to detect the following:

- Humidity level
- Sender ambient temperature and
- Windscreen temperature

All three functions are combined in the sender housing.

The humidity sender is intended for all equipment versions.

The sender data enable the air conditioning system to detect potential misting of the windscreen in good time.
Before water vapour from the air in the passenger compartment can form on the windows, the output of the air conditioner compressor and the blower speed are automatically increased and the defrost flap is opened further. Dry air is then routed from the open defrost vents to the windscreen and side windows via the evaporator and heat exchangers.

Measurement of humidity level and corresponding temperature

Physical principles

Humidity measurement involves determining the water vapour content of the passenger compartment air. The capacity of air to absorb water vapour is governed by the air temperature. It is thus necessary to determine not only the humidity level but also the corresponding air temperature in the measurement area.

The warmer the air, the more water vapour it can absorb. Water starts to condense if this water-vapour enriched air cools down again. This results in fine droplets forming on the windscreen.

Operation

Measurement is performed by way of a special capacitor which can absorb water vapour. The water absorbed produces a change in the electrical properties and thus the capacitance of the capacitor. The capacitance measurement thus provides information on the humidity level. The sender electronics convert the measured capacitance into a voltage signal.

SSP282_105

Measurement of windscreen temperature

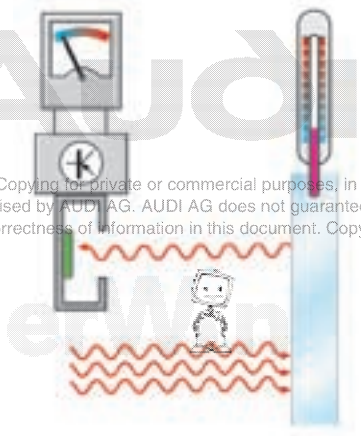
Physical principles

All bodies exchange heat with their environment in the form of electromagnetic radiation. This electromagnetic radiation can include thermal radiation in the infrared range, visible light or ultraviolet components.

The wavelength of the radiation emitted depends on the temperature of the actual body. A change in the temperature of the body alters, for example, the infrared component of the radiation emitted. The temperature of the body can be determined in a non-contacting manner by measuring the infrared radiation emitted.

Operation

The infrared radiation emitted by a body (windscreen) is measured by means of a highly sensitive infrared radiation sensor. A change in the temperature of the windscreen also produces a change in the infrared component of the thermal radiation emitted by the windscreen. This is detected by the sensor and converted by the sensor electronics into a voltage signal.



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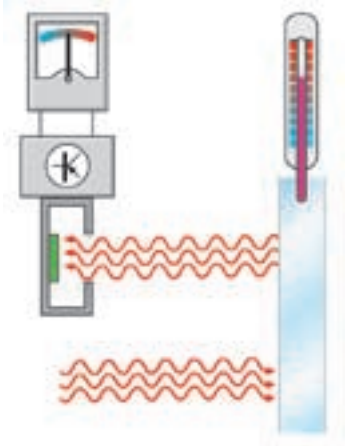
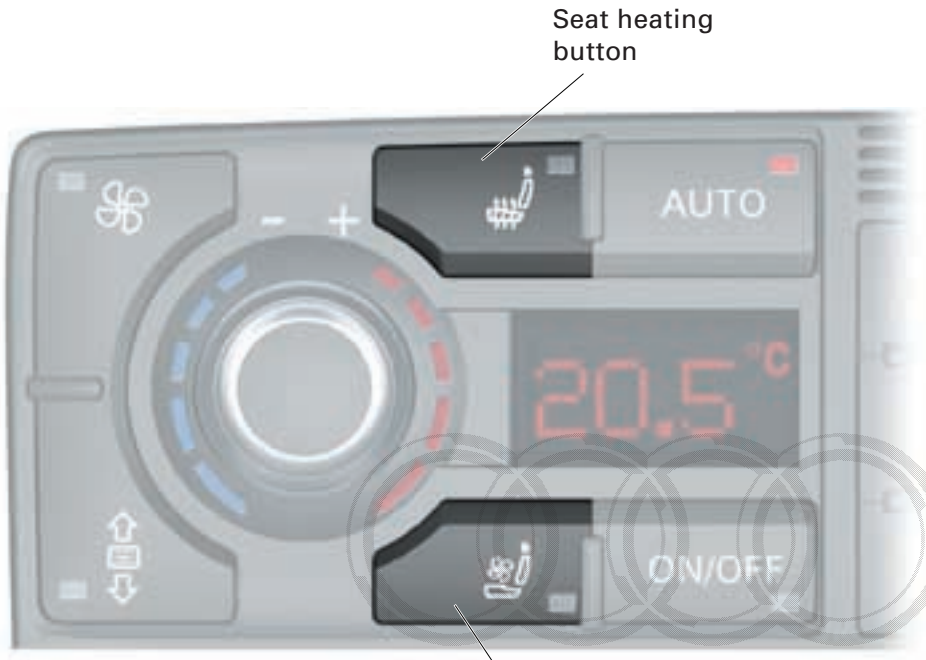


