



The 2016 Audi A3 Sportback e-tron

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Always check Technical Bulletins and the latest electronic service repair literature for information that may supersede any information included in this booklet.

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This eSelf Study Program teaches a basic knowledge of the design and functions of new models, new automotive components or technologies.

It is not a Repair Manual! All values given are intended as a guideline only.

For maintenance and repair work, always refer to the current technical literature.



Note



Reference

Introduction

The Audi A3 Sportback e-tron is a plug-in hybrid engineered to provide a fully integrated e-mobility solution.

There is no need for drivers to change their driving habits because the Audi A3 Sportback e-tron is designed to allow simple use of e-mobility.

It has an all-electric driving range of 31 miles (50 km) and is driven by a 102 hp (75 kW) electric motor with a top speed of 80 mph (130 km/h). At high speeds and under heavy acceleration, the internal combustion engine is automatically activated to provide additional power.

The Audi A3 Sportback e-tron brings together the best of both worlds - an electric motor for emission-free driving and an economical internal combustion engine for long range.

It combines both driving enjoyment and environmental awareness.

A3 e-tron



Vehicle distinguishing features

MMI system with e-tron displays



e-tron logo on the instrument panel (front passenger side) (European version shown)



Switch for EV mode (E656)



e-tron logo on the design cover in the engine compartment



e-tron specific single-frame radiator grille in chrome/matte black



e-tron specific front bumper with two aluminum-look surrounds on the air intake covers



e-tron logo on the front fenders



e-tron logo on the selector lever



Instrument cluster with power meter and e-tron displays



e-tron logo on the rear deck lid



e-tron specific rear bumper with diffuser, aluminum-look surrounds and concealed exhaust pipes



Various e-tron light alloy wheels available. See the Product Information Book for complete details.



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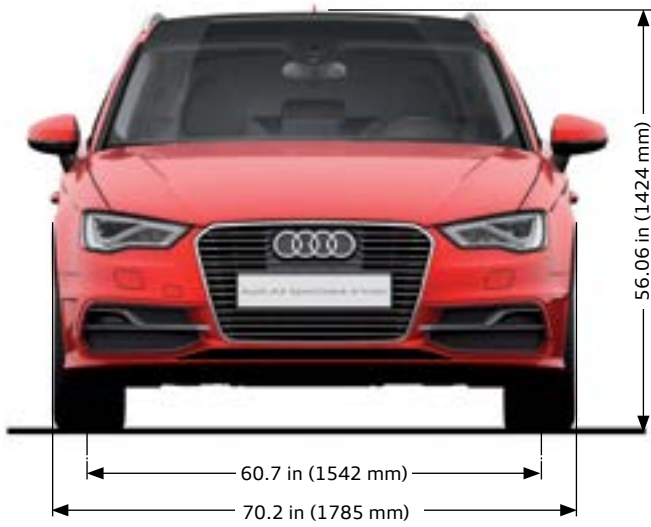
e-tron logo on the door sills



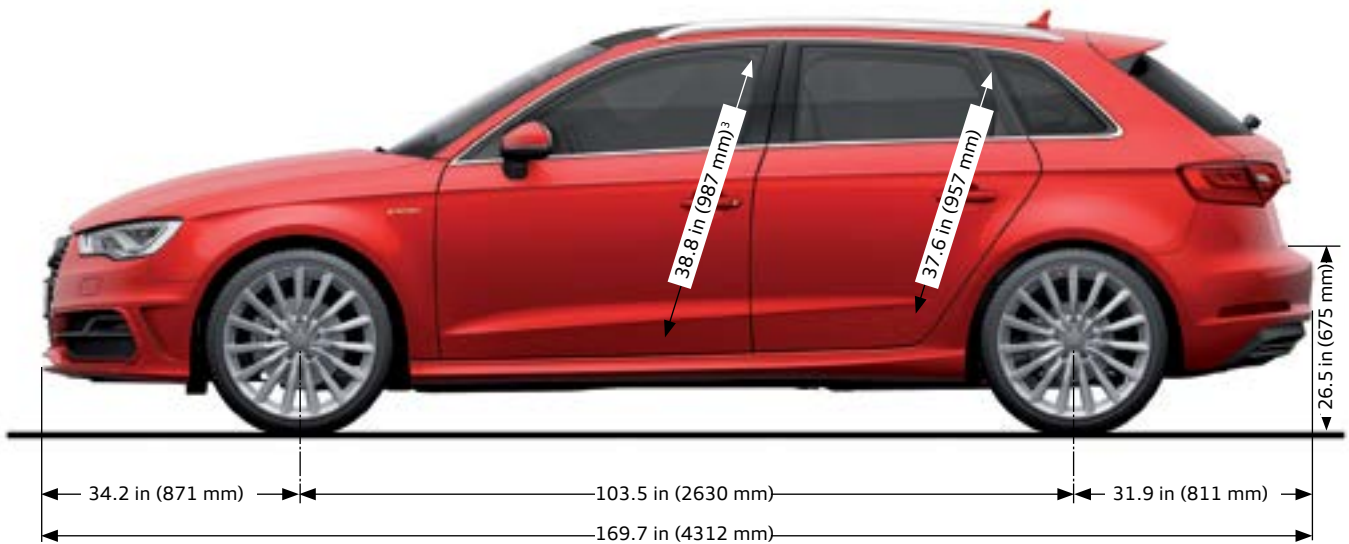
S line sills



Dimensions



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627_021



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Interior dimensions

Front cabin width	54.8 in(1392 mm) ¹⁾ 57.2 in (1453 mm) ²⁾
Rear cabin width	52.9 in (1344 mm) ¹⁾ 55.9 in (1422 mm) ²⁾
Front headroom	38.8 in (987 mm) ³⁾
Rear headroom	37.6 in (957 mm)
Through-loading width	39.3 in (1000 mm)
Load sill height	26.5 in (675 mm)
Trunk capacity	13.6 cu ft (385 l) ⁴⁾ 43 cu ft (1220 l) ⁴⁾

Exterior dimensions and weights

Length	169.7 in (4312 mm)
Width	70.2 in (1785 mm) ⁵⁾
Width	77.4 in (1966 mm) ⁶⁾
Height	56.06 in (1424 mm)
Front track width	60.7 in (1542 mm)
Rear track width	59.6 in (1516 mm)
Wheelbase	103.5 in (2630 mm)
Curb weight	3395 lb (1540 kg)
Gross vehicle weight	4519 lb (2050 kg)

¹⁾ Shoulder room width

²⁾ Elbow room width

³⁾ Maximum headroom

⁴⁾ With rear backrest folded down

⁵⁾ Excluding mirror

⁶⁾ Including mirror

Other specifications

Concept	Plug-in hybrid (PHEV)
Battery type	Lithium-ion system
Total capacity in kWh	8.8
Top speed in electric-only mode	80 mph (130km/h)
Top speed	138 mph (222km/h)
Acceleration 0 - 37 mph (0 - 60 km/h) in electric-only mode in s	4.9 seconds
Acceleration 0 - 60 mph (0 - 100 km/h) kph	7.6 seconds
Range (electric drive only)	up to 31 m (50 km)
Total range	up to 584 m (940 km)
Drag coefficient c_w	0.32
Capacity of fuel tank	10.5 gal (40 l)

All dimensions are based on the unladen weight of the vehicle.

Safety instructions

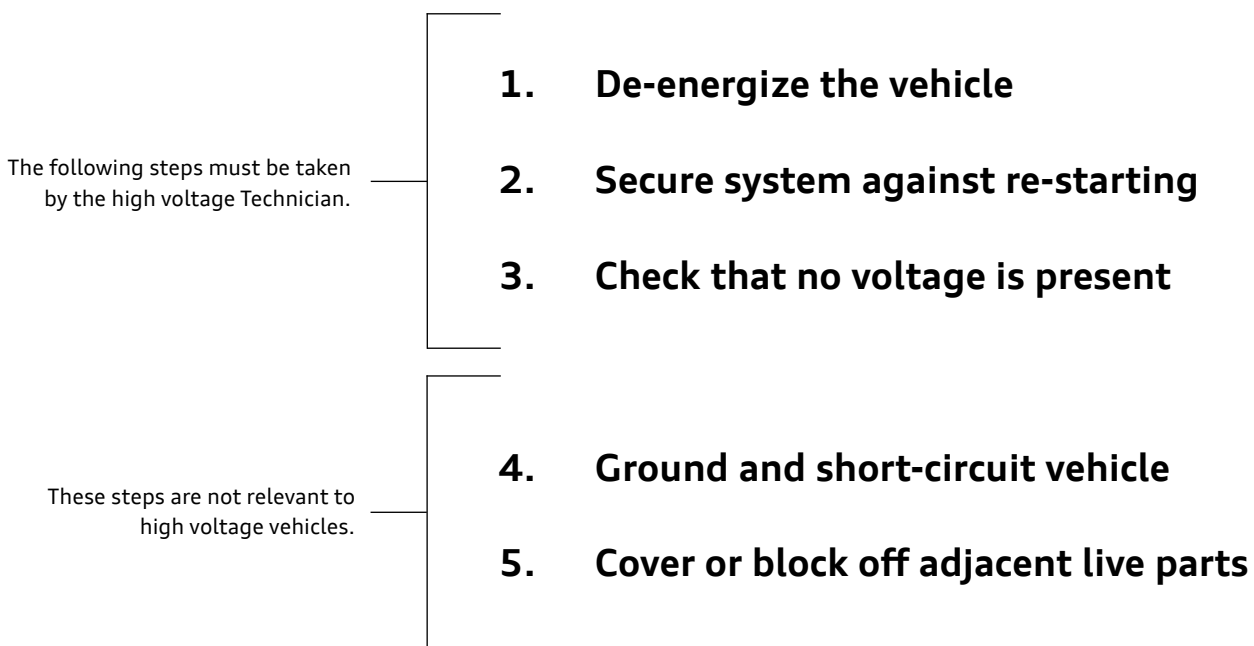
Electrical safety rules

The following five safety rules must always be observed and followed whenever performing work on the high-voltage system.

This work may only be performed by qualified High Voltage Technicians.

The following five high voltage safety rules apply to all high voltage work in any and all applications. The first three apply to high voltage systems in Audi electric vehicles.

These safety rules must be applied in the given order before beginning work on high voltage systems.



Information

Even AC voltages of 25 volts and DC voltages of 60 volts are hazardous to humans. It is, therefore, important to follow the safety instructions given in ElsaPro and in Guided Fault Finding Test Plans, as well as the warnings displayed on the vehicle.



Information

Work on the high voltage system may only be performed by a qualified high voltage Technician.

Warning signs

To minimize the risk associated with the high voltage system for users, service and repair shop personnel, as well as for technical and medical emergency responders, there are several warning and information labels attached to the Audi A3 Sportback e-tron.

Basically, two types of warning label are used:

- ▶ Yellow warning label with warning symbol for electrical voltage.
- ▶ Warning label marked "Danger" against a red background.

The following yellow warning labels are used to identify high voltage conducting components or high voltage components installed in the immediate vicinity or, for example, hazardous components concealed by covers.

Warning against hazardous electrical voltage according to DIN* 4844-2 (BGV A8)



627_004

Warning against a hazardous area according to DIN 4844-2 (BGV A8)

Warning against touching live parts



627_005

Warning against hazardous electrical voltage according to DIN 4844-2 (BGV A8)

Mandatory signs:
Observe instructions for use according to DIN 4844-2 (BGV A8)

The warning labels marked "Danger" identify high voltage components or high voltage conducting components.



627_006

Warning against hazardous electrical voltage according to DIN 4844-2 (BGV A8)

Warning against touching live parts

Mandatory signs:
Observe instructions for use according to DIN 4844-2 (BGV A8)



627_007

Special high voltage battery identification label

This adhesive label is affixed to the top of the high voltage battery, both in English and in the import country's national language.

*DIN - Deutsches Institut für Normung. A standards defining organization. Similar in function to the SAE.

Drive unit

Specifications

Torque-power curve

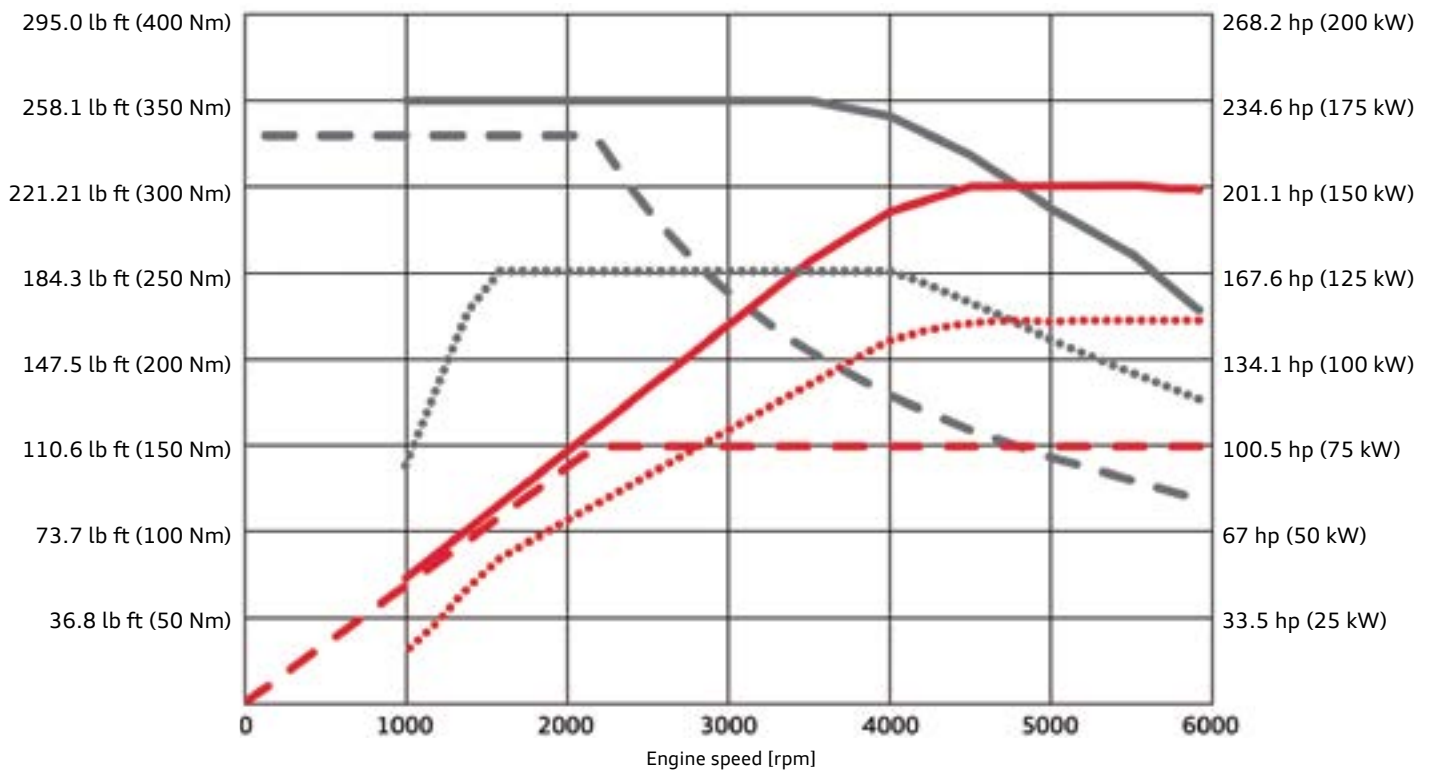
EA211 series 1.4l TFSI engine CUKB

Torque in Nm

- Internal combustion engine
- - - Electric motor
- System (15 seconds)

Power in hp

- Internal combustion engine
- - - Electric motor
- System (15 seconds)



627_093

Internal combustion engine and e-machine with transmission



627_107

Features	Specifications
Engine code	CUKB
Type	Four-cylinder in-line engine
Internal combustion engine output	150 hp (110 kW) at 5000 - 6000 rpm
Electric motor output	102 hp (75 kW) at 2000 - 2300 rpm
System output	150 kW
Torque of internal combustion engine	184 lb ft (250 Nm) at 1600 - 3500 rpm
Electric motor torque	243 lb ft (330 Nm) at 2200 rpm
System torque	258 lb ft (350 Nm)
Displacement in cm ³	1395
Stroke	3.1 in (80 mm)
Bore	2.9 in (74.5 mm)
Number of valves per cylinder	4
Firing order	1-3-4-2
Compression ratio	10 : 1
Fuel type	Premium 91 AKI
Turbocharging	Exhaust turbocharger
Engine management system	Bosch MED 17.01.21
Powertrain type	6-speed dual clutch transmission (S tronic)
Oxygen sensor control	1 sensor upstream of catalytic converter and 1 sensor downstream of catalytic converter
Mixture formation	Direct injection
Emission standard	SULEV 30

Internal combustion engine

The A3 Sportback e-tron uses the EA211 series 1.4l engine. Because the transmission is 2.26 in (57.5 mm) longer to accommodate the e-machine, the engine is mounted further to the right than in the standard A3 Sportback.

The main bearings, the connecting rod big end bearings and the piston rings of this engine have special coatings. In addition, piston backlash has been adapted and the cylinder liners are plasma-coated.

The Audi A3 Sportback e-tron can be driven in electric-only mode. This can result in periods of time during which the internal combustion engine is not in use.

During electric-only driving, the internal combustion engine can start in order to heat up the catalytic converter.

To ensure wear-free starting of the internal combustion engine after electric-only operation, clutch K0 closes and the e-machine turns the engine over until sufficient oil pressure is obtained.

In the U.S. market, the engine is also equipped with secondary air injection.



627_023

Engine start

The internal combustion engine is started by the e-machine. Unlike the Q5 hybrid quattro, there is no 12V starter motor. Engine Control Module J623 sends a start message to DSG Transmission Mechatronic Module J743. Clutch K0 is closed and connects the e-machine rotor to the internal combustion engine's crankshaft. The rotor brings the engine's crankshaft up to starting speed. J623 then enables the ignition and fuel injection and the engine starts.

If it is necessary for the internal combustion engine to start when the vehicle is running in electric-only mode, the torque from the e-machine is increased by the amount necessary to start the internal combustion engine when the clutch closes. This prevents judder. After starting, clutch K0 is opened and the internal combustion engine runs at no load. After the speed of the internal combustion engine has been adapted to that of the e-machine, clutch K0 is closed again.

Fuel system

Because hydrocarbons also form when the vehicle is driven in electric-only mode, there is a danger of overloading the activated charcoal filter (carbon canister). To prevent this, the A3 Sportback e-tron is equipped with a pressure reservoir.

During electric-only driving, the line leading to the carbon canister is closed by Tank Switch-off Valve N288. The pressure in the fuel tank then increases to approximately 4.3 psi (0.3 bar). The pressure is measured by Fuel Tank Pressure Sensor G400 and relayed to the ECM.



Tank Switch-off Valve N288

Fuel Tank Pressure Sensor G400

627_094

Fuel filler flap

The fuel filler flap of the A3 Sportback e-tron is locked and cannot be opened by hand until the pressure in the fuel tank has dropped. This only takes a few seconds.

When the driver actuates Fuel Filler Door Release Button E319 on the driver's door panel, the ECM opens Tank Shut-off Valve N288. The reduction in pressure is detected by Fuel Tank Pressure Sensor G400. Vehicle Electrical System Control Module 1 J519 then automatically opens the fuel filler flap.

The status of the fuel filler flap is indicated in the DIS.

Fuel Filler Door Release Button E319



627_095



627_096



627_097

Power transmission

Overview

Power transmission is provided by the front wheel drive, six-speed ODD S tronic (DSG) transmission.

The integrated Electro-drive Drive Motor V141 (e-machine) is a permanently excited synchronous machine that develops up to 102 hp (75 kW) of power. It is capable of delivering approximately 243 lb ft (330 Nm) of torque to the transmission. V141 provides electric-only drive-away from standstill and electric-only driving as well as starting the internal combustion engine via clutch K0. (see page 10).

If necessary, in Boost mode, the (e-machine) and internal combustion engine are connected via clutch K0 and deliver the maximum system power to the transmission.

In generator mode, V141 is driven by the internal combustion engine using the vehicle's propulsion energy (recuperation) or through the closed K0 clutch. The electric drive motor supplies power to the entire vehicle.

Clutches K1 and K2 (see page 16, page 17) transfer the entire power generated by both drives to sub-gearboxes 1 and 2.

All 3 of clutches K0, K1 and K2 are wet-type clutches and are controlled by the DSG Transmission Mechatronic Module J743.

The transmission has only one ATF supply. Approximately 7.3 qt (7 l) of ATF supply both the transmission hydraulics and the sub-gearbox. Both sub-transmissions form the manual transmission of the transmission.

2-pin connector for safety line

10-pin connector for:
2 contacts for Drive Motor Temperature Sensor G712,
6 contacts for Drive Motor Rotor Position Sensor 1 G713 and
2 contacts for the safety line

Parking lock lever

Oil gauge pipe

ATF drain plug 1 (manual transmission)

ATF inspection bolt

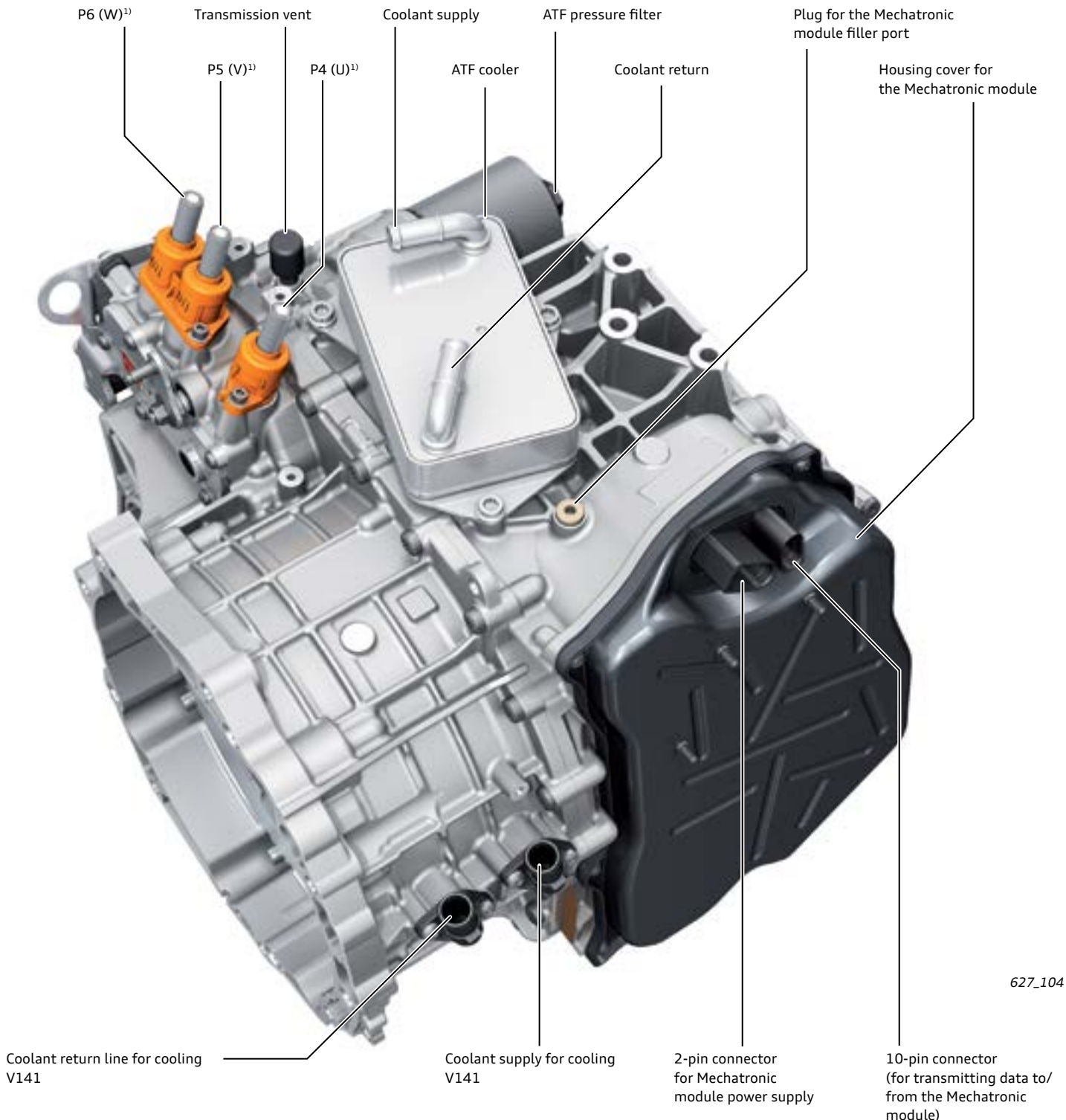
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The six forward gears of the transmission provide a ratio spread of 6.8:1.

The Mechatronic module is located below its housing cover and is separated from the manual section of the transmission by a bulkhead. During vehicle operation, the Mechatronic module is filled to the overflow port by the bulkhead. (See page 14,15).

The Mechatronic module, clutches, gear selectors and manual gearbox are supplied on demand by an electrically driven ATF pump. A hydraulic pressure accumulator serves as an ATF reservoir.

The ODD transmission is integrated into the vehicle's thermal management system. The transmission will also have a Start/Stop system. DSG Transmission Mechatronic Module J743 is a participant of the immobilizer system.