Heating/Air Conditioner

Climate-controlled seats with heating and ventilation function

The Audi A8 ´03 can be fitted with front and rear climate-controlled seats as optional equipment. These seats offer a combination of seat heating and seat ventilation and can be regulated individually for each occupant.

The buttons for the seat heating and ventilation options are integrated into the front and rear control and display units (refer to Page 74).



SSP282_107

The corresponding feedback LED lights after pushbutton activation of seat heating/seat ventilation. The selected seat heating/seat ventilation stage can be called up in the display segment of the Climatronic control unit J255 and in the MMI (Multimedia Interface) climate control menu. Once seat heating/seat ventilation has been activated, it remains active even after switching off the air conditioner by means of the ON/OFF button.

The use of seat ventilation leads to lower occupant skin temperatures. Automatic additional seat heating operation controlled as a function of temperature cancels the cooling effect and the air flow is warmed.

The ventilation function promotes pleasant conditions in the occupant's back and seat area and eliminates sweating more quickly.

Under normal circumstances, the seat ventilation function is deactivated automatically after approx. 30 minutes.

Comfort seat

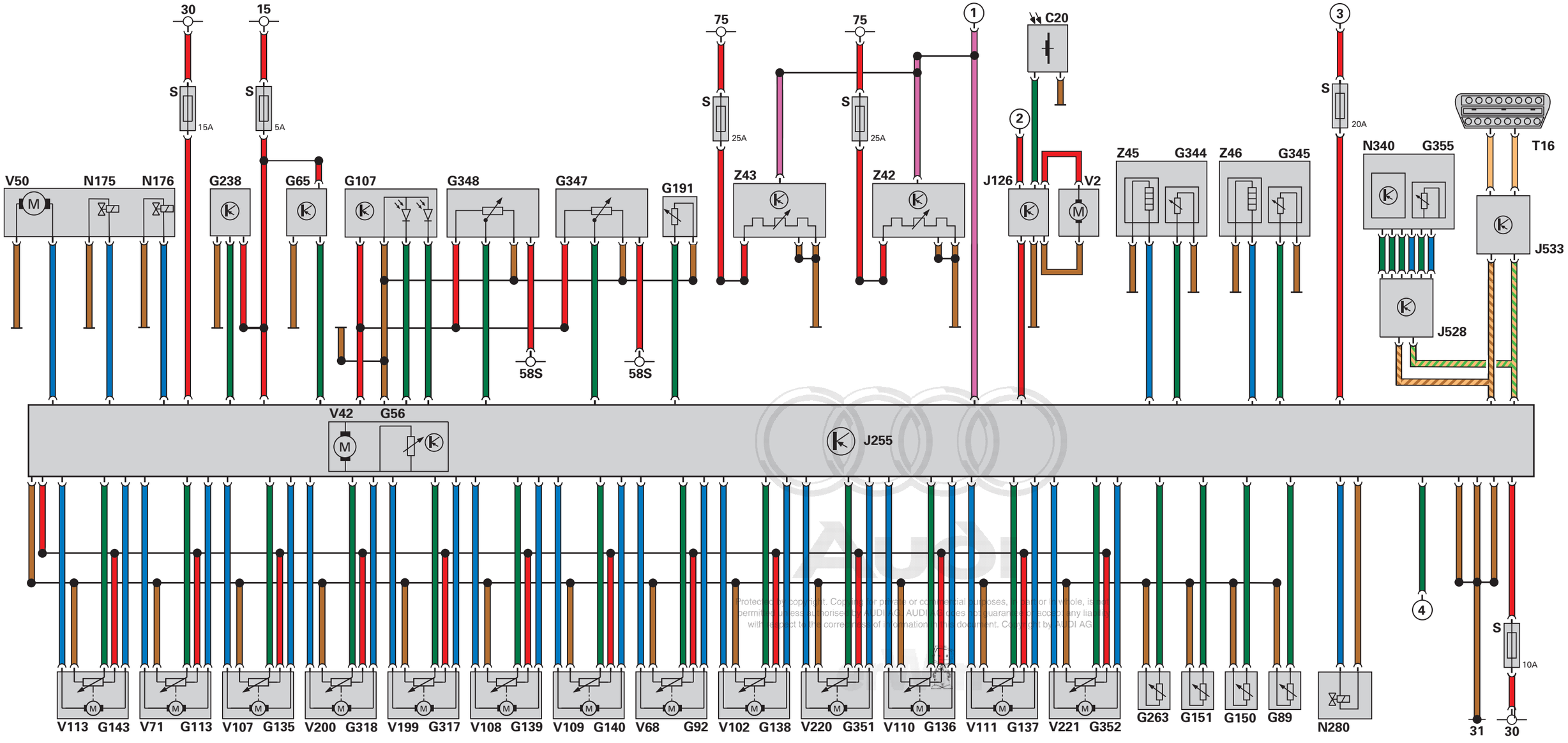
Seat climate control is achieved by way of integrated fans in the seat cushion and backrest. Air ducts in the seat padding convey the air warmed by the seat heating to the occupant through the fine perforations in the leather.

The seat heating and seat ventilation functions are not incorporated into automatic climate control mode.

Block diagram for front air conditioner

Key

C20	Solar cells
G56	Dash panel temperature sensor
G65	High-pressure sender
G89	Fresh-air intake duct temperature sensor
G92	Temperature flap control motor potentiometer
G107	Sunlight penetration photosensor
G113	Air-flow flap control motor potentiometer
G135	Defrost flap control motor potentiometer
G136	Left central vent control motor potentiometer
G137	Right central vent control motor potentiometer
G138	Central vent control motor potentiometer
G139	Left footwell flap control motor potentiometer
G140	Right footwell flap control motor potentiometer
G143	Air recirculation flap control motor potentiometer
G150	Left vent temperature sender
G151	Right vent temperature sender
G191	Centre vent temperature sender
G238	Air quality sensor
G263	Evaporator outflow temperature sender
G317	Front right defroster/ chest vent shutoff flap control motor potentiometer
G318	Front left defroster/ chest vent shutoff flap control motor potentiometer
G344	Temperature sender for front left seat
G345	Temperature sender for front right seat
G347	Centre left vent sensor
G348	Centre right vent sensor
G351	Rear left vent warm/cold control motor potentiometer
G352	Rear right vent warm/cold control motor potentiometer
G355	Humidity sender
J126	Fresh-air blower control unit
J255	Climatronic control unit
J528	Sunroof electronics control unit
J533	Data bus diagnostic interface
N175	Left heat regulation valve
N176	Right heat regulation valve
N280	Air conditioning system compressor regulating valve
N340	Humidity sender heater
T16	16-pin connector (diagnostic connection)
V2	Fresh-air blower
V42	Temperature sensor blower
V50	Coolant circulation pump
V68	Temperature flap control motor
V71	Air-flow flap control motor
V102	Central vent control motor
V107	Defroster flap control motor
V108	Left footwell flap control motor
V109	Right footwell flap control motor
V110	Left central vent control motor
V111	Right centre vent control motor
V113	Air-recirculation flap control motor
V199	Front right defroster/chest vent shutoff flap control motor
V200	Front left defroster/chest vent shutoff flap control motor
V220	Rear left vent warm/cold flap control motor
V221	Rear right vent warm/cold flap control motor
Z42	Rear left footwell heater element
Z43	Rear right footwell heater element
Z45	Front left heated seat
Z46	Front right heated seat



SSP282_109

in out

Colour code

- = Input signal
- = Output signal
- = Positive supply
- = Earth
- = Convenience CAN High
- = Convenience CAN Low
- = LIN bus