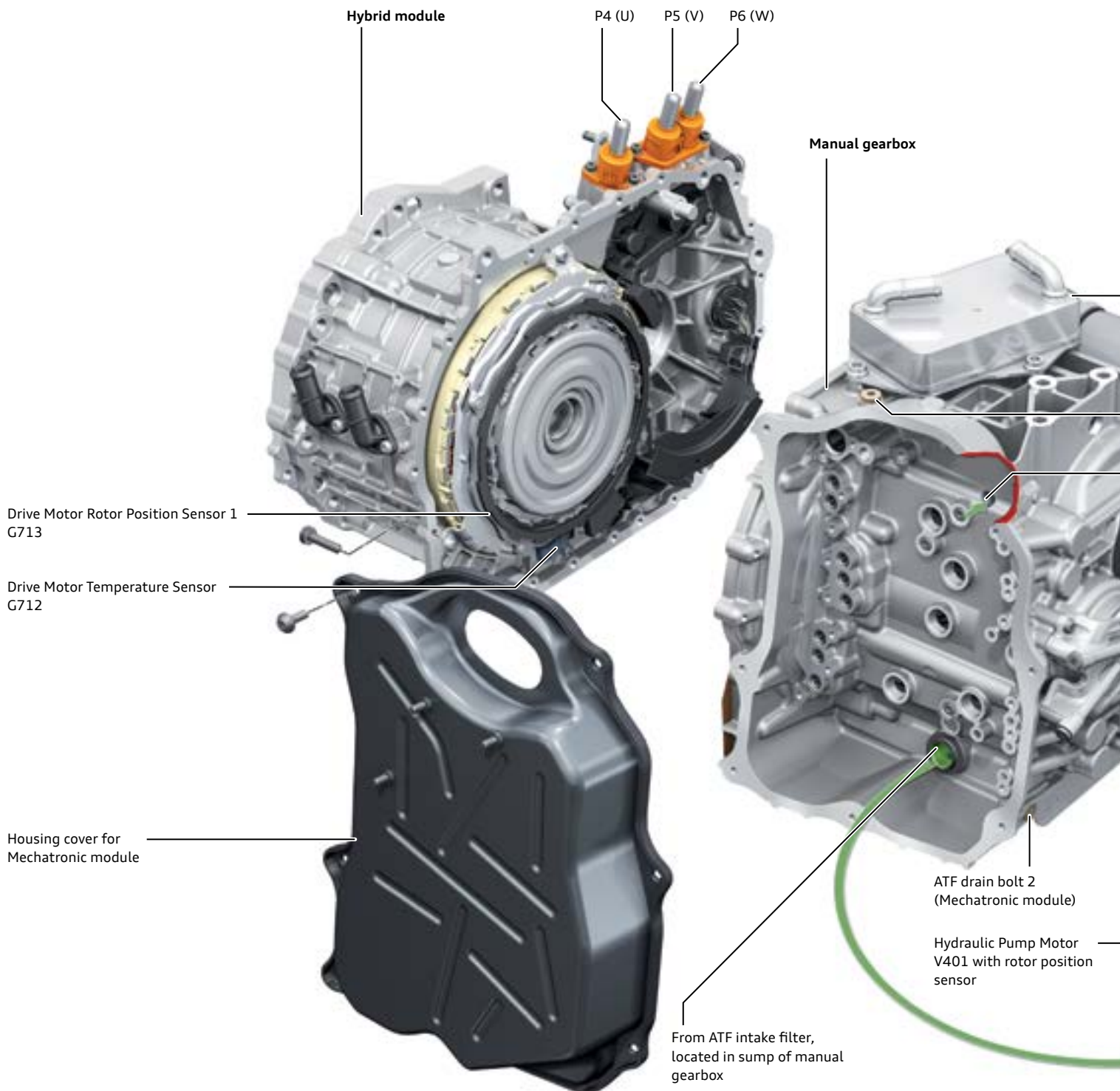
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³⁾ P4 (U), P5 (V), P6 (W) are high voltage lines running from Electric Drive Power and Control Electronics Module JX1 to Electro-drive Drive Motor V141.

Gearbox modules

The six-speed dual clutch ODD transmission consists of the hybrid module, the manual gearboxes and the Mechatronic module.

Drive Motor Rotor Position Sensor 1 G713 and Drive Motor Temperature Sensor G712 are located on the hybrid module. Both supply their data to Electric Drive Power and Control Electronics Module JX1.



Information

Before removing the transmission or the Mechatronic module, it must be ensured that the ATF pressure accumulator is de-pressurized and that the hydraulic pump is disabled by running the relevant ODIS Service Test Plan. If the ATF, the transmission or the Mechatronic module is replaced, check that the ATF level has been set correctly, as detailed in ElsaPro, and that the Mechatronic module is filled with ATF before starting the engine. This prevents the high-pressure pump from running dry. The Mechatronic module and the immobilizer must be adapted using the relevant ODIS Service Test Plan for replacing the Mechatronic module.

DSG Transmission Mechatronic J743

Apart from the gear selector and clutch slave cylinder, the Mechatronic module houses all sensors and actuators of the transmission control module. This includes the valves, pump motor, pressure and temperatures sensors and the distance and speed sensors.

Main pressure valve and pressure relief valves

- ▶ Main Pressure Valve N472 (accumulator filling valve, allows controlled evacuation of the pressure accumulator).
- ▶ Automatic Transmission Pressure Regulating Valve 3 N217 (pressure relief valve, sub-gearbox 1).
- ▶ Automatic Transmission Pressure Regulating Valve 4 N218 (pressure relief valve 2, sub-gearbox 2).

During operation, the Mechatronic module is filled to the ATF overflow port. This oil volume does not drain off during maintenance via ATF drain plug 1. ATF drain plug 2 must be removed for this purpose.

Clutch valve

- ▶ Automatic Transmission Pressure Regulating Valve 1 N215 (pressure control valve of clutch K1, sub-gearbox 1).
- ▶ Automatic Transmission Pressure Regulating Valve 2 N216 (pressure control valve of clutch K2, sub-gearbox 2).
- ▶ Decoupler Valve N689 (clutch pressure control valve K0).

Cooling oil valve

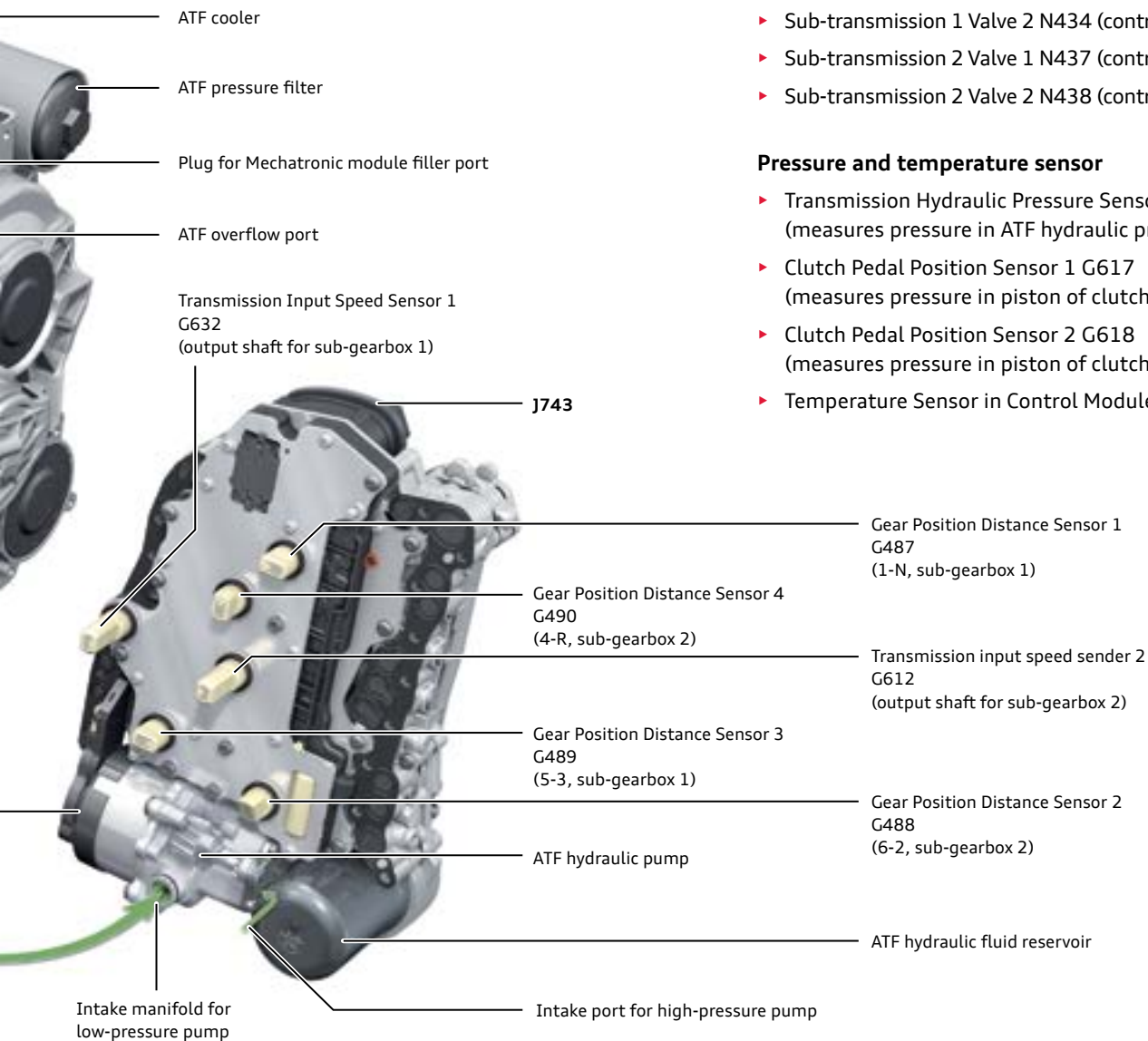
- ▶ Cooling Oil Valve N471 (controls clutch cooling).

Gear selector valves

- ▶ Sub-transmission 1 Valve 1 N433 (controls the 1-N gear selector).
- ▶ Sub-transmission 1 Valve 2 N434 (controls the 5-3 gear selector).
- ▶ Sub-transmission 2 Valve 1 N437 (controls the 4-R gear selector).
- ▶ Sub-transmission 2 Valve 2 N438 (controls the 6-2 gear selector).

Pressure and temperature sensor

- ▶ Transmission Hydraulic Pressure Sensor G270 (measures pressure in ATF hydraulic pressure accumulator).
- ▶ Clutch Pedal Position Sensor 1 G617 (measures pressure in piston of clutch K1).
- ▶ Clutch Pedal Position Sensor 2 G618 (measures pressure in piston of clutch K2).
- ▶ Temperature Sensor in Control Module G510.



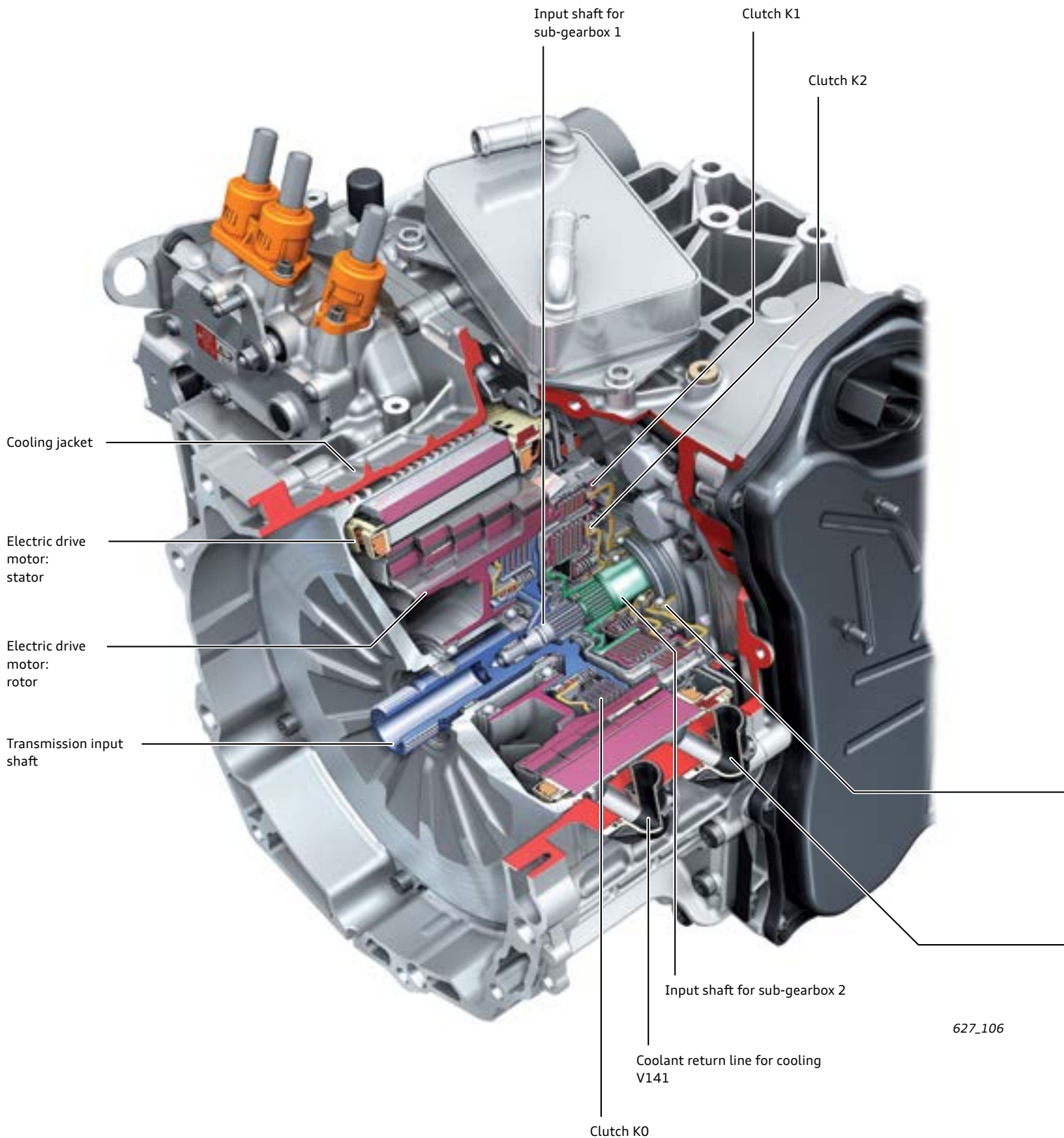
The ATF hydraulic pump is a tandem pump. It consists of a low-pressure pump and a high-pressure pump. The low-pressure pump delivers, through the ATF intake filter, a large volume of ATF for cooling the clutch and lubricating all components.

The high-pressure pump serves to activate the clutch and the gear selectors. It draws in ATF from the flooded Mechatronic area through a port. To ensure that this area is kept flooded, a portion of the ATF flows from the low-pressure pump into the Mechatronic area.

Hybrid module

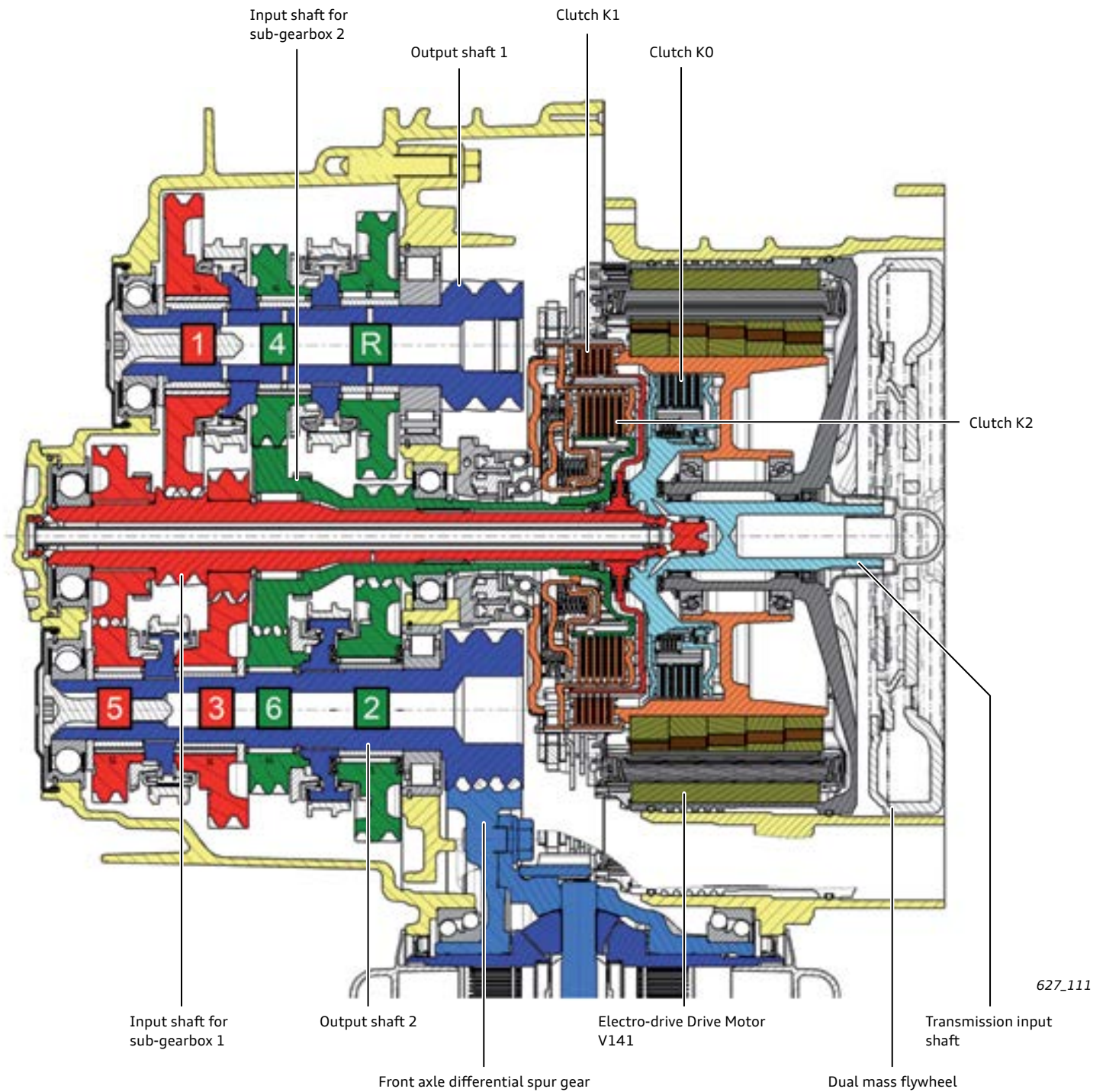
The hybrid module consists of Electro-drive Drive Motor V141 (which is encapsulated by a cooling jacket), clutches K1 and K2 for sub-gearboxes 1 and 2 plus clutch K0.

Clutch K0 is located on the secondary side of the dual mass flywheel and connects the e-machine to the internal combustion combustion engine. The clutch is activated and cooled through the hollow-drilled input shaft of sub-gearbox 1 by means of rotary feed-throughs.



627_106

Manual gearbox



2 concentric clutch slave cylinders actuate the engagement bearings of clutches K1 and K2. Due to the engagement bearings, the clutch slave cylinders no longer have to rotate. This means there are no feed throughs that cause unwanted friction loss and leakage.

Coolant return line for cooling V141

Clutch K1 transmits the engine torque to sub-gearbox 1. The uneven gears (1, 3 and 5) are engaged in sub-gearbox 1.

Clutch K2 transmits the engine torque to sub-gearbox 2, in which the even gears (2, 4 and 6) and reverse gear are engaged.

The reverse gear pinion meshes with the 2nd gear pinion. The reverse gear is engaged by power transmission to output shaft 1 through clutch K2, input shaft 2, the engaged 2nd gear pinion and the engaged reverse gear pinion.

Both output shafts mesh with the spur gear of the front axle drive.

Suspension

Overview

The suspension system of the Audi A3 Sportback e-tron is based on the suspension system of the conventional-engined Audi A3 Sportback.

ABS/ESC module

Continental MK100

- ▶ Carry-over from Audi A3 Sportback

Manually adjustable steering column

- ▶ Carry-over from Audi A3 Sportback

Wheels/tires

- ▶ Exclusive wheel design (17" and 18")
- ▶ Use of low rolling resistance tires (17" only)

MacPherson front suspension

- ▶ Carry-over from Audi A3 Sportback
- ▶ Modified damper setup

Electro-mechanical steering

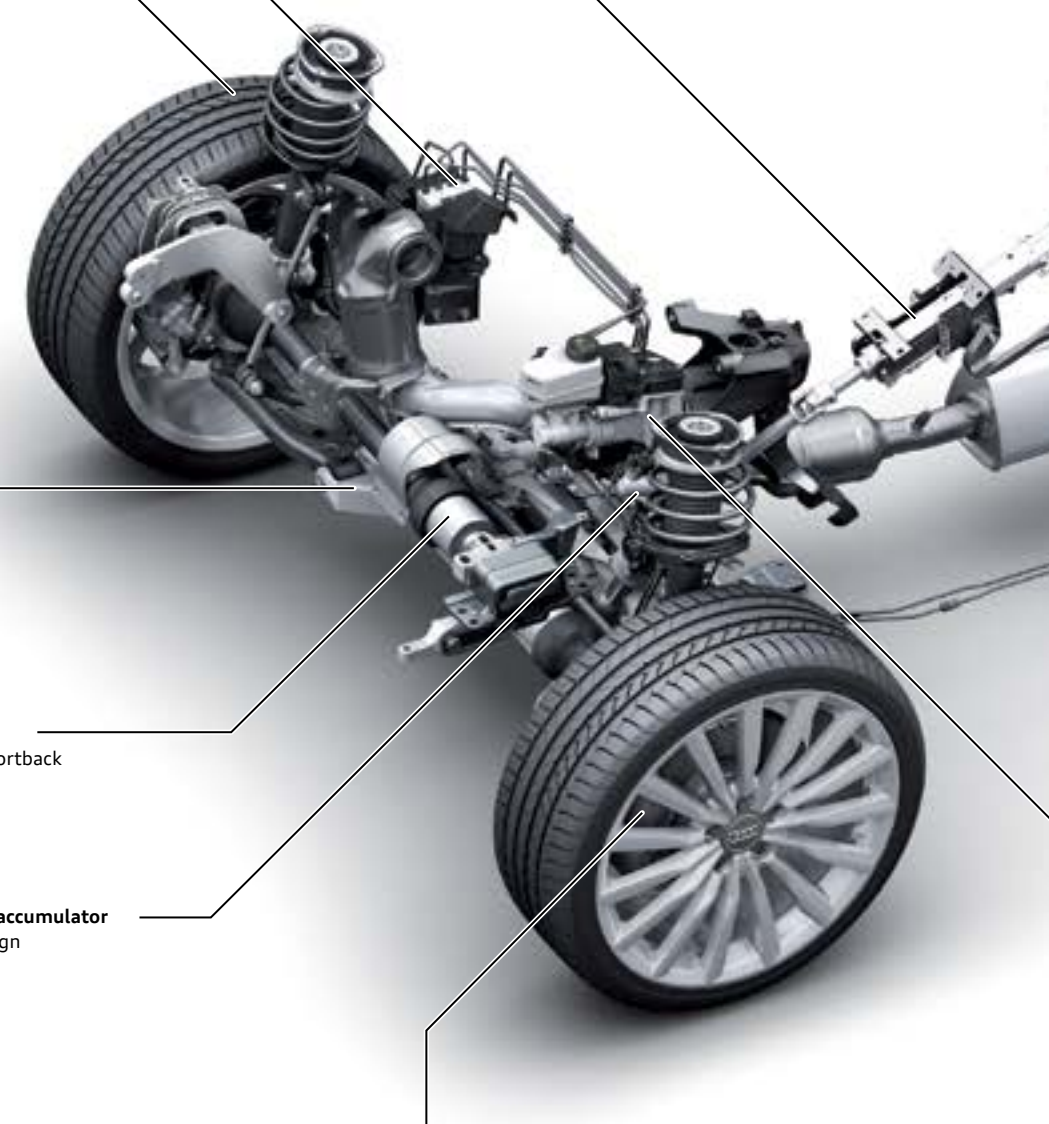
- ▶ Carry-over from Audi A3 Sportback

Brake system pressure accumulator

- ▶ New concept and design

Front wheel brakes

- ▶ 16" brake system
- ▶ Brake caliper TRW PC 57-25/14
- ▶ Brake disc diameter: 12.2 in (312 mm)

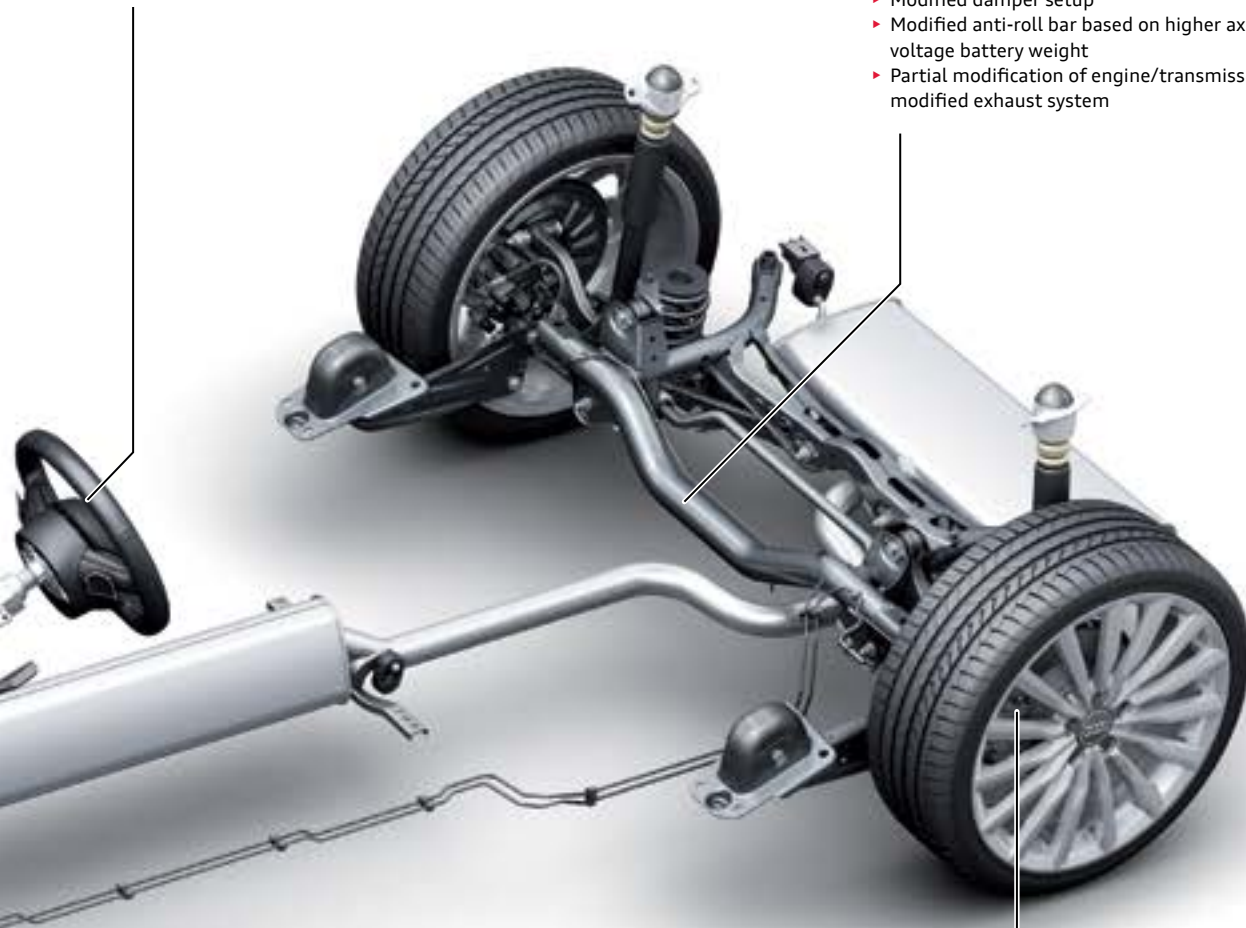


Multi-function steering wheel

- ▶ Carry-over from Audi A3 Sportback

Four-link rear suspension

- ▶ Carry-over from Audi A3 Sportback
- ▶ Modified damper setup
- ▶ Modified anti-roll bar based on higher axle load due to high voltage battery weight
- ▶ Partial modification of engine/transmission mounts due to modified exhaust system