Additional signals

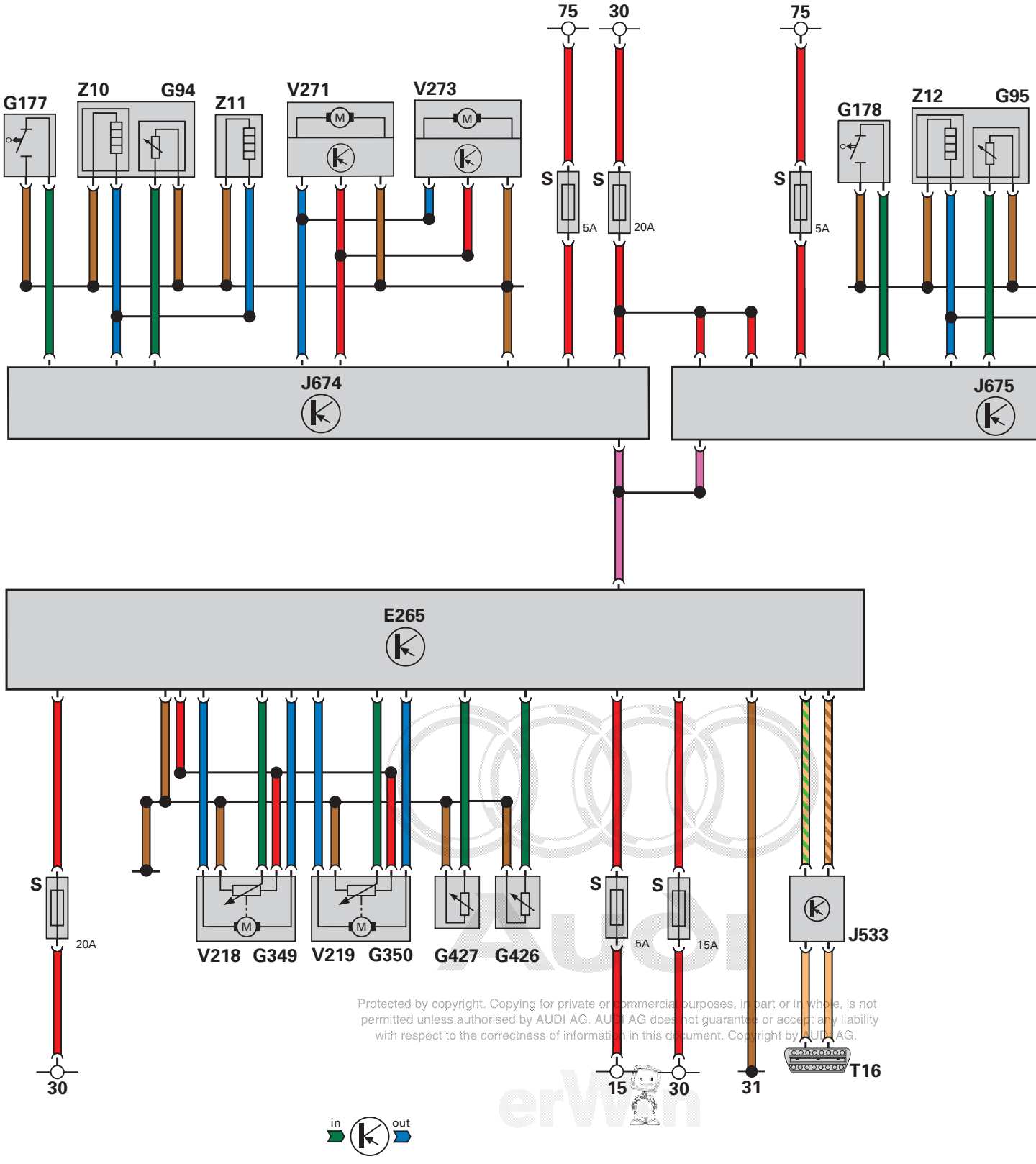
(1) Climate control LIN bus for
- Heated windscreen control unit J505
- Driver seat ventilation control unit J672
- Front passenger seat ventilation control unit J673