Electro-mechanical brake servo

- ▶ First use in an Audi model

Rear wheel brakes

- ▶ 15" brake system
- ▶ Brake caliper Continental FNC-M38
- ▶ Brake disc diameter: 10.7 in (272 mm)

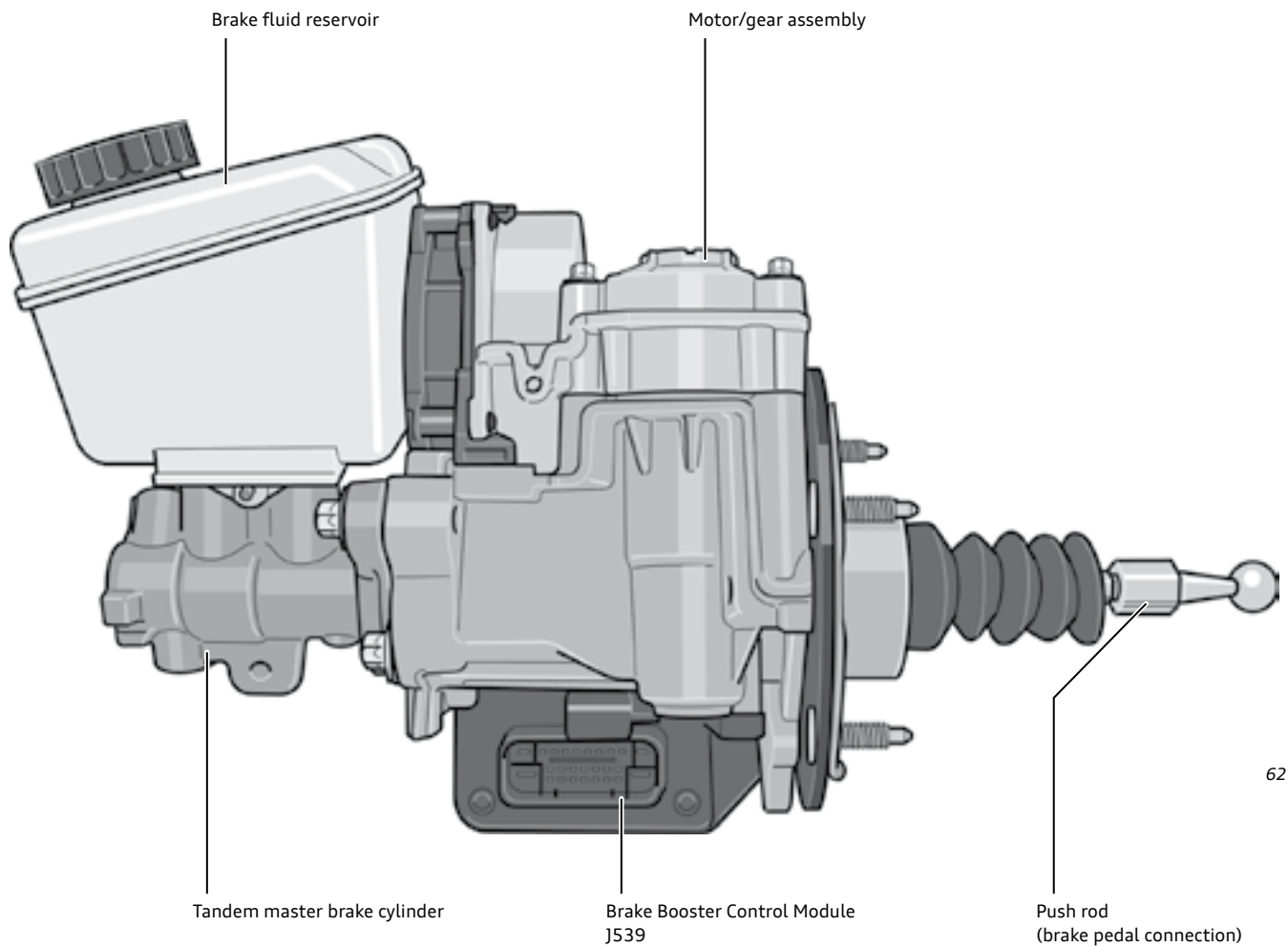
627_098

Electro-mechanical brake servo

Because intake manifold vacuum isn't available when driving in electric only mode, a new brake booster system was developed. The use of the electro-mechanical brake servo eliminates the need for an additional vacuum pump normally used in conjunction with a conventional pneumatic brake servo.

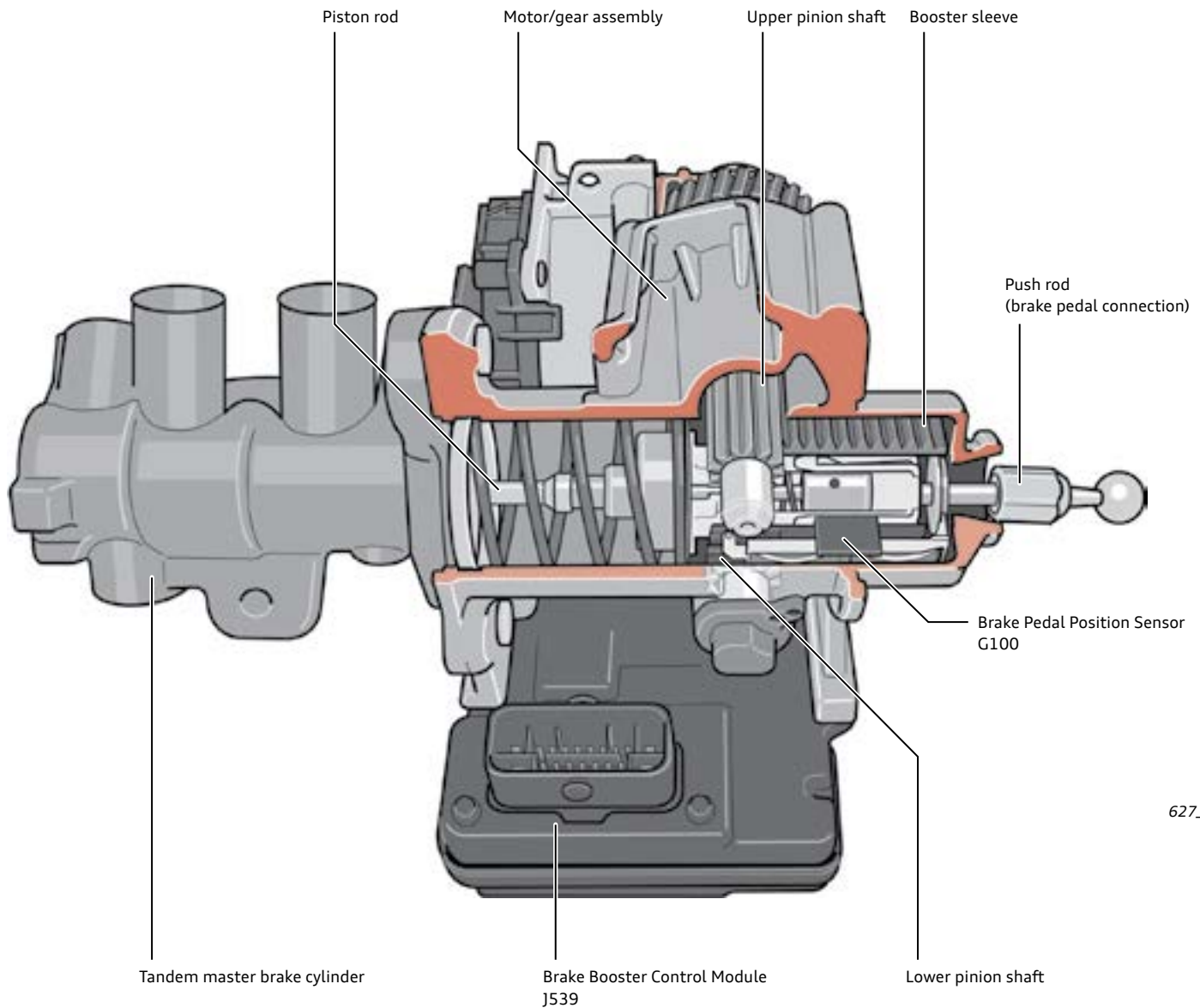
The electro-mechanical brake servo offers the following key advantages over a conventional pneumatic brake servo:

- ▶ Vacuum-independent brake servo.
- ▶ High pressure generation dynamics.
- ▶ High pressure regulation accuracy.
- ▶ Constant brake pedal characteristic/pedal force.



627_099

Design and functional principle



627_100

The brake pressure applied by the driver is boosted by the Motor/gear assembly. An AC motor drives two pinion shafts through a reduction ratio. The splines of the pinion shafts are in mesh with the spline on the booster sleeve. The rotary motion of the pinion shafts is translated into a longitudinal motion of the booster sleeve. To increase the brake pressure, the booster sleeve is moved towards the tandem master brake cylinder (to the left in the diagram). After a defined amount of the idle travel (play), the booster sleeve comes into contact with the push rod and, if the electric motor is further activated, exerts force upon the push rod (in addition to the brake pressure applied by the driver). The electric motor is activated by Brake Booster Control Module J539. The control module receives information on the position of the brake pedal and the push rod (= driver input) from integrated Brake Pedal Position Sensor G100.

The position of the electric motor rotor and, indirectly, the position of the booster sleeve is monitored by a rotor position sensor (Hall sender) in the electric motor.

The sliding assembly of the booster sleeve on the push rod, and the resultant separation of both components, ensures that the driver can apply brake pressure even if the boost function fails.

J539 provides for terminal 15 after-run when the ignition is switched off. If the vehicle is stationary and the driver is not applying the service brake, the run-on time is approximately 1 minute.

If the vehicle is actively braked by the driver after the ignition is switched off, brake boost is maintained for up to approximately six minutes. After approximately three minutes and after approximately six minutes, the driver is instructed to secure the vehicle against rolling and informed that brake boost will be deactivated.

The signals from Brake Pedal Position Sensor G100 of the electro-mechanical brake servo are used for activating the brake light.

Brake System Pressure Reservoir VX70

If required, the e-machine is used as a generator in over-run mode to recharge the high voltage battery (recuperation). The electric motor is “driven”. It creates drag and generates additional braking torque at the driven wheels.

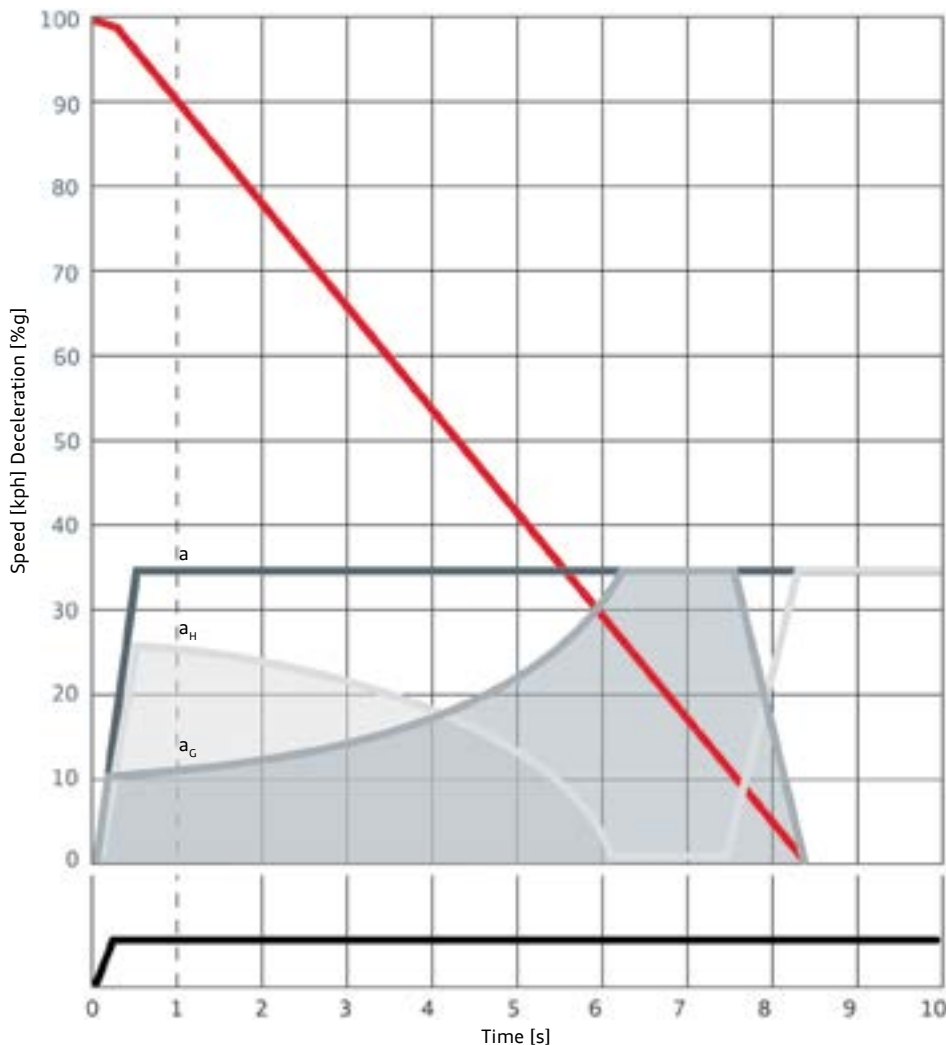
Because this process would be independent of driver inputs, it would be more difficult for the driver to perform anticipatory braking. This is why it is important that a braking torque defined by the driver be available at any time and that the driver be able to gauge the effect of this torque.

Hydraulic brake pressure is reduced during recuperation. This reduction is made in an effort to match the total amount of “hydraulic” braking and “electrical” braking to the actual driver input. Brake System Pressure Reservoir VX70 is used to achieve the desired effect.

The combination of “hydraulic” braking and “electrical” braking is referred to as “blended braking.” As an example, the deceleration at a specific point in time (one second after the start of braking) is specially marked in the diagram. The amount of deceleration ‘a’, which the driver wishes to achieve, is provided by the total deceleration resulting from hydraulic braking torque ‘a_H’ plus the deceleration resulting from generator braking torque ‘a_G’.

$$a_G \cdot a = a_H + a_G$$

Example of "Blended Braking"



627_101

Key:

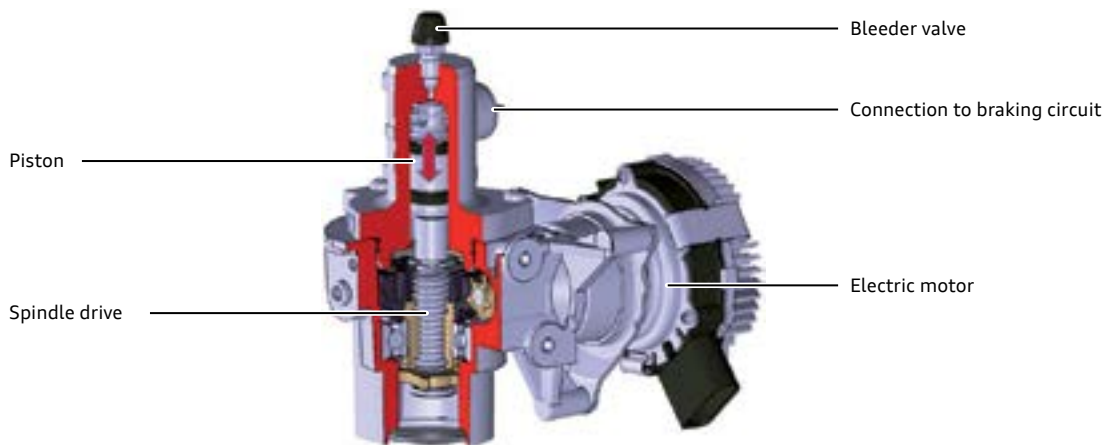
- Deceleration resulting from "hydraulic" braking torque a_H
- Deceleration resulting from generator braking torque (recuperation) of AC drive a_G
- Requested deceleration through brake pedal actuation by driver a
- Pedal travel
- Vehicle speed

Design and functional principle

Brake System Pressure Reservoir VX70 is connected directly to the brake master cylinder.

If the brake pressure applied by the driver (dependent on the additional braking torque of the e-machine during recuperation) has to be reduced, the electric motor of the pressure reservoir is activated by the Brake Booster Control Module J539. The piston performs a lift motion due to the spindle drive in the cylinder, cylinder volume increases and brake fluid is taken in from the braking circuit. The braking pressure within the system decreases. At the same time, the brake boost provided by the electro-mechanical brake servo is reduced to ensure that the brake pedal does not "give".

If the additional braking torque of the e-machine decreases again during active braking, or if the generator mode of the electric drive is fully deactivated, the previously reduced braking pressure must be increased again. J539 re-activates the electric motor of the pressure reservoir. The piston movement reduces the cylinder volume and the brake fluid in the cylinder is returned to the braking circuit. The pressure within the braking system increases accordingly.



627_102

Service

The electro-mechanical brake servo - including Brake Servo Control Module J539 and Brake System Pressure Reservoir VX70 - are accessed through Address Word 23 in ODIS Service. It can only be replaced as a complete assembly.

After replacement, the control module must be encoded. It is important to bleed the brake system properly before encoding. This is done through a Basic Setting Test Plan which configures the system to acquire measured data from the corresponding sensors when the brake pedal is at rest (released) and when it is depressed.

In addition, brake pressure is developed by activating the electric motor, and a pressure-volume curve is obtained. Component tolerances are recognized and factored in during subsequent control operations.

It is also necessary to perform the Basic Setting procedure for the pressure reservoir. Both basic setting procedures must also be carried out after replacing the pressure reservoir.

Actuator diagnosis Test Plans have been implemented for function-testing the electro-mechanical brake servo and pressure reservoir.

High voltage battery

Overview of hybrid components

The following high voltage components are installed in the Audi A3 Sportback e-tron:

Power electronics

It converts the direct current stored in the high voltage battery to alternating current for the e-machine. The power electronics are cooled by the low-temperature cooling circuit 2.

Engine

Four cylinder engine with turbocharger :
▶ 1.4l TFSI 147 hp (110 kW)

Charging port

The all-purpose charging cable can be used to charge the high voltage battery at both household outlets and commercial outlets using an interchangeable connecting plug (120 V AC and 240 V AC).

Electric AC compressor

The electric AC compressor is integrated into the high voltage system and cools both the passenger compartment and Hybrid Battery Unit AX1 as required.

Electrical brake servo

The dependencies governing the utilization of braking torque lead to electrical deceleration fluctuations which have to be compensated hydraulically in accordance with the driver's wishes. The main focal points during the development of the electrical brake servo were fully utilizing the deceleration potential of the e-machine under driver initiated braking and extending the electric driving range of the e-machine.

PTC heater

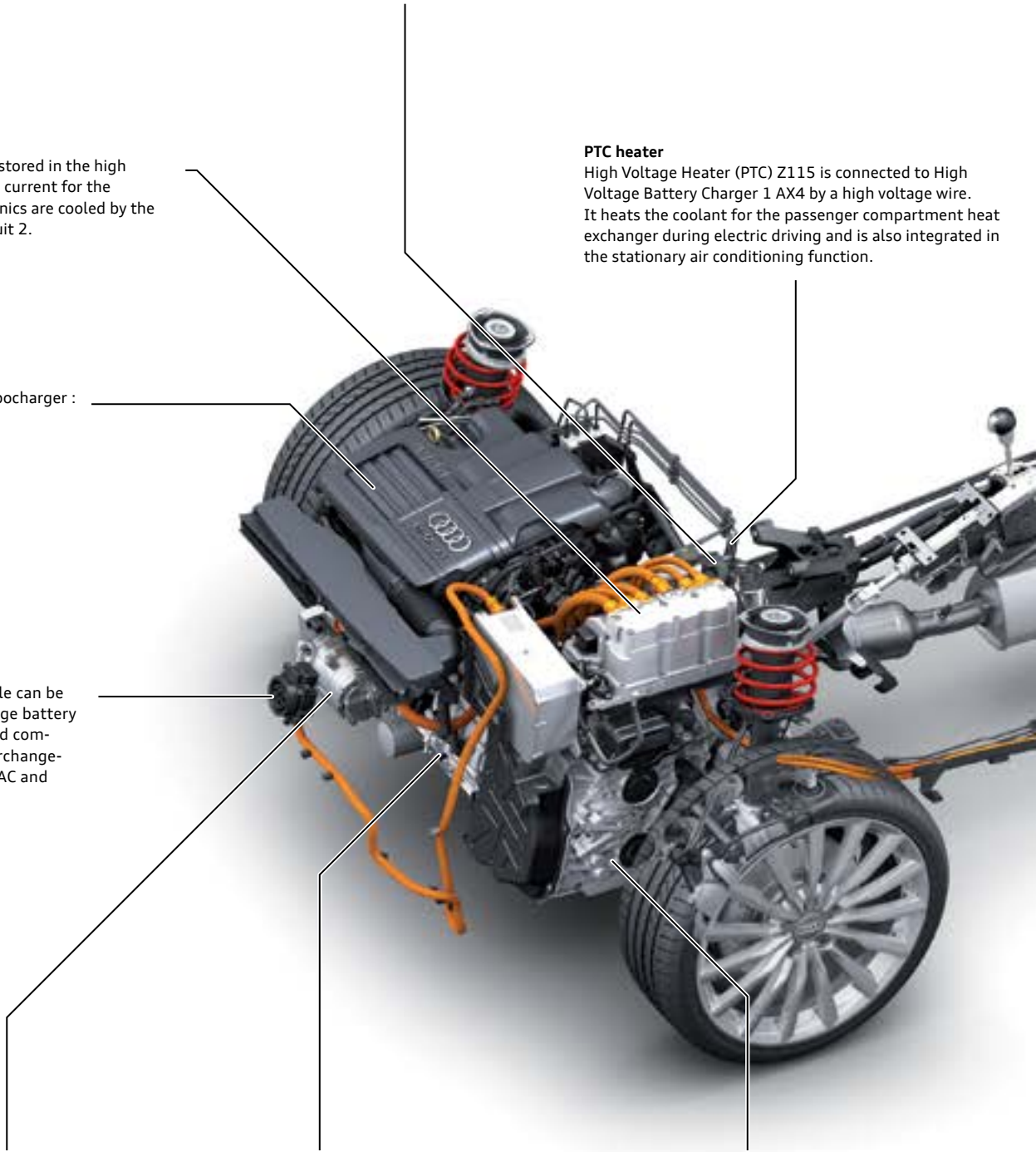
High Voltage Heater (PTC) Z115 is connected to High Voltage Battery Charger 1 AX4 by a high voltage wire. It heats the coolant for the passenger compartment heat exchanger during electric driving and is also integrated in the stationary air conditioning function.

e-machine (Electro-drive Drive Motor V141)

The e-machine is connected to the transmission via clutch K0. It is able to generate a braking torque at the wheel in dependence on RPM, battery temperature and state of charge.

6-speed dual clutch transmission S tronic

Consists of 2 sub-gearboxes engaged by multi-plate clutches K1 and K2. It is possible to select between 3 drive programs using the selector lever.



Information

All high voltage components are connected to the vehicle chassis via equipotential bonding. The equipotential bonding is a low-resistance wire or bolted connection, connecting the high voltage components to the vehicle chassis.

Battery cooling system

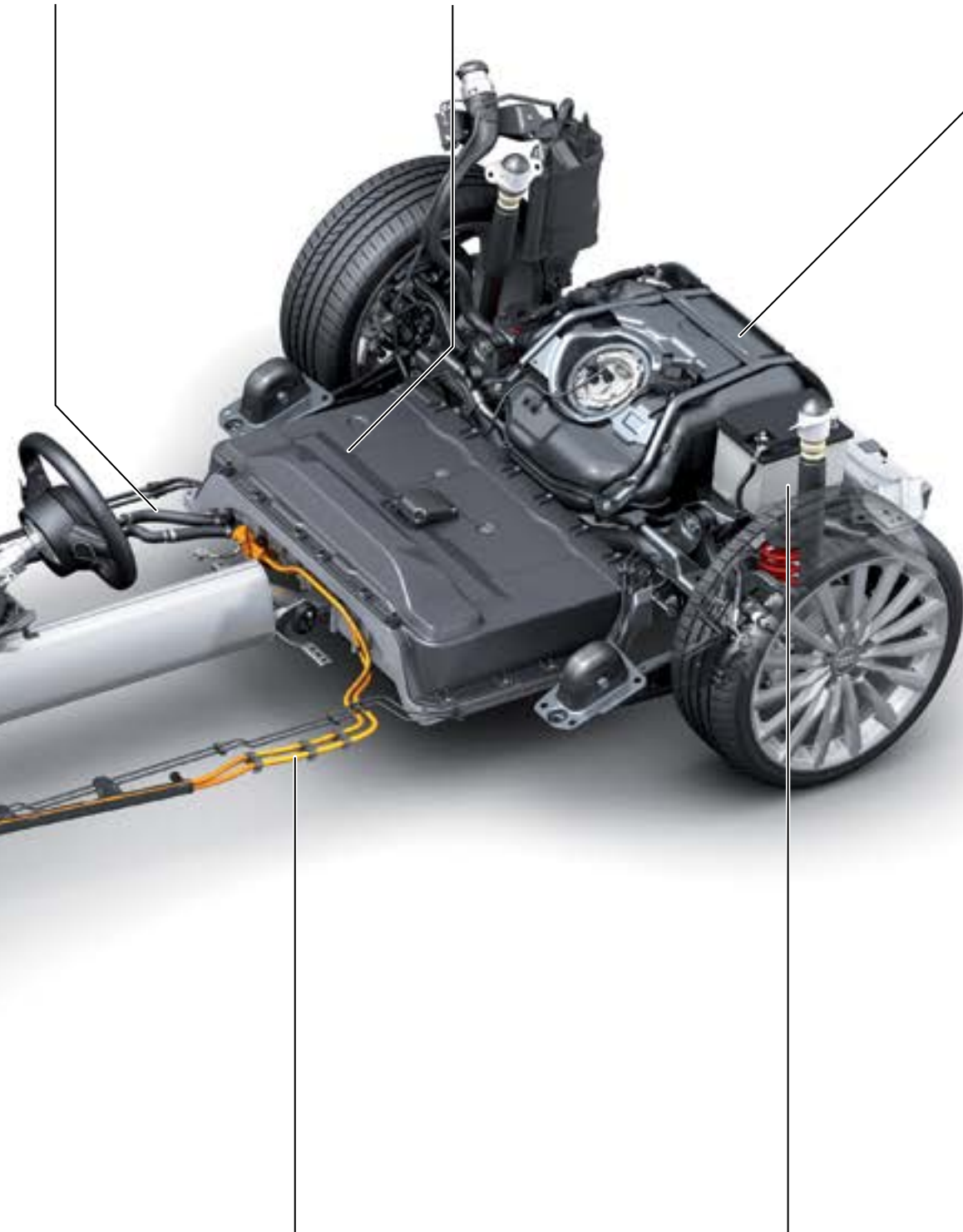
The battery cooling system is integrated into the low-temperature cooling circuit 2.