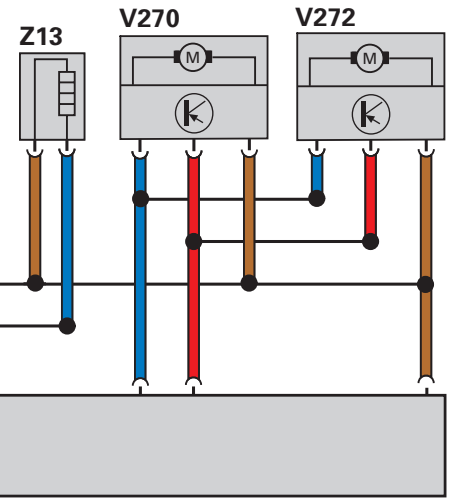
(2) Terminal 30/blower

(3) Terminal 30/front seat heating

(4) Input/rear roller blind switch E149

Block diagram for rear air conditioner





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Key

E265	Rear Climatronic control and display unit
G94	Rear left seat temperature sensor
G95	Rear right seat temperature sensor
G177	Driver side rear seat occupied sensor
G178	Front passenger side rear seat occupied sensor
G349	Positioning motor potentiometer for rear left vent
G350	Positioning motor potentiometer for rear right vent
G426	Driver side rear seat temperature sensor
G427	Passenger side rear seat temperature sensor
J533	Data bus diagnostic interface
J674	Driver side rear seat ventilation control unit
J675	Front passenger side rear seat ventilation control unit
T16	16-pin connector (diagnostic connection)
V218	Rear left vent control motor
V219	Rear right vent control motor
V270	Rear right seat fan
V271	Rear left seat fan
V272	Rear right seat backrest fan
V273	Rear left seat backrest fan
Z10	Left heated rear seat
Z11	Left heated rear seat backrest
Z12	Right heated rear seat
Z13	Right heated rear seat backrest

Colour code

- = Input signal
- = Output signal
- = Positive supply
- = Earth
- = Convenience CAN High
- = Convenience CAN Low
- = LIN bus

Auxiliary heater/coolant additional heater

An auxiliary heater is available as an option for all vehicle and engine versions. The auxiliary heater with petrol engines and additional heater with diesel engines are integrated into the engine coolant circuit. Vehicles with diesel engine are fitted with an additional heater as standard. On diesel engines with auxiliary heater, the activated auxiliary heater is also used as engine additional heater depending on temperature.

Design and operation are described in SSP 240 – Audi A2 Technical Features.

Operation with cut-in by way of remote control or timer

In the Audi A8 ´03, the auxiliary heater is activated by the air conditioner. The heated coolant is initially supplied to the passenger compartment (primarily auxiliary heater mode). On attaining pre-determined temperature levels, engine pre-heating is then switched in in line with a characteristic curve.

The cut-in time is "programmed" by way of the MMI system (Multimedia Interface) under the menu item "timer status".

Activation sequence:

1 A remote control or timer signal is transmitted to the auxiliary heater control unit.

2 The auxiliary heater then transmits a signal via the CAN bus to the Climatronic control unit J255.

3 The control unit then decides as a function of desired temperature, ambient temperature and passenger compartment temperature whether auxiliary ventilation or auxiliary heating is to be employed. The setting of the auxiliary heater/ ventilation function is shown in the setup menu in the MMI (Multimedia-Interface).

4.1 Auxiliary ventilation sequence

The energy management control unit J644 interrogates the battery capacity check function of the battery and energy management system to determine whether auxiliary ventilation can be accepted. In the event of acceptance, the fresh-air blower is actuated.

4.2 Auxiliary heating sequence

The level of fuel in the tank is interrogated. If the fuel tank is "empty", the auxiliary heating function is not permitted and the auxiliary heater symbol in the dash panel insert goes out. "Empty" roughly corresponds to the red display zone. The energy management control unit J644 checks whether there is sufficient energy to accept auxiliary heating. If this is the case, the auxiliary heater is switched on in the various operating modes depending on the characteristic temperature curve and the fresh-air blower is actuated.
If the auxiliary heating temperature reaches a level of 30 °C, the fresh-air blower is activated and the coolant shutoff valve N279 pulsed in line with the characteristic curve.

The auxiliary heater is switched off automatically on completion of the operating time transmitted by the MMI system to the Climatronic control unit or it can be switched off using the remote control OFF button.

If the engine is switched off again and not all additional heater criteria (temperature, time) are satisfied, the auxiliary heater remains in operation for any residual operating time before being deactivated. This function can be encoded.

Auxiliary heater circulation pump control

To speed up heating of the passenger compartment and to achieve a better "heat yield" in the air conditioner unit heat exchanger, the circulation pump V55 and coolant shutoff valve N279 are pulsed as a function of water temperature and the heating circuit flow rate is thus reduced.

An electric circulation pump is used for the auxiliary heater. It is not possible to reduce the supply voltage in the auxiliary heater control unit and the circulation pump is thus actuated at specific intervals to decrease its output.

Additional control curve for "auxiliary heater" and "additional heater"

When the engine is on, the auxiliary heater and engine temperatures are constantly compared. A switch to the large coolant circuit is made as soon as the engine temperature exceeds the auxiliary heater temperature.

Activation of auxiliary heater circulation pump with engine on (pulsed operation of circulation pump)

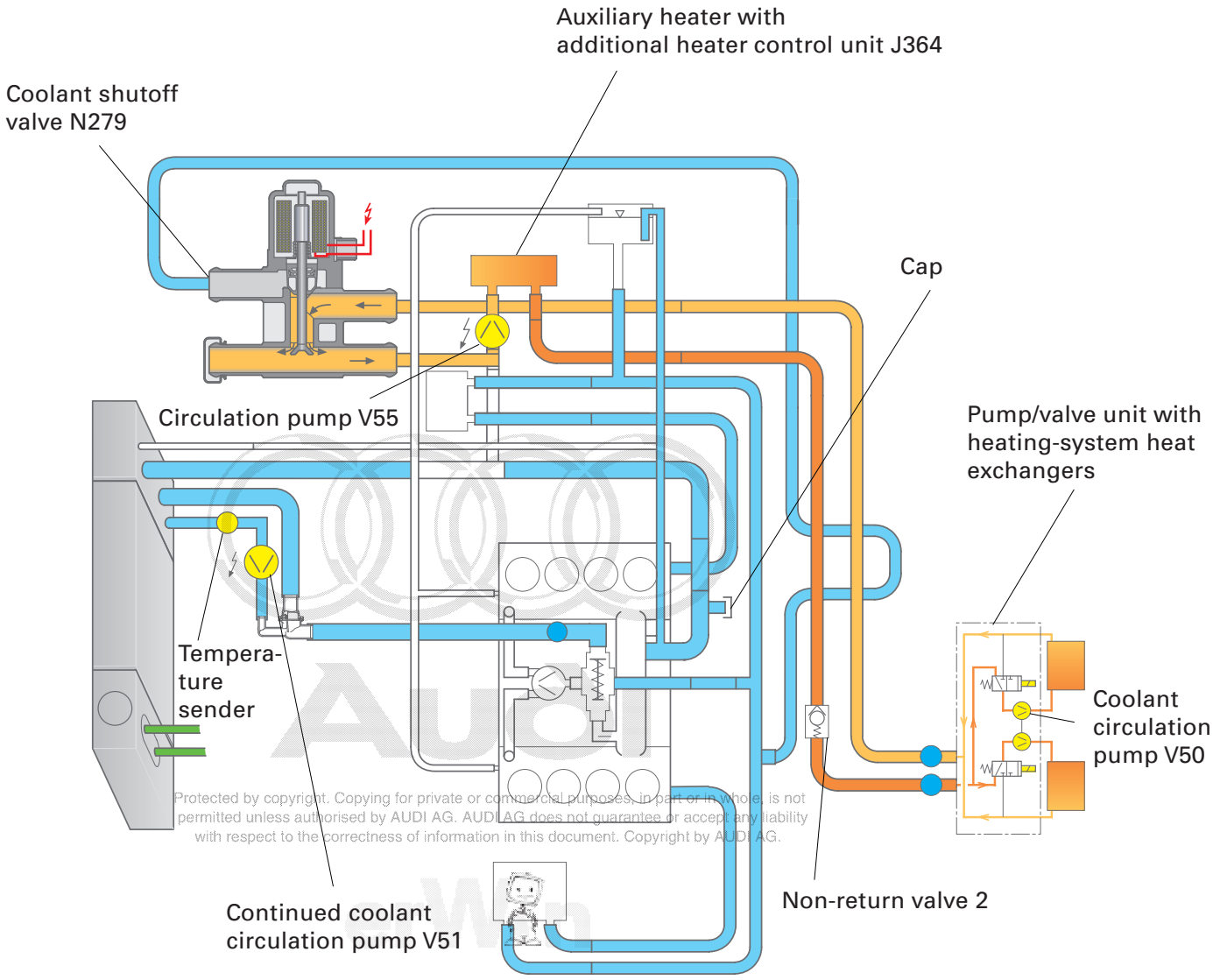
In order to be able to ensure a sufficient flow of water through the heat exchanger, the auxiliary heater circulation pump must additionally be switched on, as is the case for instance with the 12-cylinder engine.

Small coolant circuit with auxiliary heater

The small coolant circuit employed with auxiliary heating is designed to ensure rapid warming of the passenger compartment.

With the engine stopped, the coolant shutoff valve N279 switches to the small heating circuit until a defined temperature value has been attained. The coolant exiting from the heat exchangers via the pump/valve unit is conveyed by the circulation pump V55 into the auxiliary heater. After being warmed, the coolant is pumped back into the heat exchangers and initially heats the passenger compartment.

Design and operation are described in SSP 267 – The 6.0 l W12 engine in the Audi A8 - Part 1.



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Notes

Notes

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