High voltage battery module

The high voltage battery module consists of 8 modules each with 12 prismatic cells. The voltage is between 280 and 390 V, depending on state of charge.

Fuel tank

The fuel tank has a capacity of 10.5 gal (40 l) and is installed over the rear axle.

**High voltage lines**

All high voltage lines are double-insulated and color-coded orange for easy recognition. To avoid incorrect assembly, the high voltage lines are mechanically coded and identified by a colored ring below the bayonet ring.

12 volt vehicle battery

Installed over the rear axle, it is responsible for supplying power to the low-voltage components.

627_003

**Information**

Always follow the directions in the electronic repair information when performing work on equipotential bondings.

Hybrid Battery Unit AX1

Hybrid Battery Unit AX1 is mounted on the underside of the vehicle and has the following components:

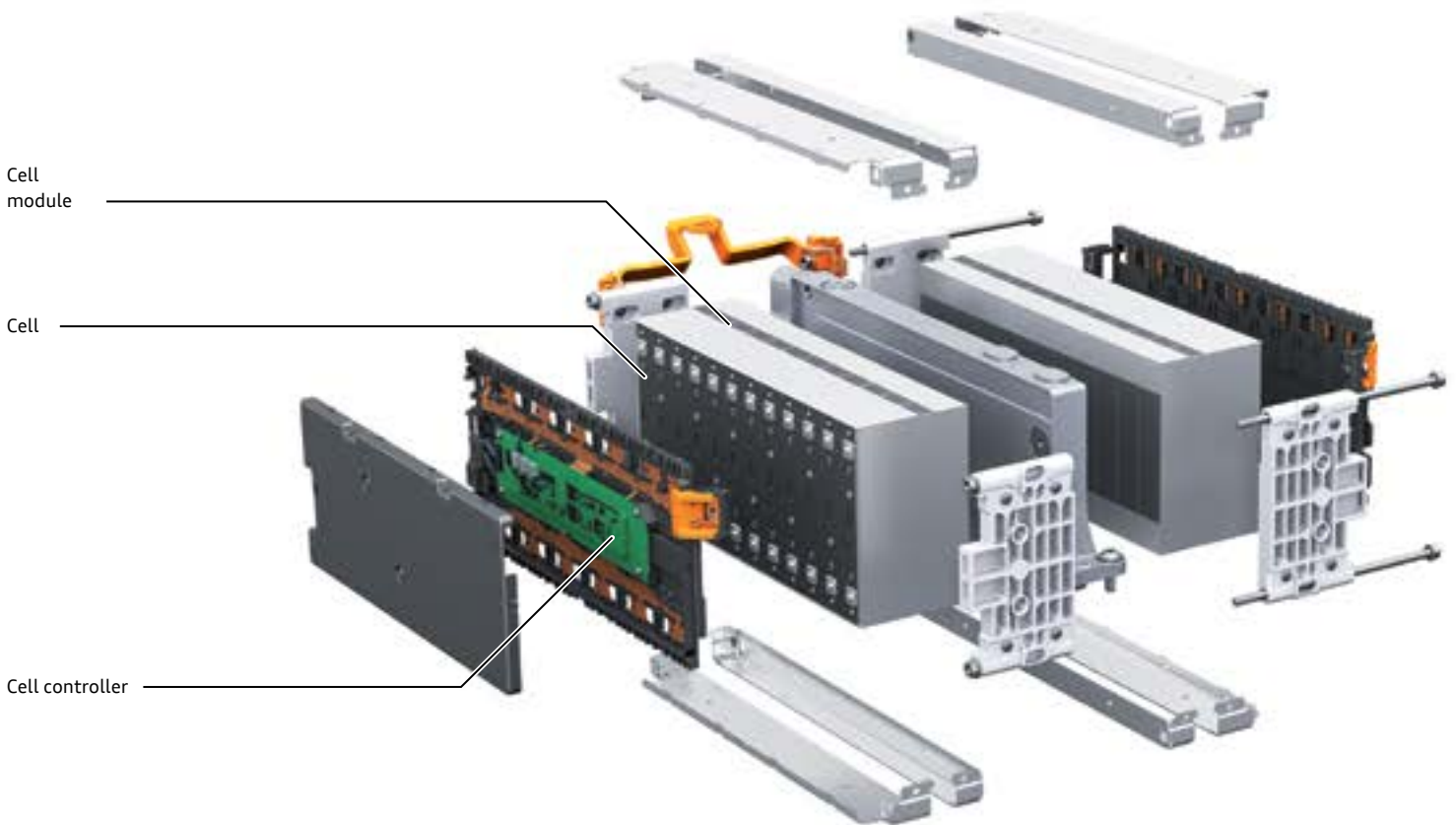
- ▶ Battery Regulation Control Module J840.
- ▶ High voltage Battery Switch Box SX6.
- ▶ 8 cell modules each with 12 battery cells and controller.
- ▶ Battery cell cooling system.
- ▶ Connections for the high voltage wiring harness.
- ▶ Connections for the 12 volt electrical system.
- ▶ Coolant connections.

The bottom section of Hybrid Battery Unit AX1 housing is made from cast aluminum and the top section from polymer. The sections are bolted and bonded forming an airtight housing.

Pressure changes inside the housing caused by temperature variation are equalized by the pressure equalization elements. If the pressure inside AX1 is too high, the pressure relief valve opens.

The pressure equalization elements and the pressure relief valve are installed under a cover on the top side of AX1.

Hybrid Battery Unit AX1 is attached to the vehicle chassis by an equipotential bond.



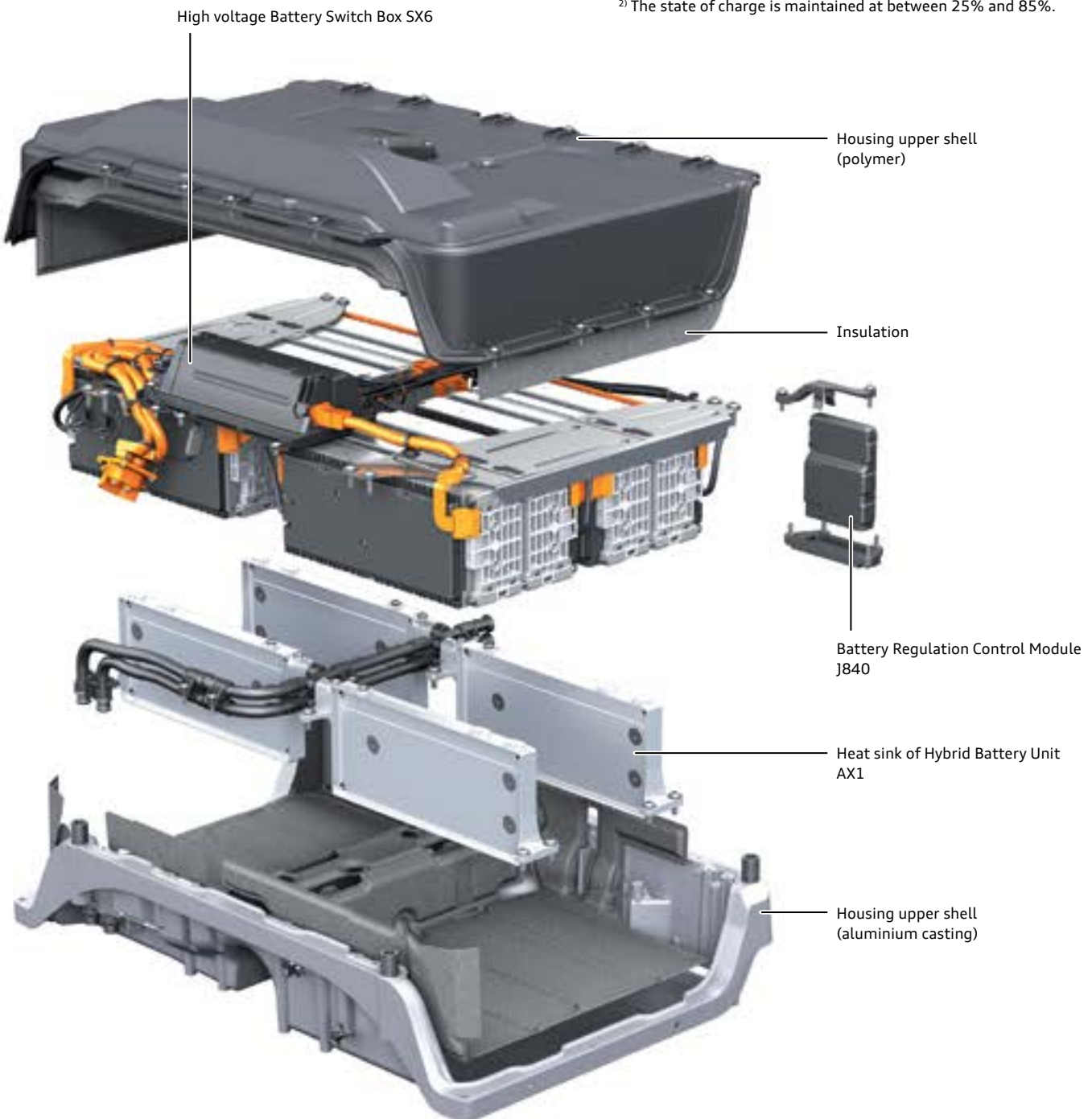
Specifications

Two cell modules are bolted to a cooling element on the underside. The four cooling elements are connected to AX1 in parallel. The inlet and outlet temperature sensors are integrated into the coolant connections.

Rated voltage	352
Cell voltage	3.7
Number of cells	96
Capacitance in Ah	25
Operating temperature	-18 to 140 °F (-28 to 60 °C) ¹⁾
Energy content in kWh	8.8
Usable energy content in kWh	7.0 ²⁾
Power in kW	Maximum 90
Weight	264 lb (120 kg)

¹⁾ The charging/discharging currents are reduced at temperatures of 122 °F (50 °C) and higher.

²⁾ The state of charge is maintained at between 25% and 85%.



High voltage contacts

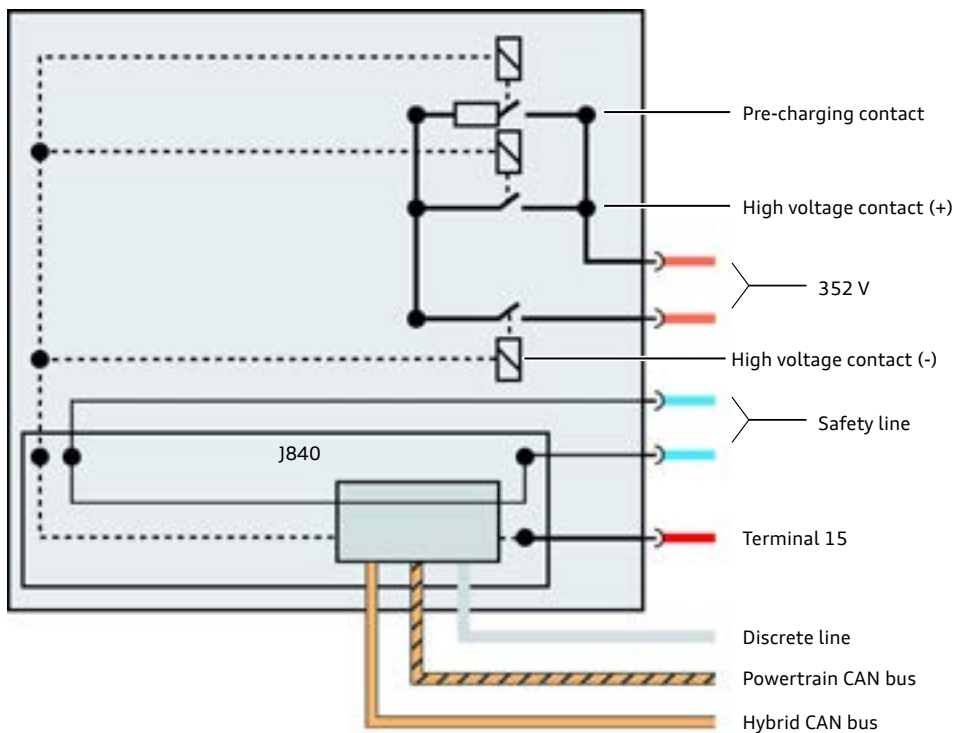
There are three high voltage contacts (referred to as contactors) in Hybrid Battery Unit AX1. A contactor can be compared to a relay but is designed to carry higher electrical loads.

If these high voltage contacts are closed, AX1 is connected to the other high voltage components and current is able to flow. Contactors for both the positive and negative side are installed. A 10 ohm resistor is integrated in the second positive high voltage contact. This is referred to as the pre-charging contact.

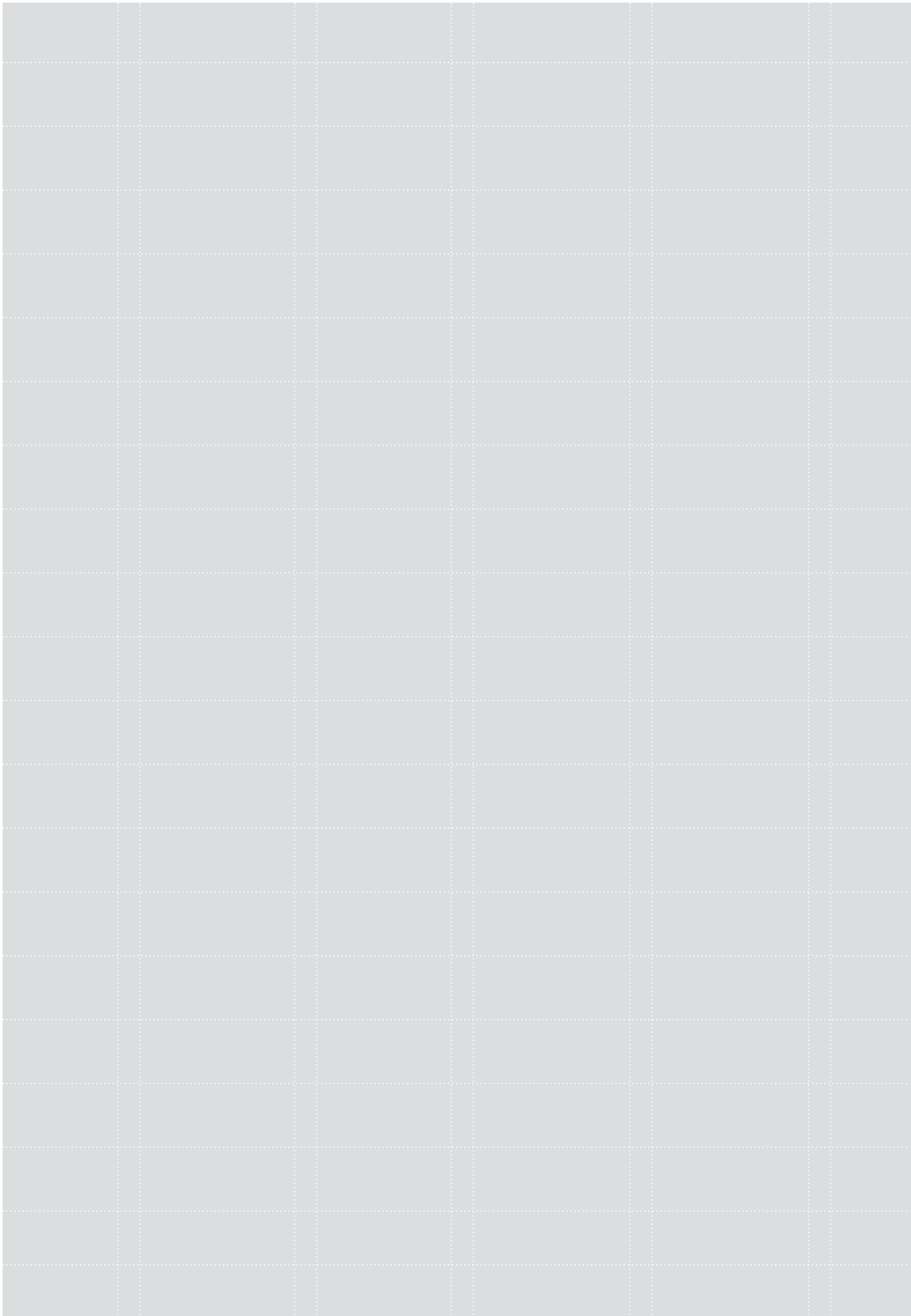
When terminal 15 is switched on, Battery Regulation Control Module J840 closes the negative high voltage contacts and the pre-charging contact. A small amount of current flows through the resistor which charges Intermediate Circuit Capacitor 1 C25 in Electric Drive Power and Control Electronics JX1. The positive high voltage contact is not closed by J840 until the C25 is fully charged.

The high voltage contacts are opened by Battery Regulation Control Module J840 if:

- ▶ Terminal 15 is switched “off “,
- ▶ Or the safety line is disconnected,
- ▶ Or a crash signal from Airbag Control Module J234 is detected,
- ▶ Or the 12-volt power supply for Battery Regulation Control Module J840 is interrupted.



Notes



Battery Regulation Control Module J840

Battery Regulation Control Module J840 is bolted to Hybrid Battery Unit AX1 from below.

It performs the following tasks:

- ▶ Measurement and evaluation of the battery voltage.
- ▶ Measurement and evaluation of the individual cell voltages.
- ▶ Measurement of high voltage battery temperature.
- ▶ Regulation of high voltage battery temperature using coolant circulation pump 2 and Solenoid Valve 1 N88 in low-temperature circuit 2.

High voltage Battery Switch Box SX6

The following components are installed in SX6:

- ▶ Controller.
- ▶ High voltage System Fuse 2 S352.
- ▶ High voltage Battery Voltage Sensor G848.
- ▶ High voltage Battery Protection Resistor N662.
- ▶ Power contactor 1 of High voltage Battery Power Output Protection 1 J1057 (HV pos.).
- ▶ Power contactor 2 of High voltage Battery Power Output Protection 2 J1058 (HV neg.).
- ▶ Precharging contactor of High voltage Battery Pre-load Protection J1044 (20 Ω).

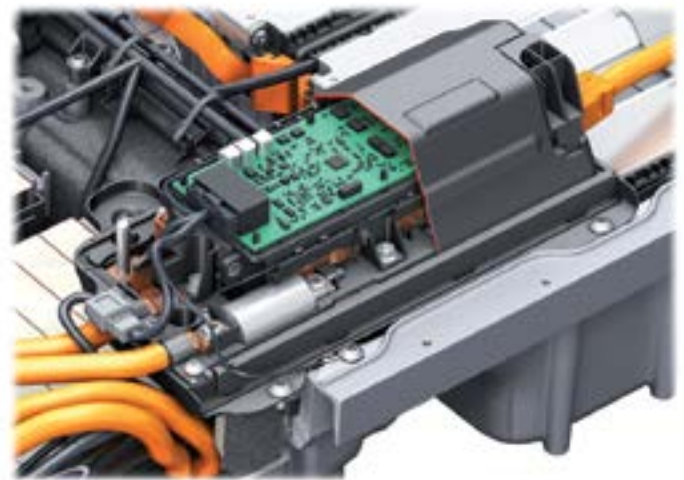
When terminal 15 is switched on, the power contactor 2 of High voltage Battery Power Output Protection 2 J1058 (HV negative) and the precharging contactor of High voltage Battery Pre-load Protection J1044 (20 Ω) are at first closed. A small amount of current flows through the resistor until the intermediate circuit capacitor 1 C25 in Electric Drive Power and Control Electronics Module JX1 is charged up. When the intermediate circuit capacitor is charged up, the power contactor 1 of High voltage Battery Power Output Protection 1 J1057 (HV positive) is closed and then the precharging contactor of J1044 (20 Ω) is opened.

Cell controller

The cell controllers are a component part of the cell module. The cell controllers measure the voltage of each individual cell and, using an NTC resistor, the temperature of the cell module and send this data to Battery Regulation Control Module J840.

J840 communicates with other modules via the interfaces to the Powertrain CAN and Hybrid CAN.

A crash signal is transmitted from Airbag Control Module J234 to J840 over the Powertrain CAN and a discrete wire. If a crash signal is generated, the high voltage contacts are opened and the high voltage system is deactivated. The control module communicates with High voltage Battery Switch Box SX6 and the eight cell controllers over a private CAN.



627_037

The power contactors are opened if at least one of the following conditions is met:

- ▶ Terminal 15 switched off.
- ▶ A crash signal from Airbag Control Module J234 is detected.
- ▶ Maintenance connector TW is opened.
- ▶ Fuse for power supply to power contactors terminal 30c is disconnected.
- ▶ 12 volt power supply for Hybrid Battery Unit AX1 is interrupted.
- ▶ Safety line open.

J840 evaluates the cell voltages and instructs the cell controllers to discharge cells with high cell voltage through a resistor. As a result, all cells achieve the same cell voltage and Electric Drive Power and Control Electronics JX1 has maximum capacity.

Insulation monitoring

When the high voltage system is active, High voltage Battery Switch Box SX6 performs an insulation test every 60 seconds.

The resistance between the high voltage conductors and the housing of the Hybrid Battery Unit AX1 is measured at the rated voltage of 352 V.

Insulation faults in the high voltage components and high voltage lines are detected.

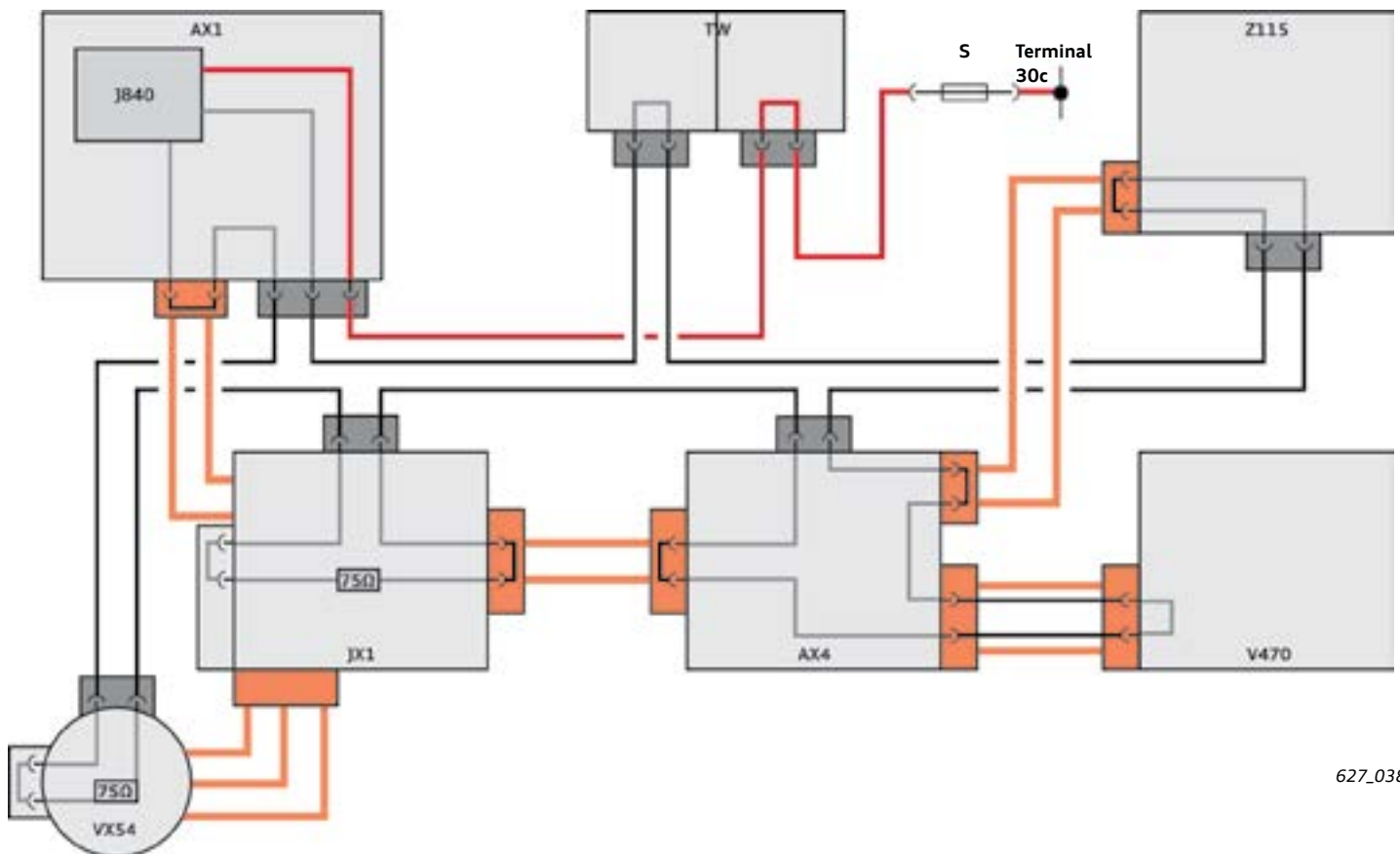
The charging socket and the AC/DC inverter in the high voltage charger are not tested due to the galvanic isolation between 230 V AC and 352 V DC.

If an insulation fault is detected, a message is displayed in the DIS. The customer is prompted to bring the vehicle in for repair.

Safety line

The safety line is a 12 volt ring wire which interconnects all high voltage components in series. Battery Regulation Control Module J840 inputs an electrical current of approximately 10 mA into the safety line and evaluates the current flow. In addition, Electrical Drive Control Module J841 monitors the safety line.






If the safety line is broken, the high voltage system is immediately deactivated by J840. The high voltage contacts are opened. The driver is notified via the display in the instrument cluster.



627_038

Key:

- AX1** Hybrid Battery Unit
- AX4** High voltage battery charger 1
- J840** Battery Regulation Control Module
- JX1** Electric Drive Power and Control Electronics Module
- S** Fuse
- TW** High voltage System Maintenance Connector
- V470** Electrical AC compressor
- VX54** Three-phase Current Drive
- Z115** High voltage Heater (PTC)

-  High voltage connector
-  High voltage line
-  Safety line outside of component
-  Safety line inside of component
-  Line to protect the power supply to the line contactors

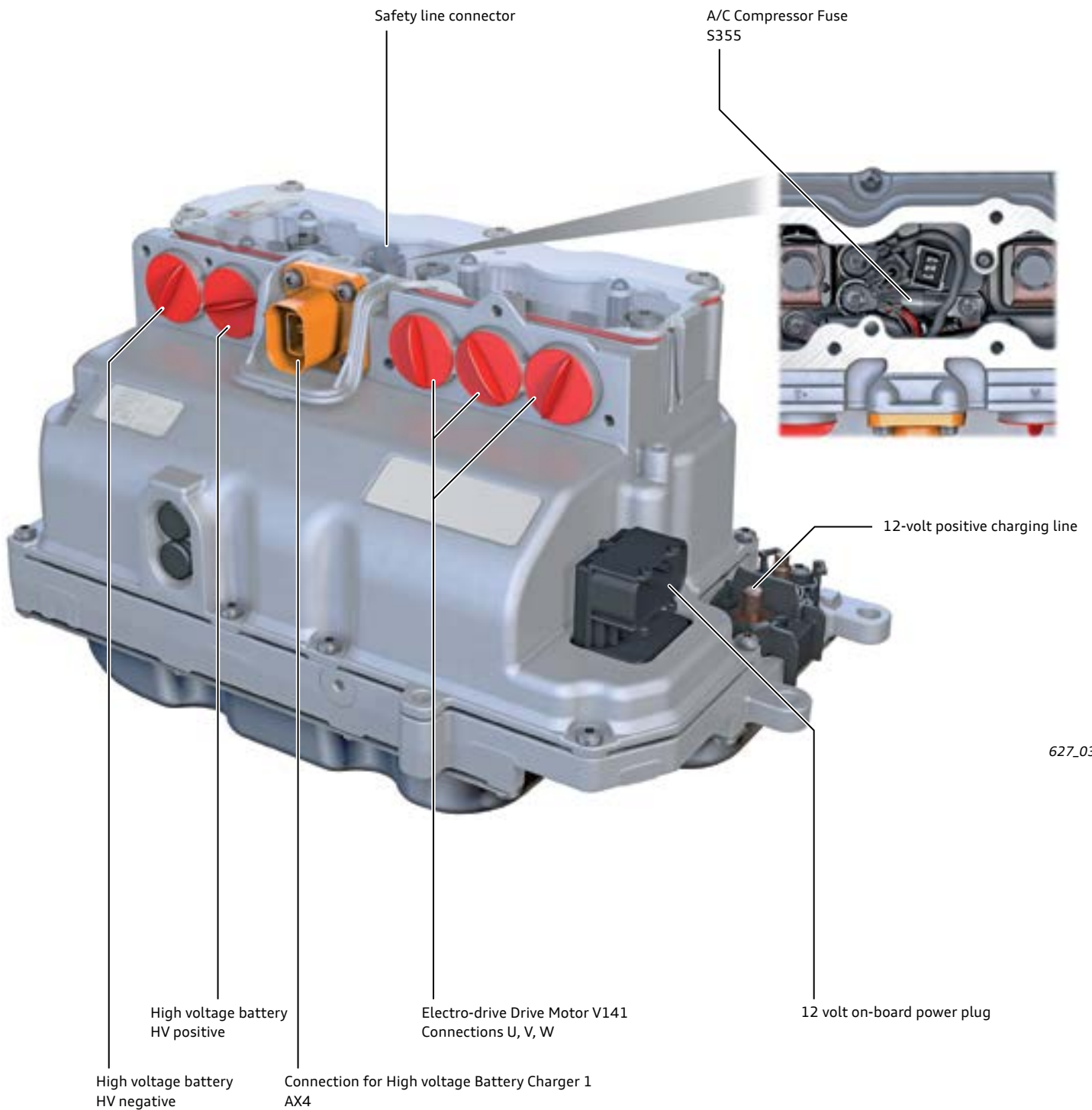
Electric Drive Power and Control Electronics Module JX1

JX1 is installed on the driver's side of the engine compartment and has the following components:

- ▶ Electric Drive Control Module J841.
- ▶ Drive Motor Inverter A37.
- ▶ Voltage Converter A19.
- ▶ Intermediate Circuit Capacitor 1 C25.
- ▶ AC Compressor Fuse S355.
- ▶ Connections for high voltage lines.
- ▶ Connections for 12 volt electrical system.
- ▶ Coolant connections.

The high voltage line from the high voltage charger is connected externally. All other high voltage lines are bolted inside JX1. JX1 is connected to the vehicle chassis via an equipotential bonding. JX1 is cooled by low-temperature circuit 2.

A/C Compressor Fuse S355 is integrated in JX1 and is connected between HV positive and HV positive of High Voltage Battery Charger 1 AX4. AX4 is cooled in the low temperature cooling circuit.



627_039



Information

To replace fuse S355, you must open Electric Drive Power and Electronic Control Module JX1. Always follow the instructions given in the electronic service information and ODIS Service when doing this procedure.

Electric Drive Control Module J841

Electric Drive Control Module J841 monitors the rotor speed of Electro-drive Drive Motor V141 with Drive Motor Rotor Position Sensor 1 G317.

The temperature of V141 is monitored by Drive Motor Temperature Sensor G712 and relayed to the ECM.

Electric Drive Control Module J841 monitors component temperatures with sensors in Electric Drive and Control Electronics Module JX1. This information is used by the ECM to activate the coolant circulation pump upstream of Coolant Pump in Front of Electric Drive Power and Control Electronics V508 on demand. J841 is networked via the Powertrain and Hybrid CAN systems.

Voltage Converter A19

A19 is a DC/DC converter that converts the 352 DC voltage to the 12 DC voltage of the vehicle's electrical system.

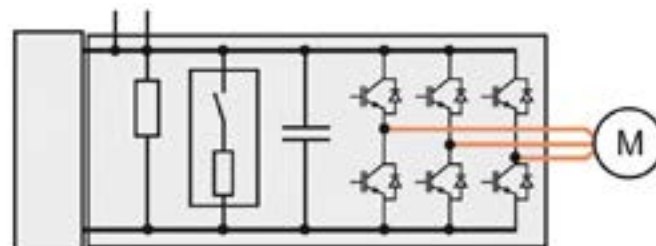
A pulse inverter converts the voltage of the high voltage battery of 12 volts. The voltage is transmitted to the 12-volt electrical system by coil induction (galvanic isolation). As a result, there is no conductive connection between the high voltage system and the 12-volt electrical system.

Intermediate Circuit Capacitor 1 C25

Another component of Electric Drive Power and Electronics Control Module JX1 is Intermediate Circuit Capacitor 1 C25. Its job is to stabilize voltage. Voltage fluctuations can occur during start-up or at transmission kick-down.

C25 is discharged actively and passively at Terminal 15 off or if the high voltage system is disabled due to a crash.

Passive discharge means that C25 is discharged through a 22K ohm resistor between HV positive and HV negative. In the case of active discharge, a 1K ohm resistor is connected. This ensures that C25 is discharged in the least possible time.



615_024a

Drive Motor Inverter A37

The drive motor inverter A37 is both a DC/AC converter and an AC/DC converter.

Electro-drive Drive Motor V141 (e-machine) as motor

In electric driving mode A37 converts the AC voltage of the Hybrid Battery Unit AX1 to a 3-phase AC voltage. The voltage is converted by pulse width modulation. There are six transistors in A37. Two for each of the three phases, U, V, and W. Each phase has a separate transistor for positive and negative.

When activated, the corresponding potential is connected. The transistors are activated by Electric Drive Control Module J841 using pulse width modulated signals. RPM is regulated by changing the frequency, and the torque of V141 by changing the activation times of the individual pulse widths.

Electro-drive Drive Motor V141 in generator mode

If V141 is running in generator mode A37 converts the generated 3-phase AC voltage to a 352 V DC voltage. The high voltage system is supplied with the generated DC voltage and the 12-volt electrical system is supplied through Voltage Converter A19.

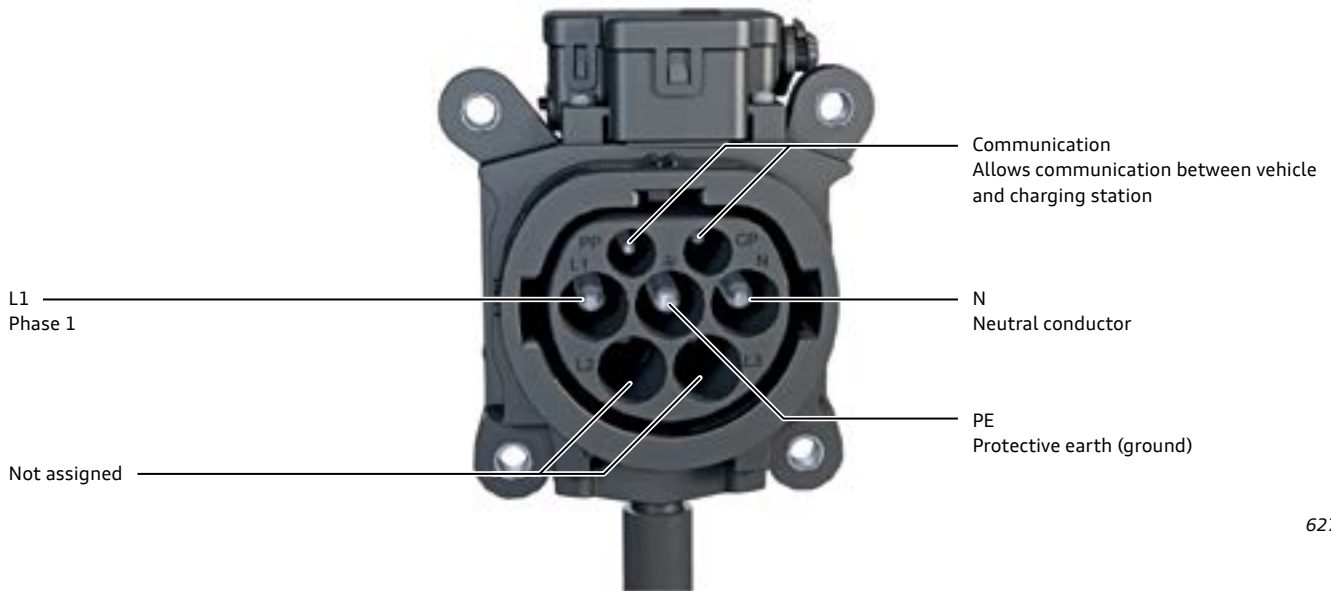
Charging

High Voltage Battery Charging Socket 1 UX4

High Voltage Battery Charging Socket 1 UX4 is located behind a flap at the front of the radiator grille.

It is connected to the vehicle chassis via equipotential bonding.

Both Charging Socket Temperature Sensor 1 G853 and High voltage Charging Connector Lock 1 Adjuster F498 are integrated with UX4.



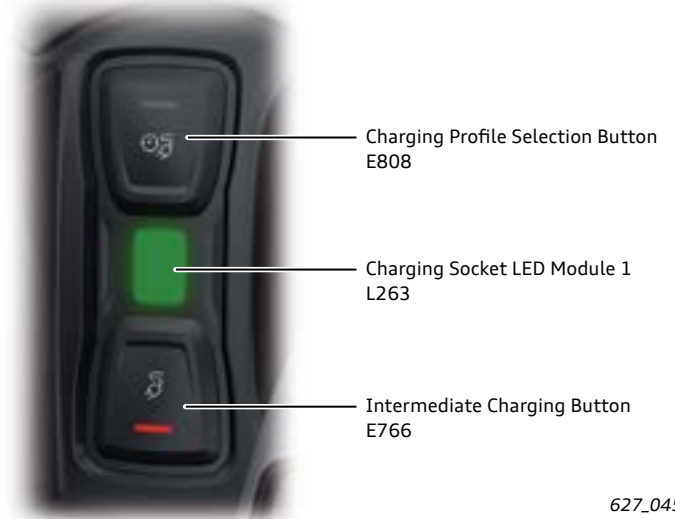
627_044

Charging button module with display

The charging button module has the following components:

- ▶ Intermediate Charging Button E766.
- ▶ Charging Profile Selection Button E808.
- ▶ Charging Socket LED Module 1.

L263 indicates the current status of the charging cycle through various colors and by flashing or steady light. The active charging option is indicated by the red LED in the button.



627_045

Overview of status LED messages

Display	Definition
LED is red	Plug has been detected, but is not locked; charging is not possible
LED is yellow	Plug has been detected and is not locked, but no charging voltage is available; charging is not possible
LED is flashing yellow	Plug has been detected and is locked, selector lever not in position P ; charging is not possible
LED flashes green every 4 s for 60 s, then the LED goes out	Timer for charging cycle is active, charging cycle starts depending on the programmed departure time
LED is flashing green	Charging cycle is active
LED lights up green and then the LED goes out	Charging cycle completed

High Voltage Battery Charger 1 AX4

High Voltage Battery Charger 1 AX4 is connected to Electric Drive Power and Control Electronics Module JX1 by a high voltage line.

High Voltage Battery Charger Control Module J1050 is also integrated with AX4. It is networked with other control modules through the Powertrain CAN and Hybrid CAN. J1050 has an internal coolant temperature sensor which sends information to the ECM. The ECM can then activate Coolant Pump in Front of Electric Drive Power and Control Electronics V508 on demand.

A pulse inverter which converts the AC voltage of the operating unit to a DC voltage for charging Hybrid Battery Unit AX1 is integrated in AX4. The voltage is transmitted to the high voltage onboard power supply by coil induction (galvanic isolation). As a result, there is no conductive connection between the AC system and the high voltage system in the vehicle. AX4 is connected to the vehicle chassis via an equipotential bonding.

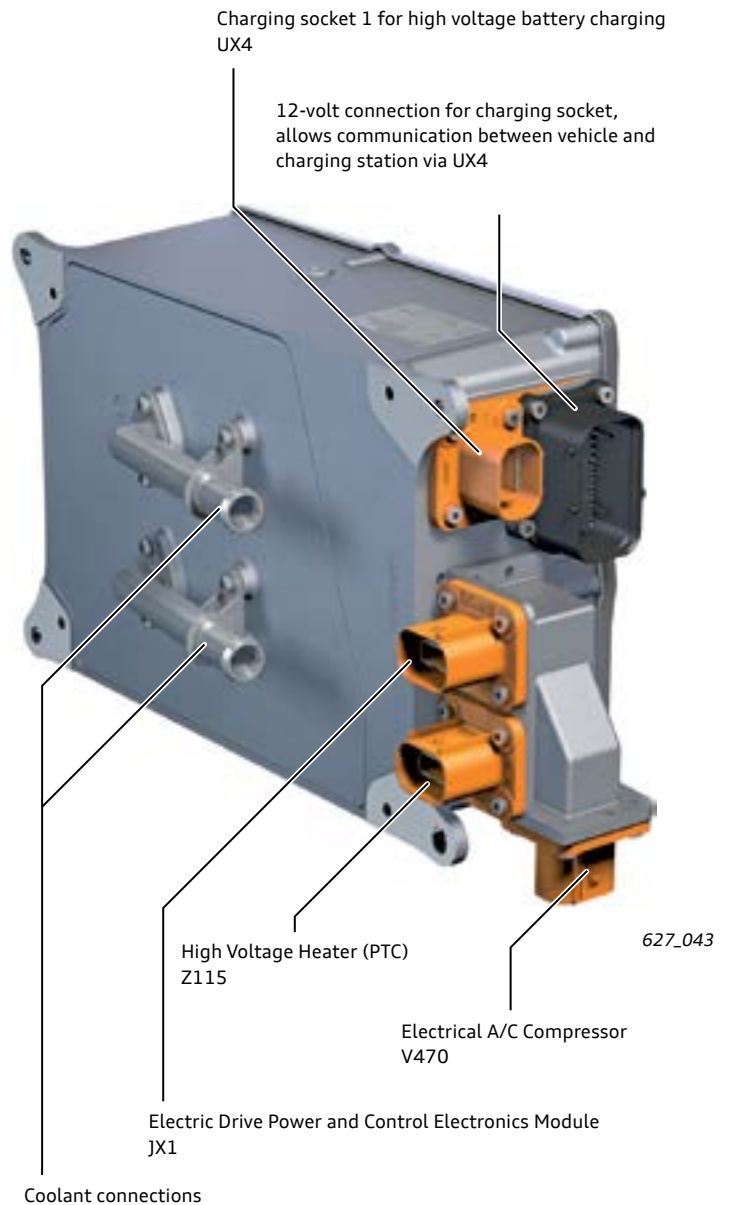
The following sensors are connected to High Voltage Battery Charger Control Module J1050:

- ▶ Charging Socket Temperature Sensor 1 G853 in High Voltage Battery Charging Socket 1 UV4 in the High Voltage Battery Charging Socket 1 UX4.

The following actuators are connected to High Voltage Battery Charger Control Module 1 J1050:

- ▶ High Voltage Charge Flap Lock Adjuster F496.
- ▶ High Voltage Charging Connector Lock 1 Adjuster F498 in High Voltage Battery Charging Socket 1.

Input voltage in V	AC 100 – 240
Output voltage in V	DC 220 – 450
Maximum current consumption	16 A



Information

Preset charging timers are stored in High Voltage Battery Charger 1 AX4.

Charging the high voltage battery

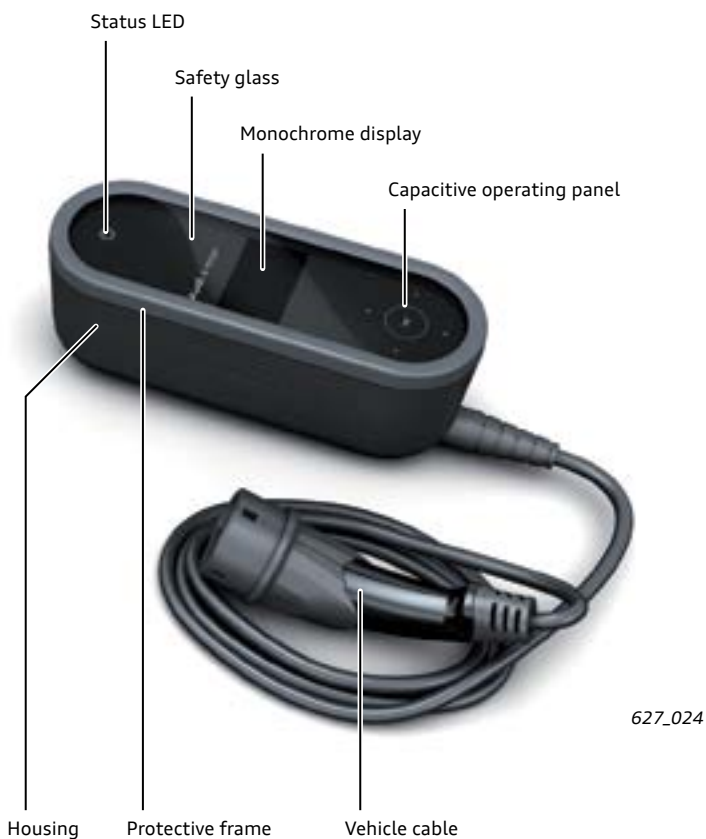
Charging with alternating current

When the vehicle is using the internal combustion engine to provide drive, the high voltage battery is charged via the e-machine, which acts as a generator.

Audi e-tron charging system

The Audi A3 Sportback e-tron comes with the Audi e-tron charging system. For mobile use, the Audi e-tron charging system can be carried in a transport case.

Two replaceable AC cables are supplied for connecting to a three-phase AC supply. One cable is suitable for household (120V) use while the other cable is for attaching to a 240V AC source.



The high voltage battery can be charged with alternating current from both a 240V AC or 120V AC voltage. Charging the vehicle with AC voltage will allow for a greater range of electric driving by charging the vehicle battery prior to driving.

Operating unit

The cables are encoded in such a way that the operating unit can detect whether a connection has been made with a 120V or 240V plug.

If the vehicle is connected with 240V AC source, the maximum power consumption is 16 A, resulting in a maximum charging output of 3.6 kW. If the vehicle is connected to a 120V outlet, power consumption is limited to 10 A.

The charging output can be set to 50% or 100% by the user. If the vehicle is connected to 240V AC, a charging output of 50% is set automatically. This setting is maintained until the charger unit is disconnected from the vehicle or the wall socket.

To prevent unauthorized access, the operating unit can be protected by entering a 4-digit PIN code. If a customer were to forget their PIN number, it can be re-set by dealership personnel.

Before the charging cycle begins, the operating unit and the high voltage charger unit in the vehicle communicate with one another.

The operating unit has a self-diagnosis function and indicates any faults detected via the display.

The operating unit has a temperature monitor. If the permissible temperature is exceeded, the charging cycle is interrupted until the temperature returns to an acceptable level.

Charging cable

A charging cable is connected from an AC power source to the Audi e-tron charger unit.



Information

The charging cable must always be connected directly to a socket. Never use the charging cable together with an extension cord, a cable drum, a multiple socket outlet or a timer. Failure to heed this warning can result in damage to the operating unit or the home electrical system.

Charging at home

A charging dock for home installation is available. It can be attached to a wall over a conventional household power outlet.

The vehicle battery charger can be clipped into the charging dock. Charging cables are available in various lengths for connecting the vehicle to the charging dock.



627_026a

Charging cycle

To charge the high voltage battery, the charging cable must be plugged into the charging dock.

When the charging cable is plugged into the vehicle, the charging plug is locked and cannot be removed. This is indicated by the yellow status LED.

The charging cycle starts when the selector lever is in position **P** and the operating unit is connected to the AC voltage source.

If no timer is programmed, the charging cycle starts immediately.

If a charging timer is programmed, but the state of charge of the high voltage battery is less than 60%, the charging cycle starts immediately until the state of charge reaches approximately 60%. If the instant charge button is pressed, the charging cycle stops and timer programming is activated.

The active charging cycle is indicated by the flashing LED on the relevant button (see page 34).



Displays of the status LED

The status LED flashes green during the charging cycle.

The charging cycle will stop if the vehicle is unlocked while charging is in progress.

If the charging plug is not removed within 30 seconds of unlocking the vehicle, the charging cycle will restart.

Charging times

The charging times are dependent on the AC voltage source:

Household 120V	8 h
Commercial 240V	2 h 15 min



627_028

627_029



Information

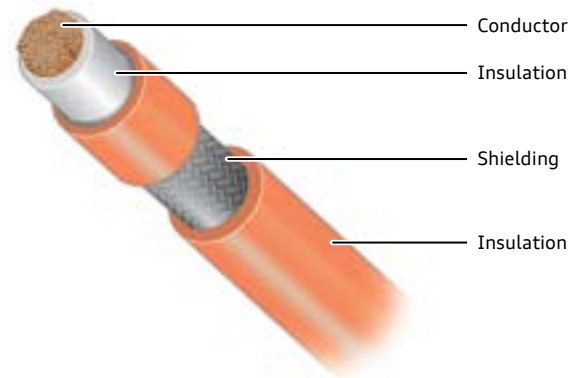
The vehicle cannot be started if the charging cable is plugged in. During the charging period, the 12 volt battery is also charged.

High voltage lines

All high voltage lines in the high voltage system are color-coded orange for identification. Due to the high voltages and currents involved, the electrical lines have a significantly larger cross-section and are connected by special plug-in contacts. The electrical lines of the high voltage system differ from the other lines in the 12-volt electrical system in terms of their core design.

The high voltage lines may also have a corrugated plastic tube to provide protection against chafing. Three different types of high voltage line are used in the high voltage system: single-pole and 2-pole lines with and without a safety line.

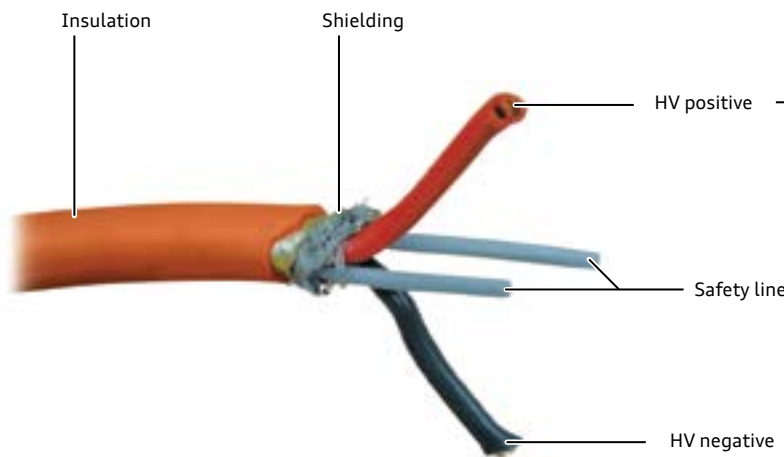
Single-pole high voltage line



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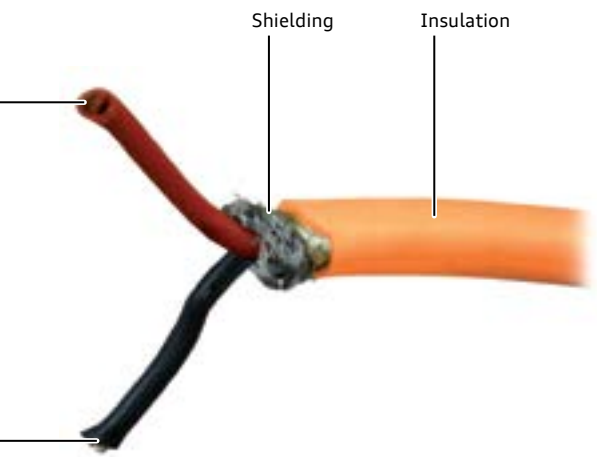
2-pole high voltage line

With safety line



627_054

Without safety line



627_053

High voltage connections

The high voltage lines on the Audi A3 Sportback e-tron are bolted onto or plugged into the high voltage components.

To avoid incorrect assembly, all connections are mechanically encoded.

Bolted connection

- ▶ Electric Drive Power and Control Electronics Module JX1.
- ▶ Three-phase Current Drive VX54.

2-pole plug connection

- ▶ Electric Drive Power and Control Electronics Module JX1¹⁾.
- ▶ High Voltage Battery Charger 1¹⁾.
- ▶ High Voltage Heater (PTC) Z115¹⁾.
- ▶ Electrical A/C Compressor V470.



627_055



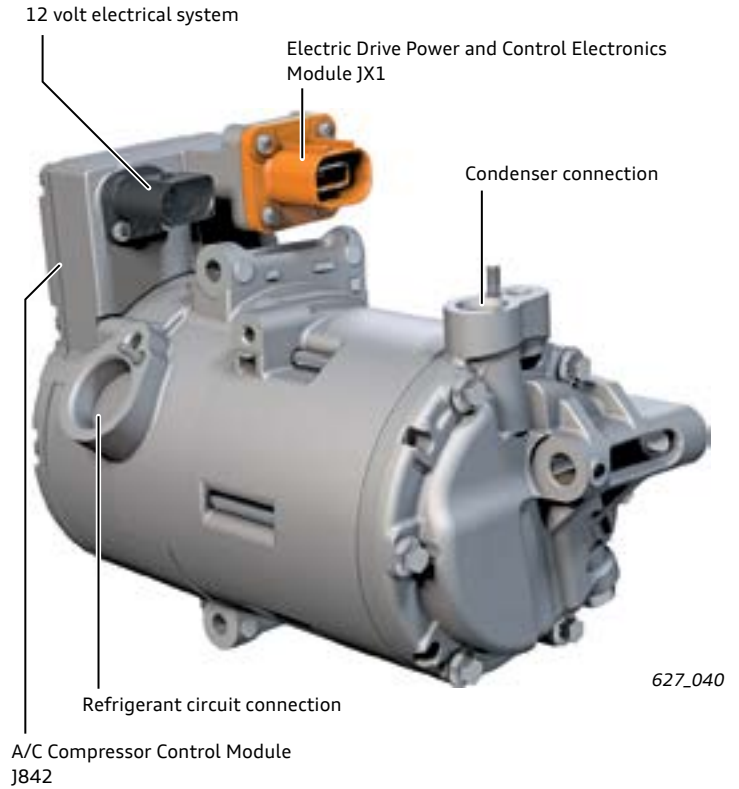
627_056

¹⁾For these connections, a jumper for the safety line contacts is integrated into the plug.

Electrical A/C compressor V470

Electrical A/C Compressor V470 is bolted to the front of the internal combustion engine. There is no belt drive. It is integrated with the high voltage electrical system via High Voltage Battery Charger 1 AX4 and operates at 352 volts. A/C Compressor Control Module J842 is integrated with the compressor. J842 is controlled by Climatronic Control Module J255 via a LIN bus. The A/C compressor is attached by an equipotential bonding.

Type	Scroll compressor
Rated voltage in V	352
Speed in RPM	800 - 8600
Power consumption in kW	3.6
Weight in kg	13.2 lb (6 kg)

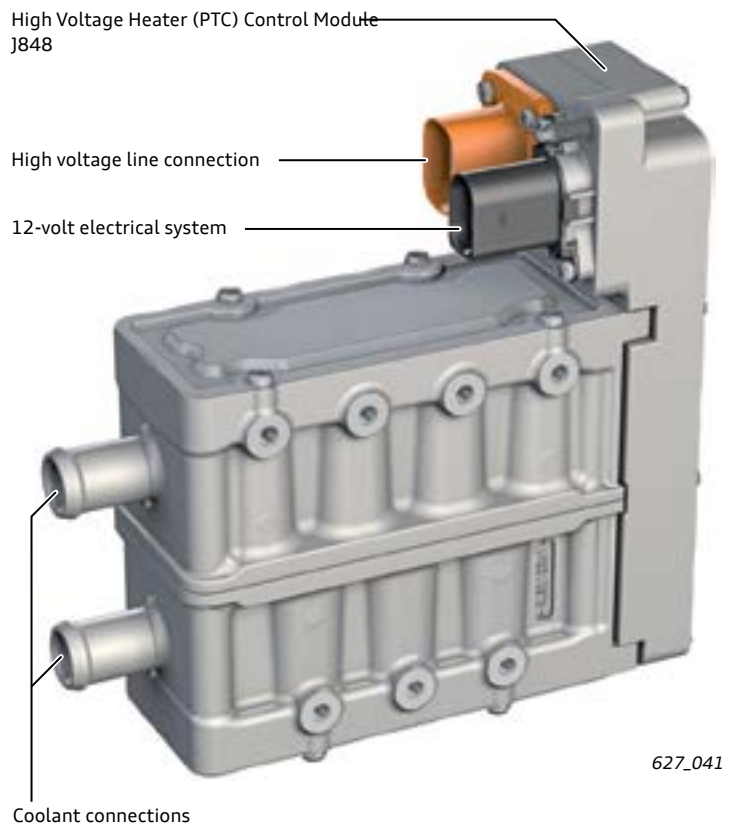


High Voltage Heater (PTC) Z115

When the vehicle is driven in electric-only mode, Z115 heats the engine coolant for the passenger compartment heat exchanger. It is bolted to the vehicle underbody and connected to High Voltage Battery Charger 1 AX4 by a high voltage line. The integrated High Voltage Heater (PTC) Control Module J848 is controlled by Climatronic Control Module J255 by a LIN bus connection.

J848 monitors the inlet and outlet temperatures of the engine coolant via temperature sensors and send the information to J255. J255 determines the required heating output and sends this information to J848 as a value between 0 and 100%.

Rated voltage	352
Heating levels	3
Activation mechanism	PWM signal 0 - 100%



Information

All A/C timer information is stored in Climatronic Control Module J255.

High Voltage System Maintenance Connector TW

High Voltage Electrical System Maintenance Connector TW is located in the engine compartment. It serves as an electrical connection in the 12 volt control circuit for the high voltage battery contacts and as a component part of the safety line.

Opening TW opens the safety line and breaks the 12 volt control circuit of the high voltage power contacts. TW serves to de-energize the high voltage system.

The VAS Scan Tool must be used to properly de-energize the high voltage system. After TW is opened, it must be secured with padlock T40262/1 to prevent it from being accidentally reconnected.

In the engine compartment

The maintenance connector TW is labelled.



627_057



627_058

Fuse panel in passenger compartment

The power supply fuse for the control circuit of the power contacts is labelled. This fuse is to be utilized by first responders in an emergency situation.



627_059



627_060



Information

After de-energizing the system, a check must be made to ensure that no voltage is present by running the relevant Test Plan in ODIS Service.

Hybrid manager

The software of Engine Control Module J623 has been extended to include the hybrid manager function.

- ▶ Operating strategy.
- ▶ Torque distribution to Electro-drive Drive Motor V141 and the internal combustion engine.
- ▶ High voltage coordinator.
- ▶ Recuperation under braking and acceleration.
- ▶ Control of the coolant circuits.

The following hybrid-specific functions of the vehicle are controlled by the hybrid manager.

- ▶ Control of hybrid displays.
- ▶ Power meter.
- ▶ Display in dash panel insert.
- ▶ MMI energy flow diagrams.
- ▶ e-tron statistics.

Operating strategy

The operating strategy is configured to operate the vehicle efficiently using both drive systems. Taking the ambient conditions and information from other control modules as well as the driving profile into account, the system decides whether to use the internal combustion engine, the e-machine or both.

Electric driving also requires enabling signals from other control modules. A low state of charge in the high voltage battery, a too-low ambient temperature, high torque demand or high cabin heating demand may necessitate starting the internal combustion engine.

	Internal combustion engine is:	Electro-drive Drive Motor V141 serves as:
Internal combustion engine start	off	Electric motor ¹⁾
Electric drive	off	Electric motor ¹⁾
Drive by internal combustion engine	on	Generator
Hybrid drive	on	Electric motor ¹⁾
Boost	on	Electric motor ¹⁾
Recuperation with and without electrical braking	on or off	Generator

¹⁾ In this operating mode, the 12-volt electrical system is supplied by Hybrid Battery Unit AX1.

High voltage coordinator

In its capacity as a high voltage coordinator, the hybrid manager monitors and coordinates all high voltage components. It enables activation of the high voltage system and controls the displays for hybrid operation and display of messages for the driver.

Recuperation under braking and acceleration

The hybrid manager controls over-run and braking recuperation functions based on the position of the accelerator or brake pedal, the state of charge of the high voltage battery, the vehicle's speed and driving stability criteria.

Plug-in hybrid modes

Electric driving (EV)

When the ignition is on, EV mode is active and the vehicle preferentially runs on electric-only mode provided the conditions for this are met.

EV mode is only active if the state of charge of the high voltage battery is sufficient and the following conditions are met:

- ▶ The temperature of the 12-volt battery and of the high voltage battery is not less than approximately 14 °F (-10 °C).
- ▶ The vehicle is not travelling faster than approximately 80 mph (130 km/h).
- ▶ No kick-down is performed.
- ▶ The selector lever is not engaged in the **S** position.

If one or more of the above conditions is not met, EV mode is deactivated.

Use battery charge (Hybrid Auto)

A decision is made based on the driving profile whether to start in Hybrid mode or to run on electric power.

When the route guidance function is active in the navigation system, the use of electrical power is optimized through moderate recharging or startup of charging stations based on the predictive route data.

Hold battery charge (Hybrid Hold)

During vehicle operation, the state of charge of the high voltage battery is held at a constant level. The vehicle runs in Hybrid mode and uses only a small portion of the battery charge.

Increase battery charge (Hybrid Charge)

During vehicle operation, the high voltage battery is charged by the internal combustion engine more intensively (this involves higher fuel consumption) in order to achieve longer electrical range, for example, at the destination.

Sport mode

Moving the selector lever into tiptronic or **S** reveals the sporty side of the Audi A3 Sportback e-tron. Full drive power is now available to the driver at any time, and the high voltage battery is continuously recharged. Increased over-run torque boosts recuperation capacity and provides a sporty driving feel.



627_066a



Information

These settings can be made in the "Car" menu under "Systems" in the menu item "e-tron mode" or by pressing Electric Drive Button E656 several times.

Climate control

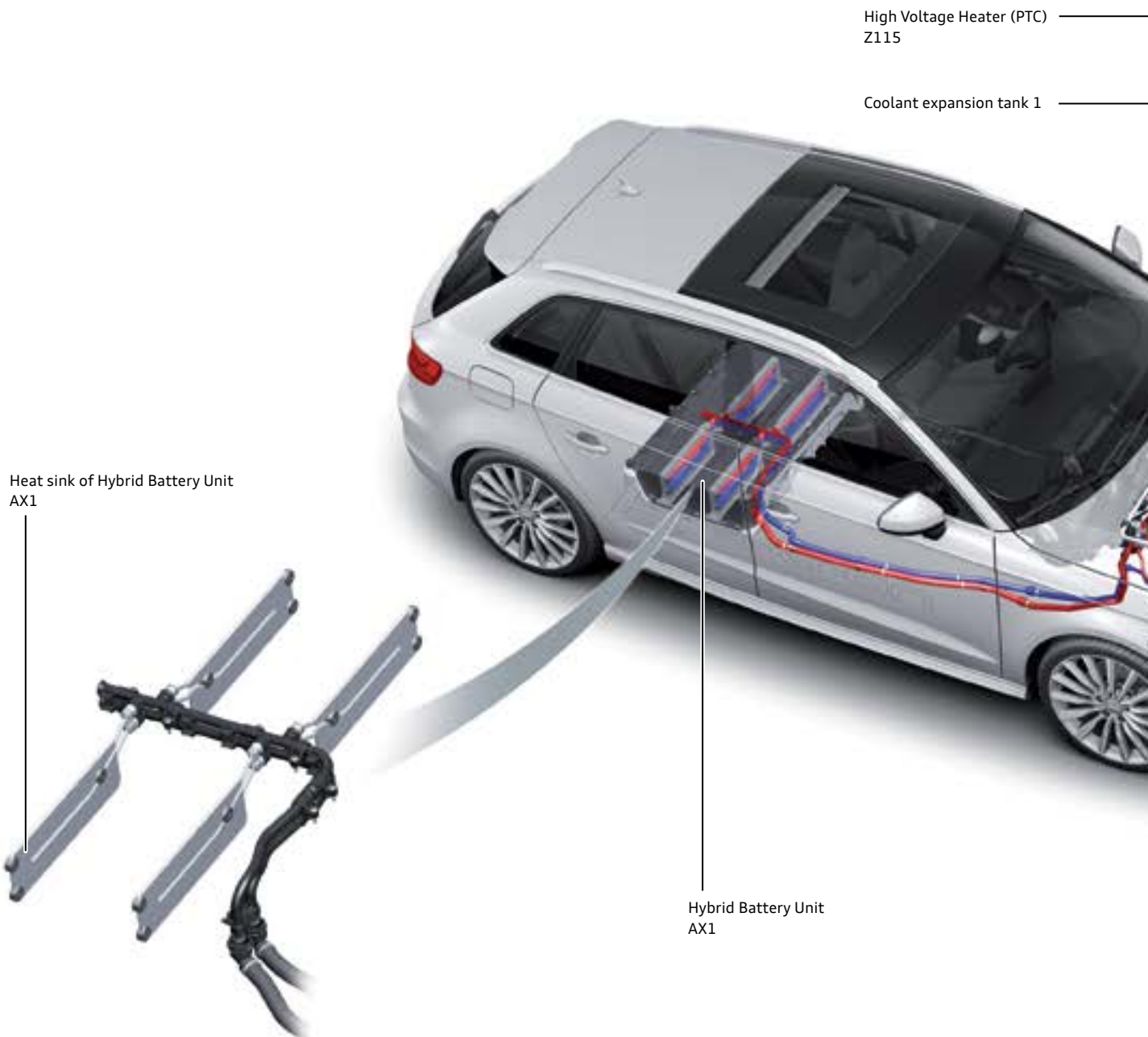
Cooling systems, climate control and thermal management

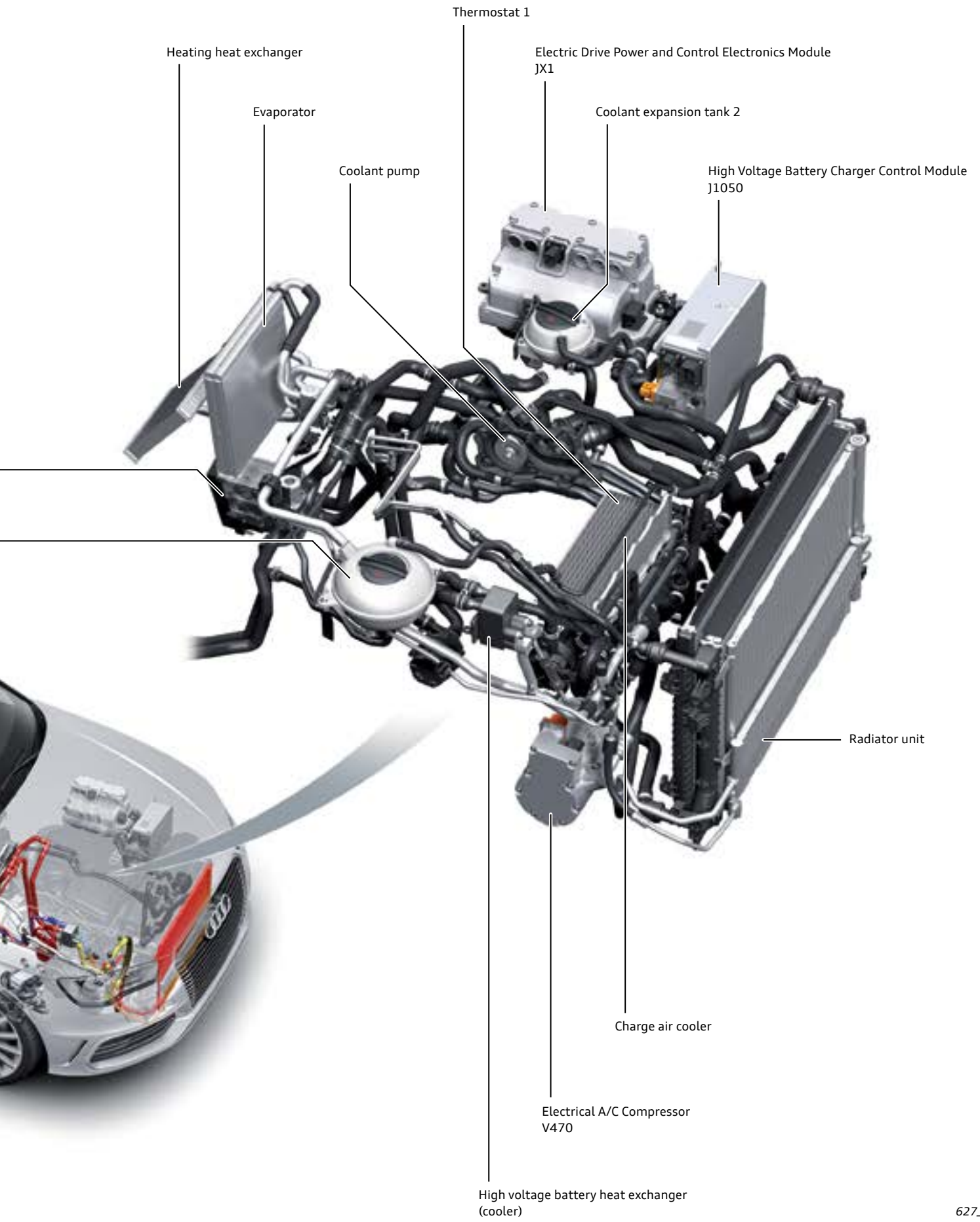
The cooling and climate control systems of the A3 Sportback e-tron provide passenger comfort, cooling of the internal combustion engine, transmission and high voltage components. All components are integrated into the various cooling circuits.

In the various operating states, for example in electric drive mode or in Boost mode, the cooling circuits provide the optimal coolant flow in order to ensure operational reliability, a high level of passenger comfort and a high overall level of efficiency.

The thermal management system enables the components to reach their operating temperatures quickly. Passenger comfort has the highest priority.

Overview of cooling system





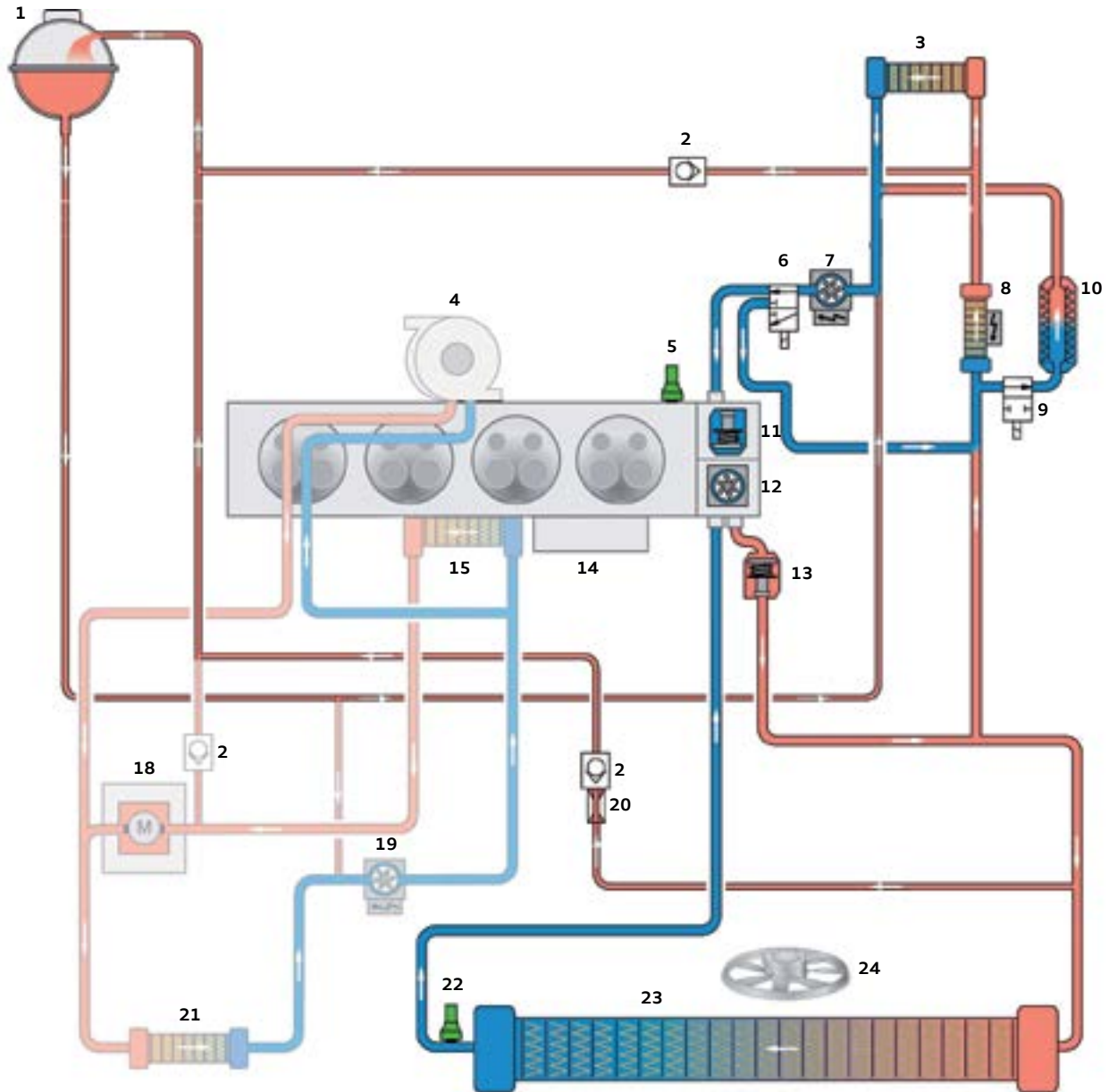
High-temperature coolant circuit

The high-temperature coolant circuit represents the actual coolant circuit of the internal combustion engine. The system is a twin-circuit cooling system which enables different coolant temperatures to be achieved in the cylinder head and the engine block.

The temperature level in the high-temperature coolant circuit is, on average, between 188 - 221 °F (87 - 105 °C).

Components of the high-temperature coolant circuit:

- ▶ Coolant expansion tank 1.
- ▶ Heating heat exchanger.
- ▶ Gear oil cooler.
- ▶ Coolant pump with thermostat.
- ▶ Engine oil cooler.
- ▶ High Voltage Heater (PTC) Z115.
- ▶ Radiator.



627_010b

Key:

- | | | | |
|-------------------------------------|---------------------------------------|----|--|
| — | Cooled coolant | 6 | Coolant Change-over Valve N633 |
| — | Heated coolant | 7 | High Temperature Circuit Coolant Pump V467 |
| 1 | Coolant expansion tank 1 | 8 | High Voltage Heater (PTC) Z115 |
| 2 | One way check valve | 9 | Transmission Coolant Valve N488 |
| 3 | Heater heat exchanger | 10 | Transmission oil cooler (ATF heat exchanger) |
| 4 | Exhaust turbocharger | 11 | Thermostat 1 |
| 5 | Engine Coolant Temperature Sensor G62 | 12 | Coolant pump |

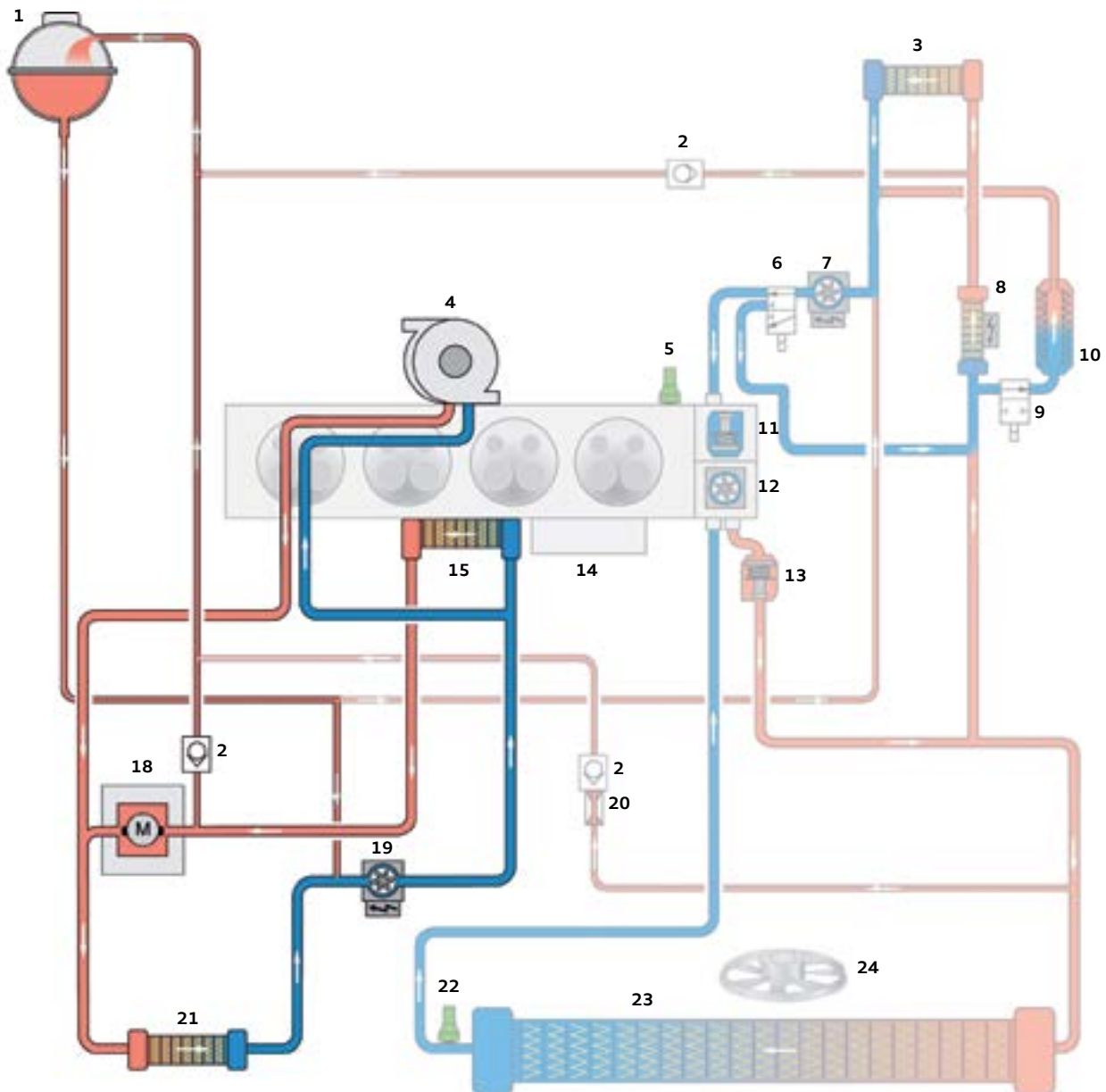
Low-temperature coolant circuit 1

Low-temperature coolant circuit 1 represents the coolant circuit of the internal combustion engine's charge air cooling system. This low-temperature coolant circuit is an independent cooling circuit in the 1.4l TFSI engine. The low-temperature coolant circuit uses the same coolant expansion tank as the high-temperature coolant circuit. During use of the 1.4l TFSI in the Audi A3 Sportback e-tron, the e-machine is also integrated into low-temperature coolant circuit 1.

The temperature level in low-temperature coolant circuit 1 is, on average, between 167 - 194 °F (75 °C - 90 °C).

Components of low-temperature coolant circuit 1:

- ▶ Exhaust turbocharger.
- ▶ Charge air cooler.
- ▶ Three-phase Current Drive VX54.
- ▶ Low Temperature Circuit Coolant Pump V468.



627_011b

- | | | | |
|----|---|----|--|
| 13 | Thermostat 2 | 20 | Flow restrictor |
| 14 | Engine oil cooler | 21 | Radiator for charge air cooling |
| 15 | Charge air cooler integrated into intake manifold | 22 | Engine Coolant Temperature Sensor on Radiator Outlet G83 |
| 18 | Three-phase Current Drive VX54 | 23 | Radiator |
| 19 | After-run Coolant Pump V51 | 24 | Radiator Fan V7 |

Low-temperature coolant circuit 2

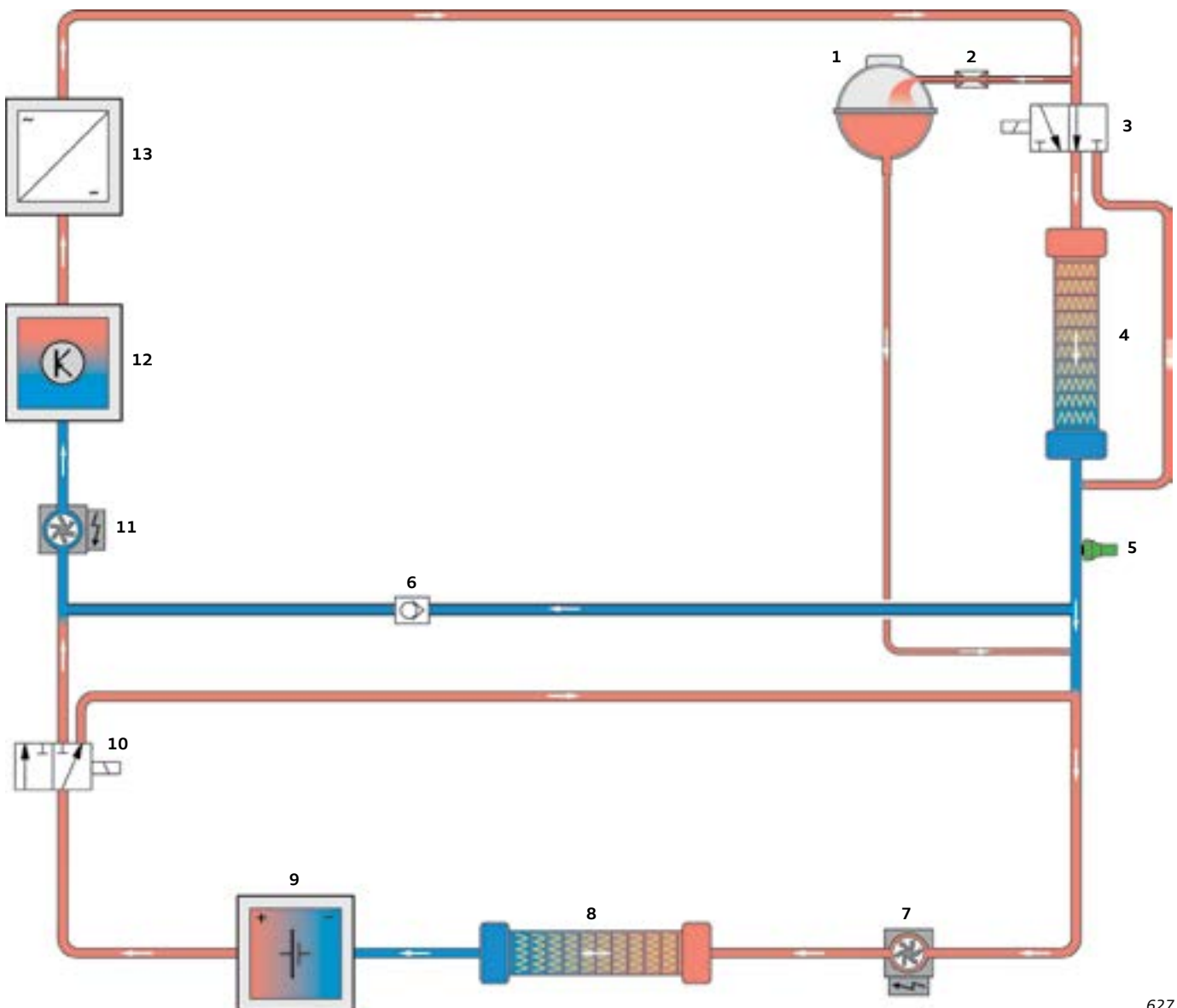
The high voltage modules are grouped together in low-temperature coolant circuit 2. The high voltage components are temperature-critical and require a constant temperature below the average temperature in low-temperature coolant circuit 1.

This low temperature is achieved by using a completely separate, second coolant circuit. This circuit has its own coolant equalization tank and is implemented by a coolant recirculation pump upstream of Coolant Pump in front of Electric Drive Power and Control Electronics Module V508 and the High Voltage Battery Coolant Pump V590.

The temperature level in low-temperature coolant circuit 2 is, on average, between 68 - 104 °F (20 °C - 40 °C).

Components of low-temperature coolant circuit 2

- ▶ Coolant expansion tank 2.
- ▶ Electric Drive Power and Control Electronics Module JX1.
- ▶ High voltage battery charger control module.
- ▶ High voltage battery heat exchanger.
- ▶ Hybrid Battery Unit AX1.
- ▶ Coolant Pump in front of Electric Drive Power and Control Electronics Module V508.
- ▶ High Voltage Battery Coolant Pump V590.



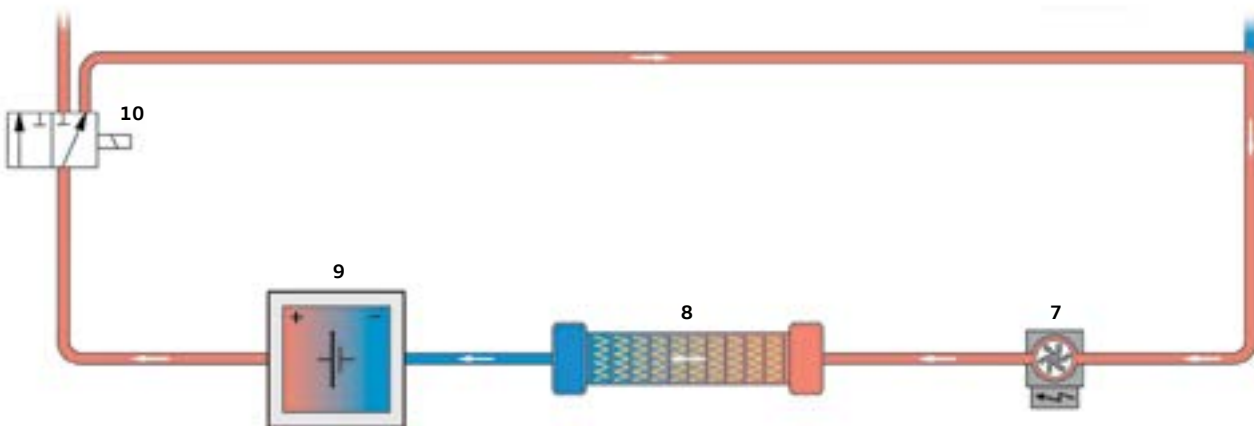
627_012

Coolant circuit of the high voltage battery heat exchanger

Low-temperature coolant circuit 2 can also be subdivided into 2 sub-circuits, allowing different temperatures and, thus, different component temperature requirements to be met.



A shortened circuit can be implemented by means of the High Voltage Battery Coolant Valve N688 and High Voltage Battery Coolant Pump V590. The sole task of this circuit is to control the temperature of the Hybrid Battery Unit AX1 through the high voltage battery heat exchanger, which is also an integral part of the coolant circuit.

The required temperature in low-temperature coolant circuit 2 can be obtained by passive cooling (using low-temperature radiator 2) or by active cooling (using the high voltage battery heat exchanger).



627_013

Key:

	Cooled coolant	7	High Voltage Battery Coolant Pump V590
	Heated coolant	8	High Voltage battery heat exchanger (cooler)
1	Coolant expansion tank 2	9	Hybrid Battery Unit AX1
2	Flow restrictor	10	High Voltage Battery Coolant Valve N688
3	Coolant Change-over Valve 1 N632	11	Pump for coolant circulation upstream of V508
4	Low-temperature radiator 2	12	Electric Drive Power and Control Electronics Module JX1
5	Temperature sensor upstream of JX1	13	High Voltage Battery Charger Control Module J1050
6	Non-return valve		

Refrigerant circuit

The A/C refrigerant circuit of the A3 Sportback e-tron differs from other A3 models.

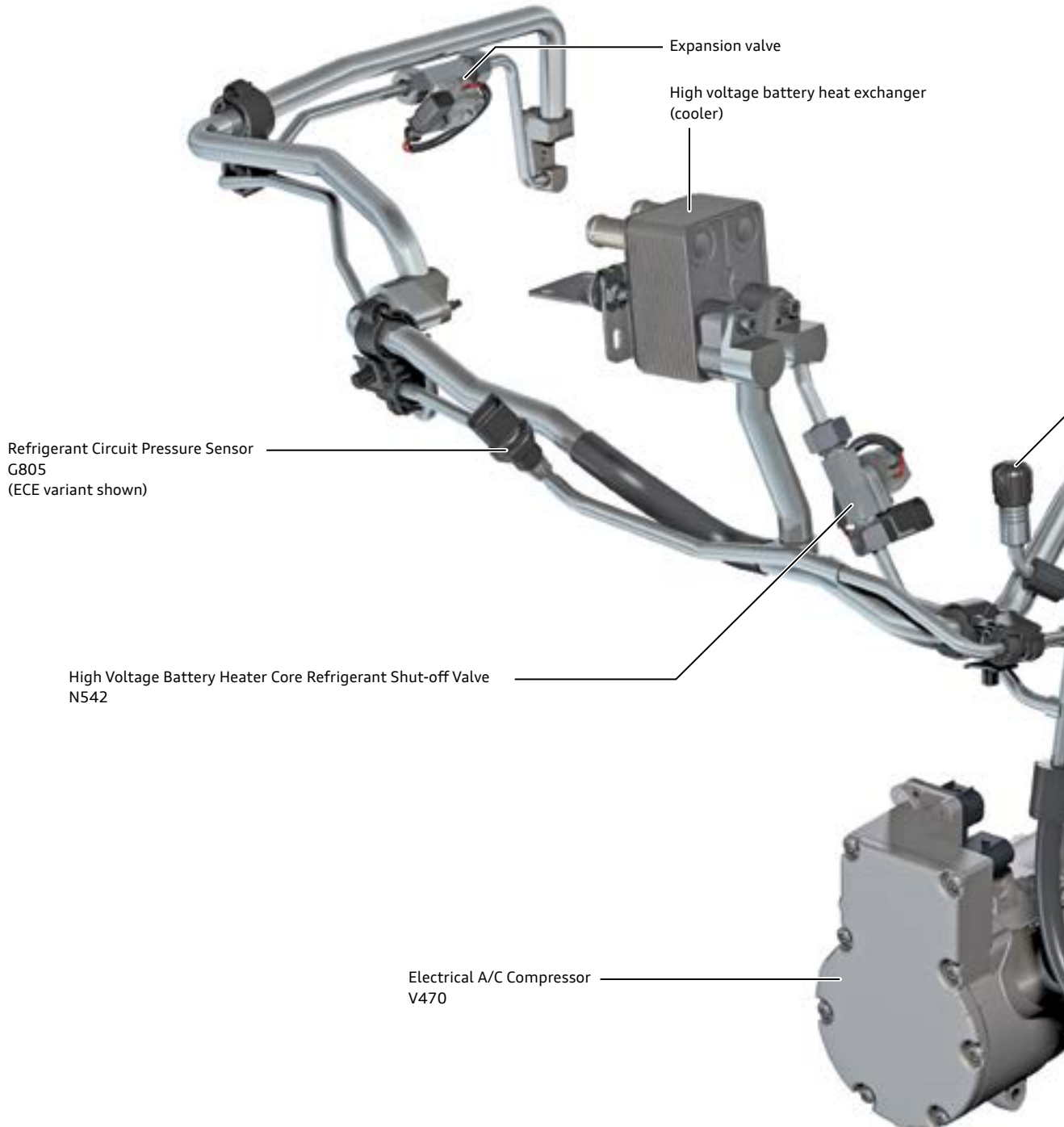
Electrical A/C Compressor V470 can, if required, be used for cooling Hybrid Battery Unit AX1 as well and the passenger compartment of the vehicle.

The refrigerant circuit from the A/C compressor to the expansion valve has separate high low pressure lines (but no internal heat exchanger is used).

A flow restrictor with a 0.7 mm diameter is integrated into the high pressure refrigerant line to the high voltage battery heat exchanger.

There are different high-pressure lines with built in or inserted flow restrictors. Inserted flow restrictors can be installed with a pre-screen.

R134a refrigerant is used. However, SPA2 PAG oil is used. This different from the PAG oil used in mechanically driven A/C compressors.



Information

The quantity of refrigerant and air conditioning refrigeration oil can deviate from the quantity of refrigerant and air conditioning refrigeration oil in other Audi A3 models and is specified in the current version of ElsaPro.

Flushing process notes

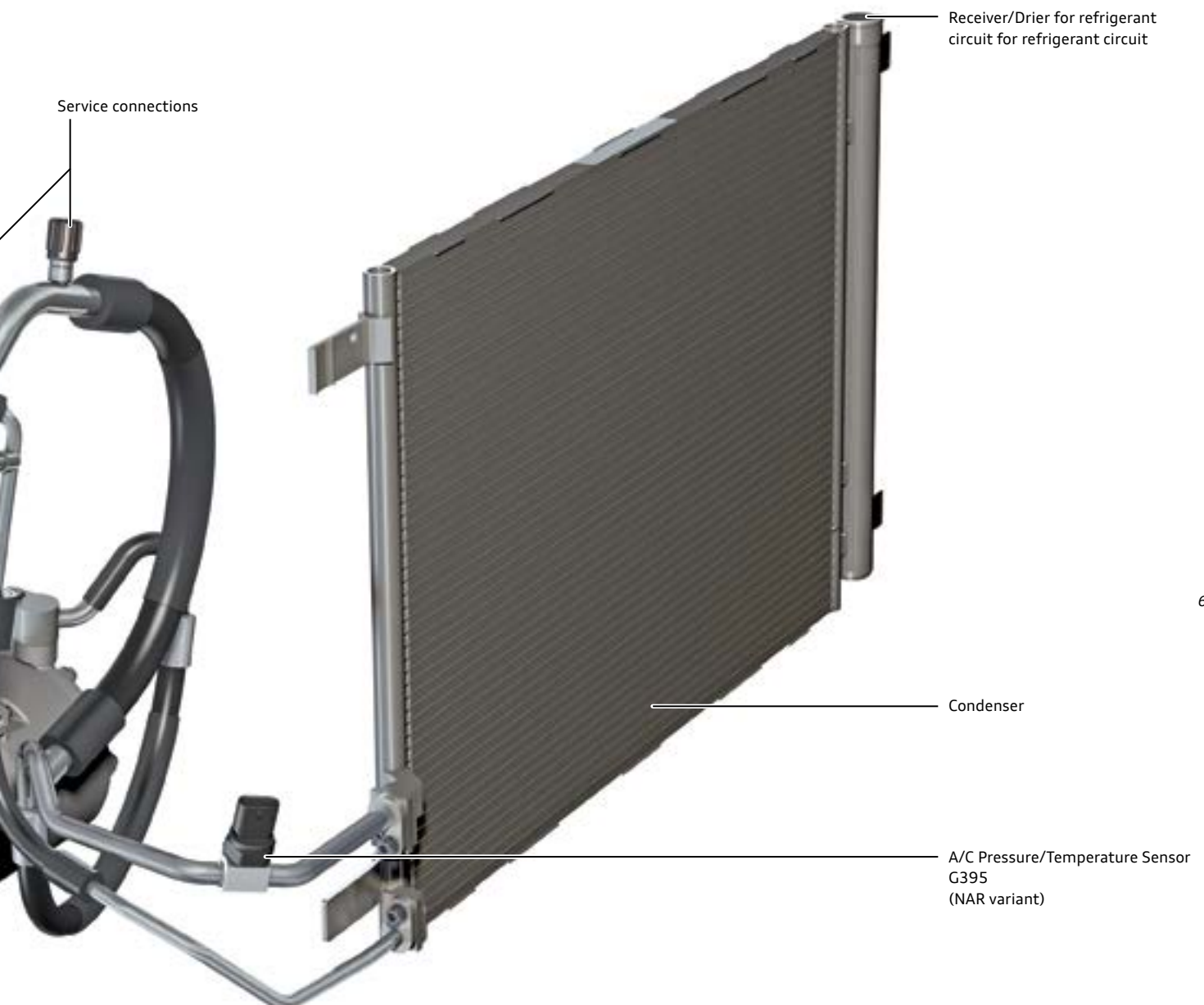
If repairs are required, it may be necessary to flush the refrigerant circuit in the Audi A3 Sportback e-tron. The following general conditions must be observed:

- ▶ It is not possible to drain the PAG oil from Electrical A/C Compressor V470. There is no drain plug. It must be flushed in order to determine the quantity of oil. The compressor is always flushed in the direction of flow.

The refrigerant circuit is flushed in two phases:

- ▶ In the first flushing cycle, the circuit is flushed together with the evaporator. A flushing adapter - VAS 6338/38 is installed in the refrigerant circuit in place of the expansion valve.
- ▶ In the second flushing cycle, the circuit is flushed together with the evaporator in the high voltage battery heat exchanger.

To ensure a constant refrigerant flow during the flushing cycle, the inserted flow restrictor (0.7 mm diameter) must be removed beforehand. In the case of a built in flow restrictor, the orifice must be drilled out to a diameter of 5.0 mm. This refrigerant line must be replaced after the flushing process is completed.



627_014

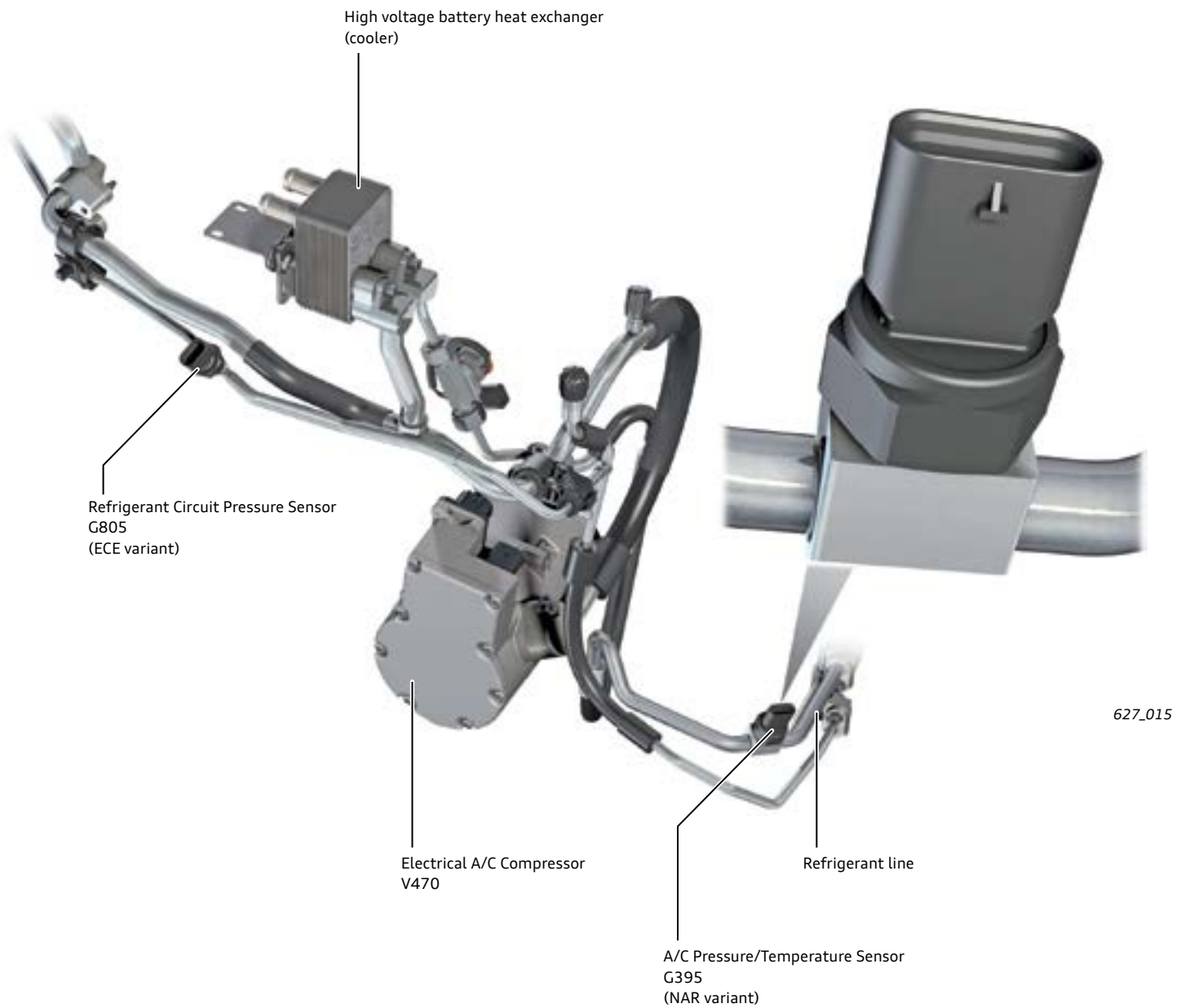


Information

Always look for the latest repair procedures in ElsaPro regarding the refrigerant flushing process.

Refrigerant pressure sensor

In vehicles for the North American market, A/C Refrigerant Pressure/Temperature Sensor G395 is installed in place of Refrigerant Circuit Pressure Sensor G805. This is to comply with OBD II compatibility requirements. It is located directly in the refrigerant flow. The refrigerant system must be evacuated before the sensor can be removed.



627_015

Stationary HVAC

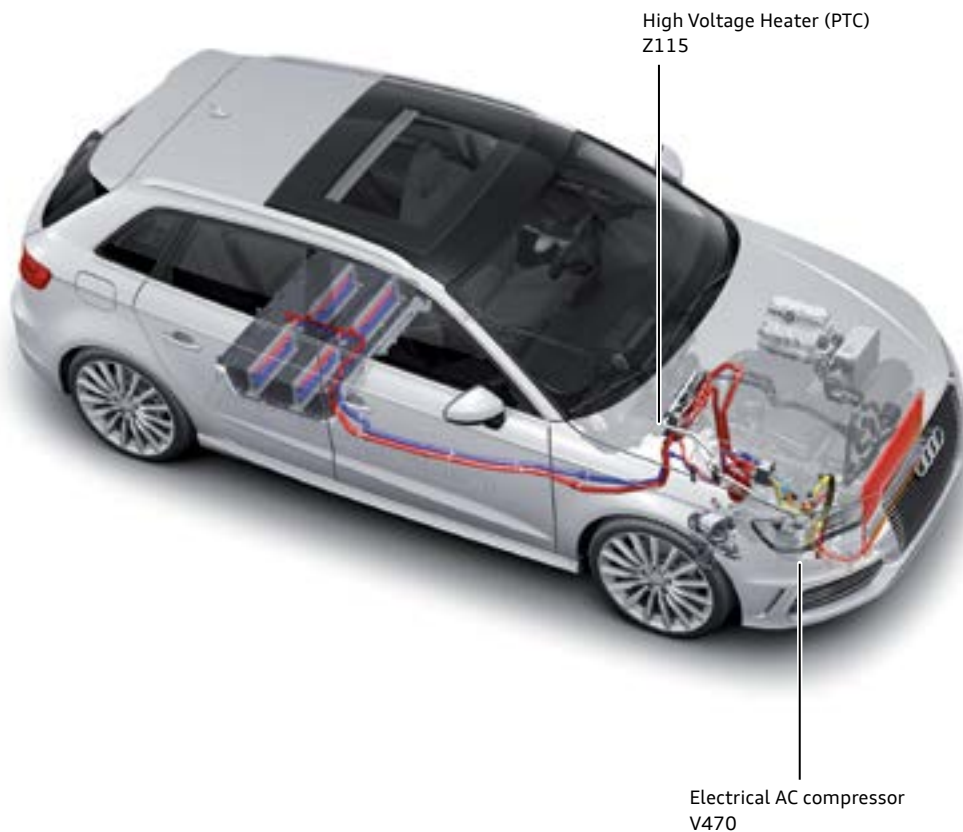
On the Audi A3 Sportback e-tron, the stationary HVAC can be selected via the MMI or using a smartphone app.

The following vehicle components can be used for stationary HVAC:

- ▶ Electrical AC compressor V470.
- ▶ High Voltage heater (PTC) Z115.

Conditions for operation of the stationary HVAC system

- ▶ The stationary HVAC system can be programmed and started by the MMI or using the smartphone app.
- ▶ The stationary HVAC system has the capacity to cool the vehicle using the Electrical A/C Compressor V470 at high temperatures.
- ▶ Stationary HVAC is only possible if Hybrid Battery Unit AX1 is sufficiently charged and if there is enough fuel in the fuel tank.
- ▶ The stationary HVAC also has the ability to warm the vehicle using the high voltage heater (PTC) Z115.



Infotainment

The 2016 A3 Sportback e-tron is equipped with the Modular Infotainment Platform (MIB).

The A3 Sportback e-tron also has Control Module for Emergency Call Module and Communication Unit J949. The module (also referred to as the Online Connectivity Unit [OCU]) facilitates communication between the customer and the vehicle when it is parked. It operates separately from Audi connect services.

Overview of versions

The Audi A3 Sportback e-tron is available with 2 versions of the information/entertainment system. It comes with the MMI radio as standard. The technical designation for this is MIB Standard. MMI Navigation plus is optional. This technical designation for this is MIB High.

The table on the following page shows the key standard and optional equipment features.



627_092

MMI Navigation plus with Audi connect



Reference

For more information about the information/entertainment system of the Audi A3, refer to [eSelf Study Program 990143 "The 2015 Audi A3 Introduction"](#).

For further information about the Modular Information/Entertainment System, refer to [eSelf Study Program 970143 "The 2015 Audi A3 Modular Infotainment Platform \(MIB\)"](#).

MMI Radio**MMI Navigation plus with Audi connect****Standard equipment**

5.8" TFT colour monitor with a resolution of 400 x 240 pixels

7.0" TFT colour monitor with 800 x 480 pixel resolution

3D hard drive navigation system

MMI touch

AM/FM radio with phase diversity

AM/FM radio with phase diversity and background tuner

Car menu

Car menu

CD drive (MP3, WMA, AAC)

DVD drive (audio/video, MP3, AAC, WMA, MPEG4)

1 SD card reader (SDHX up to 32 GB)

2 SD card reader (SDHX up to 32 GB)

approx. 11 GB for jukebox

Audi music interface

Audi Sound System

Audi sound system

Bluetooth interface with speech dialogue system and audio streaming

Bluetooth interface with speech dialogue system and audio streaming

Premium interactive voice control system

Premium interactive voice control system

Audi connect e-tron services

Audi connect e-tron services

Sirius

Sirius

Optional equipment

Audi music interface

Bang & Olufsen Sound System

Standard on Prestige, optional on Premium Plus

Audi connect

The term Audi connect embraces applications and developments which allow media to be used in the vehicle and to be connected to the outside world.

Audi connect e-tron services

Audi has developed special connect services for the e-tron. They allow specific information to be retrieved by smartphone and web portal as well as individual functions to be controlled by a smartphone. These services are available as standard in the Audi A3 Sportback e-tron and have to be activated by the customer.

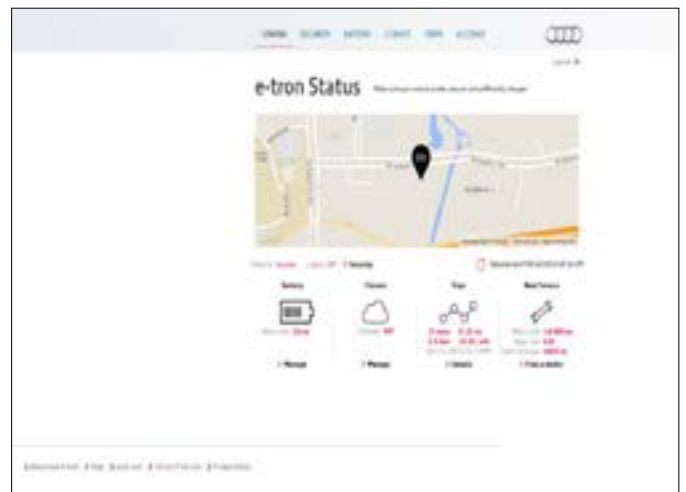
This information can be retrieved via a smartphone app and the A3 e-tron website @ www.etronelectrified.com. Data on vehicle status can be retrieved. This includes current state of charge, remaining electrical range and vehicle location. Information on recent trips, such as average electrical consumption, is also available.

The charging cycle and the air conditioning system can be started immediately by the app or after a specified time has elapsed (using a customizable departure timer), allowing the user to ensure that the vehicle is charged up and optimally pre-conditioned before driving. The combination of charging cycle and preconditioning enable the vehicle to retain its full electrical range. If the vehicle is ready for charging, the power required to cool or heat the passenger compartment is drawn from the wall plug without discharging the vehicle's high voltage battery.

Control Module for Emergency Call Module and Communication Unit J949 acts as the interface between the vehicle and the smartphone or e-tron platform.



627_087



627_086a

Audi connect

Other Audi connect services can be used if the vehicle is equipped with Audi MMI Navigation plus and Audi connect.



Audi connect

627_088

Display elements for driving in hybrid mode

The Audi A3 Sportback e-tron uses the following components to indicate that it is running in hybrid mode:

- ▶ Power meter instead of a tachometer.
- ▶ Special display in the instrument cluster.
- ▶ Animated display on MMI screen.
- ▶ High voltage battery charge indicator instead of coolant temperature display.

Displays in power meter

The power meter displays various vehicle operating states and the power output or charging capacity of the hybrid system during the trip.



627_048

European instrument cluster shown in illustration

Key:

- | | |
|--|---|
| <p>1 Vehicle ready "Hybrid Ready", "Terminal 15 on" and "Enable terminal 50 on" depending on the enabling conditions</p> <p>2 Electric driving (engine starting is possible) or hybrid driving</p> <p>3 Threshold for EV mode</p> <p>4 Economical driving (partial throttle range)</p> <p>5 Full throttle range</p> <p>6 Internal combustion engine 100%</p> | <p>7 Electric drive motor provides assistance in addition to maximum engine torque (boost)</p> <p>8 Fuel gauge</p> <p>9 Charge level of high voltage battery</p> <p>10 Terminal 15 off or terminal 15 on and terminal 50 off</p> <p>11 Hydraulic braking in addition to electrical braking</p> <p>12 Energy recovery by recuperation (under braking and acceleration)</p> |
|--|---|

Displays in the instrument cluster

The driver can see the energy flow within the high voltage system.

Status of the hybrid system

EV mode is activated.



(European instrument cluster shown in illustration) 627_061

The messages displayed in the dash panel insert and/or MMI display can be used for this purpose.

Charging cycle display

Information on range of high voltage battery charge and charging duration.



(European instrument cluster shown in illustration) 627_062

Information on the hybrid system

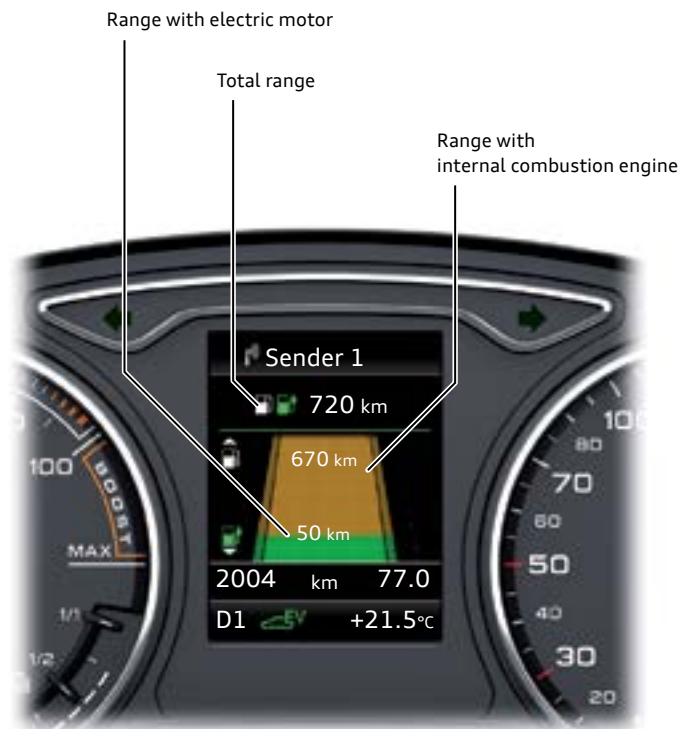
A system malfunction has occurred and the driver is prompted to take the vehicle in for servicing.



(European instrument cluster shown in illustration) 627_063

Range display

The range of the electric motor and the internal combustion engine are displayed.



(European instrument cluster shown in illustration) 627_049

Displays on the MMI screen

Energy flow display

The energy flow is indicated to the driver on the screen.



627_050a

e-tron statistics

The driver can call up the e-tron statistics on the display.

"Emission-free:"

- ▶ distance covered with zero emissions (electric + coasting + recuperation)

"Fuel type:"

- ▶ distance covered with the internal combustion engine

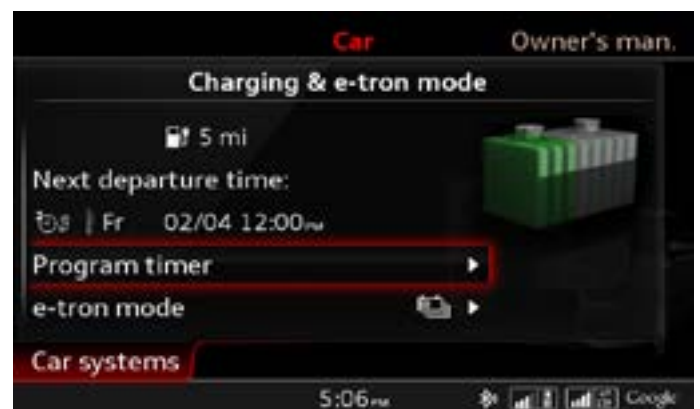
Statistics can be displayed for actual trip and total distance covered. The current display is dependent on the onboard computer.



627_064a

Charging and e-tron mode

The driver can view the settings.



627_065b

Service

Service interval overview for North American region

Service recommendations can be viewed through the MMI.

- ▶ Oil change service.
- ▶ Mileage based service events.
- ▶ Time based service events.

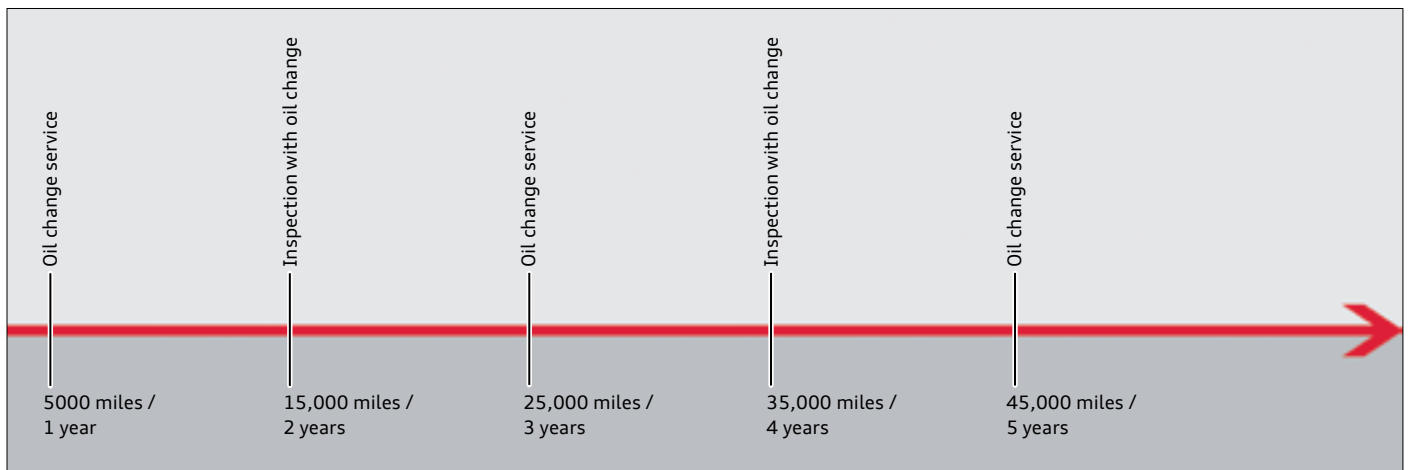


Overview of maintenance intervals for vehicles in the USA

The Audi A3 Sportback e-tron is generally subject to fixed inspection and maintenance intervals in the US market.

The value for the next inspection is 15,000 miles / 730 days for new vehicles. The next inspection after this is done together with the oil change at 20,000 miles / 730 days.

The value indicated for the next oil change is 5,000 miles / 365 days for new vehicles. The next oil change after this is set at 10,000 miles / 365 days.



627_018

Frequently Asked Questions (FAQs)

Extreme care should be taken when working on hybrid vehicles. You must always follow relevant regulations and guidelines. This information will help you recognize hazards, enabling you to respond promptly and correctly in the event of an accident.

Q: Can the 2016 Audi A3 Sportback e-tron be washed in an automatic car wash?

A: Yes, the 2016 Audi A3 Sportback e-tron can be washed in an automatic car wash without any special restrictions.

Q: Can you perform an engine wash on the 2016 Audi A3 Sportback e-tron?

A: You can perform an engine wash on the 2016 Audi A3 Sportback e-tron as long as you observe accepted environmental rules. If using a high pressure sprayer, do not aim it directly at high voltage components.

Q: What should I do if the vehicle needs to be towed?

A: The vehicle should be transported by flat bed towing. If this is not possible, it must be flat towed (front or rear axles must not be raised) and a towing speed of 31 mph (50 km/h) must not be exceeded.

Q: Can the 2016 Audi A3 Sportback e-tron be driven without a high voltage battery?

A: Any malfunction in the high voltage battery will trigger defined error mechanisms in the system. In the event of a more serious defect, the high voltage system will usually shut down. If this happens, the vehicle can only be driven until the 12V battery is discharged.

Q: What do I need to know about raising the vehicle on a car lift, wheel alignment platform, or brake test platform?

A: There are no special instructions for the 2016 Audi A3 Sportback e-tron that differ from the standard Audi Q5. Important: if the ignition is switched ON, the combustion engine may start.

Q: Does the customer require special training for the 2016 Audi A3 Sportback e-tron?

A: The customer does not need any special training. However, the information in the owner's manual specific to hybrid technology should be noted.

Q: What service work can be done by the customer?

A: All non-high voltage system service work can be done by the customer, as with any other Audi vehicle. However, work on the high voltage system should only be done by a trained high voltage technician at an authorized service center in accordance with Audi guidelines.

Q: What additional tasks should be performed as part of PDI?

A: No additional preparations are needed for high voltage components during the PDI of the 2016 Audi A3 Sportback e-tron. In transport mode, the electric motor is used solely as a generator, which means that electric driving, boost, start-stop, and recuperation are not possible. In this mode, the high voltage battery is continually charged as long as the combustion engine is running.

Q: What needs to be kept in mind when the 2016 Audi A3 Sportback e-tron is parked or stored?

A: Please refer to the standard checklist for vehicles in stock and in storage. This list describes what activities need to be carried out and when.

Q: What should be done in the event of an accident?

A: First, either someone in the car or a rescue worker should switch OFF the ignition. This process is the same as in any Audi vehicle. The high voltage system in the 2016 Audi A3 Sportback e-tron is automatically shut down when the belt tensioners or airbags are activated. There is no need for emergency responders to isolate it. Details are provided in a separate manual for emergency services.

Q: What type of voltage and current are there in the high voltage system of the 2016 Audi A3 Sportback e-tron?

A: When the high voltage system is active, direct current (DC) voltage flows through the electric A/C compressor, high voltage battery, and power electronics. The electric motor operates with alternating current (AC) voltage. An extra capacitor is fitted in the power electronics to serve as a power reserve. This capacitor is discharged when the ignition is switched OFF.

Q: What levels of voltage and currents are dangerous?

A: Alternating voltage of 25V or above and direct voltage of 60V or above are dangerous. Maximum contact voltage must not exceed 50V for alternating current (AC) voltage or 120V for direct current (DC) voltage. A current of approximately 5mA or more can be recognized by the human body, with a current of approximately 10mA or more representing a serious safety hazard.

Q: What are the effects of alternating current (AC) and direct current (DC) if a person comes in direct bodily contact with these currents?

A: Alternating current (AC): Direct contact with this current will add a harmful disruptive electrical current to the human body that can trigger involuntary vibrations in the muscles and heart. The lower the frequency, the more dangerous the voltage. Ventricular fibrillation (heartbeat alteration and/or heart stoppage) can result. Without prompt first aid, this can prove fatal. Direct current (DC): Direct contact with this current can break down (liquefy) body tissues through electrolytic dissolution, resulting in tissue poisoning. This damage will only be noticeable several days after the DC direct contact, and if left untreated, can be fatal.

Q: What are the effects and after effects of electrical accidents?

A: Shock effect: Risk of injury from uncontrolled movements and loss of balance.

Thermal effect: Burns and carbonizations at the entry and exit points of the current, as well as internal burns. Resulting stress to the kidneys may be fatal.

Chemical effect: Blood and cell fluids are broken down by electrolysis. The result is serious poisoning that becomes noticeable after several days

Effect on muscles: Muscle contractions and impairment of controlling brain functions. Consequences may include loss of movement, contraction of the lung muscles (breathing stops), and arrhythmia (ventricular fibrillation, heart stops pumping).

Q: What should I do if a person is touching and/ or is in direct contact with electrical voltage?

A: It is important to follow these instructions:

1. Consider your own safety first.
2. Do not touch someone who is in direct contact with electrical voltage.
3. If possible, de-energize the electrical system. Immediately switch OFF the vehicle's ignition or unplug the service connector for the high voltage system.
4. Separate the person or electrical conductor from the power source with a non-conductive object (for example, a wooden plank or broom handle).

Q: What first aid should be given following an electrical accident?

A: If the person is verbally unresponsive:

1. Check pulse and breathing.
2. Call 911 or arrange for someone else to make the call without delay.
3. Perform artificial respiration and CPR until EMS arrives.
4. If it appears that the person has stopped breathing or their heart is in distress, use an automated external defibrillator (AED) to quickly diagnose and treat them. AEDs are simple to use, with their proper use taught in first aid and CPR classes.

The AED will only supply a shock to the patient if it detects an abnormal or no heartbeat, and can return the patient to a normal heartbeat. Even when the AED is successful, the patient should still be treated by a first responder team.

If the person is verbally responsive:

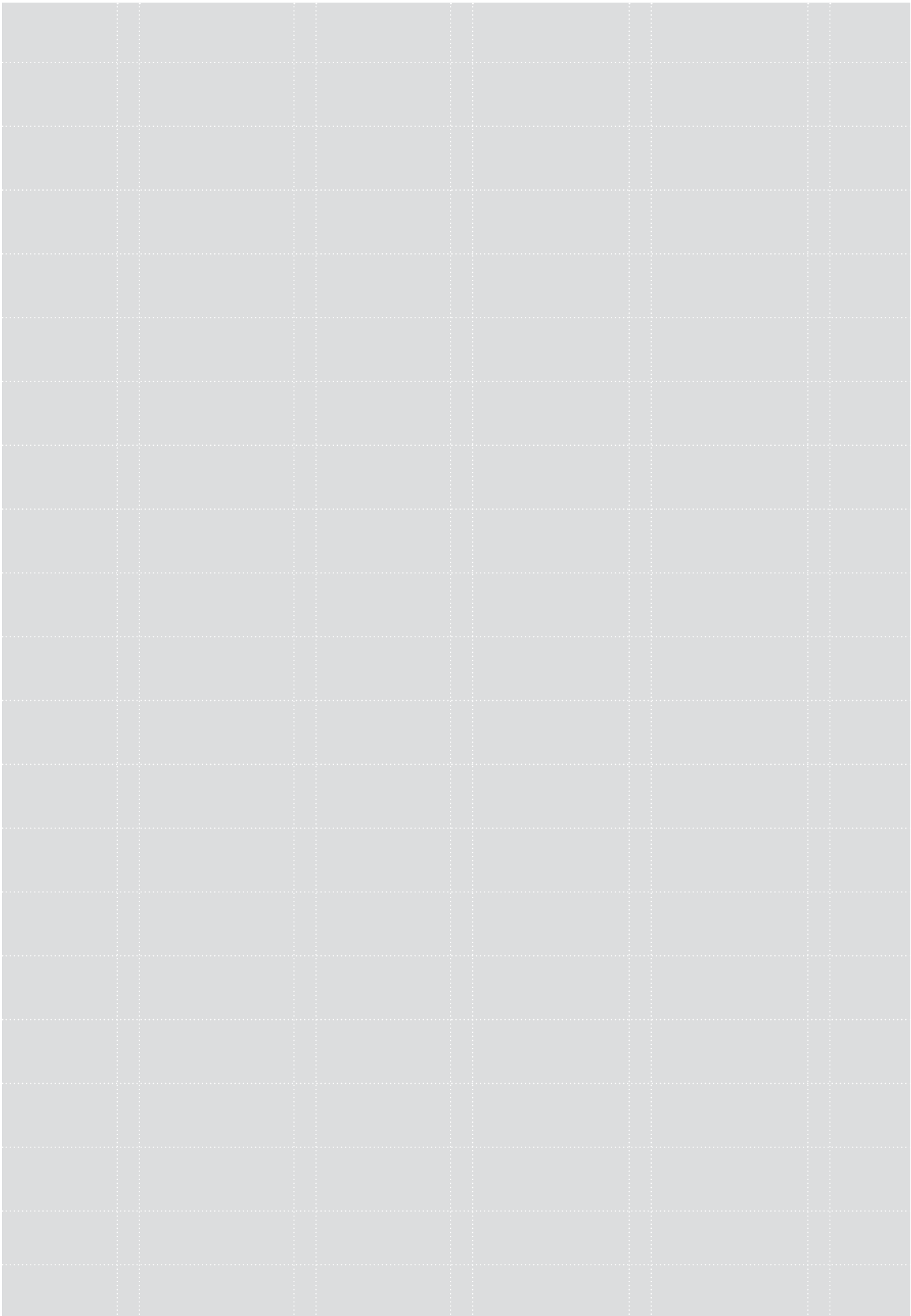
1. Cool any burns and cover with a sterile lintfree dressing.
2. The person must be examined by a doctor to help prevent after effects.

Q: What should I do in the event of an accident involving batteries or battery contents?

A: It is important to follow these instructions:

1. If skin contact occurs, rinse well with water.
2. In the case of gas inhalation, move the person to fresh air.
3. If eye contact occurs, rinse with plenty of water (for at least 10 minutes).
4. If battery contents are swallowed, the person should drink plenty of water, but not so much that vomiting is induced.
5. Seek medical treatment.

Notes



Special tools and workshop equipment

Special tools

Locking cap T40262



627_067

Adaptor for workhop crane T10542



627_068

Workshop equipment

Hybrid warning labels



Lightning flash VAS 6649

627_069



Switch VAS 6650A

627_070

Warning label for high voltage batteries



VAS 6786

627_081

High voltage testing module VAS 6558A



627_071

High voltage test adaptor VAS 6558/9-6



627_072

High voltage test adaptor for charging socket VAS 6558/10-1 (Europe)



627_075

USB adaptor for e-tron charging system



627_076

High voltage test adaptor VAS 6558/9-5



627_073

High voltage test adaptor VAS 6558/9



627_074

High voltage test adaptor VAS 6558/15



627_077

High voltage diagnostics box VAS 5581



627_078

Test adaptor VAS 6606/10



627_079

Assembly platform support for engine bracket VAS 6131/16-4



627_080

Other workshop equipment is as follows:

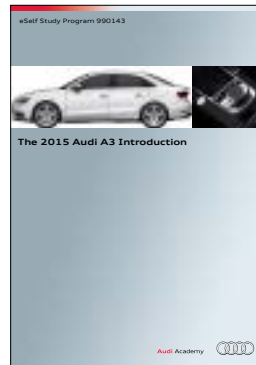
- ▶ AC flushing adaptor, high pressure VAS 6338/40.
- ▶ AC flushing adaptor, low pressure VAS 6338/41.

Self-study programs

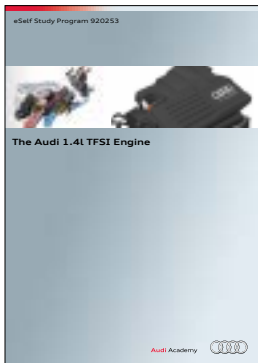
For more information please refer to the following Self-study programs.



[SSP 990123](#)
[Audi Q5 Hybrid quattro](#)



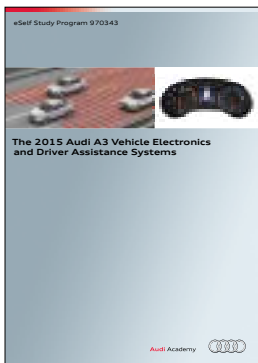
[SSP 990143](#)
[The 2015 Audi A3 Introduction](#)



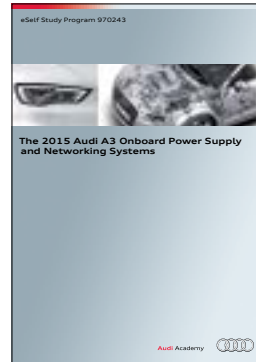
[SSP 920253](#)
[The Audi 1.4L TFSI Engine](#)



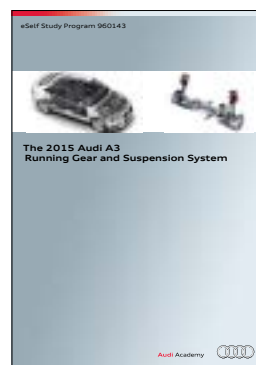
[SSP 970143](#)
[Modular Infotainment Platform \(MIB\)](#)



[SSP 970343](#)
[The 2015 Audi A3 Vehicle Electronics and Driver Assistance Systems](#)



[SSP 970243](#)
[The 2015 Audi A3 Onboard Power Supply and Networking Systems](#)



[SSP 960143](#)
[The 2015 Audi A3 Running Gear and Suspension System](#)

Knowledge assessment

An On-Line Knowledge Assessment (exam) is Available for this eSelf-Study Program.

The Knowledge Assessment is required for Certification credit.

You can find this Knowledge Assessment at:

www.accessaudi.com

From the accessaudi.com Homepage:

- ▶ Click on the “ACADEMY” tab
- ▶ Click on the “Academy site” link
- ▶ Click on the Course Catalog Search and select “970253 - The 2016 Audi Sportback e-tron”

Please submit any questions or inquiries via the Academy CRC Online Support Form which is located under the “Support” tab or the “Contact Us” tab of the Academy CRC.

Thank you for reading this eSelf-Study Program and taking the assessment.

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Audi of America, LLC
2200 Ferdinand Porsche Drive
Herndon, VA 20171